CORPORATE ASSET MANAGEMENT PLAN

2017 Interim Update

CITY OF Guelph
Making a Difference

guelph.ca

Making a Difference

2017 Corporate Asset Management Plan

Acknowledgement

The Corporate Asset Management division would like to acknowledge the time and efforts of the City staff from each of the City departments who contributed to the development of this plan. The development of this plan has been an organization-wide effort, and bears testament to our collective desire to make the best possible decisions regarding our assets. The support and dedication of each department has been critical in ensuring that this is a holistic and enduring plan.

Executive Summary

E.1 Introduction

Guelph is vibrant community with a population of over 120,000 located in the heart of Southern Ontario. The City of Guelph contributes to a high quality of life by providing a diverse array of services including culture and recreation, drinking water, wastewater collection and treatment, stormwater drainage, garbage collection, public transit, various options for transportation, and emergency services. If all of the assets that support these services were to be replaced today it would cost $4 billion dollars, or about $30,000 per Guelph resident. The City of Guelph's 2017 Corporate Asset Management Plan is the first asset management plan developed and published by the City. The plan outlines the processes and practices in place to get the maximum value from the City's assets and services.

E.2 State of the Assets

The state of the assets report card provides a quantitative assessment of the asset portfolio in terms of overall replacement value and estimated remaining life. **Table E-1** provides an overview of the replacement value and ratings of City-owned assets. Overall, the City's asset portfolio has approximately 46 per cent remaining service life, which is considered to be in the fair rating category. Of the portfolio, approximately 30 per cent, or $1.2 billion in assets, have below 40 per cent remaining service life. Approximately $491 million are beyond their typical service lives.

Table E-1. Asset System Ratings Based on Service Life and Condition

Asset System	Replacement Value	Remaining Service Life (%)	Rating Category	Assets Below 40 Per cent Remaining Service Life	
				%	Replacement Value
Administrative Facilities	$110.7 million	54%	Fair	17%	$19.3 million
Corporate Vehicles and Equipment	$39.6 million	46%	Fair	33%	$13.3 million
Culture and Recreation	$295.8 million	-2%	Very Poor	52%	$155.1 million
Emergency Services	$77.8 million	71%	Good	12%	$9.4 million
Information Technology	$7.2 million	-1%	Very Poor	52%	$3.7 million
Parking	$57.8 million	-5%	Very Poor	72%	$41.6 million
Transportation	$1,549.3 million	61%	Good	13%	$195.9 million
Solid Waste	$58.7 million	44%	Fair	25%	$14.6 million
Stormwater	$558.2 million	52%	Fair	28%	$156.0 million
Transit	$76.7 million	22%	Poor	64%	$49.0 million
Wastewater	$559.7 million	31%	Poor	45%	$250.2 million
Water	$615.5 million	43%	Fair	45%	$279.6 million
Total	**$4,007.0 million**	**46%**	**Fair**	**30%**	**$1,187.6 million**

It should be noted, that the estimates of remaining lives and rating categories do not necessarily mean that the assets are insufficiently providing service. In order to improve the confidence in the numbers, the City must continue to conduct investigations, and complete condition and performance assessments to best understand potential impacts to risks, levels of service and lifecycle costs.

E.3 Desired Levels of Service

One of the key goals of asset management is to understand the balance between the cost, performance and risks. Well-defined levels of service can be used to:

- Inform customers of the current level of service provided and any proposed changes to level of service and associated costs;
- Measure performance against these defined levels of service;
- Identify the costs and benefits of services; and
- Enable customers to consider the level of service provided within the context of affordability.

In 2017, the City is embarked on several key initiatives to help define levels of service over the long term. The vision is for the City to establish key level of service requirements, and better understand the relationship between the levels of service and costs to provide the service. Tools and techniques will be developed to predictively model levels of service over time. Key initiatives that are underway or planned include:

- Corporate level of service initiative (Corporate Asset Management);
- Service review (Project Management Office and Corporate Asset Management); and
- Corporate performance and accountability framework (Chief Administrative Officer's Office).

Findings of the Levels of Service initiative can be found in Section 3.4.

E.4 Lifecycle Management Strategy

Many City departments and community stakeholders are involved in various aspects of each asset's lifecycle. Often those responsible for delivering the service will identify the need for new assets. After a need has been identified, the asset will be acquired or constructed. The asset then is operated and maintained on an ongoing basis, until heavier renewal would be required. As the asset nears the end of its life, a plan is established to replace, decommission or upgrade the asset to meet the future needs. These activities collectively represent the asset's lifecycle. In asset management, the focus is on using a full lifecycle approach when planning. An asset lifecycle management strategy is the set of planned actions throughout the asset's full lifecycle that will enable the assets to provide desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost. For the purposes of this plan, lifecycle activities are categorized as follows:

- **Non-infrastructure solutions**: Actions or policies that can lower costs or extend asset life (e.g., better integrated infrastructure planning and land use planning, demand management, insurance, process optimization, managed failures).
- **Maintenance activities**: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events.
- **Renewal/rehabilitation activities**: Significant repairs designed to extend the life of the asset. For example, the lining of iron watermains can defer the need for replacement.
- **Replacement activities**: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehabilitation is no longer an option.

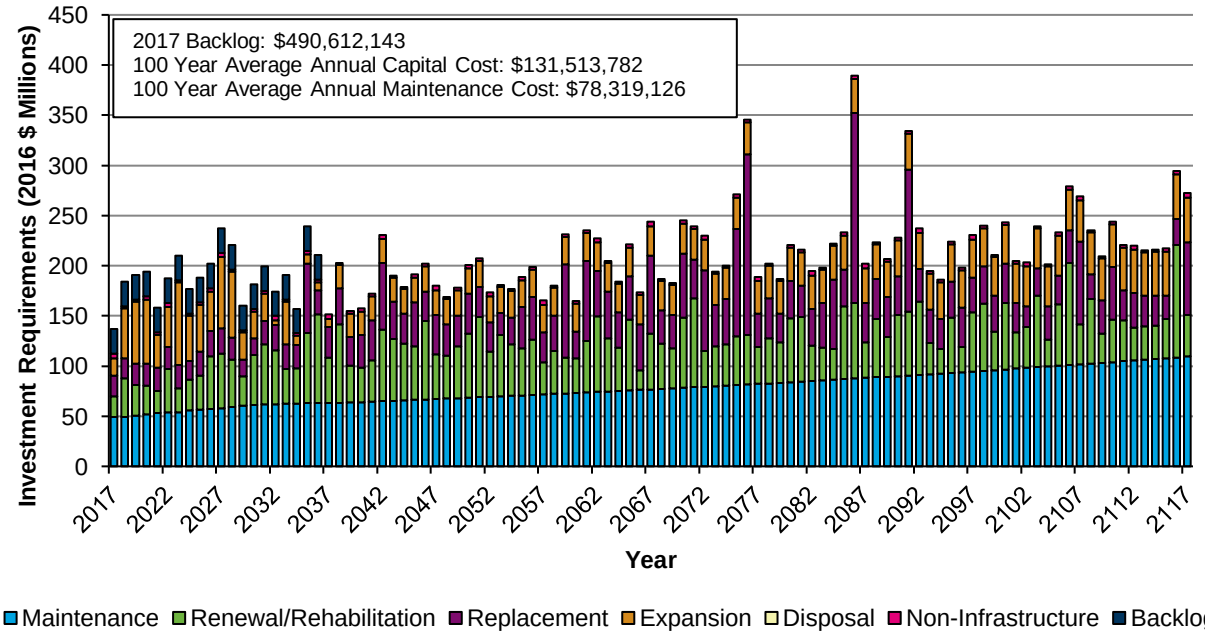
- **Disposal activities** – the activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality.
- **Expansion activities** – planned activities required to extend services to previously un-serviced areas – or to expand services to meet growth demands.

E.5 Financing Strategy

Long-term asset investment forecasts provide insight into prospective investment requirements which may fall outside of the 10-year planning horizon typically used in capital budgeting. Large quantities of asset construction during a short time span, as seen in the 1990s, will require equally as heavy investment once those assets reach the end of their service lives. If those investment requirements are not addressed appropriately, levels of service could potentially decline and operations and maintenance costs could increase. The 100-year forecast aims to cover the entire lifecycle of the assets, therefore allowing identification of such trends. All graphs below have been updated to reflect the findings of the 2018 Development Charges study.

Funding and investment requirements were developed for each asset system to establish an average annual lifecycle cost. **Figure E-1** provides the overall lifecycle investment requirements broken down by each lifecycle activity. As can be seen from the figure, average annual capital and maintenance costs of $131 million and $78 million are forecasted to be required over the 100-year period.

Figure E-1. 100 Year Lifecycle Investment Requirements



A comparison of various funding levels against the cumulative lifecycle funding requirements for 20 years was completed to provide insight into funding gaps over time. **Figure E-2** provides the cumulative 20 year forecast for tax supported asset systems. In 2017, tax supported asset systems have approximately $220 million in deferred capital, which has been spread over the 20-years for the purpose of the analysis, resulting in an additional $11 million in investment requirements per year. Annual increases of zero per

cent and one per cent would result in backlogs of $1,250 million, and $1,130 million by 2037, respectively. A 6.81 per cent annual capital increase would be required to eliminate the backlog by 2037.

Figure E-2. 20 Year Cumulative Capital Investments vs. Revenues (Tax Supported)

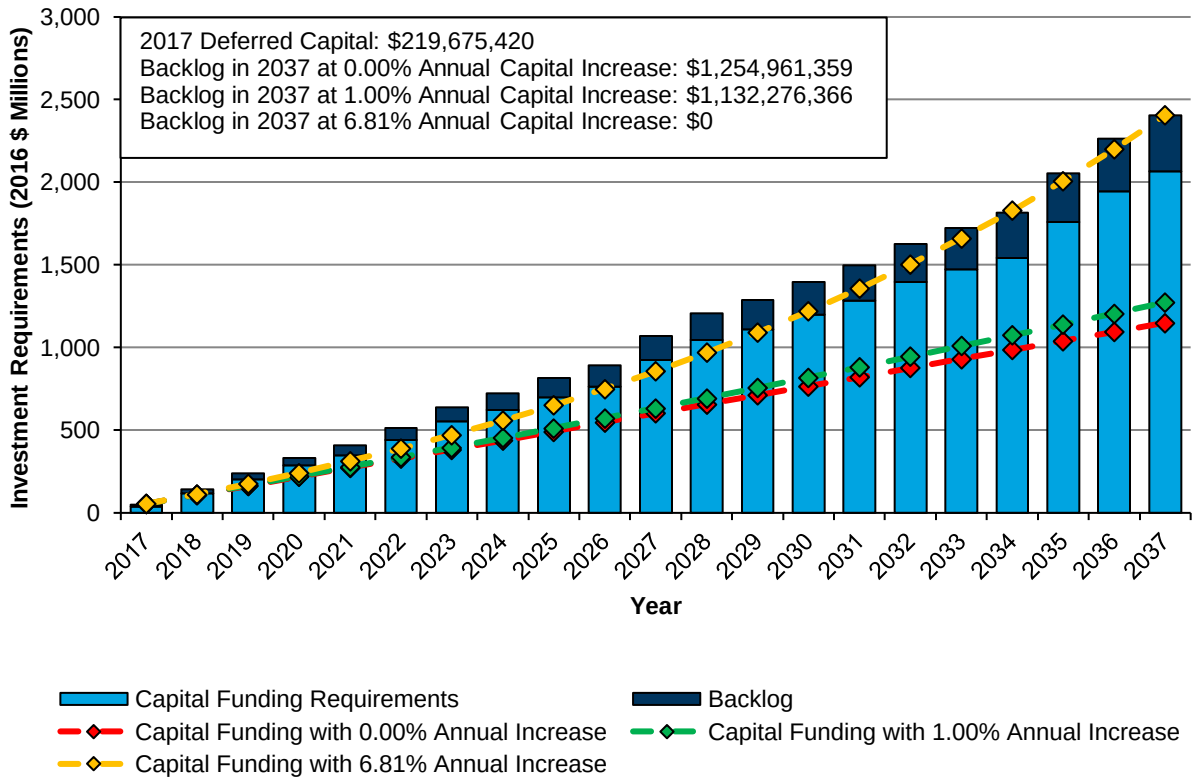
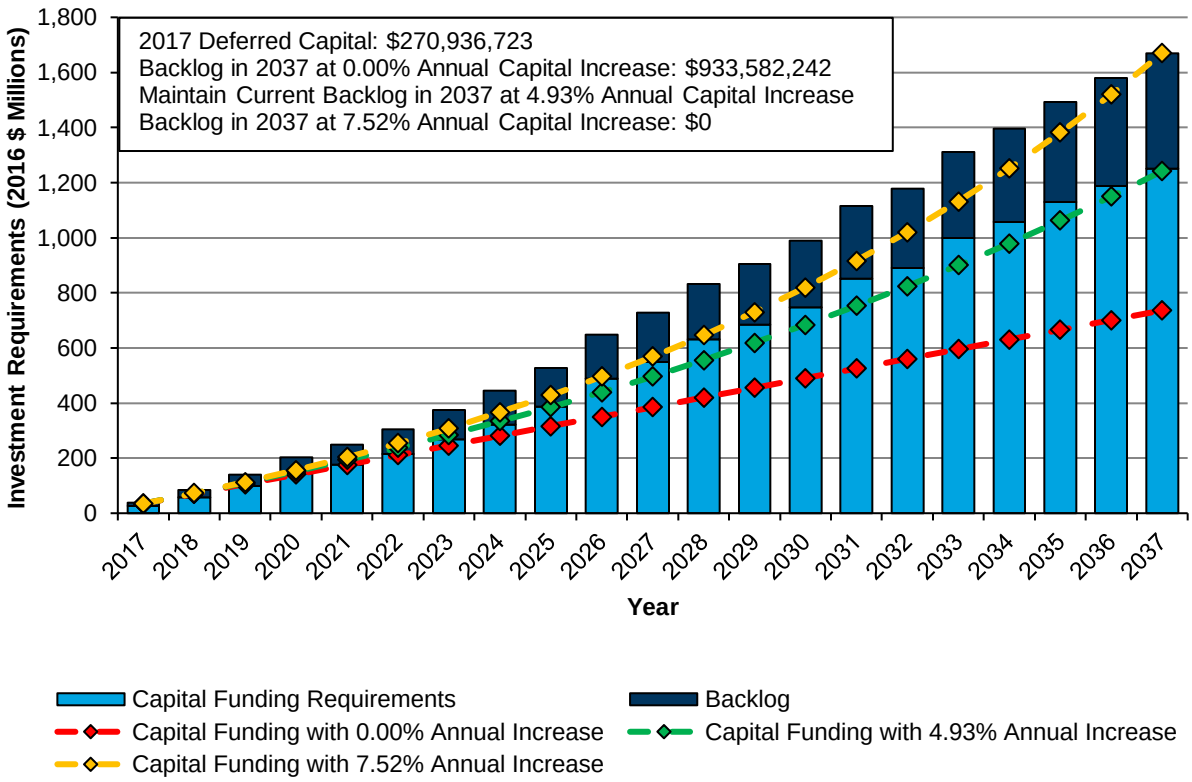


Figure E-3 provides the cumulative 20-year forecast for rate supported asset systems (water, wastewater and stormwater). Rate supported asset systems, have approximately $271 million in deferred capital, which has been spread over the 20 years, resulting in an additional $14 million in investment requirements per year. A zero per cent annual increase would result in a backlog of $993 million by 2037. A 7.52 per cent annual capital increase would be required to eliminate the backlog by 2037.

Figure E-3. 20 Year Cumulative Capital Investments vs. Revenues (Rate Supported)

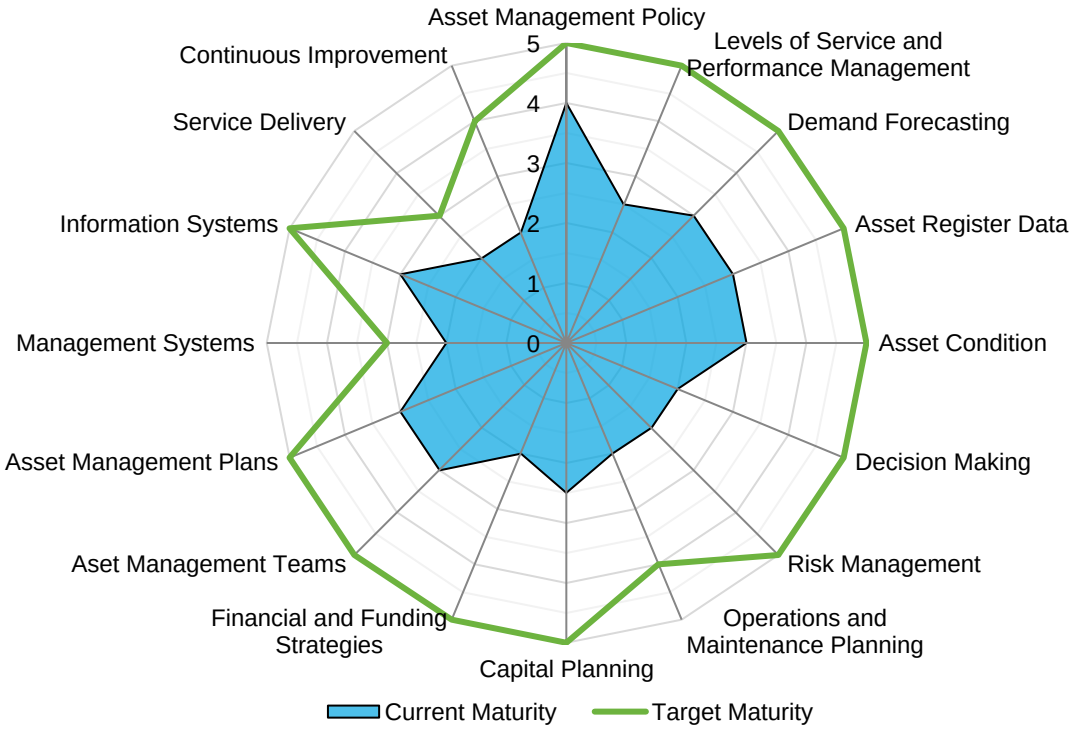


It should be noted that the analysis considers only capital funding, and does not consider the current reserve position. Therefore, the percentage annual increase does not specifically correlate to a direct increase to rates or the tax levy, and could potentially be funded from a variety of sources, including but not limited to existing reserves or grants and subsidies.

E.6 Improvement Monitoring

One of the goals of this asset management plan was to establish a baseline of the current asset management practices, to inform a work plan for continuous improvement of the Corporate Asset Management Program. Any assumptions made and opportunities identified have been documented to serve as the basis for continuous improvement. This plan presented a proposed continuous improvement program in terms of two components: (1) actions related to improving future asset management plans; and (2) actions to advance the City's overall asset management capabilities. **Figure E-4** provides the current and target maturity of our Corporate Asset Management Program in each key aspect of the asset management system. The work plan developed from this baseline aims to progress towards the targets over the next four years.

Figure E-4. Current and Target Asset Management Maturity based on the IIMM and ISO55000



The proposed work plan builds on the City's existing strengths and is aimed at developing a leading Corporate Asset Management Program that will achieve organizational objectives while balancing costs, opportunities and risks against the desired levels of service.

Asset management provides a mechanism for reliable, repeatable and transparent decision making. However, asset management is more than just a one-off project and to realize the full benefits, the principles should be systematically developed, embedded and integrated across all departments, and be continuously improved. This is the City's aim.

Quality

Primary Authors

Daryush Esmaili	Manager, Corporate Asset Management
Jessica Angers	Analyst, Corporate Asset Management

Corporate Asset Management Steering Committee Review

Adam Fischer
Andy MacDonald
Blair Labelle
Brad Coutts
Cameron Walsh
Conrad Coutts
Danna Evans
David Godwaldt
Donna Tremblay
Doug Godfrey
Greg Clark
Heather Flaherty
James Krauter
Jeet Joginder
Jennifer Slater
Jennifer Smith
John Osborne
Katherine Gray
Kealy Dedman
Mario Petricevic
Martin Neumann
Mike Spicer
Peter Cartwright
Peter Busatto
Sarah Purton
Stephen O'Brien
Tara Sprigg
Tim Robertson
Todd Salter
Tomoko King
Wayne Galliher

Revision History

Revision #	Date	Revised By:	Revision Description
1	December 23, 2016	D. Esmaili and J. Angers	First draft for Asset Management Steering Committee review.
2	December 24, 2016	D. Esmaili	Updates to the executive summary.
3	January 25, 2017	D. Esmaili, J. Angers, and L. Mousseau	Editorial review and incorporation of review comments.
4	February 02, 2017	D. Esmaili	Incorporation of revised remaining life and replacement costs from Wastewater Services
5	November 27, 2018	D. Esmaili and J. Angers	Incorporation of 2018 Development Charge Study into 100 year lifecycle forecasts and funding analysis. Incorporation of preliminary results from Levels of Service Initiative into Section 3 – Desired Levels of Service.

