


2021

HALTON REGION

Asset Management Plan




Halton REGION

Foreword

Halton Region (the Region) was established in 1974 and today serves more than 610,000 residents within the City of Burlington, the Town of Halton Hills, the Town of Milton, and the Town of Oakville. Halton is one of the fastest growing communities in Canada and is situated on the northern shore of Lake Ontario within the industrial and commercial heartland of Ontario, Canada.

The Region is within a 640 km radius of some of the largest population centres and markets in North America. Halton's location within the Greater Toronto Area, as well as its close proximity to the United States, translates into expanded business and professional employment opportunities for residents.

Halton Region's infrastructure includes an integrated transportation network of roads and bridges, stormwater management, water treatment and distribution, wastewater collection and treatment, waste management collection, disposal and recycling assets, paramedic services, public health services, services for vulnerable residents (social housing, long-term care for seniors and child care facilities and subsidies), and administration facilities for police and other service departments. All of these services are dependent on the Region's infrastructure assets, that help ensure safe, reliable and consistent service. Asset management is the systematic approach that the organization applies to manage the lifecycle of these assets, with the ultimate goal of meeting expected levels of service and minimizing risks in a cost-effective manner.

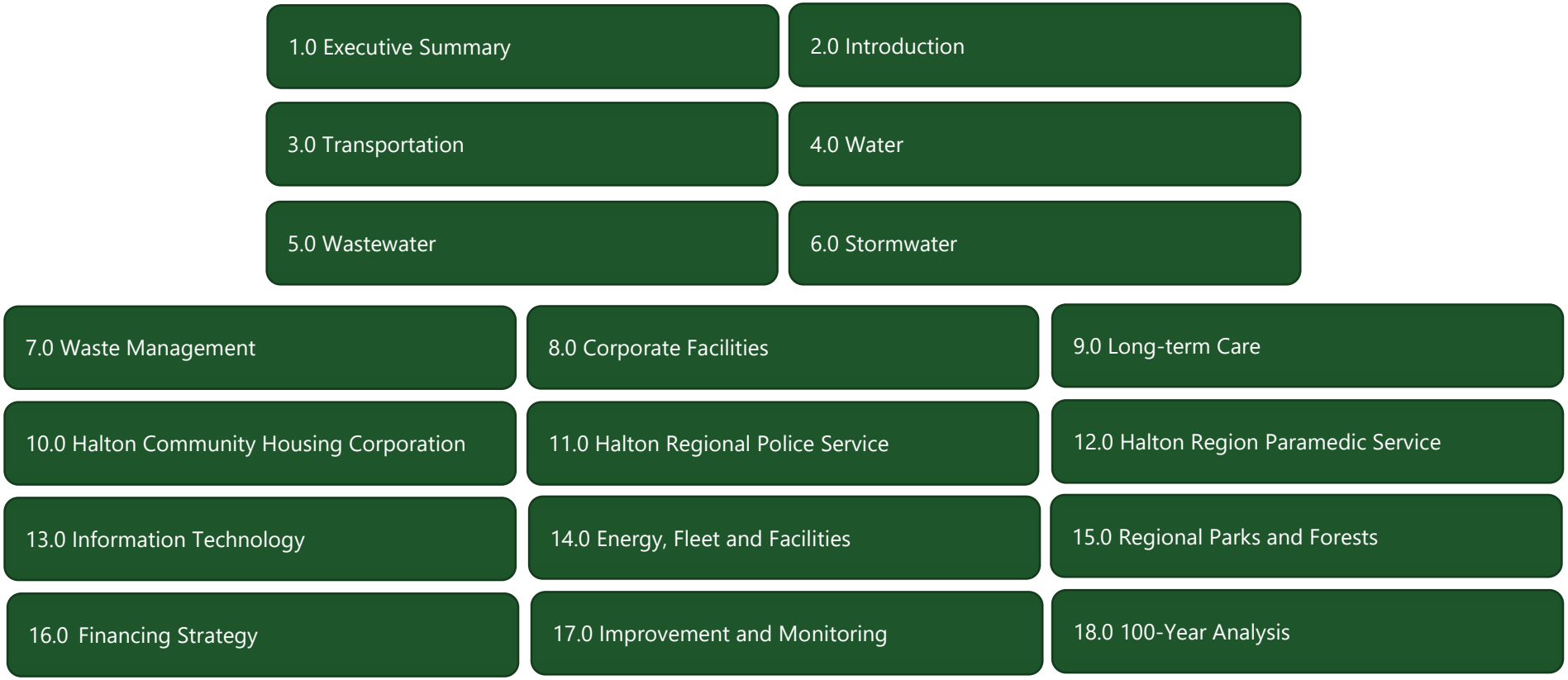
Guided by the Region's Corporate Asset Management Policy, this Asset Management Plan describes the infrastructure that the Region owns, operates and maintains to support services to the community. This document identifies what has been achieved, what is being done and what needs to be done to ensure services provided to citizens, businesses and institutions are delivered based on desired levels of service while maintaining financial sustainability. Future iterations of this plan will also integrate ways to adapt to and mitigate the impacts that climate change has on the Region's infrastructure assets. With the increase in frequency and severity of extreme weather events in Southern Ontario, municipalities must consider the strain that these events will have on their systems and ultimately their ability to maintain levels of service.

The Region has been applying asset management principles ever since the first assets were constructed, operated and maintained by the municipality. Through the years, the Region has been a strong advocate of asset management and has established structured asset management approaches since 2006. Building upon over 15 years of significant efforts from across the organization, this plan aims to set the foundation for the next steps in the Region's Asset Management journey. This approach will continue to provide a robust, transparent and consistent methodology while maintaining the Region's strong financial position and long-term sustainability. Halton Region's commitment to managing its assets aligns with directions and objectives reflected in Halton's Budget and Business Plan, Strategic Business Plan and Regional Official Plan. The asset management program is a key component in achieving Halton Region's vision – to enhance the quality of life for all people of Halton today and into the future.

Summary Table of Contents

This Asset Management Plan includes "core" and "other" municipal infrastructure assets as defined by the Ministry of Infrastructure. Figure 1 provides a link to each of the key sections of the Asset Management Plan. The definition and structure of each of the sections is provided in Section 2.0 Introduction. Please click the section title in the figure to navigate to that section.

Figure 1. Links to Each Asset Management Plan Section



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Abbreviations

Acronym	Definition
AMP	Asset Management Plan
ATMS	Advanced Traffic Management System
BCI	Bridge Condition Index
CCTV	Closed Circuit Television
CDM	Conservation and Demand Management
CNA	Condition Needs Assessment
CWWF	Clean Water and Wastewater Fund
DC	Development Charges
DWQMS	Drinking Water Quality Management Standard
ESL	Estimated Service Life
ETR	Express Toll Route
FCM	Federation of Canadian Municipalities
GHG	Greenhouse Gas
HVAC	Heating, Ventilation and Air Conditioning
I&I	Inflow and Infiltration
IT	Information Technology
LOS	Levels of Service
MACP	Manhole Assessment and Certification Program
O. Reg	Ontario Regulation
OSIM	Ontario Structure Inspection Manual
PACP	Pipeline Assessment and Certification Program
PQI	Pavement Quality Index
PSAB	Public Sector Accounting Board
QEW	Queen Elizabeth Way
SCADA	Supervisory Control and Data Acquisition
TCA	Tangible Capital Asset
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Definitions

Note: Terminology within this document has been developed to align with the ISO55000 series of standards where possible. The following definitions draw from the following sources:

- ISO/IEC 55000:2014(E) pp.10-15
- Gulati (2020) Uptime Elements Dictionary for Reliability Leaders and Asset Managers
- IPWEA (2015) International Infrastructure Management Manual

Term	Definition
Asset	Item, thing or entity that has potential or actual value to an organization. Value can be tangible or intangible, financial or non-financial, and includes consideration of risks and liabilities. It can be positive or negative at different stages of the asset life. Physical assets usually refer to equipment, inventory and properties owned by the organization. Physical assets are the opposite of intangible assets, which are non-physical assets such as leases, brands, digital assets, use rights, licences, intellectual property rights, reputation or agreements. A grouping of assets referred to as an asset system could also be considered as an asset.
Asset Management	Coordinated activity of an organization to realize value from assets. Realization of value will normally involve a balancing of costs, risks, opportunities and performance benefits. Activity can also refer to the application of the elements of the asset management system. The term "activity" has a broad meaning and can include, for example, the approach, the planning, the plans and their implementation.

Term	Definition
Asset Management Plan	Documented information that specifies the activities, resources and timescales required for an individual asset, or a grouping of assets, to achieve the organization's asset management objectives. The grouping of assets may be by asset type, asset class, asset system or asset portfolio. An asset management plan is derived from the strategic asset management plan. An asset management plan may be contained in, or may be a subsidiary plan of, the strategic asset management plan.
Asset Management System	Management system for asset management whose function is to establish the asset management policy and asset management objectives. The asset management system is a subset of asset management.
Asset Portfolio	Assets that are within the scope of the asset management system. A portfolio is typically established and assigned for managerial control purposes. Portfolios for physical hardware might be defined by category (e.g., plant, equipment, tools, land). Software portfolios might be defined by software publisher, or by platform (e.g., PC, server, mainframe). An asset management system can encompass multiple asset portfolios. Where multiple asset portfolios and asset management systems are employed, asset management activities should be coordinated between the portfolios and systems.

Term	Definition
Asset Type	Grouping of assets having common characteristics that distinguish those assets as a group or class (for example, physical assets, information assets, intangible assets, critical assets, enabling assets, linear assets, information and communications technology (ICT) assets, infrastructure assets, moveable assets).
Capability	Measure of capacity and the ability of an entity (system, person or organization) to achieve its objectives. Asset management capabilities include processes, resources, competences and technologies to enable the effective and efficient development and delivery of asset management plans and asset life activities, and their continual improvement.
Computerized Maintenance Management System	A software system that keeps, records and tracks all maintenance activities (e.g., maintenance work orders, preventative maintenance (PM) schedules, PM masters, material parts, work plans and asset history). Usually, it is integrated with support systems such as inventory control, purchasing, accounting and manufacturing, and controls maintenance and warehouse activities.
Continual Improvement	Recurring activity to enhance performance.
Enterprise Asset Management	Coordinated activity of an organization to realize value from assets using an enterprise or organization-wide approach.

Term	Definition
Enterprise Asset Management System	An information system that integrates all asset related applications for an entire enterprise. An Enterprise Asset Management (EAM) system includes an asset registry (inventory of assets and their attributes) combined with a computerized maintenance management system (CMMS) and other modules (such as inventory or materials management). Assets that are geographically distributed, interconnected or networked, are often also represented through the use of geographic information systems (GIS).
Level of Service	Parameters, or combination of parameters, which reflect social, political, environmental and economic outcomes that the organization delivers. The parameters can include safety, customer satisfaction, quality, quantity, capacity, reliability, responsiveness, environmental acceptability, cost and availability.
Lifecycle	Stages involved in the management of an asset. The naming and number of the stages and the activities under each stage usually vary in different industry sectors and are determined by the organization.

Term	Definition
Objective	Result to be achieved. An objective can be strategic, tactical or operational. Objectives can relate to different disciplines (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, project, product and process). An objective can be expressed in other ways, e.g., as an intended outcome, a purpose, an operational criterion, an asset management objective or by using other words with similar meaning (e.g., aim, goal, or target). In the context of asset management systems, asset management objectives are set by the organization, consistent with the organizational objectives and asset management policy, to achieve specific measurable results.
Organization	Person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives. The concept of organization includes, but is not limited to, sole-trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private.
Organizational Objective	Overarching objective that sets the context and direction for an organization's activities. Organizational objectives are established through the strategic level planning activities of the organization.

Term	Definition
Performance	Measurable result. Performance can relate either to quantitative or qualitative findings. Performance can relate to the management of activities, processes, products (including services), systems or organizations. For the purposes of asset management, performance can relate to assets in their ability to fulfil requirements or objectives.
Policy	Intentions and direction of an organization as formally expressed by its top management.
Preventative Action	Action to eliminate the cause of a potential nonconformity or other undesirable potential situation. Preventive action is taken to prevent occurrence and to preserve an asset's function, whereas corrective action is taken to prevent recurrence. Preventative action is normally carried out while the asset is functionally available and operable or prior to the initiation of functional failure.
Process	Set of interrelated or interacting activities which transforms inputs into outputs.
Requirement	Need or expectation that is stated, generally implied or obligatory. "Generally implied" means that it is custom or common practice for the organization and stakeholders that the need or expectation under consideration is implied. A specified requirement is one that is stated, for example in documented information.
Risk	Effect of uncertainty on objectives. An effect is a deviation from the expected — positive and/or negative. Objectives can relate to different disciplines (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, project, product and process). Risk is often characterized by reference to potential "events" and "consequences", or a combination of these. Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated "likelihood" of occurrence. Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood.

Term	Definition
Stakeholder	Person or organization that can affect, be affected by, or perceive themselves to be affected by a decision or activity. A "stakeholder" can also be referred to as an "interested party".

1.0 Executive Summary

Halton Region is responsible for the delivery of many services that are critical to the community and are dependent on well-managed infrastructure. These services include providing transportation, clean drinking water, wastewater collection and treatment, waste management, social housing, emergency services, and corporate facilities. Each of the services is dependent on a wide variety of linear, vertical, and mobile asset systems that have unique lifecycle behaviours and activities, service expectations, risks and regulations. Asset Management is the coordinated activity of an organization to realize value from assets (ISO55000:2014(E), p. 14). The management practices, objectives and documentation form the components of the Region's asset management system, which is the management system associated with defining the asset management policy, objectives, and practices (IPWEA, 2015; ISO55000:2014(E)).

Delivering an asset management program is not a one-time project, but rather a journey of improvements and enhancements all driving to help municipalities make better informed decisions on asset spending while understanding the impact of this spend on level of service. A municipal asset management journey can take years to develop a comprehensive asset management environment and Halton's program will continually evolve and grow as the community changes and grows.

Since publishing the first Asset Management Plan in 2013, the Region has embarked on several asset management initiatives to establish and enhance the overall asset management framework. In 2014, the Region established an asset management roadmap implementation plan aligned with the Region's Asset Management Plan and corporate structure. This roadmap documented the overall asset management corporate vision and strategic direction, corporate asset management strategy, asset management program, and processes to establish infrastructure investment planning and financing (GM BluePlan Engineering, 2014).

Since then, departments such as Public Works have implemented several initiatives to further enhance asset management practices. The most recent Asset Management Plan was published in 2014, and included transportation, water, wastewater, waste management, corporate facilities and social housing assets. An updated executive summary to the plan was also published in 2015. The Region's 2021 Asset Management Plan is designed to enable the management of infrastructure and services in a way that supports the lifestyles of its residents who have chosen Halton for its beautiful landscape, proximity to a broad employment market, safe and attractive neighbourhoods, excellent services and strong civic pride.

This is a long-range planning document that can be used to support the continuous improvement of asset-related activities for public services and provides a guide for understanding:

- Halton's organizational strategic goals as they relate to and are supported by asset management initiatives.
- The specific asset portfolios included on a Region-wide scale.
- Halton's levels of service and performance standards.
- Demand forecasts from a system perspective.
- The lifecycle activities to operate, maintain, renew and dispose of assets and their cash flow forecasts.
- Key actions to improve asset management practices.

The Asset Management Plan is structured to provide consistency and ease of understanding for readers. For each of the asset portfolios included in the plan, the following subsections will be applied:

1. State of Local Infrastructure
2. Levels of Service
3. Lifecycle Management Strategy
4. Forecasted Lifecycle Activity Costs

The plan is concluded with the Financing Strategy and Improvement and Monitoring sections which are inclusive of all service areas.

Figure E1 illustrates the total replacement value of the infrastructure and facilities owned, operated, and maintained by Region, estimated at a value of over $13 billion. Some are considered "core" assets as defined by the Ministry of Infrastructure (water, wastewater, stormwater, transportation) under Ontario Regulation 588/17

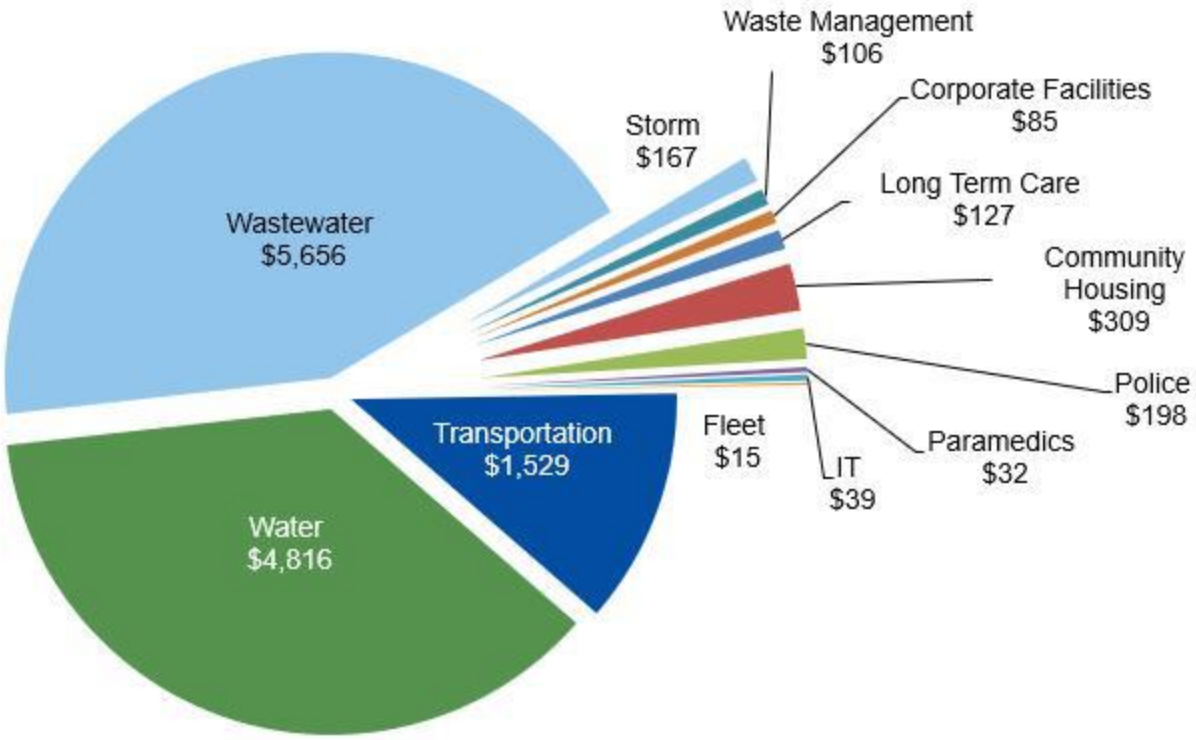


Figure E1. Current Replacement Value ($ Millions) of Region's Infrastructure

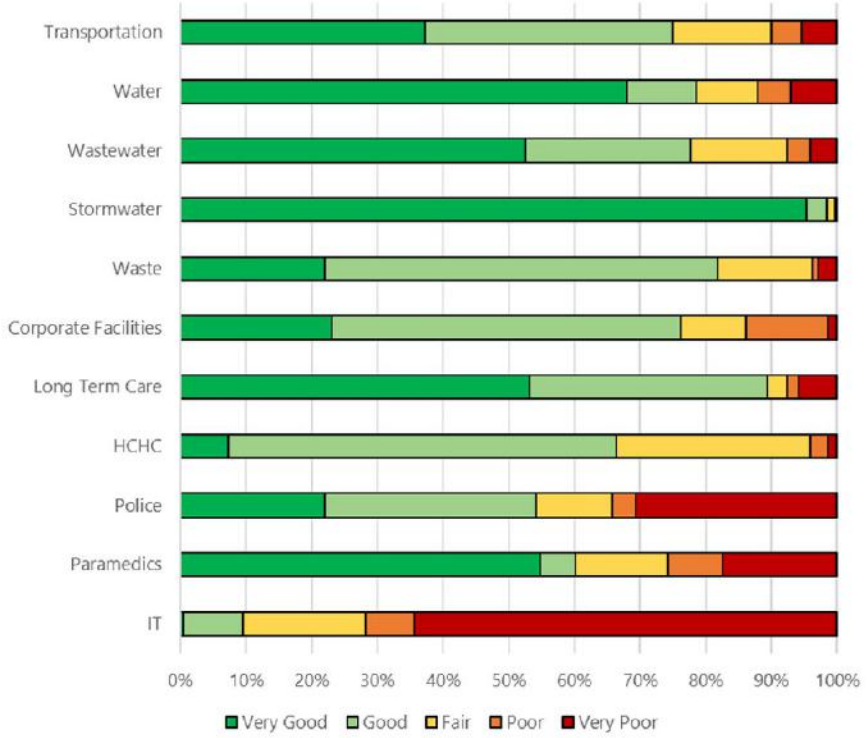
A comprehensive asset register of all assets was built from existing Halton inventories and enhanced where data gaps could be filled. The current condition of assets within each category was assessed using several different methodologies and industry standard scales (i.e., 1-Very Good to 5-Very Poor). Dedicated condition assessment programs have been established for most asset categories, and where a program is not in place, asset condition has been inferred based on the percentage of remaining estimated service life available.

Figure E2 provides the condition distribution of assets as a percentage of replacement value which forms a component of the State of the Infrastructure assessment. The figure shows that overall, the majority of assets are in Very Good or Good condition. Some portfolios with shorter estimated life spans (IT and Police as an example), have a portion of the assets in Fair or lower condition, which is typical and acceptable for assets of this nature. The condition ranking of the assets is not a concern as the purpose of a comprehensive AMP is to ensure that these investments are identified, planned for and funded appropriately (i.e., it is appropriate to run assets to failure if that is the planned lifecycle strategy).

Levels of Service are a key business driver that form one of the key pillars of asset management decision making. Defined Levels of Service describe the planned outcome from the asset from the user or functional performance perspective. Level of Service statements describe the outputs that Halton Region intends on delivering to the community in terms of attributes such as availability, cost-effectiveness, reliability, responsiveness, safety, suitability, and sustainability.

As part of this process, Halton Region determines the current Levels of Service being provided by the infrastructure systems. These frameworks help to provide a relationship between the defined Levels of Service being provided by the Region's infrastructure systems and the associated operating and capital expenditures required to achieve them.

Figure E2. Condition Distribution by Replacement Value



The financing strategy of this Asset Management Plan (AMP) sets out the approach to ensuring that the appropriate funds are available to support the delivery of the specified Levels of Service. The financing strategy considers the revenues, operating and capital expenditures, debt, and future commitments for operating or capital activities related to the assets included within the plan. The strategy builds upon the foundation of the current situation to provide a connection between future capital or operating budgets and asset-related service levels. It is meant to augment current budgeting processes by providing a long-term perspective on the impact of providing higher/lower asset-related service levels to the required revenues and affordability to the community.

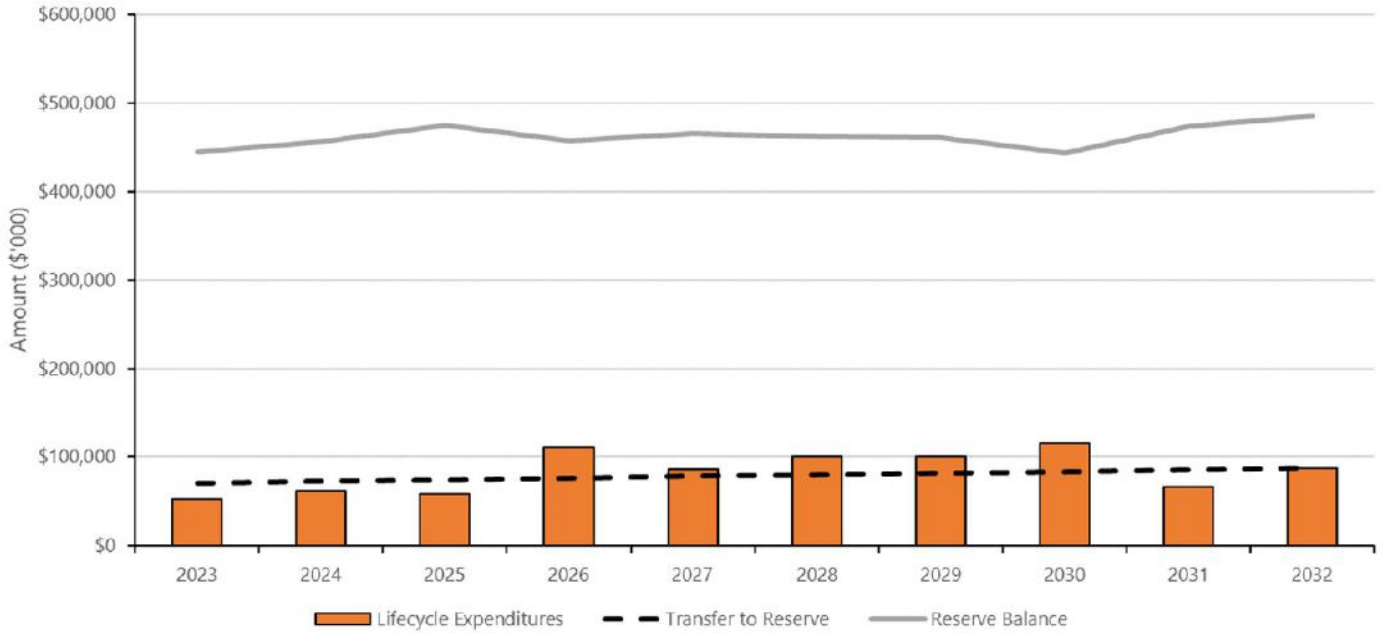
Halton Region's budget can be broadly categorized into operating and capital components, as follows:

- The operating budget is used to support the day-to-day functions that provide services to the community. Staff salaries, energy bills, and fuel for vehicles are examples of expenditures that are funded from the operating budget.
- Through the capital budget component, the Region plans future large expenditures (including the construction of infrastructure assets) and the use of reserve funds and debt to manage its financial position over a ten-year period.

The Region allocates a portion of current year revenues, from property taxes and utility rates, to use in the capital budgets as a source of funding. This funds current year projects, contributes to reserve funds, and makes debt repayments. The use of debt as a source of funding impacts operating budgets by having to pay debt servicing costs (interest) each year.

Figure E3 and E4 provide the reserve fund forecast for the Tax Capital and Rate Capital Reserves, respectively. The graphs show that the anticipated revenues are sufficient to fund the proposed lifecycle strategies in both reserves. It should be noted that the reserves are used to fund a wide variety of projects which have not been included in this analysis. This analysis focused on the tax supported assets included in this plan and Water and Wastewater transfers to reserve and associated projected expenditures, respectively.

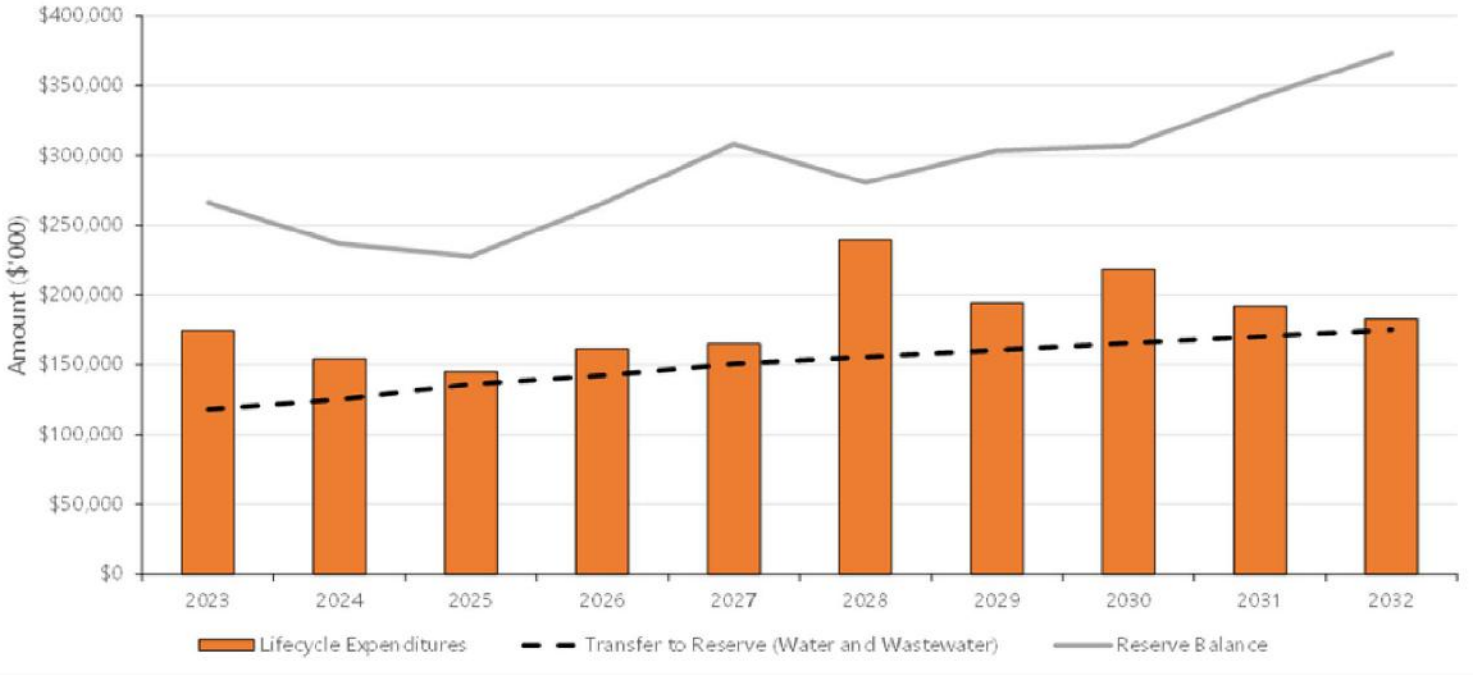
Figure E3. Forecasted Tax Capital Reserve Revenues, Expenditures and Balance – Tax Supported Assets



Notes: **The forecasted Transfers to Reserve are based on Halton Region (2020) Budget and Business Plan 2020, p. 51, and Halton Region (2021) Budget and Business Plan 2021, p. 66. Forecasted transfers (2022 – 2032) are extrapolated based on the 2019 – 2021 transfers.*

***The Opening Balance is based on the 2021 Projected Ending Balance stated on Halton Region (2021) Budget and Business Plan 2021, p. 96.*

Figure E4. Forecasted Rate Capital Reserve Revenues, Expenditures and Balance – Water and Wastewater



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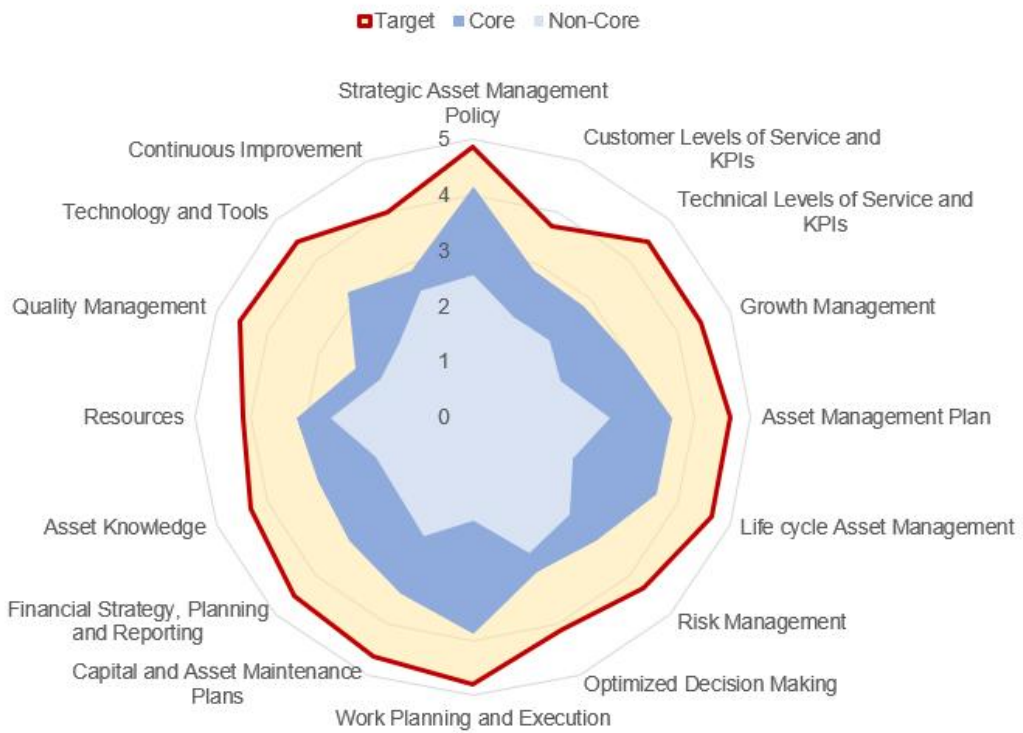
As outlined throughout this document, the Region has demonstrated commitment to continuous improvement for over more than a decade, that includes data improvements, decision-making optimization, and strategic planning. Throughout the development of this plan, any assumptions and opportunities for improvement have been documented with the goal of improving future iterations of the plan.

An asset management capability assessment was conducted to provide an objective review of each stakeholder group's current and target asset management capabilities.

Figure E5 provides the overall average current and target state for each of the capability areas. Overall, the average capabilities are between repeatable and defined. The capabilities with high opportunities for improvement are Technology and Tools, Quality Management and Continuous Improvement. The overall target based on the stakeholder feedback is to move towards the level 4 or 5 capabilities in each area.

Figure E5. Overall Capability Assessment Results



Currently, the management capabilities for core assets are at the intermediate to advanced levels. Overall, the Region has initiated several significant enhancements to asset management practices over the last decade, resulting in high levels of asset management capabilities in some departments. There is an overall desire to advance asset management within each group in the Region, with the foundational elements currently underway.

Building upon over 15 years of significant efforts from across the organization, this plan sets the foundation for the next steps in the Region's Asset Management journey. This approach will continue to provide a robust, transparent and consistent methodology while maintaining the Region's strong financial position and long-term sustainability.

Halton Region's commitment to managing its assets aligns with directions and objectives reflected in Halton's Budget and Business Plan, Strategic Business Plan and Regional Official Plan. The asset management program is a key component in achieving Halton Region's vision – to enhance the quality of life for all people of Halton today and into the future.

2.0 Introduction

The Regional Municipality of Halton (Halton Region or the Region) is located within the Greater Toronto Area of Ontario, on the northern shore of Lake Ontario. Halton Region is considered one of the fastest-growing communities in Canada and is comprised of four distinct municipalities including: the City of Burlington, the Town of Halton Hills, the Town of Milton and the Town of Oakville. Halton's infrastructure systems are essential in servicing its 610,000 residents, and the infrastructure supports a range of municipal services that enable citizens, businesses and institutions to live, work and grow in Halton.

2.1 Asset Management Plan Purpose

Halton Region is responsible for the delivery of many services that are critical to the community and are dependent on well-managed infrastructure. These services include providing transportation, clean drinking water, wastewater collection and treatment, waste management, social housing, emergency services, and corporate facilities. Each of the services are dependent on a wide variety of linear, vertical, and mobile asset systems that have unique

lifecycle behaviours and activities, service expectations, risks and regulations. Asset Management is the coordinated activity of an organization to realize value from assets (ISO55000:2014(E), p. 14). The management practices, objectives and documentation form the components of the Region's asset management system, which is the management system associated with defining the asset management policy, objectives, and practices (IPWEA, 2015; ISO55000:2014(E)).

The Federation of Canadian Municipalities (FCM) has defined an Asset Management Plan as the development of a plan "for the management of one or more infrastructure assets that combines multidisciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost-effective manner to provide a specified Level of Service".

Since publishing the first Asset Management Plan in 2014, the Region has embarked on several asset management initiatives to establish and enhance the Region's overall asset management framework. Also in 2014, the Region established an asset management roadmap implementation plan aligned with the Region's Asset Management Plan and corporate structure. This roadmap documented the overall asset management corporate vision and strategic direction, corporate asset management strategy, program asset management strategies, and processes to establish infrastructure investment planning and financing (GM BluePlan Engineering, 2014).

Since then, departments such as Public Works have implemented several initiatives to further enhance asset management practices. The most recent asset management plan was published in 2014, and included transportation, water, wastewater, waste management, corporate facilities and social housing assets. An updated executive summary to the plan was published in 2015. The Region's 2021 Asset Management Plan is designed to enable the management of infrastructure and services in a way that supports the lifestyles of its residents who have chosen Halton for its beautiful landscape, proximity to a broad employment market, safe and attractive neighbourhoods, excellent services and strong civic pride.

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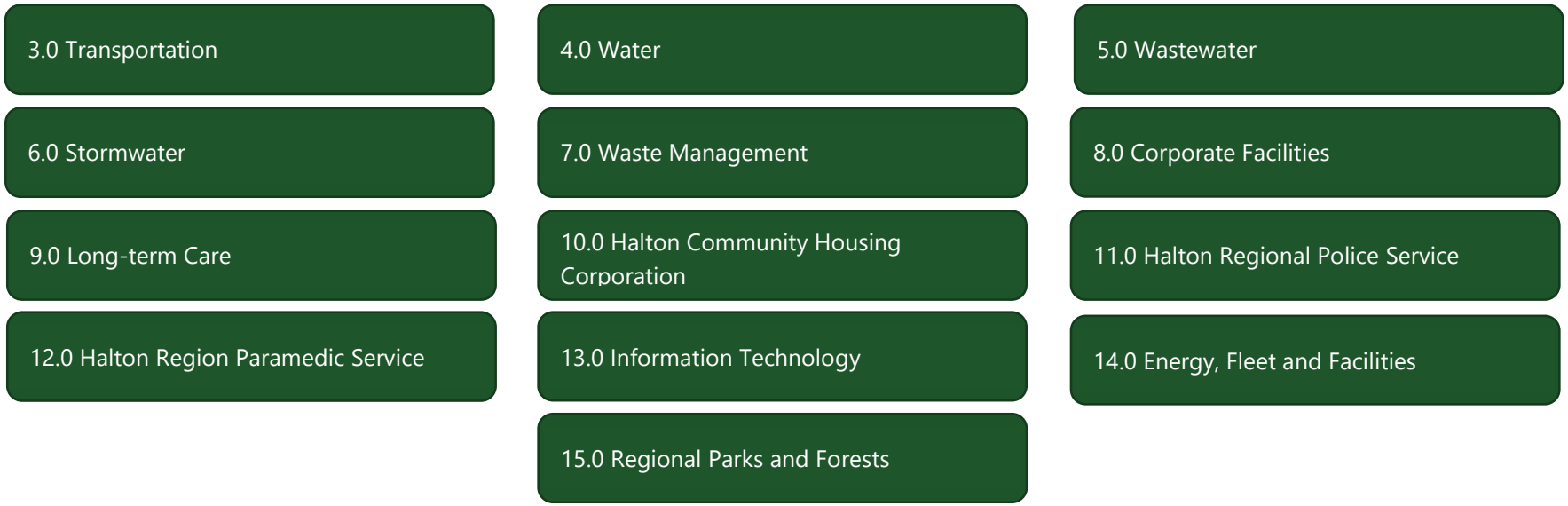
- Halton's Levels of Service and performance standards.
- Demand forecasts from a system perspective.
- The lifecycle activities to operate, maintain, renew and dispose of assets and their cash flow forecasts.
- Key actions to improve asset management practices.

2.2 Assets included in the Plan

Halton Region's public services and infrastructure includes an integrated transportation network of roads and bridges, storm water management, water treatment and distribution, wastewater collection and treatment, waste management collection, disposal and recycling assets, paramedic services, public health services, services for vulnerable residents (social housing, long-term care for seniors and child care facilities and subsidies), and administration facilities for police and other service departments.

This asset management plan includes "core" and "other" municipal infrastructure assets as defined by the Ministry of Infrastructure. Each category is broken down into sub-categories based on the specific services they provide. For instance, water assets include those that relate to collection, production, treatment, storage, supply or distribution. The services are illustrated in Figure 2.

Figure 2. Assets Included in this Plan



2.3 Alignment with the Region's Vision, Mission and Strategic Goals

Every term of Council, Halton Region develops a Strategic Business Plan to guide Halton Region's work over the next four years. In 2019, as part of the strategic business planning process, Regional Council worked together to identify strategic themes, objectives and specific actions that reflected current social, economic and demographic conditions as well as resident priorities. These guiding principles were documented in the 2019-2022 Strategic Business Plan that focuses on ensuring that Halton Region continues to be a great place to live as it continues to grow. The plan defines the vision and mission statements followed by objectives and specific actions to achieve them.

One of the key concepts of asset management is ensuring line of sight between the organizational objectives, the asset management objectives, and asset management activities. As such, the strategic direction document forms one of the guiding pillars for this asset management plan and is paramount to achieving the Region's asset management goals and objectives. The Region's vision, mission and strategic statements are summarized in Figure 3. As can be seen from the figure, asset management is a fundamental enabling factor in achieving the vision, mission and objectives.

Figure 3. 2019-2022 Strategic Business Plan Vision, Mission and Strategic Statements

Halton's Vision and Mission

Halton Region's vision is to enhance the quality of life for all people of Halton today and into the future.

The Region is committed to preserving a landscape that is rich, diverse, balanced, productive and sustainable and a society that is economically strong, equitable and caring. We must plan for communities where urban sprawl is minimized, where infrastructure is maximized, where natural heritage is protected and natural spaces and farmland are preserved.

The Strategic Business Plan identifies 21 strategic objectives and their outcomes which are organized into the following five (5) themes:

Figure 4. 2019-2022 Strategic Business Plan Strategic Objectives and Outcomes

2.4 Climate Change and Asset Management

In 2019, Regional Council passed a resolution to declare climate change an emergency and thus its impacts must be considered in all aspects of Regional planning, including Asset Management. Depending on geography, the impacts of climate change look different across the globe. In Halton Region, these impacts are most evident in the increase in frequency and severity of extreme weather events and rising average annual temperatures. Some specific examples of severe weather events that occurred in or near Halton Region in the last 10 years include: the 2013 flood in Toronto, which resulted in more than $1 billion dollars in damage; the 2013 ice storm which delivered over 30 mm of freezing rain to Halton Hills, and the 2014 flood in Burlington as a result of 191 mm of rainfall in only eight hours – the equivalent of two months of rainfall on average.

Extreme weather events have a direct impact on municipal infrastructure assets. Intense rainfall can lead to flooding of pumping stations, by-pass issues for combined systems, fluctuations from drought and intense rain periods, source water impairment, impacts on treatment regimens due to rapid variations in temperature, and the deployment of operation and maintenance staff during extreme weather events. The consideration of these impacts alongside existing asset management models and systems offers an opportunity for improvement as decision-making and resource allocation will both be better informed. These efforts will help align Asset Management with the Regional Official Plan (ROP) which aims to address climate change through a variety of policies geared towards climate change adaptation and mitigation. The Region is currently involved in a Climate Change Adaptation Pilot project with Toronto, Peel, Hamilton and Durham that is testing a framework for integrating climate change adaptation and asset management. This project will drive the inclusion of climate change into the AM processes in Halton.

2.5 Risk Management Strategy

The Region has developed a risk-based approach to identifying renewal needs to maintain service to existing customers. Asset risk management not only considers the current condition and performance of assets and their likelihood of failing, but also the consequences of those failures on services and customers. During the risk process, the analysis is based on more robust and comprehensive evidence relating to the issue being investigated with strong input from operations staff. Unlike the lifecycle model, which only considers need based on asset condition, a risk-based process considers a broad range of root causes of failure such as inadequate design, utility failure, and third party damage.

Risk assessments have been undertaken on the Public Works capital plan and projects since 2017. Through the approach, Risks associated with identified issues are scored and then ranked in descending order for programming in the 10-Year Capital Plan.

The risk management process is implemented on a yearly basis to inform Years 1 through 3 of the capital budget.

2.6 Asset Management Guiding Principles

Halton Region's Corporate Asset Management Policy sets out principles and requirements for asset management practices across all departments involved in the lifecycle management of Halton's assets. One of the objectives of the policy is to ensure transparent, auditable and evidence-based asset management planning. The following table highlights the guiding principles from the 2019 Corporate Asset Management Policy.

Figure 5. 2019 Asset Management Policy Guiding Principles

Customer Focused	Define Levels of Service that balance customer expectations with risk, affordability, and time constraints that support Halton Regional Council and community priorities, where customers have the opportunity to provide input.
Holistic	Consider all assets in a service context and take into account their interrelationships as opposed to optimizing individual assets in isolation. Think holistically across all departments in Halton Region, local municipalities and Provincial strategies when managing services.
Affordable	Choose practices, interventions and operations that aim at reducing the lifecycle cost of asset ownership while satisfying agreed Levels of Service.
Systematic	Adopt a robust, transparent and consistent approach to the management of assets that will ensure services are provided in the most efficient and effective manner.
Forward-Looking	Make appropriate decisions and provisions to enable assets to meet future challenges, including changing demographics/populations and new legislative requirements.
Risk-Based	Manage the asset risk associated with attaining the defined Levels of Service. In doing so, focus on resources, expenditures, and priorities based upon risk assessments and the corresponding cost/benefit analysis.
Innovative	Continually improve the asset management approach by driving innovation in the development of tools, practices and solutions.
Sustainable and Environmentally Adaptable	Services and assets are socio-culturally, environmentally, and economically sustainable into the long term. This will involve triple bottom line consideration to address vulnerabilities caused by climate change, mitigation approaches to climate change, and implementing disaster planning and resiliency actions.

2.0 Introduction

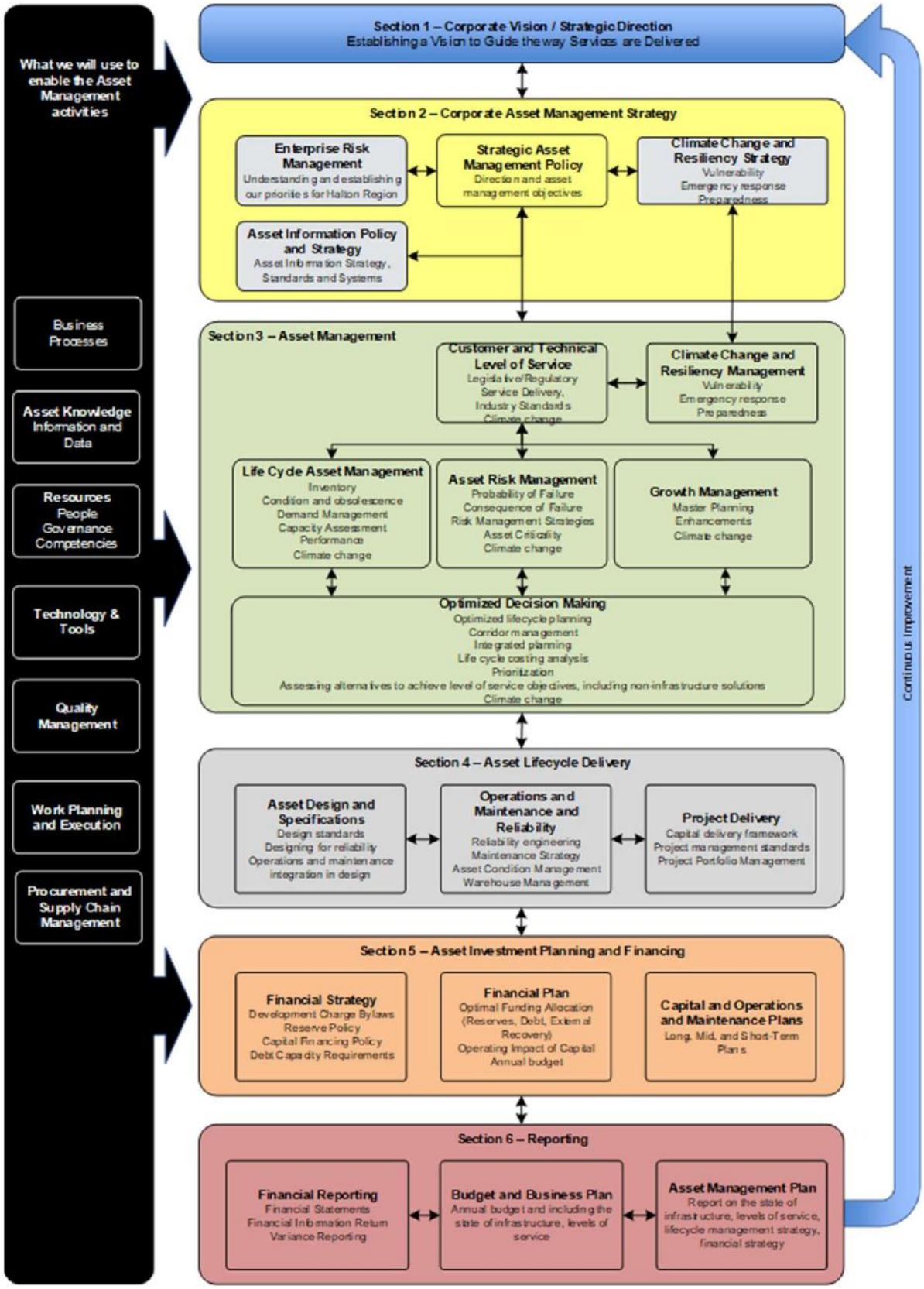
This asset management plan supports the achievement of each of the guiding principles.

The Region's Corporate Asset Management Policy operates as a component of an overall Asset Management Framework developed in 2014 and implemented in the subsequent years. The Asset Management Roadmap Implementation plan applies corporately and was led by the Public Works and Finance departments. The framework includes the following key sections:

- Section 1 – Corporate Vision/Strategic Direction which establishes a vision to guide the way services are delivered in the Region.
- Section 2 – Corporate Asset Management Strategy reviews risks across Program Areas and establishes customer expectations of Levels of Service and how performance will be assessed from the customer's perspective.
- Section 3 – Infrastructure Asset Management Strategy establishes technical Levels of Service and key performance indicators and contains all of the processes related to the day-to-day management and decision making of the assets that support the delivery of infrastructure services.
- Section 4 – Infrastructure Investment Planning and Financing contains the processes to establish the capital and maintenance plans for the infrastructure systems in the Region. This also includes processes to develop the financial plans and strategies to fund the infrastructure needs over their lifecycle.
- Section 5 - Reporting includes the activities related to preparing the Region's Asset Management Plan and Financial reports.

A visual representation of the framework, including each of the above sections is shown in Figure 6. In developing the 2021 plan, the AM Framework was modified and updated to reflect improvements to Halton's AM practices. The boxes in grey were modified or added as part of this exercise.

Figure 6. Region of Halton Asset Management Framework



2.7 Relationships to other Planning Documents

The Region's overall asset management framework as depicted in the diagram is tightly integrated into many planning documents within the organization. Some of the key documents are summarized in Table 1 below.

Table 1. Relationships to Other Municipal Planning Documents

Municipal Planning Document	Relationship to the Asset Management Plan
Official Plan	Sets out policies that guide how Halton grows and develops. It includes goals and objectives for new development that reflect the vision of residents and regional Council.
Halton Region Strategic Business Plan	Sets out the strategic vision, mission and objectives for the organization. These objectives are supported by asset management capabilities.
Halton Region Budget and Business Plan	Provides the overall budget guidance and business plan for all services within the Region, and asset investment requirements.
Energy Conservation and Demand Management Plan	The Energy Conservation and Demand Management (CDM) Plan intends to guide Halton Region through the managed control of its utility costs, energy use, greenhouse gas (GHG) emissions, the capture and re- use of available resources, and adoption of green building and green procurement policies to deliver optimal results. This impacts requirements and Levels of Service for facilities.
Development Charges Background Study	Development Charges are imposed under the provisions of the Development Charges Act, 1997, as amended. The background study is undertaken to calculate the DC to support capacity enhancements as well as benefits to existing users.
Master Plans	Halton Region has master plans for water, wastewater and transportation. These master plans recommend a preferred long-term servicing strategy for the relevant infrastructure systems within the urban boundary of Halton, integrating existing and future servicing needs to the year 2031.

2.8 Asset Management Plan Development and Timeline

As previously mentioned, Halton Region has been successfully implementing various Asset Management practices for a number of years. In 2006, a vision for a comprehensive Asset Management program was developed. The implementation of this vision began with the development of the Regional Tangible Capital Asset register completed in 2009 to comply with new financial reporting requirements of the Public Sector Accounting Board (PSAB) 3150. In 2012, utilizing 2010 data, the first Public Works' infrastructure condition report card was presented to Council. The Public Works infrastructure condition report card is updated every 3 years and reported in the Budget and Business plan; the most recent update occurred in 2017.

In 2014, a consultant was retained by the Public Works department to facilitate a review and develop a Corporate Asset Management Framework and implementation plan to begin enhancements to the Public Works' asset management program. Furthermore, the Energy, Fleet and Facilities Division has been undertaking a Building Condition Assessment process and energy audit which enhances asset management planning for social housing and corporate facilities assets. The Building Condition Assessments form the basis of the Energy, Fleet and Facilities Division Report Card, which shows that the assets continue to be in a state of good repair.

In the Asset Management Roadmap Implementation Plan which was applied corporately, the cover sheet for each section in the plan provided an overview of the percentage of assets within each condition rating. Some

assets show data for 2010, 2013, 2018 and 2020. Asset data is not shown for all years for all assets since:

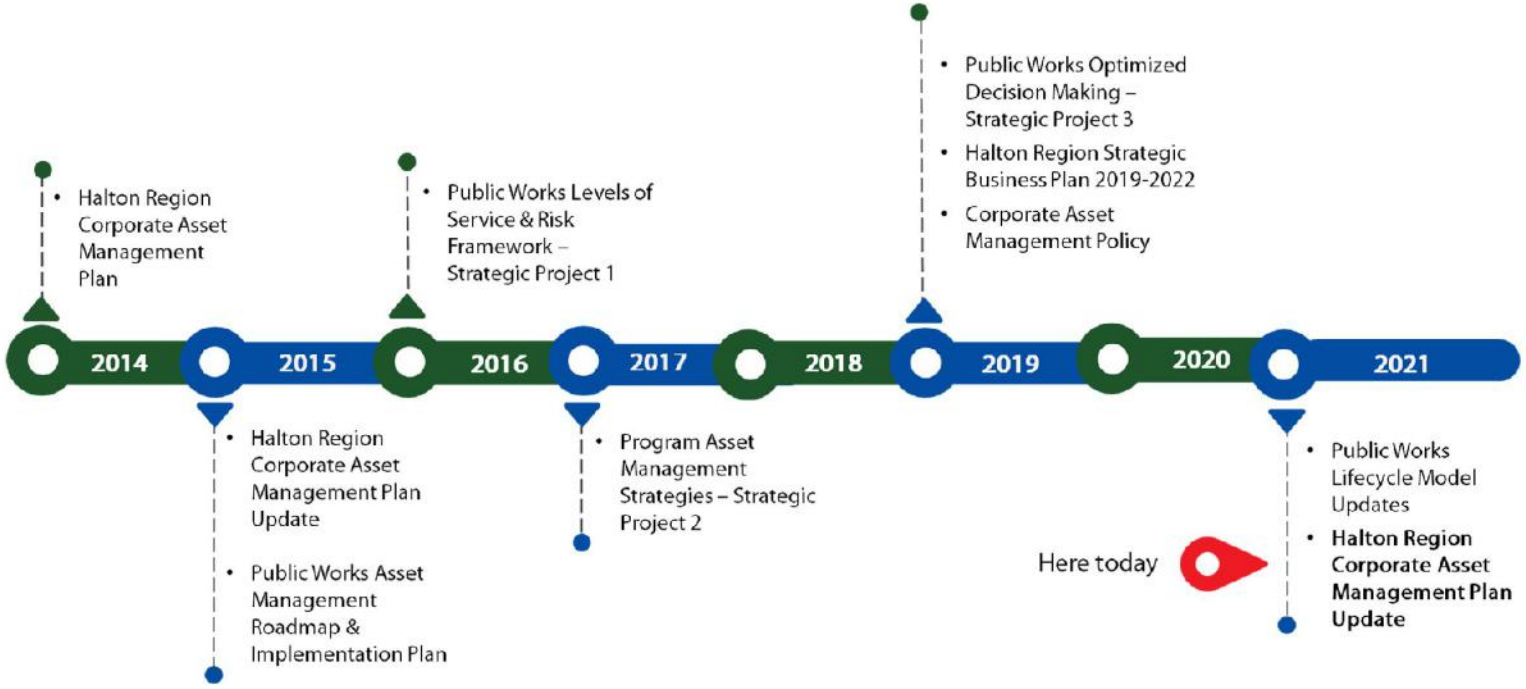
- The 2010 asset management plan only included public works assets;
- The 2013 report card included Public Works and Energy, Fleet and Facilities; and
- The 2017 report card did not itemize some of the services (such as Police and Paramedics).

The key stages of the Roadmap Implementation Plan were achieved through a variety of key strategic projects (Strategic Projects 1 through 3) in which the following outcomes were developed and established:

- Public Works customer and technical Levels of Service and Key Performance Indicators
- Public Works risk management framework and Asset Risk Management process
- Lifecycle Asset Management (models)
- Growth management process
- Capital Plan Development Process, including business case development, project prioritization, and asset strategies.

The Public Works department also updated their Lifecycle models in 2021 to forecast asset lifecycle activities and expenditures. An overview of the evolution of Asset Management for Halton Region is presented in Figure 7.

Figure 7. Asset Management Timeline



2,0 Introduction

The development of the 2021 asset management plan was led by the Public Works and Finance Departments and supported by a team comprising department stakeholders. Key representatives for each service area were engaged to act as representatives to provide input during workshops and discussion, provide data inputs and technical reviews. This asset management plan has been developed to meet the requirements of Ontario Regulation 588/17 as part of the *Infrastructure for Jobs and Prosperity Act, 2015*.
With these objectives in mind, Table 2 identifies each key stakeholder group and their roles and responsibilities for the development, implementation, and approval of Halton's Asset Management Plan.

Table 2. Stakeholder Roles and Responsibilities

Roles and Responsibilities	Regional Council	Treasurer	Leadership Team	Asset Management Stakeholders
▪ Approve the Asset Management Plan. ▪ Serve as representatives of stakeholder and community needs, particularly related to determining the services and service levels to be provided. ▪ Approve funding levels for both capital and operating budgets associated with Asset Management through the annual budget and business plan. ▪ Support ongoing efforts to continuously improve and implement the asset management plan.	R	A	S	A
▪ Ensure alignment between Halton Region's asset management financing plan and Halton Region's long-term financial plan.	C	R, A	C	R
▪ Implement the Asset Management Plan. ▪ Provide input on needs of department, current status of assets, and current Levels of Service ▪ Support and comply with data collection requirements. ▪ Participate in the development of the corporate asset management work plans pertaining to their areas of expertise. ▪ Participate in the regular review of all documentation, data, and asset measurement tools to ensure continued relevance and applicability of existing policies and practices. ▪ Document the alignment of Asset Management Plan with the priorities established and projects requested through the budget process.	I	S	S	R, A
▪ Ensure Halton meets and maintains compliance with regulatory requirements. ▪ Lead the development of asset management plan and strategy and confirm the implementation plan/resource requirements. ▪ Provide corporate support for asset management. ▪ Establish practices that ensure uniformity of approach across the organization. ▪ Encourage information sharing and collaboration across departments. ▪ Provide input and direction to corporate asset management work plans to ensure consistency with other initiatives. ▪ Lead the development of asset inventories, condition assessments, risk assessments and related asset management initiatives in line with industry best practices.	S	S	R, A	R

***Notes**: R=Responsible, A=Accountable; S=Supportive, C=Consulted, I=Informed*

2.9 Shared Asset Management Responsibilities

Within the Region, each service area is responsible for the budgeting of their asset portfolio. Energy, Fleet and Facilities provides operations and maintenance, capital delivery and support for the majority of the vehicles, corporate facilities, and some equipment. Within this asset management plan, all vehicle, facility and equipment assets have been included under each service area section, however a summary Energy, Fleet and Facility section is provided at the end.

2.10 Provincial Asset Management Planning Requirements

In 2012, the Province published the *'Building Together: Guide for Municipal Asset Management Plans'* (Ministry of Infrastructure, 2012) to encourage and support municipalities in Ontario to develop asset management plans in a consistent manner. The guide describes a general approach to structuring asset management plans and provides insight into the content that should be included in sections related to the State of Local Infrastructure, Levels of Service, Asset Lifecycle Management Strategies, and Financing Strategies. Building Together outlines the information and analysis that municipal asset management plans are to include. To encourage the development of asset management plans, the Provincial and Federal governments also made asset management plans a prerequisite to accessing capital funding grants.

In 2015, Ontario passed the Infrastructure for Jobs and Prosperity Act which affirmed the role that municipal infrastructure systems play in supporting the vitality of local economies. After a year-long industry review process, the Province created Ontario Regulation 588/17 – Asset Management Planning for Municipal Infrastructure as the first regulation made under the Infrastructure for Jobs and Prosperity Act. O. Reg 588/17 further expands on the Building Together guide, mandating specific requirements for municipal asset management policies and asset management plans, phased in over a five-year period. Figure 8 summarizes the general requirements and timelines of O. Reg. 588/17.

Figure 8. Regulatory Requirements and Timelines for Asset Management Planning (O. Reg. 588/17)

July 1, 2019	A Corporate Asset Management Policy is required that articulates specific principles and commitments that will guide decisions around when, why and how money is spent on infrastructure systems.
July 1, 2022	An Asset Management Plan is required that documents the current Levels of Service being provided and the costs to sustain them for the Region of Halton's water, wastewater, stormwater, roads and bridges infrastructure systems (i.e., 'core' assets per O. Reg. 588/17).
July 1, 2024	An Asset Management Plan is required that documents the current Levels of Service being provided and costs to sustain them for all infrastructure systems in Halton.
July 1, 2025	An Asset Management Plan is required that documents the current Levels of Service being provided, the costs to sustain the current Levels of Service, the desired Levels of Service, the costs to achieve the desired Levels of Service, and the financial strategy to fund the expenditures necessary to achieve the desired Levels of Service for all infrastructure systems in the Region of Halton.

2.11 Asset Management Plan Updates

An asset management plan is a long-range planning document that can be used to support the continuous improvement of asset-related activities for public services and provides a guide for understanding:

- Halton's organizational strategic goals as they relate to and are supported by asset management initiatives.
- The specific asset portfolios included on a Region-wide scale.
- Halton's levels of service and performance standards.
- Demand forecasts from a system perspective.
- The lifecycle activities to operate, maintain, renew and dispose of assets and their cash flow forecasts.
- Key actions to improve asset management practices.

Over the last number of years, the Region of Halton has been actively developing and improving its asset management program. Halton's 2021 Asset Management Plan was developed to optimize the allocation of capital funds to assets in an informed manner that considers opportunities to improve service levels. The 2021 Plan was updated with the following objectives in mind:

- To build on the solid 2014 asset management plan foundation and incorporate all the asset management advancements that Halton has implemented over the last 7 years, that include:
    - Asset Management Roadmap Implementation Plan, GMBP, 2015, that developed Halton's Asset Management Framework, and detailed asset management strategic projects to implement a formalized asset management program.

- Strategic Project 1: Asset Management Risk and Level of Service frameworks, GHD, 2016, that developed Halton's asset risk, level of service and key performance indicators with a direct line of sight to Halton strategy and action plan.
- Strategic Project 2: Program Asset Management Strategies, Jacobs 2017, that defined a systematic approach, by first documenting Halton's corporate vision/strategic direction and the corporate asset management approach followed by developing program specific technical level of service, technical key performance indicators, lifecycle, asset risk and growth management. The strategy provides a clear line of sight between Halton Strategic Action Plan and the services that are provided by Public Works through a transparent, auditable, repeatable and evidence –based capital programming, which now forms the basis for development of the capital program for the annual Budget and Business Plan aligned with the Strategic Business Plan, 2019-2022
- Strategic Project 3: Optimized Decision Making, Jacobs 2019, that developed tools and procedures to enable the optimized decision-making component of the asset management framework, in order to defensibly prioritize capital projects, identify the highest benefit/cost solution, and mitigate risk while supporting public health, safety, community mobility, and sustainability initiatives
- Costing Tool, EY 2020, that documents Region's Public Works capital project costing documents including planning cost estimation process related to state of good repair and growth projects. A costing approach and model tool was developed to create more accuracy, transparency and consistency in the development of planning cost estimates for Public Works capital projects.

- To review and update the lifecycle models that have been utilized to date in Halton in a manner that can be incorporated into a future lifecycle tool that will support detailed analysis for long term budget forecasts at the asset level.
- To ensure Halton's 2021 Asset Management Plan complies with O. Reg 588/17.

GM BluePlan Engineering (GMBP) was retained by the Region in 2020 to update the lifecycle models to incorporate all the asset management advancements since 2014 and prepare an update to the 2014 Asset Management Plan. Through a series of stakeholder workshops, meetings, data reviews and analysis, GMBP worked with Regional staff to update logic and standards utilized in the previous asset management plan. Recognizing that the requirements driving asset management plans have changed slightly with O. Reg 588/17, the key aspects of the regulation and how they were addressed in this project are summarized below.

O. Reg 588/17 Requirement	How it is addressed in the AMP
A strategic asset management policy	Approved Corporate asset management Policy (2019)
Infrastructure Asset Inventory	Halton's asset register has been updated and enhanced to develop a comprehensive inventory of 100% of all assets with condition/replacement values, maintained in the lifecycle models delivered as part of this project.
Level of Service Strategy	Utilizing current data and outputs from past asset management projects (including Strategic Project 2: Program Asset Management Strategies, Jacobs 2017), LOS was incorporated as an indicator of asset condition (and age where condition was not available) and utilized in all analysis (Section 2.13.2).
Lifecycle Management Strategy	As part of the Lifecycle Model updates, strategies from Strategic Project 2: Program

O. Reg 588/17 Requirement	How it is addressed in the AMP
	Asset Management Strategies, Jacobs 2017 were updated and programmed in the lifecycle models utilized to analyze the plan needs (Section 2.13.3).
Mitigation Approaches to Climate Change	Mitigating and adapting to climate change is discussed in Section 2.4.
Financial Strategy	A long-term financial strategy was developed for both Tax and Rate supported asset portfolios, as discussed in Section 2.13.5.

In addition to the key regulatory requirements, the following additional activities were carried out to support the update:

- Growth and asset/system performance were incorporated into the Plan by first updating the Asset Register with planned and approved capital projects associated with SOGR, growth or performance.
- Risk management was incorporated into the lifecycle models to inform years 1 to 3 of the current capital budget through the prioritization logic that ranks assets at a higher risk first, as defined in Strategic Project 2: Program Asset Management Strategies, Jacobs 2017.
- Identify improvement actions and update the Asset Management 5 Year Roadmap to ensure sustainability of Halton's AM program, including considerations of data management, resources, technology and outcomes via an asset management maturity assessment.
- Prepare an Asset Management Plan and asset management program strategy presentation for delivery to various stakeholders, including Regional Management and presentation to council by Commissioner.

It is intended that the plan is a 'living document' that will be updated every 5 years and improved to reflect Halton's Corporate Asset Management Policy, Strategic Plan and Budget and Business Plan in terms of strategic goals and vision while the datasets that form the basis of the Asset Management Plan will be updated and maintained annually. The regular improvements to the asset management plans and supporting data will not only increase the value of the plan but also Halton Region's Asset Management Program as a whole. These improvements to the plan will be driven by a variety of factors including the following:

- Implementing, revising, refining and reporting on Halton's Official Plan and Strategic Business Plan.
- Outputs from key projects from Halton's asset management program.
- Continual cross-functional collaboration towards identifying asset management improvements in processes, systems, data, asset management plans, and implementation tactics.
- Monitoring progress on the asset management plan implementation while quantifying and reporting benefits from asset management program activities.

Best practices to achieve continuous improvement include the development of an improvement plan, and delivering the improvement plan with defined annual targets, appropriate benchmarks, and responsibilities for internal resources with their associated funding levels, as approved by Halton's annual budgeting process.

To effectively achieve what has been described above, the Region's Asset Management Program relies on additional programs, policies, documents and datasets that form the basis of the Asset Management Plan as shown in Table 3.

Table 3. Timeframes and Update Frequency of Asset Management Planning Documents

Asset Management Planning Document	Timing	Targeted Benefits
Corporate Asset Management Policy and updates	▪ 2019 (updated at least once every five (5) years)	▪ Broadly outlines the principles and requirements for undertaking asset management across the organization in a structured and coordinated way, consistent with the organization's strategic plan. ▪ Clarifies the vision, mission and objectives for Asset Management. ▪ Increases awareness, priority and leadership for Asset Management. ▪ Subsequent updates will facilitate the development of new guiding principles and affirms the relevance of current guiding principles for Halton Region's Asset Management Program. ▪ Incorporates new best practices, strategic documents, or regulatory changes.
Asset Hierarchy and Register Developed for the 2021 Asset Management Plan	▪ 2021 (completed for all assets that are included in the 2021 Asset Management Plan) – to be updated annually	▪ Provides a robust database for enabling a data driven approach for asset management planning functions. ▪ Increases utility in recommendations to support decision making. ▪ Facilitates data sharing between departments and service areas. ▪ Improves planning of budgets with higher quality historical data and analysis capabilities.
Asset Management Plan Update	▪ 2021 (and once at least every five (5) years)	▪ Clarifies the vision for Asset Management. ▪ Provides a mandate for Halton Region staff with direction for targeted and cost-effective investments in community infrastructure systems. ▪ Informs discussions with Council regarding the impact to Levels of Service from policy priorities, strategic initiatives, and capital and operational budgets. ▪ Defines a service oriented, long-term financial forecast with a supporting business case. ▪ Secures commitment to long-term planning for infrastructure systems. ▪ Defines opportunities for improvement in Asset Management. ▪ Incorporates outputs from Asset Management improvement initiatives. ▪ Maintains compliance with changing regulatory requirements.
Asset Condition Assessments	▪ Ongoing	▪ Identifies condition assessment frequencies to better understand assets and Levels of Service. ▪ Enables clear analysis of current condition of assets, which directly feeds into informed decision-making and lifecycle models. ▪ Assists in allocating funding to the most critical assets and assists in risk management.
Asset Full Lifecycle Costing Models	▪ Every three years	▪ Quantification of full asset lifecycle costs, based on assumed unit rates for capital budget use.

Asset Management Planning Document	Timing	Targeted Benefits
Asset Management Performance Reporting	▪ Annual	▪ Ensures trends are measured and monitored for asset management functions. ▪ Tools, techniques and metrics/KPIs to report annual progress and opportunities. ▪ Provide an indication of level of asset management sophistication and advancement.
Strategic Business Plan	▪ Every four years	▪ Provides the vision, mission and strategic themes for the organization.
Drinking Water Financial Plan	▪ Every eight years	▪ The Financial Plan is a key component under the Municipal Drinking Water Licensing Program. ▪ The Municipal Drinking Water Licensing Program requires drinking water system owners to prepare a Financial Plan in accordance with the requirements of Ontario Regulation 453/07. ▪ The main objective of this regulation is for municipal government to develop a long-term strategy to promote financial sustainability of drinking water systems.
Budget and Business Plan	▪ Annually	▪ Allocates funding for Asset Management improvement initiatives including condition assessments, lifecycle costing models, performance measurement, and business-oriented technologies including information systems development. ▪ Allocates funding for implementing the Asset Management Plans.

2.12 Asset Management Plan Assumptions and Limitations

The following points summarize the assumptions and limitations of the 2021 Asset Management Plan:

- This Asset Management Plan was developed based on the best available information where some assumptions using professional judgement were made to address gaps. Specific assumptions made regarding each asset group are discussed in their respective chapters under 'Data Sources and Confidence'. Halton's December 31, 2020 TCA asset list was one of the foundational sources of data utilized.
- This Asset Management Plan is compliant with the 2021 requirements of O. Reg. 588/17.
- The Asset Management Plan should be updated every five (5) years and data relevant to the plan should be updated and maintained annually.

2.13 Asset Management Plan Structure

The Asset Management Plan is structured to provide consistency and ease of understanding for readers. The Asset Management Plan is comprised of transportation, water, wastewater, stormwater, waste management, corporate facilities, long-term care facilities, Halton Community Housing Corporation facilities, police, paramedics, fleet, regional parks and forests, and information technology equipment.

For each of the service areas the following subsections have been applied:

1. State of Local Infrastructure
2. Levels of Service
3. Lifecycle Management Strategy
4. Forecasted Lifecycle Activity Costs

The plan is concluded with the Financing Strategy and Improvement and Monitoring sections which are inclusive of all service areas.

2.13.1 State of the Local Infrastructure

The Region owns, operates and maintains an integrated network of infrastructure and facilities with a total replacement value estimated at over $13 billion. The State of Local Infrastructure subsections for each service area include the following information:

- A summary of the inventory of assets that support the service area, the quantity/extent, and their replacement values.
- Asset age distribution and asset age as a proportion of estimated service life (ESL). The ESL of each asset refers to the estimated duration of time that an asset is forecasted to be in service.
- An overview of current observed or predicted asset condition and how asset condition is assessed for each asset type.
- Data sources used and all assumptions made to complete the state of local infrastructure analysis.

Condition ratings were assigned to all assets across each service area using the condition rating scale shown in **Error! Reference source not found.**. This five-point rating scale aligns with the Federation of Canadian Municipalities (FCM) Canadian Infrastructure Report Card's condition rating scale and is a common standard used by most municipalities. All asset condition scores were aligned to this five-point rating scale which will provide a sound basis for assessment and allow for benchmarking of the results against the values presented within the Asset Management Plan.

Table 4. Condition Rating Scale

Condition Rating	Definition
Very Good	▪ The asset is fit for the future. It is well maintained, in good condition, new or recently rehabilitated.
Good	▪ The asset is adequate. It is in the early stage of its useful life. Acceptable condition with some deterioration.
Fair	▪ Infrastructure is in the mid-stage of its useful life. The asset shows signs of deterioration and some elements exhibit deficiencies.
Poor	▪ Infrastructure in the later stage of its useful life. May show minor deterioration. ▪ There is an increasing potential for its condition to affect the service it provides.
Very Poor	▪ The asset is in the end stage of its useful life. May show major deterioration or condition may be critical. Some assets may be unusable.

One of the key components of asset management planning is evidence-based decision making. Asset management decisions or forecasts often include compiling data from multiple data sets across asset portfolios that vary significantly in age and level of detail. While asset management practitioners always endeavor to make the best possible decisions and recommendations based on available information, it is important to consider any uncertainty that is introduced through assumptions or gaps in the data. Through the development of the plan, all information has been ranked in terms of a data confidence rating framework, to provide transparency around the level of confidence in the data. In addition, by recognizing missing or low confidence data, it gives the opportunity to establish targeted initiatives to improve the overall confidence.

Table 5 provides the data confidence assessment approach used to rate each data set. This data confidence score and proposed improvement plan is documented within each asset portfolio section.

Table 5. Data Confidence Ratings

Data Quality Rating	Definition
5 – Very High	▪ No assumptions, with available condition data from a reliable data source, and age and value are known.
4 – High	▪ Minor assumptions are made for condition, age, or replacement values, e.g., most of condition, age, and replacement values are known.
3 - Medium	▪ Minor assumptions are made for condition, age, or replacement values from moderately reliable sources.
2 - Low	▪ Data comes from significantly out of date documents or two of condition, age, or replacement values come from a moderately reliable source and the third item is unknown or unreliable.
1 – Very Low	▪ Only one of condition, age, or replacement values come from a moderately reliable source and the other two items are unknown or unreliable.

2.13.2 Levels of Service

Levels of Service (LOS) are a measure of the degree to which an asset meets functional or user requirements. Typically, Levels of Service are measured in terms of parameters that reflect social, political, environmental, and economic outcomes that the organization delivers. The parameters can include safety, customer satisfaction, quality, quantity, capacity, reliability, responsiveness, environmental acceptability, cost, and availability.

Figure 9 illustrates how LOS indicators align with Halton Region's mission, vision, strategic goals, and customer values. The structure of each LOS table is consistent among all service areas which provide the following information:

1. The column headings of the framework consist of: Key Service Attribute, Level of Service Statements, Customer Levels of Service, Technical Levels of Service, and Current Performance. Each of these headings are defined below:
    - **Key Service Attribute:** a phrase that describes the service being provided, e.g., accessible, environmentally conscious, safe, reliable, etc. These descriptions cover all aspects of the service and are easy for the public to understand and recognize.
    - **Level of Service Statements**: a short sentence that describes the outputs of the Service from the community perspective. The output clearly states customer standards and is measurable.
    - **Customer Levels of Service**: Descriptions of performance measures that outline the community impacts or perspective on Levels of Service.
    - **Technical Levels of Service:** Performance indicators, typically expressed in technical terms.
    - **Current Performance:** The metric associated with the performance indicator in present day performance measured against Technical LOS requirements.
2. The rows of the LOS tables consist of different key attributes values such as Availability, Cost Effectiveness, Reliability, Responsiveness, Safety, Suitability, and Sustainability. This enables staff to develop a holistic perspective on all aspects of a service area that is valued by the community, and to develop the performance metrics accordingly. The Region's key service attributes that have been applied within the Level of Service frameworks are shown in Table 6.

Figure 9. Level of Service Hierarchy

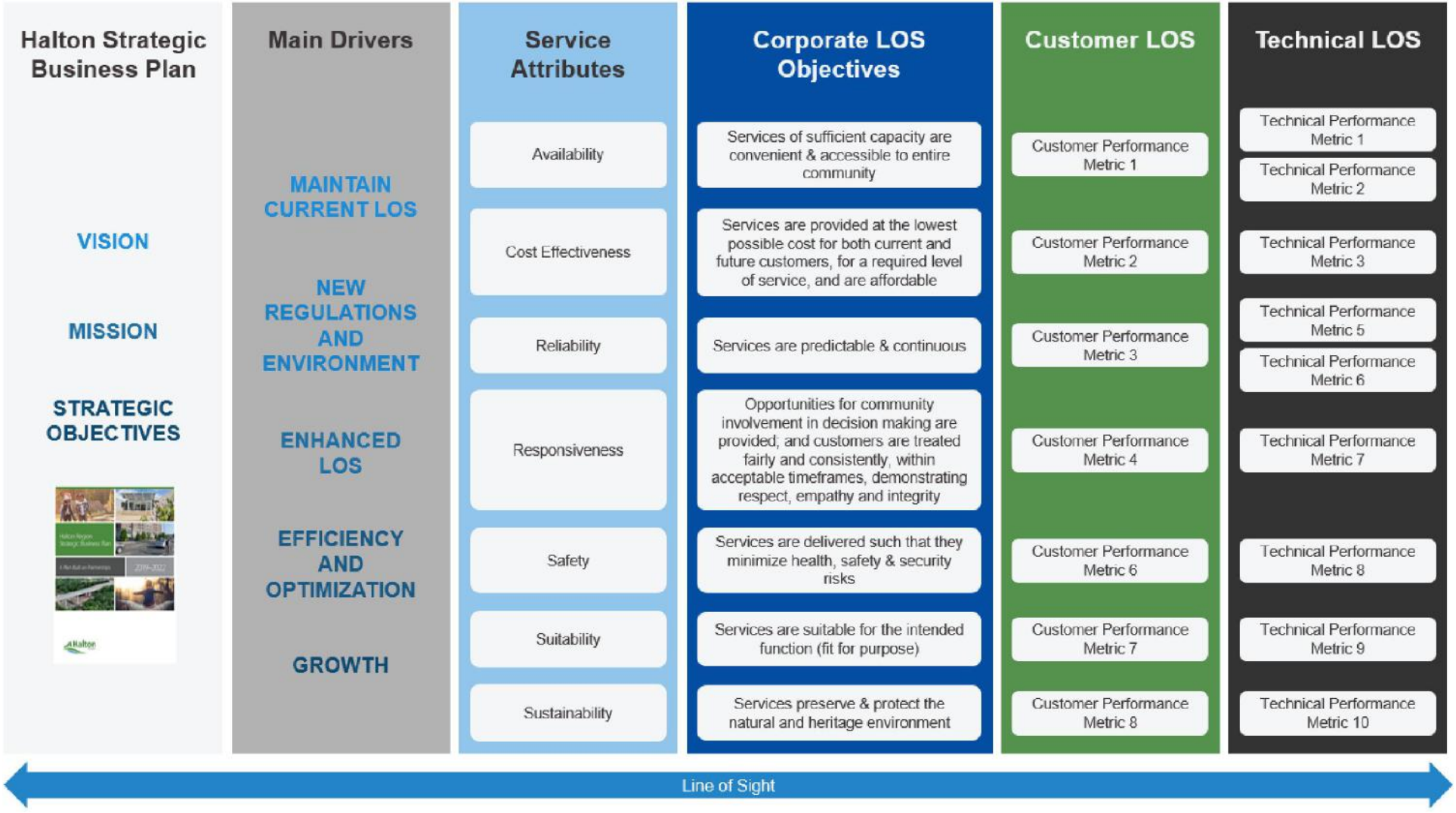


Table 6. Key Service Attributes and Descriptions

Key Service Attribute	Description
Availability	▪ Services of sufficient capacity are convenient and accessible to the entire community.
Cost Effectiveness	▪ Services are provided at the lowest possible cost for both current and future customers, for a required LOS, and are affordable.
Reliability	▪ Services are predictable and continuous.
Responsiveness	▪ Opportunities for community involvement in decision making are provided, and customers are treated fairly and consistently; within acceptable timeframes, demonstrating respect, empathy and integrity.
Safety	▪ Services are delivered such that they minimize health, safety, and security risks.
Suitability	▪ Services are delivered for the intended function (fit for purpose). Commonly represented as quality.
Sustainability	▪ Services preserve and protect the natural and heritage environment.

LOS are a key business driver that form one of the pillars of asset management decision making. Defined LOS describe the planned outcome from the customer expectations and the associated asset performance perspectives. The Regulation is asking for municipalities to identify current LOS being provided in the current AMP updates and future LOS proposed based on the proposed budgets for the 2024 deadline. The Regulation provides examples of Community and Technical LOS measures for core assets in Tables 1 to 5 that should be considered.

In Halton, LOS is dealt with in more detail for the 1 to 3 year budget and then more generically for the 4 to 10 and beyond budget analysis.

2.13.2.1 Short-Term LOS

Currently, LOS statements describe the outputs that Halton Region intends on delivering to the community in terms of attributes such as availability, cost-effectiveness, reliability, responsiveness, safety, suitability, and sustainability, which support the requirements of the Regulation. During the Strategic Project 2: Program Asset Management Strategies project delivered in 2017 (Jacobs), Halton defined the following:

- Characterization of asset portfolios by Program Areas.
- Customer LOS attributes and customer objectives
- Customer Key Performance Indicators (KPIs)
- Asset/System (technical) based KPIs

The first 3 years of the approved capital budget incorporate risk and LOS into the prioritization of asset needs during this window as noted in Report No. PW-28-17 re: Public Works Asset Management Program Update, 2017. Halton has developed a list of criteria that is ranked on each asset and used to develop the 1 to 3 plan considering the best improvement to LOS and highest reduction of risk. The criteria utilized, as defined in SP2, resemble the factors outlined in Tables 1 to 5 in the Regulation. The table shown below provides an example of the LOS criteria used in this risk process for water treatment plants that drive the 1 to 3 year capital plan.

