THE CITY OF Waterloo

Asset Management Plan

2024

Executive Summary

The City of Waterloo (City), like most cities, is responsible for providing a significant number of services, including infrastructure needs, and has limited financial resources to maintain them. The City owns infrastructure that is valued at almost $4 billion and is comprised of a variety of complex asset groups. These assets support the City's ability to provide a wide range of services to the community, such as sports field programming, the active transportation network, municipal enforcement, day camps, and swimming lessons. These services are supported by a wide range of infrastructure assets enabling a quality of life enjoyed by stakeholders. An important aspect of offering services is the installation and treatment (i.e. maintenance, rehabilitation, and replacement) of the infrastructure that is required to provide these services. The City has supported community growth by building the infrastructure needed to offer these services.

Developing and sustaining public infrastructure is a complex and challenging task requiring continuous improvement and monitoring. This Asset Management Plan (AMP) is the City of Waterloo's (City) third comprehensive AMP and will assist with data-driven decision-making for the City's assets. The AMP includes the consideration of installation, maintenance, rehabilitation, and replacement of the infrastructure that is the backbone of the community. This document has been developed to meet Phase 1 through Phase 3 of **Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure** (O. Reg. 588/17).

The City's AMP has been developed using currently available data for asset inventory, performance, and deterioration rates along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. All this information is captured within the City's custom-built Waterloo Decision Support System (Waterloo DSS) and allows for illustration of how planned renewal expenditures affect the performance of the assets over the next 25 years.

The Waterloo DSS has forecasting capabilities that allow staff to project the performance of City assets over a 25-year timeframe. The analysis is completed using the current year asset inventory, performance, and deterioration trends, and planned funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, as well as any unspent rehabilitation and replacement funding from in-process projects, approved in prior budget cycles. The analysis excludes proposed infrastructure funding incorporated in the staff-tabled 2024-2026 budget for Council's approval on February 12, 2024, or the financial impacts of reaching Council's ambitious new goal for the corporation to achieve net zero emissions by 2050. Using this "status quo" approach, it is estimated that over the next 25 years, the performance of City assets will decline. Specifically, it is projected that the proportion of tax-base funded assets exhibiting a poor or very poor performance profile will increase from 34% to 76%. Enterprise-funded assets are also projected to decline over the 25-year timeframe, changing from 25% of assets with a poor or very poor performance profile to almost 50%.

In summary, the 2024 AMP is fully compliant with Phase 1 through Phase 3 of O. Reg. 588/17 and the information demonstrates that the City is continuing to manage its assets in a responsible manner.

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Land Acknowledgement

In the spirit of truth-seeking, respect, and reconciliation, we recognize that many of our staff and our community are settlers who benefit from the lands cared for by the Indigenous Peoples from the very beginning. Waterloo is situated on the land traditionally cared for by the Haudenosaunee, Anishnaabe and Chonoton People. We acknowledge the enduring presence and deep traditional knowledge and philosophies of the Indigenous People with whom we share this land today. Acknowledgment of the traditional lands of Indigenous Peoples is only a starting point in the City's journey toward reconciliation.

One of the core goals of the 2024 AMP is to ensure the City has sufficient information and understanding to make sustainable decisions regarding the long-term and cumulative consequences of managing public infrastructure. A concept introduced through the Corporate Climate Action Plan (CorCap) was the idea of borrowing the definition of the Seventh Generation Principle from the Great Law of the Haudenosaunee Confederacy: In every deliberation, we must consider the impact of our decisions on the next seven generations A generation is approximately 20-30 years.

Today, the City of Waterloo is virtually unrecognizable from the small Germanic farming town built around a Mennonite Grist Mill. It plays host to one of the largest tech sectors in Canada, three world-class post-secondary institutions, and a booming insurance sector.

It is important to recognize that the echoes of decisions made all those generations ago continue to influence the City, and our assets and services. We have no idea what the future will look like in seven generations, but we do know that the decisions we make today will continue to have long-term impacts. We must make the best decisions possible based on the information and knowledge we have today.

Staff Acknowledgement

Asset management is a collaborative and iterative activity, and our collective success is a result of everyone's participation, from operational staff through to Council. The Asset Management team would like to acknowledge staff efforts from across the City of Waterloo. This includes subject matter experts for the 17 asset classes included in this plan, the Asset Management Working Group, and the Asset Management Steering Committee for all the time, effort and support they put forth to help accumulate the data and develop the findings of this Asset Management Plan. We are also thankful to City Council for their continued support for the City's asset management practices.

City of Waterloo Council (2023-2026)

Mayor Dorothy McCabe

Councillor Sandra Hanmer (Ward 1)

Councillor Royce Bodaly (Ward 2)

Councillor Hans Roach (Ward 3)

Councillor Diane Freeman (Ward 4)

Councillor Jen Vasic (Ward 5)

Councillor Mary Lou Roe (Ward 6)

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Disclaimer

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Glossary

Asset

Any item, thing or entity that has potential or actual value to the organization.

Asset Management (AM)

A coordinated set of activities to realize optimal value from the organization's assets throughout its lifecycle.

Asset Management Plan (AMP)

Document that details how groups of assets are to be managed over their lifespan. The plan describes the characteristics and conditions of infrastructure assets, the levels of service expected from them, planned operational and maintenance actions to help assets provide the expected level of service, and financing strategies to try to implement the planned actions. This document also addresses the impacts and maintenance risks associated with owning the asset.

Asset Management System

A set of processes and procedures which govern how Asset Management is to be implemented.

Betterment

Costs incurred for enhancements to the service potential of a capital asset such as:

- an increase in the previously assessed physical output or service capacity;
- a reduction in associated operating costs;
- an extension of the estimated useful life; or
- an improvement in the quality of output of the asset.

Capital Infrastructure Reinvestment Reserve Fund (CIRRF)

A specified envelope of funding to address existing infrastructure needs for performance improvement and sustainability.

ClimateActionWR

A collaboration between local organizations, community members, and all eight (including the Region of Waterloo) regional municipalities focused on implementing the TransformWR greenhouse gas mitigation strategy on a community level.

Core Assets

Any municipal infrastructure asset that is a,

(a) water asset that relates to the collection, production, treatment, storage, supply or distribution of water,

(b) wastewater asset that relates to the collection, transmission, treatment or disposal of wastewater, including any wastewater asset that from time to time

manages stormwater,

(c) stormwater management asset that relates to the collection, transmission, treatment, retention, infiltration, control or disposal of stormwater,

(d) road, or

(e) bridge or culvert;[1]

Corporate Climate Action Plan (CorCAP)

A plan to reduce the City of Waterloo's corporate greenhouse gas emissions and integrate sustainability and climate change into all applicable City processes and procedures.

Corporate Climate Change Adaptation Plan (CCCAP)

A plan to adapt the City of Waterloo's corporate assets, operations, and services to the impacts of climate change.

Environmental Sustainability Team (EST)

An internal cross divisional team comprised of staff from across the organization with representatives from Strategic Initiatives, Planning, Fleet and Procurement, Asset Management, Finance, and Facility Design and Management Services, Executive Director of Operational Modernization, the Commissioner of Integrated Planning and Public Works, and the CAO. The team was established in February 2021 to streamline sustainability and climate change initiatives across the City. As part of their mandate, the EST also helps to guide the creation and implementation of appropriate plans and strategies including the creation of the Corporate Climate Action Plan (CorCAP), the implementation of TransformWR, and the implementation of the Corporate Climate Change Adaptation Plan.

Level of Service (LOS)

Defined service for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability, and cost. In the case of public infrastructure, the Level of Service is directly and wholly proportional to its performance.

Lifecycle

The various phases of an asset's life that are identified as: planning and construction,operations, maintenance, and disposal. Each phase has its own opportunities, risks, impacts and costs.

Linear Asset

Assets that are connected in a linear network creating one larger asset or asset class and are not specific to a single location. Examples include roads and water distribution pipes.

Long Term Financial Plan (LTFP)

A framework of tools for Councils and staff to consider future financial challenges and opportunities through financial forecasting scenarios, analysis, and financial policies and to devise strategies to achieve financial sustainability.

1 Province of Ontario, O. Reg 588/17: Asset Management Planning for Municipal Infrastructure

Non-Core Assets

Any municipal infrastructure asset that is not considered to be a core asset under Ontario Regulation 588/17.

Master Plans (MP)

Long-range plans which integrate infrastructure requirements for existing and future land use with environmental assessment planning principles. These plans examine an infrastructure system(s) or group of related projects in order to outline a framework for planning for subsequent projects and/or developments. At a minimum, Master Plans address Phases 1 and 2 of the Municipal Class EA process.[2]

Modern Equivalent

Refers to replacing existing assets with a like-for-similar equivalent or accepted alternative that serves the same purpose and function, using the same sources of energy, delivery methods to meet current design needs, follow Council direction and influence climate change related capital project implementation such as reaching GHG emission targets and reach strategic plan or master plan goals.

Official Plan (OP)

The City's legislated long-term plan for land use and development for 2012 through 2031.

Optimization

The City will apply a consistent application of practices based on the needs of the asset classes, interventions, and operations to achieve sustainability and provide optimum value for the public through the:

- Implementation of a lifecycle approach to managing infrastructure;
- Inclusion of changes that consider and address impacts on equity deserving groups;
- Evaluation of risk related to environmental, social, and external impacts; and,
- Incorporation of sustainability criteria into infrastructure projects to help ensure a responsible balance between cost, performance, people-centered outcomes, and risk.

People-Centered Outcomes

A focus on the well-being, needs, and experiences of individuals or communities emphasizing people at the center of decision-making and considering their perspectives, interests, and welfare.

Rehabilitation

Work completed to restore an asset to a better condition.

Renew / Renewal

Improvement activity or treatment of existing infrastructure assets.

Replacement

Undertaken when an asset has reached the end of its life and/or is no longer providing acceptable service.

2 Municipal Engineers Association (MEA), Municipal Class Environmental Assessment (MEA), **Appendix 4 – Master Plans**

Single Source of Truth (SSOT)

A data architecture practice that consolidates information from various subsystems within an organization into a singular, centralized location. The SSOT ensures data consistency, accuracy, and efficiency by avoiding duplication and establishing a common reference point for data retrieval and maintenance.

Strategic Plan

A strategic plan serves as a guiding document that includes the organization's vision, mission, guiding principles and strategic priorities aligned with each new term of Council. It is based on engagement with Council, City staff and the community and allows us to align our resources on targeted outcomes and helps to unify the City and the community on common goals.

Subject Matter Expert (SME)

Individuals who accumulate knowledge over time in particular fields or topics and have a level of understanding that is broader than just common knowledge. SMEs are an important resource in maintaining or improving municipal processes or assets.

Sustainable

Achieving or retaining an optimum compromise between performance, costs, and risk of the asset life, while avoiding adverse long-term impacts to the organization from short-term decisions.

TransformWR

Waterloo Region's community-wide strategy to mitigate greenhouse gas emissions from transportation, space heating, waste, and food systems. The City of Waterloo is a partner in implementing this strategy.

Treatment

Any infrastructure improvement activity, including but not limited to maintenance, betterment, renewal, rehabilitation, reconstruction, replacement, and lifecycle management activity.

Waterloo Decision Support System (Waterloo DSS)

The City's customized analytical decision support system is designed to aid asset project prioritization and provide analysis of asset class strategies.

1 Introduction

The City of Waterloo (City) is a lower-tier, mid-sized city in southwestern Ontario, with a population of just over 151,000, including about 31,000 students. Home to three leading post-secondary institutions, it attracts some of the best and brightest talent from Canada and around the world. Located in the heart of Canada's Technology Triangle, the City is one of the fastest-growing regions in Canada in terms of both population and employment. Many people have chosen Waterloo as a place to live, work, play and learn as it offers a harmonious balance of open space, amenities, employment opportunities and a vibrant uptown. Residents expect innovation when managing operations and almost $4 billion in assets with the City's limited financial resources.

To assist the current and growing community, the City is responsible for providing a significant number of services such as recreational facilities (indoor and outdoor), roads, the active transportation network (sidewalks, trails, and trail links), cemetery services, day camps, senior services, stormwater management, water distribution, and sanitary collection.

The City has supported growth throughout the past few decades by building the infrastructure needed to offer services to the community. The need to maintain assets such as water pipes, sanitary pumping stations, roads, facilities, parks, and trees is not new, but prioritizing which assets are replaced and when is a challenge. The City has been actively practicing a form of asset management for several decades. Computerized maintenance management systems assisted in the development of maintenance quality standards for infrastructure components, such as the method and frequency of inspections.

To further assist the City's asset management (AM) activities, an ambitious program completed in 2016 established an integrated approach to activating corporate asset management throughout the organization. The program engaged 50+ staff from across the City who are directly involved, or support infrastructure-related decision-making for the various asset classes and Council. A key element was the development of the City's custom-built decision support analytical system. The system, the Waterloo Decision Support System (Waterloo DSS) demonstrates the relationship between planned activities and asset performance for all the asset classes identified in **Table 1**. The data for the assets is managed by subject matter experts (SME) within the City.

TABLE 1: CITY OF WATERLOO ASSET CLASSES

TAX BASE ASSET CLASSES	ENTERPRISE ASSET CLASSES
Transportation*^	Sanitary Collection*
Facilities	Water Distribution*
Parks	Stormwater*
Forestry	Cemeteries
Fire	Parking
Information Technology	Fleet
Bridges and Culverts*	
Public Art	
Land	
Library Equipment and Furniture	
Uptown Business Improvement Area	

*Asset groups considered to be core assets under Ontario Regulation 588/17

^Transportation asset group includes roads, sidewalks, streetlights, traffic and wayfinding signs, retaining walls and trails and trail links

SMEs are responsible for updating inventory records for City-owned assets including location, performance, and when and how to treat them. These updates are incorporated into the Waterloo DSS and inform the Asset Management Plan (AMP). For cemeteries, parking, water distribution, sanitary and stormwater collection systems, the City has established enterprise or utility models that promote sustainability. Funds are collected through user fees for each of these areas and dedicated for system operation, maintenance, rehabilitation, and replacement.

The City's AM approach enables infrastructure assets to be managed within the direction provided through the City's 2023 to 2026 Strategic Plan. The strategic plan includes the Community Vision: "A leader in sustainability and a future-ready community for all." For this vision to be realized, the services and programs provided by City-owned and operated assets are essential and must be in place to provide a solid foundation upon which to build and achieve these higher order goals.

The AMP supports the strategic plan by working to make these services dependable and sustainable. The City's Official Plan (OP) also works to facilitate the community vision by establishing a land use policy focusing on intensification for the City. The AMP supports the vision by identifying the maintenance, rehabilitation, and replacement needs for City assets. The Region of Waterloo as the upper-tier municipality also provides essential services, such as regional transportation, water treatment and supply, and wastewater (sanitary) treatment; the rehabilitation or replacement needs of those assets are addressed in its AMP.

This AMP is a tool for Council and staff to help the City manage its infrastructure, valued at almost $4 billion. The AMP provides information about the assets the City owns as well as the projected performance of infrastructure assets based on currently available inventory data, deterioration rates and the funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

1.1 Overview of the City of Waterloo's Asset Management Plan

Like most cities, the City of Waterloo (City) is responsible for providing a significant number of services including infrastructure needs and has limited financial resources to maintain them. The City owns infrastructure that is valued at almost $4 billion and is comprised of a variety of complex asset groups. These assets support the City's ability to provide a wide range of services to the community, such as sports field programming, the active transportation network, municipal enforcement, day camps, and swimming lessons. An important aspect of offering services is the installation and treatment (i.e. maintenance, rehabilitation, and replacement) of the infrastructure that is required to provide these services. The City has supported community growth by building the infrastructure needed to offer these services.

Developing and sustaining public infrastructure is a complex and challenging task requiring continuous improvement and monitoring. The 2024 Asset Management Plan (AMP) is the outcome of the City of Waterloo's asset management (AM) program, which identifies the City's infrastructure value, rehabilitation needs and funding requirements by using the following principles:

- Understanding that good AM practices are fundamental to ensure that the services provided by infrastructure assets meet the expectations of the community;
- Incorporating Ontario Regulation 588/17 requirements;
- Understanding the current state of the City's infrastructure;
- Recognizing the connection between an organization's strategic (societal) objectives and spending decisions;
- Appreciating the processes needed to bring a clear line of sight from organizational objectives to day-to-day activities;
- Working with subject matter experts (SME) to determine asset lifecycle management activities (i.e. how infrastructure is operated, maintained, rehabilitated, and replaced);
- Determining the lifecycle costing required to provide service levels that meet community expectations; and
- Establishing a financial strategy for the rehabilitation and/or replacement of the City's infrastructure assets.

Since the approval of the City's first comprehensive AMP in 2016, staff throughout the organization have been improving the maturity (quantity, quality, and completeness) of infrastructure data. The information gathered through these efforts has been used to inform the City's custom Waterloo Decision Support System (Waterloo DSS) to help prioritize infrastructure projects and calculate the annual infrastructure-funding gap.

It is important to note that the information included in this plan is based on the best available information in 2023 for asset inventory, performance, deterioration trends, estimated replacement, and treatment costs. It also incorporates the capital funding within the 2023 Approved Capital Budget and 2024-2032 Capital Forecast and previously approved unspent rehabilitation and replacement funding from prior budgets. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

Advanced AM practice is an equal partnership between subject matter experts (SMEs) (operation and maintenance staff), engineering, finance, senior management, and elected officials. The ability of the City's staff to bridge gaps of knowledge between positions is key to the City's success. The City's success has resulted in momentum in advancing municipal AM principles and practices. It is recommended the City continue building on top of existing processes and build on this momentum. This will enhance the City's decision-making effectiveness for selecting the most appropriate infrastructure improvements and their timing.

It is important to consider asset needs to reduce the risk of infrastructure underperformance that will negatively affect the quality of life for the community. Examples include the impacts of unplanned road closures, increased water main breaks, or unexpected indoor/outdoor recreational facility closures. Where applicable, preventative maintenance or minor repairs is a cost-effective approach that can delay more costly rehabilitation or replacement requirements.

Based on the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, the City's infrastructure funding is anticipated to result in an estimated 42% increase in tax-funded assets exhibiting poor and very poor performance over the next 25 years and an estimated 25% increase in enterprise-funded assets. It is anticipated that this level of asset performance will be unacceptable to most interested parties. The most efficient and effective way to manage the City's infrastructure is through skillful investments that includes treating assets at the right time and for the right cost. **Table 2** provides an overview of the City of Waterloo's infrastructure and displays the average annual funding gap. Land is excluded from **Table 2** as land is unique. Uptown Business Improvement Area (BIA) assets are also excluded from **Table 2** as the Uptown BIA is responsible for funding its assets.

TABLE 2: CITY OF WATERLOO INFRASTRUCTURE OVERVIEW (000'S)

ASSET GROUPS	REPLACEMENT VALUE *(millions)*	CURRENT PERFORMANCE	PROJECTED PERFORMANCE IN 25 YEARS	ANNUAL FUNDING NEEDED TO MEET TARGET PERFORMANCE	AVERAGE ANNUAL FUNDING	2023 AVERAGE ANNUAL FUNDING GAP
Transportation*	1,122	Fair	Very Poor	30,000	7,000	23,000
Facilities	541	Poor	Very Poor	16,700	5,200	11,500
Parks	69	Poor	Very Poor	4,200	1,800	2,400
Information Technology	19	Fair	Fair	1,200	1,200	0
Fire	15	Fair	Good	1,300	1,200	100
Bridges and Culverts^	28	Good	Very Poor	400	250	150
Forestry	113	Excellent	Excellent	500	100	400
Library	6	Good	Good	300	300	0
Public Art	2	Good	Good	15	5	10
Total Tax Base				**$ 54,615**	**$ 17,055**	**$ 37,560**
Stormwater	761	Fair	Poor	17,200	4,300	12,900
Water Distribution	635	Good	Fair	3,800	3,800	0
Sanitary Collection	526	Good	Fair	6,000	3,000	3,000
Fleet and Shop Equipment	28	Poor	Fair	3,000	2,800	200
Bridges and Culverts^	28	Good	Very Poor	400	250	150
Parking	38	Fair	Poor	600	200	400
Cemeteries	15	Fair	Poor	200	100	100
Total Enterprise				**$ 31,200**	**$ 14,450**	**$ 16,750**
Total City of Waterloo Funding Gap	**$ 3,946**			**$ 85,815**	**$ 31,505**	**$ 54,310**

* The transportation class is comprised of roads, sidewalks, streetlights, retaining walls, trails and trail links, traffic and wayfinding signs.

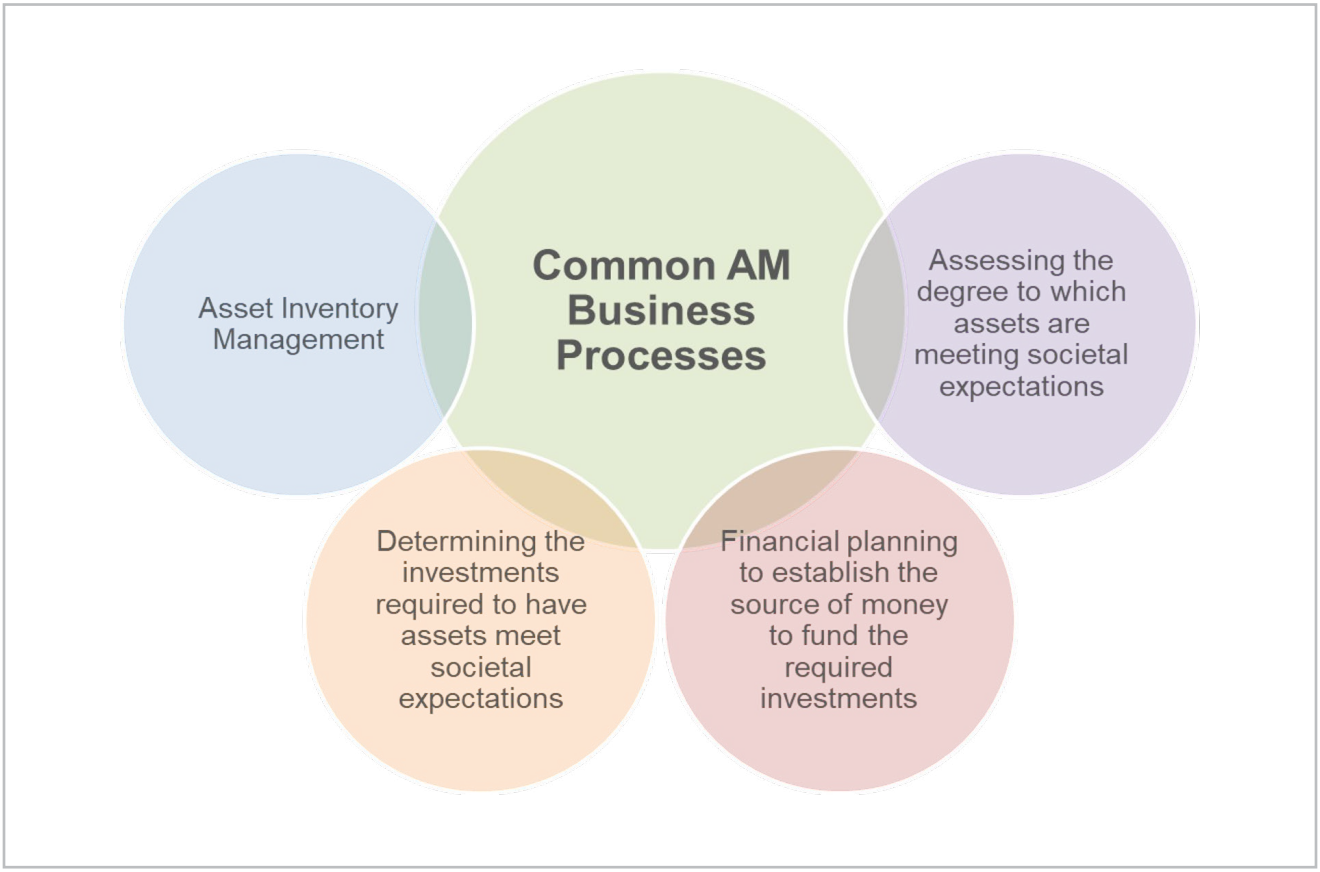
^ The bridges and culverts asset class is jointly owned by the tax base and by stormwater resulting in the infrastructure funding gap being split 50/50.

* Note: Some numbers may not add due to rounding.

1.2 What is Asset Management?

AM is a cross-disciplinary expertise involving a series of integrated business processes used to inform infrastructure-related decisions, as indicated in **Figure 1**. This includes the process of making the best possible decisions regarding the building, operating, maintaining, renewing, and disposing of infrastructure assets. The overall objective is to maximize value, manage risk, and provide satisfactory levels of service to the public in a sustainable manner.

FIGURE 1: COMMON AM BUSINESS PROCESSES



AM is an activity that everyone practices with their limited financial resources. Everyone makes choices about their priorities for spending their money. For example, if a community member owns a vehicle, they are making decisions on whether it is worth repairing, buying a new one, buying an EV vehicle or exploring other modes of transportation such as transit and cycling. The vehicle owner knows they need to do maintenance on their vehicle, such as oil changes, or it will need to be replaced earlier than desired. Other factors include deciding whether the vehicle is too old, too small, or too big. Vehicle owners know their needs and make decisions on the best way to spend money to support their needs.

AM considers the same information and makes recommendations for the hundreds of vehicles and related equipment and an even larger number of customers these vehicles provide service to. AM takes that thought process applied to a personal vehicle and applies that to thousands of assets while considering the needs of thousands of customers in the City of Waterloo.

1.3 Contributions to Asset Management

The City has been an active participant in the AM community by sharing knowledge, experience, and leading practices. These opportunities have occurred through conference presentations, partnerships, and previous research initiatives with the University of Waterloo. In addition, the City has won three awards since 2016 for our AM initiatives.

Awards presented to the City of Waterloo:

- Canadian Network of Asset Managers Tereo Award
  - 2016 – The City won 1st place for the Decision Support System
  - 2018 – The City won 3rd place for the Cross Asset Prioritization Tool
- Federation of Canadian Municipalities – Gas Tax Award
  - 2017 – The City won for the Asset Management System

The City has shared our knowledge and experiences through the following organizations:

- Canadian Network of Asset Managers (CNAM)
  - Including staff participating as a Board of Director member and/or volunteering on CNAM committees
- Asset Management Ontario (AMONTario)
- PEMAC Asset Management Association of Canada
  - Including staff participating as a volunteer on cross-sector committees
- Centre for Advancement of Trenchless Technologies (CATT)
- Municipal Engineers Association (MEA)
- National Conference on Transportation Asset Management (USA)
- National Water and Wastewater Benchmarking Initiative (NWWBI)
- Transportation Association of Canada
- University of Waterloo
- Municipalities to share our experiences in the development and operationalization of the Waterloo DSS

In addition, the City of Waterloo is profiled in two **AMONTario case studies**. AMONTario is an organization that knows that municipalities are on the front lines of climate change. The City knows that much of our public infrastructure was designed to perform in conditions that are no longer the reality due to the changing impacts of climate change.

Case Study 1 is entitled "An Integrated Approach to Climate Change and Asset Management at the City of Waterloo". It highlights the importance of an approach to climate change that moves away from applying a "climate lens" to one that focuses on integrating climate change into everything we do. The City's Asset Management team is recognized as a significant collaborator as part of this approach to use asset management to advance our climate change goals.

Case Study 7 is entitled "The City of Waterloo's collaborative approach to prioritization". The case study celebrates Waterloo's approach to project prioritization made possible through the award-winning Waterloo Decision Support System (Waterloo DSS). This case study also highlights the unique way all asset categories have access to funding through the rehabilitation funding allocation process which allows all services to receive equitable funding. Furthermore, the importance of collaboration both internally and externally was also profiled, which was critical to the success of the Waterloo DSS.

1.4 Goals and Objectives

The 2024 AMP outlines how the City's assets are being managed to meet the principles identified in the **Strategic Asset Management Policy**. The intent is to ensure the City has sufficient information and understanding about the long-term and cumulative consequences of managing public infrastructure. This includes the City's approach to planning, designing, constructing, acquiring, operating, maintaining, renewing, replacing, and disposing of infrastructure assets. This is achieved by ensuring that the systems and processes are in place to facilitate the optimal choices to deliver sustainable infrastructure-related services. This will be accomplished by combining data-driven and evidence-based analysis with professional management in a structured method to evaluate assets, to:

- Facilitate effective decision-making and risk assessments;
- Meet legislative and regulatory requirements;
- Establish levels of service and adjust as necessary to accommodate asset efficiency, effectiveness, sustainability, growth, and people-centered outcomes;
- Mitigate and adapt to impacts of climate change; and
- Work towards assets with accessibility elements meeting legislative requirements.

The City has a social, environmental, and fiduciary responsibility to develop a structured method of effectively managing assets on behalf of the public. Significant portions of the City's assets have long lifecycles and are in service for decades. Through the establishment of good AM practices staff will critically evaluate the impact of the assets lifecycle to ensure assets provide optimum value for the public in a fiscally responsible manner.

The City's assets support many services and require significant resources during their lifecycle to continue to deliver those services effectively. Evaluating assets to find the optimal value will allow the City to realize efficiencies and support the long-term sustainability of both the services and the assets. The Province of Ontario has identified 14 guiding principles to be incorporated in municipal asset management plans and they can be found in section 3 of the **Infrastructure for Jobs and Prosperity Act, 2015**. The City's objectives are:

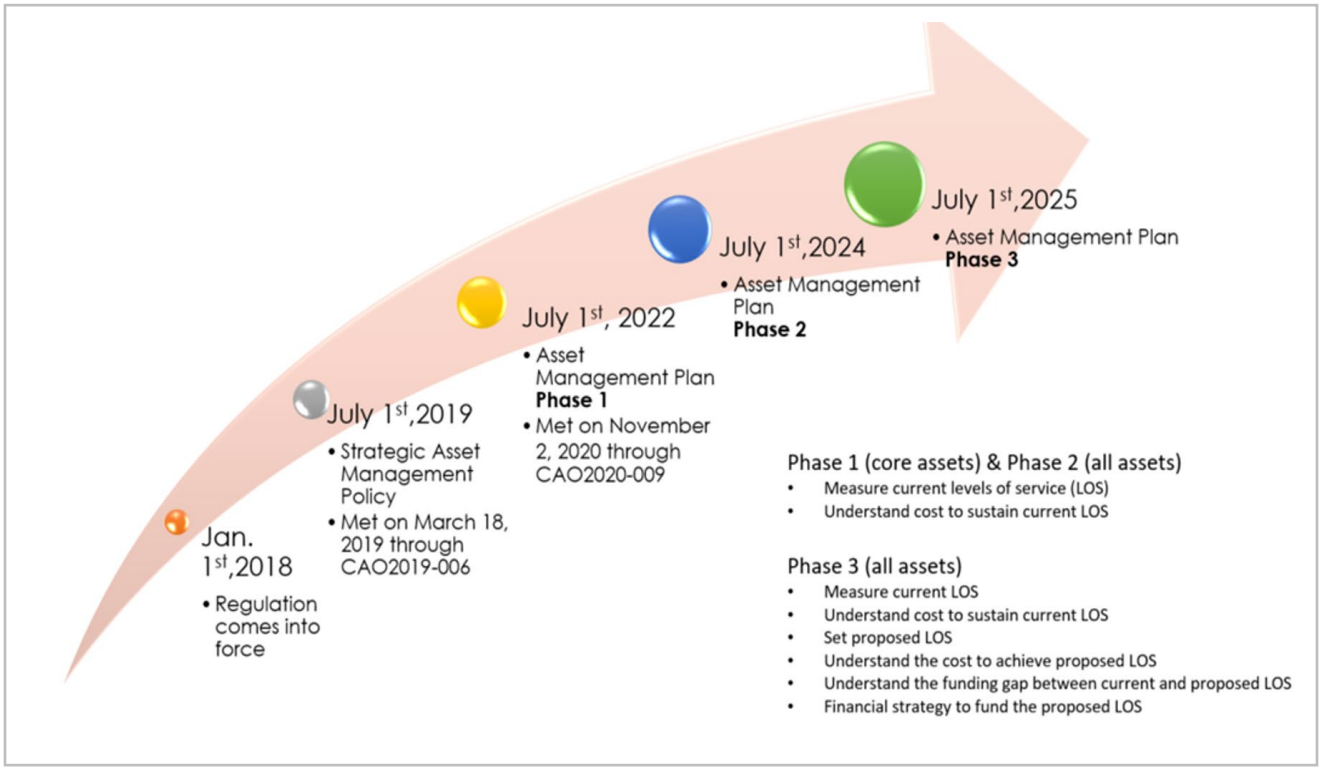
1. Infrastructure Legislation (O. Reg 588/17).
2. Develop and implement a lifecycle approach to the management of City assets.
3. Attain optimum value by critically evaluating cost, risk, and performance.
4. Develop sustainable asset management practices.
5. Clearly communicate service level information and expectations.
6. Achieve a state of continuous improvement.
7. Expand upon or create evidence-based decision-making practices.

1.5 Legislated Requirements

The Province of Ontario recognized the importance of AM planning when **Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure** (O. Reg. 588/17) was enacted on January 1, 2018. O. Reg 588/17, which provides guidelines and expectations for the application of AM principles for municipalities. A significant number of municipal assets are intended to last for decades or beyond to continually support the community and it is imperative that the lifecycle costing, performance, risks, and impacts of asset ownership are considered.

Lifecycle phases consist of demand requirements, design, construction/acquisition, operating, maintenance, and disposal. Consideration of these factors will benefit both current and future generations utilizing the City's assets. O. Reg. 588/17 identifies numerous items that municipalities must consider and include in future AMPs although the requirements have a 7-year phased-in timeline, as summarized in **Figure 2**. The original phase-in period was 6 years, however, due to the pandemic the Province extended the timeline by one year.

FIGURE 2: ONTARIO REGULATION 588/17 REQUIREMENT PHASE-IN REVISED TIMELINE



Strategic Asset Management Policy

One of the requirements of O. Reg. 588/17 is the requirement that all municipalities prepare Council-endorsed Strategic AM Policies by July 1, 2019, and shall review and, if necessary, update it at least every five years.

The City of Waterloo met that requirement through Council's approval of CORP2019-006 Asset Management Policy Update on March 18, 2019. While O. Reg 588/17 identifies a review requirement every 5 years, the current plan is to review the policy one year in advance of an AMP update resulting in a 4-year AM policy review cycle to match the 4-year AMP cycle.

AM staff reviewed the Strategic AM policy and CORP2023-039 Strategic Asset Management Policy Update was approved by Council on November 20, 2023. The policy updates included a best practice review of other municipalities as well as incorporating people-centered outcome considerations and updated internal governance components as recommended by the City's Reconciliation, Equity, Accessibility, Diversity, and Inclusion (READI) team.

Phase 1 Requirements: Core Assets

Phase 1 is specific to assets identified as 'core assets', comprised of roads, bridges, stormwater, water and sanitary. This phase was completed through Council's approval of CAO2020-009 on November 2, 2020, and includes an inventory of core assets, current levels of service and the cost to maintain levels of services.

Phase 2 Requirements: Non-Core Assets

Phase 2 requirements are an expansion of Phase 1 by requiring the same information for non-core assets. This includes the development of an inventory, level of service metrics, and the cost to maintain the current levels of service of all the non-core assets included in the Municipal Financial Information Return (FIR). Examples of these assets include Facilities, Fire, and Parks. This phase is required to be approved by Council on or before July 1, 2024, and approval of this AMP will meet this requirement.

Phase 3 Requirements

Due to the efforts undertaken since 2015, the City has been able to comply with Phase 3 requirements. The intent of Phase 3 is to increase the amount of information within municipal AMPs with Council endorsement received on or before July 1, 2025. The additional information incorporated includes the proposed level of service (the target scenarios), lifecycle management and a financial strategy.

Due to the work undertaken over the past 9 years, the City of Waterloo has been able to comply with O. Reg. 588/17 requirements from Phase 1 through Phase 3.

1.6 Development and Approval Methodology

O. Reg. 588/17 identifies the requirement that AM policies be reviewed and updated as necessary at least once every 5 years. The City's **Strategic Asset Management Policy** was updated in 2023 to meet legislated requirements and received final approval by Council on November 20, 2023.

In addition, AMPs are required to be updated at least once every 5 years. As part of the update process, AMPs require endorsement by the Executive Lead for AM and passing of resolution by Council. The City's AMPs will be developed internally by the AM section with the assistance of internal resources: subject matter experts and the AM Working Group. These internal resources assist in making improvements to both the data and processes for AM, such as the creation of processes to allow for data updates to occur organically from source data systems (e.g. GIS). This work is supported by the AM Steering Committee through their advice, feedback, and support to the AM section.

In a continued effort to keep Council and the public informed of efforts to sustain existing and planned infrastructure, the City has developed AM report cards (RC). The RCs are intended to be a brief snapshot of the performance and needs of the City's infrastructure and are updated on an annual basis. **Table 3** identifies the planned frequency of updates for AM-related documents.

TABLE 3: FREQUENCY OF AM UPDATES

DOCUMENT	FREQUENCY
Strategic Asset Management Policy	Every 4 years
Asset Management Plan	Every 4 years
Report Cards	Annually
Annual Review of AM Progress	Annually*

*The City's first annual review report card will be tabled before Council in Q2 2025.

Council has been receiving annual updates through our annual Report Card and Asset Management Update reports that started in 2020. Asset Management staff will consider annual reporting requirements required by O. Reg 588/17 to ensure that the City complies with the legislation. Links to background information and reports have been included throughout this document. Both the Strategic Asset Management Policy and AMP are posted on the City's website. Copies will be provided to the public, if requested.

2 Asset Management Strategy

An AM strategy is the set of planned actions that will enable the assets to provide the desired levels of service sustainably, while managing risk, at the lowest lifecycle cost. This section of the AMP summarizes planned actions, including non-infrastructure solutions, maintenance activities, renewal/rehabilitation activities, replacement/reconstruction activities, disposal activities, expansion activities, procurement methods and risk.

The combination of lifecycle analysis, financial sustainability, and risk analysis will be the driver in the recommendations and design of community development or redevelopment that requires new assets, or existing asset enhancements, to take place. Parties involved in the development and maintenance of the AM plans will reference the direction established in the community plan as well as the methods, assumptions, and data used in its development. The aim of cross-referencing these plans is to help ensure that development and redevelopment occur within the municipality's means through an understanding of current and future demands for assets.

AM planning itself will not occur in isolation from other municipal goals, plans, and policies. An integrated approach will be followed to successfully develop practical AMPs that align with the overarching accountabilities and aspirations of our community. Council, CMT, the AM Steering Committee, AM Working Group, and staff will review this policy and incorporate AM principles into everyday decisions that encompass the City's goals and objectives detailed in the:

- Strategic Plan;
- Official Plan;
- Long Term Financial Plan;
- Corporate Climate Action Plan (CorCap)
- Corporate Climate Change Adaptation Plan; and
- Various Master Plans.

2.1 Non-Infrastructure Solutions

2.1.1 Strategic Plan

The City's **2023-2026 Strategic Plan** is both a corporate and community strategic plan. Over the next four years, this plan sets out the strategic direction for the City and is intended to unite and mobilize efforts of volunteers, staff, leadership, and Council. The strategic plan includes a corporate mission, vision, guiding principles and strategic priorities. There are five strategic priorities which also contain several objectives and

actions to help the City accomplish the goals of the strategic plan. All the strategic priorities align with the goals of AM, however, Infrastructure and Transportation Systems is of noted importance given its focus on expanding and supporting infrastructure and transportation systems in an environmentally and fiscally sustainable manner to create resilient public infrastructure.

2.1.2 Official Plan

The **Official Plan (OP)** states that the City will be planned to include interconnected networks that support the community. The networks serve a range of functions, including facilitating the movement of people and goods, facilitating the distribution of water and collection of stormwater and sanitary or other waste, facilitating communication, accommodating social, cultural, recreational and leisure activities and supporting conservation and protection of environmental resources.

Chapter 5 of the OP is titled "Networks" and includes objectives and policies that speak to planning for the provision, maintenance, and efficient use of networks, including: Servicing and Utilities Networks; Trails and Open Space Networks; Road Network; and Rail Network. The OP provides the foundation upon which the more detailed plans are built.

2.1.3 Master Plans

Master plans are long-range documents used to guide the introduction, expansion or elimination of infrastructure assets and the services they provide. Master plans are used by the City as they provide a comprehensive approach to identifying project needs. While master plans generally have a planning horizon of 20-30 years, the documents are typically updated every 10-15 years. This is to ensure that actual changes to best practices, population density and/or servicing requirements are captured within a reasonable timeline and the long-term plans updated accordingly. In addition, an asset may no longer provide acceptable levels of service (LOS) because of its condition. Implementation and operationalization of the Waterloo DSS will facilitate the ongoing monitoring of the City's assets and their ability to provide acceptable LOS.

Examples of **master plans** utilized by the City of Waterloo include but are not limited to:

- Accessibility Plan;
- Cemetery Services Bechtel Park Master Plan:
- Corporate Climate Adaptation Plan;
- Energy Conservation and Demand Management (ECDM) Plan;
- Sanitary Master Plan;
- Stormwater Master Plan;
- Transportation Master Plan;
- Water Distribution Master Plan; and
- Waterloo Park Master Plan

2.1.4 Technology

As noted earlier, the City has extensive infrastructure assets, limited financial resources to maintain them, and no political or community desire for significant property tax increases. And like other municipalities, those infrastructure challenges are the result of decades of growth and development without a comprehensive plan to maintain things over the long term. To help make informed rehabilitation or replacement decisions, the City has been using technology for the past several decades. Examples of technology in use include, but are not limited to:

- Pavement Management Analysis (PMA)
  - This system is used to gather, store, and analyze data about the City's streets and help provide a strategized program for implementing preventive maintenance and rehabilitation projects Citywide.
- Work Order Management System
  - The City uses IBM Maximo to manage and maintain an array of assets through work orders. It provides staff with the ability to schedule maintenance activities to extend the lifecycle of assets. The data collected provides the opportunity to assess costs and condition, plan for budgetary needs, and reduce down time. IBM Maximo is an enterprise application used in conjunction with financial (PeopleSoft) and geographical (GIS) systems to provide an accurate representation of asset spending and location.
- Geographical Information System (GIS)
  - This system combines databases and maps to store, manage, present, and analyze corporate spatial information. Approximately 80% of municipal information has a spatial context (i.e. is tied to a location) which is inventoried within this system.
- Financial Management System
  - The City uses PeopleSoft Financials to exercise financial control and accountability. Reporting from this system is used to track costs related to the City's assets.
- Fleet Management System
  - The City employs a fleet management system, which serves as a comprehensive tool for the organization and oversight of its vehicle and equipment assets. This platform efficiently categorizes these assets and stores vital information for each unit. The system also functions as a work order program, enabling the recording of service and repair history in detail. A custom-built Microsoft Access program is used to manage equipment financial information.

2.2 Maintenance Activities

The City has created or follows established maintenance standards for many asset groups. These standards are used to guide maintenance and operations activities to ensure the assets can be relied on to provide the service for which they are intended.

Examples of AM activities for which the City has created or follows maintenance standards include:

- Tree Planting
- Spills Response
- Hydrant Replacement
- Vehicle Maintenance and Inspection Standards
- **Elevating Devices (Ontario Regulation 209/01)**
- **Operating Engineers (Ontario Regulation 219/01)**
- **Boilers and Pressure Vessels (Ontario Regulation 220/01)**
- **Sidewalk Maintenance (Ontario Regulation 239/02)**
- **Roads Winter Operation (Ontario Regulation 239/02)**
- **Road Patrol (Ontario Regulation 239/02)**

2.3 Renewal/Rehabilitation or Replacement Activities

The City's asset groups utilize various types of performance information to inform the recommendations for treatment activities.

Examples of approaches used by the City for determining the appropriate activities to undertake are:

- Facilities:
  - Facility Design and Management Services uses facility performance information to recommend projects and, where possible, coordinate the timing for projects to align with the needs of all assets within a specific facility.
- Fleet and Equipment:
  - The Fleet and Procurement division utilizes a variety of performance data points (e.g. total kilometers driven, maintenance costs and overall unit condition) for each unit to formulate a suitable replacement strategy.
- Linear Assets:
  - Engineering Services uses performance information for all assets located within the municipal right-of-way to recommend projects that allow for funding to be allocated based on need. In some cases, all assets may benefit from replacement, while in other cases, only one asset may exhibit the need for rehabilitation.
- Parks:
  - Parks, Forestry and Cemetery Services use performance information to recommend projects and, where possible, coordinate the timing for projects to align with the needs of all assets within a park.

2.4 Disposal Activities

Disposal activities are those associated with decommissioning an asset once it has reached the end of its useful life, the technology is obsolete, when the repair costs exceed a threshold or are otherwise no longer needed by the municipality. Disposal activities are typically limited to equipment and vehicles under the Water Distribution, Facilities, Fleet, Fire, and Information Technology asset classes. Civil engineering infrastructure (e.g. roads) composes the remainder of the portfolio, and these assets are typically considered "treated" rather than disposed of as the transportation corridor asset is considered in perpetuity.

2.5 Procurement Methods

The City is committed to ensuring its procurement decisions are fair, open, transparent, and non-discriminatory. Purchases made by City staff must comply with the City's Purchasing By-law and applicable legislation. This by-law and legislation provide standard rules that govern the procurement of goods and services that reflect the best value for the City, protect the City's financial interests and encourage competitive bidding.

2.6 Risk Overview

In general, risk is any factor that could potentially mitigate the City's ability to attain its goals outlined in the Strategic Plan, Official Plan and the City's master plans that guide the services offered to the community. As noted earlier, the City's almost $4 billion in infrastructure assets support the City's ability to provide a wide range of services to the community, such as sports field programming, the active transportation network, municipal enforcement, day camps, and swimming lessons. An important aspect of offering services is the installation and treatment (i.e. maintenance, rehabilitation, and replacement) of the infrastructure required to provide these services. This includes the management of the City's infrastructure assets to ensure compliance with regulations and design standards to ensure safe and reliable assets that meet their intended service delivery requirements.

Due to the importance of municipal services, O. Reg. 588/17 includes a component requiring municipalities to identify the risks associated with lifecycle options that could be undertaken to maintain current levels of service. Risk is also used for project prioritization, which can be attributed to the risk the project represents if it does not move forward. For capital projects, a good quantification of risk can be developed by considering two factors associated with the asset: the probability of underperformance (or failure) and the consequence of underperformance (or failure). For example, a malfunctioning air conditioning system at a small recreation centre may lead to program and service disruptions for a small number of residents and clients (low consequence). However, the same situation at a large recreation center may lead to program and service disruptions for a large number of residents and clients (high consequence).

Risk is applied by SMEs on an asset class-by-asset class basis and in some situations, case-by-case basis to minimize the impacts to service delivery. For example, large-diameter sanitary sewer mains are triggered for replacement earlier in their lifespan compared to smaller-diameter mains. The likelihood of underperformance would most likely be very similar, however, the consequence of underperformance is greater. This underperformance will impact a larger number of residents and potentially cause larger environmental impacts.

Another risk component is the set of revenue assumptions included in the Long-Term Financial Plan (LTFP) and in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. Both documents include revenue assumptions (e.g. inflation adjustments, user rate increases, Canada Community Building transfer grant revenue and development charge revenue collection) that allow projects to be planned for. If these revenue assumptions do not come to fruition, different choices may be required. Examples include postponing or cancelling projects, reducing service levels, or reallocating funding from one project to another to advance higher-priority projects.

SMEs use the Waterloo DSS to communicate various risks by working with the AM team to adjust levers (e.g. treatment trigger). For example, the treatment trigger for key building envelope (e.g. roofing), mechanical and electrical infrastructure was adjusted to reflect a treatment trigger when these assets have approximately 10-20% of their life remaining. This provides staff with a line of sight that the assets need to be replaced and provides an opportunity for a proactive replacement plan. This results in the ability to incorporate the replacement within the capital budget, work with the operational or programming areas on the optimal timeline to complete the work and improve the reliability of the building envelope, and mechanical and electrical assets. This assists in prioritizing a range of items from large lump sum budget allocations and capital projects to maintenance activities.

3 State of Waterloo's Infrastructure

The City has been practicing the principles of AM for several decades and has been undertaking inspection, maintenance, and replacement activities for many of its assets. The aggregated information provided in this section represents all asset groups and is managed by the City's dedicated staff. Table 4 identifies the asset groups managed by SMEs within the City.

TABLE 4: CITY-OWED ASSET CLASSES

TAX BASE ASSET CLASSES	ENTERPRISE ASSET CLASSES
Transportation*^	Sanitary Collection*
Facilities	Water Distribution*
Parks	Stormwater*
Forestry	Cemeteries
Fire	Parking
Information Technology	Fleet
Bridges and Culverts*	
Public Art	
Land	
Library Equipment and Furniture	

* The transportation asset class is comprised of roads, sidewalks, trails, trail links, traffic and wayfinding signs, bike racks, retaining walls, and standard streetlights.

^ The bridges and culverts asset class is jointly owned by the tax base and by stormwater enterprise

In addition to the City-owned asset classes, the City is responsible for reporting on assets consolidated into our financial statements, which include Waterloo Public Library (WPL) and Uptown Business Improvement Area (BIA) assets. BIA assets have been excluded from Table 4 as the Uptown BIA funds the purchase and replacement of their assets.

3.1 Maturity of Asset Information

Developing and sustaining public infrastructure is a complex and challenging task requiring continuous improvement and monitoring. Staff evaluates the performance of our assets using asset data, a combination of historical knowledge, age, observed conditions, measurements, and analytical techniques. Updates to asset data and deterioration trends will influence the projected performance of an asset. This information's quality, completeness, and availability (also known as "asset data maturity") is continuously improving. The higher the data maturity is, the greater confidence we have in our future performance projections for the asset.

The type, form, and timeliness of available data can vary, affecting asset data quality and long-term asset performance projections. The process of evaluating data maturity started in 2016 and the process was updated in 2022 when, with the assistance of SMEs, a data maturity questionnaire was developed. The questionnaire allows SMEs and AM staff to collaboratively assess asset data consistently and quantify the quality and availability of asset data called data maturity. Data maturity is a crucial aspect of AM. It can help improve operational efficiency, greater asset utilization, and help with capital planning and better projections.

There are a couple of important items to note for the data maturity rating:

- The rating does not influence the capital rehabilitation and replacement funding allocated during the budget process;
- The data maturity is assigned to each asset class individually; and
- The rating is not meant to be compared from one asset class to another, it is more relevant to compare from year to year for the same asset class.

The data maturity rating is a qualitative assessment of the data and information provided and utilized by the Waterloo DSS for each asset class. The rationale behind determining a data maturity rating is intended to help staff (AM and SMEs) understand the availability, completeness, and quality of the data/information used within the Waterloo DSS. It is meant to help guide staff from AM and SMEs to know where improvements can be made to help inform future decisions via the Waterloo DSS. It also provides a baseline overview for Council and the public so that readers understand that the projected performance of an asset class may change as data improves and that the average annual infrastructure-funding gap may change. It is envisioned to be a high-level overview of how mature the data is for each asset class. The data maturity for each asset class funded by the City has been identified in **Table 5**.

TABLE 5: CITY OF WATERLOO ASSET DATA MATURITY

ASSET CLASS	PROPORTION OF TOTAL INFRASTRUCTURE IN WATERLOO BASED ON REPLACEMENT VALUE	2023 MATURITY OF ASSET INFORMATION	2022 MATURITY OF ASSET INFORMATION
Transportation*	28.4%	High	High
Stormwater	19.3%	Medium	Medium
Water Distribution	16.1%	High	High
Facilities	13.7%	Medium	Medium
Sanitary Collection	13.3%	High	High
Forestry	2.9%	Medium	High
Parks	1.7%	Low	Low
Bridges and Culverts	1.4%	Medium	Medium
Parking	1.0%	Medium	Medium
Fleet and Shop Equipment	0.7%	Medium	Low
Information Technology	0.5%	Medium	Medium
Cemeteries	0.4%	Medium	Medium
Fire	0.4%	Medium	Medium
Public Art	0.0%	High	NA
Library	0.0%	NA	NA

* The Transportation class is comprised of roads, sidewalks, trails and trail links, bike racks, traffic and wayfinding signs, retaining walls and standard streetlights.

3.2 Data Requirements

To support consistency across asset classes, AM maintains an inventory database of the key attributes for each asset. SMEs are responsible for maintaining a record of assets owned, including maintenance and renewal records. SMEs can store data in the corporate GIS or another database (e.g. VFA, TopDesk) or spreadsheets.

SMEs are also responsible for keeping their asset data in the selected source system current and sharing up-to-date data with AM at a minimum of once per year to refresh the Waterloo DSS. The updates include new or rehabilitated assets, condition, and replacement costs.

A single source of truth (SSOT) architecture stands as the preferred approach for the utilization and upkeep of corporate-wide asset data within the Waterloo DSS framework. Any alternative methods of accessing or maintaining data should be evaluated for potential conversion into an SSOT source, seamlessly integrated with systems like GIS or VFA. It is strongly advised that custodians of asset classes consider storing pertinent information within existing City systems, fostering the aggregation of similar or related assets in unified databases. This strategic approach aims to promote standardization, integration, and optimization of information management. Storing data about signs from various asset classes within the GIS system exemplifies this methodology. Where assets are required to be duplicated in subsystems (e.g. Maximo/GIS) we need to ensure that the subsystems are intelligently linked through unique identifiers or birth records, to enable a cohesive SSOT consolidation for efficient cross-system asset representation.

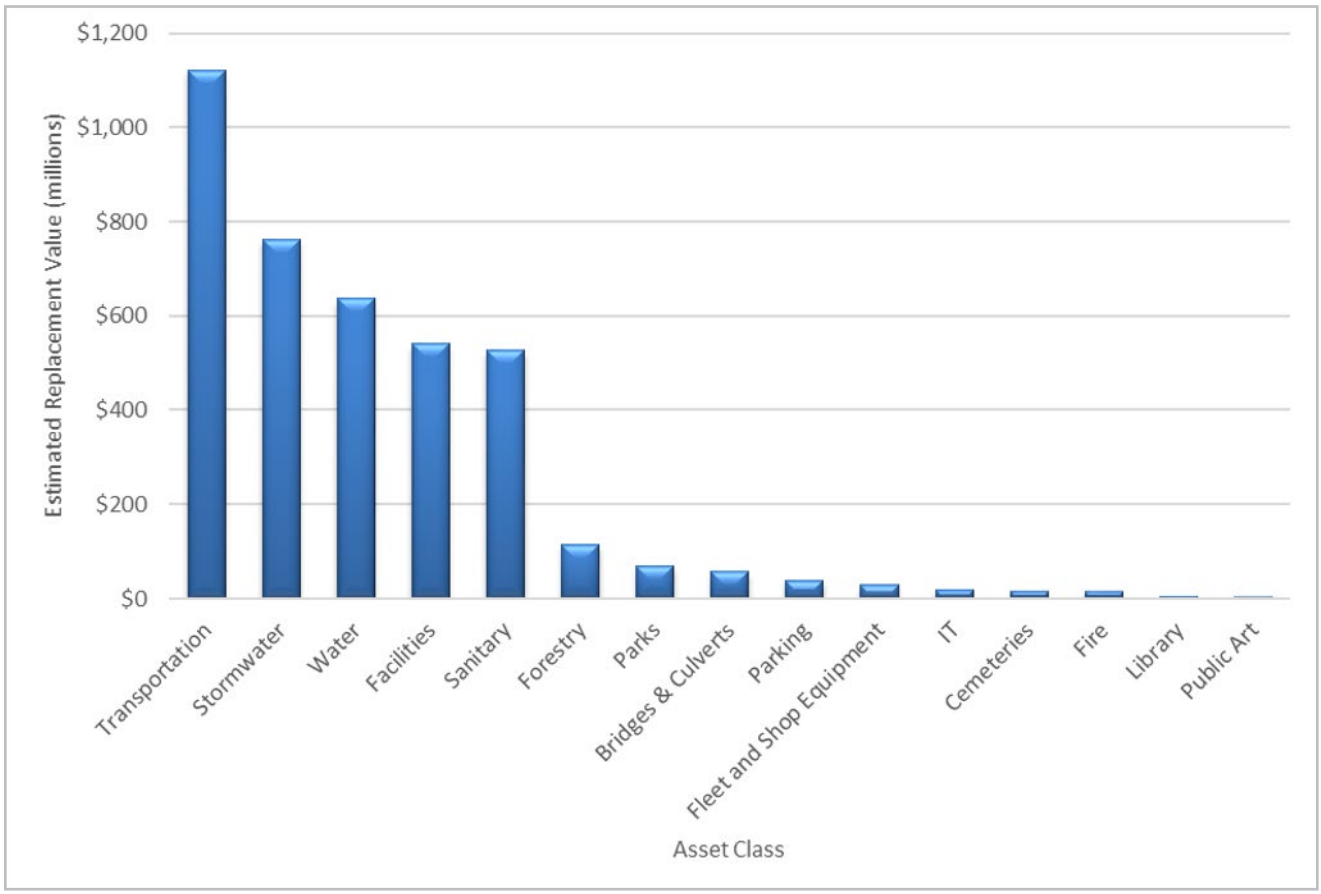
Examples of key asset attributes maintained by SMEs and AM include but are not limited to:

- Asset ID
  - A unique identification used in asset inventory databases and spreadsheets to connect sources of asset lifecycle data across all data sources.
  - Asset ID is typically assigned by the asset record source system (e.g. GIS, Fleet Access program, VFA).
  - It is considered a best practice to use a one-to-one relationship (asset IDs are the same as the identified inventory source data or native data source or SSOT instead of one-to-multiple relationships (where a new asset is assigned).
- Asset Description
  - Refers to technical description, which can include size, model, common name, materials of construction, or location. For example, the facilities asset class uses an ASTM industry standard for classifying building elements and related site work called UNIFORMAT II Elemental Classification for Building Specifications, Cost Estimating and Cost Analysis (ASTM Standard E1557). It excludes specialized process equipment related to a building's functional use but does include furnishings and equipment. The classification incorporates three hierarchical levels described as Levels 1, 2, and 3.
- Service Start Year
  - The year the asset is installed, manufactured or put in service is selected based on what impacts the asset's service life.

3.3 Assets and Their Value

AM data is based on the best available information for asset inventory, performance, deterioration trends, estimated replacement, and treatment costs. In addition to the asset information, staff have incorporated the capital funding within the 2023 Approved Capital Budget and 2024-2032 Capital Forecast and previously approved unspent rehabilitation and replacement funding from prior budgets. The analysis indicates an estimated replacement value of almost $4 billion for all City infrastructure assets. **Figure 3** displays the replacement value of the City's infrastructure, proportioned by individual asset class.

FIGURE 3: REPLACEMENT VALUE* OF THE CITY'S INFRASTRUCTURE (MILLIONS)



* Actual costs are subject to market forces at the time of the infrastructure construction or improvement activity. The values in the figure are based on current unit prices and industry standards.

3.4 Measuring Performance of Assets

Measuring performance is a complex activity, with two main factors – condition and function. Condition is often the primary factor used when considering when and how an asset should be treated although functional performance is also an important consideration. Many different factors are integrated into the decision-making processes of the experts who decide when an asset is not achieving its intended performance targets.

Examples of condition and function influences that inform the decision to determine when and how and asset is renewed (replacement or rehabilitation or maintenance) are:

- Condition: The decision to rehabilitate the surface asphalt of a road to prevent the entire road structure (e.g. base asphalt and granular base) from failing and subsequently needing full-depth reconstruction.
- Function: Types of considerations that are captured in the functional performance of assets include:
  - The size of an asset (i.e. is it too big or too small)
  - Whether the asset is functionally obsolete (e.g. outdated computer hardware)
  - Whether the asset is functioning as intended (e.g. greenhouse gas emissions from a facility are greater than an established target)

Asset Performance

The City's current approach to projecting asset performance starts with a performance measure that can be derived from available data. In most cases, this is a measure of the physical condition of the asset. As a result, in most asset classes, the physical condition is still the primary driver for deciding when assets need to be renewed.

If available, the asset class's SME provides a conditional and/or functional assessment. An asset's current condition and function can be linked to the most recent inspection report. If an inspection report is available for an asset, the standard/industry condition assessment score is first converted to a score between 0 and 1. The performance percentages on the graphs provided in subsequent sections of this AMP are derived from the normalization of subject matter expert performance indicators to a scale of 0-100% (or 0 to 1) identifies the City's approach to providing a qualitative description of the indicators. Depending on the asset class, the SME performance indicators typically include assessed or projected condition, estimated service life (ESL), or a mix of both. Examples include the Pavement Quality Index for roads, the number of pipe breaks for water distribution pipes, and assessed condition and ESL for facility components such as floor or heating-ventilation-air conditioning (HVAC) systems, respectively.

TABLE 6: QUALITATIVE DESCRIPTION OF PERFORMANCE INDICATORS

ASSET PERFORMANCE SCORE	RATING	QUALITATIVE DESCRIPTION
80-100%	Excellent	Fit for the future. The asset is well maintained, in good condition, new or recently rehabilitated.
60-79%	Good	Adequate for now. Acceptable, generally approaching mid-stage of expected service life.
40-59%	Fair	Requires attention. Signs of deterioration, some elements exhibit deficiencies.
20-39%	Poor	At risk of affecting service. Approaching the end of service life, conditions are below standard, and a large portion of the system exhibits significant deterioration.
0-19%	Very Poor	Near or beyond service life, widespread signs of advanced deterioration, some assets may be unusable. No longer providing the intended service.

If recent condition assessment information is available, this is used to represent the current performance of the asset. If a recent condition assessment is not available, there are various ways performance is calculated, such as comparing age to its expected service life. In other cases, the calculation may be tied to known defects (e.g. cracks or heaves in sidewalks) or may be calculated using a variety of factors (e.g. watermains – the number of breaks/size of pipe/location of pipe/age). When forecasting performance over 25 years, a straight-line deterioration curve based on estimated service life is used to deteriorate the performance of the asset. Some asset classes follow a unique condition curve based on professional expertise from SMEs and AM. Examples include Forestry and IT software.

3.5 Levels of Service – Expenditure Needs and Asset Performance

Using the Waterloo DSS, staff can develop scenarios to project future performance and the primary scenarios developed are budget and target scenarios. To assist in the budget and target scenario projections, staff throughout the organization work collaboratively to improve data and processes. The individual analysis at the operational and tactical levels can then be consolidated to obtain a strategic perspective on the overall suite of assets. The analyses of these "what-if" scenarios will be the key to addressing the infrastructure challenges over the coming years and can be utilized when the City's LTFP is updated with each three-year budget process or when considering the rationalization of City assets.

Using the Waterloo DSS will position the City to leverage operational level AM processes. This will help prioritize the specific assets requiring renewal activities. In addition, the Waterloo DSS will support the evaluation of alternative practices, strategies, or construction techniques that will reduce the expenditures required to achieve the target performance of the assets. This approach will enable the City (over time) to

work toward the goal of having sufficient resources to help ensure that the services provided by the City's infrastructure systems can be sustained over the long term.

The two scenarios that are included within this plan are the budget scenario (based on 2023 approved budget) and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

The Waterloo DSS analysis uses the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation, and replacement funding from prior budget cycles, for projects currently underway, has also been included. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Developing and sustaining public infrastructure is a complex and challenging task requiring continuous improvement and monitoring. Since the development and approval of the City's first comprehensive asset management plan in 2016, staff throughout the organization have been improving the data maturity (quantity, quality, and completeness). In addition, AM staff have been working with SMEs to improve the forecasting capabilities of the Waterloo DSS. This has resulted in an update to the annual infrastructure funding gap for 2023 which is estimated to be $54.4 million ($37.6 million is for tax-funded assets and $16.8 million is for enterprise-funded assets).

Since 2020, Council has had a plan to narrow the infrastructure funding gap. While the plan has been approved, the infrastructure gap may increase due to increasing construction costs, continued deterioration and the asset inventories being updated to reflect assets that were excluded (e.g. retaining walls, library assets). **Table 7** identifies the additional annual contributions needed to fund the target scenario for each asset class and will be used to inform the updates to the City's LTFP.

TABLE 7: INFRASTRUCTURE OVERVIEW (000'S)

ASSET GROUPS	REPLACEMENT VALUE *(millions)*	CURRENT PERFORMANCE	PROJECTED PERFORMANCE IN 25 YEARS	ANNUAL FUNDING NEEDED TO MEET TARGET PERFORMANCE	AVERAGE ANNUAL FUNDING	2023 AVERAGE ANNUAL FUNDING GAP
Transportation*	1,122	Fair	Very Poor	30,000	7,000	23,000
Facilities	541	Poor	Very Poor	16,700	5,200	11,500
Parks	69	Poor	Very Poor	4,200	1,800	2,400
Information Technology	19	Fair	Fair	1,200	1,200	0
Fire	15	Fair	Good	1,300	1,200	100
Bridges and Culverts^	28	Good	Very Poor	400	250	150
Forestry	113	Excellent	Excellent	500	100	400
Library	6	Good	Good	300	300	0
Public Art	2	Good	Good	15	5	10
Total Tax Base				**$ 54,615**	**$17,055**	**$ 37,560**
Stormwater	761	Fair	Poor	17,200	4,300	12,900
Water Distribution	635	Good	Fair	3,800	3,800	0
Sanitary Collection	526	Good	Fair	6,000	3,000	3,000
Fleet and Shop Equipment	28	Poor	Fair	3,000	2,800	200
Bridges and Culverts^	28	Good	Very Poor	400	250	150
Parking	38	Fair	Poor	600	200	400
Cemeteries	15	Fair	Poor	200	100	100
Total Enterprise				**$ 31,200**	**$ 14,450**	**$ 16,750**
Total City of Waterloo Funding Gap	**$ 3,946**			**$ 85,815**	**$ 31,505**	**$ 54,310**

* The transportation class is comprised of roads, sidewalks, streetlights, retaining walls, trails and trail links, traffic and wayfinding signs.

^ The bridges and culverts asset class is jointly owned by the tax base and by stormwater resulting in the infrastructure-funding gap is split 50/50.

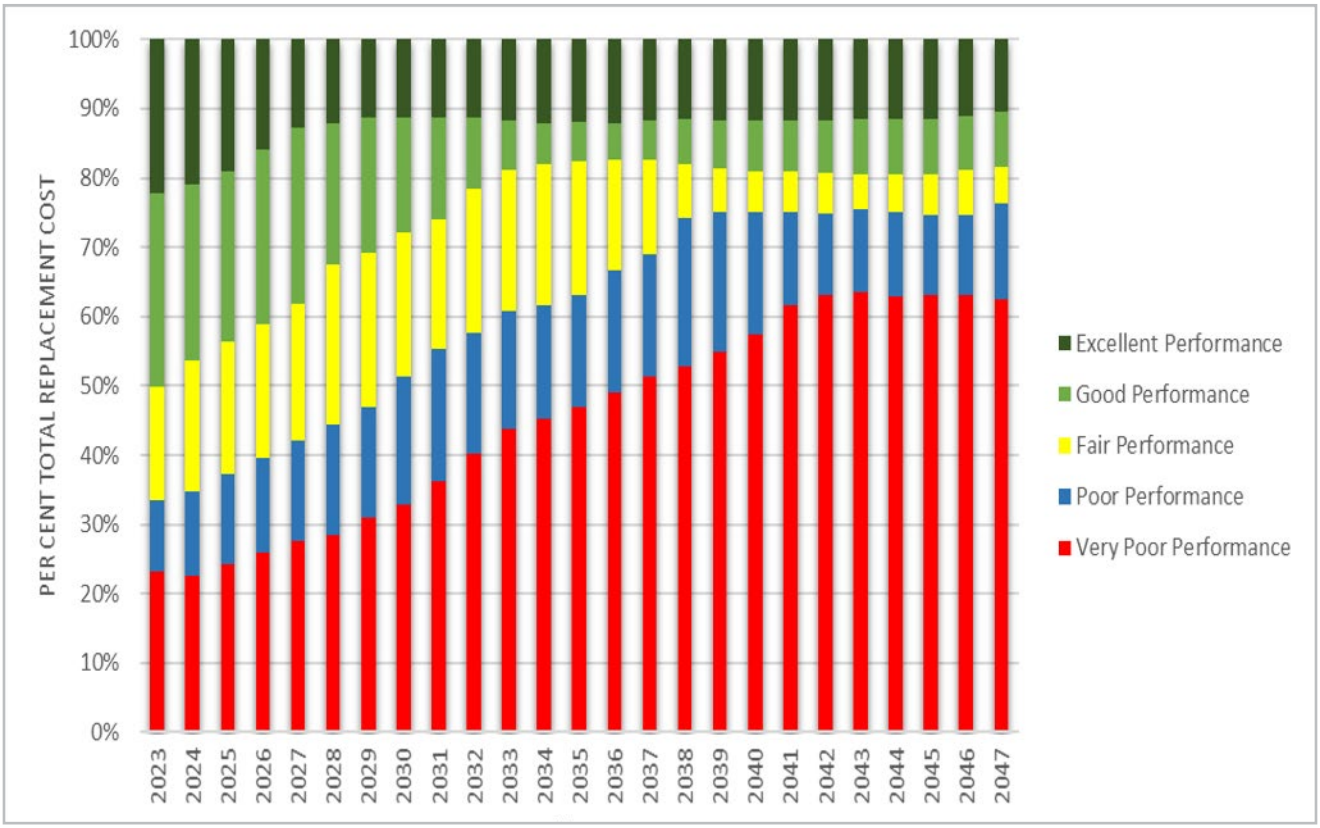
* Note: Some numbers may not add due to rounding.

The annual infrastructure funding gap is calculated through the comparison of the Waterloo DSS budget and target scenario outputs. The budget scenario provides perspective on the projected performance of assets based on the budgeted expenditures for each asset group. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service as established through collaboration with SMEs. The Waterloo DSS analysis uses the capital funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, as well as any unspent rehabilitation and replacement funding from in-progress projects approved in prior budget cycles for the first ten years. The analysis then uses the City's 10-year average capital funding for years 15-25 to calculate the projected performance.

3.5.1 Budget Scenario

Figure 4 illustrates the current projected tax-base asset performance over 25 years and identifies that 34% of the City's tax-funded infrastructure assets currently exhibit poor or very poor performance profiles. However, more importantly, it is estimated that with current levels of funding, in 25 years, the proportion of assets exhibiting poor or very poor performance profiles will increase from 34% to approximately 76%. It is anticipated that this performance level will be unacceptable to most interested and affected parties.

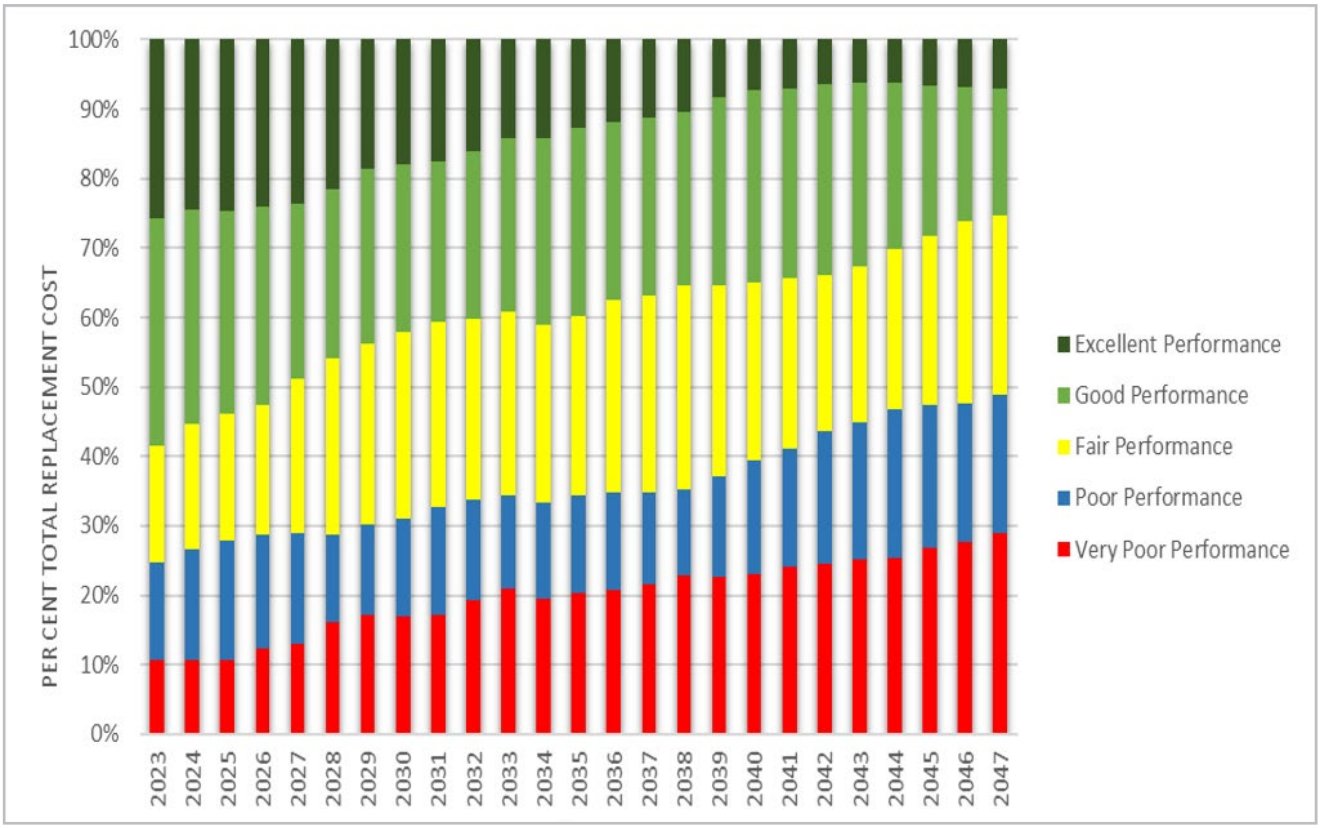
FIGURE 4: PROJECTED ANNUAL PERFORMANCE OF TAX BASE ASSETS IN THE BUDGET SCENARIO



Using the same approach for enterprise-funded infrastructure assets, Figure 5 illustrates the projected performance using currently available data. Similar to **Figure 4**, this graph represents enterprise asset inventory, performance, and deterioration trends, and planned funding included in the 2023 Approved Capital Budget

and 2024-2032 Capital Forecast, as well as any unspent rehabilitation and replacement funding from in-process projects, approved in prior budget cycles. **Figure 5** identifies that with current levels of funding, in 25 years, enterprise asset performance is projected to decline, increasing from 25% of assets exhibiting a poor or very poor performance profile to almost 50%. It is anticipated that this performance level will be unacceptable to most interested and affected parties.

FIGURE 5: PROJECTED ANNUAL PERFORMANCE OF ENTERPRISE ASSETS IN THE BUDGET SCENARIO



* Enterprise assets include water distribution, sanitary collection, storm collection, stormwater management ponds, parking, fleet vehicles, fleet shop equipment, cemeteries, and 50% of bridges and culverts.

It is important to note climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with the Strategic Initiatives division, the Environmental Sustainability Team (EST) and SMEs throughout the organization to incorporate climate change adaptation and mitigation into the Waterloo DSS and performance forecasting methodologies as more information and data become available.