Table of Contents

Case Studies

Figures

Tables

Appendices

Abbreviations

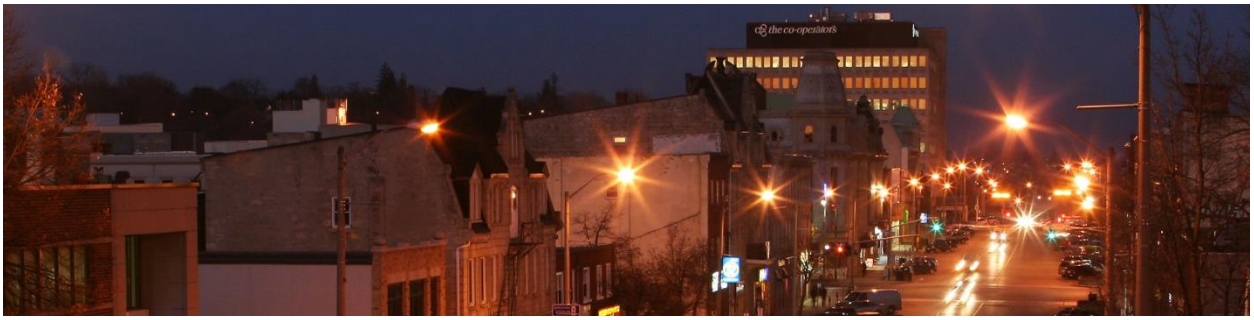
AODA	Accessibility for Ontarians with Disabilities Act
CAD	Canadian Dollars
CAM	Corporate Asset Management
CCTV	Closed Circuit Television
CIRC	Canadian Infrastructure Report Card
CMMS	Computerized Maintenance Management System
EAM	Enterprise Asset Management
EMS	Emergency Medical Service
GIS	Geographic Information System
GFMAM	Global Forum on Maintenance and Asset Management
ISO	International Organization for Standardization
IIMM	International Infrastructure Management Manual
IPWEA	Institute of Public Works Engineering Australasia
MOECC	Ministry of the Environment and Climate Change (Ontario)
NBV	Net Book Value
NRBCPI	Non-Residential Building Construction Price Index
NWWBI	National Water and Wastewater Benchmarking Initiative
O&M	Operations and Maintenance
OSIM	Ontario Structure Inspection Manual
PCI	Pavement Condition Index
POA	Provincial Offences Act
PSAB	Public Sector Accounting Board
SAMPLE	Systemic Asset Management Practice Level Evaluation
WAM	Oracle Work and Asset Management

Definitions

Asset	An Item, thing or entity that has potential or actual value to an organization.
Asset Lifecycle	Period from asset creation to asset end-of-life.
Asset Management	Coordinated activity of an organization to realize value from assets.
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.
Asset Management System	The people, processes, tools and other resources involved in the delivery of asset management. 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
Asset System	Set of assets that interact or are interrelated.
Asset Type	Grouping of assets having common characteristics that distinguish those assets as a group or class.
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.
Competence	Ability to apply knowledge and skills to achieve intended results.
Continual Improvement	Recurring activity to enhance performance.
Corporate Asset Management	The application of asset management principles at a corporate level to maximize consistency among diverse asset groups. Corporate asset management creates efficiency by harmonizing service levels and business processes wherever possible.
Corrective Action	Action to eliminate the cause of a nonconformity and to prevent recurrence.
Critical Asset	Asset having potential to significantly impact on the achievement of the organization's objectives.
Effectiveness	extent to which planned activities are realized and planned results achieved
Intangible Assets	Non-physical assets, such as leases, brands, digital assets, use rights, licenses, intellectual property rights, reputation or agreements.
Level Of Service	Parameters, or a combination of parameters, which reflect social, political, environmental and economic outcomes that the organization or asset delivers.
Life Cycle	Stages involved in the management of an asset.
Management System	Set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives.
Net Book Value	The original cost of an asset, less any accumulated depreciation, accumulated depletion, or accumulated amortization, and less any accumulated impairment. The value at which a company carries an asset on its balance sheet.

Objective	Result to be achieved. An objective can be strategic, tactical or operational and 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. 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
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.
Organizational Plan	Documented information that specifies the programmes to achieve the organizational objectives
Performance	Measureable 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
Predictive Action	Action to monitor the condition of an asset and predict the need for preventive action or corrective action
Preventive Action	Action to eliminate the cause of a potential nonconformity or other undesirable potential situation.
Process	Set of interrelated or interacting activities which transform inputs into outputs.
Requirement	Need or expectation that is stated, generally implied or obligatory.
Risk	Effect of uncertainty on objectives. 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.
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".
Strategic Asset Management Plan	Documented information that specifies how organizational objectives are to be converted into asset management objectives, the approach for developing asset management plans, and the role of the asset management system in supporting achievement of the asset management objectives
Tangible Capital Asset	Physical asset, typically equipment, inventory and property, owned by the organization.
Top Management	Person or group of people who directs and controls an organization at the highest level.

1 Introduction



1.1 Our Community

The City of Guelph (the City) is a vibrant community of over 120,000 people situated in the heart of southern Ontario, just 100 km west of Toronto, Ontario Canada. Guelph is consistently rated as one of Canada's best places to live.[1,2] Home to award-winning festivals, vibrant communities and unique cultural events, the City is known for its low crime rates, progressive environmental practices and a generally high standard of living. The Guelph Census Metropolitan Area has the lowest unemployment rate in the country,[3] and is currently ranked at the bottom of Canada's crime severity list.[4] The diverse economy of Guelph is driven by advanced manufacturing companies, agri-food and innovation firms, environmental management and technology companies and tourism operators. It is these five facets of the local economy that have been identified in Guelph's Economic Development Strategy as growth industries on which to focus economic development activities in the years to come. According to Places to Grow and the related Growth Plan for the Greater Golden Horseshoe, Guelph is targeted to increase its population to 175,000, including 30,000 more jobs, by 2031. The Provincial legislation established that 40 per cent of that growth must occur in "established areas". This means putting denser, mixed use developments into existing built-up areas of the city, and improving existing infrastructure to support this development.

1.2 Asset Management Plan

The City of Guelph's 2017 Corporate Asset Management Plan (the Plan) is the first asset management plan developed and published by the City. The purpose of this asset management plan is to outline the processes and practices in place to ensure the delivery of the City's services over the next 10 years. Although various service areas have developed mature processes with respect to asset management, the City's overarching corporate asset management practices are relatively early in development, with a number of targeted strategies to advance the overall level of practice over the next few years. The aim of the Corporate Asset Management Program is to develop a holistic and coordinated approach to asset

---

1 *"Canada's Best Places to Live". Canadian Business Online. Archived from the original on 2012-02-24. Retrieved 2008-03-18.*

2 *"Guelph recognized as one of Canada's top ten cities". Guelph.ca. 2009-04-16. Archived from the original on 2008-12-25. Retrieved 2012-02-20.*

3 *Statistics Canada. Table 282-0135 - Labour force survey estimates (LFS), by census metropolitan area based on 2011 Census boundaries, 3-month moving average, seasonally adjusted and unadjusted, monthly (persons unless otherwise noted) [Online: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=2820135&&pattern=&stByVal=1&p1=1&p2=37&tabMode=dataTable&csid=]. Retrieved November 19, 2016.*

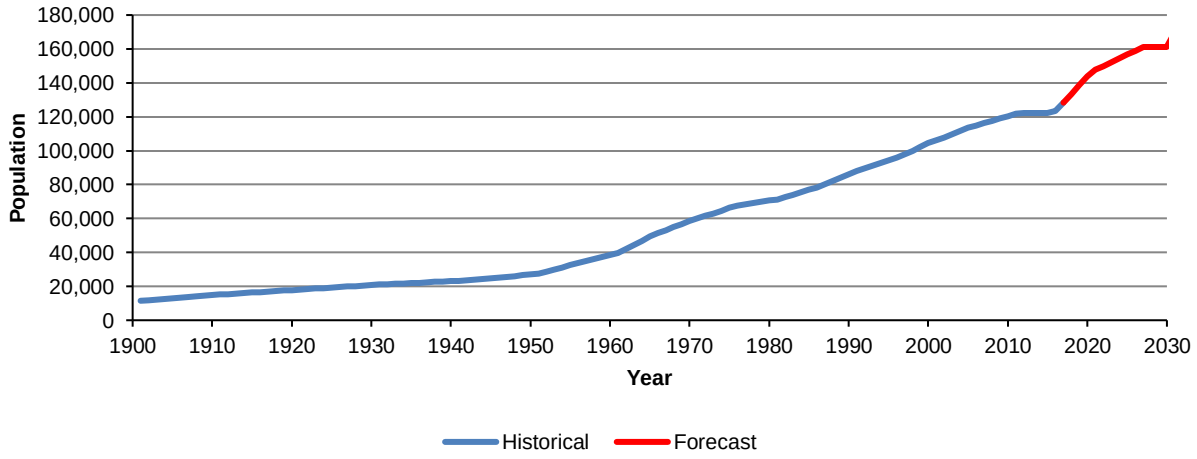
4 *Statistics Canada (2016) Table 3 – Police-reported Crime Severity Index and crime rate, by census metropolitan area [Online: http://www.statcan.gc.ca/daily-quotidien/160720/t003a-eng.htm]. Retrieved November 19, 2016.*

management that ensures levels of service are met and risks are managed in the most cost effective manner.

This plan has been developed to meet and do better than the requirements of the Infrastructure Ontario (2012) Building Together Guide for Asset Management Plans. In addition, this document and the associated management system are aligned with the requirements and definitions in ISO 55000:2014(E) – International Standard for Asset Management,[5] and BSI PAS55:2008. Moreover, the goal is to also develop asset management maturity based upon the guidelines set forth in IPWEA (2015) International Infrastructure Management Manual, and detail a strategy to quantify and address the growing infrastructure deficit.

While this is the first document of this kind for Guelph, the City has been managing its assets for almost two centuries. The discipline of asset management, however, which is focused on integration, sustainability, and whole lifecycle optimization, has only recently emerged to prominence. Like the majority of Canadian municipalities, the City of Guelph has seen significant growth throughout the 20th and 21st centuries. **Figure 1** shows the historical and projected population within the City of Guelph since the beginning of the 20th century. As the community has grown and flourished, a diverse portfolio of assets has been established to support services that support a high quality of life including parks, recreational opportunities, drinking water, garbage collection, transportation services, and emergency services. If all of these assets were to be replaced today, it would cost $4 billion dollars, which is equivalent to approximately $30,000 per Guelph resident. These assets are part of interrelated networks that require significant resources to be operated throughout their lifecycles, ensuring that they are maintained, monitoring their performance, and eventually replacing and disposing of them. The costs associated with these activities can often amount to five times greater than the acquisition or construction costs. By applying the principles of effective asset management, the City will get the most value from these significant investments, in terms of ensuring levels of service and minimizing risks.

Figure 1. Historical and Projected Population Growth



Published in 2017, this document is a snapshot in time of the asset management processes and practices at the City. This document will be updated annually with a full re-evaluation at least every four years, ensuring that the most up-to-date information is documented and communicated.

[5] *ISO/IEC. (2014). ISO International Standard ISO/IEC 55000:2014(E) – Asset management – Overview, principles and terminology. Geneva, Switzerland: International Organization for Standardization (ISO)*

1.1 Goals of the Municipality and Dependence on Assets

An integral component of ensuring reliable service is creating an effective approach to managing existing and future municipal assets. Effective asset management aims to realize value from assets in a way that balances levels of service, risk, and cost effectiveness throughout the entire asset lifecycle. Ultimately, adopting effective and comprehensive asset management strategies across the organization will support long term sustainability and efficiency while maintaining levels of service.

1.2.1 2017 Asset Management Policy

The City produced its first Asset Management Policy (the Policy) in 2013. This Policy detailed the City's key objectives for asset management, and established a baseline that Guelph has continued to build on. The Corporate Asset Management Division was formed in 2016 to coordinate the development and advancement of the City's corporate asset management system. An early objective for the Corporate Asset Management division was updating the Asset Management Policy to reflect advances in best practices for asset management, and incorporate the current Corporate Administrative Plan as well as other City initiatives. The Policy is included in **Appendix A**, and details the principles and general framework for a consistent and coordinated approach to asset management in order to achieve the organization's asset management objectives, guided by the Corporate Administrative Plan 2016-2018. The City will meet these objectives by:

- Balancing life cycle costs and acceptable risks with desired levels of service;
- Linking asset investment decisions to service outcomes;
- Ensuring accountability, transparency and engagement; and
- Demonstrating sustainable, full lifecycle planning.

The key sections of the Policy are as follows:

1. **Terms and Definitions:** Key definitions for use within the Asset Management Policy, and a commitment that all terminology in official asset management documents shall be consistent with ISO 55000:2014(E) – International Standard for Asset Management
2. **Background:** A brief introduction to the history of the Corporate Asset Management Program and Policy.
3. **Policy Statement:** A brief description of what the Policy includes.
4. **Scope of the Asset Management System:** A definition of the components, scope, and documents within the asset management system.
5. **Asset Management Mission, Goals and Principles:** Key goals and guiding principles of the Corporate Asset Management Program. The asset management mission statement, and the key asset management goals.
6. **Review Period:** The frequency of update of the Asset Management Policy.
7. **Roles and Responsibilities:** The roles and responsibilities of Council, the Executive Team, the Corporate Asset Management Steering Committee, Corporate Asset Management division, and the asset system working groups and service providers.
8. **Contact Information:** The contact details for questions and comments.

1.1.1 2016-2018 Corporate Administrative Plan

In 2016, the City published the Corporate Administrative Plan, which takes a sharp focus on long-term benefits and results for the community and will make the best use of the City's assets to build a solid foundation.

The plan sets out three core goals:

- **Service excellence:** delivering quality service and showing results.
- **Financial stability:** managing our resources to achieve maximum public value.
- **Innovation:** modernizing how the City works.

Three programs of work encompass initiatives that will help the City to accomplish its goals.

- **Service modernization:** Delivering municipal services that make lives better. The City will deliver easy access to the services our community needs and provide an exceptional service experience.
- **Leadership and engagement:** Building a great community together. Policies and practices that encourage an environment of openness and culture of collaboration to promote employee development, growth and satisfaction.
- **Sustainable resources:** Ensuring a solid foundation for a growing city. A disciplined, long-term approach that ensures financial stability and maximum value from our municipal assets.

An overview of the framework and related initiatives is provided in **Figure 2**.

Figure 2. Corporate Administrative Plan 2016-2018

While the Corporate Asset Management Program falls under the "Our Resources" category, it also supports the "Our Services" and "Our People" categories.

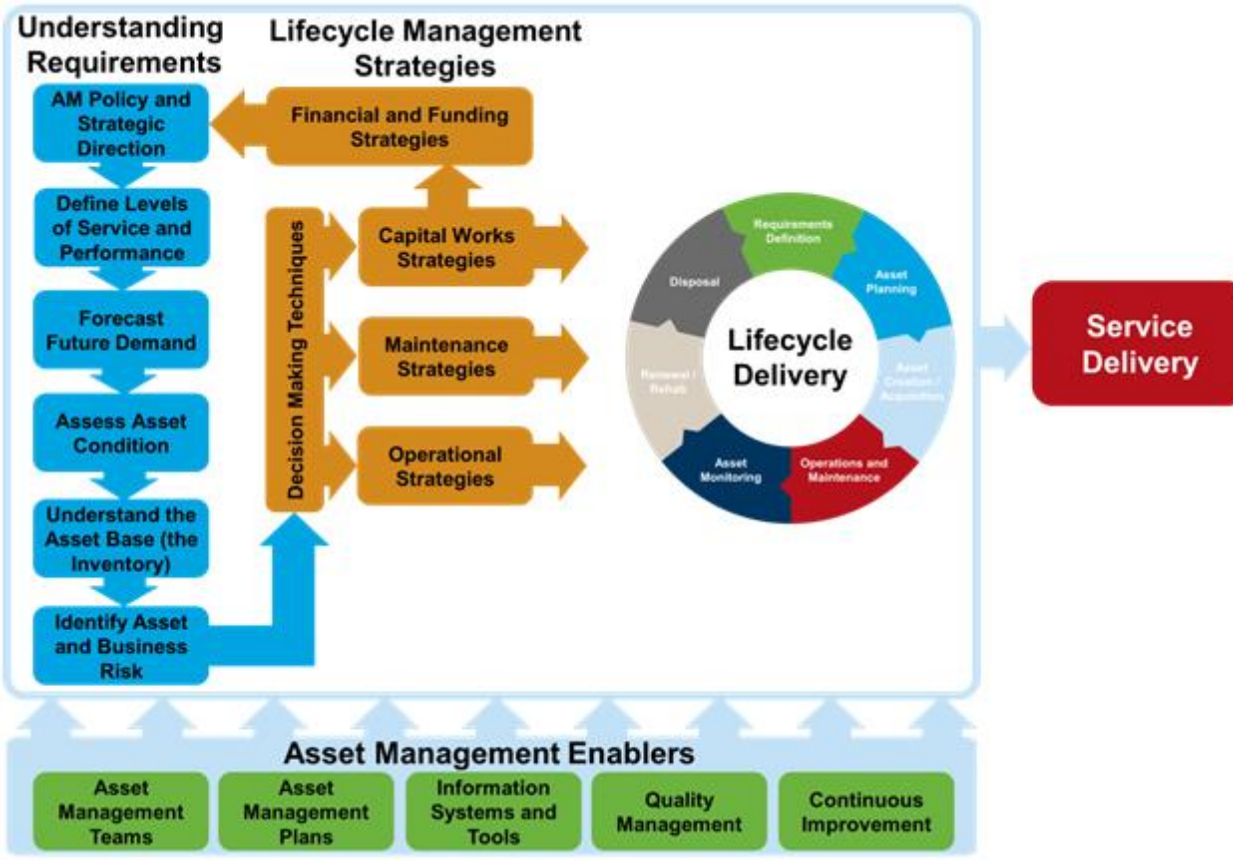
1.2 Relationship with Municipal Planning Documents

The City's asset management system can be categorized into the key processes and resources shown within **Figure 3**. The asset management processes include:

- **Functional Processes:** The processes involved in understanding and defining requirements, and asset lifecycle management strategies; and

- **Enabling Processes/Resources:** The supporting processes and resources that make the functional processes possible.

Figure 3. The Asset Management System



The asset management system, and subsequently this Asset Management Plan are supported by a number of municipal planning and financial documents that include those summarized in **Table 1**.

Table 1. Key Documents that Relate to the Asset Management System

Asset Management System Component and Relationship	Document or strategy
Asset Management Policy and Strategic Direction Guides the long term vision and goals of asset management.	• Asset Management Policy • Corporate Administrative Plan • Enterprise Framework

Asset Management System Component and Relationship	Document or strategy
Levels of Service and Performance Informs and establishes key service criteria, service expectations and performance measures.	• Service Review Framework • Accountability Framework • Community Engagement Framework • Communications Plan • 2009 Urban Design Action Plan • Downtown Guelph Streetscape Manual, Built Form Standards and St. George's Square Concept • Multi-Year Accessibility Plan • myGuelph • Service Excellence Strategy • Think Youth: 2013-2018 Guelph Youth Strategy • Open Government Action Plan
Future Growth and Demand Identifies future demand patterns and capacity requirements	• Biosolids Management Master Plan • Development Priorities Plan • Cycling Master Plan – Bicycle-Friendly Guelph • Downtown Secondary Plan • Growth Management Strategy • Natural Heritage System (Official Plan Amendment 42) • Official Plan • Guelph Market Place Strategic Urban Design Plan • Water Supply Master Plan • Water Efficiency Strategy • Parking Master Plan • Parks and trails planning • Recreation, Parks and Culture Strategic Master Plan • Stormwater Management Master Plan • Transit Growth Strategy • Transportation Master Plan • Solid Waste Management Master Plan • Urban Forest Management Plan • Wastewater Treatment Master Plan • Water and Wastewater Servicing Master Plan • Guelph Innovation District (York District Lands) • Prosperity 2020 • South Gordon Community Plan • Older Adult Strategy
Understanding the Asset Portfolio Develops, analyzes and improves asset inventory and attribute information.	• Corporate GIS Strategic Plan • Enterprise Asset Management Implementation • Water and Wastewater Data Modelling • Corporate GIS Data Modelling
Identifying Asset and Business Risks Defines processes for the evaluation of risks, and identification of risk management strategies.	• Emerald Ash Borer (EAB) Plan • Emergency Response Plan • Source Water Protection Program • Enterprise Risk Management Framework • Water and Wastewater Linear Network Risk Management Framework
Financial and Funding Strategies Outlines investment and funding opportunities. Evaluates revenues and funding streams.	• Community Investment Strategy • General Reserve and Reserve Fund Policy

Asset Management System Component and Relationship	Document or strategy
Operations and Maintenance Strategies Informs operational and service delivery processes	• Community Energy Initiative • Corporate Energy Management Plan • City of Guelph Budget
Capital Works Strategies Summarizes specific capital plans and improvement strategies.	• Old University and Centennial Neighbourhoods Community Improvement Plan • St Patrick's Ward Community Improvement Plan • City of Guelph Budget
Asset Management Human Resources and Capabilities Outlines requirements for available resources and capability development.	• Diversity Strategy • Integrated Talent Blueprint • Wellness Strategy
Asset Management Plans Documents the processes, procedures and plans.	• 2017 Corporate Asset Management Plan • Asset System Management Plans • Water Services Property Acquisition Master Plan
Information Systems and Tools Advances information systems and tools in order to complete asset management activities quicker and more efficiently.	• Corporate Technology Strategic Plan • Records and Information Management (RIM) Strategy
Quality Management and Continuous Improvement Establishes a quality management system, and pushes for continual improvement.	• Drinking Water Quality Management Standard

1.3 Purpose of the Asset Management Plan

This first Corporate Asset Management Plan sets out how the City's assets will be managed to meet levels of service, considering a full lifecycle approach, and ensuring long term financial sustainability. This document represents a jump forward in the City's journey towards asset management excellence and will be improved and updated as we forge ahead and learn more, and as the field of asset management grows and develops. This Plan covers the City's Corporate Asset Management Program at a high-level, identifying gaps and opportunities, and it outlines a work plan for continual improvement as the program matures.

The purpose of this Plan is to:

- Meet and do better than the requirements of the Ontario Ministry of Infrastructure (2012) Building Together Guide for Municipal Asset Management Plans.
- Establish a baseline of current asset management practices to inform a work plan for continually improving asset management.
- More accurately quantify the infrastructure deficit and investment gap.
- Demonstrate long-term asset care and sustainability.
- Create a single master asset hierarchy and inventory.
- Support the development of improved practices that clarify and justify funding requirements.
- Provide increased transparency related to the City's asset management practices, challenges and opportunities.

The Plan provides a baseline for the following initiatives planned for 2017 and 2018:

- Corporate level of service framework;
- Risk management and prioritization strategies;
- Condition assessment strategies;
- Data management strategies; and
- Detailed asset system management plans.

1.3.1 Catalysts for Change

In 2012, as a component of the Municipal Infrastructure Investment Initiative, the Province introduced a requirement that any municipality seeking grant funding was required to have an asset management plan in place. At that time, the Ministry of Infrastructure Ontario released the Building Together: Guide for Municipal Asset Management Plans (the Building Together Guide),[6] which outlines the key components and requirements of asset management plans.