Division	Customer LOS Attribute	Customer Objective	KPI
Water Treatment	Availability	Water system has sufficient capacity to meet demand	# of days water purification plants operate above 85% of rated capacity[1]
	Cost Effectiveness	Lowest life cycle cost is considered when making investment decisions.	Operator and maintenance staff hours per megalitre of water produced
	Reliability	Unplanned service interruptions are minor	% emergency vs. all other types of maintenance work orders

2.13.2.2 Long-Term LOS

Halton's lifecycle models are utilized to analyze the long-term (4 to 10+ years) capital needs for each asset portfolio. The list of expenditures is prioritized through the optimized decision-making process by identifying the highest benefit/cost solution, and mitigating risk while supporting public health, safety, community mobility and sustainable initiatives. The 1 to 3 year expenditures defined in risk process (above) are hard coded into the lifecycle models to ensure the first 3 years of the analysis match the current approved capital budget. The lifecycle models then analyze the long-term expenditure needs from year 4 beyond.

The outcomes from SP2 were the starting point for the enhancements and calibration of the asset management logic for the lifecycle model around LOS. For each asset group, deterioration models or estimated service life, replacement and rehabilitation activities and condition or age are all utilized in establishing the long-term needs.

LOS utilized in the lifecycle models is currently based on asset condition for all asset portfolios. An example of the long-term output from the lifecycle models is illustrated in the figure below for Transportation assets.

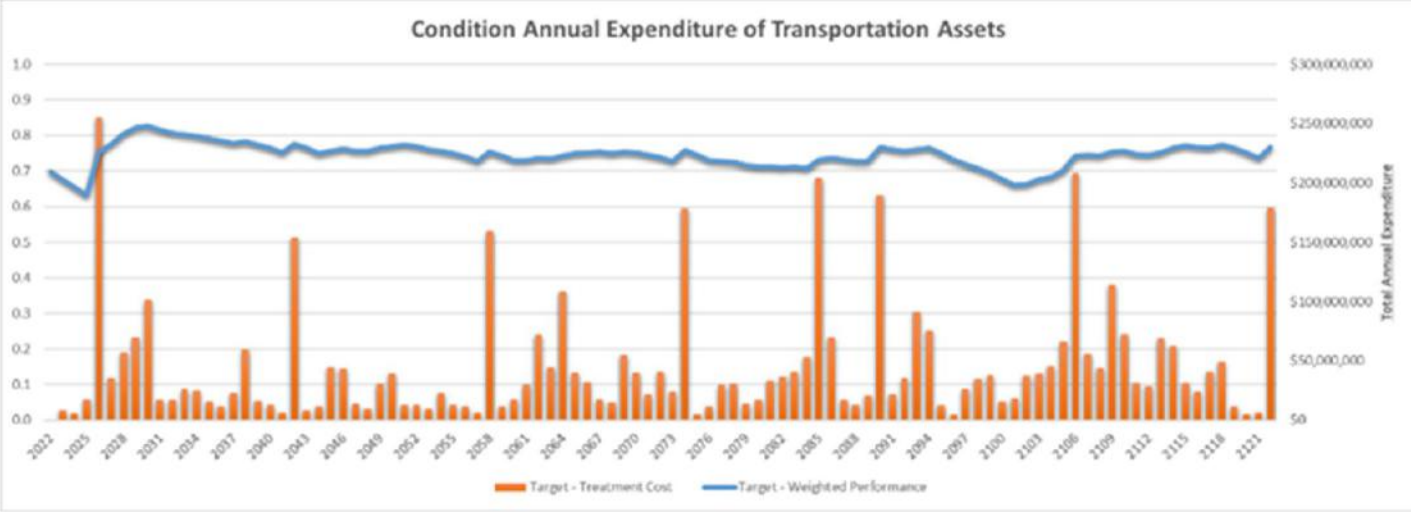


Figure 10. Transportation Expenditure 100-Year Forecast

Each lifecycle model output includes both the average condition of the asset portfolio (LOS) and the forecasted expenditure for each year. The lifecycle model allows Halton to visualize the condition versus spending scenarios and consider LOS in these long-term planning processes. In this case, the average condition of the transportation portfolio started around 70% and seem to be maintained based on the spending below between 60-80%.

Until better LOS information is available, many municipalities are utilizing average condition as a LOS indicator. The thinking being in most cases if you are able to maintain a fairly consistent average condition across the portfolio, current customer LOS should be maintained. The Regulations are calling for a closer link between LOS measures and expenditure plans.

2.13.2.3 Future LOS

As part of a typical AMP development process, municipalities must determine the current LOS being provided by the infrastructure systems. The Regulations are calling for these asset management frameworks to help provide a relationship between the defined LOS being provided by the Region's infrastructure systems and the associated operating and capital expenditures required to achieve them, both in the short and long-term.

While this is not ideal, most organizations start with condition as a measure of LOS and develop strategies to collect additional data that support more customer focused LOS measures. An example of how LOS can be approached for road assets is provided below for road assets.

Basic LOS Models for Roads	Condition is based on the Pavement Condition Index (PCI), if available, or based on age. Technical LOS is established for each road to be rehabilitated or replaced once a given condition is reached for each asset. The life cycle model will prioritize based on the assets in the worst condition/those assets closest to their LOS target. Customer LOS is typically identified as an overall average condition/PCI for the road network, normalized based on replacement value or lane km.
Advanced LOS Models for Roads	Condition is also based on the PCI, if available, but Annual Average Daily Traffic (AADT) counts are also utilized to prioritize spending. Technical LOS is established for each road to be rehabilitated or replaced once a given condition is reached for each asset. The life cycle model will prioritize based on highest AADT counts and assets in the worst condition/those assets closest to their LOS target. It prioritizes which assets to spend money on based on the biggest impact to traffic counts. Customer LOS is typically identified by the percentage of trips per day on GOOD roads (i.e., a good road is an asset with an overall average condition/PCI above 72 points).

With the example above in Figure 10, it is obvious that decision making becomes easier when looking at % of trips on good roads instead of average condition. As Halton continues to build on the AM Roadmap, consideration should be given to enhancing LOS beyond just asset condition to LOS factors that are directly linked to customer impacts for all asset portfolios that support this approach and have the data to support it. The LOS factors Halton will need to consider have been provided in SP2. The regulation has provided examples of LOS measures for Core assets, which Halton will also want to consider where possible for the 2024 deadlines.

The LOS sections within each chapter of the Asset Management Plan describe the LOS indicators that are currently being tracked for that asset portfolio. In addition, the sections include the performance metrics required by O. Reg. 588/17, and additional metrics established through best practices and discussions and workshops with key stakeholders. Using the principle of line of sight, Levels of Service should align with one or more components of the organization's strategic mission, vision and objectives. In addition, climate change is a significant priority for the Region of Halton and is one of the key considerations for asset Levels of Service.

2.13.3 Lifecycle Management Strategy

The Lifecycle Management Strategy is the set of planned actions performed on assets to provide Levels of Service in a sustainable way, while managing risk, at the lowest lifecycle cost. This section of the Asset Management Plan is composed of the following:

1. Descriptions of the specific lifecycle activities applied to each asset and the risks associated with the alternative "Do Nothing" approach.
2. The forecasted lifecycle activity costs illustrating the capital and operational needs across the entire asset lifecycle from creation to disposal.

All Halton divisions follow an approved Purchasing Policy for Surplus and Disposal as part of the Purchasing Bylaw 65-10 that was approved by

Regional Council. Section 30 of the bylaw outlines the surplus and disposal of assets and related activities.

Halton also has TCA and data verification policies that outline the disposal of assets and how those disposals are recorded in the financial records. All of these lifecycle activities are important as they work together to extend the asset life, reduce overall lifecycle costs, and achieve other objectives such as environmental goals and balancing risk. In 2018, the Public Sector Accounting Board (PSAB) issued the new Asset Retirement Obligations (ARO) Standard, PS 3280. This requires municipalities to meet accounting and reporting obligations when retiring infrastructure and other tangible capital assets (TCA). The standard applies to all public entities and provides guidance on accounting for and reporting a liability for AROs. Overall, this standard will improve the availability of financial data which in turn will assist the Region with decision-making around assets.

The lifecycle management activities documented in this section are the range of actions funded through the operating or capital budget that are performed on the asset or asset category. The asset lifecycle activities are generally grouped in the categories shown in Table 7. Major risks associated with stopping performing the activities are discussed within each section.

Table 7. Lifecycle Activity Categories and Descriptions

Lifecycle Activity Category	Description
Non-Infrastructure	▪ Actions or policies that can lower costs or extend asset life.
Maintenance	▪ Regularly scheduled inspection and maintenance, or repair and activities associated with unexpected events.
Renewal/ Rehabilitation	▪ Significant repairs designed to extend the life of the asset.
Replacement	▪ Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehabilitation is no longer an option.
Service Improvement	▪ Planned activities to improve an asset's capacity, quality, and system reliability.
Disposal	▪ Activities associated with disposing of an asset once it has reached the end of its useful life or is otherwise no longer needed by the municipality.
Expansion	▪ Planned activities required to extend services to previously un-serviced areas - or expand services to meet growth demands.

Source: Adapted from Ministry of Infrastructure, 2012

2.13.4 Forecasted Lifecycle Activity Costs

The analysis of the costs associated with each lifecycle activity is presented within this section. The costs for each lifecycle activity were developed with data based on: recent tenders, condition assessments, studies with asset valuation assessments., TCA replacement values (which are original construction costs, inflated to current year dollars), and unit rates based on professional judgement. A long-term investment forecast has been developed for each asset category using a 10-year planning horizon and illustrates the capital and operational needs to support the current Levels of Service.

With the increased forecast in capital infrastructure to be delivered, Halton as with many municipalities in the GTA, has to consider the impacts this will have on resourcing engineering and construction Team(s) to deliver the forecasted 10 year Growth and SOGR program. Other municipalities like Peel and Hamilton, have already started to look at their ability to deliver their capital needs and how their Project Management Office (PMO) is structured to support this growth. Similarly, Halton will need to consider a review of the impacts this growth in capital will have and look at opportunities to optimize PMO related processes and the staffing requirements to support these needs.

2.13.5 Financing Strategy

The financial strategy is one of the key components within the asset management plan, as it puts the Asset Management Plan into action. The financial plan provides a way for municipalities to integrate asset management planning with financial budgeting.

There are several common financial strategies available for the Region. These strategies include:

- Pay as you go: Paying for an asset by saving in advance.
- Reserve Accounts: Maintaining a reserve account to contribute revenues to draw funds from for expected and unexpected costs.
- Debenture Financing: A loan for the acquired asset with annual interest (limited to 25% of the municipality's source revenue).
- Third-Party Contributions: External contributions, subsidies and grants from higher levels of government.
- User Fees: Fees for the user of a service (typically based on a full-cost-recovery model).

Halton Region uses a combination of these financing strategies, depending on the scenario, which are outlined within the financial strategy section. As suggested by the *Building Together – Guide for Municipal Asset Management Plans* (Ministry of Infrastructure, 2012), this section will outline the financing strategy and annual expenditure forecasts for the following activities in alignment with the lifecycle management strategies:

- Non-infrastructure solutions
- Maintenance activities
- Renewal/rehabilitation activities
- Replacement activities
- Disposal activities
- Expansion activities (if necessary)
- Service Improvements

Each category will include actual expenditures from previous years to draw comparisons, a breakdown of yearly revenues by confirmed source, a discussion of key assumptions and the identification of funding shortfalls relative to financial requirements.

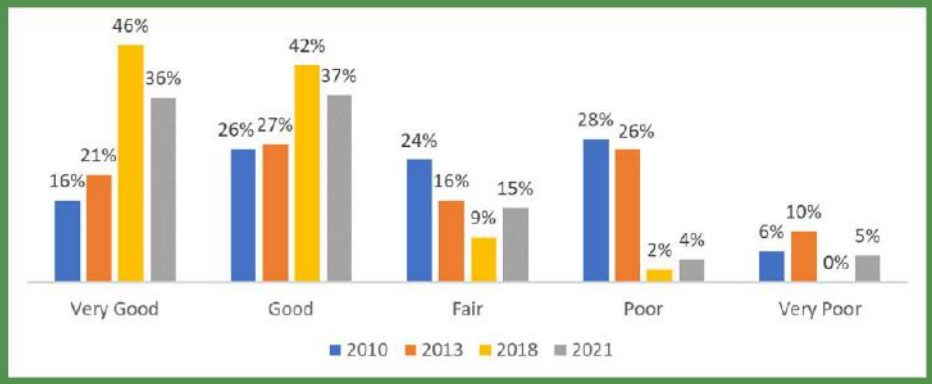
2.13.6 Improvement and Monitoring

Ontario Regulation 588/17 encourages municipalities to put an emphasis on a continuous improvement approach to asset management. Ensuring an open document requires monitoring and reporting on the implementation of asset plans to Council and staff.

This section highlights opportunities for improvement for the Region to achieve Halton's asset management objectives including an overall roadmap to improve asset management plans in the future.

Transportation

The Region is committed to expanding transportation options throughout Halton while promoting safety, minimizing environmental impact and optimizing traffic flows.



Key Messages

The improvement in overall condition reflects significant investments through the ongoing capital renewal program and growth-related transportation construction.

Quick Facts

1,085 lane-km of Roads

95 Bridges

178 Culverts

271 Noise Walls

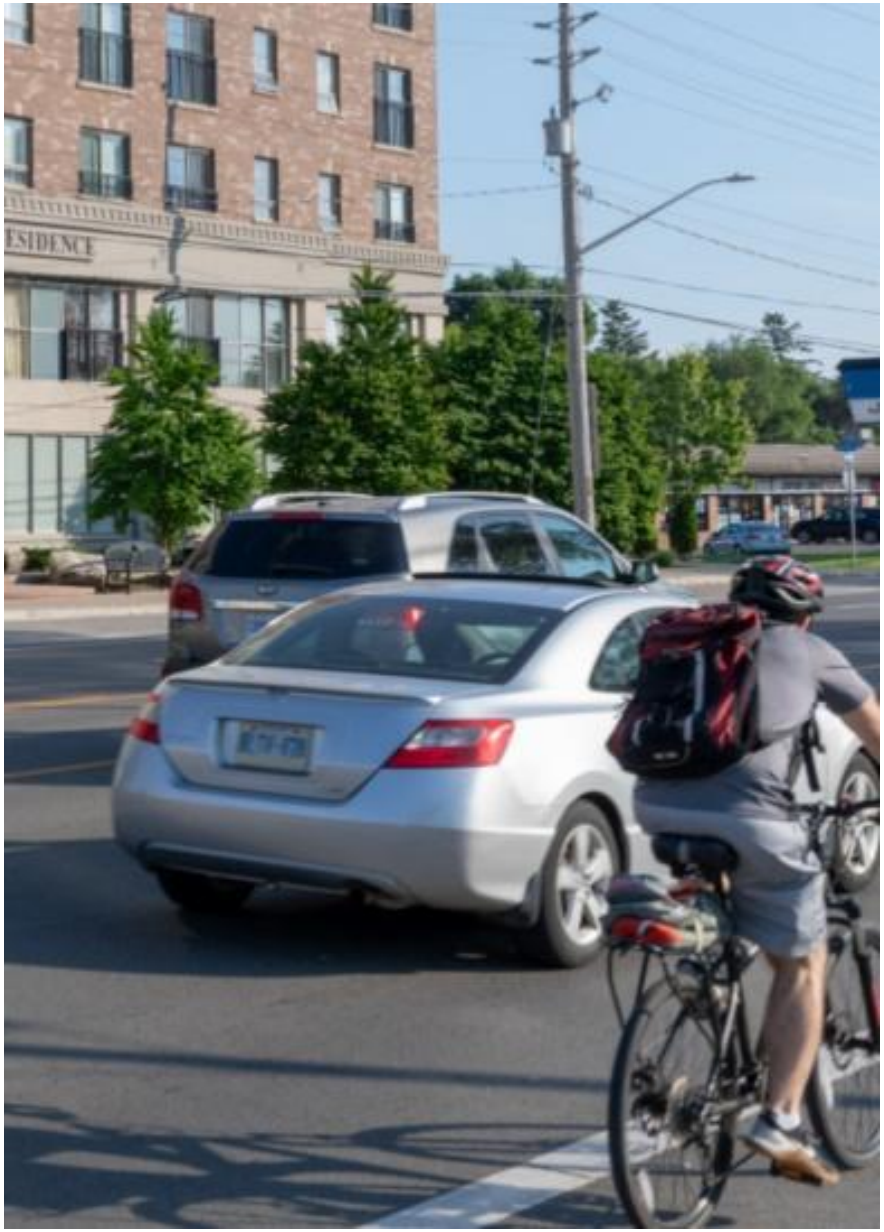
Asset Ratings

The overall condition of the transportation infrastructure is **Very Good**. As can be seen from the figure above, the proportion of assets above a Good rating has significantly increased since 2013 and decreased since 2018.

3.0 Transportation (Core Asset)

Halton Region's goal is to provide transportation services to residents and businesses that support a healthy and active lifestyle, contribute to the Region's economic vitality while balancing economic, social and environmental goals, and keeping the infrastructure in a good state of repair. The transportation assets that support the service include roadways that support the movement of people and goods, and structures, right-of-way features, and the traffic signal network. The transportation asset portfolio has a total replacement value of over $1.5 billion (asset valuation December 31, 2019).

In October 2011, the Region filed the final Transportation Master Plan to 2031, titled "the Road to Change". The plan defined a sustainable, integrated transportation system that considers all modes of travel (automobiles, transit, cycling, walking) and supports the policies and objectives arising out of the Halton Region Official Plan Review to the year 2031. This plan was followed in 2015, by the Region's first Active Transportation Master Plan that addressed cycling and walking along Regional roads with the objective of promoting integrated, sustainable, accessible, affordable and efficient multi-modal transportation. These strategies, in addition to the Region's ongoing evaluation of the state of good repair needs are helping ensure a reliable transportation service that meets the needs of the community now and in the future.



3.1 State of the Local Infrastructure

3.1.1 Asset Register

Having a well-running transportation network is a fundamental expectation of many members of the community. Whether someone is travelling to get to work or school, picking up groceries, or taking an evening stroll, they are dependent on safe and accessible transportation infrastructure. As previously mentioned, the Region's transportation asset portfolio is comprised of roads, structures, road right-of-way assets, and traffic signals. The roads are further

classified by road class into rural, urban, and suburban. Structures include bridges, culverts, retaining walls, and noise walls, right-of-way assets include guide rails, streetlights, signage, and the traffic signal network includes flashing beacons/warning signals, traffic management systems and signalized intersections. If all the roadways were to be replaced, it is estimated it would cost in the order of $892 million. The replacement cost for structures is estimated to be $443 million, whereas the road right-of-way assets are estimated to be $197 million. Figure 11 provides an overview of each of the asset categories by replacement cost.

summarizes the quantities and replacement costs of the transportation assets. As can be seen from the Figure and Table, Roadways and Bridges account for 72% of the overall transportation assets.

Figure 11. Asset Categories by Replacement Value (Transportation)

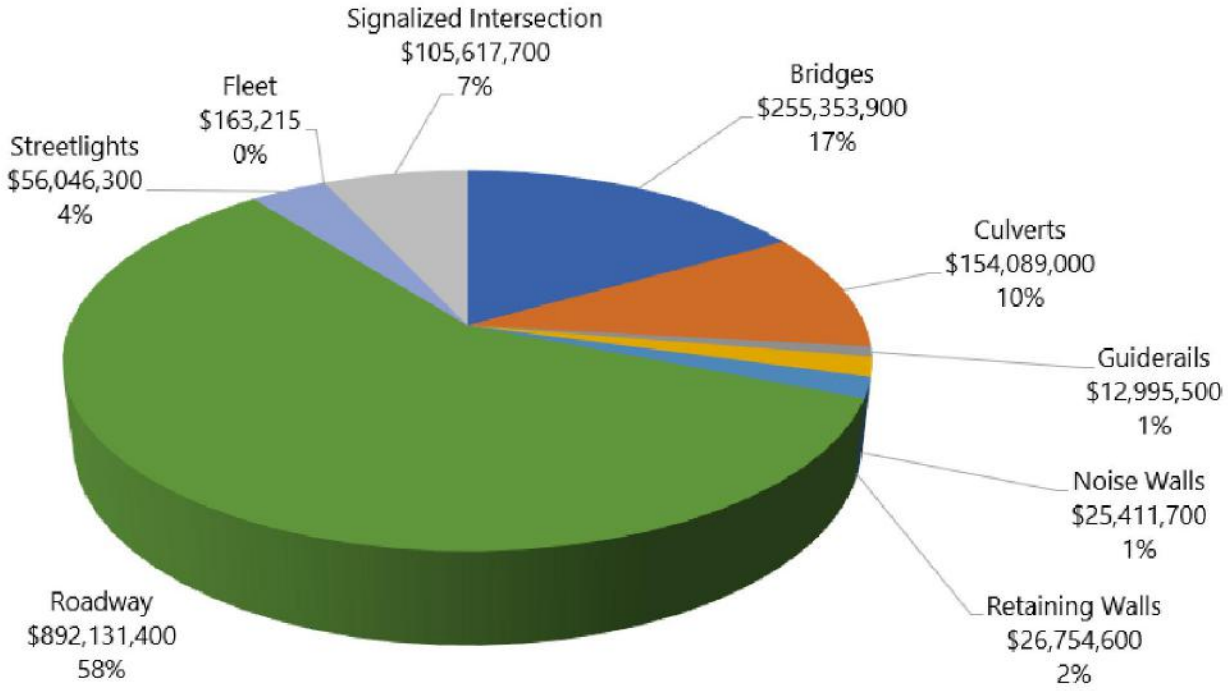


Table 8. Asset Quantities and Replacement Values (Transportation)

Program Area	Description	Asset	Count	Unit	Estimated Replacement Value (2020)
Transportation	Roadway	Rural	458	Lane km	$375,805,700
		Sub-urban	80	Lane km	$67,562,100
		Urban	547	Lane km	$448,763,600
	Structures	Bridges	95	Each	$255,353,900
		Culverts	178	Each	$154,089,000
		Noise Walls	24	Length km	$25,411,700
		Retaining Walls	8,361	Area sq m	$26,754,600
	Road Right-of-Way	Guide Rails	624	Each	$12,995,500
		Signalized Intersections	263	Each	$105,617,700
		Streetlights	3,665	Each	$56,046,300
	Traffic Signal Network	Flashing Beacons/Warning Signals	TBC	Each	TBC
		ATMS	TBC	Each	TBC
	Fleet	Fleet	4	Each	$163,215
Total					**$1,528,563,315**

Note: *TBC – To Be Confirmed (will be collected for next update)*

3.1.2 Asset Age Distribution

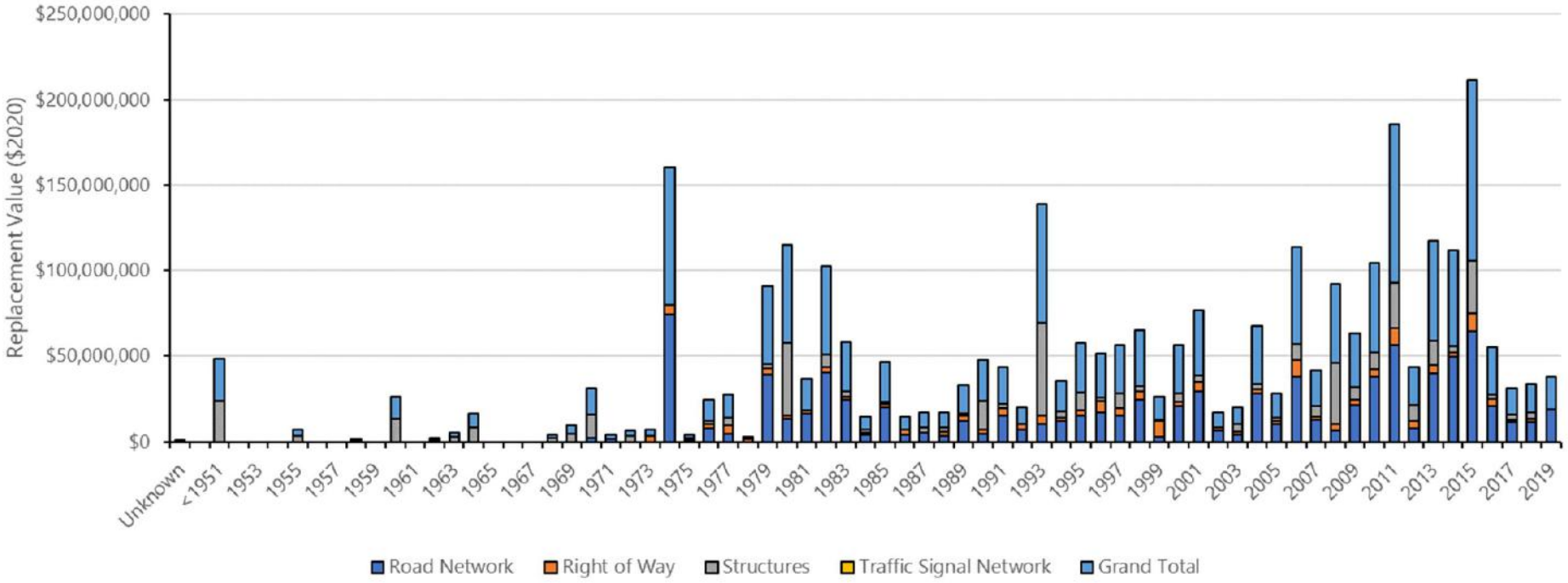
Figure 12 summarizes the average age and average Estimated Service Life (ESL) of each asset type. It should be noted that road right-of-way assets (streetlights, signage and guiderails) have been excluded as they are generally replaced and renewed through the minimum maintenance standards, and currently there is insufficient data to accurately represent the average age. Bridges, roadways, noise walls and signalized intersections are relatively early in their lifecycles.

Figure 12. Average Asset Age as a Proportion of Average Asset ESL (Transportation)

Note: *All data is weighted by the 2020 replacement value of the components.*

Like any municipality, Halton Region has seen cycles of economic growth throughout the last century; these cycles are reflected in Figure 13 which indicates large proportions of transportation assets were constructed in the 1970's, 1990's and 2010's.

Figure 13. Construction Years by Replacement Value (Transportation)



3.1.3 Asset Valuation

Assets are typically valued from two perspectives: financial accounting valuation and replacement cost valuation. Financial valuation is based on historical costs and applies depreciation to estimate the current book value of the assets. Replacement costs are based on consultant estimates, unit rates based on professional judgement and TCA replacement values which are the original construction costs adjusted for inflation to the current year. Table 9 shows the financial accounting valuation (also referred to as the book value) and the replacement cost valuation of the transportation portfolio. As can be seen from the table, the book value is considerably lower than the replacement cost valuation. This is due to the assets depreciating in value through their life to date. It should be noted that the valuation was as of December 31, 2019. The replacement values within the plan are based on estimates by subject matter experts (such as from Condition Needs Assessments), and where that information was not available, historical costs have been used.

Table 9. Financial Accounting and Replacement Cost Valuation (Transportation)

Financial Accounting Valuation	Replacement Valuation
$753,358,373	$1,528,563,315

3.1.4 Asset Condition

Road condition is assessed through a dedicated condition assessment program performed on a three-year cycle. When a road is assessed, a

Pavement Quality Index (PQI) ranging from 0 to 100 is assigned to the road. The PQI is then converted to the Very Poor to Very Good scale. This data is stored within the Region's pavement management system, Road Matrix.

Bridges and culverts are also assessed through biennial structure inspections in accordance with Ontario Regulation 104/97 to ensure structures are kept in a state of good repair. Bridge Condition Index (BCI) ratings ranging from 1 to 100 are calculated for each bridge and culvert and converted to the Very Poor to Very Good scale, which is defined in Table 10. For the purposes of the Asset Management Plan, assets with no available condition data were assigned estimated condition scores using age and estimated service lives.

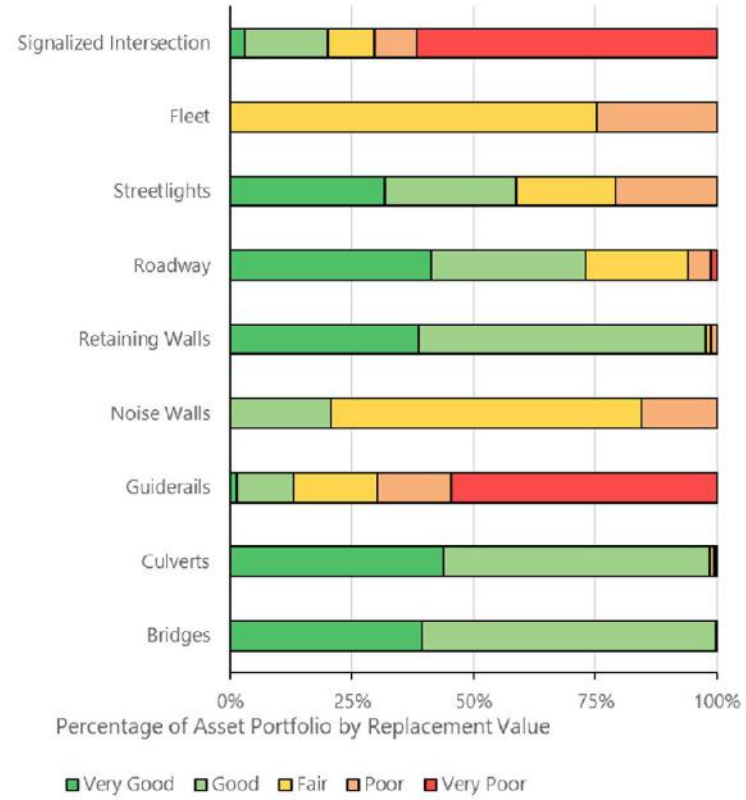
These condition assessment and inspection programs help to inform the Risk Evaluation and Optimized Decision-Making Processes already established by the Region. Issues identified from Condition Assessments, lifecycle models and operating and maintenance staff are considering annually as part of the budgeting process. These results are used to build business cases for capital projects which are evaluated and prioritized using the Optimized Decision-Making process. Together, these procedures help to prioritize needs for the first 1-3 years of the 10-year capital budget.

Table 10. Condition Score and Rating Scales (Transportation)

Condition Score	Condition Rating	Bridge/Culverts (BCI)	Roadway (PQI)	Noise Walls	Retaining Walls	Age-Based (1-Age/ESL)
1	Very Good	80 - 100	80 – 100	5	80 - 100	0.80 – 1.00
2	Good	60 - 79	60 – 79	4	60 - 79	0.60 - 0.79
3	Fair	40 - 59	40 – 59	3	40 - 59	0.40 – 0.59
4	Poor	20 - 39	20 – 39	2	20 - 39	0.20 – 0.39
5	Very Poor	0 - 20	0 - 20	1	0 - 20	0 – 0.20

Another perspective of the state of the infrastructure is to view the proportion of assets in each rating category as shown in Figure 14.

Figure 14. Condition Distribution by Replacement Value (Transportation)



The figure shows that the overall condition of transportation infrastructure is Very Good. The proportion of assets above a Good rating has significantly increased since 2013 and decreased since 2018. This is reflective of a risk-based approach – since structures and roadways are critical assets to service delivery, they are maintained to a high Level of Service. It should be noted that the data confidence is also high for the roadways and structures since the full networks are assessed on a three year and two-year cycle respectively. The data confidence and continuous improvement considerations are included in the following section.

3.1.5 Data Sources and Data Confidence

As with any data intensive analysis, it is important to understand the confidence in the information that that forms the basis for the analysis. The data was provided in 2020 from the following sources to complete the state of local infrastructure analysis:

- Roadways: An export from Road Matrix which included street segments and their attributes such as PQI, age, and construction year.

- Bridges and Culverts, Retaining Walls, and Noise Walls: OSIM inspection inventories with asset attributes including location, condition data, and length.
- Guide Rails and Streetlights: An export of TCA data of the asset inventory for guide rails, signage, and streetlights. It includes replacement values, installation dates, and useful life.
- Signalized Intersections: The Traffic Signal inventory is saved within the Corporate GIS.

The following assumptions were made during the development of this section of the Asset Management Plan:

- For those assets with known condition, the condition was adjusted to present day condition by deteriorating the asset from the day that it was inspected to an estimated present condition.
- Roadways: All roadways were assigned replacement values of $\$200/m^2$. If the construction year of a road was unknown, the resurfacing year was used. The condition was adjusted to represent the current state based on the asset degradation curves and inspection information.
- Bridges and Culverts: The ESL was assumed to be 75 years for bridges and 50 years for culverts. The condition was adjusted to represent the current state based on the asset degradation curves and provided inspection information.
- Retaining Walls: All retaining walls were assigned a replacement value of $\$1,000/m^2$ of wall area. The condition was adjusted to represent the current state based on the asset degradation curves and provided inspection information.
- Noise Walls: The condition was adjusted to represent the current state based on the asset degradation curves and provided inspection information.
- Signalized Intersections: Signalized intersection condition was assumed using an age/ESL based formula and all intersections were assigned a replacement value of $175,000.

The following table shows the data confidence assessment, impacts and proposed actions for the transportation asset portfolio.

Table 11. Data Confidence Assessment (Transportation)

Description	Asset	Confidence Rating	Confidence Comment
Roadway	Rural	Very High	Data is based on recent inspections, with information currently stored in the pavement management system.
	Sub-urban		
	Urban		
Structures	Bridges	Very High	Data is based on OSIM inspections with asset attributes including location, condition data, and length.
	Culverts		
	Noise Walls		
	Retaining Walls		
Road Right-of-Way	Guide Rails	Good	The assessment is based on TCA historical costs, which may be underestimating condition due to maintenance activities not being captured on components.
	Streetlights		
Traffic Signal Network	Flashing Beacons/Warning Signals	Very Low	Currently flashing beacons/warning signals and ATMS data is not available. The analysis of signalized intersections is only based on the parent asset level (i.e., the intersection as a whole).
	ATMS		
	Signalized Intersections		

3.2 Levels of Service

As part of the commitment to ensuring Levels of Service, the Region is committed to expanding transportation options throughout Halton while promoting safety, minimizing environmental impact, optimizing traffic flows, and striving to maintain assets in a state of good repair. The Region's Official Plan, through Section 173(19) of ROPA 38, requires staff to monitor the overall performance of Halton's Transportation System and to report annually to Council through the Transportation Services Progress Report on the Region's activities relating to the planning, design, construction, operation and maintenance of the Region's transportation system. Key system performance indicators provided in the report enable the overall state of the Regional road system to be tracked and measured over time. Annual programs are undertaken to ensure that regional roads are operating in the safest and most efficient way possible, and that the service life of infrastructure is optimized.

Transportation staff at the Region play an active role in setting and managing Levels of Service throughout all stages of the asset lifecycle as described in Table 12.

Table 12. Levels of Service and the Asset Lifecycle (Transportation)

Lifecycle Activity	Description
Maintenance	Halton Region has adopted a Road Maintenance strategy that defines the activities to be carried out as part of the maintenance of the Region's road infrastructure to ensure safety, preservation and quality of life, and establishes the timeframes within which those activities will be completed. The Road Maintenance LOS meets the Ontario Regulation 239/02 Minimum Standards for Municipal Highways. Regional road maintenance in Halton is primarily performed through maintenance agreements with the Region's lower-tier municipalities to performance standards

Lifecycle Activity	Description
	outlined in the Contractors Maintenance Services document.
Renewal/ Rehabilitation and Replacement	The Road Needs Study is prepared annually to provide an overview of the condition of the road sections in the Regional network and uses the Ministry of Transportation Inventory Manual for Municipal Roads methodology to consider factors such as capacity, geometry, surface width, surface type, structural adequacy, and drainage. These results will help ensure existing Regional roads are able to accommodate growth and identify areas where existing roads require expansion, resurfacing, or rehabilitation. Biennial structure inspections are performed on all bridges and major structures in accordance with Ontario Regulation 104/97 Standards for Bridges to ensure structures are kept safe and in good repair. Needs identified by the above activities are analyzed during the annual Risk Evaluation process and prioritized using the Optimized Decision-Making process. Whenever possible, projects related to renewal/rehabilitation and replacement are scheduled in coordination with the Local municipalities and other asset types (water and wastewater), to minimize costs and mitigate service disruption.
Expansion	The need for additional road capacity is determined by comparing the evening (PM) peak-hour traffic volume at the screenline level versus the available capacity. Capacity deficiencies are determined based on achieving a target through the volume/capacity (v/c) ratio. At a v/c ratio of 0.90, the transportation network crossing the screenline is operating at 90 per cent of its functional capacity. For screenlines that exceed a v/c ratio of 0.90, the construction of additional lanes is considered to provide sufficient additional capacity to return the screenline to 90 per cent of its capacity. The current Transportation Master Plan (2031) The Road to Change used this methodology to determine the preferred roadway solutions to accommodate travel demand growth in the Region to 2031.

In addition to the program-based Levels of Service, Key Performance Indicators for the transportation asset portfolio are tracked as part of the annual budget and business plan and are reviewed on an annual basis.

O.Reg. 588/17 has set requirements for both customer Levels of Service and technical Levels of Service for all core assets. O.Reg. 588/17 customer Levels of Service use qualitative descriptions to describe the scope and quality of the service being provided by the asset or asset category while technical Levels of Service use performance measures to measure the scope or quality of the service being provided by the asset or asset category. For the purposes of the Asset Management Plan, a Level of Service framework has been developed to incorporate the following:

- Key metrics in alignment with the Key Performance Indicators in the annual budget and business plan.
- Performance indicators developed internally by Halton Region staff and through projects such as Strategic Project 2, which defined customer and technical Levels of Service.
- Regulatory Levels of Service as required by O. Reg 588/17.

Table 13 provides the Region's community and technical Levels of Service for transportation assets.

Table 13. Community and Technical Levels of Service (Transportation)

Customer Levels of Service	Reference	Technical Levels of Service	Current Performance
Description or images that illustrate the different levels of road class pavement condition	Table 14	Average surface condition	Good
Description or images of the condition of bridges and how this would affect use of the bridges	Table 15	For bridges in the municipality, average bridge condition index value (BCI)	71.87*
Description or images of the condition of culverts and how this would affect use of the culverts	Table 15	For structural culverts in the municipality, average bridge condition index value (BCI)	76.44*
Description, which may include maps, of the road network in the municipality and its level of connectivity	Figure 15	Average surface condition (e.g., Excellent, Good, Fair or Poor) for paved roads (PQI)	76.29 (PQI)**
Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	Currently Regional Bridges support traffic over and under for rail, heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians and cyclists.	# of lane-kilometers of arterial roads as a proportion of square kilometers of land area of the municipality. ***	0.89 lane km/km^2
		# of lane-kilometers of collector roads as a proportion of square kilometers of land area of the municipality. ***	0.22 lane km/km^2
		# of lane-kilometers of local roads as a proportion of square kilometers of land area of the municipality. ***	0.01 lane km/km^2
		% of bridges in the municipality with loading or dimensional restrictions.	1.14%

Notes: ** BCI has been converted to a 0-100 scale, where 100 would be in excellent condition.*

*** PQI is weighted based on lane-km*

**** "arterial roads" means Class 1 and Class 2 highways as determined under the Table to section 1 of Ontario Regulation 239/02 (Minimum Maintenance Standards for Municipal Highways) made under the Municipal Act, 2001; "collector roads" means Class 3 and Class 4 highways as determined under the Table to section 1 of Ontario Regulation 239/02; "local roads" means Class 5 and Class 6 highways as determined under the Table to section 1 of Ontario Regulation 239/02.*

The "reference" column in Table 13 is referring to the following tables and maps that provide the customer Levels of Service. The percentage of lane-km of roads for each of the road classifications within each PCI category is provided in Table 14. Table 15 provides the percentage of bridge and culvert assets within each BCI category.

Table 14. Road Class Pavement Condition Percentage of Lane-km within each Category

Roadway Condition Score	Class 1, 2*	Class 3, 4*	Class 5, 6*	Total
Very Good Condition Score = 1	37.81%	50.61%	24.25%	40.14%
Good Condition Score = 2	33.38%	23.70%	36.91%	31.54%
Fair Condition Score = 3	22.73%	18.22%	25.36%	21.88%
Poor Condition Score = 4	5.54%	3.36%	4.16%	5.10%
Very Poor Condition Score = 5	0.54%	4.11%	9.33%	1.35%

Notes: **As determined under the Table "Classification of Highways" in section 1 of Ontario Regulation 239/02 (Minimum Maintenance Standards for Municipal Highways) made under the Municipal Act, 2001.*

Table 15. Descriptions of the Condition Ratings of Bridges (BCI) and Culverts (BCI)

Bridges and Culverts Condition Score	Bridges	Culverts	Total
Very Good Condition Score = 1	14.59%	35.55%	22.48%
Good Condition Score = 2	85.34%	62.98%	76.93%
Fair Condition Score = 3	0.07%	0.84%	0.36%
Poor Condition Score = 4	0.00%	0.63%	0.24%
Very Poor Condition Score = 5	0.00%	0.00%	0.00%

A map of the road network within the Region and the level of connectivity is shown in Figure 15. Halton Region is connected to a number of provincial freeways, regional and local roads.

In addition to the provincial road network, the Regional road network, which is managed by the Region, connects the rural and urban centres and provides connectivity to the provincial highway system. The primary east-west Regional arterials include Dundas Street through Burlington and Oakville; and Derry Road, Britannia Road and Steeles Avenue through Milton and Halton Hills. The primary north-south Regional arterials include Regional Road 25, Trafalgar Road and Guelph Line. These roadways provide connectivity to Highways 7, 401, 407 and the QEW/403.

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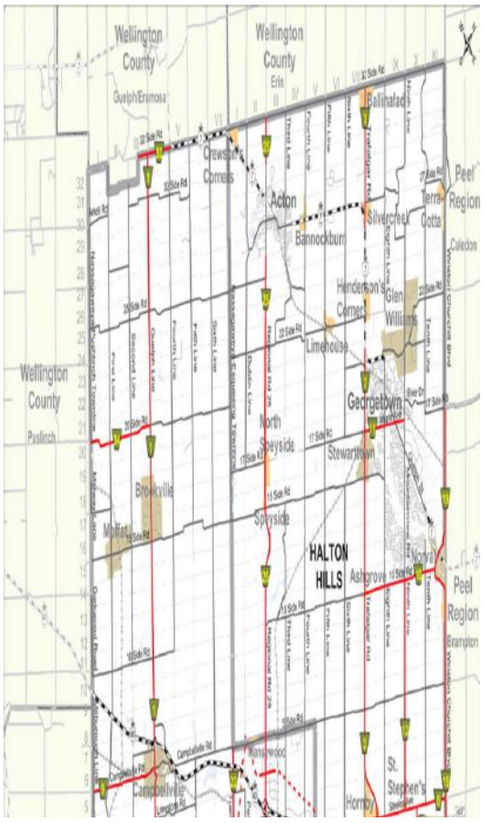
Figure 15. Map of the Road Network in the Region and the Level of Connectivity



3.3 Lifecycle Management Strategy

Across the full lifecycle, various strategies are applied to Transportation assets to ensure that the Levels of Service are being sustained. In short, the activities enable the system to have adequate capacity and ensure that it is maintained in a state of good repair. The Region has undertaken a number of non-infrastructure solutions to assist in meeting the Levels of Service as well as advancing overall asset management capabilities. The non-infrastructure solutions include:

- Travel Demand Management and Active Transportation initiatives within the Transportation Master Plan assist in extending the life of assets by reducing single occupant vehicle usage and providing additional road capacity.
- The continuation of Smart Commute Halton and the planning of High Occupancy Vehicle Lanes also reduce single-occupant vehicle usage and provide additional road reserve capacity that can extend asset life.
- Signal optimization and progression studies are undertaken on a programmed basis to ensure that existing system capacity is optimized through the adjustment and coordination of signal timing.
- Load restrictions are applied to extend pavement life on certain secondary roads where the pavement structure could be impacted by full truck loads.
- Coordination of water and wastewater construction with transportation improvements reduces the impact of construction activities on the community and minimizes pavement cuts which reduce the life of the pavement structure.
- Joint contracts with the local municipalities help to minimize construction impacts for residents and lower project costs.

Several asset management initiatives have also been implemented to improve asset management capabilities and business processes for asset planning and budgeting. These include the Region's Risk Evaluation and Optimized Decision-Making processes along with 100-year lifecycle models to project investments throughout the life of an asset. Risks associated with upcoming projects and existing assets are identified and assessed and those results are subsequently used to build business cases for capital projects. Through the Optimized Decision-Making process (see inset), business cases are evaluated and prioritized based on the best cost vs. benefit

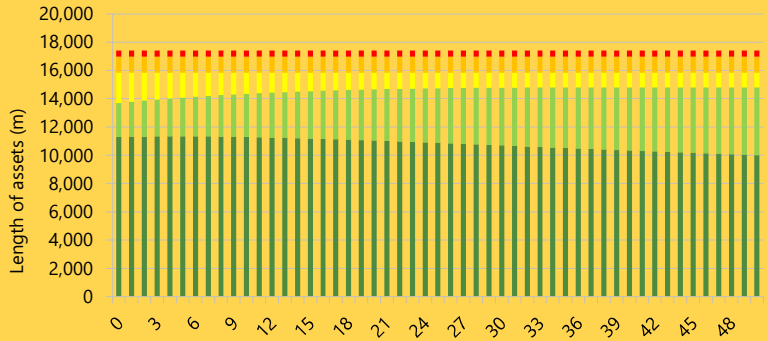
Lifecyle Model Development

The Region uses 100-year lifecycle models to analyze long-term renewal investment projections of rehabilitation and replacement interventions throughout the life of the assets.

The outputs from lifecycle modeling inform both the short-term and long-term capital expenditure plan. Long-term investment planning relies more heavily on lifecycle modeling, using age and condition data to forecast asset interventions. The extent and reliability of data needed to drive these forecasts is lower compared to short-term investment planning; a good understanding of asset deterioration rates is vital to ensure the accuracy of long-term projections. Lifecycle modeling can have a number of roles in long-term planning, including:

- Expenditure projections for Years 4 to 10 of the capital plans.
- Input to estimates of rate / tax increases required to fund the asset base over the long-term and
- the identification of potential peaks in future expenditure to inform the reserve fund requirements.

An example output model is shown below.



solution for risk mitigation. While these activities inform the first 1-3 years of the 10-year capital budget, the long-term lifecycle models inform the latter 4-10 years.

Halton Region's road maintenance strategies ensure that the Region's maintenance activities meet or exceed the provincially mandated Minimum Standards for Municipal Highways. This includes weekly routine patrols undertaken to identify system deficiencies which are supplemented by spring and fall night tours conducted to observe luminaries, safety devices, pavement markings and monitor sign replacement. These patrols are completed by the local municipalities on behalf of the Region.

Scheduled inspections of critical structural assets including bridges and culverts are conducted biennially. The Region's pavement management system is used to identify and prioritize road rehabilitation and renewal requirements, while specific project-level testing of roadway pavement is completed to ensure that the rehabilitation methodology is optimized. Based on data collected, localized resurfacing, crack sealing and renewal of pavement markings are conducted on an annual basis as required. More substantial road resurfacing and structural rehabilitation work is programmed through the risk and prioritization process for delivery as part of annual resurfacing and rehabilitation programs. Replacement programs are coordinated with other adjacent asset classes and incorporated into the budget and business plan. In recent years, the Region has seen significant growth resulting in rapidly increasing transportation demand and a corresponding growth in the Region's capital expansion program. Based on the Transportation Master Plan, investment in system expansion is expected to remain at high levels until 2031.

Replacement of infrastructure elements is considered in the same manner as rehabilitation and renewal activities. Long-term capital replacement requirements are incorporated into the 10-year Capital Budget based on lifecycle estimates and are programmed based on detailed inspection data and project-specific needs. Replacement of infrastructure is being impacted by the need to provide additional system capacity where assets with residual useful life are being preserved through the expansion of the infrastructure system.

All Halton divisions follow an approved Purchasing Policy for Surplus and Disposal as part of the Purchasing Bylaw 65-10 that was approved by Regional Council. Section 30 of the bylaw outlines the surplus and disposal of assets and related activities.

In addition to the activities described above, Table 16 provides an overview of the lifecycle activities that apply to each component of the transportation portfolio lifecycle as well as the risks associated with not following the strategy.

Table 16. Lifecycle Activities and Risks Associated with Not Following the Strategy (Transportation)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	**All Assets:** ▪ Lifecycle models have been developed for transportation assets which predict asset deterioration. ▪ Asset Management Plan and Policy development and updates. ▪ Development of the Infrastructure Condition Report Card which summarizes the overall condition of transportation assets. The Report Card is updated every three years. **Roadways:** ▪ Annual speed and delay review of corridors. ▪ Travel Demand Management and active transportation initiatives to encourage multi-transit modes. ▪ Extending pavement life on certain secondary roads by applying load restrictions on those roads where full truck loads can impact the pavement structure. ▪ Coordinating road construction projects with water and wastewater projects to reduce the impacts of construction on the community. **Traffic Signal Network Assets:** ▪ Optimization of signal timing which includes the Annual Corridor Review Program. ▪ Updating traffic signal timings when necessary.	**All Assets:** ▪ Asset deterioration is over or underestimated. ▪ Inaccurate growth numbers and estimation of funding. **Roadways and Structures:** ▪ Continued growth in travel on roadways instead of transit mode splits leading to pavement failure and traffic congestion. **Right-of-Way Assets:** ▪ Energy consumption and costs are not reduced. **Traffic Signal Network Assets:** ▪ Inefficient signal timing leading to traffic congestion at intersections. ▪ Incorrectly updated signal timings may pose health and safety risks.
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**All Assets:** ▪ Condition inspections ▪ Reactive maintenance activities	**All Assets:** ▪ Deficiencies are not identified through patrols. ▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	▪ System deficiencies identified through weekly routine patrols and spring and fall night tours. ▪ Minor deficiencies are repaired on the spot when possible. **Roadways:** ▪ Pavement condition monitoring through the Pavement Management Data Collection and Review to determine appropriate pavement interventions/treatments. ▪ Road maintenance in accordance with O. Reg. 239/02. ▪ Localized spot repairs, resurfacing, crack sealing, and renewal of pavement markings on an annual basis. ▪ Spot repair and pothole repair. ▪ Road salting and snow removal in the winter. **Structures:** ▪ Biennial structure inspections in accordance with O. Reg. 104/97 to ensure all bridges and major structures are kept in a state of good repair.	▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Customer dissatisfaction with road congestion, road closures, and other disruptions. ▪ Inspection data is not up to date or inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure.
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Roadways:** ▪ Scheduled rehabilitation activities such as road resurfacing. ▪ Minor and major rehabilitation activities based on road condition and previous rehabilitation activities performed. **Structures:** ▪ Minor and major rehabilitation activities based on condition and previous rehabilitation activities performed. **Right-of-Way Assets:** ▪ Asset repair as needed after complaints, inspections or	**All Assets:** ▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled. **Right-of-Way Assets** ▪ Health and safety risks due to missing or falling signage or malfunctioning streetlights.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	weather events.	
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	**Roadways:** ▪ Road reconstruction based on condition and previous rehabilitation activities performed. **Structures:** ▪ Replacement or reconstruction based on asset condition and previous rehabilitation activities performed. **Right-of-Way Assets:** ▪ Light fixture, guide rails, streetlight and signage replacement.	**All Assets:** ▪ Delay in construction projects may result in health and safety risks, higher costs, longer service disruption, and customer dissatisfaction. **Right-of-Way Assets:** ▪ Health and safety risks due to missing or falling signage or malfunctioning streetlights. **Traffic Signal Network Assets:** ▪ Delayed traffic signal replacements will lead to increased traffic congestion at intersections and further service disruption.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	**Roadways:** ▪ Disposal activities include decommissioning the road by blocking off entry or removing the pavement and redirecting traffic. ▪ Asphalt disposal according to regulations and standards. **Structures:** ▪ Disposal activities include closing the bridge, demolition, and disposal of materials according to regulations and standards. **Right-of-Way Assets:** ▪ Disposal of damaged guard rails, signage and streetlight poles. **Traffic Signal Network Assets:**	**All Assets:** ▪ Improper disposal can lead to environmental impacts and expenses.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	▪ Disposal of traffic signals and cabling when they are replaced.	
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	**All Assets:** ▪ Road volume/capacity ratio analysis to determine strategies to accommodate for travel demand growth. ▪ Capital projects including road widening, extension and new construction projects to service new growth and intensification. ▪ Transportation and Active Transportation Master Plan development. **Right-of-Way Assets:** ▪ Installation of ROW assets in areas with new road construction to service growth in previously unserved areas.	**All Assets:** ▪ Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth. ▪ Master Plans may overestimate, or underestimate required road expansions to accommodate for growth. **Right-of-Way Assets** ▪ Health and safety risks due to lack of signage or proper lighting.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	**All Assets:** ▪ The Roads Needs Study is prepared annually which assesses the adequacy of the entire network. ▪ Establishing and monitoring Levels of Service to identify opportunities of improvement and establishing target Levels of Service. **Right-of-Way Assets:** ▪ Installing new lights or signage in areas with high collision rates. ▪ Replacing high pressure sodium (HPS) streetlights with light emitting diodes (LED) fixtures through the LED Street Light Conversion Program. LED fixtures reduce energy consumption and costs.	**All Assets:** ▪ Service improvement is not as significant as expected and traffic congestion continues to worsen. ▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks. **Right-of-Way Assets:** ▪ Health and safety risks due to lack of signage or proper lighting.

3.4 Forecasted Lifecycle Activity Costs

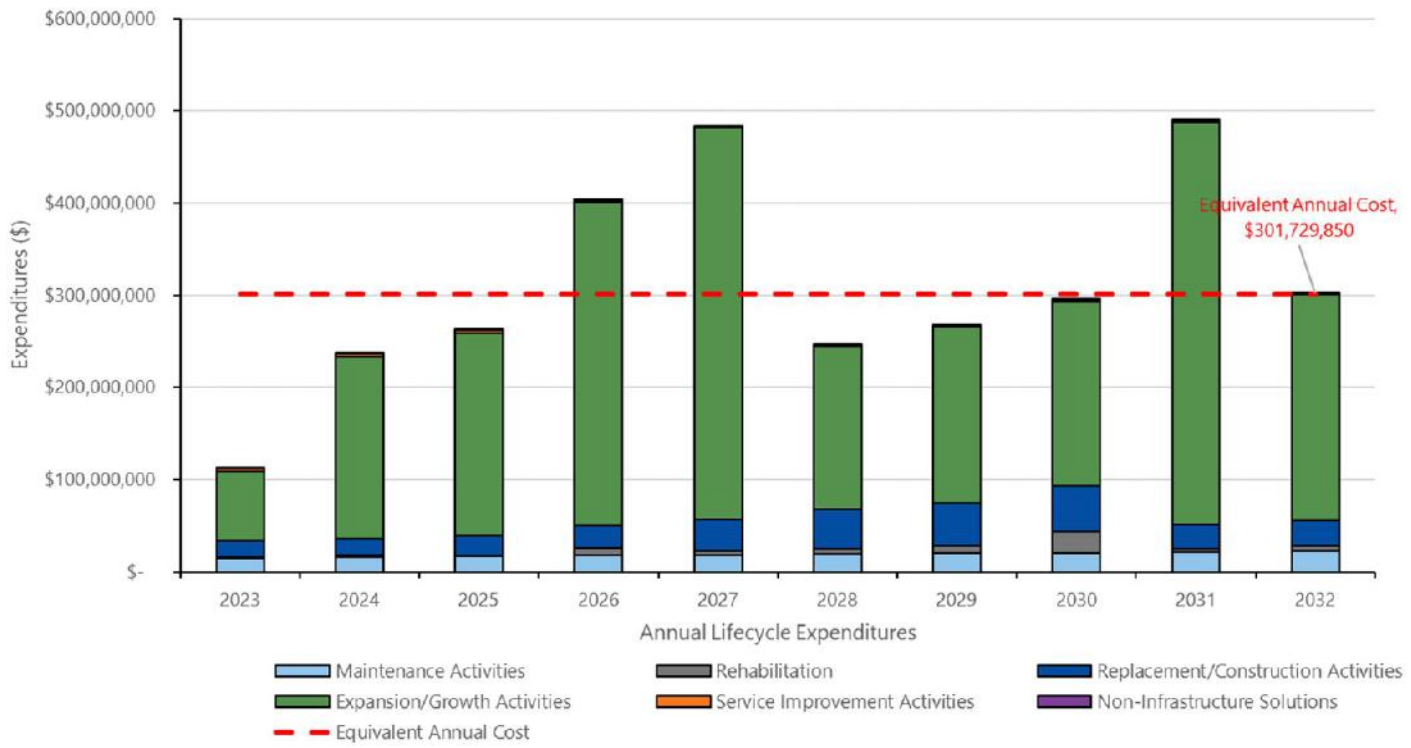
In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities described in section 3.3. To estimate the lifecycle activity costs, the assumptions in Table 17 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $302 million for the full transportation portfolio which is dominated by growth activities. Figure 16 provides the expenditures over the next 10 years to support this strategy.

Table 17. Lifecycle Forecast Assumptions (Transportation)

Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan and planned capital budget. The proposed budget and business plan amounts have been used for 2022 to 2031.	$739,467
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for Transportation, deducting the estimated stormwater maintenance costs. Assuming a starting budget in 2021 of 58.237 million (the base budget of 5.841 million with 168,400 deducted for stormwater maintenance expenses), with an assumed annual increase of 2.3%, in-line with the 2021 budget request (Budget and Business Plan 2021, p. 114).	$18,562,037
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$5,709,514
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$30,670,143
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal costs.	N/A

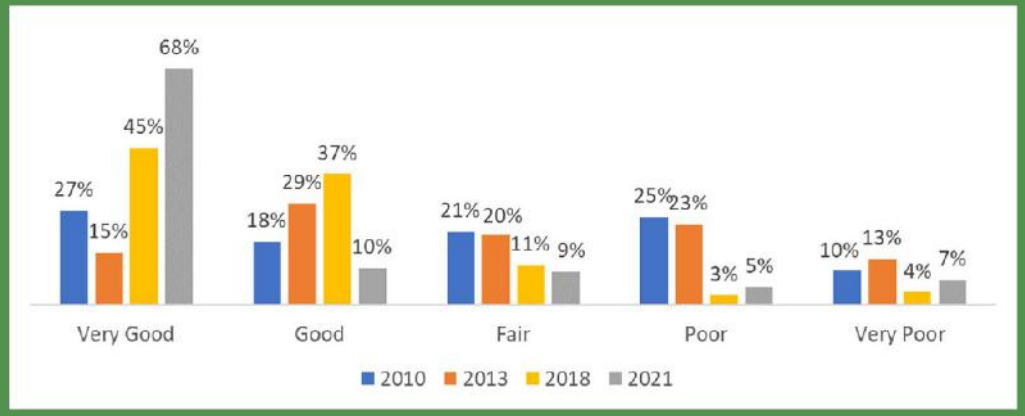
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast by applying a 2.63% growth rate in the asset portfolio from 2021 to 2031, and 2.31% from 2032 to 2046. The growth percentages were determined using the forecasted population numbers from the 2011 Sustainable Water and Wastewater Master Plan.	$244,016,600
Service Improvement Activities	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$2,032,089

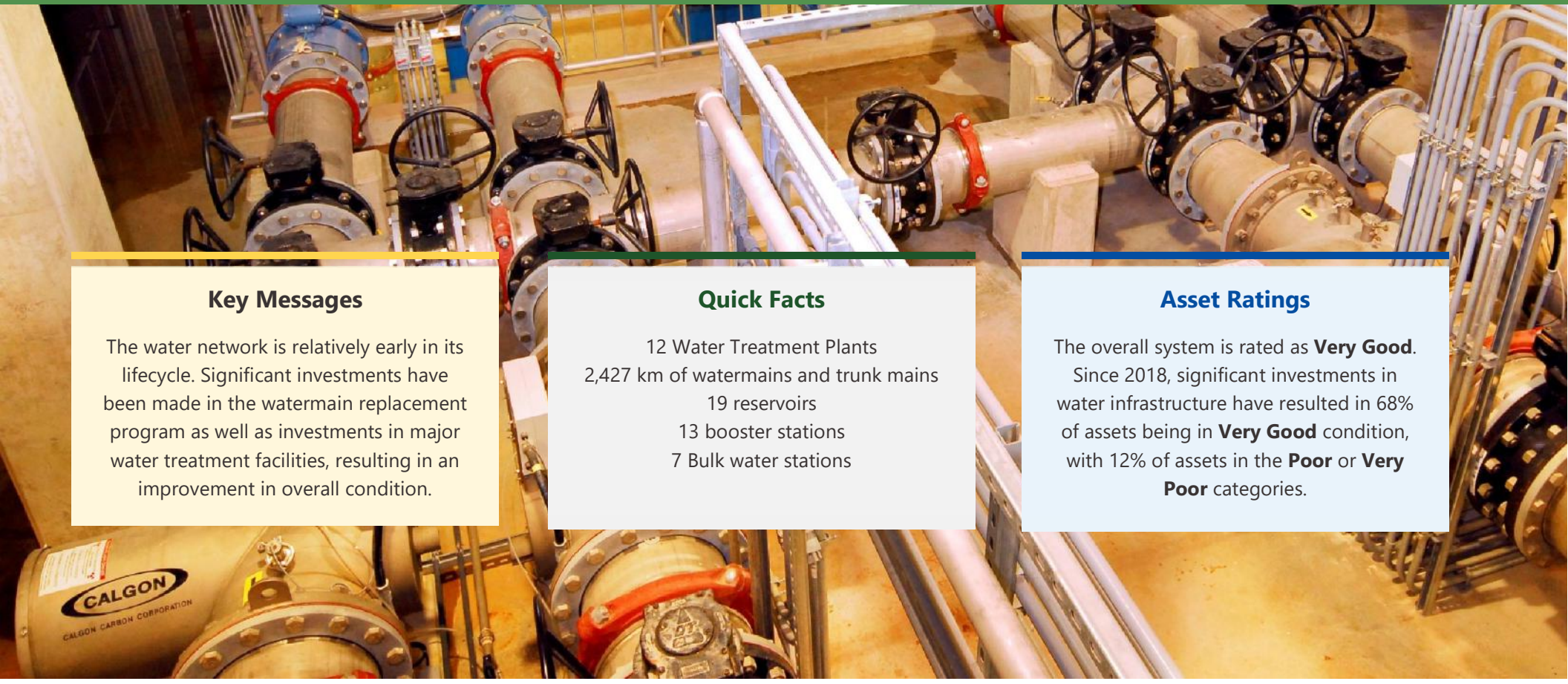
Figure 16. Forecasted Needs for 2023 to 2032 (Transportation)



Water

The Region is committed to reliably and cost effectively providing safe, high quality drinking water with adequate pressure and flow.





Key Messages

The water network is relatively early in its lifecycle. Significant investments have been made in the watermain replacement program as well as investments in major water treatment facilities, resulting in an improvement in overall condition.

Quick Facts

12 Water Treatment Plants
2,427 km of watermains and trunk mains
19 reservoirs
13 booster stations
7 Bulk water stations

Asset Ratings

The overall system is rated as **Very Good**. Since 2018, significant investments in water infrastructure have resulted in 68% of assets being in **Very Good** condition, with 12% of assets in the **Poor** or **Very Poor** categories.

4.0 Water (Core Asset)

Halton Region provides safe, high quality drinking water to over 580,000 residents and businesses every day. Halton's drinking water supply comes from either Lake Ontario or groundwater sources. The water is treated to provincial water quality standards and then potable water is distributed to homes and businesses through underground water systems. Halton Region maintains and operates municipal drinking water systems that service residents of Burlington, Halton Hills, Milton and Oakville.

Halton Region has developed and implemented a Drinking Water Quality Management Standard (DWQMS) that applies a continuous improvement approach to the management of the water utility. The DWQMS is documented within the Halton Region Drinking Water Quality Management System Operational Plan and meets the requirements of the Ministry of the Environment, Conservation and Parks' Drinking Water Quality Management Standard under the *Safe Drinking Water Act, 2002*. Through the quality management system, the Region is committed to:

- Providing customers with safe drinking water
- Complying with applicable legislation and regulations
- Maintaining and continually improving the Drinking Water Quality Management Standard

The water assets include transmission infrastructure such as watermains and booster stations that convey water from the water treatment plant to residences and businesses, and reservoirs and bulk water stations that provide water storage, capacity, and bulk water access. The water asset portfolio has a total replacement value of $4.7 billion.

4.1 State of the Local Infrastructure

4.1.1 Asset Register

Residents of Halton Region expect their drinking water to be safe and expect to be protected from hazards related to their water supply. Under the *Safe Drinking Water Act, 2002*, all accredited operating authorities are required to ensure full cost accounting for the water utilities and operate under a quality management standard. As a result, water utilities often have made significant advancements in asset management planning and investments. The Region operates a vast network of infrastructure that includes distribution mains (smaller than 400 mm in diameter), trunk mains (400 mm or larger in diameter), booster pumping stations, bulk water stations, water treatment plants, wells, and reservoirs. Figure 17 shows the breakdown of the water asset portfolio by replacement value. Water distribution mains make up 61% of the water asset register with a replacement value of just over $3 billion. This is followed by water treatment plants at $823 million, trunk mains at $594 million, and reservoirs at $408 million. Table 18 on the following page summarizes the quantity of assets within each of the asset categories.

Figure 17. Asset Categories by Replacement Value (Water)

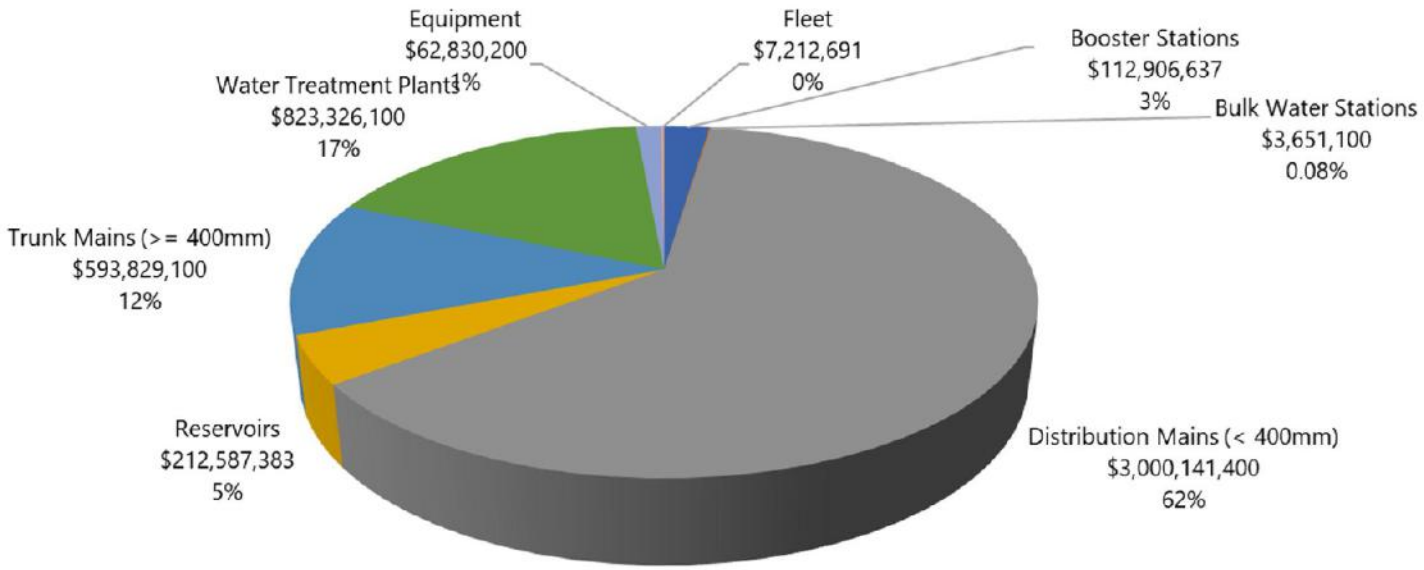


Table 18. Asset Quantities and Replacement Values (Water)

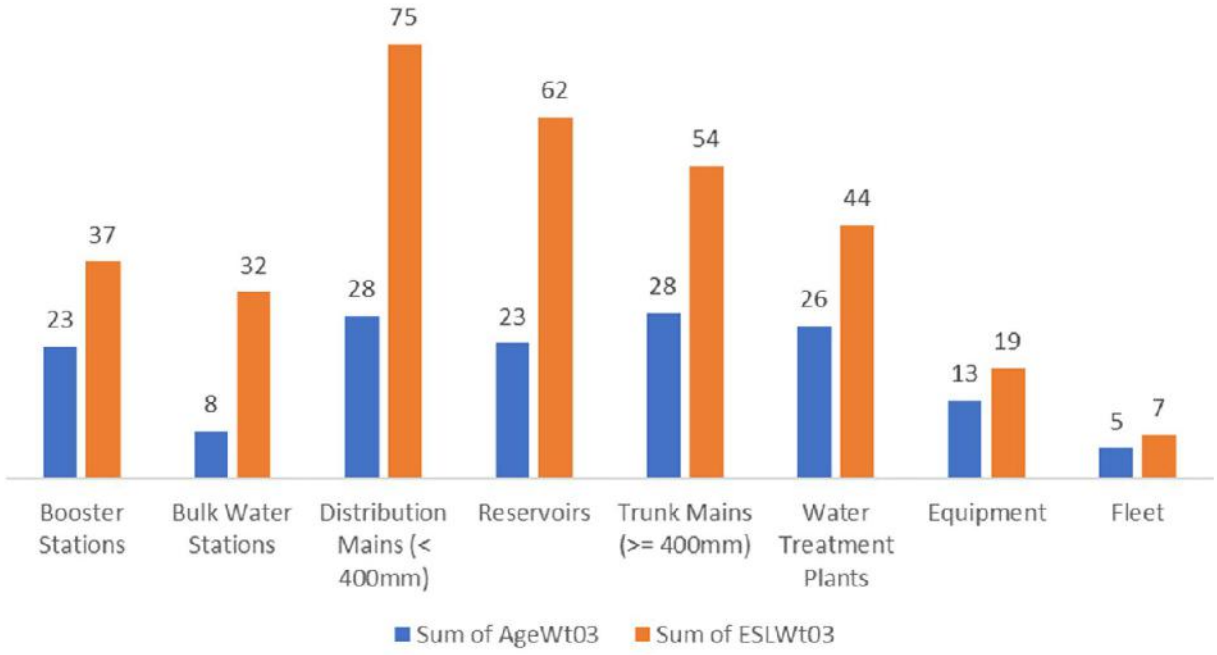
Program Area	Description	Asset	Count	Unit	Estimated Replacement Value (2020)
Water	Water Transmission	Trunk Mains (>= 400mm)	370	Length (km)	$593,829,100
		Distribution Mains (< 400mm)	2,056	Length (km)	$3,000,141,400
		Booster Stations	13	Each	$112,906,637
		Bulk Water Stations	7	Each	$3,651,100
	Water Treatment	Water Treatment Plants	12	Each	$823,326,100
		Reservoirs	19	Each	$212,587,383
	Fleet	Fleet	119	Each	$7,212,691
		Equipment	293	Each	$62,830,200
Total					**$4,816,484,611**

4.1.2 Asset Age Distribution

Figure 18 summarizes the average age and average ESL of each asset category within the water portfolio. In general, each asset group has between 40% and 60% of its estimated service life remaining; indicative of a network that is relatively early in its lifecycle. Overall, reservoirs are closest to the end of their estimated service lives.

In considering this data, it is important to remember that the ESL presented in the figure below represents an *average* ESL of all assets within a facility – so these values include mechanical systems with typically shorter service lives than the structural components of the same facility. When averaged together the resulting ESL is not reflective of the typical ESL assigned to a facility as whole. Also of note, small distribution mains have a longer average ESL than larger distribution mains as ESL is influenced by pipe material.

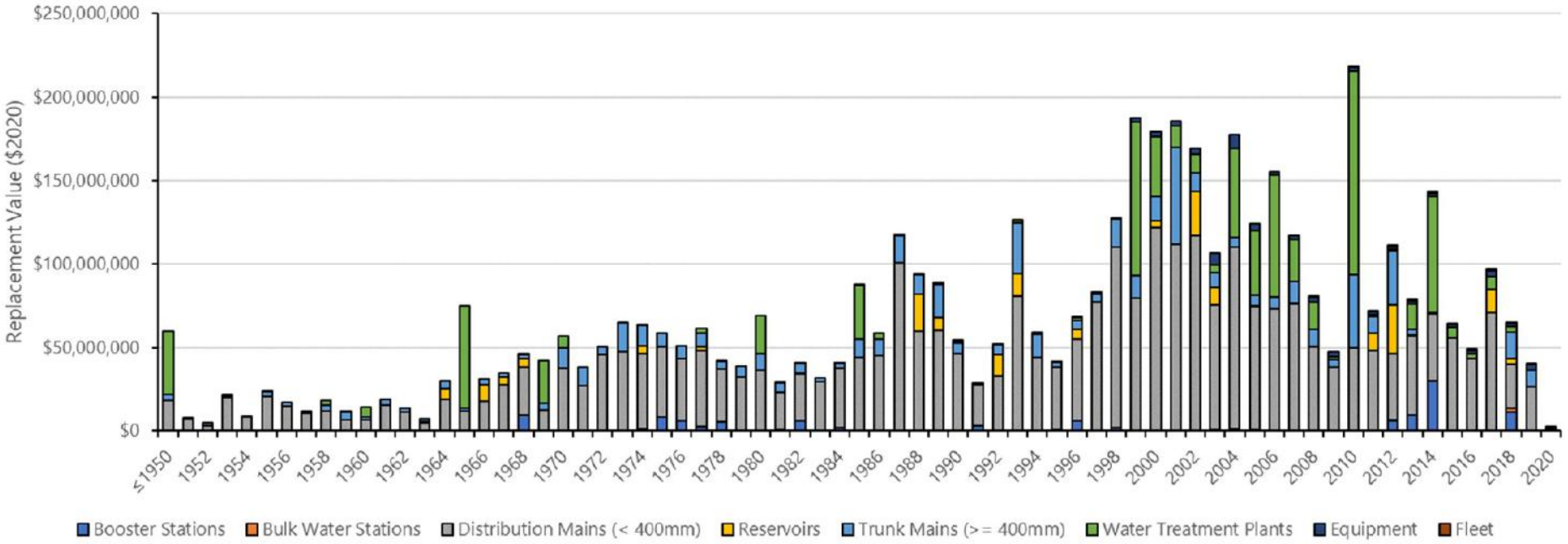
Figure 18. Average Asset Age as a Proportion of Average Asset ESL (Water)



Note: *All data is weighted by the 2020 replacement value of the components.*

Figure 19 provides an overview of the installation dates of the assets within the water portfolio. Similar to the road portfolio, there were cycles of investments that occurred in the 1980's, 2000's, and 2010's. It is important to note that, where applicable, this figure represents the age of assets within a facility, and not the construction date of said facility.

Figure 19. Construction Years by Replacement Value (Water)



4.1.3 Asset Valuation

The accounting value of an asset, sometimes referred to as the financial cost valuation, provides an understanding of the historical costs and applies depreciation to estimate the current book value of the assets. Generally, for long-range asset management planning, the replacement cost valuation is used, which accounts for expected inflation, changes in technology and other factors. Table 19 shows the comparison of value of the water portfolio using each of these methods. The comparison is significantly different since the financial accounting valuation includes a deduction of value of depreciation for each year that the assets have been in service. On the other hand, the replacement valuation is the estimated cost to replace all assets today. It should be noted that the valuation was as of December 31, 2019. The replacement values within the plan are based on estimates by subject matter experts (such as from Capital Needs Assessments), and where that information was not available, included historical costs have been used.

Table 19. Financial Accounting and Replacement Cost Valuation (Water)

Financial Accounting Valuation	Replacement Valuation
$1,518,257,723	$4,816,484,611

4.1.4 Asset Condition

The Region has an active condition assessment program for water facilities, referred to as Condition Needs Assessments. These are detailed assessments of the inventory and condition of assets located at each of the sites. So far, 41 water sites have been assessed since 2016 and 16 are in progress. The

Region currently completes condition assessments for facilities on a 5-year cycle. The facility condition needs assessments are completed to obtain current condition data on the assets to inform maintenance requirements and the 10-year capital program through establishing priority and renewal requirements. This is done through the Risk Evaluation and Optimized Decision-Making Processes already established at the Region. Issues identified from Condition Assessments, lifecycle models and operating and maintenance staff are considered annually, as part of the budgeting process. These results are used to build business cases for capital projects which are evaluated and prioritized using the Optimized Decision-Making process. Together, these procedures help to prioritize needs for the first 1-3 years of the 10-year capital budget.

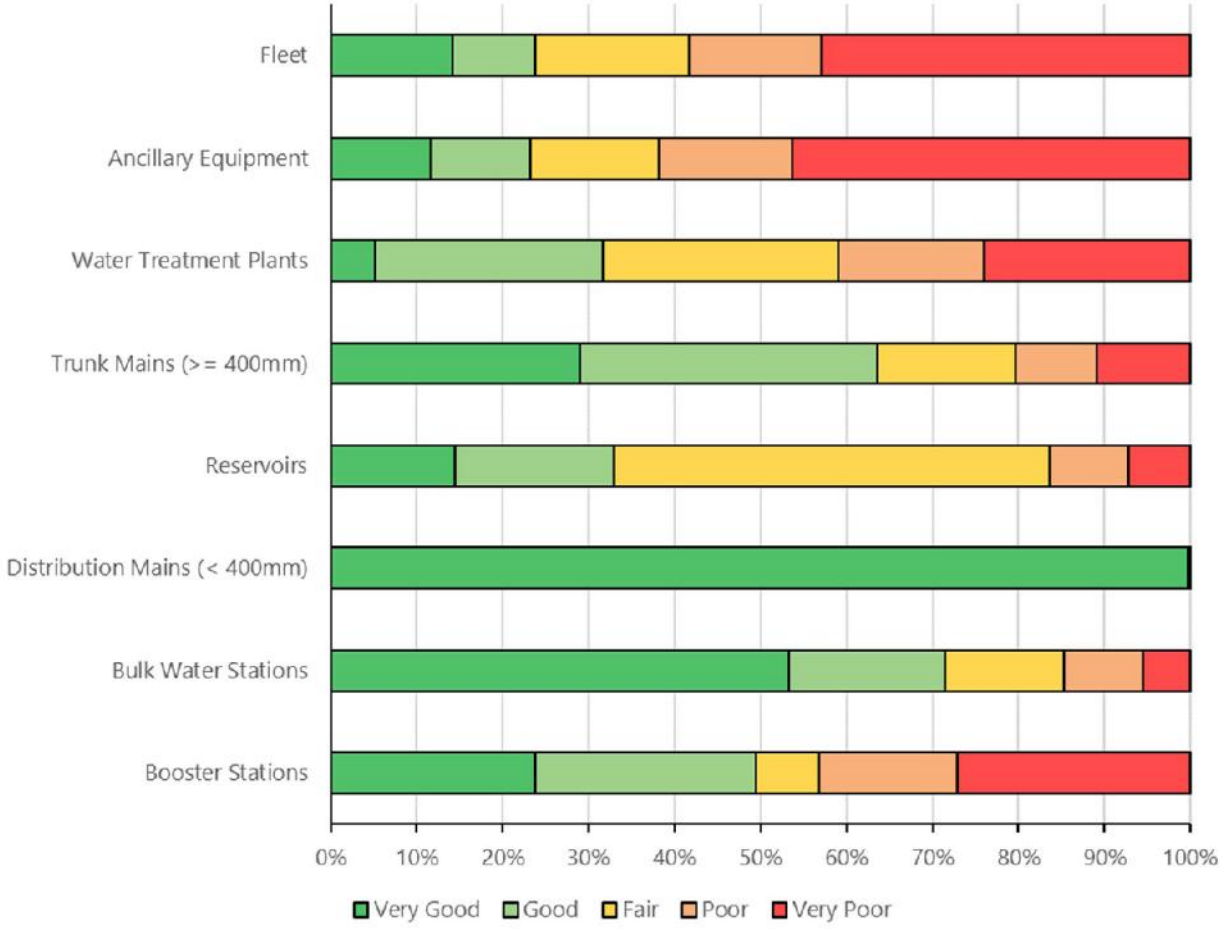
In some cases, visual inspections to assess condition and determine where major repairs or replacements need to be done are difficult for underground assets, such is the case with watermains. Therefore, decisions for major interventions for these assets are determined using break history, criticality and in coordination with adjacent asset groups (e.g., transportation or wastewater). For the purposes of the analysis for the asset management plan, watermain condition was estimated through analysis of historical watermain breaks, and the condition of water facilities was determined through outcomes of the Condition Needs Assessments. Where condition needs assessment data is unavailable for facility assets, condition was determined using tangible capital asset data and an estimate of the likely condition based on the asset age and expected life. An age approach entails a higher level of risk as age is not necessarily indicative of condition thus should not be relied on for critical assets. Table 20 shows a comparison of each technique that was used to estimate condition for the water asset portfolio.

Table 20. Condition Score and Rating Scales (Water)

Condition Score	Condition Rating	Watermains	Facilities (CNA Condition)	Age-Based (1-Age/ESL)
1	Very Good	0 -1 Breaks	1	0.80 – 1.00
2	Good	2 - 4 Breaks	2	0.60 - 0.79
3	Fair	5 - 6 Breaks	3	0.40 – 0.59
4	Poor	7 - 8 Breaks	4	0.20 – 0.39
5	Very Poor	8+ Breaks	5	0 – 0.20

Figure 20 provides an overview of the percentage of assets within each of the condition rating categories. The figure shows that the water network is relatively early in its lifecyle whereas fleet and equipment have the largest proportion of assets in the Very Poor category due to their age relative to their estimated service life. These assets are inspected annually to determine if replacement is required.

Figure 20. Condition Distribution by Replacement Value (Water)



It should be noted that it appears that there is a significant difference between Figure 18 and Figure 20, particularly for water treatment plants, with a low average age compared to service life, however with a large proportion of assets in the Poor category. This illustrates the risk of using age to estimate asset condition as well as averages. Figure 20 includes condition information from the condition needs assessments which demonstrates the additional insights that condition inspection programs can provide.