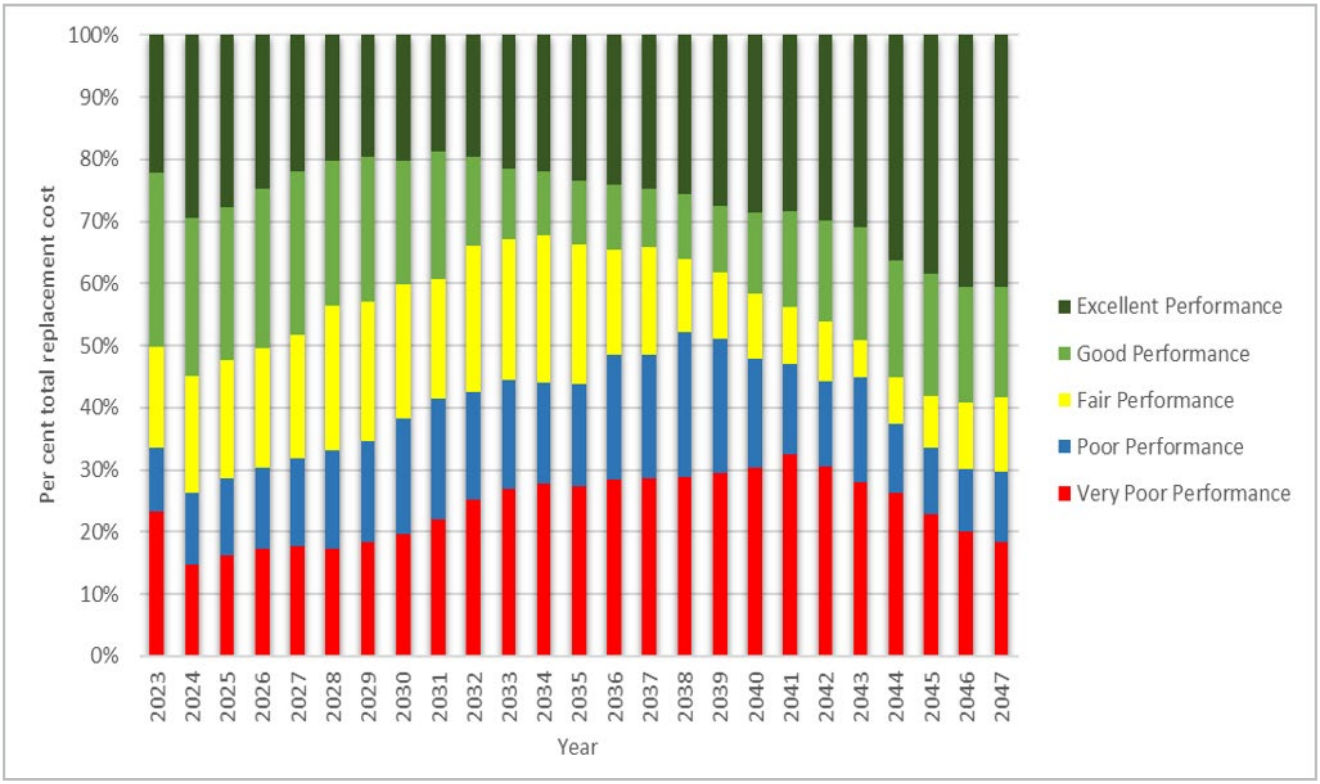
Asset-related level of service adjustments approved by Council and incorporated in the Waterloo DSS will influence the budget and target scenarios as well as the infrastructure-funding gap. The adjustments will be brought forward to Council for approval, as recommended by the AM Steering Committee before execution within the Waterloo DSS. Adjustments incorporated in the Waterloo DSS for the level of service will influence the budget and target scenarios (Figure 4 and **Figure 5**) as well as the infrastructure-funding gap.

3.5.2 Target Scenario

The target scenario follows the same principles as the budget scenario; however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is used to generate a list of infrastructure expenditure needs to achieve the target levels of service that have been established for each asset class. The target scenario is designed to maintain a target proportion of assets in each asset class in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

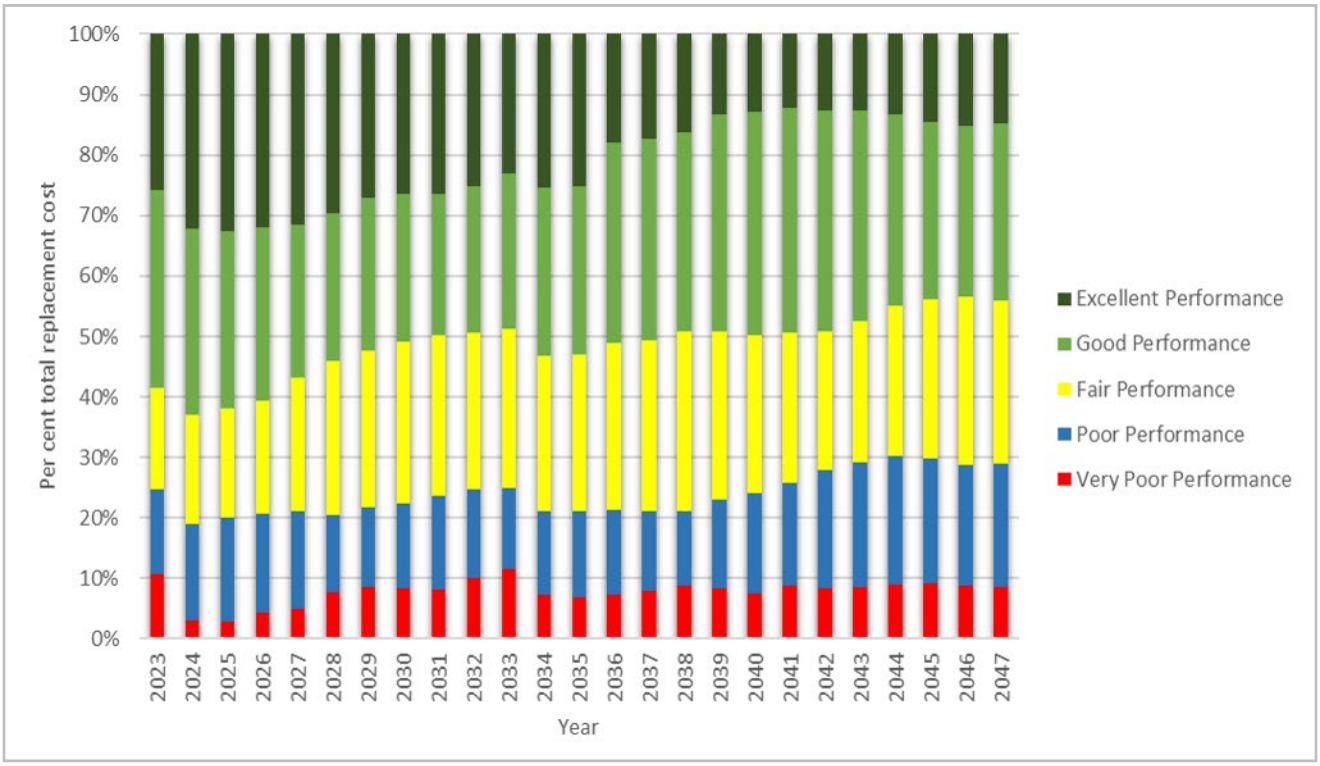
Target levels of service have been established with collaboration from asset class SMEs and through this process, it is estimated that the additional average annual capital expenditure required for the target scenario for tax-funded assets is $37.6 million. Applying an average annual increase of $37.6 million provides $54.6 million annually for tax-funded asset classes resulting in the aggregate performance for tax base funded asset classes summarized in **Figure 6**. Analysis suggests this level of funding would result in a proportion of assets in each performance category that is anticipated to be acceptable to most interested and affected parties.

FIGURE 6: PROJECTED ANNUAL PERFORMANCE OF TAX BASE ASSETS IN THE TARGET SCENARIO



Target levels of service for enterprise-funded assets have also been established with collaboration from asset class SMEs. Through this process, it is estimated that the average annual capital expenditure increase required for the enterprise funded asset target scenario is $14.4 million. Applying an increase of $14.4 million will provide $31.2 million annually for enterprise assets and results in the aggregate performance for all asset classes summarized in **Figure 7**. Analysis suggests this level of funding would result in a proportion of assets in each performance category that is anticipated to be acceptable to most interested and affected parties.

FIGURE 7: PROJECTED ANNUAL PERFORMANCE OF ENTERPRISE ASSETS IN THE TARGET SCENARIO



3.5.3 Scenario Capabilities

The City's SMEs and AM professionals can generate a range of scenarios for individual asset classes. The individual analysis at the operational and tactical levels can then be consolidated to obtain a strategic perspective on the overall suite of assets. The analyses of these "what-if" scenarios will be the key to addressing the infrastructure challenges over the coming years and can be utilized when the City's LTFP is updated with each three-year budget process.

Using the Waterloo DSS will position the City to leverage operational level AM processes. This will help prioritize the specific assets requiring renewal activities. In addition, the Waterloo DSS will support the evaluation of alternative practices, strategies, or construction techniques that will reduce the expenditures that are required to achieve the target performance of the assets. This approach will enable the City (over time) to work toward the goal of having sufficient resources to help ensure that the services provided by the City's infrastructure systems can be sustained over the long term.

4 Financial Strategy

In addition to the City's budget processes, the City works to identify long-term financial trends and the inclusion of AM is a critical component. Long-term financial planning is the process of projecting revenues and expenditures over a long-term period using assumptions relevant to the City. The City's Long-Term Financial Plan (LTFP) represents a framework of tools for Council and staff to plan for future financial challenges and opportunities through the forecasting of scenarios, analysis, and the use of financial policies to devise strategies to achieve financial sustainability.

Understanding long-term trends and potential risk factors that may impact overall financial sustainability allows Council and staff to proactively address these issues. The process of developing a LTFP allows Council and staff to strategically focus on long-term objectives while ensuring commitment to financial sustainability. In essence, long-term financial planning is the process of aligning financial capacity with long-term service objectives and the City's strategic plans.

The development and maintenance of a LTFP is complex and contains many inter-related decision-making factors. With each update to the LTFP, the data and information is refined to reflect the financial environment faced by the City at the time and projected for the future. The City's third LTFP was received by Council on December 11, 2023, via CORP2023-052. The recent update included items recommended within the 2024-2026 budget process and other applicable financial changes that have occurred since the prior update in December 2019. There were numerous items reviewed and considered throughout the process which included:

- The City's financial environment, including factors that have influenced present financial performance and position;
- The City's financial procedures and policies, which help guide the City's financial management, as well as recommended changes to key financial policies;
- The City's key assumptions for revenues, operating expenses, capital investment, and reserve and reserve fund contributions and withdrawals;
- The City's current estimated annual infrastructure funding gap; and
- Updates to the asset management data to reflect replacement cost updates and overall data improvements.

The LTFP incorporates the funding required for each of the City of Waterloo's assets. A capital asset is an item with physical substance, with a useful economic life extending beyond one year. Ongoing general maintenance (painting, mechanical maintenance, replacement of existing parts) of an asset is not considered a capital item unless it increases the value of an asset or is a betterment. A betterment is a cost incurred to enhance the service potential of a capital asset by either increasing productivity or service capacity and results in an extension of the life of an asset.

The City's first LTFP was approved on April 16, 2018, via CORP2018-011. Increasing the general property tax revenues through higher annual tax increases was an option considered through the initial LTFP development. This approach provides more flexibility for determining how the additional revenue is allocated, between

additional contributions to reserves versus increases to the operating expenditures. While potentially more flexible, this approach limits the ability to report on the positive actions that Council has undertaken to reduce the City's infrastructure deficit. As a result, staff have continued to develop and update the LTFP utilizing increases to the general tax revenue level as a methodology to fund only operational activities (i.e. base budget plus operating impacts of capital and growth), with infrastructure increases over and above inflation allocated to Capital Infrastructure Reinvestment Reserve Fund (CIRRF).

Based on the analysis undertaken through the 2023 LTFP modelling process, it is projected that the general tax revenue level will require increases as noted below in **Table 8**. These projected tax revenue increases are for the base budget and operating impacts of capital only. Service level changes or other enhancements are captured on a separate line. New or proposed infrastructure funding increases are indicated on a separate line.

TABLE 8: ANTICIPATED PROPERTY TAX INCREASES

TYPE OF INCREASE	2024*	2025*	2026*	2027-2030 (AVERAGE ANNUAL INCREASE)	2031-2034 (AVERAGE ANNUAL INCREASE)	2035-2048 (AVERAGE ANNUAL INCREASE)
** Tax Revenue	3.37%	3.84%	3.49%	2.5%-3.5%	2.5%-3.5%	2.0%-3.0%
Service Level Changes	2.02%	1.76%	2.19%	To Be Determined	To Be Determined	To Be Determined
Infrastructure Increase	0.75%	0.74%	0.73%	1%-1.5%	1%-1.5%	1%-1.5%

* As approved by Council on February 12, 2024

** Base budget + operating impacts of capital (does not include service level changes or infrastructure increases)

As part of the 2020-2022 and 2023 approved budgets, supported by the Long-Term Financial Plan (LTFP), Council approved additional funding intended to begin the process of closing the infrastructure gap with almost $2.8 million in additional annual funding for infrastructure assets. The additional infrastructure funding was added to the Capital Infrastructure Reinvestment Reserve Fund (CIRRF). Council approval of the increases noted in **Table 8** will be recommended through the City's normal budget process and the infrastructure increase is intended to continue the process of closing the infrastructure gap. The longer-term increases are subject to change based on decisions made by future Councils and updates to model parameters over time.

In addition, an increase in staff resources to implement additional capital reinvestment activities was approved. Examples of the resources approved asset management, procurement staff, mechanical engineer, water technician and a project coordinator. Additional resources included in the LTFP for 2027 and beyond include, but are not limited to project management, asset management, operational, finance and information technology. Council's decision to increase or decrease funding for asset treatment activities as part of the City's budget process will influence the predicted asset performance and the estimated annual funding gap. These items will also be influenced by staff efforts to consistently improve the data maturity and performance forecasting activities.

4.1 Current Funding Sources

The LTFP uses traditional sources of funding such as property tax, user fees, reserves, and debt as well as committed grant funding from the Canada Community Building Reserve Fund (CCBF) (formerly known as the Federal Gas Tax Fund) formula-based funding. No further grant funding has been considered as the City requires a firm commitment to the funding before it can be incorporated into the LTFP.

The 2023 Approved Capital Budget and 2024-2032 Capital Forecast contains a detailed listing of each capital project planned for implementation over the 2023-2032 timeframe. Capital project sheets supporting the capital budget identify the appropriate funding sources for each project. Tax supported assets can access more than one reserve such as the Capital Infrastructure Reinvestment Reserve Fund (CIRRF) and Canada Community Building Reserve Fund (CCBF). The City's 17 asset classes and the potential reserve and reserve funds are identified in **Table 9**

TABLE 9: ALIGNING ASSET CLASSES TO THE APPROPRIATE RESERVE FUNDS

ASSET CLASS	RESERVE AND RESERVE FUNDS*
Sanitary Collection	Sanitary Sewer Utility Capital Reserve (SEWCAP)
Water Distribution	Water Utility Capital Reserve (WATCAP)
Stormwater	Stormwater Utility Reserve (SWM)
Parking	Parking Reserve Fund (PKG)
Fleet	Equipment Reserve (Fleet) (ER), Climate Action Reserve Fund (CARF), Capital Infrastructure Reinvestment Reserve Fund (CIRRF), Rental Housing Reserve (RHR), Building Permit Reserve Fund (BLD)
Transportation **Facilities** **Parks** **Forestry** **Fire** **Information Technology** **Library** **Land**	Capital Infrastructure Reinvestment Reserve Fund (CIRRF) Canada Community Building Reserve Fund (CCBF) Climate Action Reserve Fund (CARF) Economic Development Reserve (ECDEV) Employee Development and Capacity Building Reserve (EMPDV) Industrial Land Account Reserve (ILA)
Bridges and Culverts	Capital Infrastructure Reinvestment Reserve Fund (CIRRF) Stormwater Utility Reserve (SWM)
Public Art	Public Art Reserve (ART)
Uptown BIA	Not applicable as the assets are funded by the BIA

* Rehabilitation funding from the Parkland Dedication Reserve Fund (PUB) is incorporated as applicable.

4.2 Financing Opportunities

Integrating AM with financial planning is as equally important as the integration with engineering and other SMEs throughout the City. They are all important when considering the value of infrastructure and the reliance on the assets to deliver services to the community. The efforts to integrate AM and financial planning include utilizing the Waterloo DSS to help determine the optimal allocation of available treatment funding provided through reserves, the development of a lifecycle costing methodology and the inclusion of asset-specific data within capital project sheets used for the budget process. All these activities improve the link between financial planning and AM by allowing for data-driven decisions.

4.2.1 Capital Infrastructure Reinvestment Reserve Fund (CIRRF)

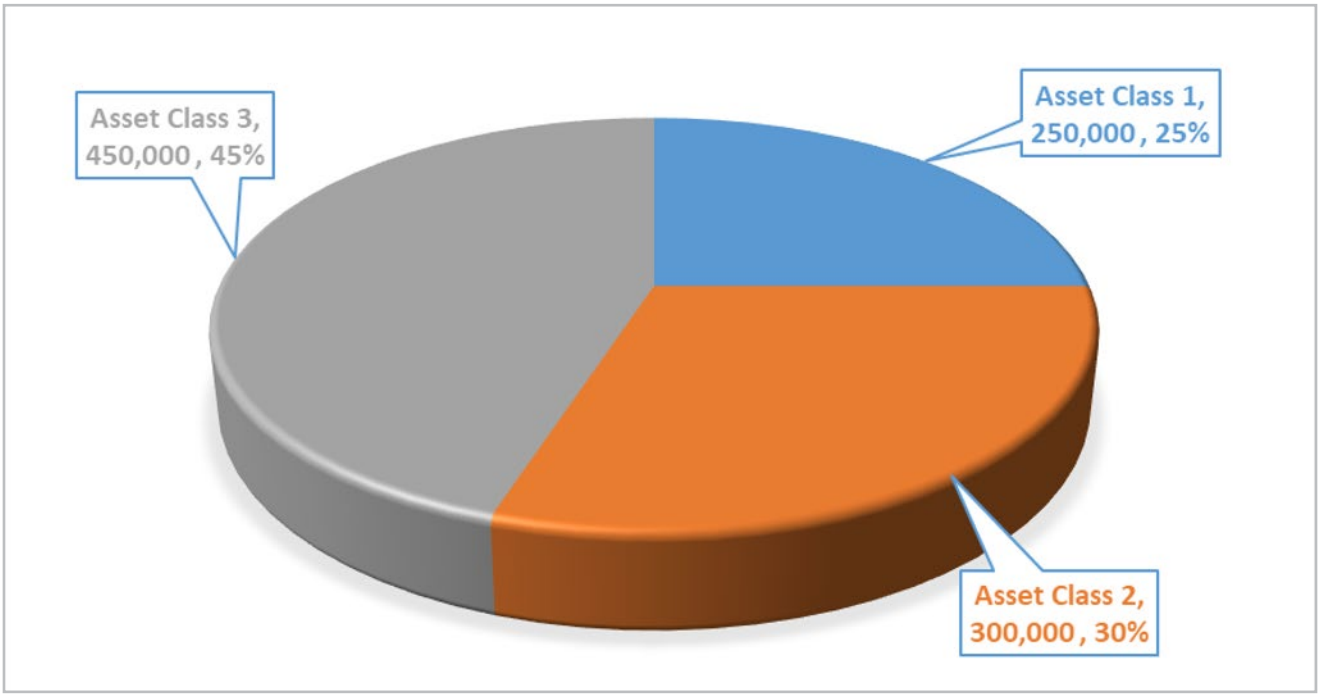
Instituting a property tax increase above inflation dedicated to fund infrastructure renewal activities (administered through CIRRF) has proven over the years at the City to be one of the best strategies to fund the additional contributions. This approach provides a more direct line of sight from the taxes that residents pay to the services/infrastructure that it funds.

Since 2020, Council has implemented a plan to begin narrowing the infrastructure-funding gap. This includes Council's approval within the 2020-2022 budget of an increase of $2.1 million by 2022, a $0.7 million increase within the 2023 budget and increase of $1.3 million as part of the 2024-2026 budget for a total increase of $4.1 million annually for infrastructure assets. The additional infrastructure funding was added to the CIRRF and since its inception in 2008 by Council, the annual contribution to CIRRF has increased significantly and is currently $13.4 million per year in infrastructure-related funding. The new funding approved as part of the 2024-2026 budget process will be incorporated as part of future AM reporting.

4.2.2 Infrastructure Funding Allocation Methodology

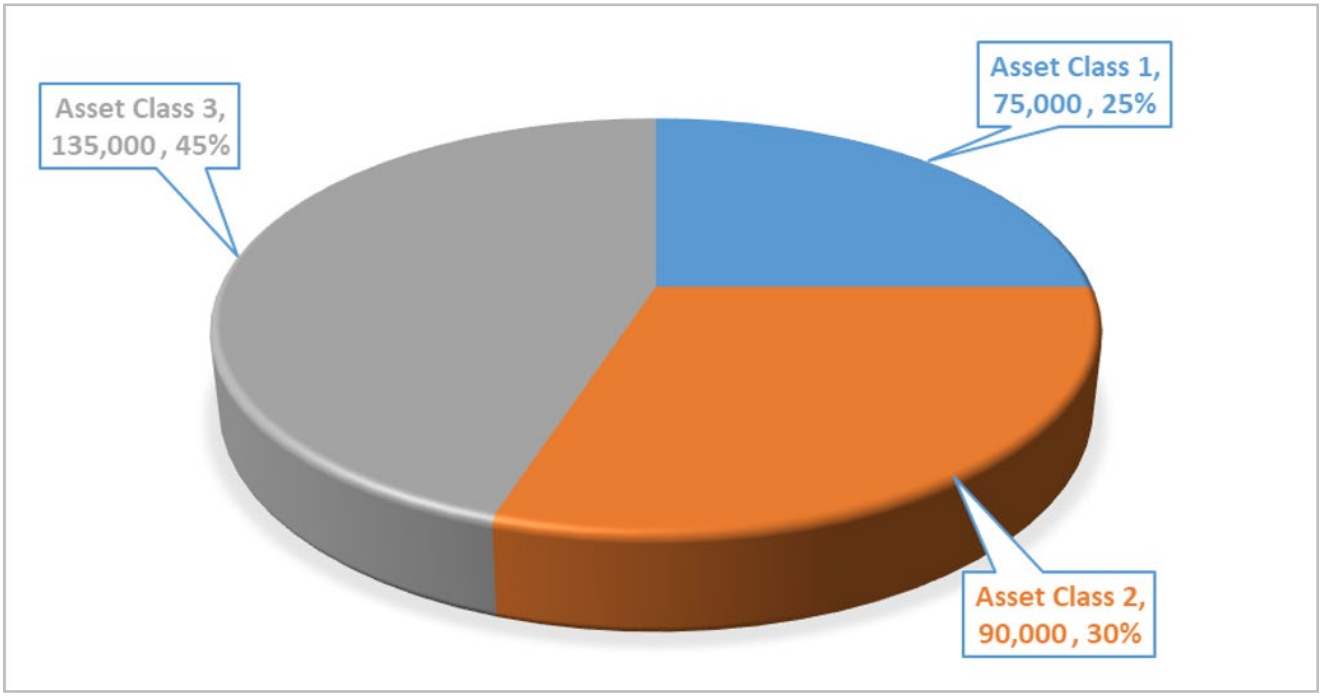
The capital budget contains the most significant portion of funding allocated for both tax base and rate funded infrastructure systems, with the balance provided through the operating budget. As part of the budget process, AM uses the Waterloo DSS to determine the percentage of needs by asset class. The Budget Committee uses these percentages to allocate the limited rehabilitation and replacement funding in the most optimal manner possible. The percentage is created based on the concept of what each asset area would need if we had unlimited funding. For example, in **Figure 8**, the City's assets need $1 million in funding to meet target which translates into needs of $250,000 for asset class 1, $300,000 for asset class 2 and $450,000 for the third asset class which is then converted into a percentage of needs which translates into 25%, 30% and 45% respectfully.

FIGURE 8: UNLIMITED FUNDING SCENARIO



Once those percentages are calculated, they are applied to the available funding which in this scenario is $300,000 compared to the earlier $1 million. This means that while asset class 1 needs $250,000, their 25% share of the available $300,000 amounts to $75,000 as illustrated in **Figure 9**. Through the development of the capital budget, our SMEs professionally manage what assets can or cannot wait to be rehabilitated or replaced. For the 2023 budget process, on average the City's asset classes received 37 cents for every dollar that is needed under the target scenario.

FIGURE 9: AVAILABLE FUNDING SCENARIO



4.2.3 Debenture Financing

Debenture (debt) financing is borrowed money that is paid back over time along with interest charges (normally over ten years, but by policy can be up to 20 years with CFO approval). Debt at the municipal level cannot be used to fund operating expenditures (e.g. salaries), however, can be an important capital financing tool. Municipalities may consider debt as a logical option when financing larger infrastructure projects and looking to spread the cost of the project over a longer period of time in alignment with the asset's useful life.

For the City of Waterloo, there is a Council approved policy (FC-009 Debt Management Policy) that outlines Council's commitment to demonstrating financial leadership and sustainability. The policy provides a defined and transparent process for the City's management of debt. Within FC-009, the City has made strategic decisions and updates to set appropriate limits on debt along with permitting internal inter-reserve borrowing as an additional financing resource when appropriate. City Staff reviewed this policy and brought forward revisions for Council approval in June 2023. Future reviews of the debt policy will be conducted periodically, ensuring it has the correct parameters and guidelines for future financial environments.

Debt can be a viable option if interest rates are lower than the rate of inflation as the cost to complete the project may be higher if delayed under a pay-as-you-go financing approach. Based on fall 2023 estimates, the current projected interest rates are between 4.5% - 5.0% for a 10-year term based on recent information provided by the Region of Waterloo. The Region of Waterloo is a AAA-rated municipality and issues debt on behalf of the lower-tier municipalities in the Region including the City of Waterloo.

Debt may also serve as a means to allow the City to professionally manage the assets with the appropriate treatment with the highest cost/benefit ratio at the correct time. Resurfacing a road at the appropriate time allows for a lower whole of life cost compared to the asset missing that resurfacing treatment window due to a lack of available funding.

Tax-based Debt

The Debt Management Policy also requires that the City's net debt charges (the principle and interest payments on debt less the amount recovered from user fees such as development charges and utility rates) do not exceed the budgeted annual contributions to the Capital Reserve Fund (CRF), the Climate Action Reserve Fund (CARF), and the Capital Infrastructure Reinvestment Reserve Fund (CIRRF). This policy serves to ensure that debt charges are funded through the operating budget contributions to capital reserve without impacting operational program costs.

User Rate-based Debt

Development charge based debt is exempt from the Debt Management Policy, as this form of debt is recovered through future DC by-laws and does not impact the tax base. The capacity to support development charge based debt must be considered in the development of the associated background study and ultimately incorporated when establishing future DC rates.

4.2.4 Grants

The City maintains a professional and constructive relationship with both the provincial and federal government and we frequently apply for funding from both levels of government. Both the Provincial and Federal governments have established grant programs over the past several years to help fund the rehabilitation or replacement of municipal infrastructure and to support municipalities in reaching their sustainability goals. Grants are traditionally awarded through an application program or annual formula-based allocation programs (preferred method for infrastructure planning purposes). However, for municipalities like Waterloo to address their existing infrastructure funding gaps and achieve ambitious climate action goals more funding from higher orders of government will be required.

Application Programs:

Application grant programs invite eligible parties, such as municipalities, to submit grant applications that align with the grant stream's objectives through a competitive process. Funding approval is not guaranteed, and often there are significant interest and application volumes to contend with. However, the City remains active in searching out applicable grants that can leverage funding from other levels of government or organizations to help with the AM objective of supporting a coordinated approach of good stewardship of municipal assets.

Over 2012-2024 year-to-date the City has benefited from over $33 million in application-based grant funding awarded, and staff will continue to pursue this as a source of rehabilitation funding. Please note that the $33 million figure above does not include the first two instalments of the City's successful $22 million grant application related to the CMHC Housing Accelerator Fund (HAF) to be received over 2023-2026. The City's HAF successful application decision was announced on February 2, 2024. This investment will help us provide opportunities for families, individuals, seniors, and youth of all socio-economic backgrounds to call one of our thriving, sustainable Waterloo neighbourhoods home.

Allocation Programs

The Canada Community-Building Fund (CCBF) is an example of an allocation program (formally the Federal Gas Tax Rebate Reserve Fund (GTR)). The City of Waterloo receives a semi-annual allocation of funds from

the Association of Municipalities of Ontario (AMO) on behalf of the Federal Government as per the agreement for the transfer of revenues. For 2024 the City of Waterloo will receive $3.8 million from CCBF under the annual program. Annual, stable, and predictable allocation grant programs like the CCBF are optimal for municipal planning and capital budgeting as it allows the City to allocate the CCBF funds to assets that require rehab/replacement, similar to how we allocate CIRRF funding during capital budget development to the assets with the highest need as per the Waterloo DSS.

4.2.5 User fees / rate model

The City has operated several divisions/sections under a 'User Fee/Rate Model' for many years. The model operates under the principles of a full cost recovery operation. If the user fees were set at full cost recovery, there would be no tax base impact, however, this is not always possible due to other factors including price elasticity.

Tax Base Operations

For tax base operations, user fees are applied based on the principle of full cost recovery, to the extent possible, for services residents choose to participate in. Examples include user fees for community space rentals in facilities, and sport field rental fees. While the user fees are based on full cost recovery principles, the fees are monitored and compared against the market and neighbouring municipalities. Other factors include market conditions, and community benefit/need, and as such fees cannot always be set at full cost recovery and may require some level of tax base support.

Rate Base Operations

The rate-based budget philosophy results in the development of realistic and adequate resource alignment to meet the Council approved level of service within a specific division; and an associated user fee is generally applied as the revenue source. Once adopted, within the parameters of Council policy guidelines, these divisions operate with anticipated revenues and expenditures and balance minor annual fluctuations using a reserve/ reserve fund. Of significant value to this concept is the ability for the division to plan on a 10-year cycle; while at the same time allowing latitude for addressing unexpected changes to operations or Council direction.

Successful divisional/section examples of the "Rate Model" in the City currently include the City Utilities division (water, sanitary and stormwater), Parking (section within the Economic Development division), and Cemeteries (section within the Parks, Forestry and Cemetery Services division).

4.2.6 Rationalization of Existing City Assets

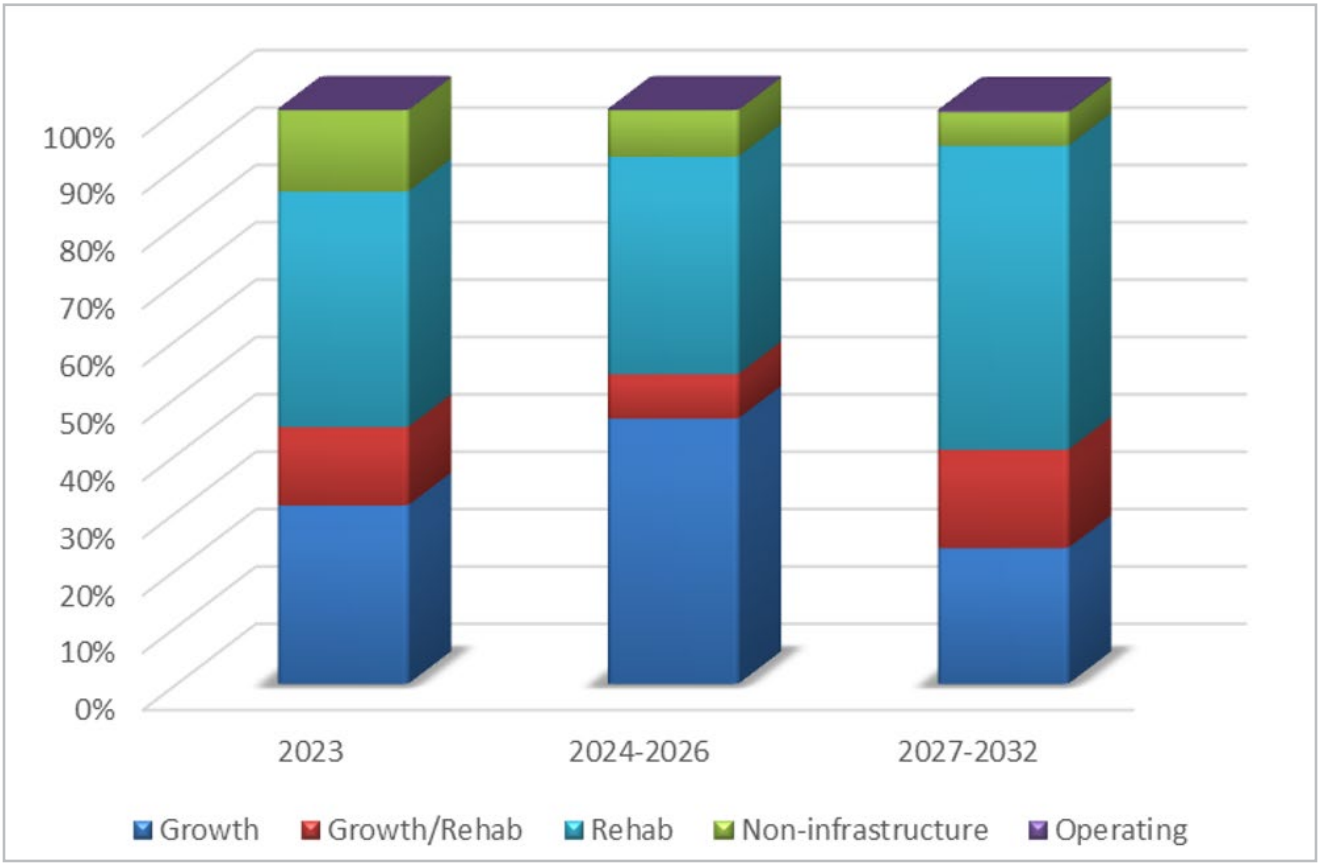
The City owns a variety of assets that will reach the end of their useful life or are no longer needed by the organization. Most assets will be rehabilitated or replaced upon reaching the end of their useful life, however, in some instances, the assets (e.g. land) may be deemed surplus and sold with the net proceeds then being potentially available to use for the treatment of other City assets.

4.3 Infrastructure Funding

The capital budget contains the most significant portion of funding allocated for both tax base and rate funded infrastructure systems, with the balance provided through the operating budget. The 2023 Approved Capital

Budget and 2024-2032 Capital Forecast allocates approximately $849 million in funding for various types of capital projects, as identified in **Figure 10**

FIGURE 10: ESTIMATED DISTRIBUTION OF 2023-2032 CAPITAL EXPENDITURES



* Note: Values are estimated based on the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

The City also spends money on infrastructure through its annual operating budget. **Table 10** provides a summary of the planned expenditures in the 2023 operating budget. Approximately 4% of the operating budget is related to maintaining infrastructure assets. In some asset classes there are also expenditures in the operating budget that are used to renew existing assets, such as the $347,000 in the Facilities divisions operating budget which is spent on building and mechanical maintenance each year.

TABLE 10: DISTRIBUTION OF THE 2023 APPROVED OPERATING BUDGET BY ASSET CLASS (000'S)

ASSET CLASS	EXPENDITURES THAT RENEW EXISTING ASSETS	HYDRO, NATURAL GAS AND WATER	EXPENDITURES TO OPERATE AND MAINTAIN ASSETS	*TOTAL
Transportation	1,595	0	2,833	4,428
Facilities	1,701	3,549	2,498	7,748
Parks	759	0	2,937	3,695
Forestry	580	0	136	716
Fire	242	0	580	822
Information Technology	0	0	1,934	1,934
Public Art	0	0	0	0
Total Tax Base Funding	**4,878**	**3,549**	**10,918**	**19,345**
Water Distribution	1,429	0	1,746	3,175
Sanitary Collection	1,543	102	412	2,057
Stormwater	731	0	1,017	1,748
Parking	37	113	744	893
Cemeteries	67	70	794	931
Fleet	16	0	71	87
Bridges and Culverts	19	0	0	19
Total Enterprise Funding	**3,842**	**284**	**4,783**	**8,910**
Non-infrastructure Expenditures^				**177,702**
Library Expenditures				**7,365**
Regional Expenditures				**1,587**
Total City of Waterloo Funding	**8,720**	**3,834**	**15,701**	**214,908**

* Note: Values may not add exactly due to rounding.

^ Note: Non-infrastructure expenses include but are not limited to salaries, insurance, recreation program expense, wastewater treatment and transfers to capital reserves.

As part of the City's capital process, the forecasted operational requirements to maintain new capital projects being implemented to accommodate growth within the City to maintain services is captured. **Table 11** provides a summary of the estimated lifecycle operating funding increase requirements identified as part of the 2023 budget process. These funding needs will be evaluated, refined, and considered for approval by Council through each budget process.

TABLE 11: 2024-2032 ESTIMATED LIFECYCLE COST INCREASE REQUIREMENTS (000'S)

ASSET CLASS	2024-2032 TOTAL
Transportation	1,605
Facilities	214
Parks	1,379
Fire	0
Information Technology	355
Forestry	0
Library Equipment and Furniture	0
Total Tax Base Funding	**3,565**
Water Distribution	0
Sanitary Collection	126
Stormwater	79
Parking	0
Cemeteries	145
Fleet	453
Bridges and Culverts	18
Total Enterprise Funding	**822**
Total Estimated Funding Needs	**4,387**

4.4 Infrastructure Gap

As part of the 2020-2022 and 2023 approved budgets, supported by the 2019 Long Term Financial Plan (LTFP), Council approved additional funding intended to begin the process of closing the infrastructure gap. When Council approved the $2.8 million of increased infrastructure funding, it was allocated to four key tax-funded asset classes, facilities, information technology, parks, and the transportation network based on their weighted average need. **Figure 11** provides a summary of the capital rehabilitation and replacement funding for tax-based funded assets and enterprise assets for the last four budget cycles. Using the same information, Figure 12 breaks **Figure 11** down further by asset class. Additional investments in infrastructure rehabilitation or replacement approved as part of the 2024-2026 budget process will be incorporated in future AM reporting.

FIGURE 11: 2016-2023 AVERAGE ANNUAL CAPITAL REHABILITATION AND REPLACEMENT

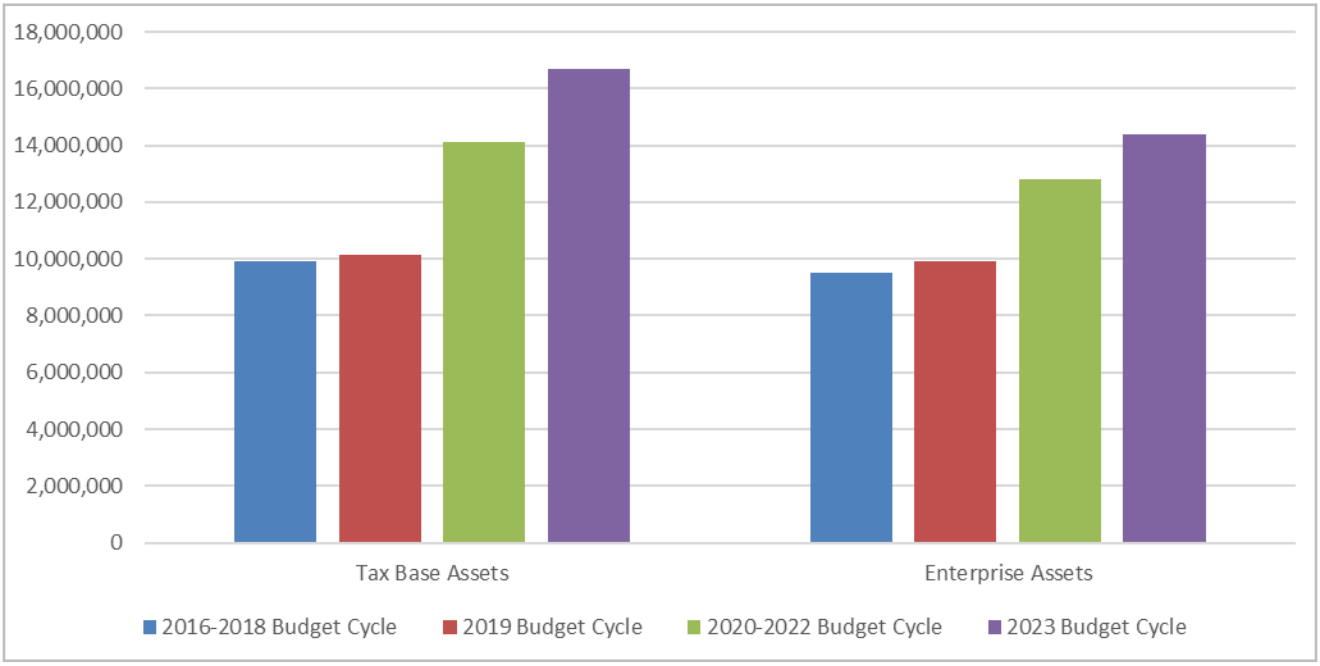
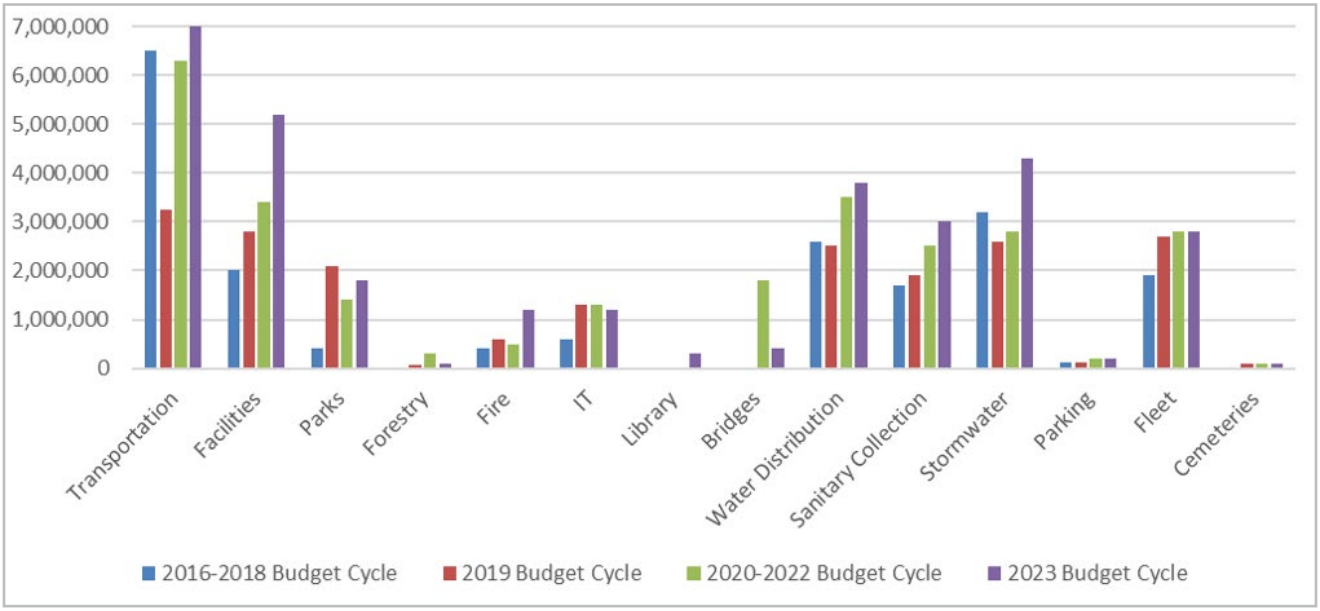


FIGURE 12: 2016-2023 AVERAGE ANNUAL CAPITAL REHABILITATION AND REPLACEMENT



Although the 2023 Approved Capital Budget and 2024-2032 Capital Forecast will invest an average annual funding of $31 million for the treatment of City-owned assets over the 2023-2032 timeframe, the analysis performed through the Waterloo DSS has determined this amount is insufficient to maintain existing levels of service as identified in **Table 12**. Financial constraints have resulted in the City of Waterloo identifying infrastructure projects that cannot be implemented during the 2024-2032 period. As noted earlier, the estimated annual infrastructure funding gap is approximately $54.4 million ($37.6 million for tax-funded assets and $16.8 million for enterprise-funded assets). Additional funding is required to achieve a level of service anticipated to be acceptable to most interested and affected parties. The City's average annual funding target is based on maintaining the average performance of assets with a fair or better performance profile. This reflects the fact that the City's infrastructure assets are in various performance categories and will need rehabilitation or replacement at different times. The required expenditures have been established based on an analysis of the available asset data, combined with professional management strategies, to determine why, when, and how each different type of asset should be renewed. Since it is not financially sustainable to maintain all assets with an excellent performance profile, that approach has not been incorporated in the City's approach to AM.

Additional infrastructure expenditure is required to achieve a level of service that is anticipated to be acceptable to most interested parties. The required expenditures have been established based on an analysis of the most granular asset data available in the City combined with operational level decision-making strategies about when and how each different type of asset is renewed. **Table 12** identifies the additional annual contributions needed to fund the target scenario for each asset class and was used to inform the City's 2023 LTFP. While the plan to begin the process of closing the infrastructure funding gap has been approved, the average annual infrastructure-funding gap is influenced by escalating construction costs, continued deterioration, rehabilitation or replacement improvements, improved asset inventory data, and the addition of assets that were previously excluded. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. Since 2020, Council has received an annual update on the status of the City's average annual infrastructure gap as shown in **Table 12**
It is estimated that this process will continue and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

TABLE 12: INFRASTRUCTURE FUNDING GAP (000'S)

ASSET CLASS	ANNUAL FUNDING NEEDED TO MEET TARGET PERFORMANCE	AVERAGE ANNUAL FUNDING	2023 AVERAGE ANNUAL FUNDING GAP	2022 AVERAGE ANNUAL FUNDING GAP	2021 AVERAGE ANNUAL FUNDING GAP	2020 AVERAGE ANNUAL FUNDING GAP
Transportation*	30,000	7,000	23,00	20,200	13,200	13,700
Facilities	16,700	5,200	11,500	3,300	1,200	1,200
Parks	4,200	1,800	2,400	2,200	1,000	1,500
Information Technology	1,200	1,200	0	800	0	300
Fire	1,300	1,200	100	400	100	300
Bridges and Culverts^	400	250	150	200	200	200
Forestry	500	100	400	1,000	0	-100
Library	300	300	0	NA	NA	NA
Public Art	15	5	10	NA	NA	NA
Total Tax Base	**$ 54,615**	**$ 17,055**	**$ 37,560**	**$ 28,100**	**$ 15,700**	**$ 17,100**
Stormwater	17,200	4,300	12,900	4,100	3,700	4,800
Water Distribution	3,800	3,800	0	-100	200	1,000
Sanitary Collection	6,000	3,000	3,000	700	500	1,700
Fleet and Shop Equipment	3,000	2,800	200	200	200	200
Bridges and Culverts^	400	250	150	200	200	200
Parking	600	200	400	400	200	300
Cemeteries	200	100	100	100	100	0
Total Enterprise	**$ 31,200**	**$ 14,450**	**$ 16,750**	**$ 5,600**	**$ 4,400**	**$ 7,800**
Total City of Waterloo Funding Gap	**$ 85,815**	**$ 31, 505**	**$ 54, 310**	**$ 33,700**	**$ 20,100**	**$ 24,900**

* The transportation class is comprised of roads, sidewalks, streetlights, retaining walls, trails and trail links, traffic, and wayfinding signs.

^ The bridges and culverts asset class is jointly owned by the tax base and by stormwater resulting in the infrastructure-funding gap being split 50/50.

The annual infrastructure-funding gap is calculated through the comparison of the Waterloo DSS budget and target scenario outputs. The budget scenario provides perspective on the projected performance of assets based on the budgeted expenditures for each asset group. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service that have been established through collaboration with SMEs. The Waterloo DSS analysis uses the capital funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, as well as any unspent rehabilitation and replacement funding from in-progress projects approved in prior budget cycles for the first ten years. The analysis then uses the City's 10-year average capital funding for 15-25 years to calculate the projected performance.

Since the development of the DSS, the AM team has been incorporating funding approved through the capital budget process. Unspent capital represents the approved funding held within capital project accounts that will be spent on rehabilitating or replacing assets but have not been spent yet. The inclusion of unspent capital funding is a process improvement that ensures that these investments are not missed in the Waterloo DSS while the capital project is ongoing. **Table 13** identifies the unspent funding incorporated within the Waterloo DSS in 2023 and reduced the annual infrastructure funding gap by approximately $1.7 million.

TABLE 13: UNSPENT CAPITAL FUNDING (000'S)

ASSET GROUPS	UNSPENT CAPITAL FUNDING
Transportation*	6,226
Facilities	5,857
Parks	10,650
Information Technology	3,734
Remaining Tax Base Asset Classes**	1,155
Total Tax Base Unspent Funding $	**27,623**
Stormwater	10,275
Remaining Enterprise Funded Asset Classes**	3,991
Total Enterprise Unspent Funding $	**14,266**
Total Unspent Capital Funding $	**41,889**
25-Year Average Annual Unspent Capital Funding $	**1,676**

* The transportation asset class is comprised of roads, sidewalks, standard streetlights, retaining walls, trails and trail links, traffic and wayfinding signs.

** A consolidation of all unspent funding of less than $3 million per asset class.

Capital project implementation is very complex, and projects can often span numerous years or encounter delays outside of City staff control. Examples of potential delays include but are not limited to:

- Land acquisition or expropriation;
- Third-party delays (e.g. developers, regulatory agency approvals);
- Increased public engagement requirements;
- Staff capacity to complete the projects;
- Tender pricing coming in over budget resulting in projects being rescoped or re-budgeted;
- Long-term capital projects where full funding is allocated to award a contract and funding is drawn down over a period of time as work is completed.

An important aspect of the 2023 LTFP received by Council on December 11, 2023, was the inclusion of measures for increases to infrastructure funding. The additional annual infrastructure funding approved through the 2024-2026 budget process will continue to progress on closing the annual infrastructure funding gap. Increases to infrastructure funding will need to continue as part of future budget cycles for Council's approval and will set the City of Waterloo on a path towards delivering our Strategic Plan objective to address the infrastructure deficit over time. The increases to infrastructure funding included within the 2023 LTFP range between 1%-1.5% annually.

To understand the magnitude of the additional annual contributions required to fund the target scenario in the City of Waterloo, a 1% increase in the property tax levy generates approximately $920,000 in additional revenue (based on the 2023 final levy). Therefore, the additional contributions to CIRRF necessary to close the annual infrastructure funding gap represent an increase in property taxes of approximately 40% above and beyond other increases for inflation.

It is important to recognize that while additional revenue into the reserve funds is required, addressing the infrastructure challenges in the City is about more than collecting additional revenue. The continuous updating or operationalizing of AM processes are equally, if not more, important to help:

- Prioritize the assets that are renewed;
- Reduce the required expenditures to achieve the performance objectives of the infrastructure systems; and
- Understand where levels of service may be reduced and result in lower infrastructure expenditure needs.

5 Tactical and Operational Practice

To realize strategic asset management objectives, it is necessary to apply appropriate tactical and operational practices. These require employing detailed knowledge of the following:

- What do we own and what is it worth?
- Treatment Strategies
- Current Performance and Projected Impact on Budgeted Capital Expenditures
- Target Performance and Required Expenditures
- Lifecycle Management Activities
- Levels of service
- Demand Management Plan
- Allocation of Infrastructure Funding
- Risk

The following sections explain the details of the above items that are applicable to every asset class.

5.1 What do we own and what is it worth?

Like most cities, the City is responsible for providing a significant number of services, including infrastructure needs, and has limited financial resources to maintain them. The City owns infrastructure that is valued at almost $4 billion and is comprised of a variety of complex asset groups as noted in **Table 14**.

TABLE 14: CITY ASSET CLASSES AND THEIR REPLACEMENT VALUE

ASSET GROUPS	REPLACEMENT VALUE (MILLIONS)
Transportation*	1,122
Facilities	541
Parks	69
Information Technology	19
Fire	15
Bridges and Culverts^	28
Forestry	113
Library	6
Public Art	2
Total Tax Base	**1,914**
Stormwater	761
Water Distribution	635
Sanitary Collection	526
Fleet and Shop Equipment	28
Bridges and Culverts^	28
Parking	38
Cemeteries	15
Total Enterprise	**2,032**
Total City of Waterloo Replacement Value	**$3,946**

* The transportation class is comprised of roads, sidewalks, streetlights, retaining walls, trails and trail links, traffic and wayfinding signs.

^ The bridges and culverts asset class is jointly owned by the tax base and by stormwater resulting in the infrastructure-funding gap is split 50/50.

* Note: Some numbers may not add due to rounding.

These assets support the City's ability to provide a wide range of services to the community, such as sports field programming, the active transportation network, municipal enforcement, day camps, and swimming lessons. An important aspect of offering services is the installation and treatment (i.e. maintenance, rehabilitation, and replacement) of the infrastructure that is required to provide these services. The City has supported community growth by building the infrastructure needed to offer these services. The types of assets owned throughout the City are summarized in **Table 15**.

TABLE 15: ASSET CLASSES AND THE RELATED SUB-ASSET CLASS

SECTION	ASSET GROUPS	SUB-ASSET CLASSES
Appendix B	**Tax Base Funded Asset Classes**	
8.2.1	Transportation	Roads, sidewalks, trail and trail links, bike racks, traffic and wayfinding signs, streetlights
8.2.2	Facilities	City hall, community centres, operations facilities, fire halls, EV charging stations
8.2.3	Information Technology	Remote sensing data, computer hardware, infrastructure (fiber optics, phone systems, servers, switches, uninterrupted power storage units), and on-premise software, and applications.
8.2.5	Fire	Large fire apparatus and support vehicles, equipment used by fire fighters
8.2.6	Bridges and Culverts	Pedestrian bridges and road structure culverts
8.2.7	Forestry	Street and park trees
8.2.8	Library	Computers, electronics, equipment, and furniture
8.2.9	Public Art	Permanent art installed across the City
Appendix C	**Enterprise Asset Classes**	
8.3.1	Stormwater	Underground pipe network, stormwater management ponds, natural assets (creeks) and impoundments
8.3.2	Water Distribution	Underground pipe network
8.3.3	Sanitary Collection	Underground pipe network, sanitary pumping stations
8.3.4	Fleet and Shop Equipment	Zero-emission vehicles, ice resurfacers, loader/ backhoes, turf equipment and associated shop equipment

SECTION	ASSET GROUPS	SUB-ASSET CLASSES
Appendix C	**Enterprise Asset Classes** *(continued)*	
8.3.5	Parking	Uptown Parkade, surface parking lots, EV charging stations
8.3.6	Cemeteries	Cemeteries including buildings, trees, columbarium's, internal roads, and walking paths
Appendix D	**Other Asset Class**	
8.4.1	Uptown BIA	Christmas décor, lighting, benches, waste receptacles and planters

Before determining the worth of an asset, it is important to note that the question applies to the entire asset class rather than a component of it. For example, a sanitary section pipe, depending on the community's geographical location, may be worth $500-$700 per metre. Its replacement worth is typically determined by multiplying its length by the unit cost. As per municipalities' purchasing bylaws that ensure procurement decisions are fair, open, transparent, and non-discriminatory, the current year's unit cost is based on pricing received from contractors in a competitive bidding environment. Subsequently, the asset class's worth can fluctuate from year to year, depending on various market forces.

Please refer to the corresponding sections in Appendix B: Tax Base Funded, Appendix C: Enterprise Funded Assets and Appendix D: Uptown BIA for asset class specific information.

5.2 Allocation of Infrastructure Funding

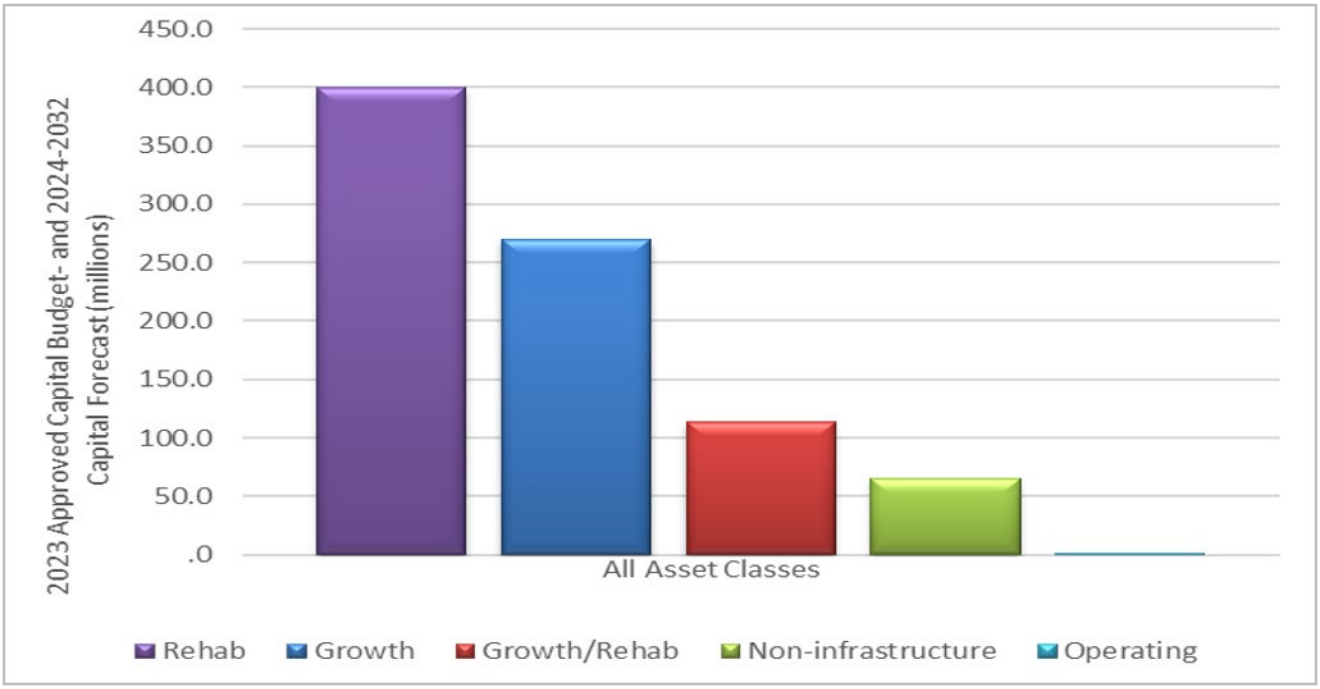
The 2023 Approved Capital Budget and 2024-2032 Capital Forecast allocates funding for numerous capital projects, based on the following categorizations:

- **Replacing Assets.** Replacing assets indicates that existing assets are being "replaced." However, at the SME level, the actual treatment may include maintenance, rehabilitation, or replacement/reconstruction. For example, a roof replacement is a rehabilitative treatment when considering the entire facility, since the facility as a whole is not replaced.
- **Combination of New/Replacement of Assets.** This category indicates a mix of treating existing assets and adding new assets. An example would be the reconfiguration of baseball diamonds and installing a lighting system to better support the needs of user groups.

- **New Assets.** New Assets indicates construction or procurement of infrastructure assets in locations where there were previously none. For example, a new operations centre to dispatch crews and vehicles to serve the community.
- **Decommissioning Assets.** Decommissioning assets is a relatively rare category, as municipal assets are necessary for a community's socioeconomic wellness, especially in growing communities. There are no capital projects in the 2023 Approved Capital budget and 2024-2032 Capital Forecast identifying that an asset will be decommissioned.

The above categories have been assigned to every capital project, which allows the opportunity to illustrate how the funding was professionally allocated for each asset class. **Figure 13** provides an example using all asset classes for how the information is shown for each asset class.

FIGURE 13: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR ALL CITY ASSET CLASSES



Please refer to the corresponding sections in Appendix B: Tax Base Funded, Appendix C: Enterprise Funded Assets and Appendix D: Uptown BIA for asset class specific information.

5.3 Lifecycle Management

While formal AM practices were introduced to municipalities in the late 2000s, municipalities have been undertaking AM and lifecycle management using an informal approach for decades. The City utilizes three main categories of lifecycle management activities: maintenance, rehabilitation, and reconstruction. There are a few important considerations when applying AM practices to infrastructure assets:

- Understanding that lifecycle management activity for mechanically engineered assets is different from civil engineered assets or natural assets.

- Understanding that typical Tangible Capital Asset Valuation or amortization cannot be used for planning lifecycle management activities for civil engineered assets.

Mechanically engineered assets fleet, HVAC, pumps, and mechanized equipment and natural assets include creeks, wetlands, open spaces, and urban forests. Together they represent less than 30% of the City's asset portfolio's value. The majority of all other assets are considered civil engineered assets.

Unlike civil assets, mechanically engineered assets are tested under typical working conditions before being introduced to the market and available for purchase. Manufacturers can develop a relatively reliable schedule of treatments (i.e. preventive and reactive maintenance, repair, and replacement) for mechanical assets. In addition, manufacturers can develop treatments of varying magnitude, such that a specific desired LOS can be achieved. Mechanical lifecycle management activity is generally concerned with the number of kilometers on a vehicle, or the number of operating hours on equipment and can be applied across many municipalities or organizations. For example, when a boiler needs treatment, SMEs will apply maintenance, repair, or replacement of its parts or as a whole in response to the assessed wear and tear to ensure the desired LOS is provided. In this case, the desired LOS is the length of time that the boiler remains in service. Forecasting future asset performance and corresponding expenditure according to prescribed or scheduled lifecycle management activities is relatively reliable, with exceptions, for mechanically engineered assets. While the forecasting of mechanically designed assets is relatively reliable, professional management by staff is a critical component, especially when there is limited funding available for the treatment of the assets.

Civil engineered assets are different from mechanically designed assets as they are typically designed to not fail. Civil engineered assets consider the unique circumstances of the community and location the particular asset is serving. Therefore, AM for civil engineered assets requires professional management by staff to analyze the pressures/stresses/consumption the community is exerting on its infrastructure. Similar to mechanical assets, the professional management aspect is critical for civil engineered assets when funding to treat assets is limited.

Municipalities have been executing infrastructure maintenance, rehabilitation, and reconstruction strategies for decades. Corresponding decisions are usually based on the availability of potential treatments for each of the categories, whether in-house or contracted out. For example, the optimal treatment according to an engineering point of view may be crack sealing of a certain road section, due to its current performance. However, if market suppliers cannot provide this service as a sustainable business practice (i.e. at a reasonable cost), then it will not be considered the optimal treatment by SMEs, and they will determine the most cost-effective treatment for the City.

AMPs are "a snapshot in time" and cannot reliably prescribe specific treatments (within one of the main treatment categories mentioned above) for assets at explicit costs in the future. The City relies on our SMEs to professionally manage the assets and decide on the most appropriate treatment with the highest cost/benefit ratio at the time the specific project moves forward. In the above example, both crack sealing and selective resurfacing are typically considered maintenance treatments in road construction terminology. For this reason, it is feasible to forecast future expenditure at the level of the aggregate treatment categories of maintenance, rehabilitation, and reconstruction rather than at the level of single specific treatments available within each of the categories.

In addition to considering the maintenance, rehabilitation, and reconstruction strategies available for each asset, SMEs utilize their professional management and understanding of corporate decision factors. Corporate decision factors include but are not limited to:

- Economies of scale
- Staff capacity
- Cost-sharing opportunities
- Collaborative rehabilitation strategies and timing (e.g. with the Region of Waterloo)
- Potential development impacts
- New design standards
- Updated legislative requirements
- Funding limitations
- Climate change adaptation or mitigation requirements

Please refer to the corresponding sections in Appendix B: Tax Base Funded, Appendix C: Enterprise Funded Assets and Appendix D: Uptown BIA for asset class specific information.

5.4 Levels of Service

Using the Waterloo DSS, staff can develop scenarios to project future performance and develop budget and target scenarios. To assist in the budget and target scenario projections, staff throughout the organization work collaboratively to improve data and processes.

The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

Historically, the City has had insufficient infrastructure funding levels and thereby created a backlog of rehabilitation or replacement work across all City assets. This has placed the City in a reactive environment for replacement or rehabilitation activities. The proposed levels of service identified for each asset class for 2023-2031 reflect the historical infrastructure funding levels along with the increased funding approved by Council through the 2020-2022 and 2023 budget processes. The proposed levels of service are appropriate currently due to the available funding, affordability for the community and the City and the regressive nature of property tax, however, to maintain these service levels over the long term increased funding will be required. Both the Provincial and Federal governments have established grant programs over the past several years to help fund the rehabilitation/replacement of municipal infrastructure and address climate change. For municipalities like Waterloo to rehabilitate or replace their assets while achieving their climate action goals, more funding from higher orders of government will be required.

The Waterloo DSS analysis uses the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation, and replacement funding from prior budget cycles for projects currently underway has also been included. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining 11-25 years.

Developing and sustaining public infrastructure is a complex and challenging task requiring continuous improvement and monitoring. Since the development and approval of the City's first comprehensive asset management plan in 2016, staff throughout the organization have been improving the data maturity (quantity, quality, and completeness). In addition, AM staff have been working with SMEs to improve the forecasting capabilities of the Waterloo DSS.

The term "Levels of Service" (LOS) migrated to public infrastructure management from sectors incurring expenditures related to person-to-person services, rather than consumer goods. Most of the expenditure related to public infrastructure management is concentrated on providing the end user (i.e. public) with a service delivered via infrastructure (e.g. safe drinking water via a watermain). As such, the LOS provided by public infrastructure is directly proportional to the performance of that infrastructure. The budget scenario and target scenario performance graphs in each section quantify and illustrate the LOS provided by an asset class to the public. From an SME, engineering, and academic point of view, this is the primary and objective LOS quantification for public infrastructure.

Please refer to the corresponding sections in Appendix B: Tax Base Funded, Appendix C: Enterprise Funded Assets and Appendix D: Uptown BIA for asset class specific information.

5.4.1 Current Performance and Projected Impact of Budgeted Capital Expenditures

The degree to which an asset can fulfill its intended purpose is the performance level at which it performs. When discussing asset performance, it is important to note that the term "asset class" or "asset group" is typically used interchangeably with "asset." At the most granular level of an asset class inventory are the individual assets making up that class. Individual assets cannot fulfill their intended purpose unless they are connected to other individual assets in the physical environment. For example, a road section which is not connected to the rest of the road network (i.e. the roads asset class) has no value to the community and is therefore not an asset. Similarly, a pipe which is not connected to the rest of the sanitary collection network (i.e. the sanitary asset class) has no value to the community and is therefore not an asset, and so on. It is therefore only when the individual assets are arranged together to create a network that they realize their full potential of being an asset to the community. This realization manifests itself in the form of an asset class, and then typically the "class" part is dropped for communication convenience.

Subsequently, when looking at asset performance, it is important to forecast at the asset class level, as it is at this level that the community is served. Even when an administration is not projected to spend funds on individual assets for decades, by being a part of their respective asset classes, their performance is still serving the community.

The same logic applies to naturally "disconnected" individual assets. For example, a City of 100,000+ residents cannot be served adequately with one park or one recreational facility; a group of facilities making up an asset class is necessary.

Each class will have a budget scenario that illustrates the current projected asset performance over 25 years as illustrated in section 3.5.1. It is important to be aware that future forecasts are scientifically reliable at the aggregate level of expenditure. Specifically, how much in a particular year is forecast to be spent in total will then drive the corresponding annual performance of the asset class (i.e. the distribution of assets in very poor, poor, fair, good, and excellent performance categories). SME's adjustments to actual treatment costs and selections regarding the individual assets to be treated within the one-to-three-year outlook are necessary, for reasons discussed in previous sections. However, these adjustments will not upset the aggregate forecast.

5.4.2 Target Performance and Required Expenditures

The target scenario follows the same principles as the budget scenario; however, supplementary infrastructure funding is added above and beyond the approved budget scenario. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated. Similar to the budget scenario, each class will have a target scenario that illustrates the current projected asset performance over 25 years as illustrated in section 3.5.2. Once both the budget and target scenarios have been created, the annual infrastructure-funding gap is calculated through the comparison of the Waterloo DSS budget and target scenario outputs.

It is important to note climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions, or fully offsets its emissions — by 2050.

5.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of AM planning when Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure (O. Reg. 588/17) was enacted on January 1, 2018. O. Reg 588/17, which provides guidelines and expectations for the application of AM principles for municipalities. In O. Reg. 588/17, the Province introduced specific metrics of interest (from a provincial point of view) that are to be reported for core assets (roads, water, stormwater, sanitary, and bridges and culverts). Municipalities are responsible for introducing and reporting on metrics for non-core assets (all other asset classes).

Please refer to the corresponding sections in Appendix B: Tax Base Funded, Appendix C: Enterprise Funded Assets and Appendix D: Uptown BIA for asset class specific information and where applicable, metrics established by the City.

5.5 Modern Equivalent

A key methodology used by the City since 2016 was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap. A few examples of the like-for-like concept include:

- Replacing natural gas boilers with natural gas boilers
- Replacing high-pressure sodium (HPS) decorative street light bulbs with HPS light bulbs
- Replacing concrete sidewalks with concrete sidewalks

In 2022, the City adjusted from using a like-for-like approach to a "modern equivalent" (or "like-for-similar") approach. This concept changes the earlier examples to:

- Replacing natural gas boilers with electric boilers
- Replacing HPS decorative street light bulbs with Light Emitting Diode (LED) bulbs
- Replacing a concrete sidewalk with a multi-use asphalt path

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation (such as reducing GHG emissions), and reach strategic plan or master plan goals. This will improve the Waterloo DSS's forecasting capability, adjust the estimated annual infrastructure funding gap and inform the "percentage of needs" calculation used to allocate capital replacement and rehabilitation funding (Capital Infrastructure Reinvestment Reserve Fund (CIRRF) and Canada Community-Building Fund (CCBF) for tax base funded assets). The modern equivalent approach is not intended to be applied as a "blank" update however, and will take time to incorporate into the Waterloo DSS and involve detailed conversations with SMEs.

Moving to a "modern equivalent" approach will likely increase the City-wide annual infrastructure funding gap; however, the magnitude of the increase is difficult to determine until AM staff and SMEs can undertake a detailed review of each asset class. It is important to note that in some situations, a true "like-for-like" replacement is not possible so the modern equivalent approach is already in use when necessary. For example, when replacing a clay sanitary pipe, it is not possible to replace it with a new clay pipe and as a result, a PVC pipe (the modern equivalent) is installed. Other modern equivalent examples that are in use already (when necessary) are:

- Upgrading a desktop computer with a laptop computer;
- Upgrading a computer server with a cloud server;
- Road reconstruction projects that adds active transportation infrastructure;
- Replacing asphalt curbs with concrete curb and gutter;
- Replacing conventional facility lighting (e.g. fluorescent) with LED bulbs.

5.6 Climate Change Adaptation and Mitigation

The City has, or is a partner in, several climate change plans related to adjusting to the impacts of climate change (adaptation) and reducing the amount of greenhouse gases in the atmosphere (mitigation). These plans cover both corporate and community scales on a wide range of subject areas including infrastructure and physical assets.

For adaptation, the City approved a Corporate Climate Change Adaptation Plan (CCCAP) in 2019. The goals of the CCCAP are to:

- minimize health and safety risks to outdoor workers and community members;
- generate awareness of changing climate conditions with staff and the public;
- ensure a coordinated response to extreme weather events;

- consider climate change impacts in infrastructure design, construction and maintenance;
- foster resiliency within the urban forest and natural landscape;
- reduce risk associated with heavy rainfall and flooding;
- minimize the disruption of City services; and
- integrate climate adaptation into the City planning and operations.

In addition, the CCCAP includes 37 actions to help the City adapt to the effects of climate change. The actions in the plan included increasing the capacity of stormwater management systems, using different construction materials, updating operating procedures, and modifying outdoor work policies. Furthermore, the CCCAP both directly and indirectly considers asset management through recommending the inclusion of climate change and green infrastructure into asset management exercises, among other actions.

The CCCAP includes a summary of the projected climate changes for the City as identified in below. As noted in the CCCAP, there is an inherent component of uncertainty, however, climate models provide the best available information to utilize when planning for the future of the City's assets, operations, and services.

Summary of Projected Climate Changes in the City of Waterloo[3]

Temperature

- The annual mean temperature between 1981-2010 was 7°C. Waterloo can expect the annual mean temperature to increase to 8.4°C by the 2020s, to 10.2°C in the 2050s, and to 12.2°C in the 2080s.
- Trends show significant warming across seasons, with the greatest warming to occur in winter and spring.
- More freeze-thaw days are expected in the 2020s and 2050s with an eventual slight decline in the 2080s
- The number of hot days (days above 30°C) is expected to increase from a baseline (1981-2010) of 10.1 days to 12.7 days by the 2020s, 30.9 days by the 2050s and 59.3 days by the 2080s.
- The number of cold days (days below -15°C) is expected to decrease from a baseline of 22.1 days to 9.9 days by the 2020s, 5.8 days by the 2050's and 2.8 days by the 2080s.

Precipitation

- The mean annual precipitation between 1981-2010 was 918.5 mm. Waterloo can expect the annual mean precipitation to increase to 953.4 mm by the 2020s, 1,014 mm by the 2050s and 1,028.7 mm by the 2080s.
- Trends show precipitation events, in general, are expected to become more intense and extreme with winter, spring, and summer projected to become significantly wetter.
- Number of dry spells (6 or more consecutive days with no precipitation) are expected to decrease slightly over the century.

3 City of Waterloo, **Corporate Climate Change Adaptation Plan**, 8

Extreme Weather and Winter Precipitation

- Increase in the intensity, duration and frequency of extreme rainfall events.
- Severed wind events to increase in both frequency and magnitude by the end of the century.
- Annual mean snowfall is predicted to decrease while freezing rain events will increase by the end of the century.

Mitigation includes any actions that reduce the amount of greenhouse gases released into our atmosphere that contribute to climate change. Examples include improving the energy efficiency of buildings and using low-emission or zero-emission vehicles. The City approved its **Corporate Climate Action Plan** (CorCap) on January 29, 2024, which directs all City divisions to integrate climate change considerations in the work the City does and examines City operations and services and how they influence the creation or sequestration of greenhouse gas emissions. On the community scale, the City is a member of ClimateActionWR, the collaboration responsible for the development and implementation of **TransformWR**, a regional community mitigation strategy. This strategy lays out several transformative changes focusing on transportation, buildings, waste, and equity.

These three plans are all intended to guide the City towards a resilient and low-carbon future and will heavily intersect with planned asset management practices. Of note, adaptation and mitigation are not mutually exclusive as some actions have co-benefits, meaning they contribute to both adaptation and mitigation. For example, planting trees will assist in providing shade and adapting to extreme heat, while also mitigating greenhouse gas emissions by acting as a carbon sink and potentially lowering energy use in both summer and winter months.

It is important to note climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions, or fully offsets its emissions — by 2050. AM staff will collaborate with the Strategic Initiatives division, the Environmental Sustainability Team (EST) and SMEs throughout the organization to incorporate climate change adaptation and mitigation into the Waterloo DSS and performance forecasting methodologies as more information and data become available.

5.7 Demand Management Plan

Demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand will change over time in terms of demand for quantity of service (e.g. increasing need for pickleball courts) and types of services required (e.g. ebooks versus physical books). Table 16 is intended to help forecast how the demand for services will impact assets. For example, an increase in usage of the outdoor artificial turf fields at RIM Park may mean that the fields will need to be renewed earlier than originally planned.

There are two main types of demand management – Supply-Side and Customer Demand.

Supply-Side Demand Management

Refers to the actions taken to maximize the capacity of the existing network (without a need for an asset upgrade) and/or to minimize demand arising from the management of the network (such as water loss). Supply-side demand management strategies may include improved scheduling, alternative service options, and network loss management.

Customer Demand Management

Refers to demand management strategies aimed at changing customer behaviour, usually to reduce overall demand and/or shift demand into off-peak times to reduce peak demands. Drivers for implementing customer demand management strategies typically include:

- Deferral of capital expenditures;
- Operational cost-efficiencies;
- Environmental constraints on resource use; or
- Social desire to "be greener".

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes. City-wide demand drivers are included in **Table 16** below.

Please refer to the corresponding sections in Appendix B: Tax Base Funded, Appendix C: Enterprise Funded Assets and Appendix D: Uptown BIA for asset class specific information.