In 2014, the City of Guelph signed the new gas tax funding agreement which provides approximately $7 million of funding each year towards infrastructure related work. One of the conditions of future funding from the Federal Gas Tax fund is that the City should have an asset management plan in place by December 31, 2016, which meets the requirements of the Building Together Guide. The Province also announced that future infrastructure funding opportunities will be conditional on municipalities ensuring that their asset management plans meet the requirements outlined in the Building Together Guide.

While these government funding requirements have increased the awareness around asset management, and put a level of urgency on the development of associated plans, the benefits of asset management extend far beyond meeting regulatory requirements. Asset management focuses on making the best possible decisions regarding the building, operating, maintaining, renewing, replacing and disposing of assets. Effective asset management has been demonstrated to support strong governance and accountability, sustainable decision-making, enhanced customer service, effective risk management, and improved financial efficiency. By adopting a culture of asset management excellence, the City is taking the necessary steps to ensure that budgets are allocated wisely, while ensuring service levels are detailed and maintained.

1.3.2 Defining Asset Management

The discipline of asset management is a combination of management, financial, economic, engineering, operational and other practices applied to assets with the objective of providing the required level of service in the most cost-effective manner. The key principles of asset management are:

- Providing defined levels of service and monitoring performance;
- Managing the impact of growth through demand management and asset investment;
- Taking a full lifecycle approach to developing cost-effective management strategies for the long-term to meet the defined level of service;
- Identifying, assessing and appropriately controlling risks; and
- Having a long-term financial plan which identifies expenditures and how they will be funded.

Fundamentally, effective asset management means making the best possible decisions regarding our assets.

[6] *Ministry of Infrastructure Ontario (2012) Building together – Guide for municipal asset management plans [Online https://www.ontario.ca/page/building-together-guide-municipal-asset-management-plans]. Retrieved November 19, 2016.*

1.4 Assets Included in the Plan

This asset management plan is intended to include all assets with available information at the time of development. The following physical asset systems that support the City's core services are included in the plan:

- Administrative facilities;
- Corporate vehicles and equipment;
- Culture and recreation;
- Emergency services;
- Information technology;
- Land;
- Parking;
- Solid waste;
- Stormwater Management;
- Transit;
- Transportation;
- Wastewater; and
- Water

It should be noted that the above list does include some asset systems that are related to the City of Guelph, but are managed by various Boards and Agencies such as Guelph Police Services and the Guelph Public Library.

In addition to physical assets, this asset management plan includes the following non-physical assets, where applicable:

- Digital and non-digital records.

At this time, assets owned by affiliated organizations such as the Guelph Cemetery Commission, Guelph Hydro, the Guelph Junction Railroad and others were excluded from the Plan. Social housing is managed by Guelph Non-Profit Housing Corporation, an external entity, and has also been excluded.

1.5 Duration and Updates to the Plan

A 100 year asset renewal outlook is used to capture the full lifecycle of the assets when identifying the timing of asset replacement and rehabilitation requirements and associated costs. Many of the assets have life expectancies that span decades, therefore a 100 year timeframe ensures that the complete lifespan of each asset is captured. In cases where there is an extremely short lifespan (such as vehicles and information technology devices), a 40-year analysis period was used.

This asset management plan will be updated annually, with a full re-evaluation at least every four years or following the update of the City's Corporate Strategic Plan and/or the Corporate Administrative Plan. **Table 2** shows the intended update frequencies of the Plan and associated documents.

Table 2. Timeframes and Updates Frequency of Asset Management Planning Documents

Document	Update Frequency
Asset Management Policy	Reviewed by the Asset Management Steering Committee annually, and following any updates to the Corporate Strategic Plan or Corporate Administrative Plan.
Corporate Asset Management Plan	Annual Update Full re-evaluation every four years

Document	Update Frequency
Asset system management plans	Annual Update Full re-evaluation every four years
Capital and operating budgets	Annual Update

1.6 Developing the Corporate Asset Management Plan

A consultative and structured approach was followed to develop the plan. This process will be further refined in future iterations. An outline of key tasks, the stakeholders involved, and limitations of the work plan are provided in the following sections.

1.6.1 Key Tasks

The Corporate Asset Management Plan was developed by the Corporate Asset Management division and forms part of a broader asset management work plan that began in 2016. The development of this initial Plan primarily included data collection, compiling data from multiple inventories and sources, developing analysis tools, and meeting with asset system working groups to discuss each component of the Plan and initial data results. The key tasks of Plan development were:

1. **State of the Assets**
   - 1.1. Background data collection
   - 1.2. Develop initial condition estimates
   - 1.3. Develop replacement costs
   - 1.4. Create the asset management plan template, and analyze and summarize data
2. **Levels of Service**
   - 2.1. Identify current levels of service by group
   - 2.2. Identify current regulations by group
3. **Asset Management Strategy**
   - 3.1. Document current decision making strategies and business processes
   - 3.2. Document O&M, rehabilitation, and replacement strategies
   - 3.3. Document capital planning process
4. **Financial Management Strategy**
   - 4.1. Document sustainable funding levels
   - 4.2. Document financing and funding strategies
5. **Draft Asset Management Plan**
   - 5.1. Draft Development
   - 5.2. Submit to Asset Management Steering Committee and Working Groups for review
   - 5.3. Address Comments
6. **Final Asset Management Plan**
   - 6.1. Incorporate revisions and development of Final Asset Management Plan
   - 6.2. Present final Plan to Council
   - 6.3. Creation of Asset Management page on the City website

1.6.2 Who Was Involved

Table 3 summarizes the roles and responsibilities of the key stakeholders who were involved in the development of the Plan.

Table 3. Corporate Asset Management Plan Stakeholders

Stakeholder Team	Roles and Responsibilities
Corporate Asset Management	▪ Coordinate and manage the work plan. ▪ Collate asset and historical data. ▪ Compile and reconcile asset inventory. ▪ Develop tools and conduct analysis. ▪ Research levels of service and current asset management strategies. ▪ Arrange meetings with asset management working groups. ▪ Develop draft and final plan. ▪ Address comments. ▪ Present and publish the final plan.
Asset Management Steering Committee	▪ Provide direction to the overall asset management work plan. ▪ Support the development of the asset management plan through ensuring staff availability where required. ▪ Review and provide comment on the draft asset management plan. ▪ Approve the final asset management plan.
Asset System Working Groups	▪ Supply and collate service area specific inventory data, levels of service, documents and other pertinent information. ▪ Attend update meetings. ▪ Review the draft asset management plan.
Executive Team	▪ Approve the final asset management plan for publication.
City Council	▪ Endorse and approve the final asset management plan.

1.6.3 Limitations

The Corporate Asset Management Plan was developed based on the best available information and making assumptions using professional judgement to address gaps. Limitations of this Plan include assumptions made regarding:

- Installation dates, where they were unavailable.
- Allocation of total replacement costs of facilities to the various sub-components (such as structural, electrical, and mechanical) due to the differing life expectancies of each component.
- Use of age-based condition assessment in the absence of actual condition information, and estimates of costs based on professional judgment where cost information was unavailable.

In addition to the previous assumptions, some limitations were encountered as the Corporate Asset Management Plan was developed. These are as follows:

- Different service areas within the City have different approaches to asset management, limiting Corporate Asset Management's capabilities for comparisons and prioritization.
- There is no centralized asset management system that offers a complete inventory or summary of project information. The City relies on its geodatabase, work order management system and its financial software to collect most of its asset information. However, there is limited integration between the systems at this time.
- There are gaps in inventory and condition information and considerable effort is required to consolidate information from multiple sources.
- The City does not have a level of service register and has no system to track levels of service for most service areas. The City plans to complete a level of service framework in 2017 to guide future asset management planning; this will be discussed further on in this plan.
- The City does have an approved enterprise risk management framework, although it is not currently being implemented for the assets. A corporate asset risk management framework is proposed as part of the developing Corporate Asset Management Program.

- The City addresses condition information in a variety of ways. Condition may be technically assessed and reported on in a quantifiable way. This method is the most accurate and most expensive (e.g. Pavement Condition Index). Condition may also be assumed based on age and estimated service life. Finally, condition may be based on the expert opinion of staff using the asset. However, many asset types do not have objective condition assessment information.. Given the type and level of data available for condition, risk and level of service indicators there is limited ability to accurately determine trends at a detailed level.
- Currently, projects are compared and prioritized based on cost and perception of need. This results in decisions being made without the benefit of the considerations available through an optimized decision-making process that allows triple bottom line considerations, risk and level of service to enter the discussions.
- This City does not have asset system management plans in place that would have provided a base for authoring this Plan. However these supporting plans will be developed and implemented over the next few years as part of the City's Corporate Asset Management Program.

The development and implementation of a corporation-wide asset management plan will support the opportunity to generate data that will improve confidence in the condition rating of assets, and the through the work plan, the City will develop the ability to optimize decision making using level of service and risk factors. Where any of the above assumptions have been utilized, a corresponding action item has been developed to close any gaps in the future. All of these limitations will be resolved over time as the Corporate Asset Management Program evolves.

1.7 Evaluation and Improvement

As previously mentioned, this document is the City of Guelph's first Corporate Asset Management Plan, and provides a high-level overview of the Corporate Asset Management Program. The Corporate Asset Management Program is early in development, having only being established for eight months before publication of this document. Therefore, this document is simply the tip of the iceberg, and will be developed and improved as the City completes the prioritized list of work plan items depicted in **Section 6**. In addition, this plan and associated documents will be routinely reviewed to update to the most accurate data as background processes and information are continually improved.

The City's Corporate Asset Management Program is founded on the principles of continuous improvement, transparency, and accountability. This Plan is just one part of the overall quality management system for asset management being established based on best practices at the City of Guelph. The Corporate Asset Management division will complete annual audits of asset management practices against industry best practices that include ISO55000, the International Infrastructure Management Manual, the Asset Management Anatomy by the Institute of Asset Management, and BSI PAS55:2008. While setting up the Corporate Asset Management Program, the City has conducted self-assessments based upon these industry best practices to evaluate Guelph's program maturity against them and to establish the path forward. In the initial years, the maturity assessment will be completed internally on an annual basis and reported to the Asset Management Steering Committee to evaluate progress and improvements towards asset management excellence. In the future, independent audits may be completed in order to provide an impartial view of the City's asset management capabilities.

2 State of the Assets

The state of the assets report card provides a quantitative assessment of the asset portfolio in terms of overall replacement value and estimated remaining life. In 2012 and 2015, the City presented report cards for water, wastewater, stormwater and transportation assets as part of the Sustainable Infrastructure Report,[7] and the 2015 Infrastructure Report Card,[8] respectively. This Plan provides an update that includes the full City asset portfolio.

The primary objective of the report card is to provide high-level insights into the overall age and condition of the asset portfolio based on typical asset lifecycles. Where actual condition assessment data exists, it has been incorporated to provide the most accurate insights possible based on available data. When reviewing the results that are presented, it is important to bear in mind the confidence in the data. In some cases, where condition, age or cost data does not exist, professional judgment has been used to provide the fullest picture possible. To assist the reader, as well as the City in future data improvement efforts, an average data confidence rating has been provided alongside each of the results. As an outcome of this plan, the City has developed a strategy to improve the data and address gaps. Readers will see adjusted results and confidence ratings in future updates as the background data improves.

Although based on several assumptions such as asset ages and deterioration, asset report cards are a valuable tool in establishing an understanding of the current state of assets, trends, potential levels of service and upcoming issues or opportunities. This methodology is widely used in the industry, and in particular is used by the Canadian Infrastructure Report Card.[9] While the City currently has significant data regarding the structural condition of a large majority of its asset classes, a number of data gaps exist around physical performance. Additional information about these areas for improvement is included in section 2.7 of this document.

7 *AECOM (2012) The City of Guelph Sustainable Infrastructure Report. AECOM, Kitchener, Ontario. [Online: http://guelph.ca/wp-content/uploads/SustainableInfrastructureReport_ExecSummary_Sept2012.pdf]. Retrieved November 26, 2016.*

8 *City of Guelph (2015) 2015 Infrastructure Report Card, Infrastructure, Development and Enterprise Committee. City of Guelph, Ontario [Online: http://guelph.ca/wp-content/uploads/info_items_103015.pdf]. Retrieved November 26, 2016.*

9 *The Canadian Infrastructure Report Card Website [Online: http://canadianinfrastructure.ca/en/index.html]. Retrieved November 26, 2016.*

This asset report card:

- Translates the consolidated, estimated age or condition of the assets within each of the asset systems into a five-level rating system ranging from Very Poor to Very Good.
- Aggregates the ratings for each of the asset systems into the overall portfolio rating using a weighted average.
- Uses a methodology that is repeatable and consistent with the Canadian Infrastructure Report Card to enable comparative analysis and benchmarking over time.
- Provides transparency in terms of the confidence of the input data, to provide context to the reader.
- Improves over time as the overall confidence of the background data improves.

While the initial emphasis focuses on the age and physical structural condition of assets, capacity analysis and master planning activities will be crucial in helping to define the functional capacity of the assets moving forward. The report card is a living document that will incorporate additional and improved information as it becomes available.

2.1 Asset Types

An inventory for the City's assets was developed using the City's detailed asset data for each of the asset systems. Each program area was divided into the asset systems as shown in **Table 4**. Though not shown in the table, the asset classes were further broken down to the individual asset level for the analysis (for example, a section of road on a particular street or individual vehicles).

Table 4. Asset Inventory Classification

Asset System	Level 2	Level 3	Replacement Cost	Quantity	Unit
Administrative Facilities	Civic	City Hall	$71,236,597	2	ea
		Courthouse	$15,775,274	1	ea
		Operations Facility	$20,595,433	5	ea
	Commercial	Commercial Buildings	$3,127,511	3	ea
Corporate Vehicles and Equipment	Signs	Construction Signs	$5,000	TBC**	ea
	Equipment	Heavy Equipment	$ 7,513,265	99	ea
		Medium Equipment	$1,350,872	188	ea
		Small Equipment	$ 1,906,354	290	ea
		Generator	$125,600	19	ea
	Vehicles	Heavy Vehicle	$20,244,725	61	ea
		Medium Vehicle	$970,000	159	ea
		Light Vehicle	$7,513,389	188	ea
Culture and Recreation	Cultural Facilities and Spaces	Library	$10,353,000	1	ea
		Museum	$20,183,811	2	ea
		Theatre	$24,599,444	1	ea
		Bandshell	$555,634	1	ea
	Forestry	Tree	TBC**	TBC**	ea
	Open Spaces	Park	$79,046,694	89	ha
		Natural Space	$6,362,648	TBC**	ea
	Administration Space	Office	$1,137,121	1	ea
		Storage	$1,412,672	2	ea
		Stadium	$1,115,242	1	ea
	Sports and Recreation	Community Centre	$14,373,377	8	ea
		Recreation Centre	$124,673,715	10	ea
		Skate Parks	$1,165,375	1	ea

Asset System	Level 2	Level 3	Replacement Cost	Quantity	Unit
		Washroom, Change Rooms, Concession	$7,223,188	13	ea
	Trail Network	Paved Trails	TBC**	TBC**	ea
		Unpaved Trails	TBC**	TBC**	ea
	Water Features	Wading Pools	TBC**	TBC**	ea
		Public Fountains	$4,718,158	3	ea
		Splash Pads	TBC***	TBC**	ea
Emergency Services	EMS	EMS Station	$10,731,828	2	ea
		EMS Vehicle	$1,440,000	32	ea
	Fire	Fire Equipment	$3,353,850	36	ea
		Fire Vehicle	$13,753,605	44	ea
		Fire Hall	$16,696,441	6	ea
	Police	Police Station	$29,678,394	2	ea
		Police Vehicle	$ 2,182,000	78	ea
Information Technology	Devices	Communication Device	$410,913	2,012	ea
		Computer	$2,241,441	1,585	ea
		Computer Accessory	$84,318	522	ea
		Display	$231,169	1,144	ea
		Storage Device	$681,700	47	ea
		Power Device	$110,129	290	ea
		Printing and imaging	$204,764	326	ea
	Network	Network Accessories	$41,052	22	ea
		Network Cabling	$522,873	84	ea
		Network Device	$1,246,152	573	ea
		Server	$119,200	56	ea
		Server Chassis	$1,282,253	125	ea
Parking	Equipment	Meter	TBC**	TBC**	ea
	Parkades	Parking Garage	$43,050,000	2	ea
	Surface Parking	Parking Lot	$14,741,608	8	ea
		Street Parking	TBC**	TBC**	ea
Solid Waste	Facilities	Landfill	TBC**	2	ea
		Waste Resource Innovation Centre	$53,400,497	1	ea
	Vehicles	Garbage Truck	$5,260,000	18	ea
Stormwater	Stormwater Drainage	Culverts (<3m)	TBC**	15,943	km
		Pipes	$ 534,208,742	469	km
		Inlets/Outlets	TBC**	15,944	ea
	Stormwater Management	SWM Channel	$3,780,834	38	ea
		SWM Pond	$20,213,368	118	ea
		Oil and Grit Separator	TBC**	102	ea
Transit	Facilities	Station	$1,872,902	1	ea
		Terminal	TBC**	1	ea
		Operations Yard	$24,579,720	1	ea
		Bus Stop	$3,209,000	686	ea
	Vehicles	Bus	$45,135,000	86	ea
		Light Vehicle	$375,000	4	ea
	Equipment	Light Equipment	$12,500	1	ea
		Medium Equipment	$ 224,700	5	ea
		Heavy Equipment	$1,255,000	8	ea
Transportation	Bridge	Bridge	$53,360,343	16	ea
		Pedestrian Bridge	$13,436,222	7	ea
	Culvert	Culvert	$31,517,753	38	ea

Asset System	Level 2	Level 3	Replacement Cost	Quantity	Unit
	Pavement	Laneway	TBC**	10	km
		Road	$1,146,894,113	510	km
	Railway Crossings	Railway Crossings	TBC**	TBC**	ea
	Sidewalks	Asphalt	$1,274,585	5,416	km
		Brick	$118,107	281	m
		Concrete	$162,782,500	687	km
	Signs	Overhead Signs	TBC**	TBC**	ea
		Pole Mounted Signs	TBC**	TBC**	ea
	Streetlighting	LED	TBC**	TBC**	ea
		High pressure sodium	$110,837,390	13,119*	ea
	Traffic	Controller	$2,820,000	188	ea
		Intersection	$26,285,000	189	ea
		Traffic Duct	TBC**	TBC**	ea
Wastewater	Facilities	Pump Stations	$10,958,594	5	ea
		Wastewater Treatment Plant	$225,521,131	1	ea
	Pipe Network	Wastewater Collection Network	$323,267,241	528	km
Water	Facilities	Water Treatment Plant	$19,128,780	1	ea
		Water Storage Facilities	$19,025,128	3	ea
		Water Pumping Facilities	$100,901,948	24	ea
	Pipe Network	Water Distribution System	$476,418,606	579	km
Total			**$4,006,997,116**		

Note:

* *Value used in the financial analysis and condition rating. A reduced number was used due to missing information such as installation dates.*

* *To be confirmed: The data is currently unavailable; placeholders have been included to be potentially populated in future iterations of the Corporate Asset Management Plan.*

In addition to physical assets, the City is responsible for the management of a significant portfolio of digital and physical records, without which, many City services would be unable to function. At this time the inventory information is limited, however the City aims to further apply asset management best practices to digital and physical records in future iterations. **Table 5** provides a breakdown of the City's available data for digital and physical records.

Table 5. Digital and Physical Records

Asset System	Level 2	Level 3	Quantity	Unit
	Digital Records	By-Laws	5,844	ea

Asset System	Level 2	Level 3	Quantity	Unit
Digital and Physical Records		Internet Sites	18	ea
		Intranet Sites	2	ea
		Shared Drives	TBC*	ea
		E-mail Accounts	TBC*	ea
		E-mail Archives	TBC*	ea
		Shared Drives	TBC*	ea
		MyDocuments (personal drives)	TBC*	ea
		Hard Drives	TBC*	TB
		External Devices	TBC*	ea
		Externally Hosted Servers	TBC*	ea
		ECM	TBC*	ea
	Physical Records	By-Laws	20,432	ea
		Employee Filing Cabinets	TBC*	ea
		Record Centre (decentralized basement storage)	TBC*	ea
		Offsite Storage	TBC*	ea

Note:

* *To be confirmed: The data is currently unavailable; placeholders have been included to be potentially populated in future iterations of the Corporate Asset Management Plan.*

The City also owns land located in areas such as parks and road right of ways. Land is managed differently than conventional assets as it exists into perpetuity without any expectation of life cycle renewal (other than contaminated sites, which may require remediation before use). Nevertheless, the land still needs to be managed, and has therefore been included within the hierarchy. **Table 6** includes the current known land assets.

Table 6. Land Inventory

Asset System	Asset Class	Value	Quantity	Units
Land	Park Land	TBC*	175	ea
	General Land	TBC*	2,092	ea
	Contaminated Sites	$27,728,500**	38	ea

Note:

* *To be confirmed: The data is currently unavailable; placeholders have been included to be potentially populated in future iterations of the Corporate Asset Management Plan.*

** *Estimated remediation cost for sites that are known to be contaminated or potentially contaminated based on the history and usage of the site.*

2.2 Financial Accounting Valuation and Replacement Cost Valuation

In the asset management industry, there are two generally accepted methods of reporting the value of asset portfolios, the accounting valuation method, and the replacement cost valuation method. Some key differences between the two methods are:

- **The Accounting Valuation:** Includes the full historical cost to acquire and commission the asset, which is depreciated over the expected life of the asset. The 'Net Book Value' follows financial accounting principles defined by the Public Sector Accounting Board (PSAB); and

- **Replacement Cost Valuation:** Based on current industry pricing and inflation to the year of replacement and/or rehabilitation.

2.2.1 Accounting Valuation

The accounting valuation is based on the PSAB 3150 reporting at December 31, 2015 and assumes straight line depreciation over the useful life of the assets.

The valuation of assets by asset type is shown in **Table 7,** and indicates the following:

- The total historical cost of the assets is $1,598,812,355;
- The accumulated amortization is approximately $719,393,787, which means that the total asset base is approximately 55 per cent through its life expectancy; and
- The Net Book Value of the asset portfolio is approximately $920,686,421.