4.1.5 Data Sources and Data Confidence

The data that was used for the analysis was compiled from multiple sources, including:

- Watermains and trunk mains: A shapefile of watermains with each main segment and asset attributes such as installation date, length, and historical watermain breaks.
- Booster Stations, Bulk Water Stations, Reservoirs, Water Treatment Plants, and Wells: Facilities were developed based on specific condition needs assessments. Where this information was not available, an export of the tangible capital asset register was used to compile asset data and condition was determined based on percent of ESL remaining.

Throughout this analysis, any inconsistent data was aligned as best as possible. The following assumptions were made during the development of this section of the Asset Management Plan:

- Watermains: The condition of watermains was determined using the watermain break analysis.
- Booster Stations, Bulk Water Stations, Reservoirs, Water Treatment Plants, and Wells: Estimated service lives were assumed based on industry best practices.

A summary of the data confidence assessment is provided in Table 21.

Table 21. Data Confidence Assessment (Water)

Description	Asset	Confidence Rating	Confidence Comment
Water Transmission	Trunk Mains (>= 400mm)	Medium	Data is based on age and a predictive model for watermain breaks
	Distribution Mains (< 400mm)		
	Booster Stations	Medium	Data is based on 49 condition needs assessments, with the remainder from TCA. The condition needs assessment sometimes included inconsistent formatting and ratings
	Bulk Water Stations		
	Reservoirs		
Water Treatment	Water Treatment Plants		
	Wells		

4.2 Levels of Service

The Region is committed to reliably and cost effectively providing safe, high quality drinking water with adequate pressure and flow. In support of this commitment, the water division has had established Levels of Service for a number of years and have been using them to drive their strategy. Technical, legislated and customer Levels of Service have been put in place to describe and measure the outputs that Halton Region intends on delivering to the community in terms of attributes such as availability, cost-effectiveness, reliability, responsiveness, safety, suitability, and sustainability.

One document that sets out Levels of Service related to growth is the Sustainable Halton Water and Wastewater Master Plan. This is a planning document which follows the Municipal Class Environmental Assessment process. The Master Plan identifies system capacities and compares them to projected needs for a specified planning horizon. In addition, it identifies target pressures, unit demand rates, peaking factors, minimum fire flows, storage requirements and production and pumping rates for water which are used to establish a list of growth-related capital projects that are required to deliver the future service needs. Technical criteria and design standards for the provision of water services (pressures, quantities, fire flows, sizing materials, etc.) are also outlined in the Region's Water and Wastewater Linear Design Manual.

Ontario's *Clean Water Act* helps to protect drinking water from source to tap with a multi-barrier approach that stops contaminants from entering sources of municipal drinking water - lakes, rivers and aquifers.

Building on existing policy and practice in Ontario's treatment and distribution of drinking water, the *Safe Drinking Water Act* requires that all municipal drinking water systems obtain an approval from the Director of the Ministry of the Environment in order to operate. Operators are required to be trained and certified to provincial standards. The act also provides legally binding standards for testing of drinking water and requires that testing be done in licensed and accredited laboratories. In addition to setting out specific technical requirements, Levels of Service provide a means to assess the level to which customer expectations are being met. In addition, these frameworks help to provide a relationship between the defined Levels of Service being provided by the Region's infrastructure systems and the associated operating and capital expenditures required to achieve the LOS. The Region incorporates Key Performance Indicators into the annual budget and business plan.

O. Reg. 588/17 has set requirements for both customer Levels of Service and technical Levels of Service for all core assets. O. Reg. 588/17 customer Levels of Service use qualitative descriptions to describe the scope and quality of the service being provided by the asset or asset category while technical Levels of Service use performance measures to measure the scope or quality of the service being provided by the asset or asset category. For the purposes of the Asset Management Plan, a Level of Service framework has been developed to incorporate the following:

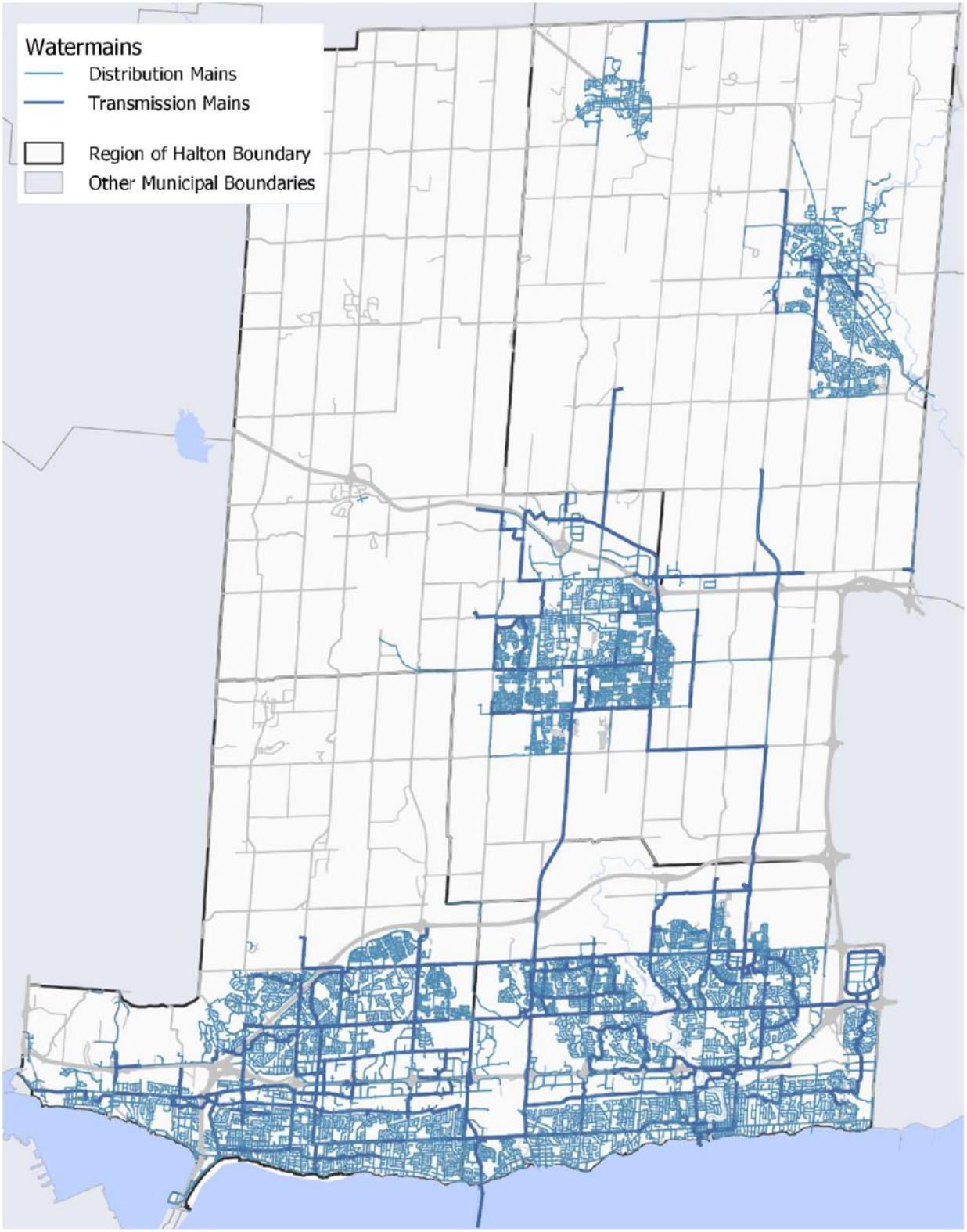
- Key metrics in alignment with the Key Performance Indicators in the annual budget and business plan.
- Performance indicators developed internally by Halton Region staff and through projects such as Strategic Project 2, which defined customer and technical Levels of Service.
- Regulatory Levels of Service as required by O. Reg 588/17.

Table 22 provides some of the Region's Level of Service indicators applicable to the water division (there are others not applicable to this AMP). The current performance is the most recent data for the performance indicator, based on 2019 data or 2020 where available.

Table 22. Community and Technical Levels of Service (Water)

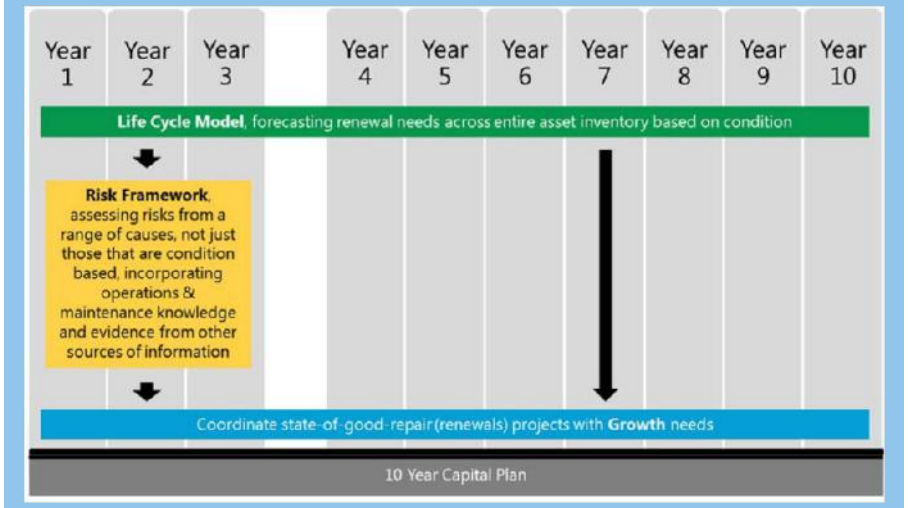
Key Service Attribute	Customer Levels of Service	Reference	Technical Levels of Service	Current Performance
Suitability	Description or images that illustrate the user groups or areas of the municipality that are connected to the Municipal water system	Figure 21	% of properties connected to the municipal water system	88%
Suitability	Description or images that illustrate that user groups or areas of the municipality that have fire flow		% of properties where file flow is available	94%
Suitability	Description of boil water advisories and service interruptions	TBC	# 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	TBC
Cost Effectiveness	N/A		Water plant operations cost / mega litre of water treated	$242 / ML
Suitability	N/A		Percent of compliance to drinking water standards	99.9%
Reliability	N/A		Percent of water infrastructure rated as Good and Very Good	82%
Reliability	N/A		Annual Number of Watermain Breaks / 100 km	4.66
Sustainability	N/A		Energy consumed (kWh) per mega litre (ML) of water treated	468.7kWh/ML
Cost Effectiveness	N/A		Cost of maintenance per megalitre treated water (ML)	$93 / ML

Figure 21. Map of Areas of the Municipality that are Connected to the Municipal Water System



Risk Management

In pursuit of a comprehensive asset management strategy for its infrastructure assets, the Region has undertaken a series of initiatives to define the components of a successful asset management strategy and to lay out the steps through which such a strategy will be implemented. One key component of that strategy was defining a risk evaluation approach for Public Works capital projects. Asset risk management not only considers the current condition/performance of assets and their likelihood of failing, but also the consequences of those failures on services and customers. Issues identified from Condition Assessments, lifecycle models and operating and maintenance staff are considered annually, as part of the risk evaluation process. Risks identified through this process are scored and then ranked in descending order for programming in the 10-Year Capital Plan. Risk mitigation options are assigned and monitored on an ongoing basis. The diagram below shows how this process fits within the annual planning process.



4.3 Lifecycle Management Strategy

To support the achievement of the planned Levels of Service, the Region carries out a variety of lifecycle activities. These lifecycle activities are typically grouped into seven categories as outlined in Table 23. All of these lifecycle activities are important as they work together to extend the asset life, reduce overall lifecycle costs, and achieve other objectives such as environmental goals and balancing risk.

The Water division has implemented a variety of non-infrastructure solutions to help lower costs and/or extend the asset useful life, including:

- Optimization of Linear Assets and Plants to enhance facility performance and capability which has resulted in process improvements. Supervisory Control and Data Acquisition (SCADA) automation of equipment and data analysis enables staff to achieve operating cost savings and extend asset life through maintenance and replacement of inefficient equipment.
- Water Efficiency Outreach and Conservation programs promote efficient water use and may contribute to the potential deferral of capacity-related upgrades to the water system and reduction of peak-day water demands on the existing water system infrastructure.
- Joint contracts with the local municipalities help to minimize construction impacts on residents and to lower project costs.
- Where possible, projects are combined with other programs such as Transportation and Wastewater to minimize construction impacts for residents and minimize project costs.

Preventative and corrective maintenance programs are in place to ensure reliable operation of the system and high-quality water. These include watermain flushing, valve and hydrant maintenance, leak detection and regular inspection programs for facilities. Renewal and replacement needs are identified based on the regular inspections as well as the review of long-range infrastructure forecasts. Replacement of infrastructure elements is considered in the same manner as rehabilitation and renewal activities. Long-

term capital replacement requirements are incorporated into the 10-year Capital Budget based on lifecycle estimates and are programmed based on detailed inspection data and project-specific needs. Replacement of infrastructure is being impacted by the need to provide additional system capacity where assets with residual useful life are being preserved through the expansion of the infrastructure system.

All Halton divisions follow an approved Purchasing Policy for Surplus and Disposal as part of the Purchasing Bylaw 65-10 that was approved by Regional Council. Section 30 of the bylaw outlines the surplus and disposal of assets and related activities. Halton also has TCA and data verification policies that outline the disposal of assets and how those disposals are recorded in the financial records. All of these lifecycle activities are important as they work together to extend the asset life, reduce overall lifecycle costs, and achieve other objectives such as environmental goals and balancing risk.

In addition to the activities described above, Table 23 provides an overview of the lifecycle activities that apply to each component of the water portfolio lifecycle as well as the risks associated with not following the strategy.

Table 23. Lifecycle Activities and Risks Associated with Not Following the Strategy (Water)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for water services transmission and distribution assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Development of Public Works' Infrastructure Report Card which summarize the overall condition of all assets; updated every 3 years. ▪ Asset strategies are developed for key asset types to provide a standardized approach to renewal over the lifecycle of a specific type of asset. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of the water distribution system. ▪ Development of water conservation programs, initiatives and outreach to promote efficient use of water which contributes to the delay of costly infrastructure upgrades and increased demands on the water transmission system and at water treatment facilities. Programs and initiatives include: Halton's Water-Efficient Toilet	▪ Asset deterioration is over or under-estimated. ▪ Lack of capital funds to support proper maintenance of the system can lead to health risks, community disruptions, fire protection. ▪ Inaccurate growth numbers and estimation of funding. ▪ Lack of coordination will increase public disruption, construction costs, and replacing assets before end of service life.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	Rebate Program, Halton's Water Meter Replacement Program, Outdoor water conservation and indoor water efficiency. ▪ Joint contracts with local municipalities help to minimize construction impacts on residents and to lower project costs. ▪ Project bundling with other services such as transportation and wastewater to minimize construction impacts and costs. ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs. ▪ Optimization Program for Linear Assets and Plants enhances facility performance and capability resulting in SCADA automation of equipment, operating cost savings and extending asset life.	
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance (PM) programs and activities for both transmission assets: o Valve PM, hydrant PM, watermain flushing program. ▪ And treatment assets: o Equipment maintenance, well water sample testing and maintenance and WTP sample testing. ▪ Reactive maintenance programs and systems to efficiently address unexpected issues. ▪ Implementation and optimization of Reliability Centred Maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized and the service life of the assets are maximized, along with a focus on planning and scheduling to efficiently and effectively realize the maximum value of Halton Region's water assets. ▪ Watermain leak detection studies to locate and repair small leaks. ▪ Scheduled inspections are performed for pumps, electrical controls, and standby generators.	▪ Inspection data is not up to date or inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure. ▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Customer dissatisfaction with water service disruptions.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition needs assessments. ▪ Pipe relining ▪ Cathodic protection program on existing cast or ductile iron watermains and water service connections to protect against corrosion, premature leaks and breaks.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement of deteriorated cast iron watermains and lead public service lines and connections. ▪ Replacement of watermains with high break rate. ▪ Replacement of equipment, SCADA, and facility assets.	▪ Deterioration of watermains impacting resident's health, community disruption, fire protection and customer satisfaction. ▪ Delay in construction projects may result in higher costs, longer service disruption, and customer dissatisfaction.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal activities include decommissioning transmission assets (including watermains, bulk water stations, and booster stations) and treatment assets (including WTP, wells and reservoirs) or assets belonging to the facility, and materials according to regulations and standards. ▪ Assessment of material type to determine considerations of health and safety concerns (i.e., asbestos pipe). ▪ Pipe abandoned in place when decommissioned.	▪ Improper disposal can lead to environmental impacts and expenses.
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Expansion needs are identified and documented through the development of the Sustainable Halton Water and Wastewater Master Plan using population projections. ▪ Capital projects to accommodate for population growth in new and existing areas.	▪ Growth activities are delayed or cancelled, resulting in the transmission system being unable to accommodate for increased flow due to population and employment growth.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
		▪ Master Plan overestimates or underestimates required watermain upgrades and facility expansions or upgrades to accommodate for increased flows.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitoring Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Water hydraulic modelling identifies areas that require system improvements such as fire flow or pressure. ▪ Upgrades or operating changes to equipment to improve operational efficiencies. ▪ Energy Management Strategy activities, including implementing advanced water meter infrastructure to automate meter reading and automated control of the lake-based water treatment facilities based on good energy conservation practices. ▪ Continuous improvement efforts to enhance finished water quality and public health protection through process optimization.	▪ Projects/activities are delayed, and lack of service improvements can result in health and safety risks. ▪ Service improvement is not as significant as expected and water facilities cannot accommodate for increased flows.

4.4 Forecasted Lifecycle Activity Costs

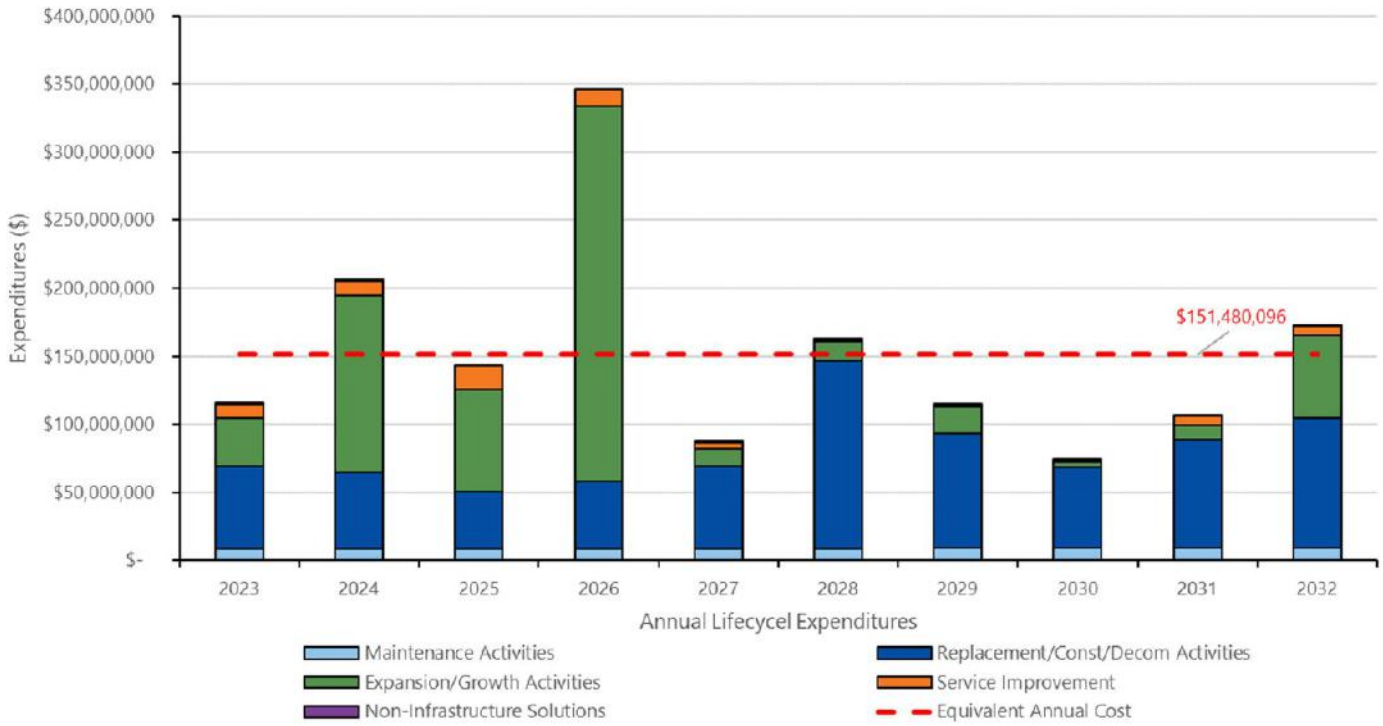
In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 24 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $151 million for the full water portfolio which includes growth and expansion activities identified though previous Master Plans and DC technical studies.

Table 24. Lifecycle Forecast Assumptions (Water)

Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan to 2031 and a review of upcoming capital projects.	$1,131,481
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for Water and Wastewater. An assumed allocation of 29% of the budget has been made to the water assets, based on the replacement value compared to wastewater. Assuming a starting budget in 2021 of 35.5 million, with an assumed annual increase of 2.6%, in-line with the 2021 budget request (Budget and Business Plan 2021, p. 248)	$8,573,742
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$1,480,818
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$72,674,987
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A

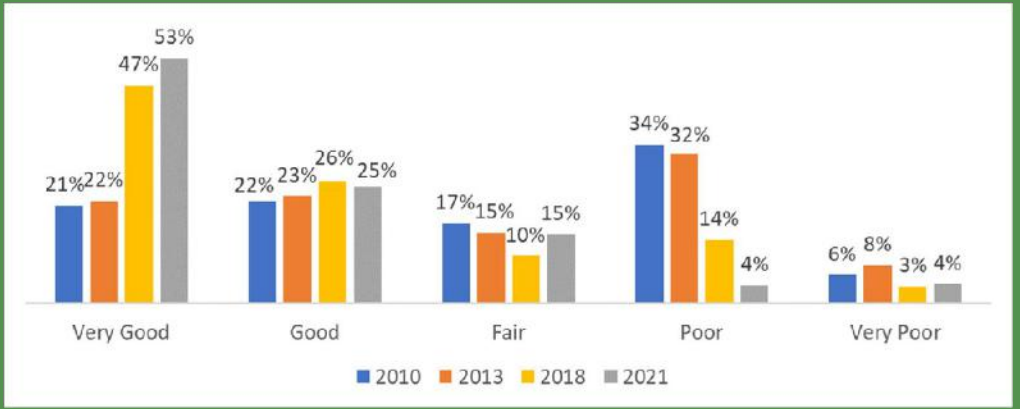
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget (2021-2030).	$61,031,400
Service Improvement Activities	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget (2021-2030).	$6,587,667

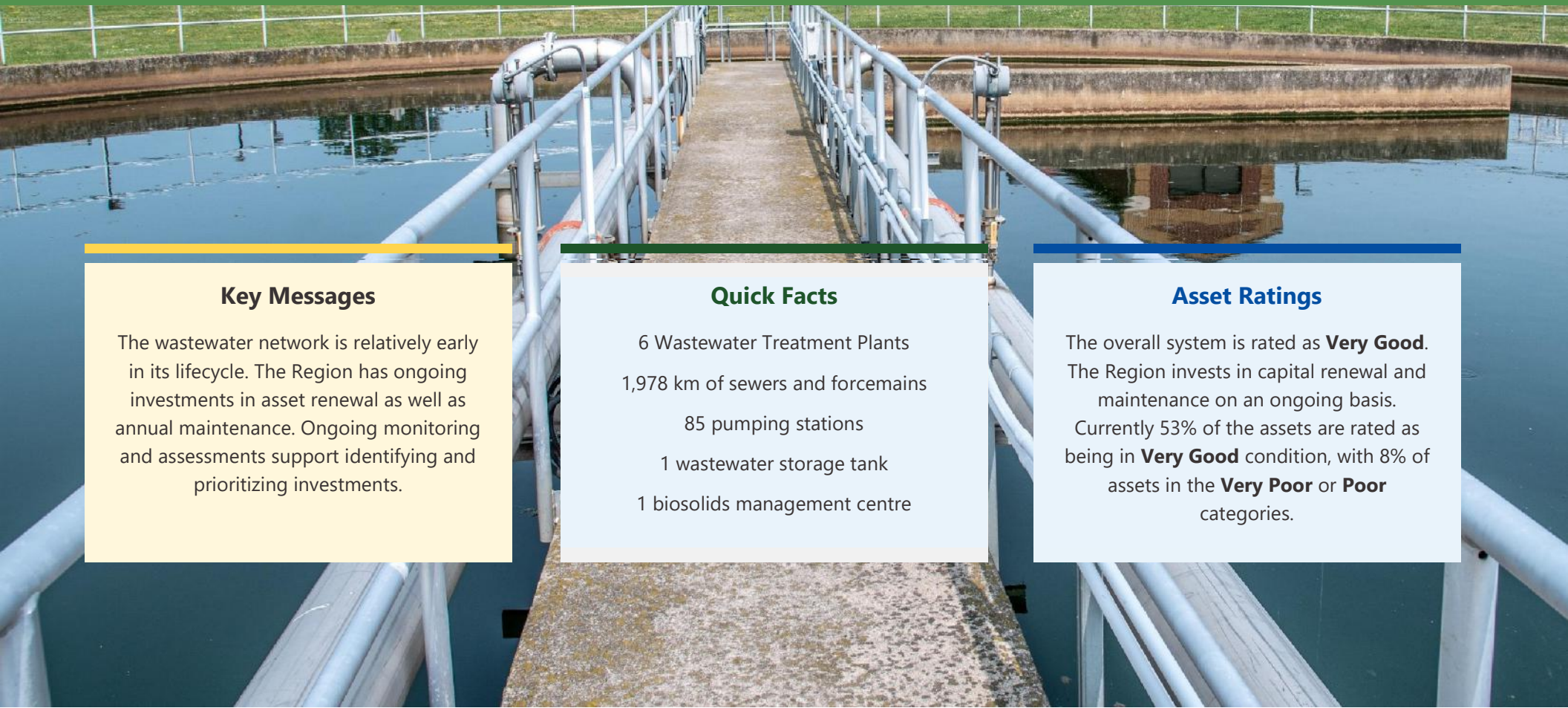
Figure 22. Forecasted Needs for 2023 to 2032 (Water)



Wastewater

The Region is committed to providing reliable and cost-effective wastewater services while protecting the environment and the community.





Key Messages

The wastewater network is relatively early in its lifecycle. The Region has ongoing investments in asset renewal as well as annual maintenance. Ongoing monitoring and assessments support identifying and prioritizing investments.

Quick Facts

6 Wastewater Treatment Plants

1,978 km of sewers and forcemains

85 pumping stations

1 wastewater storage tank

1 biosolids management centre

Asset Ratings

The overall system is rated as **Very Good**. The Region invests in capital renewal and maintenance on an ongoing basis. Currently 53% of the assets are rated as being in **Very Good** condition, with 8% of assets in the **Very Poor** or **Poor** categories.

5.0 Wastewater (Core Asset)

The Region of Halton is responsible for all wastewater systems, including treatment plants and collection infrastructure. The existing Regional wastewater treatment system consists of Lake Ontario based wastewater treatment plants servicing Oakville, Burlington and part of Milton and stream-based wastewater treatment plants that service Halton Hills (Georgetown and Acton) and part of Milton. These treatment plants deal with 232,000 cubic metres of wastewater every day. The existing Regional wastewater collection system consists of over 1,900 km of wastewater gravity mains and forcemains and 85 pumping stations. Overall, the wastewater infrastructure has a replacement value of approximately $5.6 billion.

5.1 State of the Local Infrastructure

5.1.1 Asset Register

The overall portfolio of wastewater assets is summarized in Figure 23. As can be seen from the figure, the largest proportion of the replacement cost of the wastewater network is the gravity mains, making up approximately $3.9 billion of the total cost. Service laterals and maintenance holes have been included in the gravity main replacement values, and valves with the forcemain replacement values. Treatment assets include the wastewater treatment plants, which have a replacement value estimated to be $1.2 billion.

Table 25 provides the asset counts and replacement values by each sub-category within the wastewater portfolio.

Figure 23. Asset Categories by Replacement Value (Wastewater)

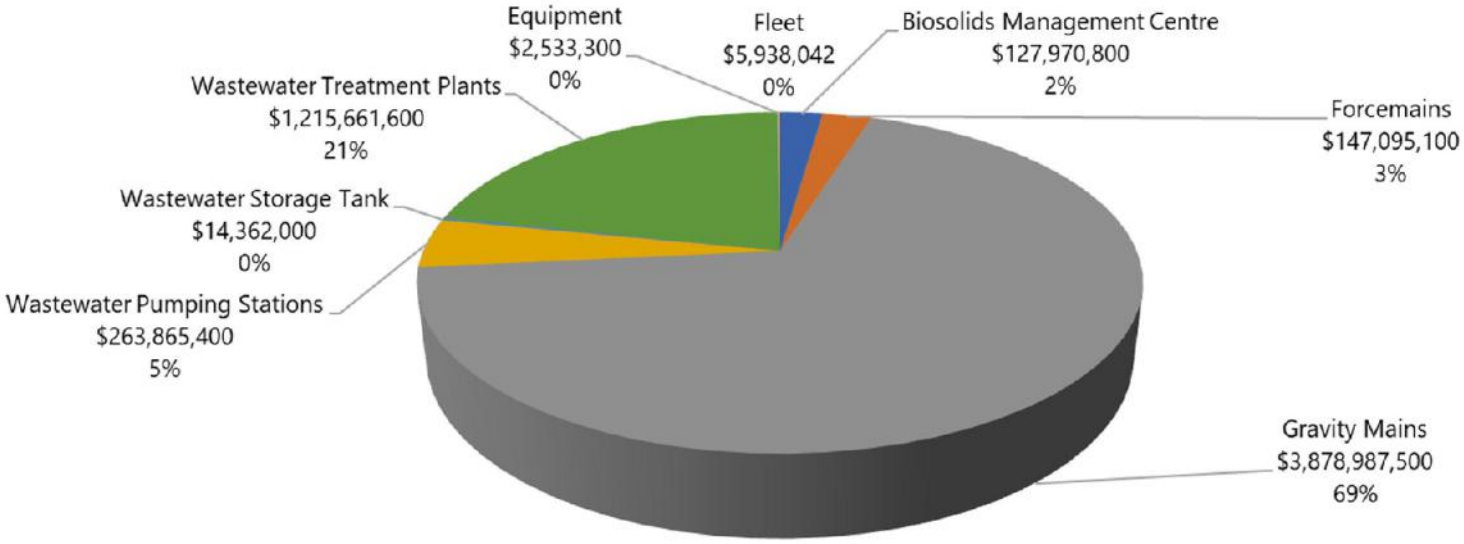


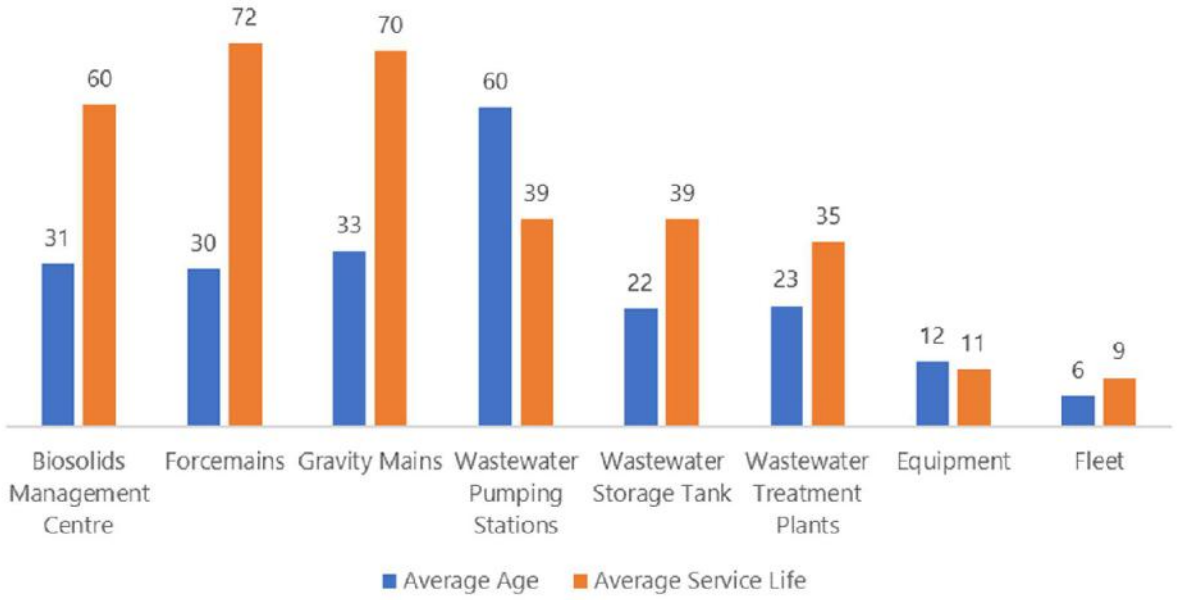
Table 25. Asset Quantities and Replacement Values (Wastewater)

Program Area	Description	Asset	Count	Unit	Estimated Replacement Value (2020)
Wastewater Services	Collection	Forcemains	77	Length (km)	$147,095,100
		Gravity Mains	1,901	Length (km)	$3,878,987,500
		Pumping Stations	85	Each	$263,865,400
		Wastewater Storage Tank	1	Each	$14,362,000
	Treatment	Biosolids Management Centre	1	Each	$127,970,800
		Wastewater Treatment Plants	6	Each	$1,215,661,600
	Fleet and Equipment	Fleet	101	Each	$5,938,042
		Equipment	91	Each	$2,533,300
Total					**$5,656,413,742**

5.1.2 Asset Age Distribution

Figure 24 summarizes the average age and average ESL of each asset. Each of the asset categories, on average is at the mid- to early stage in its estimated useful life.

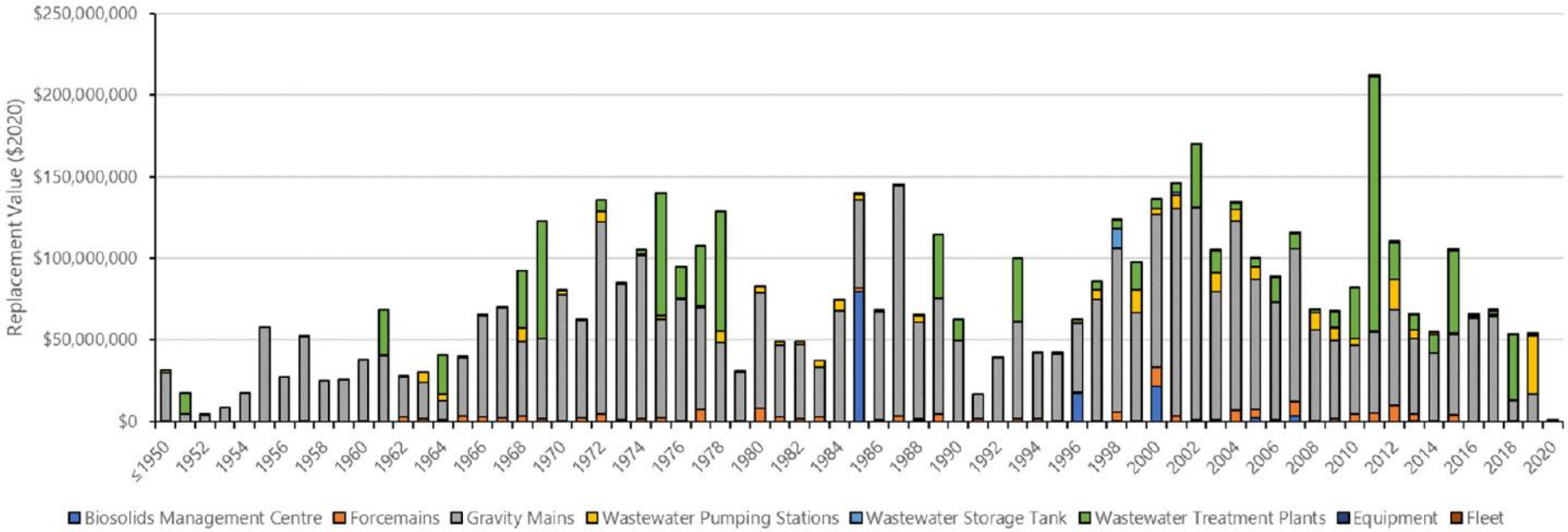
Figure 24. Average Asset Age as a Proportion of Average Asset ESL (Wastewater)



Note: *All data is weighted by the 2020 replacement value of the components.*

Figure 25 provides a profile of the replacement cost of assets for each year since 1950. There were several significant investment spikes in the 1970's, 2000's, and 2010's. It is important to note that where applicable, this figure represents the age of assets within a facility, and not the construction date of said facility.

Figure 25. Construction Years by Replacement Value (Wastewater)



5.1.3 Asset Valuation

One of the most common approaches to valuing assets is using the replacement value method that estimates the cost to replace the assets under current or future market conditions. In addition, an accounting valuation is also used to understand the book value of assets after depreciation has been applied. Table 26 shows a comparison between the two methods. As can be seen from the table, the book value is considerably lower than the replacement cost valuation. This is due to the assets depreciating in value through their life to date. It should be noted that the valuation was as of December 31, 2019. The replacement values within the plan are based on estimates by subject matter experts (such as from Capital Needs Assessments), and where that information was not available, included historical costs have been used.

Table 26. Financial Accounting and Replacement Cost Valuation (Wastewater)

Financial Accounting Valuation	Replacement Valuation
$1,347,687,580	$5,656,413,742

5.1.4 Asset Condition

Similar to water, there is an active condition assessment program for wastewater facilities, referred to as Condition Needs Assessments. These are detailed assessments of the inventory and condition of assets located at each of the sites and are currently completed on a 5-year cycle These assessments are completed to obtain current condition data on the assets to inform maintenance requirements and 10-year capital program through establishing priority and renewal requirements.

This is done through the Risk Evaluation and Optimized Decision-Making Processes already established at the Region. Issues identified from Condition Assessments, lifecycle models and operating and maintenance staff are considered annually as part of the budgeting process. These results are used to build business cases for capital projects which are evaluated and prioritized using the Optimized Decision-Making process. Together, these procedures help to prioritize needs for the first 1-3 years of the 10-year capital budget. Since 2015, 25 CNA's have been completed at wastewater facilities, 56 are in progress, 2 new facilities are being commissioned, 1 is being decommissioned and 7 facilities have yet to be inspected.

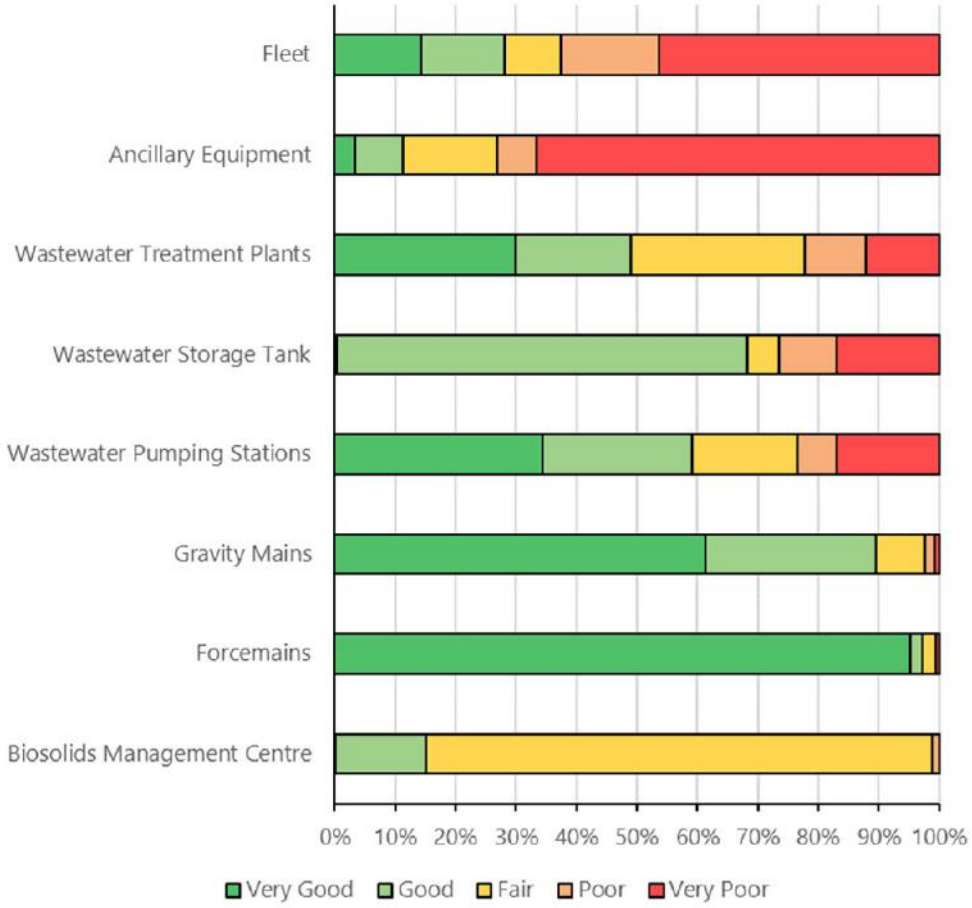
For linear assets, the Region conducts maintenance hole condition assessments, as well as a comprehensive CCTV inspection program with a target to inspect each pipe once every 20 years. For this Asset Management Plan, the gravity main condition was estimated based on PACP score, where available and estimated based on a deterioration model where a direct condition rating was not available. Where condition needs assessment data is unavailable for facility assets, condition was determined using tangible capital asset data and an estimate of the likely condition based on the asset age and expected life. Table 27 shows a comparison of each technique that was used to estimate condition for the wastewater asset portfolio.

Table 27. Condition Score and Rating Scales (Wastewater)

Condition Score	Condition Rating	Gravity Mains (PACP Scores)	Storage Tanks and Pumping Stations (CNA Condition)	Biosolids Management Centre and WWTPs (CNA Condition)	Age-Based (1-Age/ESL)
1	Very Good	0 or 1	1	1	0.80 – 1.00
2	Good	2	2	2	0.60 - 0.79
3	Fair	3	3	3	0.40 – 0.59
4	Poor	4	4	4	0.20 – 0.39
5	Very Poor	5	5	5	0 – 0.20

Figure 26 on the following page provides a breakdown of the percentage of each asset type within each condition category. This perspective of the asset shows that the majority of forcemains and gravity mains are in very good condition, whereas pumping stations and treatment plants have approximately 20% to 30% of assets that are nearing the end of their life.

Figure 26. Condition Distribution by Replacement Value (Wastewater)



5.1.5 Data Sources and Data Confidence

The following data sources were used to complete the state of local infrastructure analysis:

- Gravity mains and forcemains: an ESRI shapefile of wastewater sewers which included each main segment and their attributes.
- Wastewater Storage Tanks, Pumping Stations, Biosolids Management Centre, and WWTPs: facility specific CNA documents and exports of the TCA data which included condition data, replacement values, installation dates, etc.

The following assumptions were made during the development of this section of the Asset Management Plan:

- For those assets with known condition, the condition was adjusted to present day condition by deteriorating the asset from the day that it was inspected to an estimated present condition.
- Gravity Mains and Forcemains: Replacement values were assigned through the wastewater linear estimates based on pipe diameter. If the installation year of a sewer was unknown, 1800 was included to note that it would need to be populated at a later date.
- Wastewater Storage Tanks, Pumping Station, Biosolids Management Centre, and WWTPs: Some ESLs were assumed based on best practices. TCA data was used where CNA data was not available.

A summary of the data confidence assessment is provided in Table 28.

Table 28. Data Confidence Assessment (Wastewater)

Description	Asset	Confidence Rating	Confidence Comment
Collection	Forcemains	Medium	Data is based primarily on lifecycle information. Condition data for forcemains is limited as it is difficult to obtain condition information in operating forcemain, and Halton has had few breaks. Although the data is based on lifecycle, the likelihood of failure is low due to the inventory being relatively new and there has been a low occurrence of asset failures.
	Gravity Mains	High	Data is based on PACP condition assessments and robust data.
	Wastewater Pumping Stations	Medium to High	Many of the condition needs assessments had varying formats and level of detail. Where available these provided a reasonably reliable source. In the absence of CNA data, TCA data was used.
	Wastewater Storage Tank		
Treatment	Biosolids Management Centre		
	Wastewater Treatment Plants		

5.2 Levels of Service

The Region is committed to providing reliable and cost-effective wastewater services while protecting the environment and the community. In doing so, Halton Region's wastewater group has established Levels of Service that document expectations in terms of availability, cost-effectiveness, reliability, responsiveness, safety, suitability, and sustainability. Levels of Service form a key pillar in asset management decision-making for wastewater services, including tracking several annually as part of the annual budget and business plan.

As previously discussed, the Sustainable Water and Wastewater Master Plan identifies target flows, unit demand rates, peaking factors, existing and future growth-related projects. The new flows are modeled, and existing capacity is reviewed. For wastewater linear assets, if the projected flow of a sewer is greater than 85 per cent, the sewer main will be identified for upsizing.

Third parties are retained by Halton Region to assess the condition of the wastewater treatment plants and pumping stations. The assessments typically include structural, process, building, HVAC, and site reviews. The reports will recommend maintenance or capital projects with timing and cost estimates and these assessments are typically performed every five years.
Halton Region has a CCTV inspection program for mainline sewers that assesses the condition and scores each asset. Currently, the wastewater mains in Halton Region are inspected on a cycle of one in every 20 years. An outside consultant is hired to perform a condition assessment on a predetermined number of manholes. All manholes are inspected and scored based on Manhole Assessment and Certification Program (MACP) industry standards. Any manholes identified with deficiencies are repaired or replaced as needed. All manholes that score a MACP score of 5 (worst rating) are addressed immediately.

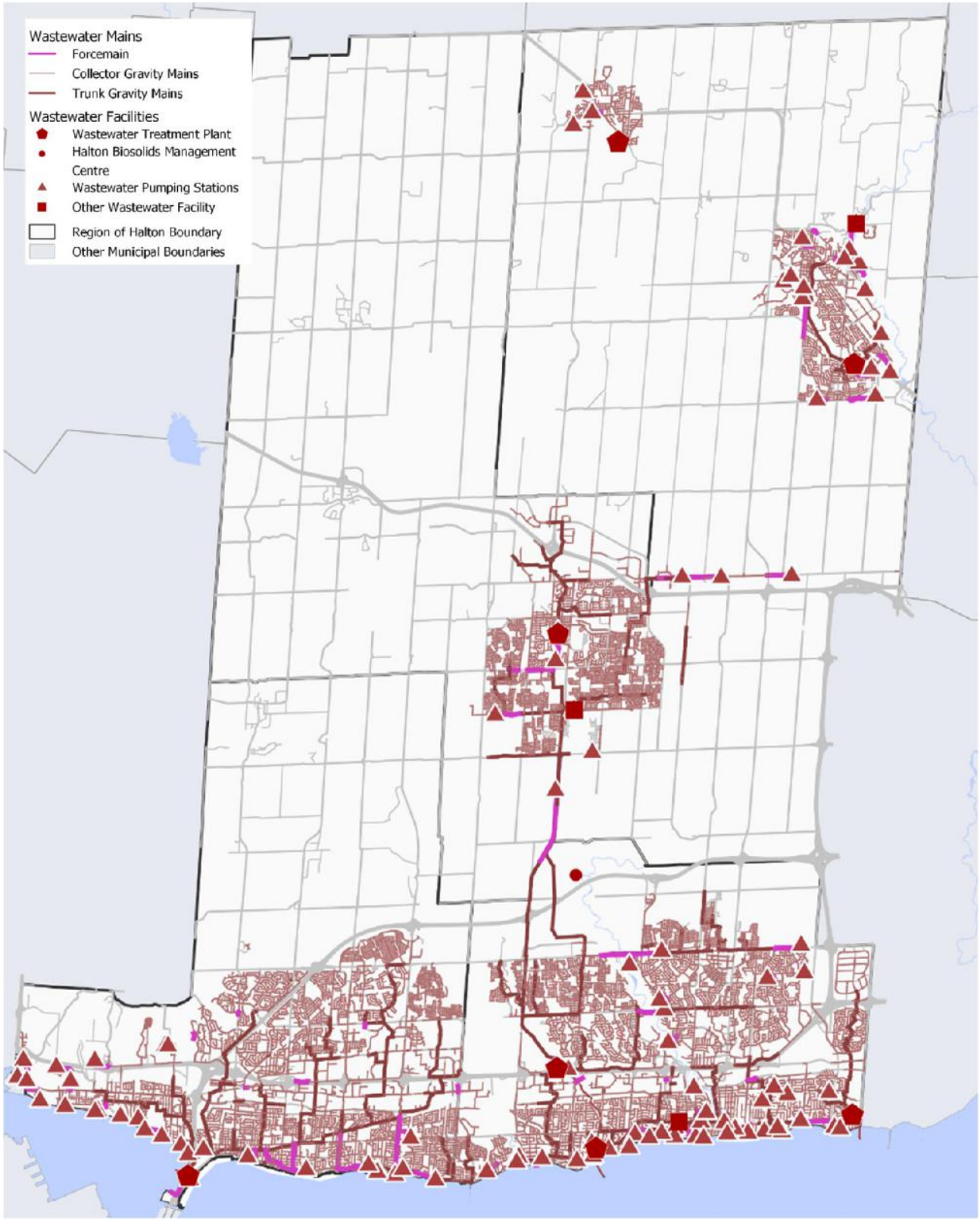
In-line with O.Reg 588/17 requirements, the Region tracks both customer Levels of Service and technical Levels of Service for all core assets. Table 29 provides the O. Reg 588/17 Customer Levels of Service and O.Reg. 588/17 Technical Levels of Service for wastewater assets.

Table 29. Community and Technical Levels of Service (Wastewater)

Key Service Attribute	Customer Levels of Service	Reference	Technical Levels of Service	Current Performance
Suitability	Description which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	Figure 27	Percentage of properties connected to the municipal wastewater system	91% (reliant on homeowner request)
Suitability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes	The Region currently does not own any combined sewers	Number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total numbers of properties connected to the municipal wastewater system	The Region currently does not own any combined sewers
Reliability	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches	The Region currently does not own any combined sewers	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system	0.000242
Suitability	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes	Inflow and infiltration are sources of contamination. Inflow includes entrance through direct connection (i.e., improper connections through roof drain connections). Infiltration includes entrance points through cracks and leaks in the sanitary pipes by	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	0.02%

Key Service Attribute	Customer Levels of Service	Reference	Technical Levels of Service	Current Performance
		deterioration, loose joints, damage or root intrusion.		
Suitability	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in previous row	The Region has established a variety of programs; I&I Program that identifies problematic areas that are prone to inflow and infiltration, Downspout disconnection program to disconnect any improper stormwater connections and the spot repair program in which any cracks or deficiencies are fixed.	Not Applicable	
Sustainability	N/A	N/A	Number of downspouts disconnected	1,001
Sustainability	N/A	N/A	Number of weeping tiles disconnected	44
Reliability	N/A	N/A	Number of by-passes at pumping stations	5
Cost Effectiveness	N/A	N/A	Cost/tonne of biosolids treated and disposed	$81/tonne
Reliability	N/A	N/A	Percent of wastewater infrastructure rated as Good and Very Good	0.73%
Cost Effectiveness	N/A	N/A	Wastewater plant maintenance cost / megalitre of wastewater treated	$267/ML
Reliability	N/A	N/A	km of sanitary mains with condition grade of 5 (Very Poor)	25.8km
Cost Effectiveness	N/A	N/A	Wastewater plant maintenance cost/megalitre of wastewater treated	$119/ML

Figure 27. Map illustrating the user groups and areas that are connected to the Municipal wastewater system



5.3 Lifecycle Management Strategy

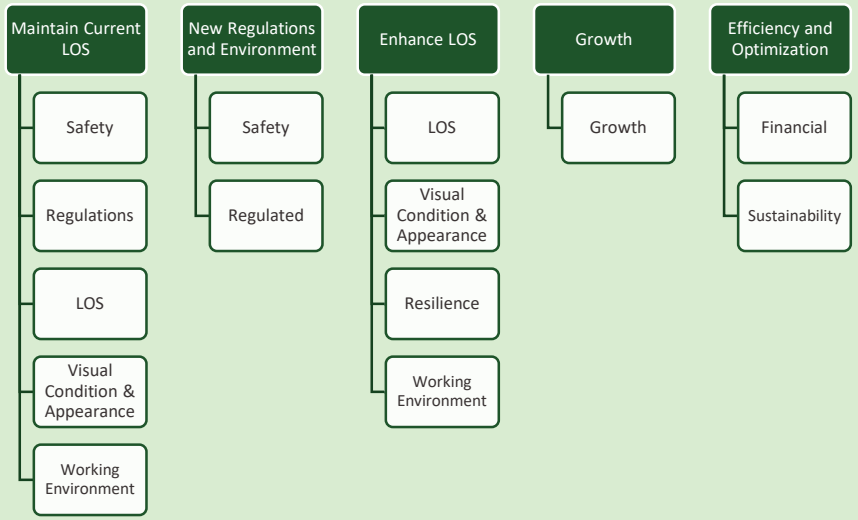
The wastewater group implements various non-infrastructure solutions, maintenance activities, renewal/rehab activities, replacement/construction activities, disposal activities, service improvement activities, and expansion/growth activities to sustain the defined Levels of Service. In particular, a number of non-infrastructure solutions are utilized to lower asset lifecycle costs and/or extend the asset useful life. These include:

- Optimization Program for Linear Assets and Plant Assets which have enhanced facility performance and capability and has resulted in process improvements. Through SCADA automation of equipment, operating cost savings are achieved and asset life is extended.
- Preventative maintenance and spot repair programs ensure assets continue to operate at an acceptable LOS.
- Annual maintenance flushing programs and flushing of trouble sections of wastewater main help to remove debris, grit, grease, etc., ensuring main capacity and operation are not compromised.
- Basement Flooding Prevention programs
- Joint contracts with the local municipalities help to minimize construction impacts for residents and lower project costs.
- Where possible, projects are combined with other programs such as Transportation and Water to minimize construction impacts on residents and to minimize project costs.

In addition, the Region has an active Inflow and Infiltration (I&I) Program, with various studies to identify problem areas. Spot Repair programs are conducted to resolve deficiencies identified by operations staff and through the CCTV inspection program. A manhole rehabilitation program is also carried out, where manholes identified with deficiencies are repaired either with lining or grouting. Capital projects are prioritized based on growth, risk, criticality, coordination with local municipalities, age and condition of the asset. All of these lifecycle activities are important as they work together to extend the asset life, reduce overall lifecycle costs, and achieve other

Optimized Decision-Making Procedures

In 2019, Halton Region completed the development of optimized decision-making procedures for Public Works, which includes Transportation. The optimized decision-making procedures support the prioritization of projects based on the highest benefit/cost solution, that mitigates risk while supporting public health, safety, community mobility, and sustainability initiatives. Following a review of other similar jurisdictions who have implemented good practice in optimized capital investment decision-making, guiding principles were identified to advance and sustain the optimized decision-making processes for the Region. Business Case Evaluation and Project Prioritization/Sequencing Procedures and Tools were developed, tested, and implemented to enable optimized decision-making for the capital budget plan. The image below shows the planning procedure and project priority considerations.



objectives such as environmental goals and balancing risk. Table 30 provides an overview of the lifecycle strategies for Wastewater and the risks associated with not following the strategies.

Table 30. Lifecycle Activities and Risks Associated with Not Following the Strategy (Wastewater)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for wastewater services transmission and treatment assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Development of Public Works' Infrastructure Report Card which summarize the overall condition of all assets; updated every 3 years. ▪ Asset strategies are developed for key asset types to provide a standardized approach to renewal over the lifecycle of a specific type of asset. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of the wastewater collection system. ▪ Joint contracts with the local municipalities to minimize construction impacts and lower project costs. ▪ Project coordination with other services such as transportation and water to minimize construction impacts and costs. ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs. ▪ Optimization Program for Linear Assets and Plant Assets: enhances Level of Service and facility performance and capability resulting in SCADA automation of equipment,	▪ Asset deterioration is over or underestimated. ▪ Increased demand and required capacity on the sanitary sewer system. ▪ Potential risk of sewer backup and basement flooding. ▪ Lack of coordination between local municipalities and other services may cause construction delays causing increased public disruption, construction costs, and replacing assets before end of service life.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	operating cost savings and extending asset life. ▪ By-law No. 2-03 to regulate and control discharges into the sanitary sewers and sanitary sewage works. ▪ Downspout disconnection program to reduce stormwater flows in the sanitary system.	
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance programs for collection assets: o Spot Repair program o Annual Maintenance Flushing Program o Manhole Inspection Program o Preventative Maintenance Program o CCTV Inspection Program ▪ And treatment assets: o Inspection o Testing and calibration of electrical, mechanical, instrumentation and control equipment. ▪ Reactive maintenance may arise during normal operation of assets or from inspections. ▪ Implementation and optimization of Reliability Centred Maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized and the service life of the assets are maximized, along with a focus on planning and scheduling to efficiently and effectively realize the maximum value of Halton's water assets.	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Customer dissatisfaction with wastewater service disruptions.
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition assessments. ▪ Manhole rehabilitation program to identify any deficiencies. ▪ Inflow & Infiltration program to identify areas and sources of inflow and infiltration.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	▪ Lining and Spot Repair Program ▪ Enhanced Basement Flooding Prevention Subsidy Program for private sewer lateral lining and repair.	scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Pipe replacement is based on condition, replacement methods include: ○ Open-cut replacement ○ Horizontal Directional Drilling ○ Pipe Bursting ▪ Replacement of equipment, SCADA, and facility assets based on condition and performance.	▪ Delay in construction projects may result in higher costs, longer service disruption, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal activities include decommissioning the Biosolids Management Centre and WWTPs, or assets belonging to the facilities, and materials according to regulations and standards. ▪ Assessment of material type to determine considerations of health and safety concerns (i.e., asbestos pipe) ▪ Pipes are grouted and abandoned in place once decommissioned.	▪ Improper disposal can lead to environmental impacts and expenses.
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Expansion needs are identified and documented through the development of the Sustainable Halton Water and Wastewater Master Plan using population projections. ▪ Capital projects to accommodate for population growth in new and existing areas. ▪ Undertake Environmental Assessments to accommodate for growth population. ▪ Development of biosolids management strategy through the development of the Biosolids Master Plan.	▪ Master Plans overestimate or underestimate required wastewater system expansions or upgrades to accommodate for increased flows and waste. ▪ Growth activities are delayed or cancelled, resulting in the wastewater system being unable to accommodate for increased flow due to population and employment growth.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
		▪ Incorrect sizing can cost more money to maintain and potentially lead to operational issues.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitoring Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies. ▪ Wastewater hydraulic modelling identifies areas that require system improvements such as treatment facility capacity upgrades. ▪ Verify alignment with Energy Management Strategy, which includes potentially reducing the number of pump stations (see Wastewater Pumping Station Master Plan).	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

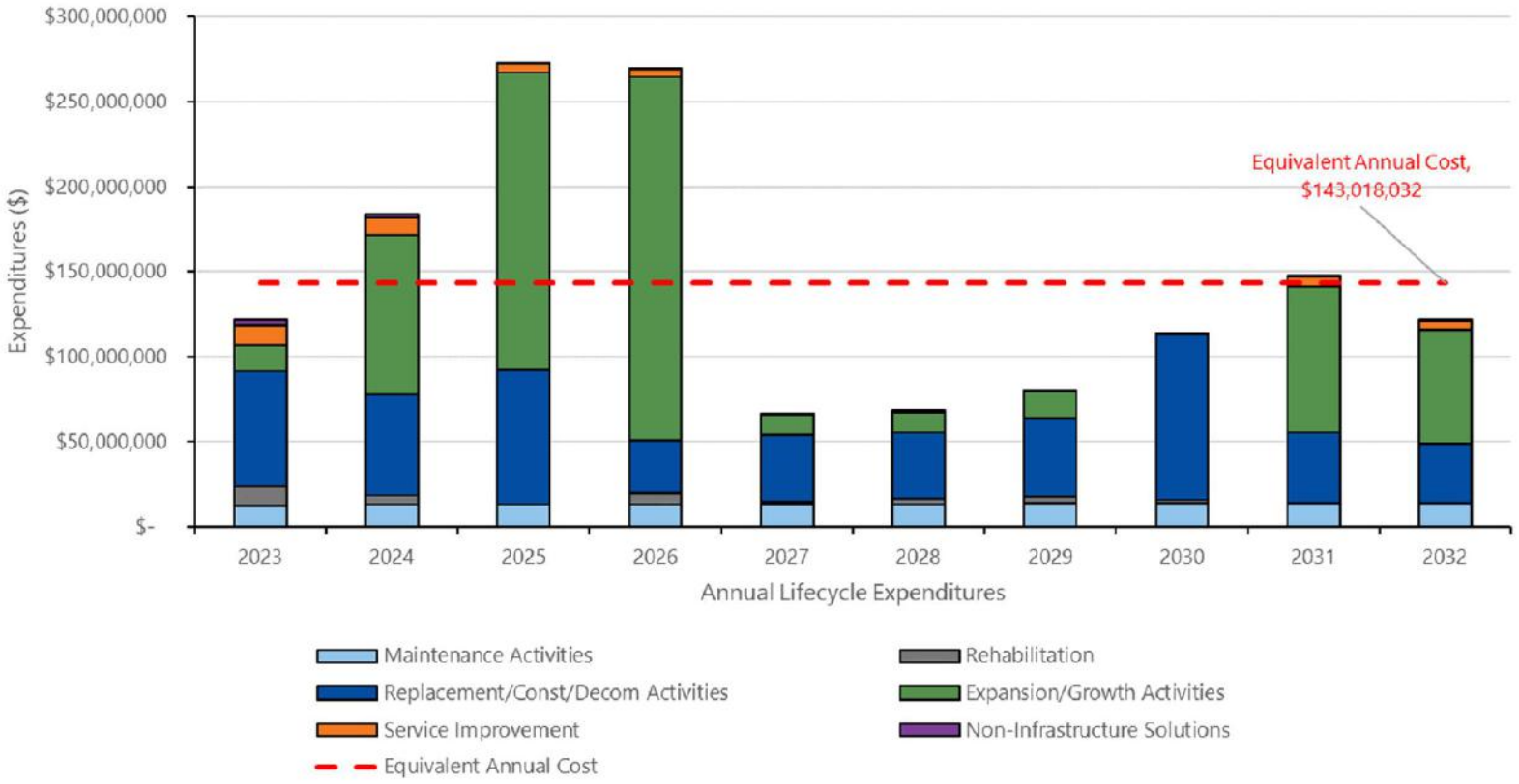
5.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 31 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $143 million for the full wastewater portfolio.

Table 31. Lifecycle Forecast Assumptions (Wastewater)

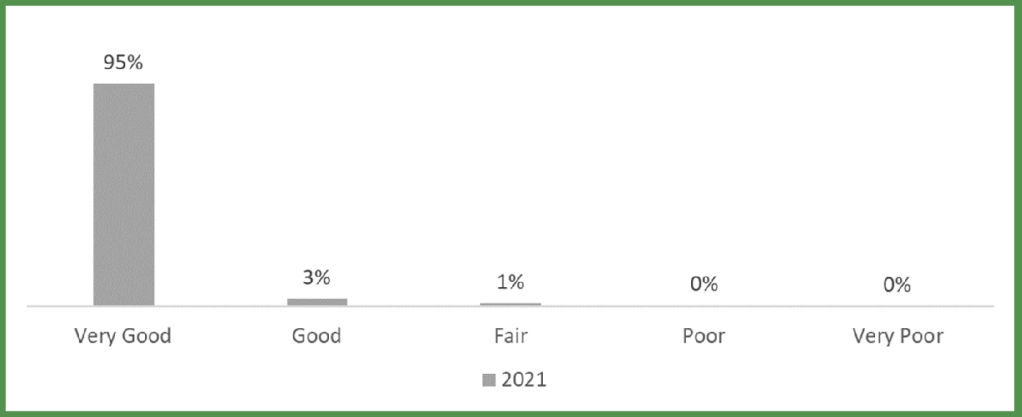
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan to 2031 and a review of upcoming capital projects.	$1,053,303
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for Water and Wastewater. An assumed allocation of 71% of the budget has been made to the wastewater assets, based on the replacement value compared to water. Assuming a starting budget in 2021 of 84.3 million, with an assumed annual increase of 2.6%, in-line with the 2021 budget request (Budget and Business Plan 2021, p. 248)	$13,083,210
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$3,042,503
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$53,688,700
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$67,054,748
Service Improvement Activities	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$5,095,568

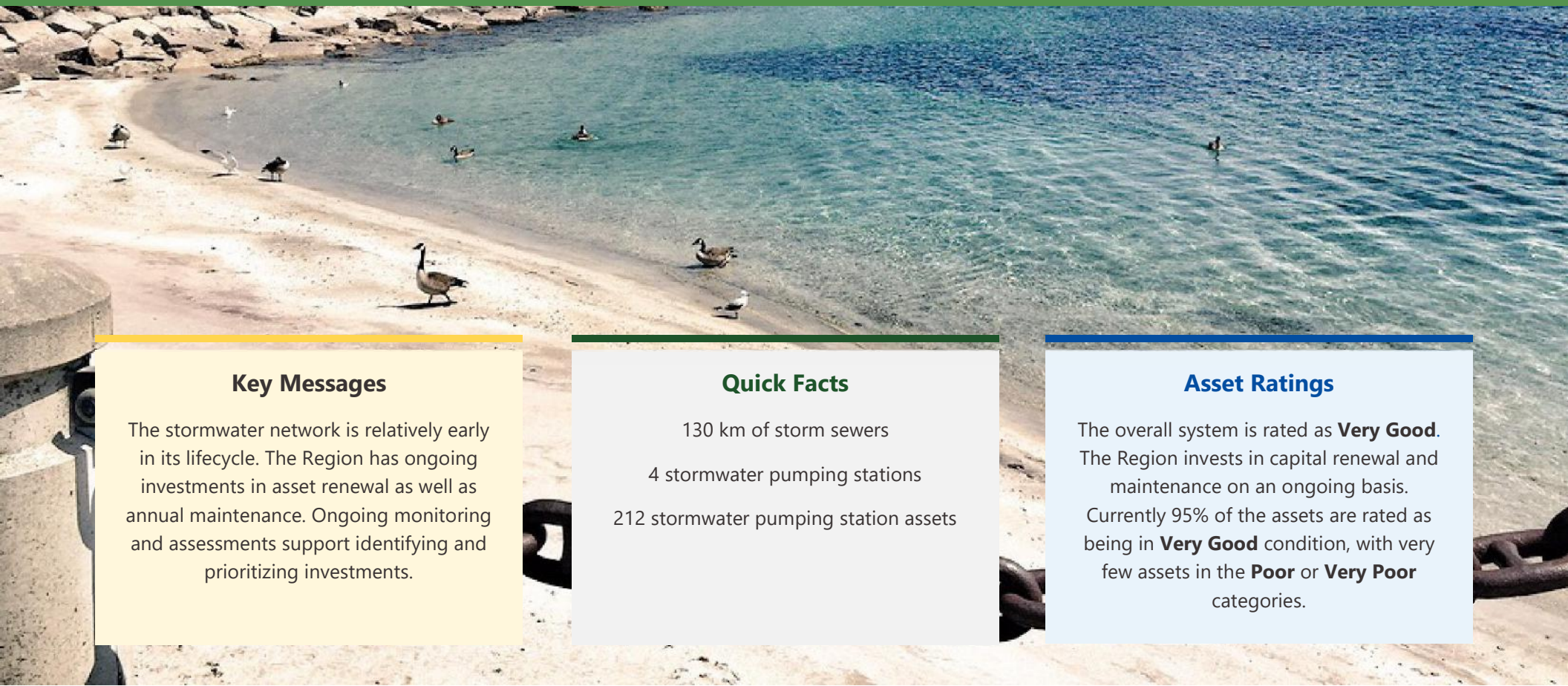
Figure 28. Forecasted Needs for 2023 to 2032 (Wastewater)



Stormwater

The Region is committed to providing reliable stormwater drainage while protecting the environment and the community.





Key Messages

The stormwater network is relatively early in its lifecycle. The Region has ongoing investments in asset renewal as well as annual maintenance. Ongoing monitoring and assessments support identifying and prioritizing investments.

Quick Facts

130 km of storm sewers

4 stormwater pumping stations

212 stormwater pumping station assets

Asset Ratings

The overall system is rated as **Very Good**. The Region invests in capital renewal and maintenance on an ongoing basis. Currently 95% of the assets are rated as being in **Very Good** condition, with very few assets in the **Poor** or **Very Poor** categories.

6.0 Stormwater (Core Asset)

Stormwater comes from rain and snowmelt and enters the storm sewer system through catch basins, ditches, creeks, and other stormwater channels. The Region aims to provide stormwater services to collect and convey these flows to protect the natural environment and reduce the risk of flooding, while complying to source water protection plans. Stormwater management is becoming increasingly important due to the increased frequency and intensity of storm events from the effects of climate change. An increase in precipitation can sometimes exceed the drainage capacity of the natural environment, which is exasperated by increased impervious land due to urbanization that decreases the natural drainage during rain events. Combined, these elements can potentially lead to flooding incidents especially if stormwater infrastructure is not resilient or maintained in a state of good repair to accommodate these flows.

Halton Region is specifically responsible for stormwater collection and conveyance along Regional roadways and local municipalities are responsible for all other stormwater systems. The stormwater assets presented in this Asset Management Plan include regional storm mains and stormwater pumping stations. The Region owned assets are estimated to have a replacement value of $164 million.

6.1 State of the Local Infrastructure

6.1.1 Asset Register

The stormwater network within the Region is primarily made up of storm sewers and catch basins along Regional roads, and four stormwater pumping stations. The overall replacement value by category is shown in Figure 29. Storm mains have the highest replacement value of $160 million, followed by the pump stations valued at 7.5 million. Table 32 summarizes the quantities and replacement values of the Region's stormwater assets.

Figure 29. Asset Categories by Replacement Value (Stormwater)

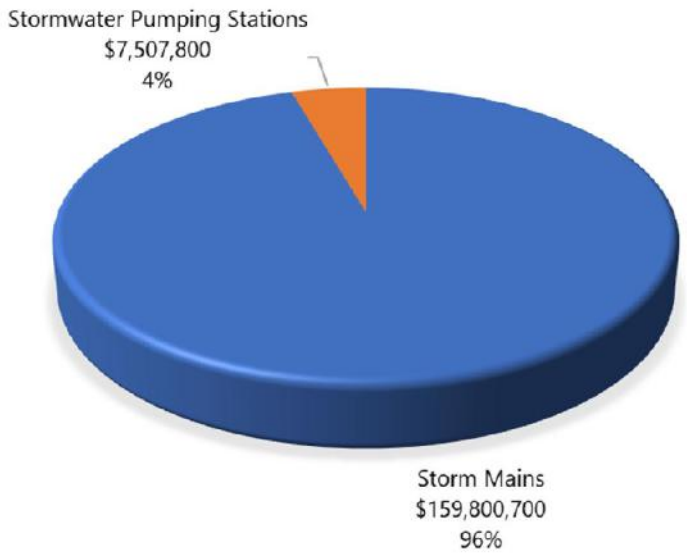


Table 32. Asset Quantities and Replacement Values (Stormwater)

Program Area	Description	Asset	Count	Unit	Estimated Replacement Value (2020)
Stormwater	Stormwater Collection	Storm Mains	130	Length (km)	$159,800,700
		Stormwater Pumping Stations	4	Each	$7,507,800
Total					**$167,308,500**

6.1.2 Asset Age Distribution

Figure 30 below summarizes the average age and average service life of each stormwater asset category, weighted based on asset replacement value. The stormwater facilities are approximately halfway through their service lives, whereas storm mains are just 20% into their estimated service life.

Figure 30. Average Asset Age as a Proportion of Average Asset ESL (Stormwater)

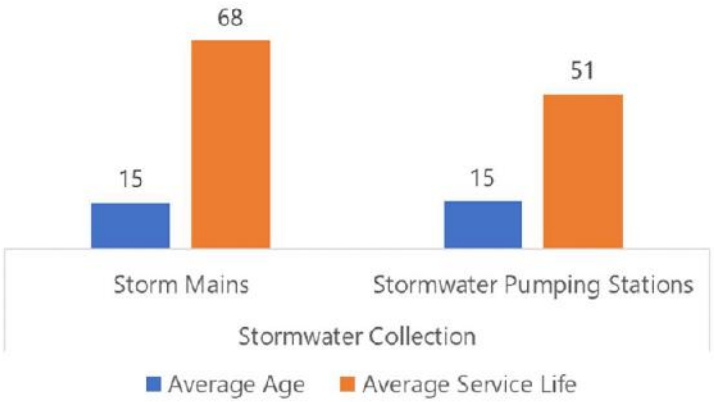


Figure 31 provides an overview of the years that the assets in the portfolio were constructed. The figure shows that the majority of the stormwater network is early in its lifecycle. It is important to note that where applicable, this figure represents the age of assets within a facility and not the construction date of said facility

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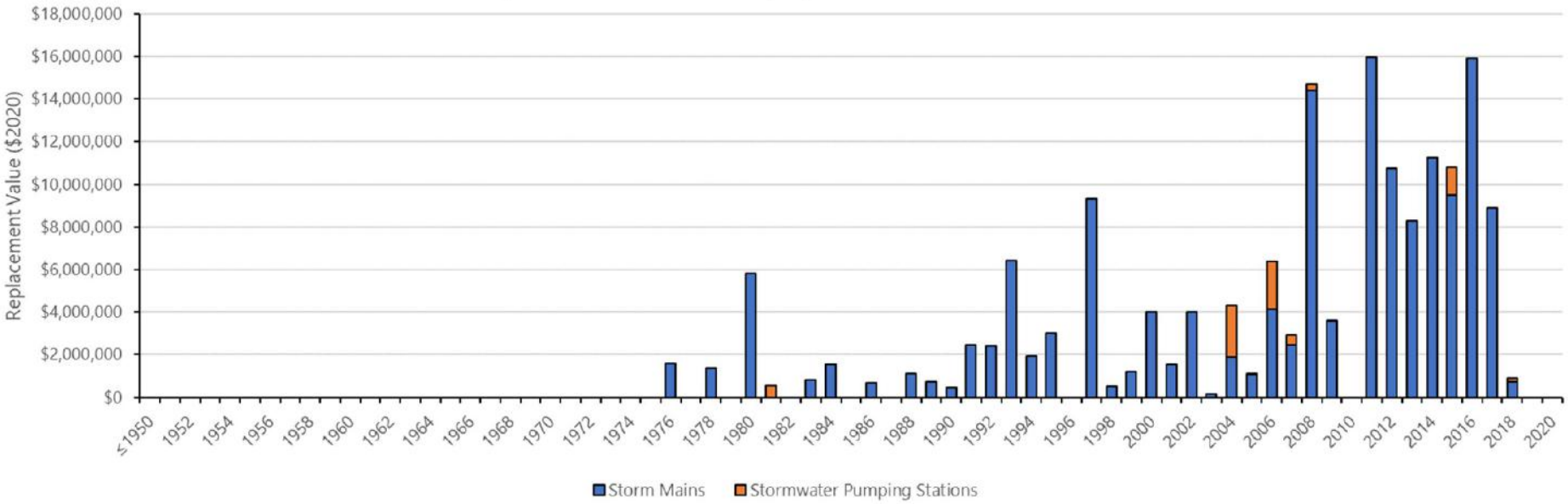
Figure 31. Construction Years by Replacement Value (Stormwater)



6.1.3 Asset Valuation

Assets are typically valued in terms of their financial accounting valuation and their replacement cost valuation. Financial valuation is based on historical costs and applies depreciation to estimate the current book value of the assets, whereas replacement cost valuation is forward-looking and accounts for expected inflation, changes in technology and other factors. Table 33 shows the financial accounting valuation (also referred to as the book value) and the replacement cost valuation. As can be seen from the table, the book value is considerably lower than the replacement cost valuation. This is due to the assets depreciating in value through their life to date. It should be noted that the valuation was as of December 31, 2019. The replacement values within the plan are based on estimates by subject matter experts (such as from Capital Needs Assessments), and where that information was not available, historical costs have been used.

Table 33. Financial Accounting and Replacement Cost Valuation (Stormwater)

Financial Accounting Valuation	Replacement Valuation
$26,811,998	$167,308,500

6.1.4 Asset Condition

Currently the Region does not have an established CCTV inspection program for storm sewers, partly due to the infrastructure being relatively early in its lifecycle. For the stormwater pump stations, the Region currently completes condition assessments on a 5-year cycle. Through these assessments, the current condition data is obtained to identify maintenance needs and 10-year capital program through establishing priority and renewal requirements. This is done through the Risk Evaluation and Optimized Decision-Making Processes already established at the Region. Issues identified from Condition Assessments, lifecycle models and operating and maintenance staff are

considered annually, as part of the budgeting process. These results are used to build business cases for capital projects which are evaluated and prioritized using the Optimized Decision-Making process. Together, these procedures help to prioritize needs for the first 1-3 years of the 10-year capital budget.

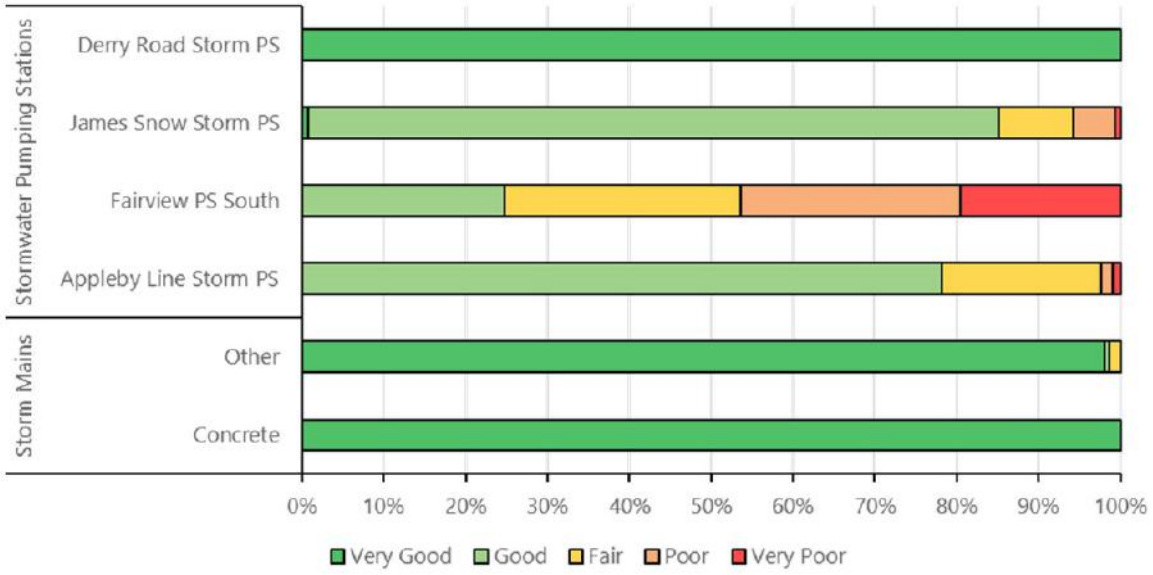
Table 34 shows how asset condition was determined for each of the asset categories for the purposes of the Asset Management Plan analysis. Storm main condition was determined using a deterioration model based on the age and expected life, and, except for the Derry Pumping Station, the condition of vertical assets was determined through Condition Needs Assessments. The Derry PS did not undergo an inspection as it is relatively new (2015).

Table 34. Condition Score and Rating Scales (Stormwater)

Condition Score	Condition Rating	Storm Mains(Age-Based, using a deterioration model)	Vertical Assets (CNA Condition)
1	Very Good	0.80 – 1.00	1
2	Good	0.60 - 0.79	2
3	Fair	0.40 – 0.59	3
4	Poor	0.20 – 0.39	4
5	Very Poor	0 – 0.20	5

Figure 32 provides the breakdown of the percentage of each asset sub-category in each condition rating group. The linear networks are almost all in the Very Good category, whereas one pumping station is in the Fair to Very Poor categories along with most miscellaneous equipment.

Figure 32. Condition Distribution by Replacement Value (Stormwater)



6.1.5 Data Sources and Data Confidence

The following data sources were used to complete the state of local infrastructure analysis:

- Storm Mains: an ESRI personal geodatabase of storm mains which included each Regional main segment and their attributes.
- Vertical Assets: facility specific CNA documents which included condition data, replacement values, and other attributes.
- Asset condition was degraded 3 years to account for the time passed since the initial inspection.

The following assumptions were made during the development of this section of the Asset Management Plan:

- Storm Mains: The average pipe diameter and installation date of the inventory was assigned to storm mains missing diameter values and installation dates. The current condition of storm mains was calculated based on a deterioration model using age and expected condition. Replacement values were assigned through the stormwater linear estimates based on pipe diameter.
- Vertical Assets: ESLs of similar assets were assigned to those assets with missing ESL values.

Table 35 provides the assessment of that data confidence and proposed actions to enhance data confidence.

Table 35. Data Confidence Assessment (Stormwater)

Description	Asset	Confidence Rating	Confidence Comment
Stormwater Collection	Storm Mains	Low	Data is primarily based on estimates of condition based on the pipe age. Currently, this strategy to assign condition is low risk since storm mains are relatively new.
	Stormwater Pumping Stations	Very High	Data is based on detailed condition needs assessments.

6.2 Levels of Service

Similar to the other asset portfolios, stormwater asset Levels of Service are key to asset management decision-making. The Region is committed to providing reliable stormwater drainage while protecting the environment and community. The Level of Service framework provides a means to establish the current Levels of Service being provided by stormwater services along with establishing proposed Levels of Service which can be achieved over time. In addition, these frameworks help to provide a relationship between the defined Levels of Service being provided by the Region's infrastructure systems and the associated operating and capital expenditures required to achieve the LOS.

O. Reg. 588/17 has set requirements for both customer Levels of Service and technical Levels of Service for all core assets. O. Reg. 588/17 customer Levels of Service use qualitative descriptions to describe the scope and quality of the service being provided by the asset or asset category while technical Levels of Service use performance measures to measure the scope or quality of the service being provided by the asset or asset category. For the purposes of the Asset Management Plan, a Level of Service framework has been developed to incorporate the following:

- Key metrics in alignment with the Key Performance Indicators in the annual budget and business plan.
- Performance indicators developed internally by Halton Region staff and through projects such as Strategic Project 2, which defined customer and technical Levels of Service.
- Regulatory Levels of Service as required by O. Reg 588/17.