TABLE 16: CITY-WIDE DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Climate Change	The 2019 Corporate Climate Change Adaptation Plan identifies actions to help the City adapt its assets, operations, and services to address the impacts of climate change.	More extreme weather events are expected such as extreme heat and more intense rain and wind events. A higher frequency of freeze/thaw cycles is anticipated. It is possible that extreme weather events may damage or negatively impact assets (e.g. tree canopy, facility roofs).	Additional stress on assets (e.g. road surfaces, underground infrastructure, facilities, natural assets) results in the potential for more repairs and reduced life cycles.	Monitor and adapt as per recommendations identified in the Corporate Climate Change Adaptation Plan.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Infill Infrastructure Requirements	Infill construction in the City's core is occurring along with design changes (e.g. complete streets) to accommodate changing demographics and needs.	The City has limited greenfield sites left and significant infill construction will be needed to accommodate the anticipated population growth.	Increased demand for renewed and enhanced Transportation networks to accommodate more users.	Monitor and adapt, as necessary.
Population Growth (residents and students)	Numerous high-density development proposed in the Uptown Core and along LRT corridor. There can be a very abrupt population increase, maximizing the resources in the City. Specifically, from September to April the population rises in the university and college areas overextending the resources further.	Growth is expected to continue in the foreseeable future. City to rapidly grow in the next ten years. Risk of both students and residents cannot effectively access services (e.g., public transportation). There is a higher demand for scarce resources as the population rises. (e.g., access to community spaces)	Increased demand for public spaces and resources such as access to City recreation facilities, road maintenance, and transportation networks like trails. This will result in increased pressure on existing municipal infrastructure.	Monitor and adapt resources (e.g. additional staff and vehicles) as the population grows.
Bill 23 Impacts	Bill 23 has potentially impacted the City's ability to support affordable housing and community infrastructure projects.	Bill 23 allows for additional units for residential lots zoned for single homes however those who rely on affordable housing are impacted by the lack of affordable housing. As the population ages more accessible living spaces are needed.	Bill 23 reduces the amount that municipalities can collect from developers to contribute towards growth related infrastructure. To maintain existing services levels and build the required new infrastructure to support affordable housing unit growth, new funding from senior levels of government will be required, or additional tax levies at the municipal level may be needed. Increased infrastructure demand.	Monitor provincial legislation and adapt, as necessary. Consider prioritizing housing supports.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Demographic Changes	The City has seen an increase in the elderly, young adults, and recent graduates' population. Substantial population growth is also driven by increased immigration. The current pace of immigration will likely result in immigrants coming from a greater variety of regions across the world, contributing to the continued ethnic diversity of the City.	Further demand for infrastructure to meet the needs of a more diverse community including cemetery spaces that meet the burial needs of diverse cultural groups, access to indoor and outdoor facilities that offer a diversity of recreation opportunities.	Creating an inclusive environment for all demographics and abilities to meet emerging needs.	The creation/review of City policies to guide management of requests for use of facilities and access to cemeteries for diverse users is recommended.
Heat Island and the need for more shade (trees/shade structures)	The tree canopy in older neighbourhoods is thinning and there is a lack of available shade structures in the City. The public has asked for more.	Folks with lower incomes will require green spaces to get relief from the heat. Planned capital projects to provide shade in the Uptown Core.	Without access to outdoor spaces for more shade, there may be a greater demand for indoor facilities that function as cooling stations. Investigate options to allocate increased resources.	Allocate resources to monitor and adapt rehabilitation and replacement activities as limited funding allows.

5.8 Risk

As noted earlier in section 2.6, SMEs manage the City's infrastructure assets to ensure compliance with regulations and design standards to ensure safe, reliable assets that meet their intended service delivery timelines. The asset risk is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the performance of the City's assets supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized. In addition to their inherent expertise, SMEs always consider a wide range of factors during infrastructure decision-making processes to minimize risk, as included in section 5.3.

Please refer to the corresponding sections in Appendix B: Tax Base Funded, Appendix C: Enterprise Funded Assets and Appendix D: Uptown BIA for asset class specific information.

6 Conclusion

The City of Waterloo's infrastructure assets are critical to providing municipal services to the community. This AMP is a strategic document that outlines the current and projected performance of the City's assets along with the methodologies used to manage assets over their life. This document is the third in-house AMP produced by the City's Asset Management team and builds upon on-going efforts by SME and AM staff by leveraging new and improved asset data/information from each asset class, using new tools and techniques where available.

To practice effective asset management as it applies to management of public infrastructure, building on top of existing organizational processes (rather than changing them) is necessary. The City has risen to the challenge by putting forth the effort necessary to bridge gaps in asset management practices. Our success is due to our efforts to operationalize asset management and building on the processes that staff already use.

This AMP identifies the current and projected performance of the City's almost $4 billion worth of infrastructure assets. As noted in section 3.5.1, 66% of the City's tax base funded assets and 75% of enterprises have a fair, good or excellent performance profile. Based on the analysis completed for this AMP, the average annual funding gap is $54 million. The City recommends strategies to mitigate the annual growth of the infrastructure gap. The strategies are to balance the impact on the affordability of City taxation increases on the community while attaining financial sustainability of the infrastructure gap.

As illustrated in this plan, the City is continuing to manage its assets in a responsible manner, notwithstanding typical municipal resource constraints and available funding sources. Decades of data collection and integrated planning for asset rehabilitation and replacement have resulted in well-managed systems. The City plans to continue this approach with ongoing improvements of infrastructure assets and updates to the Waterloo DSS.

7 Recommendations

For several years, the City has gained momentum in advancing municipal asset management principles and practices. It is recommended that the City sustain this momentum along its charted path and continue to build on top of existing processes, as outlined in the 2024 AMP.

These are the main categories of activity to focus on over the next few years:

1. Continuing to align with the Strategic Plan, Official Plan, and other master plans.
2. Continuing to advance the City's AM program including but not limited to:
    a. Minimizing impact on staff time for sharing information required for the Waterloo DSS
    b. Continuous effort in increasing performance data collection capabilities (e.g. bridges and culverts deterioration rates)
    c. The addition of asset condition data, when available, into the Waterloo DSS
    d. Investigate and incorporate the modern equivalent practices, when available
    e. Investigate and incorporate climate change adaptation and mitigation impacts
3. Improving or creating tools (e.g. Corridor tool) that provide data that SMEs can use in their day-to-day decision-making.
4. Recommend preventative maintenance funding increases for public art and bridges and culverts within the operating budget within the 2027 and 2028-2030 budget processes for Council's consideration.
5. Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate.
6. Monitoring and sharing the City's AM progress annually with Council and the public.

These activities will increase decision-making effectiveness with respect to selecting the most appropriate infrastructure improvements and their timing. They will also contribute to minimizing previously anticipated costs while achieving the same anticipated performance.

The City is already working on further advancement of its AM practice, by ensuring current processes are leveraged, and supporting new ones. This approach continues to be an essential strategy for success.

Advanced AM practice is an equal partnership between SMEs (operation and maintenance staff), engineering, finance, senior management, and elected officials. The ability of the City's staff to bridge gaps in knowledge between positions continues to be the key to success.

8 Appendices

8.1 Appendix A: A-030 Strategic Asset Management Policy

CORPORATE POLICY

Policy Title: **Strategic Asset Management Policy**
Policy Category: **Administration Policy**
Policy No.: A-030
Department: Corporate Services
Approval Date: November 16, 2016
Revision Date: November 20, 2023
Author: Cassandra Pacey
Attachments:
Related Documents/Legislation: Jobs and Prosperity Act, 2015, ONT REG 588/17
Key Word(s): Asset, Management, Infrastructure, Sustainability, Service

POLICY STATEMENT

The principles and governance models found within this policy are intended to support and guide the organization to develop a coordinated approach to the management of municipal assets by establishing good stewardship practices.

PURPOSE

This requires the City to have information and an understanding about the long-term and cumulative consequences of managing public infrastructure. This is achieved by ensuring that the systems and processes are in place to facilitate good decision-making and guide staff toward optimal choices to deliver sustainable infrastructure-related services. This includes the City's approach to planning, designing, constructing, acquiring, operating, maintaining, renewing, replacing, and disposing of infrastructure assets. The policy confirms the City's commitment to the management of the City's infrastructure assets and sets out governance and accountability roles for asset management at the City.

This policy guides the development and maintenance of its comprehensive Asset Management (AM) Plan and provides the principles under which plans and strategies are to be developed. The City will combine high quality data collection, evidence-based analysis with professional management in a structured method to evaluate assets in order to:

1. Facilitate effective decision-making and risk assessments;
2. Meet legislative and regulatory requirements;
3. Establish levels of service and adjust as necessary to accommodate asset efficiency, effectiveness, sustainability, growth, and people-centered outcomes;
4. Mitigate and adapt to impacts of climate change; and
5. Work towards assets with accessibility elements meeting legislative requirements.

SCOPE

This policy applies to all members of the City's organization and all infrastructure assets or asset systems, including natural assets owned and operated by the City and used to deliver services to the community.

POLICY COMMUNICATION

This policy will be posted on the City website and staff will be advised via distribution to Managers, the Operational Leadership Team (OLT) and the Corporate Management Team (CMT).

DEFINITIONS

Asset: Any item, thing or entity that has potential or actual value to the organization.

Asset Management (AM): A coordinated set of activities to realize optimal value from the organization's assets throughout its lifecycle.

Asset Management Plan (AMP): Document that details how groups of assets are to be managed over their lifespan. The plan describes the characteristics and conditions of infrastructure assets, the levels of service expected from them, planned operational and maintenance actions to help assets provide the expected level of service, and financing strategies to try to implement the planned actions. This document also addresses the impacts and maintenance risks associated with owning the asset.

Asset Management System: A set of processes and procedures that govern how Asset Management is to be implemented.

Capital Infrastructure Reinvestment Reserve Fund (CIRRF): CIRRF is a specified envelope of capital funding to address existing infrastructure needs for condition improvement and sustainability.

Waterloo Decision Support System (DSS): The City's customized analytical support system designed to aid asset project prioritization and provide analysis of asset class strategies.

Level of Service: Defined service for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability, and cost.

Lifecycle: The various phases of an asset's life that are identified as; planning and construction, operations, maintenance and disposal. Each phase has its own opportunities, risks, impacts and costs.

Optimization: The City will apply consistent application of practices based on the needs of the asset classes, interventions, and operations to achieve sustainability and provide optimum value for the public through the:

- Implementation of a lifecycle approach to managing infrastructure;
- Inclusion of changes that consider and addresses impacts to equity deserving groups;
- Evaluation of risk related to environmental, social, and external impacts; and,
- Incorporation of sustainability criteria into infrastructure projects to help ensure a responsible balance between cost, performance, people-centered outcomes, and risk.

People-Centered Outcomes: A focus on the well-being, needs, and experiences of individuals or communities emphasizing people at the center of decision-making and considering their perspectives, interests, and welfare.

Subject Matter Expert (SME): Individuals that accumulate knowledge over time in particular fields or topics and have a level of understanding that is broader than just common knowledge. SMEs are an important resource in maintaining or improving municipal processes or assets.

Sustainable: Achieving or retaining an optimum compromise between performance, costs, and risk of the asset life, while avoiding adverse long-term impacts to the organization from short-term decisions.

Treatment: Any infrastructure improvement activity, including but not limited to maintenance, betterment, renewal, rehabilitation, reconstruction, replacement, lifecycle management activity.

POLICY

Corporate Policy Principles

The City's Corporate Asset Management (CAM) methodology is designed to be an integrated network that will create a systematic framework to critically evaluate municipal infrastructure decisions. The principles in this policy will guide the City in developing an effective approach to managing its assets and deliver optimal value. The City will:

1. Adopt a Lifecycle Approach: Applying a whole-life methodology for managing infrastructure assets through the various phases of its lifecycle;
2. Provide Optimal Value: Balance cost, people-centered outcomes, risk, and performance of assets;
3. Ensure Sustainability: Prioritize environmental, financial, people-centered outcomes and meeting customer levels of service;
4. Develop Service Knowledge: Asset service levels will be clearly defined and communicated;
5. Continuously Improve: Adopt and improve asset management practices and processes throughout the City; and,
6. Endorse Evidence Based Decisions: Improve asset optimization by utilizing up to date infrastructure information.

Objectives

The City has a social, environmental, and fiduciary responsibility to develop a structured method of effectively managing assets on behalf of the public. Significant portions of the City's assets are long lifecycles and in service for decades. Through the establishment of good asset management practices planning for assets will critically evaluate the impact of the assets lifecycle to ensure the asset is providing optimum value for the public in a fiscally responsible manner.

The City's assets support many services and require significant resources during their lifecycle to continue to deliver those services effectively. Evaluating assets to find the optimal value will allow the City to realize efficiencies and support the long-term sustainability of both the services and the assets. The Province of Ontario has identified 14 guiding principles to be incorporated in municipal asset management plans and they can be found in Section 3 of the **Infrastructure for Jobs and Prosperity Act, 2015**. The City's objectives are:

1. Align processes and procedures to meeting the Asset Management Planning for Municipal Infrastructure Legislation (O. Reg 588/17)
2. Develop and implement a lifecycle approach to the management of City assets
3. Attain optimum value by critically evaluating cost, risk and performance
4. Develop sustainable asset management practices
5. Clearly communicate service level information and expectations
6. Achieve a state of continuous improvement
7. Expand upon or create evidence-based decision-making practices

Asset Management Planning

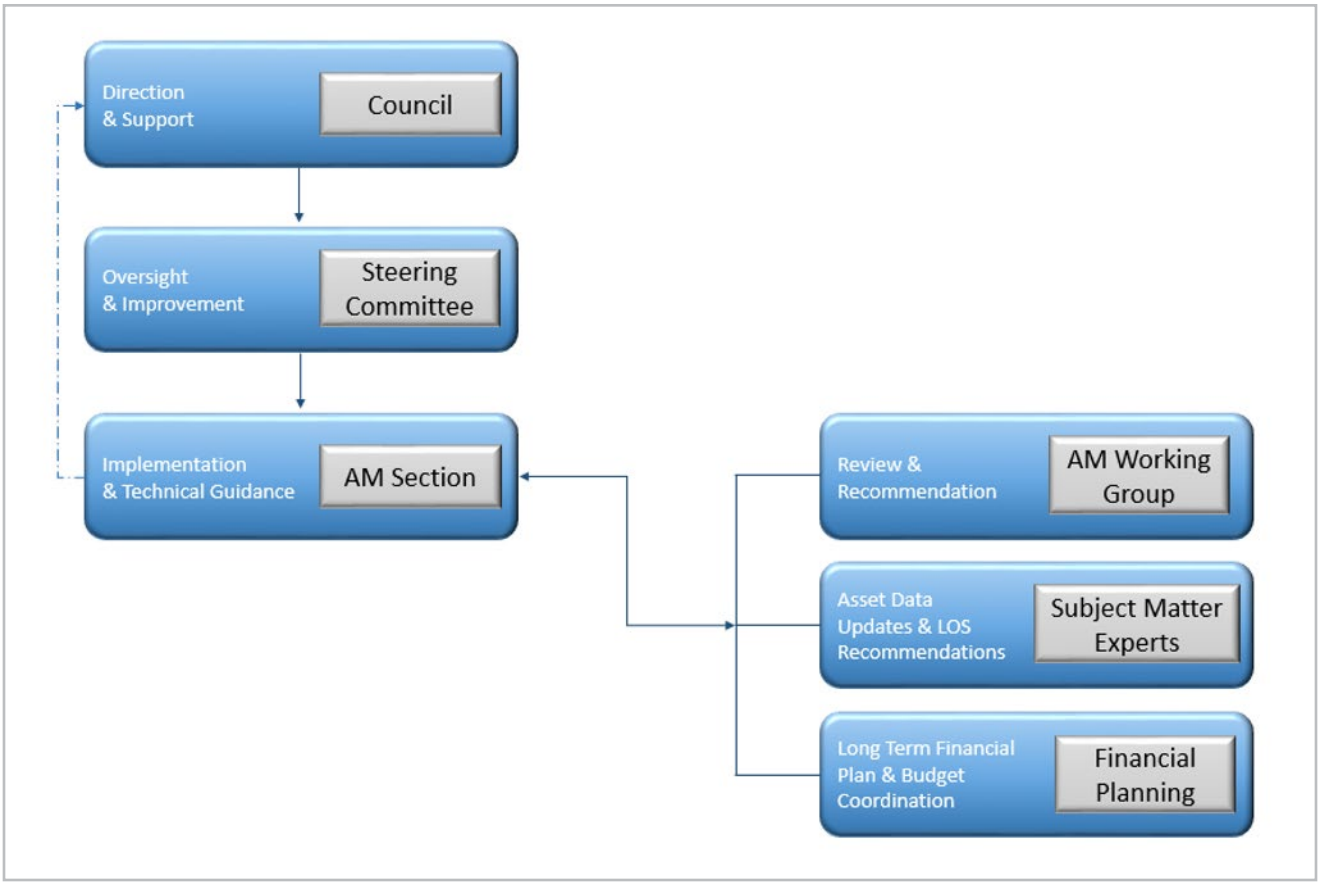
The combination of lifecycle analysis, financial sustainability, and risk analysis will be the driver in the recommendations and design of community development or redevelopment that requires new assets, or existing asset enhancements, to take place. Parties involved in the development and maintenance of the asset management plans will reference the direction established in the community plan as well as the methods, assumptions, and data used in its development. The aim of cross-referencing these plans is to help ensure that development and redevelopment occur within the municipality's means through an understanding of current and future demands for assets.

Asset management planning itself will not occur in isolation from other municipal goals, plans, and policies. An integrated approach will be followed to successfully develop practical asset management plans that align with the overarching accountabilities and aspirations of our community. Council, CMT, the AMP Steering Committee, AM Working Group, and staff will review this policy and incorporate AM principles into everyday decisions that encompass the City's goals and objectives detailed in the:

- Strategic Plan;
- Official Plan;
- Long Term Financial Plan;
- Corporate Climate Action Plan (CorCap)
- Corporate Climate Change Adaptation Plan; and
- Various Master Plans.

Asset Management Key Roles and Responsibilities

The model described is the internal governance structure to outline the connections and flow of information in regards to the City's AM model.



Council's Role

The policy requires the commitment of key participants within the City's organizational structure. Council is entrusted with the responsibility of overseeing, on behalf of citizens, a large range of services provided through a diverse portfolio of assets. Council, having stewardship responsibility, is the final decision maker on all matters related to asset management in the City.

1. Council serves as the publics' advocates and bring forth the community's perspectives when managing the City's Assets.
2. Council will approve policies and strategic asset management plans developed by the AM section.
3. Council will approve customer facing level of service adjustments (e.g. amendments to the pavement quality index target) recommended by the Asset Management Steering Committee.
4. Council will direct staff to report on and consider factors such as lifecycle costs, risks and asset purpose and performance to help in Council decision-making.

5. Council will conduct an annual review of its asset management progress on or before July 1 of each year beginning in 2025 that must address:
    - The City's progress in implementing its AM plan;
    - Any factors impeding the City's ability to implement its AM plan; and
    - A strategy to address the factors impeding the City's ability to implement its AM plan.
6. Council will receive an AMP for endorsement once every four years post approval of the three-year budget.
7. Subject to budget approval provisions in the **Municipal Act**, the Mayor or Council will evaluate and consider staff-recommended funding plans to maintain corporate capacity, including but not limited to financial and staff resources and competency, business processes, data, and integrated information systems, to support asset management through the City's budget process in alignment with the Long Term Financial Plan.
8. Support ongoing efforts to continuously improve and implement the asset management plans.

Executive Lead Role – CAO

1. Provide input on all AMPs, policies and strategies within the organization including the review, approval and alignment with the City's goals and compliance with the AM principles and legislative requirements.
2. Support and encourage corporate adoption and integration of AM Principles, Objectives and Practices.
3. Encourage an integrated approach to planning and communication to help ensure the AM goals are achieved.
4. Endorses the AM policy, and any updates at least every five years.
5. Endorses the AMP and its updates at least every five years in advance of seeking Council approval.

Asset Management Steering Committee Role

1. Committee will be comprised of CMT, Director of Financial Planning and Asset Management, Manager of Asset Management and the Councilor appointed as the Finance liaison.
2. Approve technical level of service adjustments (e.g. watermain replacement strategies/timeline) recommended by the Asset Management Working Group and recommend customer facing level of service changes (e.g. amendments to the pavement quality index target) to Council for approval.
3. Provide input and direction on plans, policies and strategies and review processes.
4. Promotes corporate adoption and integration of AM principles, objectives and practices.
5. Provides adequate resources to support asset management goals at the functional level.

Asset Management Section

1. The AM Manager is the centralized point of contact for asset management and is responsible for the integration of AM principles and advises the Steering Committee, AM Working Group and SMEs.
2. The AM section provides corporate leadership for asset management practices and concepts.
3. The AM section provides guidance to SMEs and facilitates skill development as it relates to asset management.

4. The AM section will work with SMEs to evaluate and recommend proposed level of service changes to the Asset Management Working Group.
5. The AM section is responsible for preparing the City's AMPs and annual report cards based on input from SMEs, the AM Working Group and the AM Steering Committee
6. Leads continuous improvement activities for the Waterloo Decision Support System (DSS) and asset management throughout the City.
7. The AM section develops and updates asset management policies and procedures and will ensure that the policy and AMPs are publicly available on the City's website and shall provide a copy of the policy and plan to any person who requests it.
8. The AM section develops and maintains AM guidelines specific for each asset class.
9. Liaises with Financial Planning regarding asset management components as part of the development of the City's operating and capital budgets and Long-Term Financial Plan.
10. Is responsible for seeking public input regarding asset management principles and plans.

Asset Management Working Group

1. Will be comprised of directors specifically responsible for each individual asset class and the related support(*) divisions. The committee includes the following areas:

- Transportation Network^
- Parks
- Public Art
- Facilities
- Water Distribution
- Sanitary Collection
- Stormwater and Natural Assets
- Bridges and Culverts
- Fire
- Information Technology
- Parking
- Fleet
- Cemeteries
- Forestry
- Strategic Initiatives*
- Engineering*
- Communications*
- Manager, AM*
- Reconciliation, Equity, Accessibility, Diversity and Equity*

^ The Transportation Network is comprised of various sub-asset classes such as roads, streetlights, sidewalks and trails.

2. Communicate with their respective staff about asset management to increase awareness of their role in asset management decision-making, including the value of the activities they are undertaking and the asset information they are providing.
3. Continuously improve and adopt appropriate asset management planning practices within their asset classes.
4. Responsible for supporting and recommending level of service changes proposed by subject matter experts and the Asset Management section, to the Steering Committee.

5. Review and provide input on the detailed AMPs, which will be developed through coordination between the specific department / section and the AM section.
6. Review and provide input on AM report cards, policies and strategies prepared by the AM section.
7. Coordinate planning with peer municipalities with shared and interrelated assets.
8. Request SMEs take the City's AM training modules.

Financial Planning

1. Shall incorporate AM data into the Long Term Financial Plan, the Capital and Operating budgets including the allocation of CIRRF dollars based on the weighted average needs from the DSS to help inform senior management and Council budget decision-making;
2. Assist in the maintenance of lifecycle costing methodologies and data.

Subject Matter Experts

1. Collect and track asset information for assets within their portfolio. This includes but is not limited to asset inventory, condition, risk, treatment strategies, deterioration rates, treatment costs, replacement costs and estimated service life.
2. Help establish and maintain a risk profile for their related assets.
3. Assist in the data maturity rating process to help identify and resolve data and / or process gaps.
4. Use AM data to inform decisions in their rehabilitation and replacement prioritization processes.
5. Integrate people-centered outcome considerations in their rehabilitation and replacement prioritization processes.
6. Apply a full lifecycle perspective when considering the construction or acquisition of assets and development of future capital plans.
7. SMEs will work with the AM section to evaluate and recommend proposed level of services changes to the AM Working Group.
8. Review the City's AM training modules as recommended by the AM section and AM Working Group.

Residents, Stakeholders and Customers

Public input is vital to the success of the AM program. The public shall be encouraged to become as engaged as possible. It is necessary that the City understands the needs of current collaborators and consider the needs of future generations. This understanding shall be incorporated into asset management plans. To this end, the City will investigate opportunities to inform and engage with the public and provide feedback opportunities.

Asset Management Integration and Principles

Asset Management and Climate Adaptation

That the City is committed to asset management and throughout the planning process the City will consider and evaluate the following integration principles:

Community Focused

- Observe asset management processes and practices supported by service levels and regularly updated asset data.
- Recognize that asset management decisions extend beyond a Council term and that the focus will be on the municipal lifecycle of assets from acquisition/construction to disposal including level of service, risk, maintenance and operating activities and lifecycle costs.
- Identify people-centered outcomes as a decision factor when evaluating rehabilitation and replacement needs.

- Service Levels
  - Maintain assets to sustain the Community and Technical Levels of Services for each asset class while complying with all relevant legislation, regulatory and statutory requirements. Examples include but are not limited to the Safe Drinking Water Act 2002 and Ontario's Land Use Planning Framework.
- Long-Term Sustainability and Financial Implications
  - AM will align with the strategic plan, official plan and other master plans as approved by Council.
  - Manage assets to deliver City services in a financially and environmentally sustainable manner to meet community expectations, legislative requirements, climate mitigation and adaptation needs, climate change impacts and anticipated needs of future generations.
  - Consider financial, social, cultural and environmental sustainability goals and risk throughout decision-making processes. Recognize that financial constraints and challenges exist for all City services and assets and that asset management practices must be proactive and responsive to changing environments and require long-term financial planning.
  - That the City will include asset management information into corporate financial planning exercises (i.e., the Long Term Financial Plan, Capital and Operating budgets) and that funding outcomes shall influence the development and updates of the AMP. Similarly, infrastructure / asset information generated by the Asset Management Section will be foundational components of those financial planning and budget exercises.
  - Asset areas will work with AM and Financial Planning to incorporate AM data in their review and development of capital projects, funding levels and gaps.
  - Identify and plan for required operational, maintenance and rehabilitation/replacement needs associated with new and existing infrastructure while considering ways to minimize the impacts of lifecycle costs;
  - Make informed decisions that incorporates operational, maintenance, replacement and decommissioning requirements;
  - Coordinate planning for asset management, where City infrastructure assets connect or are interrelated with those of its upper-tier or neighbouring municipalities.
- Climate Change, Mitigation and Adaptation
  - Anticipate and plan for costs that may arise from climate change, mitigation and adaptation risks and implications.
  - Identify opportunities and strategies to mitigate climate change, mitigation and adaptation risks and effects.

- Consider climate change mitigation and adaptation impacts and the impact on levels of service.
- Prioritize environmentally sustainable infrastructure development to improve infrastructure resilience in order to meet the needs of future generations;
- Consideration for disaster planning for climate change mitigation and adaptation related impacts on infrastructure assets including contingency funding.
- Promote climate adaptation equity as identified in the development guidelines and as identified in various City guidelines and policies (e.g. the Comprehensive Engineering and Landscape Manual).

- Clear and Transparent Process
  - Operate with a clear structure of organizational accountability and responsibility for service delivery, risk management and the inventory, performance and use of infrastructure assets.
  - Embedding asset management principles and practices throughout the organization by adopting a consistent and repeatable approach to the management of infrastructure assets to ensure services are delivered in an efficient and effective manner.
  - Ensure transparency to the public by engaging interested and affected parties to understand current needs and those of future generations.
  - Investigate opportunities to provide the public ways to become informed and provide feedback.

Capitalization Thresholds

The capitalization thresholds for the City are detailed in the Tangible Capital Assets (TCA) Policy FC-007. Every asset that provides value or has the potential to provide value and connects to the ability to deliver a level of service shall be evaluated for inclusion within the Asset Management Plan. Inclusion will not be based solely on the established TCA capitalization thresholds.

Reporting, Review and Updates

The AM Section will review the Strategic Asset Management Policy for continuous improvement recommendations, to ensure legislative and regulatory compliance. Recommended updates will be reviewed by the AM Working Group and Steering Committee and brought forward to Council for approval at minimum every 5 years.

Staff shall report annually, starting in 2025, to Council on the status of AM initiatives and outcomes. The reporting shall inform Council on the following:

1. Status of AM Plan including the adoption of AM principles within the organization and efforts to ensure continuous improvements.
2. Factors that are impeding the City's ability to implement AM activities.
3. The strategy to address identified opportunities and concerns.

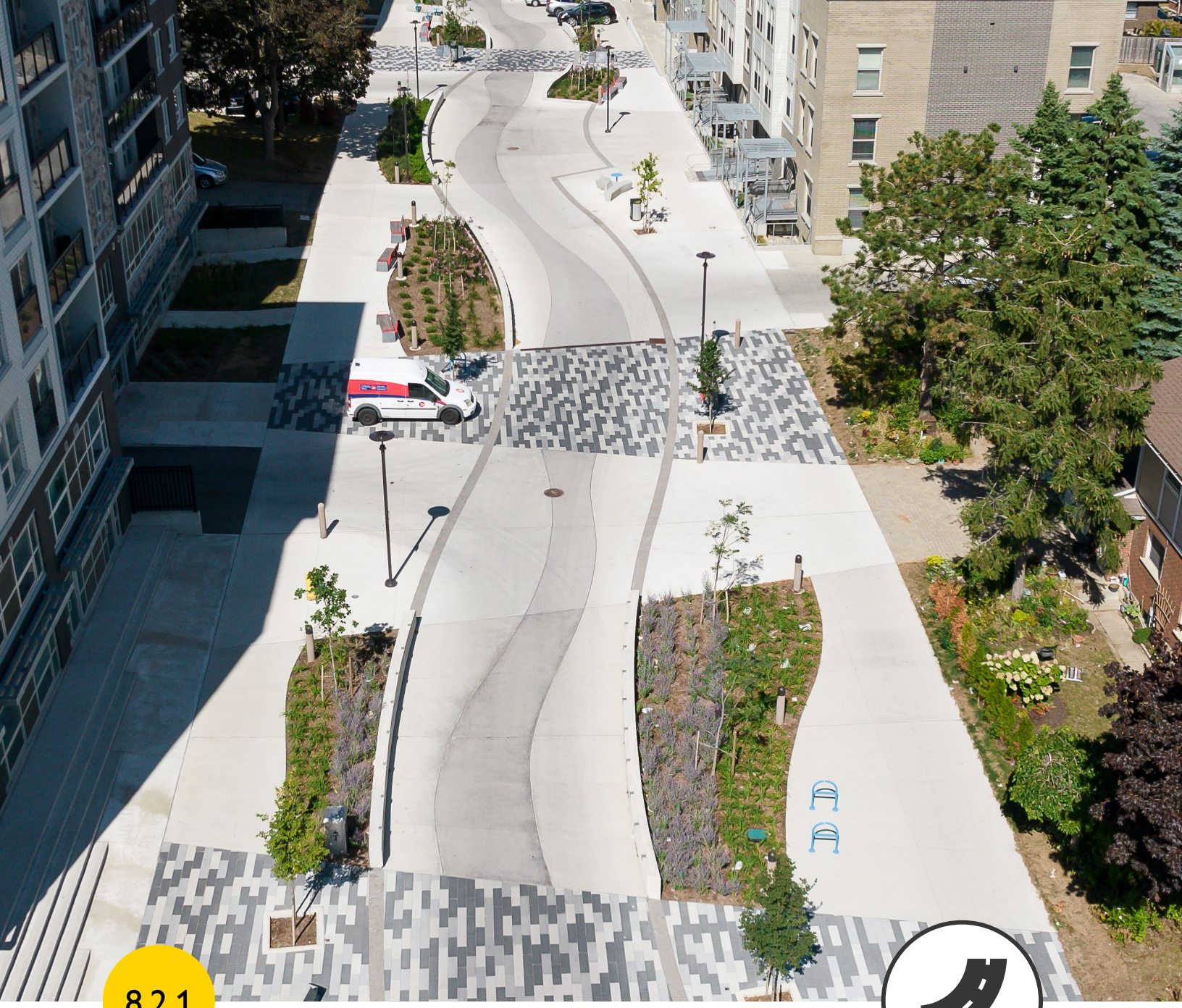
COMPLIANCE

In cases of policy violation, the City may investigate and determine appropriate corrective action.

Appendix B

TAX BASE ASSETS

8.2.1 Transportation
8.2.2 Facilities
8.2.3 Parks
8.2.4 Information Technology
8.2.5 Fire
8.2.6 Bridges and Culverts
8.2.7 Forestry
8.2.8 Library Equipment and Furniture
8.2.9 Public Art
8.2.10 Land



8.2.1

Transportation

8.2.1.1 What do we own and what is it worth?

The 2023 replacement value of the City's transportation assets is estimated at $1.122 billion and includes the city-owned municipal road networks connecting to regional road networks, and City networks of active transportation that consist of sidewalks, multi-use paths, multi-use trails, recreational trails, walkways, and cycling facilities, as well as associated infrastructure such as retaining walls, streetlights, traffic signs and wayfinding signs. A well-maintained transportation network helps people and goods move around our City and encourages many ways to move.

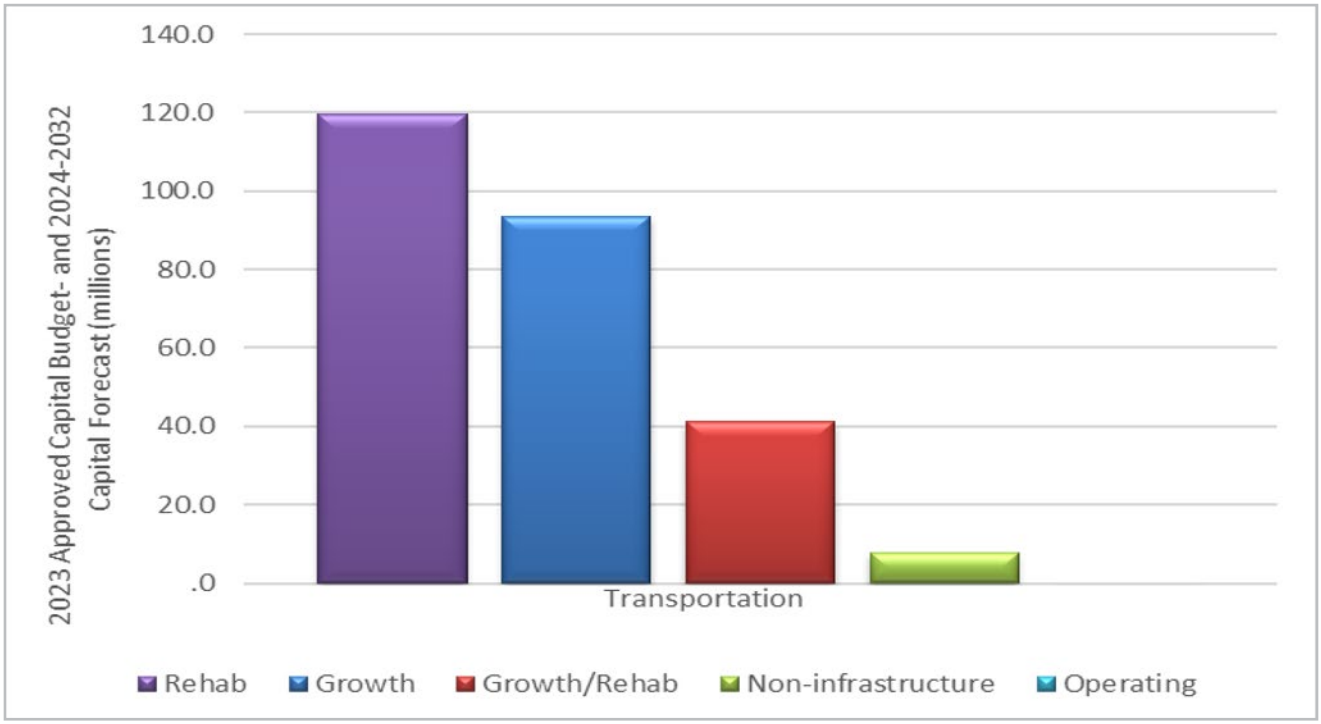
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.1.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the Approved 2023 Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $262 million over the next ten years in transportation assets as illustrated in **Figure 14**.

FIGURE 14: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR TRANSPORTATION ASSETS



The growth component for the transportation asset class is related to development driven needs to build new roads such as the Ira Needles Boulevard By-pass and new trails. On average approximately 9% of transportation assets as a percentage by replacement cost ($99 million) will need to be rehabilitated or replaced in 25 years or less after installation to maintain the service they provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced within 25 years will increase), subsequently increasing the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the Approved 2023 operating budget. The 2023 operating budget included $1.6 million in funding considered to be directly related to treating transportation assets such as retaining wall maintenance activities, pothole repairs and sidewalk replacement activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $7 million over the next 25 years on transportation assets. Based on the best available transportation asset data, deterioration rates and 2023-2032 capital funding, we estimate that transportation assets have an annual infrastructure funding gap of $23 million as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation and replacement costs, continued deterioration, replacements, and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.2.1.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the transportation asset class performance and corresponding expenditure over a 25-year timeframe. Once the forecast activities are within the one to three-year span, SMEs determine what roads, sidewalks, trails, or signs need to be rehabilitated or replaced. Transportation and Engineering SMEs review the asset needs and plan for rehabilitation or replacement to provide an optimized utilization of the assets. The City's current performance for transportation assets is outlined in section 8.2.1.4.1 and the target performance is outlined in section 8.2.1.4.1. When projecting the performance of assets, condition is important. The condition of roads are assessed through a pavement condition inspection process on a bi-annual basis. Retaining walls located in the municipal right-of-way are inspected on a bi-annual basis while sidewalks and trail condition is assessed annually by City staff while the remaining transportation asset condition is performance and age-based.

Roads are rehabilitated when their condition falls below the target pavement quality index (PQI) for a portion of the road. PQI is a rating from zero (very poor condition) to 100 (excellent condition). It considers surface condition, ability to support and bear weight, and how rough the road is. The target condition for each road

segment is based on the classification of larger volume arterial roads (like Union Street and Albert Street), and collector roads (such as William Street and Beechwood Drive) have a higher target condition than lower volume local and residential roads. The City has an overall road network target of 60 PQI; currently, the assessed PQI level is 59.

To maximize spending effectiveness, roads are primarily replaced in coordination with other underground infrastructure work, such as watermains or sanitary/storm sewer repairs or replacements. Roads are typically rehabilitated rather than replaced when only the road requires attention. The timing of proposed developments is also considered when deciding whether to replace or rehabilitate a road.

Further, road renewal is guided by performance "windows" for which different renewal strategies can be applied. If the performance of a road falls below a certain PQI, then rehabilitation is no longer practical, and the road will require a full replacement. **Table 17** summarizes the target performance for each road classification in the City.

TABLE 17: ROAD CLASSIFICATION PERFORMANCE TARGETS

ROAD CLASSIFICATION	PERFORMANCE TARGET
Arterial and Collector	Forecast rehabilitation or replacement when PQI falls below 55 Forecast replacement when PQI falls below 45 Minimum PQI target is 20
Local and Rural	Forecast rehabilitation or replacement when PQI falls below 50 Forecast replacement when PQI falls below 40 Minimum PQI target is 20
Alley	Forecast rehabilitation or replacement when PQI falls below 40 Forecast replacement when PQI falls below 35 Minimum PQI target is 20

For sidewalks and trails, we repair them on complaint response basis and replace them once they reach a very poor performance. Table 18 lists examples of maintenance, rehabilitation, and replacement practices the City undertakes for the transportation assets.

TABLE 18: TRANSPORTATION TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Roads	Pothole repair Crack sealing Surface asphalt layer replacement	Surface layer and a portion of underlying asphalt layer removal and replacement (resurfacing) All asphalt layer removal and replacement Cold-in-place asphalt recycling Hot-in-place asphalt recycling Full depth pavement (asphalt and granular) reclamation	Removal of all existing asphalt and granular layers and replacement with new layers
Sidewalks	Elimination of "step-ups" or "step-downs" between sidewalk sections when >20mm as identified in O. Reg 239/02 Sidewalk grinding	Replacing a few sections within a sidewalk segment	Removal of sidewalk segments and replacement with new ones or with a multi-use path. Typically, this is completed in conjunction with road reconstruction projects
Trails and Trail Links	Elimination of "step-ups" or "step-downs" between trail sections Crack sealing	Replacing a few sections within a trail segment	Removal of the existing asphalt layer (and potentially the granular layer) and replacing it with a new one for the entire length of the trail segment
Traffic and Wayfinding Signs	Inspection	Not applicable	Full replacement of the signs and/or support
Bike Racks	Inspection and repair if there is damage	Not applicable	Full replacement of the bike rack

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Retaining Walls	Settlement repairs* Reinstate/replace capstones Re-point mortar joints^	Replacement of the retaining wall Repair specific sections of wall** Settlement repairs*	Replacement or removal of the retaining wall
Streetlights	Visual inspection of light, electrical components, and support Replace light bulbs Regular cleaning	Repairing loose or damaged wires, tightening screws and nuts	Replacement of the streetlights or the components (e.g. poles, luminaries)

* Settlement can often be challenging to address due to the relationship to trees on private property or other issues that are not obvious. The issues are sometimes captured outside the retaining wall program, e.g. settlement within the right-of-way.

^ When considering large sections of walls or entire walls it is generally more cost effective to replace the entire wall due to the complexities to repointing mortar joints.

** It can be impossible to repair retaining wall sections depending on the location and what ties into it.

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.2.1.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Transportation asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for transportation assets is assessed to be high. The City is continuously working to improve asset data quality as outlined in section 3.1.

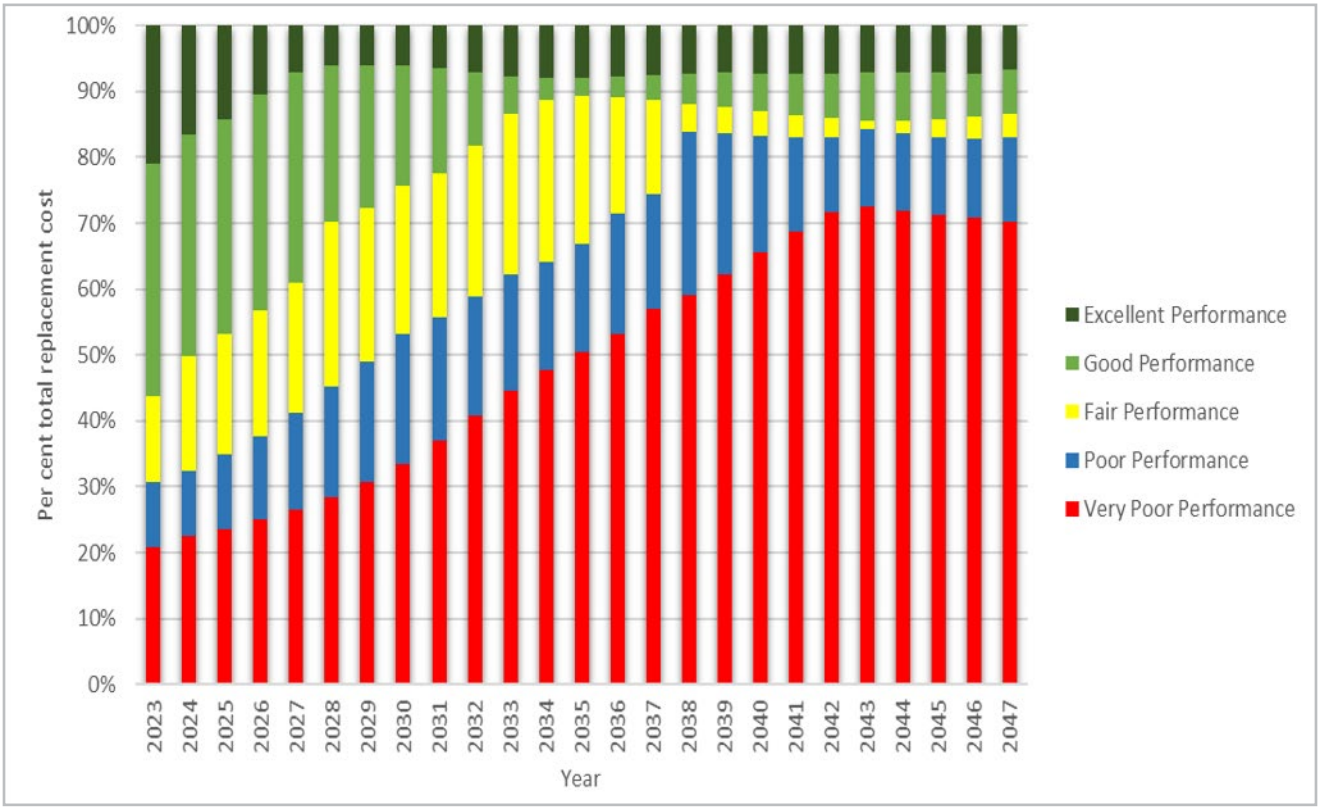
Section 8.2.1.3 identifies the lifecycle management activities required to provide the levels of services offered by transportation assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $1.6 million considered to be directly related to treating transportation assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $7 million annually and increase capital funding to close the $23 million average funding gap as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $31.6 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and approved by Council through each budget process.

8.2.1.4.1 Current Performance and Projected Impact of Budgeted Capital Expenditures

About 31% of the transportation assets are currently considered in poor or very poor performance, as illustrated in **Figure 15**. Over the 25-year timeline, with the current level of funding, we anticipate the percentage of our transportation assets with a poor or very poor performance profile to increase to approximately 83% which is anticipated to be unacceptable to most interested and affected parties. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that transportation assets have an annual infrastructure funding gap of $23 million. The infrastructure funding gap is primarily attributed to the road network at $16 million and the remaining transportation assets having a gap of $7 million.

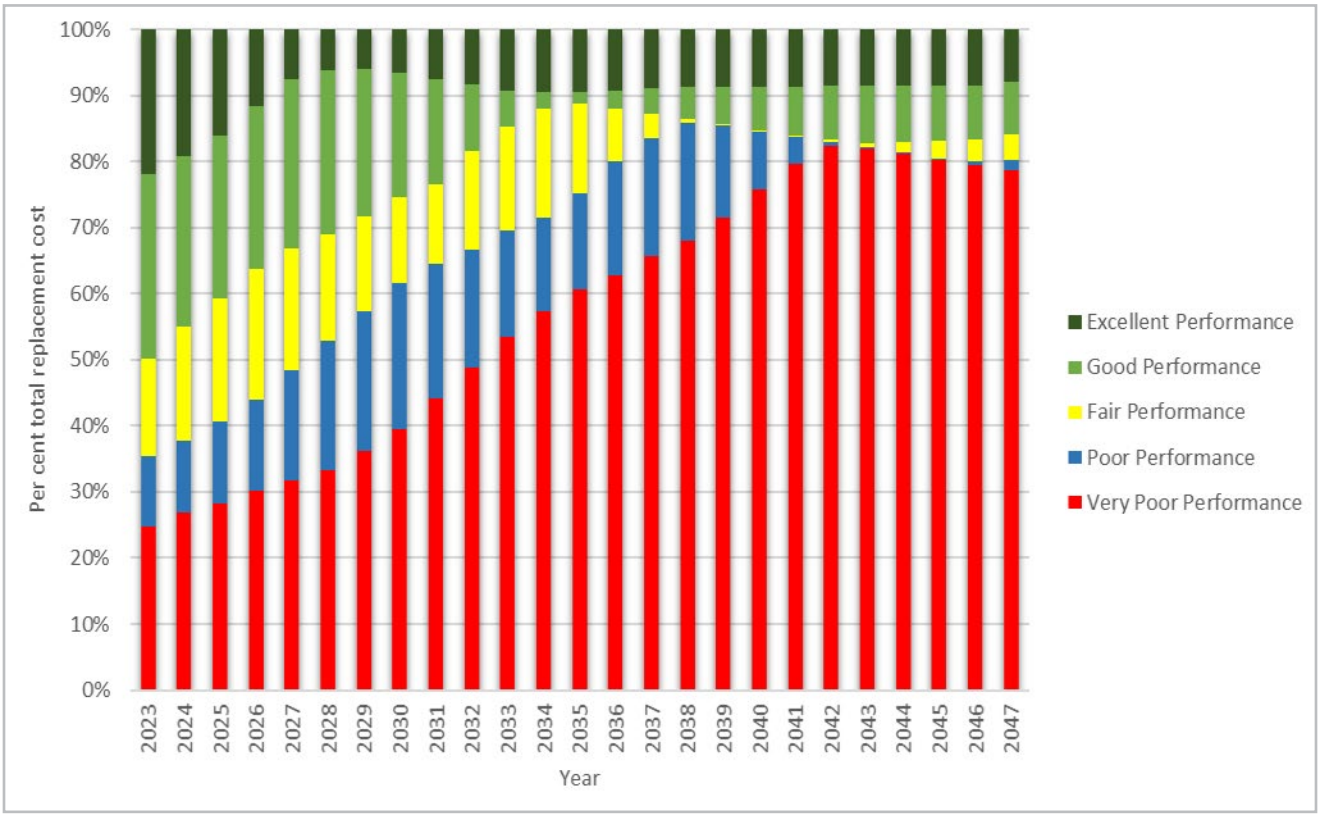
FIGURE 15: PROJECTED ANNUAL PERFORMANCE OF TRANSPORTATION NETWORK ASSETS IN THE BUDGET SCENARIO



Roads

There are currently about 35% of roads (including bike lanes) that are considered to have a poor or very poor performance, as illustrated in **Figure 16**. Over the 25-year timeline, the average annual level of funding of $6.2 million is anticipated to increase the percentage of road assets with a poor or very poor performance profile to increase to 80%. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, it is estimated that road assets have an annual infrastructure funding gap of $16 million and require additional investment.

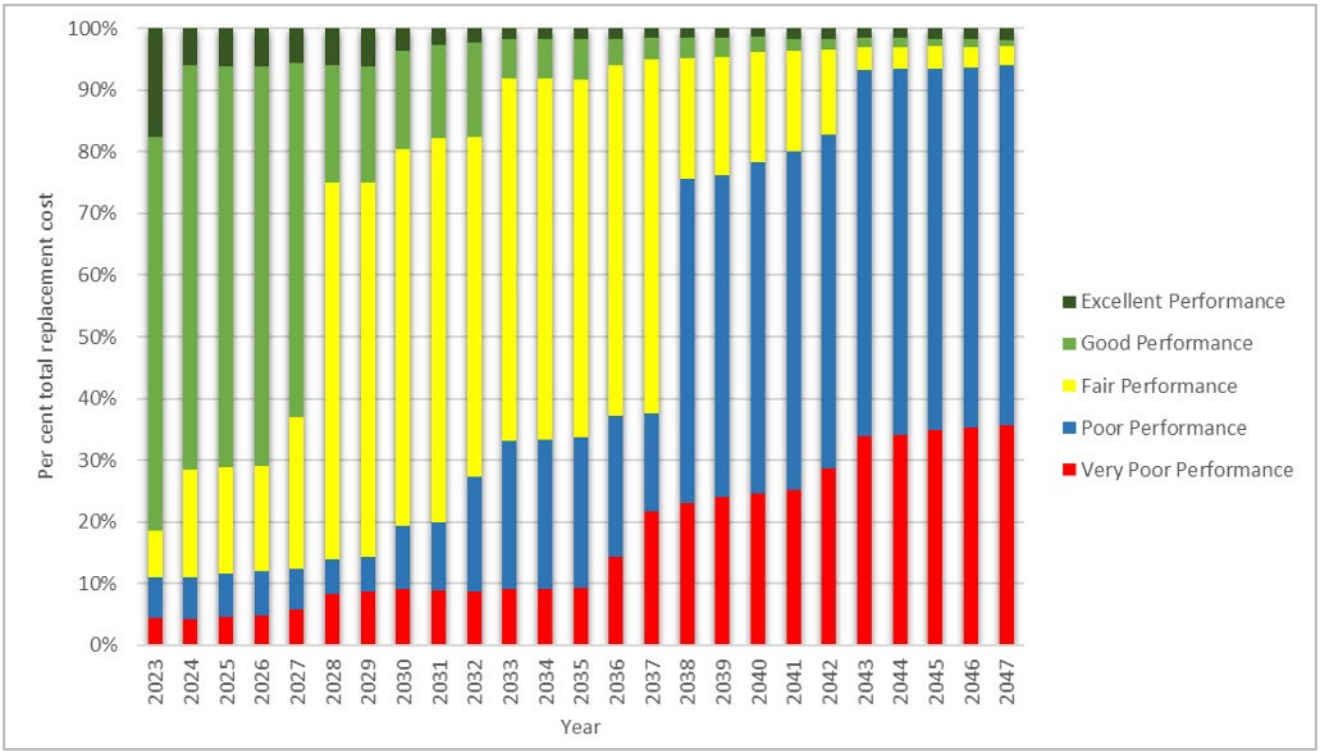
FIGURE 16: PROJECTED ANNUAL PERFORMANCE OF ROAD ASSETS IN THE BUDGET SCENARIO



Transportation Assets

Currently 10% of the transportation assets are considered in poor or very poor performance, as illustrated in Figure 17. Over the 25-year timeline, the average annual level of funding of $800,000 is anticipated to increase the percentage of our transportation assets with a poor or very poor performance profile to increase to 95%. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that these assets have an annual infrastructure funding gap of $7 million and require additional investment.

FIGURE 17: PROJECTED ANNUAL PERFORMANCE OF TRANSPORTATION ASSETS IN THE BUDGET SCENARIO

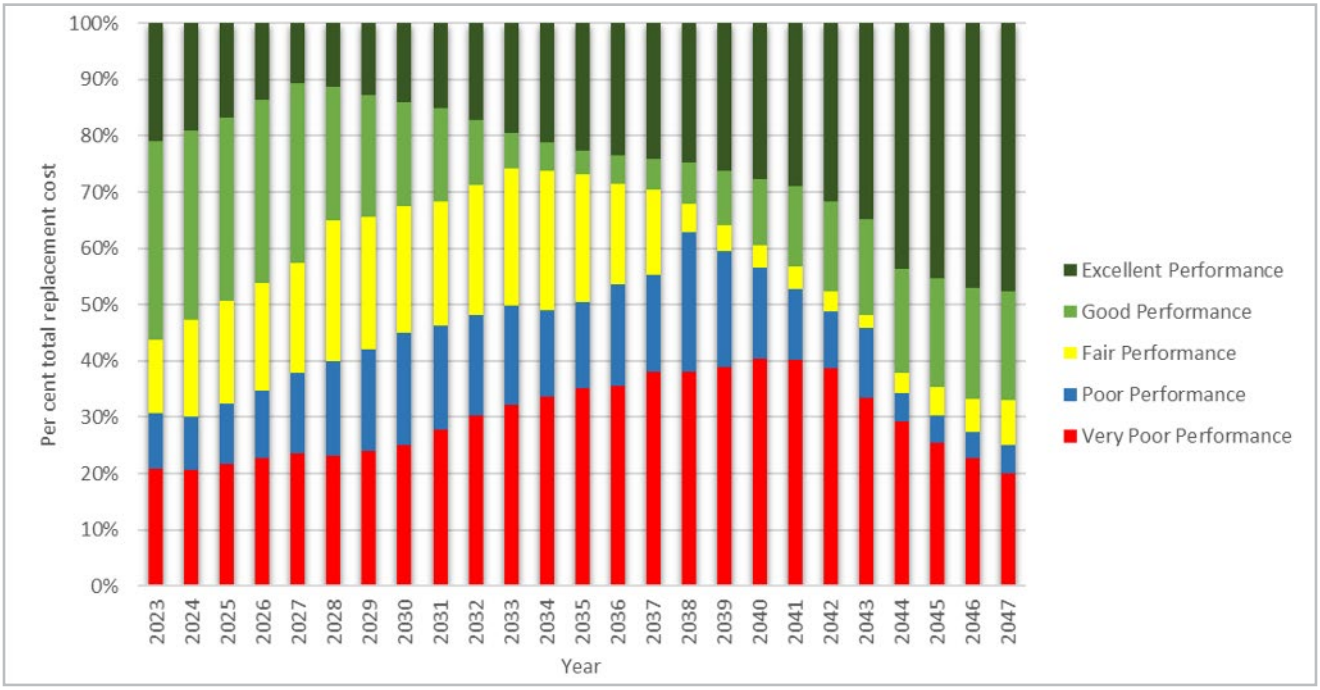


8.2.1.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is used to generate a list of infrastructure expenditure needs to achieve the target levels of service for transportation assets. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

For all transportation assets, the analysis completed for this plan has determined that an average annual expenditure of approximately $30 million over the next 25 years is required to achieve the target performance profile. In the target scenario, the portion of the asset class with fair, good, and excellent decreases during the 2030's however returns to about 70% by the end of the 25-year timeframe as illustrated in **Figure 18**.

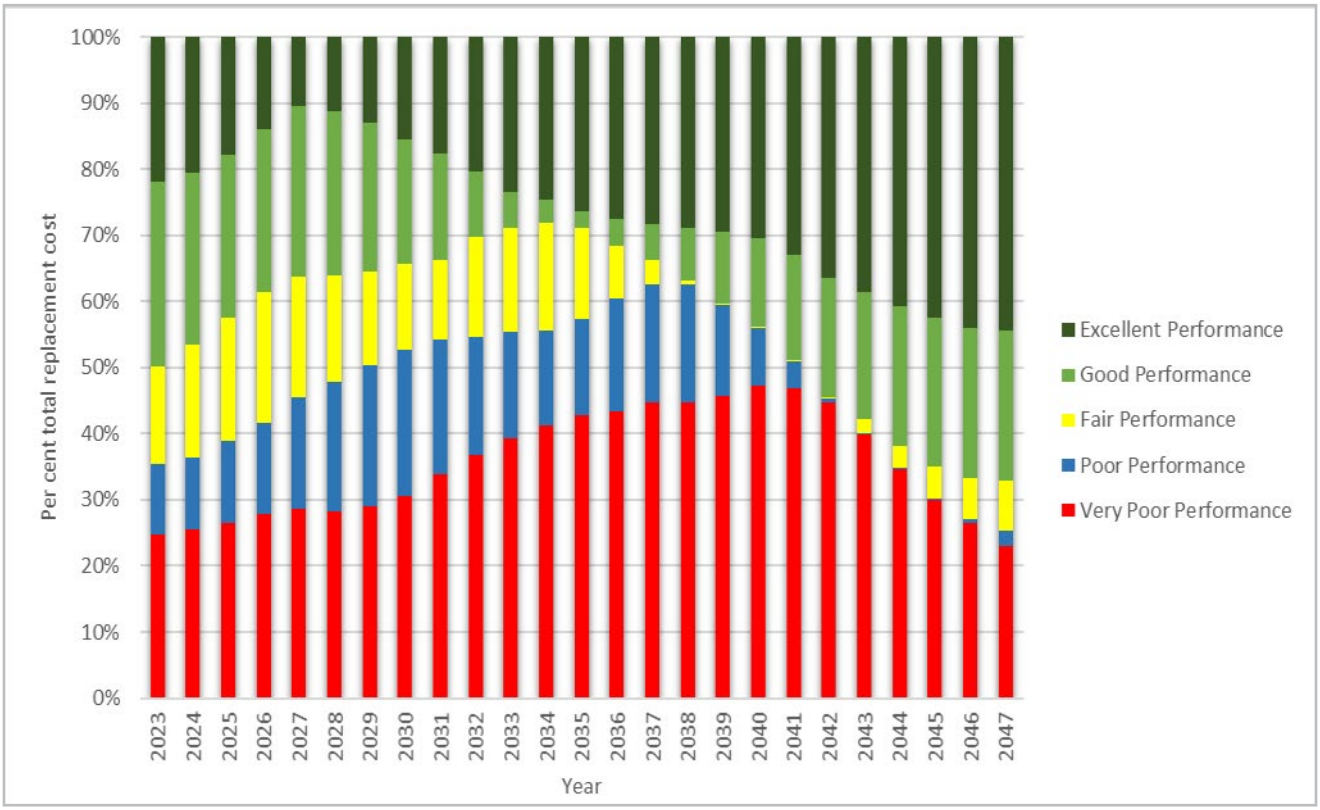
FIGURE 18: PROJECTED ANNUAL PERFORMANCE OF TRANSPORTATION NETWORK ASSETS IN THE TARGET SCENARIO



Roads

For the road network, the analysis completed for this plan has determined that an average annual expenditure of approximately $16 million over the next 25 years is required to achieve the target performance profile. In the target scenario, the portion of the asset class with fair, good, and excellent decreases in the 2030's and returns to is maintained at almost 75% by the end of the 25-year timeframe as illustrated in **Figure 19**.

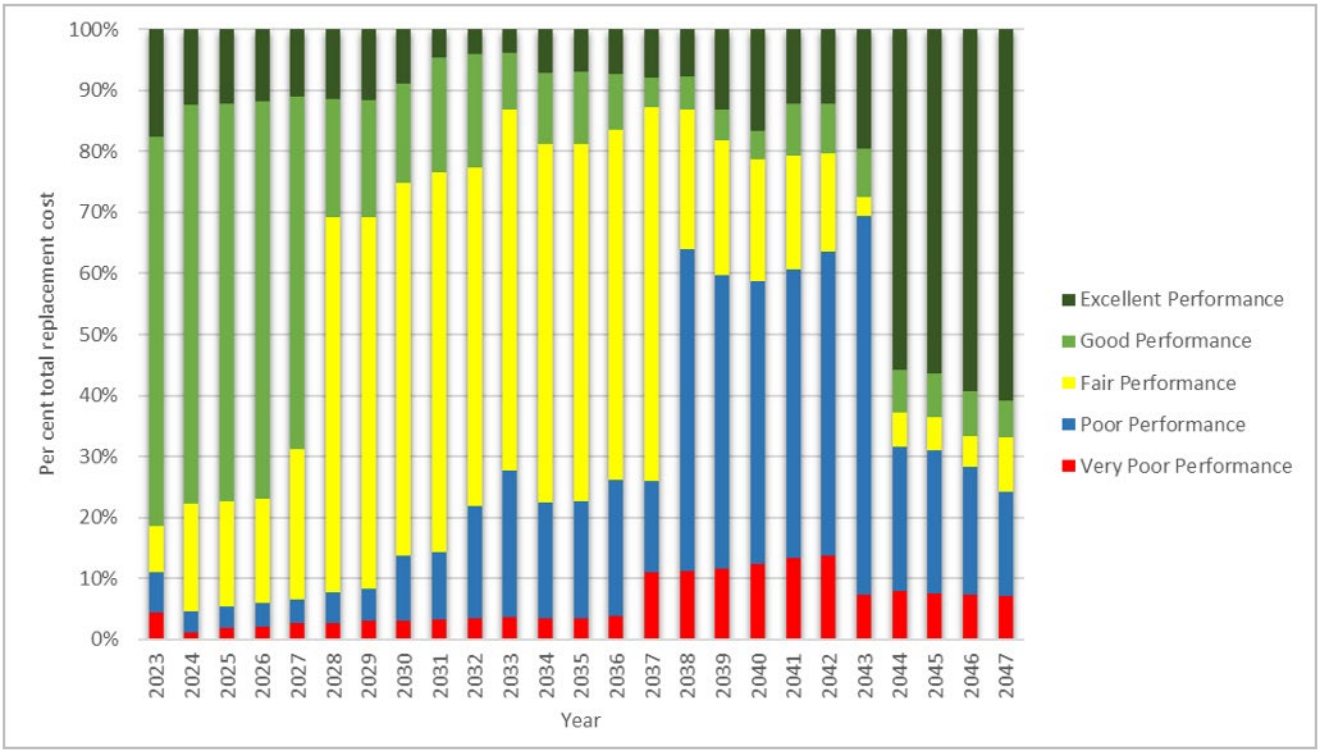
FIGURE 19: PROJECTED ANNUAL PERFORMANCE OF ROAD ASSETS IN THE TARGET SCENARIO



Transportation Assets

The analysis completed for this plan has determined that an average annual expenditure of approximately $7 million over the next 25 years is required to achieve the target performance profile. In the target scenario, the portion of the asset class with fair, good, and excellent decreases in the 2030's and returns to approximately 70% by the end of the 25-year timeframe as illustrated in **Figure 20**.

FIGURE 20:PROJECTED ANNUAL PERFORMANCE OF TRANSPORTATION ASSETS IN THE TARGET SCENARIO



8.2.1.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 21** for the City's Roads and Figure 22 for Transportation assets.

FIGURE 21: AVERAGE AGE (YEARS) FOR ROADS

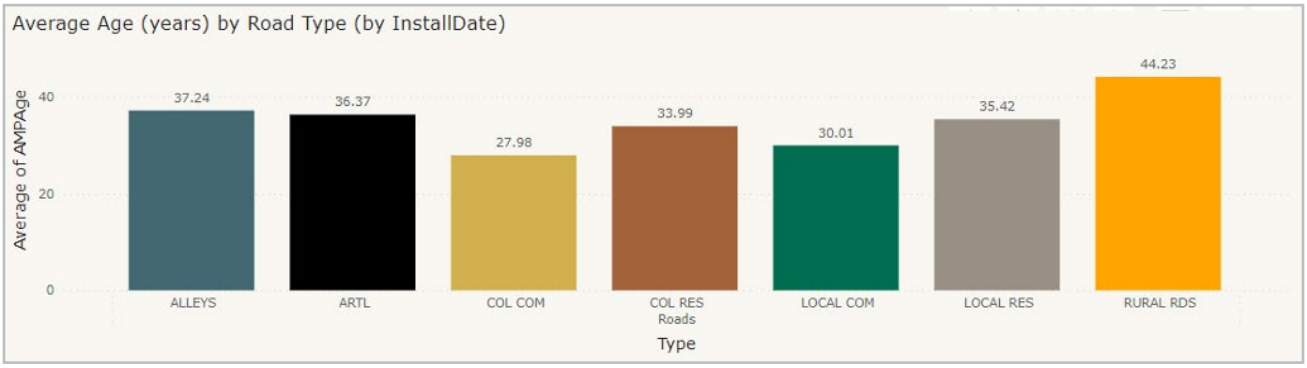
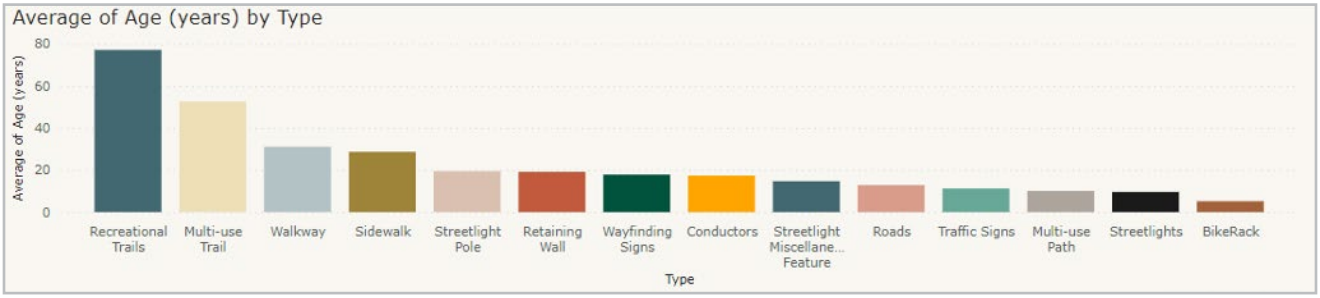


FIGURE 22: AVERAGE AGE (YEARS) FOR TRANSPORTATION ASSETS



The following tables show the levels of service established by the City for transportation assets. These metrics include the technical and community level of service required as part of Ontario Regulation 588/17. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on. As a core asset, transportation metrics are identified below in **Table 19** and **Table 20** and include metrics for the 2021 and 2022 calendar years.

TABLE 19: TRANSPORTATION COMMUNITY LEVEL OF SERVICE METRICS

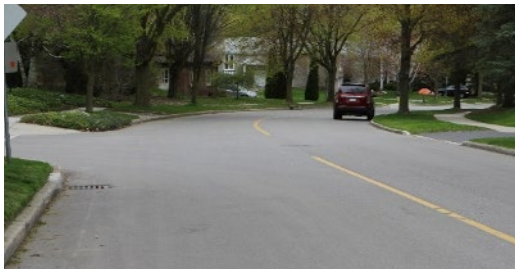
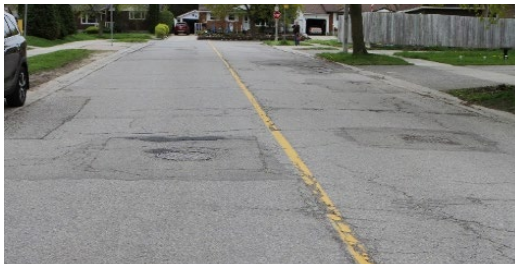
SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION	2022
Scope	Description, which may include maps, of the road network in the City and its level of connectivity.	The City of Waterloo is a lower-tier municipality within the Region of Waterloo and is interconnected by a network of Regional, Arterial, Collector and Local roads, which facilitate travel between in all areas of the City.
Quality	Description or images that illustrate the different levels of road class pavement condition.	See Table 21 for details.
	Description or images that illustrate the different levels of asphalt walkway condition.	See Table 22 for details.

TABLE 20: TRANSPORTATION TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUANTITATIVE METRICS	2021	2022
Scope	Number of lane-kilometres of arterial roads as a proportion of square kilometres of land area of the municipality.	0.9	0.8
	Number of lane-kilometres of collector roads as a proportion of square kilometres of land area of the municipality.	2.8	2.8
	Number of lane-kilometres of local roads as a proportion of square kilometres of land area of the municipality.	8.9	8.9

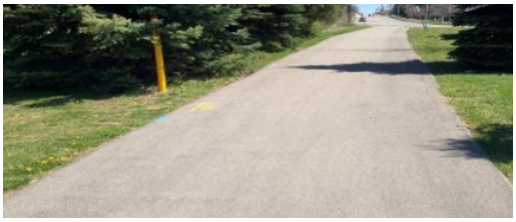
SERVICE ATTRIBUTE	QUANTITATIVE METRICS	2021	2022
Quality	Description or images that illustrate the different levels of road class pavement condition.	58	59
	Description or images that illustrate the different levels of asphalt walkway condition.	Good	Good

TABLE 21: IMAGES OF ROAD PAVEMENT QUALITY INDEX

PAVEMENT CONDITION	DESCRIPTION	EXAMPLE
Excellent	• Offers a smooth ride • Is aesthetically pleasing • Has no cracks/minor cracks • Has good drainage • Has no patching • Condition score of 81-100	
Good	• Offers a smooth ride • Is aesthetically pleasing • Has minor cracks • Has good drainage • Has no patching • Condition score of 61-80	
Fair	• Offers a decent ride • Has some cracks • Has patches • Repairs made but smooth • Has started to deteriorate • Resurfacing candidate • Condition score of 41-60	
Poor	• Provides a bumpy ride • Has several patches • Has sunken manhole covers • Many cracks • Requires reconstruction • Condition score of 21-40	

PAVEMENT CONDITION	DESCRIPTION	EXAMPLE
Very Poor	• Provides a bumpy ride • Has several patches • Has sunken manhole covers • Many cracks • Has poor drainage • Top layer of asphalt is crumbling • Requires reconstruction • Condition score of 0-20	

TABLE 22: IMAGES OF ASPHALT WALKWAY CONDITION

PAVEMENT CONDITION	DESCRIPTION	EXAMPLE
Excellent	• Uniform cross slope • No dips/heaves • Has no cracks • Smooth surface • Condition score of 81-100	
Good	• Minimal dips/heaves • Minimal small cracks • No broken asphalt • Condition score of 61-80	
Fair	• More than minimal cracking • Minor ponding (sediment build up) • Asphalt overall in one piece • Root/vegetation penetration to surface • Uneven pavement surface • Condition score of 41-60	
Poor	• Significant cracks in asphalt surface • Evidence of heaving or settling in asphalt • Small pieces of asphalt broken off • Uneven surface • Larger and more frequent areas of ponding • Condition score of 21-40	

PAVEMENT CONDITION	DESCRIPTION	EXAMPLE
Very Poor	• Asphalt surface dips and heaves. • Potholes present in asphalt • Uneven surface • Asphalt crumbling and broken into pieces • Very poor drainage • Vegetation penetration and overgrowth • Condition score of 0-20	

8.2.1.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap. A few examples of the like-for-like concept include:

- Replacing natural gas boilers with natural gas boilers
- Replacing high-pressure sodium (HPS) decorative street light bulbs with HPS light bulbs
- Replacing concrete sidewalks with concrete sidewalks

In 2022, SME and AM staff adjusted our approach to using a "modern equivalent" (or "like-for-similar") approach. This changes the earlier examples to:

- Replacing natural gas boilers with electric boilers
- Replacing HPS decorative street light bulbs with Light Emitting Diode (LED) bulbs
- Replacing a concrete sidewalk with a multi-use path

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals. It is important to note that in some situations, a true "like-for-like" replacement is not possible so the modern equivalent approach is already in use when necessary. For example, when reconstructing a road, the current standard is to replace an asphalt curb with a concrete curb and gutter. Other modern equivalent examples for transportation that are in use already (when necessary) are:

- Road reconstruction projects that add active transportation infrastructure;
- Replacing asphalt curbs with concrete curb and gutter;
- Replacing HPS decorative street light bulbs with LED bulbs

8.2.1.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. As identified in section 5.6, AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for transportation assets.

8.2.1.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 23** below identifies the drivers for transportation assets.

TABLE 23: TRANSPORTATION DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Transportation Network Corridors	The 2021 Transportation Master Plan includes a Primary Network of active transportation facilities and a priority implementation plan	TransformWR Action 1.1.1 – Plan a network of major active transportation corridors across cities and townships that will provide high-volume priority travel for walking, cycling, and rolling to key destinations across the region, as well as access to public transit.	Limited infrastructure funding is resulting in delays in the rehabilitation and replacement of assets and impacts the ability to widen high-use existing active routes and for separated cycling infrastructure. There is an increase in demand for trail lighting and road crossing facilities and limited funding for implementation. Increased OandM costs for assets for year-round access.	Allocate resources to progress the priority projects listed in the TMP to provide alternate modes of travel to the auto and for asset rehabilitation. Continue to monitor user numbers on the Primary Network and expand the number of counters to inform operating and capital funding requests.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Weight of EV vehicles on roads	EV vehicles on average are 30% heavier than traditional gas-powered vehicles. The main reason is the weight of their batteries.	Although EV vehicles weigh 30% more than traditional gas-powered vehicles, roads are designed to handle CVOR rated vehicles which are in excess of 4500 kg.	It is currently unknown if the extra weight of EV vehicles will drastically change the life cycle or maintenance of roadways.	Monitor and adapt, as necessary.
Population growth (residents and students) (joint driver for Parks and Transportation)	An increase in the number of residents as Waterloo Region is a designated growth area.	An increase in the number of residents typically means an increase in traffic, park and active transportation volumes. The City's Parkland Strategy recommends considering converting neighbourhood parks to community parks to help fulfill the leisure and recreation needs of the community. (Recommendation #29)	Increased pressure on the existing transportation and parks network including operations and maintenance for Transportation and Parks staff.	Allocate resources to progress the priority projects listed in the Transportation Master Plan and the Parkland Strategy to provide alternate modes of travel to the auto and to increase leisure and recreation opportunities for the community.

8.2.1.8 Risk

The risk associated with not undertaking the treatment options available for transportation assets is a reduced lifespan resulting in the need to replace assets earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related for transportation assets is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the transportation level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.3. Information related to transportation asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.1.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for transportation assets over the next 25 years is an annual average of $23 million as shown in **Table 24**.

TABLE 24: SUMMARY OF TRANSPORTATION ASSETS

ASSET GROUP	ANNUAL FUNDING TO MEET TARGET PERFORMANCE	AVERAGE ANNUAL FUNDING	2023 AVERAGE ANNUAL FUNDING GAP*
Roads	$22.2 million	$6.2 million	$16.0 million
Transportation Assets*	$7.8 million	$0.8 million	$7.0 million
Total Transportation Group	**$30.0 million**	**$7.0 million**	**$23.0 million**

Note: Values may not add exactly due to rounding.

* The transportation data is comprised of sidewalks, streetlights, retaining walls, trails and trail links, traffic, and wayfinding signs

To ensure management of transportation assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Discuss the applicability of incorporating the modern equivalent approach

- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can use in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate
- Collaborate with SMEs to improve the Cross Asset Tool parameters to assist in their decision-making process

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.2.2

Facilities

8.2.2.1 What do we own and what is it worth?

The 2023 replacement value of the City's facilities is estimated at $541 million and comprises more than 100 buildings ranging from sheds to large recreation facilities, fire stations and libraries, and their fixtures. The facilities asset class has an estimated 1,232,337 square feet (114,487 m3) of City-owned and operated floor space and includes sub-assets such as the building envelope (e.g. roofing), mechanical and electrical infrastructure, interior water and sanitary pipe systems, and flooring. The City is committed to maintaining our buildings, energy efficiency and equipment to support the services provided to the community. Of note, buildings that are funded by enterprises (e.g. cemetery buildings, sanitary pumping stations) have been excluded from this section as they are reported through their respective enterprise asset class.