Table 7. Accounting (PSAB) Valuation of Portfolio

Asset System	Historic Cost	Accumulated Amortization	Net Book Value	Life Remaining
Administrative Facilities	$110,308,747	$14,258,839	$97,319,842	88%
Contaminated Sites	N/A	N/A	N/A	N/A
Corporate Vehicles and Equipment	$27,544,322	$19,739,937	$7,935,458	29%
Culture and Recreation	$154,579,748	$73,711,089	$84,657,424	55%
Emergency Services	$46,117,759	$19,720,561	$27,759,932	60%
Information Technology	$23,128,468	$19,523,563	$5,302,868	23%
Parking	$6,341,116	$3,434,314	$3,771,118	59%
Transportation	$390,287,619	$209,773,272	$190,809,947	49%
Solid Waste	$85,543,891	$39,103,256	$46,443,645	54%
Stormwater	$184,420,227	$48,901,126	$139,157,213	75%
Transit	$59,943,897	$30,944,191	$33,097,096	55%
Wastewater	$280,017,184	$141,168,784	$143,799,169	51%
Water	$230,579,377	$99,114,855	$140,632,709	61%
Digital and Non-Digital Records	N/A	N/A	N/A	N/A
Total	**$1,598,812,355**	**$719,393,787**	**$920,686,421**	**55%**

Financial accounting valuation is completed on an annual basis at the City of Guelph to meet financial reporting requirements; however it is not used for asset management purposes. In the PSAB reporting, a straight line depreciation method is used to estimate the amortization. Based on this approach, many assets that are beyond their service lives have been fully depreciated; however, from an asset management perspective, continue to provide adequate levels of service. Therefore, while the net book value is a valuable approach for financial reporting, it is not necessarily indicative of the condition and performance. In addition, the value is based upon the historical cost, and not the current cost to replace the asset, which provides some limitations when planning future replacements. From an asset

management perspective, therefore, it is also valuable to evaluate the portfolio using replacement cost valuation. The replacement values provide a more accurate estimate of the future cost required to replace the asset at the end of their life.

2.2.2 Replacement Cost Valuation

The replacement cost valuation is based on using a combination of current industry practices for the assets and indexing historical costs to current year to reflect the value in 2016 dollars. Several methods were used to estimate the replacement costs of the assets, including:

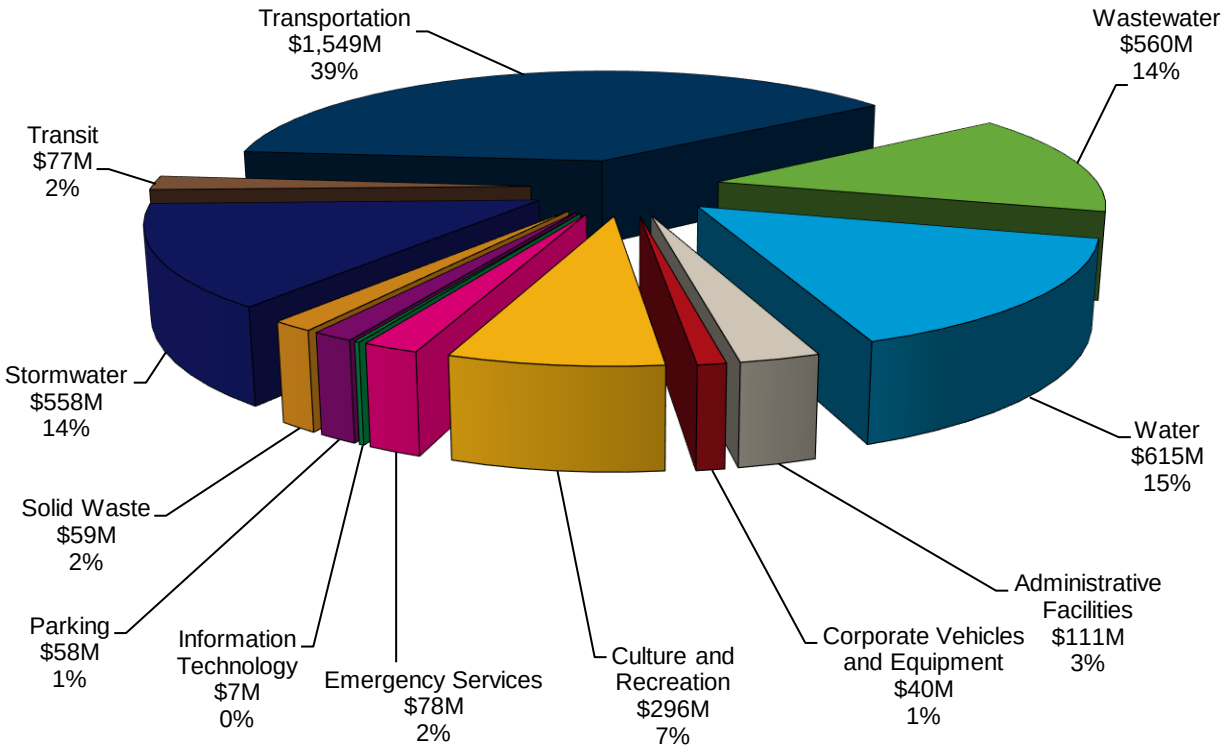
- **Tender pricing and recent unit costs:** Based upon recent closed tender pricing, which provides an accurate perspective of the anticipated cost to replace a similar asset.
- **Condition assessment replacement costs:** Based upon third-party cost estimates.
- **Property insurance values:** In the absence of tender pricing and recent unit costs, recent insurance replacement cost valuations were used.
- **Market unit cost indices:** If none of the above were available, industry cost indices were used such as Hanscomb (2016) Yardsticks for Costing: Cost Data for the Canadian Construction Industry.
- **Inflated historic costs:** When none of the above was available, the historic cost was inflated to present day dollars using the Non-Residential Building Construction Price Index.[10]

The useful lives were also adjusted where necessary from those used in the accounting valuation to reflect life expectancies from an engineering perspective and industry experience.

Figure 4 shows the replacement value of the assets. The total replacement value of the City's entire asset portfolio is estimated to be approximately $4 billion in 2016 dollars. This is the estimated cost that would be incurred if the City were to replace all of its assets today.

[10] *Statistics Canada (2016) Table 327-0043 Price indexes of non-residential building construction, by class of structure, annual [Online: http://www5.statcan.gc.ca/cansim/a47]. Retrieved November 22, 2016*

Figure 4. Replacement Cost Valuation of Asset Portfolio

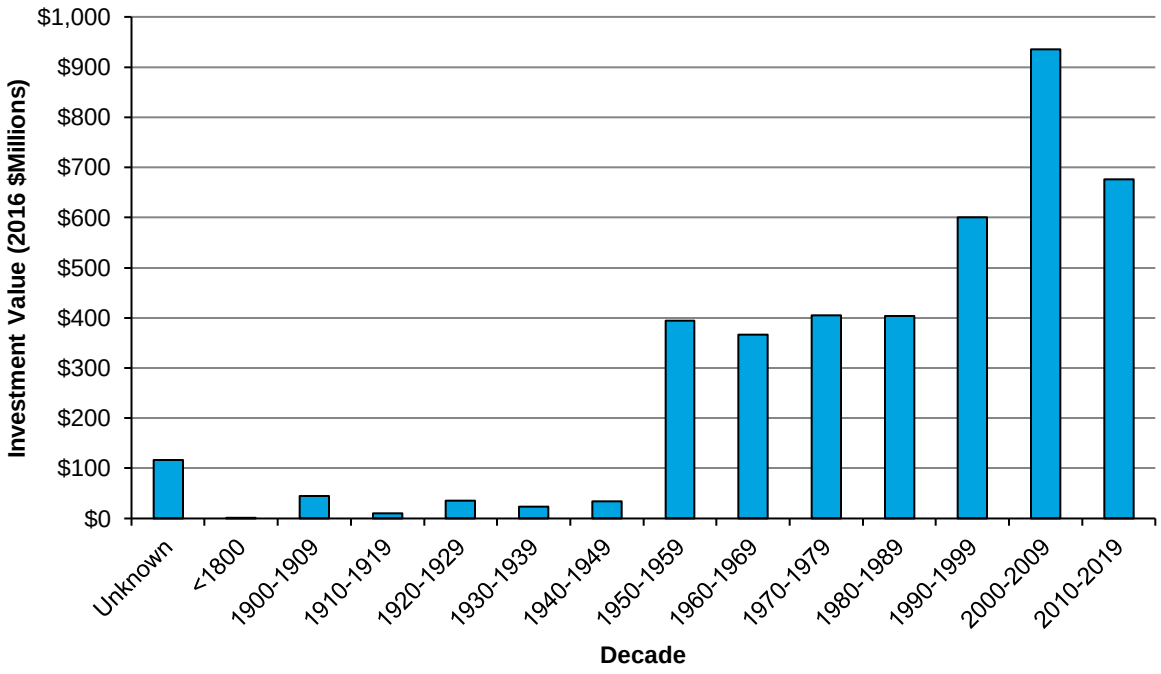


2.3 Asset Age Distribution

An asset's estimated service life is the period of time that it is expected to be of use and fully functional to the City. For the purposes of this analysis, unless condition and performance data exists, once an asset has reached the end of its service life, it has been deemed to have deteriorated to a point that necessitates replacement. Individual estimated service lives were used in conjunction with original construction dates to determine the theoretical remaining service life of each asset.

Figure 5 summarizes the year of installation by replacement value for the asset portfolio by decade. As can be seen from the figure, the City saw significant growth after the Second World War, and again in the early 2000's. It is also important to note that based on current inventory data, approximately $116 million (or three per cent of the overall portfolio) in assets have unknown installation dates, which represents a "blind spot" in the long range forecast. Risk assessments planned to be completed in 2017 will identify the risk exposure of these assets, and identify appropriate strategies to evaluate the "unknown" inventory in terms of condition and performance.

Figure 5. Guelph Asset Age Distribution by Replacement Value (2016 CAD)



Using the estimated service life remaining and physical condition data (where available), a weighted average remaining life score was computed for each asset. The average remaining life score can then be categorized into five rating categories ranging from very good to very poor as shown in **Table 8** below. The rating scale is consistent with the Canadian Infrastructure Report Card (2016) to facilitate benchmarking between the City of Guelph and other Canadian municipalities.

Individual asset scores were then aggregated up to the asset system, and then a weighted overall portfolio rating can be obtained.

Table 8. Rating Categories Based on Service Life and Condition

Rating Category	Per cent of Remaining Service Life	Definition
Very Good	80% - 100%	**Fit for the Future** - The assets in the system is generally in very good condition, typically new or recently rehabilitated.
Good	60% - 79%	**Adequate for Now** - Some assets elements show general signs of deterioration that require attention. A few elements exhibit deficiencies
Fair	40% - 59%	**Requires Attention** – The assets in the system shows general signs of deterioration and require attention with some elements exhibiting significant deficiencies.
Poor	20% - 39%	**At Risk** - The assets in the system is in poor condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration.
Very Poor	<20%	**Unfit for Sustained Service** - The assets in the system are below standard condition with widespread signs of advanced deterioration. Many components in the system exhibit signs of imminent failure, which may be affecting service or increasing risks.

Understanding the percentage remaining life for each of the asset systems helps to provide insights into the age and condition distribution, as wells as potential areas that may need further investigation due to increasing probability of failure and subsequently deteriorating levels of service. It is important to note that some low-risk assets may also be feasible to run-to-failure, and though they may have exceeded their estimated service lives, they may be fully functional and meet level of service requirements for many years. Through effective asset management planning, one can diagnose and evaluate the impacts of such a scenario.

Table 9 provides an overview of the replacement value and condition rating of City-owned assets, categorized into each asset system. The replacement value, estimated average remaining service life, and summary of the poor and very poor categories are also shown. Overall, the City's asset portfolio has approximately 46 per cent remaining service life (weighted by replacement value). Of the portfolio, approximately 30 per cent, or $1.19 billion in assets are within the poor and very poor rating categories. When interpreting the ratings, it is important to note that there is a significant variation in the service lives of assets, ranging from under 10 years to over 100 years. Equipment and fleet items, for example, regularly cycle through shorter life cycles, and are relatively uncomplicated to replace. Thus, they are quicker to move through their service life, and the overall portfolio can appear to be in worse condition than it truly is.

Table 9. Asset System Ratings Based on Service Life and Condition

Asset System	2016 Replacement Value	Remaining Service Life (%)	Rating Category	Assets Below 40 Per cent Remaining Service Life	
				%	2016 Replacement Value
Administrative Facilities	$110.7 million	54%	Fair	17%	$19.3 million
Contaminated Sites	N/A	N/A	N/A	N/A	N/A
Corporate Vehicles and Equipment	$39.6 million	46%	Fair	33%	$13.3 million
Culture and Recreation	$295.8 million	-2%	Very Poor	52%	$155.1 million
Emergency Services	$77.8 million	71%	Good	12%	$9.4 million
Information Technology	$7.2 million	-1%	Very Poor	52%	$3.7 million
Parking	$57.8 million	-5%	Very Poor	72%	$41.6 million
Transportation	$1,549.3 million	61%	Good	13%	$195.9 million
Solid Waste	$58.7 million	44%	Fair	25%	$14.6 million
Stormwater	$558.2 million	52%	Fair	28%	$156.0 million
Transit	$76.7 million	22%	Poor	64%	$49.0 million
Wastewater	$559.7 million	31%	Poor	45%	$250.2 million
Water	$615.5 million	43%	Fair	45%	$279.6 million
Digital and Non-Digital Records	N/A	N/A	N/A	N/A	N/A
Total	**$4,007.0 million**	**46%**	**Fair**	**30%**	**$1,187.6 million**
Replacement Value Per Household	**$75,886**				**$22,492**

Note:

* *Value used in the financial analysis and condition rating. A reduced number was used due to missing information such as installation dates.*

As can be seen from **Table 9**, the weighted average for the City's asset portfolio falls within the poor category with an average estimated remaining service life of 46 per cent. However, as has been noted, this number is approximate, and does not necessarily mean that the assets are insufficiently supporting the service; it is predominantly based upon age and lifecycle assumptions. In order to improve the confidence in this number, and better understand asset risks, the City must continue to complete condition and performance assessments in order to inventory and properly assess the condition of the assets. For example, the majority of buildings had building condition audits last completed in the mid-2000s. These reports are now obsolete and must be updated to determine the true condition of facility assets. Consequently, in 2017 the several structural and building condition assessments are planned to be completed.

Table 10 provides a comparison between the Guelph asset report card and the Canadian Infrastructure Report Card. As can be seen from **Table 10**, Guelph has a greater percentage of assets in the poor and very poor rating categories than the national average, which is predominantly driven by transit, wastewater and water.

Table 10. City of Guelph Compared to the Canadian Infrastructure Report Card

Asset System	City of Guelph Per cent in Poor and Very Poor Rating Categories	Canada-Wide 2016 Extrapolated Replacement Value	Canada-Wide Assets in Poor & Very Poor Rating Categories	
			%	2016 Replacement Value
Water	$279.6 million (45%)	$207 billion	12%	$25 billion
Wastewater	$250.2 million (43%)	$234 billion	11%	$26 billion
Stormwater	$156.0 million (28%)	$134 billion	7%	$10 billion
Roads**	$147.7 million (10%)	$330 billion	15%	$48 billion
Bridges***	$48.2 million (49%)	$50 billion	4%	$2 billion
Buildings	$56.6 million (26%)	$70 billion	17%	$12 billion
Sport and Recreation Facilities	$63.0 million (42%)	$51 billion	18%	$9 billion
Transit	$49.0 million (64%)	$57 billion	16%	$9 billion
Total	$1,050.2 million (30%)*	$1.1 trillion	12%	$141 billion

Source: CIRC (2016), Figure 5. p.12[11]

Note:

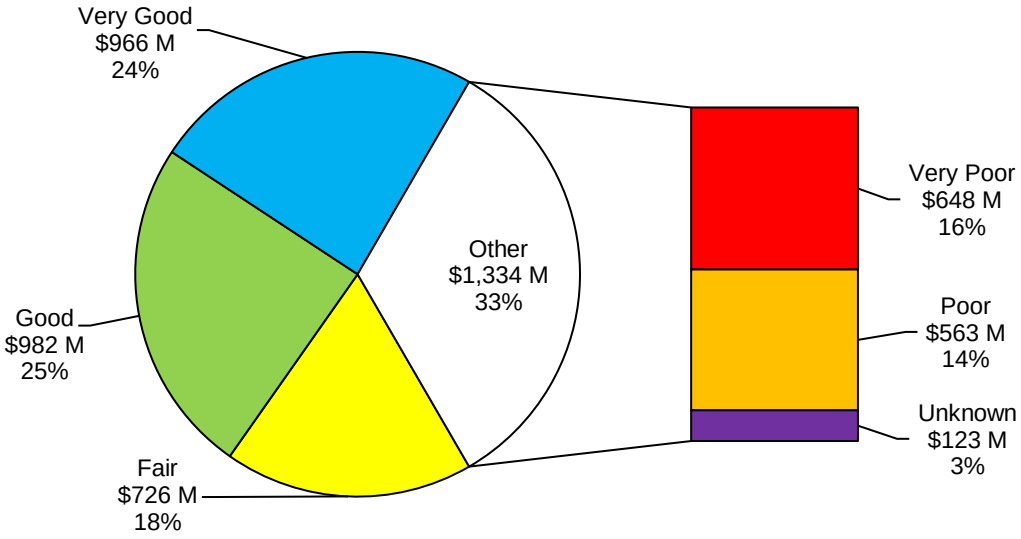
* *The value varies from the total provided in Table 9 due to the exclusion of Corporate Vehicles and Equipment, Emergency Services, Information Technology, and Solid Waste.*

** *Includes all assets in the Transportation asset system, except Bridges and Structures.*

Figure 6 shows the replacement value of assets within each of the rating categories. Presently, approximately 30 per cent of Guelph's overall asset portfolio is in poor and very poor condition with three per cent unknown due to missing information.

[11] *Canadian Construction Association (CCA), the Canadian Public Works Association (CPWA), the Canadian Society for Civil Engineering (CSCE) and the Federation of Canadian Municipalities (FCM) (2016) Canadian Infrastructure Report Card: Informing the Future. Figure 5. [Online: http://canadianinfrastructure.ca/downloads/Canadian_Infrastructure_Report_2016.pdf#page=5]. Retrieved November 26, 2016.*

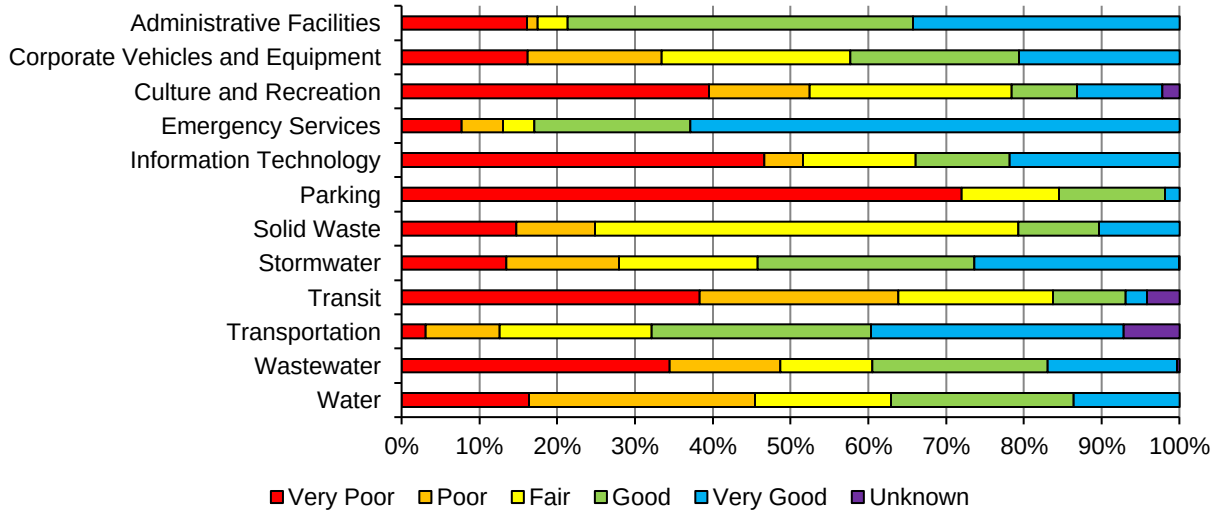
Figure 6. Asset Rating Category Summary by Replacement Value ($ Millions)



Note: *Contaminated sites and intangible assets not included*

Figure 7 shows the breakdown of assets by rating category for each of the asset systems. Culture and Recreation, Information Technology and Parking all have a significant portion of the inventory in the poor or very poor categories. Administrative Facilities, Emergency services, and the Transportation System have a large percentage of assets in the good or very good categories.

Figure 7. Asset Portfolio Percentage Remaining Life by Replacement Value



2.4 Asset System Condition Summaries

The following section summarizes the available replacement value and condition information specific to each asset system and their major asset types. At this time digital and non-digital assets have not been included, however are planned to be included in future iterations of the Asset Management Plan.

2.4.1 Administrative Facilities

Replacement Value:	$110,734,815	Data Confidence Grade:	74%

Summary:

The Administrative Facilities asset system includes the public works facility, City Hall, commercial buildings, and the Courthouse. The vast majority of the inventory within this category falls into either very good (34 per cent, approximately $38 million) or good (45 per cent, approximately $49 million) rating categories. The good and very good categories consist predominantly of City Hall and the courthouse. The fair category, at four per cent ($4 million) consists of predominantly courthouse assets, while the poor (1 per cent, approximately $1 million) category and very poor (18 per cent, approximately $18 million) category are almost exclusively the Public Works facilities and commercial buildings.