Table 36. Community and Technical Levels of Service (Stormwater)

Key Service Attribute	Customer Levels of Service	Reference	O.Reg. 588/17 Technical Levels of Service	Current Performance
Safety	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.	Not Applicable – Halton Region only owns assets under the Regional roads (i.e., storm mains) and assets to protect from flooding are owned by the surrounding local municipalities (i.e., Burlington, Oakville, Milton and Halton Hills).	Percentage of properties in municipality resilient to a 100-year storm.	TBC
			Percentage of the municipal stormwater management system resilient to a 5-year storm.	TBC

6.3 Lifecycle Management Strategy

Table 37 summarizes the key activities that the Region completes to ensure the Levels of Service are maintained. The table also summarizes the risks associated with not following the strategies.

Table 37. Lifecycle Activities and Risks Associated with Not Following the Strategy (Stormwater)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for stormwater management assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Development of Public Works' Infrastructure Report Card which summarize the overall condition of all assets; updated every 3 years. ▪ Asset strategies are developed for key asset types to provide a standardized approach to renewal over the lifecycle of a specific type of asset. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of the stormwater system. ▪ Joint contracts with the local municipalities to minimize construction impacts and lower project costs. ▪ Project coordination with other services such as transportation to minimize construction impacts and costs. ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs. ▪ Street sweeping to decrease amount of debris and litter entering the system.	▪ Asset deterioration is over or underestimated. ▪ Increased demand and required capacity on the stormwater system. ▪ Potential risk of storm sewer backup and flooding on streets. ▪ Lack of coordination between local municipalities and other services may cause construction delays causing increased public disruption, construction costs, and replacing assets before end of service life.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	▪ Downspout disconnection program to reduce stormwater flows in the sanitary system.	
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Stormwater assets routine maintenance programs include: o Spot Repair program o Annual Maintenance Flushing Program o Manhole Inspection Program o Preventative Maintenance Program o CCTV Inspection Program ▪ Annual oil-grit separator (OGS) inspections. ▪ Scheduled and reactive OGS and catchbasin cleaning and maintenance.	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions and road closures or pose health and safety risks. ▪ Customer dissatisfaction with service disruptions.
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition assessments. ▪ Manhole rehabilitation program to identify any deficiencies. ▪ Pipe relining and grouting.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Pipe replacement is based on the condition and replacement methods include: o Open-cut replacement o Horizontal Directional Drilling o Pipe Bursting	▪ Delay in construction projects may result in higher costs, longer service disruption, road closures, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal activities include decommissioning stormwater pumping stations, or assets belonging to the facilities, and materials according to regulations and standards. ▪ Assessment of material type to determine considerations of health and safety concerns. ▪ Disposal of pipe when decommissioned.	▪ Improper disposal can lead to environmental impacts and expenses.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Capital projects to upgrade and extend system to accommodate for population growth in new and existing areas. ▪ Undertake Environmental Assessments to accommodate for growth population.	▪ Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for increased flow due to population and employment growth. ▪ Incorrect sizing can cost more money to maintain and potentially lead to operational issues.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitoring Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies. ▪ I&I Program: reducing the amount of I&I from the wastewater system can drive service improvement activities in the stormwater system, such as increasing the capacity at pumping stations. ▪ Implementation of LID technologies.	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

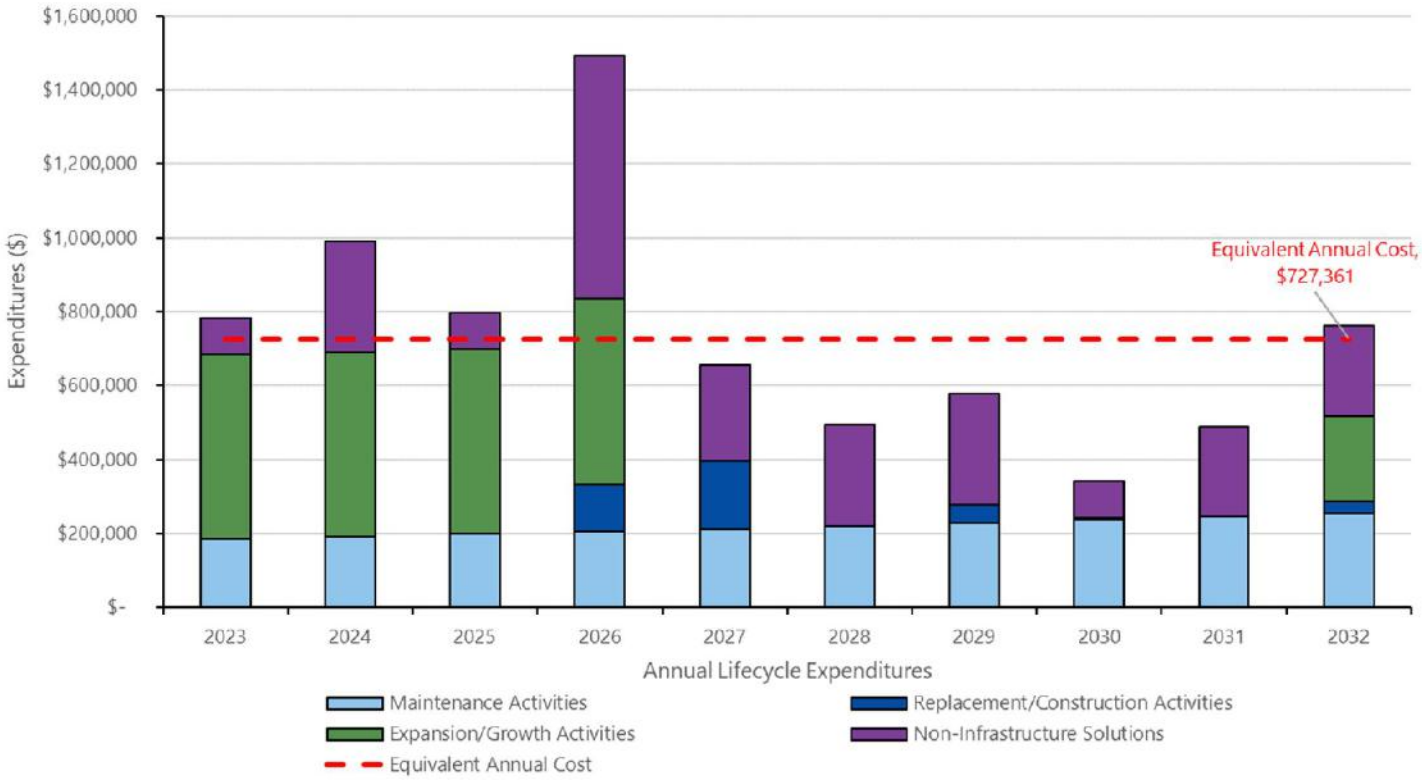
6.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities described in the previous section. To estimate the lifecycle activity costs, the assumptions in Table 38 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $727,000 for the full stormwater portfolio.

Table 38. Lifecycle Forecast Assumptions (Stormwater)

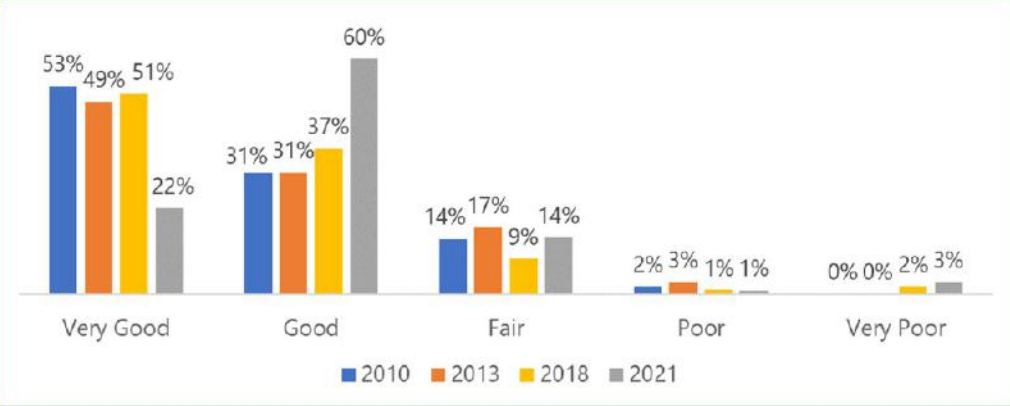
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Limited information was available for non-infrastructure solutions, therefore an assumed $50,000 per year has been included to account for pump station maintenance and coordination.	$243,889
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on provided data for the actual and budget maintenance activities for stormwater in 2020 and 2021, respectively. Assuming a starting budget in 2021 of $168,400, with an assumed annual increase of 2.3%, in-line with the 2021 roads operations budget request (Budget and Business Plan 2021, p. 114).	$213,182
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$0
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$40,290
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal costs.	N/A
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$230,000
Service Improvement Activities	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$0

Figure 33. Forecasted Needs for 2023 to 2032 (Stormwater)



Waste Management

The Region is committed to providing a reliable solid waste service that protects the environment



Key Messages

The Halton Waste Management Site is a state-of-the art facility that includes the Region's only operational landfill as well as several opportunities to increase waste diversion

Quick Facts

1 Open Landfill (Halton Waste Management Site)

4 Closed Landfills

Asset Ratings

Overall, 84% of Waste Management assets are in **Good** or **Very Good** condition, 14% are in **Fair** condition and the remaining 3% are in **Poor** or **Very Poor** Condition.

7.0 Waste Management (Non-Core)

Halton Region owns and operates the Halton Waste Management Site (HWMS), an integrated waste management facility that includes the only operating landfill in the Region. The HWMS opened in 1992 and is 126 hectares in size, 53 of which is the landfill. The remainder of the state-of-the art facility includes several opportunities for waste diversion such as a container station, yard waste composting facility and transfer station. Additional infrastructure at the HWMS includes a Landfill Gas Collection and Utilization System and Leachate Collection System. At the time of construction, the landfill was intended to service the Region for 20 years, until 2023. The Region is also responsible for 11 inactive, closed landfills, that while not currently in operation, do required ongoing maintenance. Four of these sites, one which is not owned by the Region, have active leachate collection systems which must be managed and thus include the infrastructure required to do so. In 2012, the Region implemented its updated Solid Waste Strategy, which provided recommendations to increase waste diversion rates through different programs such as expanding the blue box capacity and decreasing garbage bag limits. More recently in the 2019-2022 Strategic Business Plan, the Region has once again committed to an improvement in its waste diversion, with a goal of achieving a rate of 65%, an impressive goal considering the interim Provincial goal is 30% as set out by the *Waste Diversion Transition Act (2016)*. With the successful implementation of waste-diversion tactics the useful life of the landfill may be extended to 2046.

7.1 State of The Infrastructure

7.1.1 Asset Register

A key factor in a sustainable community is having a well-managed system for the proper disposal of waste generated by residents and businesses alike. The 2018 Energy and Resource Management Strategy in part focuses on recommendations for the Halton Waste Management Site (HWMS) and how energy and resource management can be improved at the facility, such as a composting facility for food waste and the construction of a solar field. These

recommendations build on efforts already in place such as the Landfill Gas Collection and Utilization Systems that were commissioned in 2006, and together have the capacity to produce up to 2.1 megawatts of "green" energy directly from landfill gas.

Waste Management's asset portfolio generally includes the aforementioned HWMS and 4 inactive landfills and their associated systems. Waste Management's entire asset portfolio is currently estimated at $99.7 million, and a large proportion is the HWMS. Figure 34 provides the breakdown of asset categories by replacement value and Table 39 summarizes quantities within each category.

Figure 34. Asset Categories by Replacement Value (Waste)

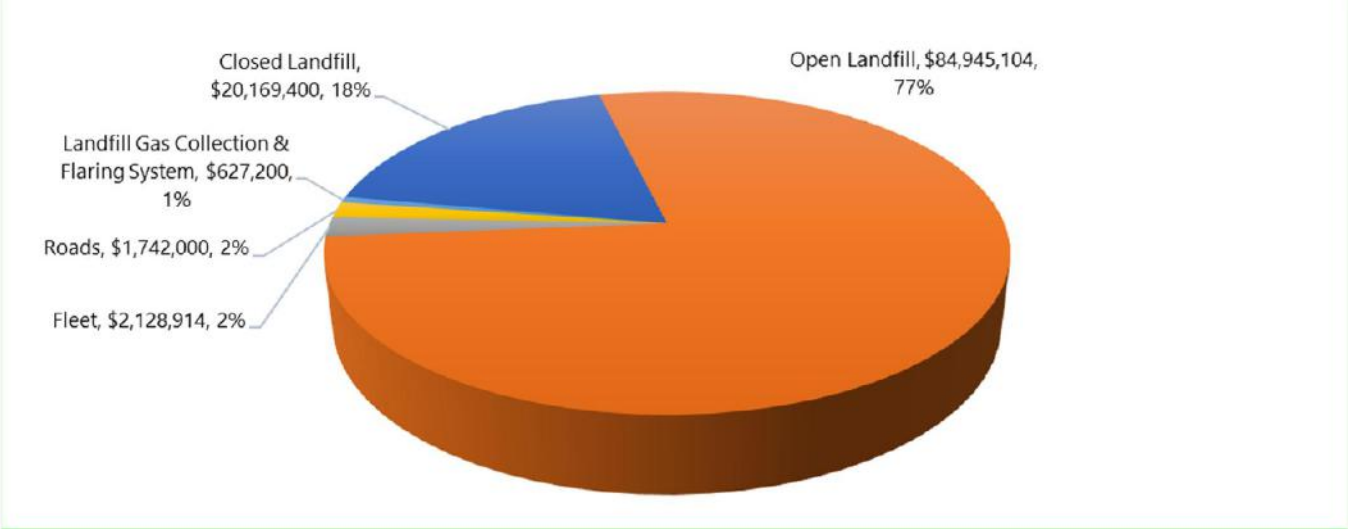


Table 39. Asset Quantities and Replacement Values (Waste)

Program Area	Description	Asset	Quantity	Unit	Estimated Replacement Value (2020)
Waste	Open Landfill	Waste Management Site	1	Each	$82,089,704
	Closed Landfill	Leachate PS	4	Each	$20,169,400
	Roads	Roads	14	Each	$1,742,000
	Fleet	Fleet	31	Each	$2,128,914
Total					**$106,130,018**

7.1.2 Asset Age Distribution

Figure 35 represents the average age of assets associated with both open and closed landfills, in comparison to their average estimated service life (ESL). Overall, closed landfill assets are approximately half-way through their ESL's, whereas open landfills, or the Halton Waste Management Site, is very early in the lifecycle as the facility is relatively new. It should be noted that landfills do not have a traditional end of life like other assets. For example, they are not replaced, but are capped and monitored beyond their service lives. Some assets do have scheduled replacements which have been built into the model.

Figure 36 provides a profile of the replacement costs of assets for each year since 1975. A significant investment was made in 1990, two years before the Halton Waste Management Site began operations. Since then, other significant investments have included the Landfill Gas Collection and Utilization System (2006 and 2007).

Figure 35. Average Asset Age as a Proportion of Average Asset ESL (Waste)

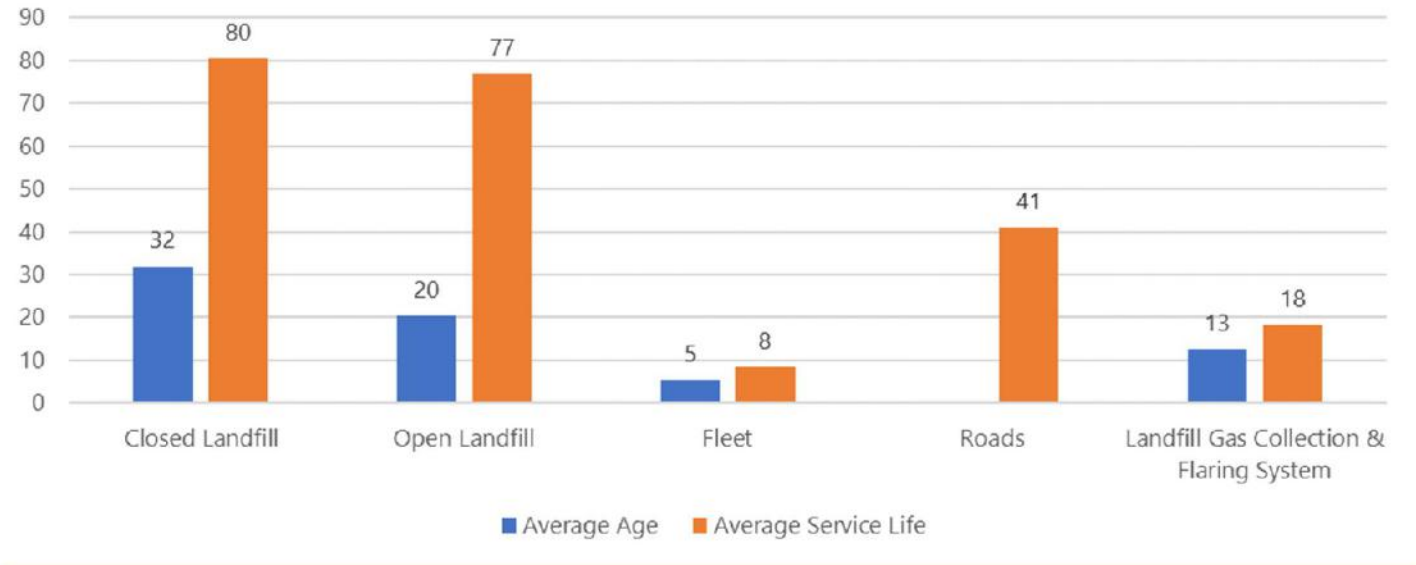
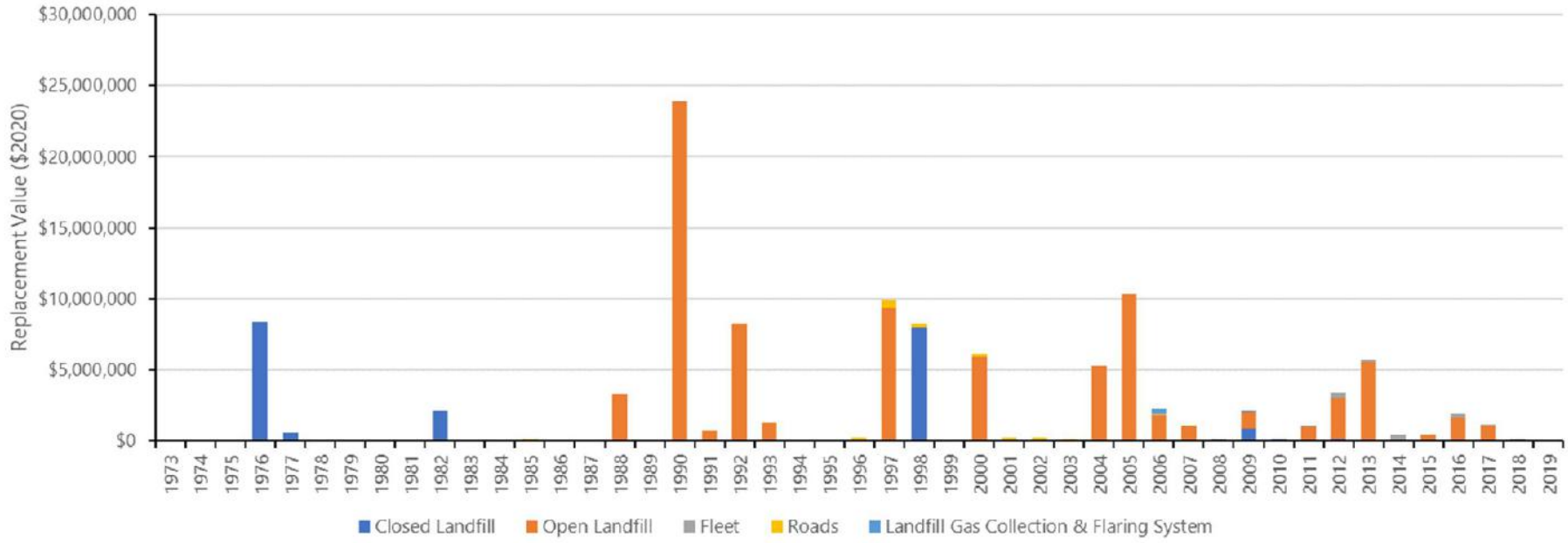


Figure 36. Construction Years by Replacement Value (Waste)



7.1.3 Asset Valuation

Assets are generally assigned a value using two methods: financial accounting valuation and replacement costs for the current year. The financial accounting valuation is based on historical costs (what was paid for the asset) and applies depreciation over time since initial acquisition. Replacement cost valuation represents how much it would cost to replace a particular asset in the present day. These costs are determined based on estimates obtained from professionals (e.g., consultants or Regional experts). Where this is not available, inflated historical costs are used. Table 40 provides the financial valuation and the replacement cost valuation for the Waste Management portfolio. The financial accounting valuation is significantly lower since assets depreciate in value over time.

Table 40. Financial Accounting and Replacement Cost Valuation (Waste) (2020)

Financial Accounting Valuation	Replacement Valuation
$53,516,085	$106,130,018

7.1.4 Asset Condition

Halton Region has an ongoing building condition assessment program in which all of its facilities are inspected on a 5-year cycle. Included within this program are the HWMS Public Works Buildings and Sites, most recently inspected in 2017. This detailed condition data informs the 10-year capital program by establishing priority maintenance and renewal requirements which feeds into the Risk Evaluation and Optimized Decision-Making Processes already established at the Region. Issues identified from Condition Assessments, lifecycle models and operating and maintenance staff are

considered annually, as part of the budgeting process. These results are used to build business cases for capital projects which are evaluated and prioritized using the Optimized Decision-Making process. Together, these procedures help to prioritize needs for the first 1-3 years of the 10-year capital budget. Condition data for assets not captured by the building condition assessments, such as leachate collection systems, was calculated using straight line deterioration. Condition scores were converted to a rating based on Table 41

.

Table 41. Condition Score and Rating Scale (Waste)

Condition Score	Condition Rating	Age-Based (1-Age/ESL)	HWMS (BCA Condition)
1	Very Good	0.80 – 1.00	1
2	Good	0.60 - 0.79	2
3	Fair	0.40 – 0.59	3
4	Poor	0.20 – 0.39	4
5	Very Poor	0 – 0.20	5

Figure 37 represents the distribution of condition ratings by replacement value for Waste Management. The majority of assets associated with closed landfills are in Fair condition, as expected based on average age and average estimated service life since assets with less than half of their ESL's remaining are classified as Fair (or lower). In contrast, open landfill assets are predominantly in Good or Very Good condition.

Figure 37. Condition Distribution by Replacement Value (Waste)

7.1.5 Data Sources and Data Confidence

The data that was used for the analysis was compiled from multiple sources, including:

- Open Landfills: Facility Condition Assessment for Halton Region Waste Management Site Buildings, TCA for other associated assets
- Closed Landfills: TCA

A summary of the data confidence is provided in Table 42.

.

Table 42. Data Confidence Assessment (Waste Management)

Description	Asset	Confidence Rating	Confidence Comment
Waste Management	Open Landfill	High	Many assets at the HWMS were captured during building condition assessments, however the leachate pumping system was not. It is recommended that an inventory and assessment of all assets at the site is completed.
	Closed Landfill	Medium	Closed landfills were not included in condition assessments and thus their condition is based on age. It is recommended that an inventory and assessment of all assets at the site is completed.

7.2 Levels of Service

Developing a Levels of Service (LOS) framework for each asset class is a crucial component of asset management planning. LOS help define expectations within each service area both from the service providers point of view (technical) and service users' point of view (customer) and help determine what lifecycle activities should be undertaken in order to maintain the current LOS for a particular asset. Unlike core assets presented in earlier sections, O.Reg. 588/17 does not define any legislative Levels of Service for Waste Management or the other non-core asset categories presented in the following sections.

Overall, Halton Region strives to provide a reliable solid waste service that protects the environment. A detailed framework has been established for Levels of Service related to waste management at the technical and customer level in terms cost effectiveness, sustainability and reliability. Table 43 below provides the technical and customer Levels of Service for waste management.

Table 43. Community and Technical Levels of Service (Waste)

Key Service Attribute	Customer Levels of Service Reference	Technical Levels of Service Measure	Current Performance
Cost Effectiveness	Providing a solid waste service in a cost-effective manner	Average cost / metric tonne of materials collected	
		Average cost of recyclables processed (per metric tonne)	
		Average cost to haul and process green bin material (per metric tonne)	
		10-Year forecast average capital funding as a % of estimated 100-year average annual capital budget needs	
Sustainability	Providing solid waste services that have minimal impacts on the environment	Residential solid waste diversion rate	
Reliability	Providing reliable solid waste services	Percentage of assets in good condition or better	

7.3 Lifecycle Management Strategy

Halton Region's Waste Management Division implements various non-infrastructure solutions, maintenance activities, renewal/rehabilitation activities, replacement/construction activities, disposal activities and expansion/growth activities to sustain the defined Levels of Service described in the previous section. Together, these activities work to extend the life of an asset, reduce overall lifecycle costs and achieve other objectives such as environmental goals and balancing risk. In particular, a number of non-infrastructure solutions are utilized to minimize costs, identify areas for improvement and ultimately extend the useful life of assets in waste management's portfolio. These include:

- Halton Waste Management Site Optimization Study
- Solid Waste Management Strategy
- Household Hazardous Waste Study
- Organics Study

Table 44 below provides a summary of all lifecycle activities related to waste management.

Table 44. Lifecycle Activities and Risks Associated with Not Following the Strategy (Waste)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Solid Waste Management Strategy to provide recommendations that will ultimately improve waste diversion and thus increase the useful life of the landfill. ▪ HWMS Optimization ▪ Lifecycle models have been developed for Waste Management assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Development of Public Works' Infrastructure Report Card which summarize the overall condition of all assets; updated every 3 years. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of waste management assets. ▪ Environmental Management Plans.	▪ Asset deterioration is over or underestimated. ▪ Inaccuracies in assumptions such as projections of diversion rates.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs.	
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance programs. ▪ Reactive maintenance may arise during normal operation of assets or from inspections. ▪ Implementation and optimization of maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized, and the service life of the assets are maximized, along with a focus on planning and scheduling to efficiently and effectively realize the maximum value of Halton Region's waste management assets.	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Inspection data is not up to date if inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure.
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition assessments.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement or reconstruction based on asset condition and previous rehabilitation activities performed.	▪ Delay in construction projects may result in higher costs, longer service disruption, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Landfills are not disposed of at the end of their lifecycle, but rather capped and monitored. There are strict environmental protocols and regulations that are required to be followed.	▪ Improper disposal can lead to environmental impacts, and regulatory breaches.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Capital projects to accommodate for population growth in new and existing areas. ▪ Undertake Environmental Assessments to accommodate for growth population.	▪ Master Plans overestimate or underestimate growth projections resulting in inadequate capacity needs to service residents.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitoring Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies. ▪ Verify alignment with Energy Management Strategy, which includes biogas capture and utilization for energy production and the installation of solar panels for off-grid power generation. ▪ Construction of cell 4 and new transfer station.	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

7.4 Forecasted Lifecycle Activity Costs

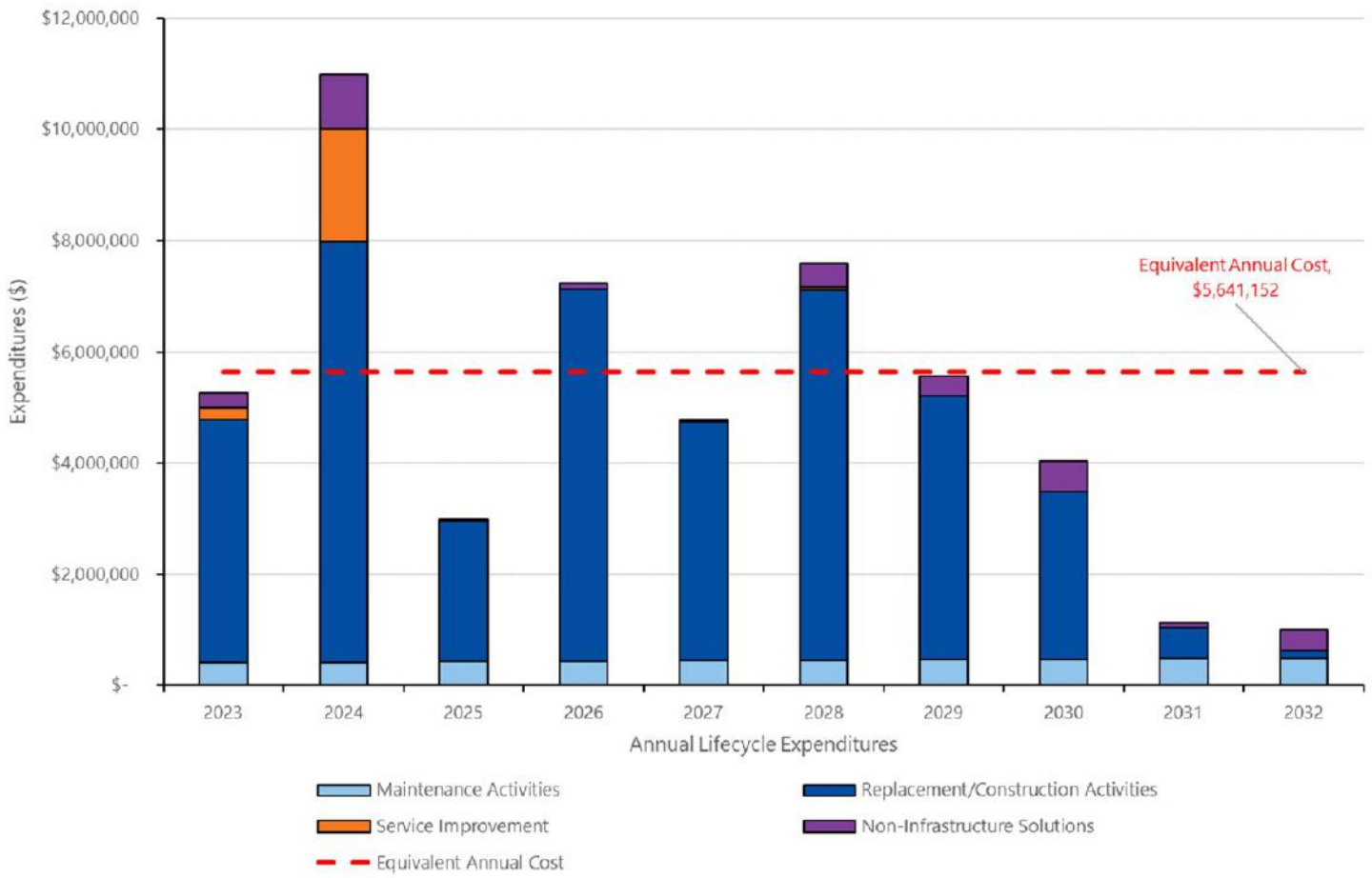
In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 45 have been used. The equivalent annual cost for each lifecycle stage has been included, which amount to $5.6 million for the full waste management portfolio.

Figure 38 depicts the annual forecasted needs for each applicable category for the years 2022-2031.

Table 45. Lifecycle Forecast Assumptions (Waste Management)

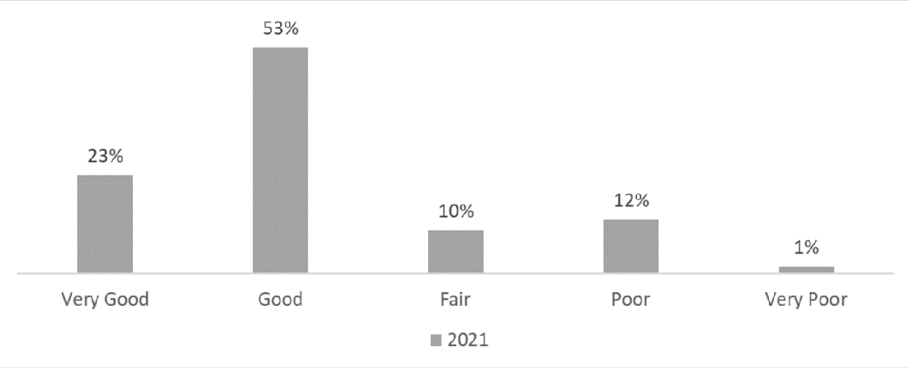
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan. The proposed budget and business plan amounts have been used for 2022 to 2031.	$366,967
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for Waste. Assuming a starting budget in 2021 of 44.2 million, with an assumed annual increase of 2.3%, in-line with the 2021 budget request (Budget and Business Plan 2021, p. 114).	$445,594
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Based on forecasted capital projects for waste services.	$164,545
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$4,058,592
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal costs.	N/A
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$300,000
Service Improvement Activities:	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$305,455

Figure 38. Forecasted Needs for 2022 - 2031 (Waste Management)



Corporate Facilities

The Region is committed to providing reliable, safe, accessible and energy efficient facilities.



Key Messages

Corporate facilities include only the facilities that do not belong to the services described in each chapter. For the full overview, please see Section 14.0 Energy, Fleet and Facilities.

Quick Facts

1 Museum (Halton Region Museum)
1 Farmhouse (Ford Farmhouse)
2 Operation Centres
1 Activity Centre
4 Child Care Centres
1 Administration Centre (Halton Regional)

Asset Ratings

Overall, 76% of corporate facilities owned by the Region are in **Very Good** or **Good** condition, with only 1% in **Very Poor** condition.

8.0 Corporate Facilities (Non-Core)

Halton Region owns and operates several facilities that support a wide range of service areas. They provide staff with a safe and efficient space to carry out the day-to-day operations necessary for effective service delivery, while also providing a central location for residents to seek services in-person.

8.1 State of the Infrastructure

8.1.1 Asset Register

The overall asset portfolio for Corporate Facilities is provided in Figure 39. The facilities presented in all figures in the following sections include:

- Halton Regional Centre
- The Halton Region Museum
- The Ford Farmhouse
- Milton Activity Centre
- North Operation Centre
- Woodlands Operations Centre
- Halton Waste Management Site buildings (included under Operations Centres)
- Four child-care centres

Table 46 provides the number of facilities for each category.

Figure 39. Asset Categories by Replacement Value (Corporate Facilities)

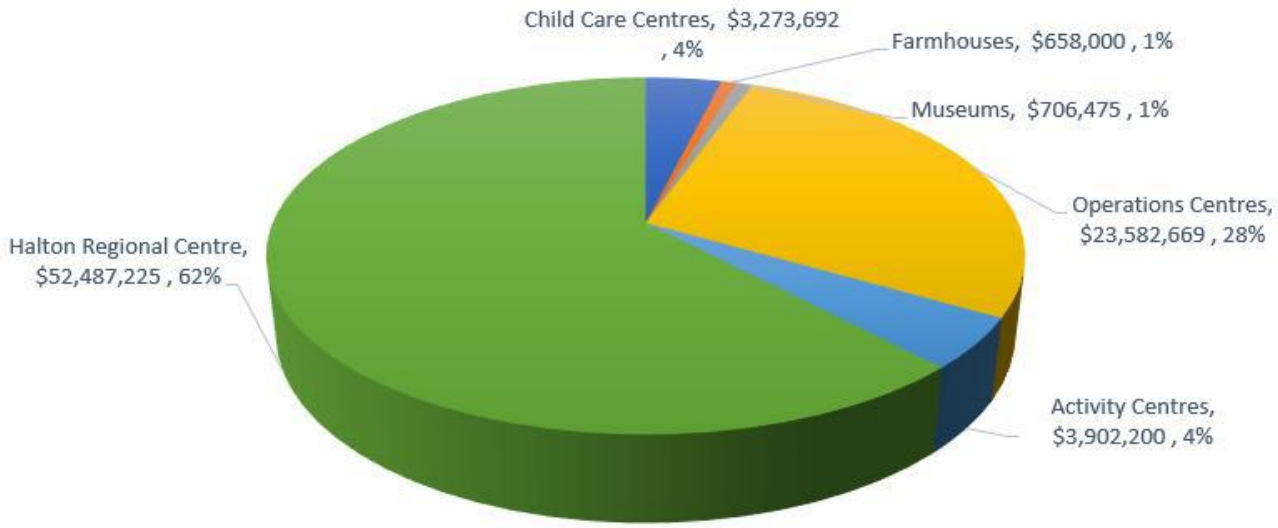


Table 46. Asset Quantities and Replacement Values (Corporate Facilities)

Program Area	Description	Quantity	Unit	Estimated Replacement Value (2020)
Corporate Facilities	Child Care Centres	4	Each	$3,273,692
	Farmhouses	1	Each	$658,000
	Museums	1	Each	$706,475
	Operations Centres	3	Each	$23,582,669
	Activity Centres	1	Each	$3,902,200
	Halton Regional Centre	1	Each	$52,487,225
Total				**$84,610,261**

Note: *The Replacement Valuation currently does not include the full replacement value for the Halton Regional Centre, which is approximately $152 m. This will be incorporated in the next iteration of the plan.*

8.1.2 Asset Age Distribution

Figure 40 below presents the average age of each category against its respective average estimated service life. All Corporate Facility categories are either quickly approaching or have exceeded the average estimated service life of the assets associated with them. Based on age alone, it would be expected that these assets would all be classified as being in Very Poor condition.

Figure 40. Average Asset Age as a Proportion of Average Asset ESL (Corporate Facilities)

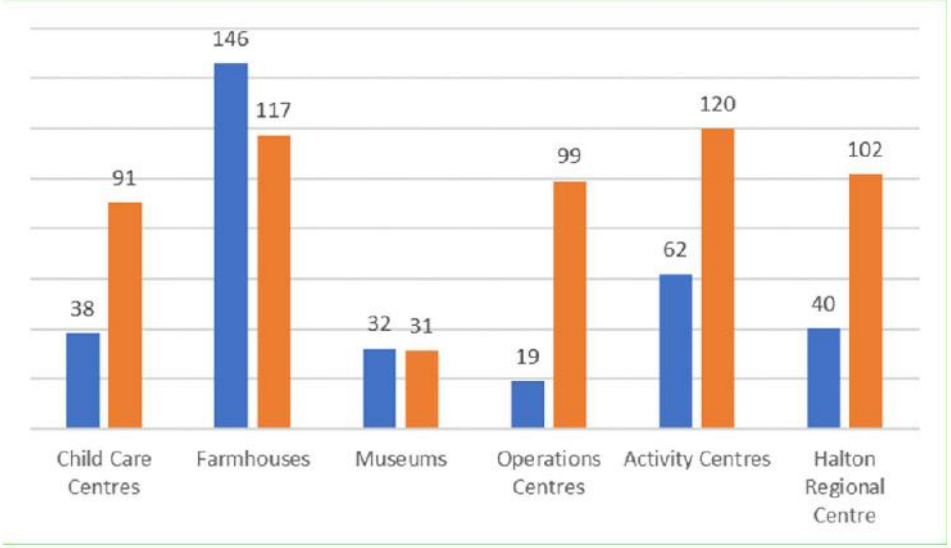
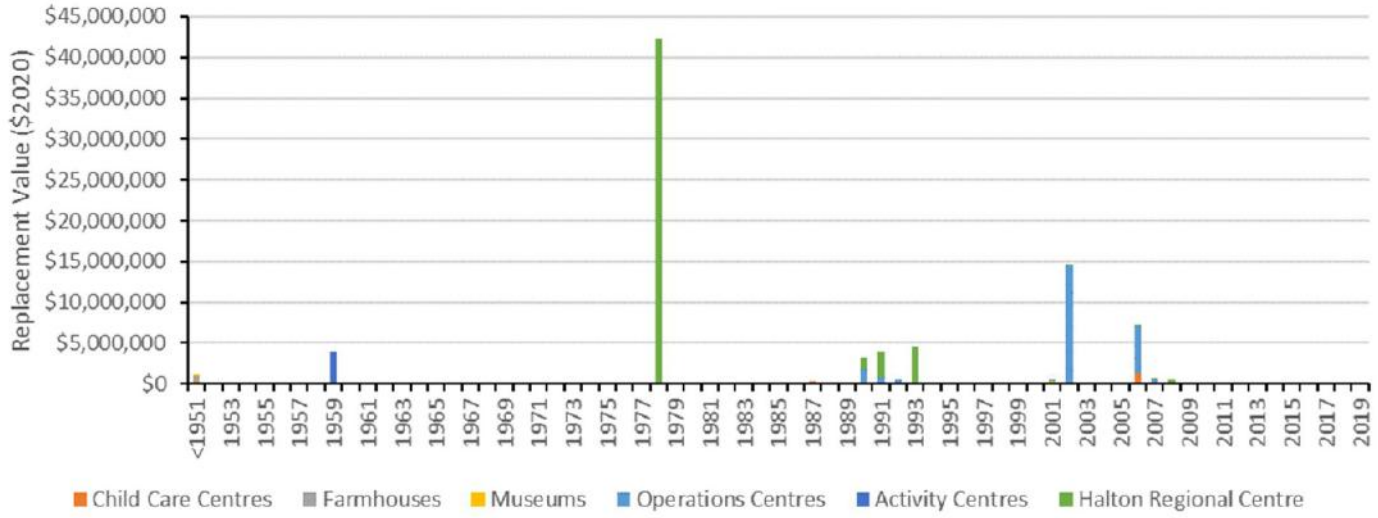


Figure 41 presents the corporate facilities asset portfolio based on replacement costs by installation year. There were significant peaks in investment both during the early 1990's and early 2000's. Those in the early 1990's that fall in the Corporate Facilities category can be attributed to the second phase of construction for the Halton Regional Centre.

Figure 41. Construction Years by Replacement Value (Corporate Facilities)



8.1.3 Asset Valuation

Asset valuation can be approached using two different methods: financial accounting valuation and replacement cost valuation. Financial accounting valuation is based on historical costs (what was paid for the asset) and considers depreciation over time since initial acquisition. Replacement cost valuation represents how much it would cost to replace a particular asset in present dollars. These costs are determined based on estimates obtained from professionals (e.g., consultants or Regional experts). Where this is not available, inflated historical costs are used.

Table 47 provides the financial valuation and the replacement cost valuation for the Corporate Facility portfolio.

Table 47. Financial Accounting Valuation and Replacement Cost Valuation (Corporate Facilities) (2020)

Financial Accounting Valuation	Replacement Valuation
$16,555,559	$84,610,261

Note: *The Replacement Valuation currently does not include the full replacement value for the Halton Regional Centre, which is approximately $152 m. This will be incorporated in the next iteration of the plan.*

8.1.4 Asset Condition

The Region has an active condition assessment program for corporate facilities. These are detailed assessments of the inventory and condition of assets located at each of the facilities which are currently completed on a 5-year cycle. This detailed condition assessment informs the 10-year capital program by establishing priority maintenance and renewal requirements.

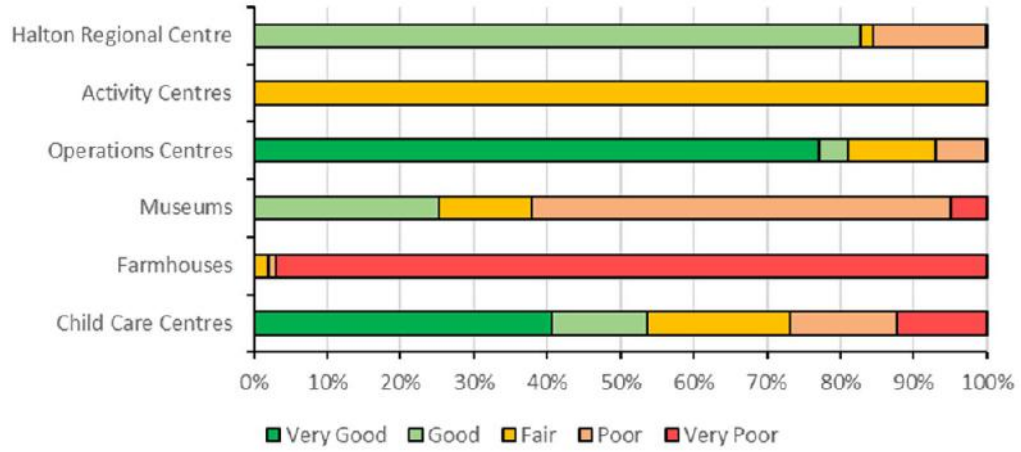
These condition assessments also include the facility condition index (FCI), a tool used to illustrate the condition of a property as a ratio between renewal / rehabilitation costs and the replacement costs of the building. Therefore, a lower FCI is representative of a building in better condition compared to those with a higher FCI. In 2016 – 2017, all facilities that are included this plan were inspected. Condition scores were converted to ratings based on Table 48.

Table 48. Condition Scores and Rating Scale (Corporate Facilities)

Condition Score	Condition Rating	BCA Condition
1	Very Good	1
2	Good	2
3	Fair	3
4	Poor	4
5	Very Poor	5

Figure 42 represents the condition of corporate facility assets by replacement value which was captured during condition assessments, as opposed to calculating it based on age alone. Generally, corporate facility assets are distributed somewhat evenly between Good, Fair and Poor condition, with the largest asset, Halton Regional Centre, mainly in Good condition.

Figure 42. Condition Distribution by Replacement Value (Corporate Facilities)



8.1.5 Data Sources and Data Confidence

The data that was used for the analysis was compiled from the Facility Building Condition Assessments (BCA) completed for all facilities.

The following assumptions were made during the development of this section of the Asset Management Plan:

- Individual asset records/information available in the BCAs were used, including the replacement value assessed.
- Where the value of the combined asset records was less than the insured value of the building, an additional Miscellaneous Asset was created with a replacement value covering the difference. This asset was assigned an ESL of 120 years.

The confidence in the data is provided in Table 49.

Table 49. Data Confidence Assessment (Corporate Facilities)

Description	Asset	Confidence Rating	Confidence Comment
Corporate Facilities	Corporate Facilities	High	Majority of data is based on detailed condition assessments with miscellaneous assets based on assumptions.

8.2 Levels of Service

Halton Region has developed Levels of Service for its corporate facilities in terms of both technical and customer Levels of Service. These provide a basis from which the Region can determine whether or not a service area is performing as expected. Generally speaking, Energy Fleet and Facilities (EFF), the division which manages corporate facilities, aims to provide reliable, safe, accessible and energy efficient services. Table 50 below provides more detailed Levels of Service as established by EFF in terms of cost-effectiveness, availability, sustainability, reliability, safety and accessibility.

Table 50. Community and Technical Levels of Service (Corporate Facilities)

Key Service Attribute	Customer Levels of Service Reference	Technical Levels of Service Measure	Current Performance
Cost Effectiveness	Providing facilities management services in a cost-effective manner	Cost to provide service ($/sqft)	
		10 Year forecast average capital funding as a % of estimated 100-year average annual capital budget needs	
Availability	Providing an appropriate number of recreation facilities and amenities	Total Service Area - Corporate Facilities and Social Housing Sq. Ft.	
Sustainability	Providing facilities that are environmentally conscious	Total Corporate kWh Energy Consumption (per Sq. Ft.)	
		% of facilities in Good or Very Good condition	
		Total Corporate ekWh Energy Consumption (per Sq. Ft.)	
		Water Consumption (m) for Headquarters (HQ) per Square Foot of HQ Building	
Reliability	Providing facilities that are reliable	FCI of facilities	
		Demand work orders as a percentage of total work orders	

8.3 Lifecycle Management Strategy

Table 51 summarizes the key lifecycle activities undertaken by Halton Region to ensure that the Levels of Service as set out by Energy Fleet and Facilities are upheld. Certain risks associated with not following the strategy are also included.

Table 51. Lifecycle Activities and Risks Associated with Not Following the Strategy (Corporate Facilities)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for Corporate Facilities assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs.	▪ Asset deterioration is over or underestimated. ▪ Inaccurate assumptions for analysis and forecasts.
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance programs ▪ Reactive maintenance may arise during normal operation of assets or from inspections. ▪ Implementation and optimization of maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized and the service life of the assets are maximized, along with a focus on planning and scheduling to efficiently and effectively realize the maximum value of Halton Region's assets related to corporate facilities.	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Inspection data is not up to date if inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure.
Renewal/ Rehab Activities Significant repairs designed to extend the life	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
of the asset	condition assessments.	asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement or reconstruction based on asset condition and previous rehabilitation activities performed.	▪ Delay in construction projects may result in higher costs, longer service disruption, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal of assets at the end of their useful life.	▪ Improper disposal can lead to environmental impacts and expenses.
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Capital projects to accommodate for population growth in new and existing areas.	▪ Inadequate forecasts for space needs and facility specifications.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitor Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies.	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

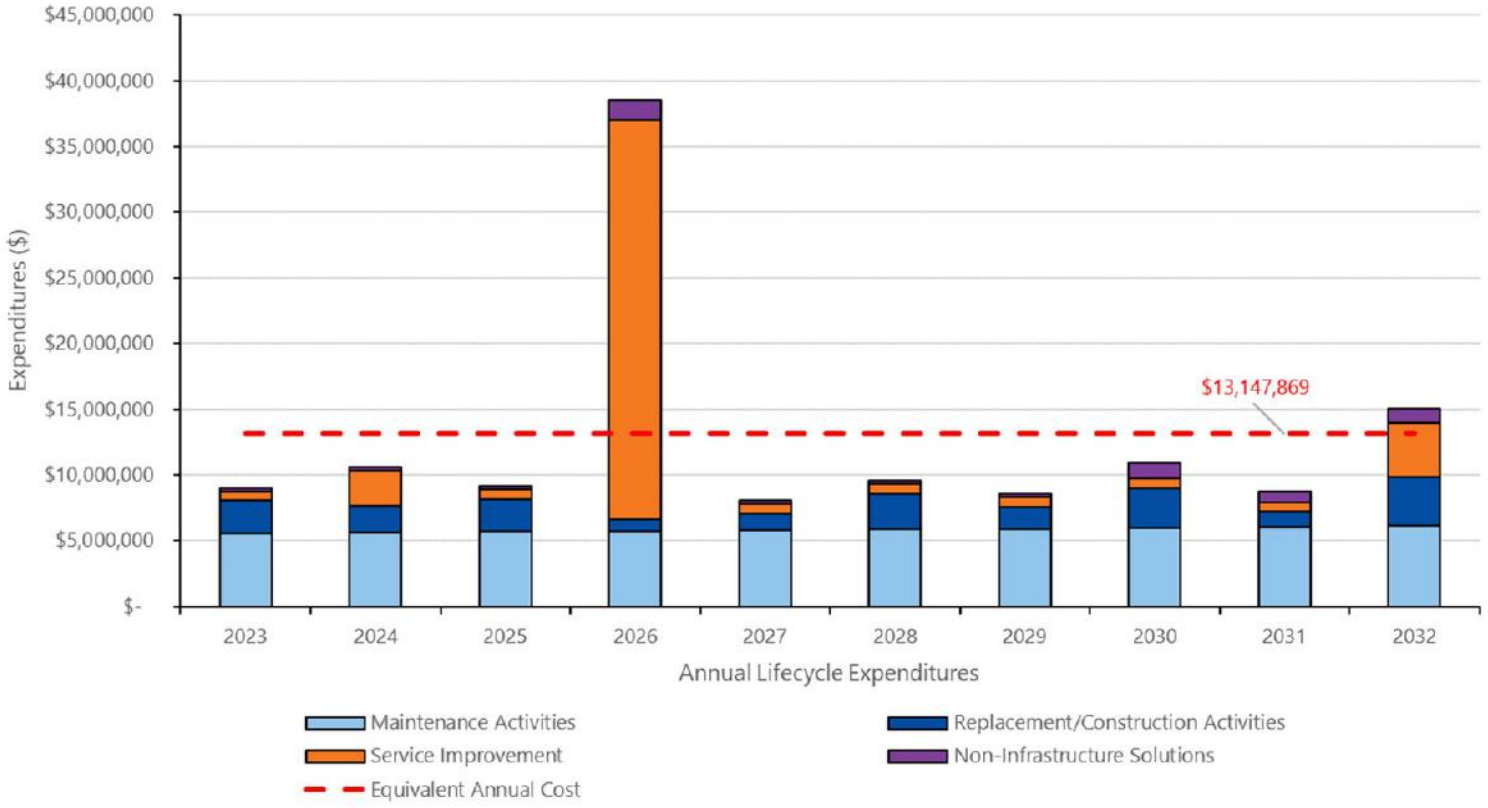
8.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 52 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $13.1 million for the full corporate facility portfolio.

Table 52. Lifecycle Forecast Assumptions (Corporate Facilities)

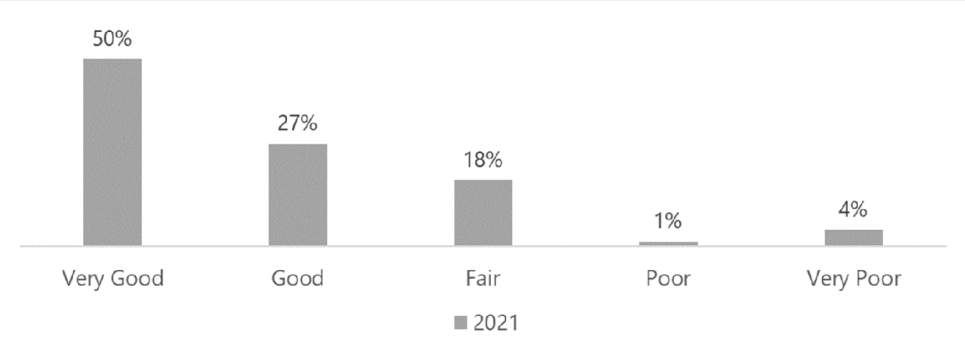
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan. The proposed budget and business plan amounts have been used for 2022 to 2031.	$1,168,000
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for Energy, Fleet and Facilities (p.336). A weighted distribution has been developed between fleet and facilities based on replacement value of the assets. Assuming a starting budget in 2021 of 18.7 million, with an assumed annual increase as per the Ten Year Operating Budget Forecast on p. 80.	$5,792,109
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$10,909
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$2,078,651
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$0
Service Improvement Activities	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$4,098,200

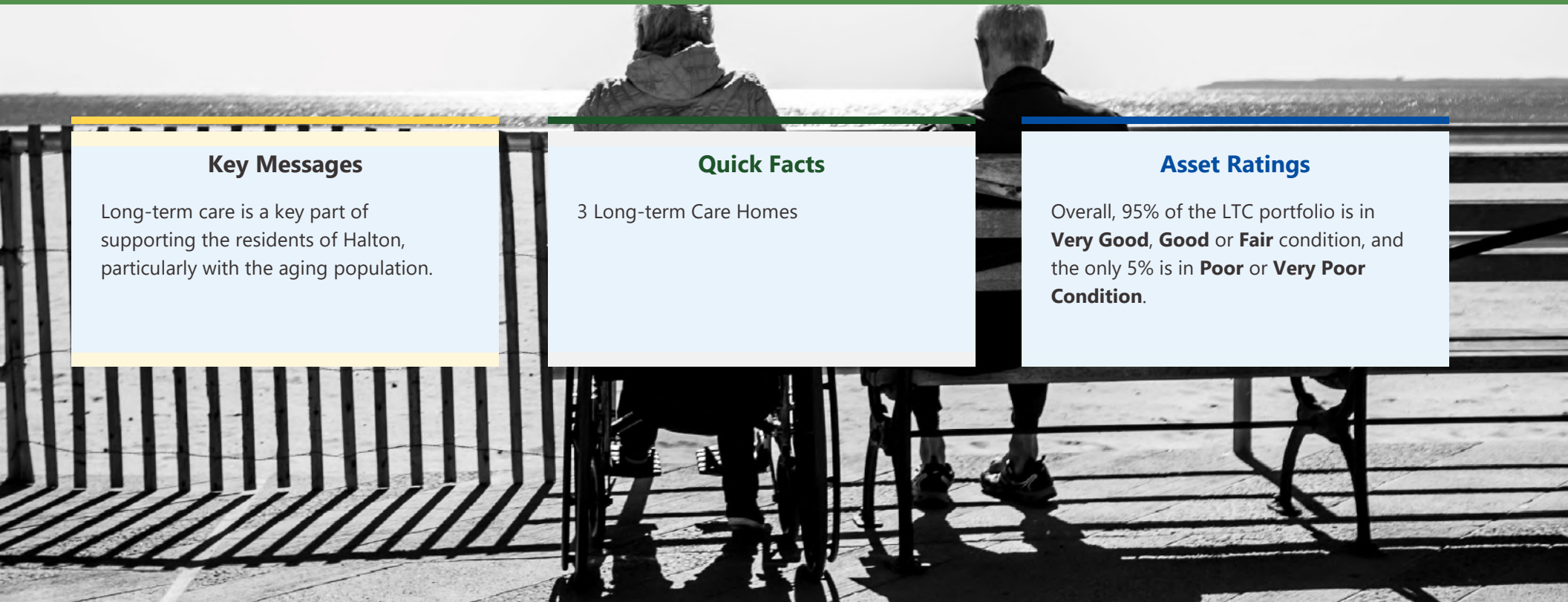
Figure 43. Forecasted Needs for 2023 - 2032 (Corporate Facilities)



Long-term Care

The Region is committed to providing long-term care services to residents that require respite, medical, nursing, personal, therapeutic and social work services in a cost-effective way.





Key Messages

Long-term care is a key part of supporting the residents of Halton, particularly with the aging population.

Quick Facts

3 Long-term Care Homes

Asset Ratings

Overall, 95% of the LTC portfolio is in **Very Good**, **Good** or **Fair** condition, and the only 5% is in **Poor** or **Very Poor Condition**.

9.0 Long-term Care (Non-Core)

Halton Region owns and operates three accredited, non-profit long-term care (LTC) homes in Oakville, Burlington and Milton. The homes range in size from 144 to 228 beds and offer a variety of services to residents. All three LTC homes are Commission on Accreditation of Rehabilitation Facilities (CARF) accredited and have joined the Registered Nurses Association of Ontario's (RNAO) Long-term Care Best Practice Spotlight Organization. In order to properly uphold these standards, the assets associated with these facilities must be properly managed.

By 2041, it is estimated that 25% of the population of Ontario will be 65 years of age or older, trends that are reflected in Halton Region. These projections highlight the importance of safe and reliable LTC homes in the Region as they provide a space for those who are eligible to access a standard of care which allows them to live with dignity as they age.

9.1 State of the Infrastructure

9.1.1 Asset Register

Residents at Halton Region's long-term care homes and seniors' residences have access to a wide range of services including 24-hour nursing and medical care (where applicable), social programs, spiritual support, meals, live entertainment and specialized services such as dental care, hairdressing and barber services. In contrast to other facilities owned and operated by Halton Region, these provide a living space for residents and thus their assets not only include typical structure, mechanical and site works; they also include special equipment and furnishings necessary for residents to be comfortable and properly cared for. The LTC asset portfolio is broken down into facility assets and equipment, presented by replacement value in Figure 44. Table 53 summarizes the quantities within each category.

Figure 44. Asset Categories by Replacement Value (Long-term Care)

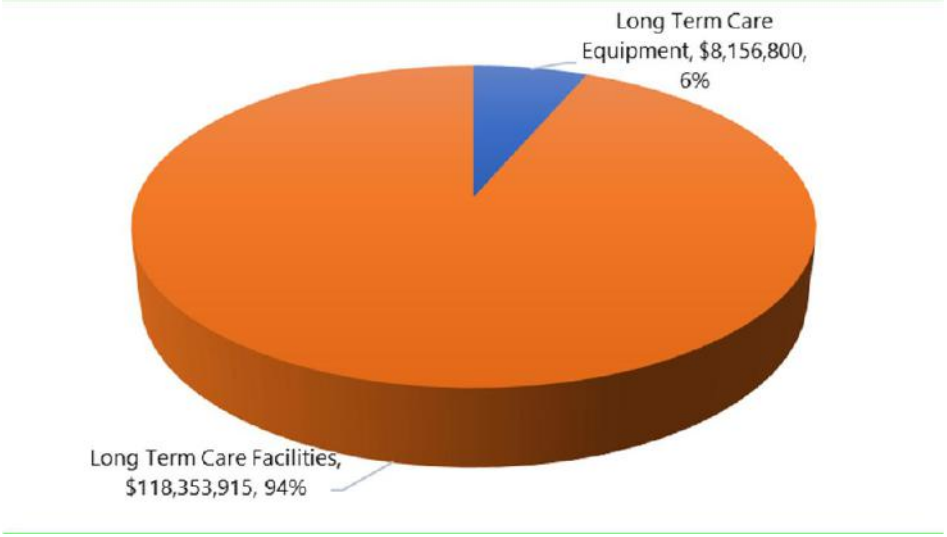


Table 53. Asset Quantities and Replacement Values (Long-term Care)

Program Area	Description	Quantity	Unit	Estimated Replacement Value (2020)
Long-term Care	Long-term Care Facilities	3	Each	$118,353,915
	Long-term Care Equipment	122	Each	$8,156,800
Total				**$126,510,715**

9.1.2 Asset Age Distribution

Figure 45 presents the average age of assets in the long-term care portfolio compared to the average estimated service life of those same assets.

Figure 45. Average Asset Age as a Proportion of Average Asset ESL (Long-term Care)

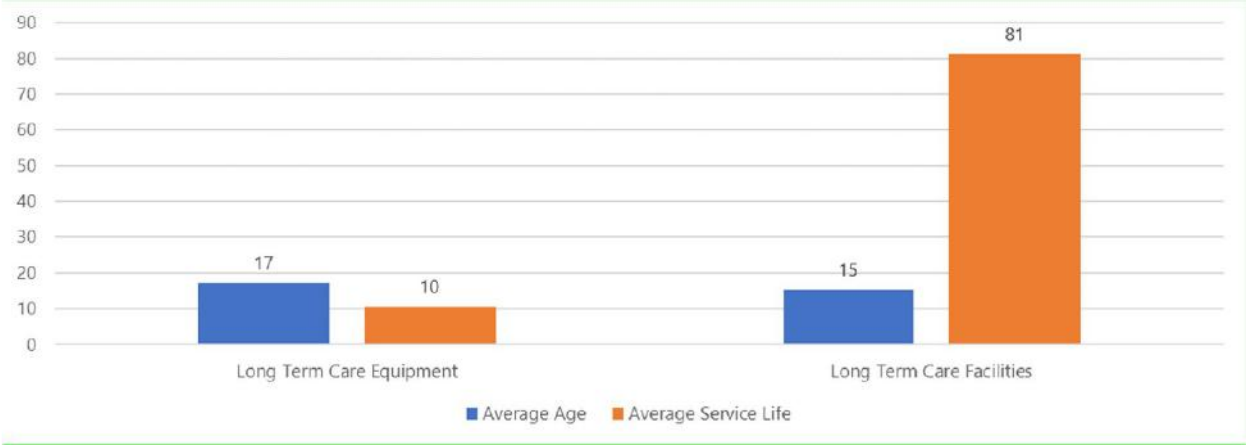
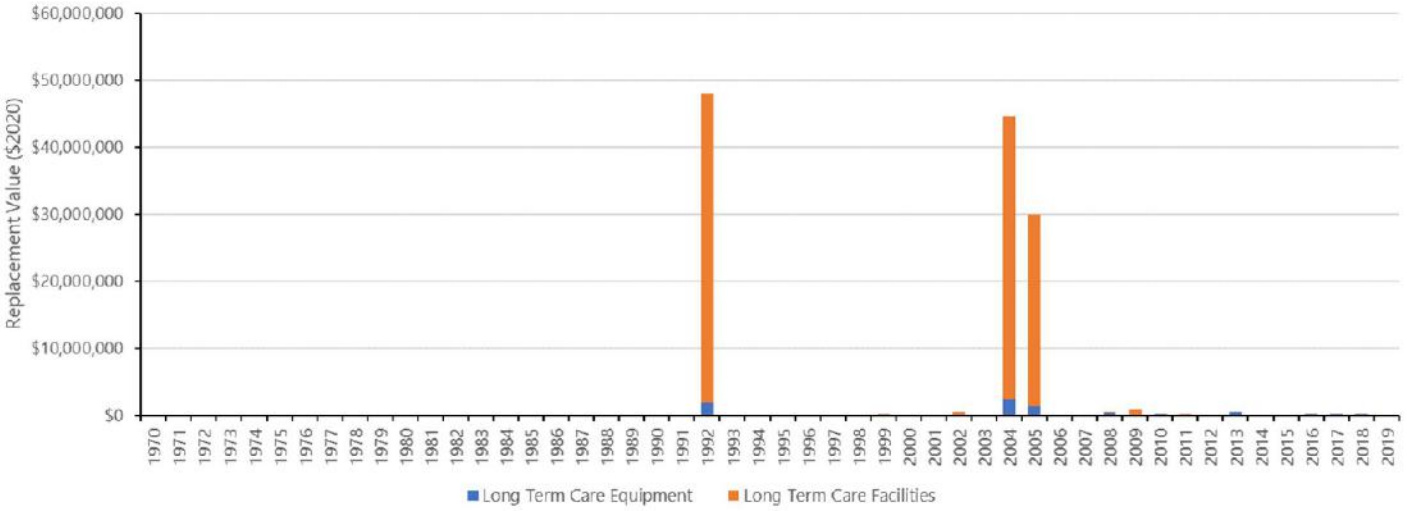


Figure 46 provides a profile of Long-term Care replacement costs for assets, based on construction or acquisition year. A large majority of investments in long-term care were made in 1992 and again in 2004 / 2005.

Figure 46. Construction Years by Replacement Value (Long-term Care)



9.1.3 Asset Valuation

Value can be assigned to an asset using two different methods: financial accounting valuation and replacement cost valuation. The former is determined using the historical construction or acquisition costs (what was originally paid for the asset) and applies depreciation over time up until the current year. The latter represents how much it would cost to replace the asset in current dollars. These costs are determined based on estimates obtained from professionals (e.g., consultants or Regional experts). Where this is not available, inflated historical costs are used. Table 54 provides the financial valuation and the replacement cost valuation for the Long-Term Care portfolio.

Table 54. Financial Accounting and Replacement Cost Valuation (Long-term Care) (2020)

Financial Accounting Valuation	Replacement Valuation
$7,171,323	$126,510,715

9.1.4 Asset Condition

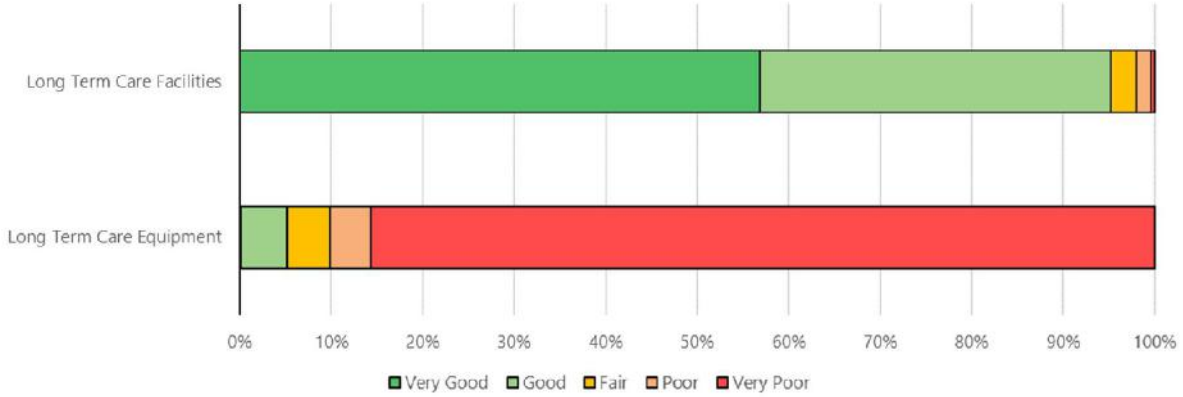
The active condition assessment program for facilities owned and operated by Halton Region includes its three long-term care homes. These inspections provide detailed condition data for all assets associated with each facility and identify maintenance and renewal needs. This data helps to inform the 10-year capital program. These condition assessments also include the facility condition index (FCI), a tool used to illustrate the condition of a property as a ratio between renewal / rehabilitation costs and the replacement costs of the building. Therefore, a lower FCI is representative of a building in better condition compared to those with a higher FCI. Most recently, all three long-term care underwent a condition assessment in 2017. Condition scores for assets not captured in the building condition assessments, such as some equipment, were calculated using straight line deterioration. Condition scores were converted to condition ratings based on Table 55.

Table 55. Condition Score and Rating Scales (Long-term Care)

Condition Score	Condition Rating	Age-Based (1-Age/ESL)	BCA Condition
1	Very Good	0.80 – 1.00	1
2	Good	0.60 - 0.79	2
3	Fair	0.40 – 0.59	3
4	Poor	0.20 – 0.39	4
5	Very Poor	0 – 0.20	5

LTC facilities are approaching the end of their ESL's while LTC equipment assets have, on average, surpassed their average ESL's. These observations are partially reflected in Figure 47. Since LTC equipment did not have visual condition assessment data, condition for those assets had to be calculated based on age and are thus mostly categorized as being in Very Poor condition. If LTC facilities assets were also calculated based on age alone, the same would be true. However, visual condition assessment data for those assets was available and thus condition does not align with average age as a proportion of average useful life and more than half of LTC facility assets are in Fair or Good condition.

Figure 47. Condition Distribution by Replacement Value (Long-term Care)



9.1.5 Data Source and Data Confidence

The data that was used for the analysis was compiled from multiple sources, including:

- Long-term Care Homes: Building Condition Assessments
- Equipment: TCA

The following assumptions were made during the development of this section of the Asset Management Plan:

- Individual asset records/information available in the BCAs were used, including the replacement value assessed.
- Where the value of the combined asset records was less than the insured value of the building, an additional Miscellaneous Asset was created with a replacement value covering the difference. This asset was assigned an ESL of 120 years.

The confidence in the data is provided in Table 56.

Table 56. Data Confidence Assessment (Long-term Care)

Description	Asset	Confidence Rating	Confidence Comment
Long-term Care	Long-term Care Homes	Very High	Data is based on detailed condition assessments
	Long-term Care Equipment	Medium	Condition is based on age

9.2 Levels of Service

Establishing a detailed Level of Service framework is crucial to sound service delivery in the context of long-term care. Generally, Halton Region strives to provide long-term care services to residents that require respite, medical, nursing, personal, therapeutic and social work services in a cost-effective way.

Table 57 provides more detailed community and technical Levels of Service as established by the Region in terms of cost-effectiveness, availability, sustainability, reliability and suitability.

Table 57. Community and Technical Levels of Service (Long-term Care)

Key Service Attribute	Customer Levels of Service Reference	Technical Levels of Service Measure	Current Performance
Cost Effectiveness	Providing long term care services in a cost-effective manner	Cost of a bed/day in Regionally operated Long-Term Care Homes	
		10 Year forecast average capital funding as a % of estimated 100-year average annual capital budget needs	
Availability	Providing an appropriate number of long- term care facilities	Number of beds at LTC Homes	
		Percentage of municipal long-term care beds per population over 75 years of age	
Sustainability	Providing facilities that are environmentally conscious	Total Energy Use per sq. ft. in eKWH	
Reliability	Providing long-term facilities that are reliable	FCI of facilities	
Suitability	Providing long-term care facilities that are suitable	% of facilities that are wheelchair accessible	

9.3 Lifecycle Management Strategy

Table 58 below outlines the lifecycle activities carried out by the Region to ensure Levels of Service are upheld. All of these lifecycle activities are important as they work together to extend the asset life, reduce overall lifecycle costs, and achieve other objectives such as environmental goals and balancing risk.

Table 58. Lifecycle Activities and Risks Associated with Not Following the Strategy (Long-term Care)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for LTC assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of LTC assets. ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs.	▪ Asset deterioration is over or underestimated. ▪ Inaccurate assumptions for analysis and forecasts.
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance programs. ▪ Reactive maintenance may arise during normal operation of assets or from inspections. ▪ Implementation and optimization of maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized and the service life of the assets are maximized, along with a focus on planning and scheduling to efficiently and effectively realize the maximum value of Halton Region's assets related to facilities.	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Inspection data is not up to date if inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure.
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition assessments.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
		▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement or reconstruction based on asset condition and previous rehabilitation activities performed.	▪ Delay in construction projects may result in higher costs, longer service disruption, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal of assets at the end of their useful life.	▪ Improper disposal can lead to environmental impacts and expenses.
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Capital projects to accommodate for population growth in new and existing areas.	▪ Master Plans overestimate or underestimate growth projections resulting in inadequate capacity needs to service residents
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitor Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies.	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

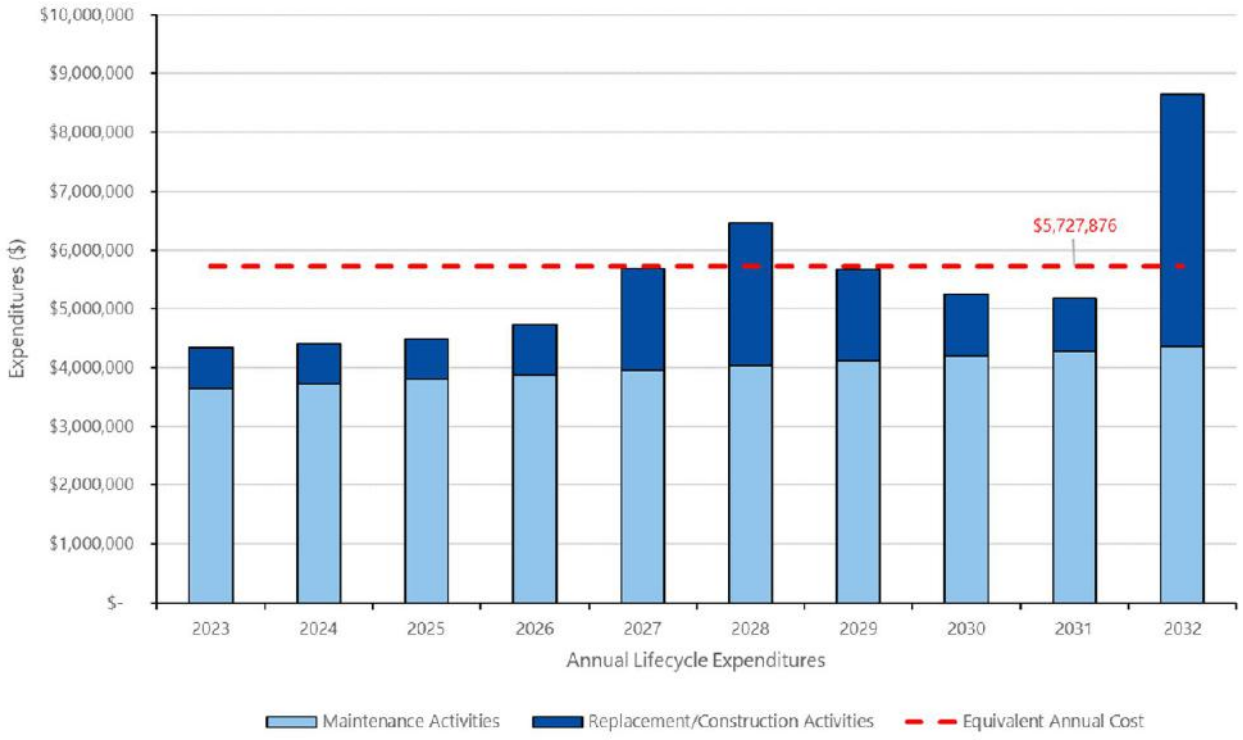
9.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 59 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total $5.7 million for the full long-term care portfolio.

Table 59. Lifecycle Forecast Assumptions (Long-term Care)

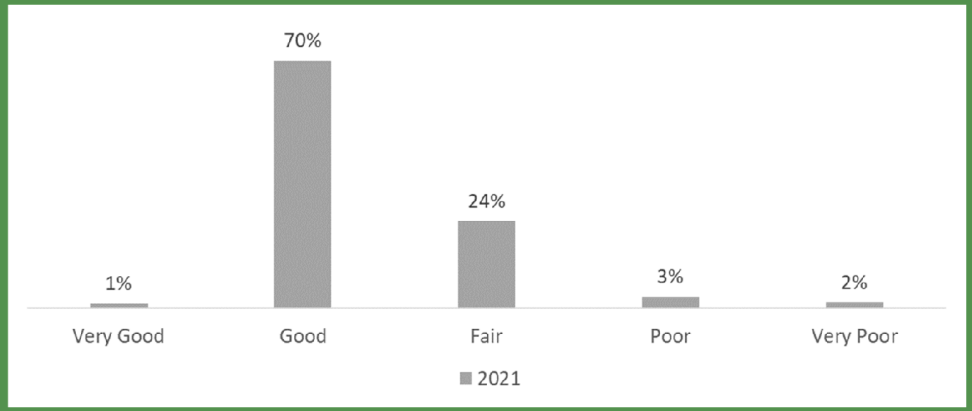
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan to 2031 and a review of upcoming capital projects.	$0
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for IT (p.219). Assuming a starting budget in 2021 of 13.224 thousand, with an assumed annual increase as per the Ten Year Operating Budget Forecast on p. 80.	$3,958,229
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$19,091
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$1,750,556
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A
Expansion/Growth Improvement Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget..	$0
Service Improvement Activities	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$0

Figure 48. Forecasted Needs for 2022 - 2031 (Long-term Care)



Halton Community Housing Corporation

The Region is committed to providing reliable and suitable communities that are healthy and safe and enjoyable places to live while being energy efficient and cost effective.



Key Messages

Halton Region provides or assists with housing in the form of apartments, town houses, single and semi-detached homes to individuals, families and seniors.

Quick Facts

38 Housing Communities

Asset Ratings

Overall, 70% of HCHC assets are in **Good** condition, 24% are in **Fair** condition and the remaining 5% are in **Poor** or **Very Poor** condition.

10.0 Halton Community Housing Corporation (Non-Core Asset)

The Halton Community Housing Corporation (HCHC) provides subsidized housing to residents including townhouses, apartments, single and semi-detached dwellings and condominiums. In total, the HCHC owns and operates 38 communities with 2,210 separate units. The 2019-2020 Progress Report for the Community Development Strategy outlines HCHC's commitment to well-built and well-maintained communities. In support of this commitment the HCHC has established an on-call/service desk to respond to maintenance requests 24 hours a day, 7 days a week. Additionally, improvements have been made to communications with residents regarding scheduled capital improvements, on-going maintenance and consultations for up-coming projects. In addition to the 38 communities owned and operated by Halton Region, 24 residences have been included in this plan that the Region does not own but is involved with in some capacity.

10.1 State of the Infrastructure

10.1.1 Asset Register

The Halton Community Housing Corporation has a large portfolio of assets that are spread out geographically over the entire Region. These residences are occupied by individuals, couples and families. There are 2,210 units in total that provide different living arrangements from bachelor apartments to multi-bedroom single and semi-detached homes. The Region is responsible for the maintenance of these dwellings both inside and out.

Figure 49 provides the breakdown of asset categories by replacement value and Table 60 summarizes quantities within each category.

Figure 49. Asset Categories by Replacement Value (HCHC)

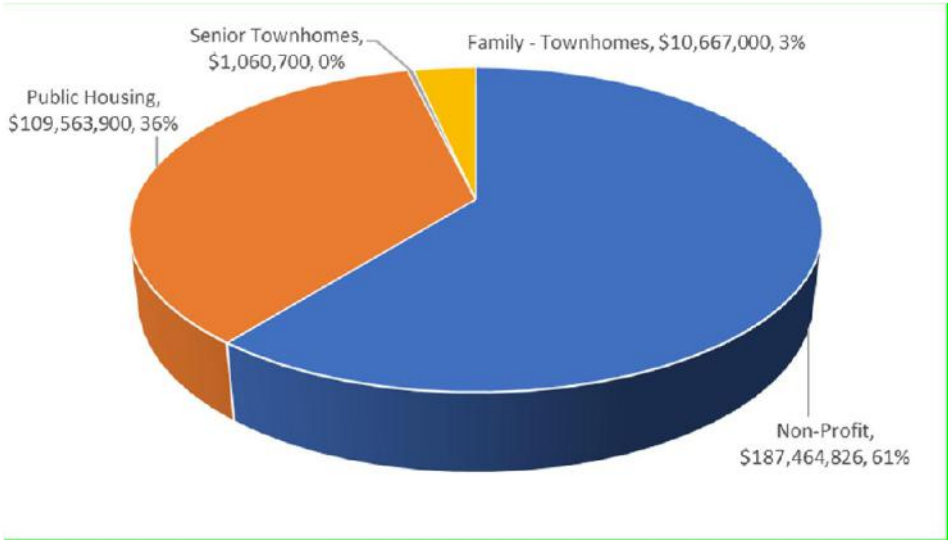


Table 60. Asset Quantities and Replacement Values (HCHC)

Program Area	Description	Quantity	Unit	Estimated Replacement Value (2020)
Halton Community Housing Corporation	Public Housing	16	Each	$109,563,900
	Senior Townhomes	3	Each	$1,060,700
	Family - Townhomes	2	Each	$10,667,000
	Non-Profit	45	Each	$187,464,826
Total				**$308,756,426**

10.1.2 Asset Age Distribution

Figure 50 presents the average age of assets in the HCHC portfolio against their average estimated service lives. Overall, the average age of these assets has already exceeded the average estimated service lives, however, since condition assessment data was available for HCHC assets, distribution of assets by condition ratings are not reflective of their age (Figure 52).