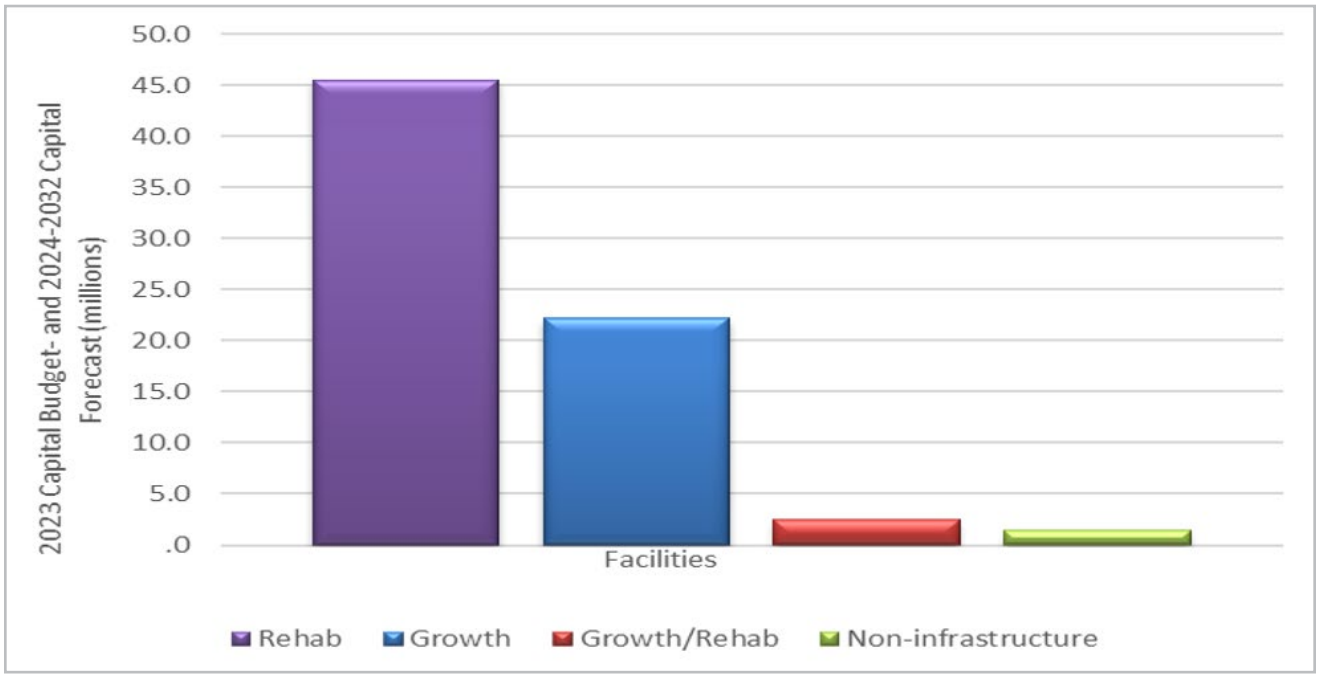
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.2.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $72 million over the next ten years in Facilities assets, $46 million allocated to rehabilitation of existing facilities. The estimated distribution of the funding is shown in **Figure 23**.

FIGURE 23: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR FACILITIES



The growth component for the facilities asset class is related to growth-driven needs to build new facilities such as a recreation storage facility, fire station and a mini operations centre. The $22 million included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast for growth projects have been identified by service delivery areas (i.e. Fire Services, Recreation Services or Economic Development). These service delivery areas are responsible for facilitating the discussion with Council when determining when a new facility or an expansion is needed and once constructed, will become part of the facilities asset class.

Growth for the service delivery needed for facilities is directly impacted as the City experiences urban intensification. The City is experiencing vertical growth and high-density residential infill developments and as a result, residents will be looking to City-owned facilities to provide an increased amount of indoor recreational space opportunities. On average, almost 31% of facility assets as a percentage by replacement cost ($166 million) will need to be rehabilitated or replaced in 25 years or less to maintain the service they provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced within 25 years will increase) and will subsequently increase the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the 2023 approved operating budget. The 2023 operating budget included $1.7 million in funding directly related to treating facility assets such as building and mechanical maintenance activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $5.2 million over the next 25 years in facilities assets. The budget will fund a variety of work that includes facility assessments, energy management work and space planning. Based on the best available facility asset data, deterioration rates and 2023-2032 capital funding, we estimate that facility assets have an average annual infrastructure funding gap of $11.5 million as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating construction costs, continued deterioration, rehabilitation or replacement improvements, improved asset inventory data, and the addition of assets that were previously excluded. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.2.2.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the facilities' asset class performance and corresponding expenditure over a 25-year timeframe. Once the forecast activities are within the one to three-year span, SMEs determine what assets (e.g. building envelope, mechanical assets) need to be rehabilitated or replaced. Facilities SMEs review the asset needs and plan for rehabilitation or replacement to provide an optimized utilization of the assets. The City's current performance for facility assets is outlined in section 8.2.2.4.1 and the target performance is outlined in section 8.2.2.4.1. When projecting the performance of assets, condition is important, and the facility asset condition is a combination of performance and age based. One example is the performance and age of rooftop HVAC unit as they may be replaced early as the unit may not be providing the appropriate service to the building. The condition of surface parking lots is assessed through a pavement condition inspection process on a bi-annual basis.

Facilities are typically rehabilitated through the replacement or refurbishment of individual or group components. Each component has an industry-accepted estimated service life that is combined with observations about the condition of each component during site investigations. Examples of the replacement or rehabilitation activities for facilities are identified in **Table 25**. Analysis of the current and target performance indicates that an increased focus on preventative maintenance may be beneficial as it will help optimize the life of the City's facility assets.

TABLE 25: FACILITY TREATMENT EXAMPLES

MAINTENANCE	REHABILITATION	REPLACEMENT
Painting Floor tile replacement Broken fixtures	Programmed/grouped repairs (e.g. roof replacement program) Component replacements (e.g. windows, doors) Interior and exterior renovation	Partial or full replacement of the facility (very rare).

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City. The City's current performance for Facilities assets is outlined in section 8.2.2.4.1 and the target performance is outlined in section 8.2.2.4.1.

8.2.2.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component of the method of projecting performance is how the assets are assessed.City-owned facilities' asset performance is evaluated using historical knowledge, age, and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for facilities assets is assessed to be medium. The City is continuously working to improve asset data quality as outlined in section 3.1.

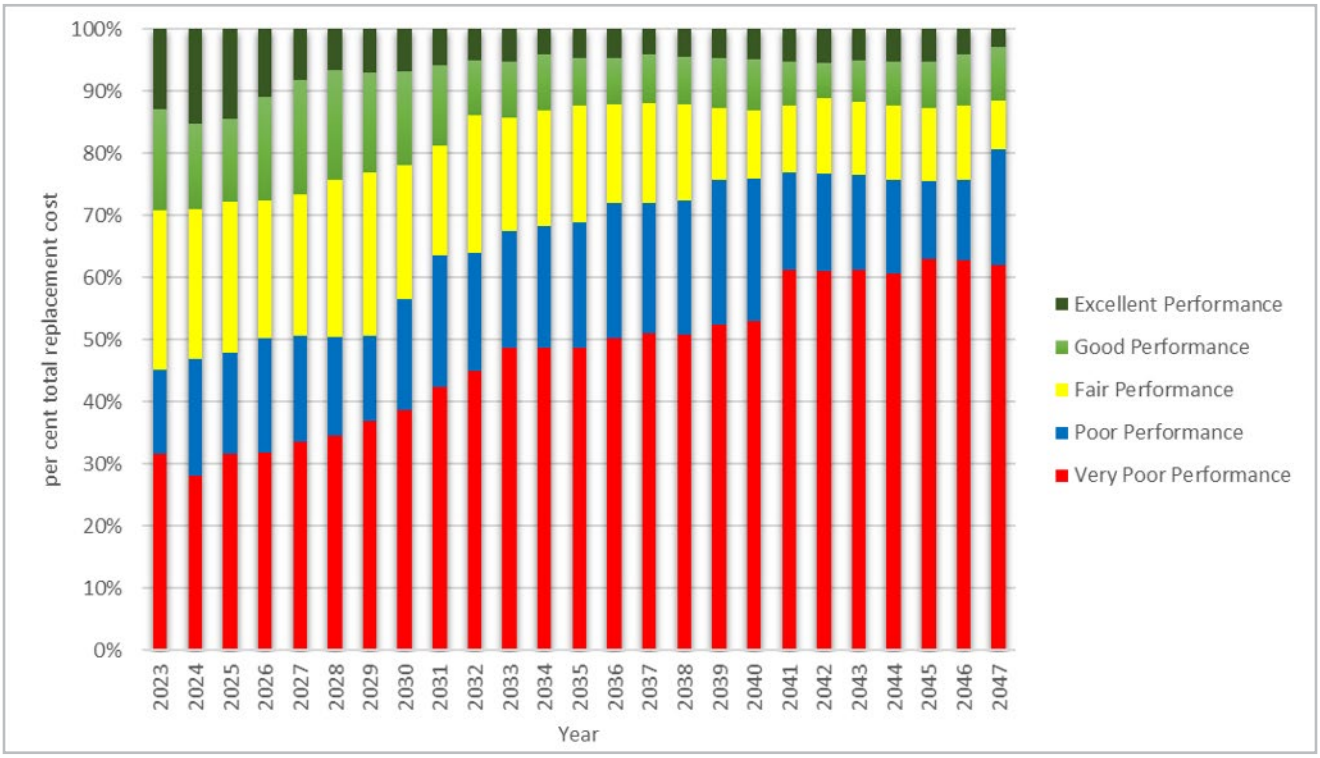
Section 8.2.2.3 identifies the lifecycle management activities required to provide the levels of services offered by facility assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $1.7 million considered to be directly related to treating facility assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $5.2 million annually as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $6.9 million each year. It is important to recognize that this is an insufficient level of funding and has created a backlog of rehabilitation or replacement work and placed the city in a reactive environment for replacement or rehabilitation activities. For City owned buildings (e.g. recreations buildings, libraries) that are used on a day-to-day basis by the community and staff, the insufficient funding has created an ongoing challenge, impacting the reliability of key building systems. A more sustainable facility level of service funding is $18.4 million annually.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.2.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

The proportion of facilities assets exhibiting fair, good, or excellent performance profiles is 55% as illustrated in **Figure 24**. The average annual budgeted capital expenditure of approximately $5.2 million is anticipated to result in a decline in the performance profile over the next 25 years. As noted earlier, the budget will fund a variety of work that includes facility assessments, energy management work and space planning. While 55% of facility assets have a fair, good or excellent performance profile, the current and projected performance profile can result in unexpected failures, which can impact the community levels of service. Based on the current deterioration rates, funding and asset data, facilities are projected to largely have a very poor performance profile which is anticipated to be unacceptable to most interested and affected parties. Based on the best available facility asset data, deterioration rates and 2023-2032 capital funding, we estimate that facility assets have an annual infrastructure funding gap of $11.5 million and require additional investment.

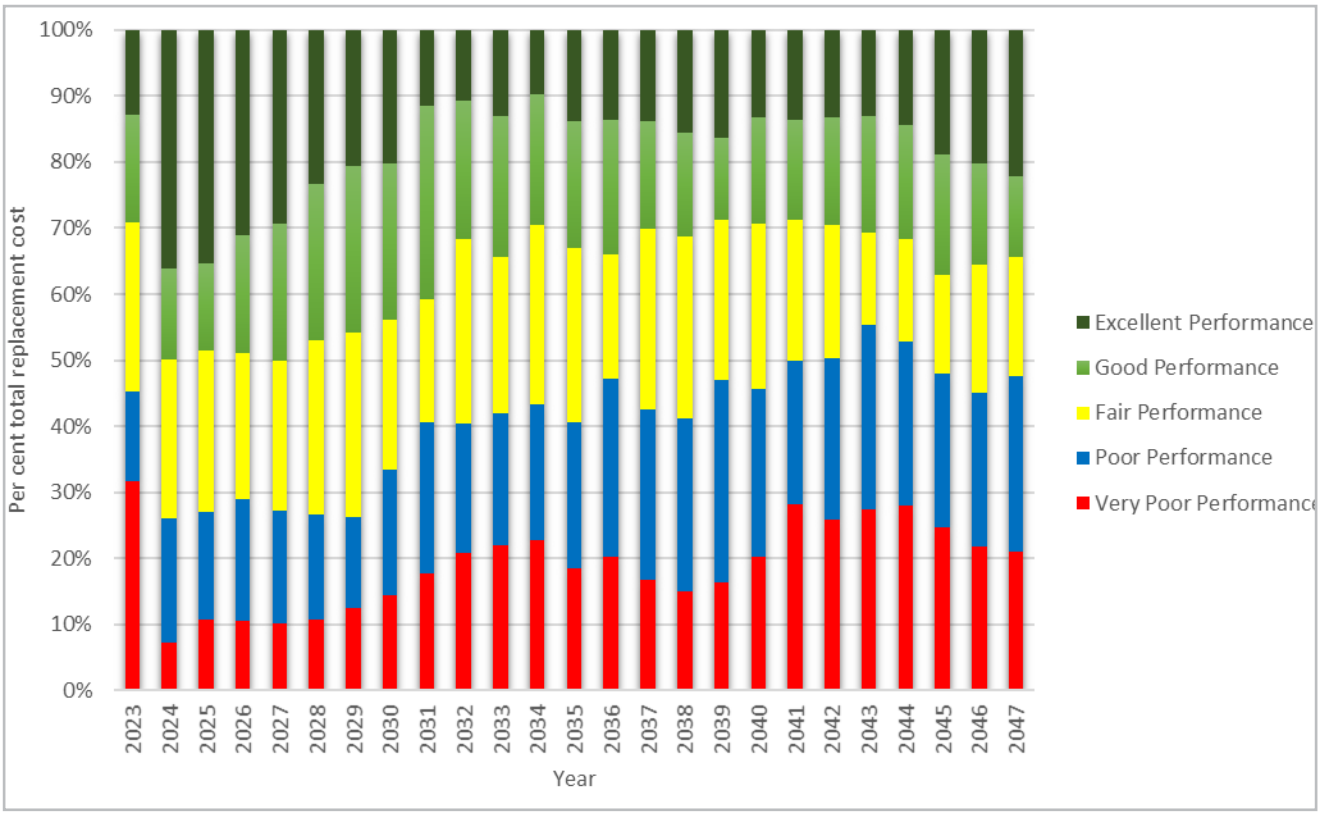
FIGURE 24: PROJECTED ANNUAL PERFORMANCE OF FACILITIES ASSETS IN THE BUDGET SCENARIO



8.2.2.4.2 Target Performance and Required Expenditures

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $16.7 million over the next 25 years is required to achieve the target performance profile for the facility asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance at the end of the 25 years is similar to the current performance profile as illustrated in **Figure 25**.

FIGURE 25: PROJECTED ANNUAL PERFORMANCE OF FACILITIES ASSETS IN THE TARGET SCENARIO

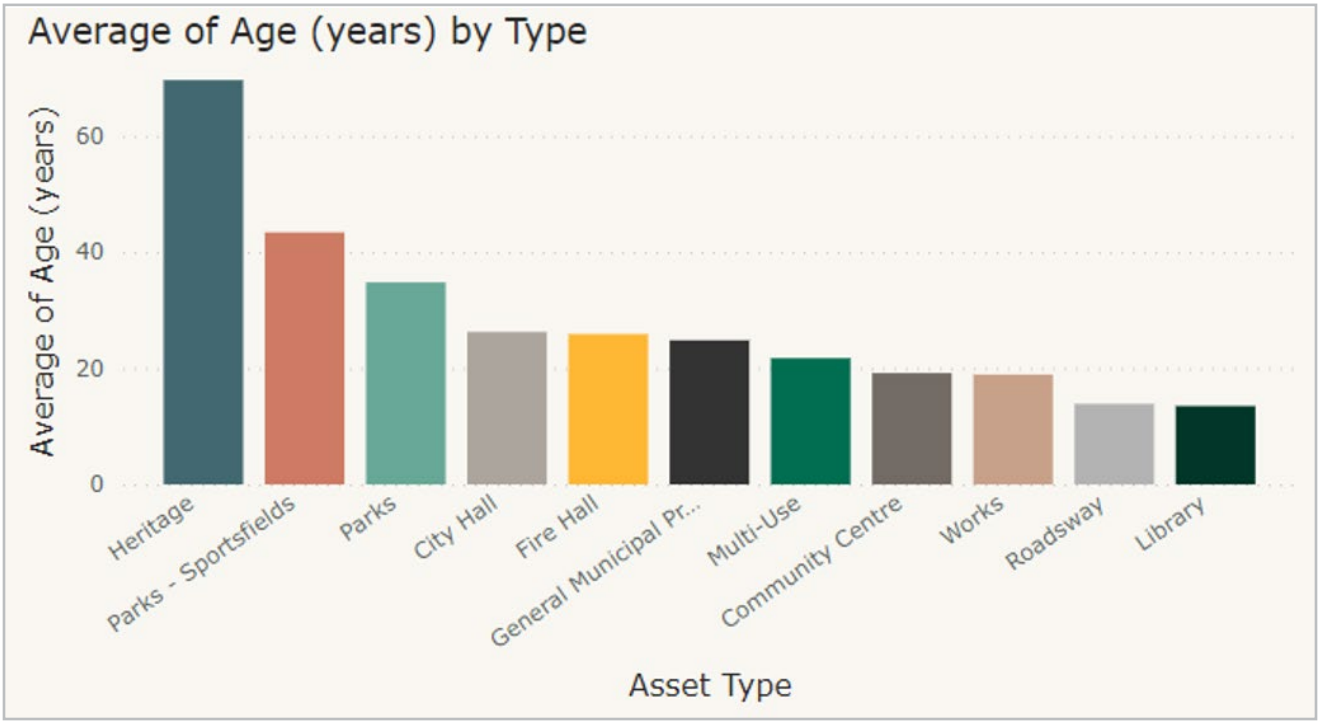


The target performance profile is based on the 2023 asset inventory and uses the SME's professional management of the estimated service life of the asset. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced before they have reached the end of their life (age or condition). Facility assets have a large component of mechanical assets that have a prescribed estimated service life that starts in excellent and as they age, they progress towards very poor. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets in each performance category and a portion will be poor or very poor until they are rehabilitated or replaced.

8.2.2.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for the application of asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 26** for the City's facility assets.

FIGURE 26: AVERAGE AGE (YEARS) FOR FACILITIES



The following tables show the levels of service established by the City for facility assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, facility metrics have been developed in a collaborative effort between facility SMEs and Asset Management staff. Facility metrics are identified below in **Table 26** and **Table 27** and include metrics for the 2021 and 2022 calendar years.

TABLE 26: FACILITY COMMUNITY LEVEL OF SERVICE METRICS

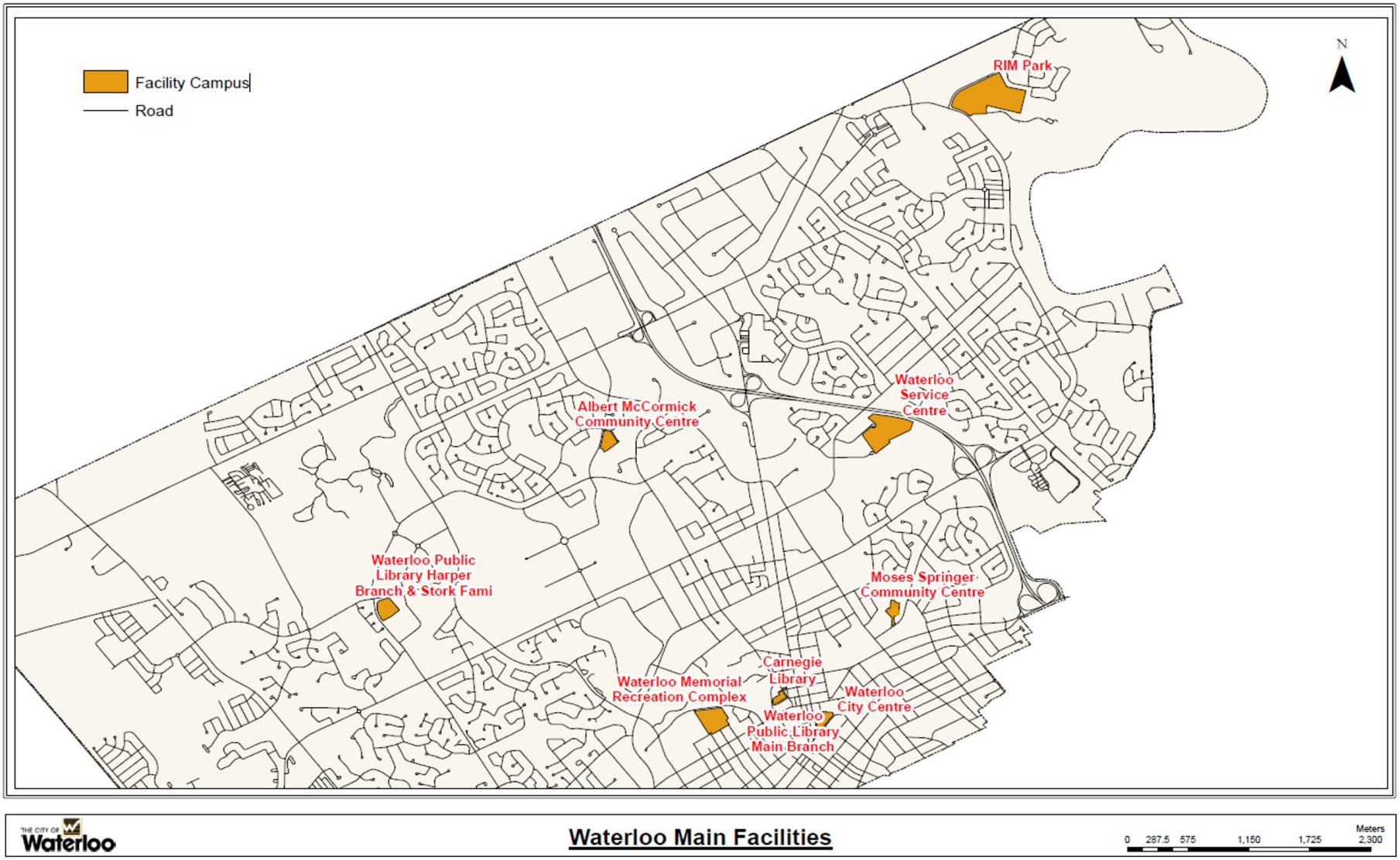
SERVICE ATTRIBUTE	COMMUNITY LEVEL OF SERVICE MEASURE	COMMUNITY LOS PERFORMANCE
Scope	Description, which may include maps, of the City of Waterloo facilities that support the services provided to the community.	Map included in Figure 27.

TABLE 27: FACILITY TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Scope	Square footage of facilities	1,181,953 sq ft	1,232,337 sq ft
	Replacement Value*($ per square foot)	$267 /sq ft	$401 /sq ft
Reliability	Facilities assets that are in fair or better condition (per cent)	50%	54%
Environmental Stewardship	Annual electricity consumption (kilowatt hour)	14,076,794 kWh	17,306,802 kWh
	Annual natural gas consumption (cubic meter)	1,545,266 m^3	1.538.554 m^3
	Annual greenhouse gas emissions (GHG), tonnes of carbon dioxide equivalent (tCO_2e)	3,352 tCO_2e	3,774 tCO_2e

* Replacement value per square foot reflects the building or floor space cost and excludes outdoor site rehab/replacement costs such as parking lots.

FIGURE 27: CITY OF WATERLOO MAIN FACILITIES



8.2.2.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap. A few examples of the like-for-like concept include:

- Replacing natural gas boilers with natural gas boilers
- Replacing high-pressure sodium (HPS) decorative street light bulbs with HPS light bulbs
- Replacing concrete sidewalks with concrete sidewalks

In 2022, SME and AM staff adjusted the approach used for facilities assets to use a "modern equivalent" (or "like-for-similar") approach. This changes the earlier examples to:

- Replacing natural gas boilers with electric boilers
- Replacing HPS decorative street light bulbs with Light Emitting Diode (LED) bulbs
- Replacing a concrete sidewalk with a multi-use path

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals. It is important to note that the use of the modern equivalent approach will not fully capture the full cost to reach climate action goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to facility assets. It is anticipated that the modern equivalent for facility assets will be highly influenced by improvements to address new health and safety requirements, accessibility, climate change adaptation and mitigation.

8.2.2.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

In 2019 Council declared a climate emergency recognizing that bold change would be required to address the climate change emergency facing our community and the planet. As part of that declaration, Council also adopted a corporate greenhouse gas (GHG) emission reduction target of 80% by 2050 (2010 baseline). In 2021, a corporate GHG emission target for facilities of 50% by 2030 was also established.

Municipalities across the country and the world are looking for ways to take transformational actions to create the lasting and impactful change needed to reduce and eliminate our GHG emissions. On October 16, 2023, Council requested that the City amend its corporate GHG emission reduction target from 80% by 2050 to net-zero by 2050 to harmonize with the Government of Canada's national climate target established in 2021. According to the Government of Canada, net-zero is defined as follows: "Achieving net-zero emissions means our economy either emits no greenhouse gas emissions or offsets its emissions."[4]

Buildings and facilities represent approximately 70% of scope 1 and scope 2 GHG emissions and the largest opportunity for direct City-controlled GHG emission reduction opportunities. Two recent staff reports

4 NRCAN. (2023). Net-zero emissions by 2050. Retrieved from: **Net-zero emissions by 2050 - Canada.ca**

(COM2021-027 – Corporate Energy and Greenhouse Gas Road Map Phase 1 and COM2022-013 – Green Building Policy 2022) specifically addressed the original GHG emission reduction targets (50% by 2030 and 80% by 2050). This was accomplished by assessing feasible pathways to achieve emissions reductions for five different building types and providing updates to the Green Building Policy to align with those general identified measures. In addition, the updates to the Green Building Policy also provided energy and carbon performance targets for new buildings and major retrofits.

The study done as part of the energy and GHG road map identified system changes required for significantly reducing GHG emissions to the levels desired which included:

- Electrification, through conversion of natural gas-fueled air and water heating systems to an electrically powered system.
- Improvement of building enclosure performance by increasing insulation values and reducing infiltration.
- Equipment and lighting control optimization.
- Renewable electricity generation through solar Photovoltaic (PV) arrays.

The measures and resulting Green Building Policy align with the Zero Carbon Building Standard published by the Canadian Green Building Council (CaGBC), as well as a net-zero retrofit study published by CaGBC on several building archetypes in different geographical locations across Canada. Following the identified path is the same direction required for net-zero emissions with the additional consideration of balancing the cost-effectiveness of the extent of certain measures.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. While staff worked to incorporate the modern equivalent approach for facility assets, it is noteworthy that this was one step of a much larger picture, and more work is required over the coming years to incorporate climate change adaptation and mitigation for facility assets.

8.2.2.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 28** below identifies the drivers for the facility asset class.

TABLE 28: FACILITY DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
EV Charging Stations – Community Use (joint driver for Facilities and Parking)	The City owns four community use-charging stations. One at each of the following locations: Waterloo Town Square North Lot, Albert McCormick Community Centre, Moses Springer Community Centre and Waterloo Memorial Recreation Centre (WMRC). There are three EV charging stations owned by the City-funded organization Grand River Energy. These include Williams Street, Waterloo Memorial Recreation Complex, and Father David Bauer Drive at Erb Street.	TransformWR Action 2.2.1 – Provide more public electric vehicle charging stations in public spaces, commercial.	An increase in transformer capacity is anticipated when multiple EV charging stations are installed. The cost of increasing the back-end electrical infrastructure to support higher electricity demand is anticipated to cost more than $100,000 and will need to be considered.	The development of a community EV Charging Station Policy and Implementation Plan in collaboration with community partners.
EV Charging Stations – City Use (joint driver for Facilities and Fleet)	The City is investigating implementation needs for City vehicle use through the development of a corporate EV infrastructure strategy.	The corporate EV infrastructure strategy will determine the City's medium and long-term needs related to charging stations to meet the needs of the growing electrified fleet.	Additional City Fleet EV vehicles will be challenging to charge without an increase in the number of charging stations and investment in related infrastructure. An increase in transformer capacity is anticipated with the installation of multiple EV charging stations. The cost of increasing the back-end electrical infrastructure to support higher electricity demand will be determined as part of the corporate EV infrastructure strategy.	The development and implementation of a corporate EV Infrastructure strategy is recommended.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Council Approved GHG Reduction Target – 50 by 2030 and Net Zero by 2050	GHG targets will necessitate transformational change at City facilities, including deep energy retrofit work (i.e. building envelope upgrades, electrification of mechanical equipment, etc.)	Work is underway to achieve the 2030 target; however, limited funding is a risk to the successful completion of this initiative. There remains a heavy reliance on Provincial and Federal Grants, which are not guaranteed and have been extremely	Transformational change due to GHG related work will have a positive impact on the infrastructure deficit since aging equipment/ systems will be replaced/renewed.	Staff are unclear of the impact of this decision at this time – further investigation is needed.
Climate Change	The 2019 Corporate Climate Change Adaptation Plan identifies actions to help the City adapt its assets, operations, and services to address the impacts of climate change.	More extreme weather events are expected such as extreme heat/ cold. Extreme weather events may damage or negatively impact assets (e.g. facility roofs or mechanical units.).	Additional stress on assets (e.g. road surfaces, underground infrastructure, facilities, natural assets) results in the potential for more repairs and reduced life cycles.	Climate changes (i.e. extreme heat/cold) will require investment in building envelope upgrades (i.e. better insulation, more air-tight buildings), as well as enhancements to mechanical equipment, to maintain adequate indoor air temperatures.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Accessibility for Ontarians with Disabilities Act (AODA) (joint driver for Facilities and Parks)	In 2023 the City conducted an accessibility audit study to help identify gaps and barriers to achieving optimal accessibility to City facilities as a long-term goal and developed priorities and an implementation plan. AODA retrofits and improvements continue to take place across all City facilities (indoor and outdoor). This is a key focus at all facilities, to ensure that we have welcoming and inclusive facilities for all.	This work will continue for the foreseeable future, since there is a significant backlog of work, especially at older facilities. The City's Parkland Strategy recommends the prioritization of projects that improve barrier-free access to facilities and activities within parks, especially actions that bring parkland into compliance with AODA (Recommendation #4)	AODA work should be aligned with other major renovation projects at facilities (where possible), to efficiently and effectively complete this work.	Monitor and adapt, as necessary.

8.2.2.8 Risk

There are a number of things that we do not have control over as a City that will impact our ability to reach a net-zero target. For instance, reaching a net-zero target is largely dependent on the decarbonization of the provincial energy grid, allowable renewable electricity generation agreements, and participation in a carbon market. As a result of population growth, there will invariably be growth in City operations and services. This is why it is critical that as we look to rehabilitate City-owned buildings and facilities to respond to the increase in growth, we take a holistic approach and follow the Council approved direction outlined in the City's Green Building Policy for City-Owned Buildings (A-033) Also, changes in terms of legislation will also occur along our path to net-zero. We will need to pivot as those changes occur and identify opportunities with each change that will help the City in its work to meet its targets.

The risk associated with not undertaking the treatment options available for facilities is a reduced lifespan resulting in the need to replace the infrastructure earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the facilities asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the facility's level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.3. Information related to facilities asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.2.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the Budget Scenario (current LOS) and Target Scenario (proposed LOS) for facility assets over the next 25 years is an annual average of $11.5 million. To ensure management of facilities assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Continue investigating and incorporating modern equivalent practices, when applicable
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.2.3

Parks

Photo credit: McNeil Photography

8.2.3.1 What do we own and what is it worth?

Park assets help the community achieve a high quality of life by providing vibrant public space through equitable park spaces. The City has two City-wide parks: Waterloo Park, and RIM Park. Between the two of them, they cover 268 hectares of parkland. In addition, there are 136 parks of varying sizes across the City, ranging from small parkettes to large neighbourhood parks which cover 107 hectares of parkland. The City's park assets include the parks themselves and their amenities (playgrounds and equipment, structures, benches, sports fields, action sport parks and signs). The 2023 replacement value of parks is estimated at $69 million. It is important to note that buildings with parks are captured under the facilities asset class and fleet and associated equipment (e.g. turf equipment) is captured under the fleet asset class.

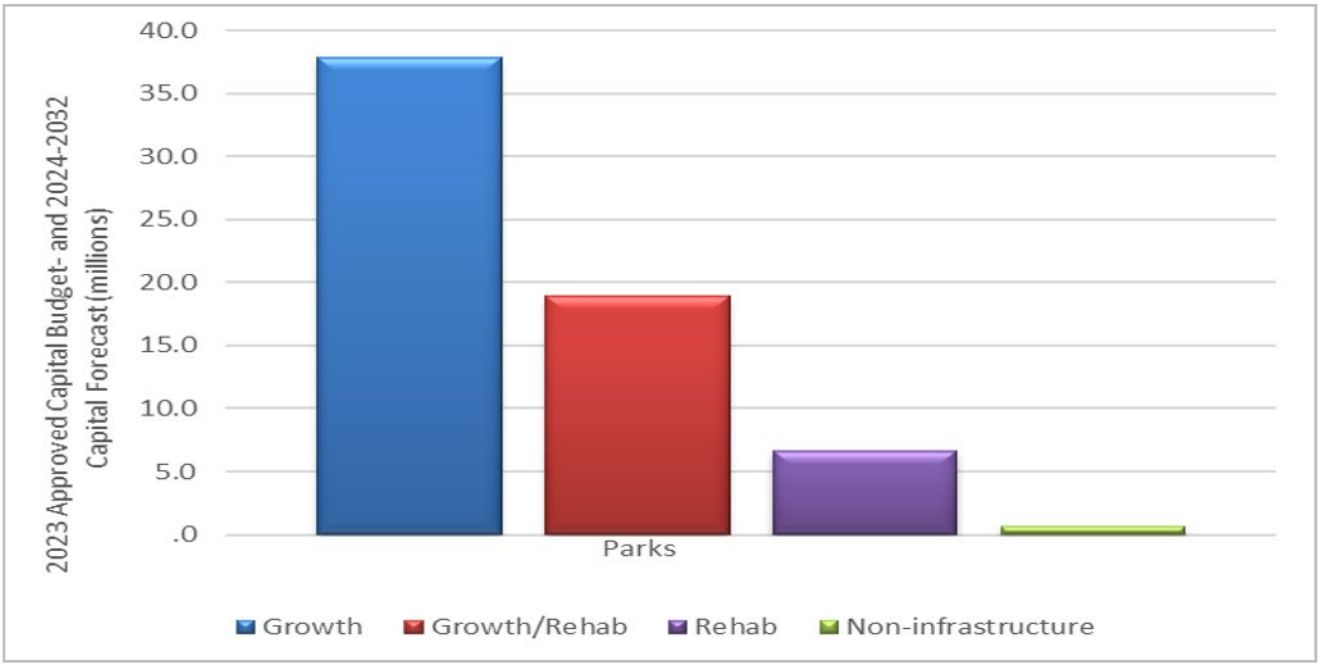
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.3.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest $64 million in funding over the next ten years in park assets, $7 million that is dedicated for rehabilitation activities within parks. The estimated distribution of the funding is shown in **Figure 28**.

FIGURE 28: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR PARKS



The growth component for the parks asset class is related to growth driven needs to build new facilities such as a west side recreation storage facility, action sports parks and spray pad/cooling area. Growth for parks is directly impacted as the City experiences urban intensification. Waterloo is experiencing vertical growth and high-density residential infill developments that have limited to no on-site green space for residents to access. As a result, residents will be looking to City-owned parks to provide green space and park amenities that traditionally may have been accounted for with detached single-family lots. On average, almost 80% of park assets as a percentage by replacement cost will need to be rehabilitated or replaced ($57 million) in 25 years or less to maintain the service they provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced within 25 years will increase) and will subsequently increase the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the approved 2023 operating budget. The 2023 operating budget included $759,000 in funding considered to be directly related to treating park assets such as sportsfield turf renovations and playground inspections.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $1.8 million over the next 25 years in park assets. Based on the best available park asset data, deterioration rates and 2023-2032 capital funding, we estimate that park assets have an average annual infrastructure funding gap of $2.4 million as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating construction costs, continued deterioration, rehabilitation or replacement improvements, improved asset inventory data, and the addition of assets that were previously excluded. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.2.3.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management activities.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the parks asset class performance and corresponding expenditure over a 25-year timeframe. Once the forecast activities are within the one to three-year span, SMEs determine what parks need to be replaced. Parks SMEs undertake a comprehensive review of the vehicles and equipment needed to provide an optimized utilization of the assets.

The City's park assets include the parks themselves, and their amenities (playgrounds and equipment, structures, benches, sports fields, action sport parks and signs). There are different performance standards for all the

different elements in our parks, and park assets are replaced when they fall below the target performance for their respective component. Pieces that would have a greater impact on park users if they are worn or damaged (such as playgrounds and structures) have a higher target performance expectation than other pieces (like signs or benches). Examples of the lifecycle activities or treatments that the City of Waterloo uses to maintain levels of service and manage risk are identified in **Table 29**. The City's current performance for park assets is outlined in section 8.2.3.4.1 and the target performance is outlined in section 8.2.3.4.1. Analysis of the current and target performance indicates that an increased focus on preventative maintenance may be beneficial. Increasing preventative maintenance activities will help optimize the life of the City's park assets. When projecting the performance of assets, condition is important and currently park asset condition is primarily performance and age based. Retaining walls within parks are inspected bi-annually and parking lots and interior laneways are inspected bi-annually through a pavement condition inspection process.

TABLE 29: PARKS TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Playgrounds	Localized repair or replacement (e.g. corrosion repairs, painting, slide replacement)		Full replacement
Sportsfields and Courts (Action Sports)	Localized repairs	Resurfacing courts	Full replacement
Roadways or Laneways	Localized repairs such as pothole repair, crack sealing	Pavement removal and replacement (i.e. resurfacing)	Removal of asphalt and granular base, replacement with new (i.e. reconstruction)
Utilities	Scheduled maintenance, Flushing, or Spot Repairs	Repair or Structural lining	Full replacement

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.2.3.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with

SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Park asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for park assets is assessed to be low. The City is continuously working to improve asset data quality as outlined in section 3.1.

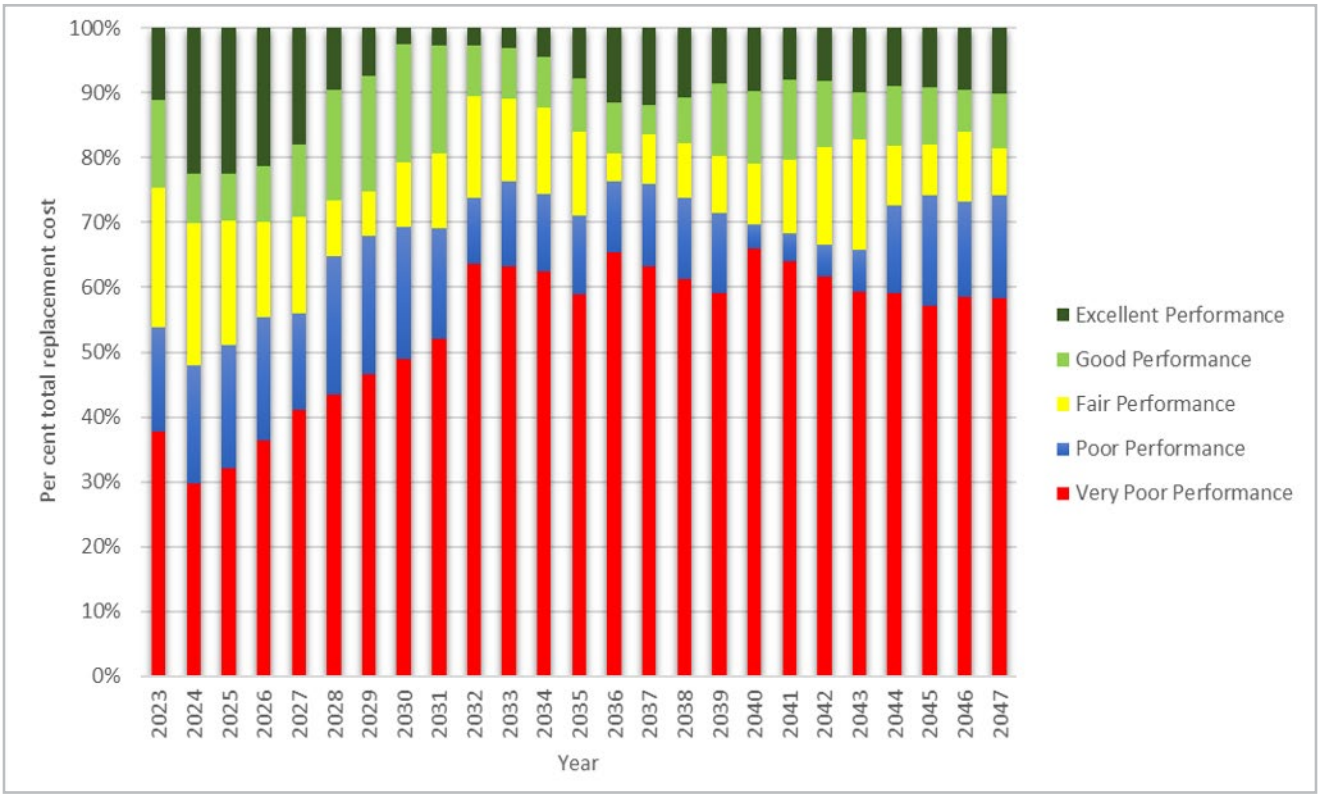
Section 8.2.3.3 identifies the lifecycle management activities required to provide the levels of services offered by park assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $759,000 million considered to be directly related to treating park assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $1.8 million annually and increase capital funding to close the $2.4 million average funding gap as identified in **Table 12**. It is important to recognize that park assets have a low data maturity rating and that as the data maturity improves, there will be greater confidence in the performance projections as identified in section 3.1. As a result, the estimated total funding projected based on the available data to provide the lifecycle activities to maintain the current level is $5 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.3.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Approximately 54% of park assets are currently considered in poor or very poor performance categories. The average annual budgeted capital expenditure of approximately $1.8 million is anticipated to result in a decline in the performance of park assets over the next 25 years, which is anticipated to be unacceptable to most interested parties. The portion of the asset class with fair, good, and excellent performance profiles starts at 46% in 2023 and declines to less than 30% by 2047 as shown in **Figure 29**. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that park assets have an annual infrastructure funding gap of $2.4 million.

FIGURE 29: PROJECTED ANNUAL PERFORMANCE OF PARK ASSETS IN THE BUDGET SCENARIO

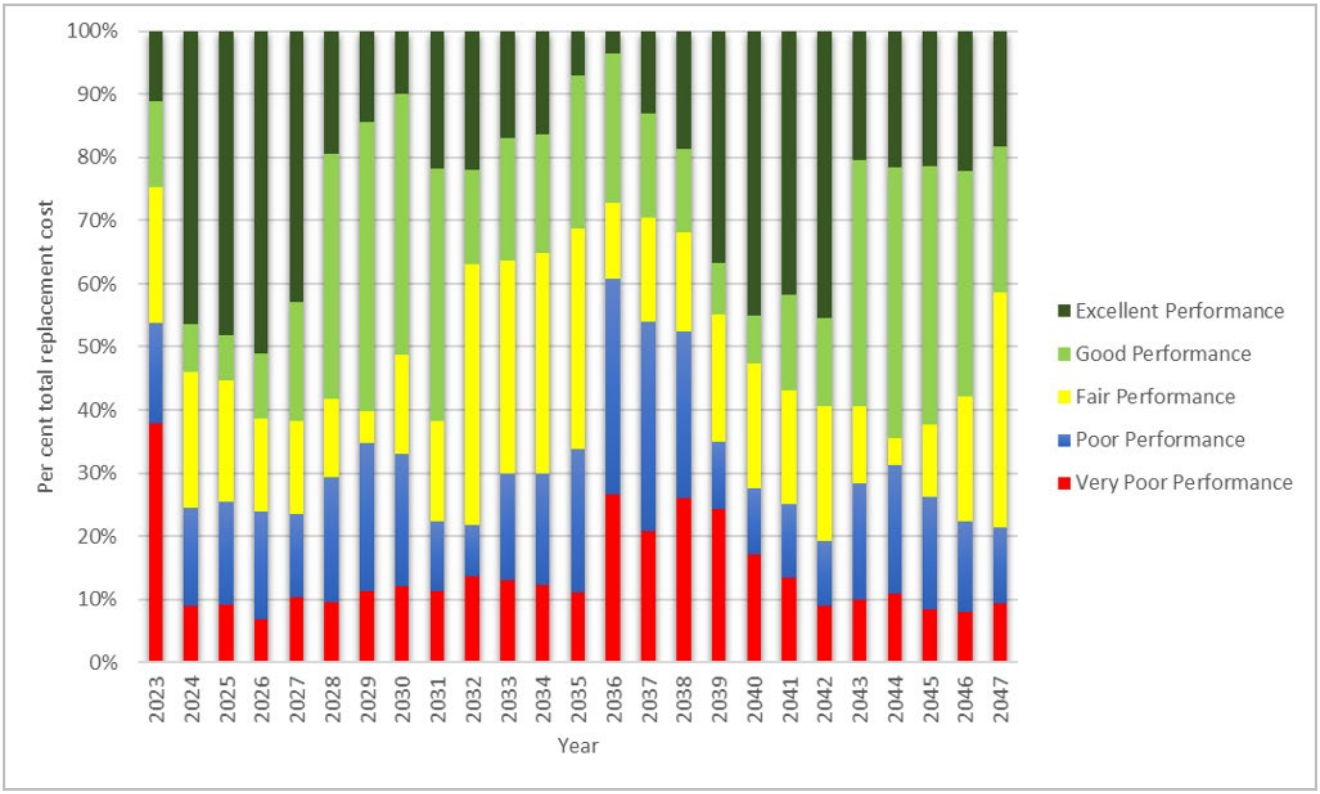


8.2.3.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is used to generate a list of infrastructure expenditure needs to achieve the target levels of service for park assets. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $4.2 million over the next 25 years is required to achieve the target performance profile for the park asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance fluctuates around 70% over the 25 years as illustrated in **Figure 30**.

FIGURE 30: PROJECTED ANNUAL PERFORMANCE OF PARK ASSETS IN THE TARGET SCENARIO

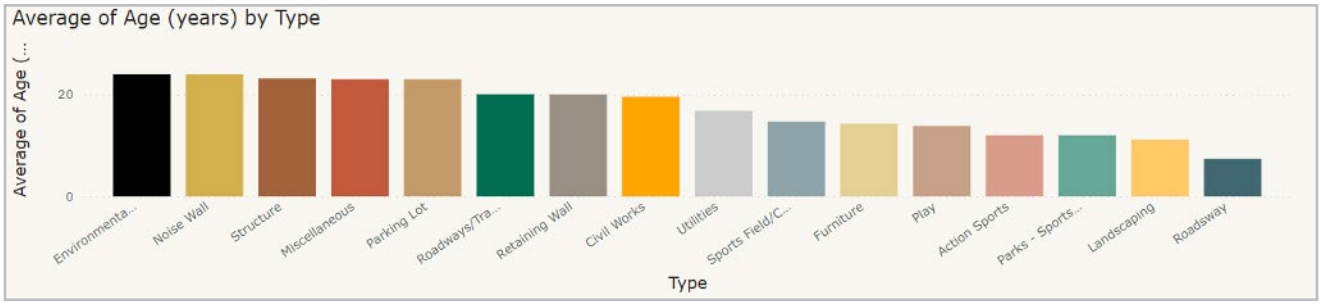


The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data (when available). Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition). It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets being in each performance category and a portion being in poor or very poor condition until they are rehabilitated or replaced. It is important to note that SMEs maintain assets to ensure that the assets are operational and safe.

8.2.3.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for the application of asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 31** for the City's park assets.

FIGURE 31: AVERAGE AGE (YEARS) FOR PARK ASSETS



* The installation date of signs assets is generally unknown and has not been included in the graph.

The following tables show the levels of service established by the City for park assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, park metrics have been developed in a collaborative effort between SMEs and Asset Management staff. Park metrics are identified below in **Table 30** and **Table 31** and include metrics for the 2021 and 2022 calendar years.

TABLE 30: PARKS COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION	2022
Scope	Description, which may include maps, of the park network supporting the City of Waterloo community.	Waterloo's park system includes two major parks and 136 neighbourhood parks. The park system contributes to the City's overall sustainability and reputation as a green, diverse City and creates lasting and memorable experiences for both residents and visitors.

TABLE 31: PARKS TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUANTITATIVE METRICS	2021	2022
Scope	Properties less than 800 m walking distance from a park (percent)	85%	85%
Quality	Playgrounds past their optimum service life (percent)	2.3%	46%*
Safety	Playgrounds achieving CSA compliance based on monthly inspections (percent).	100%	100%
Reliability	Park assets that are in fair or better condition (percent)	39%	52%

* In 2022 the optimum service life was revised from 25 years to 15 years as recommended by the subject matter experts. This was done to better reflect the useful life of current materials used in playground construction. Staff will monitor this data and make future improvements as recommended.

8.2.3.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to park assets. It is anticipated that the modern equivalent for parks assets will be highly influenced by improvements to address new health and safety requirements, accessibility, climate change adaptation and mitigation and to respond to engagement feedback received from the public.

8.2.3.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for park assets.

8.2.3.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 32** below identifies the drivers for the parks asset class.

TABLE 32: PARKS DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Accessibility for Ontarians with Disabilities Act (AODA) (joint driver for Parks and Facilities)	AODA retrofits and improvements continue to take place across all City facilities (indoor and outdoor). This is a key focus at all facilities, to ensure that we have welcoming and inclusive facilities for all.	This work will continue for the foreseeable future, since there is a significant backlog of work, especially at older facilities. The City's Parkland Strategy recommends the prioritization of projects that improve barrier-free access to facilities and activities within parks, especially actions that bring parkland into compliance with AODA (Recommendation #4)	AODA work should be aligned with other major renovation projects at facilities (where possible), to complete this work efficiently and effectively.	Monitor and adapt, as necessary.
Population growth (residents and students) (joint driver for Parks and Transportation)	An increase in the number of residents as Waterloo Region is a designated growth area.	An increase in the number of residents typically means an increase in traffic, park and active transportation volumes. The City's Parkland Strategy recommends considering converting neighbourhood parks to community parks to help fulfill the leisure and recreation needs of the community. (Recommendation #29)	Increased pressure on the existing transportation and parks network including operations and maintenance for Transportation and Parks staff.	Allocate resources to progress the priority projects listed in the Transportation Master Plan and the Parkland Strategy to provide alternate modes of travel to the auto and to increase leisure and recreation opportunities for the community.

8.2.3.8 Risk

The risk associated with not undertaking the treatment options available for park assets is a reduced lifespan resulting in the need to replace assets earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the park asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the parks level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are included in section 5.3. Information related to parks asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.3.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the Budget Scenario (current LOS) and Target Scenario (proposed LOS) for parks over the next 25-years is an annual average of $2.4 million. To ensure management of park assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time with respect to sharing information required for the Waterloo DSS
- The development of data maintenance processes enhancements for park assets
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate.

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.2.4

Information Technology

8.2.4.1 What do we own and what is it worth?

The 2023 replacement value of the City's information technology (IT) assets is estimated at $19.1 million. The City owns approximately 2,586 IT-related assets, ranging from computers and software applications to fibre optics infrastructure. About 55% of the value of our IT assets is software, 35% is infrastructure,7% is hardware, and the remaining balance is remote sensing data. The City has invested a significant amount of time, effort, and funding to build the technology network and infrastructure to support corporate and community growth.

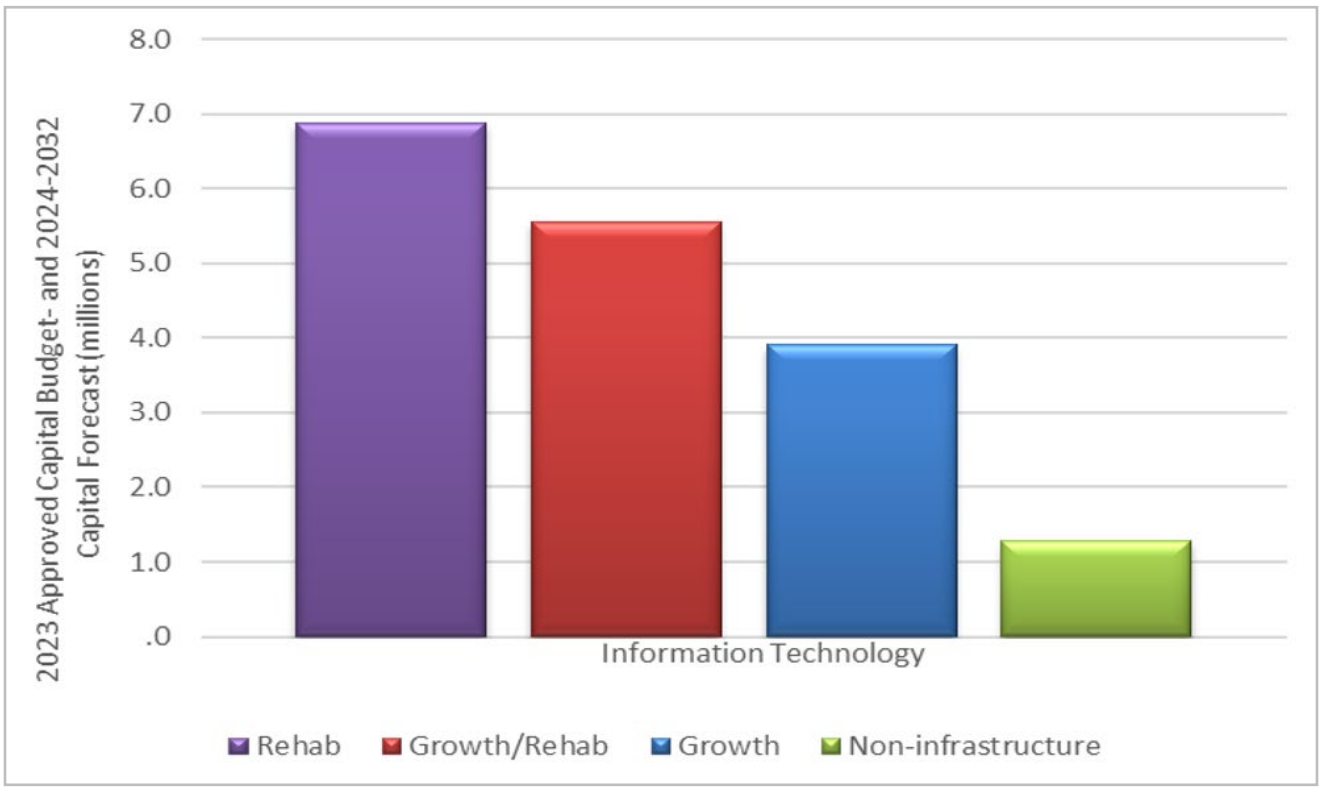
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.4.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $18 million over the next ten years in IT assets, $6.7 million on rehabilitation activities. The estimated distribution of the funding is shown in **Figure 32**.

FIGURE 32: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR IT ASSETS



The growth component for the IT asset class is related to growth driven needs to expand the capabilities of existing software (e.g. Maximo). Almost 45% of IT assets will need to be replaced (in 25 years or less to maintain the service they provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases ($8 million) the percentage and value of assets that will need to be rehabilitated or replaced within 25 years will increase) and will subsequently increase the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 provides a summary of the planned expenditures in the 2023 approved operating budget. The IT assets group does not have any items within their operating budget dedicated to maintaining existing assets although does have annual licensing costs included. A trend in recent years is a migration by software companies moving applications from an on-site approach to public cloud provider services. This trend is anticipated to increase the annual subscription costs that the City pays to utilize services (e.g. Outlook). It is unknown at this time if this approach will reduce costs to upgrade programs.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $1.2 million over the next 25 years in IT assets. Based on the best available IT asset data, deterioration rates and 2023-2032 capital funding, we estimate that IT assets are sufficiently funded as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation costs, continued deterioration, rehabilitation or replacement improvements, improved asset inventory data, and the addition of assets that were previously excluded. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.2.4.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management activities.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the information technology asset class performance and corresponding expenditure over 25 years. SMEs continually assess, prioritize, and determine the appropriate asset treatment, which ranges from maintenance activities (e.g. application refreshes) to complete replacement throughout the City's 10-year budget cycle. Once the forecast activities are within one to three years, potential projects are added to the one-year or three-year budget for Council approval.

IT assets fall into three categories: software, infrastructure, and hardware, and unlike other municipal infrastructure assets, most IT assets have a short service life ranging from three to 5 years. As noted earlier, software is trending towards a switch from on-site programs to public cloud services. IT SMEs are monitoring this trend and are working with AM staff to ensure the Waterloo DSS reflects the software the City owns.

Infrastructure and hardware assets are replaced when they reach their estimated service life or when they fail or become obsolete due to a change in technology. The City's current performance for IT assets is outlined in section 8.2.4.4.1 and the target performance is outlined in section 8.2.4.4.2. When projecting the performance of assets, condition is important and IT asset condition is performance and age based.

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.2.4.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

IT assets are replaced when they reach the end of their useful life. The estimated service life ranges between three and ten years for software and hardware assets and 25 years for fibre optic infrastructure assets. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for IT assets is assessed to be medium. The City is continuously working to improve asset data quality as outlined in section 3.1.

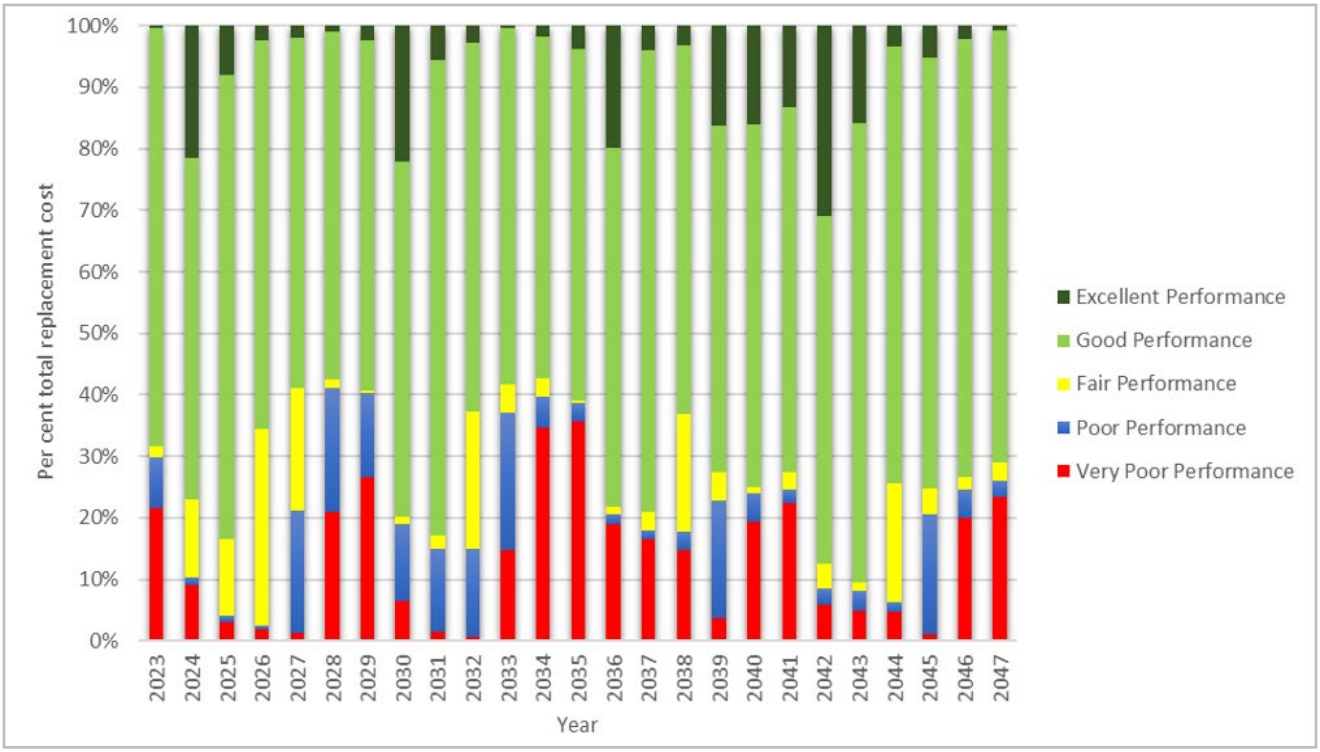
Section 8.2.4.3 identifies the lifecycle management activities required to provide the levels of services offered by information technology assets are funded through the capital budgets. To maintain the current level of service provided in 2023, the City needs to continue to invest the $1.2 million annually as identified in **Table 12** to provide the lifecycle activities to maintain the current level of service.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.4.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

The proportion of IT assets exhibiting fair, good, or excellent performance profiles is 70% as illustrated in **Figure 33**. The average annual budgeted capital expenditure of approximately $1.2 million is anticipated to maintain this performance profile over the next 25 years. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that IT assets are sufficiently funded.

FIGURE 33: PROJECTED ANNUAL PERFORMANCE OF INFORMATION TECHNOLOGY ASSETS IN THE BUDGET SCENARIO

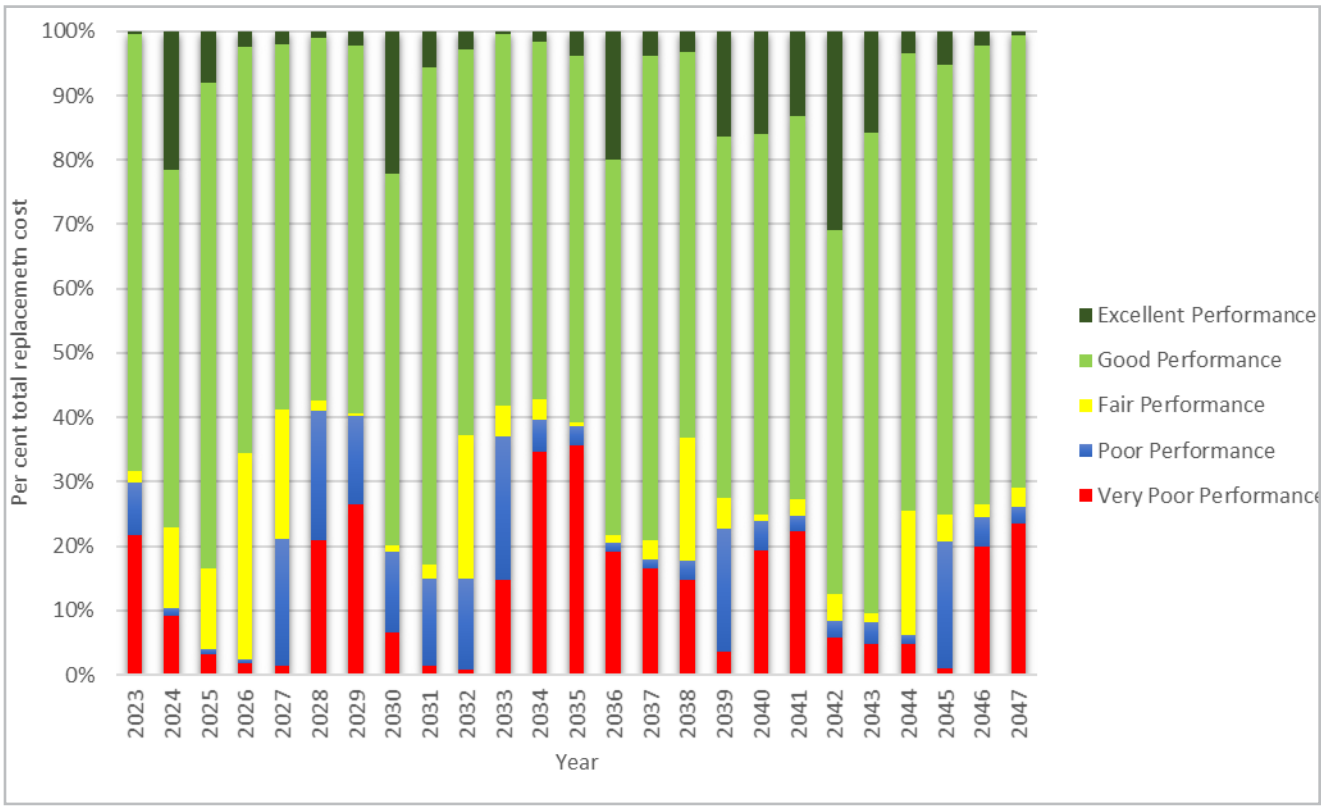


8.2.4.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is used to generate a list of infrastructure expenditure needs to achieve the target levels of service for IT assets. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $1.2 million over the next 25 years is required to achieve the target performance profile for IT assets. In the target scenario, the portion of the asset class with fair, good, and excellent performance is relatively similar to the budget scenario as illustrated in **Figure 34**.

FIGURE 34: PROJECTED ANNUAL PERFORMANCE OF INFORMATION TECHNOLOGY ASSETS IN THE TARGET SCENARIO

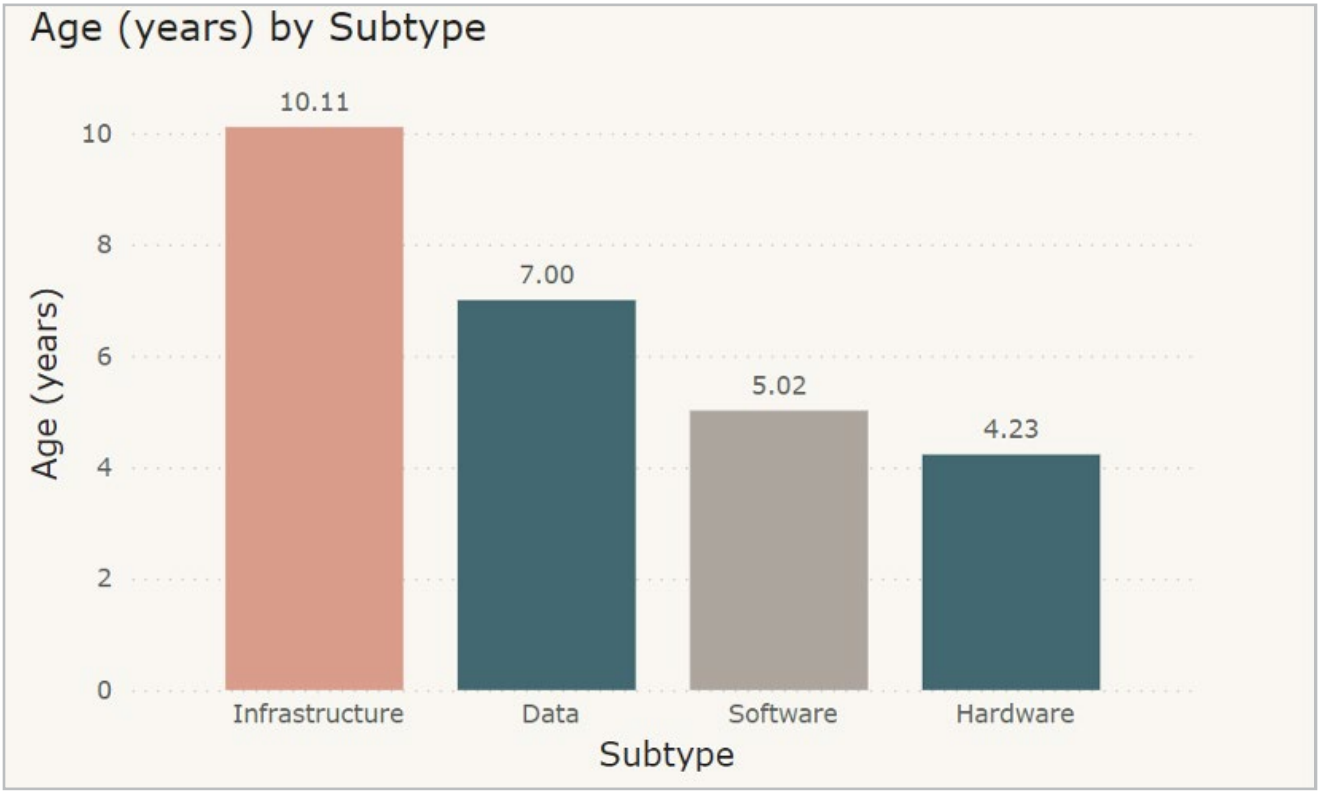


The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. IT assets are unique as they are largely technology based and may require replacement due to functional needs rather than the traditional condition approach used by other asset classes such as playgrounds or roofs. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets will be in each performance category and a portion being poor or very poor until they are rehabilitated or replaced.

8.2.4.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for the application of asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 35** for the City's IT assets.

FIGURE 35: AVERAGE AGE (YEARS) FOR IT ASSETS



The following tables show the levels of service established by the City for IT assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, IT metrics have been developed in a collaborative effort between IT SMEs and Asset Management staff. IT metrics are identified below in **Table 33** and **Table 34** and include metrics for the 2021 and 2022 calendar years.

TABLE 33: INFORMATION TECHNOLOGY COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	COMMUNITY LEVEL OF SERVICE MEASURE	COMMUNITY LOS PERFORMANCE
Reliability	Description of how the City provides reliable IT services.	Information Management and Technology Services division ensures business processes and objectives are clearly understood to provide better public service and increase self-serve options. The solid critical technology infrastructure is the key to improve access to data and reporting capabilities, integrate existing systems, modernize services, and utilize new technologies.

TABLE 34: INFORMATION TECHNOLOGY TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Reliability	Square footage of facilities	29%	30%
	Replacement Value*($ per square foot)	99.8%	99.8%
	Enterprise database available (e.g. Amanda, PeopleSoft, Open Text) (per cent)	99.8%	99.8%
	IT assets considered in fair or better condition (per cent)	71%	70%

8.2.4.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to IT assets.

8.2.4.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision

on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for IT assets. As technology is improved and as software and/or hardware are moved to cloud-based solutions, it is anticipated there will be a positive local impact for GHG emissions. However, it is possible that there may be an undetermined global impact.

8.2.4.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 35** below identifies the drivers for the IT asset class.

TABLE 35: INFORMATION TECHNOLOGY DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Technological Advancements: AI, Chatbot	We are currently in the pilot testing phase for AI and Chatbot implementation across specific use cases.	The adoption of AI and chatbots is expected to increase, leading to greater technological integration and automation.	Services will need to evolve to incorporate AI-driven features and improved chatbot functionality, enhancing customer support and streamlining user experiences.	Develop and implement AI and chatbot capabilities within existing systems. Leverage new AI features already being added to some of the cloud services to which we already subscribe. Ensure that staff are trained to effectively utilize these technologies to meet user needs. While several subscription-based applications have begun integrating AI features, the specific use cases remain unclear, emphasizing the necessity for comprehensive planning and governance.
Business Growth: more servers	Our infrastructure currently comprises 30 physical servers, serving as the backbone for over 150 virtual servers running atop this robust foundation.	Business growth will lead to increased data processing and storage requirements, necessitating additional server infrastructure.	Services will need to scale to accommodate the growing demand for data processing and storage, ensuring consistent performance.	Procure and integrate additional servers in line with business growth projections, while continuously monitoring performance and scaling as needed.
Obsolete or Aging Equipment: server and network device refresh	We have almost 100 Network routers and switches, most of which were refreshed in 2019. The server virtualization solution was refreshed in 2023.	The current servers and network devices are becoming obsolete, posing potential risks and inefficiencies.	Outdated equipment may lead to service disruptions and security vulnerabilities, affecting overall service quality.	Plan and execute a comprehensive refresh of servers and network devices, ensuring minimal service disruptions and enhanced security.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Security Requirements: filtering software for new security threats	Significant upgrades were completed in 2019 to reinforce email and web security measures. In 2021, staff implemented an advanced threat protection systems to further enhance our security infrastructure	Evolving security threats necessitate advanced filtering software to safeguard data and systems.	Implementing robust filtering software will enhance security protocols and reduce potential risks.	Invest in and deploy advanced filtering software solutions to bolster security and compliance efforts.
Regulatory Compliance: underground fibers	The City owns fibre optic cable, vaults, sleeves, and conduit.	Compliance requirements will mandate the installation of underground fibres to protect data and maintain regulatory standards.	Underground fibres will ensure data security and compliance, reducing the risk of data breaches.	Allocate resources for the installation of underground fibres to comply with regulations while minimizing service disruptions.
Remote Work and Mobility: desktop, laptop, tablet, and phone refresh	Desktop and laptop computers were refreshed between 2019 and 2021. A portion of our smartphones were refreshed in 2023.	The trend towards remote work and increased mobility will require updated desktops, laptops, tablets, and phones.	Enhanced mobility and remote work capabilities will improve user experiences and productivity.	Plan for the periodic refresh of these devices, ensuring that they meet evolving mobility and remote work needs.
Software Upgrades: PeopleSoft, Maximo, Amanda, etc.	Enterprise software applications are updated to maintain their efficiency and functionality. Recent updates include Amanda and PeopleSoft Financials and HR Systems.	Ongoing software upgrades will be necessary to maintain compatibility, security, and functionality.	Regular software upgrades will enhance system performance and security, contributing to the overall reliability of services.	Establish a schedule for software upgrades, considering user needs, compatibility, and security requirements.
Data Growth: extra data storage	In 2022, we expanded our storage for our backup system, and in 2023, added new hard drives to further enhance our computational capabilities.	Increased data generation will necessitate additional data storage capacity.	Adequate data storage will ensure seamless data management, access, and analysis.	Continually assess data growth and procure extra data storage as needed to accommodate expanding data volumes.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Disaster Recovery and Business Continuity: redundant network devices and servers	The Internet Resiliency Design phase has been successfully concluded, and our next step will involve the implementation process. We are ready to move forward with the practical execution of our plans.	Ensuring disaster recovery and business continuity will require redundant network devices and servers.	Redundant equipment will reduce downtime and maintain service availability during unforeseen disruptions.	Invest in redundant network devices and servers and establish disaster recovery and continuity plans for service resilience.
Energy Efficiency: server virtualization, desktop virtualization	We currently have over 150 virtual servers in our infrastructure and have the capability to support approximately 120 virtual desktops which efficiently manages an average daily workload of around 30 VDI sessions.	Energy efficiency initiatives, such as server and desktop virtualization, will be prioritized to reduce energy consumption.	Enhanced energy efficiency will lower operational costs and environmental impact.	Implement server and desktop virtualization strategies to optimize energy use and promote sustainability.
User Experience: bigger monitors	In 2023, we conducted a monitor refresh for the Engineering Services Division, replacing over 40 monitors to ensure their workstations are equipped with up-to-date and efficient display screens.	Enhancing user experiences will involve providing bigger monitors for improved productivity and comfort.	Larger monitors will enhance user satisfaction and productivity.	Incorporate the provision of larger monitors to improve the overall user experience.
Strategic Projects: Digital services strategy impact on services	The transformation of the IT Steering Committee into the Digital and Technology Steering Committee has brought several significant benefits, including Broader Scope; Alignment with Current Trends; Enhanced Relevance and Improved Decision-Making.	Strategic initiatives, especially those related to digital services, will influence service offerings and performance.	Adapting services in line with strategic initiatives will improve alignment with organizational goals and user expectations.	Align services with the digital services strategy, making necessary adjustments to meet evolving needs and goals.

8.2.4.8 Risk

The risk associated with not undertaking the treatment options available for IT assets is a reduced lifespan, increased cyber-security risks and operational impacts to internal and external customers. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the IT assets is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the IT level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are included in section 5.3. Information related to IT asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.4.9 Conclusion and Next Steps

Regarding the infrastructure funding gap, there is minimal difference between the budget scenario (current LOS) and the target scenario (proposed LOS) for IT assets over the next 25 years. To ensure management of IT assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts

- Partnering with SMEs to better understand their practices to provide data that can used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate.

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.2.5

Fire

8.2.5.1 What do we own and what is it worth?

The 2023 replacement value of the City's fire assets is estimated at $14.5 million and includes 22 vehicles and 1,500 pieces of equipment needed by our fire crews to respond to emergencies, as well as all the personal protective gear required to keep them safe. It is important to note that fire stations are captured under the facilities asset class.