Figure 8. Administrative Facilities Overall Rating Breakdown

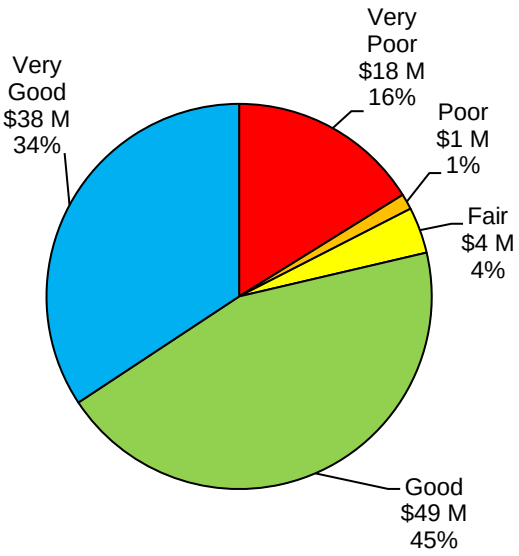
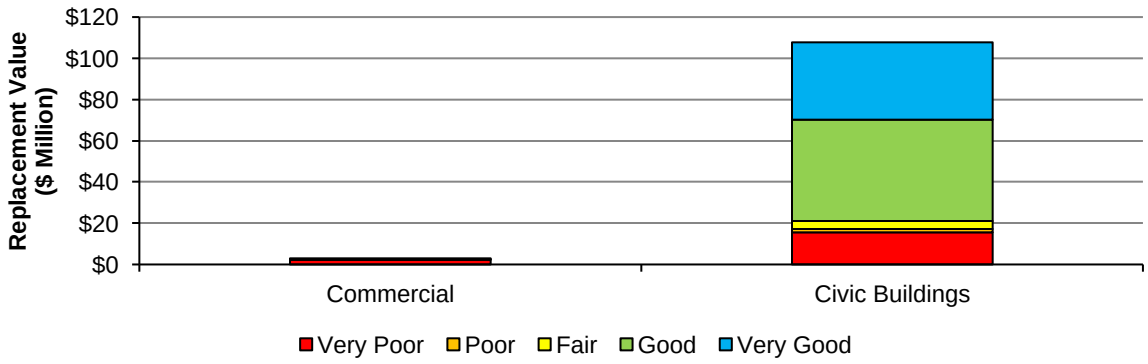


Figure 9. Administrative Facilities Category Rating Breakdown



2.4.2 Contaminated Sites

Replacement Value:	N/A	Data Confidence Grade:	28%

Summary:

There are at least 43 City owned properties, roads and/or right-of-ways that are known to be contaminated or potentially contaminated. These sites are considered contaminated or potentially contaminated based on the historical usage/former activities at these sites (e.g. as former industrial or commercial uses or historical landfill sites). However, of the 43 sites, only 15 sites have some degree of environmental information on them, such as Phase One Environmental Site Assessments (ESA); Phase Two ESAs; and other Investigative Studies. These 15 sites were identified and accounted for under the Public Sector Accounting Board (PSAB) Standard- PS 3260- Liability for Contaminated Sites.

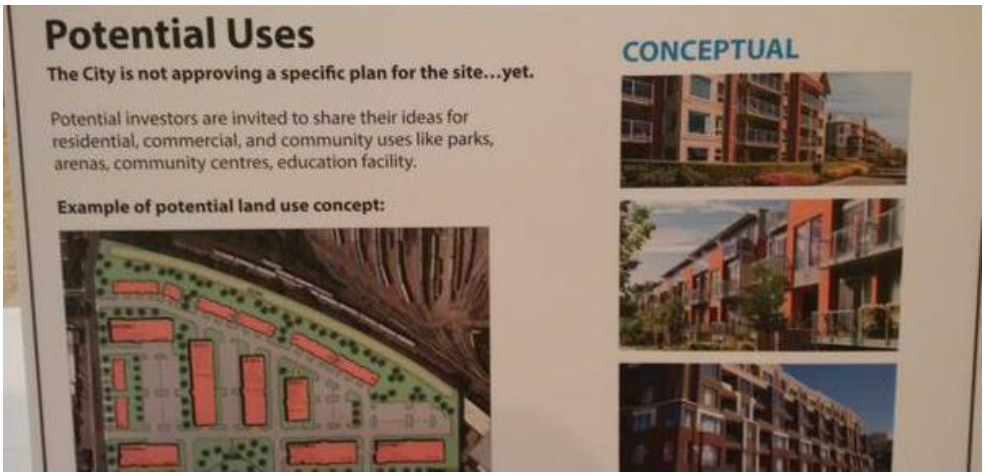
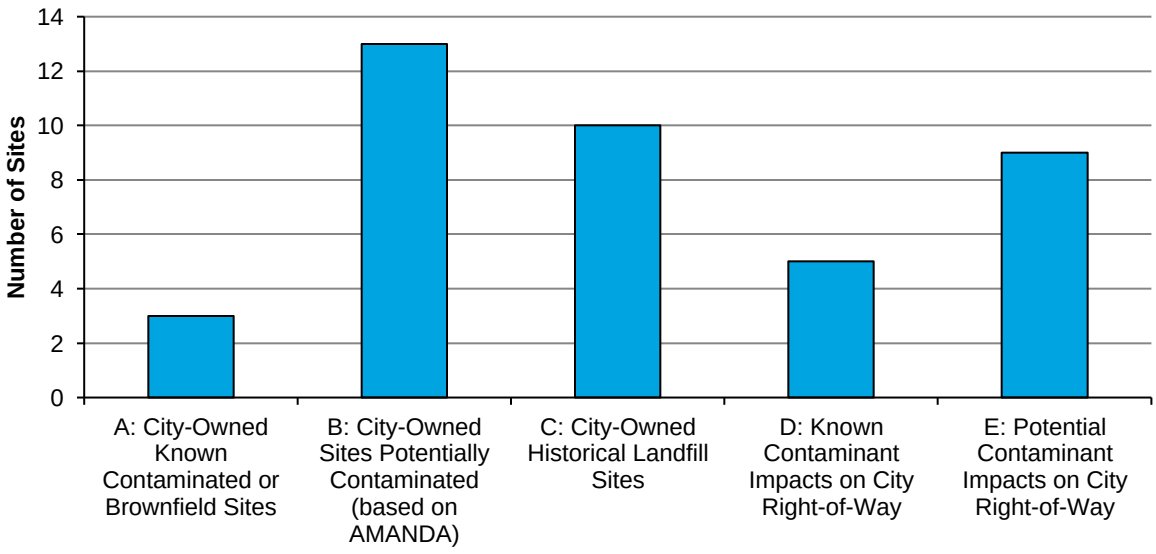


Figure 10. Contaminated Sites Number of Sites in Each Category



2.4.3 Corporate Vehicles and Equipment

Replacement Value:	$39,629,205	Data Confidence Grade:	71%

Summary:

The Corporate Vehicles and Equipment inventory has a relatively even distribution within the rating categories. 21 per cent ($8 million) of the inventory falls within very good; 22 per cent ($9 million) is within good; 24 per cent ($10 million) is considered fair; 17 per cent ($7 million) can be considered poor; and 16 per cent ($6 million) is rated as very poor. Approximately $10 million of the vehicles fall within the very poor rating category, which is partly due to them exceeding the short theoretical service life. Meanwhile, approximately $8 million of the equipment falls within fair to very good, despite the even shorter life cycles.

Figure 11. Corporate Vehicles and Equipment Overall Rating Breakdown

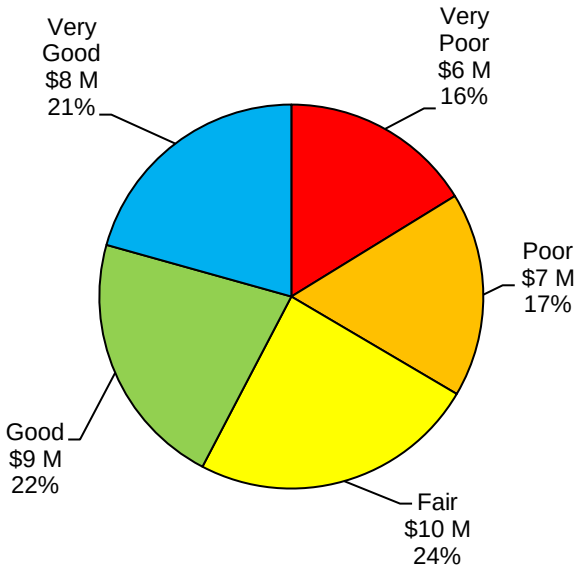
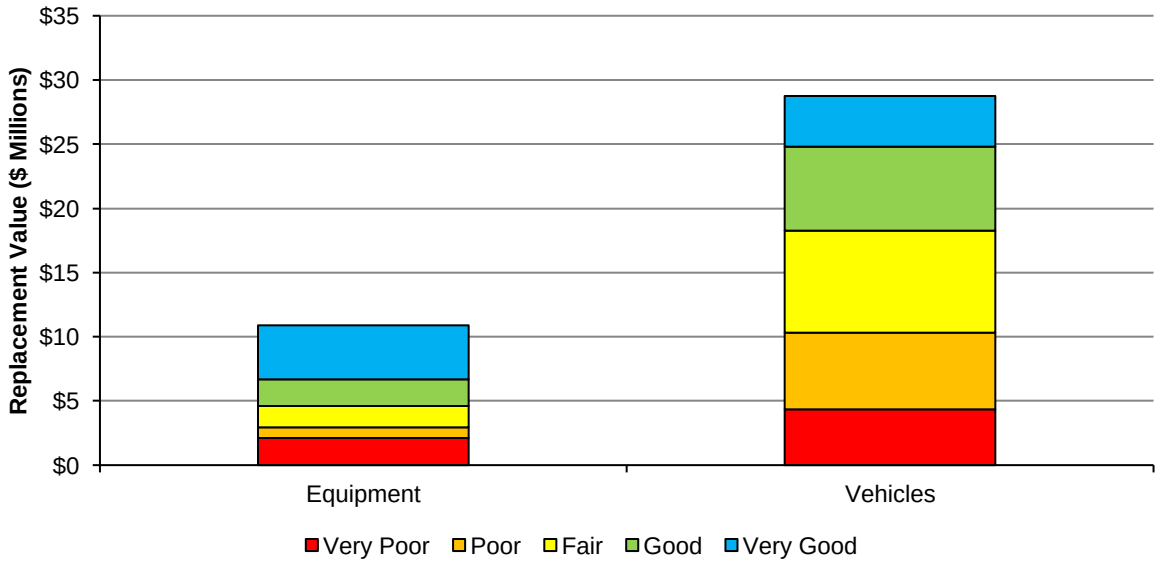


Figure 12. Corporate Vehicles and Equipment Category Rating Breakdown



2.4.4 Culture and Recreation

Replacement Value:	$295,754,705	Data Confidence Grade:	79%

Summary:

The Culture and Recreation inventory has approximately 40 per cent ($117 million) within the very poor rating category, while an additional 13 per cent ($38 million) is rated as poor. Within these two categories, a notable amount is contributed by recreation centres, parks and community centres. Washrooms, concessions and change rooms are also primarily ranked as very poor; however their comparatively small value makes their contribution less noticeable. Parks and community centres are distributed fairly evenly over the other four categories, while recreation centres make up a significant amount of the rating in the Fair category. There is a significant portion of the asset inventory with unknown condition and installation dates, despite having a valuation. Approximately two per cent of the overall inventory (valued at $6 million) is considered unknown.

Figure 13. Culture and Recreation Overall Rating Breakdown

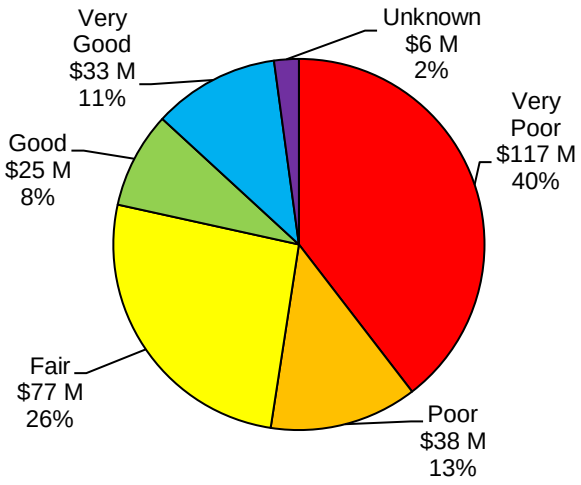
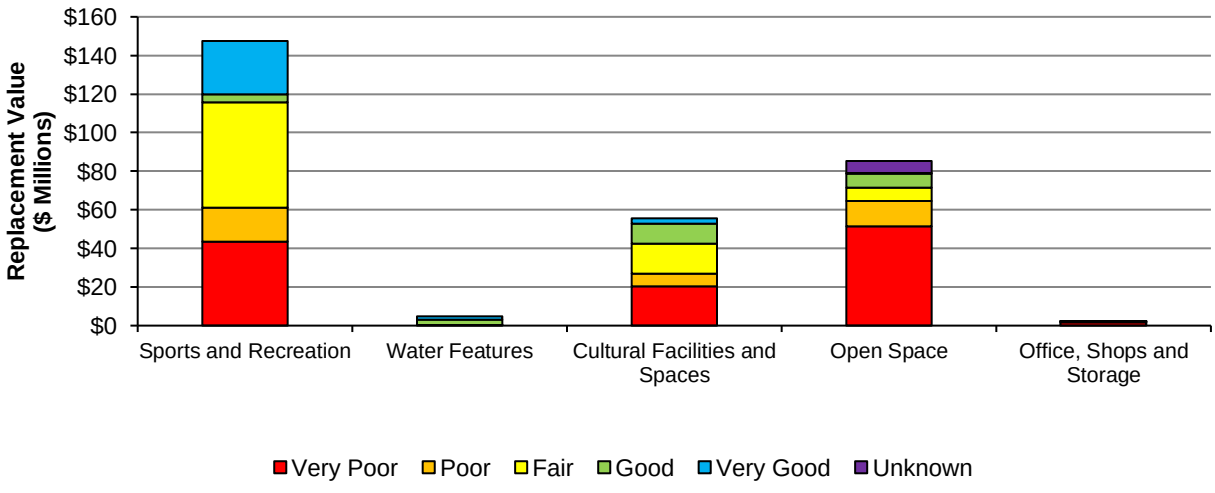


Figure 14. Culture and Recreation Category Rating Breakdown



2.4.5 Emergency Services

Replacement Value:	$77,836,118	Data Confidence Grade:	65%

Summary:

The assets included in the emergency services category include facilities, equipment and vehicles within the Emergency Medical Services, Fire Services and Police Services. Generally these items are in good or very good condition, with 83 per cent (approximately $65 million) of the inventory falling within these ranges. While assets in the Fire Services area are fairly evenly distributed across the condition rating scale, the Police Service assets fall primarily within the very good category, and the Emergency Medical Services assets are either in good or very good condition.

Figure 15. Emergency Services Overall Rating Breakdown

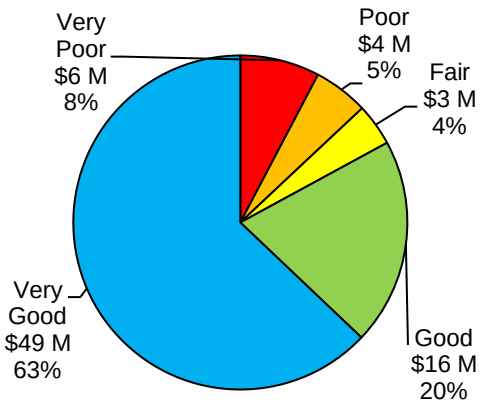
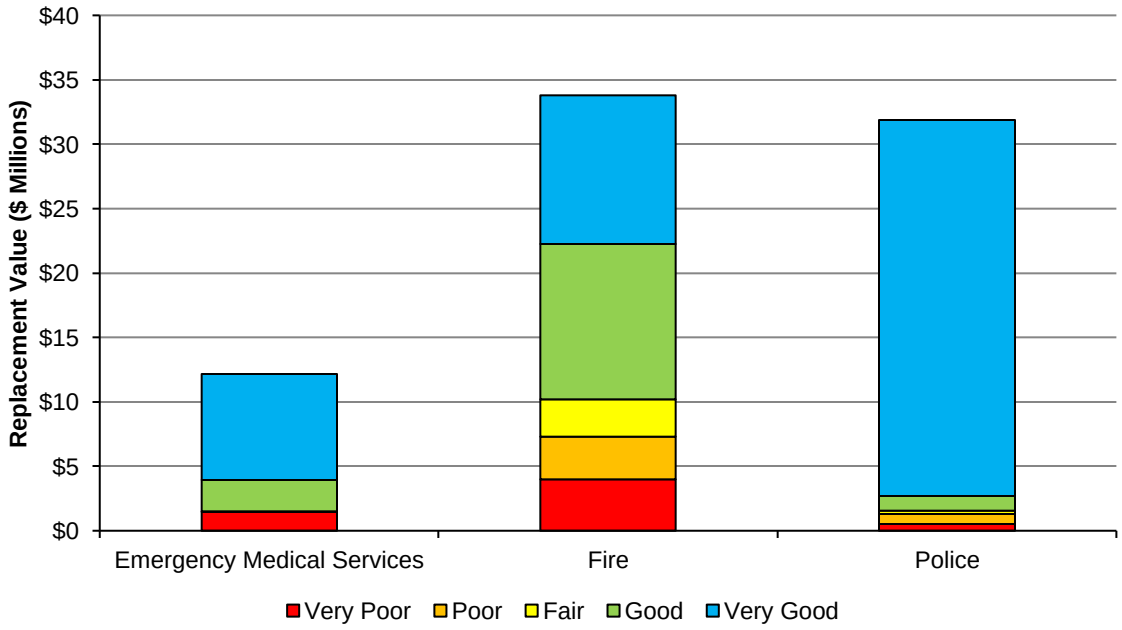


Figure 16. Emergency Services Category Rating Breakdown



2.4.6 Information Technology

Replacement Value:	$7,175,900	Data Confidence Grade:	50%

Summary:

Approximately 47 per cent ($3.3 million) of the Information Technology service assets fall within the poor and very poor condition ratings. This can be attributed to a large number of short service life items, such as communication devices, network devices, server chassis and storage devices. These assets generally have a low consequence of failure, and often a run-to-failure replacement scheme is appropriate. 14 per cent ($1 million) of the inventory are within the fair category, 12 per cent ($0.9 million) in good and 22 per cent ($1.6 million) in very good. Notably, computers make up the majority of the items in very good condition.

Figure 17. Information Technology Overall Rating Breakdown

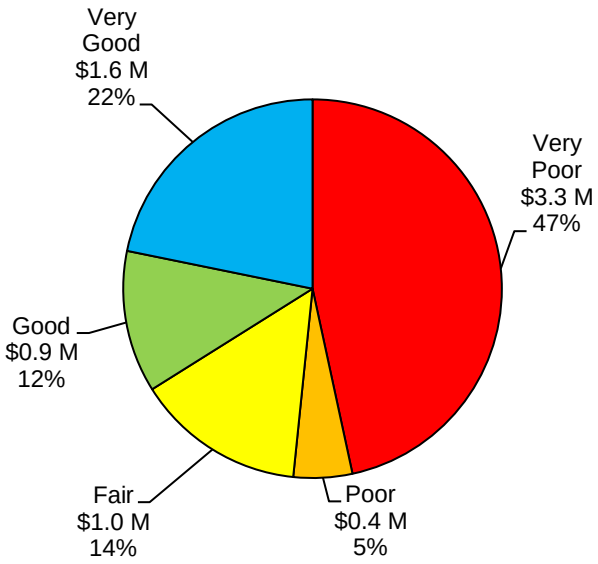
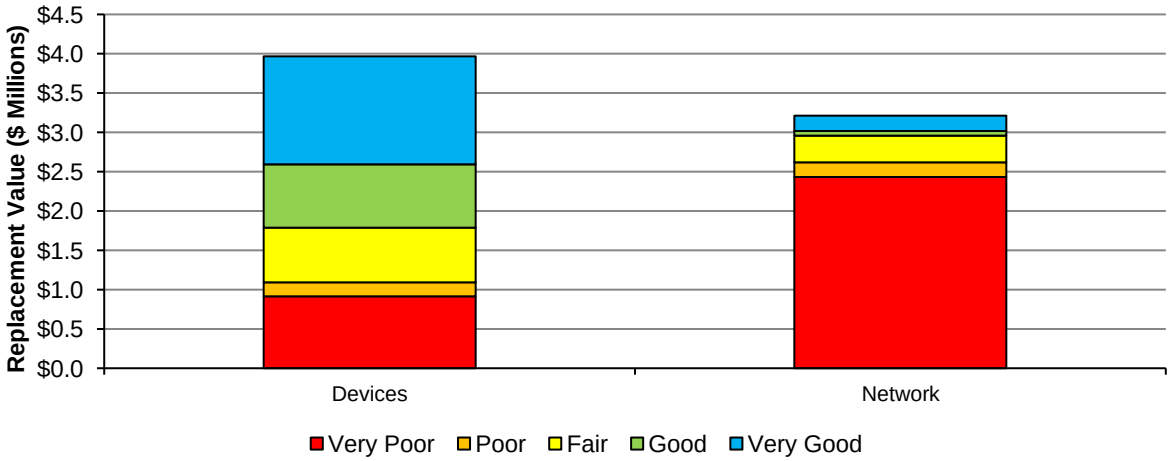


Figure 18. Information Technology Category Rating Breakdown



2.4.7 Parking

Replacement Value:	$57,791,600	Data Confidence Grade:	38%

Summary:

An exceptionally large proportion of the Parking Structures and Lots inventory is rated very poor at 70 per cent ($42 million). This can be attributed to the Parking Structures which are nearing the end of their lifecycle and are in need of significant repairs, as well as having limited lifecycle information on parking lots. 14 per cent ($8 million) of the assets are within the fair rating, 13 per cent ($8 million) within good, and three per cent ($2 million) within very good.