Figure 50. Average Asset Age as a Proportion of Average Asset ESL (HCHC)

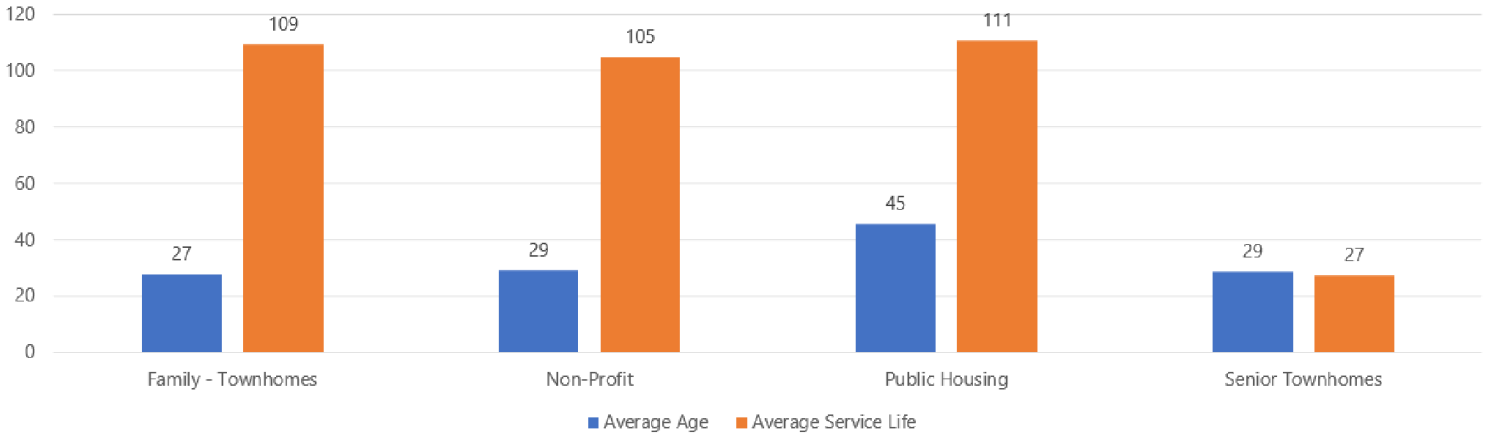
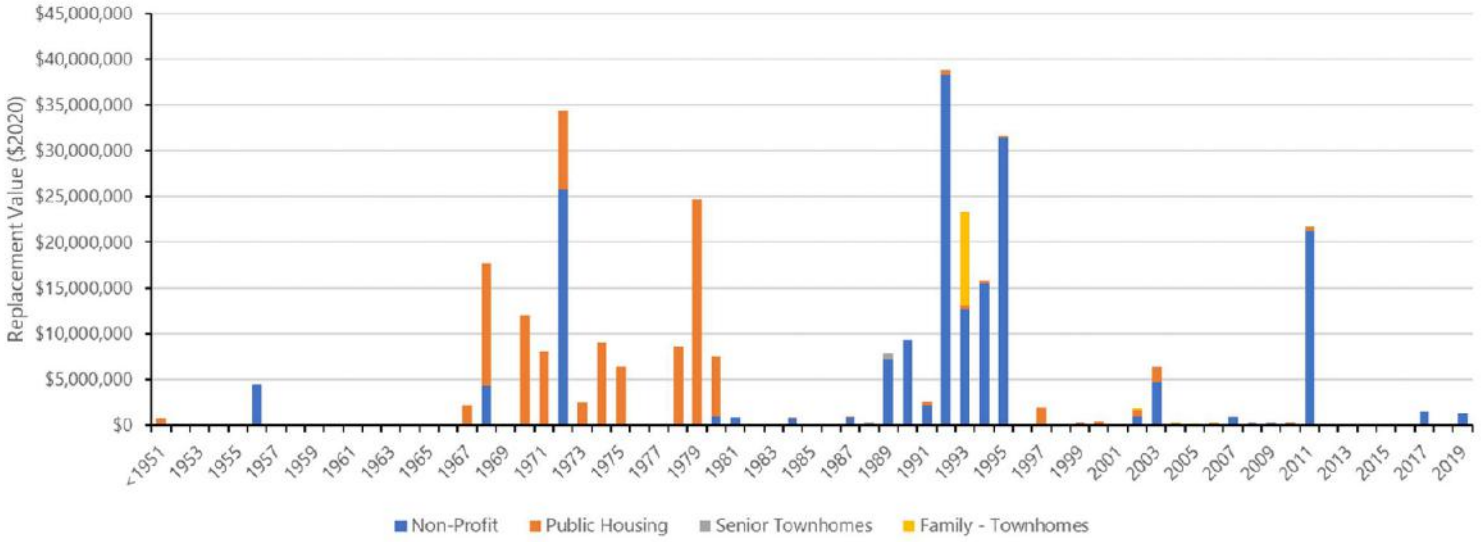


Figure 51 presents HCHC owned assets by replacement value based on construction year. As with other categories presented in this plan, large investments were made in the early 1990's and the early 2000's.

Figure 51. Construction Years by Replacement Value (HCHC)



10.1.3 Asset Valuation

The accounting value of an asset, sometimes referred to as the financial cost valuation, provides an understanding of the historical costs and applies depreciation to estimate the current book value of the assets. Generally, for long-range asset management planning, the replacement cost valuation is used, which accounts for expected inflation, changes in technology and other factors. These costs are determined based on estimates obtained from professionals (e.g., consultants or Regional experts). Where this is not available, inflated historical costs are used. Table 61 shows the replacement value of the HCHC portfolio.

Table 61. Replacement Cost Valuation (HCHC) (2020)

Replacement Valuation
$308,756,426

10.1.4 Asset Condition

In 2017-2018 all HCHC owned properties underwent a building condition assessment (BCA), reserve fund study (RFS) and energy audit (EA) as part of the Region's long-term strategy to manage and maintain its building assets. These inspections provide detailed condition data and identify maintenance and renewal needs. This data helps to inform the 10-year capital program. Any HCHC assets not captured during a building condition assessment was calculated using straight line deterioration. Condition scores were converted to condition ratings based on Table 62. Figure 52 illustrates that most of the asset portfolio is in good condition.

Table 62. Condition Score Rating Scales (HCHC)

Condition Score	Condition Rating	Age-Based (1-Age/ESL)	BCA Condition
1	Very Good	0.80 – 1.00	1
2	Good	0.60 - 0.79	2
3	Fair	0.40 – 0.59	3
4	Poor	0.20 – 0.39	4
5	Very Poor	0 – 0.20	5

Figure 52. Condition Distribution by Replacement Value (HCHC)

10.1.5 Data Sources and Data Confidence

The data that was used for the analysis was compiled from Building Condition Assessments.

The following assumptions were made during the development of this section of the Asset Management Plan:

- Individual asset records/information available in the BCAs were used, including the replacement value assessed.
- Where the value of the combined asset records was less than the insured value of the building, an additional Miscellaneous Asset was created with a replacement value covering the difference. This asset was assigned an ESL of 70 years (Taylor to confirm this ESL).

The confidence in the data is provided in Table 63.

Table 63. Data Confidence Assessment (HCHC)

Description	Asset	Confidence Rating	Confidence Comment
Halton Community Housing Corporation	Residences	High	Condition data is based on detailed condition assessments

10.2 Levels of Service

Halton Region is committed to providing reliable and suitable communities that are healthy and safe and enjoyable places to live while being energy efficient and cost effective. In support of this overarching goal, Halton Region has defined Levels of Service in terms of cost-effectiveness, availability, sustainability and reliability. These are presented below in Table 64.

Table 64. Community and Technical Levels of Service (HCHC)

Key Service Attribute	Customer Levels of Service Reference	Technical Levels of Service Measure	Current Performance
Cost Effectiveness	Providing HCHC residences in a cost-effective manner	Annual investment in assisted housing stock ($000s)	
		Asset management state of good repair spending ($000s)	
		Asset management state of good repair capital projects	
Availability	Providing an appropriate number of HCHC units	Number of units in the Halton Community Housing Corporation (HCHC) portfolio	
Sustainability	Providing HCHC residences that are environmentally conscious		
Reliability	Providing HCHC residences that are reliable	FCI of facilities	

10.3 Lifecycle Management Strategy

Table 65 below outlines the lifecycle activities carried out by the Region to ensure Levels of Service are upheld. All of these lifecycle activities are important as they work together to extend the asset life, reduce overall lifecycle costs, and achieve other objectives such as environmental goals and balancing risk.

Table 65. Lifecycle Activities and Risks Associated with Not Following the Strategy (HCHC)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for HCHC assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of HCHC assets ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs. ▪ 2019-2020 Progress Report for the Community Development Strategy. ▪ Halton Community Housing Corporation Community Development Strategy.	▪ Asset deterioration is over or underestimated. ▪ Inaccurate assumptions for analysis and forecasts.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance programs ▪ Reactive maintenance may arise during normal operation of assets or from inspections. ▪ Implementation and optimization of maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized and the service life of the assets are maximized, along with a focus on planning and scheduling to efficiently and effectively realize the maximum value of Halton Region's assets related to facilities	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Inspection data is not up to date if inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure.
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition assessments.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement or reconstruction based on asset condition and previous rehabilitation activities performed.	▪ Delay in construction projects may result in higher costs, longer service disruption, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal of assets at the end of their useful life.	▪ Improper disposal can lead to environmental impacts and expenses.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Capital projects to accommodate for population growth in new and existing areas.	▪ Master Plans overestimate or underestimate growth projections resulting in inadequate capacity needs to service residents.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitor Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies.	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

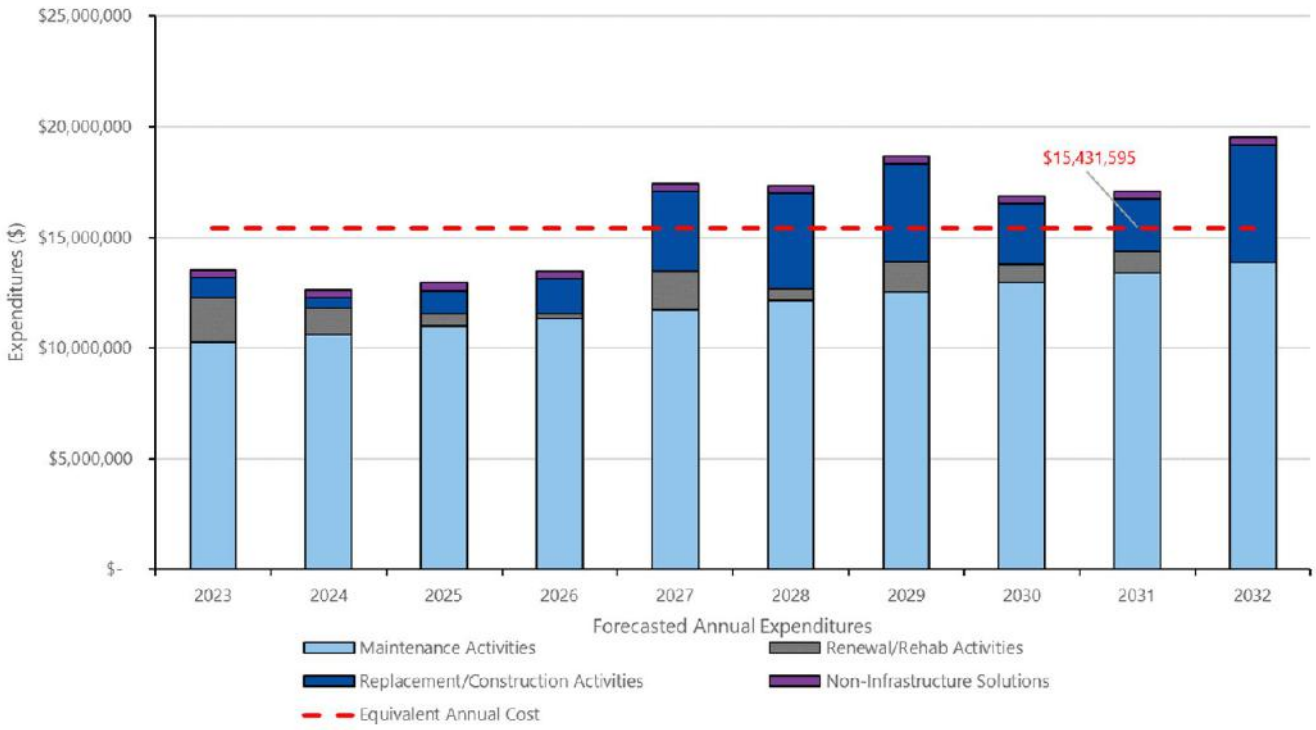
10.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 66 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $15.4 million for the full HCHC portfolio, not including expansion and growth activities.

Table 66. Lifecycle Forecast Assumptions (HCHC)

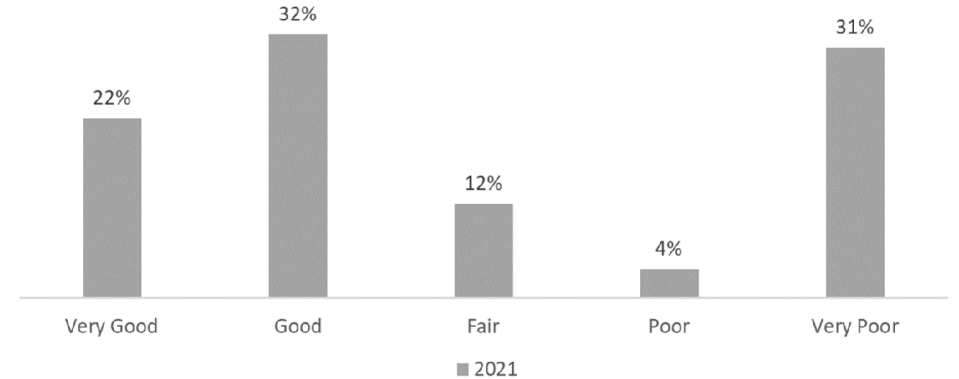
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan to 2031.	$350,000
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for IT (p.219). Assuming a starting budget in 2021 of 13.224 thousand, with an assumed annual increase as per the Ten Year Operating Budget Forecast on p. 80.	$11,799,385
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$848,727
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$2,433,482
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A
Expansion/Growth/Service Improvement Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth and service improvement needs were incorporated based on the actual projected projects from 2022 to 2031.	$10,010,000

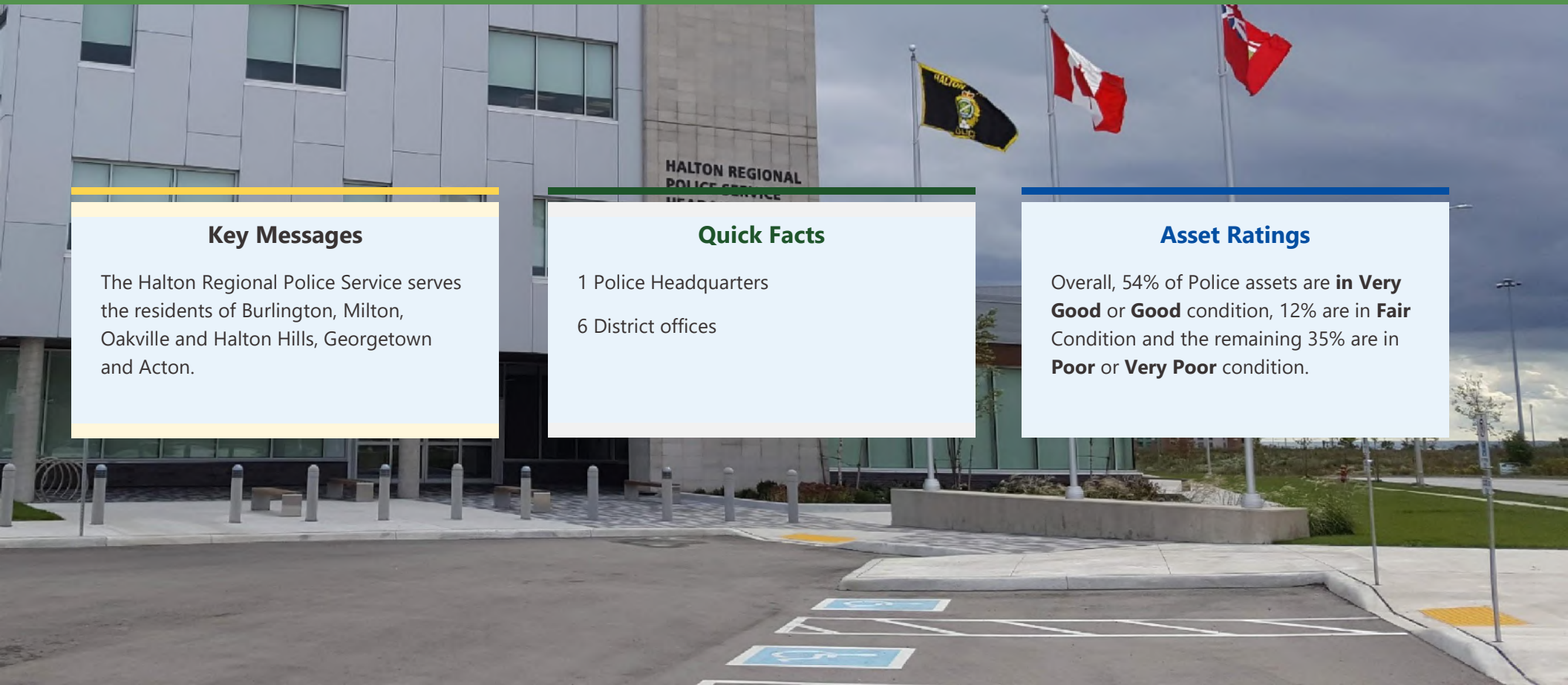
Figure 53. Forecasted Annual Needs 2023 - 2032 (HCHC)



Police

Halton Region is dedicated to providing effective and reliable police services that keep the community safe





Key Messages

The Halton Regional Police Service serves the residents of Burlington, Milton, Oakville and Halton Hills, Georgetown and Acton.

Quick Facts

1 Police Headquarters

6 District offices

Asset Ratings

Overall, 54% of Police assets are **in Very Good** or **Good** condition, 12% are in **Fair** Condition and the remaining 35% are in **Poor** or **Very Poor** condition.

11.0 Halton Regional Police Service (Non-Core Asset)

The Halton Regional Police Service (HRPS) serves its residents under the guiding vision to be the leader in community safety and policing excellence, and their mission to provide effective and efficient community-based policing. Through their efforts, Halton Region has consistently been deemed one of the safest communities in Canada.

With the rapidly increasing population of the Region, many service areas have had to expand and thus provide more space to accommodate their growing work force. In September 2018 the new Police Headquarters opened in Oakville – the new facility considers 25-year growth projections and includes several new state-of-the-art spaces for training, forensics and property / evidence management. Currently under construction is the new District 1 Facility to service both the Town of Halton Hills and Milton. The proposed site for the new facility is Hornby Park located in Halton Hills. Five existing district offices are in Georgetown, Milton, Oakville, Burlington and Acton.

11.1 State of the Infrastructure

11.1.1 Asset Register

The replacement value of HRPS assets captured in this plan is estimated to be approximately $206 million, the majority of which is related to police facilities which comprise 72% of the entire portfolio. Figure 54 presents the entire HRPS portfolio by replacement value and Table 67 includes the quantities for each category.

Figure 54. Asset Categories by Replacement Value (Police)

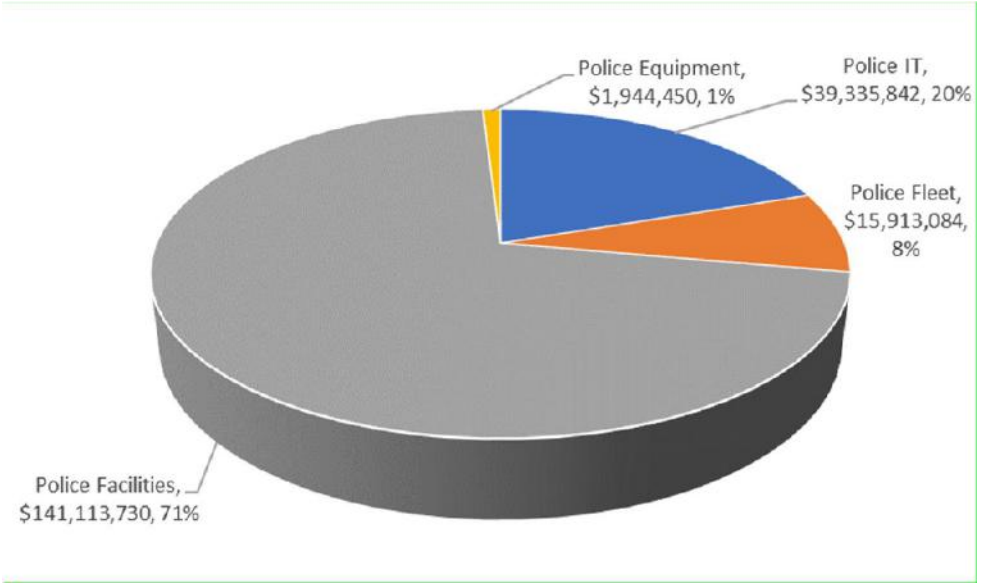


Table 67. Asset Quantities and Replacement Values (Police)

Program Area	Description	Quantity	Unit	Estimated Replacement Value (2020)
Police	Police IT	227	Each	$39,335,842
	Police Fleet	377	Each	$15,913,084
	Police Facilities	149	Each	$141,113,730
	Police Equipment	11	Each	$1,944,450
Total				**$198,307,107**

11.1.2 Asset Age Distribution

Figure 55 below presents HRPS assets based on average age in comparison to their average estimated service life.

Figure 55. Asset Age Distribution as a Proportion of Average ESL (Police)

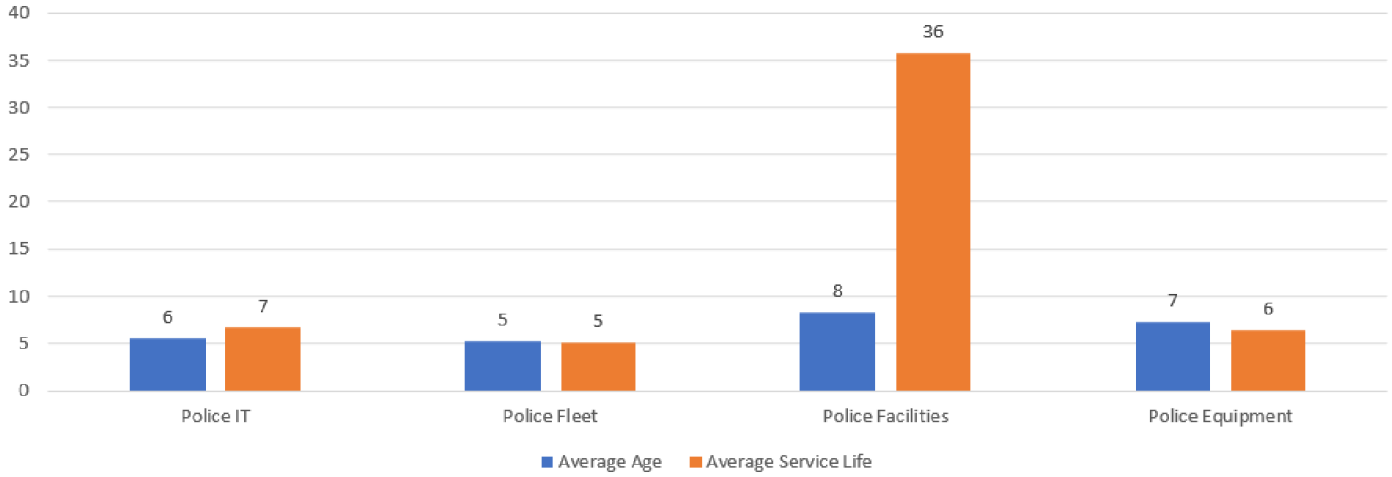
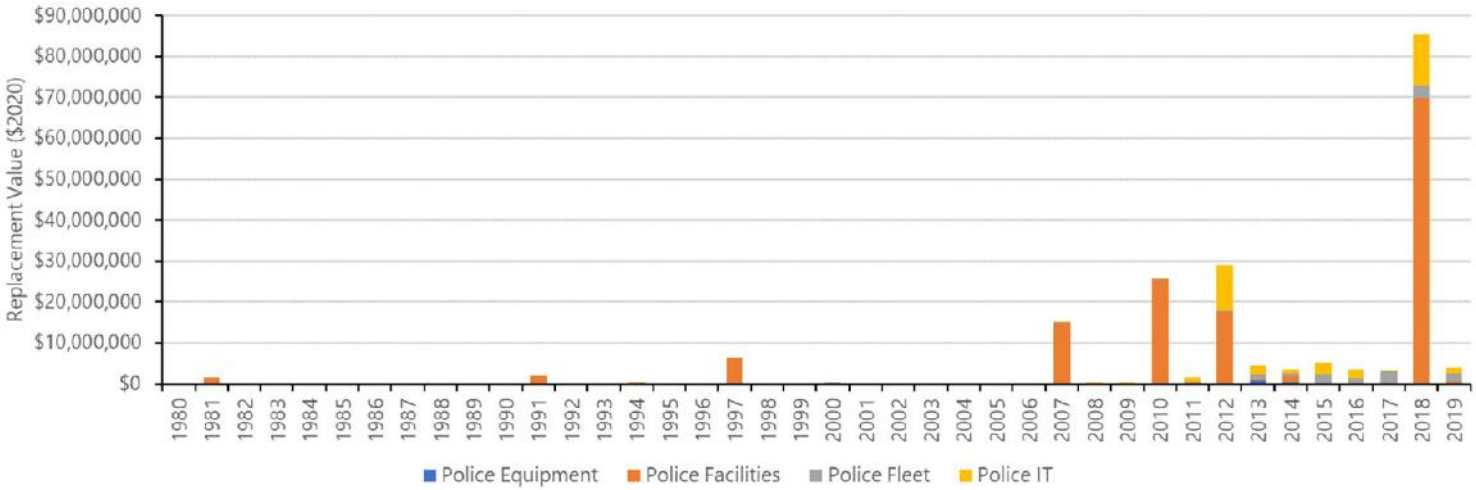


Figure 56 below presents police assets by replacement cost based on year of construction or acquisition. The large investment made in 2018 can be attributed to the new HRPS headquarters.

Figure 56. Construction Years by Replacement Value (Police)



11.1.3 Asset Valuation

Value can be assigned to an asset using two different methods: financial accounting valuation and replacement cost valuation. Financial accounting valuation uses historical construction or acquisition costs and applies depreciation in order to estimate the current book value of the asset. Replacement costs represent the amount it would cost to replace an asset in the current year. These costs are determined based on estimates obtained from professionals (e.g., consultants or Regional experts). Where this is not available, inflated historical costs are used. Table 68 provides the valuation of the entire police portfolio using both of these methods.

Table 68. Financial Accounting and Replacement Cost Valuation (Police) (2020)

Financial Accounting Valuation	Replacement Valuation
$298,681,834	$205,872,100

11.1.4 Asset Condition

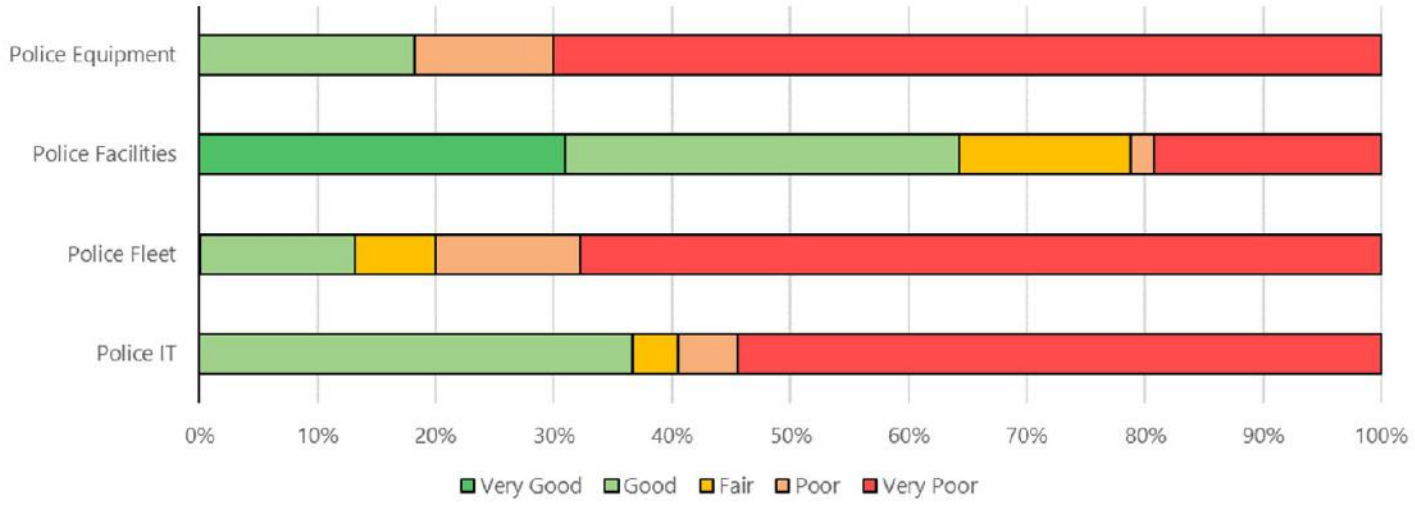
Condition was calculated for HRPS assets based on age as a proportion of remaining estimated service life, including facility assets. Four BCAs were provided for the district offices. The calculated condition scores were converted to condition ratings based on Table 69 below.

Table 69. Condition Score Rating Scales (Police)

Condition Score	Condition Rating	Age-Based (1-Age/ESL)
1	Very Good	0.80 – 1.00
2	Good	0.60 - 0.79
3	Fair	0.40 – 0.59
4	Poor	0.20 – 0.39
5	Very Poor	0 – 0.20

With the exception of facility assets which are currently well below their ESLs, thus in good condition, all HRPS assets are at or have exceed their ESL's. Since condition for these assets was calculated using age, the condition data presented in Figure 57 is reflective of these observations and shows that the majority of police assets have been classified under Very Poor condition. This rating is not necessarily reflective of their actual condition which is evaluated as items come up for renewal.

Figure 57. Condition Distribution by Replacement Value (Police)



11.1.5 Data Sources and Data Confidence

The data that was used for the analysis was compiled from multiple sources, including:

- All Police asset categories: TCA

The confidence in the data is provided in Table 70.

Table 70. Data Confidence Assessment (Police)

Description	Asset	Confidence Rating	Confidence Comment
Police	Police Equipment	Medium	Condition data is based on age. For the short-lived assets such as equipment, fleet and IT, this information is reasonable, with an evaluation as the items come up for renewal.
	Police Facilities	Medium	Condition data is based on age. It is recommended that a condition assessment be completed.
	Police Fleet	Medium	Condition data is based on age. For the short-lived assets such as equipment, fleet and IT, this information is reasonable, with an evaluation as the items come up for renewal.
	Police IT	Medium	

11.2 Levels of Service

HRPS is dedicated to providing effective and reliable police services that keep the community safe. Levels of Service related to infrastructure assets within the HRPS portfolio help to define how the service will achieve this overarching goal. The HRPS has developed a Levels of Service framework, a key pillar in any effective asset management program. LOS provide a basis from which the HRPS can evaluate service delivery in regard to cost effectiveness, availability, sustainability, reliability, suitability and responsiveness. Table 71 outlines HRPS's technical and customer Levels of Service

.

Table 71. Community and Technical Levels of Service (Police)

Key Service Attribute	Customer Levels of Service Reference	Technical Levels of Service Measure	Current Performance
Cost Effectiveness	Providing Police services in a cost-effective manner	Cost to provide service ($/capita)	
		10 Year forecast average capital funding as a % of estimated 100-year average annual capital budget needs	
Availability	Providing a Police service that is available	% of time tactical/emergency response vehicles were available for service	
Sustainability	Providing Police services that are environmentally conscious	Annual fuel consumption	
		Annual electricity consumption per square foot	
Reliability	Providing Police services that are reliable	Average end-user IT asset (computers/phones/radios) renewal rate (# years)	
		Average facility asset renewal rate (# years)	
		Average fleet asset renewal rate (# years)	
		Average Backend IT Infrastructure (servers/storage/networking/security) asset renewal rate (# years)	
		% of police facilities in Poor or Very Poor condition	
		% of police fleet in Poor or Very Poor condition	
		% of police IT assets in Poor or Very Poor condition	
		% of assets that meet Provincial Adequacy Standards	
Suitability	Providing suitable Police services	% of vehicles with in-car camera systems installed	
Responsiveness	Providing Police services that are responsive	# of agencies linked to Public Sector Broadband Network (PSBN)	
		Business Intelligence Availability and Functionality	
		% PSBN network availability	
		% of overall HRPS network availability	

11.3 Lifecycle Management Strategy

Table 72 presents the key lifecycle activities implemented by the Region to ensure the HRPS Levels of Service are upheld. Together, these strategies help to save costs and mitigate risks associated with the assets. Some specific non-infrastructure solutions related to Police include the Halton Regional Police Service Strategic Plan 2020 – 2023 and the 2014 Halton Regional Police Facility Plan

Table 72. Lifecycle Activities and Risks Associated with Not Following the Strategy

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for HRPS assets which predict deterioration. ▪ Asset management plan and asset management policy development and updates. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of Police assets. ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs, avoiding reactive, unplanned maintenance or replacement costs. ▪ Halton Regional Police Service Strategic Plan 2020 – 2023 ▪ 2014 Halton Regional Police Facility Plan	▪ Asset deterioration is over or underestimated. ▪ Inaccurate growth numbers and estimation of funding.
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance programs including: ▪ Reactive maintenance may arise during normal operation of assets or from inspections. ▪ Implementation and optimization of maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized and the service life of the assets are maximized, along with a focus on planning and scheduling to	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Inspection data is not up to date if inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	efficiently and effectively realize the maximum value of Halton's assets related to facilities.	
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition assessments.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement of equipment related to site function.	▪ Delay in construction projects may result in higher costs, longer service disruption, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal of assets at the end of their useful life.	▪ Improper disposal can lead to environmental impacts and expenses.
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Capital projects to accommodate for population growth in new and existing areas.	▪ Master Plans overestimate or underestimate growth projections resulting in inadequate capacity needs to service residents.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitor Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies.	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

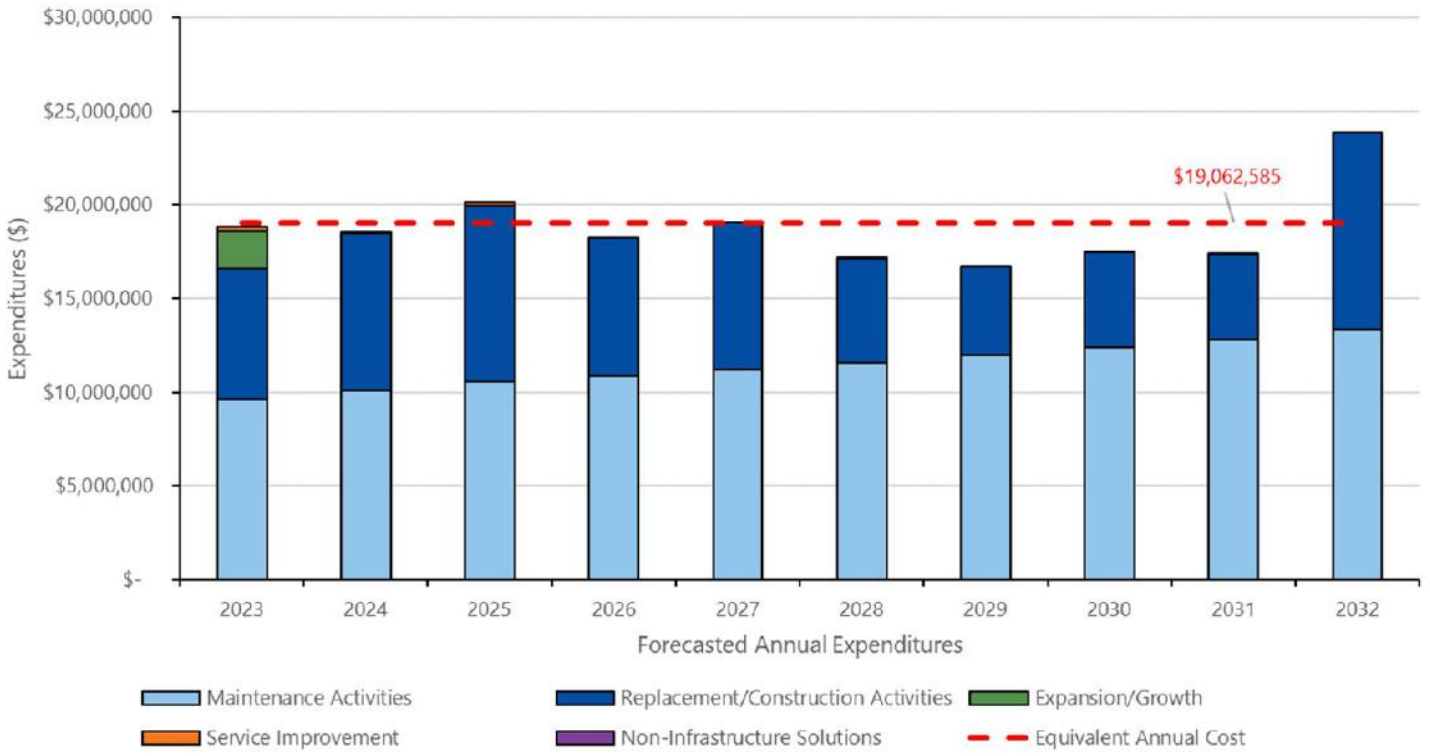
11.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 73 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total $19 million.

Table 73. Lifecycle Forecast Assumptions (Police)

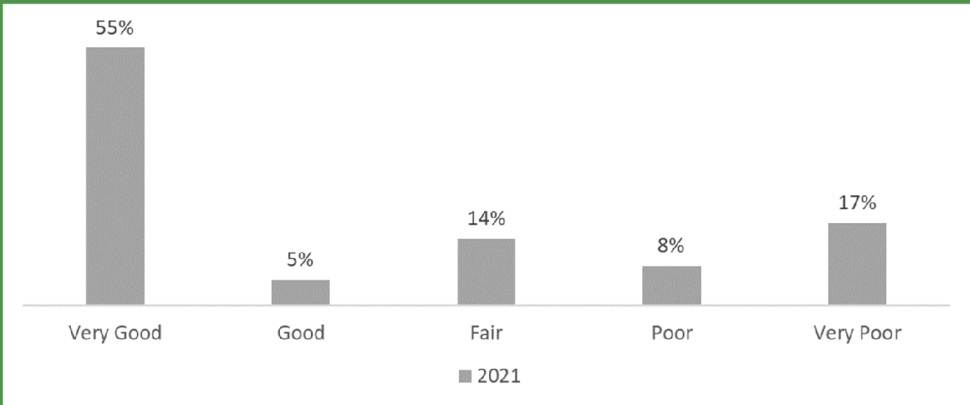
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan to 2031.	$0
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for IT (p.219). Assuming a starting budget in 2021 of 13.224 thousand, with an assumed annual increase as per the Ten Year Operating Budget Forecast on p. 80.	$11,241,987
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$0
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$7,107,931
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$566,667
Service Improvement Activities:	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$146,000

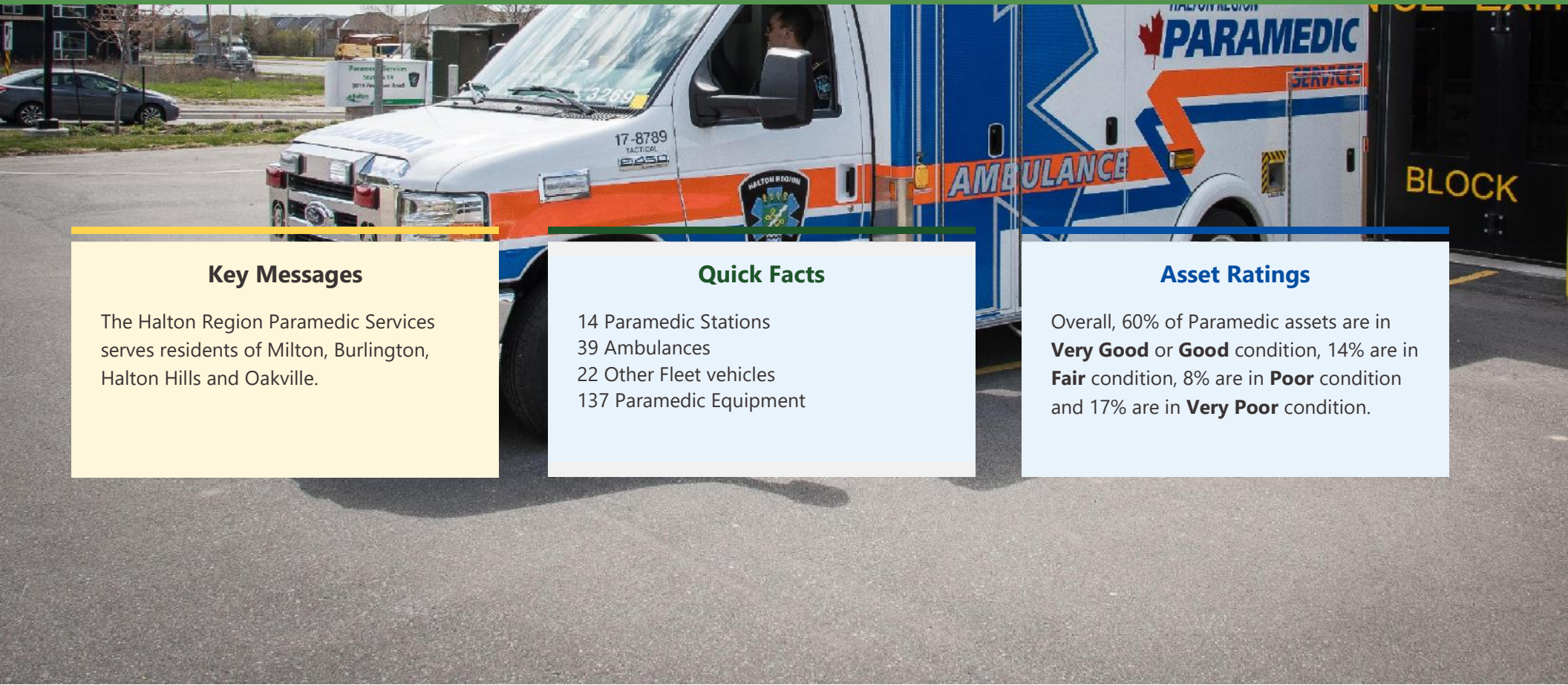
Figure 58. Forecasted Needs 2023 - 2032 (Police)



Paramedics

The Region is committed to providing effective and reliable paramedic services that keep the community safe.





Key Messages

The Halton Region Paramedic Services serves residents of Milton, Burlington, Halton Hills and Oakville.

Quick Facts

14 Paramedic Stations
39 Ambulances
22 Other Fleet vehicles
137 Paramedic Equipment

Asset Ratings

Overall, 60% of Paramedic assets are in **Very Good** or **Good** condition, 14% are in **Fair** condition, 8% are in **Poor** condition and 17% are in **Very Poor** condition.

12.0 Halton Region Paramedic Service (Non-Core Asset)

Halton Regional Paramedic Services provide advanced and primary emergency medical services to the residents of Burlington, Halton Hills, Milton and Oakville. Given the nature of the services provided by them, it is critical that the assets within their portfolio are well managed and in no way impact service delivery. In 2018, Paramedic Services responded to 53,094 calls, a figure that is quickly approaching the call volume projection for 2026 of 55,800 which was presented in the Paramedic Service 2015 Master Plan. Pre-pandemic calls for paramedics were increasing at a rate 5 to 6 years ahead of current Master Plan projections. Updated projections indicate that potential annual response volumes could reach 132,000 by 2036. This scenario would require a fleet of 92 ambulances, more than double the current inventory.

12.1 State of the Infrastructure

12.1.1 Asset Register

The Paramedic Services asset portfolio has been broken down into facilities, equipment, ambulances and other vehicles that serve the group including trucks, vans and SUVs. The asset portfolio is presented by category and replacement value in Figure 59 and Table 74 outlines the quantities of assets in each category

.

Figure 59. Asset Categories by Replacement Value (Paramedics)

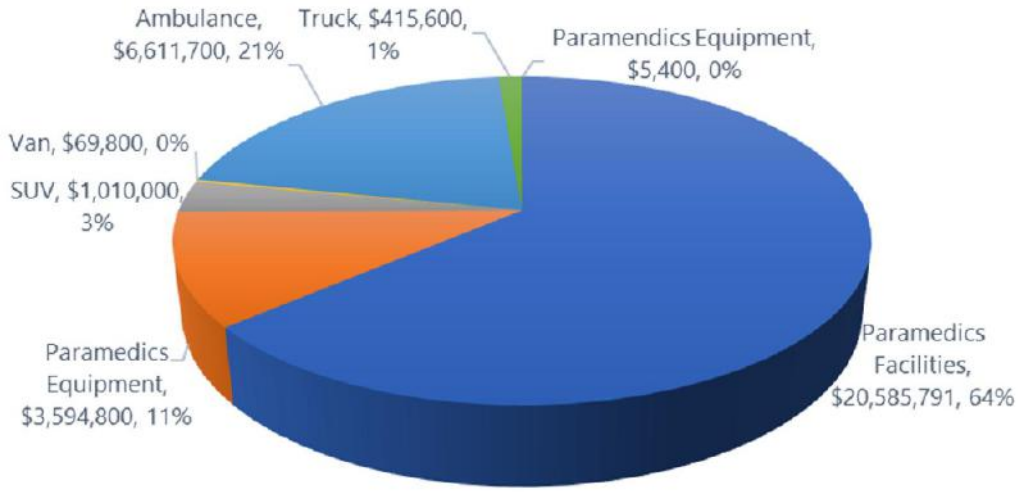


Table 74. Asset Quantities and Replacement Values (Paramedics)

Program Area	Description	Quantity	Unit	Replacement Value (2020)
Paramedics	Paramedic Stations	14	Each	$20,585,791
	Paramedic Equipment	137	Each	$3,600,200
	Ambulance	39	Each	$6,611,700
	Van	2	Each	$69,800
	SUV	18	Each	$1,010,000
	Truck	2	Each	$415,600
Total				**$32,293,091**

12.1.2 Asset Age Distribution

Figure 60 below presents the average age of each asset category compared to its average estimated service life. Paramedic vehicles on average are either at or have exceeded their respective ESL's.

Figure 60. Average Asset Age as a Proportion of Average Asset ESL (Paramedics)

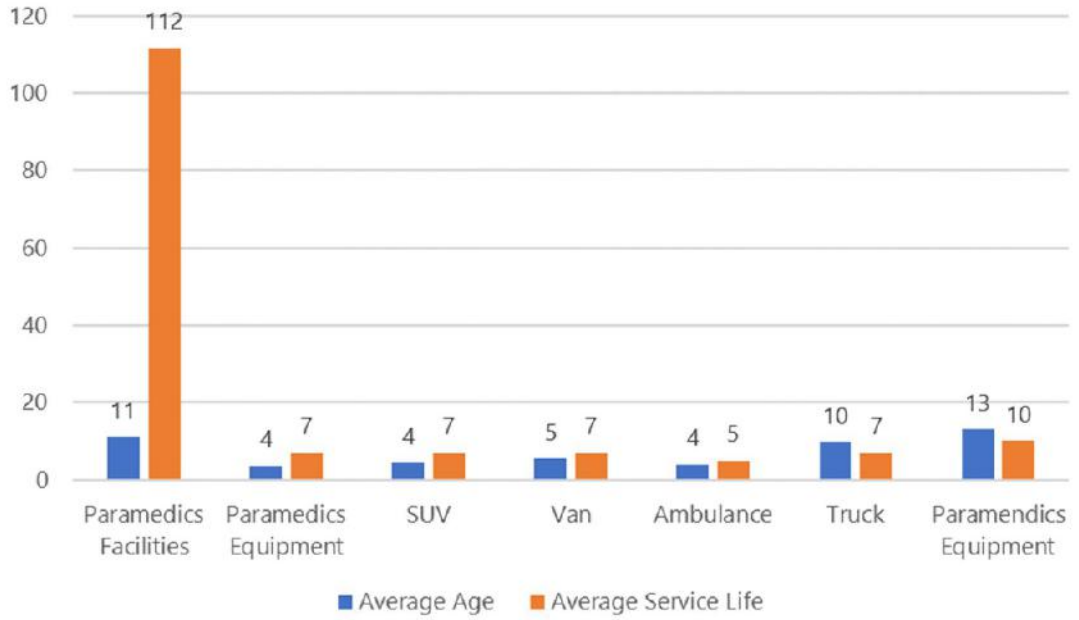
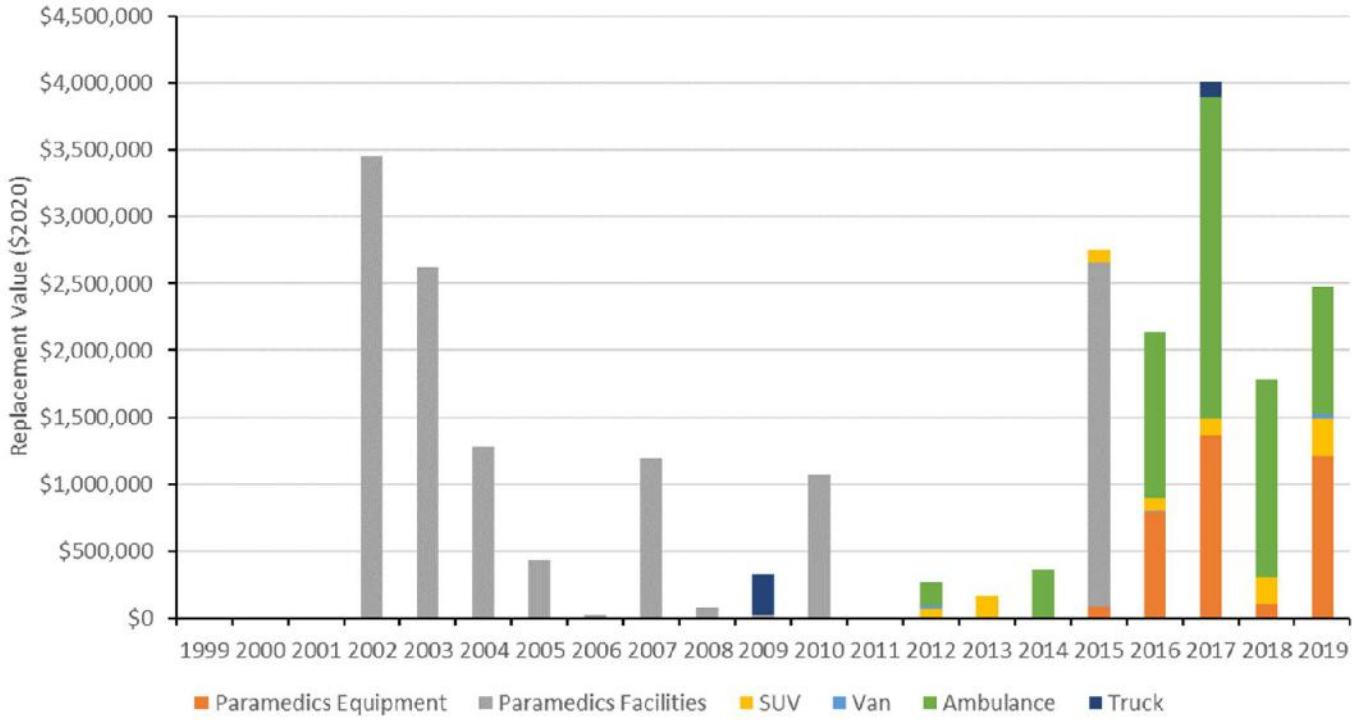


Figure 61 provides a profile of paramedic assets by their year of construction or acquisition. In last 5 to 6 years, significant investments have been made to procure additional ambulances and equipment. This can be attributed to the growth in Halton Region's population and thus the necessary expansion of their paramedic services, as outlined in the 2015 Paramedic Services Master Plan.

Figure 61. Construction / Acquisition Year by Replacement Value (Paramedics)



12.1.3 Asset Valuation

One of the most common approaches to valuing assets is using the replacement value method that estimates the cost to replace the assets under current or future market conditions. These costs are determined based on estimates obtained from professionals (e.g., consultants or Regional experts). Where this is not available, inflated historical costs are used. In addition, an accounting valuation is also used to understand the book value of assets after depreciation has been applied. Table 75 presents the valuation of paramedic assets using both methods.

Table 75. Financial Accounting and Replacement Cost Valuation (Paramedic) (2020)

Financial Accounting Valuation	Replacement Valuation
$6,396,341	$13,482,120

12.1.4 Asset Condition

The Region has an active condition assessment program which includes its 13 paramedic stations and the South Service Storage Facility. These are detailed assessments of the inventory and condition of assets located at each of the facilities which are currently completed on a 5-year cycle. This data informs the 10-year capital program. These condition assessments also include the facility condition index (FCI), a tool used to illustrate the condition of a property as a

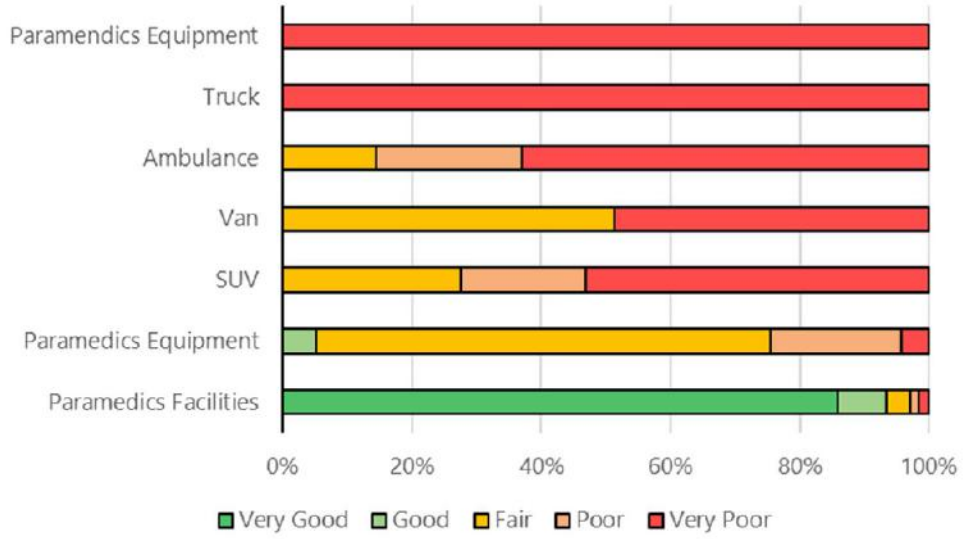
ratio between renewal / rehabilitation costs and the replacement costs of the building. Therefore, a lower FCI is representative of a building in better condition compared to those with a higher FCI. Condition ratings for assets not captured in these assessments were calculated based on age using straight line deterioration. It is important to note that for short-lived assets like equipment and vehicles, using a lifecycle-based approach is reasonable. Using ESL is appropriate for equipment and vehicles for the long-term. Assets identified for replacement are reviewed and confirmed that replacement is needed (based on mileage, maintenance reports, level of use, etc.) before being budgeted. For the purposes of analysis, all condition scores were converted to a condition rating based on Table 76 below.

Table 76. Condition Score and Rating Scales (Paramedics)

Condition Score	Condition Rating	Age-Based (1-Age/ESL)	BCA Condition
1	Very Good	0.80 – 1.00	1
2	Good	0.60 - 0.79	2
3	Fair	0.40 – 0.59	3
4	Poor	0.20 – 0.39	4
5	Very Poor	0 – 0.20	5

As can be seen in Figure 62, the average age does not necessarily reflect overall condition in this case. For instance, based on the condition data, the ambulance fleet is made up of a good mix of ages, with some being very early in their service life while others are reaching the end. Facilities are the highest value assets in the portfolio with most assets in good condition. This is an excellent position to be in and shows these assets are being well managed and planned.

Figure 62. Condition Distribution by Replacement Value (Paramedics)



12.1.5 Data Sources and Data Confidence

The data that was used for the analysis was compiled from multiple sources, including:

- Paramedic Stations: Building Condition Assessments
- Equipment: TCA
- Vehicles: TCA

The following assumptions were made during the development of this section of the Asset Management Plan. The confidence in the data is provided in Table 77.

Table 77. Data Confidence Assessment (Paramedics)

Description	Asset	Confidence Rating	Confidence Comment
Paramedic Services	Paramedic Vehicles	Medium	Condition data is based on age
	Equipment	Medium	Condition data is based on age
	Facilities	High	Condition data is based on detailed condition assessments

12.2 Levels of Service

Halton Region is committed to providing effective and reliable paramedic services to keep the community safe. In support of this overarching goal, Table 78 below outlines Paramedics community and technical Levels of Service in terms of cost-effectiveness, suitability, reliability and sustainability.

Table 78. Community and Technical Levels of Service (Paramedics)

Key Service Attribute	Customer Levels of Service Reference	Technical Levels of Service Measure	Current Performance
Cost Effectiveness	Providing Paramedic services in a cost-effective manner	Annual cost to provide service ($/household)	
		10 Year forecast average capital funding as a % of estimated 100-year average annual capital budget needs	
Suitability	Providing suitable Paramedic services	% of paramedics fleet assets that meet the quality targets	
		% of paramedic vehicles that meet or exceed the target design standard	
Reliability	Providing Paramedic services that are reliable	% of paramedic vehicle uptime	
Sustainability	Providing Paramedic services that are sustainable	Total paramedics fuel consumption of per year (L/100 km)	

12.3 Lifecycle Management Strategy

Table 79 summarizes the key lifecycle activities undertaken by Halton Region to ensure that the Levels of Service as set out by Energy Fleet and Facilities and Paramedic Services are upheld. Certain risks associated with not following the strategy are also included.

Table 79. Lifecycle Activities and Risks Associated with Not Following the Strategy (Paramedics)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for paramedics assets which predict deterioration using a straight line method. ▪ Asset management plan and asset management policy development and updates. ▪ Policies and strategies that advocate and prioritize the sustainability and maintenance of paramedics assets. ▪ Perform condition assessments at regular intervals (i.e., 5-year cycles) on all facilities to inform maintenance and capital planning programs; avoiding reactive, unplanned maintenance or replacement costs. ▪ Master Plan for Halton Region Paramedic Services	▪ Asset deterioration is over or underestimated. ▪ Inaccurate growth numbers and estimation of funding.
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Routine and preventative maintenance programs. ▪ Reactive maintenance may arise during normal operation of assets or from inspections. ▪ Implementation and optimization of maintenance program in order to ensure critical infrastructure is maintained, breakdowns are minimized and the service life of the assets are maximized, along with a focus on planning and	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions or pose health and safety risks. ▪ Inspection data is not up to date if inspections are postponed which may lead to delayed maintenance activities resulting in premature asset failure.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
	scheduling to efficiently and effectively realize the maximum value of Halton Region's assets related to facilities.	
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through ongoing maintenance, inspections, and condition assessments.	▪ Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity. ▪ Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement or reconstruction based on asset condition and previous rehabilitation activities performed.	▪ Delay in construction projects may result in higher costs, longer service disruption, customer dissatisfaction and health and safety risks.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Disposal of assets at the end of their useful life.	▪ Improper disposal can lead to environmental impacts and expenses.
Expansion/Growth Activities Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	▪ Capital projects to accommodate for population growth in new and existing areas.	▪ Master Plans overestimate or underestimate growth projections resulting in inadequate capacity needs to service residents.
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitor Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies.	▪ Projects/activities are delayed, and lack of service improvement can result in health and safety risks.

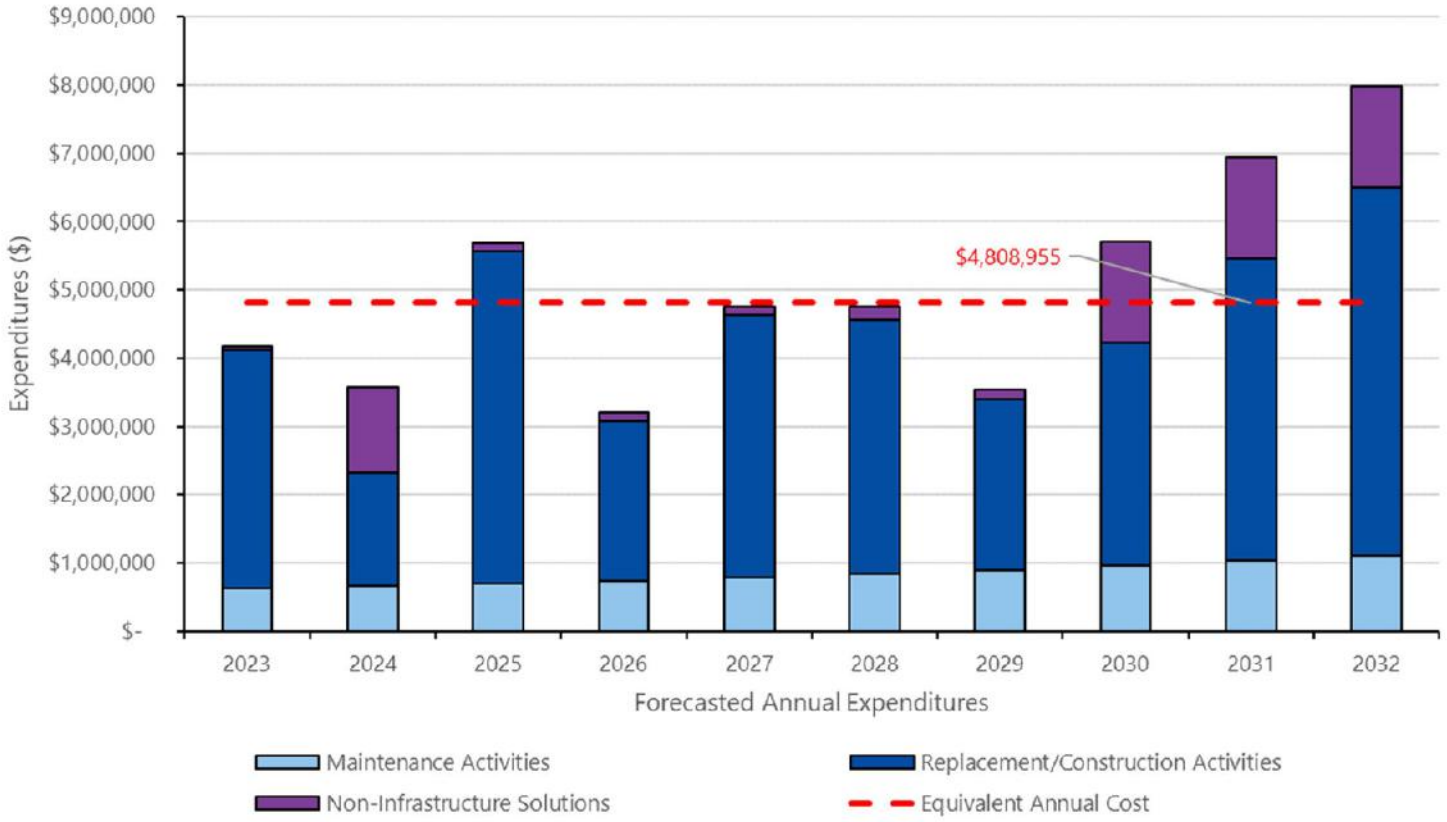
12.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 80 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $4.8 million for the Paramedic portfolio.

Table 80. Lifecycle Forecast Assumptions (Paramedics)

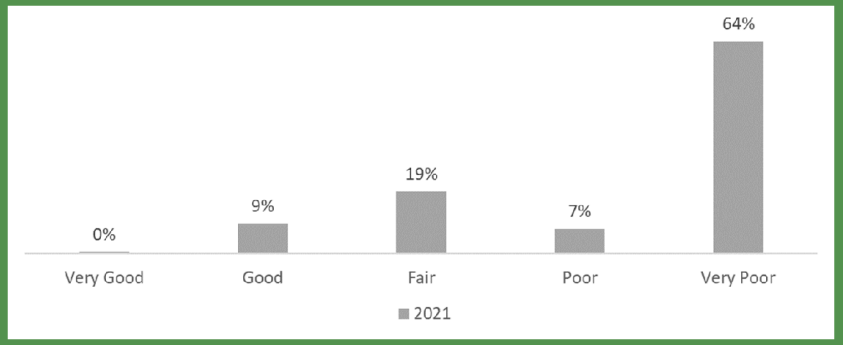
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan to 2031.	$600,727
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Developed based on a review of the annual budget and business plan for IT (p.219). Assuming a starting budget in 2021 of 13.224 thousand, with an assumed annual increase as per the Ten Year Operating Budget Forecast on p. 80.	$809,700
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$0
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$3,398,527
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A
Expansion/Growth/Service Improvement Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth and service improvement needs were incorporated based on the actual projected projects from 2022 to 2031.	$0

Figure 63. Forecasted Needs 2023 - 2032 (Paramedics)



Information Technology

The Region is committed to efficiently providing secure information technology at an appropriate quality and quantity to support the delivery of services



Key Messages

Information Technology Services are crucial for service delivery in all Regional departments.

Quick Facts

3,049 Workstations
3,452 Monitors
629 Printers
10 Network Communications Devices

Asset Ratings

Overall, 8% of IT assets are in **Good** condition, 30% are in **Fair** condition, 10% are in **Poor** condition and 46% are in **Very Poor** condition.

13.0 Information Technology (Non-Core Asset)

Information Technology (IT) assets are integral to every other asset category included in this plan. Without well-functioning and properly managed IT assets, efficient service delivery throughout Halton Region would not be possible. IT assets at Halton Region include workstations (desktops, laptops, etc.), software, VOIP phones, wireless cellphones, monitors, network equipment, printers and servers.

13.1 State of the Infrastructure

13.1.1 Asset Register

The Region's Information Technology assets are illustrated by replacement value in Figure 64 and Table 81 includes quantities for each category.

Figure 64. Asset Categories by Replacement Value (IT)

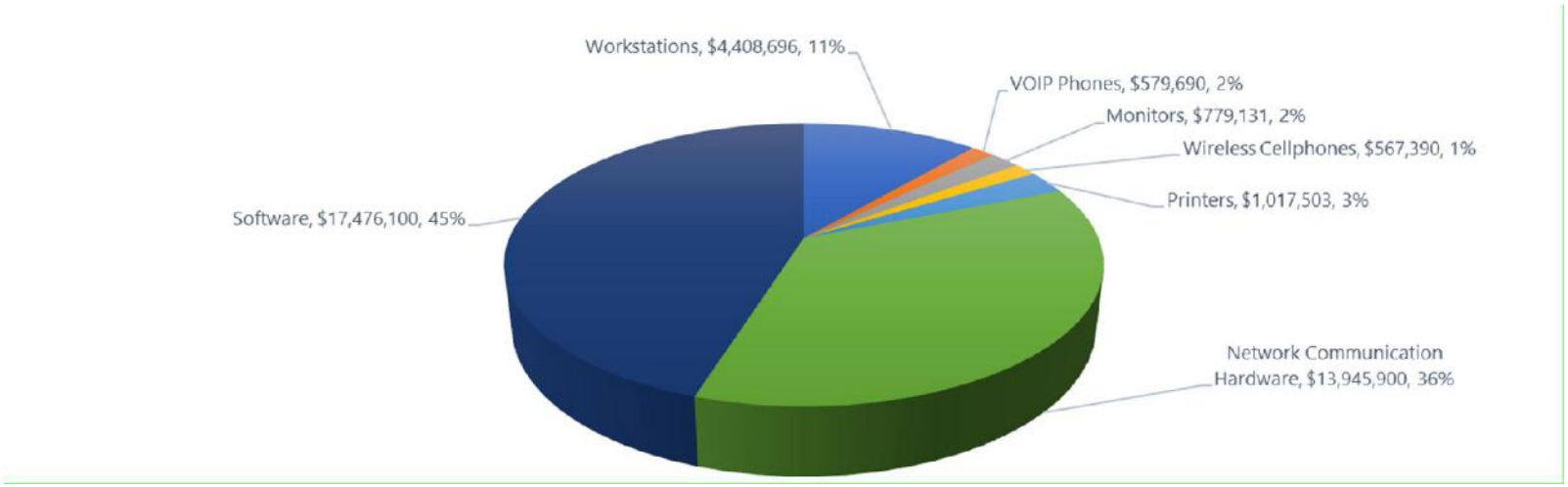


Table 81. Asset Quantities and Replacement Values (IT)

Program Area	Description	Quantity	Unit	Estimated Replacement Value (2020)
Information Technology	Workstations	3,049	Each	$4,408,696
	VOIP Phones	2,147	Each	$579,690
	Monitors	3,452	Each	$779,131
	Wireless Cellphones	1,891	Each	$567,390
	Printers	629	Each	$1,017,503
	Network Communication Hardware	10	Each	$13,945,900
	Software	32	Each	$17,476,100
Total				**$38,774,410**

13.1.2 Asset Age Distribution

Figure 65 below presents the IT asset categories by average age in comparison to the average estimated service life for that same category. With the exception of monitors, all asset categories are either very close to their average ESL or have exceeded it. However, it is important to remember that these are averages and thus are not necessarily a fair representation of the entire asset category in terms of condition.

Figure 65. Average Asset Age as a Proportion of Average Asset ESL (IT)

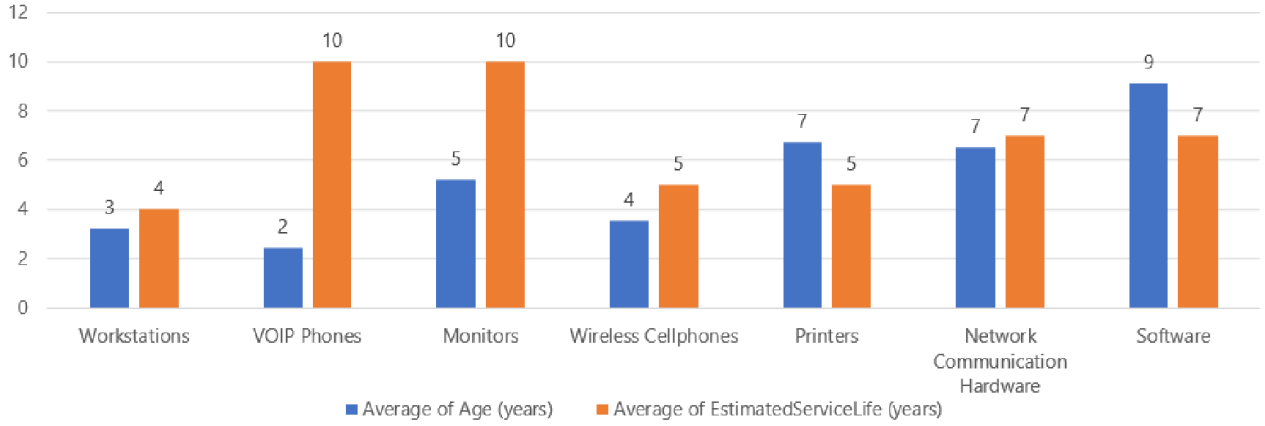
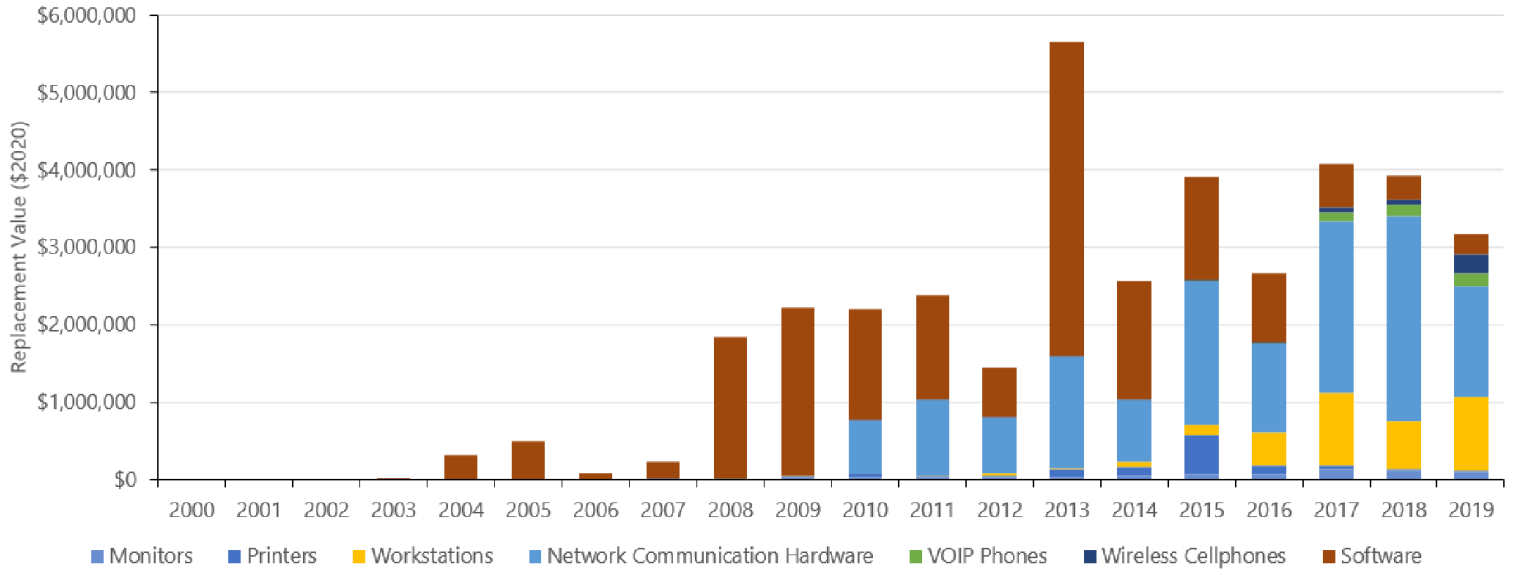


Figure 66 shows that since the Region started tracking the acquisition of IT assets in 2010, the highest costs have consistently been related to network communication hardware and an increase in spending on workstations began in 2015.

Figure 66. Acquisition Year by Replacement Value (IT)



13.1.3 Asset Valuation

Value can be assigned to an asset using two different methods: financial accounting valuation and replacement cost valuation. Financial accounting valuation uses historical acquisition costs and applies depreciation in order to estimate the current book value of the asset. Replacement costs represent the amount it would cost to replace an asset in the current year. These costs are determined based on estimates obtained from professionals (e.g., consultants or Regional experts). Where this is not available, inflated historical costs are used. Table 82 provides the valuation of the entire IT portfolio using both of these methods.

Table 82. Financial Accounting and Replacement Cost Valuation (IT) (2020)

Financial Accounting Valuation	Replacement Valuation
$5,193,712	$38,774,410

13.1.4 Asset Condition

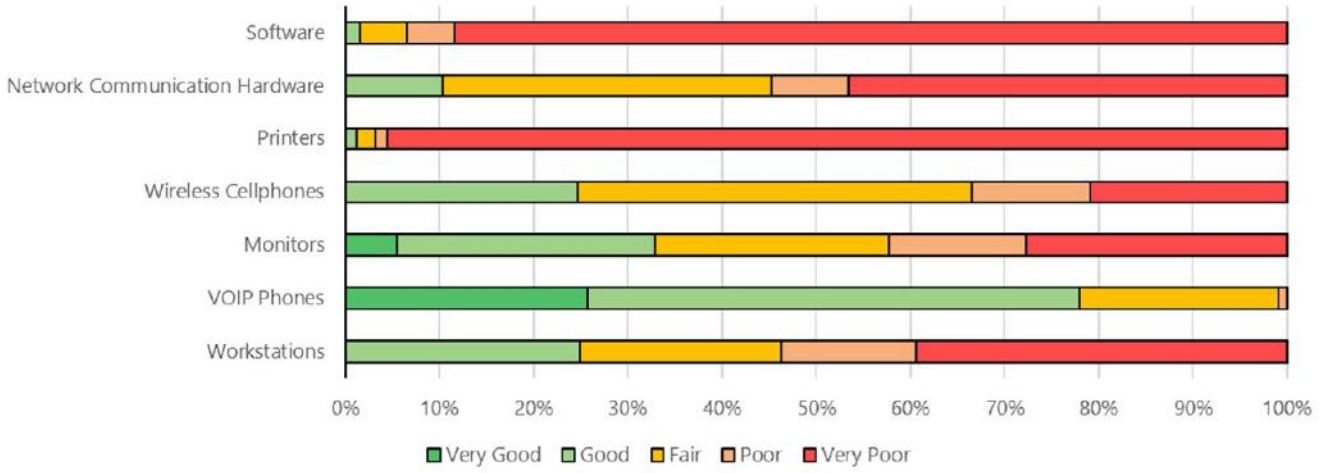
Condition for all IT assets was calculated based on age as a proportion of remaining useful life. The calculated condition scores were converted to a rating based on Table 83 below.

Table 83. Condition Rating Score and Rating Scale (IT)

Condition Score	Condition Rating	Age-Based (1-Age/ESL)
1	Very Good	0.80 – 1.00
2	Good	0.60 - 0.79
3	Fair	0.40 – 0.59
4	Poor	0.20 – 0.39
5	Very Poor	0 – 0.20

Figure 67 presents the distribution of condition ratings for IT assets.

Figure 67. Condition Distribution Replacement Value (IT)



13.1.5 Data Sources and Data Confidence

The data that was used for the analysis was compiled from multiple sources, including:

- All IT Assets: IT Hardware Asset Report
- Network Devices: Based on TCA Data

The confidence in the data is provided in Table 84.

Table 84. Data Confidence Assessment (IT)

Description	Asset	Confidence Rating	Confidence Comment
Information Technology	Workstations	Medium - High	Condition data is based on age which is a reasonable approach for IT assets.
	Monitors		
	Printers		
	Software		
	Network Communication Hardware		

13.2 Levels of Service

Information Technology Services is committed to efficiently providing secure information technology at an appropriate quality and quantity to support the delivery of services.

Table 85 below defines the community and technical Levels of Service required to support this overarching goal.

Table 85. Community and Technical Levels of Service (IT)

Key Service Attribute	Customer Levels of Service Reference	Technical Levels of Service Measure	Current Performance
Cost Effectiveness	Providing IT services in a cost-effective manner	Annual cost to provide service ($/employee)	
		10 Year forecast average capital funding as a % of estimated 100-year average annual capital budget needs	
		Annual operating budget for IT	
		Annual capital budget for IT	
		Cost of monitoring software ($/year)	
		Number of devices lost	
		Number of devices damaged	
		% of damaged devices repaired	
Availability	Providing IT services that are available	Number of IT Devices Supported	
Suitability	Providing IT services that are suitable	% of assets past their estimated service life	
		% of server assets past their estimated service life	
		% of network infrastructure assets past their estimated service life	
		% of work station assets past their estimated service life	
		% of mobile assets past their estimated service life	
		% of telephony assets past their estimated service life	
		% of software that is considered obsolete	
Responsiveness	Providing IT services that are responsive	% of outstanding IT hardware requests	
Safety	Providing IT services that are safe	# of threats	
		% of mitigated threats	

13.3 Lifecycle Management Strategy

Table 86 below outlines the key lifecycle activities implemented within the IT Services division to ensure the Levels of Service defined in the previous section are upheld.

Table 86. Lifecycle Activities and Risks Associated with Not Following the Strategy (IT)

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Non- Infrastructure Solutions Actions or policies that can lower costs or extend useful lives	▪ Lifecycle models have been developed for IT assets which predict deterioration based on age. ▪ Asset management plan and asset management policy development and updates.	▪ Asset deterioration is over or underestimated.
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	▪ Reactive repairs occurring due to asset failure or defects. ▪ Proactive maintenance, updates or repairs.	▪ Increased lifecycle costs if maintenance is done improperly or not as scheduled. ▪ May contribute to premature asset failure, service disruptions.
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	▪ Renewal and rehabilitation needs are identified through standard asset lifecycles or based on identified need.	▪ Increased lifecycle costs or drops in Levels of Service if renewal/rehab activities are done improperly or not as scheduled.
Replacement/ Construction Activities Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	▪ Replacement needs to are identified through standard asset lifecycles or based on identified need.	▪ Delay in projects may result in higher costs, longer service disruption, customer dissatisfaction. ▪ Risk of technological or functional obsolescence.
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	▪ Standard disposal, recycling or storage for spares.	▪ Improper disposal can lead to environmental impacts and expenses.
Expansion/Growth Activities	▪ IT asset master planning or growth forecasts. ▪ Expansion of services or users (internally).	▪ Projections overestimate or underestimate growth projections resulting in inadequate capacity needs to service internal staff.

Activity Type	Asset Management Practices	Risks Associated with Not Following the Strategy
Planned activities required to extend services to previously unserved areas or expand services to meet growth demands		
Service Improvement Activities Planned activities to improve an asset's capacity, quality, and system reliability	▪ Establishing and monitor Levels of Service to identify opportunities of improvement and develop target Levels of Service. ▪ Upgrades or operating changes to equipment to improve operational efficiencies.	▪ Projects/activities are delayed.

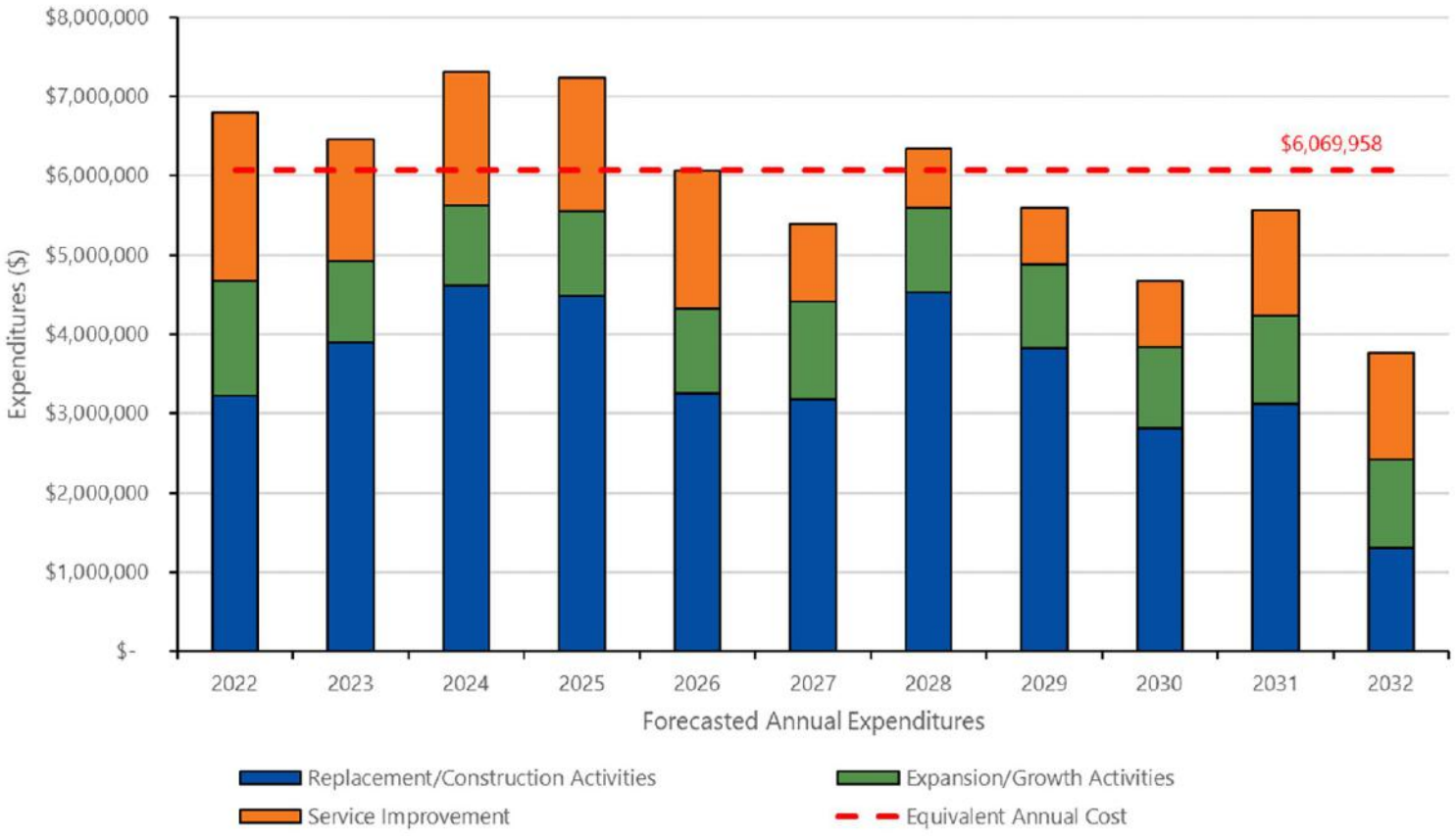
13.4 Forecasted Lifecycle Activity Costs

In order to sustain the desired Levels of Service, investment is required within each of the lifecycle categories for the activities previously described. To estimate the lifecycle activity costs, the assumptions in Table 87 have been used. The equivalent annual cost for each lifecycle stage has been included, which amounts to a total of $6.1 million for the full IT portfolio.