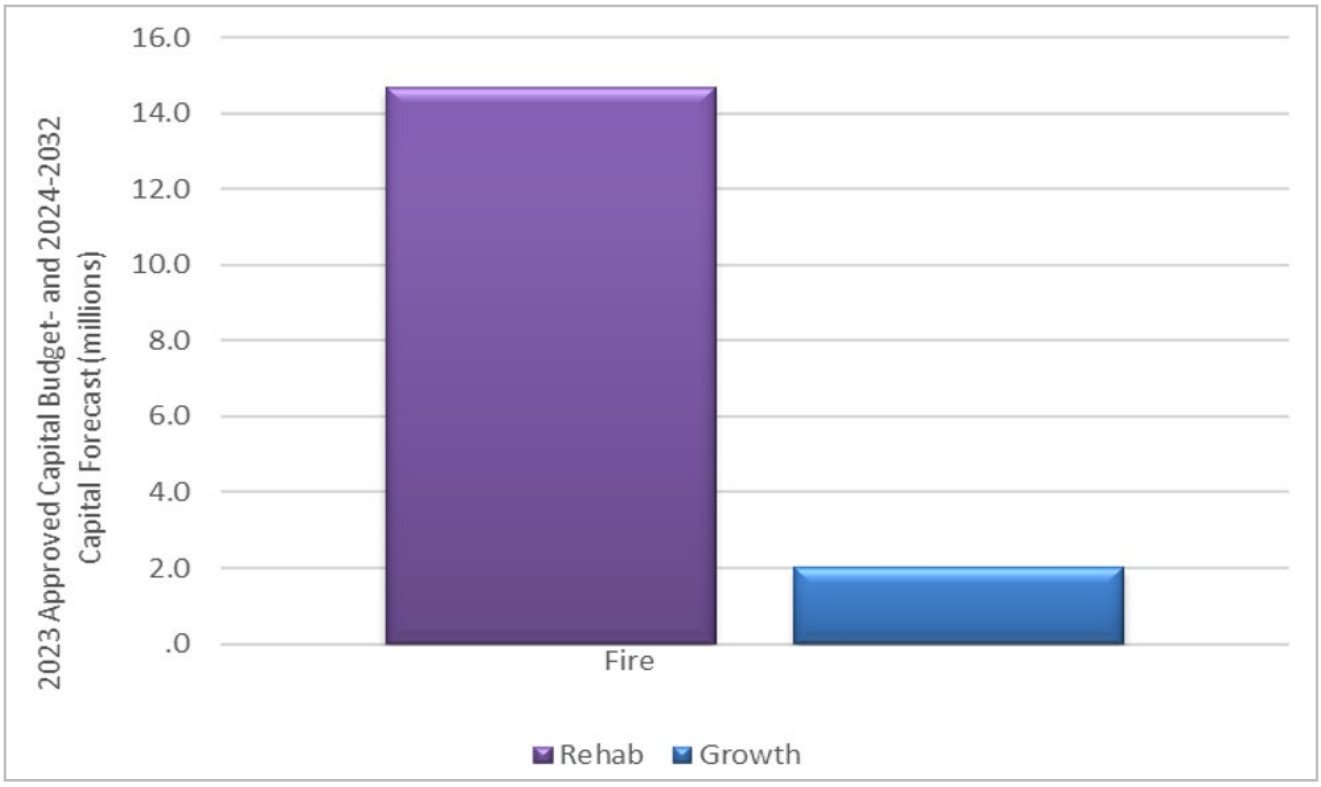
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.5.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $17 million over the next ten years on fire assets, $15 million for replacement of assets as illustrated in **Figure 36**.

FIGURE 36: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR FIRE ASSETS



The growth component for the fire asset class is related to new assets (e.g. personal protective equipment, new pumper truck) required for a new fire station as outlined in the Fire Master Plan approved by Council on November 27, 2023, through COM2023-024. Fire SMEs have identified that rehabilitation funding will be used to replace aging fire trucks, personal protective equipment, and other equipment. As noted earlier, fire stations are captured within the facilities asset class. On average, over 90% of fire assets will need to be rehabilitated or replaced ($13 million) in 15 years or less to maintain the service they provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced within 15 years will increase) and will subsequently increase the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 provides a summary of the planned expenditures in the 2023 approved operating budget. The 2023 operating budget included $242,000 in funding considered to be directly related to treating fire assets such as mandatory apparatus testing and vehicle maintenance activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $1.2 million over the next 25 years on fire assets. Based on the best available fire asset data, deterioration rates and 2023-2032 capital funding, we estimate that fire assets have an annual infrastructure funding gap of $100,000 as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation and replacement costs, continued deterioration, replacements, and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.2.5.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the fire asset class performance and corresponding expenditure over a 25-year timeframe. Once the forecast activities are within the one to three-year span, SMEs determine what vehicles and equipment need to be replaced. Fire SMEs undertake a comprehensive review of the vehicles and equipment needed to provide an optimized utilization of the assets.

Fire vehicle and equipment needs are unique as maintenance and rehabilitation activities are ongoing throughout the year to ensure that the assets can provide an acceptable level of service. Within the fire asset class, the assets fall into two categories: fire equipment and fire vehicles and apparatus. Fire equipment includes but is not limited to voice radio user gear, defibrillators, extrication equipment (e.g. jaws-of-life) or personal protective

equipment. Fire vehicles include emergency response vehicles (e.g. aerial or tanker trucks) and support vehicles (e.g. public education).

Fire equipment such as voice radio user gear, defibrillators, extrication equipment (e.g. jaws-of-life) or personal protective equipment is replaced when it reaches the end of its useful life in accordance with industry standards along with professional management by fire staff. The estimated service life ranges between seven and 20 years, depending on the type of equipment. Fire vehicles are replaced when they reach the end of their useful life, based on professional management by fire staff. The estimated service life ranges between seven and 15 years depending on the type of vehicle. Examples of the replacement or rehabilitation activities for fire assets are identified in **Table 36**. The City's current performance for fire assets is outlined in section 8.2.5.4.1 and the target performance is outlined in section 8.2.5.4.2. When projecting the performance of assets, condition is important and fire asset condition is performance and age based.

TABLE 36: FIRE TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Equipment	Mechanical inspections	Planned and unplanned maintenance repairs	Full replacement of the equipment
Vehicles and Apparatus	Preventative maintenance activities (e.g. oil changes) and inspections are undertaken at predetermined intervals or according to prescribed criteria, aimed at reducing the failure, risk or performance degradation of the equipment.	Scheduled and unscheduled maintenance repairs to correct deficiencies that occur between scheduled services to maintain the fleet in a safe and operable manner.	Full replacement of the vehicle including all related apparatus

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.1.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.2.5.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Fire asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for fire assets is assessed to be medium. The City is continuously working to improve asset data quality as outlined in section 3.1.

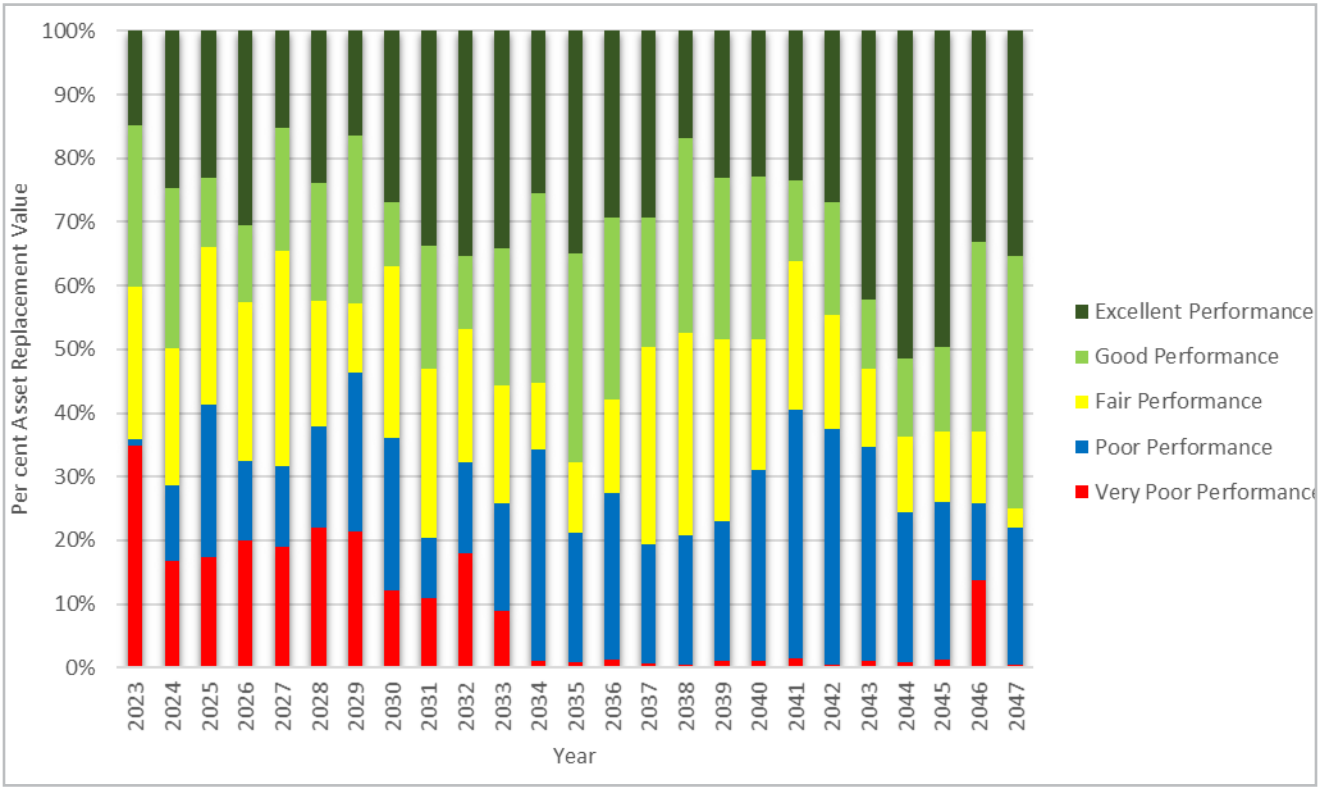
Section 8.2.5.3 identifies the lifecycle management activities required to provide the levels of services offered by fire assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $242,000 considered to be directly related to treating fire assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $1.2 million annually as identified in **Table 12.** The total funding required to provide the lifecycle activities to maintain the current level is $1.4 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.5.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Approximately 36% of fire assets are currently considered in poor or very poor performance categories as illustrated in **Figure 37**. It is important to note that fire SMEs maintain the vehicles and equipment to ensure that the assets are operational and safe. This is critical to ensuring both compliance with ever-evolving regulations and the longevity of complex essential equipment. This approach ensures a consistent and safe fire service to the community. Over the 25-year timeline, with the current level of funding, we anticipate the percentage of our fire assets with a poor or very poor performance profile to stay the same. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that fire assets have an annual infrastructure funding gap of $100,000.

FIGURE 37: PROJECTED ANNUAL PERFORMANCE OF FIRE ASSETS IN THE BUDGET SCENARIO

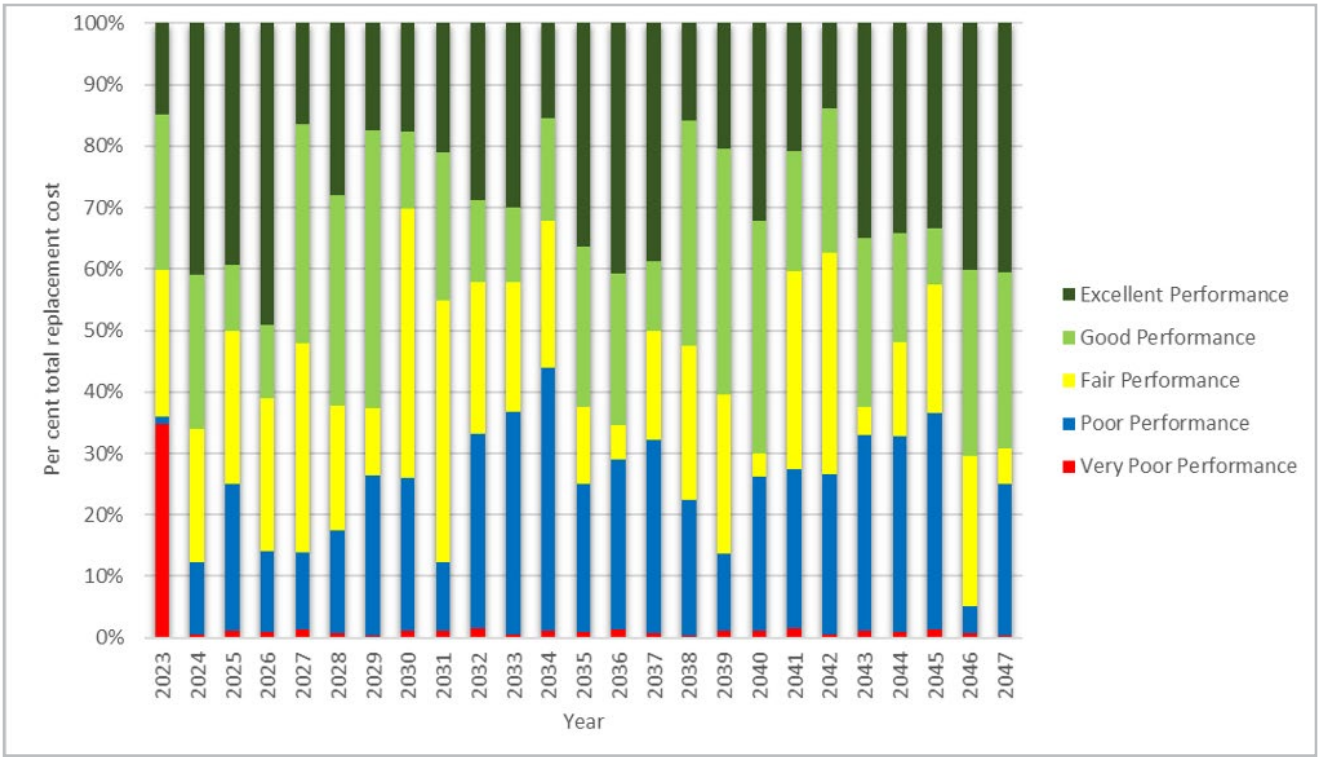


8.2.5.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $1.3 million over the next 25 years is required to achieve the target performance profile for the fire assets. In the target scenario, the portion of the asset class with fair, good, and excellent performance is relatively similar to the budget scenario as illustrated in **Figure 38**.

FIGURE 38: PROJECTED ANNUAL PERFORMANCE OF FLEET AND SHOP EQUIPMENT ASSETS IN THE TARGET SCENARIO

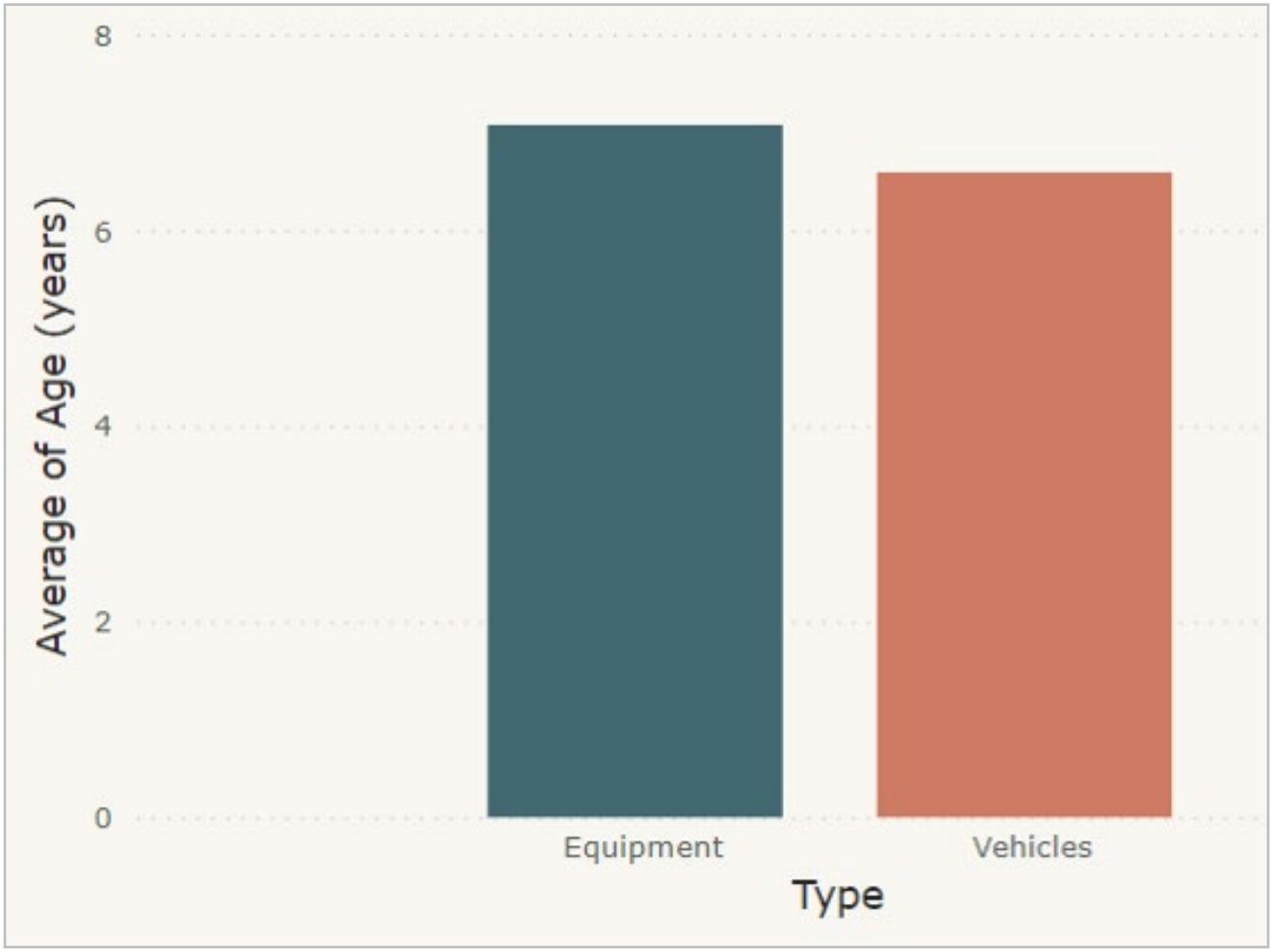


The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. Fire assets are unique assets that have guidelines when the replacement of the assets is recommended. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets in each performance category and a portion will be in poor or very poor until they are replaced.

8.2.5.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for the application of asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 39** for the City's fire assets.

FIGURE 39: AVERAGE AGE (YEARS) FOR FIRE ASSETS



The following tables show the levels of service established by the City for fire assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, fire metrics have been developed in a collaborative effort between SMEs and Asset Management staff. Fire metrics are identified below in **Table 37** and **Table 38** and include metrics for the 2021 and 2022 calendar years.

TABLE 37: FIRE COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION	2022
Reliability	Description of how the municipality provides fire services with minimal impact to the community.	Through a comprehensive preventative maintenance program and the positions of four dual-role of firefighter-mechanics (one per platoon per 24-hour shift) fleet and equipment are regularly maintained.
Cost Efficiency	Description of how the municipality delivers effective fire services.	Fire Services uses pumper/rescue combination and ladder fire trucks that enhance emergency response capacities and preventive maintenance programs.

TABLE 38: FIRE TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUANTITATIVE METRICS	2021	2022
Safety	Fire assets that are in fair or better condition (percent)*	39%	64%
Reliability	Amount of time when suppression equipment is available and operating properly (percent)	Estimated to be 95%	Estimated to be 95%

* New and improved data was collected between 2021 and 2022 increasing the number of assets in fair or better condition.

8.2.5.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to fire assets.

As the implementation of an analytics program of on-scene activity is introduced and refined, the measuring of metrics can be researched. This may indicate that a different combination of vehicles may be a more appropriate allocation of limited resources. This may include individual or a combination of replacement changes at various vehicle's end-of-life. Smaller and less complex, or larger and more costly replacements of existing fire fleet vehicles may occur to achieve this overall fleet improved efficiency.

8.2.5.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. As identified in section 5.1.6, AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for fire assets. One consideration for fire when implementing Council's desire to reduce GHG emissions is the availability of zero-emission vehicles for municipal purposes and the cost premium to purchase zero-emission vehicles. A secondary consideration is the need for charging infrastructure at all stations and the impact that may have on the required flexibility for WFR to move different fire apparatus to different stations to meet operational requirements.

8.2.5.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's Asset Management Section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 39** below identifies the drivers for fire assets.

TABLE 39: FIRE DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Electric fire trucks	Fire Rescue Services (FRS) is monitoring. At present, fire services are transitioning from hydraulic/gas-powered extrication tools i.e. 'jaws of life' and small hand tools to rechargeable battery operation.	As part of current and future budget processes, FRS will continue to explore financial opportunities to purchase electric fire trucks.	Currently, the average cost of an electric fire truck is estimated to be $800,000 to $1 million more than a gas-powered fire vehicle.	The transformation to zero-emission vehicles is reviewed as vehicle replacement or expansion occurs.
Increased density and height of buildings	FRS presented a Fire Master Plan (FMP) to Council to address the impacts of, in this case, vertical growth and high-density buildings.	Subject to Council's approval, a 4-year implementation plan will include 27 new FTEs, a new pumper and squad unit to enhance emergency response.	As part of the FMP, FRS is requested approximately $5M in annual operating funds and $10M in capital that may include a new fire station.	FRS will monitor day-to-day and long-term response capacities in conjunction with the 10-year FMP.

8.2.5.8 Risk

The risk associated with not undertaking the treatment options available for fire assets is a reduced lifespan resulting in the need to replace assets earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the fire asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the fire level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.1.3. Information related to fire asset management is included within the Waterloo DSS, allowing staff another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.5.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for fire assets over the next 25 years is an annual average of $100,000. To ensure management of fire assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

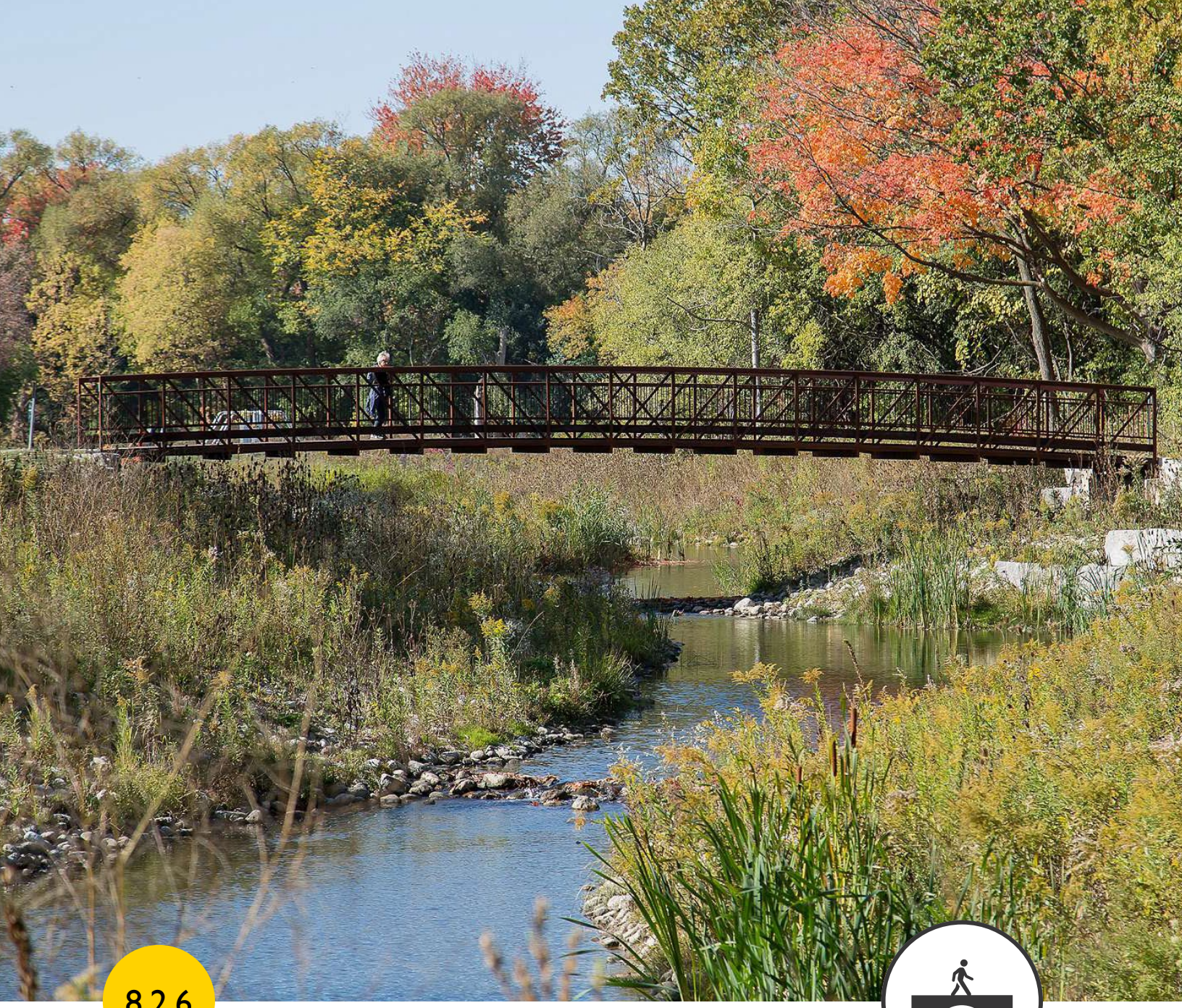
- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Assess and potentially utilize, where possible, data obtained through emergency services dispatch
- Discuss the applicability of incorporating the modern equivalent approach
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress



8.2.6

Bridges and Culverts

8.2.6.1 What do we own and what is it worth?

The 2023 replacement value of the City's bridges and culverts is estimated at $57 million and includes 54 pedestrian bridges and 22 road culverts. The bridges and culverts asset class is jointly owned and funded by the Tax Base and by Stormwater. This results in a proportional split of the asset needs and the infrastructure funding gap between the two funding areas.

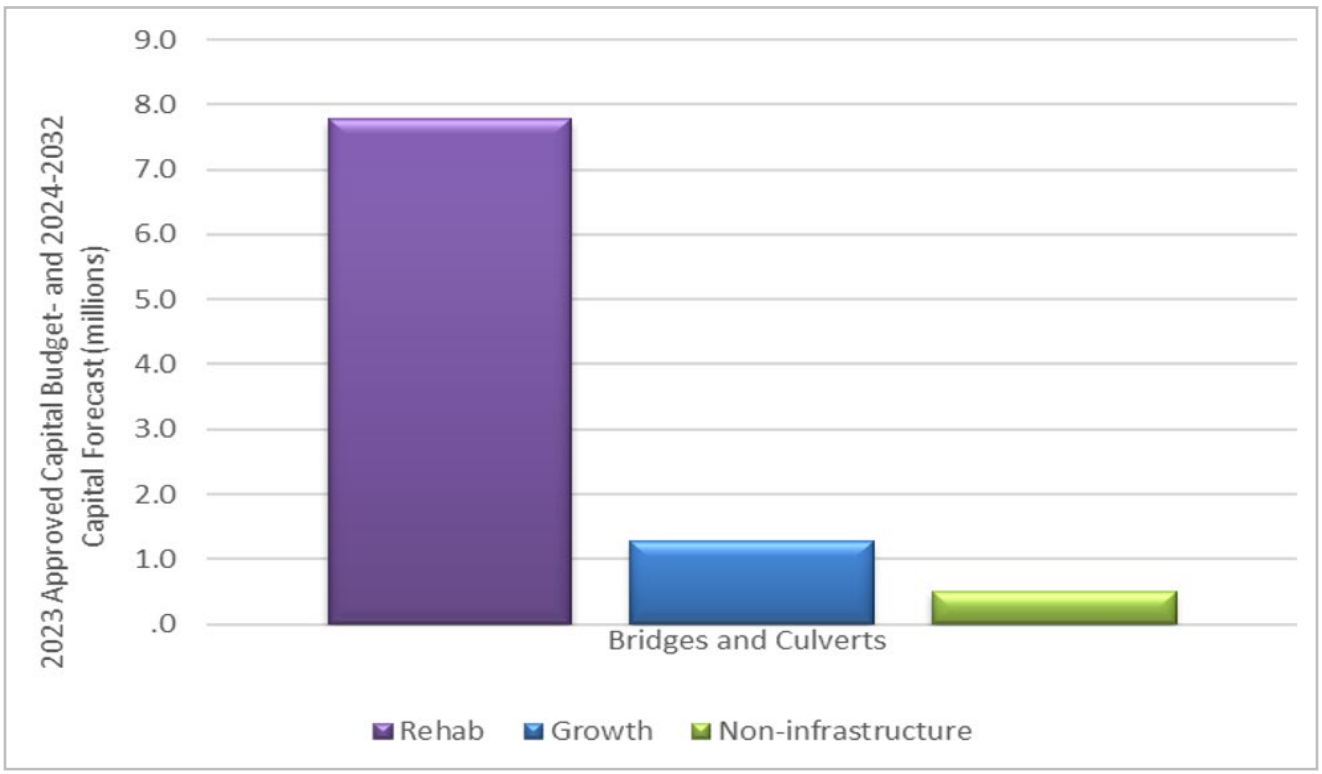
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.6.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the Approved 2023 Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $10 million over the next ten years in bridges and culverts assets, of which $7.8 million is for rehabilitation activities. The estimated distribution of the funding is shown in **Figure 40**.

FIGURE 40: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR BRIDGES AND CULVERTS



The growth component is related to growth-driven needs to build new pedestrian bridges. On average 100% of bridges and culvert assets as a percentage by replacement cost will need to be rehabilitated or replaced in 25 years or longer to maintain the service they provide to the community. As new assets are added due to growth, the percentage and value of assets that will need to be rehabilitated or replaced will increase and impact the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the Approved 2023 operating budget. The 2023 operating budget included $19,000 in funding considered to be directly related to treating bridge and culvert assets such as bridge inspections and maintenance activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $500,000 over the next 25 years in bridge and culvert assets. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that the assets have an average annual infrastructure funding gap of $300,000 as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating construction costs, continued deterioration, rehabilitation or replacement improvements, improved asset inventory data, and the addition of assets that were previously excluded. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.2.6.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the bridge and culvert asset class performance and corresponding expenditure over 25 years. Once the forecast activities are within the one to three-year span, SMEs determine the appropriate treatment which ranges from maintenance activities (e.g. painting, debris removal), to repair (e.g. deck board replacements, spot repairs) through to full replacement. The City's current performance for bridges and culvert assets is outlined in section 8.2.6.4.1 and the target performance is outlined in section 8.2.6.4.1.

Within the City, bridges fall into two categories: pedestrian bridges and road structures. Pedestrian bridges are meant to support pedestrians, cyclists, and maintenance vehicles such as those used for snow clearing. All road structure bridges in the City are storm culverts with a span of three metres or greater and may support heavy transport, motor vehicles, emergency vehicles, pedestrians, and cyclists. The bridges and culverts asset class is jointly owned and funded by the Tax Base and by Stormwater user fees. This results in a proportional split of the asset needs and the gap between the two funding areas.

Both types of bridge structures are replaced when they reach the end of their useful life. Inspections are completed every two years and determine if there is a need for work to be done, ranging from replacement of railings to asphalt and concrete repairs, and safety enhancements right up to full bridge replacement. Examples of the replacement or rehabilitation activities for bridges and culverts are identified in **Table 40**.

TABLE 40: BRIDGES AND CULVERTS TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Bridges	Painting Protective coating Concrete curb repair	Repair of bridge components such as deck board and railings Replace barriers with an approved barrier	Full replacement of the bridge and infrastructure around the bridge
Culverts	Debris removal Spot repairs	Full-length repair Lining	Full replacement of the culvert including all related infrastructure Twinning the culverts

Analysis of the current and target performance indicates that an increased focus on preventative maintenance is needed. The Ontario Structure Inspection Manual (OSIM) report and Asset Management Plan (2022) for Roadway Structures and Pedestrian Bridges identifies preventative maintenance activities or inspections for bridges and road structures. Based on the OSIM inspection report, it is anticipated that annual preventative maintenance funding of $273,000 is required on an annual basis and an increase of $254,000 is recommended. It is recommended that the City include these additional funding needs within the 2027 and 2028-2030 budget processes for Council's consideration. The current funding approach is 50/50 between the tax base and the stormwater enterprise and utilizing this funding ratio is recommended. Increasing preventative maintenance activities will help optimize the life of bridges and culverts.

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City. The City's current performance for bridge and culvert assets is outlined in section 8.2.6.4.1 and the target performance is outlined in section 8.2.6.4.1.

8.2.6.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average

of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed.

Bridge asset performance is evaluated using historical knowledge, age, and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for bridge assets is assessed to be medium. The City continuously works to improve asset data quality as outlined in section 3.1.

The Bridge Condition Index (BCI) is a single value that provides an overview of the overall condition of each structure. It is calculated as per the Ministry of Transportation's (MTO) standardized methodology by the OSIM inspection and report consultant. Each element is assigned a proportionate value of the total BCI. The Bridge Condition Index originates at 100 when the structure has been newly constructed and gradually declines as the elements deteriorate due to the severity of their exposure.

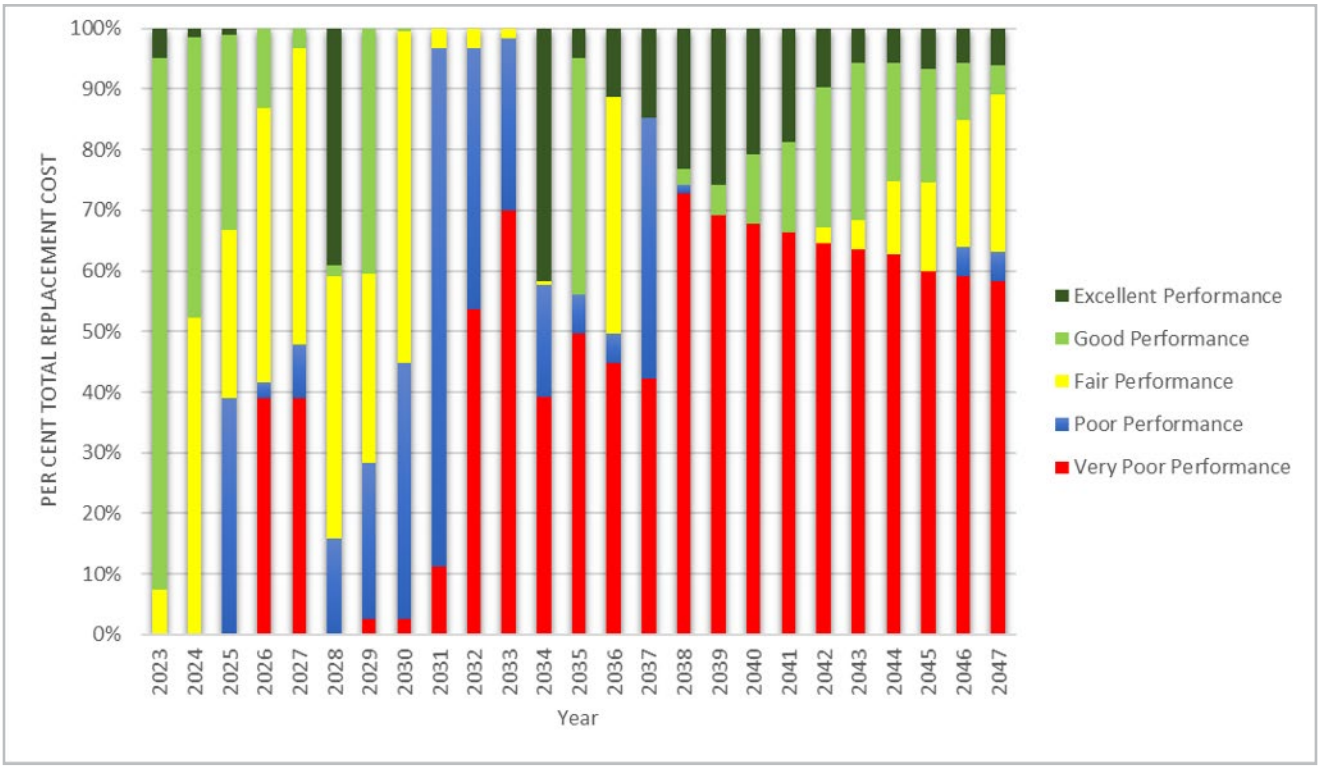
Section 8.2.6.3 identifies the lifecycle management activities required to provide the levels of services offered by bridge and culvert assets funded through the capital budgets. To maintain the current level of service provided in 2023, the City needs to increase the annual operating budget funding of $19,000 to $273,000 as identified in section 8.2.6.3. In addition to the operating funding, the City needs to continue to invest the $500,000 annually and increase capital funding to close the $300,000 funding as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $1.1 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.6.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

The proportion of bridge and culvert assets exhibiting fair, good, or excellent performance profiles is 100% as illustrated in **Figure 41**. The average annual budgeted capital expenditure of approximately $500,000 is anticipated to result in a decline in the performance profile over the next 25 years. The proportion of bridge and culvert assets with fair, good, and excellent performance starts to decline in the mid-2020s with a shift to a primarily poor or very poor performance profile by 2030. Based on the current deterioration rates, funding, and asset data, throughout the 2030's and beyond, bridges and culverts are projected to largely have a very poor performance profile which is anticipated to be unacceptable to most interested and affected parties. Based on the best available bridge asset data, deterioration rates and 2023-2032 capital funding, we estimate that bridge assets have an annual infrastructure funding gap of $300,000.

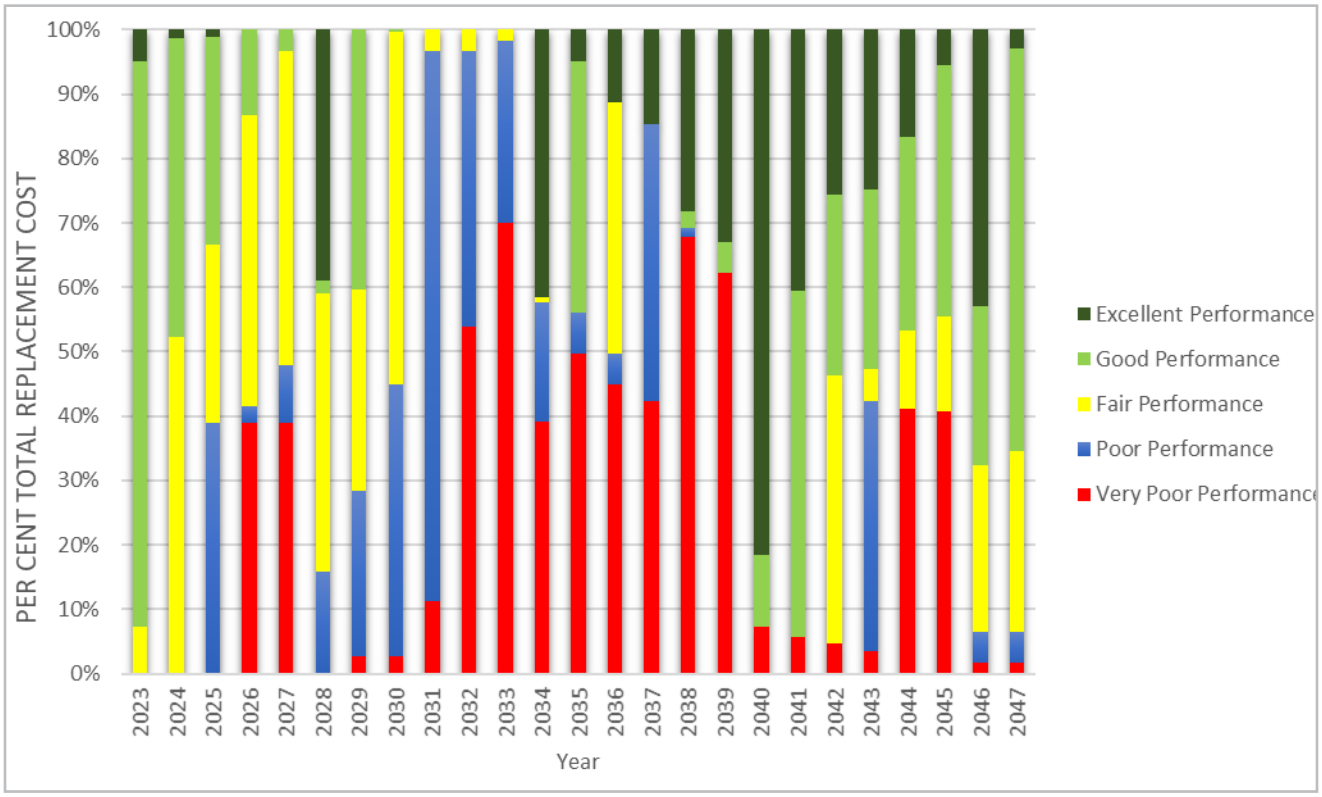
FIGURE 41: PROJECTED ANNUAL PERFORMANCE OF BRIDGES AND CULVERTS ASSETS IN THE BUDGET SCENARIO



8.2.6.4.2 Target Performance and Required Expenditures

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $800,000 over the next 25 years is required to achieve the target performance profile for the bridges and culverts asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance fluctuates throughout the first ten years and increases to almost 90% at the end of the 25 years. The remaining portions of the asset class are in the poor and very poor performance categories for the same period as illustrated in **Figure 42**.

FIGURE 42: PROJECTED ANNUAL PERFORMANCE OF BRIDGES AND CULVERTS ASSETS IN THE TARGET SCENARIO

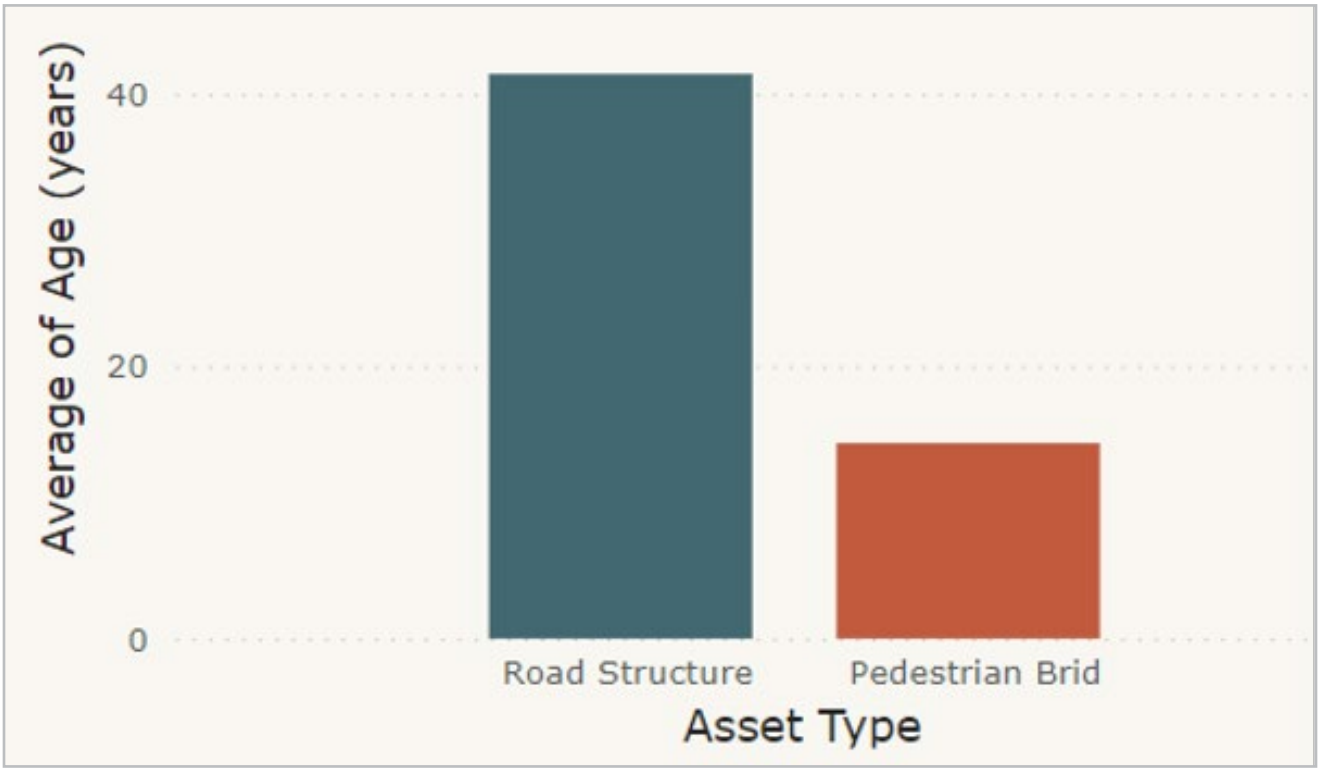


The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. Bridges and culverts are engineered assets that start in excellent and as they age, they progress towards very poor. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets will be in each performance category and a portion being poor or very poor until they are rehabilitated or replaced.

8.2.6.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for the application of asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 43** for the City's pedestrian bridges and culverts.

FIGURE 43: AVERAGE AGE (YEARS) FOR BRIDGES AND CULVERTS



The following tables show the levels of service established by the City for bridge assets. These metrics include the technical and community level of service required as part of Ontario Regulation 588/17. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on. As a core asset, bridge metrics are identified below in **Table 41** and **Table 42** and include metrics for the 2021 and 2022 calendar years.

Pedestrian Bridge Bank – Emergency Repair

New Pedestrian Bridge

TABLE 41: BRIDGES AND CULVERTS COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	COMMUNITY LEVEL OF SERVICE MEASURE	COMMUNITY LOS PERFORMANCE
Scope	Description of the traffic that is supported by municipal bridges (e.g. heavy transport, motor vehicles, emergency vehicles, pedestrians, cyclists).	In the City of Waterloo bridges fall into two categories, pedestrian bridges, and road structures. Pedestrian bridges are meant to support pedestrians, cyclists, and maintenance vehicles such as those used for snow clearing. All road structures in the City are storm culverts with a span of three metres or greater. These structures may support heavy transport, motor vehicles, emergency vehicles, pedestrians, and cyclists.
Quality	Description or images of the condition of bridges and how this would affect their use.	A number of factors related to the various elements that comprise a bridge structure can affect the condition and use of a bridge. Elements of a bridge include substructures such as foundations and abutments, primary components, and secondary components. The elements may be composed of varying materials which may display ranging levels of defect. Bridges where the severity and extent of any one defect is high, or bridges with a high proportion of elements in a poor condition state and structures with load limits all affect the use of a bridge structure from a public safety, comfort, and convenience perspective.
	Description or image of the condition of culverts and how this would affect their use.	A number of factors related to the various elements that comprise a culvert can affect the condition and use of a bridge. Elements of a culvert include barrels, barriers, headwalls, foundations, embankments, and streams, etc. The Culvert barrels themselves may be made of concrete, or corrugated steel pipe and may be constructed in several shapes: namely, round, ellipses, pipe arches or rectangular. The other elements that make up the bridge structure may be composed of varying materials which may display ranging levels of defect. Bridges where the severity and extent of any one defect is high, or bridges with a high proportion of elements in a poor condition state and structures with load limits all affect the use of a bridge structure from a public safety, comfort, and convenience perspective.

TABLE 42: BRIDGES AND CULVERTS TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Scope	% of bridges in the municipality with loading or dimensional restrictions*	20.4%	15.8%
Quality	Amount of time when suppression equipment is available and operating properly (percent)	74	74
	For structural culverts in the municipality, the average bridge condition index value.^	67	69

^ Bridge Condition Index (BCI) values were obtained from the biannual OSIM inspection report.

* New and improved data was collected between 2021 and 2022 decreasing the number of bridges with loading or dimensional restrictions.

8.2.6.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine its applicability. It is anticipated that bridges and culverts will be replaced with the modern equivalent to meet current design standards.

8.2.6.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.1.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for bridges and culvert assets.

8.2.6.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 43** below identified the identified drivers for the bridge and culverts asset class.

TABLE 43: BRIDGES AND CULVERTS DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Need for increased load capacity – new equipment and impact of year-round access	The City has 50+ pedestrian bridges of various size, type, age, and condition. The winter-maintained bridges have had capacity loading assessed. The remaining bridges have not been assessed.	Aging infrastructure will require more rehabilitation activities or to be replaced. Assessment for loading capacity of remaining bridges required.	Limited infrastructure funding is resulting in delays in the rehabilitation and replacement of bridges. Staff capacity to manage rehabilitation and replacement of assets is limited.	Allocate resources to monitor and adapt rehabilitation and replacement activities as limited funding allows.

8.2.6.8 Risk

The risk associated with not undertaking the treatment options available for bridges and culverts is a reduced lifespan resulting in the need to replace the infrastructure earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the bridges and culverts asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the bridges and culverts' level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are included in section 5.3. Information related to bridges and culverts asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.6.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for bridges and culvert assets over the next 25 years is an annual average of $400,000. Due to the dual ownership by both the Tax Base and Stormwater, the proportional share for 2023 is 50/50, $200,000 from the tax base and $200,000 for Stormwater.

To ensure management of bridges and culvert assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate
- Investigate historical Bridge and Culvert OSIM report BCI values and determine if deterioration rates can be refined to better predict the City's bridge and culvert asset performance.
- Recommending an increase of $254,000 in the 2027 and 2028-2030 budget processes for Council's consideration

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.2.7

Forestry

8.2.7.1 What do we own and what is it worth?

The 2023 replacement value of the forestry assets is estimated at $113 million and includes 37,656 trees, comprised of 31,188 street trees and 6,468 park trees. The City's urban forest includes trees planted along streets, and trees on City-owned lands like open spaces, parks, and woodlots. Trees located within City cemeteries are captured as a cemetery asset. It is important to note fleet and associated equipment (e.g. Aerial Lift trucks, Gator, and Pickup Trucks) is captured under the fleet asset class.

The Parks, Forestry and Cemeteries division is currently undertaking an Urban Forest Management Strategy (UFMS) that is anticipated to be complete by the end of 2024. The UFMS will be reviewed with forestry SMEs to inform the Waterloo DSS and performance forecasting.

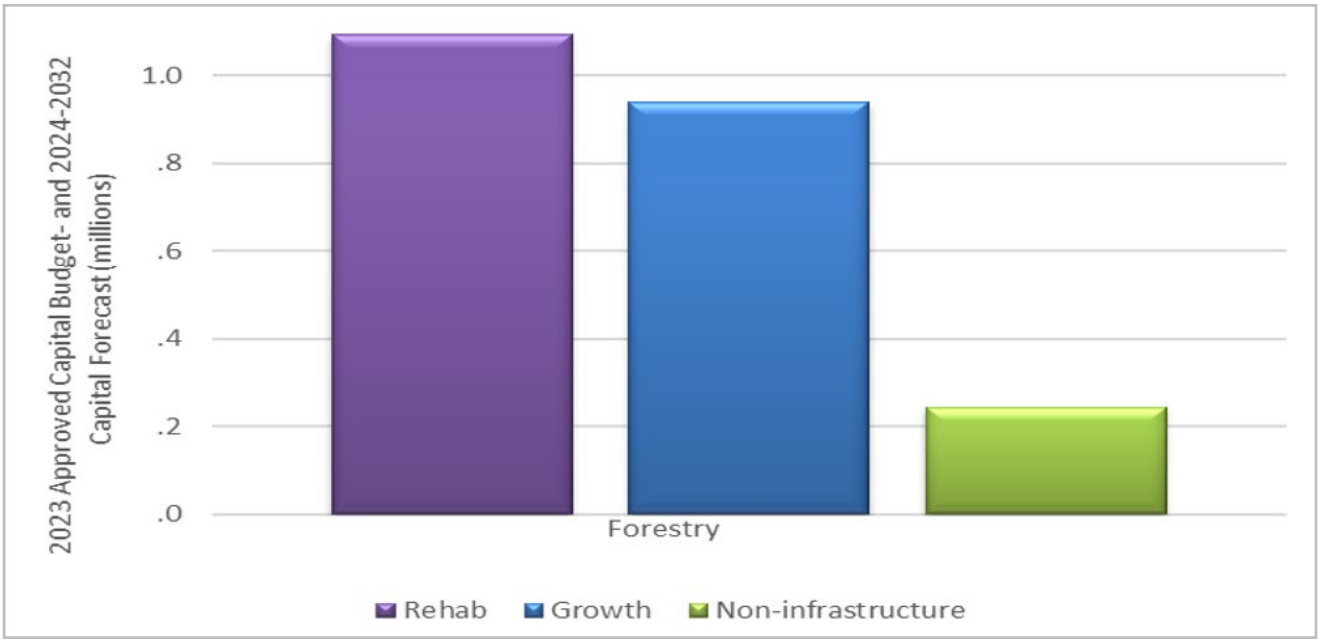
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.7.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $2.3 million over the next ten years in Forestry assets, $1 million which is for rehabilitation activities. The estimated distribution of the funding is shown in **Figure 44**.

FIGURE 44: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR FORESTRY ASSETS



The growth component for the forestry asset class is related to the implementation of the UFMS. All forestry asset types maintain the service they provide to the community without the need to be rehabilitated or replaced for 25 years or longer. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced will increase) and will impact the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the 2023 approved operating budget. The 2023 operating budget included $580,000 in funding considered to be directly related to treating forestry assets such as tree elevating and inspection activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $100,000 over the next 25 years on forestry assets. Based on the best available forestry data, deterioration approach and 2023-2032 capital funding, we estimate that forestry assets have an average annual infrastructure funding gap of $400,000 as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.2.7.3 Lifecycle Management Activities

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management activities.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the forestry asset class performance and corresponding expenditure over 25 years. Tree assets' lifecycle is modelled differently than that of engineered assets. As trees mature and appreciate over time, they are considered to stay in excellent condition until they reach the end of their estimated service life by species, at which point they degrade very rapidly. Once the forecast activities are within the one to three-year span, SMEs determine the appropriate treatment which ranges from maintenance activities (e.g. tree elevating), to full replacement. The current focus of the forestry team is woodlot maintenance to address ash trees that need to be removed because of the Emerald Ash Borer pest.

Within the City, trees primarily fall into two categories: street trees and park trees. Trees are removed and replaced when they are dying, damaged or impacted by invasive pests. The useful life ranges from 50 to 200 years and varies depending on the species of tree. Examples of the replacement or rehabilitation activities for forestry are identified in **Table 44**. The City's current performance for forestry assets is outlined in section 8.2.7.4.1 and the target performance is outlined in section 8.2.7.4.2. Analysis of the current and target performance indicates that an increased focus on preventative maintenance may be beneficial. Increasing

preventative maintenance activities will help optimize the life of the City's trees. The current trend is for forestry staff to visit street trees approximately three times throughout their lives. When projecting the performance of assets, condition is important and currently forestry asset condition is performance and age based.

TABLE 44: FORESTRY TREATMENT EXAMPLES

MAINTENANCE	REPLACEMENT
Trimming/pruning Tree elevating Within woodlots, dropping in place Emerald Ash Borer infected trees (no removal or replanting)	Removal and replanting

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.2.7.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Forestry asset performance is evaluated using historical knowledge, age, and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for forestry assets is assessed to be medium. The City is continuously working to improve asset data quality as outlined in section 3.1.

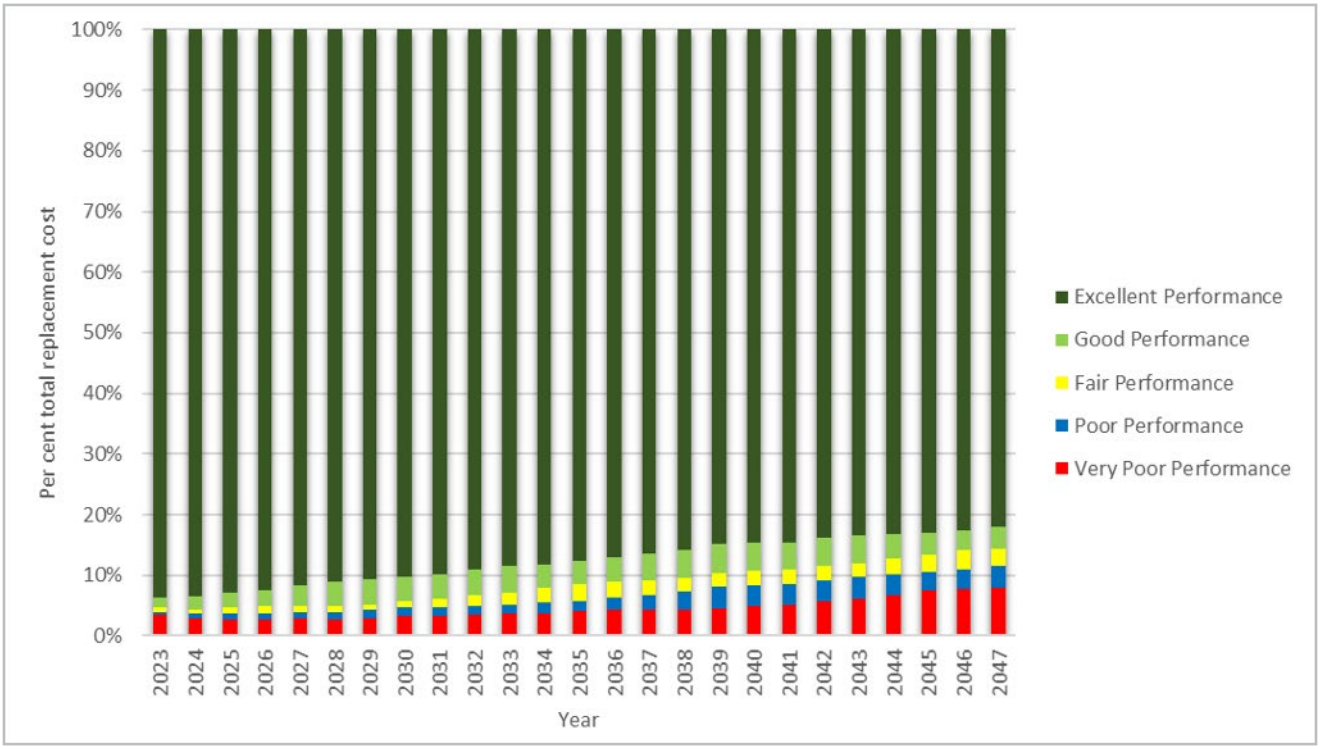
Section 8.2.7.3 identifies the lifecycle management activities required to provide the levels of services offered by forestry assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $500,000 considered to be directly related to treating forestry assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $100,000 annually as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $600,000 annually.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.7.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

The proportion of forestry assets exhibiting fair, good, or excellent performance profiles is approximately 96% as illustrated in **Figure 45**. The average annual budgeted capital expenditure of approximately $100,000 is anticipated to result in a slight decline in the performance profile over the next 25 years. Based on the current deterioration rates, funding and asset data, forestry assets are projected to have an excellent performance profile, which is anticipated to be acceptable to most interested and affected parties.

FIGURE 45: PROJECTED ANNUAL PERFORMANCE OF FORESTRY ASSETS IN THE BUDGET SCENARIO

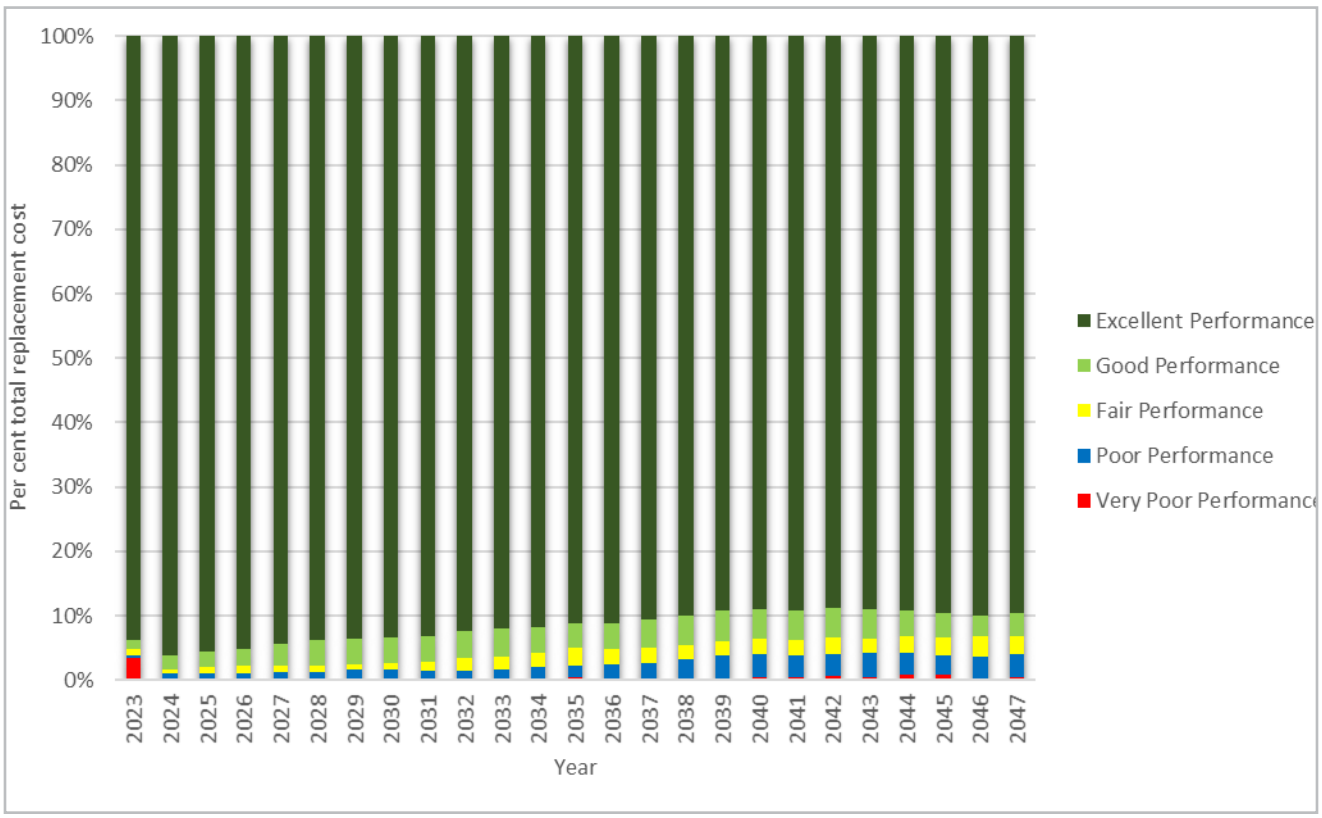


8.2.7.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $500,000 over the next 25 years is required to maintain the target performance profile for the forestry asset class as illustrated in **Figure 46**.

FIGURE 46: PROJECTED ANNUAL PERFORMANCE OF FORESTRY ASSETS IN THE TARGET SCENARIO

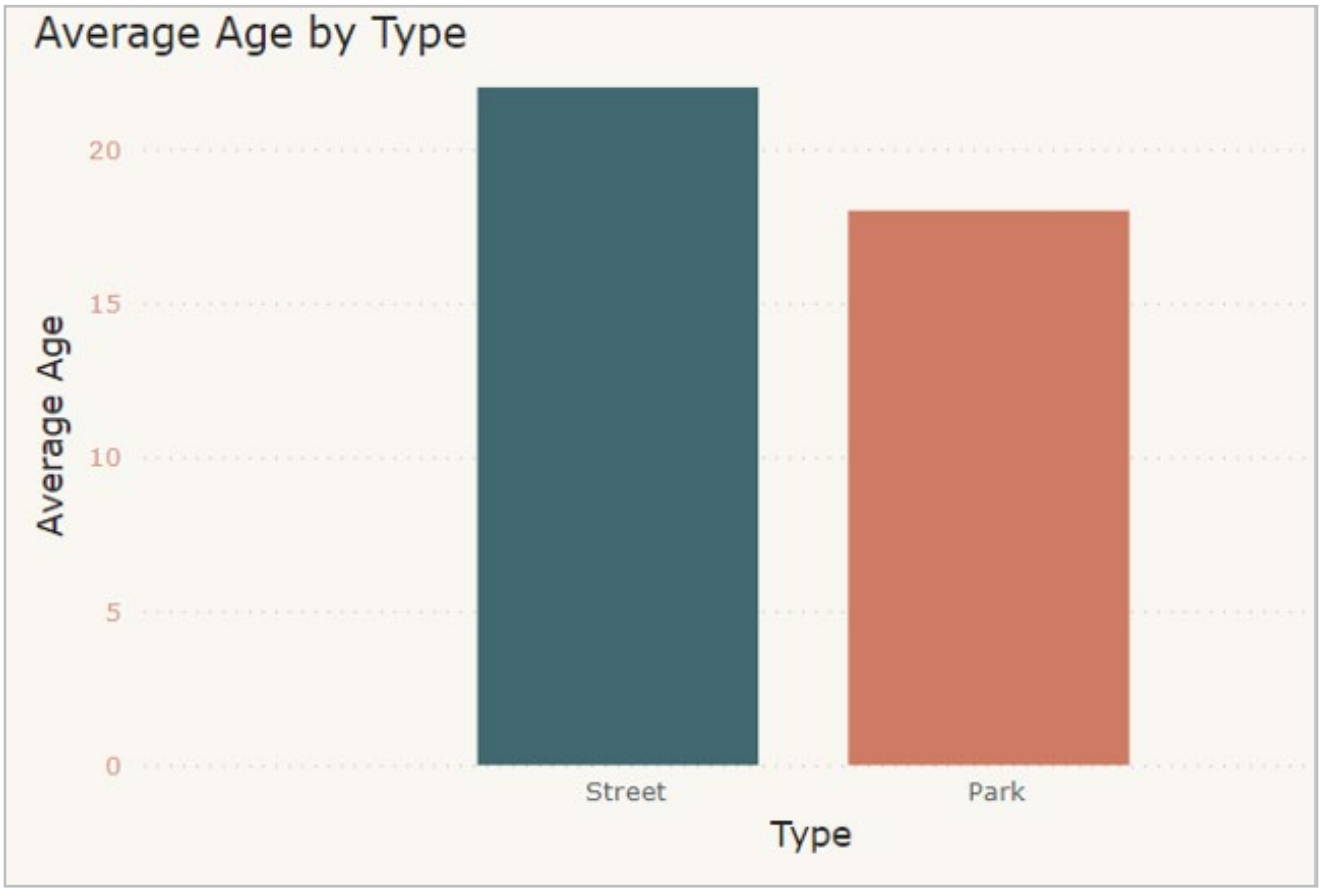


The target performance profile is based on the 2023 asset inventory and uses the SME's professional management of the estimated service life of the asset. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. Forestry assets are natural assets that start in excellent and stay in excellent condition until they reach their estimated service life, at which time they progress rapidly towards very poor. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets will be in each performance category and a portion being poor or very poor until they are rehabilitated or replaced.

8.2.7.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for the application of asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 47** for the City's forestry assets.

FIGURE 47: AVERAGE AGE (YEARS) FOR FORESTRY ASSETS



The following tables show the levels of service established by the City for forestry assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, forestry metrics have been developed in a collaborative effort between SMEs and Asset Management staff. Forestry metrics are identified below in **Table 45** and **Table 46** and include metrics for the 2021 and 2022 calendar years.

TABLE 45: FORESTRY COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION
Scope	Manage and maintain the urban forest including scheduled and emergency tree maintenance, tree assessment and tree planting throughout the City.
Customer Service	The average number of days to replace a street or park tree is six months, although emergency tree maintenance is undertaken within 24 hours. Scheduled maintenance can take up to one year.
	The average number of days to respond to a tree inspection request is two to three days.

TABLE 46: FORESTRY TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Quality	Street trees receiving preventative maintenance (percent)	5-10%	5%
	Forestry assets that are in fair or good condition (percent)	95%	96%
Environmental Stewardship	Diversity of the tree canopy (percent). To reduce the risk of catastrophic tree loss due to pests, the City plans to keep the urban tree population to no more than 10% of any one species and 30% of any one genus.	Species – Norway Maple exceeds 10% target, currently at 15% Genus – Maple exceeds 30% target, currently at 40%	Species – Norway Maple exceeds 10% target, currently at 15% Genus – Maple exceeds 30% target, currently at 38%

8.2.7.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals. It is important to note that in some situations, a true "like-for-like" replacement is not possible so the modern equivalent approach is already in use when necessary. For example, Ash trees will not be replaced like-for-like with another Ash tree and therefore the remaining Ash trees in the City's inventory will be replaced with a modern equivalent.

8.2.7.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, adaptation and mitigation are not mutually exclusive as some actions have co-benefits, meaning they contribute to both adaptation and mitigation. For example, planting trees will assist in providing shade and adapting to extreme heat, while also mitigating greenhouse gas emissions by acting as a carbon sink and potentially lowering energy use in both summer and winter months. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for forestry assets.

8.2.7.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's Asset Management Section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on assets is an overarching theme that affects all asset classes.

8.2.7.8 Risk

The risk associated with not undertaking the treatment options available for forestry assets is a reduced lifespan resulting in the need to replace assets earlier than desired. Please refer to section 5.8 for general context and appropriate asset management interpretation of this section's specifics.

Risk related to the forestry asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that forestry's level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS allows staff to ensure that the future probability of underperforming infrastructure and its consequences is minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.3. Information related to forestry asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.7.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for forestry assets over the next 25 years is an annual average of $400,000. To ensure management of forestry assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Discuss the applicability of incorporating the modern equivalent approach
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate
- Incorporating recommendations from the Urban Forest Management Strategy

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.2.8

Library Equipment and Furniture

8.2.8.1 What do we own and what is it worth?

The 2023 replacement value of the Library Equipment and Furniture assets is estimated at $5.5 million and includes the equipment, furniture, electronics, and computers used by residents to access and enjoy the collections, and to support library programming. The City of Waterloo supports the Waterloo Public Library's purpose to satisfy the multiple literacy needs of the community. The library provides public access to print and digital collections to support the information, cultural, learning and leisure needs of its customers. It is important to note that library buildings are captured under the facilities asset class and that the replacement value of collections is not included. There are $13.1 million worth of collection items including hardcover books, paperbacks, CD audiobooks, DVDs, and eBooks.

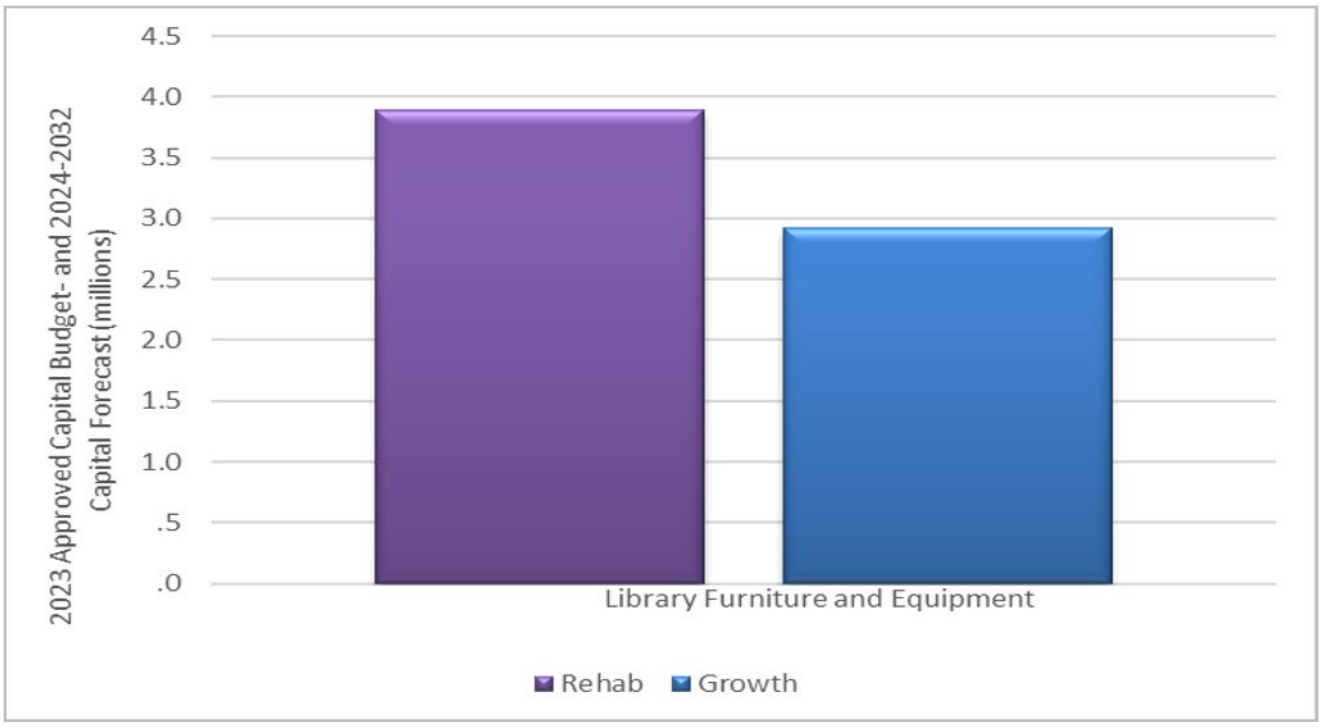
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.2.8.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest approximately $6.8 million over the next ten years in Library assets, of which $3.9 million is specifically for rehabilitation activities. The estimated distribution of the funding is shown in **Figure 48**.

FIGURE 48: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR LIBRARY ASSETS



The growth component for the library asset class is related to new collection items. As noted earlier, library buildings are captured within the facilities' asset class. All library assets will need to be replaced in 25 years or less to maintain the service they provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced within 25 years will increase) and will subsequently increase the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the 2023 approved operating budget. The 2023 operating budget included $7.4 million in funding considered to be directly related to funding library programming and activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $300,000 over the next 25 years in Library assets. Based on the best available Library data, deterioration approach and 2023-2032 capital funding, we estimate that assets are sufficiently funded as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation costs, continued deterioration, rehabilitation or replacement improvements and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information

8.2.8.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management strategies.

O. Reg 588/17 requires municipalities to document future lifecycle activities to meet current service levels and identify financial strategies for assets for the following ten years. The Waterloo DSS forecasts the Library asset class performance and corresponding expenditure over 25 years. Once the forecast activities are within the one to three-year span, SMEs plan replacement.

Library assets fall into three categories: computer and electronics, equipment, and furniture that support library programs. Collection items (hardcover books, paperbacks, CD audiobooks, DVDs, eBooks) are not included in the Asset Management Plan. The estimated service life of library assets ranges from 3 years to 7 years and assets are replaced when they reach their service life or when they fail.

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City. The City's current performance for library assets is outlined in section 8.2.8.4.1 and the target performance is outlined in section 8.2.8.4.1. When projecting the performance of assets, condition is important and currently library asset condition is performance and age based.

8.2.8.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Library asset performance is evaluated using historical knowledge, age, circulation and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for Library assets has not been assessed. The City is continuously working to improve asset data quality as outlined in section 3.1.