Figure 19. Parking Overall Rating Breakdown

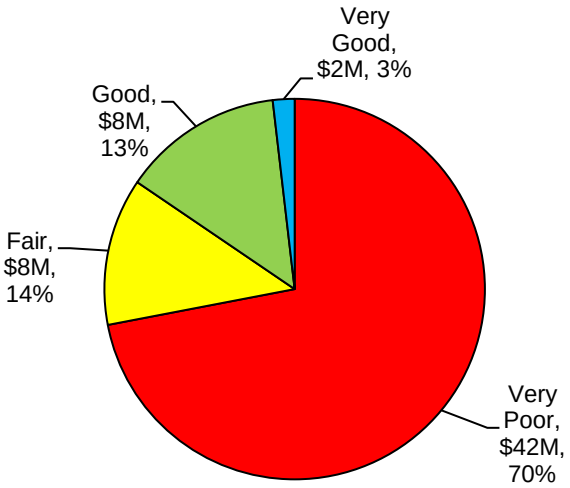
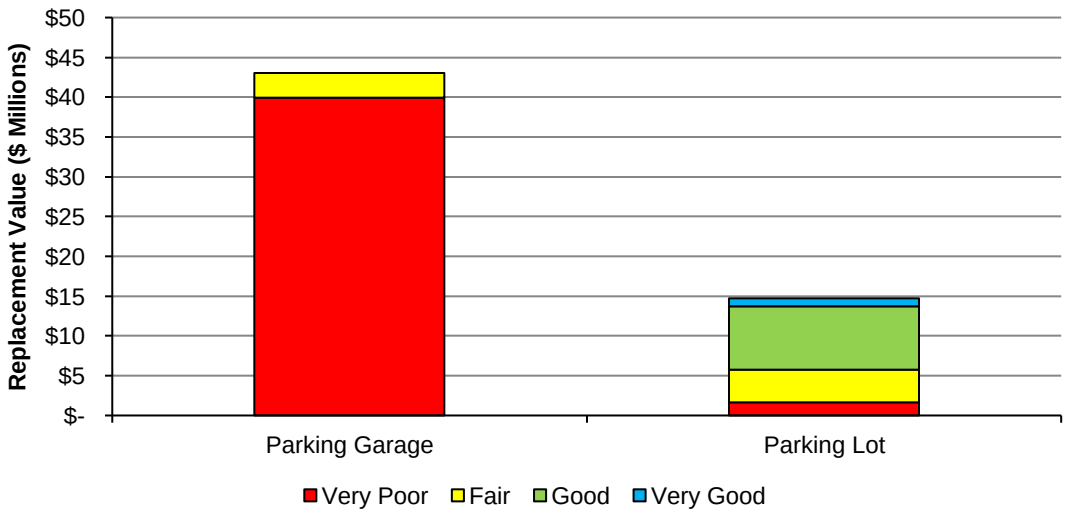


Figure 20. Parking Category Rating Breakdown



2.4.8 Solid Waste

Replacement Value:	$58,660,497	Data Confidence Grade:	62%

Summary:

The Solid Waste asset inventory is predominantly considered to be in the Fair rating category at 52 per cent (approximately $32 million). The remainder of the inventory is evenly distributed across the other rating categories. 15 per cent (approximately $9 million) is rated as very poor, 10 per cent (approximately $6 million) are rated as poor, 12 per cent (approximately $7 million) as good and 11 per cent (approximately $7 million) as very good. The Solid waste inventory is a mixture of vehicles and facilities. Facilities contribute just over $31 million to the fair rating, with the remainder of the replacement value evenly distributed across the other rating categories. The vehicle inventory makes up a large proportion of the poor and very poor categories, though a small portion can be seen in the fair and good ratings as well.

Figure 21. Solid Waste Overall Rating Breakdown

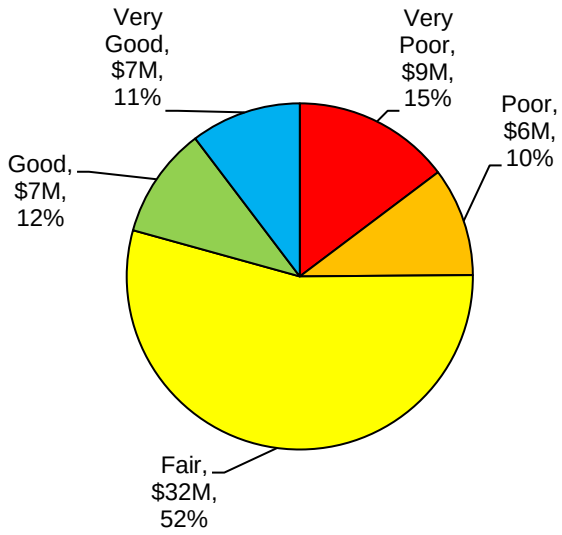
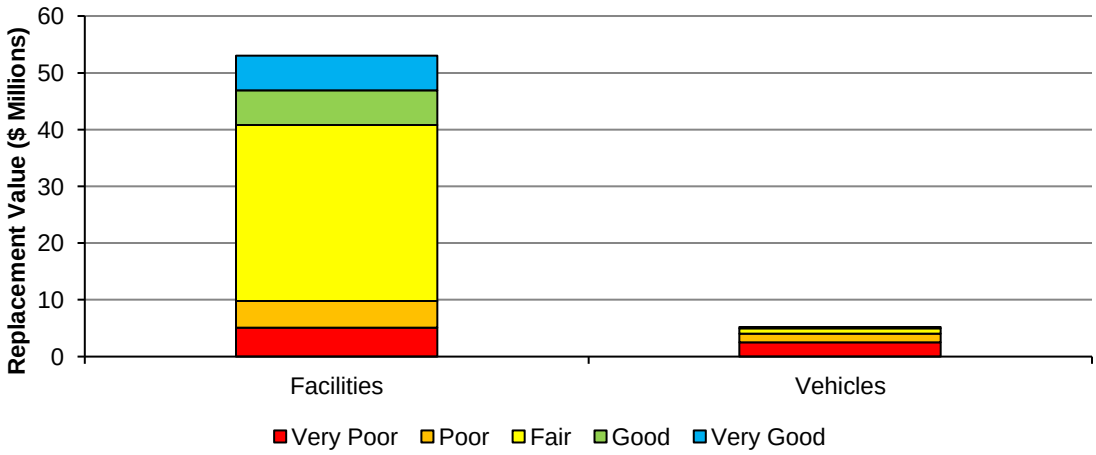


Figure 22. Solid Waste Category Rating Breakdown



2.4.9 Stormwater

Replacement Value:	$558,202,943	Data Confidence Grade:	37%

Summary:

Overall, the majority of the Stormwater management assets are in the fair or better rating categories. While there is 13 per cent ($75.2 million) rated as very poor, and an additional 15 per cent ($8.8 million) rated as poor, the remaining amounts are relatively evenly distributed between fair (18 per cent, $99.7 million), good (28 per cent, $155.3 million) and very good (26 per cent, $146.7 million). The majority of the replacement value consists of piping, which is visible across all categories, with a fairly even distribution of the remaining assets. Less than one per cent (approximately $0.5 million) of the inventory has unknown age and condition.

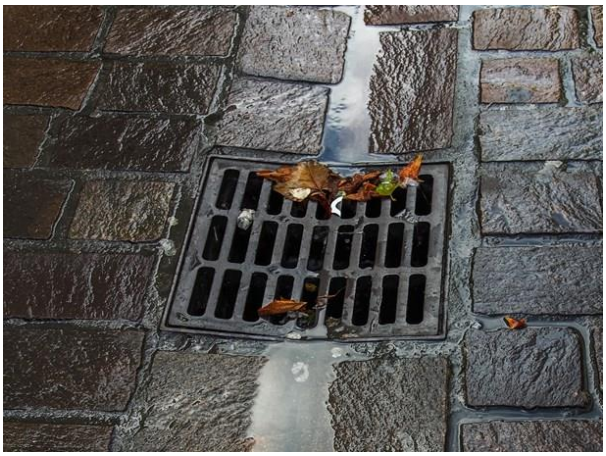


Figure 23. Stormwater Overall Rating Breakdown

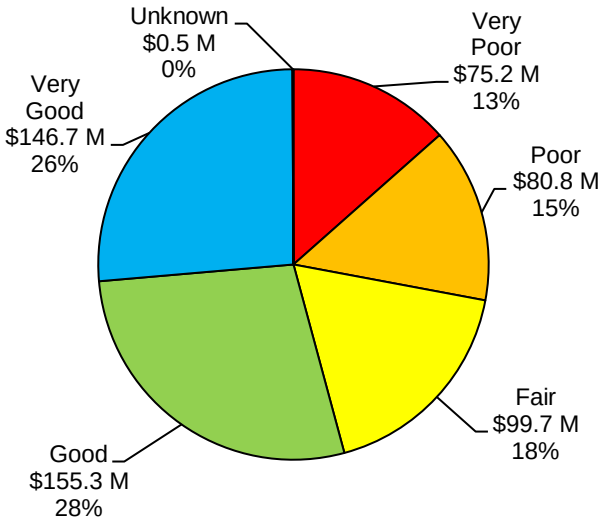
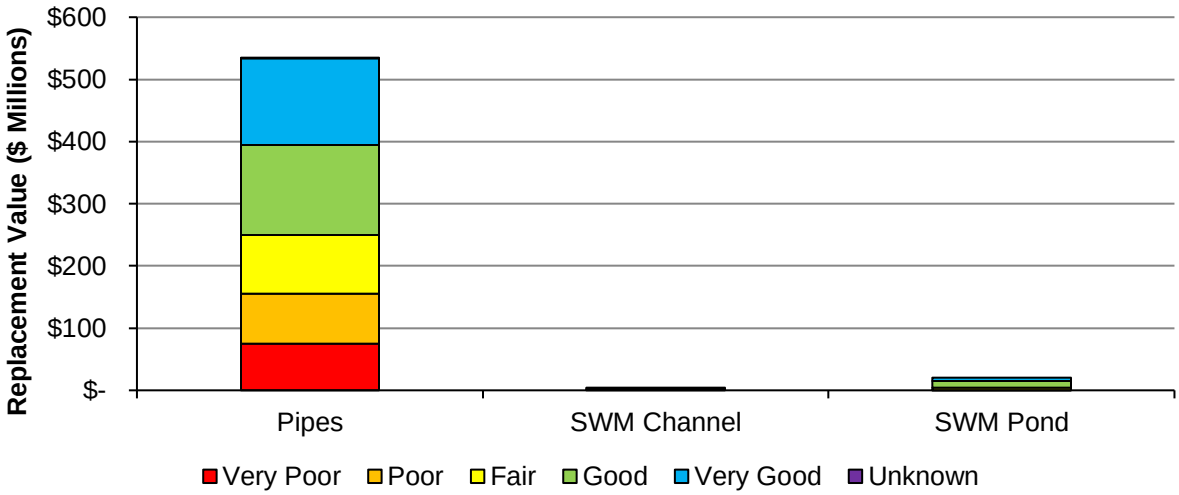


Figure 24. Stormwater Category Rating Breakdown



2.4.10 Transportation

Replacement Value:	$1, 549,326,012	Data Confidence Grade:	67%

Summary:

The majority of the transportation system is rated at either very good (32 per cent, approximately $504) or good (28 per cent, approximately $436 million). 20 per cent (approximately $303 million) of the system is rated as fair, 10 per cent (approximately $148 million) are rated as poor and three per cent (approximately $48 million) are rated as very poor. Roads and Sidewalks make up the majority of the assets located in the good and very good categories, while the other assets categories are relatively evenly distributed across the other rating categories. It is important to bear in mind that the roads assets make up a large portion of the replacement value in this inventory. Additionally, there is approximately seven per cent, or $111 million of the inventory with unknown installation dates or condition. This primarily consists of the streetlighting system.

Figure 25. Transportation Overall Rating Breakdown

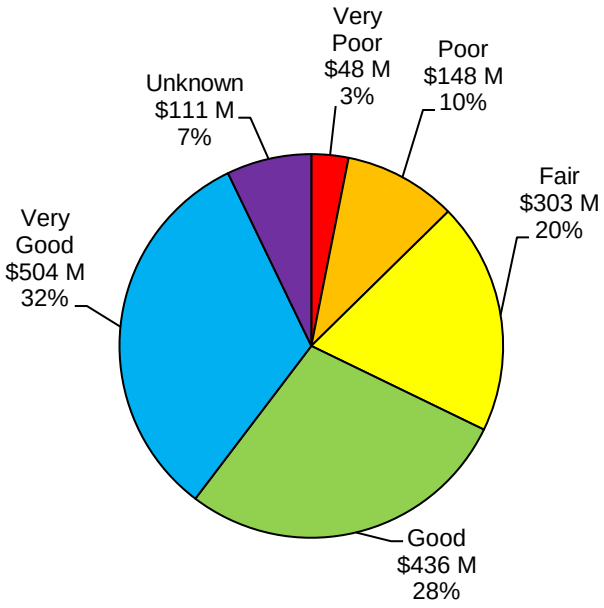
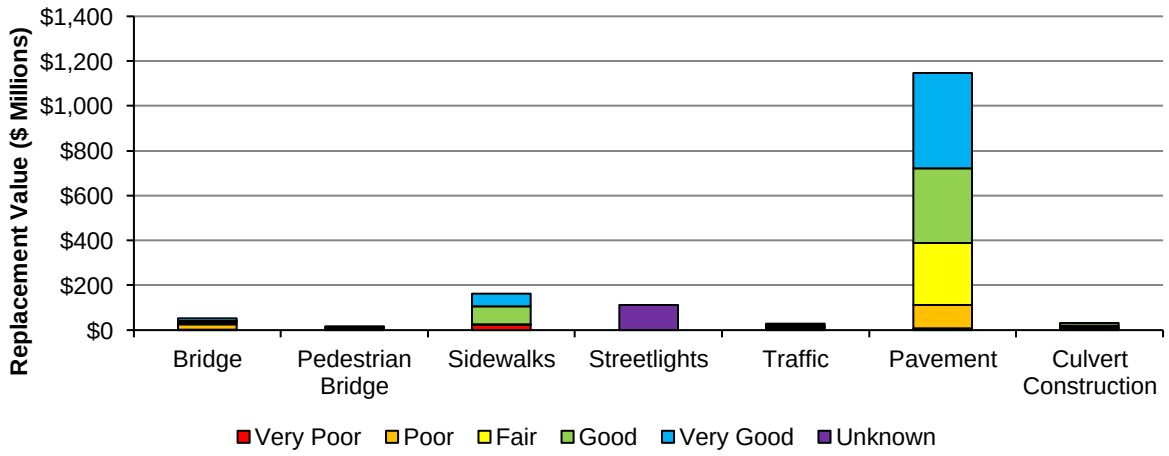


Figure 26. Transportation Category Rating Breakdown



2.4.11 Transit

Replacement Value:	$76,663,822	Data Confidence Grade:	29%

Summary:

64 per cent of the assets within the Transit Service are rated within the very poor (38 per cent, $29 million) or poor (26 per cent, $20 million) categories. While 20 per cent ($15 million) of the remaining inventory rated as fair, 9 per cent ($7 million) was rated good, and three per cent ($2 million) as very good. The inventory is a mixture of vehicles, equipment and facilities. A roughly equal amount of assets from both vehicle and facilities fall within the very poor and poor rating categories. Meanwhile, equipment assets, though much lesser in total replacement value, is almost entirely rated as poor. The majority of the assets within fair and good categories are vehicles; meanwhile the very good category is made up entirely of facilities. Approximately four per cent, or $3 million, of the inventory has unknown condition or installation dates, which is mostly the bus stop inventory.

Figure 27. Transit Overall Rating Breakdown

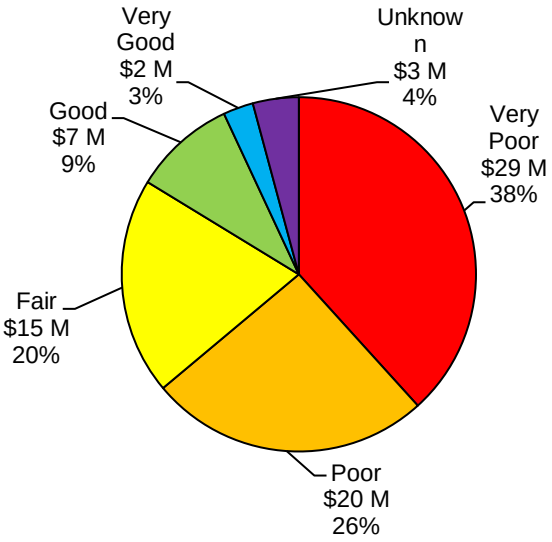
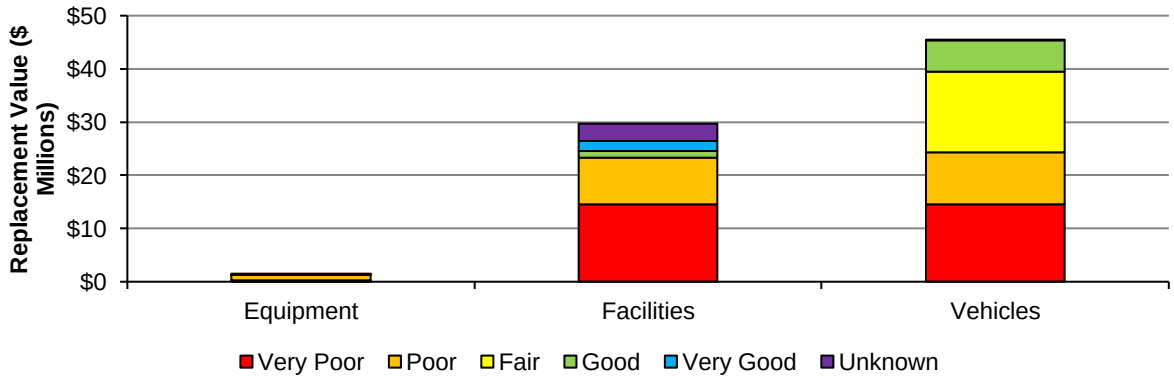


Figure 28. Transit Category Rating Breakdown



2.4.12 Water

Replacement Value:	$615,474,461	Data Confidence Grade:	80%

Summary:
Overall, the Water system is in fair condition. At present, 16 per cent (101 million) of the inventory is considered very poor, 29 per cent ($179 million) is considered poor, 18 per cent ($108 million) is rated fair, 23 per cent ($145 million) is rated good, and 14 per cent ($84 million) is rated very good. In both the linear (pipe network) and vertical sections of the inventory, assets are spread fairly evenly across the rating categories.

Figure 29. Water Overall Rating Breakdown

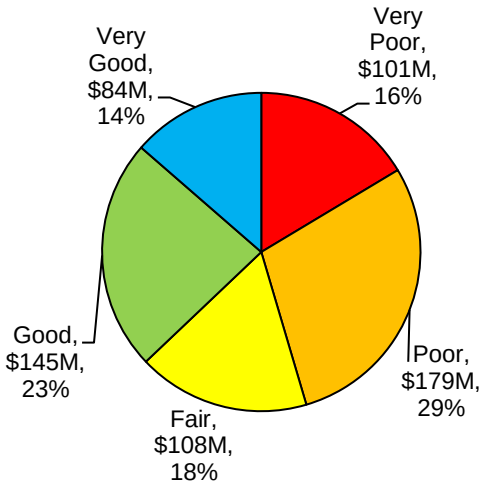
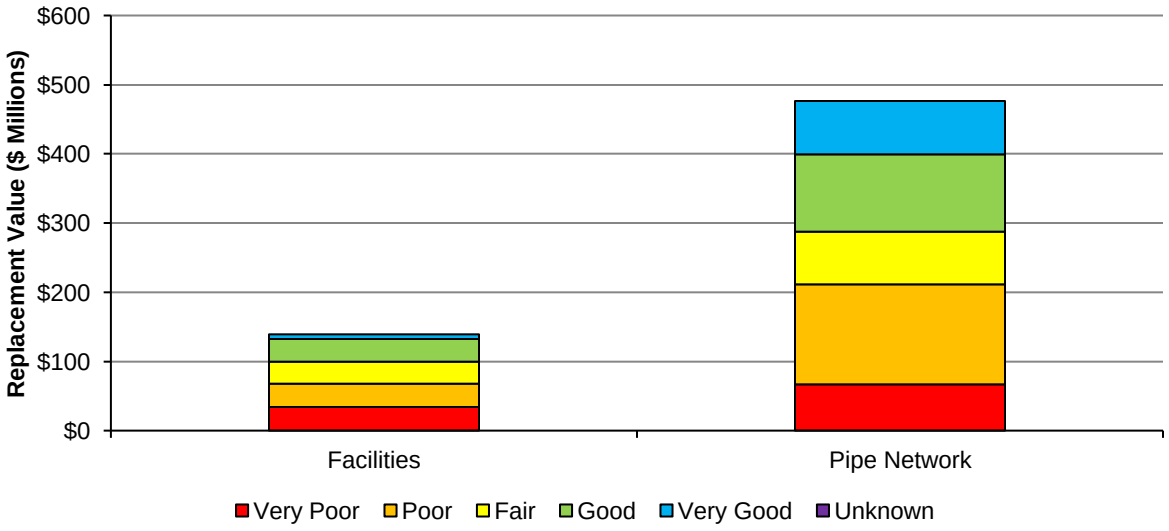


Figure 30. Water Category Rating Breakdown



2.4.13 Wastewater

Replacement Value:	$559,746,967	Data Confidence Grade:	45%
Summary:			

The wastewater asset inventory includes both linear and vertical assets required to collect and treat wastewater. The linear assets are primarily rated as either very poor or good. Meanwhile, vertical assets were more evenly distributed across the very poor to good ratings, with a small proportion receiving a rating of very good. Overall, 34 per cent ($193 million) was rated as very poor, 14 per cent ($79 million) as poor, 12 per cent ($66 million) as fair, 23 per cent ($126 million) as good and 17 per cent ($93 million) as very good. Less than one per cent ($2 million) of the inventory was in unknown condition due to lack of information on age or condition assessment data.