Table 87. Lifecycle Forecast Assumptions (IT)

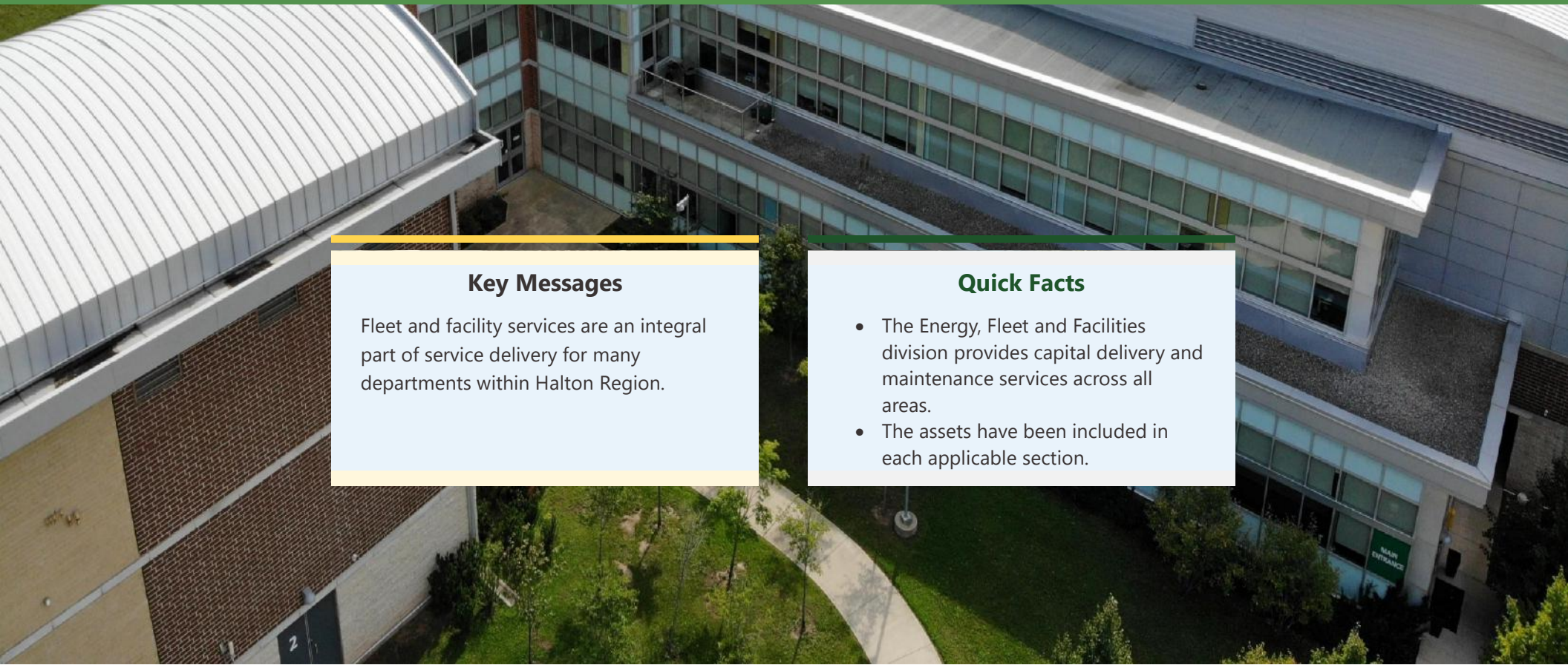
Activity Type	Model Assumptions	Equivalent Annual Cost (2023 to 2032)
Non- Infrastructure Solutions: Actions or policies that can lower costs or extend useful lives	Developed based on a review of the annual budget and business plan to 2031.	$144,444
Maintenance Activities: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	Replacement and repairs of IT assets are considered operating expenses rather than maintenance expenses.	$0
Renewal/ Rehab Activities: Significant repairs designed to extend the life of the asset	Forecasted based on a lifecycle model applied to each asset in the asset register.	$0
Replacement/ Construction Activities: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option	Forecasted based on a lifecycle model applied to each asset in the asset register.	$3,474,819
Disposal Activities: Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality	Disposal activities have been incorporated within the replacement and renewal, costs.	N/A
Expansion/Growth Activities: Planned activities required to extend services to previously unserved areas or expand services to meet growth demands	Growth needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$1,110,139
Service Improvement Activities	Service improvement needs were incorporated into the forecast based on the Region's proposed 10-year capital budget.	$1,340,556

Figure 68. Forecasted Needs 2023 - 2032 (IT)



Energy, Fleet and Facilities

The Region is committed to providing safe, reliable, cost effective and fuel-efficient vehicles and corporate facilities



Key Messages

Fleet and facility services are an integral part of service delivery for many departments within Halton Region.

Quick Facts

- The Energy, Fleet and Facilities division provides capital delivery and maintenance services across all areas.
- The assets have been included in each applicable section.

14.0 Energy, Fleet and Facilities

Halton Region's Energy, Fleet and Facilities department is responsible for the planning, development, construction, maintenance and energy management of owned and leased corporate facilities, fleet, long-term care and social housing assets. The department develops asset management strategies related to fleet, facilities, equipment, maintenance, operations, energy management, security, space planning, and furniture to address full life-cycle costing and analysis to plan for Halton's rehabilitation and replacement needs.

Fleet predominantly serves three service areas - Halton Regional Police Services, Halton Regional Paramedic Services and Halton Regional Public Works (Water, Wastewater, Roads, Waste Management). Having a well-functioning and well-maintained fleet is integral to service delivery for all three of these groups. Halton Region has undertaken a recent study to access Fleet Services and define ways in which management can be improved, both from an environmental and cost perspective. For instance, the Energy and Resource Management Strategy (2018), identified the innovative opportunity to utilize upgraded biogas (renewable natural gas) produced at the Halton Region Waste Management Site and Halton's Wastewater Treatment Plants, as fuel for the Region's fleet. Ideas such as this help align service areas with Halton Region's efforts to be a sustainable community.

14.1 State of the Infrastructure

14.1.1 Asset Register

There are 270 vehicles in Halton Region's fleet, and they are classified using the Municipal Benchmarking Network (MBN) which groups vehicles according to their Gross Vehicle Weight Rating (GVWR) and service area. For instance, within all service areas there are vehicles classified as Light (< 4,500 kg), Medium (4,500 – 9,000 kg), and Heavy (> 9,000 kg). Within these categories there are specific vehicle types such as tractors, trucks, snow plows, vans and loaders; using these categories Region's fleet has been broken down and is presented using replacement costs in Figure 69. Table 88 provides the quantities of each category along with replacement costs.

Figure 69. Asset Categories by Replacement Value (Fleet)

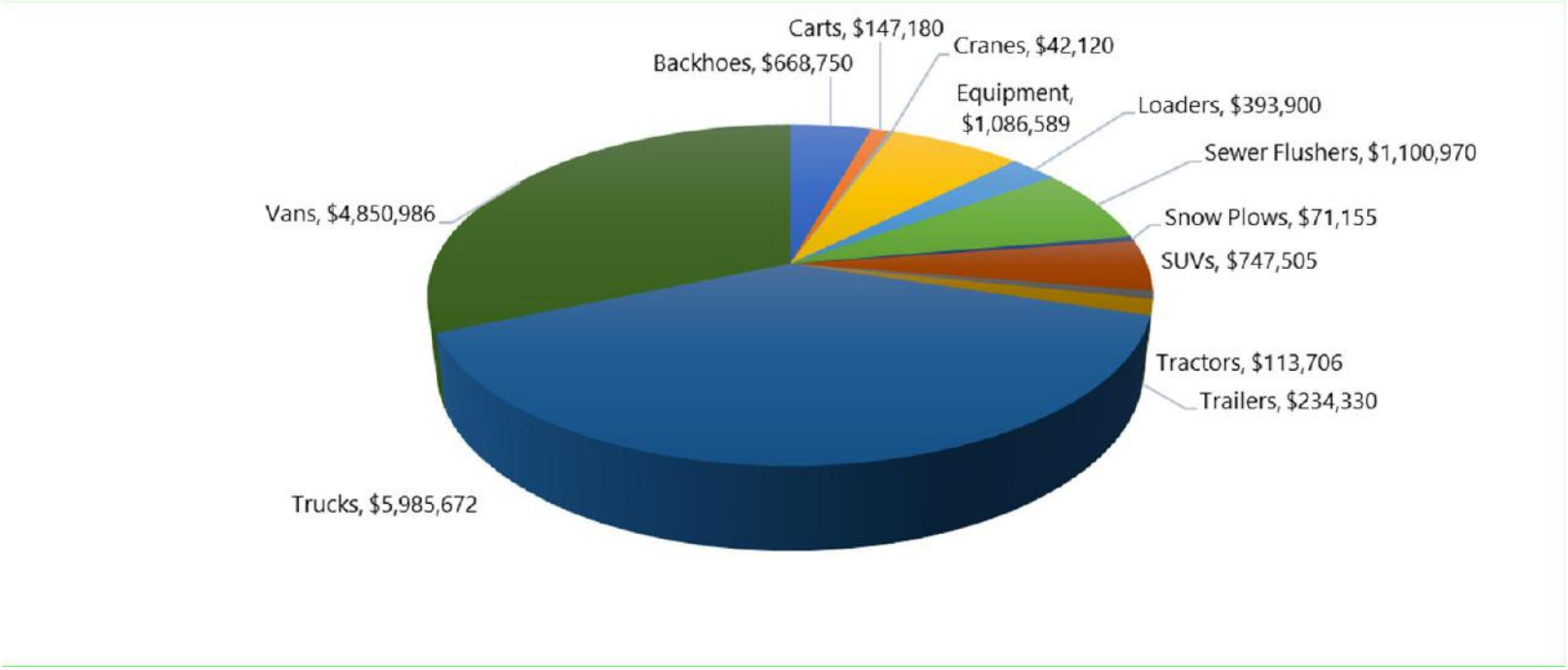


Table 88. Asset Quantities and Replacement Value (Fleet)

Program Area	Description	Quantity	Unit	Estimated Replacement Value (2020)
Fleet	Trucks	95	Each	$5,985,672
	Vans	83	Each	$4,850,986
	Trailers	7	Each	$234,330
	Equipment	27	Each	$1,086,589
	Backhoes	5	Each	$668,750
	SUVs	17	Each	$747,505
	Snow Plows	7	Each	$71,155
	Loaders	2	Each	$393,900
	Carts	5	Each	$147,180
	Tractors	3	Each	$113,706
	Sewer Flushers	2	Each	$1,100,970
	Cranes	2	Each	$42,120
Total				**$15,442,862**

The overall asset portfolio for Corporate Facilities is provided in Figure 70 and includes facilities associated with service areas such as Long-term Care, Paramedics and Waste Management. The category "Corporate Facilities" presented in all figures in the following sections includes:

- Halton Regional Centre
- The Halton Region Museum
- The Ford Farmhouse
- North Operation Centre
- Woodlands Operations Centre
- 4 child-care centres

Table 89 provides the number of facilities for each category.

Figure 70. Asset Categories by Replacement Value (EFF Managed Facilities)

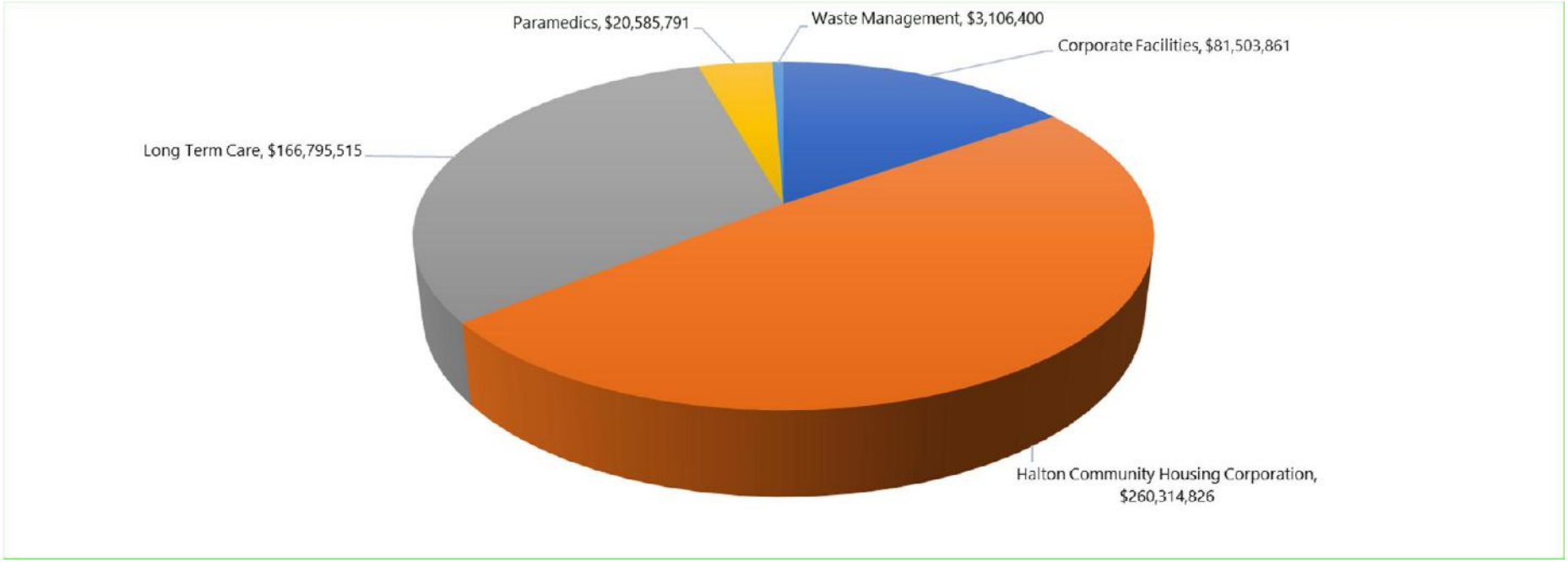


Table 89. Asset Quantities and Replacement Values (Corporate Facilities)

Program Area	Description	Quantity	Unit	Replacement Value (2020)
Corporate Facilities	Corporate Facilities	11	Each	$84,610,261
	Halton Community Housing Corporation	66	Each	$260,314,826
	Long-term Care	3	Each	$166,795,515
	Paramedics	14	Each	$20,585,791
	Waste Management	1	Each	$3,106,400
Total				**$535,412,793**

14.1.2 Asset Age Distribution

Figure 71 below presents the Region's fleet assets by average age in comparison to the average estimated service life for each category of vehicle. For the most part, vehicles are at least half-way through their ESL, if not in exceedance of it.

Figure 71. Average Age as a Proportion of Average Asset ESL (Fleet)

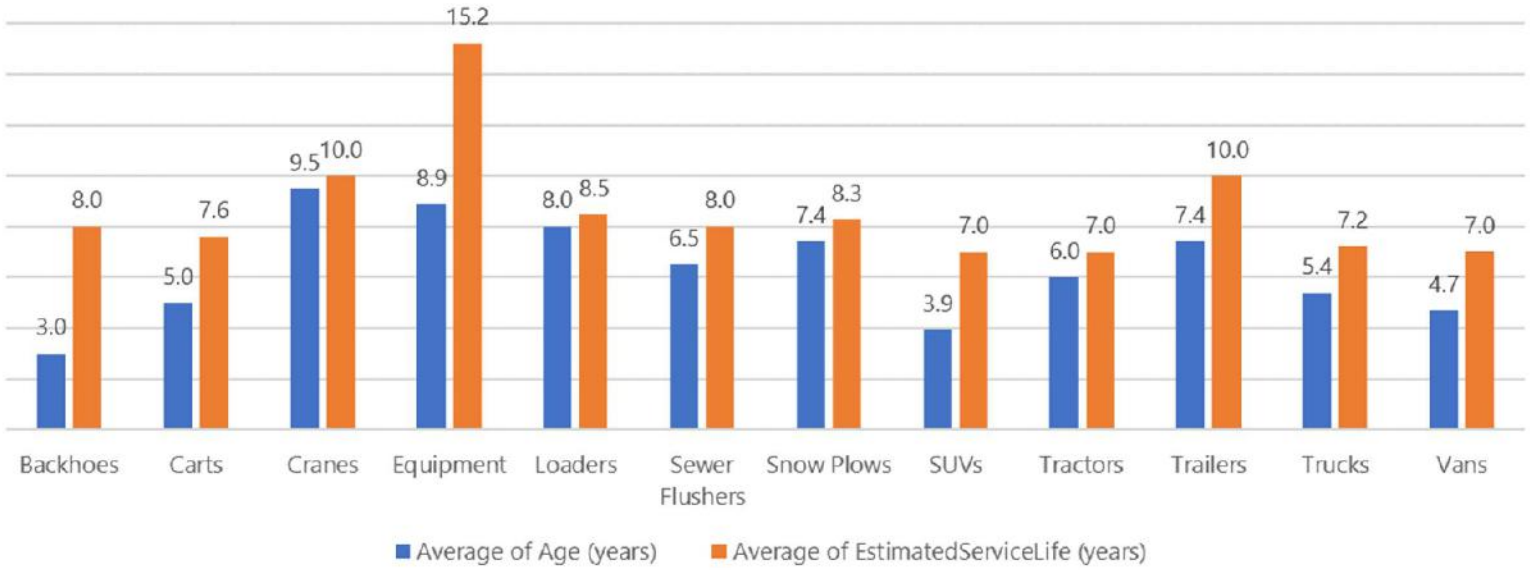
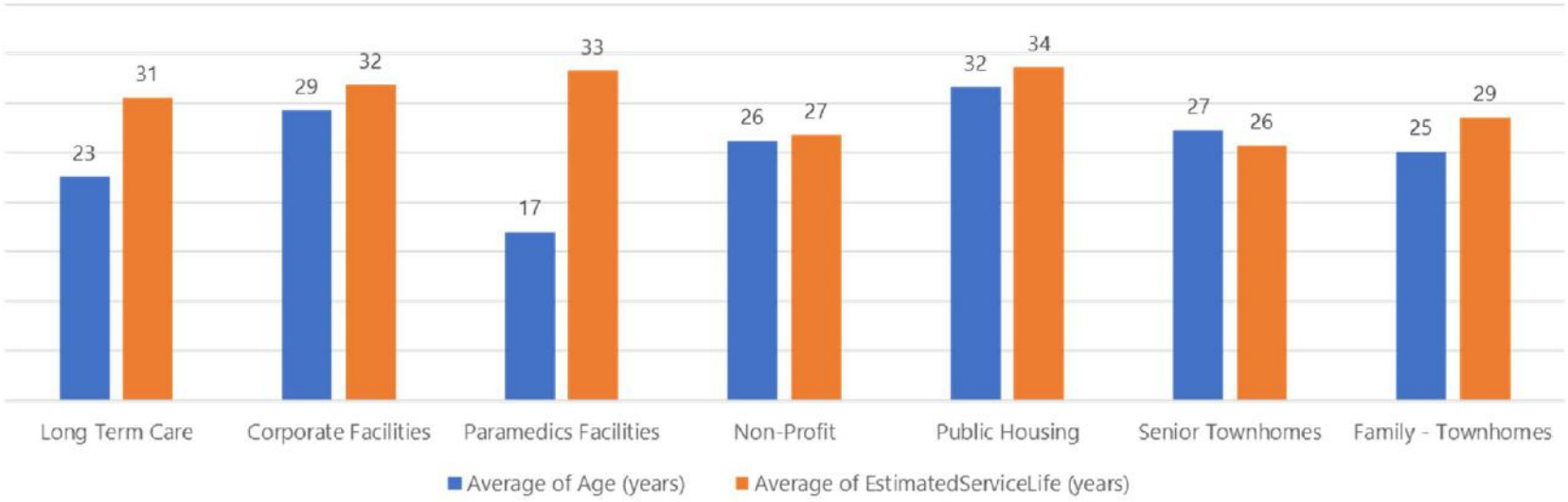


Figure 72 below presents the average age of each facility category against its respective average estimated service life. All Corporate Facility categories are either quickly approaching or have exceeded the average estimated service life of the assets associated with them. Based on age alone, it would be expected that these assets would all be classified as being in Very Poor condition.

Figure 72. Average Asset Age as a Proportion of Average Asset ESL (Corporate Facilities)



Based on Figure 73 which presents fleet assets by replacement values based on acquisition year, the majority of the Region's fleet is relatively new, however a large investment was made in 2014 which may translate to high replacement costs in the next 1-2 years.

Figure 73. Acquisition Year by Replacement Value (Fleet)

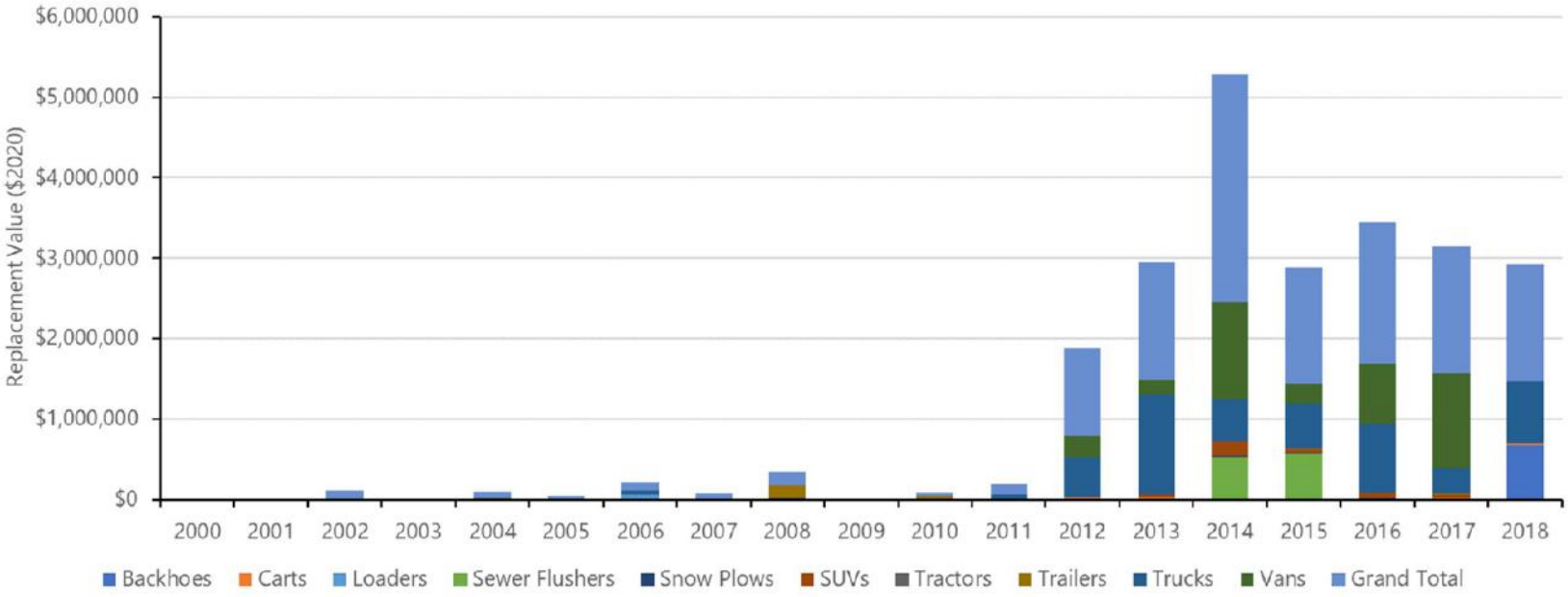
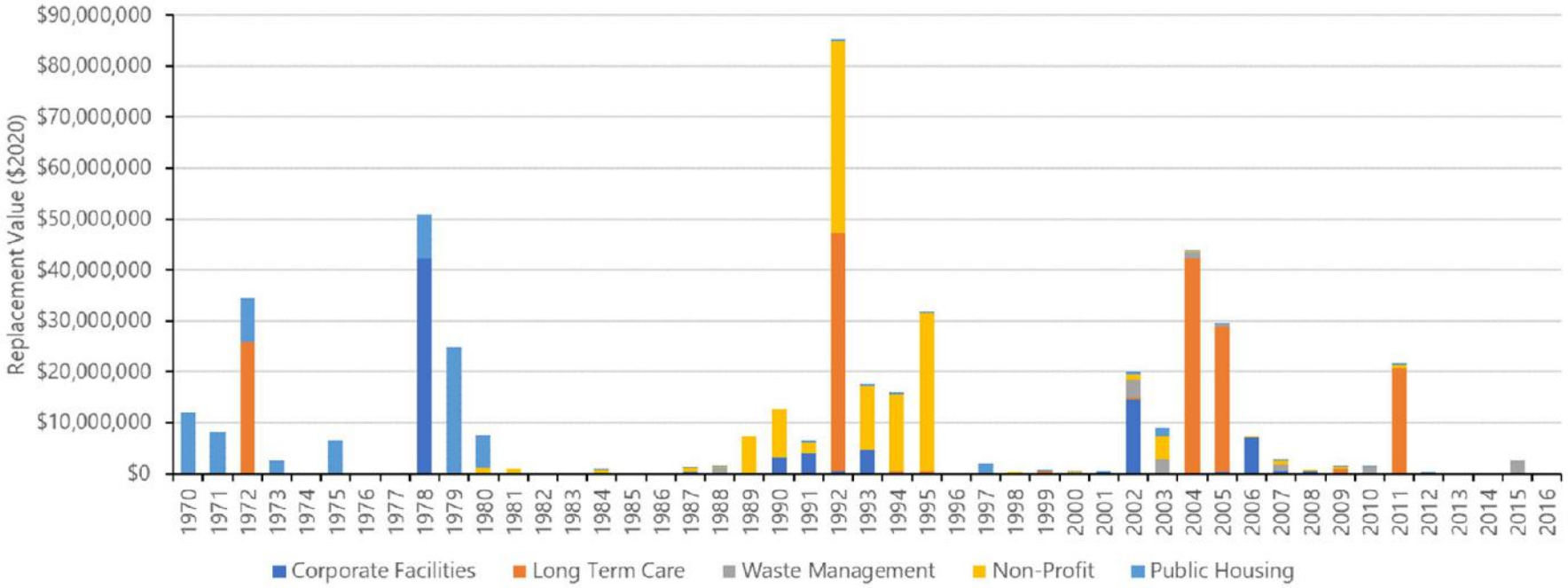


Figure 74 presents the corporate facilities asset portfolio based on replacement costs by installation year. There were significant peaks in investment both during the early 1990's and early 2000's. Those in the early 1990's that fall in the Corporate Facilities category can be attributed to the second phase of construction for the Halton Regional Centre in 1991.

Figure 74. Construction Years by Replacement Value (Corporate Facilities)

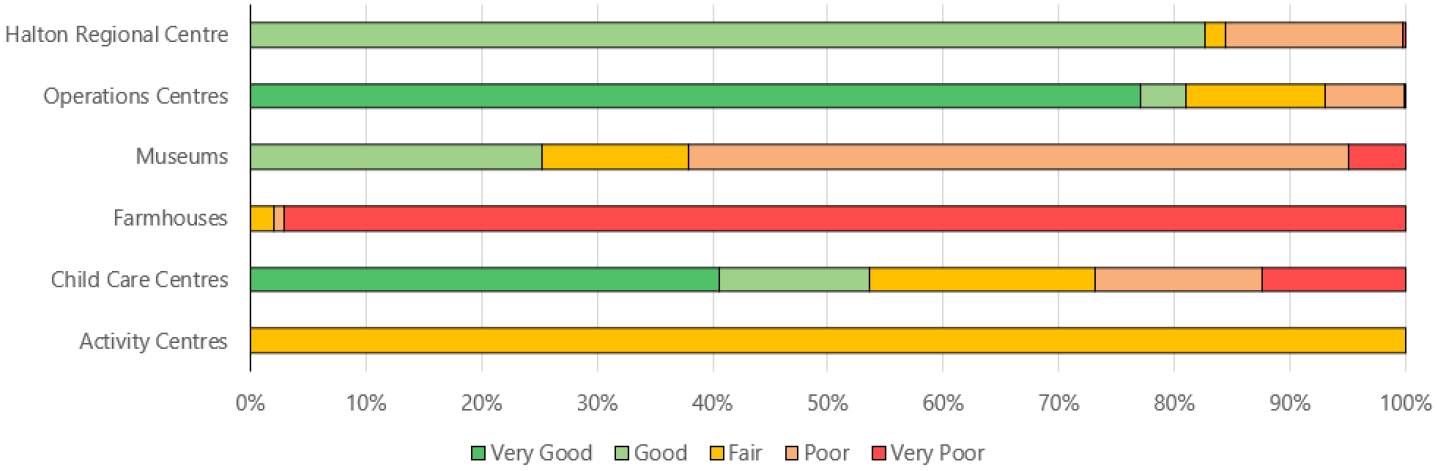


14.1.3 Asset Condition

Asset condition has been addressed in previous sections related to facilities and fleet for the Divisions utilizing these assets and are therefore not addressed here.

Figure 75. Condition Distribution by Replacement Value (Fleet)

Figure 76. Condition Distribution by Replacement Value (Facilities)



14.2 Levels of Service

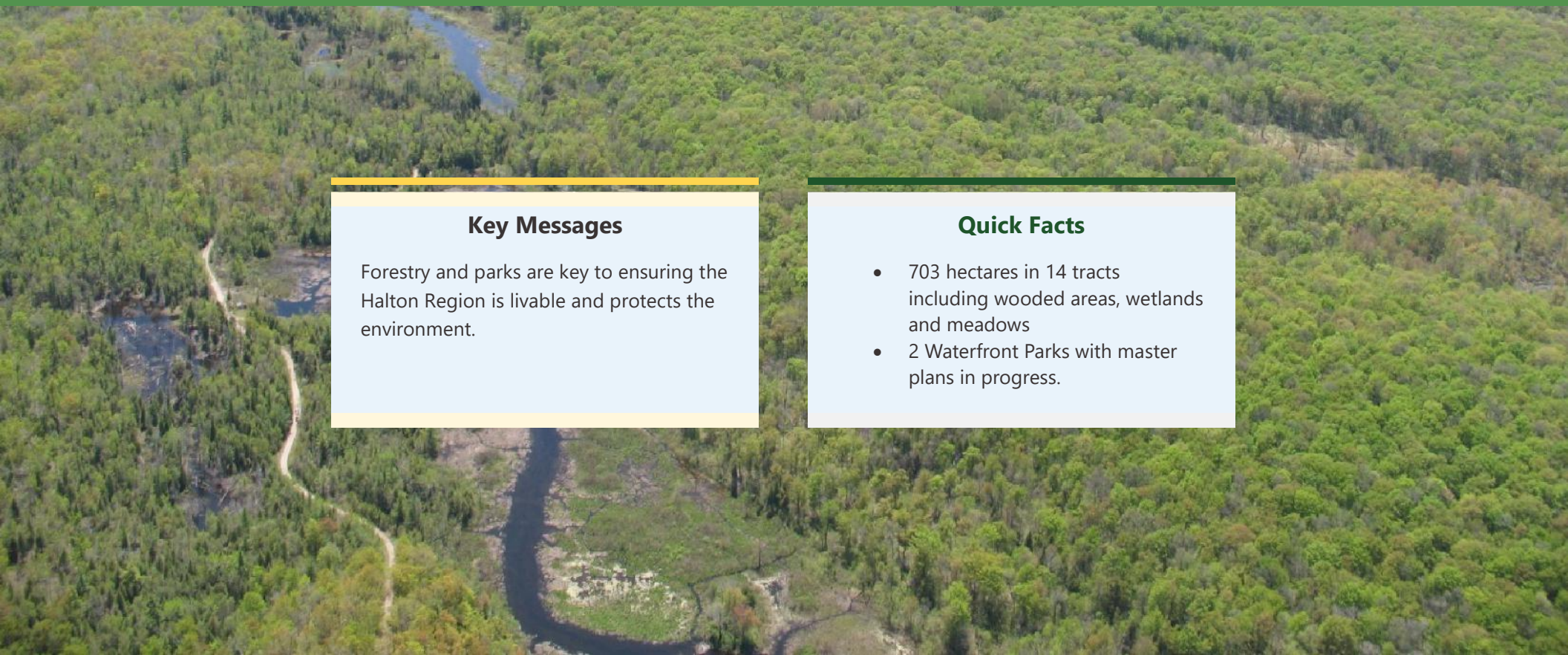
Halton Region's Energy, Fleet and Facilities division is committed to providing safe, reliable, cost effective and fuel-efficient vehicles and reliable, safe, accessible, and energy efficient facilities. In support of these overarching goals, Table 90 below outlines the community and technical Levels of Service.

Table 90. Community and Technical Levels of Service (Energy, Fleet and Facilities)

Key Service Attribute	Performance Measure	2020 Performance
Availability	Total Service (Building) Area	283
Sustainability	Total Energy Consumption	27.11
Cost Effectiveness	Cost to provide service	9,501.77
Reliability	FCI	3
Reliability	Demand work orders as a percentage of total work orders	44
Sustainability	Total Water Consumption	0.04
Cost Effectiveness	Operating budget for fleet services	1,616,590.22
Safety	% of regulated MTO maintenance inspections completed	85%
Reliability	% of uptime	100%
Reliability	# of missed planned inspections	31
Sustainability	Total fuel consumption of medium vehicles per year	74,773
Sustainability	Total fuel consumption of light vehicles per year	466,185
Sustainability	Total fuel consumption of heavy vehicles per year	60,019
Sustainability	% of vehicles with non-fossil fuels	0%
Sustainability	% GHG reduction for fleet	N/A
Cost Effectiveness	10 Year capital forecast Fleet facilities	71,000

Regional Parks and Forests

The Region is committed to efficiently protecting and providing wetlands, forestry and parks that support a livable community.



Key Messages

Forestry and parks are key to ensuring the Halton Region is livable and protects the environment.

Quick Facts

- 703 hectares in 14 tracts including wooded areas, wetlands and meadows
- 2 Waterfront Parks with master plans in progress.

15.0 Regional Parks and Forests (Non-Core Asset)

15.1 Parks

The Regional Waterfront Parks Program is guided by the policies of the Region of Halton Official Plan (ROP). Section 133 of the ROP outlines the objectives of the Regional Waterfront Parks program:

- To maximize public accessibility to the Halton waterfront by increasing the amount of well distributed public open space.
- To provide a variety of recreational, cultural and tourism opportunities along the Halton waterfront.

The continued development of the Regional Waterfront Parks is also identified as a priority action in the 2019-2022 Halton Region Strategic Business Plan. Regional Waterfront Park Master Plan implementation is a collaborative initiative between Halton Region, the City of Burlington and Conservation Halton. Halton Region has two Regional Waterfront Parks where master plans are still being implemented: Burloak and Burlington Beach. Historically, upon completion of park development, management and day-to-day operation and liabilities of the park are transferred to the local municipality (City of Burlington or Town of Oakville). Halton is responsible for the majority of the initial capital investment associated with Master Plan implementation whereas the local municipality is responsible for operation and maintenance.

15.1.1 Burloak Regional Waterfront Park

The current Master Plan for Burloak Park was approved by Council through Report No. LPS13-14 on April 16, 2014, this resulted in technical revisions to a 2002 updated Master Plan, which itself replaces a 1986 Master Plan incorporating significant lake filling.

The 2014 plan confirmed the longstanding vision for Burloak Regional Waterfront Park as a predominantly passive park. The 2014 plan identifies a mix of natural areas, meadows, and formal gardens for a passive experience and the creation of an interconnected pathway system as shown in Figure 77. The Plan combines these with open, un-programmed space, playgrounds, and opportunities to launch small non-motorized recreational boats such as canoes and kayaks. Regional and City of Burlington staff have worked over many years to implement the Master Plan, including major shoreline erosion protection works and an aggressive invasive species removal and replanting program.

Figure 77. Burloak Regional Waterfront Park – 2014 Proposed Master Plan

15.1.2 Burlington Beach Regional Waterfront Park

The Master Plan for the Burlington Beach Regional Waterfront Park was developed in partnership with the City of Burlington and Conservation Halton and was approved by Regional Council in May 2015, through Report No. LPS54-15 re: "Burlington Beach Regional Waterfront Park – 2015 Master Plan." Regional Council also approved Report No. LPS59-15 re: "Burlington Beach Acquisition Implementation/Strategy" in May 2015, which established a plan for securing the necessary lands needed to implement the Master Plan based on a willing buyer/willing seller program.

In late 2019, staff defined a scope of work for technical studies necessary to advance the implementation process for the Park. These studies are required prior to initiating the detailed construction drawings for Burlington Beach, and to identify and mitigate potential construction and long-term maintenance risks, inform the preparation of detailed design documents, and position the project to obtain the relevant permits and approvals for construction. These studies are ongoing and planned to be completed by December 2021.

Figure 78. Burlington Beach Regional Waterfront Park

15.1.3 Regional Parks Levels of Service

Halton Region is committed to efficiently providing high quality parks, open spaces and trails that are accessible to residents and support a livable community. A draft Level of Service has been developed and is presented in Table 91.

Table 91. Community and Technical Levels of Service (Regional Parks)

Key Service Attribute	Performance Measure	Current Performance
Availability	Percentage completion of Phase 2 construction of the Burloak Regional Waterfront Park	TBC
Availability	Completion of Feasibility Study at Burlington Beach	TBC
Sustainability	Enhancing resilience to climate change	TBC
Availability	Area of new usable space	TBC

15.2 Forests

15.2.1 Overview

The Region currently owns 665.72 ha (1,645 acres) of forests on 14 separate tracts of land that were previously managed by the Ontario Ministry of Natural Resources (OMNR), under the former Agreement Forests program. The
Halton Regional Forest forms part of the Greenlands System identified in the Region's Official Plan.

Halton Region began to acquire land for forestry purposes in 1939 with the purchase of the Cox Tract, and in 1950, entered into a 30-year management agreement with the Department of Lands & Forests (now OMNR) under the provincial Agreement Forests program (Ontario Department of Lands & Forests 1969).

The initial agreement covered approximately 700 acres in nine forest tracts. Afforestation of submarginal lands in the Halton Regional Forest first occurred in the Cox Tract in 1940 with the planting of 30,000 conifer seedlings. Subsequently, some 134 ha have been planted. Stand improvement work in the Halton Regional Forest began in 1949 with cutting to release crop trees in the Snyder Tract.

Subsequent silvicultural management has involved additional release cutting, improvement cutting in hardwoods for fuelwood and sawlogs, pruning, and commercial thinning in conifer plantations (Ontario Department of Lands & Forests 1969). Approximately 37% of the Halton Regional Forest (243 ha) has received some form of silvicultural management while managed by OMNR (up to 2000). However, very little silvicultural management activity has occurred in the forest tracts in the last seven to 10 years.

In 2005, the Region established the Forest Management Plan which included Public consultation and participation in determining the future of the forest. The plan outlines four management goals, Natural Heritage, Recreation, Education and Research, and Administration, which formed the basis for objectives and recommended actions for integrated forest management of

the Halton Regional Forest. This has been accomplished through a system of management areas. The forest management plan recognizes four classes of management area for the Halton Regional Forest - Restricted, Passive, Modified, and Access - based on natural heritage features and sensitivities of those attributes and functions to human use and management activities. Permitted uses and the level of silvicultural management in a particular stand will depend on the management area designation for that stand. Where silvicultural management is proposed, the silvicultural systems involved are designed to emulate natural disturbances.

Since implementing the plan, the Region has taken an active approach in managing the infrastructure and natural environment. Physical infrastructure associated with the Forests include:

- Signage
- Gates
- Gravel access roads
- Small parking lots (up to 5 cars)
- Fencing
- Culverts

15.2.2 Regional Forests Levels of Service

The Region is committed to maintaining and enhancing the structure and function of the forest, including ground and surface water, soils, vegetation and wildlife, while providing social and economic benefits. To do this, several key Level of Service objectives have been defined as shown in Table 92.

Table 92. Community and Technical Levels of Service (Regional Forests)

Key Service Attribute	Performance Measure	Current Performance
Sustainability	% of resurfacing of forest access roads and recreational trails undertaken using soils or aggregates from quarries located outside of the Halton Regional Forest.	TBC
Availability	Stands in the late seral stage of succession (i.e., ≥90 years of age). Target 45 ha	TBC
Sustainability	Ha of additional lands acquired (both adjacent and nonadjacent to existing tracts) to enhance landscape connectivity and enlarge the Halton Regional Forest.	TBC

16.0 Financing Strategy

The financing strategy of this Asset Management Plan sets out the approach to ensuring that the appropriate funds are available to support the delivery of the specified Levels of Service. The financing strategy takes into account the revenues, operating and capital expenditures, debt, and future commitments for operating or capital activities related to the assets included within the plan. The strategy builds upon the foundation of the current situation to provide a connection between future capital or operating budgets and asset-related service levels. It is meant to augment current budgeting processes by providing a long-term perspective on the impact of providing higher or lower asset-related service levels to the required revenues and affordability to the community.

This chapter first summarizes the current financial landscape in the Region, and then discusses options for addressing the long-term infrastructure funding needs that has been identified in each service area to achieve the proposed asset-related Levels of Service.

The Region's budgets are developed to allocate funding to provide services (salaries, equipment, materials used to provide a range of services) and construct infrastructure assets. Budgets identify both the required costs (expenditures) and the available funding (revenues). Halton Region's budget can be broadly categorized into operating and capital components, as follows:

- The operating budget is used to support the day-to-day functions that provide services to the community. Staff salaries, energy bills, and fuel for vehicles are examples of expenditures that are funded from the operating budget.
- Through the capital budget component, the Region plans future large expenditures (including the construction of infrastructure assets) and the use of debt and reserve funds to manage its financial position over a ten-year period.

The Region allocates a portion of current year revenues, from property taxes and utility rates, to use in the capital budgets as a source of funding. This funds current year projects, contributes to reserve funds, and makes debt repayments. The use of debt as a source of funding impacts operating budgets by having to pay debt servicing costs (interest) each year.

Property taxes fund Regional programs and services including social services, Regional road operations, housing services, waste management, public health programs, paramedic services and other Regional services. Property taxes also fund Police Services, and provide funding for Conservation Authorities, the Royal Botanical Gardens, and the North Halton Mental Health Clinic, which is operated by Halton Healthcare. Water and wastewater services are not funded by property taxes. These services are fully funded by water and wastewater rates, and as such, analysis related to these funding sources are provided separately.

As part of the annual budget development process, the Region ensures continued financial sustainability through effective financial planning and risk management, which results in maintaining a AAA credit rating and tax rate increases at or below the rate of inflation. To achieve this objective, the 2021 budget was prepared based on the following budget principles (Region of Halton, 2021, p. 24):

- The Annual Budget is prepared in accordance with the financial plans, annual targets and policies approved by Regional Council.
- Halton's strong financial position and financial planning principles will be continued to ensure the Region's AAA credit rating is maintained.
- Strategic investments in additional staff or other resources resulting from growth, program enhancements or additional federal/provincial funding require a business case to be considered by Council as part of the annual budget process.
- The Annual Budget includes investment in the state-of-good-repair of the Region's assets to maintain a good overall condition of the assets as the Region's infrastructure continues to age and expand.
- Regional programs are funded from sustainable revenues to ensure ongoing expenditures are not funded from temporary or one-time revenues.
- 10-year Operating and Capital budget forecasts are prepared.
- All growth-related capital costs that can be recovered under the Development Charges Act (DCA) will be recovered from growth in the Annual Budget. In order to proceed with growth in the Region, an acceptable financing plan must be approved by Council prior to development proceeding.
- Halton's own debt limits are not exceeded throughout the 10-year forecasts.
- Reserves are maintained at levels to ensure financial sustainability to support the state-of-good-repair of Regional assets, tax and rate stabilization reserves targets, and to fund specific program requirements.
- The Budget that is presented to Halton Region tax and rate payers is clear and easy to understand, as evidenced by the annual receipt of the Distinguished Budget Presentation Award by the Government Finance Officers Association of the United States and Canada (GFOA).

In its commitment to fiscal responsibility and a stable service environment for its residents, Halton Region uses short and long-term analyses with the goal of developing sustainable capital plans and financing strategies. These include 100-year sustainability forecasts, 10-year capital budgets, and reserve fund forecasts. The following sections describe the interrelations between the Region's infrastructure investment needs and the financing strategies.

16.1 Expenditure Forecasts

While there are several best practices for developing long-term asset management expenditure forecasts, use of a lifecycle model is usually required as the data and the logic driving these forecasts can be very complex. A lifecycle model can be as simple as an Excel spreadsheet to a comprehensive off-the-shelf piece of software (such as Assetic Predictor or Powerplan).

Another common best practice is to perform this lifecycle analysis at the detailed asset level, assuming detailed asset information is available. Best practice is dictating the development of these plans at the asset level (i.e., a pipe, pump or culvert), utilizing the lowest level of asset information Halton has documented and has confidence in. This provides the benefit of having the ability to drill down into the analysis to the asset level to ensure the plan is transparent and can be challenged at an appropriate level of granularity.

Following these best practices, the analysis was carried out for each portfolio at the lowest level of asset data (individual watermains, roads, bridge, pumps, HVAC units, etc.). GMBP utilized the asset classifications defined in the SP2 project. Meetings with each group of stakeholders were conducted to review data, adjust lifecycle models, calibrate the lifecycle model and tools and develop a detailed Asset Management Plan analysis.

In developing the long-term expenditure plans, the following process was followed:

- The first step is to align the approved short-term capital plan and forecast (which has considered risk and LOS in years 1 to 3 year short-term plan as per the SP2 outputs) with the asset register. All capital projects from the 2022 capital budget and forecast were assigned the activity, cost and year of the project in the asset register to ensure the lifecycle model would incorporate the approved schedule for these planned activities. The projects identified in the year 4 capital budget forecast address SOGR, growth/master planning and performance related projects.
- The next step is to consider additional growth, regulatory or performance driven projects that have been identified in Halton beyond the 4 year short-term capital budget and forecast. All of these projects are identified in the asset register to again ensure these projects are forced in the year they are planned.
- With all known projects tagged in the asset register, the final step is to have the lifecycle model analyze the SOGR/condition based needs of assets not already earmarked in the capital budgets. The model will then assess and prioritize the condition based rehab and replacement activities based on the budget envelopes defined for each lifecycle analysis.

16.2 Operating Revenues and Expenditures

The operating revenues by funding source as outlined in Region's 2020 and 2021 Budget and Business Plans are shown in Table 93.

Table 93. Tax & Rate Gross Operating Revenues by Funding Source ($'000)

Funding Source	2019	2020	2021 (Projected)
Property Tax Revenue	267,704	277,014	285,847
Water and Wastewater Rate Revenue	205,631	213,789	220,740
Provincial Subsidies	181,281	180,855	187,306
Federal Subsidies	17,553	17,693	18,648
Program Revenues	34,948	36,502	37,795
Other	6,405	6,755	6,781
Investment Income	55,000	55,000	55,000
Supplementary Taxes	65,000	6,500	65,000

Source: *Adapted from Halton Region (2021) Budget and Business Plan, p. 67 and Halton Region (2020) Budget and Business Plan, p. 52.*

The net historical and projected operating budget for the assets included in this plan are shown in Table 94.

Table 94. Net Operating Budget for Services ($'000)

Operating Budget Category	2019	2020	2021 (Projected)
Roads Operations*	54,908	56,860	57,814
Stormwater**	141	224	190
Water Treatment	22,741	23,292	23,272
Wastewater Treatment	38,957	40,083	39,676
Water Distribution	26,933	26,759	27,369
Wastewater Collection	19,939	20,604	21,688
Water and Wastewater Infrastructure Management	97,060	103,051	108,735

Source: *Adapted from Halton Region (2021) Budget and Business Plan, p. 71 and 73 and Halton Region (2020) Budget and Business Plan, p. 56 and 58.*

Notes:

* *Roads Operations includes the total amounts publicized within the Halton Region 2020 and 2021 Budget and Business Plans, with the Stormwater amount from the following row deducted.*

** *The Stormwater operating budget is included within the Roads Operations category within the Halton Region 2020 and 2021 Budget and Business Plans, however, have been separated within this table.*

The following table provides the forecasted 10-year annual tax and non-tax operating budget. For the purposes of forecasting in the financial strategy, the net expenditure change has been applied to the operating budget items.

Table 95. Ten Year Operating Budget Forecast ($'000)

Year	Net Tax Expenditures	Net Expenditure Change	Water and Wastewater Net Expenditures	Net Expenditure Change
2021	285,847	3.2%	220,740	2.6%
2022	298,134	4.3%	229,575	3.3%
2023	311,482	4.5%	238,793	3.3%
2024	323,522	3.9%	248,103	3.2%
2025	335,826	3.8%	257,751	3.2%
2026	348,826	2.9%	266,192	3.2%
2027	362,018	3.8%	274,593	3.1%
2028	375,553	3.7%	283,294	3.1%
2029	389,468	3.7%	292,297	3.1%
2030	404,160	3.8%	301,535	3.1%

Source: *Adapted from Halton Region (2021) Budget and Business Plan, pp. 79 -80*

16.3 Capital Financing and Expenditures

The capital budget is used to build the infrastructure assets that form the backbone of the provision of almost all Region services. In-addition, the capital budget includes non-infrastructure solutions such as technical studies and master plans. The Region categorizes projects into the following key lifecycle stages:

- Growth
- Maintain Current Levels of Service
- Enhanced Levels of Service
- Efficiency and Optimization
- Regulation and Environmental Protection

For the purposes of this plan, the projects have been further categorized into the lifecycle stages as follows:

- Non-Infrastructure
- Maintenance
- Renewal/Rehabilitation
- Replacement
- Expansion
- Service Improvement
- Disposal

Table 96 shows the historical capital expenditures by lifecycle category for each of the asset portfolios. As can be seen from the table, the highest overall expenditures can be found within the expansion lifecycle category, which is reflective of the significant growth the Halton Region has been experiencing in recent years. Historical expenditures for non-core asset groups were not available categorized by lifecycle stage at the time of developing this plan.

Table 96. Historical Expenditures by Lifecycle Stage ($'000)

Asset Category	2018	2019	2020
Transportation and Stormwater	**98,051,925**	**146,447,366**	**135,058,475**
Non-Infrastructure	1,784,184	1,114,247	1,155,585
Renewal/Rehabilitation	36,833,391	32,544,682	30,728,013
Replacement/Constr.	3,946,660	6,757,385	1,507,343
Service Improvement	1,128	15,429	298,208
Expansion/Growth	55,486,562	106,015,623	101,369,327
Wastewater	**73,497,485**	**55,708,591**	**29,247,191**
Non-Infrastructure	3,103,656	1,906,036	1,818,341
Renewal/Rehabilitation	10,734,763	13,696,223	8,742,056
Replacement/Constr.	9,948,027	12,684,511	9,078,503
Service Improvement	705,126	3,303,716	834,659
Expansion/Growth	48,874,973	24,067,654	8,706,436
Disposal	130,941	50,450	67,197
Water	**128,593,319**	**76,903,366**	**37,034,287**
Non-Infrastructure	587,198	814,056	462,794
Renewal/Rehabilitation	316,256	1,861,410	3,781,821
Replacement/Constr.	37,157,673	30,237,847	20,870,176
Service Improvement	750,970	280,178	259,545
Expansion/Growth	89,781,207	43,674,498	11,653,649
Disposal	16	35,378	6,302
Grand Total	**300,142,730**	**279,059,323**	**201,339,953**

16.4 Reserves & Reserve Funds

The Region has a number of reserves and reserve funds that are each used for a specific purpose. The financing of the capital program requires a well-balanced funding strategy involving the Region's reserve and reserve funds, debentures and recovery from growth through Development Charges.

The Region utilizes reserves and reserve funds to finance the State-of-Good-Repair capital program for existing infrastructure. The reserves (including

operating contributions, Gas Tax revenue, and investment earnings) are used in support of the Region's pay-as-you-go approach in financing the ongoing or recurring lifecycle requirements. Debt financing is utilized for significant upgrade and rehabilitation initiatives, ensuring that the operating impacts from the significant capital program remain smooth and that the timing of revenue recoveries from rate/tax payers is appropriately matched with the benefit of infrastructure.

The Region relies on Development Charges to finance new/expansion infrastructure required for growth. Development Charges, combined with the Regional interim financing through the Capital Investment Revolving Fund, Tax Capital Reserve and debt, are used for the financing of growth-related projects consistent with FN-46-19/ PW-50-19/ LPS112-19.

In particular, the Regional interim financing is provided for the non-residential employment capital cost share and will be recovered from future Development Charges including carrying costs under the financing plan. This plan ensures that all growth-related costs that can be recovered under the DC by-law will be recovered and that Halton's strong financial position is not compromised.

Table 97 provides an overview of the 2019 reserve position and projected 2020 reserve ending balances.

Table 97. 2019 Reserve Position and Projected 2020 Ending Balances ($'000)

Description	2019 Ending	2020 Projected Ending
Reserves		
Tax Stabilization	71,452	82,702
Rate Stabilization	33,487	36,012
Program Specific	60,969	55,489
Vehicle & Equipment	85,255	77,808
Tax Capital	408,271	425,648
Rate Capital	282,984	245,816
Capital Investment Revolving Fund	112,431	97,478
Reserve Funds		
Corporate	201,538	198,987
Development Charges	-63,853	18,292

Source: *Adapted from Halton Region (2021) Budget and Business Plan, p. 96*

16.5 Debenture Financing

When debt financing is required, the Region leverages its long history of maintaining a AAA credit rating to obtain the most competitive rates available in the markets typically over a 10-year term. This is considered financially prudent in order to maintain financial flexibility in the face of significant and changing funding requirements.

These requirements occur over the forecast period to accommodate new construction, replacement and upgrade of capital assets. Notwithstanding, the Region continues to monitor market conditions to best utilize longer-term debt financing. For instance, the Region issued a 30-year term sinking fund debt in the amount of $106.0 million in 2011 to service strategic employment lands (CS-33-11/ PW-53-11/ LPS58-11 re: 2011 Water and Wastewater Servicing to Employment Lands in Halton) and $62.5 million in 2015 to construct the new Police Headquarters. The 2021 Budget and

Forecast projects a total of $5.1 million in debt financing over the next 10 years to accommodate the Police 1 District Facility needs in Georgetown/Milton.

For a detailed discussion on debt financing and the projected debt financing, please see Halton Region (2021) Budget and Business Plan pages 91 to 93.

16.6 Projected Financing Strategies

This financing strategy section discusses Region financing with the focus on infrastructure funding. It is assumed that the Region will continue to practice prudent and responsible financial management principles including:

- Promote affordable and competitive property taxes
- Reduce debt levels and costs
- Promote pay-as-you-go financing
- Contain costs
- Ensure adequacy of reserves and reserve funds
- Invest strategically
- Adopt proven asset management techniques

As highlighted previously, the Region utilizes a range of strategies to address infrastructure funding needs, including:

- Contribution to reserves (i.e., a portion of annual revenues goes directly to fund infrastructure)
- Debt Management
- Reserves and Reserve Funds
- Grants and Subsidies
- Development Charges

For the purposes of this analysis, the non-growth investment needs have been assessed against the Tax Capital and Rate Capital Reserves for each of the next 10 years. The assumed annual expenditures are based on the lifecycle costing analysis outlined within each asset portfolio section. Figure 79. Forecasted Asset Portfolio Expenditures – Tax Supported Assets

provides the forecasted annual expenditures for tax supported assets. The replacement/construction activities, rehabilitation, and non-infrastructure solutions would impact the Tax Capital Reserve. Figure 80 shows the forecasted annual expenditures for the water and wastewater asset portfolios. The replacement/construction activities, rehabilitation, and non-infrastructure solutions would impact the Rate Capital Reserve.

Figure 79. Forecasted Asset Portfolio Expenditures – Tax Supported Assets

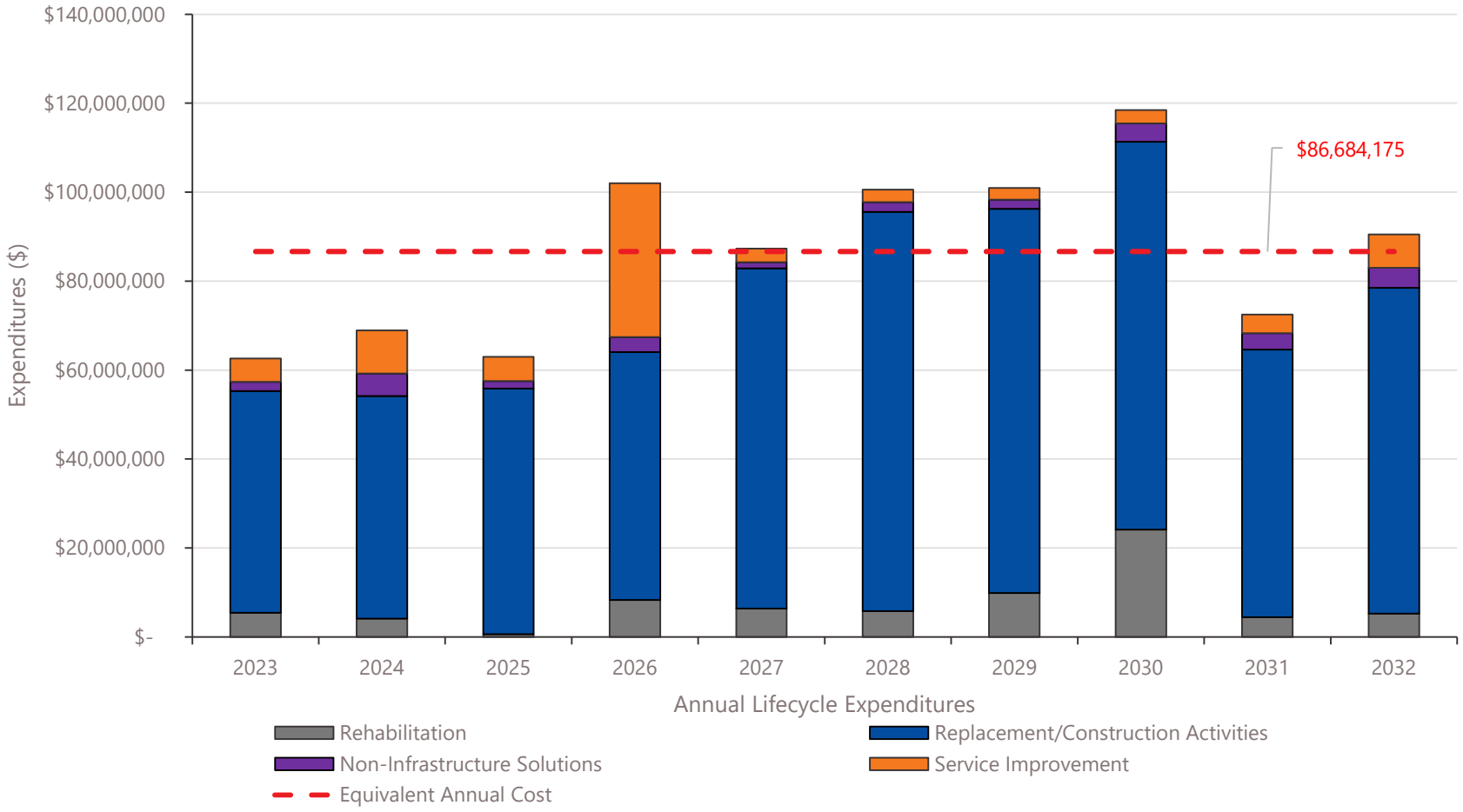
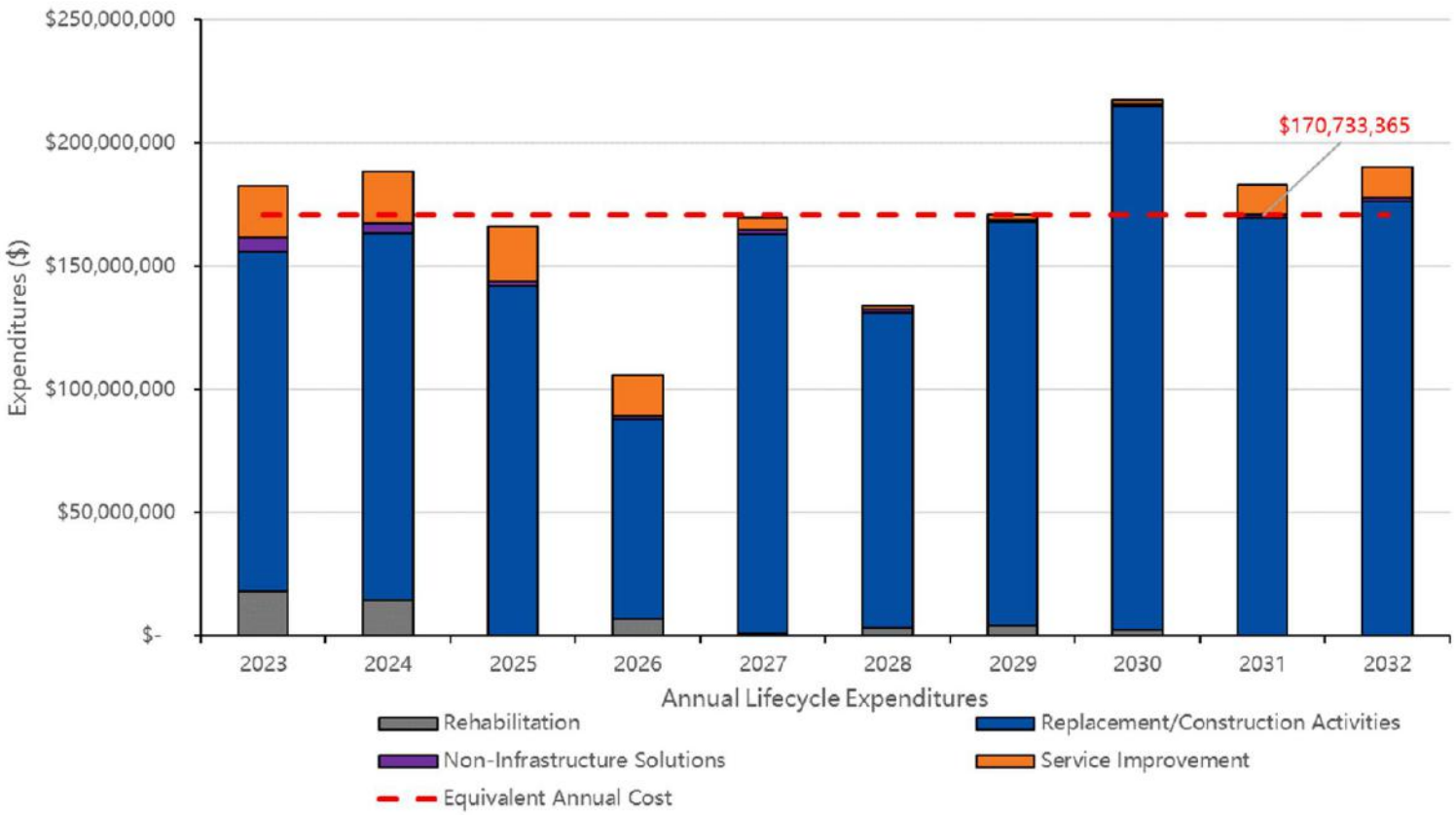


Figure 80. Forecasted Asset Portfolio Expenditures – Water and Wastewater



The financing strategy included in this Asset Management Plan Update sets out the approach to ensure that the appropriate funds are available to support the delivery of the specified Levels of Service. The financing strategy considers the revenues, operating and capital expenditures, debt, and future commitments for operating or capital activities related to the assets included within the plan. As part of the Asset Management Plan Update, the long-term sustainability of the reserve balances was analyzed against the 100-year capital needs assessment in the lifecycle models. It is projected that the transfers to reserves will continue to increase to account for future state of good repair capital investments. The annual operating contributions to reserves from property taxes and utility rate revenues are assessed each year as part of the annual Budget and Business Plan forecast.

17.0 Improvement and Monitoring

Table 98.

As outlined throughout this document, the Region has demonstrated commitment to continuous improvement over more than a decade that includes data improvements, decision-making optimization, and strategic planning. Throughout the development of this plan, any assumptions and opportunities for improvement have been documented with the goal of improving future iterations of the plan. This section further describes overall asset management maturity within the asset portfolios included within the plan.

17.1 Improving Future Asset Management Plans

Gaps identified by asset group, along with the assumptions that were made to fill them in the preparation of this Asset Management Plan serve as a basis for how future iterations may be improved. These are summarized by category in

Table 98. Opportunities by Section

Section	Opportunity
Transportation	Data confidence for road right-of-way and traffic signal network were assessed as low and very-low, respectively. To improve the quality of data for these asset groups it is proposed that an asset registry is developed for each; broken out to the component level, capturing any applicable attributes. The very high confidence ratings for roadway and structures data may be maintained by continuing the three and two-year cycles for condition assessments (roadway and structures, respectively).
Water	The data confidence rating for all water assets (water transmission and water treatment) is medium. To further improve the asset registry for water transmission assets, opportunistic samples should be taken at pipe failure events and during construction to corroborate the predictive models that have been developed. For water treatment assets, continue with the completion of capital needs assessments on the remaining facilities; using consistent templates and deliverable formats to address inconsistencies noted in format and ratings.
Wastewater	The data confidence rating for wastewater assets is medium to high. To improve data quality for forcemains, opportunistic samples should be taken from pipe failure events and during construction to corroborate the predictive models that have been developed. Data for gravity mains was given a high confidence rating, however consideration should be given to an increase in CCTV inspection frequency in high-risk locations. The remaining asset groups which fall under both collection and treatment (pumping stations, storage, biosolids management, and treatment plant) received a data confidence rating of medium to high. These data can be improved by continuing with the completion of condition needs assessments on facilities where TCA data was used, ensuring consistent templates and deliverable formats are used to aid in data compilation. Register data should be stored in a single source.
Stormwater	Data confidence for storm mains and stormwater pumping stations were assessed as low and very high, respectively. Since storm main condition data is primarily based pipe age, a dedicated CCTV inspection program for storm sewers is recommended. To maintain the very high quality of storm pumping station data, facilities should be re-inspected no more than 5 years from the original inspection.

17.2 Advancing Corporate Asset Management Capabilities

In recent years, several international standards for asset management have been developed including:

- ISO 55000
- International Infrastructure Management Manual (IIMM) 2015
- BSI PAS55:2008
- CNAM Asset Management Competency Framework

These standards have been developed based on international collaboration and are widely accepted as best practices in the field of asset management. Key principals of asset management maturity are defined within each, providing frameworks which a municipality can evaluate their own efforts in asset management, identifying areas to advance maturity and capabilities within their organization.

17.2.1 Capability Assessment

Through the development of this plan, an asset management capability assessment was conducted to provide an objective review of each stakeholder group's current and target asset management capabilities.

This assessment used the ISO AM Standard (ISO 55000) and most recently the Global Forum for Maintenance and Asset Management's asset management elements. Each of the nine asset management elements (and sub-elements) were evaluated on the ISO 55000 Maturity Rating Scale, ranging from 0, Innocent- *the organisation is starting to learn about the importance of asset management* (informal or undocumented capabilities) to 5, Excelling- *the organisation asset management activities are fully integrated and are being continuously improved to deliver optimal whole asset life value*, (documented, structured and fully implemented capabilities in-line with industry best practices) as defined in the chart on the following page.

Stakeholders were asked to provide their current and target practices in the following categories:

- Corporate Asset Management Policy
- Customer Levels of Service and KPIs
- Technical Levels of Service and KPIs
- Growth Management
- Asset Management Plan
- Lifecycle Asset Management
- Risk Management
- Optimized Decision Making
- Work Planning and Execution
- Capital and Asset Maintenance Plans
- Financial Strategy, Planning and Reporting
- Asset Knowledge
- Resources
- Quality Management
- Technology and Tools
- Continuous Improvement

Figure 81 provides the overall average current and target state for each of the capability areas. Overall, the average capabilities are between Establishing and Competence. The capabilities with high opportunities for improvement are Technology and Tools, Quality Management and Continuous Improvement. The overall target based on the stakeholder feedback is to move towards the level 4 or 5 capabilities in each area.

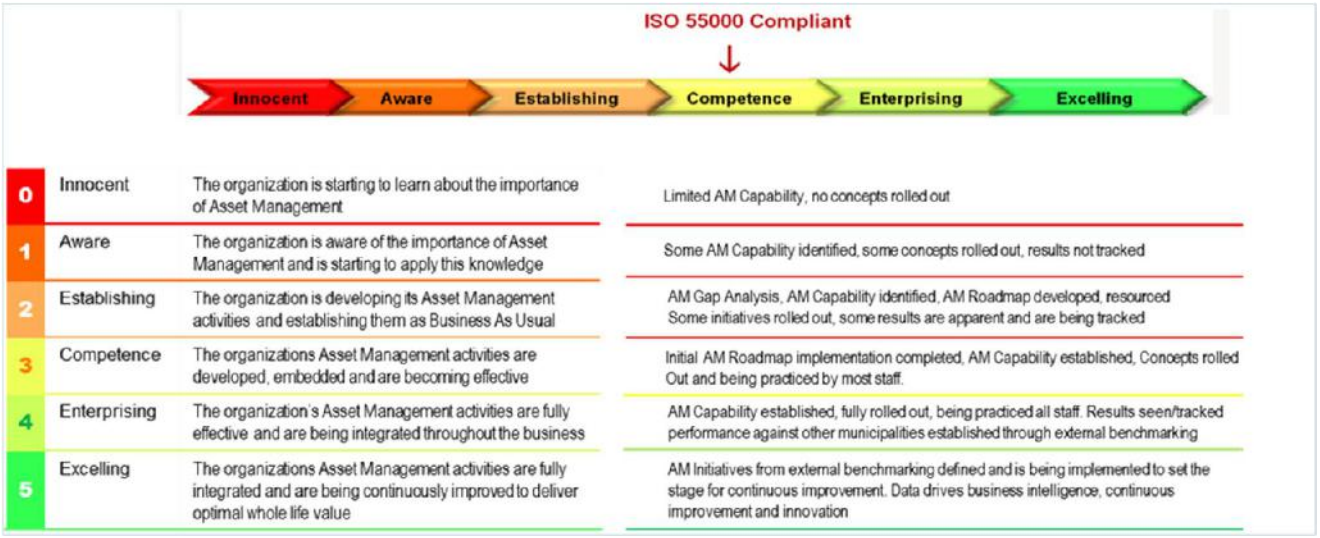
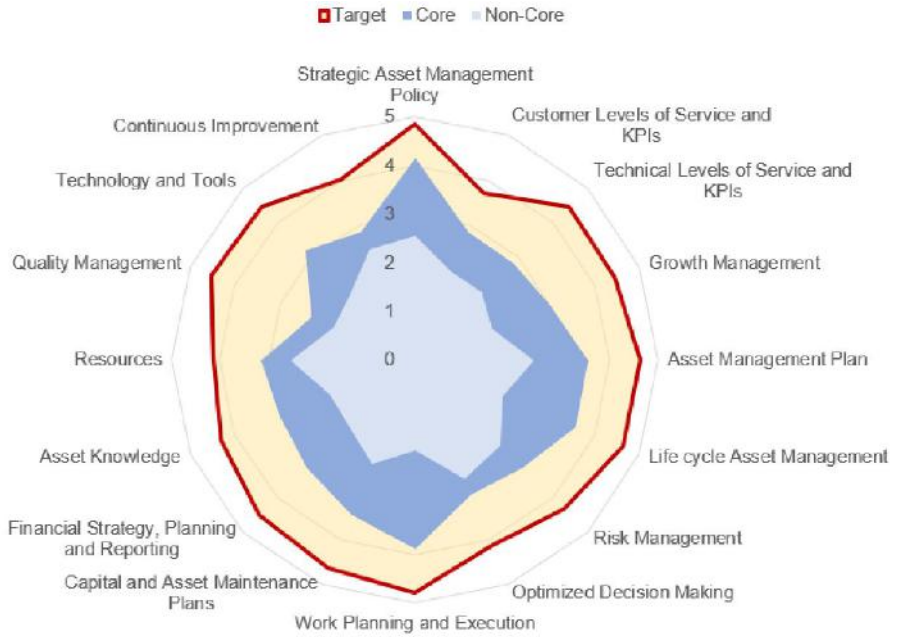


Figure 81. Overall Capability Assessment Results



Currently, the management capabilities for core assets are at the intermediate to advanced levels. An overall roadmap has been developed, and the objectives include:

- Reviewing and documenting alignment of business plans and budgets with asset management policy objectives and strategic asset management plan. Establish defined audit and updating procedures.
- Formalizing an enterprise-wide asset management governance structure
- Developing a corporate condition and risk assessment protocol
- Developing an asset-level risk evaluation framework and forecasting tools.
- Documenting standard operating procedures (SOPs) and processes for all O&M activities.
- Documenting the asset management organization structure (in alignment with the governance structure), including roles, and position descriptions for key roles.
- Establishing an internal asset management awareness and capability development program for staff identified within the asset management organization structure.
- Defining an enterprise asset information management strategy, including asset hierarchy, asset register, data management processes, roles and responsibilities.
- Reviewing and approving asset management improvement roadmap initiatives. Establishing annual progress updates to senior management

Additional items are provided in an overall asset management roadmap. Overall, the Region has initiated several significant enhancements to asset management practices over the last decade, resulting in high levels of asset management capabilities in some departments. There is an overall desire to advance asset management within each group in the Region, with the foundational elements currently underway. As the target range for all asset management components was identified to be between 4 and 5, it is clear staff understand and are striving towards best practices in asset management.

Building upon over 10 years of significant efforts from across the organization, this plan sets the foundation for the next steps in the Region's Asset Management journey. This approach will continue to provide a robust, transparent and consistent methodology while maintaining the Region's strong financial position and long-term sustainability.

Halton Region's commitment to managing its assets aligns with directions and objectives reflected in Halton's Budget and Business Plan, Strategic Business Plan and Regional Official Plan. The asset management program is a key component in achieving Halton Region's vision – to enhance the quality of life for all people of Halton today and into the future.

17.2.2 Core Assets

While the assessment considered all Halton assets, it was recognized that a more detailed evaluation of Maturity Assessment for core assets would be beneficial, given the relative proportion of asset value, with a goal to refresh the Asset Management Roadmap Implementation Plan, last developed in 2015. This analysis was completed for core assets in 2021 by SLBC Inc. and a copy of the final report is provided in Appendix B for reference. The following summarizes the results of this assessment.

17 Improvement and Monitoring

Maturity
Innocent
Aware
Establishing
Competent
Enterprising
Excelling

Focus Area		AM Element No	ISO 55000	2021 Rating	2023 Rating	2026 Rating
SD - Setting Direction	Asset Management Policy	SD-1	3	2.5	3	5
	Asset Management Strategy	SD-2	3	2.5	3.5	4
	Demand Analysis	SD-3	3	3.3	3.75	4
	Setting Asset Management Objectives	SD-4	3	3	3.5	4
PROG - Programming	Accounting and Costing	PROG-1	3	2.75	3.375	4.125
	Asset Investment Planning	PROG-2	3	2.5	3	4
	Capital Expenditure Evaluation	PROG-3	3	2.5	3	3.5
PREP - Preparation	Operations & Maintenance Decision Making	PREP-1	3	2.5	3.5	4.5
	Asset Management Plans	PREP-2	3	2	3.5	4.5
	Implementation of Asset Management Plans	PREP-3	3	2	3.5	4
IMPL - Implementation	Operations	IMPL-1	3	3.38	4	4.25
	Creation & Acquisition	IMPL-2	3	3	4	4.5
	Maintenance	IMPL-3	3	3.38	4	4.5
	Work and Resource Management	IMPL-4	3	3.13	4.375	4.5
	Rationalisation and Disposal	IMPL-5	3	3.5	4.5	5
MNTR - Asset Monitoring	Asset Condition Monitoring	MNTR-1	3	2.88	3.625	4
	Asset Performance Monitoring	MNTR-2	3	2.25	3.5	4.5
	Asset Investigation	MNTR-3	3	3	3.5	4.5
MSR - Management System Review	Management System	MSR-1	3	2.5	3	4
	Business Risk Management	MSR-2	3	2.5	3.5	4.5
	Asset Risk Management	MSR-3	3	2.75	3.75	4.5
	Continuous Improvement	MSR-4	3	2.5	3	4
	Legal, Regulatory and Other Requirements	MSR-5	3	3.88	4.5	5
ORG - People & Organisation	Goveranance	ORG-1	3	2.75	3.5	3.5
	People Resoruces	ORG-2	3	2.25	3.5	3.5
	Right Sourcing	ORG-3	3	2.5	3.5	3.5
	Stakeholder Engagement	ORG-4	3	2	3	4
D&I - Data & Information	Processes for Managing Asset Knowledge	D&I -1	3	2.25	3.5	4.5
	Asset Data and Knowledge	D&I-2	3	2.13	3.5	4.5
	Activity Data and Knowledge	D&I-3	3	2	3.5	4.5
SYS - Technology	Technology Landscape and Architecture	SYS-1	3	1.5	3.5	4.5
	Financial and Administrative Information Systems	SYS-2	3	2	3.5	4.5
	Service Delivery Information Systems (e.g. CMMS,GIS, Risk, PMIS)	SYS-3	3	2.13	3.75	4.375
	Supply and Logistic Management Information Systems	SYS-4	3	2.75	3.5	4.5
	Advanced Information Systems	SYS-5	3	1.5	3	4
			3.0	**2.6**	**3.5**	**4.3**

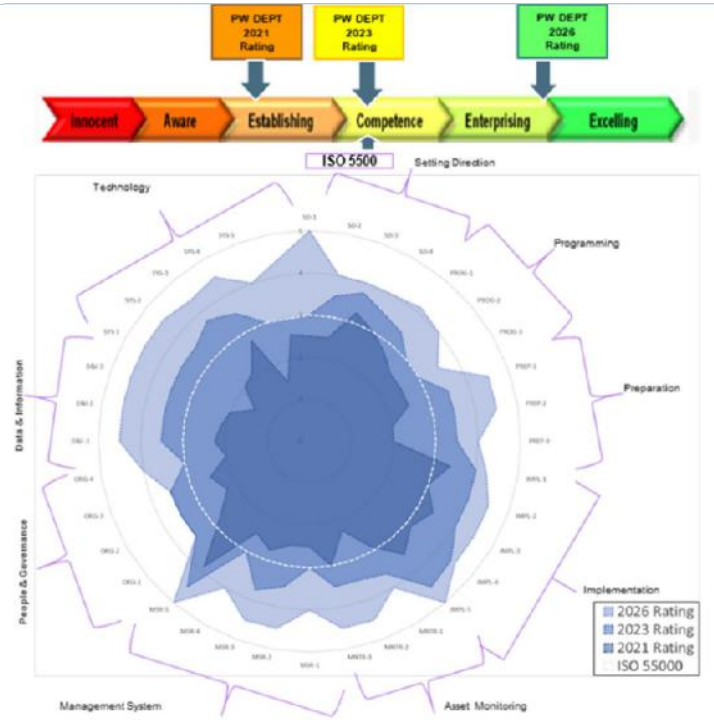


Figure 82. Maturity Assessment Results

Through the project, a number of gaps and related opportunities were identified for core assets, including:

Setting Direction	• Update of the AM Policy and Objectives to incorporate new and emerging business drivers • Review and update the AM Strategy/improvement roadmap and report on program benefits • Incorporate risk management in the Master Planning process
Programming	• Refine/update AM Planning processes • Continue to build on options analysis and business cases
Preparation	• Leverage existing operations and maintenance practices to create an O&M Master Plan • Develop, document and implement processes for AM Plan development to meet O.Reg 588/17 requirements • Clearly define roles and responsibilities for AM Plan implementation
Implementation	• Develop MRO and AM Readiness specifications • Build on asset criticality work being done at W-WW Treatment • Continue to review, refine, and document processes for work and resource
Asset Monitoring	• Leverage asset criticality to set up condition assessment PMs in the CMMS • Improve Asset Performance Monitoring focusing on Strategic, Tactical and Operational dashboards • Improve Asset Incident Investigation
Technology Systems	• Provide input into the Corporate Digital Master Plan • Leverage Project Accounting in SAP ERP • Improve materials management to allow materials costs to be tracked to the asset level • Implement a Project Management Information System (PMIS) to support project delivery • Implement advanced analytic functions for decision making
Data and Information	• Implement standard processes for managing data and information • Document and implement data standards for managing asset and activity knowledge • Conduct data collection/updates to close historic data gaps
People and Organization	• Update AM governance processes – include Divisional Requirements • Continue to develop, document and implement processes for Right Sourcing • Document and implement processes for improved stakeholder engagement
Management System	• Improve the asset management framework that includes process diagrams/flow charts and records • Leverage the Business Risk Management Framework for LOS Business Continuity Plans • Develop and maintain processes to audit for continual improvement of the AM system and processes

The detailed assessment allowed for the identification of a series of prioritized recommendations to update the Asset Management Roadmap to improve asset management maturity in for core assets.

The key initiatives are presented in Figure 83, along with the proposed implementation roadmap in Figure 84.