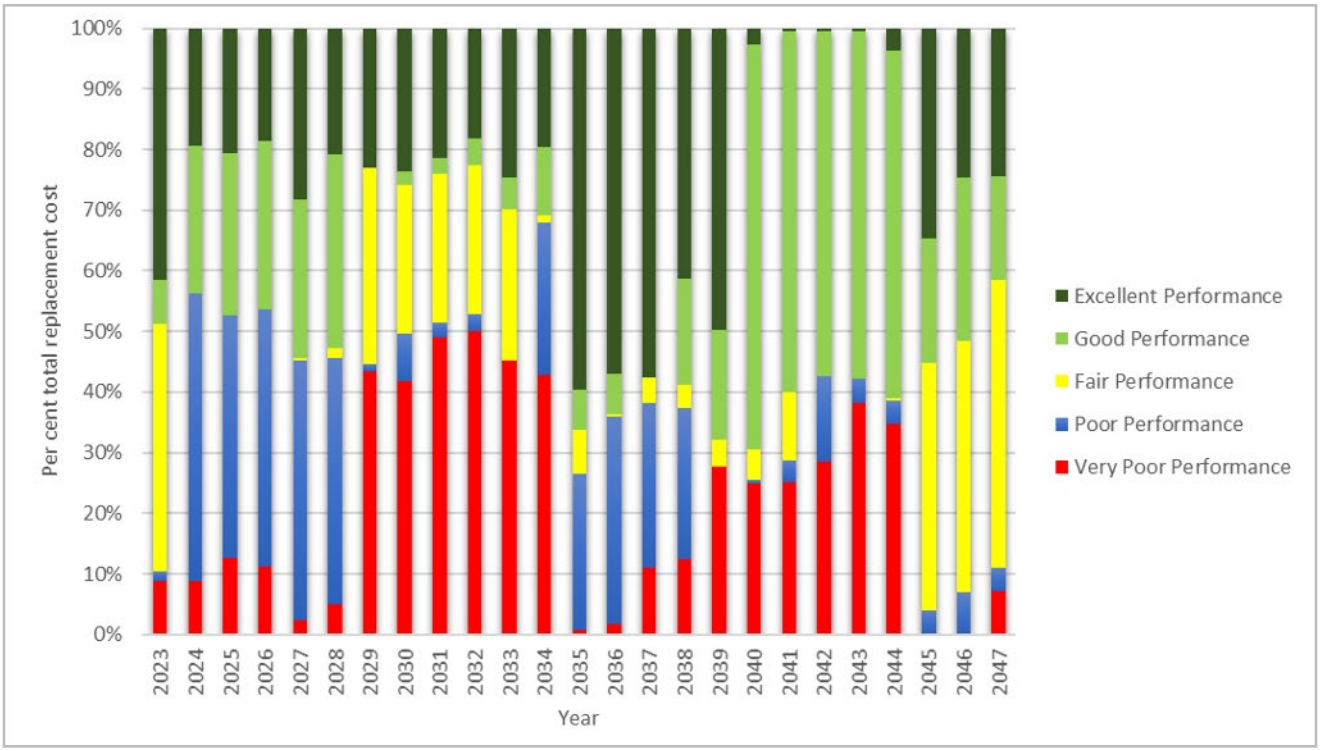
Section 8.2.8.3 identifies the lifecycle management activities required to provide the levels of services offered by library assets and are funded through the capital budget. To maintain the current level of service provided in 2023, the City needs to continue to invest the $300,000 annually as identified in **Table 12**.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.8.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Approximately 10% of library assets are currently considered to be in poor or very poor performance as illustrated in **Figure 49**. Starting the year 2024 to 2034, the percentage of poor or very poor performance increases significantly to 50% on average. However, over the 25-year timeline, with the current level of funding, we anticipate the percentage of library content assets with poor or very poor performance profiles to be back at 10% by the end of the 25-year timeframe. Based on the best available Library asset data, deterioration rates and 2023-2032 capital funding, we estimate that Library assets are sufficiently funded.

FIGURE 49: PROJECTED ANNUAL PERFORMANCE OF LIBRARY ASSETS IN THE BUDGET SCENARIO

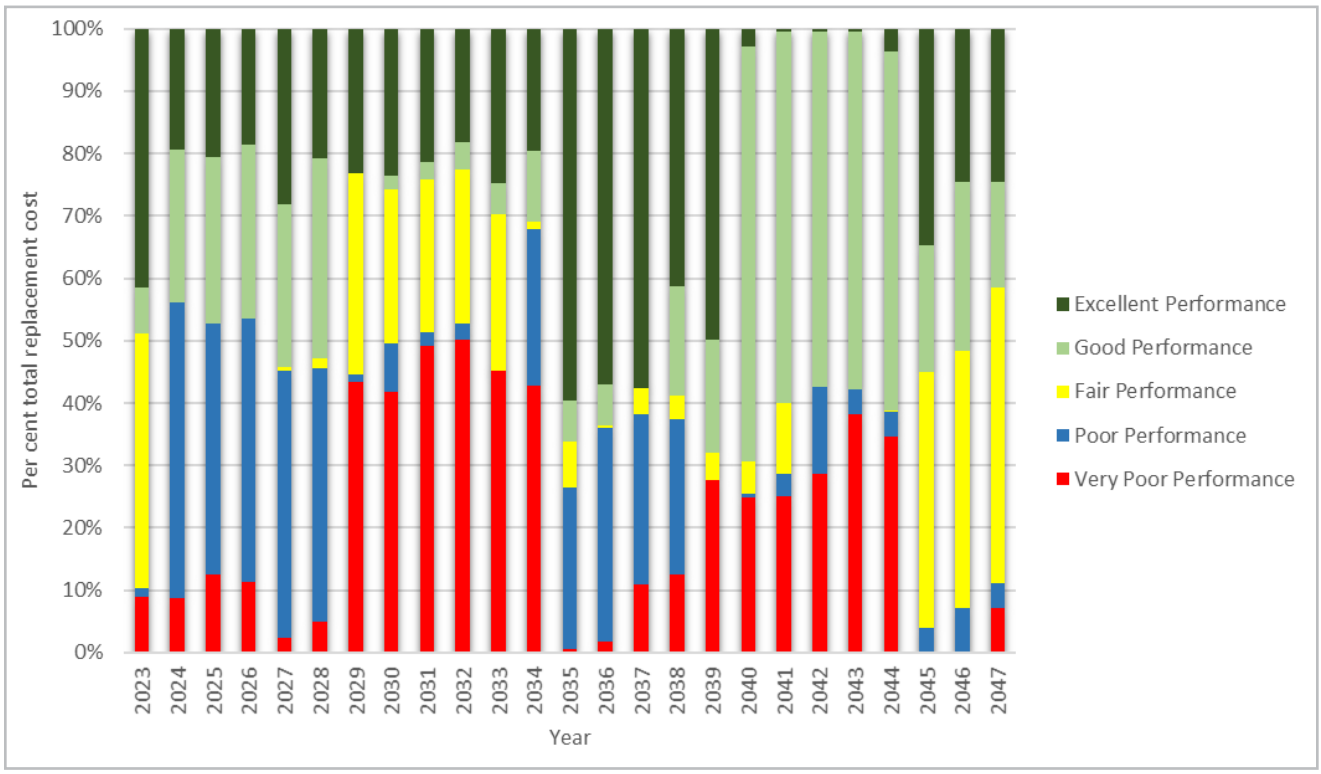


8.2.8.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $300,000 over the next 25 years is required to achieve the target performance profile for the Library asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance fluctuates throughout the first ten years, however, returns to the 2023 performance profile levels at the end of the 25 years as illustrated in **Figure 50**.

FIGURE 50: PROJECTED ANNUAL PERFORMANCE OF LIBRARY ASSETS IN THE TARGET SCENARIO

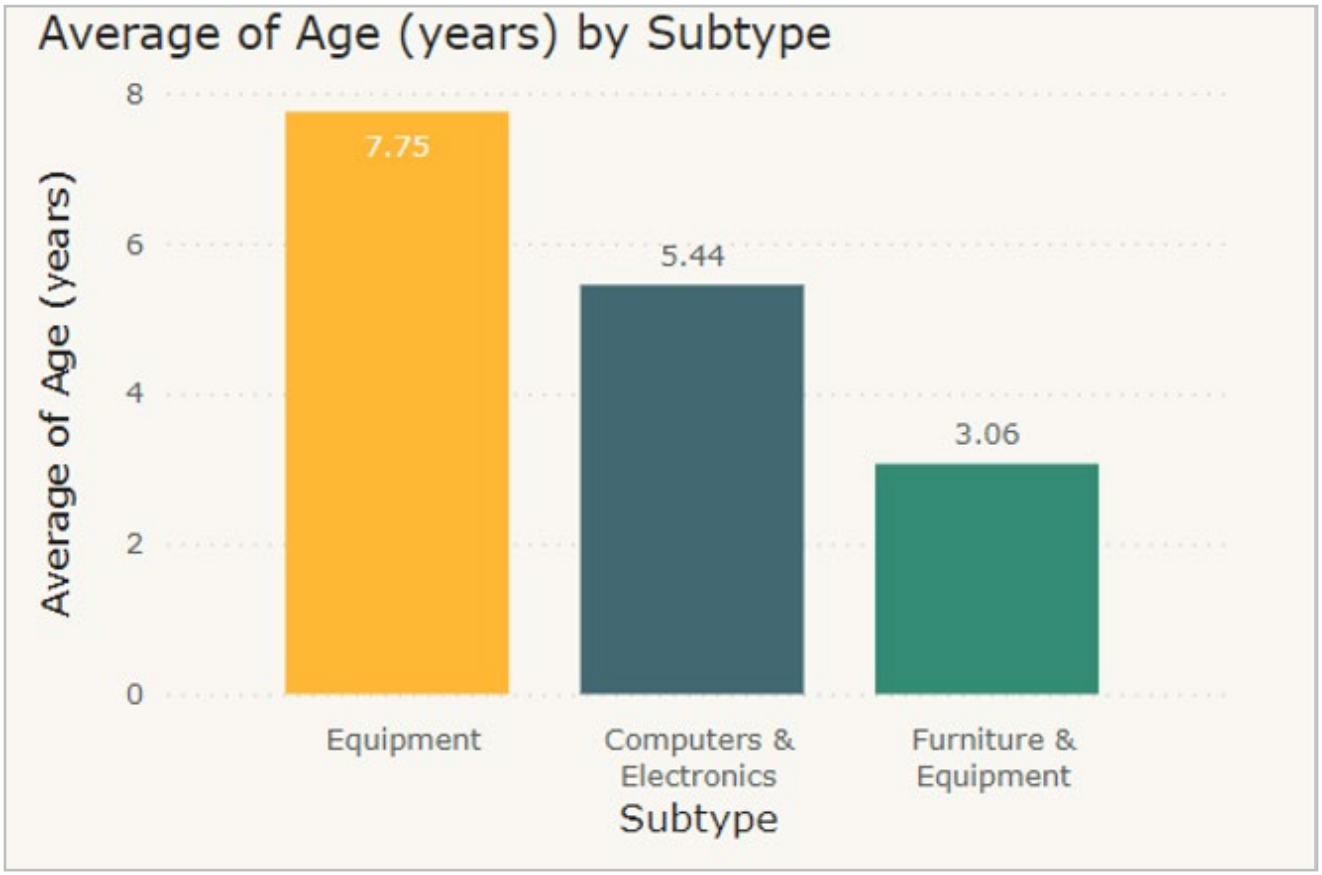


The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. Library assets are an engineered type of asset that start in excellent and as they age, they progress towards very poor. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets will be in each performance category and a portion being poor or very poor until they are rehabilitated or replaced.

8.2.8.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for the application of asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 51** for the City's Library assets.

FIGURE 51: AVERAGE AGE (YEARS) FOR LIBRARY ASSETS



The following tables show the levels of service established by the City for library assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, Library metrics have been developed in a collaborative effort between Library SMEs and Asset Management staff. Library metrics are identified below in **Table 47** and Table 48 and include metrics for the 2021 and 2022 calendar years.

TABLE 47: LIBRARY COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION
Scope	Library network and contents supporting the City of Waterloo residents.

TABLE 48: LIBRARY TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUANTITATIVE METRICS	2021	2022
Reliability	Collections assets in fair or better condition (per cent)	(not reported)	80%
Utilization	Waterloo population with a library card (number of active cardholders as a percentage of the population including students)	(not reported)	38%
	Total number of in-person visits	412,450	583,760
	Use of collection (number of items borrowed every minute)	2.5	3
	Public computer user sessions per year	11,110	27,216
	Public wireless connections per year	70,559	159,950

8.2.8.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to library assets.

8.2.8.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. As identified in section 5.6, AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for library assets.

8.2.8.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 49** below identifies the identified drivers for the Library asset class.

TABLE 49: LIBRARY DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Increased customer demand for electronic collections	We see annual increases in demand for electronic resources like e-books. E-book licenses are typically significantly more expensive than traditional books and there is high demand to have sufficient copies available to meet customer demands for popular titles. We anticipate we will have over 350,000 download ebook checkouts in 2023. We contribute to a consortia with other libraries to increase the availability of titles and reduce costs so it will be important to continue to a lot appropriate amounts to ebook material costs both for customer satisfaction and to keep pace with our partner systems.	Customer demand for electronic resources will continue to grow. Typically, we have been seeing about a 5% rate of increase year over year. In addition to e-books and e-audio books, there is increasing demand for electronic resources (databases, streaming service, subscription-based software). Increased demand for these kinds of electronic resources is also growing as people want to make use of the library's resources from wherever they are.	To maintain our current offerings, we will need to devote more funds or reduce our offerings. To meet future demand and opportunities we will need to increase funds for the collection.	Monitor and adapt as necessary by offering alternate resources, watch usage and decrease unpopular item types, work with consortias to increase purchasing power and access to different titles.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Evolving digital literacy needs / addressing the digital divide	Technology is evolving rapidly and becoming increasingly important for navigating all aspects of life. The library plays an important role in providing customers with access to the skills to use technology and the opportunities to access emergent and essential technology equitably. The library provides access to public computers, 3D printers, some maker technology and programs for learning to use these resources.	The digital divide (in terms of access and skills) will continue to increase while the need for technology skills will continue to grow. The library will play an increasingly important role in providing access to technology and the skills involved in using it. There will be increased demand for staff who can teach tech skills and use and fix technology.	In order to continue developing our offerings of publicly accessible technology we will need to increase the amount of funds we direct to this effort.	Look for efficiencies in other areas, participate in buying consortias, implement tech resources strategically with expertise living at different WPL locations.
Sustainability	In its new strategic plan, the library will have a key theme about future readiness that is connected to sustainability. This fits well within the importance the COW strategic plan has given to sustainability as well. The library provides a suite of programs that build environmental literacy skills for customers and its model of lending books and non-books is an important part of the sharing economy.	Increased environmental pressures (compounded by increasing costs for households and smaller living spaces) will make borrowing non-traditional items from the library more appealing. There will be increased demand for the library to lend collections like sports equipment, monitors, tools, technology etc.	Non-traditional collections have been very popular and as a model for future library service, play an important and useful role in reducing conspicuous consumption. Making way for these collections means evaluation of existing lending resources and either investing more towards non-traditional lending or reducing collection spending in other areas.	Monitor and reduce less active collections, engage with the community to shape non-traditional lending resources, provide opportunities for sponsored special collections.

8.2.8.8 Risk

The risk associated with not undertaking the treatment options available for library assets is a reduced lifespan resulting in the need to replace assets earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the Library assets is managed through SME knowledge and expertise.

Library assets are new to the City's asset management program and SME professional management is key to supporting Library asset management. Library assets support the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to Library staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.3. Information related to library asset management is included within the Waterloo DSS, providing Library staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the Library assets' future performance.

8.2.8.9 Conclusion and Next Steps

Regarding the infrastructure funding gap, there is minimal difference between the budget scenario (current LOS) and the target scenario (proposed LOS) for library equipment and furniture assets over the next 25 years. To ensure management of Library assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

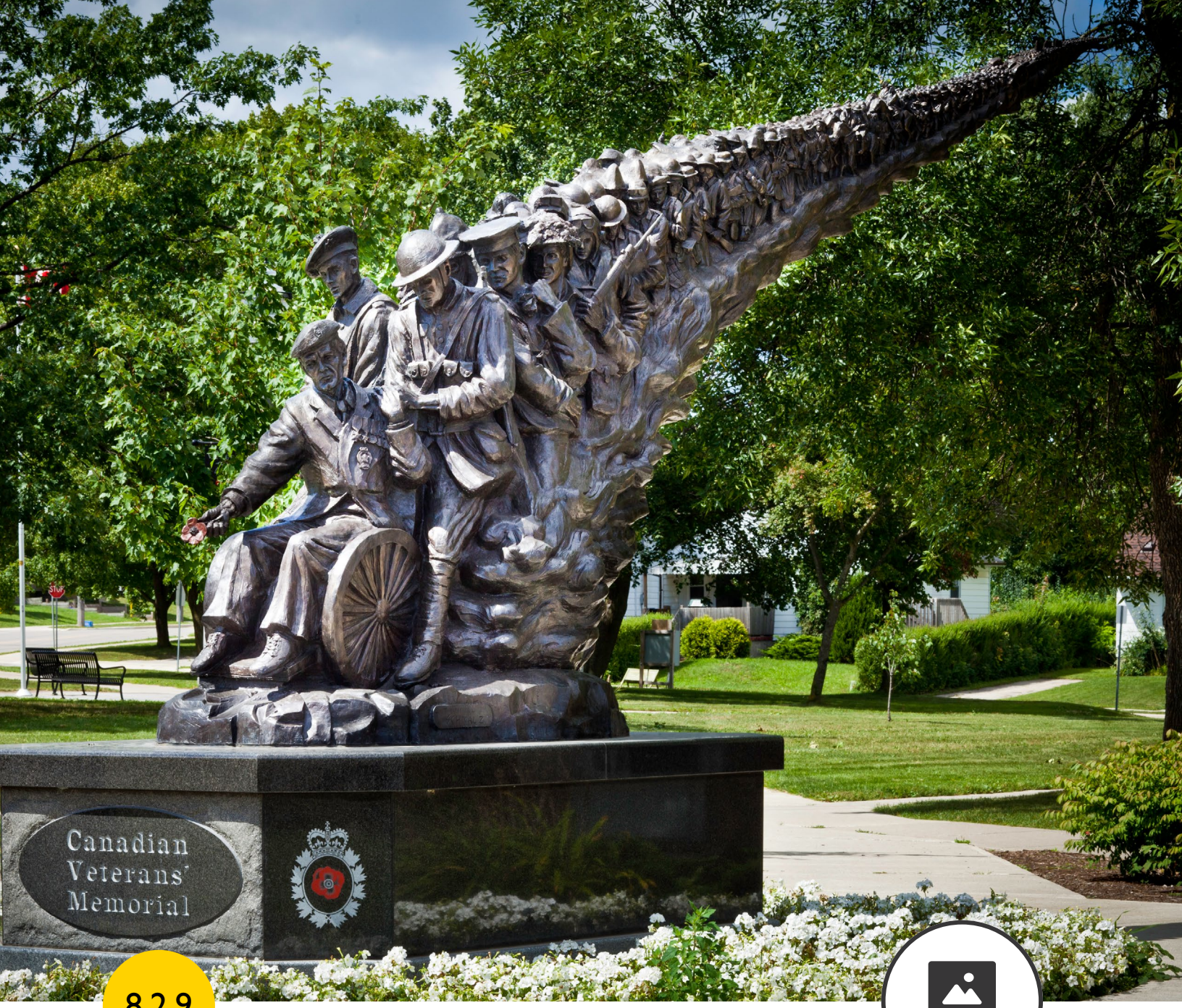
Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles

- Discuss the applicability of incorporating the modern equivalent approach
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress



8.2.9

Public Art

8.2.9.1 What do we own and what is it worth?

The City of Waterloo recognizes that public art is an asset that enhances the quality of life for citizens, strengthens community pride, improves the aesthetics of the public environment, and contributes to the City's cultural aspirations, social well-being, and economic vitality. Public art is a mechanism to celebrate culture and heritage, reflect community diversity, express shared values, and define the unique local identity. Public art advances the City's strategic goal to build a well-designed and appealing City that supports the three pillars of sustainability (economic, environmental, social) and engages the community.

The City's Public Art asset class is composed of 23 pieces with an original purchase price of $2.3 million. Public Art is a unique asset class as it is not a typical engineered asset such as a road or facility and their value generally appreciates over time so purchase value cannot be used as its replacement value. Appraisement by art professionals is necessary to estimate the replacement value.

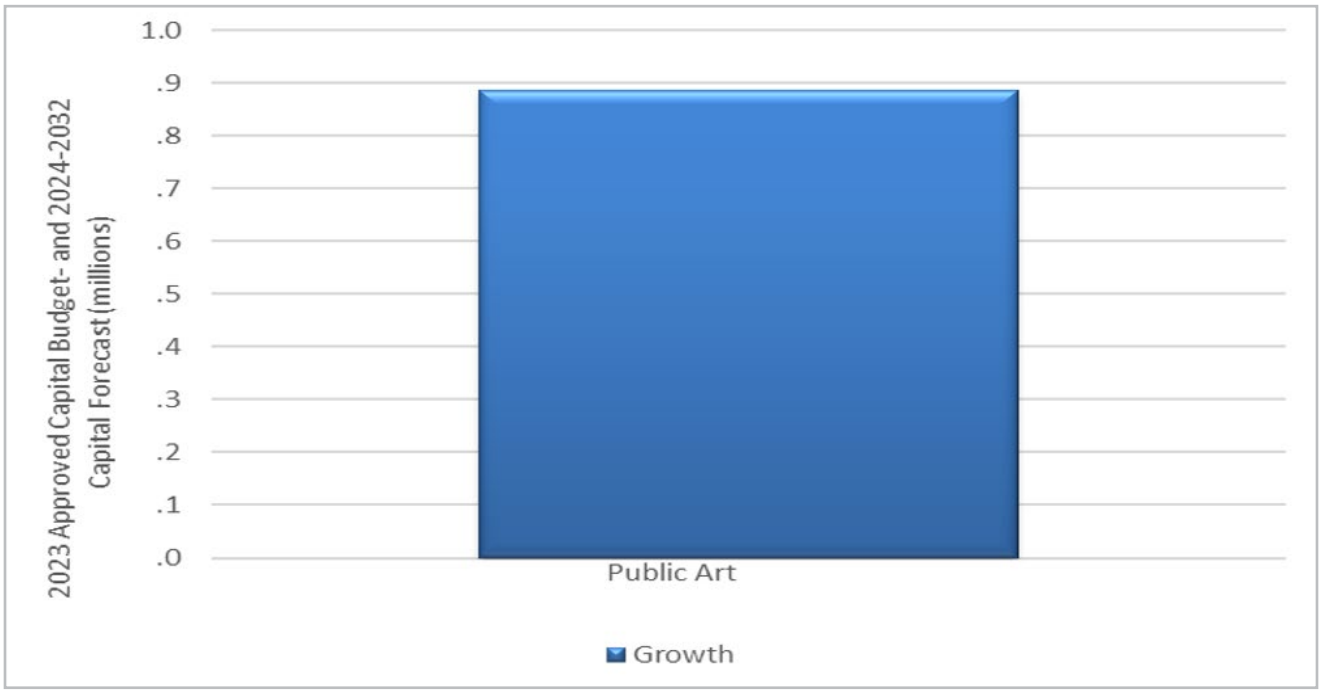
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value.

8.2.9.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in Section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $900,000 over the next ten years to expand the City's public art collection. The estimated distribution of the funding is shown in **Figure 52**.

FIGURE 52: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR PUBLIC ART



It is estimated that public art assets will not be replaced if the necessary maintenance activities occur. Over 75% of the collection will last more than 100 years if properly maintained. As new assets are added due to growth, the need for maintenance funding increases.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the approved 2023 operating budget. The 2023 operating budget includes minimal dollars in funding considered to be directly related to treating public art assets.

8.2.9.3 Lifecycle Management Activities

Public art asset performance is expected to stay in good condition with regular maintenance applied. The primary risk is vandalism, which this report does not address. Public art is a non-depreciating asset. The City must maintain the copyright and moral rights of the artwork and the artist. A consistent maintenance program and funding is essential to keep up the quality and integrity of the artwork.

O. Reg 588/17 requires municipalities to document the future lifecycle activities needed to maintain the current service levels for the following ten years. However, because public art assets are not expected to deteriorate but appreciate, the future lifecycle activities are limited to ensuring the integrity of the art is kept and monitored for vandalism and environmental wear, which is typically fixed as it is part of the agreement with the artist. Section 5.3 provides an overview of the context and asset management regarding lifecycle management activities. When projecting the performance of assets, condition is important and currently public art asset condition is age-based.

8.2.9.4 Levels of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service.

Approximately 2% of public art assets are currently considered poor or very poor performance. Over the 25-year timeline, with the current level of funding, we anticipate the percentage of our public art assets with poor or very poor performance profiles to stay the same. Based on the best available public art asset data and observed conditions, increased funding is needed for continual monitoring of vandalism and other environmental damage, as reflected in the annual funding gap of $10,000. It is recommended that the City include these additional operational funding needs within the 2027 budget and 2028-2030 budget processes for Council's consideration to maintain the current level of service.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.2.9.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Public Art is a unique asset class for which modelling parameters are difficult to ascertain and a budget scenario has not been developed.

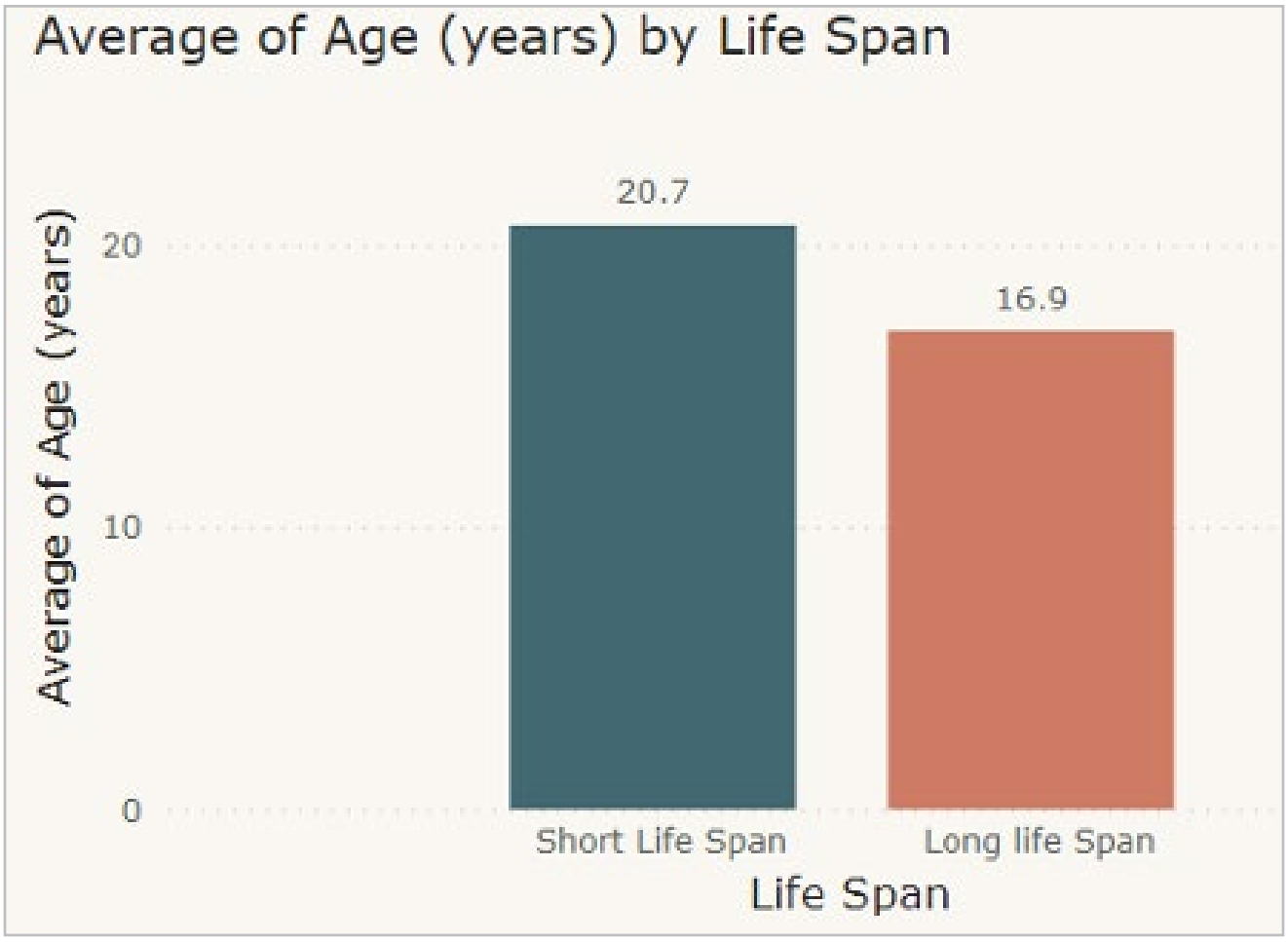
8.2.9.4.2 Target Performance and Required Expenditures

Public Art is a unique asset class for which modelling parameters are difficult to ascertain and a target scenario has not been developed.

8.2.9.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 53** for the City's public art assets.

FIGURE 53: AVERAGE AGE (YEARS) FOR PUBLIC ART ASSETS



A short life span is public art with a life span of 25 years, while a long-life span is public art with an expected life span of 100 years or more.

The following tables show the levels of service established by the City for public art assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, public art metrics have been developed in a collaborative effort between public art SMEs and Asset Management staff. Public art metrics are identified below in **Table 50** and **Table 51** and include metrics for the 2021 and 2022 calendar years.

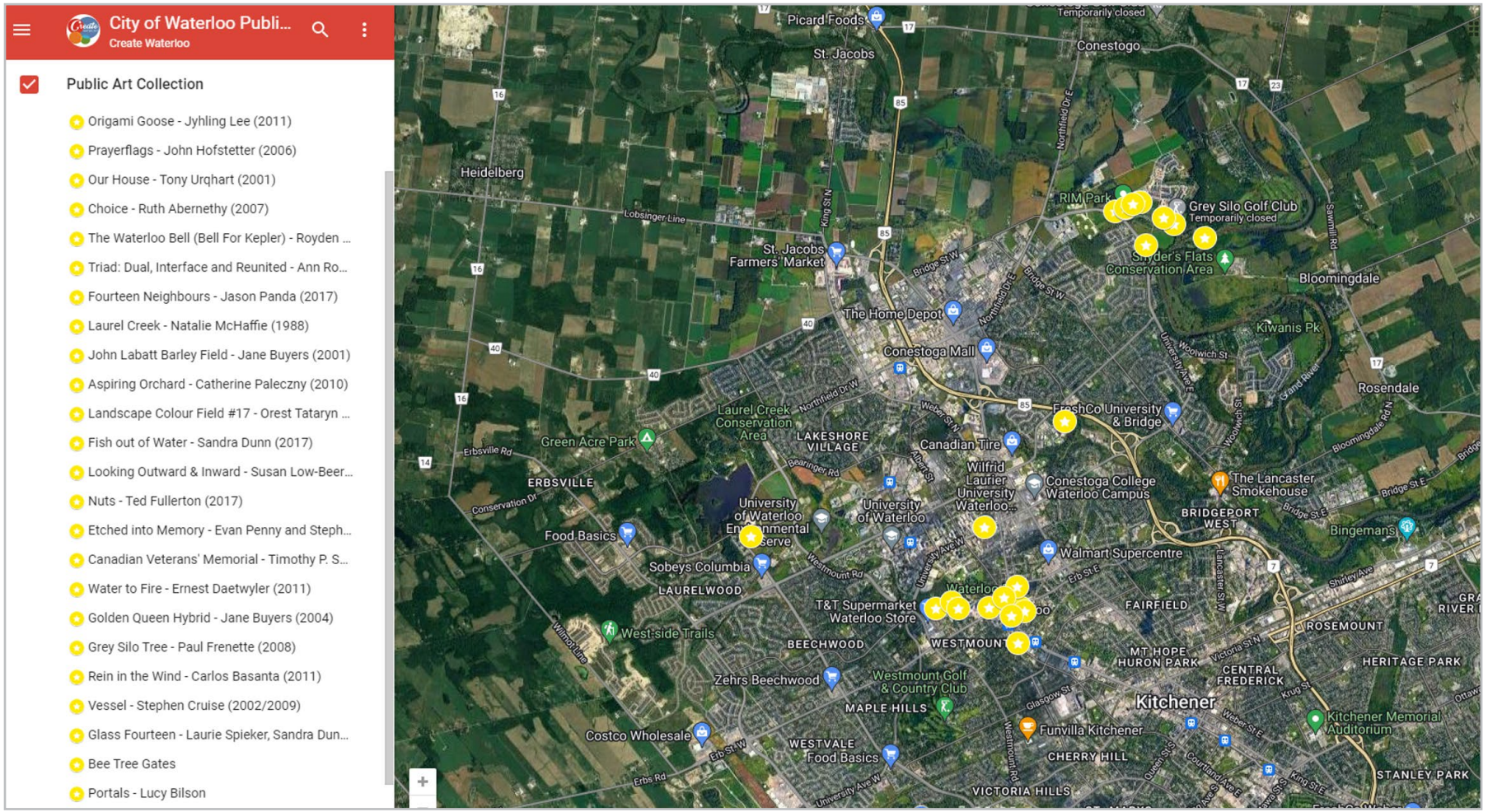
TABLE 50: PUBLIC ART COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	COMMUNITY LEVEL OF SERVICE MEASURE	COMMUNITY LOS PERFORMANCE
Scope	Description, which may include maps, of permanent public art installed on City Property.	Map included in Figure 54

TABLE 51: PUBLIC ART TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Quality	Number of permanent art installations	22	23
	Annual inspection of permanent art installed (per cent)	100%	100%
	Average condition of artwork installed	Good	Good

FIGURE 54: CITY OF WATERLOO PUBLIC ART COLLECTION



8.2.9.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to public art assets.

8.2.9.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation. Public art is a unique asset class, and it is not currently anticipated to impact the City's climate targets.

8.2.9.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes.

8.2.9.8 Risk

Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the Public Art assets class is managed through SME knowledge and expertise.

This approach ensures that Public Art supports the community's socioeconomic growth over the short and long term. In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during their decision-making processes, the core of which are included in section 5.3.

8.2.9.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for public art assets over the next 25 years is an annual average of $10,000. To ensure management of Public Art assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

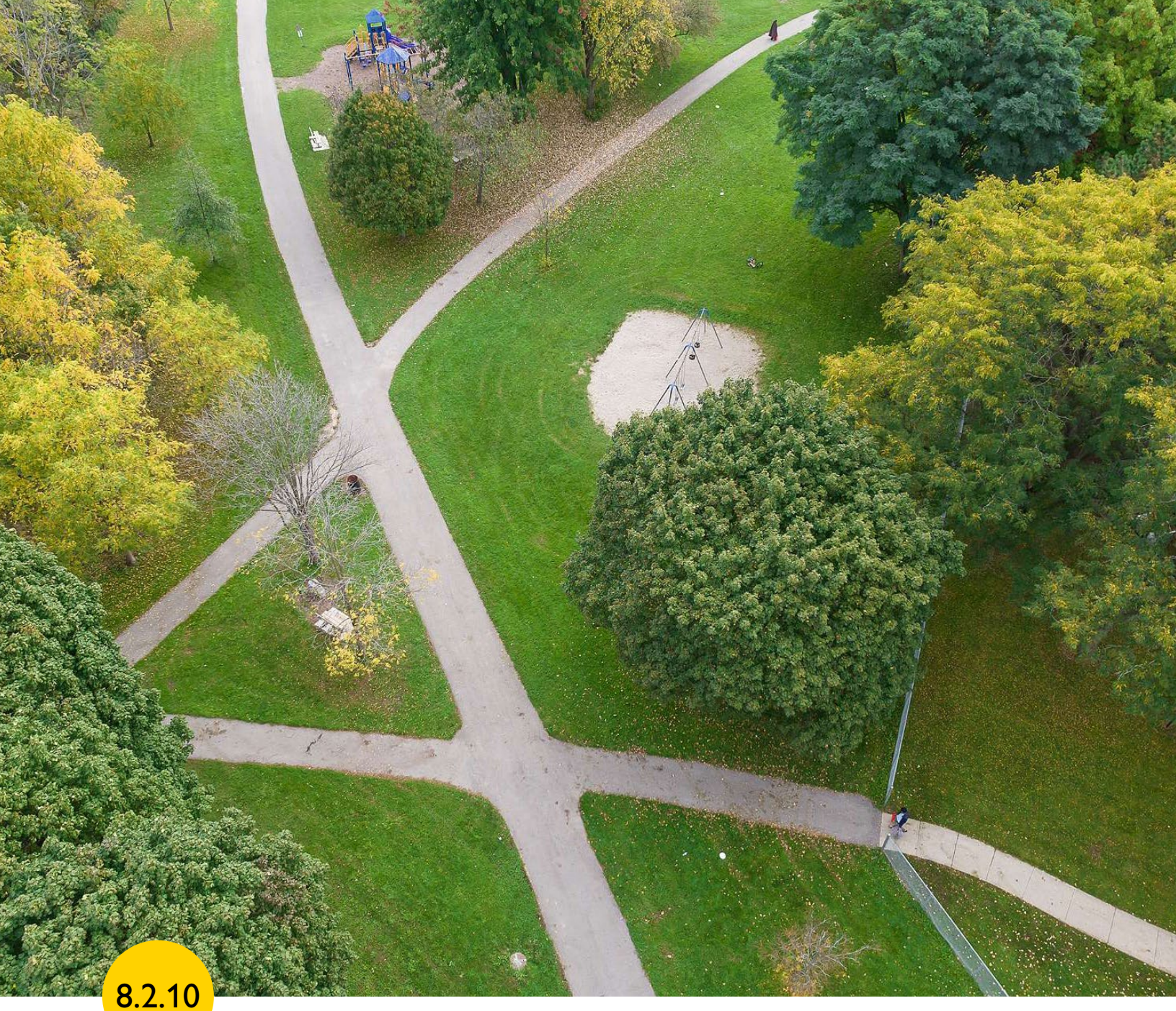
- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time concerning sharing information required for the Waterloo DSS
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Reviewing Level of Service metrics to better understand the implications and incorporate more metrics as appropriate.
- Recommending the inclusion of an operating funding increase of $10,000 as part of the 2027 budget process for Council's consideration

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress



8.2.10

Land

The land asset class is comprised of hundreds of parcels owned by the City. It is a unique asset class, and its value and condition cannot be measured or quantified in the same fashion as other assets. Land has an unlimited life and does not deteriorate in the same way as an engineered asset. Its value generally appreciates over time so purchase value cannot be used as its replacement value. A third-party appraisal by land professionals would be necessary to estimate the replacement value and would represent a moment in time. The value could change based on circumstances at the time of determination and increase or decrease based on other factors such as market conditions and the intended land use. It is important to note that buildings and infrastructure located within City owned lands are captured under their respective asset class (e.g. facilities, parks).

Unlike other assets, City-owned land is not assessed in asset terms of Excellent, Good, Fair, Poor or Very Poor performance. Most of the City-owned land are utilized to provide services to the community such as parks, City hall or community centres and not considered available for sale for the purposes of this AMP. The general exception is industrial land, which the City is preparing for market to encourage economic development and growth. **Table 52** provides a summary of the land owned by the City of Waterloo.

TABLE 52: LAND ASSET INVENTORY

LAND TYPE*	INVENTORY (ACRES)
Parks	1,596
Storm/Wetlands	625
Natural Areas^	10
General Government	74
Land Held for Sale	165
Unassumed land	88
Total**	**2,558**

* Excludes road and land used for the municipal right-of-way

^ Represents natural areas that exist outside of parkland

** Note: Some numbers may not add due to rounding.

Typically, the responsibility resides with the primary service group using the land. For example, the Park, Forestry and Cemetery Services division is responsible for the land used for parks, natural areas, and public open spaces. A significant landholder within the City is the Park, Forestry and Cemetery Services division as our parks cover almost 1,600 acres of land with our largest park being Waterloo Park, the Jewel of the City. Waterloo Park is centrally located uptown and resides on almost 120 acres of land.

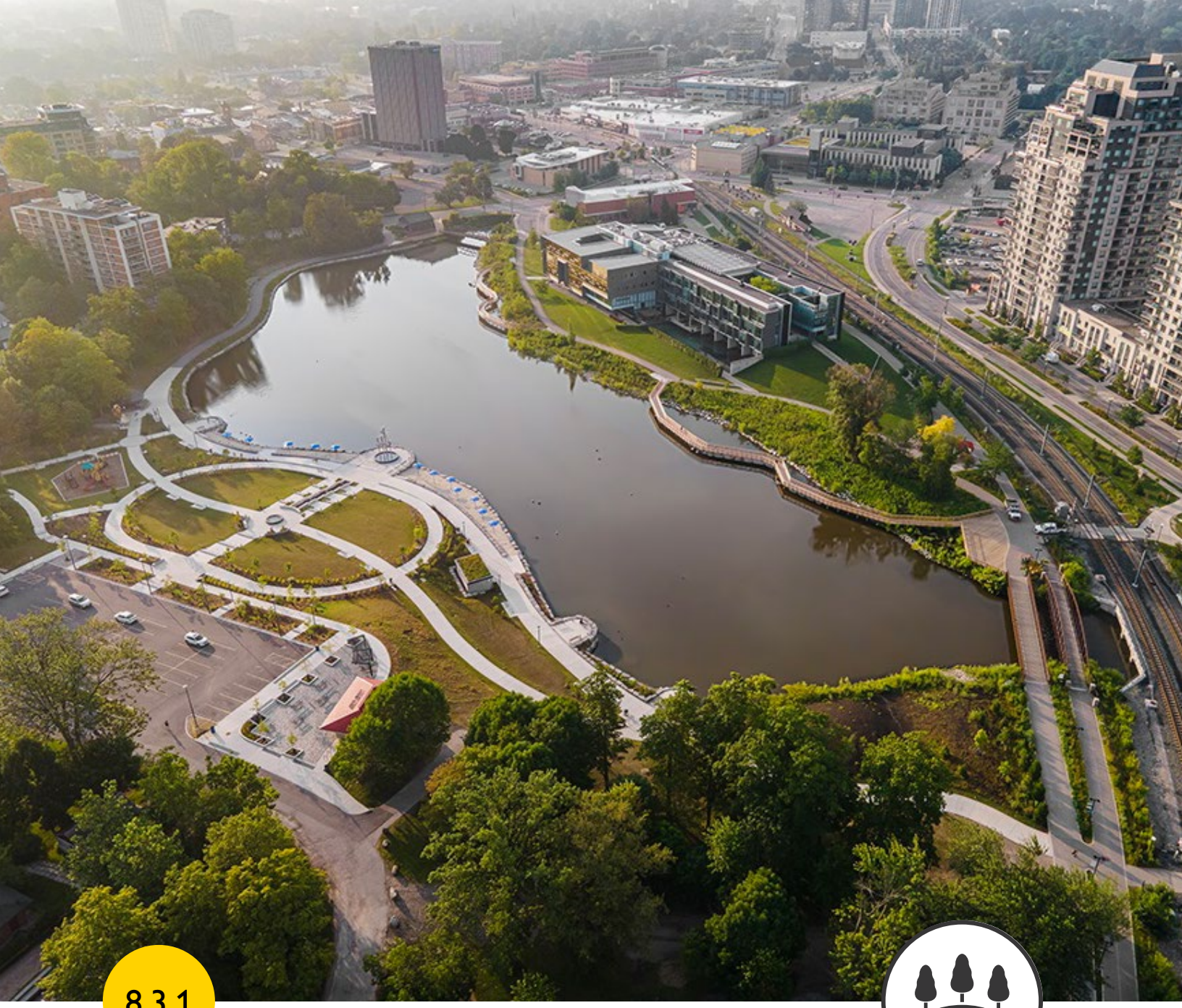
Natural areas include but are not limited to environmentally significant areas, open spaces, forested areas, and meadows. The General Government category covers all the remaining 'facilities' types of assets which include but are not limited to City Hall, fire halls, community centres, libraries, and operations facilities. For **Table 52**, land used for roads and the road allowance have been excluded. The storm/wetlands category relates to land used for stormwater management facilities, which primarily consists of stormwater management ponds, wetlands, and impoundments (e.g. Silver Lake). Additionally, this category includes linear water features (e.g. creeks) with a buffer of 10m on each side to account for fluctuations in water levels.

Land risk is directly proportional to those asset classes that are attached to it and is therefore managed via risk management of those asset classes. Land asset management will continue to be conducted indirectly via those asset classes attached to it. For vacant and non-asset centric parcels typical realty market forces will apply.

Appendix C

ENTERPRISE ASSETS

8.3.1 Stormwater
8.3.2 Water Distribution
8.3.3 Sanitary Collection
8.3.4 Fleet and Shop Equipment
8.3.5 Parking
8.3.6 Cemeteries



8.3.1

Stormwater

Photo credit: Wilson Costa/Design SQ

8.3.1.1 What do we own and what is it worth?

The 2023 replacement value of the City's stormwater management assets is estimated at $761 million. The City's stormwater assets are the pipes, catchbasins, ponds and creeks that collect, manage and infiltrate rainwater runoff from roads and properties. The stormwater pipe collection network has 361 km of pipes with associated catchbasins and manholes. The City's stormwater management facilities include 59 stormwater management ponds and two impoundments (Silver Lake and Clair Lake). In addition, the City is responsible for 70 km of natural creek channels.

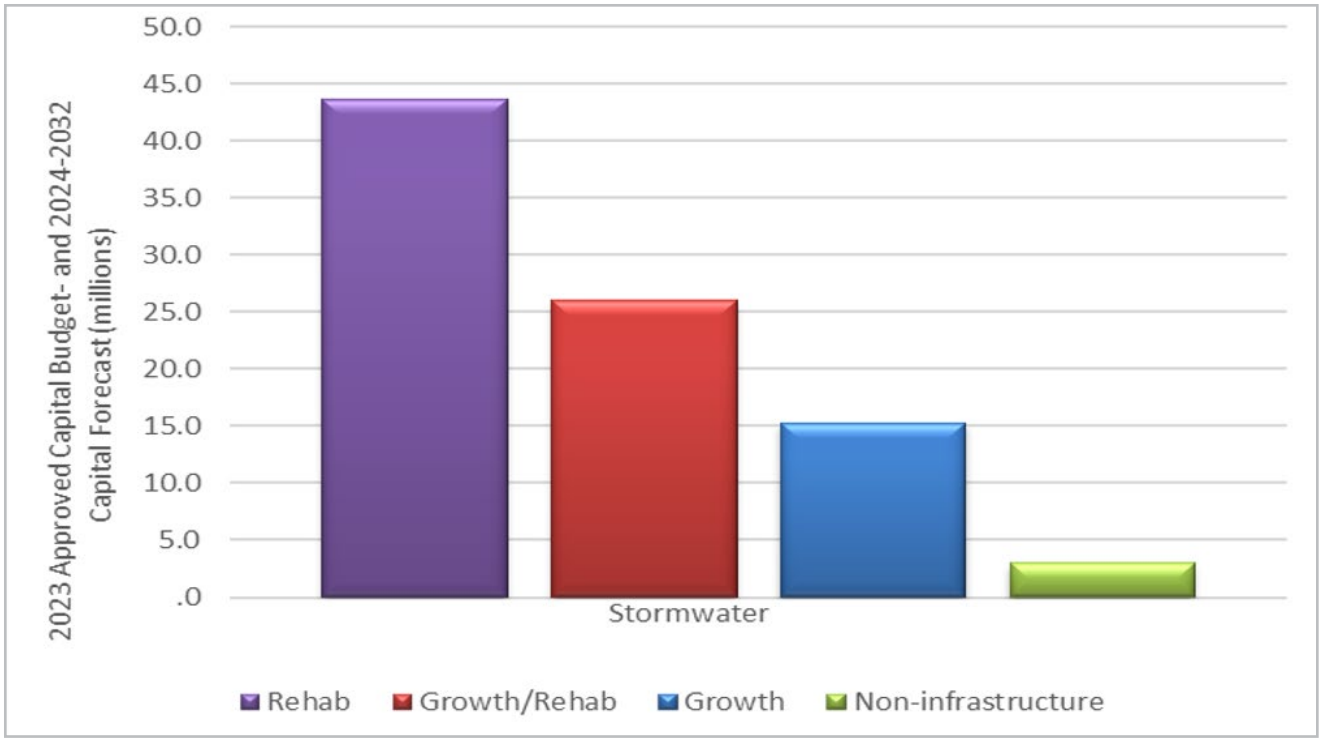
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.3.1.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $88 million over the next ten years in Stormwater assets with $44 million allocated towards rehabilitation activities as illustrated in **Figure 55**.

FIGURE 55: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR STORMWATER ASSETS



The growth component for the stormwater asset class is related to development-driven needs to rehabilitate creeks and to implement the Stormwater Master Plan, which was endorsed by Council on December 16, 2019, through IPPW2019-061. Stormwater and Engineering SMEs included rehabilitation funding for creek and stormwater management pond rehabilitation as well as creek bank stabilization work. On average the estimated service life of stormwater assets extends beyond 25 years. This results in almost 87% of the assets maintaining the service they provide to the community without the need to be rehabilitated or replaced ($887 million) for 25 years or longer. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced will increase) and will impact the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the approved 2023 operating budget. The 2023 operating budget included $731,000 in funding considered to be directly related to treating Stormwater assets such as pond condition assessments, catchbasin and manhole repair activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $4.3 million over the next 25 years on stormwater assets. Based on the best available stormwater asset data, deterioration rates and 2023-2032 capital funding, we estimate that stormwater assets have an annual infrastructure funding gap of $12.9 million as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation and replacement costs, continued deterioration, replacements, and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.3.1.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the stormwater asset class performance and corresponding expenditure over a 25-year timeframe. Once the forecast activities are within the one to three-year span, SMEs determine what underground pipes, stormwater management ponds, or creeks need to be rehabilitated or replaced. Stormwater and Engineering SMEs review of the asset needs and plan for rehabilitation or replacement to provide an optimized utilization of the assets.

Storm sewers can either be rehabilitated or replaced. In Waterloo, we replace storm sewers that are in very poor condition when other work is being done on watermains or sanitary sewers during road reconstruction. Projects are prioritized using the City's cross-asset tool to determine the rehabilitation work that is required

for storm, sanitary and watermains within the municipal right-of-way. As work to rehabilitate roads is undertaken, linear storm needs are addressed as necessary. Stormwater management ponds are dredged on a routine basis to remove sediment that has accumulated, restoring the full capability to treat and control the quality and quantity of stormwater runoff. We also maintain our natural stormwater assets (creeks) in the urban environment to support adequate flow through the system, control erosion, and reduce risk to critical infrastructure. When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

Stormwater assets are comprised of the underground pipe network, stormwater management ponds, natural assets (creeks) and impoundments (Silver Lake and Clair Lake) and they have varying estimated service lives. Examples of the replacement or rehabilitation activities for stormwater assets are identified in **Table 53**. The City's current performance for park assets is outlined in section 8.3.1.4.1 and the target performance is outlined in section 8.3.1.4.2. When projecting the performance of assets, condition is important and currently stormwater asset condition is performance and age based. The priority of rehabilitation for stormwater management ponds was modelled in the Waterloo DSS according to parameters from the Stormwater Management Plan and will be updated as new information becomes available.

TABLE 53: STORMWATER MANAGEMENT TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Storm Sewers	Flushing Spot repair	Storm sewers are not typically rehabilitated, as there is currently limited in-situ condition information to help decide when this renewal strategy is appropriate.	Full replacement, generally in conjunction with road reconstruction projects.
Stormwater Management Ponds and Impoundments	Inlet/outlet cleanout as necessary	Ponds are rehabilitated (or dredged) with confirmed sedimentation build-up.	Stormwater management ponds are not replaced in the manner typically thought of for engineering assets. Dredging ponds is considered to bring them back to design standards and be fully restored.
Natural Channels	Localized debris removals	Creek bank stabilization	Creek remediation

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.3.1.4 Level of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Stormwater asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for stormwater assets is assessed to be medium. The City is continuously working to improve asset data quality as outlined in section 3.1.

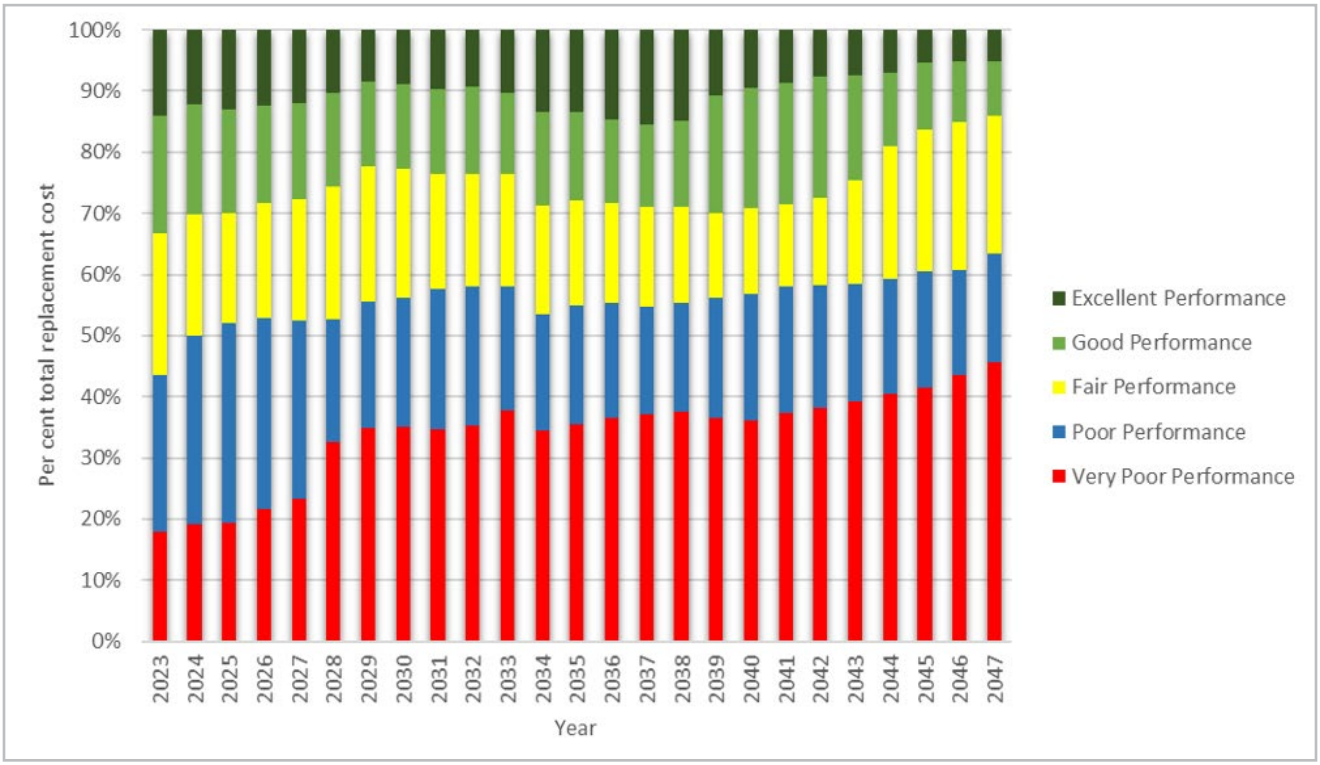
Section 8.3.1.3 identifies the lifecycle management activities required to provide the levels of services offered by stormwater assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $731,000 considered to be directly related to treating stormwater assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $4.3 million annually and increase capital funding to close the $12.9 million average funding gap as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $17.9 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.3.1.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

About 44% of the stormwater assets are currently considered in poor or very poor performance, as illustrated in **Figure 56**. This includes linear assets (stormwater collection pipes), ponds, impoundments, and natural assets. Over the 25-year timeline, with the current level of funding, we anticipate the percentage of our stormwater assets with a poor or very poor performance profile to increase to just over 60%. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that stormwater assets have an annual infrastructure funding gap of $12.9 million. The infrastructure funding gap is attributed to the stormwater pipe network with the remaining sub-asset classes (e.g. impoundments) being sufficiently funded.

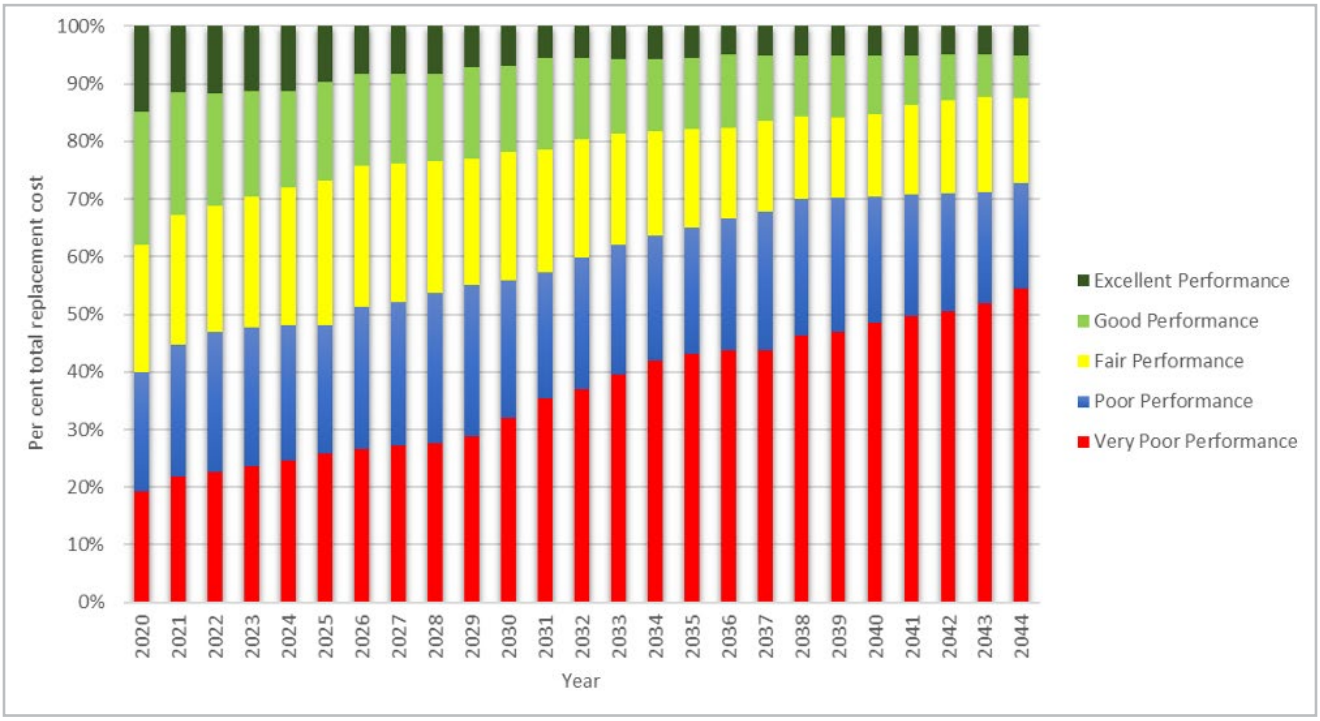
FIGURE 56: PROJECTED ANNUAL PERFORMANCE OF STORMWATER ASSETS IN THE BUDGET SCENARIO



Linear

There are currently about 40% of the stormwater pipe assets that are currently considered in poor or very poor performance, as illustrated in Figure 57. Over the 25-year timeline, the average annual level of funding of $2.6 million is anticipated to increase the percentage of our stormwater pipe assets with a poor or very poor performance profile to increase to just over 70%. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that stormwater pipe assets have an annual infrastructure funding gap of $12.9 million. Stormwater and Engineering SMEs are collaborating to create a pipe inspection program as part of the 2024-2026 budget process, which will be used to inform the projected performance of the pipe network as data becomes available.

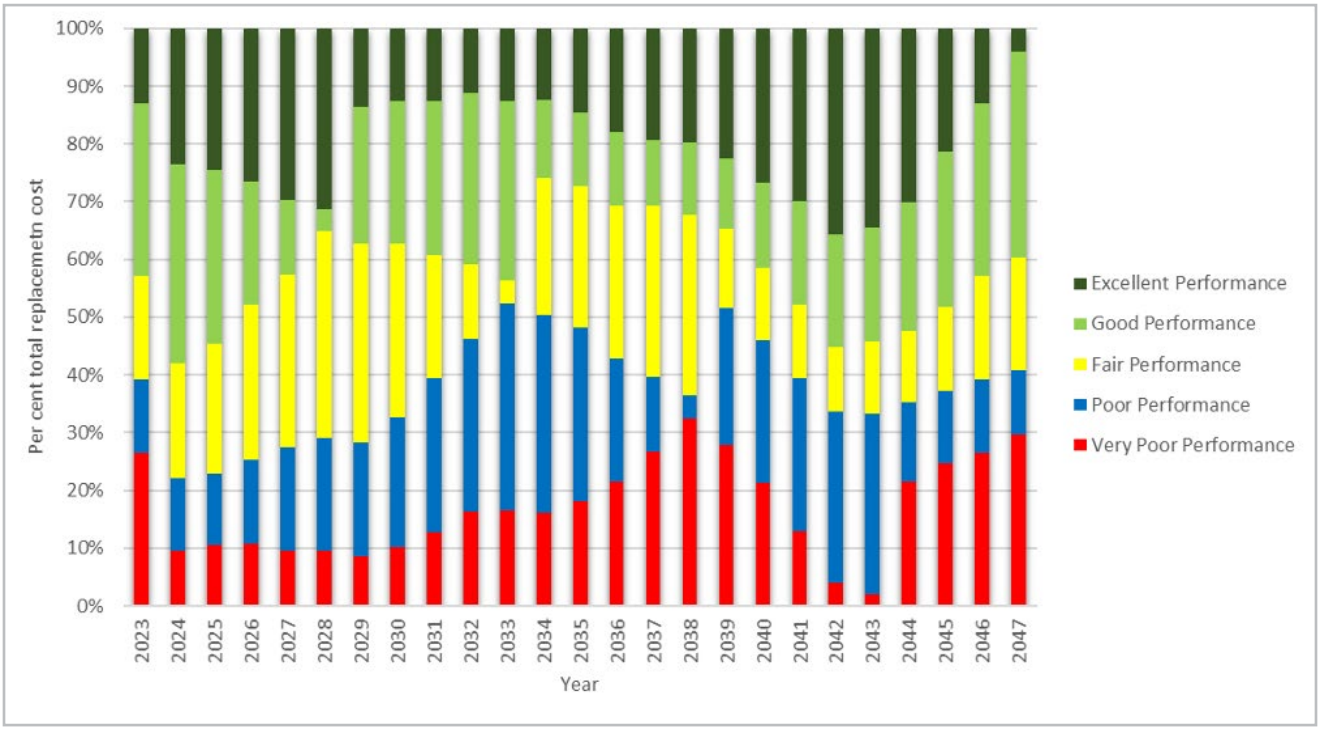
FIGURE 57: PROJECTED ANNUAL PERFORMANCE OF LINEAR STORMWATER ASSETS IN THE BUDGET SCENARIO



Stormwater Management Ponds

There are currently almost 40% of the stormwater pipe assets that are currently considered in poor or very poor performance, as illustrated in **Figure 58**. Over the 25-year timeline, with the average annual level of funding of $600,000 is anticipated to maintain the performance profile of stormwater management ponds over the 25-year timeframe. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that stormwater management ponds are sufficiently funded.

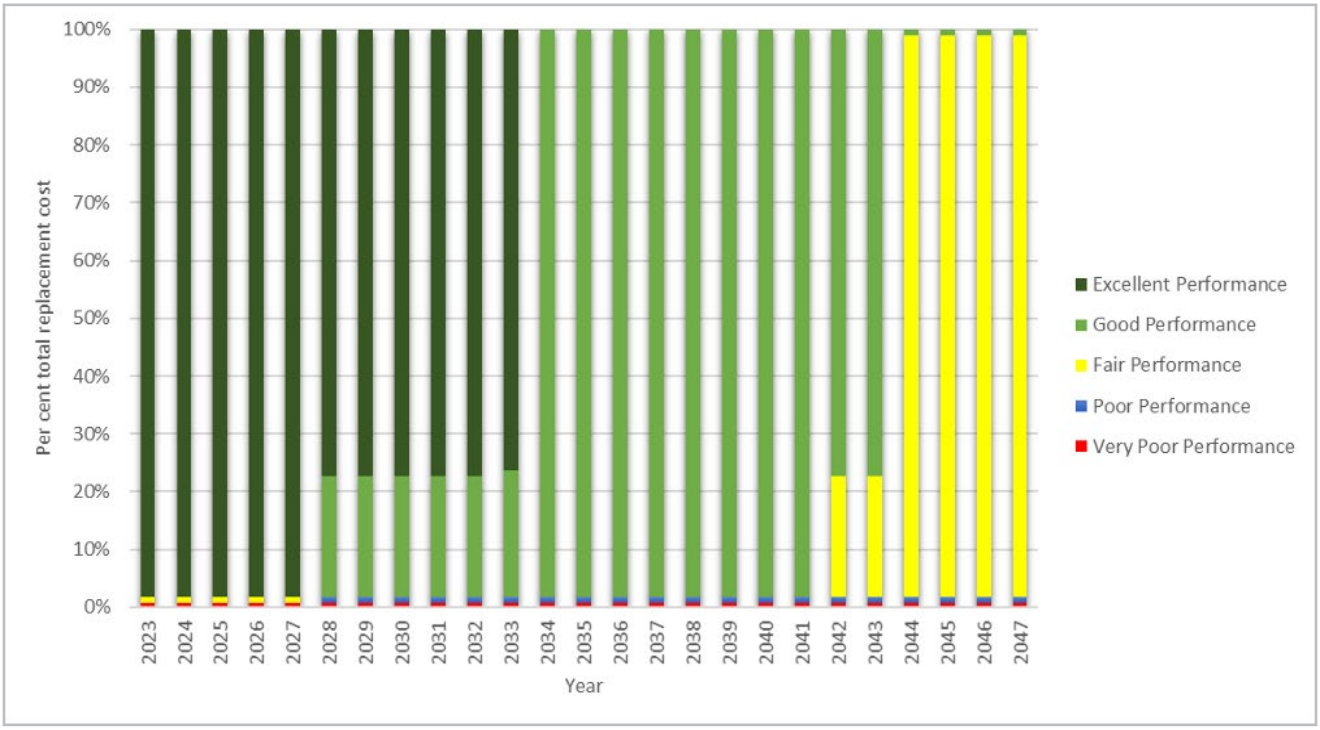
FIGURE 58: PROJECTED ANNUAL PERFORMANCE OF STORMWATER MANAGEMENT PONDS IN THE BUDGET SCENARIO



Impoundments

The impoundment asset class is primarily comprised of Silver Lake and Clair Lake. Both features represent manmade lakes used to treat and control surface water discharged to the Laurel Creek and Clair Creek respectively. Due to the rehabilitation efforts by the City in the last ten years, the impoundment sub-asset class has an excellent performance profile, as illustrated in **Figure 59**. Over the 25-year timeline, minimal funding is required although the performance profile is anticipated to decrease to fair over the 25-year timeframe. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that impoundments are adequately funded

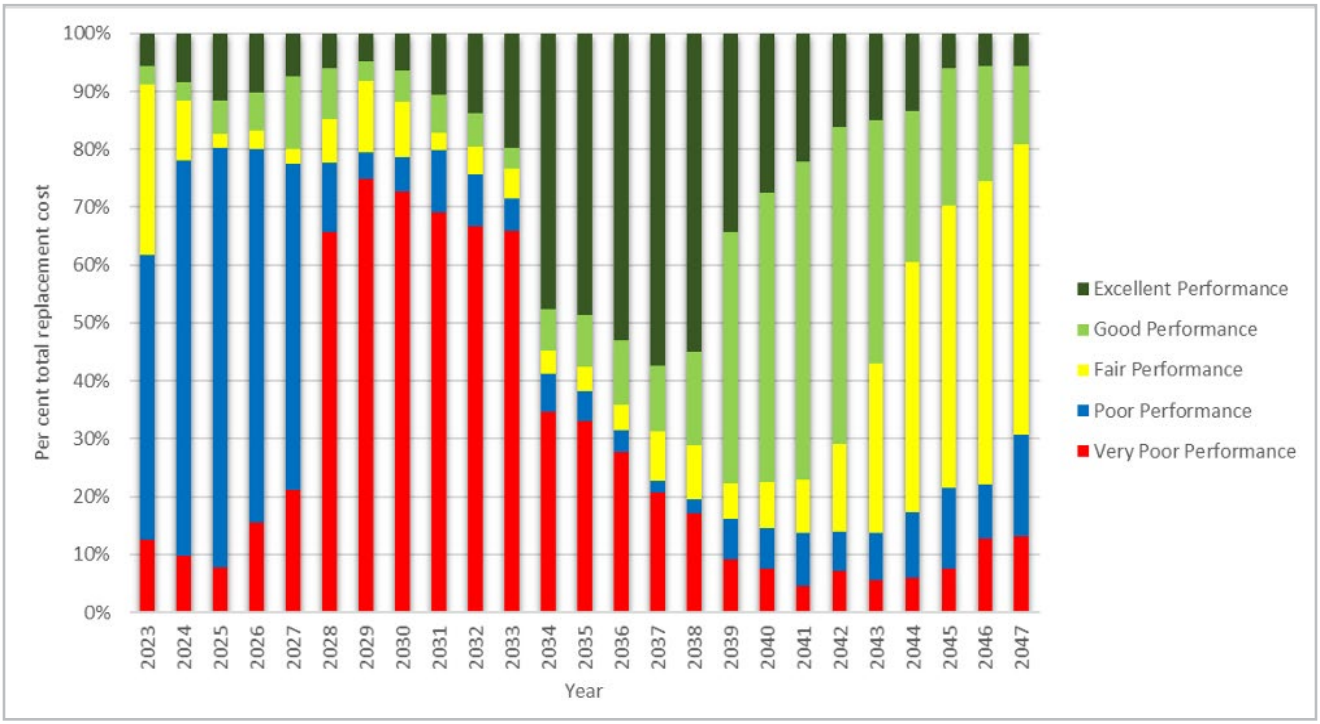
FIGURE 59: PROJECTED ANNUAL PERFORMANCE OF IMPOUNDMENTS IN THE BUDGET SCENARIO



Natural Assets

Natural assets are the 70km of creeks that are monitored and managed by the City of Waterloo. There are currently just over 60% of the natural assets that are currently considered in poor or very poor performance, as illustrated in **Figure 60**. Over the 25-year timeline, with the average annual level of funding of $1.1 million is anticipated to improve the performance profile of natural assets over the 25-year timeframe. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that natural assets are sufficiently funded.

FIGURE 60: PROJECTED ANNUAL PERFORMANCE OF NATURAL ASSETS IN THE BUDGET SCENARIO



Before restoration

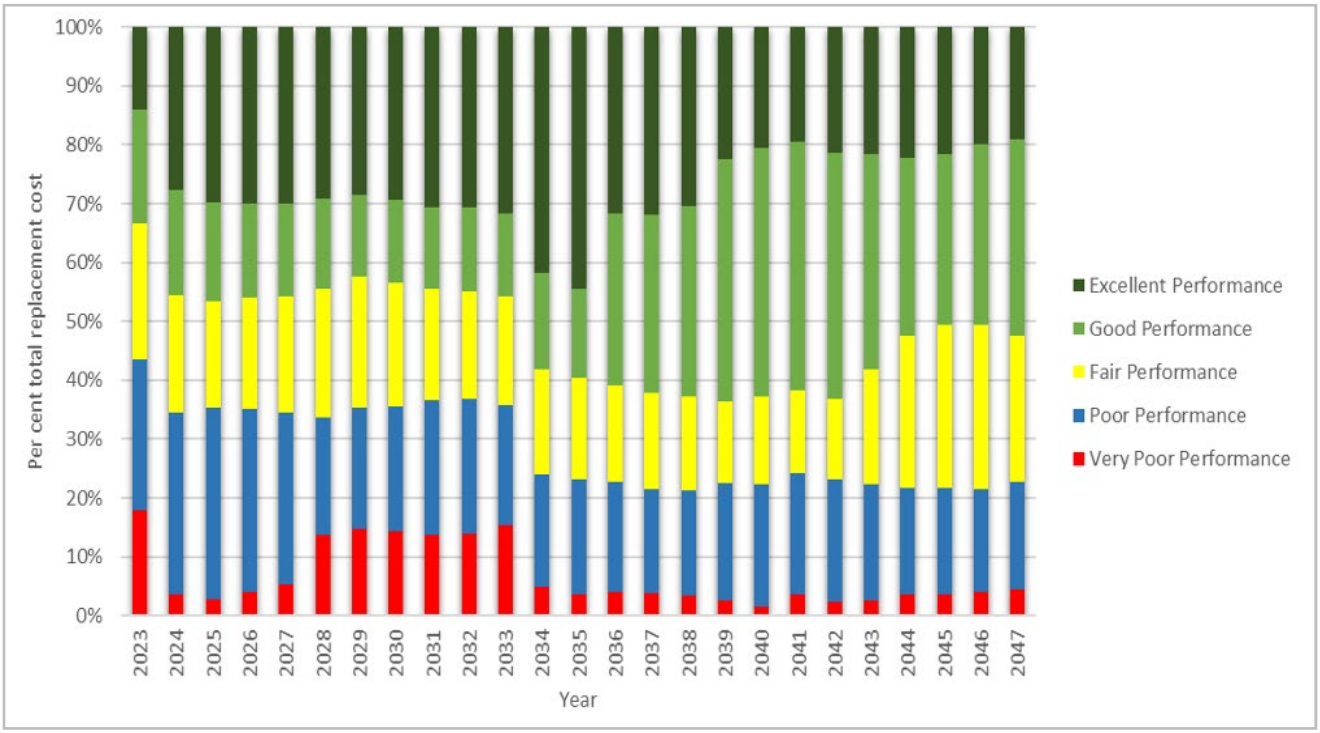
After restoration

8.3.1.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is used to generate a list of infrastructure expenditure needs to achieve the target levels of service for stormwater assets. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. For all stormwater assets, the analysis completed for this plan has determined that an average annual expenditure of approximately $17.2 million over the next 25 years is required to achieve the target performance profile for the stormwater asset class. In the target scenario, the portion of the asset class with fair, good, and excellent is maintained at about 60% to 70% over 25 years as illustrated in Figure 61.

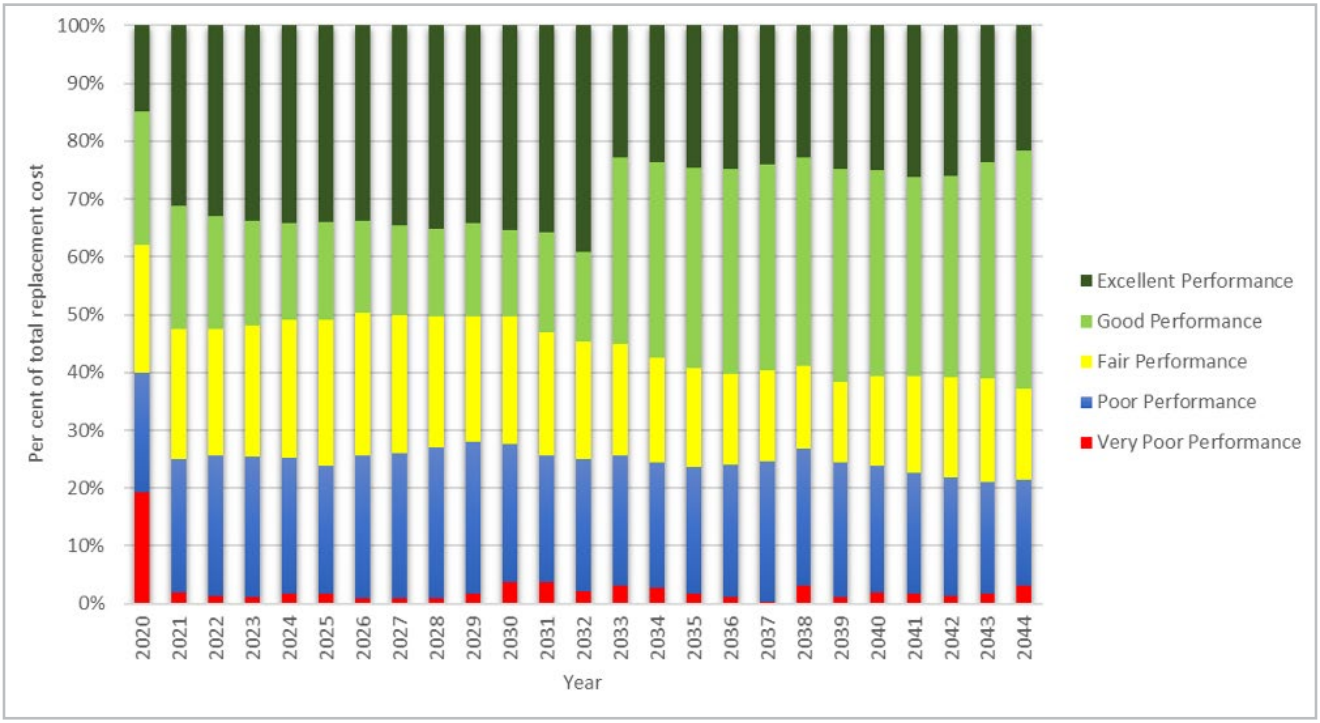
FIGURE 61: PROJECTED ANNUAL PERFORMANCE OF STORMWATER ASSETS IN THE TARGET SCENARIO



Linear

For the stormwater pipe network, the analysis completed for this plan has determined that an average annual expenditure of approximately $15.5 million over the next 25 years is required to achieve the target performance profile for the stormwater pipe network sub-asset class. In the target scenario, the portion of the asset class with fair, good, and excellent is maintained at almost 75% over 25 years as illustrated in Figure 62.