Figure 31. Wastewater Overall Rating Breakdown

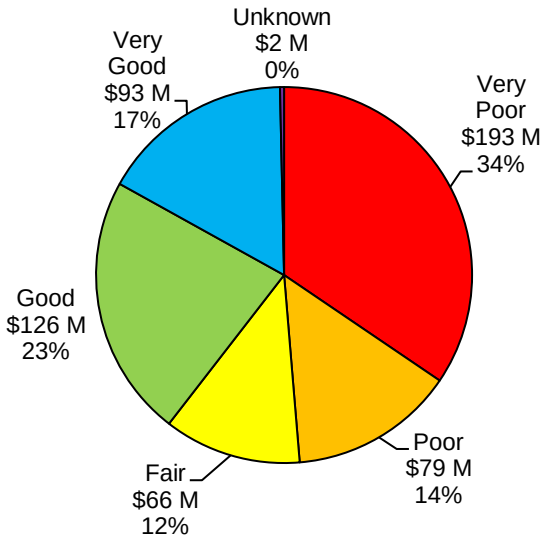
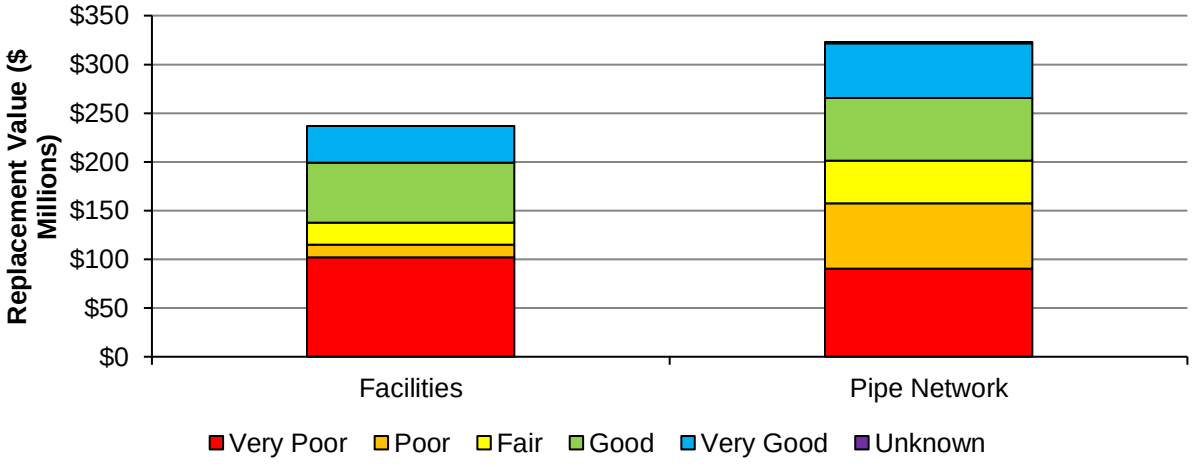


Figure 32. Wastewater Category Rating Breakdown



2.5 Asset Condition Assessment Practices

The City uses numerous investigative techniques in order to determine and track the physical condition of its assets. For instance, the interior of wastewater and storm pipes are routinely inspected using closed circuit television (CCTV) inspections. These inspections are guided by standard principles of defect

coding and condition rating that allow for a physical condition "score" for the assets to be developed. Other standardized assessment techniques relate to building condition audits, bridge audits (Ontario Structure Inspection Manual or OSIM Inspections),[12] and pavement inspections. For assets, without a standardized approach to condition assessment scoring, information from visual inspections, failure records and other maintenance related observations were used in establishing the condition of the asset.

The City conducts various types of inspections, which can be broadly categorized as follows:

- **Operations and Maintenance (O&M) Inspections:** Visual inspections typically carried out by City staff on a predetermined schedule in accordance with regulatory or operational requirements.
- **General Condition Assessments:** Assessments typically carried out by a third-party, generally covering the full inventory within an asset system at selected intervals.
- **Detailed Testing and Condition Assessments:** Specific testing or assessments carried out on a specific group of assets. Detailed condition assessments are not currently covered within this asset management plan however will be covered in the Asset System Management Plans to be developed in 2018.

Case Study 1. Driving Work Plans through Condition Assessments and Resource Analysis

In 2016, Water Services developed a Facility and Property Acquisition Master Plan. The focus of the plan was to provide a financial business case and project implementation strategy which prioritized the capital maintenance and renewal of water services' non-linear infrastructure for the next 25-year period. A condition assessment of all water facilities was completed to inform the plan, including financial and resource forecasts to deliver the plan as shown in **Figure 33**. In addition, current practices were reviewed to identify practical best practices to enhance Water Services asset management activities and strategy. In addition, a Systematic Asset Management Practice Level Evaluation (SAMPLE) was conducted, which included a series of interviews based on a 33 question questionnaire developed in general alignment with ISO 55001 standards.

The study highlighted a series of strengths, weaknesses, opportunities, and threats related to individual elements of Guelph's asset management system for water facilities. It is anticipated that the evolution of such an asset management system, currently in progress at both the department and corporate levels, will ultimately enable City staff to achieve improved results with less effort and resources.

Figure 33. Estimated Resource Needs for Combined Prioritized Works

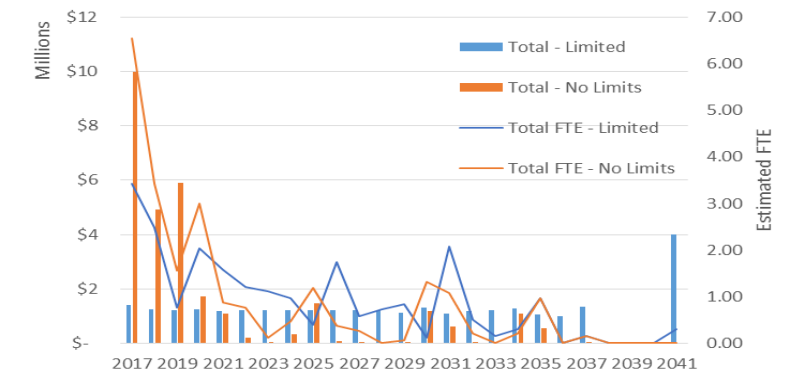


Table 11 provides an overview of the current general condition assessments, as well as recommendations to move towards asset management best practice. A full breakdown by asset type is included in **Appendix B**.

[12] *For more details, see [Online: http://www.mto.gov.on.ca/english/highway-bridges/ontario-bridges.shtml]. Retrieved November 26, 2016.*

Table 11. Summary of Current Condition Assessments

Asset System	Condition Assessment Comment
Administrative Facilities	▪ Building condition assessments have been completed for most of the facilities, however they are now approximately six years old, and are due for renewal. ▪ Complete facility inventory and condition assessment.
Contaminated Sites	▪ Continue to monitor as per 10-year plan.
Corporate Vehicles and Equipment	▪ Limited wholesale condition assessments are completed, however condition is evaluated and inspections are completed as part of manufacturer recommended preventative maintenance.
Culture and Recreation	▪ Parks and recreation facilities have been assessed by a third party, however the assessments are approximately six years old and require updating. ▪ It is also recommended that an inventory and condition assessment be completed for parks equipment. ▪ An inventory and condition assessment is required for the trail network.
Emergency Services	▪ Update facility condition assessment.
Information Technology	▪ Due to the short lifecycle, IT assets are not physically assessed, however are scheduled for lifecycle renewal. The majority of devices are run-to-failure, and are repaired and inspected on an as-needed basis.
Parking	▪ Parking structures are assessed on a biennial basis by third party consultants. ▪ Parking lots are inspected at least annually by staff. ▪ Currently, no consistent condition rating criteria are formalized and assessment is completed based on age and corrective maintenance.
Solid Waste	▪ A full assessment is required for the solid waste facilities. A partial equipment inventory exists, however it is recommended that a full inventory be developed.
Stormwater	▪ Pipeline assessments are being completed on the full network, with full coverage approximately every 10 years. ▪ The stormwater management ponds and oil and grit separators are inspected annually. It is planned that enhanced testing of the oil and grit separators be completed.
Transit	▪ A full condition assessment of the transit facilities and bus stops are required. ▪ Currently there is no formal condition grading system for vehicles, and it is recommended that one be developed.
Transportation	▪ Bridges and structures are inspected on a two-year cycle in accordance with the Ministry of Transportation Ontario Structure Inspection Manual. ▪ Some retaining walls and inlets are inspected; however it is recommended that a full inventory and condition assessment program be developed. ▪ Complete assessment of retaining walls, steps and facades that have not already been assessed within the last two years. ▪ The road and laneway network is assessed via automated data collection every three years. An assessment was completed in 2016. ▪ The sidewalks network is visually assessed annually and a formal inspection and GIS digitization approach has been developed. Railway crossings have recently been inspected by Metrolinx, and it is recommended that a routine assessment program be established. ▪ A full inventory of the traffic network exists in GIS, and the condition is estimated based on maintenance history and lifecycle analysis. ▪ Currently the City has an understanding of streetlight network quantities, however no full inventory exists. It is recommended that an inventory be developed and lifecycle analysis be conducted.

Asset System	Condition Assessment Comment
Wastewater	▪ Pipeline assessments are being completed on the full network, with full coverage approximately every 10 years. ▪ A forcemain, syphon, and trunk sewer assessment framework is to be established in 2017. ▪ Facility assessments were completed approximately six years ago, and are required to be updated.
Water	▪ The City has a leading edge leak detection program for linear assets, and an assessment framework is planned to be developed in 2017. ▪ The water facilities were assessed in 2016 as part of the Water Facility and Property Acquisition Master Plan. It is recommended that assessments be scheduled to be completed at least every five years.
Digital and Non-Digital Records	▪ The City has completed a Records and Information Strategy (RIM) in 2012, which included assessing the City's current RIM landscape by reviewing relevant City documentation/ data, surveying employees about their RIM practices and needs, and consulting with selected stakeholders about the RIM strategy and RIM program development.

2.6 Risk Assessment and Prioritization

By the definition of ISO55000, asset management is the coordinated activity of an organization to realize value from assets. One fundamental component of realizing the value of assets is achieving the desired balance of cost, risk and performance. Risk-based planning therefore should form the foundation of a mature asset management program.

The City has adopted an Enterprise Risk Management Framework (the Framework) that was presented in to Council in 2012.[13] In 2016, the City's Project Management Office championed a complex capital project risk management process that is also based upon the Framework. For consistency, future asset risk frameworks should also be based upon the Framework such that there is a common language within the organization pertaining to risks. As part of the Corporate Asset Management Program, in 2017 and 2018, the City intends to develop business processes and tools to evaluate the likelihood and consequences of failure of assets owned by the City. The defined processes will assist in predictive modeling, and will support optimized decision making.

[13] *City of Guelph (2012) CAO-A-1203 Enterprise Risk Management Framework. Staff Report. [Online: http://guelph.ca/wp-content/uploads/EnterpriseRiskManagementStaffReport.pdf] Retrieved November 26, 2016*

Case Study 2. Forestry Risk-Based Condition Assessment and Maintenance

Over the years, the Forestry division have been refining their approach to asset management, and its application to City owned trees. Their primary goal is to develop a system that allowed them to better track the labour components of their work, and help ensure due diligence in all aspects of their work. This process, however, has grown to include a number of initiatives that reflect best practices in asset management, and has resulted in a detailed system capable of producing highly valuable information.

Currently there are approximately 12,000 trees built into the computerized maintenance management system (CMMS) used at the City, though this inventory is expanding. Each tree is set up as a unique asset, and is linked to its corresponding service history, any service requests or work requests, and work orders that have been generated over the duration of its existence. Every year, Forestry conducts an annual large tree inspection. This captures information relating to health, condition, size, site, and location (particularly as it relates to usage of the area; for example, a quiet corner of a park, or a tree located along a busy street). From this information a priority rating is generated for each asset, which is used to determine the scheduling of any work orders generated over the following year based on criticality.

The results of such an extensive effort is a system that allows staff access to high quality, historical information that can be used to inform decision making, and long-range planning. As the system has matured, new needs were identified. They have built the network into the City's GIS database, and are in the process of testing the use of technology in the field to ensure the crews performing the maintenance have the most up-to-date information available when on site, and streamline the data capturing process. They have also implemented activity tracking measures that allow them to identify the type of work being performed. This has allowed them to track accomplishments from year to year, generate reports that detail labour and equipment costs, and report on scheduling quickly and easily.

By capturing this level of detail, the ability to engage in long-term planning is enhanced. Staff can forecast anticipated needs with greater certainty, and can approach each project with a clear understanding of each asset's work history. Perhaps even more importantly, Forestry staff be confident that they are exercising their due diligence when looking after the health of Guelph's green canopy. For the Forestry division, this process has been one of continual improvement, and their approach to asset management is among the most mature within the City of Guelph.

2.7 Data Confidence and Data Gaps

As with any data-intensive quantitative analysis, the results are only as good as the data that they are based upon. The City recognizes that there are gaps in the background information that has been used for the development of this asset management plan, which may impact the validity of the results. To overcome this challenge, and to not present misleading information, a standardized approach has been adopted to measure the confidence in the data and then to develop work plan to improve the confidence in the data for future iterations. This approach gives the reader a measure of how accurate the results of the analysis may be, and also aids the City in understanding deficiencies in the data and identifying areas for improvement. **Table 12** provides an overview of the inventory data confidence rating scales and descriptions.

Table 12. Inventory Data Confidence Rating Scale

Data Quality Rating	Equivalent Percentage	Description
5	80%-100%	No assumptions, with the age and value known. Reliable data source (e.g. structural report, building condition assessment, database with proven track record).
4	60%-79%	No assumptions, with the age and value known. Data is moderately reliable (e.g. out of date inventory or study, purchasing records, and internally maintained records).
3	40%-59%	One reliable data source, including minor assumptions from moderately reliable source (e.g. out of date inventory or study, purchasing records, internally maintained records).
2	20%-39%	Data from significantly out of date documents (i.e. seven or more years), relatively unreliable documents, or anecdotal, but both age and replacement value.
1	1%-19%	Moderately reliable data available for age or value, but not both. Second item not from a reliable source.
0	0%	No data available.

The data was rated using a numerical scale to indicate levels of confidence in the reliability of the information. As previously mentioned, data was gathered from a wide range of sources. Preference was given to the most current condition assessments, purchasing documents, and maintenance records. It was also occasionally necessary to utilize documentation that is, by industry standards, out of date, or reach out to staff that may be knowledgeable about the assets in question. While all these resources provide valuable insight into the history of the asset, there remains a degree of uncertainty due to the age of these documents, or fallibility of human memory. As such, efforts were taken to track information sources, and a rating assigned based on the type and reliability of the source of information.

There are a few key factors that contribute to the confidence rating, one being the age of the data source. The more recently completed or comprehensively updated a source was, the greater the confidence in its accuracy. For example, a building condition assessment for a facility completed in the previous year would receive a rating of five, whereas a building condition assessment for a facility completed 10 years ago would receive a four.

Another factor is the type, amount, and number of assumptions made, which are often interrelated issues in this process. Frequently, when information is gathered from a variety of sources there is a lower rating because more assumptions were required to fill any gaps. For example, in some instances it was necessary to pull value information from insurance documents. This information source does not typically provide age, or upgrade, information, meaning it is necessary to source this from elsewhere. The use of insurance documents was typically due to there not being available building or structural assessments, or

that those documents were out of date. Therefore, age information, while likely available for the original construction of the facility, will not necessarily reflect any renewal or rehabilitation work, and are therefore less reliable. Additionally, while reasonably accurate in providing a baseline cost for the asset, these sources are not intended to be used as a valuation system for asset management or construction, therefore not suited to purpose. In this scenario, depending on the combination of assumptions, the data source would typically be rated either a four or a three.

Finally, there are instances where information on either age or value were known, but not both (and occasionally, not either). In these instances typically stakeholders were consulted and best efforts were made to fill the gaps. Assets with information generated in this manner were rated with lower confidence ratings. The asset confidence ratings were the collated to establish the weighted average rating (by asset replacement value) for the overall category. **Table 13** provides the confidence ratings for each of the asset systems including comments summarizing the causes for the ratings.

Table 13. Inventory Data Confidence Rating

Asset System	Average Data Confidence Percentage	Comments
Administrative Facilities	74%	Based on previous building condition assessments, structural assessments and insurance values for facilities. Some building condition assessments and structural assessments are five or more years old.
Contaminated Sites	28%	Detailed remediation costs understood for 11 of 40 sites. The understanding of the scale and complexity of remediation work will grow through more enhanced monitoring and inspection programs planned for the next 10 years.
Corporate Vehicles and Equipment	71%	Data was based on detailed budget sheets, where are likely moderately out of date, however validated against purchase orders, tender documents and details stored in Oracle Work and Asset Management.
Culture and Recreation	79%	The parks inventory was used, which is highly detailed but requires updating. The tree inventory is very well maintained and raises the overall confidence rating of the inventory significantly due to the large number of tree assets.
Emergency Services	65%	The inventory data was compiled from a variety of sources, some well maintained, and others anecdotal. Fire data is highly reliable; however data from Police and EMS was less reliable.
Information Technology	50%	The majority of lifecycle inventory data was available, however assumptions has to be made for a number of assets on value and/or ages, based on the asset type.
Parking	38%	Minimal documented information was available for parking lots; however condition assessment reports are available for structures. Data for the parking lots have been collated based on anecdotal information.
Solid Waste	62%	Approximately have of the data is available, through Oracle Work and Asset Management or structural assessments and staff records; however the remainder of the information is based on anecdotal data sources.

Asset System	Average Data Confidence Percentage	Comments
Stormwater	37%	Fairly comprehensive data is available within the GIS, however the majority of the inventory is without pricing or age information.
Transit	29%	A large portion of inventory is without age information, which skews overall rating.
Transportation	67%	Inventory is based on information out of GIS, cost estimates and pricing. A large portion of the inventory is without pricing or age information. Streetlighting data is currently unavailable.
Wastewater	45%	Inventory is based on information out of GIS, cost estimates and pricing. A portion of the linear inventory is without pricing or age information. The vertical inventory is not fully developed and missing key information.
Water	73%	The inventory data is based on information out of GIS, cost estimates and pricing. A portion of the linear inventory is without pricing or age information.
Digital and Physical Records	To be added	To be added.

2.8 Updating Asset Information

As previously mentioned, there are currently a variety of data sources that contributed to this plan. One of the key data sources was the City's Geographic Information System (GIS), which stores approximately 70 per cent of the asset portfolio. The GIS division and dedicated GIS Technologists are responsible for updating and maintaining the data on a day to day basis. Another key data source was Oracle Work and Asset Management (WAM), which is the City's Computerized Maintenance Management System (CMMS). Again, WAM has dedicated staff in the user departments responsible for updating the database on an ongoing basis. Both of the aforementioned systems are currently undergoing significant initiatives to improve overall data quality, business processes, and the integrations between them and other systems. The key initiatives include:

- **Water and Wastewater Data Modeling:** A review and gap assessment of the current architecture, features, attributes, and updated processes, with a focus on the water and wastewater GIS layers.
- **City-Wide GIS Data Modeling:** A review and gap assessment of the current architecture, features, attributes, and updated processes of the overall GIS layers.
- **Enterprise Asset Management Implementation:** Business process re-engineering, system upgrades, data clean-up, hierarchy development, and cross platform integrations.
- **JD Edwards and Oracle Work and Asset Management Integration (Service Oriented Architecture Implementation):** Two way integration between the CMMS and Financial System.

In the long-term, the Corporate Asset Management division plans to work with each key service group to establish data requirements and update procedures. These procedures will be summarized in the Asset System Management Plans.

3 Desired Levels of Service

All assets that the City owns are conduits to support the provision of the City's services to both internal and external customers. Historically, the City, not unlike most other municipalities, has relied on an asset stewardship approach to asset management that places emphasis on ensuring reliability of the assets. In recent years, the City and the industry alike have seen a paradigm shift towards customer-centric asset management. This new philosophy, bases decisions upon the asset's ability to provide value to the customer. One of the key measures of value is the level of service that will be achieved. A level of service is a criteria set by the organization and community for the output of the services provided by the municipality. Levels of service typically relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.

Through the application of asset management principles, the City aims to understand the relationship between the levels of service and the cost of providing the service. This relationship can then be evaluated in consultation with the community to determine the optimum level of service they are willing to pay for. The end goal is that the City can quantitatively evaluate and communicate the impacts of decisions on levels of service.

A good example of a highly visible level of service is that related to roads. For example, if through consultation with stakeholders, it was decided that all roads should be in fair or better condition, then any road that is below that level of service would not be compliant with that target. To rehabilitate or reconstruct roads in poor condition to meet the expected level of service would require financial and resource investments. Comprehensive asset management enables decision makers to evaluate whether there is willingness to pay to bring assets up to the target levels of service, and what the risk exposure and long-term impacts may be if different investment levels are applied. In addition, predictive modelling techniques can forecast the impact of the current investments against targeted levels of service over time to simulate long-term impacts. This gives decision makers additional information for finding the optimum balance between risk, levels of service and cost.

3.1 Defining Levels of Service

One of the City's key goals is to understand the balance between the asset cost, performance and risk. Well-defined levels of service can be used to:

- Inform customers of the current level of service provided and any proposed changes to level of service and the associated cost;
- Measure performance against defined levels of service;
- Identify the costs and benefits of the services; and
- Enable customers to consider the level of service provided within the context of affordability.

In the 2016 Corporate Asset Management Plan, the City indicated that it was embarking on several key initiatives to help define levels of service over the long term. The vision was that the City will be able to

establish the key level of service requirements, and better understand the relationship between the levels of service and costs to provide the service. The City is developing tools and techniques to predictively model levels of service over time. The key initiatives planned included:

- Corporate level of service initiative (Corporate Asset Management);
- Service reviews (Project Management Office and Corporate Asset Management); and
- Corporate performance and accountability frameworks (Chief Administrative Officer's Office).

Under the Corporate Asset Management Program, levels of service will be guided by service attributes, level of service statements, and performance measures as shown in **Table 14**.

Table 14. Concepts of Levels of Service

Concept	Average Data Confidence Rating	Examples
Key Service Attributes	Aspects or characteristics of a service	Accessibility, affordability/cost efficiency, quality, quantity, reliability, responsiveness, safety.
Levels of Service Statement	**What the organization intends to deliver.** Levels of service statements describe attributes of the service from a customer point of view.	Provision of high quality recreation experiences. Provision of high-speed internet access to all staff
Customer Performance Measure	**How the customer receives or experiences the service.** Customer measures are generally those that would be uses in public documents, and should be easily understandable to the average person.	**Tangible measures:** Appearance of facilities, frequency of disruptions, incidence of illness **Intangible measures:** Staff attitude, ease of receiving the service, etc.
Technical performance measure	**What the organization does to deliver the service.** These measures support customer measures and tend to be used internally to measure performance against service levels	Number of times public toilets are cleaned each day, average wait times at intersections, the average condition rating of playgrounds.