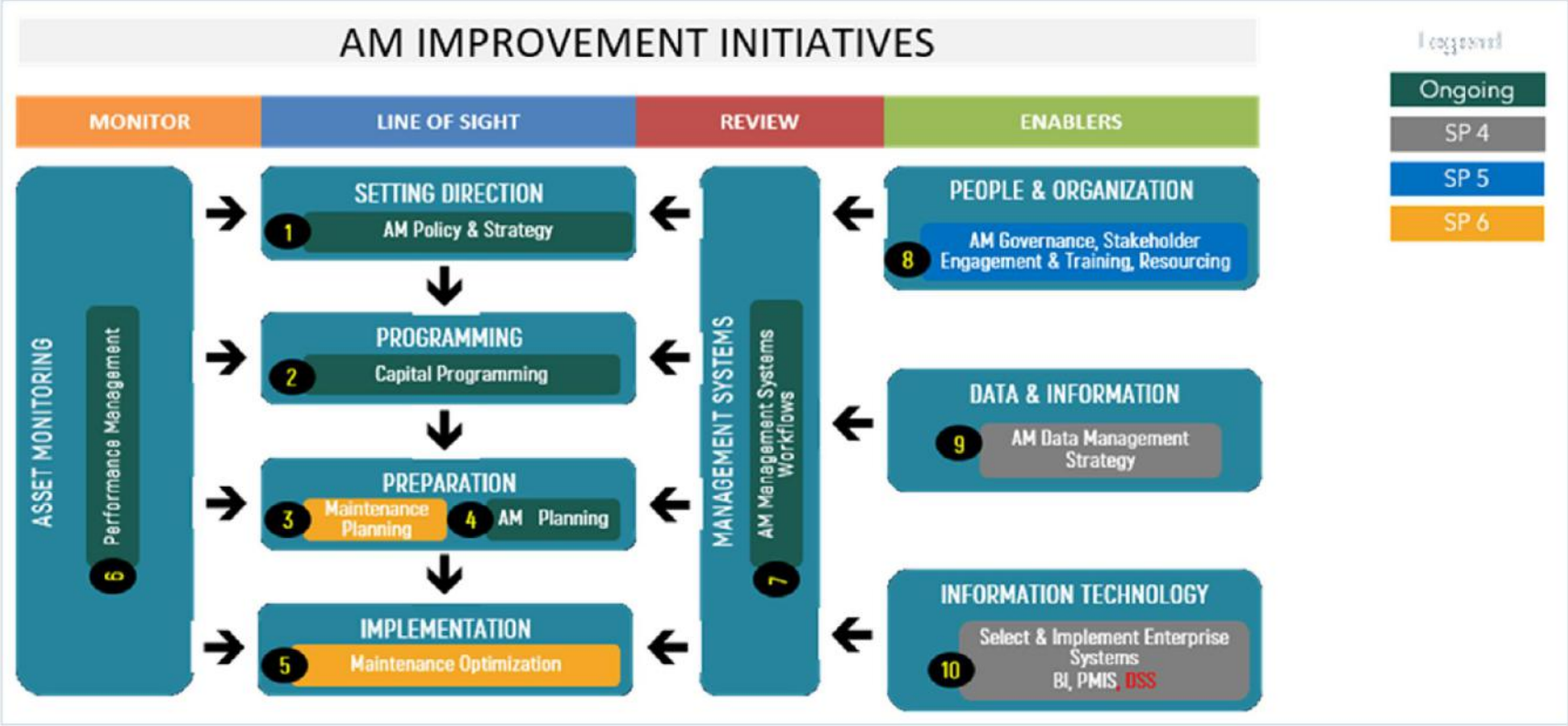


Figure 83. Maturity Assessment Improvement Initiatives

The project summarized an implementation roadmap for Halton for these asset management initiatives, as provided below.

Figure 84. Asset Management Program Implementation Roadmap

Staff are currently assessing the resources required to implement the recommendations of both assessment surveys along with alignment with other key Region initiatives, including the Digital Strategy, and will continue to advise on progress through the annual budget process.

17.3 Core Assets – Reliability Centred, Maintenance Management

The Region has begun developing a maintenance management strategy for core assets that considers opportunities to coordinate effort and to realize value from assets by balancing cost, risk and performance in a way that is aligned to the strategic plan.

The collaborative implementation of innovative asset care strategies to extend the life of installed assets has improved the Region's environmental stewardship, fiscal responsibility and capital decision making in support of a sustainable asset management program.

Realizing the Region's strategic vision that maintenance management is a prerequisite of effective asset management has created a new municipal standard and ability to have a clear line of sight on asset management as demonstrated in Figures 85-89 below.

17.3.1 Strategic Intent 2018 -2022

Figure 85. Strategic Business Plan and Reliability Centred Maintenance Actions

Strategic Intent: Develop and Implement a Reliability Centered Maintenance Program to ensure state-of-good-repair of core Infrastructure.

In order to effectively deploy strategic intent, treatment plant maintenance developed a sustainability growth plan that considered a combination of systems, business process, training and performance management, while incorporating specific targets for improvement across pillars of good practice, zero unplanned stops and sustainability as described in Figure 86.

This blueprint integrates the strategic needs of the Region along with asset management good practices to inform the three critical Maintenance Management Pillars.

To realize this plan, the Region made a number of strategic investments in SAP enhancements and staff recruitment to support the delivery and sustainability of the program; building a strong team and leveraging maintenance management good practices has been a major contributing factor in the success of the program.

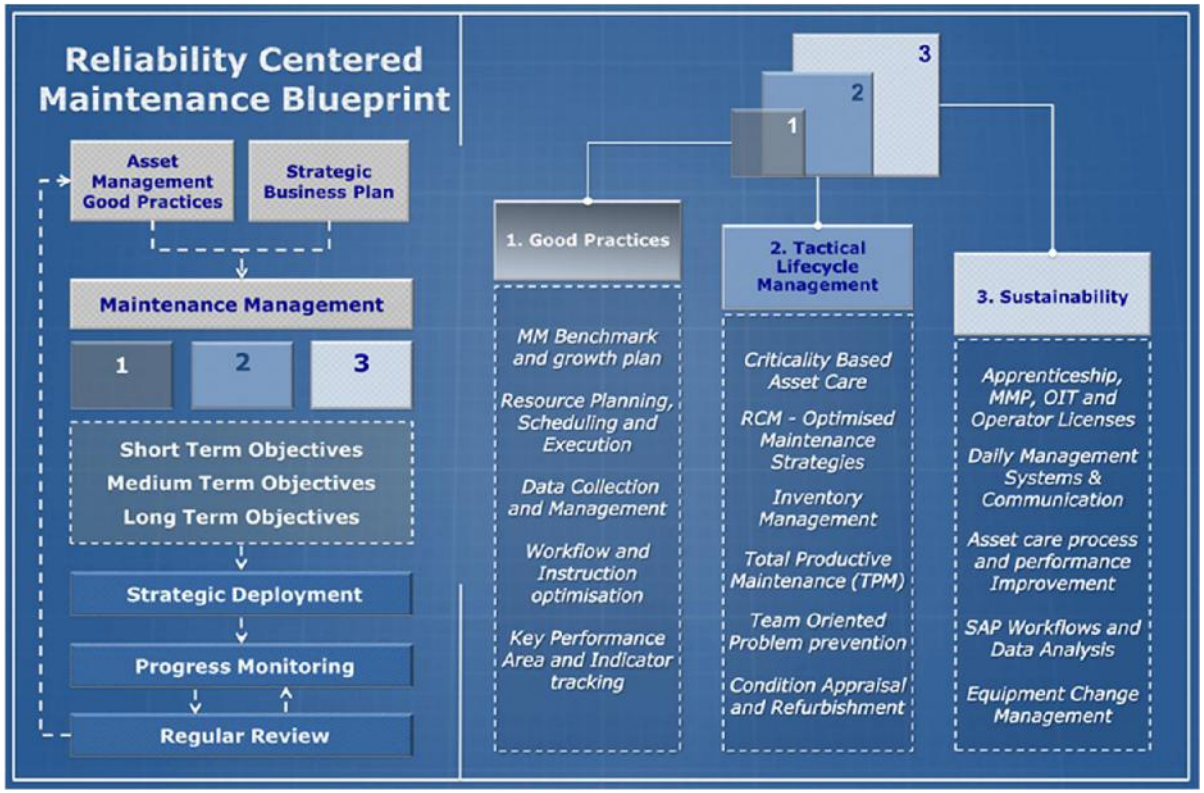


Figure 86. Reliability Centred Maintenance Blueprint

17.3.2 Maintenance Management – Value Centre and Risk Treatment Program

The level of collaboration that has taken place between maintenance and other Regional teams represents a deeper message that provides assurance that the changes made are sustainable. The following examples give a sense of the risk reduction and value creation achieved.

"Increased reliability" translates to reduced level of service risk

The pursuit of "**zero unplanned stops**" has been central to the maintenance team priorities and enhancements to collaboration. Improved proactive work practices have enabled the treatment division to realize "**Improved Reliability**" and with that "**increased value from the assets**".

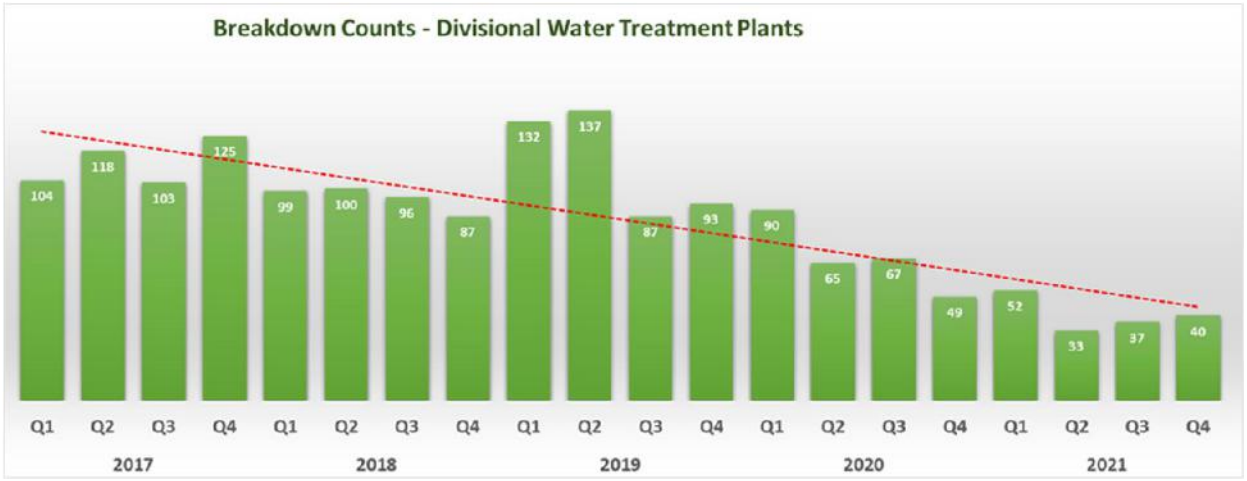


Figure 87. Trending Breakdown counts 2017 – 2021 (Water Treatment Plants)

Figure 88. Trending Breakdown counts 2017 – 2021 (Wastewater Treatment Plants)

"Reduced Capital Replacement" translates to increased value from Installed assets

Just one example of the benefits that has been realized so far is the development of "**tactical asset management strategies**", led by maintenance and utilizing condition appraisals of assets at a component level. This program proposes refurbishment and care plan enhancements as alternate strategies to capital replacement.

In the past four years, "**maintenance invested $1,525,912**" into refurbishment activities and analysis, resulting in **"$15,088,786 reduction in capital replacements**".

$ 15,088,786

Value Generation

Maintenance condition appraisal and refurbishment performance directly contributed to the positive budget variances in the treatment division.

Figure 89. Tactical Lifecycle Value Creation

17.3.3 Enhancing Culture to Unlock Potential

Treatment Plant Maintenance has started a new chapter in its journey of tactical lifecycle management, working with PEMAC Asset Management Association of Canada and the FCM to obtain Maintenance Management Professional (MMP) and Asset Management Professional (CAMP) accreditation for their team.

Continuously reinforcing the importance of the collaboration by breaking down silos has resulted in peer recognition of the team through the PEMAC "Maintenance Team of the Year" – confirming that the Region is heading in the right direction.

As part of the RCM blueprint, the intent is to build upon the foundation created, develop greater collaboration between maintenance and other Asset Management stakeholders and unlock the full potential of the assets and the teams who care for those assets.

18.0 100-Year Analysis

As part of this assignment, lifecycle models were utilized to run a 100 year forecast for each asset group. While the AMP did not require a 100 year window on asset needs, 100 year forecast can be used in financial exercises and support decisions made particularly for assets with longer lifespans. Halton has the lifecycle models and these results and can utilize them in long-term financial planning exercises.

The following section summarizes the results of this 100 year analysis in graphical format for each asset group. Each graph provides the average asset condition by year (blue line) normalized by asset replacement value as well as the annual capital spend forecasted (orange bars).

18.1 Transportation

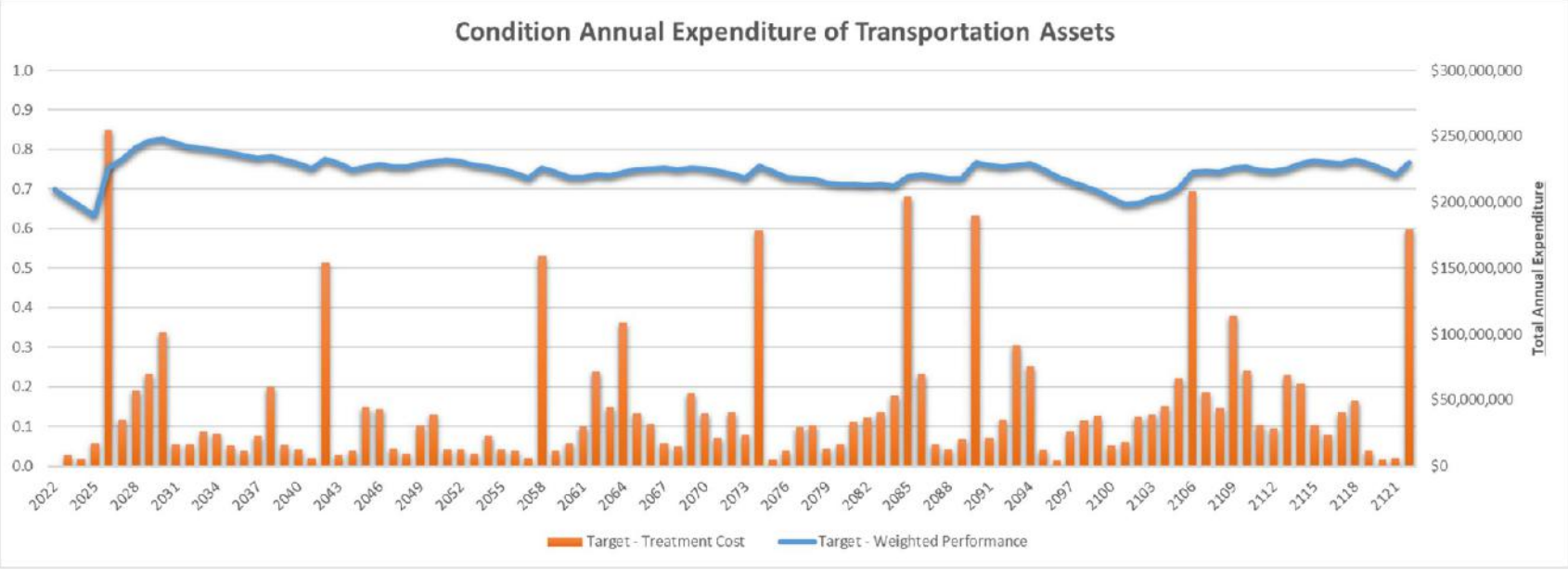


Figure 90. Transportation Expenditure 100-Year Forecast

18.2 Water

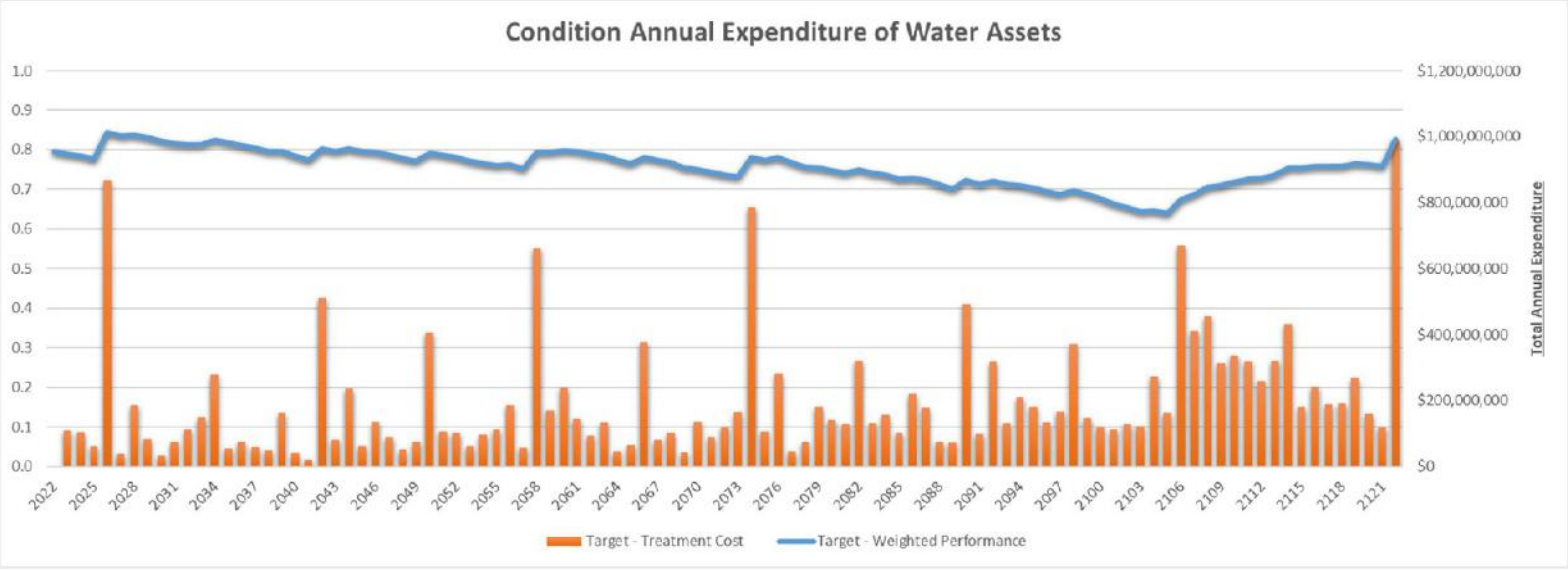


Figure 91. Water Expenditure 100-Year Forecast

18.3 Wastewater

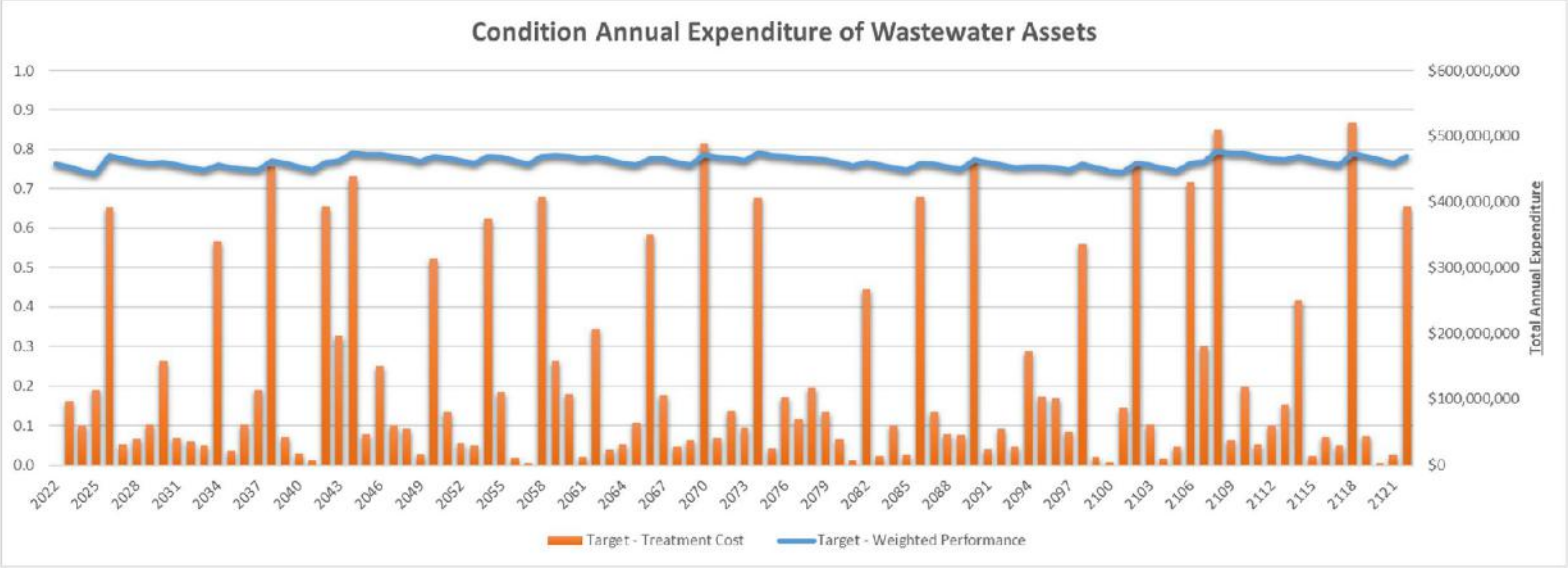


Figure 92. Wastewater Expenditure 100-Year Forecast

18.4 Stormwater

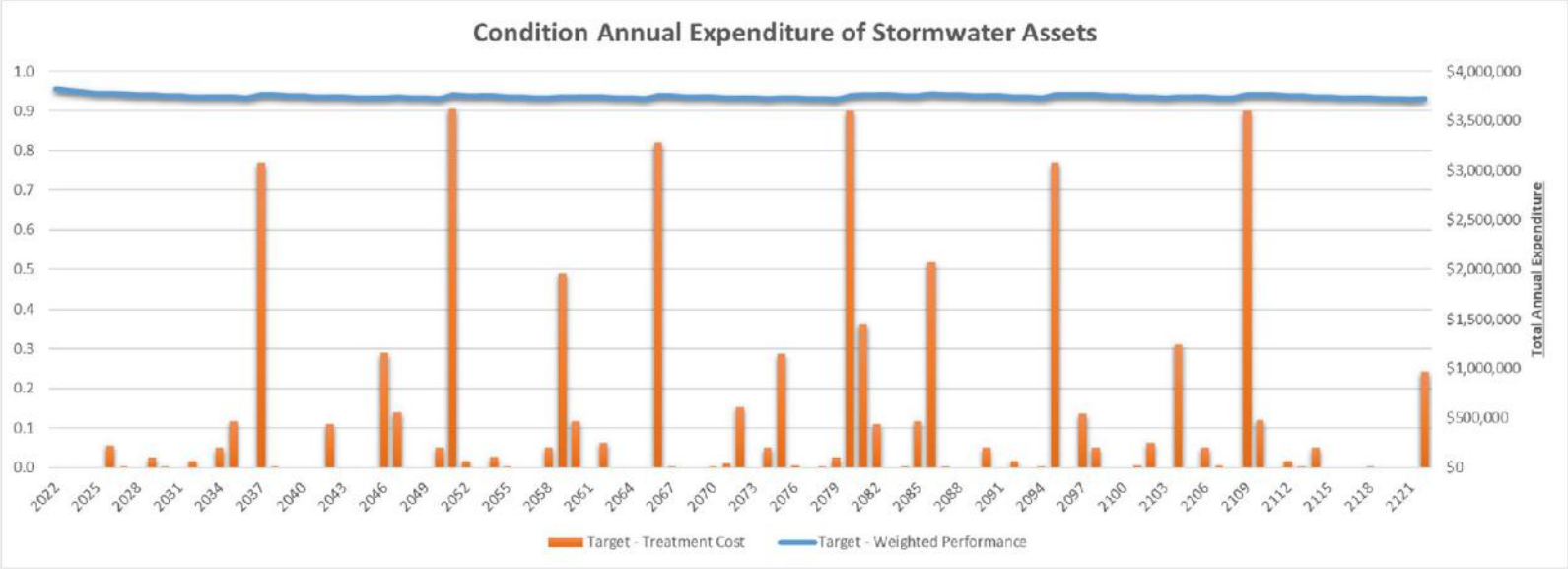


Figure 93. Stormwater Expenditure 100-Year Forecast

18.5 Waste Management

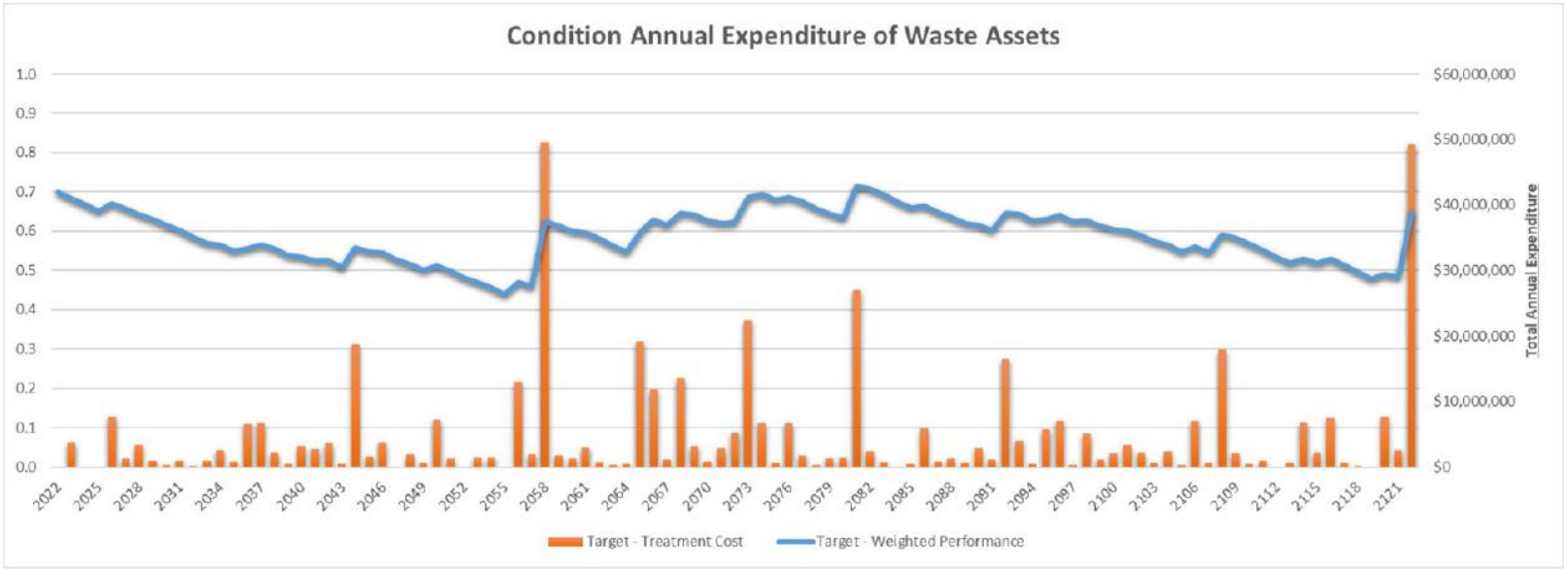


Figure 94. Waste Management Expenditure 100-Year Forecast

18.6 Corporate Facilities

Figure 95. Corporate Facilities Expenditure 100-Year Forecast

18.7 Long-term Care

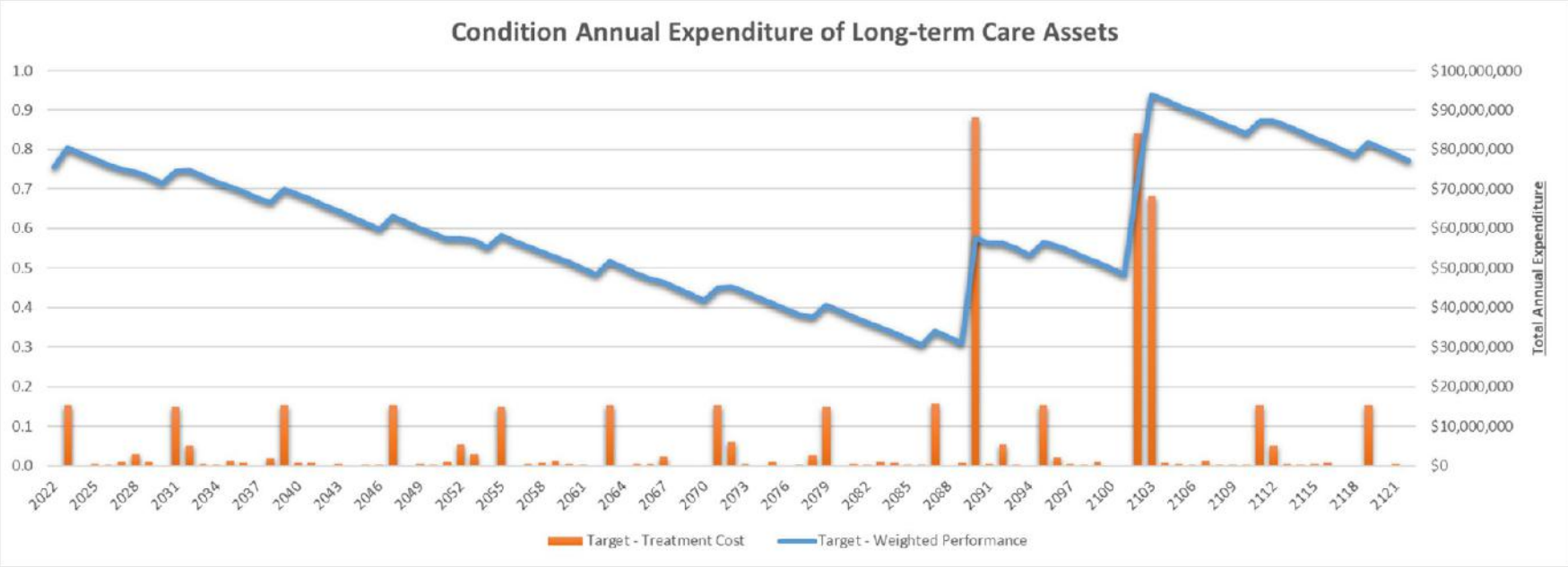


Figure 96. Long-term Care Expenditure 100-Year Forecast

18.8 Halton Community Housing Corporation

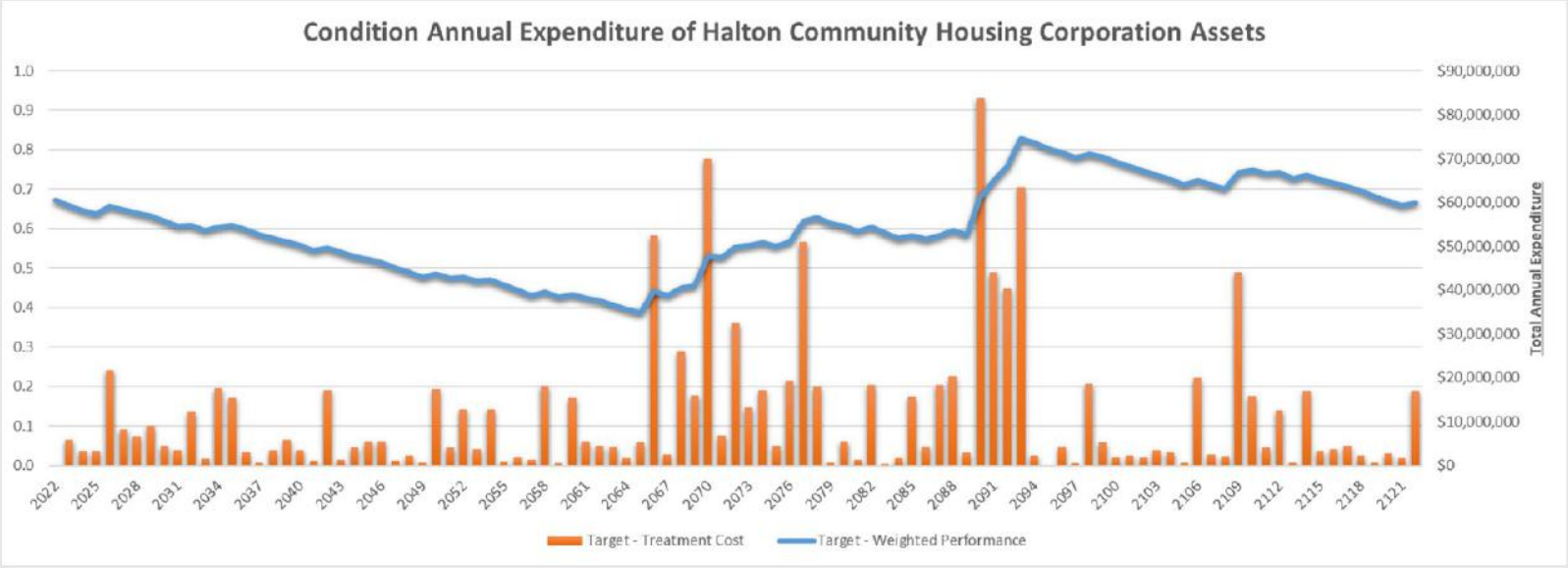


Figure 97. Halton Community Housing Corporation Expenditure 100-Year Forecast

18.9 Police

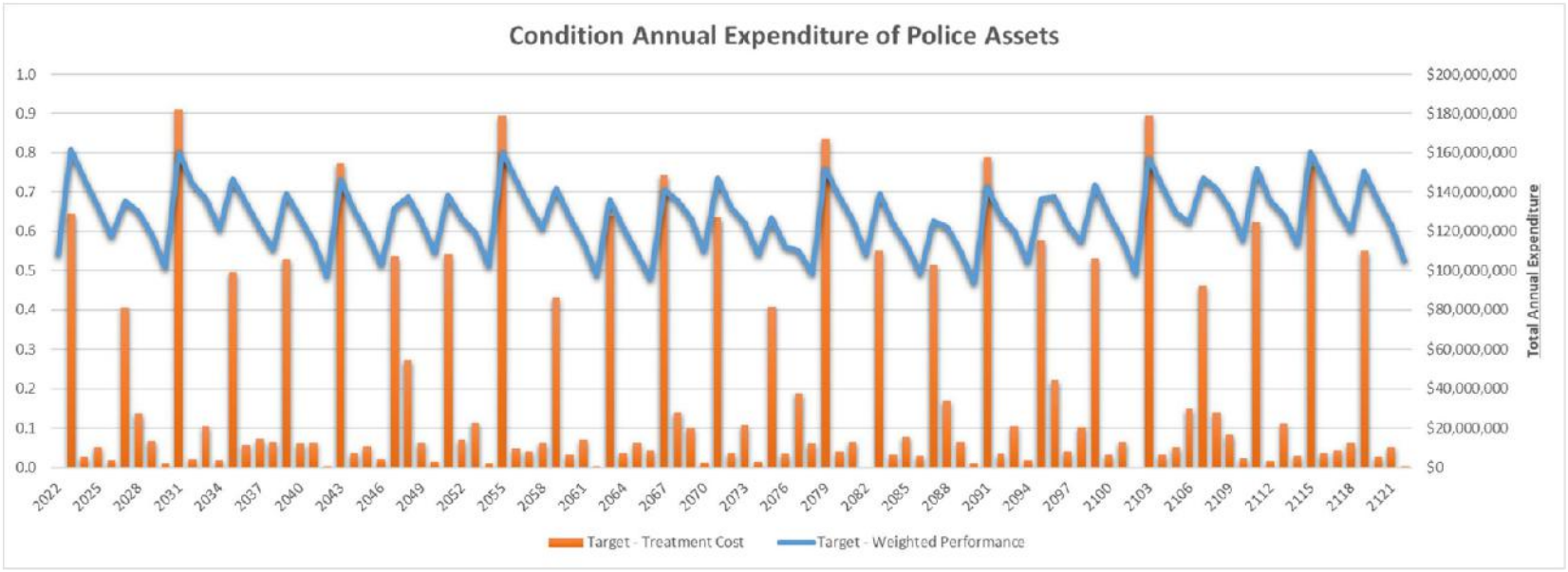


Figure 98. Police Expenditure 100-Year Forecast

18.10 Paramedics

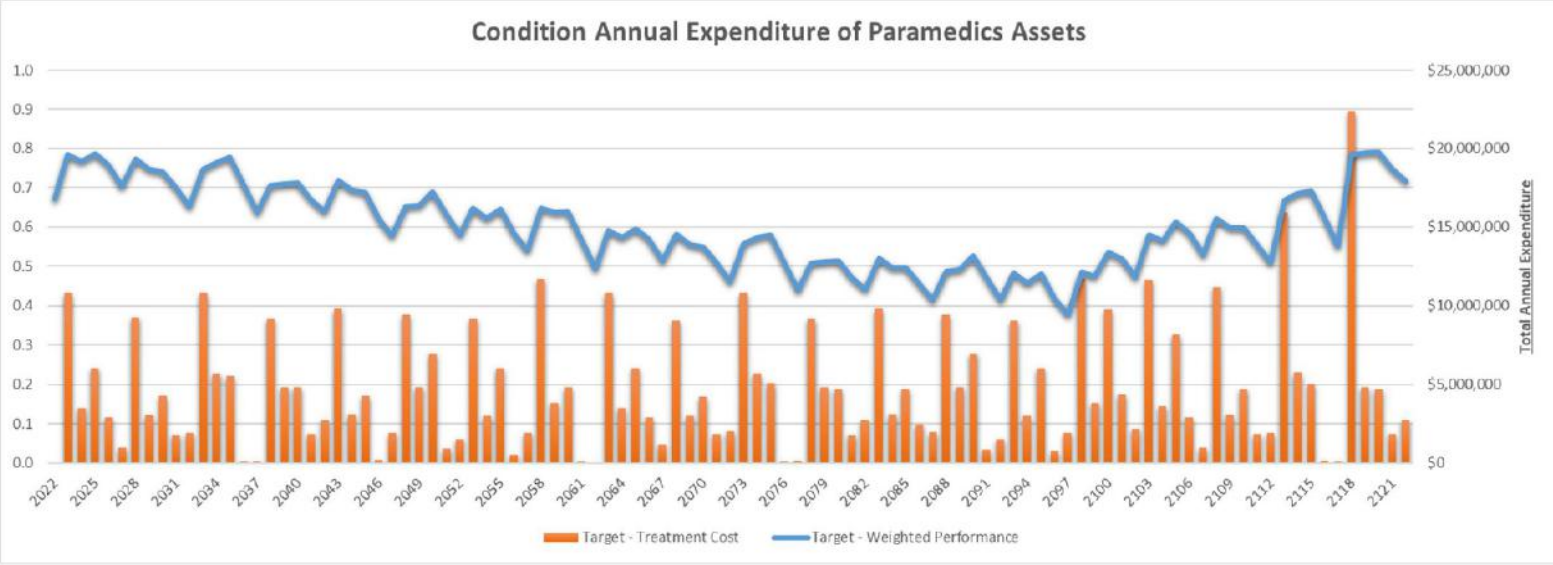


Figure 99. Paramedics Expenditure 100-Year Forecast

18.11 Information Technology

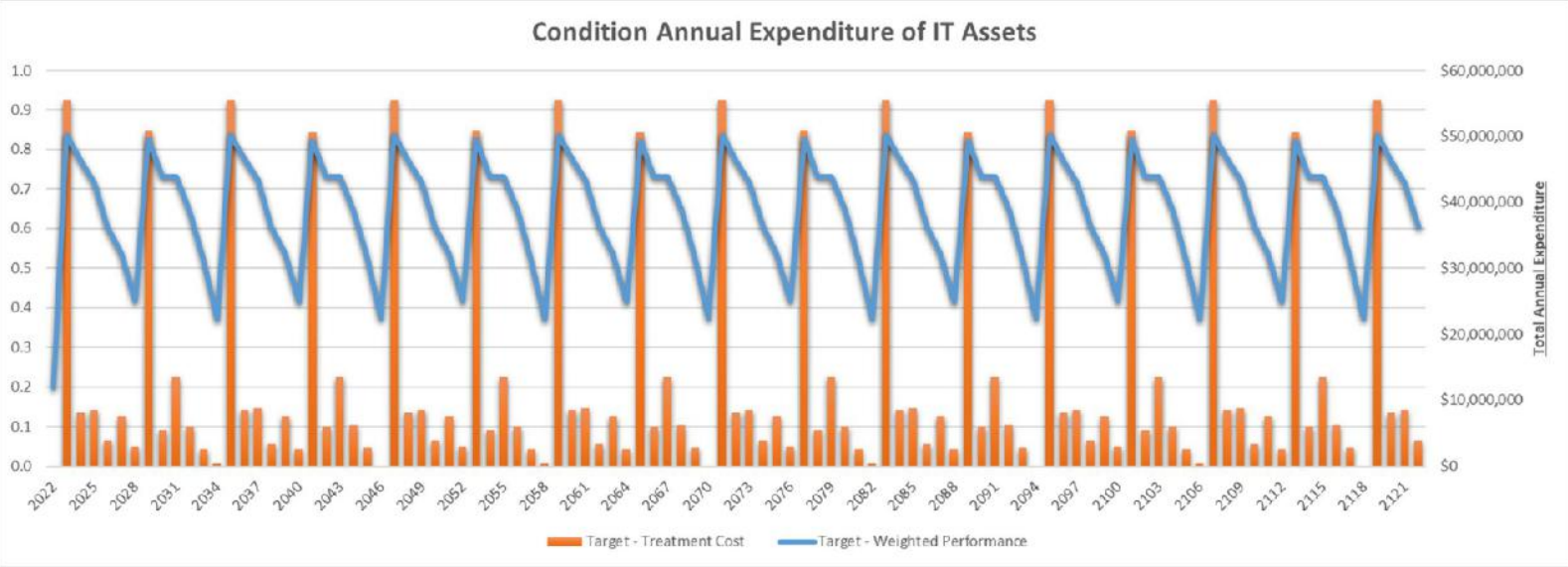


Figure 100. Information Technology Expenditure 100-Year Forecast

APPENDIX A

Corporate Asset Management Policy

Corporate Asset Management Policy

Author: Finance
Authority: CAO
Effective Date: July 1, 2019
Review by Date: April 2022
Last Modified: N/A

Related Documents

- Halton Region Asset Management Plan
- Halton Strategic Business Plan
- Halton Region Budget and Business Plan

Relevant Legislation

- *Infrastructure for Jobs and Prosperity Act, 2015*
- *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure*

1.0 Policy Statement

Halton Region will manage its assets through a robust, transparent and consistent approach while maintaining its strong financial position and long-term sustainability. Halton Region's commitment to managing its assets aligns with directions and objectives reflected in Halton's Budget and Business Plan, Strategic Business Plan and Regional Official Plan.

This policy will ensure that the requirements in *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure* are being met.

2.0 Purpose

This policy sets out principles and requirements for asset management practices across all departments in Halton Region to enable transparent, auditable, repeatable and evidence based asset management and budget and business planning. This policy provides guidance to staff to assist them in ensuring that assets are

maintained in a state of good repair and it responds to requirements in *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure*.

3.0 Scope

This policy applies to all Halton Region staff involved in life cycle management of Halton Region's assets and refers to all of Halton Region's assets.

4.0 Definitions & Acronyms

For the purposes of this policy and Halton Region's Asset Management Plan the following definitions will apply.

Asset: A tangible capital asset that has potential or actual value to Halton Region.

Asset Management (AM): Coordinated activity of Halton Region to realize value from assets. Realization of value will normally involve an appropriate balance of costs, levels of service and risks, opportunities and benefits.

Asset Management Plan: Documented information that specifies the activities, resources, and timescales required for an individual asset, or grouping of assets, to achieve defined level of service objectives.

Corporate Asset Management: The application of asset management principles and practices on a corporate level to ensure a coordinated, cost effective and organizationally sustainable approach across all Halton Region departments.

Halton Region: The Regional Municipality of Halton including Halton Community Housing Corporation

Lifecycle: The time interval that commences with the identification of the need for an asset and terminates with the disposal of the asset.

Lifecycle Management: The process of optimizing the value generated by assets throughout their lifecycle that considers Whole Life Costs (WLC) including, planning, design, procurement, construction, commissioning, operation, monitoring, maintenance, refurbishment and either replacement, retrofitting, repurposing or decommissioning and disposal of an asset.

Level of Service: Describes the outputs or objectives an organization or activity intends to deliver to customers via the respective asset classes.

Risk Management: Coordinated activities to direct and control an organization with regard to risk.

Tangible Capital Asset (TCA): As per the Public Sector Accounting Handbook Section 3150, a TCA is a non-financial asset having physical substance that is acquired, constructed, or developed, including land, land improvements, roads, buildings, vehicles, equipment, water mains, sewer mains, and capital assets acquired by capital lease or through donation. For Halton Region, the thresholds to determine a capital asset are in compliance with the Public Sector Accounting Handbook Section 3150.

5.0 Requirements & Principles

The following principles will be applied to asset management across Halton Region to respond to requirements in *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure*:

1. CUSTOMER FOCUSED - Define Levels of Service that balance customer expectations with risk, affordability, and time constraints that support Halton Regional Council and community priorities, where customers have the opportunity to provide input.
2. HOLISTIC - Consider all assets in a service context and take into account their interrelationships as opposed to optimizing individual assets in isolation. Think holistically across all departments in Halton Region, local municipalities and Provincial strategies when managing services.

3. AFFORDABLE - Choose practices, interventions and operations that aim at reducing the lifecycle cost of asset ownership while satisfying agreed levels of service.
4. SYSTEMATIC - Adopt a robust, transparent and consistent approach to the management of assets that will ensure services are provided in the most efficient and effective manner.
5. FORWARD-LOOKING - Make appropriate decisions and provisions to enable assets to meet future challenges, including changing demographics/populations and new legislative requirements.
6. RISK-BASED - Manage the asset risk associated with attaining the defined Levels of Service. In doing so, focus on resources, expenditures, and priorities based upon risk assessments and the corresponding cost/benefit analysis.
7. INNOVATIVE - Continually improve the asset management approach by driving innovation in the development of tools, practices and solutions.
8. SUSTAINABLE AND ENVIRONMENTALLY ADAPTABLE - Services and assets are socio-culturally, environmentally, and economically sustainable into the long term. This will involve triple bottom line consideration to address vulnerabilities caused by climate change, mitigation approaches to climate change, and implementing disaster planning and resiliency actions.

In order to ensure that Halton Region's asset management planning is aligned with long-term financial planning (including plans related to water and wastewater assets) and land-use planning, any studies or initiatives (i.e. Regional Official Plan Update, Development Charges Update, Source Protection Plans, Drinking Water Quality Compliance) undertaken throughout the year will be incorporated into the annual Budget and Business Plan.

6.0 Roles & Responsibilities

Halton Regional Council is responsible for approving state of good repair investments and new asset funding through the annual Budget and Business Plan.

Management Committee led by the Chief Administrative Officer (CAO) is responsible for leading the implementation of the Asset Management Policy.

7.0 Monitoring & Compliance

The Asset Management Policy will be reviewed and updated every five years, or sooner if required.

The implementation of the Asset Management Policy will be reported on annually through the Budget and Business Plan.

8.0 Approval

Updates or changes to the Asset Management Policy will be presented to Management Committee and Regional Council, as per Section 8 of O. Reg. 588/17 for approval.

This policy was approved by Management Committee on April 16, 2019, and by Regional Council on May 22, 2019.

APPENDIX B

Asset Management Maturity Assessment

Asset Management Maturity Assessment

Technical Memorandum 1 – Asset Management Assessment and Roadmap

Region of Halton

September, 2021
Prepared by: SLBC INC.

advisory services

Asset Management Maturity Assessment

Technical Memorandum 1 – Asset Management Assessment and Roadmap

LIST OF ABBREVIATIONS

Abbreviation	Definition
AM	Asset Management
AMP	Asset Management Plan
CLR	Confidence Level Rating
EAM	Enterprise Asset Management
FMEA	Failure Modes and Effects Analysis (FMEA)
FTE	Full Time Equivalent
GFMAM	Global Forum for Maintenance and Asset Management
IAM	Institute of Asset Management
IIMM	International Infrastructure Management Manual
ISO 55000	International Organization for Standardization AM Standard
IT	Information Technology
KPI	Key Performance Indicator
LOS	Levels of Service
MMS	Minimum Maintenance Standard
PCI	Pavement Condition Index
PM	Preventative Maintenance
PMO	Project Management Office
RCM	Reliability Centered Maintenance
SCADA	Supervisory Control and Data Acquisition
TCA	Tangible Capital Assets

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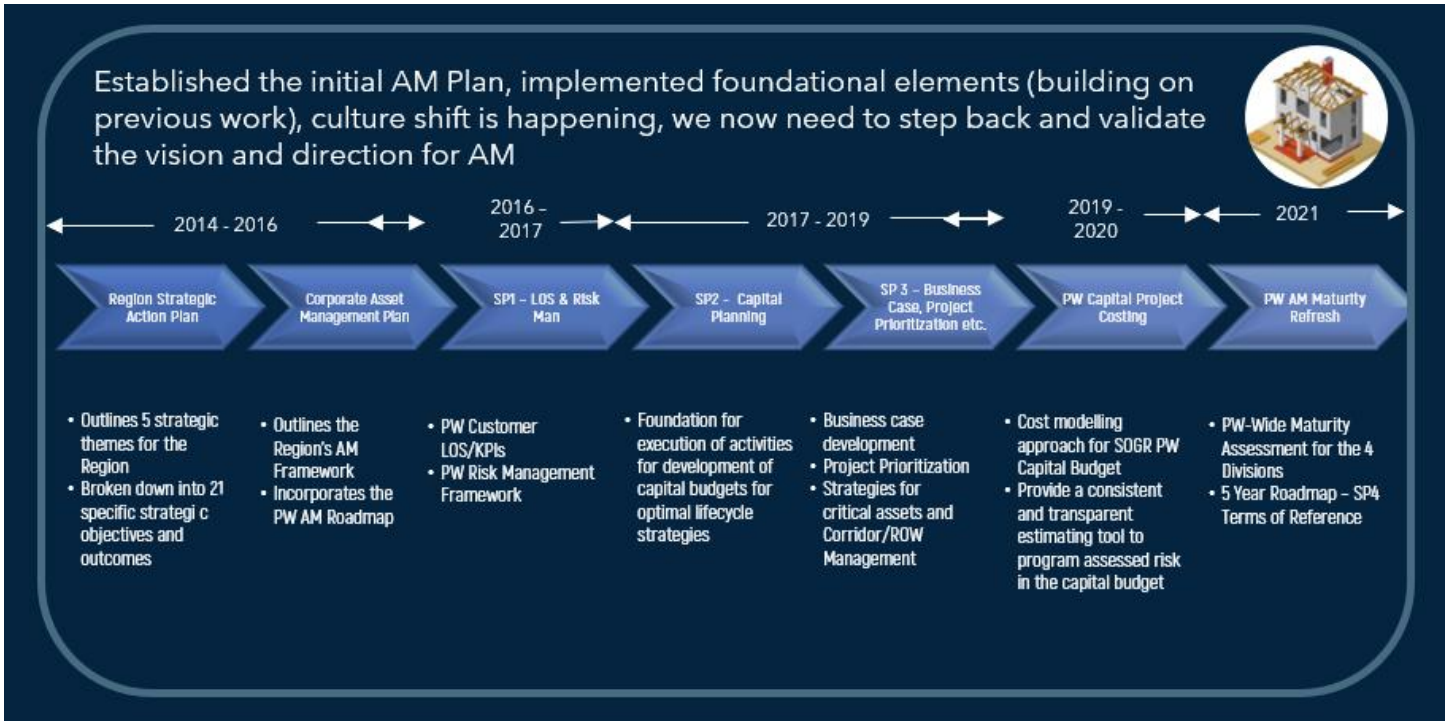
1. EXECUTIVE SUMMARY

1.1 Introduction and Background

The Public Works (PW) Department of the Region of Halton (Region) has a goal of service outcomes that are financially sustainable to achieve a government that is future-oriented and accountable. These services are infrastructure intensive based on a combination of linear, discrete, and virtual (technology) assets. The Region builds, maintains, and monitors these assets to best service the residents and businesses in Halton. The PW Department has embarked on an Enterprise Asset Management (EAM) program (Figure 1-1) that is an integrated part of its annual, strategic, and long-term planning practices. As part of its AM journey, in 2014, the Region completed its first Corporate Asset Management Plan. This was then followed by a review of the PW Department's asset management practices and resulted in a number of foundational asset management projects as part of an Implementation Roadmap. This project is intended to be an objective look at the Department's AM Maturity and the development of an AM roadmap that will set the stage for investment to improve Maturity levels in the four asset classes over the next 5 years

FIGURE 1-1: AM PROGRAM OVERVIEW



The Public Works (PW) Department on identified the need to continue improving its AM practices for its assets but based on a consistent approach to AM that supports the following Corporate AM objectives:

- Improve planning and prioritization of infrastructure needs across the organization.
- Ensure the long-term sustainability of assets and services.
- Improve the transparency of the annual budgets and forecasts.
- Support the capital planning process through outcome-based decision making.

This PW-Wide Asset Management Maturity Assessment and Strategy Project was established to:

- Set a baseline on the various AM maturity elements associated with the ISO 55000 Standard.
- Set the stage for investment by the Region to move all Asset Classes to a Maturity level of "Competence" by 2023; and,
- Provide additional tools, resources etc. to build on the good work that is being done by PW staff (not intended to be a judgement of asset classes performance).

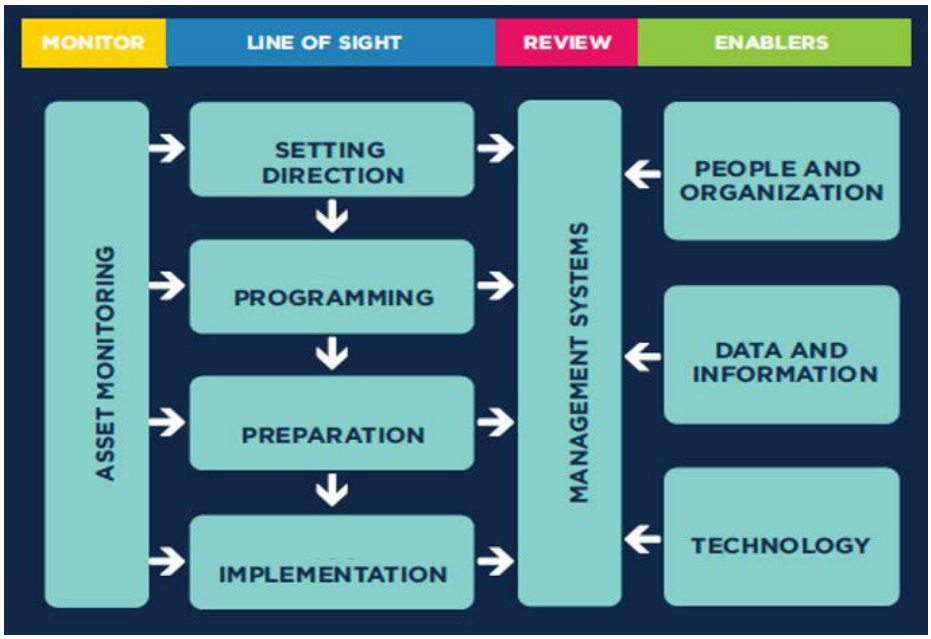
This report focuses on the current situation analysis, existing AM maturity and opportunity gaps at for following four major asset classes:

1. Roads Operations
2. Waste Management
3. Water and Wastewater Systems
4. Water and Wastewater Treatment

1.2 Project Approach and Methodology

As part of the AM Strategy development process, an AM Maturity Assessment of the Region's Public Works Department was conducted, using a comprehensive gap analysis tool (Figure 1-2), to establish the current state of AM Maturity. This tool incorporates the ISO AM Standard (ISO 55000) and most recently the Global Forum for Maintenance and Asset Management's 39 AM elements. The Region's Asset Management Team provided direction and support throughout the project. As part of the assessment, all relevant documentation was provided to the consulting team who evaluated the level of AM Capability in the nine areas. Subsequent workshops were then conducted by professional consulting facilitators to validate this Capability and established how well the processes were being executed in the four Asset classes. A consensus rating for the current state (i.e., 2021) was established together with opportunity gaps. Future ratings for 2023 and aspirational goals for 2026 (assuming that adequate resources were provided to close opportunity gaps) were established.

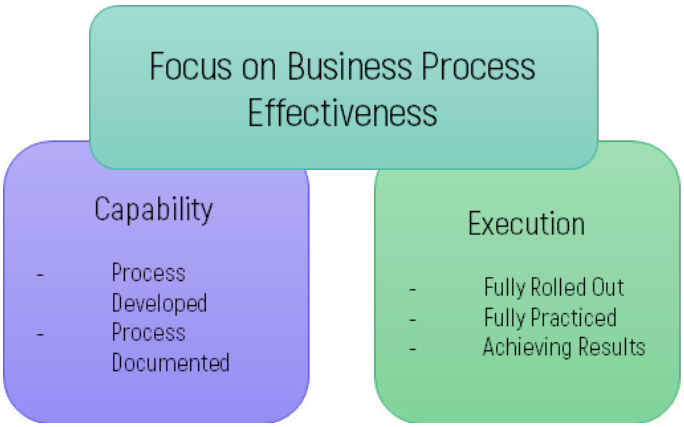
FIGURE 1-2: MATURITY ASSESSMENT ELEMENTS



Each of the nine asset management elements (and sub-elements) were evaluated on the ISO 55000 Maturity Rating Scale (0-5) - Figure 1-3 below and in the area of business process effectiveness (Capability and Execution) – see Figure 1-4 below:

FIGURE 1-3: AM MATURITY LEVELS

FIGURE 1-4: FOCUS ON BUSINESS PROCESS EFFECTIVENESS



1.3 Asset Management Maturity Results

Overall Maturity Ratings (Figure 1-5) were found to be at 2.6 (Establishing) with very good foundational work being done by the four Asset Classes. In addition, all Asset Classes were confident that with adequate Senior Executive support that they would be able to achieve a rating of 3.5 (Competence) or higher by 2023. The following chart (See Table 1-1) provides a summary of the results of the current practice assessment for each of the Region's Asset Classes. Detailed findings, by Asset Class that support these scores from the facilitated self-assessment are provided in Appendix A.

FIGURE 1-5: REGION WIDE ASSET MATURITY SCORE

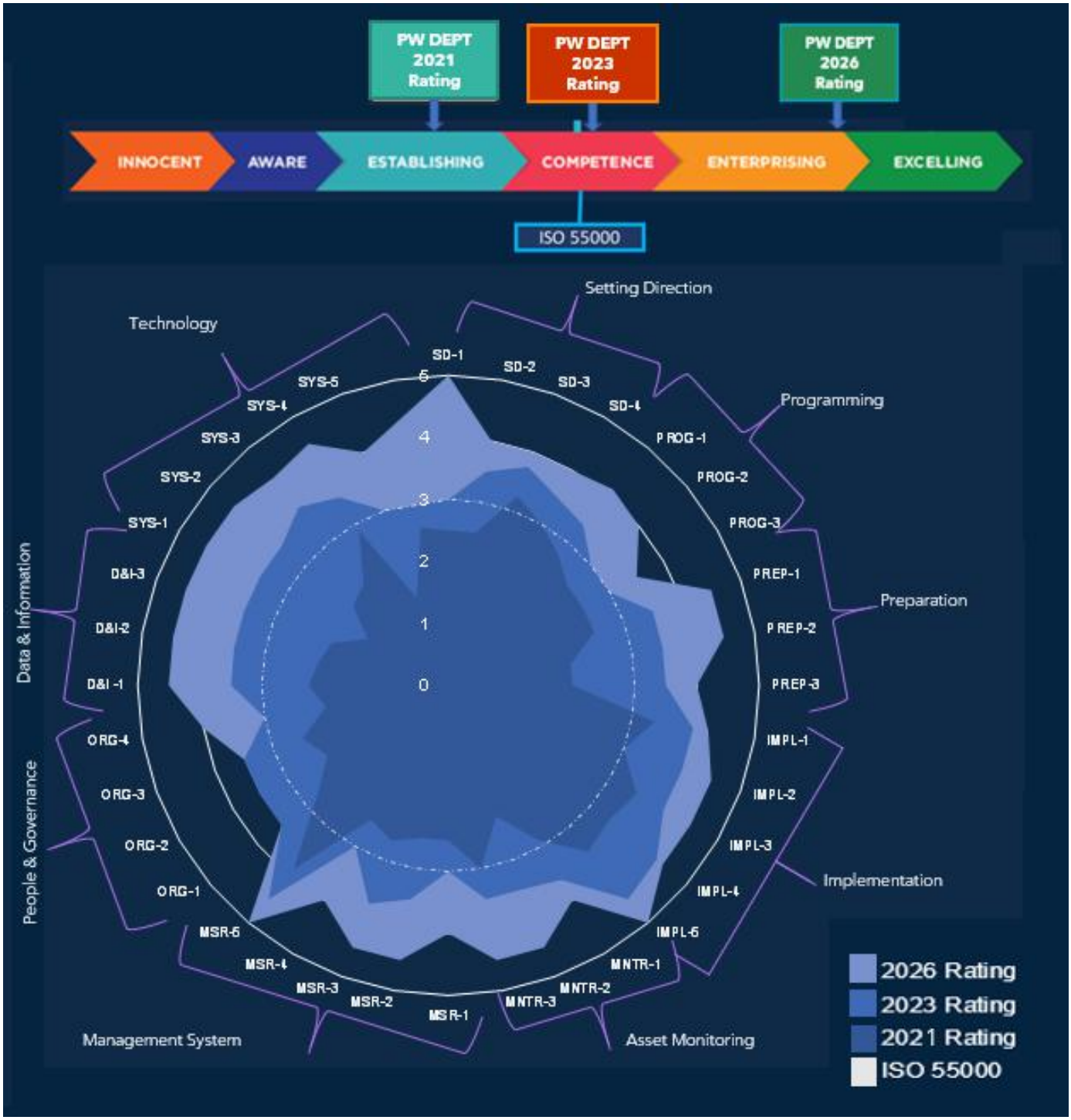


TABLE 1-1: OVERALL PW AM MATURITY RATING

Maturity	Focus Area		AM Element No	ISO 55000	2021 Rating	2023 Rating	2026 Rating
Innocent	SD - Setting Direction	Asset Management Policy	SD-1	3	2.50	3	5
Aware		Asset Management Strategy	SD-2	3	2.50	3.5	4
Establishing		Demand Analysis	SD-3	3	3.25	3.75	4
Competent		Setting Asset Management Objectives	SD-4	3	3.00	3.5	4
Enterprising	PROG - Programming	Accounting and Costing	PROG-1	3	2.75	3.375	4.125
Excelling		Asset Investment Planning	PROG-2	3	2.50	3	4
		Capital Expenditure Evaluation	PROG-3	3	2.50	3	3.5
	PREP - Preparation	Operations & Maintenance Decision Making	PREP-1	3	2.50	3.5	4.5
		Asset Management Plans	PREP-2	3	2.00	3.5	4.5
		Implementation of Asset Management Plans	PREP-3	3	2.00	3.5	4
	IMPL - Implementation	Operations	IMPL-1	3	3.38	4	4.25
		Creation & Acquisition	IMPL-2	3	3.00	4	4.5
		Maintenance	IMPL-3	3	3.38	4	4.5
		Work and Resource Management	IMPL-4	3	3.13	4.375	4.5
		Rationalisation and Disposal	IMPL-5	3	3.50	4.5	5
	MNTR - Asset Monitoring	Asset Condition Monitoring	MNTR-1	3	2.88	3.625	4
		Asset Performance Monitoring	MNTR-2	3	2.25	3.5	4.5
		Asset Investigation	MNTR-3	3	3.00	3.5	4.5
	MSR - Management System Review	Management System	MSR-1	3	2.50	3	4
		Business Risk Management	MSR-2	3	2.50	3.5	4.5
		Asset Risk Management	MSR-3	3	2.75	3.75	4.5
		Continuous Improvement	MSR-4	3	2.50	3	4
		Legal, Regulatory and Other Requirements	MSR-5	3	3.88	4.5	5
	ORG - People & Organisation	Goveranance	ORG-1	3	2.75	3.5	3.5
		People Resoruces	ORG-2	3	2.25	3.5	3.5
		Right Sourcing	ORG-3	3	2.50	3.5	3.5
		Stakeholder Engagement	ORG-4	3	2.00	3	4
	D&I - Data & Information	Processes for Managing Asset Knowledge	D&I -1	3	2.25	3.5	4.5
		Asset Data and Knowledge	D&I-2	3	2.13	3.5	4.5
		Activity Data and Knowledge	D&I-3	3	2.00	3.5	4.5
	SYS - Technology	Technology Landscape and Architecture	SYS-1	3	1.50	3.5	4.5
		Financial and Administrative Information Systems	SYS-2	3	2.00	3.5	4.5
		Service Delivery Information Systems (e.g. CMMS,GIS, Risk, PMIS)	SYS-3	3	2.13	3.75	4.375
		Supply and Logistic Management Information Systems	SYS-4	3	2.75	3.5	4.5
		Advanced Information Systems	SYS-5	3	1.50	3	4
				3.0	**2.6**	**3.5**	**4.3**

1.4 Overall Opportunity Gaps

Overall Opportunity Gaps at the Enterprise Level are provided in Table 1-2 below:

TABLE 1-2: OVERALL LEVEL OPPORTUNITY GAPS

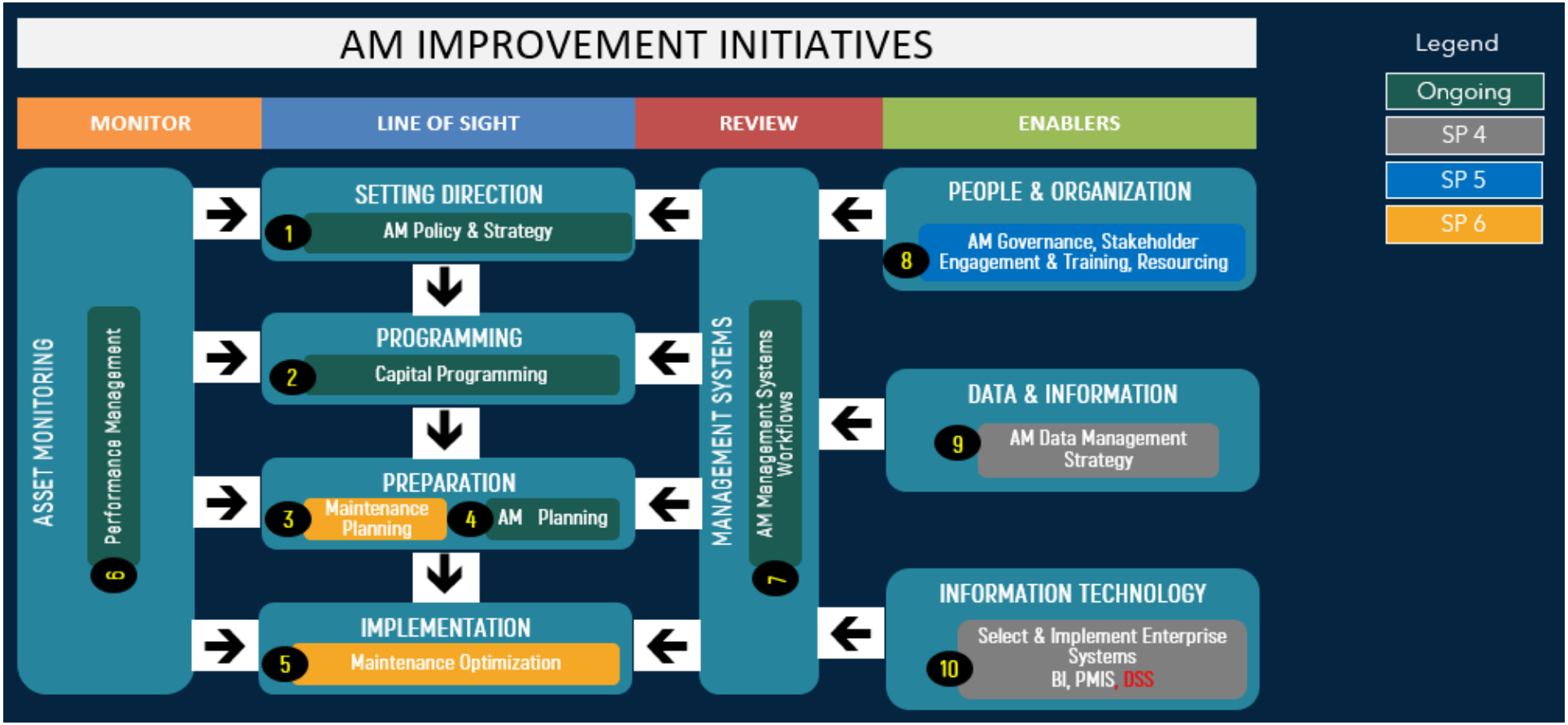
ISO Focus	Asset Management Elements	Opportunity Gaps
Line of Sight	Setting Direction	• Ongoing update of the AM Policy and Objectives to incorporate new and emerging business drivers – links to asset classes goals/objectives • Review and update the AM Strategy/improvement roadmap on a regular basis and report on program benefits. • Potential for roll out to the rest of the organisation for a holistic approach and buy-in at executive level (DMT input) • Incorporate risk management in the Master Planning process.
	Programming	• Refine/update AM Planning processes and implement a supporting enterprise DSS • Continue to build on options analysis and business cases – leverage a DSS and Content Management System for consistency continuity of knowledge • Consider asset operability during asset planning and track residual risk after assets are constructed • Establish a review cycle to ensure improved communications on the planning process
	Preparation	• Leverage existing operations and maintenance practices and add other best in class practices to create an O&M Master Plan • Develop, document, and implement processes for AM Plan development to meet O. Reg 588/17 requirements • Clearly define roles and responsibilities for AM Plan implementation.
	Implementation	• Develop MRO and AM Readiness specifications to prevent future data gaps in capital project delivery • Build on asset criticality work being done and leverage this for PM Optimization and RCM initiatives • Continue to review, refine, and document processes for work and resource management to match the changing infrastructure mix and designs • Ensure better integration with construction to accommodate late changes from operations
Asset Monitoring and Performance	Asset Condition Monitoring	• Leverage asset criticality to set up condition assessment PMs in the CMMS • Continue to develop, document, and implement processes for Asset Performance Monitoring focusing on Strategic, Tactical and Operational dashboards • Continue to develop, document, and implement processes for Incident Investigation integrating asset investigation workflows within the CMMS and Content Management Systems
Management System Review	Management System	• Continue to improve and implement an asset management framework that includes process diagrams/flow charts and records • Maintain and implement the Business Risk Management Framework along with associated LOS Business Continuity Plans • Develop and maintain processes to audit for continual improvement of the AM system and processes. • Continue to review and update regulatory requirements into the content management system
AM Enablers	People & Organization	• Continue to develop, document, and implement AM governance processes • Consider adding Engineering expertise on the Water and Wastewater Systems team to support asset planning and business case/options analysis • Continue to develop, document, and implement processes for People • Continue to develop, document, and implement processes for Right Sourcing • Document and implement processes for improved stakeholder engagement
	Data & Information	• Develop, document, and implement processes for managing data and information • Document and implement data standards for managing asset and activity knowledge • Conduct collection/updates to close historic data gaps and eliminate duplication of data and records
	Technology Systems	• Develop, document, and implement processes for managing data and information

ISO Focus	Asset Management Elements	Opportunity Gaps
		• Document and implement data standards for managing asset and activity knowledge • Conduct collection/updates to close historic data gaps and eliminate duplication of data and records

1.5 Recommendations and Improvement Initiatives

Recommendations were made to close opportunity gaps in each of the sub-elements of the asset management assessment framework and these were rolled up into then improvement initiatives and grouped into special projects show in Figure 1-6 and 1-7 below:

FIGURE 1-6: IMPROVEMENT INITIATIVES



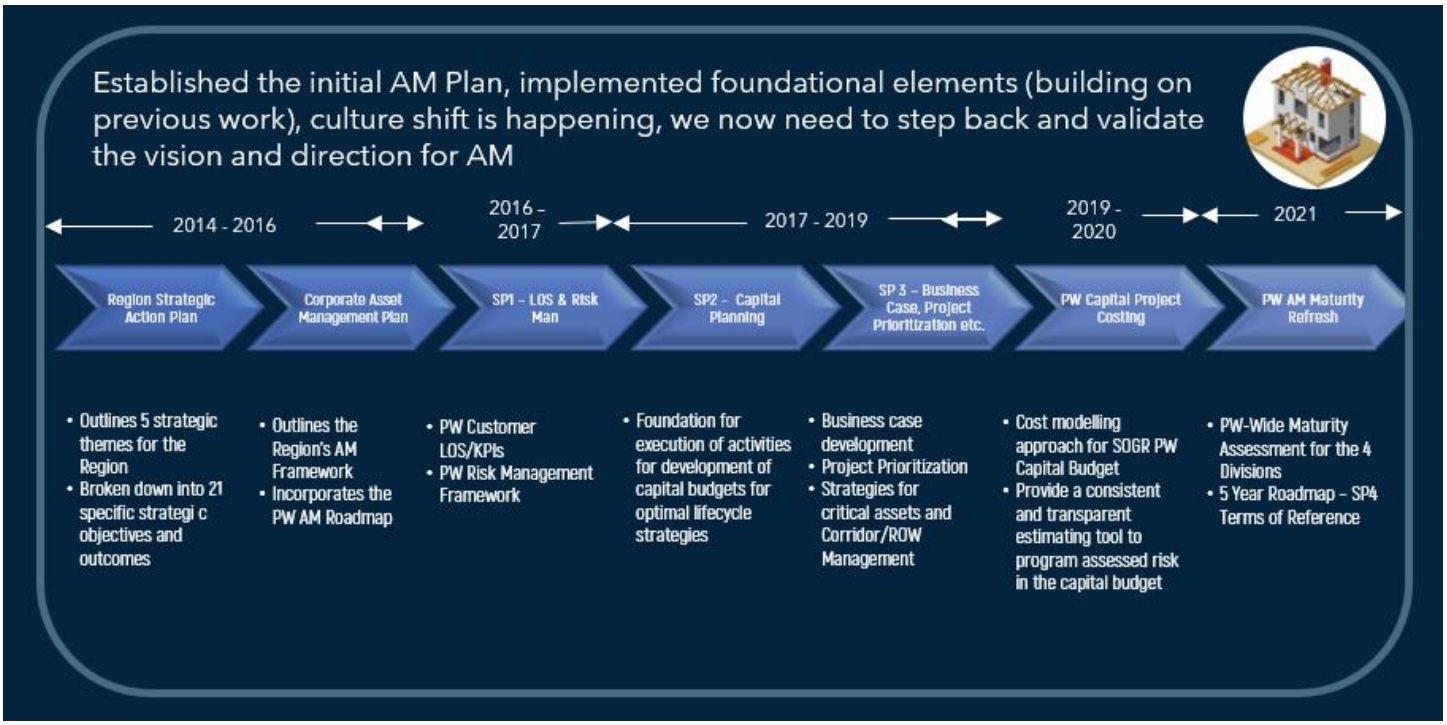
These special projects (SP 4, 5 & 6) are continuation of the Division's Asset Management Journey.

FIGURE 1-7: PUBLIC WORKS DIVISION'S ONGOING ASSET MANAGEMENT JOURNEY

2. INTRODUCTION

The Public Works (PW) Department of the Region of Halton (Region) has a goal of service outcomes that are financially sustainable to achieve a government that is future-oriented and accountable. These services are infrastructure intensive based on a combination of linear, discrete, and virtual (technology) assets. The Region builds, maintains, and monitors these assets to best service the residents and businesses in Halton. The PW Department has embarked on an Enterprise Asset Management (EAM) program (Figure 2-1) that is an integrated part of its annual, strategic, and long-term planning practices. As part of its AM journey, in 2014, the Region completed its first Corporate Asset Management Plan. This was then followed by a review of the PW Department's asset management practices and resulted in a number of foundational asset management projects as part of an Implementation Roadmap. This project is intended to be an objective look at the Department's AM Maturity and the development of an AM roadmap that will set the stage for investment to improve Maturity levels in the four asset classes over the next 5 years

FIGURE 2-1: AM PROGRAM OVERVIEW



This Asset Management Strategy Project was established with the following project objectives:

1. To establish the Region's Public Works Department existing asset management maturity compared to best-in-class practices for all Asset Classes.
2. To complete maturity assessments based on the ISO 55000 series of Asset Management Standards for four asset Classes and will leverage the Institute of Asset Management (IAM) framework.
3. Identify opportunity gaps that can be closed to improve AM maturity (corporate or global opportunity gaps and those specific to the asset Classes).
4. To develop a 5-year AM maturity improvement roadmap of initiatives to achieve a maturity state of "Competent" as defined by the ISO 55000 series of asset management standards.
5. To develop an Implementation Plan for the Region to achieve ISO 55000 series of asset management.
6. Ensure alignment with previous and ongoing AM development work being done and the Department

7. Ensure compliance with the Region's AM Policy, AM Framework and Ontario Regulation 588/17 (Asset Management Planning for Municipal Infrastructure).

This report focuses on the current situation analysis and future state for asset management at the Public Works Department and focuses on the following four Divisions:

1. Roads Operations
2. Waste Management
3. Water and Wastewater Systems
4. Water and Wastewater Treatment

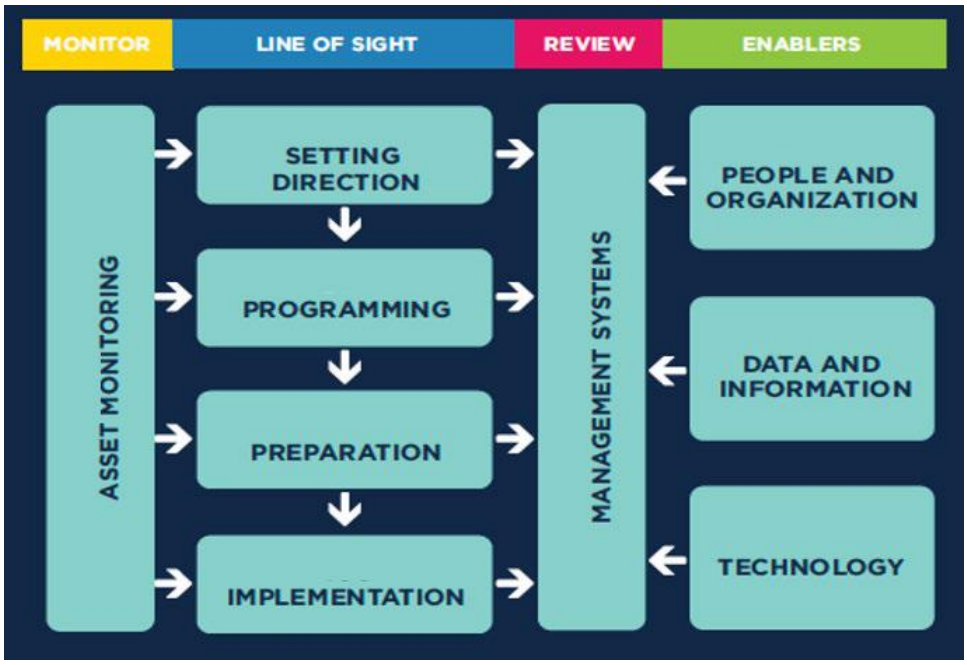
3. PROJECT APPROACH AND METHODOLOGY

3.1 Project Approach

Municipalities provide services that support economic growth, transportation of goods, land development, community culture, and health and safety. Like all asset-intensive organizations, the overall performance of municipalities depends on the performance of their critical assets such as water and wastewater treatment plants and pipe networks, roads and bridges, emergency response vehicles, technology, and facilities. These assets are spread across a wide geographic area, are subject to the physical elements and environmental stresses, and require large capital expenditures to acquire and sustain. The effective and efficient delivery of services and management of assets involves balancing continuous improvement of an organization's lifecycle business processes, people, information systems and data.

A Strategic Asset Management Plan (SAMP) or AM Strategy and Improvement Roadmap defines the structured set of actions to be undertaken by an organization to improve or enhance its AM capability and achieve strategic objectives related to the management of infrastructure. As part of the AM Strategy development process, an AM Maturity Assessment of the Region was conducted, using a comprehensive gap analysis tool (Figure 3-1), to establish the current state of AM Maturity in the Region. This tool incorporates the ISO AM Standard (ISO 55000) and most recently the Global Forum for Maintenance and Asset Management's 39 AM elements. As part of the assessment, opportunity gaps were identified, which provided input into the development of AM Strategies and Initiatives for implementation in the AM Roadmap.

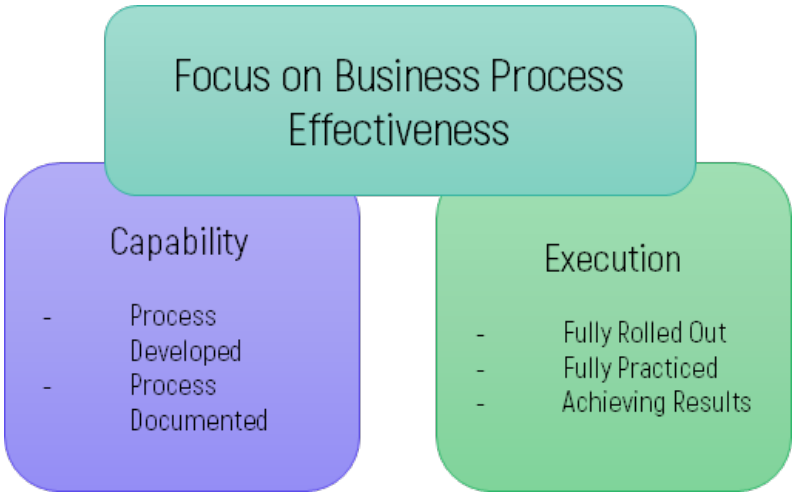
FIGURE 3-1: MATURITY ASSESSMENT ELEMENTS



Each of the nine asset management elements (and sub-elements) were evaluated on the ISO 55000 Maturity Rating Scale (0-5) - Figure 3-2 below and in the area of business process effectiveness (Capability and Execution) – see Figure 3-3 below:

FIGURE 3-2: FOCUS ON BUSINESS PROCESS EFFECTIVENESS

FIGURE 3-3: FOCUS ON BUSINESS PROCESS EFFECTIVENESS



3.2 Implementation Methodology

Current AM processes and practices were reviewed and assessed to provide a baseline for the Department's AM Strategy. This involved completing a gap assessment of these processes and practices against what is generally regarded as industry leading practices built upon many AM processes, practices, techniques, and tools developed over the past several decades. The Department will select and implement only those leading practices that are practical and cost effective given its specific needs and resources to close any identified gaps. Through a facilitated self-assessment process where Divisional staff rated their AM Maturity, the consultants then developed an understanding of the current decision-making processes and supporting data, systems, and organization.

For each of the nine areas, business processes were evaluated in terms of existing Capability (What processes are developed? Are they based on leading practices? Are they documented?) and Execution (Are these processes in place in all areas? are they being used? Are they Effective?). Subsequent Asset classes workshops were then conducted by professional consulting facilitators to validate the Capability and established how well the processes were being Executed. A consensus rating for the current state (i.e., 2021) was established together with opportunity gaps. Participants were then invited to propose future ratings for 2023 and aspirational goals for 2026 (assuming that adequate resources were provided to close opportunity gaps).