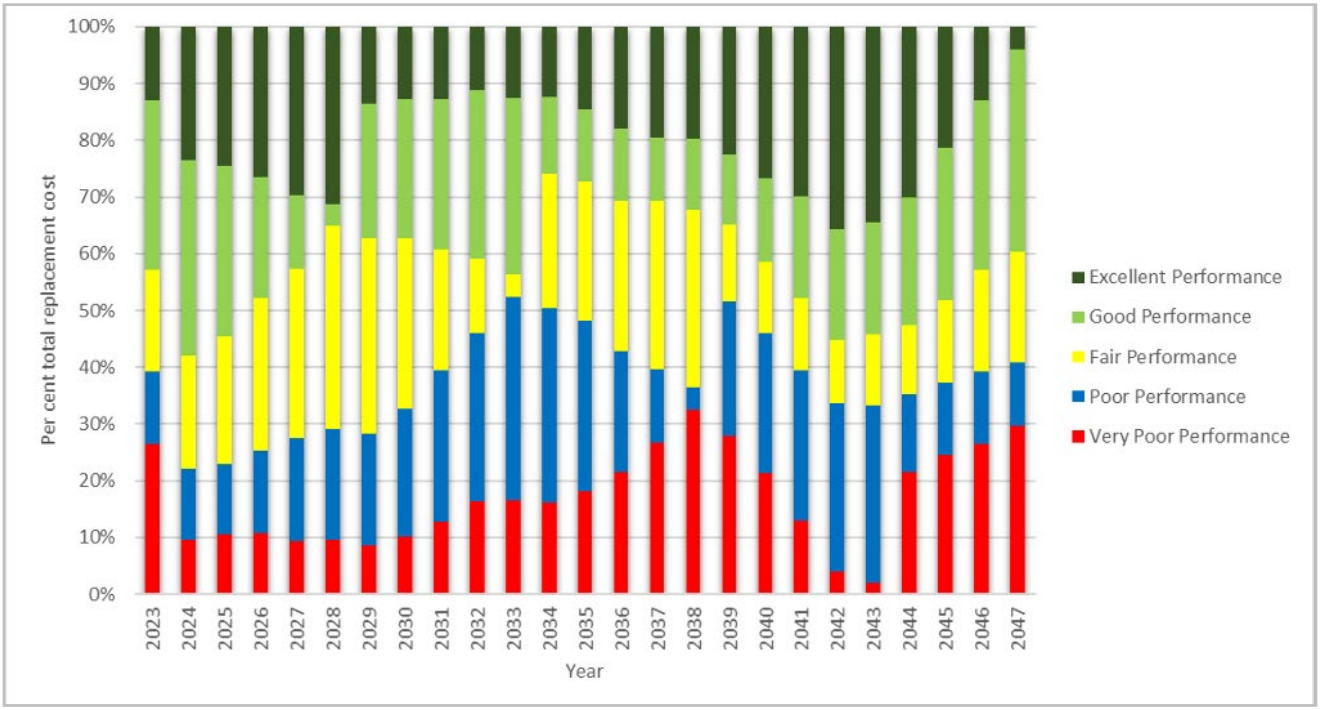
FIGURE 62: PROJECTED ANNUAL PERFORMANCE OF LINEAR STORMWATER ASSETS IN THE TARGET SCENARIO



Stormwater Management Ponds

The analysis completed for this plan has determined that stormwater management ponds are sufficiently funded at an average annual expenditure of $600,000 per year. As a result, the target scenario is similar to the budget scenario as illustrated in **Figure 63**.

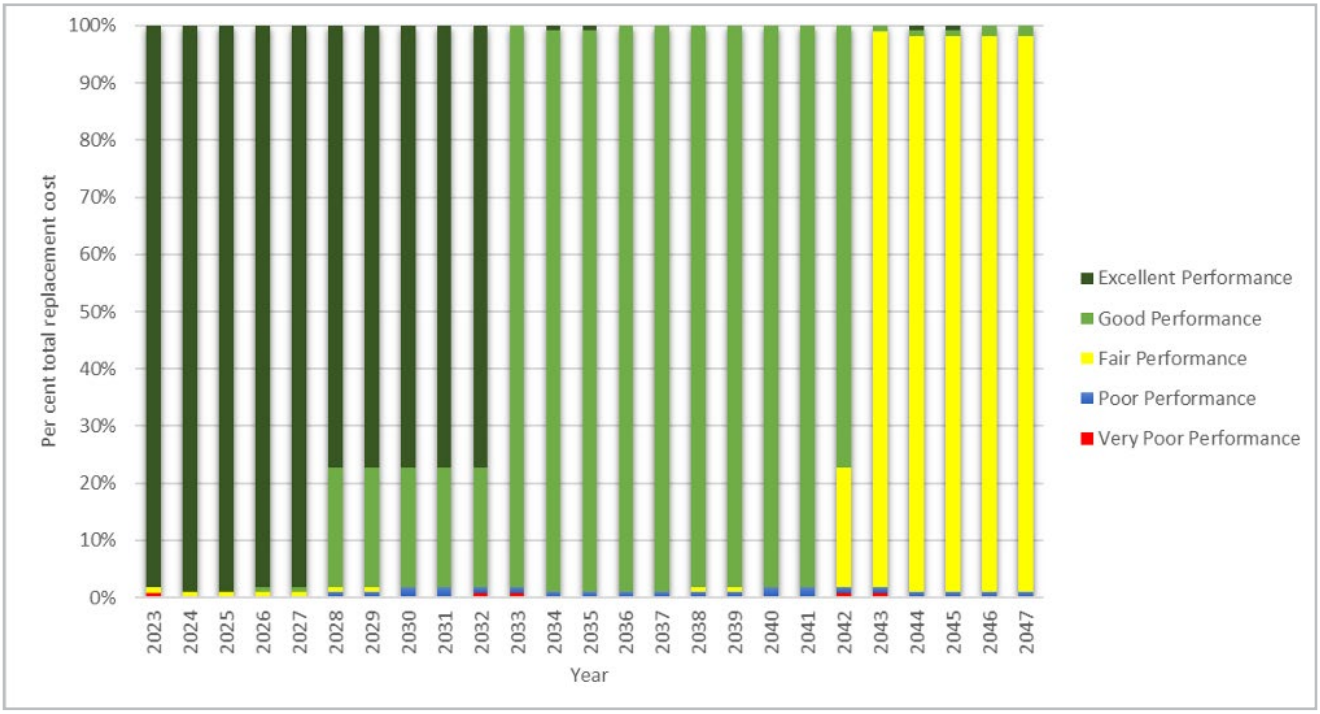
FIGURE 63: PROJECTED ANNUAL PERFORMANCE OF STORMWATER MANAGEMENT PONDS IN THE TARGET SCENARIO



Impoundments

The analysis completed for this plan has determined that impoundments require minimal funding over the next 25 years and as a result, the target scenario is similar to the budget scenario as illustrated in **Figure 64**.

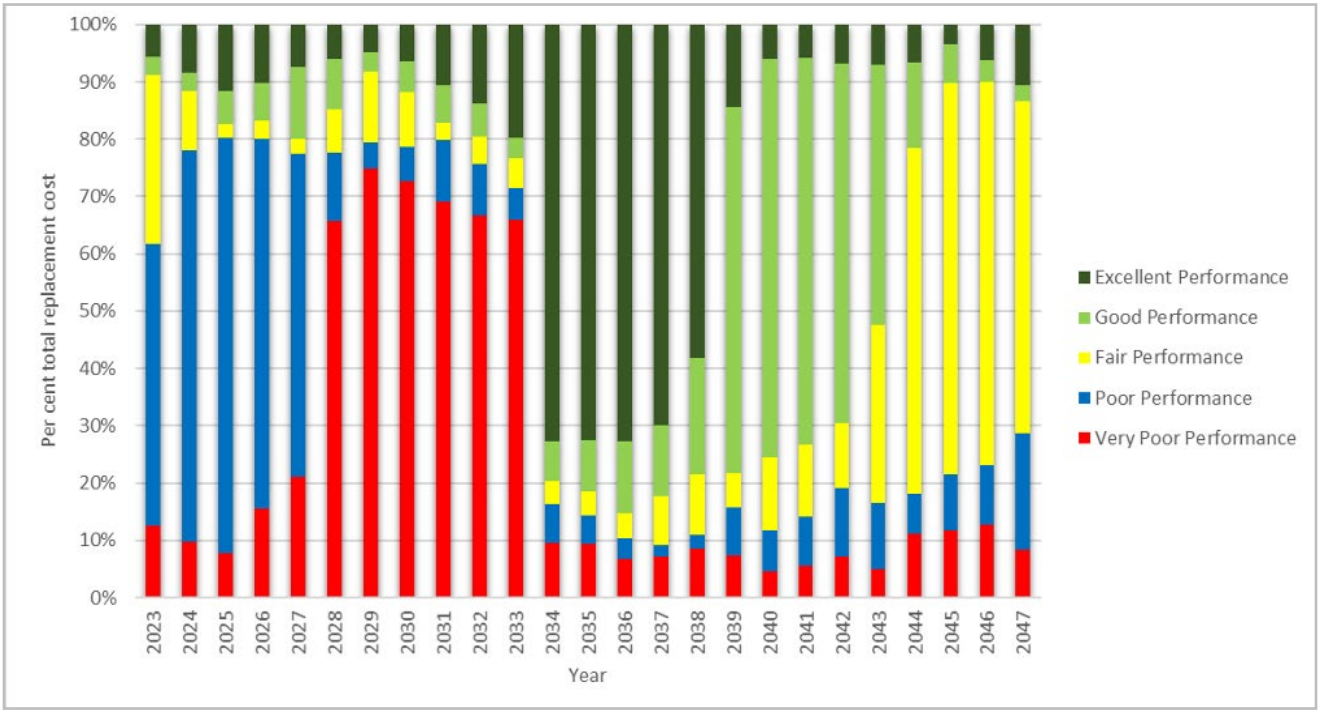
FIGURE 64: PROJECTED ANNUAL PERFORMANCE OF IMPOUNDMENTS IN THE TARGET SCENARIO



Natural Assets

The analysis completed for this plan has determined that natural assets (creeks) are sufficiently funded at an average annual expenditure of $600,000 per year. As a result, the target scenario is similar to the budget scenario as illustrated in **Figure 65**.

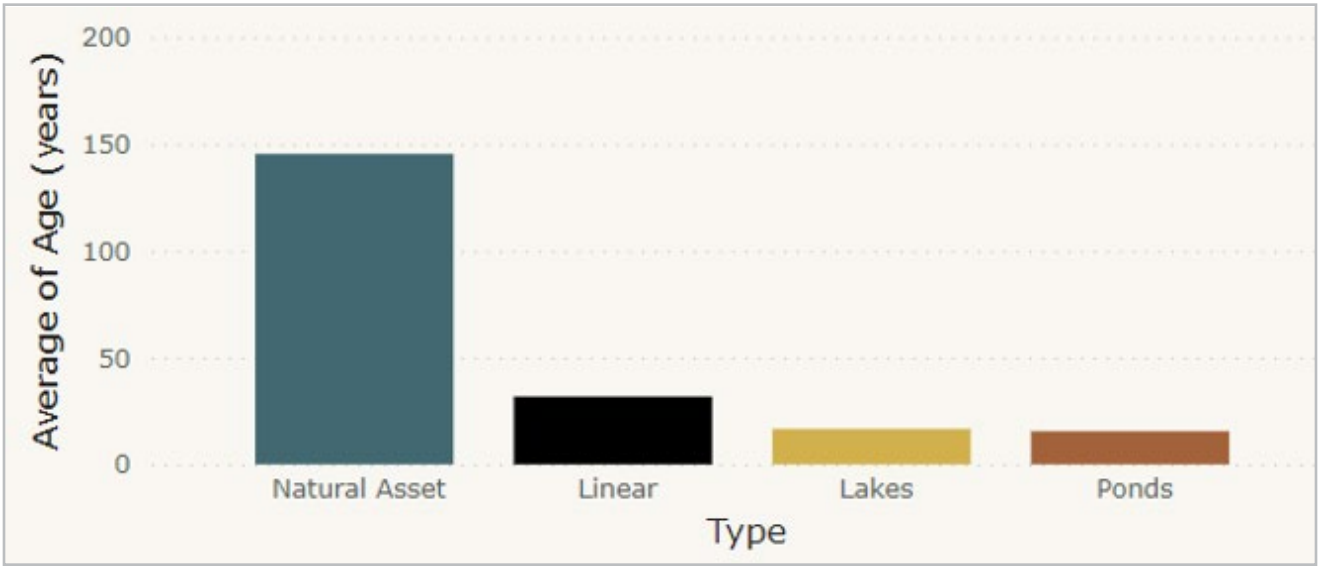
FIGURE 65: PROJECTED ANNUAL PERFORMANCE OF NATURAL ASSETS IN THE TARGET SCENARIO



8.3.1.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 66** for the City's Stormwater assets.

FIGURE 66: AVERAGE AGE (YEARS) FOR STORMWATER ASSETS*



* The average age for Lakes is based on the age from the last rehabilitation effort (e.g. Silver Lake rehabilitation)

The following tables show the levels of service established by the City for stormwater assets. These metrics include the technical and community level of service required as part of Ontario Regulation 588/17. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on. As a core asset, stormwater metrics are identified below in **Table 54** and **Table 55** and include metrics for the 2021 and 2022 calendar years.

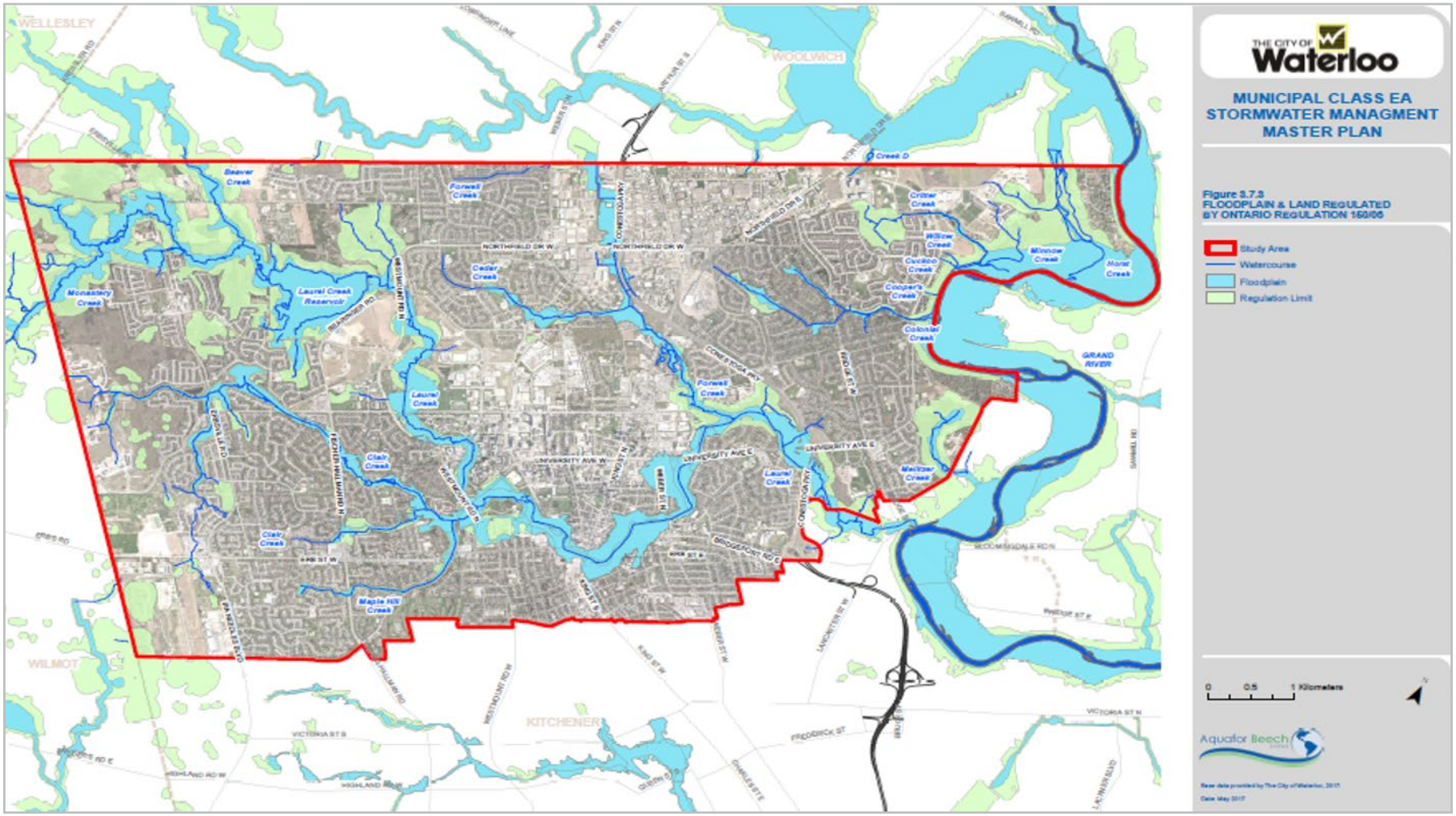
TABLE 54: STORMWATER COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION	2022
Scope	Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	A majority of the developed area within the City is protected from flooding, either through surface or subsurface infrastructure. Map included in Figure 67

TABLE 55: STORMWATER TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUANTITATIVE METRICS	2021	2022
Scope	Properties in the municipality resilient to a 100-year storm (percent)	81.5%	81.5%
	Properties in the municipality resilient to a 5year storm (percent)	92.3%	92.3%

FIGURE 67: CITY OF WATERLOO FLOODPLAIN MAPPING[5]



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8.3.1.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap. A few examples of the like-for-like concept include:

- Replacing natural gas boilers with natural gas boilers
- Replacing high-pressure sodium (HPS) decorative street light bulbs with HPS light bulbs
- Replacing concrete sidewalks with concrete sidewalks

In 2022, SME and AM staff adjusted our approach to use a "modern equivalent" (or "like-for-similar") approach. This changes the earlier examples to:

- Replacing natural gas boilers with electric boilers
- Replacing HPS decorative street light bulbs with Light Emitting Diode (LED) bulbs
- Replacing a concrete sidewalk with a multi-use path

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals. It is important to note that in some situations, a true "like-for-like" replacement is not possible so the modern equivalent approach is already in use when necessary. For example, when replacing a clay pipe, the current design standard is to replace it with a PVC pipe (the modern equivalent).

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to stormwater assets.

8.3.1.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for stormwater assets.

8.3.1.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 56** below identifies the drivers for Stormwater assets.

TABLE 56: STORMWATER DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Implementation of Low Impact Development (LID) Techniques.	Constraints of implementation due to additional capital and maintenance costs.	Feasibility of LIDs to be reviewed as part of capital planning.	LIDs require more maintenance than conventional SWM features.	Monitor and adapt.

8.3.1.8 Risk

The risk associated with not undertaking the treatment options available for Stormwater is a reduced lifespan resulting in the need to replace assets earlier than desired or the risk of flooding. Through a recent analysis completed by SMEs in Financial Planning, City Utilities and Engineering Services, a consultant was retained to provide expert guidance regarding potential project submissions to the Disaster Mitigation Adaptation Fund (DMAF). Through this work, the consultant's modelling did not reveal any significant risk of flooding within the City. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related for stormwater assets is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the stormwater level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.3. Information related to stormwater asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.3.1.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for stormwater over the next 25 years is an annual average of $12.9 million as shown in **Table 57**.

TABLE 57: SUMMARY OF STORMWATER ASSETS

ASSET GROUP	ANNUAL FUNDING TO MEET TARGET PERFORMANCE	AVERAGE ANNUAL FUNDING	2023 AVERAGE ANNUAL FUNDING GAP*
Linear	$15.5 million	$2.6 million	$12.9 million
Stormwater Management Ponds*	$0.6 million	$0.6 million	$0.0 million
Impoundments	$0.0 million	$0.0 million	$0.0 million
Natural Assets	$1.1 million	$1.1 million	$1.1 million
Total Stormwater Group	**$17.2 million**	**$7.0 million**	**$23.0 million**

Note: Values may not add exactly due to rounding.

To ensure management of stormwater assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles

- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Incorporate the condition results of the stormwater sewer CCTV inspection program
- For natural channel assets, investigate the extent of engineered or "grey" infrastructure in each defined reach and evaluate the potential for separate rehabilitation costs utilizing a high and a low complexity category.

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.3.2

Water Distribution

8.3.2.1 What do we own and what is it worth?

The City's water distribution assets are 2,601 fire hydrants and the 442 km of watermains that transport clean water to our homes and businesses. This involves managing a reliable water system capable of providing sufficient quality, flow, and pressure to satisfy drinking, recreational, irrigation, fire protection, and business needs. Treated drinking water is purchased from the Region of Waterloo and distributed to the community by the City of Waterloo. The Region of Waterloo manages all water treatment plants and sells the treated water to the lower-tier municipalities within the Region, like the City.

Water distribution is a highly regulated service, and the City of Waterloo must meet strict provincial regulations and drinking water quality standards. This requires an extensive network of infrastructure valued at approximately $635 million. It is important to note that the fleet and associated equipment (e.g. flusher truck) are captured under the fleet asset class.

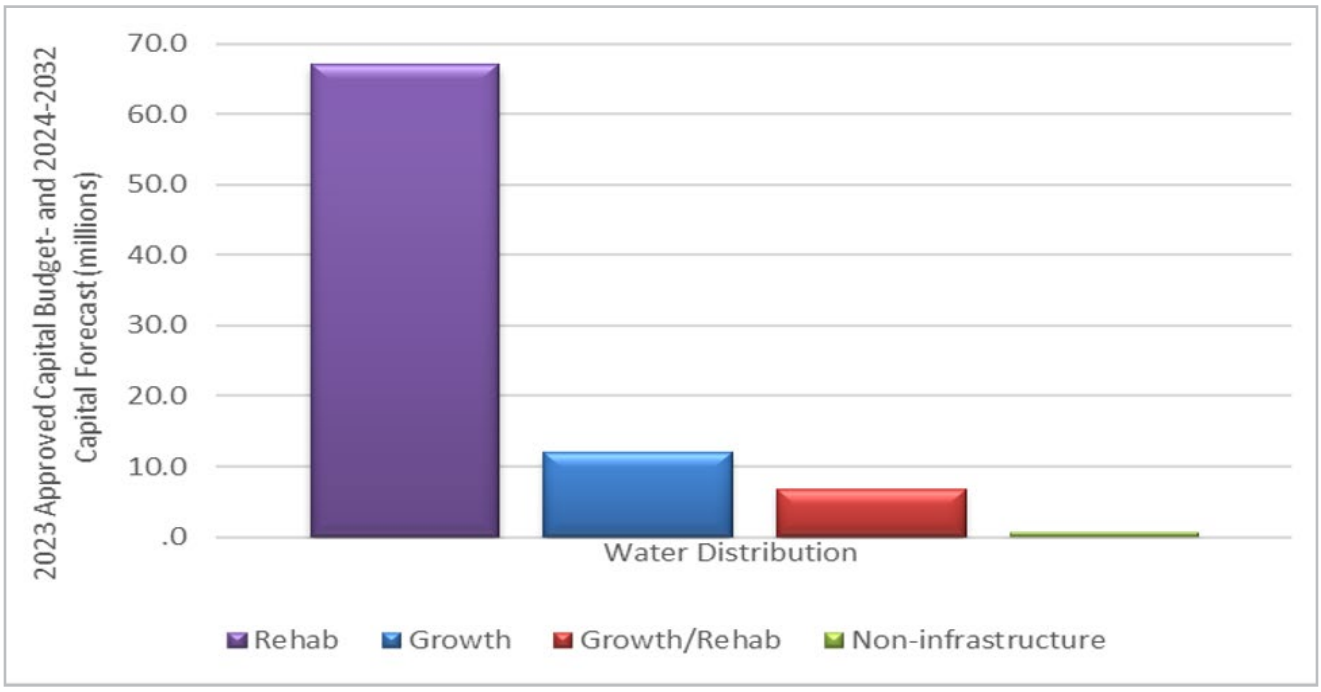
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.3.2.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest $86 million in funding over the next ten years in water distribution assets, of which $67 million is for rehabilitation activities. The estimated distribution of the funding is shown in **Figure 68**.

FIGURE 68: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR WATER DISTRIBUTION ASSETS



The growth component for the water distribution asset class is related to the implementation of advanced metering and the expansion of the Erbsville Road – Ira Needles to Columbia St watermain. On average almost 100% of water distribution asset types maintain the service they provide to the community without the need to be rehabilitated or replaced for 25 years or longer. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced will increase) and will impact the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 provides a summary of the planned expenditures in the approved 2023 operating budget. The 2023 operating budget included $1.4 million in funding considered to be directly related to treating water distribution assets such as value maintenance and repair, watermain flushing programs and fire hydrant maintenance programs.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $3.8 million over the next 25 years in water distribution assets. Based on the best available water distribution asset data, deterioration rates and 2023-2032 capital funding, we estimate that Water Distribution assets are sufficiently funded as outlined in Table 12 in section 4.4. The average annual infrastructure-funding gap is influenced by escalating construction costs, continued deterioration, rehabilitation or replacement improvements, improved asset inventory data, and the addition of assets that were previously excluded. As these inputs are enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.3.2.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding rehabilitation or replacement strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the Water Distribution asset class performance and corresponding expenditure over 25 years. Once the forecast activities are within the one to three-year span, SMEs determine the appropriate treatment which ranges from maintenance activities (e.g. flushing and valve turning), to repair (e.g. fire hydrant internal component rebuild) through to full replacement.

The City's water distribution assets are fire hydrants, values and the watermains that transport water to our homes and businesses. As noted earlier, water distribution is a highly regulated service, and the City must meet strict provincial regulations and drinking water quality standards. The City of Waterloo replaces watermains that experience a high number of breaks, or that have reached the end of their useful life. Watermain work is coordinated with other necessary replacement work on sanitary or stormwater sewers and road reconstruction to be as cost-effective and efficient as possible. Having a systematic rehabilitation or replacement approach

will reduce emergency repairs, which is more cost effective while also helping to optimize our financial and staff resources. In addition, staff are investigating methodologies to rehabilitate our water pipe network using trenchless or pipe relining where possible. These two approaches are a cost-effective way of rehabilitating the pipe without the need to dig up the pipe. As more information becomes available, the City Utilities and Asset Management teams will incorporate the approaches into future reporting. Examples of the replacement or rehabilitation activities for water distribution assets are identified in **Table 58**. The City's current performance is outlined in section 8.3.2.4.1 and the target performance is outlined in section 8.3.2.4.2. When projecting the performance of assets, condition is important and the condition of watermains are determined by the incorporation of age, the break history and the hydraulic capacity of each segment.

TABLE 58: WATER DISTRIBUTION TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Fire Hydrants	Inspections Scheduled maintenance (e.g. value turning)	Repair	Replacement
Valves	Inspections Scheduled maintenance (e.g. value turning)	Repair	Replacement
Watermains	Flushing Spot Repair	Structural lining	Replacement

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.3.2.4 Level of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Water distribution asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for

park assets is assessed to be high. The City is continuously working to improve asset data quality as outlined in section 3.1.

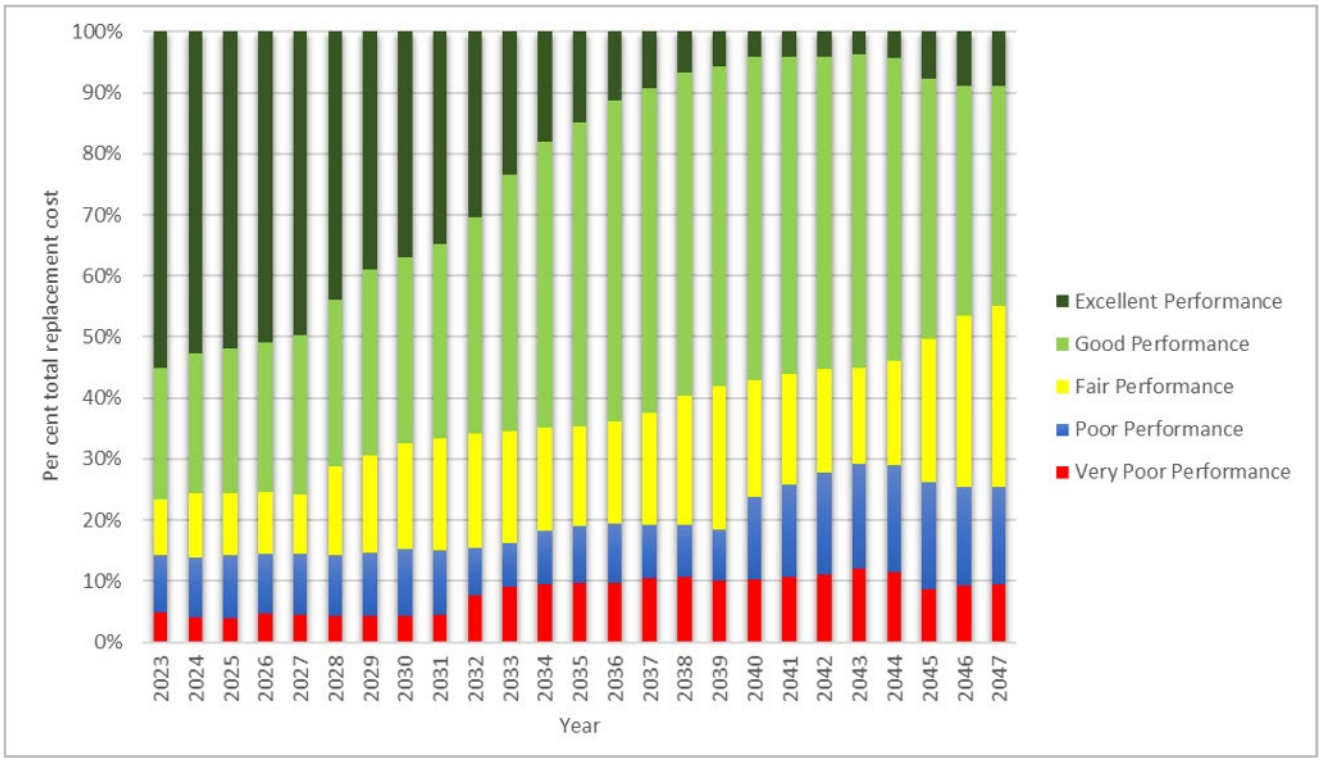
Section 8.3.2.3 identifies the lifecycle management activities required to provide the levels of services offered by water assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $1.4 million considered to be directly related to treating water assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $3.8 million annually as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $5.2 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.3.2.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Approximately 14% of water distribution assets are in poor or very poor condition. It is important to note that as the water operating authority, City Utilities is responsible for ensuring that water is safe and will make any necessary repairs. This is critical to ensuring both compliance with ever-evolving regulations and the longevity of essential assets required to provide safe and reliable drinking water. Over the 25-year timeline, with the current level of funding, we anticipate the percentage of our water distribution assets with a poor or very poor performance profile to increase slightly. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that water distribution assets are sufficiently funded as illustrated in **Figure 69**.

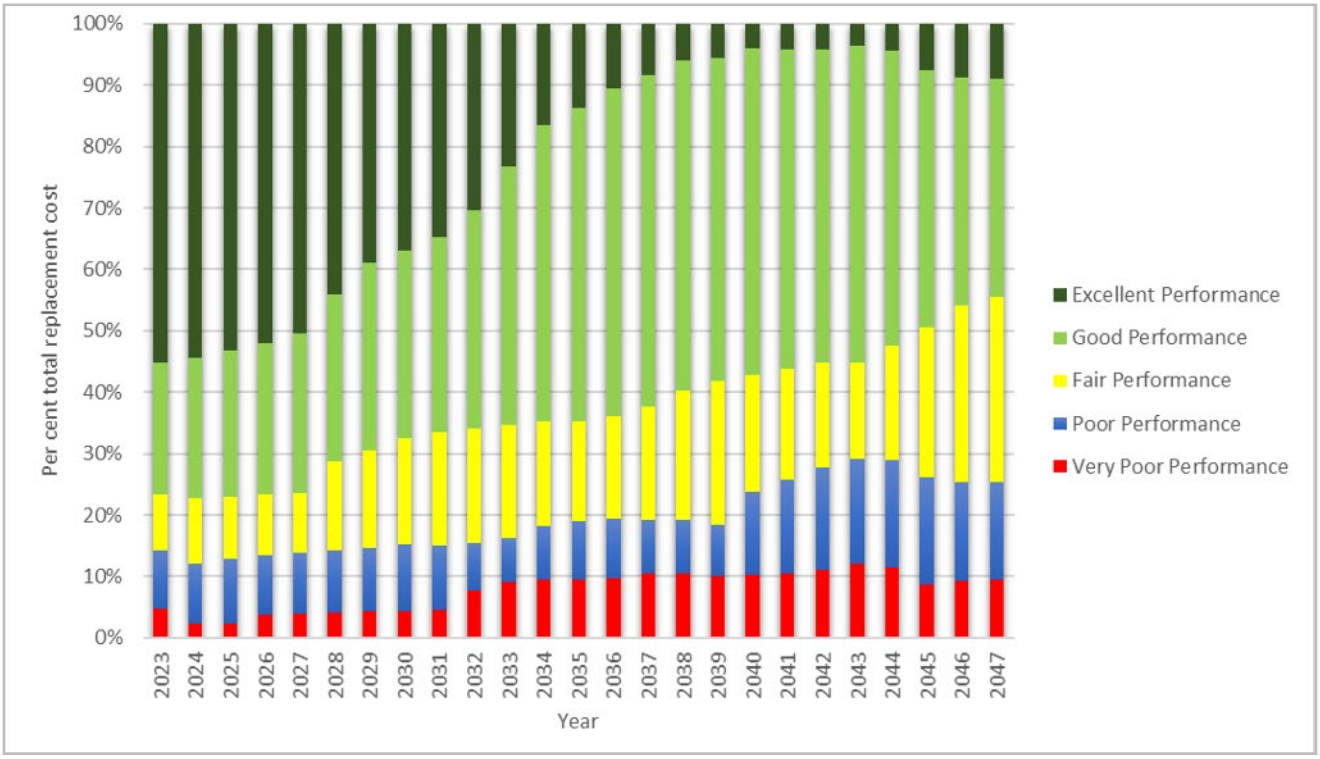
FIGURE 69: PROJECTED ANNUAL PERFORMANCE OF WATER DISTRIBUTION ASSETS IN THE BUDGET SCENARIO



8.3.2.4.2 Target Performance and Required Expenditures

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $3.8 million over the next 25 years is required to achieve the target performance profile for the Water Distribution assets as illustrated in **Figure 70**. While water distribution assets are meeting the current needs of the community, the assets are aging, and it is anticipated they will require a funding increase in the future.

FIGURE 70: PROJECTED ANNUAL PERFORMANCE OF WATER DISTRIBUTION ASSETS IN THE TARGET SCENARIO



The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data (when available). Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition). It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets being in each performance category and a portion being in poor or very poor condition until they are rehabilitated or replaced. It is important to note that SMEs maintain assets to ensure that the assets are operational and safe.

8.3.2.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for

municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 71** and **Figure 72** for the City's water distribution assets.

FIGURE 71: AVERAGE AGE (YEARS) FOR WATER MAINS

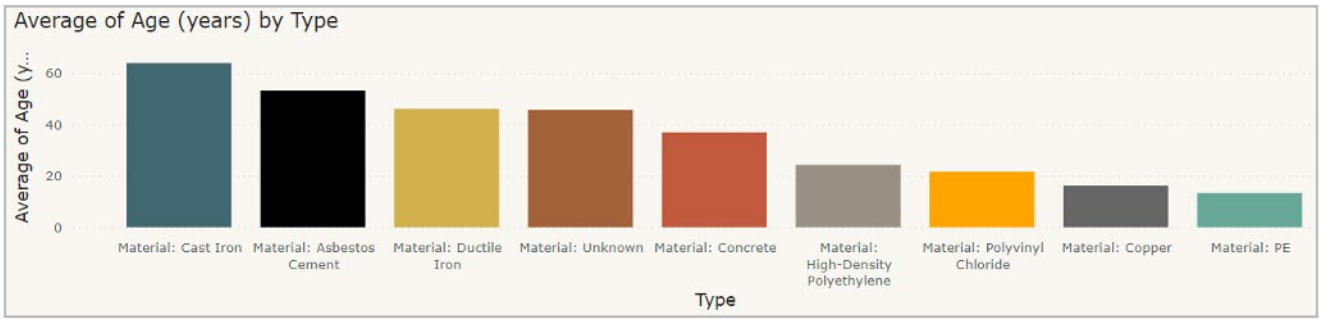
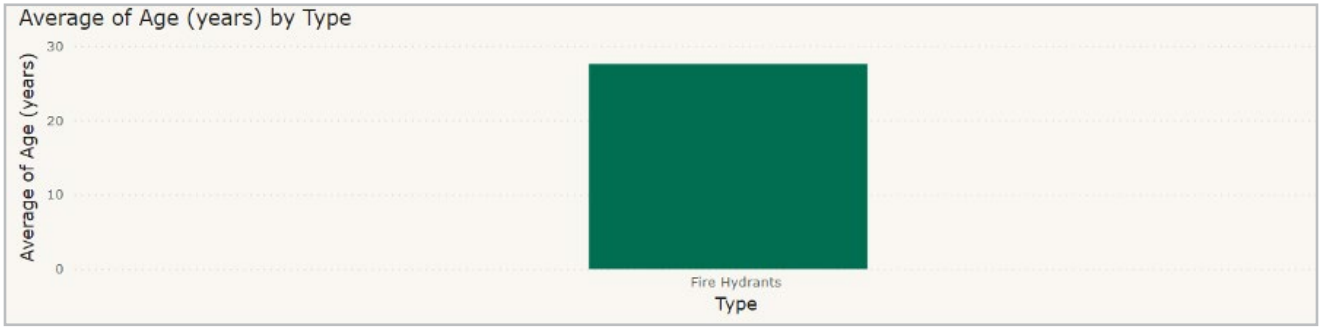


FIGURE 72: AVERAGE AGE (YEARS) FOR FIRE HYDRANTS



The following tables show the levels of service established by the City for water distribution assets. These metrics include the technical and community level of service required as part of Ontario Regulation 588/17. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on. As a core asset, water metrics are identified below in **Table 59** and

TABLE 59: WATER COMMUNITY LEVEL OF SERVICE METRICS AND INCLUDE METRICS FOR THE 2021 AND 2022 CALENDAR YEARS.

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION	2021
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system.	The City of Waterloo is largely built out to the municipal boundary and provides drinking water to most properties within the urban areas while a small portion of the rural areas are serviced by private wells.
	Description, which may include maps, of the user groups or areas of the City that are connected to the municipal water system.	A vast portion of the built-out municipality has access to municipal drinking water and in turn adequate fire flow.

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION	2021
Reliability	Description of boil water advisories and service interruptions.	A boil water advisory is issued when contaminants are detected in the water supply and present an immediate public health threat. This excludes precautionary advisories due to operational activities to maintain service. A service interruption is a result of a failure in the City managed water distribution system and excludes planned interruptions.

TABLE 60: WATER TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Scope	Properties connected to the municipal water system. (Percent)	99.58%	99.59%
	Properties where fire flow is available (Percent)	99.86%	99.85%
Reliability	Number of connection days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system.	0%	0%
	Number of connection days per year due to water main breaks compared to the total # of properties connected to the municipal water system.	0.72	1.99

8.3.2.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap. A few examples of the like-for-like concept include:

- Replacing natural gas boilers with natural gas boilers
- Replacing high-pressure sodium (HPS) decorative street light bulbs with HPS light bulbs
- Replacing concrete sidewalks with concrete sidewalks

In 2022, SME and AM staff adjusted our approach to use a "modern equivalent" (or "like-for-similar") approach. This changes the earlier examples to:

- Replacing natural gas boilers with electric boilers
- Replacing HPS decorative street light bulbs with Light Emitting Diode (LED) bulbs
- Replacing a concrete sidewalk with a multi-use path

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals. It is important to note that in some situations, a true "like-for-like" replacement is not possible so the modern equivalent approach is already in use when necessary. For example, when replacing a cast iron pipe, the current design standard is to replace it with a PVC pipe (the modern equivalent).

8.3.2.6 Climate Change Adaptation and Mitigation

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for water distribution assets.

8.3.2.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 61** below identifies the identified drivers for the water distribution asset class.

TABLE 61: WATER DISTRIBUTION DEMAND DRIVER

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Increase in main breaks due to climate change (freeze/thaw)	Frequent mid-winter thaws are increasing wear and tear on aged underground water distribution infrastructure.	This trend is expected to continue, increasing the strain on existing infrastructure	Due to the increasing frequency of watermain breaks, service disruptions to transportation networks and water service will become more frequent and the associated costs to the City may impact water rates to cover the increased operational costs.	Water distribution pipes will be flagged for structural lining or replacement, as necessary, targeting pipes in poor condition or at a substandard bury depth.

8.3.2.8 Risk

The risk associated with not undertaking the treatment options available for water distribution assets is a reduced lifespan resulting in the need to replace the assets earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the Water Distribution asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the water distribution level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are included in section 5.3. Information related to water distribution asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.3.2.9 Conclusion and Next Steps

As for the average annual infrastructure funding gap, there is minimal difference between the Budget Scenario (current LOS) and Target Scenario (proposed LOS) for water distribution assets over the next 25 years. To ensure management of water distribution assets continues to be optimal, future asset management steps will aim to find the most efficient means of maintaining and improving the performance forecast.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time to share information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles

- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts
- Collaborate with SMEs to improve the Cross Asset Tool parameters to assist in their decision-making process
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.3.3

Sanitary Collection

8.3.3.1 What do we own and what is it worth?

The 2023 replacement value of the City's sanitary collection network is estimated at $526 million and includes 421 km of sanitary pipe and six sewage pumping stations. The City's sanitary collection assets are the sewers and pumping stations that carry wastewater away from our homes and businesses. The City of Waterloo is required to have sufficient maintenance and rehabilitation funding for this system to meet provincial regulations.

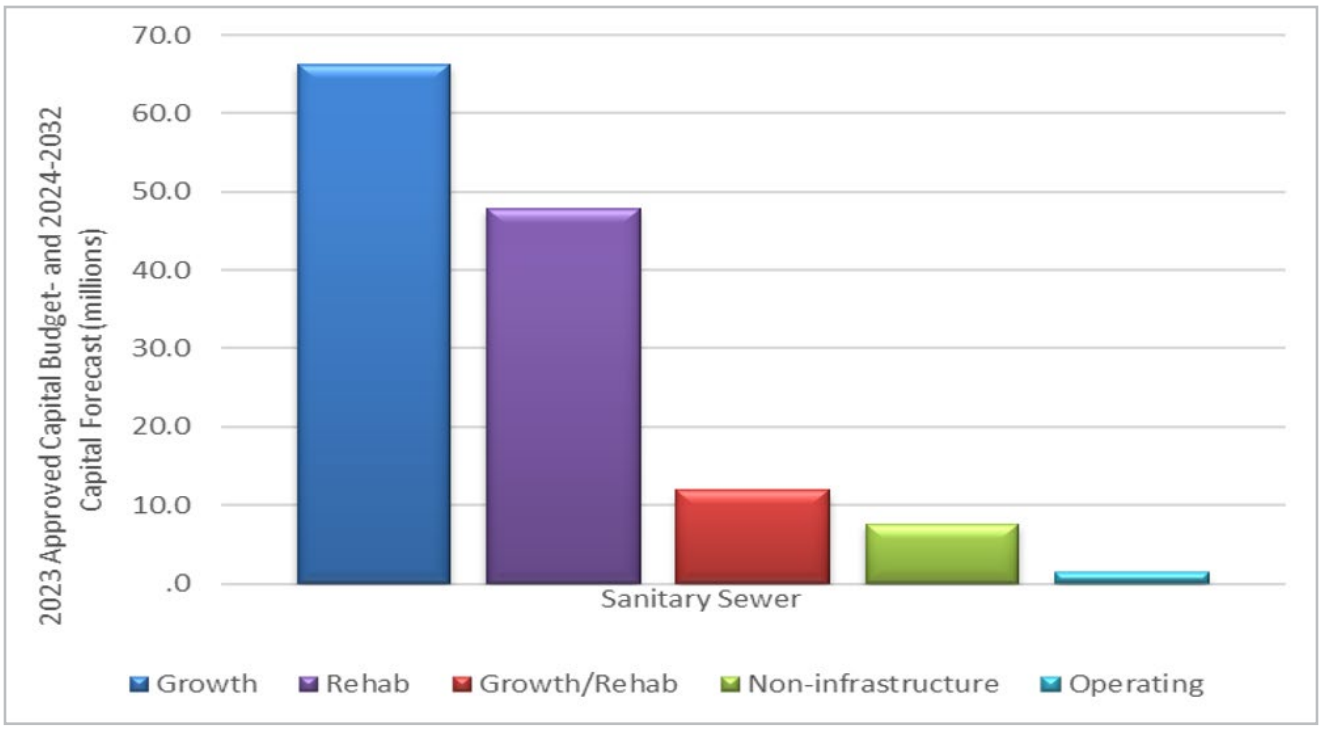
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.3.3.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $135 million over the next ten years in sanitary assets with $49 million allocated towards rehabilitation activities. The estimated distribution of the funding is shown in **Figure 73**.

FIGURE 73: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR SANITARY COLLECTION ASSETS



The growth component for the sanitary asset class is related to development-driven needs to rehabilitate or twin underground pipes such as the Forwell Trunk Sewer and upgrades to the Northlands Sanitary Pumping Station. All sanitary asset types maintain the service they provide to the community without the need to be rehabilitated or replaced for 25 years or longer. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced will increase) and will impact the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the approved 2023 operating budget. The 2023 operating budget included $1.5 million in funding considered to be directly related to treating sanitary collection assets such as sanitary pipe flushing, manhole repair and building maintenance activities for the pumping stations.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $3 million over the next 25 years in Sanitary Sewage assets. Based on the best available sanitary asset data, deterioration rates and 2023-2032 capital funding, we estimate that Sanitary Sewage assets have an average annual infrastructure funding gap of $3 million as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating construction costs, continued deterioration, rehabilitation or replacement improvements, and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.3.3.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding lifecycle management strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the Sanitary Sewer asset class performance and corresponding expenditure over 25 years. Once the forecast activities are within the one to three-year span, SMEs determine what underground pipes or pumping station process equipment needs to be replaced. There is a comprehensive review to identify the needs and "right size" the size of the assets to meet the anticipated future needs of the City and optimize the utilization of the assets.

The assets in sanitary sewer assets fall into two categories: the underground pipe network and the pumping station that offers services to the community. Sanitary sewers can either be rehabilitated or replaced. In Waterloo, we replace sanitary sewers that are in poor or very poor condition when other work is being done on watermains or stormwater sewers during road reconstruction. Sometimes it is possible to rehabilitate sewers, using trenchless technology without disturbing anything else, if the road and other pipes are still in good shape. The estimated service life for sanitary sewers ranges between 45 and 85 years depending on the

material type (e.g. clay, PVC). Sewage pumping stations are rehabilitated on an as-needed basis, replacing, or refurbishing the individual components in each facility as they reach the end of their useful life. Each component has an industry-accepted estimated service life that is combined with observations about the condition of each component during site investigations. Examples of the replacement or rehabilitation activities for Sanitary Sewers are identified in **Table 62**. The City's current performance for park assets is outlined in section 8.3.3.4.1 and the target performance is outlined in section 8.3.3.4.2. When projecting the performance of assets, condition is important and currently sanitary collection asset condition is a combination of CCTV inspection and when that is not available, condition is performance and age based.

TABLE 62: SANITARY COLLECTION TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Underground Pipe Network	Zoom video and CCTV inspections and spot repairs, flushing and mechanical cleaning.	Full-length or partial lining, Inflow and Infiltration remediation.	Full Replacement
Pumping Stations	Generator testing, wet-well cleanings, Infrared testing, flow meter calibration, pump trend analysis	Replacement of individual parts: valves, pipe sections, floats/level sensors. Rebuilding of pumps.	Full Replacement (very rare)

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.3.3.4 Level of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Sanitary collection asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for sanitary collection assets is assessed to be high. The City is continuously working to improve asset data quality. The City is continuously working to improve asset data quality as outlined in section 3.1.

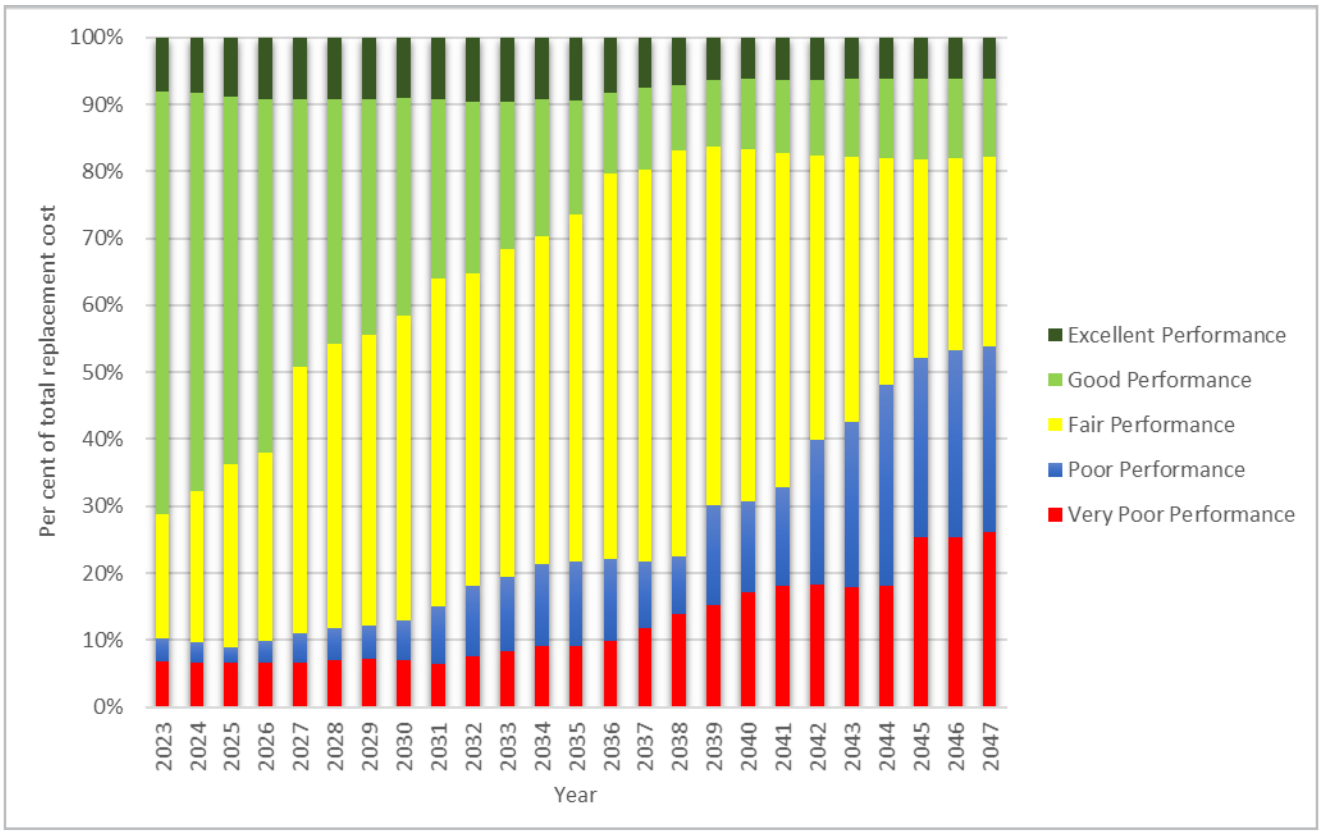
Section 8.3.3.3 identifies the lifecycle management activities required to provide the levels of services offered by sanitary collection assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $1.5 million considered to be directly related to treating sanitary collection assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $3 million annually as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $4.5 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.3.3.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Approximately 10% of our sanitary collection assets are currently considered poor or very poor performance as illustrated in **Figure 74**. With the current level of funding, we anticipate the percentage of sanitary collection assets with a poor or very poor profile to increase from 10% to 54% by 2047. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that sanitary collection assets have an annual infrastructure funding gap of $3 million.

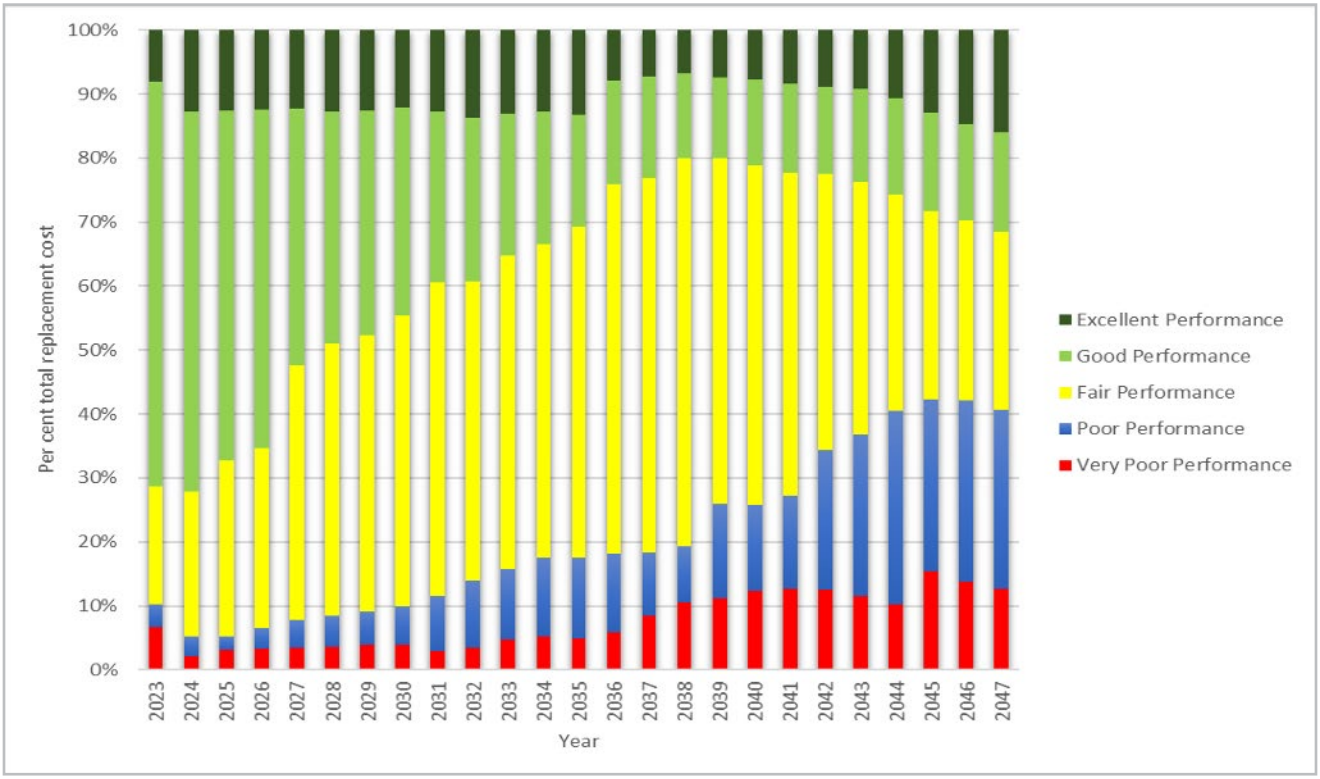
FIGURE 74: PROJECTED ANNUAL PERFORMANCE OF SANITARY COLLECTION ASSETS IN THE BUDGET SCENARIO



8.3.3.4.2 Target Performance and Required Expenditures

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $6 million over the next 25 years is required to achieve the target performance profile for the sanitary collection asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance is approximately 13% larger than when compared to the budget scenario as illustrated in **Figure 75**.

FIGURE 75: PROJECTED ANNUAL PERFORMANCE OF SANITARY COLLECTION ASSETS IN THE TARGET SCENARIO

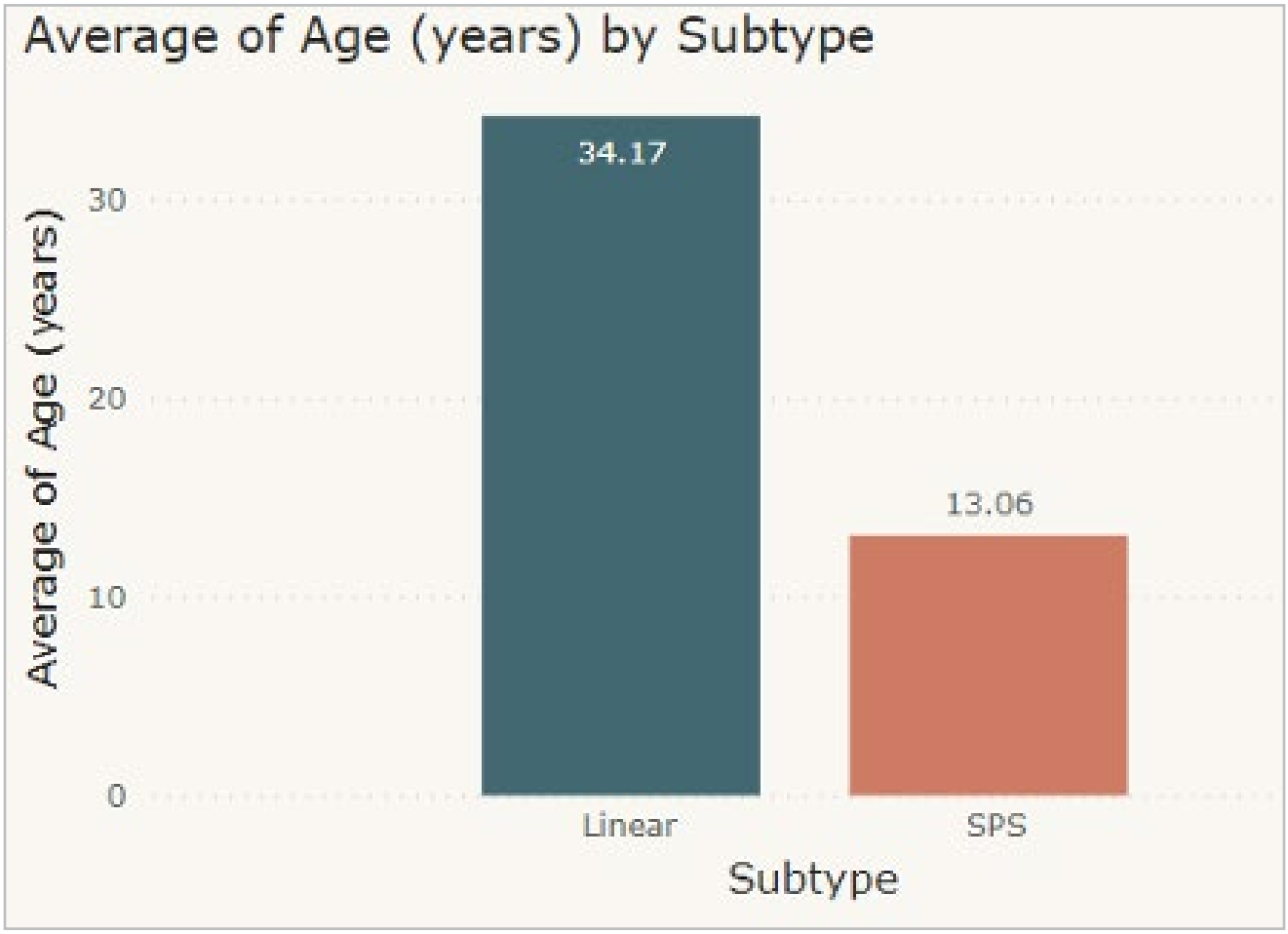


The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. The underground pipe assets are engineered assets that have recommendations for the desired preventative maintenance needs (e.g. flushing). The process equipment within the pumping stations are mechanical assets that have guidelines and schedules for the desired preventative maintenance needs of the assets and could unexpectedly fail even with all the prescribed treatments undertaken at the defined timeline. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets will be in each performance category and a portion being poor or very poor until they are rehabilitated or replaced.

8.3.3.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 76** for the City's sanitary assets.

FIGURE 76: AVERAGE AGE (YEARS) FOR SANITARY COLLECTION ASSETS



The following tables show the levels of service established by the City for sanitary assets. These metrics include the technical and community level of service required as part of Ontario Regulation 588/17. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on. As a core asset, sanitary metrics are identified below in **Table 63** and **Table 64** and include metrics for the 2021 and 2022 calendar years.

TABLE 63: SANITARY COLLECTION COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	COMMUNITY LEVEL OF SERVICE MEASURE	COMMUNITY LOS PERFORMANCE
Scope	Description of the traffic that is supported by municipal bridges (e.g. heavy transport, motor vehicles, emergency vehicles, pedestrians, cyclists).	The City of Waterloo is largely built out to the municipal boundary and provides wastewater collection to most properties within the urban areas, a small portion of the rural areas are serviced by private septic systems.
Reliability	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or homes.	Stormwater may enter the sanitary sewer through multiple sources. Groundwater may enter sanitary sewers through defective pipe joints, or broken pipe in areas where the groundwater table is at a high elevation. Alternately stormwater may enter sanitary sewers through inappropriate connections such as sump pumps, or roof drains. All the aforementioned sources could lead to an increased flow to the wastewater treatment plant.
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described above.	The City of Waterloo has a dual system for stormwater and sanitary waste to prevent stormwater entering the wastewater system. The City of Waterloo has eight flow monitors and two rain gauges to monitor the status of the system to address issues Inflow and Infiltrations issues as they arise. The City of Waterloo has a CCTV program for wastewater sewer to monitor sanitary sewer internal structure condition and operational performance to identify pipe deficiencies.

TABLE 64: SANITARY COLLECTION TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Scope	Properties connected to the municipal wastewater system (per cent)	98.81%	98.67%

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Reliability	Number of connection days per year due to wastewater backups compared to the total number of properties connected to the system (per cent)	0.00%	0.00%
	Number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system (per cent)	0.00%	0.00%
	Annual greenhouse gas emissions (GHG), tonnes of carbon dioxide equivalent (tonnes CO2e, tCO_2e)	11.45 tCO_2e	20.61 tCO_2e

8.3.3.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap. A few examples of the like-for-like concept include:

- Replacing natural gas boilers with natural gas boilers
- Replacing high-pressure sodium (HPS) decorative street light bulbs with HPS light bulbs
- Replacing concrete sidewalks with concrete sidewalks

In 2022, SME and AM staff adjusted our approach to use a "modern equivalent" (or "like-for-similar") approach. This changes the earlier examples to:

- Replacing natural gas boilers with electric boilers
- Replacing HPS decorative street light bulbs with Light Emitting Diode (LED) bulbs
- Replacing a concrete sidewalk with a multi-use path

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals. It is important to note that in some situations, a true "like-for-like" replacement is not possible so the modern equivalent approach is already in use when necessary. For example, when replacing a clay pipe, the current design standard is to replace it with a PVC pipe (the modern equivalent).

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to sanitary assets.

8.3.3.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for sanitary assets.

8.3.3.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 65** below identifies the identified drivers for the sanitary asset class.

TABLE 65: SANITARY COLLECTION DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Increased wastewater production due to population growth requires increased conveyance.	Sewer and pump station capacity is under strain due to age and actual population growth	Federal and Provincial growth targets will cause conveyance issues to worsen.	If left untreated, service interruptions, emergency repairs and sewage back-ups into basements become a more common reality.	The Sanitary Master Plan is being renewed with current growth projections. Capital projects will be identified in the plan and included in future budget processes to request resources to complete required work.

8.3.3.8 Risk

The risk associated with not undertaking the treatment options available for sanitary assets is a reduced lifespan resulting in the need to replace the infrastructure earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the sanitary collection asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the sanitary collection Level of Service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.3. Information related to sanitary asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.3.3.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) sanitary collection assets over the next 25 years is an annual average of $3 million. To ensure management of sanitary assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

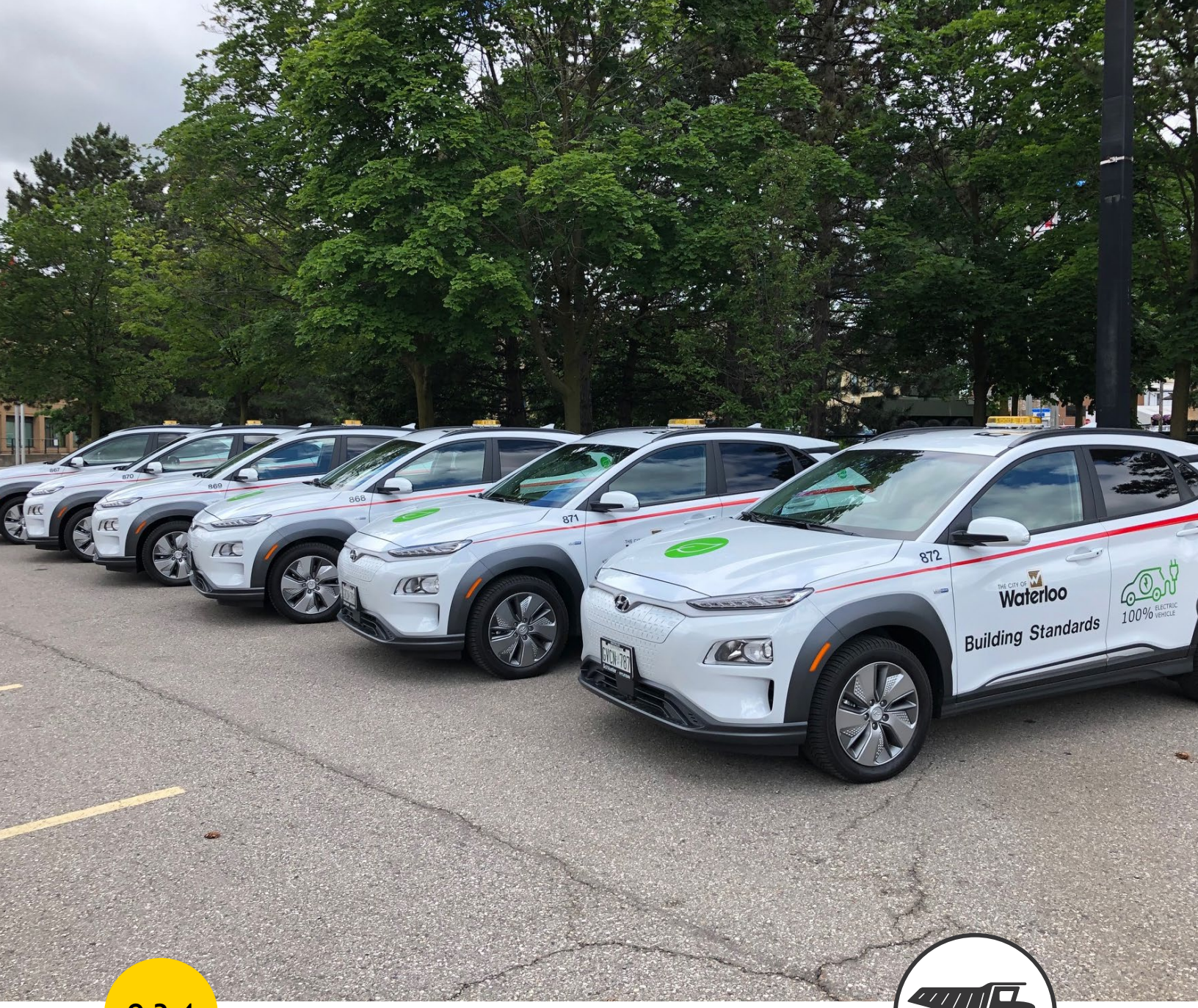
Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles

- Increasing awareness of general forecasting principles
- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress



8.3.4

Fleet and Shop Equipment

8.3.4.1 What do we own and what is it worth?

The 2023 replacement value of the City's fleet and shop equipment is estimated at $28 million. The City's fleet assets are the vehicles used in our services, and the shop equipment needed to maintain them. There are 338 fleet assets owned by the City, ranging from cars and trucks to specialized turf vehicles, loaders/backhoes, snow plows, sanders, sweepers, ice resurfacers, sanitary flusher truck and their associated equipment. Fleet assets are replaced when they reach the end of their useful life, which ranges from four to 15 years, depending on the type of vehicle. It is important to note that the fire vehicles are captured under the fire asset class.

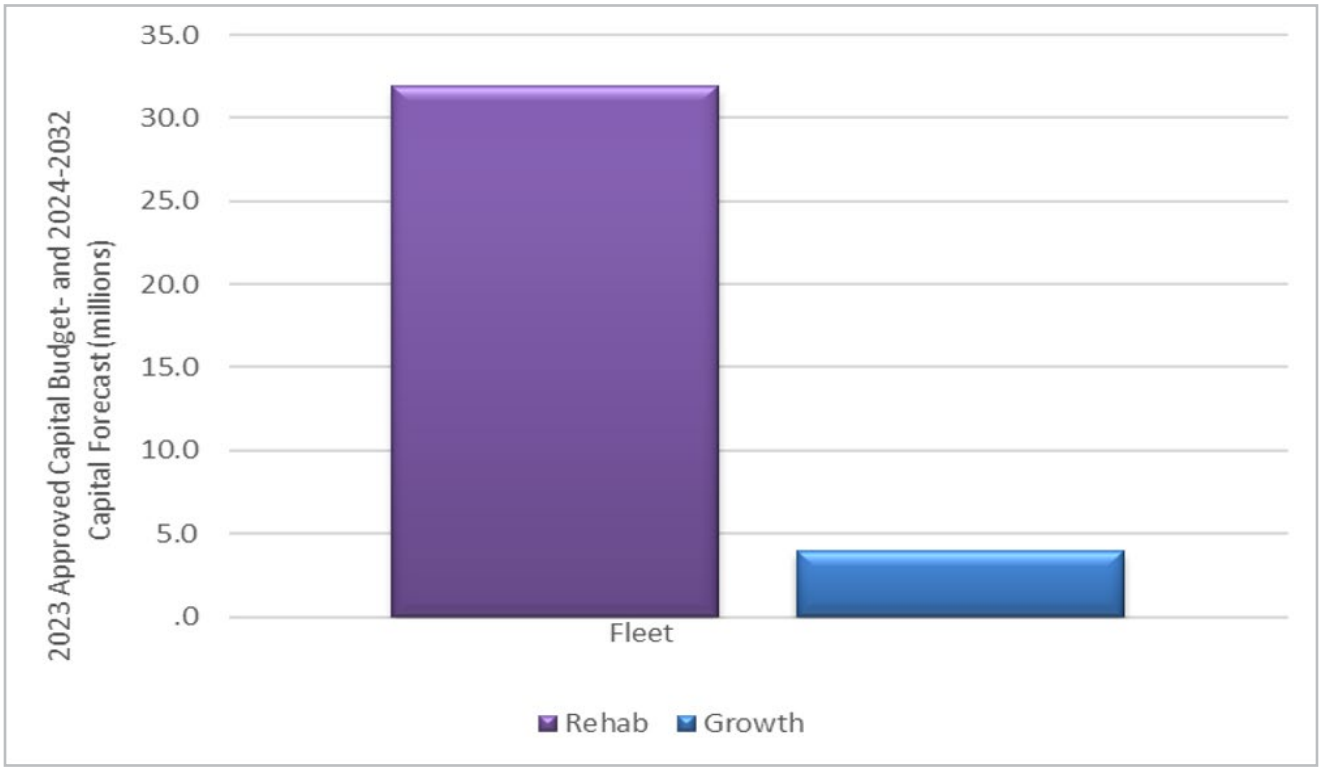
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

8.3.4.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $32 million over the next ten years in fleet and shop equipment assets, $32 million which is for rehabilitation of existing assets. The estimated distribution of the funding is shown in **Figure 77**.

FIGURE 77: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR FLEET AND SHOP EQUIPMENT



The growth component for the fleet asset class is related to new assets to meet anticipated growth of the City. Almost all fleet and shop equipment assets will need to be replaced in 25 years or less to maintain the service they provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced within 25 years will increase) and will subsequently increase the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the approved 2023 operating budget. The 2023 operating budget included $16,000 in funding considered to be directly related to treating fleet and shop equipment assets such as annual inspections, certifications, and repairs. Vehicle and equipment maintenance costs are attributed directly to the individual item.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $2.8 million over the next 25 years on fleet and shop equipment assets. Based on the best available fleet and shop equipment asset data, deterioration rates and 2023-2032 capital funding, we estimate that fleet and shop equipment assets have an annual infrastructure funding gap of $200,000 as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation costs, continued deterioration, rehabilitation or replacement improvements, and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.3.4.3 Lifecycle Management Activities

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding rehabilitation or replacement strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the fleet and shop equipment asset class performance and corresponding expenditure over a 25-year timeframe. Once the forecast activities are within the one to three-year span, SMEs determine what vehicles and equipment need to be replaced. Fleet SMEs undertake a comprehensive review of the vehicles and equipment needed to provide an optimized utilization of the assets.

The assets in the fleet and shop equipment assets fall into two categories: vehicles and equipment used to offer services to the community. This includes but is not limited to the snowplows for snow clearing purposes, ice resurfacers used to maintain the ice rinks at our community centres turf equipment to maintain our sportfields and the electric vehicles used by our Building Standards division when conducting building inspections.

Fleet vehicles are replaced when they reach the end of their useful life, which ranges from four to 15 years, depending on the type of vehicle. Shop equipment assets are replaced on an as needed basis with a specific

focus on maintaining the equipment through the replacement of components (e.g. hydraulics). Fleet staff completes regular inspections on vehicles and equipment regularly when the assets require repairs. Due to the nature of the fleet and shop equipment assets, the estimated service life is much shorter than other infrastructure assets such as roads or the water pipe network. Fleet and shop equipment assets are unique in that there can be unexpected component failures that result in earlier than anticipated replacement needs. In addition, a decision to replace vehicles is made when maintenance and repair costs exceed a reasonable amount and before a major repair occurs. Examples of the replacement or rehabilitation activities for fleet and shop equipment are identified in **Table 66**. The City's current performance for fleet and shop equipment assets is outlined in section 8.3.4.4.1 and the target performance is outlined in section 8.3.4.4.2. When projecting the performance of assets, condition is important and fleet condition is assessed through a combination of condition determined by fleet staff through their regular inspection process and age.

TABLE 66: FLEET AND SHOP EQUIPMENT TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Fleet	Preventative maintenance activities (e.g. oil changes) and inspections are undertaken at predetermined intervals or according to prescribed criteria, aimed at reducing the failure, risk or performance degradation of the equipment.	Scheduled and unscheduled maintenance repairs to correct deficiencies that occur between scheduled services to maintain the fleet in a safe and operable manner	Full replacement of the vehicle and equipment
Shop Equipment	Mechanical inspections	Planned and unplanned maintenance repairs	Full replacement of the equipment

Fleet and shop equipment is a unique asset class as maintenance and rehabilitation activities are ongoing throughout the year to ensure that the equipment can provide an acceptable level of service. When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.3.4.4 Level of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component of the method of projecting performance is how the assets are assessed. Fleet and shop equipment asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for fleet and shop equipment assets is assessed to be medium, an improvement from the previous year. The City is continuously working to improve asset data quality as outlined in section 3.1.