4. MATURITY ASSESSMENT RESULTS

4.1 Overall Maturity Assessment Ratings and Opportunity Gaps

Figure 4-1 provides a PW Department-wide overview of the AM Maturity Assessment results and Table 4-1 provides a summary of the results of the current practice assessment for the PW Department. Overall Maturity Ratings (Figure 4-1) were found to be at 2.6 (Establishing) with very good foundational work being done by all four Divisions. In addition, all the Divisions were confident that with adequate Senior Executive and the AM Steering Committee support that they would be able to achieve a rating of 3.5 (Competence) or higher by 2023. An aspirational goal of 4.3 (Excelling) by 2026 has also been proposed. Detailed findings, by each Division that support these scores from the facilitated self-assessment are provided in **Appendix A**.

FIGURE 4-1: PW-WIDE MATURITY ASSESSMENT SUMMARY SCORE

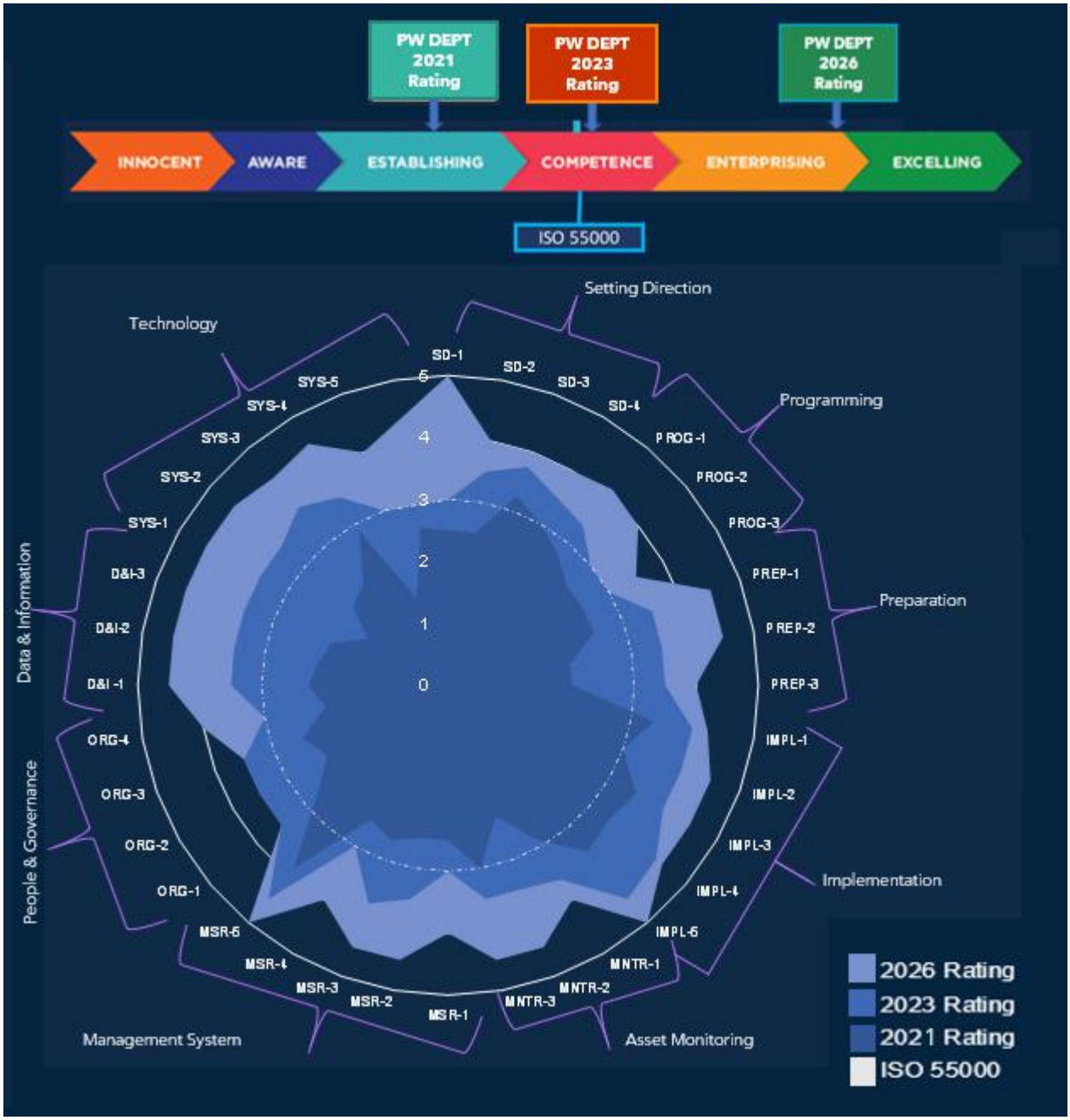


TABLE 4-2: PW AM MATURITY RATINGS

Maturity	Focus Area		AM Element No	ISO 55000	2021 Rating	2023 Rating	2026 Rating
Innocent	SD - Setting Direction	Asset Management Policy	SD-1	3	2.50	3	5
Aware		Asset Management Strategy	SD-2	3	2.50	3.5	4
Establishing		Demand Analysis	SD-3	3	3.25	3.75	4
Competent		Setting Asset Management Objectives	SD-4	3	3.00	3.5	4
Enterprising	PROG - Programming	Accounting and Costing	PROG-1	3	2.75	3.375	4.125
Excelling		Asset Investment Planning	PROG-2	3	2.50	3	4
		Capital Expenditure Evaluation	PROG-3	3	2.50	3	3.5
	PREP - Preparation	Operations & Maintenance Decision Making	PREP-1	3	2.50	3.5	4.5
		Asset Management Plans	PREP-2	3	2.00	3.5	4.5
		Implementation of Asset Management Plans	PREP-3	3	2.00	3.5	4
	IMPL - Implementation	Operations	IMPL-1	3	3.38	4	4.25
		Creation & Acquisition	IMPL-2	3	3.00	4	4.5
		Maintenance	IMPL-3	3	3.38	4	4.5
		Work and Resource Management	IMPL-4	3	3.13	4.375	4.5
		Rationalisation and Disposal	IMPL-5	3	3.50	4.5	5
	MNTR - Asset Monitoring	Asset Condition Monitoring	MNTR-1	3	2.88	3.625	4
		Asset Performance Monitoring	MNTR-2	3	2.25	3.5	4.5
		Asset Investigation	MNTR-3	3	3.00	3.5	4.5
	MSR - Management System Review	Management System	MSR-1	3	2.50	3	4
		Business Risk Management	MSR-2	3	2.50	3.5	4.5
		Asset Risk Management	MSR-3	3	2.75	3.75	4.5
		Continuous Improvement	MSR-4	3	2.50	3	4
		Legal, Regulatory and Other Requirements	MSR-5	3	3.88	4.5	5
	ORG - People & Organisation	Goveranance	ORG-1	3	2.75	3.5	3.5
		People Resoruces	ORG-2	3	2.25	3.5	3.5
		Right Sourcing	ORG-3	3	2.50	3.5	3.5
		Stakeholder Engagement	ORG-4	3	2.00	3	4
	D&I - Data & Information	Processes for Managing Asset Knowledge	D&I -1	3	2.25	3.5	4.5
		Asset Data and Knowledge	D&I-2	3	2.13	3.5	4.5
		Activity Data and Knowledge	D&I-3	3	2.00	3.5	4.5
	SYS - Technology	Technology Landscape and Architecture	SYS-1	3	1.50	3.5	4.5
		Financial and Administrative Information Systems	SYS-2	3	2.00	3.5	4.5
		Service Delivery Information Systems (e.g. CMMS,GIS, Risk, PMIS)	SYS-3	3	2.13	3.75	4.375
		Supply and Logistic Management Information Systems	SYS-4	3	2.75	3.5	4.5
		Advanced Information Systems	SYS-5	3	1.50	3	4
				3.0	**2.6**	**3.5**	**4.3**

4.2 Overall Opportunity Gaps

Overall Opportunity Gaps at the Enterprise Level are provided in Table 4-2 below:

TABLE 4-2: OVERALL LEVEL OPPORTUNITY GAPS

ISO Focus	Asset Management Elements	Opportunity Gaps
Line of Sight	Setting Direction	• Ongoing update of the AM Policy and Objectives to incorporate new and emerging business drivers – links to asset classes goals/objectives • Review and update the AM Strategy/improvement roadmap on a regular basis and report on program benefits. • Potential for roll out to the rest of the organisation for a holistic approach and buy-in at executive level (DMT input) • Incorporate risk management in the Master Planning process.
	Programming	• Refine/update AM Planning processes and implement a supporting enterprise DSS • Continue to build on options analysis and business cases – leverage a DSS and Content Management System for consistency continuity of knowledge • Consider asset operability during asset planning and track residual risk after assets are constructed • Establish a review cycle to ensure improved communications on the planning process
	Preparation	• Leverage existing operations and maintenance practices and add other best in class practices to create an O&M Master Plan • Develop, document, and implement processes for AM Plan development to meet O. Reg 588/17 requirements • Clearly define roles and responsibilities for AM Plan implementation.
	Implementation	• Develop MRO and AM Readiness specifications to prevent future data gaps in capital project delivery • Build on asset criticality work being done and leverage this for PM Optimization and RCM initiatives • Continue to review, refine, and document processes for work and resource management to match the changing infrastructure mix and designs • Ensure better integration with construction to accommodate late changes from operations
Asset Monitoring and Performance	Asset Condition Monitoring	• Leverage asset criticality to set up condition assessment PMs in the CMMS • Continue to develop, document, and implement processes for Asset Performance Monitoring focusing on Strategic, Tactical and Operational dashboards • Continue to develop, document, and implement processes for Incident Investigation integrating asset investigation workflows within the CMMS and Content Management Systems
Management System Review	Management System	• Continue to improve and implement an asset management framework that includes process diagrams/flow charts and records • Maintain and implement the Business Risk Management Framework along with associated LOS Business Continuity Plans • Develop and maintain processes to audit for continual improvement of the AM system and processes. • Continue to review and update regulatory requirements into the content management system
AM Enablers	People & Organization	• Continue to develop, document, and implement AM governance processes • Consider adding Engineering expertise on the Water and Wastewater Systems team to support asset planning and business case/options analysis • Continue to develop, document, and implement processes for People • Continue to develop, document, and implement processes for Right Sourcing • Document and implement processes for improved stakeholder engagement
	Data & Information	• Develop, document, and implement processes for managing data and information • Document and implement data standards for managing asset and activity knowledge • Conduct collection/updates to close historic data gaps and eliminate duplication of data and records
	Technology Systems	• Develop, document, and implement processes for managing data and information • Document and implement data standards for managing asset and activity knowledge

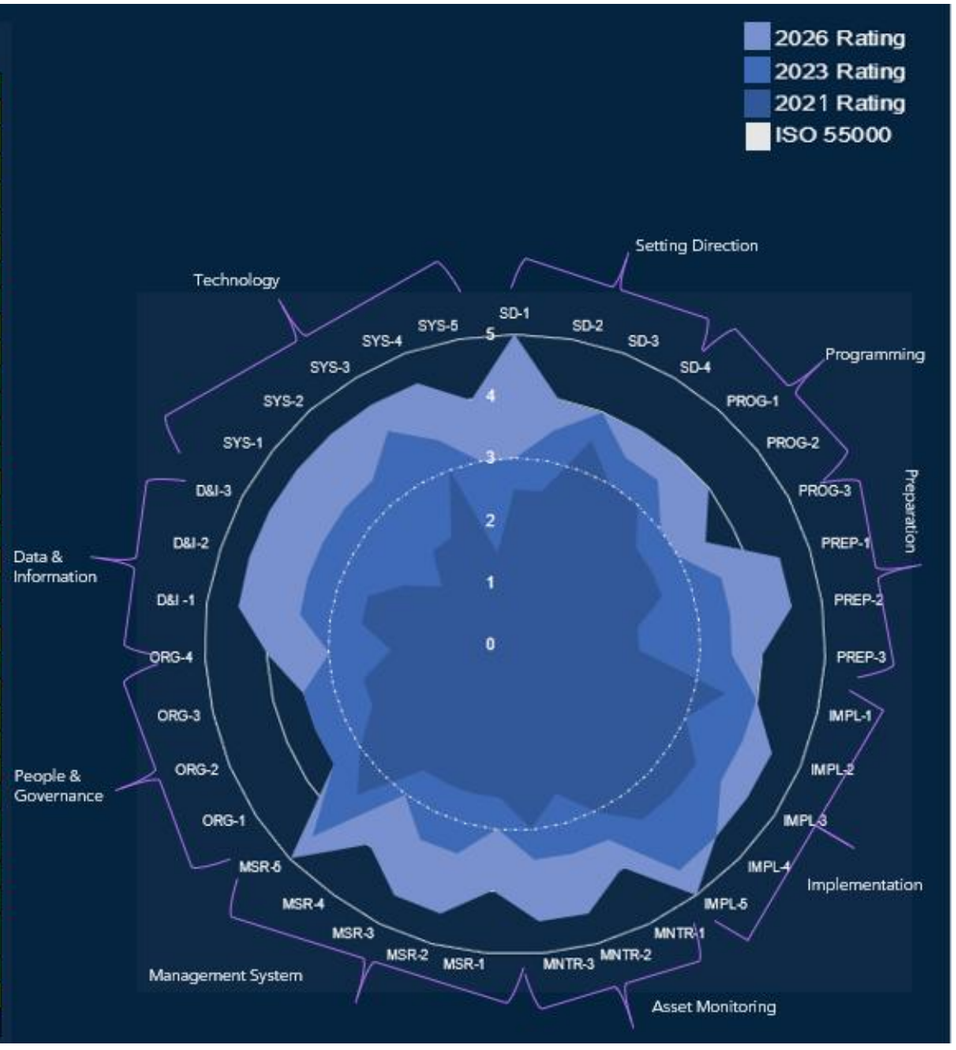
ISO Focus	Asset Management Elements	Opportunity Gaps
		• Conduct collection/updates to close historic data gaps and eliminate duplication of data and records

4.3 Asset Classes Maturity Ratings and Opportunity Gaps

Individual Asset Class Asset Management Maturity Ratings and summary Opportunity Gaps are provided below (green text denotes asset management elements that are currently at or above competence):

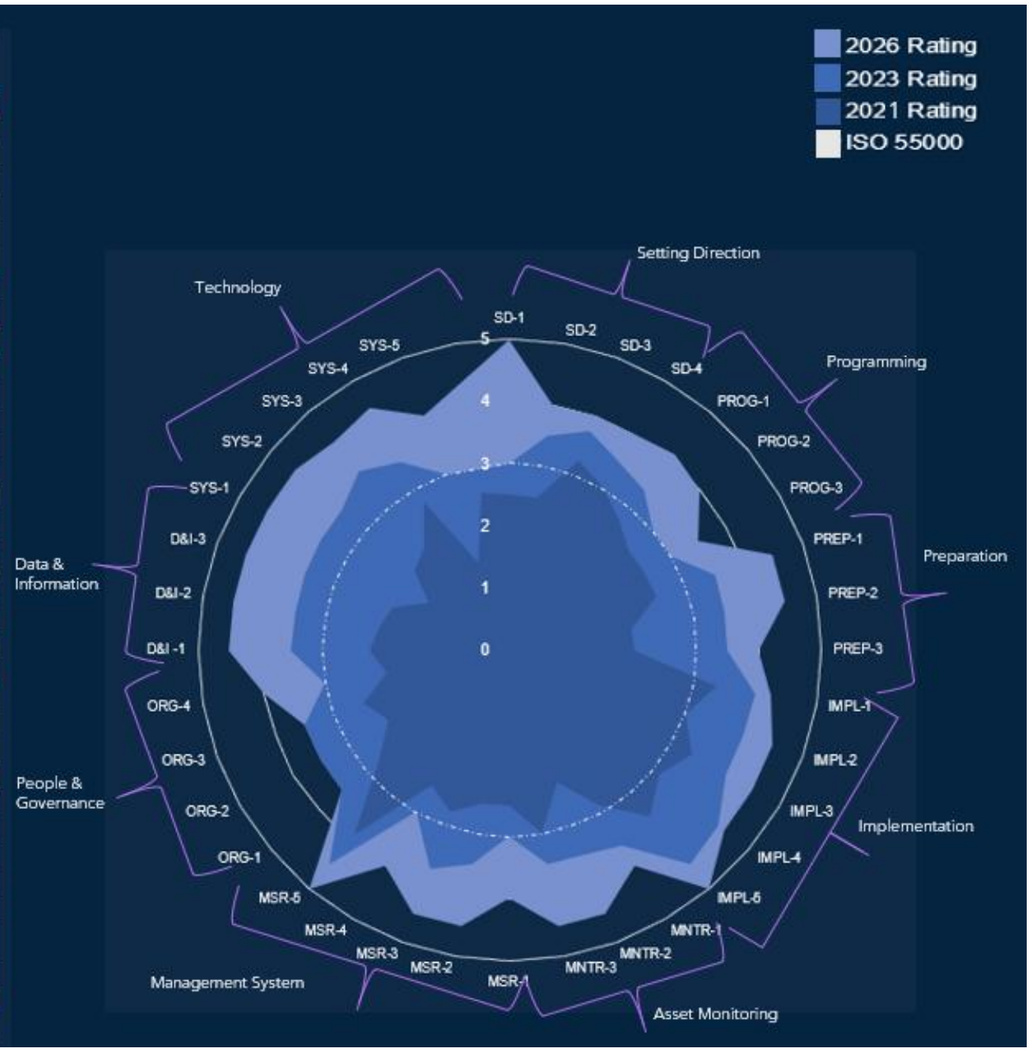
4.3.1 Roads Operations

Maturity	Focus Area		AM Element No	ISO 55000	2021 Rating	2023 Rating	2026 Rating
Innocent	SD - Setting Direction	Asset Management Policy	SD-1	3	2.5	3	5
Aware		Asset Management Strategy	SD-2	3	2.5	3.5	4
Establishing		Demand Analysis	SD-3	3	3.5	4	4
Competent		Setting Asset Management Objectives	SD-4	3	3	3.5	4
Enterprising	PROG - Programming	Accounting and Costing	PROG-1	3	3	3.5	4
Excelling		Asset Investment Planning	PROG-2	3	2.5	3	4
		Capital Expenditure Evaluation	PROG-3	3	2.5	3	3.5
	PREP - Preparation	Operations & Maintenance Decision Making	PREP-1	3	2.5	3.5	4.5
		Asset Management Plans	PREP-2	3	2	3.5	4.5
		Implementation of Asset Management Plans	PREP-3	3	2	3.5	4
	IMPL - Implementation	Operations	IMPL-1	3	3.5	4	4
		Creation & Acquisition	IMPL-2	3	3	4	4.5
		Maintenance	IMPL-3	3	3.5	4	4.5
		Work and Resource Management	IMPL-4	3	3.5	4.5	4.5
		Rationalisation and Disposal	IMPL-5	3	3.5	4.5	5
	MNTR - Asset Monitoring	Asset Condition Monitoring	MNTR-1	3	3	3.5	4
		Asset Performance Monitoring	MNTR-2	3	2.5	3.5	4.5
		Asset Investigation	MNTR-3	3	3	3.5	4.5
	MSR - Management System Review	Management System	MSR-1	3	2.5	3	4
		Business Risk Management	MSR-2	3	2.5	3.5	4.5
		Asset Risk Management	MSR-3	3	2.5	3.5	4.5
		Continuous Improvement	MSR-4	3	2.5	3	4
		Legal, Regulatory and Other Requirements	MSR-5	3	3.5	4.5	5
	ORG - People & Organisation	Goveranance	ORG-1	3	3	3.5	3.5
		People Resoruces	ORG-2	3	2.5	3.5	3.5
		Right Sourcing	ORG-3	3	2.5	3.5	3.5
		Stakeholder Engagement	ORG-4	3	2	3	4
	D&I - Data & Information	Processes for Managing Asset Knowledge	D&I -1	3	2.5	3.5	4.5
		Asset Data and Knowledge	D&I-2	3	2.5	3.5	4.5
		Activity Data and Knowledge	D&I-3	3	2	3.5	4.5
	SYS - Technology	Technology Landscape and Architecture	SYS-1	3	1.5	3.5	4.5
		Financial and Administrative Information Systems	SYS-2	3	2	3.5	4.5
		Service Delivery Information Systems (e.g. CMMS,GIS, Risk, PMIS)	SYS-3	3	2	4	4.5
		Supply and Logistic Management Information Systems	SYS-4	3	3	3.5	4.5
		Advanced Information Systems	SYS-5	3	1.5	3	4
				3.0	2.6	3.6	4.3



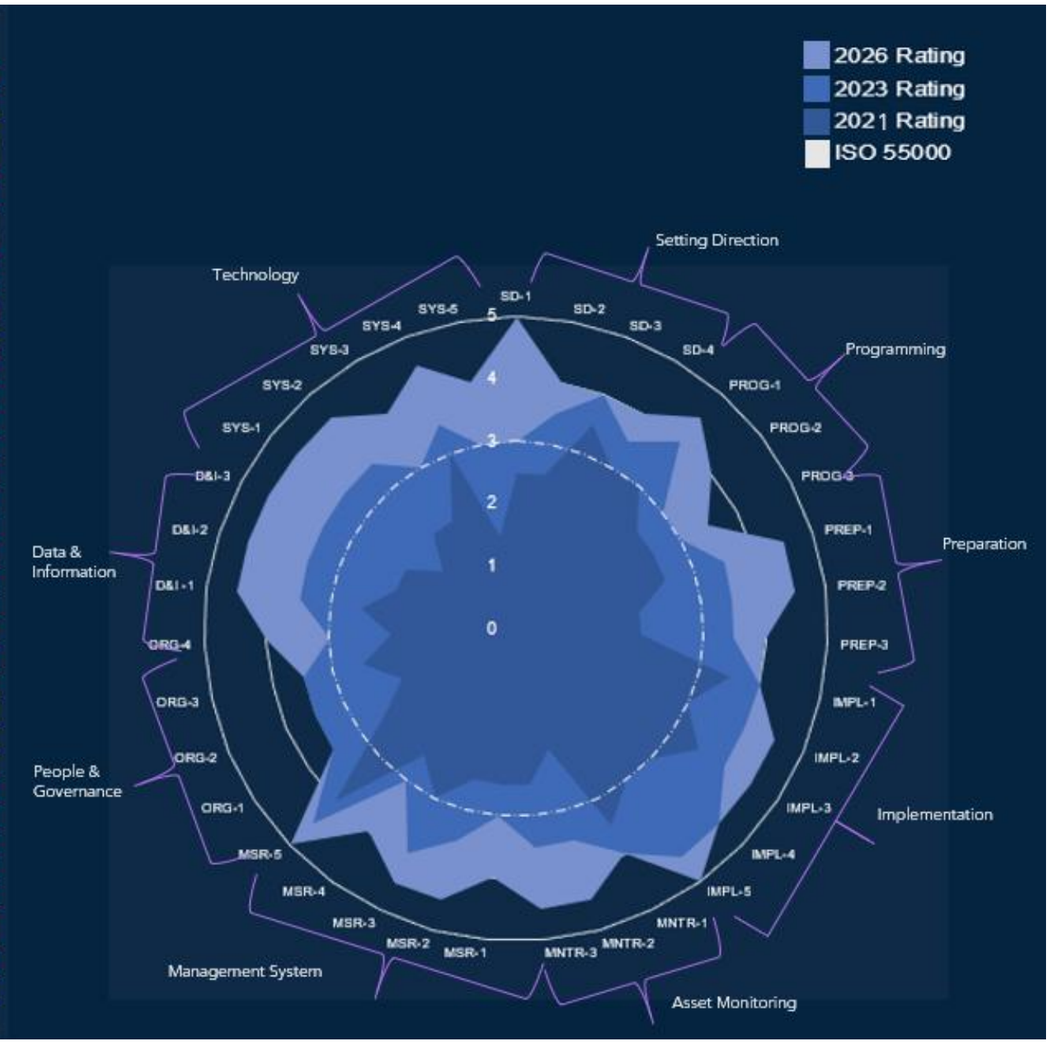
4.3.2 Waste Management Assets

Maturity	Focus Area		AM Element No	ISO 55000	2021 Rating	2023 Rating	2026 Rating
Innocent	SD - Setting Direction	Asset Management Policy	SD-1	3	2.5	3	5
Aware		Asset Management Strategy	SD-2	3	2.5	3.5	4
Establishing		Demand Analysis	SD-3	3	2.5	3	4
Competent		Setting Asset Management Objectives	SD-4	3	3	3.5	4
Enterprising	PROG - Programming	Accounting and Costing	PROG-1	3	2.5	3	4
Excelling		Asset Investment Planning	PROG-2	3	2.5	3	4
		Capital Expenditure Evaluation	PROG-3	3	2.5	3	3.5
	PREP - Preparation	Operations & Maintenance Decision Making	PREP-1	3	2	3.5	4.5
		Asset Management Plans	PREP-2	3	2	3.5	4.5
		Implementation of Asset Management Plans	PREP-3	3	2	3.5	4
	IMPL - Implementation	Operations	IMPL-1	3	3	4	5
		Creation & Acquisition	IMPL-2	3	3	4	4.5
		Maintenance	IMPL-3	3	3	4	4.5
		Work and Resource Management	IMPL-4	3	3	4.5	4.5
		Rationalisation and Disposal	IMPL-5	3	3.5	4.5	5
	MNTR - Asset Monitoring	Asset Condition Monitoring	MNTR-1	3	2.5	3.5	4
		Asset Performance Monitoring	MNTR-2	3	2.5	3.5	4.5
		Asset Investigation	MNTR-3	3	3	3.5	4.5
	MSR - Management System Review	Management System	MSR-1	3	2.5	3	4
		Business Risk Management	MSR-2	3	2.5	3.5	4.5
		Asset Risk Management	MSR-3	3	2.5	3.5	4.5
		Continuous Improvement	MSR-4	3	2.5	3	4
		Legal, Regulatory and Other Requirements	MSR-5	3	4	4.5	5
	ORG - People & Organization	Goveranance	ORG-1	3	2.5	3.5	3.5
		People Resources	ORG-2	3	2	3.5	3.5
		Right Sourcing	ORG-3	3	2.5	3.5	3.5
		Stakeholder Engagement	ORG-4	3	2	3	4
	D&I - Data & Information	Processes for Managing Asset Knowledge	D&I -1	3	2	3.5	4.5
		Asset Data and Knowledge	D&I-2	3	2	3.5	4.5
		Activity Data and Knowledge	D&I-3	3	2	3.5	4.5
	SYS - Technology	Technology Landscape and Architecture	SYS-1	3	1.5	3.5	4.5
		Financial and Administrative Information Systems	SYS-2	3	2	3.5	4.5
		Service Delivery Information Systems (e.g. CMMS,GIS, Risk, PMIS)	SYS-3	3	2	4	4.5
		Supply and Logistic Management Information Systems	SYS-4	3	2.5	3.5	4.5
		Advanced Information Systems	SYS-5	3	1.5	3	4
				3.0	2.5	3.5	4.3



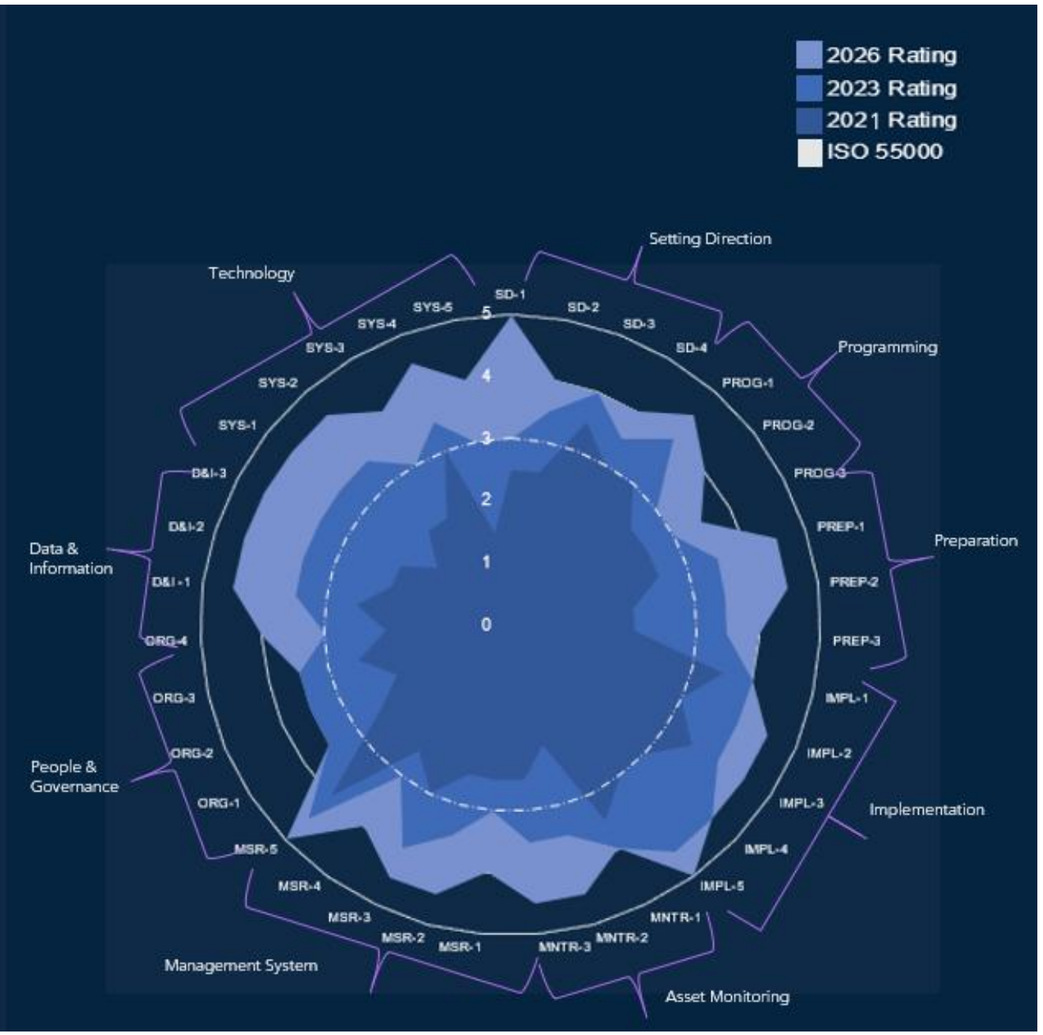
4.3.3 Water and Wastewater Systems Assets

Maturity	Focus Area		AM Element No	ISO 55000	2021 Rating	2023 Rating	2026 Rating
Innocent	SD - Setting Direction	Asset Management Policy	SD-1	3	2.5	3	5
Aware		Asset Management Strategy	SD-2	3	2.5	3.5	4
Establishing		Demand Analysis	SD-3	3	3.5	4	4
Competent		Setting Asset Management Objectives	SD-4	3	3	3.5	4
Enterprising	PROG - Programming	Accounting and Costing	PROG-1	3	3	4	4.5
Excelling		Asset Investment Planning	PROG-2	3	2.5	3	4
		Capital Expenditure Evaluation	PROG-3	3	2.5	3	3.5
	PREP - Preparation	Operations & Maintenance Decision Making	PREP-1	3	2.5	3.5	4.5
		Asset Management Plans	PREP-2	3	2	3.5	4.5
		Implementation of Asset Management Plans	PREP-3	3	2	3.5	4
	IMPL - Implementation	Operations	IMPL-1	3	3.5	4	4
		Creation & Acquisition	IMPL-2	3	3	4	4.5
		Maintenance	IMPL-3	3	3.5	4	4.5
		Work and Resource Management	IMPL-4	3	3	4.5	4.5
		Rationalisation and Disposal	IMPL-5	3	3	4.5	5
	MNTR - Asset Monitoring	Asset Condition Monitoring	MNTR-1	3	3.5	4	4
		Asset Performance Monitoring	MNTR-2	3	2	3.5	4.5
		Asset Investigation	MNTR-3	3	2.5	3.5	4.5
	MSR - Management System Review	Management System	MSR-1	3	2.5	3	4
		Business Risk Management	MSR-2	3	2.5	3.5	4.5
		Asset Risk Management	MSR-3	3	3	4	4.5
		Continuous Improvement	MSR-4	3	2.5	3	4
		Legal, Regulatory and Other Requirements	MSR-5	3	4	4.5	5
	ORG - People & Organisation	Goveranance	ORG-1	3	2.5	3.5	3.5
		People Resoruces	ORG-2	3	2	3.5	3.5
		Right Sourcing	ORG-3	3	2.5	3.5	3.5
		Stakeholder Engagement	ORG-4	3	2	3	4
	D&I - Data & Information	Processes for Managing Asset Knowledge	D&I -1	3	2.5	3.5	4.5
		Asset Data and Knowledge	D&I-2	3	2	3.5	4.5
		Activity Data and Knowledge	D&I-3	3	2	3.5	4.5
	SYS - Technology	Technology Landscape and Architecture	SYS-1	3	1.5	3.5	4.5
		Financial and Administrative Information Systems	SYS-2	3	2	3.5	4.5
		Service Delivery Information Systems (e.g. CMMS,GIS, Risk, PMIS)	SYS-3	3	2	3	4
		Supply and Logistic Management Information Systems	SYS-4	3	3	3.5	4.5
		Advanced Information Systems	SYS-5	3	1.5	3	4
				3.0	2.6	3.6	4.3



4.3.4 Water and Wastewater Treatment Assets

Maturity	Focus Area		AM Element No	ISO 55000	2021 Rating	2023 Rating	2026 Rating
Innocent	SD - Setting Direction	Asset Management Policy	SD-1	3	2.5	3	5
Aware		Asset Management Strategy	SD-2	3	2.5	3.5	4
Establishing		Demand Analysis	SD-3	3	3.5	4	4
Competent		Setting Asset Management Objectives	SD-4	3	3	3.5	4
Enterprising	PROG - Programming	Accounting and Costing	PROG-1	3	3	4	4.5
Excelling		Asset Investment Planning	PROG-2	3	2.5	3	4
		Capital Expenditure Evaluation	PROG-3	3	2.5	3	3.5
	PREP - Preparation	Operations & Maintenance Decision Making	PREP-1	3	2.5	3.5	4.5
		Asset Management Plans	PREP-2	3	2	3.5	4.5
		Implementation of Asset Management Plans	PREP-3	3	2	3.5	4
	IMPL - Implementation	Operations	IMPL-1	3	3.5	4	4
		Creation & Acquisition	IMPL-2	3	3	4	4.5
		Maintenance	IMPL-3	3	3.5	4	4.5
		Work and Resource Management	IMPL-4	3	3	4.5	4.5
		Rationalisation and Disposal	IMPL-5	3	3	4.5	5
	MNTR - Asset Monitoring	Asset Condition Monitoring	MNTR-1	3	3.5	4	4
		Asset Performance Monitoring	MNTR-2	3	2	3.5	4.5
		Asset Investigation	MNTR-3	3	2.5	3.5	4.5
	MSR - Management System Review	Management System	MSR-1	3	2.5	3	4
		Business Risk Management	MSR-2	3	2.5	3.5	4.5
		Asset Risk Management	MSR-3	3	3	4	4.5
		Continuous Improvement	MSR-4	3	2.5	3	4
		Legal, Regulatory and Other Requirements	MSR-5	3	4	4.5	5
	ORG - People & Organisation	Governance	ORG-1	3	2.5	3.5	3.5
		People Resources	ORG-2	3	2	3.5	3.5
		Right Sourcing	ORG-3	3	2.5	3.5	3.5
		Stakeholder Engagement	ORG-4	3	2	3	4
	D&I - Data & Information	Processes for Managing Asset Knowledge	D&I -1	3	2.5	3.5	4.5
		Asset Data and Knowledge	D&I-2	3	2	3.5	4.5
		Activity Data and Knowledge	D&I-3	3	2	3.5	4.5
	SYS - Technology	Technology Landscape and Architecture	SYS-1	3	1.5	3.5	4.5
		Financial and Administrative Information Systems	SYS-2	3	2	3.5	4.5
		Service Delivery Information Systems (e.g. CMMS,GIS, Risk, PMIS)	SYS-3	3	2	3	4
		Supply and Logistic Management Information Systems	SYS-4	3	3	3.5	4.5
		Advanced Information Systems	SYS-5	3	1.5	3	4
				3.0	2.6	3.6	4.3



5. FUTURE STATE FOR ASSET MANAGEMENT

5.1 Improvement Recommendations

A number of prioritized recommendations have been identified to improve asset management maturity in the Public Works Department. These are show in Table 5-1 and are color coded for priority (Red-High, Orange-Medium, and Green-Low).

TABLE 5-1: IMPROVEMENT RECOMMENDATIONS ALIGNED TO THE ISO 55000 STANDARD & IAM FRAMEWORK

ISO Focus	Asset Management Elements	Improvement Recommendations
Line of Sight	Setting Direction	○ Update the current AM Policy to Capture New and Emerging Business Drivers ○ Update the SAMP and AM Roadmap of Initiatives - document and report on maturity improvement and the Return on Investment (ROI) from the AM Program ○ Conduct Scenario Planning and Develop the Risk Based Growth and Rationalisation Master Plan
	Programming	○ Update the risk-based planning framework and processes and establish this in an Enterprise DSS ○ Water/wastewater linear subdivision versus one street approach for SOGR capital programming could be part of completing asset strategy that was initiated in SP2 ○ Implement a formalized capital project process supported with enabling technology (roll out of what was initiated at SP2 stage to Locals, Peel, MTO, Metrolinx etc.) ○ Implement options analysis using business cases to identify the risk mitigation option that creates the largest risk reduction for the lowest cost and a Multi Criteria Analysis (MCA) for prioritization of capital projects
	Preparation	○ Develop an O&M Master Plan that provides guidance for strategic maintenance (and work) and operations management practices ○ Continue with the current critical asset identification and risk scoring ○ Assign responsibilities and develop detailed AMPs by asset class compliant with O. Reg 588/17
	Implementation	○ Continue to Update Operations Manual and SOPs and keep them current using the Content Management System ○ Develop and implement an MRO Readiness and AM Readiness Specifications in Capital Project documentation ○ Improve asset reliability through establishment of Asset Criticality, PM Optimization, RCM Initiatives ○ Conduct an O&M Organizational Review and implement recommendations to ensure that appropriate no of FTEs with the right experience, skills, and competencies available for service delivery
Asset Monitoring and Performance	Asset Condition Monitoring	○ Set up Preventive Maintenance condition assessment tasks (CA) by asset class in the EAMS based on asset criticality, execute these PM work orders, and capture CA ratings in the EAMS ○ Establish KPIs for asset operations and maintenance help operators and maintainers monitor asset performance and alert them to the need for corrective action ○ Establish a process for identifying and investigating asset incidents using a suitable enabling technology system
Management System Review	Management System	○ Document the entire asset management system including Policy, Framework, Workflows and Conformance Requirements ○ Develop the LOS based Business Continuity Plan considering major threat events ○ Implement the Corporate Risk Management Framework at the asset class using a DSS ○ Develop and implement a Continuous Improvement Program ○ Document compliance requirements in the Content Management System for all applicable regulations

ISO Focus	Asset Management Elements	Improvement Recommendations
AM Enablers	People & Organization	○ Ongoing review and update of the AM Governance Model in line with desired maturity improvements and the Operating Group's needs for future proofing the AM Program ○ Establish skills and competency requirements, design and implement a supporting training program for staff ○ Develop and implement a Right Sourcing Strategy (for Core and Non-Core Activities Identified) and supporting plan unique to the PW's operating environment ○ Develop an AM Program Stakeholder Engagement Plan to report on the AM Program activities and outcomes needs and understand internal and external stakeholders current and future needs
	Data & Information	○ Develop a Data Management Strategy with Asset Data Standards and Processes for collecting and maintaining key asset management data. ○ Conduct and a data gap analysis and confidence evaluation, develop and implement a data collection program to close existing data gaps in asset registers
	Technology Systems	○ Provide input to the Corporate Digital Master Plan to include all AM System, Architecture and Data Integration needs ○ Implement/Rollout out Project Accounting Functionality in the SAP ERP System to support AM practices and decision making ○ Select and Implement an Enterprise-Wide PMIS integrated to the SAP ERP System ○ Implement an Inventory Management Module to track inventory, spares, stores, purchasing and supplier information ○ Select and implement an Advanced Analytics Tool/Decision Support Tool (evaluate the suitability of SAP BI /PowerBI as an enterprise DSS for AM needs)

5.2 Improvement Initiatives

Ten Improvement Initiatives have been from the recommendations discussed above and are aligned to the ISO 55000 Standard and IAM Framework (Figure 5-1). The Improvement Initiatives are summarized in Table 5-1 and shown in detail with associated tasks and internal and external resourcing for each Public Works Division. Details on each of the ten Improvement Initiatives are provided in Appendix B.

FIGURE 5-1: IMPROVEMENT INITIATIVES ALIGNED TO THE ISO 55000 STANDARD & IAM FRAMEWORK

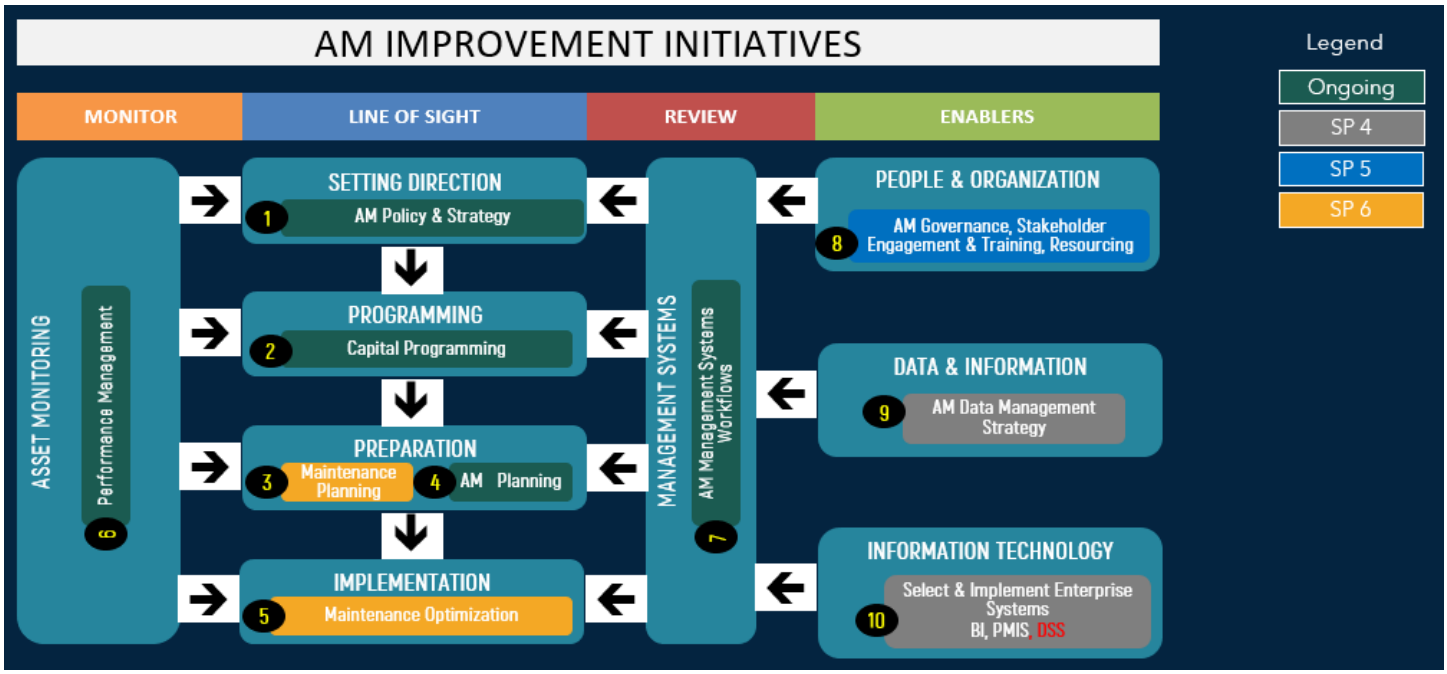


TABLE 5-1: IMPROVEMENT INITIATIVES DETAILS

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline
1	AM Policy & Strategy	Uses the AM policy and strategy to guide asset decision-making and continuous improvement of the Asset Management System (AM System). Update the Policy to account for new and emerging business drivers Interpret the AM Policy at the Divisional Level	Identification of the activities required for successful AM implementation across the Department Specific, Measurable, Achievable, Realistic and Time-bound (SMART) AM objectives for the Region and each asset class. Integration of the budgeting and AM planning processes Formal administrative procedures and or job descriptions reflecting AM governance processes and responsibilities in line with the Policy A commitment to stakeholder engagement to understand and meet their unique service delivery needs	1. Update the Policy to account for new and emerging business drivers 2. Interpret the AM Policy at the Divisional Level 3. conduct Scenario Planning and Develop the Risk Based Growth and Rationalisation Master Plan	2021 - 2022
2	Capital Programming	Implements the Capital Planning framework across all Divisions: A) Identifies and analyzes condition performance gaps. B) Decides on how to reduce identified gaps (e.g., risk, benefit-cost, and multi-criteria analyzes). C) Determines total funding needs and the impact (or risk) of insufficient funding on asset condition / performance and AM objectives. D) Understands the impact on service levels of implementing, deferring, or not implementing the various projects.	Capital planning processes enable optimized asset renewal decisions by identifying the most economical renewal solution and point in time to renew an asset, capturing and assessing lifecycle costs, identification of cost reduction or service level improvement opportunities, and for working with customers and other stakeholders during long term strategic planning. Capital, operations, and maintenance expenditures should be linked with overall business goals in triple bottom line (social, economic, and environmental) terms. In addition, the trade-offs between levels of service, cost of service, and risk should be modelled on a regular basis to inform the strategic planning process.	1. Identify and analyzes condition performance gaps. 2. Decide on how to reduce identified gaps (e.g., risk, benefit-cost, and multi-criteria analyzes). 3. Determine total funding needs and the impact (or risk) of insufficient funding on asset condition / performance and AM objectives. 4. Understand the impact on service levels of implementing, deferring, or not implementing the various projects. 5. Update the risk-based planning framework and processes and establish this in an Enterprise DSS 6. Water/wastewater linear subdivision versus one street approach for SOGR capital programming could be part of completing asset strategy that was initiated in SP2 7. Implement a formalized capital project process supported with enabling technology (roll out of what was initiated at SP2 stage to Locals, Peel, MTO, Metrolinx etc.) 8. Implement options analysis using business cases to identify the risk mitigation option that creates the largest risk reduction for the lowest cost and a Multi Criteria Analysis (MCA) for prioritization of capital projects	2021 - 2022

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline
3	Operations & Maintenance Master Planning	Implements the operations and maintenance management planning processes. The O&M master plan details the strategies necessary to achieve optimized maintenance practices Program driven work (the right mix of reactive and proactive maintenance) at all times. The practical test to see if you are in the optimized zone is that assets that are failing are those that were deliberately run to failure as those that are not have work being done in advance of failure. A strategic approach to asset operations	Improved support and reduced disruption to operations Increased understanding of the asset portfolio Balancing proactive and reactive maintenance so as to achieve better value for money Maintained asset conditions and performance Effective assessment of maintenance needs, monitoring and reporting Adherence to technical and statutory requirements	1. Develop the O&M master plan that details the strategies necessary to achieve optimized maintenance practices - (the right mix of reactive and proactive maintenance) and a strategic approach to asset operations. 2. Support implementation of the O&M Master Plan 3. Continue with the current critical asset identification and risk scoring	2021
4	AM Planning	Prepare AM Plans per asset class in line with the O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure. Assign responsibilities to monitor implementation of AMPs	AM Plans lay out the short, medium, and long term asset management strategies and associated financial needs, smooth out the funding profile, and demonstrate sustainable asset and financial management.	1. Prepare AM Plans per asset class in line with the O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure. 2. Assign responsibilities to monitor implementation of AMPs	2022 - 2023
5	PM Optimization & Asset Reliability	Implements the maintenance planning processes across all Divisions. This includes: Leveraging tacit knowledge from staff on failure modes if there is limited or poor quality information in INFOR & SAP PM for conducting PM Optimisation Leverage reliability experts and professional facilitators to develop RCM capability and use them to do RCM pilots and train up in house staff Update the CMMS configuration with appropriate failure modes by asset class and actively collect this data for all failures as part of the work management process	Understanding which assets or asset components are critical and why helps the maintenance organisation focus their activities and investments to minimize the whole life cost of the asset. O&M learnings serve as ongoing inputs to the capital planning delivery process ensuring that the right assets and configurations are created or acquired. Moving from fully reactive to Optimised Maintenance using asset criticality can save up to 40% of the OPEX Budget	1. Develop failure modes - leveraging tacit knowledge from staff on failure modes if there is limited or poor quality information in INFOR/SAP PM for conducting PM Optimisation 2. Leverage reliability experts and professional facilitators to develop RCM capability and use them to do RCM pilots and train up in house staff 3. Update the CMMS configuration with appropriate failure modes by asset class and actively collect this data for all failures as part of the work management process	2022 - 2023

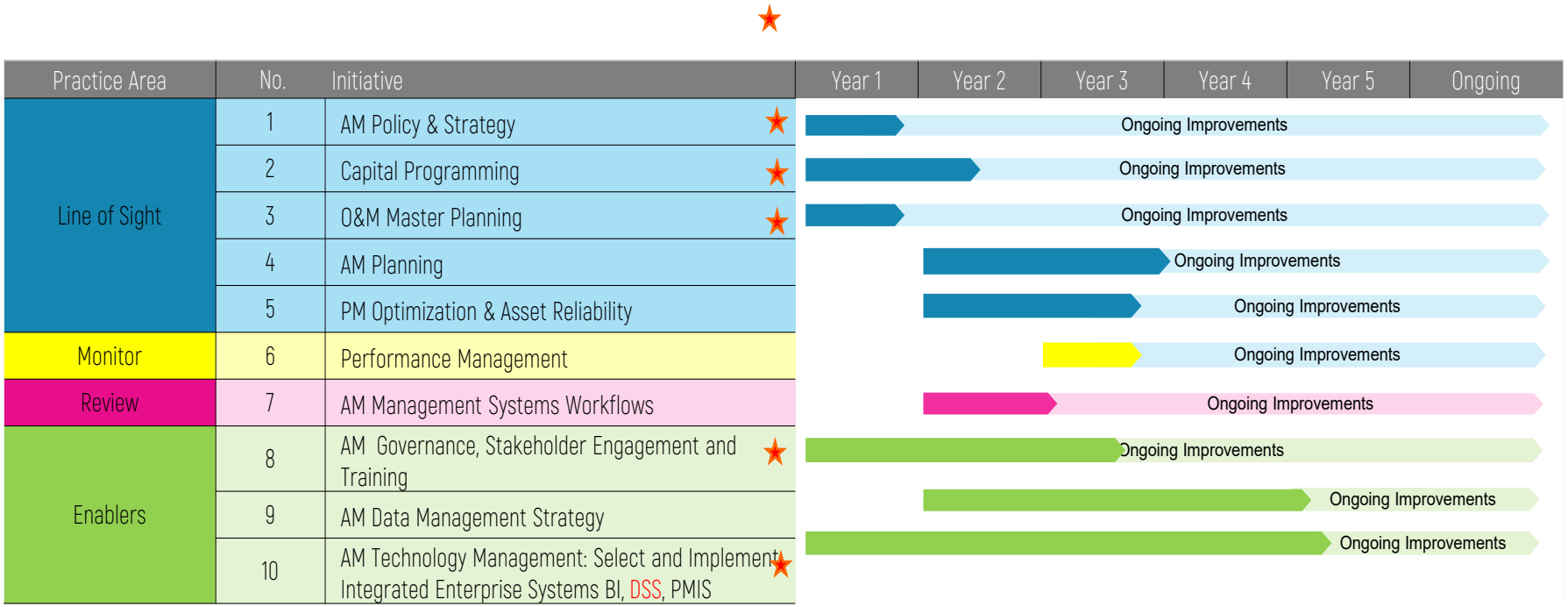
No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline
6	Performance Management	Defines what needs to be monitored, analyzed, and reported, including how and when. Undertakes the defines monitoring and investigations. Processes to monitor the condition of the various asset classes, together with appropriate controls, analysis and corrective action following asset condition parameter exceedance Processes to monitor asset performance of the various asset classes, together with appropriate controls, analysis and corrective action following poor performance. Incident investigation to provide a clear process and responsibility for handling investigation and mitigation of asset related failures, incidents, and emergency situations.	Condition and performance assessment provides insight into the remaining physical effective life of the asset and the probability of failure. Allows for better control of Operations and Maintenance Work Enables demonstrating of compliance with applicable regulations	1. Defines what needs to be monitored, analyzed, and reported, including how and when. Undertakes the defines monitoring and investigations. 2. Processes to monitor the condition of the various asset classes, together with appropriate controls, analysis and corrective action following asset condition parameter exceedance 3. Develop processes to monitor asset performance of the various asset classes, together with appropriate controls, analysis and corrective action following poor performance. 4. Establish an incident investigation to provide a clear process and responsibility for handling investigation and mitigation of asset related failures, incidents, and emergency situations. 5. Conduct an O&M Organizational Review and implement recommendations to ensure that appropriate no of FTEs with the right experience, skills, and competencies available for service delivery	2023
7	AM Management Systems Workflows	Uses the AM System to develop AM practices and related workflows. The asset management system (AM System) is a set of interrelated and interacting elements of an organization whose function is to asset management objectives and the processes needed to achieve those objectives. Develop the high-level AM System workflow and supporting workflows for each sub-element	The AM System provides a structured approach for the development, coordination and control of activities undertaken on assets by the PW over different lifecycle stages, and for aligning these activities with the PW Department's objectives. Sets the Stage for Continuous Improvement and System Auditing	1.Develop the high-level AM System workflow and supporting workflows for each sub-element Identify and develop linkages to other systems (e.g., DWQMS and ISO 14000) 2. Develop the LOS based Business Continuity Plan considering major threat events 3. Implement the Corporate Risk Management Framework at the asset class using a DSS 4. Develop and implement a Continuous Improvement Program 5. Document compliance requirements in the Content Management System for all applicable regulations	2022
8	AM Governance, Stakeholder Engagement & Training	Develops the Governance Model for AM across PW with links to the Corporate Level Develops the Stakeholder Engagement Plan Implements the Stakeholder Analysis, AM change, communications, and training strategy across the asset classes Stakeholder Engagement Analysis and Action Planning AM Communications This AM Communications Plan is comprised of four steps to support the change process through communications AM Training The outcome of the AM Training plan will be enhanced AM technical skills of staff in support of the AM Framework. The general approach for the AM Curriculum is to provide three categories or levels of training.	Clarification of the relationships between audiences, messages, channels, activities, and materials Identification and implementation of a variety of communications activities Clarification of staff members, stakeholders, and others' roles in the process Better understanding of asset management processes and concepts by staff members and stakeholders Inclusion of stakeholder input in the communications process Allows staff members and stakeholders to have a stake in successes Enables feedback on the plan's success and areas in need of strengthening	1. Develop and implement the Stakeholder Engagement Plan 2. Develop and Implement the AM Communications Plan 3. Develop and Implement the AM Training Plan - establish skills and competency requirements, design and implement a supporting training program for staff 4. Ongoing review and update of the AM Governance Model in line with desired maturity improvements and the Operating Group's needs for future proofing the AM Program 5. Develop and implement a Right Sourcing Strategy (for Core and Non-Core Activities Identified) and supporting plan unique to the PW's operating environment	2021 - 2023

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline
9	AM Data Management Strategy	Implement data governance and management strategies Establish an Asset Data Vision and Strategy that is coordinated with the Technology Architecture and Enterprise Systems implementation (e.g., DSS, PMIS, Content Management) The Strategy should include establishing standards for asset attributes, documenting data models to support communication and data design Establishing processes for monitoring and adjusting for asset data quality issues or changing needs, assessing the value or criticality of data to AM and service delivery, identifying, and prioritizing data gaps, and collecting/developing additional asset or AM data. Formalize roles, responsibilities, and authorities for managing different types of asset data.	Data needed for AM decisions and activities will be complete and correct, to a quality level appropriate to the criticality of the activity. Data will be efficiently and conveniently available to support AM activities and asset-based service delivery. Ultimately, this will result in improved service delivery and enhanced stakeholder confidence in the PW's stewardship of infrastructure.	1. Develop and implement data governance and management strategies with Asset Data Standards and Processes for collecting and maintaining key asset management data. 2. Conduct and a data gap analysis and confidence evaluation, develop and implement a data collection program to close existing data gaps in asset registers 3. Establish an Asset Data Vision and Strategy that is coordinated with the Technology Architecture and Enterprise Systems implementation (e.g., DSS, PMIS, Content Management) 4. Formalize roles, responsibilities, and authorities for managing different types of asset data.	2022 - 2024
10	AM Technology Management Implement Enterprise Systems: BI, DSS, PMIS	Continue to Implement the AM Technology Strategy and Roadmap. Ensure ongoing Divisional input to the Corporate Digital Transformation Master Plan Conduct Inventory Optimization supported by the CMMS an Integration with SAP Implement additional Enterprise Systems – BI, DSS and PMIS Ongoing development of the Content Management System with content (e.g., detailed drawings, documents etc.) where staff can easily access the right information to support business processes Data integrations and hubs/lakes/warehouses should exist to minimize re-keying and branching of data sets.	A fully developed integrated Technology Landscape will: Improve productivity Eliminate duplication of data Improve data quality Enhance decision making Knowledge development Minimize risk of knowledge loss	1. Continue to Implement the AM Technology Strategy and Roadmap. 2. Ensure ongoing Divisional input to the Corporate Digital Transformation Master Plan 3. Conduct Inventory Optimization supported by the CMMS an Integration with SAP 4. Implement additional Enterprise Systems – BI, DSS and PMIS 5. Ongoing development of the Content Management System with content (e.g., detailed drawings, documents etc.)	2022 - 2024
Totals					

5.3 Improvement Roadmap

An AM Roadmap has been developed for a five-year AM development journey based on the ten Improvement Initiatives discussed above. These have been grouped into Special Projects (SP 4, 5 & 6) These are shown in Figure 5-2 AND Figure 5-3 below:

FIGURE 5-2: ASSET MANAGEMENT ROADMAP



These special projects (SP 4, 5 & 6) are a continuation of the Division's Asset Management Journey:

1. SP 4: Capital Planning Tool
2. SP5 - Governance and Optimal Resourcing
3. SP6: Continue to build O&M Capability

FIGURE 5-3: PUBLIC WORKS DIVISION'S ONGOING ASSET MANAGEMENT JOURNEY

5.4 Implementation Strategy

Table 5-4 below shows alternative strategies for implementation of the AM Roadmap initiatives and rollout to all areas within Public Works. Option 3 is recommended for the Region and assumes appropriate governance and resourcing is in place to support implementation.

TABLE 5-4: IMPLEMENTATION STRATEGIES

Implementation Strategy	Description	Advantages	Disadvantages
Option 1: Practice Based Implementation	AM Development by AM Framework Element and roll out to all areas of the Department – note that each AMFramework Element may be practiced at various "levels" (basic, intermediate, and advanced)	A focused effort on one practice can create early successes across the Division. This approach would get all asset classes involved and maintain the interest in AM.	There can be limitations on how far practices can be implemented without data and technology solutions in place. Internal resources could be spread too thin.
Option 2: Division-Based Implementation	Focus on one asset type and implement most of the initiatives there before moving to another asset type. Work can be done concurrently in all asset classes.	A focused effort at one asset type can create early successes and demonstrate the return on investment in AM across all Elements of the AM Framework. This approach would make fewer demands on internal resources.	There can be limitations on how far practices can be implemented without data and technology solutions in place. Other areas may have to wait too long for implementation and could lose interest.
Option 3: Hybrid of Practice-Based and Division-based Implementation. **(Recommended Option)**	Focus is on one asset type, but AM preparation teams are established in all other areas that can start some of the preparatory work while major implementation is occurring at other sites. This can be data collection, documentation, etc.	A focused effort at one asset type can create early successes and demonstrate the return on investment in AM. AM preparation teams can do some of the foundational work in preparation for major implementation.	This approach would require more internal resources than Option 1. Rollout to the key areas would have to be properly scheduled to ensure there is not a long wait time for major implementation.

5.5 Business Case for Asset Management

A detailed business case for asset management was not carried out in this assignment, however, based on SLBC INC's experience with similar municipal programs, we believe that the investment of $6.3 M will create a very attractive return on investment and the Region can expect a pay back within 3 years. Potential savings and a 3 year payback period are depicted in Figure 5-3 below:

FIGURE 5-3: BUSINESS CASE FOR ASSET MANAGEMENT

The overall Value Proposition for AM at Public Works include:

1. No surprises in service delivery
2. Leverage integrated use of data for decision making
3. Transparent capital budget based on risk reduction and accurate budget decisions
4. Improved coordination of activities with local municipalities
5. Continuation of AM roadmap special projects
6. Maintain Best-in-Class practices
7. Develop a PW-wide AM Culture

The Public Works Department has already been able to demonstrate tangible savings from its asset management program, some of these are provided in Tables 5-5 and 5-6 and Figure 5-4 below:

TABLE 5-6 EXAMPLES OF PLANT CAPITAL DELIVERY OPTIMIZATION - CAPEX SAVINGS

Project	Capital Cost Reduction	Notes
Burlington Filter Rebuild	$2,250,000	AE Capital Needs Assessment in 2014 had $33.6M in structural repairs to the filters and clearwells, $4.3m before 2019 and about $10m each for 2019-2024, 2024-2029 and 2029-2034. Capital project W3168A provide filter coatings to extend the structural life by to at least 20 years to 2040.
Georgetown Aeration Upgrades	$1,727,057	Project Initiation - determined no action required for current operation, funds returned/Construction cancelled
Mid Halton Digester Gas Boosting	$300,000	Business Casing confirmed maintaining existing compressors until hydraulic mixing is installed is most cost effective
OSW MCC #1 Replacement	$240,000	Business Casing - site visit with maintenance showed this unit has additional service life available and project was not advanced
Mid Halton Aeration A&B	$996,649	Project showed the proposed connection of plant A and B did not save enough money to be advanced (engineer's estimate is 1M). Maintenance to maintain the blowers as required.
Kelso Entrance Road	$2,040,000	Study was completed and determined the road is in reasonable shape and road does not require resurfacing at this time (returned $2.34M). Road requires small ($300k) to allow better turning radius for well trucks. Defer any capital works on the road until the final decision on Lakewater to Milton is made in next master plan (2023).
Ninth Line Transfer Switch	$40,000	Project Initiation with maintenance showed the generator is in reasonable shape and the transfer switch is not required
Skyway Sidestream Treatment	$5,488,612	Study showed the side stream treatment is not worthwhile. The design funds were returned in June variance and the construction funds cancelled.
Retrofit the heating system at the Mid-Halton	$288,000	Nikolai did a cost trade-off and the results showed poor economics to continue changing natural gas heating to biogas. Could take a closer look at this for GHG savings in the future

FIGURE 5-4: BENEFITS ATTRIBUTED TO THE PW DEPARTMENT'S ASSET MANAGEMENT PROGRAM

CAPEX Savings

Project	Capital Cost Reduction	Notes
Burlington Filter Rebuild	$2,250,000	AE Capital Needs Assessment in 2014 had $33.6M in structural repairs to the filters and clearwells, $4.3m before 2019 and about $10m each for 2019-2024, 2024-2029 and 2029-2034. Capital project W3168A provide filter coatings to extend the structural life by to at least 20 years to 2040.
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Retrofit the heating system at the Mid-Halton	$288,000	Nikolai did a cost trade-off and the results showed poor economics to continue changing natural gas heating to biogas. Could take a closer look at this for GHG savings in the future

OPEX Savings

1) Grow work planning and control maturity level from 40% - 71%
2) In 2020, Directly related to our TLM program, plant capital and engineering deferred $ 7,057,585 of capital
3) In 2017, reactive work as a percentage of total work completed equaled 13 percent, in 2020 that was reduced to 3 percent and is continuing to reduce into 2021.
4) Work order count increased by 47 percent between 2017 and 2020 (the 47% is somewhat contributed to system changes and not all through efficiency)
5) 15% increase in average compliance to plan between 2018 and 2021, 79% to 92%
6) Developed new proactive work programs, main ones are as follows (RCM, TOPS, F3R, TLM)
   - RCM = Reliability engineering led program to identify optimum maintenance strategies
   - TOPS = Team Based Problem Solving to eliminate reoccurrence of unacceptable conditions or events by developing system solutions

   F3R = Change management program ensuring any equipment based changes are cross checked against Fit, Form, Function and reliability standards

   TLM = Tactical Lifecycle Management program, designed to extend the useable life of plant assets through conditional appraisals, refurbishment and optimized maintenance strategies and links with C.N.A program too

TABLE 5-6 CASE STUDY NO 2: O&M LED AM PROGRAM SAVINGS

End of Life Baseline		Baseline - Capital Needs Assessment or Project Request					Treatment Plant Maintenance			Capital
FlocID	Assembly	Material Cost	Intallation Cost	Project Cost Estimate	Recommended Replacement Yea	Source	Maintenance Acti	Work Orc	Maintenance Expenditure/Esti mate	Revised Replacement Y ar
H-P-WW-BS-SC-SCLX-S13	Secondary Clarification>0>Chain and Flight>1	503,000	1,227,100	1,656,585	2027	Skyway Ca	Rebuild	3325808	230,798.18	
H-P-WW-WS-PC-PCLX-P01	CLARIFIER #1 PRIMARY (PLANT 3 SOUTH)	171,000		342,000	2021	Oakville Sc	Rebuild	700003068	250,254.23	
H-P-WW-WS-SC-SCLX-S01	CLARIFIER #1 SECONDARY (PLANT 3 SOUTH)	190,000		380,000	2021	Oakville Sc	Overhaul	3236182	276,645.16	
H-P-WT-BW-OZ-GENR-OG1	GENERATOR #1 - OZONE	850,000		1,700,000	2020	Burlington	Overhaul/Rebuild	3231194	159,364.83	2029
H-P-WT-BW-OZ-GENR-OG2	GENERATOR #2 - OZONE	850,000		1,700,000	2019	Burlington	Overhaul/Rebuild	3233011	68,268.69	2029
H-P-WW-BS-DW-CENT	Sludge Dewatering>0>Centrifuge>1	1,059,200	2,575,500		2039	Skyway Ca	Refurbishment	700002011		
H-P-WW-HS-DG-GCPX-GC3	COMPRESSOR GAS #3						Overhaul	3234386	24,376.03	
H-P-WW-HS-DG-GCPX-GC1	COMPRESSOR GAS #1			150,000	2020	Project Rec	Rebuild	3236604	21,238.90	
H-P-WW-HS-DG-GCPX-GC2	COMPRESSOR GAS #2			150,000	2020	Project Rec	Overhaul	3237313	11,069.24	
H-P-WT-OW-AC-SEDI-ST2-T4	MOTOR DRIVE MIXER SETTLING TANK ACTI #2	$5,300.00		$10,600.00	2029	Oakville Water Treatment Plant		800000782	3,478.96	
H-P-WT-OW-AC-SEDI-ST2-RP-PUMP1	PUMP #1 RECIRCULATION ACTIFLO #2	$13,000.00		$26,000.00	2027	Oakville Water Treatment Plant		700003142	3,243.60	
H-P-WT-OW-AC-SEDI-ST2-RP-PUMP2	PUMP #2 RECIRCULATION ACTIFLO #2	$13,000.00		$26,000.00	2027	Oakville Water Treatment Plant		700003143	3,243.60	
H-P-WT-OW-AC-SEDI-ST1-RP-PUMP1	PUMP #1 RECIRCULATION ACTIFLO #1	$13,000.00		$26,000.00	2027	Oakville Water Treatment Plant		700003144	3,243.60	
H-P-WT-OW-AC-SEDI-ST2-RP-PUMP1	VALVE CHECK RECIRC PUMP #1 ACTIFLO #2	$4,200.00		$8,400.00	2027	Oakville Water Treatment Plant		3237182	6,903.35	
H-P-WT-OW-AC-SEDI-ST1-RP-PUMP2	PUMP #2 RECIRCULATION ACTIFLO #1	$13,000.00		$26,000.00	2027	Oakville Water Treatment Plant		700003145	3,243.60	
H-P-WT-OW-LL-TSCR-TS2	SCREEN TRAVELLING #2	$158,000.00		$316,000.00	2032	Oakville Water Treatment Plant		3611053	14,286.37	
H-P-WT-OW-LL-TSCR-TS1	SCREEN TRAVELLING #1	$158,000.00		$316,000.00	2032	Oakville Water Treatment Plant		3611052	8,072.08	
H-P-WT-OW-SL-WSTX-PMP-P1	PUMP #1 WASTE WATER	$32,000.00		$64,000.00	2019	Oakville W	Overhaul	700000852	7,793.43	
H-P-WW-WS-IW-SLPX-LP4	PUMP #4 SEWAGE LIFT	$80,000.00		$160,000.00	2031	Oakville Sc	Rebuild	3235839	52,700.55	
		Capital	Sum	$7,057,585			Opex	Sum	$1,123,848	
		Projected Savings	$5,933,737							

APPENDIX A – IMPROVEMENT INITIATIVES WITH ACTIVITIES AND RESOURCING BY ASSET CLASS

SUMMARY OF INITIATIVES RESOURCING

No	Initiative	Internal Resources	External Resources
1	AM Policy & Strategy	1.5	$75 - 100K
2	Capital Programming	1.5	$150 - 200K
3	Operations & Maintenance Master Planning	1.0	$100 - 150K
4	AM Planning	1.5	$250 - 300K
5	PM Optimization & Asset Reliability	2.0	$275 - 325K
6	Performance Management	1.5	$250 - 275K
7	AM Management Systems Workflows	1.0	$200 - 250K
8	AM Stakeholder Engagement & Training	2.0	$300 - 350K
9	AM Data Management Strategy	1.5	$300 - 350K
10	AM Technology Management Implement Enterprise Systems: BI, DSS, PMIS	4.0	$3.5 – 4.0M
	Totals	**17.5 FTEs**	**$5.4 – $6.3 M**

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline	Internal Resources (FTEs)						External Resources	
						Total	CAM	W-WW Treatment	W-WW Systems	Roads Operations	Waste Management	Low	High
1	AM Policy & Strategy	Uses the AM policy and strategy to guide asset decision-making and continuous improvement of the Asset Management System (AM System). Update the Policy to account for new and emerging business drivers Interpret the AM Policy at the Divisional Level	Identification of the activities required for successful AM implementation across the Department Specific, Measurable, Achievable, Realistic and Time-bound (SMART) AM objectives for the Region and each asset class. Integration of the budgeting and AM planning processes Formal administrative procedures and or job descriptions reflecting AM governance processes and responsibilities in line with the Policy A commitment to stakeholder engagement to understand and meet their unique service delivery needs	1. Update the Policy to account for new and emerging business drivers 2. Interpret the AM Policy at the Divisional Level 3. conduct Scenario Planning and Develop the Risk Based Growth and Rationalisation Master Plan	2021 - 2022	1.5	0.6	0.25	0.25	0.2	0.25	$75,000	$100,000
2	Capital Programming	Implements the Capital Planning framework across all Divisions: A) Identifies and analyzes condition performance gaps. B) Decides on how to reduce identified gaps (e.g., risk, benefit-cost, and multi-criteria analyzes). C) Determines total funding needs and the impact (or risk) of insufficient funding on asset condition / performance and AM objectives. D) Understands the impact on service levels of implementing, deferring, or not implementing the various projects.	Capital planning processes enable optimized asset renewal decisions by identifying the most economical renewal solution and point in time to renew an asset, capturing and assessing lifecycle costs, identification of cost reduction or service level improvement opportunities, and for working with customers and other stakeholders during long term strategic planning. Capital, operations, and maintenance expenditures should be linked with overall business goals in triple bottom line (social, economic, and environmental) terms. In addition, the trade-offs between levels of service, cost of service, and risk should be modelled on a regular basis to inform the strategic planning process.	1. Identify and analyzes condition performance gaps. 2. Decide on how to reduce identified gaps (e.g., risk, benefit-cost, and multi-criteria analyzes). 3. Determine total funding needs and the impact (or risk) of insufficient funding on asset condition / performance and AM objectives. 4. Understand the impact on service levels of implementing, deferring, or not implementing the various projects. 5. Update the risk-based planning framework and processes and establish this in an Enterprise DSS 6. Water/wastewater linear subdivision versus one street approach for SOGR capital programming could be part of completing asset strategy that was initiated in SP2 7. Implement a formalized capital project process supported with enabling technology (roll out of what was initiated at SP2 stage to Locals, Peel, MTO, Metrolinx etc.) 8. Implement options analysis using business cases to identify the risk mitigation option that creates the largest risk reduction for the	2021 - 2022	1.5	0.3	0.3	0.3	0.3	0.3	$150,000	$200,000

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline	Internal Resources (FTEs)						External Resources	
						Total	CAM	W-WW Treatment	W-WW Systems	Roads Operations	Waste Management	Low	High
				lowest cost and a Multi Criteria Analysis (MCA) for prioritization of capital projects									
3	Operations & Maintenance Master Planning	Implements the operations and maintenance management planning processes. The O&M master plan details the strategies necessary to achieve optimized maintenance practices Program driven work (the right mix of reactive and proactive maintenance) at all times. The practical test to see if you are in the optimized zone is that assets that are failing are those that were deliberately run to failure as those that are not have work being done in advance of failure. A strategic approach to asset operations	Improved support and reduced disruption to operations Increased understanding of the asset portfolio Balancing proactive and reactive maintenance so as to achieve better value for money Maintained asset conditions and performance Effective assessment of maintenance needs, monitoring and reporting Adherence to technical and statutory requirements	1. Develop the O&M master plan that details the strategies necessary to achieve optimized maintenance practices - (the right mix of reactive and proactive maintenance) and a strategic approach to asset operations. 2. Support implementation of the O&M Master Plan 3. Continue with the current critical asset identification and risk scoring	2021	1	0.1	0.3	0.2	0.2	0.2	$100,000	$150,000
4	AM Planning	Prepare AM Plans per asset class in line with the O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure. Assign responsibilities to monitor implementation of AMPs	AM Plans lay out the short, medium, and long term asset management strategies and associated financial needs, smooth out the funding profile, and demonstrate sustainable asset and financial management.	1. Prepare AM Plans per asset class in line with the O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure. 2. Assign responsibilities to monitor implementation of AMPs	2022 - 2023	1.5	0.3	0.3	0.3	0.3	0.3	$250,000	$300,000
5	PM Optimization & Asset Reliability	Implements the maintenance planning processes across all Divisions. This includes: Leveraging tacit knowledge from staff on failure modes if there is limited or poor quality information in INFOR & SAP PM for conducting PM Optimisation Leverage reliability experts and professional facilitators to develop RCM capability and use them to do RCM pilots and train up in house staff Update the CMMS configuration with appropriate failure modes by asset class and actively collect this data for all failures as part of the work management process	Understanding which assets or asset components are critical and why helps the maintenance organisation focus their activities and investments to minimize the whole life cost of the asset. O&M learnings serve as ongoing inputs to the capital planning delivery process ensuring that the right assets and configurations are created or acquired. Moving from fully reactive to Optimised Maintenance using asset criticality can save up to 40% of the OPEX Budget	1. Develop failure modes - leveraging tacit knowledge from staff on failure modes if there is limited or poor quality information in INFOR/SAP PM for conducting PM Optimisation 2. Leverage reliability experts and professional facilitators to develop RCM capability and use them to do RCM pilots and train up in house staff 3. Update the CMMS configuration with appropriate failure modes by asset class and actively collect this data for all failures as part of the work management process	2022 - 2023	2	0.3	0.5	0.5	0.25	0.5	$275,000	$325,000

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline	Internal Resources (FTEs)						External Resources	
						Total	CAM	W-WW Treatment	W-WW Systems	Roads Operations	Waste Management	Low	High
6	Performance Management	Defines what needs to be monitored, analyzed, and reported, including how and when. Undertakes the defines monitoring and investigations. Processes to monitor the condition of the various asset classes, together with appropriate controls, analysis and corrective action following asset condition parameter exceedance Processes to monitor asset performance of the various asset classes, together with appropriate controls, analysis and corrective action following poor performance. Incident investigation to provide a clear process and responsibility for handling investigation and mitigation of asset related failures, incidents, and emergency situations.	Condition and performance assessment provides insight into the remaining physical effective life of the asset and the probability of failure. Allows for better control of Operations and Maintenance Work Enables demonstrating of compliance with applicable regulations	1. Defines what needs to be monitored, analyzed, and reported, including how and when. Undertakes the defines monitoring and investigations. 2. Processes to monitor the condition of the various asset classes, together with appropriate controls, analysis and corrective action following asset condition parameter exceedance 3. Develop processes to monitor asset performance of the various asset classes, together with appropriate controls, analysis and corrective action following poor performance. 4. Establish an incident investigation to provide a clear process and responsibility for handling investigation and mitigation of asset related failures, incidents, and emergency situations. 5. Conduct an O&M Organizational Review and implement recommendations to ensure that appropriate no of FTEs with the right experience, skills, and competencies available for service delivery	2023	1.5	0.3	0.3	0.3	0.3	0.3	$250,000	$275,000
7	AM Management Systems Workflows	Uses the AM System to develop AM practices and related workflows. The asset management system (AM System) is a set of interrelated and interacting elements of an organization whose function is to asset management objectives and the processes needed to achieve those objectives. Develop the high-level AM System workflow and supporting workflows for each sub-element	The AM System provides a structured approach for the development, coordination and control of activities undertaken on assets by the PW over different lifecycle stages, and for aligning these activities with the PW Department's objectives. Sets the Stage for Continuous Improvement and System Auditing	1.Develop the high-level AM System workflow and supporting workflows for each sub-element Identify and develop linkages to other systems (e.g., DWQMS and ISO 14000) 2. Develop the LOS based Business Continuity Plan considering major threat events 3. Implement the Corporate Risk Management Framework at the asset class using a DSS 4. Develop and implement a Continuous Improvement Program 5. Document compliance requirements in the Content	2022	1	0.2	0.2	0.2	0.2	0.2	$200,000	$250,000

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline	Internal Resources (FTEs)						External Resources	
						Total	CAM	W-WW Treatment	W-WW Systems	Roads Operations	Waste Management	Low	High
				Management System for all applicable regulations									
8	AM Governance, Stakeholder Engagement & Training	Develops the Governance Model for AM across PW with links to the Corporate Level Develops the Stakeholder Engagement Plan Implements the Stakeholder Analysis, AM change, communications, and training strategy across the asset classes Stakeholder Engagement Analysis and Action Planning AM Communications This AM Communications Plan is comprised of four steps to support the change process through communications AM Training The outcome of the AM Training plan will be enhanced AM technical skills of staff in support of the AM Framework. The general approach for the AM Curriculum is to provide three categories or levels of training.	Clarification of the relationships between audiences, messages, channels, activities, and materials Identification and implementation of a variety of communications activities Clarification of staff members, stakeholders, and others' roles in the process Better understanding of asset management processes and concepts by staff members and stakeholders Inclusion of stakeholder input in the communications process Allows staff members and stakeholders to have a stake in successes Enables feedback on the plan's success and areas in need of strengthening	1. Develop and implement the Stakeholder Engagement Plan 2. Develop and Implement the AM Communications Plan 3. Develop and Implement the AM Training Plan - establish skills and competency requirements, design and implement a supporting training program for staff 4. Ongoing review and update of the AM Governance Model in line with desired maturity improvements and the Operating Group's needs for future proofing the AM Program 5. Develop and implement a Right Sourcing Strategy (for Core and Non-Core Activities Identified) and supporting plan unique to the PW's operating environment	2021 - 2023	2	1	0.25	0.25	0.25	0.25	$300,000	$350,000

No	Initiative	Scope of Work	Expected Benefits	Key Activities	Timeline	Internal Resources (FTEs)						External Resources	
						Total	CAM	W-WW Treatment	W-WW Systems	Roads Operations	Waste Management	Low	High
9	AM Data Management Strategy	Implement data governance and management strategies Establish an Asset Data Vision and Strategy that is coordinated with the Technology Architecture and Enterprise Systems implementation (e.g., DSS, PMIS, Content Management) The Strategy should include establishing standards for asset attributes, documenting data models to support communication and data design Establishing processes for monitoring and adjusting for asset data quality issues or changing needs, assessing the value or criticality of data to AM and service delivery, identifying, and prioritizing data gaps, and collecting/developing additional asset or AM data. Formalize roles, responsibilities, and authorities for managing different types of asset data.	Data needed for AM decisions and activities will be complete and correct, to a quality level appropriate to the criticality of the activity. Data will be efficiently and conveniently available to support AM activities and asset-based service delivery. Ultimately, this will result in improved service delivery and enhanced stakeholder confidence in the PW's stewardship of infrastructure.	1. Develop and implement data governance and management strategies with Asset Data Standards and Processes for collecting and maintaining key asset management data. 2. Conduct and a data gap analysis and confidence evaluation, develop and implement a data collection program to close existing data gaps in asset registers 3. Establish an Asset Data Vision and Strategy that is coordinated with the Technology Architecture and Enterprise Systems implementation (e.g., DSS, PMIS, Content Management) 4. Formalize roles, responsibilities, and authorities for managing different types of asset data.	2022 - 2024	1.5	0.5	0.25	0.25	0.25	0.25	$300,000	$350,000
10	AM Technology Management Implement Enterprise Systems: BI, DSS, PMIS	Continue to Implement the AM Technology Strategy and Roadmap. Ensure ongoing Divisional input to the Corporate Digital Transformation Master Plan Conduct Inventory Optimization supported by the CMMS an Integration with SAP Implement additional Enterprise Systems – BI, DSS and PMIS Ongoing development of the Content Management System with content (e.g., detailed drawings, documents etc.) where staff can easily access the right information to support business processes Data integrations and hubs/lakes/warehouses should exist to minimize re-keying and branching of data sets.	A fully developed integrated Technology Landscape will: Improve productivity Eliminate duplication of data Improve data quality Enhance decision making Knowledge development Minimize risk of knowledge loss	1. Continue to Implement the AM Technology Strategy and Roadmap. 2. Ensure ongoing Divisional input to the Corporate Digital Transformation Master Plan 3. Conduct Inventory Optimization supported by the CMMS an Integration with SAP 4. Implement additional Enterprise Systems – BI, DSS and PMIS 5. Ongoing development of the Content Management System with content (e.g., detailed drawings, documents etc.)	2022 - 2024	4	1	0.75	0.75	0.75	0.75	$3,500,000	$4,000,000
Totals						**17.5**	**5**	**3.4**	**3.3**	**3**	**3.3**	**$5,400,000**	**$6,300,000**

advisory
services

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If you would like to learn more,
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