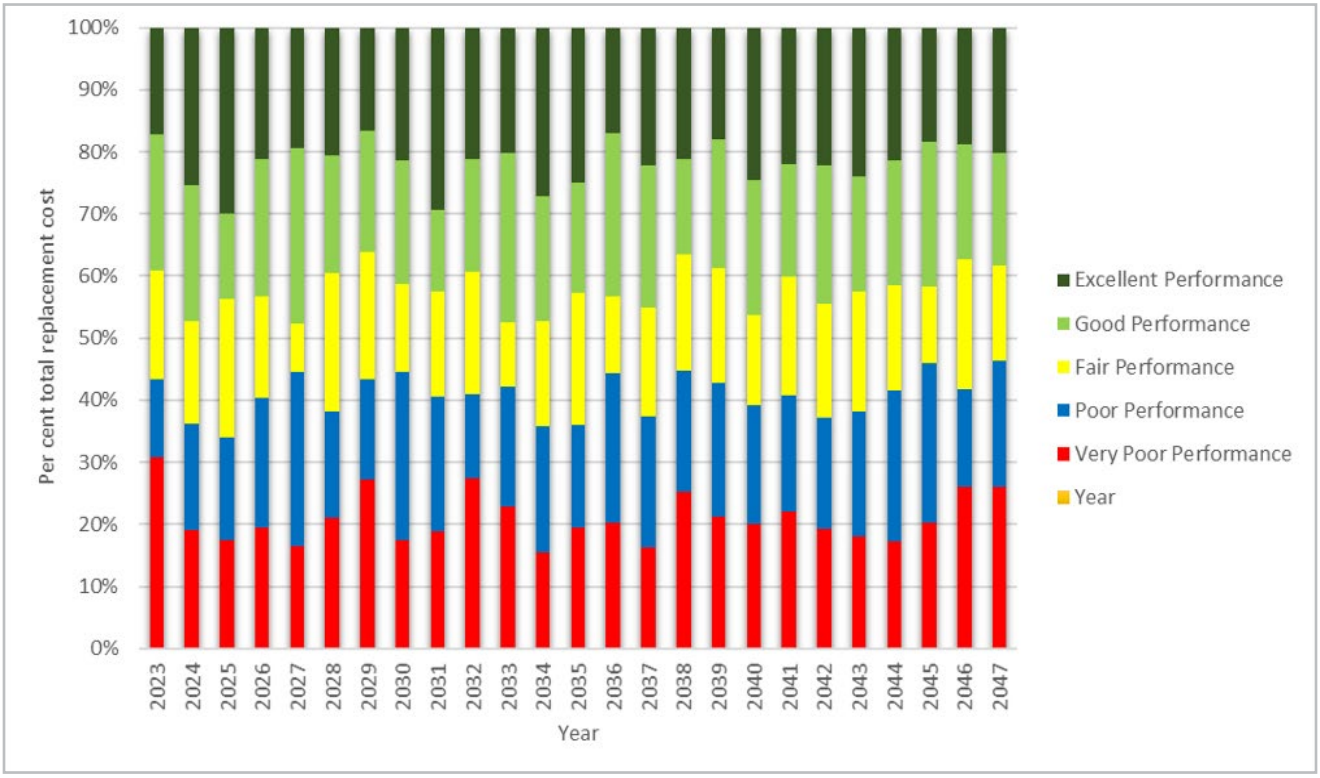
Section 8.3.4.3 identifies the lifecycle management activities required to provide the levels of services offered by fleet and shop equipment assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $16,000 considered to be directly related to treating fleet and shop equipment assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $2.8 million annually as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $2.8 million each year.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.3.4.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Almost 43% of our fleet and shop equipment assets are currently considered poor or very poor performance. as illustrated in **Figure 78**. The average annual budgeted capital expenditure of approximately $2.8 million is anticipated to maintain the current performance profile over the next 25 years. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that fleet and shop equipment assets have an annual infrastructure funding gap of $200,000.

FIGURE 78: PROJECTED ANNUAL PERFORMANCE OF FLEET AND SHOP EQUIPMENT ASSETS IN THE BUDGET SCENARIO

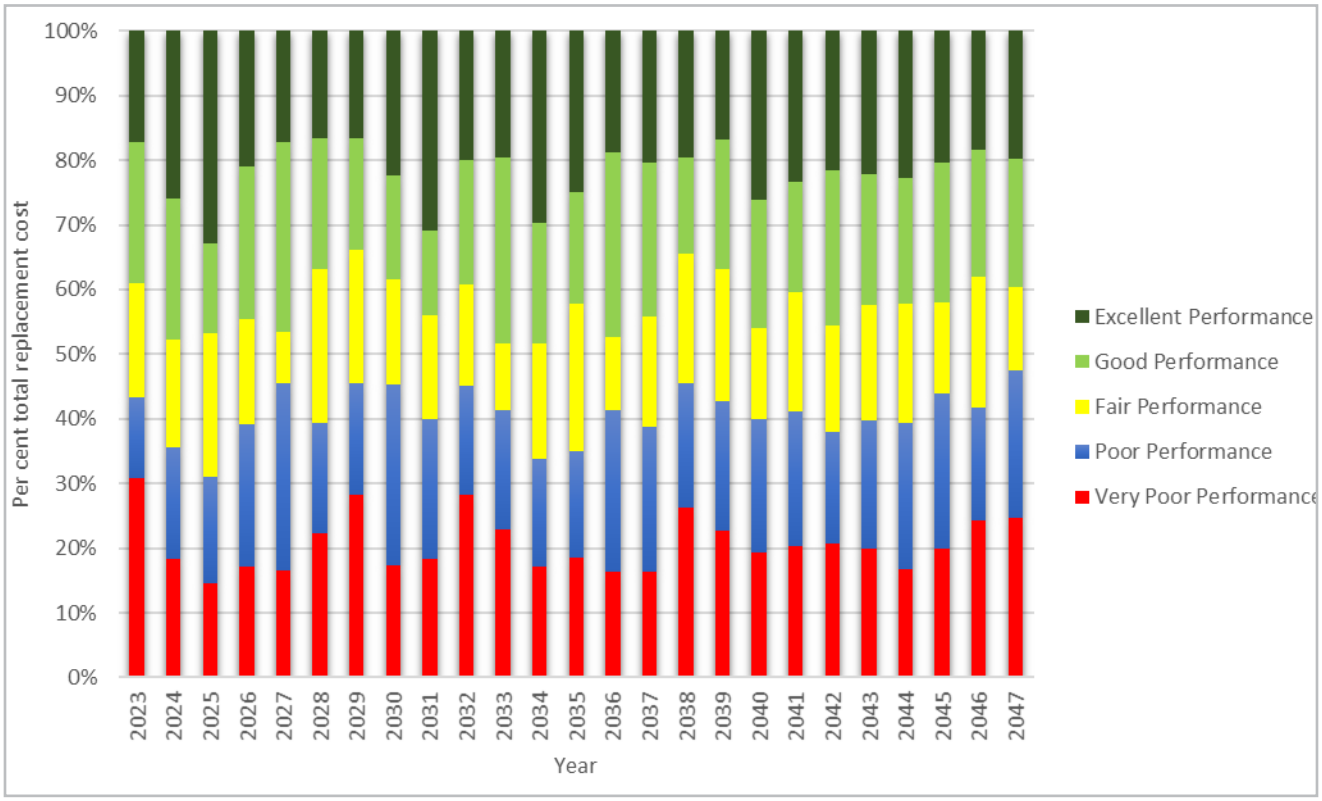


8.3.4.4.2 Target Performance and Required Expenditures

As discussed in section 3.5.2, the target scenario follows the same principles as the budget scenario, however, supplementary infrastructure funding is added above and beyond the approved budget scenario. The target scenario is designed to maintain a target proportion of assets in excellent, good, fair, poor, or very poor performance. It is important to note that the Waterloo DSS will only apply funding to assets identified as requiring rehabilitation or replacement and some funding may be left unallocated.

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $3 million over the next 25 years is required to achieve the target performance profile for the fleet and shop equipment asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance is relatively similar to the budget scenario as illustrated in **Figure 79**.

FIGURE 79: PROJECTED ANNUAL PERFORMANCE OF FLEET AND SHOP EQUIPMENT ASSETS IN THE TARGET SCENARIO



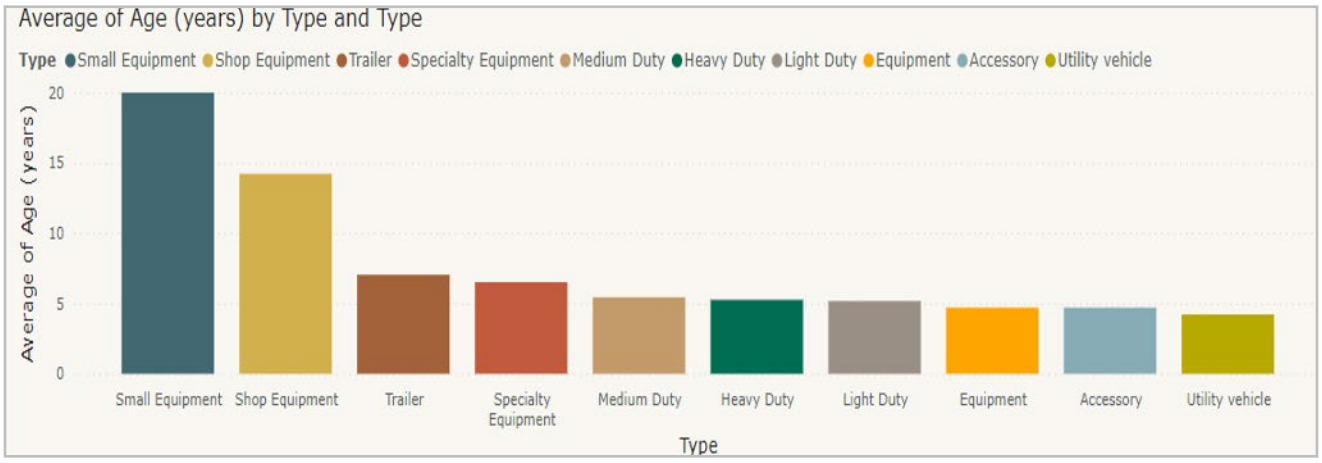
The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. Fleet and shop equipment assets are mechanical type assets that have guidelines and schedules for the desired preventative maintenance needs of the assets and could unexpectedly fail even with all the prescribed treatments undertaken (e.g. engine failure). It is important to note

that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets being in each performance category and a portion being in poor or very poor condition until they are rehabilitated or replaced. It is important to note that fleet SMEs maintain the vehicles and equipment to ensure that the assets are operational and safe.

8.3.4.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 80** for the City's fleet and shop equipment.

FIGURE 80: AVERAGE AGE (YEARS) FOR FLEET AND SHOP EQUIPMENT



The following tables show the levels of service established by the City for fleet and shop equipment assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, fleet metrics have been developed in a collaborative effort between SMEs and Asset Management staff. Fleet and shop equipment metrics are identified below in **Table 67** and Table 68 and include metrics for the 2021 and 2022 calendar years.

TABLE 67: FLEET AND SHOP EQUIPMENT COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	COMMUNITY LEVEL OF SERVICE MEASURE	COMMUNITY LOS PERFORMANCE
Scope	Description of how fleet supports operational activities through the City of Waterloo.	Life cycle management of fleet assets including acquisition, disposition and maintenance and repairs enables sustainable City service delivery. Fleet assets facilitate or improve the quality of service provided and reflect a professional image within the community.

SERVICE ATTRIBUTE	COMMUNITY LEVEL OF SERVICE MEASURE	COMMUNITY LOS PERFORMANCE
Safety	Description of how the City ensures fleet assets are safe.	The City's preventative maintenance program ensures assets are safe for use for their intended purposes and adhere to all legislative requirements.
Environmental Stewardship	Description of how the City considers environmental stewardship when managing vehicles and equipment.	Developing a process to optimize rightsizing and utilization of fleet assets.

TABLE 68: FLEET AND SHOP EQUIPMENT TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Safety	Maintenance inspections completed (per cent)	100%	100%
Reliability	Fleet assets that are in fair or better condition (per cent)	50%	57%

The information presented here is based on prior year data regarding asset inventory, performance, and degradation curves, along with funding included in 2023 approved capital budget and 2024-2032 capital forecast.

8.3.4.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to fleet and shop equipment assets.

8.3.4.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net zero emissions — the point at which the amount of greenhouse gas emitted is equal to the amount that is removed from the atmosphere — by 2050. One consideration for fleet and shop equipment when implementing Council's desire to reduce GHG emissions is the availability of zero-emission vehicles for municipal purposes. Based on the current availability, 25% of the City's vehicles comprise units that qualify for an Electrical Vehicle (EV)

alternative. This percentage diminishes when factoring in specific requirements such as market availability, capital costs, charging infrastructure, and number of units slated for replacement by 2030. The fleet team is looking at transitioning to zero-emission vehicles with the goal of reducing greenhouse gas (GHG) instead of solely focusing on replacing internal combustion engine vehicles with electric ones to address environmental concerns better and contribute to a more comprehensive sustainability strategy.

8.3.4.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 69** below identified the identified drivers for the fleet and shop equipment asset class.

TABLE 69: FLEET AND SHOP EQUIPMENT DEMAND DRIVERS

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
EV Charging Stations – City Use (joint driver for Fleet and Facilities)	The City is investigating implementation needs for City vehicle use through the development of a corporate EV infrastructure strategy.	The corporate EV infrastructure strategy will determine the City's medium and long-term needs related to charging stations to meet the needs of the growing electrified fleet.	Additional City Fleet EV vehicles will be challenging to charge without an increase in the number of charging stations and investment in related infrastructure. An increase in transformer capacity is anticipated with the installation of multiple EV charging stations. The cost of increasing the back-end electrical infrastructure to support higher electricity demand will be determined as part of the corporate EV infrastructure strategy.	The development and implementation of a corporate EV Infrastructure strategy is recommended.

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Electric Vehicles (EV)	The City continues to monitor opportunities to incorporate zero-emission vehicles into its fleet complement	CorCAP Action 43: Create a corporate electric vehicle charging strategy and TransformWR Action 2.1.2 – Plan and begin to implement a transition to zero-emission vehicles for municipal fleets, working toward a goal of at least half of municipal vehicles being zero-emission by 2030.	Increased demand for EV charging stations.	The transformation to zero-emission vehicles is reviewed as vehicle replacement or expansion occurs.
Alternative fuel sources for vehicles	Lack of availability of sufficient alternative fuel infrastructure	NA	Currently, there are no viable zero-emission options for the City's heavy equipment	The City will continue to monitor the availability of alternative fuel infrastructure in the area, e.g. Compressed Natural Gas

8.3.4.8 Risk

The risk associated with not undertaking the treatment options available for fleet and shop equipment is a reduced lifespan resulting in the need to replace the fleet and equipment earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the fleet and shop equipment asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that fleet and shop equipment level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes such as those identified in section 5.3. Information related to fleet and shop equipment asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

In addition, procurement strategies are developed with approved suppliers to mitigate the risk of shortage of replacement parts or fleet vehicles due to supply chain issues as experienced during the pandemic as well as long waiting times for new purchases.

8.3.4.9 Conclusion and Next Steps

The average annual infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for fleet and equipment assets over the next 25 years is estimated to be $200,000. To ensure management of fleet and shop equipment assets continues to be optimal, future asset management steps will aim to find the most efficient means of maintaining and improving the performance forecast.

Strategic steps will include:

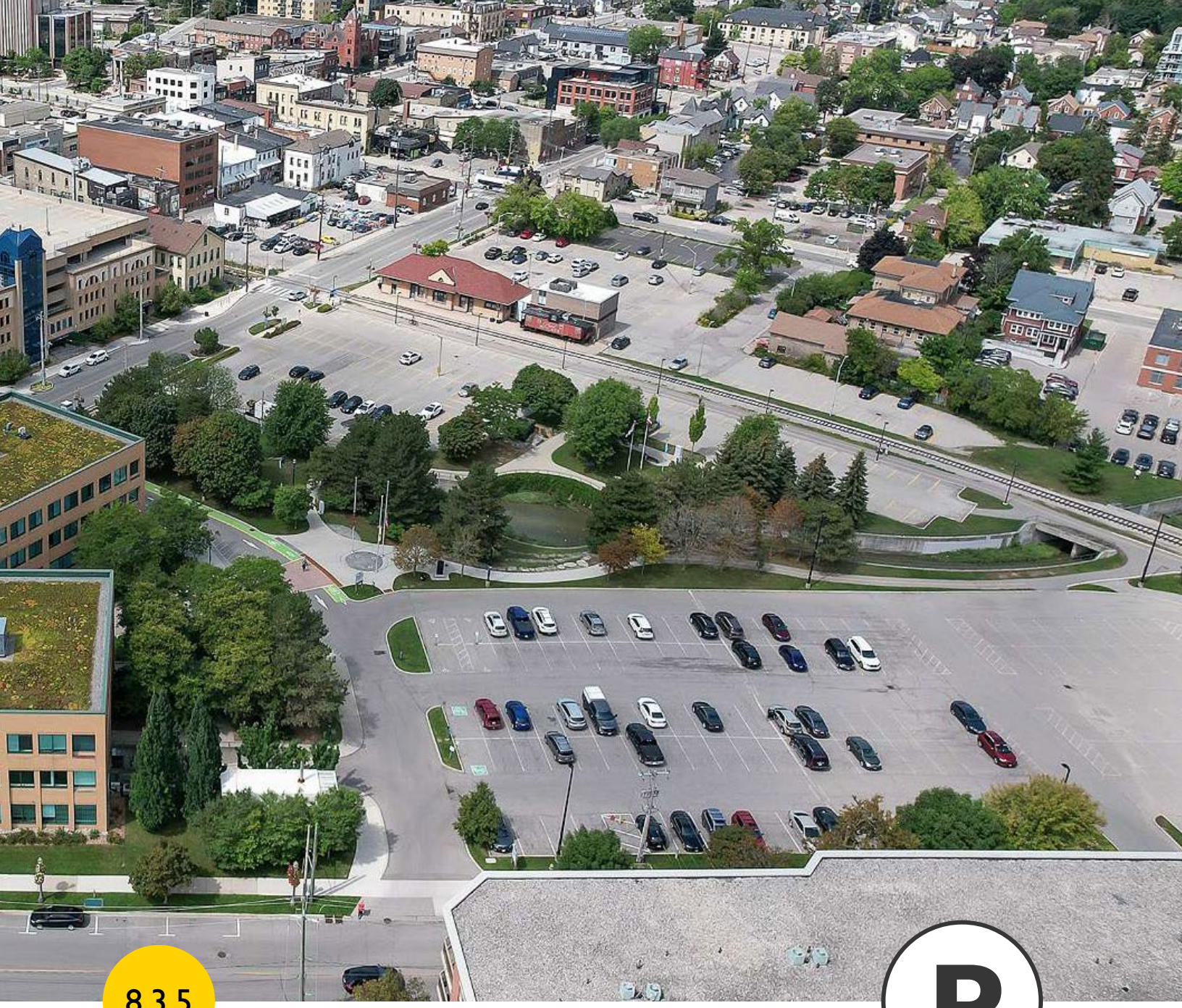
- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Discuss the applicability of incorporating the modern equivalent approach
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making
- Reviewing level of service metrics to better understand the implications and incorporate more metrics as appropriate

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress



8.3.5

Parking

8.3.5.1 What do we own and what is it worth?

The 2023 replacement value of the City's parking assets is estimated at $38 million. The City's parking enterprise is responsible for operating and maintaining one electric vehicle (EV) charging station, 16 parking lots and one parkade* in Uptown Waterloo. Of the 16 parking lots, the parking enterprise owns 12 of them while four of them are owned by other areas within the City. The Bauer Lot and Erb Lot are owned by Parks and the Caroline North and South lot lands are owned by the Industrial Land Account (ILA).

Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the 2023 Approved Capital Budget and 2024-2032 Capital Forecast.

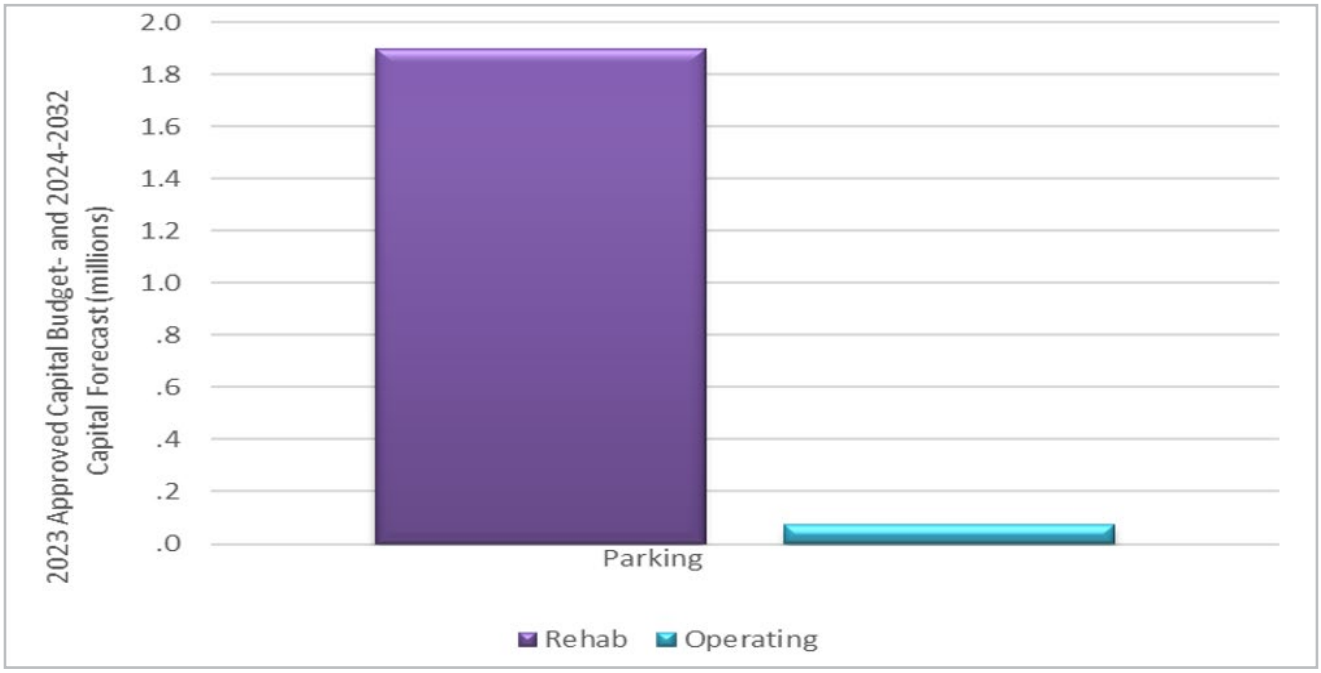
*The ownership of the Uptown Parkade was transferred to the Region of Waterloo in January 2024 and will be reflected in future AM reporting.

8.3.5.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the Approved 2023 Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $2 million over the next ten years in parking assets, $1.9 million for the rehabilitation of assets. The estimated distribution of the funding is shown in **Figure 81**.

FIGURE 81: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR PARKING ASSETS



Almost 94% of parking assets by replacement cost ($36 million) maintain the service they provide to the community without the need to be rehabilitated or replaced for 25 years or longer. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced will increase) and will subsequently impact the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the Approved 2023 operating budget. The 2023 operating budget included $37,000 in funding considered to be directly related to treating parking assets such as parking lot maintenance and building maintenance activities.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $200,000 over the next 25 years on parking assets. Based on the best available parking asset data, deterioration rates and 2023-2032 capital funding, we estimate that parking assets have an annual infrastructure funding gap of $400,000 as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating inflation and replacement costs, continued deterioration, replacements, and improved asset inventory data. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.3.5.3 Lifecycle Management Activities

Please see section 5.1.3 for an overview of the general context and appropriate asset management interpretation regarding rehabilitation or replacement strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the parking asset class performance and corresponding expenditure over a 25-year timeframe. Once the forecast activities are within the one to three-year span, SMEs determine what building components need to be replaced or surface parking lot resurfacing or reconstruction needs. Parking SMEs undertake a review of the asset needs to provide an optimized utilization of the assets.

Within the parking asset class, the assets fall into two categories: a facility and surface parking lots. Surface parking lots are resurfaced when they reach the end of their useful life. The Uptown Parkade is managed like a facility, where individual components are refurbished or replaced as they reach the end of their useful life. Examples of the replacement or rehabilitation activities for parking assets are identified in **Table 70**. The City's current performance for parking assets is outlined in section 8.3.5.4.1 and the target performance is outlined in section 8.3.5.4.1. When projecting the performance of assets, condition is important. The condition of surface parking lots is assessed through a pavement condition inspection process on a bi-annual basis while the Uptown Parkade facility condition is performance and age based.

TABLE 70: PARKING TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Surface Parking Lots	Localized repairs such as pothole repair, crack sealing	Pavement removal and replacement (i.e. resurfacing)	Removal of asphalt and granular base, replacement with new (i.e. reconstruction)
Uptown Parkade*	Individual components are refurbished or replaced, concrete repairs or resealing	Programmed/grouped repairs (e.g. roof replacement program, expansion joint rehabilitation) Component replacements (e.g. windows, doors, or lighting) Interior and exterior renovation	Complete facility replacement (very rare)

* The ownership of the Uptown Parkade transferred to the Region of Waterloo. Future AM reporting will reflect that data adjustment.

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified in section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.3.5.4 Level of Services

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Parking asset performance is evaluated using historical knowledge, age and observed conditions. The quality and availability of our asset data (data maturity) are continuously evolving. The current data maturity level for parking assets is assessed to be medium, an improvement from the previous year. The City is continuously working to improve asset data quality as outlined in section 3.1.

Section 8.3.4.3 identifies the lifecycle management activities required to provide the levels of services offered by parking assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $37,000 considered to be directly related to treating parking assets as identified in **Table 10**. In addition to the operating funding, the

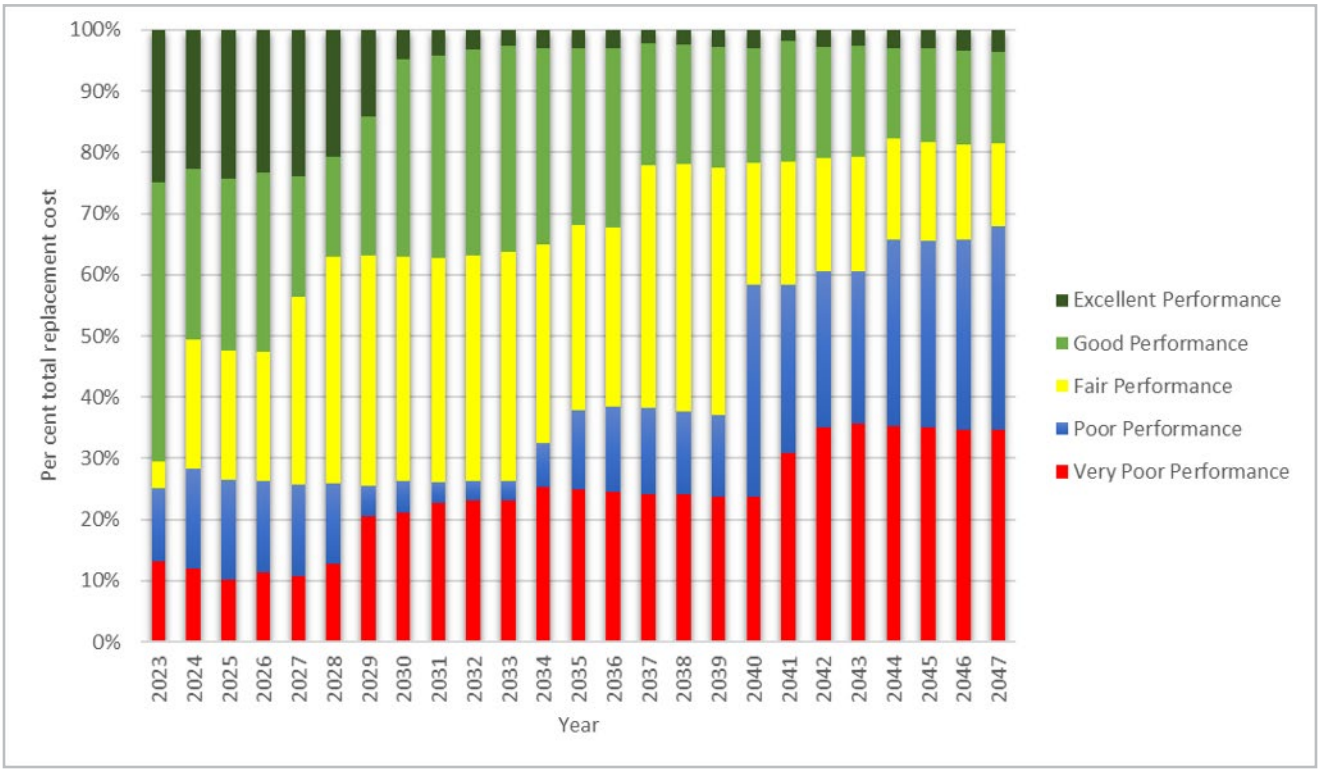
City needs to continue to invest the $200,000 annually as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $200,000 annually.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.3.5.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Approximately 25% of parking assets are currently considered in poor or very poor performance as illustrated in **Figure 82**. Over the 25-year timeline, with the current level of funding, we anticipate the percentage of our parking assets with poor or very poor performance profiles to increase from 25% in 2023 to approximately 68% by 2047, which is anticipated to be unacceptable to most interested and affected parties. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that parking assets have an annual infrastructure funding gap of $400,000.

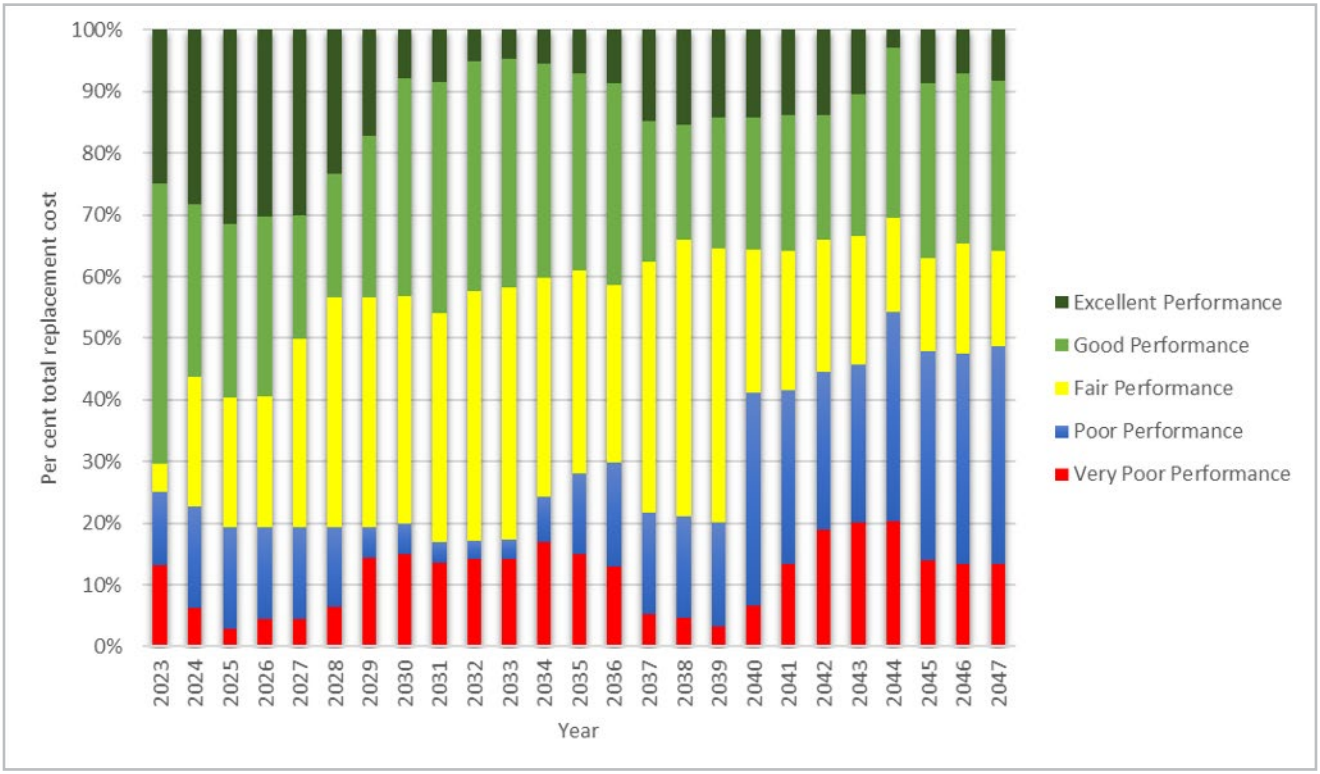
FIGURE 82: PROJECTED ANNUAL PERFORMANCE OF PARKING ASSETS IN THE BUDGET SCENARIO



8.3.5.4.2 Target Performance and Required Expenditures

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $600,000 over the next 25 years is required to achieve the target performance profile for the parking assets. In the target scenario, the portion of the asset class with poor or very poor performance profiles is anticipated to be just under 50%, an improvement slightly when compared to the budget scenario as illustrated in **Figure 83**.

FIGURE 83: PROJECTED ANNUAL PERFORMANCE OF PARKING ASSETS IN THE TARGET SCENARIO

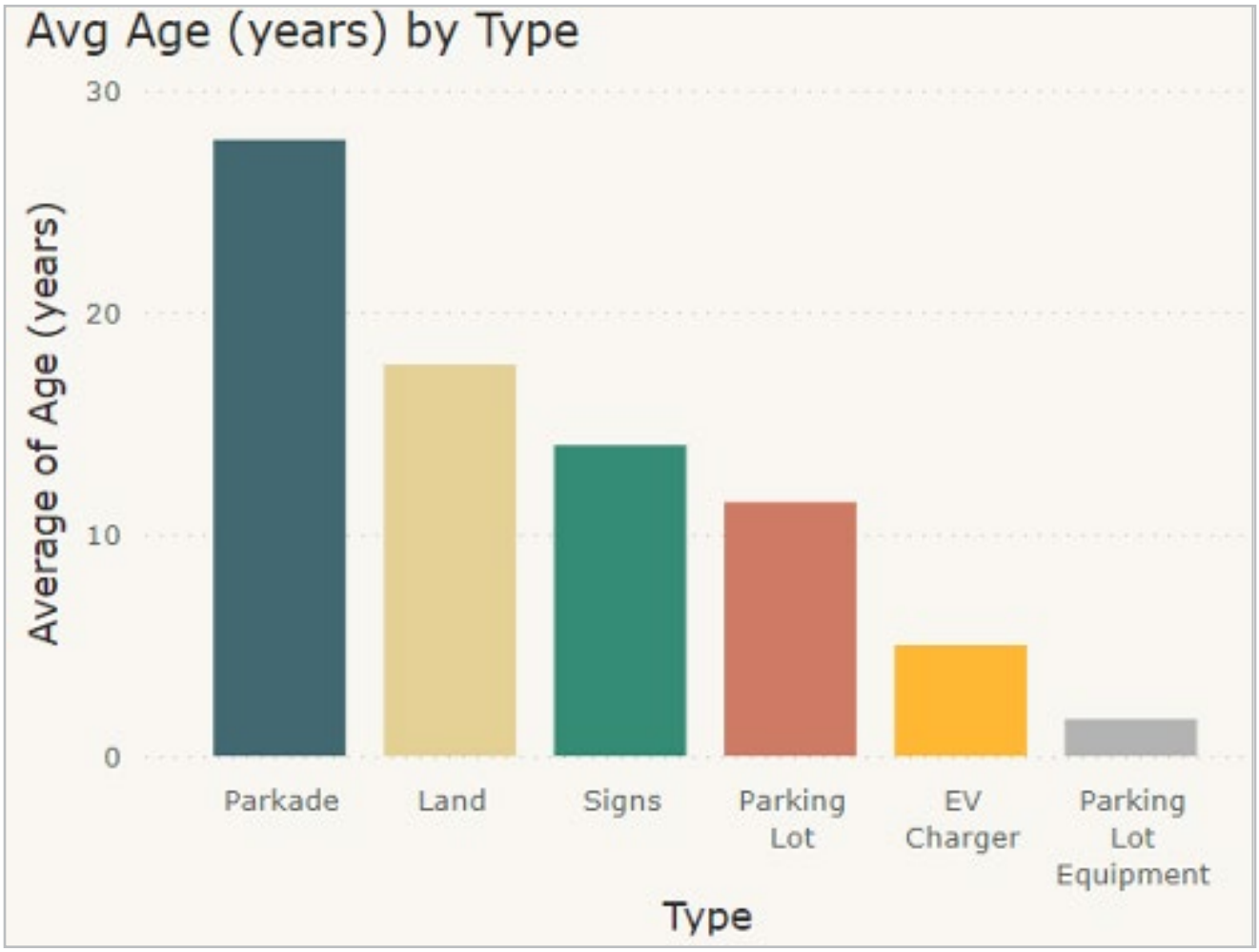


The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are rehabilitated, repaired, or replaced when they have reached the end of their life (age or condition). It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets will be in each performance category and a portion will be in poor or very poor until they are replaced.

8.3.5.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 84** for the City's parking assets.

FIGURE 84: AVERAGE AGE (YEARS) FOR PARKING



The following tables show the levels of service established by the City for parking assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, parking metrics have been developed in a collaborative effort between SMEs and Asset Management staff. Parking metrics are identified below in **Table 71** and Table 72 and include metrics for the 2021 and 2022 calendar years.

TABLE 71: PARKING COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION	2022
Scope	Description, which may include maps, of the parking network supporting all forms of transportation in Uptown Waterloo.	Map included in **Figure 85**

TABLE 72: PARKING TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Scope	Maintenance inspections completed (per cent)	56.5	65.1
Quality	Average condition for unpaved lots in Uptown Waterloo (e.g. excellent, good, fair, poor, or very poor)	Poor	Very Poor
	Parking structure assets that are in fair or better condition (percent)	56%	75%

FIGURE 85: CITY OF WATERLOO UPTOWN PARKING MAP

8.3.5.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to parking assets.

8.3.5.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.1.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for parking assets.

8.3.5.7 Demand Management Plan

As noted in section 5.1.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes and **Table 73** below identified the drivers for the parking asset class.

TABLE 73: PARKING EQUIPMENT DEMAND DRIVERS*

DEMAND DRIVER	PRESENT POSITION	PROJECTION	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
EV Charging Stations – Community Use (joint driver for Parking and Facilities)	The City owns four community use-charging stations. One belongs in the Parking asset class at Waterloo Town Square North Lot. Three belong in the facilities asset class at the following locations: Albert McCormick Community Centre, Moses Springer Community Centre and Waterloo Memorial Recreation Centre (WMRC). There are three EV charging stations owned by the City-funded organization Grand River Energy. These include Williams Street, 100 Father David Bauer Drive and Father David Bauer Drive at Erb Street.	TransformWR Action 2.2.1 – Provide more public electric vehicle charging stations in public spaces, commercial.	An increase in transformer capacity is anticipated when multiple EV charging stations are installed. The cost of increasing the back-end electrical infrastructure to support higher electricity demand is anticipated to cost more than $100,000 and will need to be considered.	The development of a community EV Charging Station Policy and Implementation Plan in collaboration with community partners.

* Demand Drivers for the Parking asset class are for parking equipment only. The City monitors parking demand through Parking Utilization Studies.

8.3.5.8 Risk

The risk associated with not undertaking the treatment options available for parking assets is a reduced lifespan resulting in the need to replace assets earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the parking asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the parking level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are included in section 5.3. Information related to parks asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.3.5.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the Budget Scenario (current LOS) and Target Scenario (proposed LOS) for parking assets over the next 25 years is an annual average of $400,000. To ensure management of parking assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

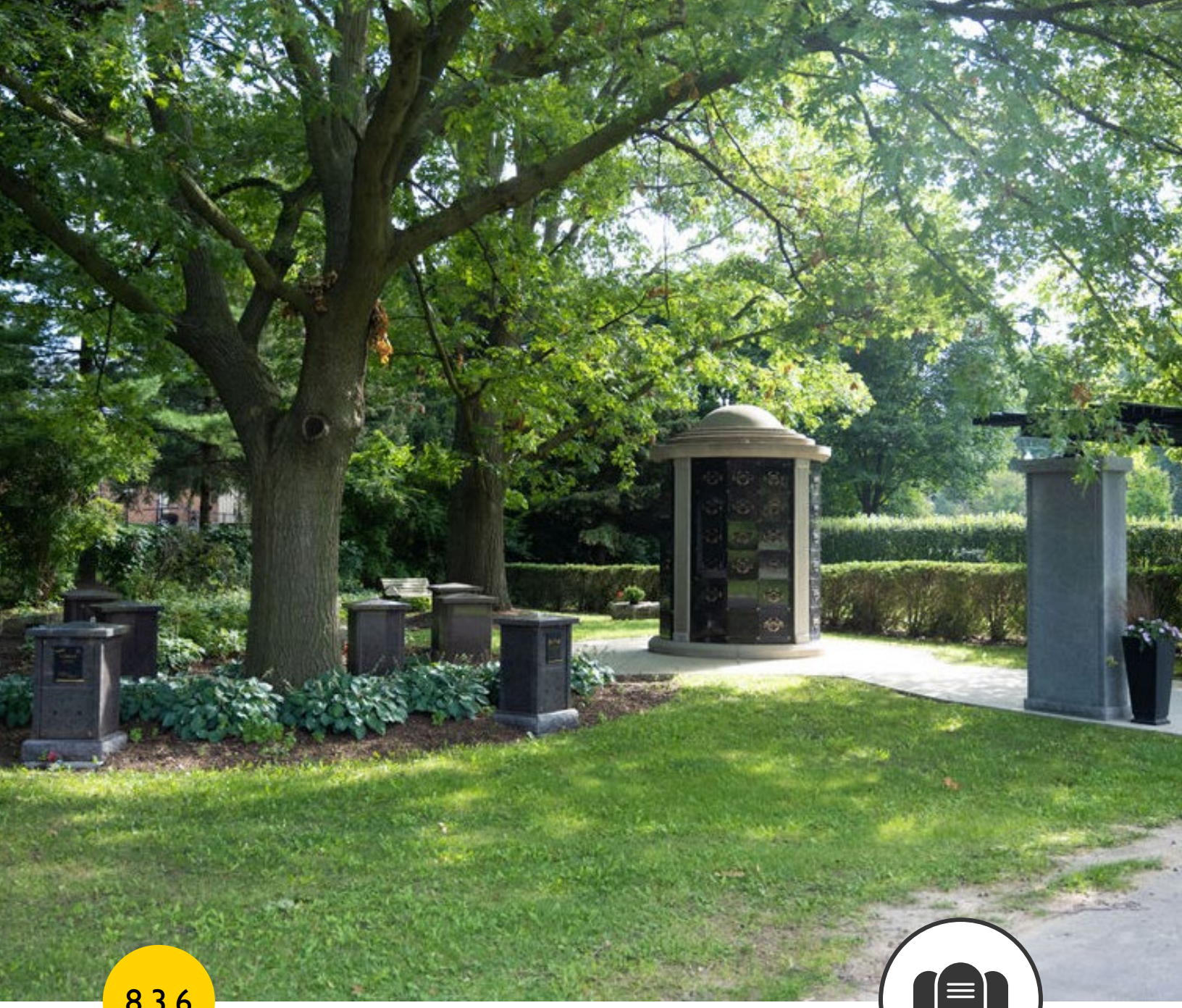
- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time with respect to sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be used in day-to-day decision-making

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress



8.3.6

Cemeteries

8.3.6.1 What do we own and what is it worth?

The 2023 replacement value of the City's cemeteries is estimated at $15 million and includes 2 cemeteries which include assets such as trees, walking paths, an administrative building, a chapel, and a crematorium. It is important to note that fleet and associated equipment (e.g. mini excavator, Gators, zero turn mowers etc.) is captured under the fleet asset class.

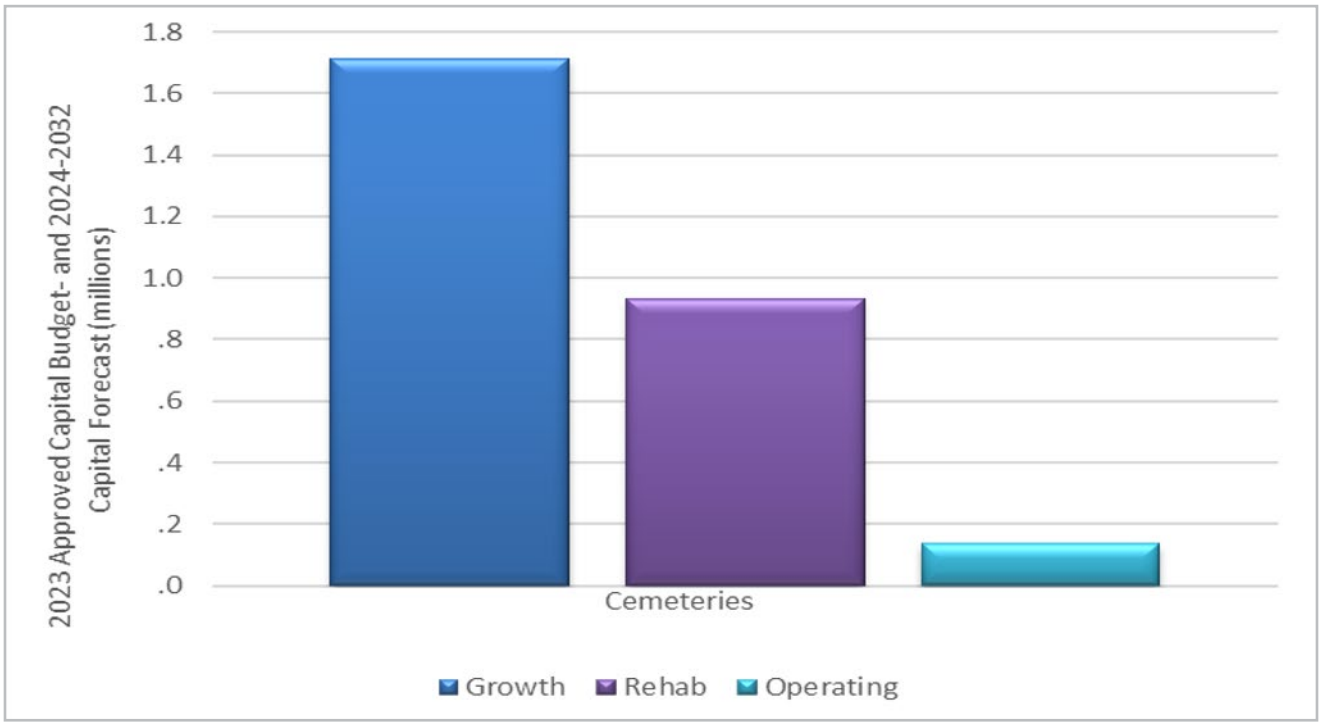
Please see section 5.1 for an overview of the context and asset management regarding ownership and replacement value. The information presented within this plan is based on 2023 data for asset inventory, performance, and degradation curves, along with funding included in the Approve 2023 Capital Budget and 2024-2032 Capital Forecast.

8.3.6.2 Allocation of Infrastructure Funding

Please see section 5.2 for an overview of the general context and appropriate asset management interpretation regarding the allocation of infrastructure funding.

As indicated in section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the 2023 Approved Capital Budget and 2024-2032 Capital Forecast, it is estimated that the City will invest almost $2.8 million over the next ten years in Cemetery assets, of which $900,000 is for rehabilitation of assets. The estimated distribution of the funding is shown in **Figure 86**.

FIGURE 86: 2023-2032 CAPITAL FUNDING DISTRIBUTION FOR CEMETERIES



The growth component for the park's asset class is related to needs for new columbarium structures and a crematorium retort expansion. On average, almost 93% of cemetery assets as a percentage by replacement cost ($14 million) will need to be rehabilitated or replaced in 25 years or longer to maintain the service they

provide to the community. As new infrastructure or assets are added due to growth, the need for reinvestment increases (the percentage and value of assets that will need to be rehabilitated or replaced will increase) and will subsequently impact the infrastructure funding gap.

The City also spends money on infrastructure through its annual operating budget. **Table 10** within section 4.3 summarizes the planned expenditures in the approved 2023 operating budget. The 2023 operating budget included $67,000 in funding considered to be directly related to treating cemetery assets building and equipment maintenance.

For the 2024 AMP, the Waterloo DSS analysis is utilizing the most recently approved capital budget and forecast, the 2023 Approved Capital Budget and 2024-2032 Capital Forecast. In addition, unspent Council-approved rehabilitation and replacement funding from prior budget cycles has also been included for projects currently underway. The Waterloo DSS then uses the City's 10-year average capital funding for the remaining years 11-25.

Based on that methodology, the City will invest an average annual of $100,000 over the next 25 years on Cemetery assets. Based on the best available cemetery asset data, deterioration rates and 2023-2032 capital funding, we estimate that Cemetery assets have an average annual infrastructure funding gap of $100,000 as outlined in **Table 12** in section 4.4. The average annual infrastructure-funding gap is influenced by escalating construction costs, continued deterioration, rehabilitation or replacement improvements, improved asset inventory data, and the addition of assets that were previously excluded. As each of these inputs is enhanced, the average annual infrastructure-funding gap is refined. It is estimated that this process will take several years and that, during that time, the estimated annual infrastructure gap will be progressively amended to reflect new and/or improved information.

8.3.6.3 Lifecycle Management Strategies

Please see section 5.3 for an overview of the general context and appropriate asset management interpretation regarding rehabilitation or replacement strategies.

O. Reg 588/17 requires municipalities to document a lifecycle management and financial strategy for assets for a ten-year period. The Waterloo DSS forecasts the cemetery's asset class performance and corresponding expenditure over 25 years. Once the forecast activities are within the one to three-year span, SMEs determine the appropriate treatment which ranges from maintenance activities (e.g. painting), to repairs (e.g. roof replacements) through to full replacement.

Within the cemeteries asset class, there are multiple categories including facilities such as the crematorium and chapel, roadways, utilities, and trees. The cemetery's utilities include water distribution, wastewater and stormwater conveyance, natural gas, and electricity. The cemetery's asset class is funded by user fees. The current funding model will experience significant funding challenges and a future detailed assessment of the sustainability of an enterprise model will need to be examined.

The cemetery facilities are managed like other City-owned facilities, where individual components are refurbished or replaced as they reach the end of their useful life. Roadways and utilities are replaced when they reach the end of their useful life. Trees are removed and replaced when they are dying, damaged or impacted by invasive pests. The tree's useful life ranges from 50 to 200 years and varies depending on the species of tree.

Examples of the lifecycle activities or treatments that the City of Waterloo uses to maintain levels of service and manage risk are identified in **Table 74**. The City's current performance for park assets is outlined in section 8.3.6.4.1 and the target performance is outlined in section 8.3.6.4.2. When projecting the performance of assets, condition is important and currently cemetery asset condition is primarily age-based however the condition of Cemetery surface parking lots and interior roadways is assessed through a pavement condition inspection process on a bi-annual basis.

TABLE 74: CEMETERY TREATMENT EXAMPLES

ASSET SUB-CLASS	MAINTENANCE	REHABILITATION	REPLACEMENT
Facilities	Localized repairs (e.g. tile replacement, painting)	Component replacement (e.g. windows, roof)	Full replacement of the building (very rare)
Roadways or Laneways	Localized repairs such as pothole repair, crack sealing	Pavement removal and replacement (i.e. resurfacing)	Removal of asphalt and granular base, replacement with new (i.e. reconstruction)
Utilities	Scheduled maintenance, Flushing, or Spot Repairs	Repair or Structural lining	Full replacement
Trees	Trimming/pruning Tree elevating		Removal and replanting

When determining the treatment approach to utilize, SMEs consider all the available information including the factors identified section 5.3 when determining the treatment choice with the optimal cost/benefit to the community. SMEs will adjust treatments and costs from the original forecast as more information becomes available. The additional information allows SMEs to choose the optimal solution for the City.

8.3.6.4 Level of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service. As noted in section 3.5, each asset class has two scenarios that are included within this plan, the budget scenario, and the target scenario. The budget scenario projects future asset performance, based on current asset performance, deterioration rates, and Council-approved funding. The target scenario generates the infrastructure expenditure needed to achieve the target levels of service established through collaboration with SMEs. Both scenarios use a similar approach for the first year of the projection by using the weighted average of replacement cost based on the current asset inventory, performance, replacement costs, and the approved infrastructure funding. The remaining years are a projection based on the deterioration of the assets along with the rehabilitation or replacement of assets based on the approved/forecasted infrastructure funding approved by Council.

An important component is the method of projecting performance is how the assets as assessed. Cemeteries asset performance is evaluated using historical knowledge, age and observed conditions. Cemetery assets are replaced when they fall below the target performance for the respective component. The buildings, which have the greatest impact on our cemetery service delivery, have higher performance standards than other parts, such as the trees or walking paths. The buildings are typically rehabilitated through the replacement or refurbishment

of individual components or groups of components. Each component has an industry-accepted estimated service life that is combined with observations about the condition of each component during site investigations. The estimated service life for all our cemetery assets ranges between five and 200 years. The current data maturity level for cemetery assets is assessed to be medium. The City is continuously working to improve asset data quality as outlined in section 3.1.

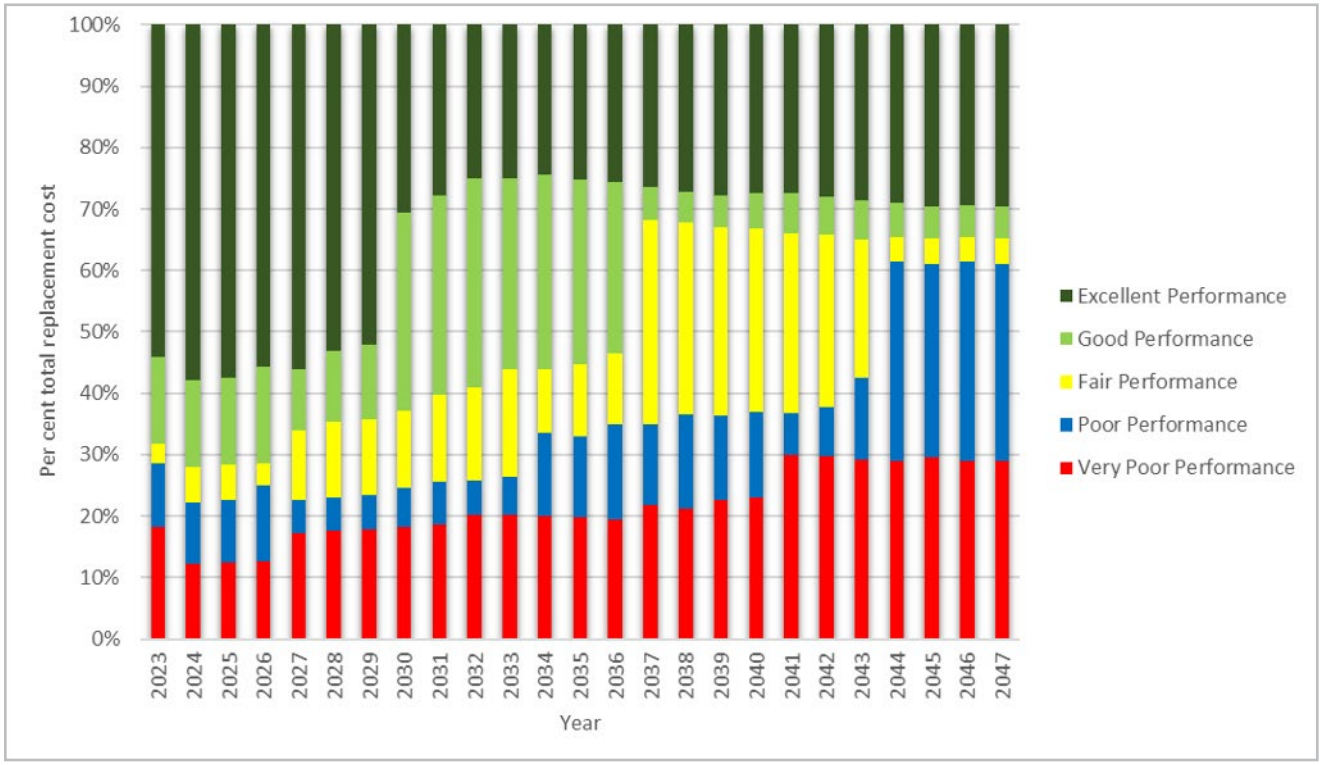
Section 8.3.4.3 identifies the lifecycle management activities required to provide the levels of services offered by cemetery assets and are funded through the capital and operating budgets. To maintain the current level of service provided in 2023, the City needs to maintain the annual operating budget funding of $67,000 considered to be directly related to treating cemetery assets as identified in **Table 10**. In addition to the operating funding, the City needs to continue to invest the $100,000 annually as identified in **Table 12**. The total funding required to provide the lifecycle activities to maintain the current level is $200,000 annually.

The forecasted funding requirements to accommodate growth to maintain services are identified in **Table 11** and will be evaluated, refined, and considered for approval by Council through each budget process.

8.3.6.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Approximately 29% of cemetery assets are currently considered in poor or very poor performance categories as illustrated in **Figure 87**. With the current level of funding, we anticipate the percentage of cemetery assets with a poor or very poor profile to increase from 29% to 61% by 2047. Based on the best available asset data, deterioration rates and 2023-2032 capital funding, we estimate that Cemetery assets have an annual infrastructure funding gap of $100,000.

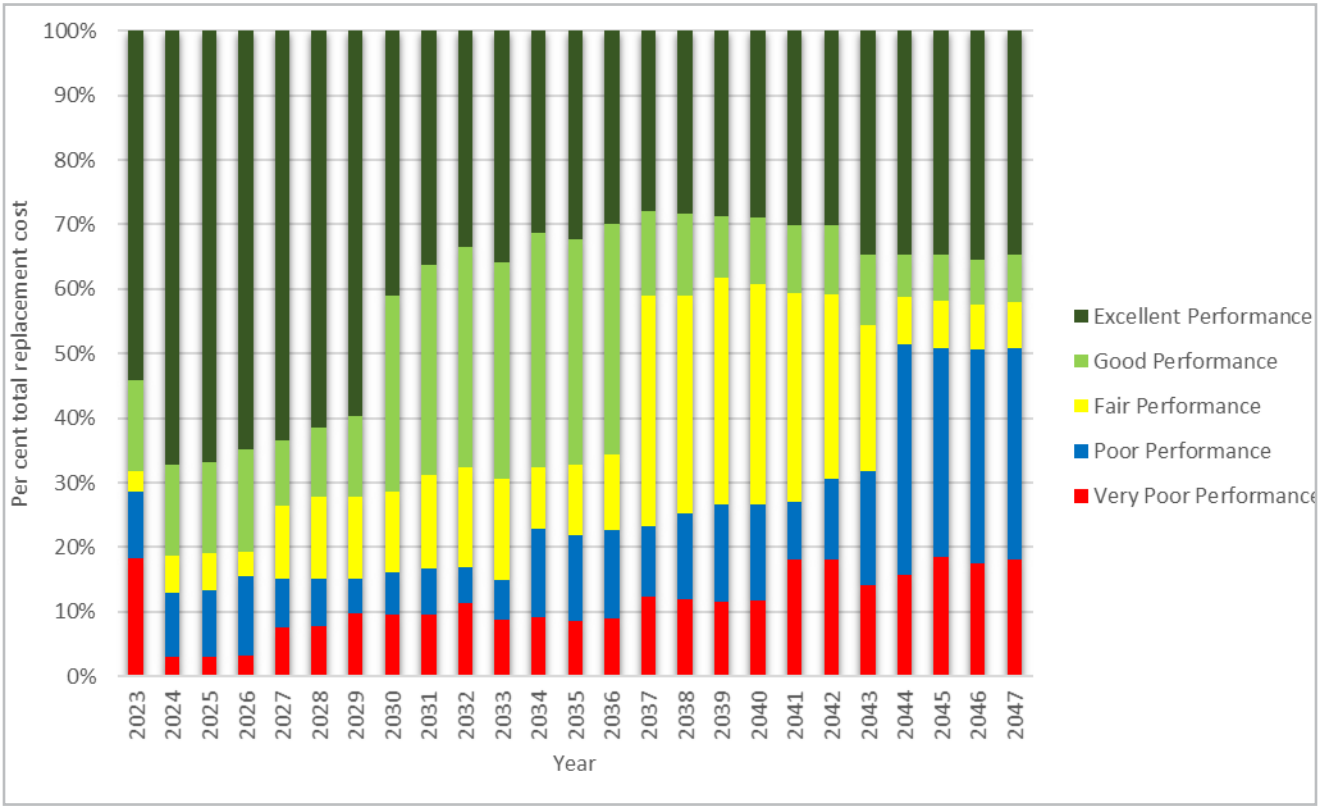
FIGURE 87: PROJECTED ANNUAL PERFORMANCE OF CEMETERY ASSETS IN THE BUDGET SCENARIO



8.3.6.4.2 Target Performance and Required Expenditures

In addition to providing information on current performance, municipalities are required to indicate target performance for each year, for a ten-year timeframe. Based on analysis completed by City of Waterloo staff an average annual expenditure of approximately $200,000 over the next 25 years is required to achieve the target performance profile for the cemetery assets. In the target scenario, the portion of the asset class with fair, good, and excellent performance to improve slightly when compared to the budget scenario as illustrated in **Figure 88**.

FIGURE 88: PROJECTED ANNUAL PERFORMANCE OF CEMETERY ASSETS IN THE TARGET SCENARIO



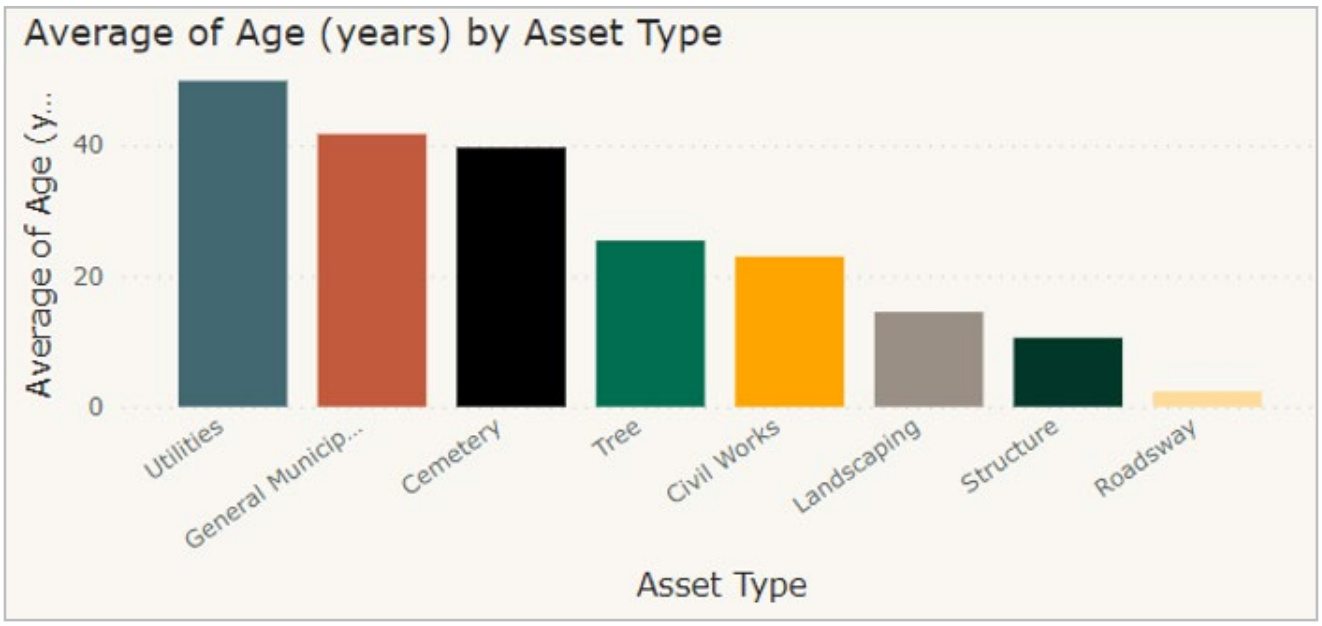
The target performance profile is based on the 2023 asset inventory, using the SME's professional management of the estimated service life of the asset, and informed by condition data. Through discussions with SMEs, there is an understanding and knowledge that there are some assets that are replaced when they have reached the end of their life (age or condition) before being replaced. It is important to note that it is not financially sustainable to maintain all our assets in excellent condition and that some will be further along in their life. This results in a portion of our assets will be in each performance category and a portion will be in poor or very poor until they are replaced.

8.3.6.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for

municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 89** for the City's cemetery assets.

FIGURE 89: AVERAGE AGE (YEARS) FOR CEMETERY ASSETS



The following tables show the levels of service established by the City for cemetery assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, cemetery metrics have been developed in a collaborative effort between SMEs and Asset Management staff. Cemetery metrics are identified below in **Table 75** and **Table 76** and include metrics for the 2021 and 2022 calendar years.

TABLE 75: CEMETERY COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION
Scope	Waterloo cemeteries provide inclusive cremation or burial services within the City. The crematorium and cemeteries are also an integral part of the regional death care response for the tri-cities.

TABLE 76: CEMETERY TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Reliability	Cemetery assets that are in fair or better condition (percent)	71%	71%
	The average pavement condition index value for paved roads in the cemetery (percent)	93%	94.5%

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Environmental Stewardship	Annual electricity consumption (kilowatt hour)	2,217 kWh	1,276 kWh
	Annual natural gas consumption (cubic metres)	87,538 m^3	95,800 m^3
	Annual greenhouse gas emissions (GHG), tonnes of carbon dioxide equivalent (tCO2e)	184 tCO_2e	204 tCO_2e

8.3.6.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

This change will help identify the funding needed to replace existing assets to meet current design needs, follow Council direction, influence climate change related capital project implementation such as reducing GHG emissions, and reach strategic plan or master plan goals.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to cemetery assets.

8.3.6.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation.

As noted in section 5.6, the climate change impacts on infrastructure have not been included in the budget and target scenarios throughout this plan. This includes the to-be-determined financial impacts of Council's decision on October 16, 2023, to set an ambitious new goal for the corporation to achieve net-zero emissions — the point at which the City does not emit greenhouse gas emissions or offsets its emissions — by 2050. AM staff will collaborate with SMEs to incorporate climate change adaptation and mitigation for cemetery assets.

A new crematorium unit has been installed and utilizes technology enhancements and development optimizations since the previous units were built in the 1970s. It is also able to complete the task of cremation with a higher level of automation. This will result in a more efficient operation using lower levels of natural gas per cremation.

8.3.6.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the organization at all levels visualize the projected performance of the City's infrastructure, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes.

8.3.6.8 Risk

The risk associated with not undertaking the treatment options available for cemetery assets is a reduced lifespan resulting in the need to replace assets earlier than desired. Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the cemetery asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the cemetery level of service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS provides information to staff for their review and consideration when recommending assets for replacement or rehabilitation of underperforming infrastructure and the related consequences are minimized.

In addition to their inherent expertise, to minimize risk SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are included in section 5.3. Information related to parks asset management is included within the Waterloo DSS, providing staff with another tool to inform comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.3.6.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the Budget Scenario (current LOS) and Target Scenario (proposed LOS) for cemetery assets over the next 25 years is an annual average of $100,000. To ensure management of cemetery assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time for sharing information required for the Waterloo DSS
- Continuous effort in increasing performance data collection capabilities
- The addition of asset condition data, when available, into the Waterloo DSS

- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles
- Investigate and incorporate the modern equivalent practices, when available
- Investigate and incorporate climate change adaptation and mitigation impacts
- Partnering with SMEs to better understand their practices to provide data that can be use in day-to-day decision-making

Operational steps will include:

- Where applicable, developing data and condition collection processes
- Continuous engagement with SMEs on progress

8.4.1

Appendix D — Uptown Business Improvement Area

8.4.1 Uptown Business Improvement Area

A Business Improvement Area (BIA) is a geographical area that is established through municipal By-law and is governed under The Municipal Act of Ontario. With support from the municipality, a BIA coordinates the organization, physical improvement, and economic development of the business area. BIAs are governed by a volunteer Board of Directors, composed of businesses, property owners, persons voted in by rate-paying members and at least one member of the municipal Council. The Board is elected every four years in conjunction with Municipal elections. The Board represents the BIA membership and advocates on their behalf. The BIA holds an Annual General Meeting, at which point annual budgets are approved by the membership.

The Uptown Waterloo BIA was formed in 1972 and is a Board of Management of the City of Waterloo Council with the boundary delineated by the City of Waterloo. The Uptown Waterloo BIA exists to promote, beautify, and enhance the urban experience of Uptown Waterloo; the role of the Uptown Waterloo BIA in redevelopment is to aid and assist the interests of Uptown business with relevance to consumer markets, neighbourhood residents, overall aesthetic, and the continued positive evolution of the Uptown core.

8.4.1.1 What do we own and what is it worth?

The 2023 replacement value of the Uptown Business Improvement Area's (BIA) assets is estimated at $200,000 and includes Christmas décor, street banners, lighting, benches, waste receptacles and planters. Additional assets include equipment supporting administration and operating initiatives such as laptops, photocopiers, and office furniture.

The information presented within this plan is based on 2023 data for asset inventory and performance, along with funding included in the 2023 Approved BIA Levy.

8.4.1.2 Allocation of Infrastructure Funding

This asset class is unique the Uptown BIA is an independent non-profit organization, financed by a levy on each property owner in the Uptown Waterloo BIA boundary. Most initiatives for the BIA are funded through the BIA Levy and grants applied for by the BIA. The average annual funding for Uptown BIA assets is $40,000.

8.4.1.3 Lifecycle Management Activities

The estimated service life of BIA assets is five to seven years. BIA asset performance is expected to stay in excellent condition with regular maintenance applied. The only risk is vandalism, which this report does not address. The majority of the assets have aged beyond their service life and require replacement in the next year or two.

Approximately 64% of BIA assets are currently considered in poor or very poor performance because the assets are beyond their estimated service life. It is estimated that to maintain the current levels of service, the BIA requires $40,000 on average annually.

8.4.1.4 Level of Service

Please refer to section 5.4 as it provides an overview of the context and asset management regarding levels of service.

Approximately 64% of BIA assets are currently considered in poor or very poor performance. It is estimated that to maintain the current levels of service, the BIA requires $40,000 on average annually.

8.4.1.4.1 Current Performance and Projected impact of Budgeted Capital Expenditures

Uptown BIA is a unique asset class for which modelling parameters are difficult to ascertain and a budget scenario has not been developed.

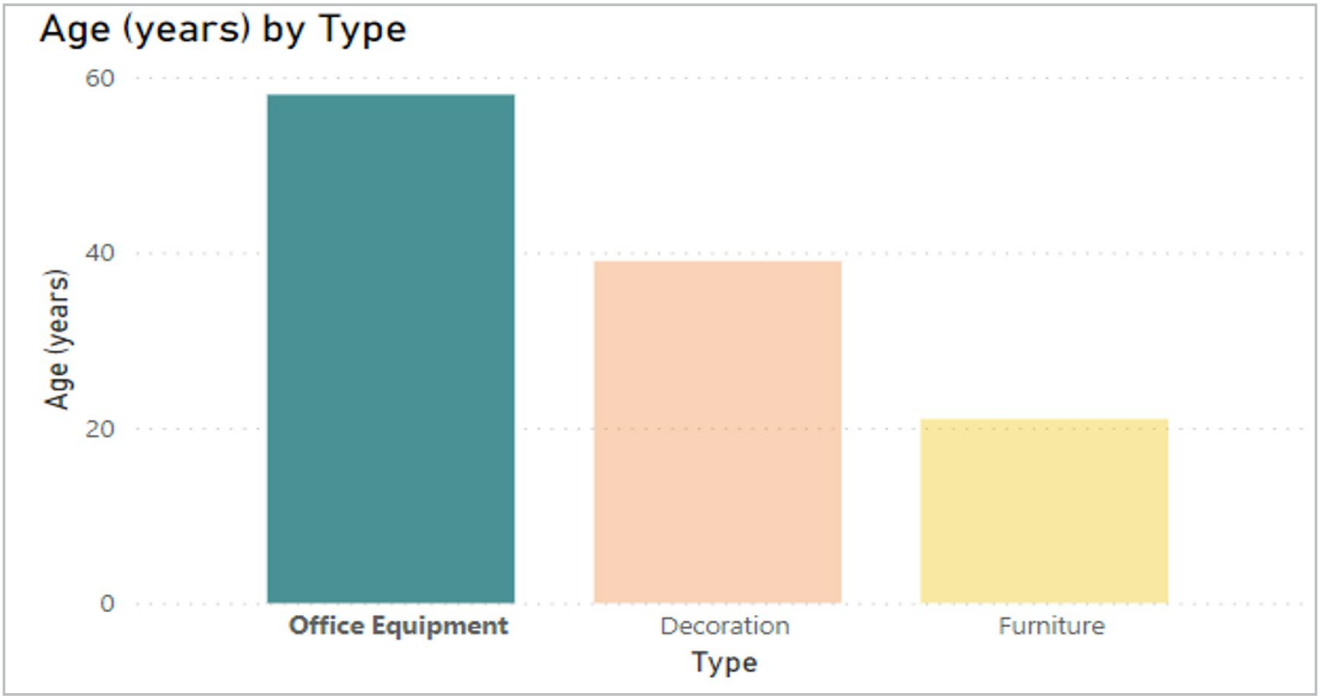
8.4.1.4.2 Target Performance and Required Expenditures

Uptown BIA is a unique asset class for which modelling parameters are difficult to ascertain and a target scenario has not been developed.

8.4.1.4.3 Ontario Regulation 588/17

The Province of Ontario recognized the importance of asset management planning as outlined in section 1.5. O. Reg 588/17, which provides guidelines and expectations for applying asset management principles for municipalities. One of the requirements is reporting the average age of assets as identified in **Figure 90** for the Uptown BIA Assets.

FIGURE 90: AVERAGE AGE (YEARS) FOR UPTOWN BIA ASSETS



The following tables show the levels of service established by the City for Uptown BIA assets. Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on, however metrics for non-core assets are to be developed by each municipality. As a non-core asset, Uptown BIA metrics have been developed in a collaborative effort between the Uptown BIA SMEs and Asset Management staff. The metrics are identified below in Table 77 and Table 78 and include metrics for the 2021 and 2022 calendar years.

TABLE 77: UPTOWN BIA COMMUNITY LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	QUALITATIVE DESCRIPTION
Scope	List of beautification assets in uptown Waterloo.

TABLE 78: UPTOWN BIA TECHNICAL LEVEL OF SERVICE METRICS

SERVICE ATTRIBUTE	TECHNICAL LEVEL OF SERVICE MEASURE	2021	2022
Quality	Monthly banner inspections	N/A	Excellent
	Quarterly lighting inspection	N/A	Excellent
	Proactive graffiti removal program	N/A	Excellent
Reliability	Agreements and Memorandum of Understanding (MOU) in place	N/A	Excellent
	Regular communication with partners	N/A	Excellent

8.4.1.5 Modern Equivalent

As noted in section 5.5, a key methodology initially used by the City was the assumption that end-of-life assets will be replaced in a "like-for-like" manner. On that basis, replacement values were assigned and used to determine the annual infrastructure funding gap.

The modern equivalent approach is not intended to be applied as a "blank" update and requires detailed conversations with SMEs to determine the applicability to Uptown BIA assets.

8.4.1.6 Climate Change Adaptation and Mitigation

Section 5.6 provides an overview of the context and asset management regarding climate change adaptation and mitigation. Uptown BIA is a unique asset class and it is not currently anticipated to impact the City's climate targets.

8.4.1.7 Demand Management Plan

As noted in section 5.7, demand management helps to identify what the City is projecting future demand for services will be. It helps to enable SMEs to plan and identify the best way to meet that demand. Demand for new services is driven by various factors such as climate change, population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

An important function of the City's AM section is to help the Uptown BIA visualize the projected performance of their assets, from various angles of interest for an asset class. Increasing demand on infrastructure is a theme that affects all asset classes.

8.4.1.8 Risk

Section 5.8 provides an overview of the context and asset management regarding risk. Risk related to the Uptown BIA asset class is managed through SME knowledge and expertise. This approach ensures that the Uptown BIA supports the community's socioeconomic growth over the short and long term.

8.4.1.9 Conclusion and Next Steps

The infrastructure funding gap, the difference between the budget scenario (current LOS) and target scenario (proposed LOS) for Uptown BIA assets over the next 25 years is an annual average of $40,000. To ensure management of Uptown BIA assets continues to be optimal, future asset management steps will aim to find the most efficient means of reporting and sharing information with the Uptown BIA.