Source: Extracted from IIMM, 2015 (p.2-24)

The Level of Service project was initiated in 2017, and is expected to be finalized at the end of 2018. The register of Levels of Service Frameworks, developed for each of the critical, asset-intensive services identified through the development of the project, are be a living database. This work is described in greater detail in **Section 3.3 – Corporate Levels of Service.**

Several level of service initiatives have already been implemented at the City. The following sections describe some of the current level of service frameworks in place.

3.1.1 National Water and Wastewater Benchmarking Initiative

Since 2012, the City's Water Services department has been an active participant in the National Water and Wastewater Benchmarking Initiative (NWWBI).[14] This project was developed in response to a need for Canadian municipal water and wastewater utilities to measure, track and report on their utility performance (NWWBI, 2013). In the 2016 iteration, the NWWBI included approximately 45 Canadian municipalities, regional districts, and water utility companies. The benchmarking framework was founded for the purpose of answering four important questions that are commonly posed to managers of water, wastewater and stormwater (NWWBI, 2012):

1. How well are we doing?
2. How do we compare with similar organizations?
3. Are we getting value for money? and
4. How can we get better at what we do?

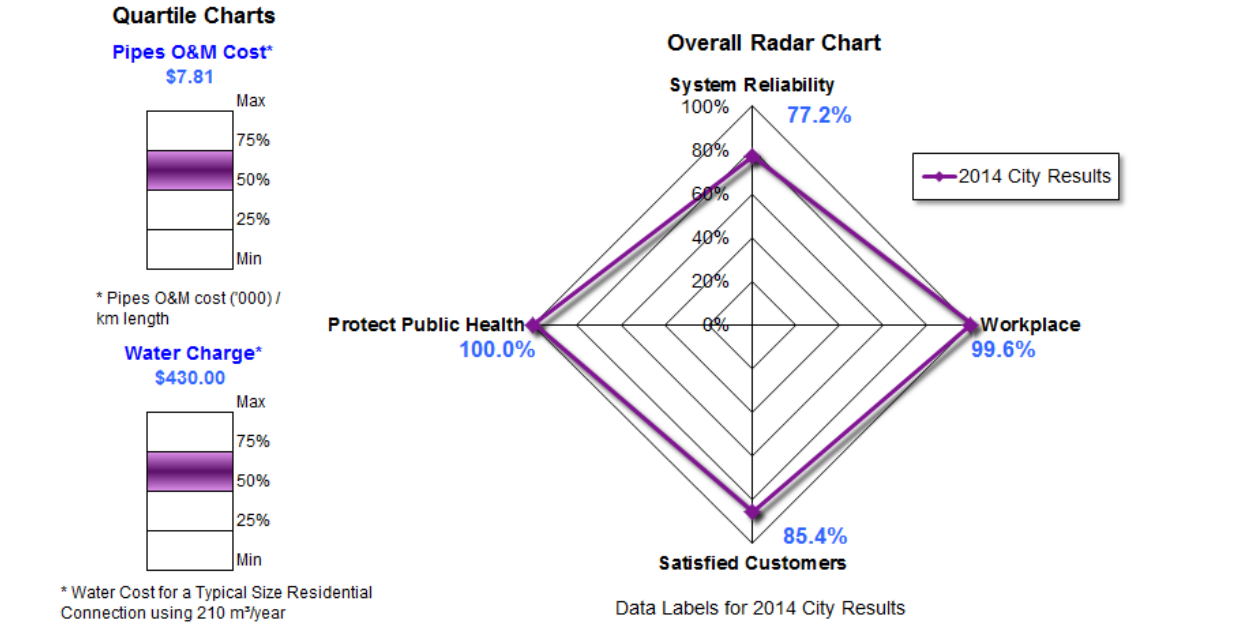
For five years, the City of Guelph has been measuring the levels of service for the water network through the NWWBI framework. The NWWBI's Utility Management Model defines a framework to achieve seven (7) high level performance goals developed through consultation with participants across Canada. The performance goals are as follows:

1. Provide reliable and sustainable infrastructure;
2. Ensure adequate capacity;
3. Meet service requirements with economic efficiency;
4. Protect public health and safety;
5. Provide a safe and productive workplace;
6. Have satisfied and informed customers; and
7. Protect the environment.

A summary of the performance indicators that are tracked on an annual basis are provided in **Appendix C**. In addition to the wide range of individual Key Performance Indicator graphs, a process to graph total goal attainment through multi-dimensional graphing tool called "radar graphs" can be used. The various indicators can be aggregated to demonstrate performance against the overall utility goals. A dashboard is a useful way to display the results visually. **Figure 34** provides an overview of the City of Guelph's results for 2014. As can be seen from the figure, the City met 100 per cent of the target metrics for protecting public health, whereas met 77.2 per cent with respect to system reliability. The low system reliability was due to the extremely cold winters of 2013-14 and 2014-15, which are captured in the results.

[14] *For a full description of the NWWBI performance indicators visit [Online: http://www.nationalbenchmarking.ca/]. Retrieved November 26, 2016.*

Figure 34. Overall Benchmark Goal Attainment for the Water Distribution Network



Quartile Charts show in which quarter your utility falls

Goals

Provide Reliable Service and Infrastructure

- ☑ # of Main Breaks/ 100 km Length
- ☑ # of Inoperable or Leaking Hydrants / # of Hydrants
- ☑ 5 year Average Capital Reinvestment / Replacement Value
- ☑ Non-Revenue Water L/connection/day
- ☑ # of Inoperable or Leaking Valves / # of Valves
- ☑ # of Emergency Service Connection Repairs and Replacements / # of Service Connections
- ☑ # of Unplanned System Interruptions / 100 km Length

Provide Safe and Productive Workplace

- ☑ # of Field Accidents with Lost Time / 1,000 Field Labour Hours
- ☑ # of Lost Hours due to Field Accidents / 1,000 Field Labour Hours
- ☑ # of Sick Days Taken per Field Employee

Have Satisfied and Informed Customers

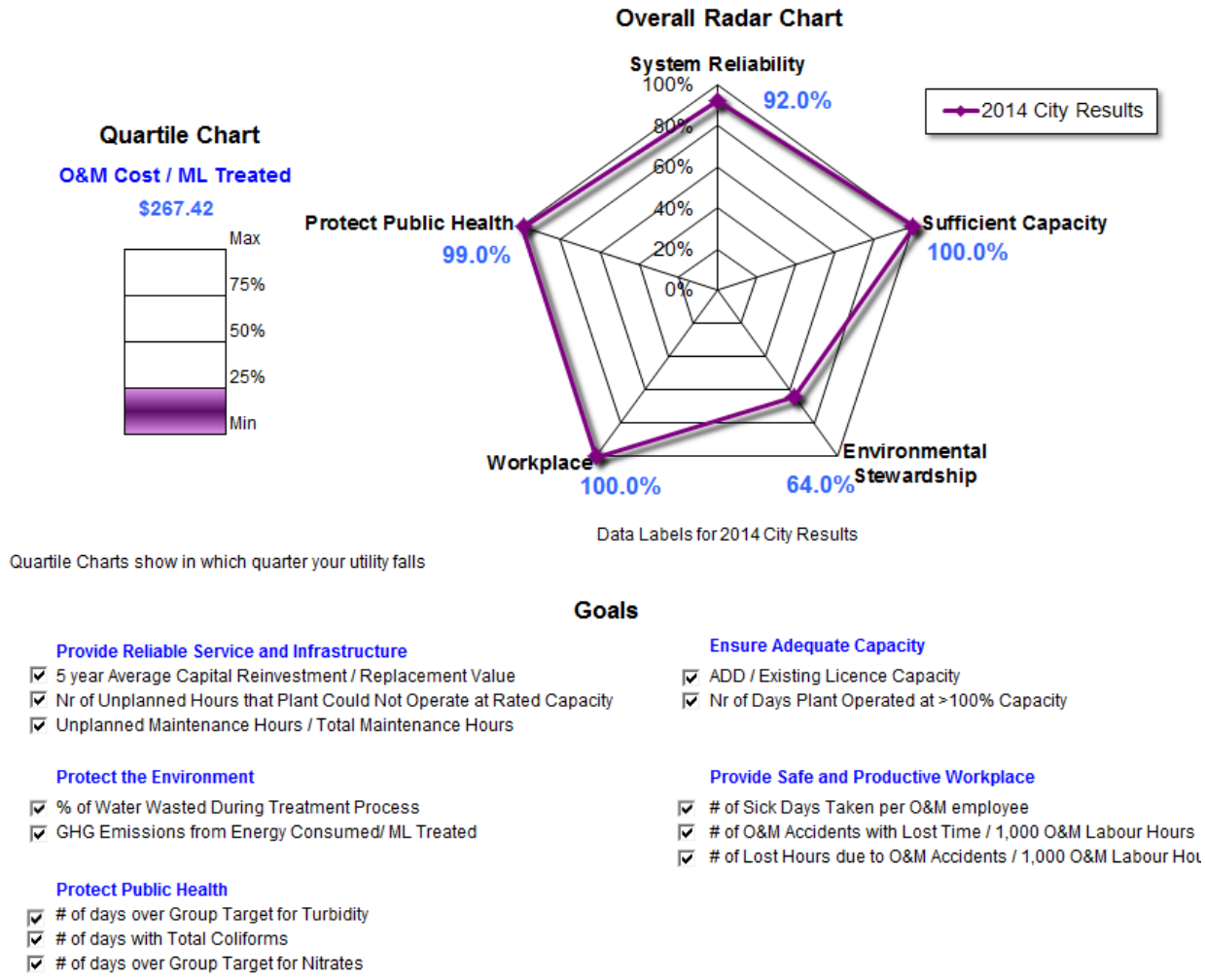
- ☑ # of Water Pressure Complaints / 1,000 People Served
- ☑ # of Unplanned System Interruptions / 100 km Length
- ☑ # of Occurrences over Group Target for Turbidity
- ☑ # of Occurrences over Group Target for Total Coliforms
- ☑ # of Occurrences over Group Target for THMs
- ☑ # of Boil Water Advisory Days
- ☑ # of Water Quality Customer Complaints / 1,000 People Served

Protect Public Health

- ☑ # of Occurrences over Group Target for Turbidity
- ☑ # of Occurrences over Group Target for Total Coliforms
- ☑ # of Occurrences over Group Target for THMs
- ☑ # of Boil Water Advisory Days

Source: NWWBI 2014.

Figure 35. Overall Benchmark Goal Attainment for the Water Treatment Plant



3.1.2 Measuring the Cost of Meeting Levels of Service for Roadways

The targets for the roadway levels of service are yet to be set, however the City has been tracking the condition level of service for a number of years. One key indicator of roadway levels of service is the Pavement Condition Index (PCI),[15] which is a numerical index between 0 and 100 which is used to indicate the general condition of a pavement.

A condition assessment of the road network was completed in September 2017, which has provided a City-wide insight into the current roads levels of service and backlog.

2.4.13.1 Visualizing Levels of Service

Although the PCI is easily understandable for an engineer, the index on its own is rather abstract for a person unfamiliar with pavement science. Therefore, it is prudent to visualize what the ranges of PCI

[15] *PCI surveying processes and calculation methods have been standardized by ASTM for both roads and airport pavements:*

- *ASTM D6433 - 11: Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys*
- *ASTM D5340 - 11: Standard Test Method for Airport Pavement Condition Index Surveys*

score mean from a practical perspective. To simplify the scales, it is common practice to split the results into five categories (from Very Good to Very Poor) according to the scale presented in **Table 8** on **page 21**. **Figure 36** shows an example of a road segment that is in very good condition, which is often the condition for the first one to five years of the road surface life.

Figure 36. Example of Road Segment in Very Good Category (PCI ≥ 80)

Source: Google (2015)[16]

As the asset continues to age, some wear may appear on the surface including defects on the curb. At this stage, it is generally prudent to crack seal any locations with cracking to slow down the rate of deterioration. An example of a road in good condition is shown in **Figure 37**.

Figure 37. Example of Road Segment in Good Category (PCI 60 to 79)

Source: Google (2014)[17]

16 *Google Maps. (May 2015). Webster St [Online: https://www.google.ca/maps/@43.5802732,-80.267371,3a,75y,330.3h,82.13t/data=!3m6!1e1!3m4!1sm0rbQXZgMSt7A9dWtuOPOw!2e0!7i13312!8i6656]*

17 *Google Maps. (June 2014). Applewood Crescent, retrieved 27 November 2016.<https://www.google.ca/maps/@43.5419679,-80.2794756,3a,90y,308.83h,87.78t/data=!3m6!1e1!3m4!1sio3yrEytqUV4T5WVcgsBxg!2e0!7i13312!8i6656*

Over time, small cracks may propagate to form starting signs of what is termed alligator cracking (due to the appearance of “scales” due to multiple interrelated cracks). In addition, minor patches may have been cut into the surface for utility cuts. An example of a segment in fair condition is shown in **Figure 38**.

Figure 38. Example of Road Segment in Fair Category (PCI 40 to 59)

Source: Google (2016)[18]

Over time, the cracks may begin to span across the entire surface and dips in the surface may form due to failure of the base below the road surface. Segments begin to separate and minor potholes may form, resulting in increasing maintenance requirements. This would result in a relatively uncomfortable driving experience with frequent bumps or depressions. An example is shown in **Figure 39**.

Figure 39. Example of Road Segment in Poor Category (PCI 20 to 39)

Source: Google (2016)[19]

[18] *Google Maps. (June 2016). Alma St retrieved 27 November 2016* https://www.google.ca/maps/@43.5371157,-80.2643913,3a,75y,127.97h,81.16t/data=!3m6!1e1!3m4!1sbN3advEKFyOx8Af2yyyl5A!2e0!7i13312!8i6656!6m1!1e1

[19] *Google Maps. (June 2016). Ironwood Road retrieved 27 November 2016* https://www.google.ca/maps/@43.5157588,-80.2305419,3a,75y,213.45h,64.66t/data=!3m6!1e1!3m4!1sR7R92KuS-bbOz7gJiJizxQ!2e0!7i13312!8i6656

Finally, the multiple cracks may result in significant potholes across the entire road surface, resulting in an uncomfortable drive with constant bumps or depression significantly impacting the driving and aesthetic experience. **Figure 40** provides an example of a road in very poor condition.

Figure 40. Example of Road Segment in Very Poor (PCI <20)

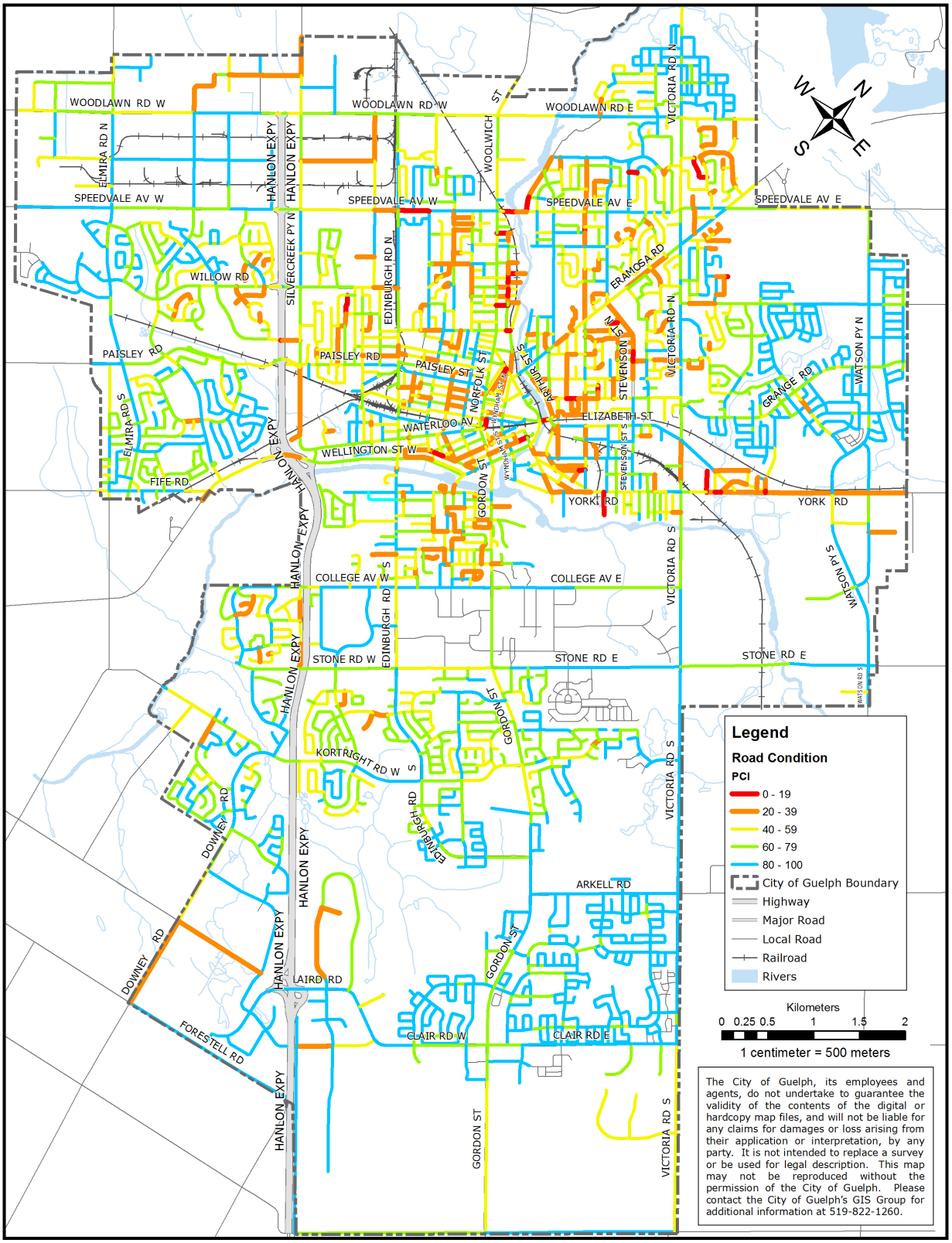
Source: Google Maps (2014)[20]

2.4.13.2 Community Profile: Mapping the Results

Based upon the automated condition assessment completed in 2016, a visual map of the entire City can be established to identify the overall level of service provided. Through the 2017 level of service initiative, the City plans to work with the community to establish the desired target levels of service for roads, among other asset types. A map of the overall road condition, categorized into the five condition scales is shown in **Figure 41**.

[20] *Google Maps (June 2014) Bristol Street, retrieved on November 27, 2016 https://www.google.ca/maps/@43.5372817,-80.2515195,3a,75y,93.28h,59.92t/data=!3m6!1e1!3m4!1sLYPxcUw247Ec7BnISw6GeQ!2e0!7i13312!8i6656*

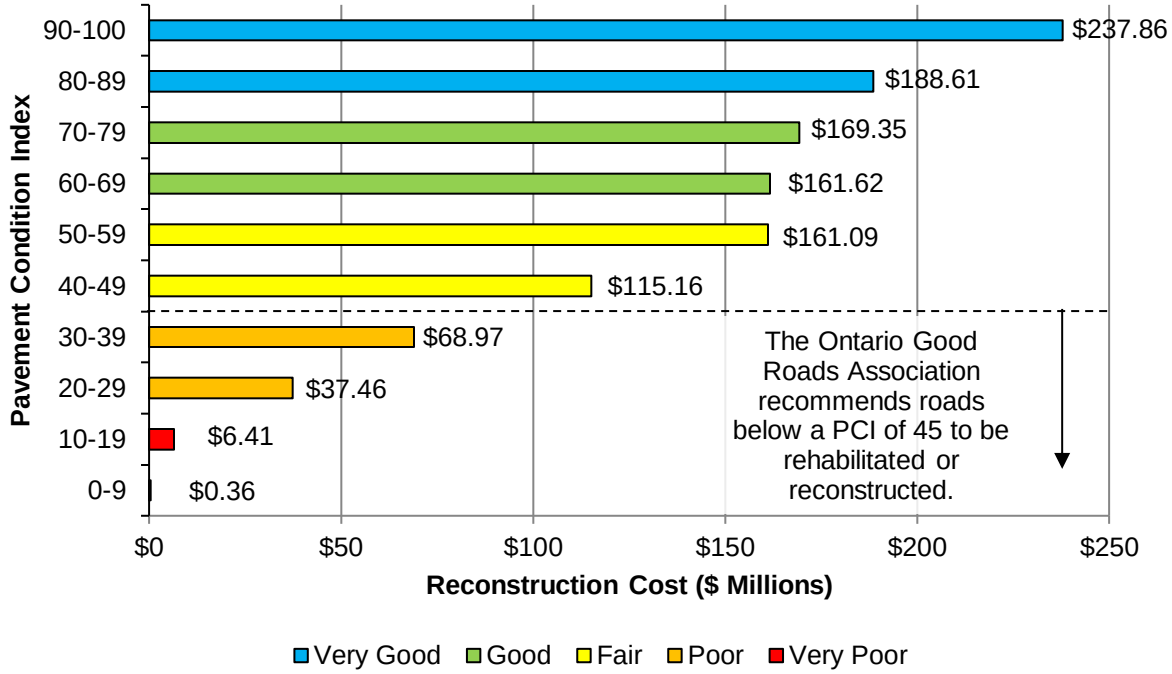
Figure 41. Thematic Map of Road Condition



2.4.13.3 The Balance between Cost and Levels of Service

At the time of setting the level of service targets, it is also important to consider the cost of meeting the target. For example, the Ontario Good Roads Association recommends roads below a PCI of 45 to be rehabilitated or reconstructed, depending on the traffic volumes.[21] **Figure 42** shows the current breakdown of pavement condition index by replacement value. As outlined with the dotted line and arrow in the figure, it would cost approximately $113.2 million to reconstruct all roads below the level of service specified by the OGRA. If all of the aforementioned road segments were to be resurfaced instead of reconstructed, it would amount to approximately $66.6 million. Either way, when compared to the average annual capital budget for roads from 2012 to 2016, which is $10.6 million per year, it would be challenging to meet that level of service. Ultimately, through the Corporate Asset Management Program, it is aimed that City staff, Council, and the community work together to find the best balance of levels of service, risk and cost. To do this, appropriate tools and techniques are being developed in order to quantify and simulate the scenarios.

Figure 42. Road PCI by Replacement Value



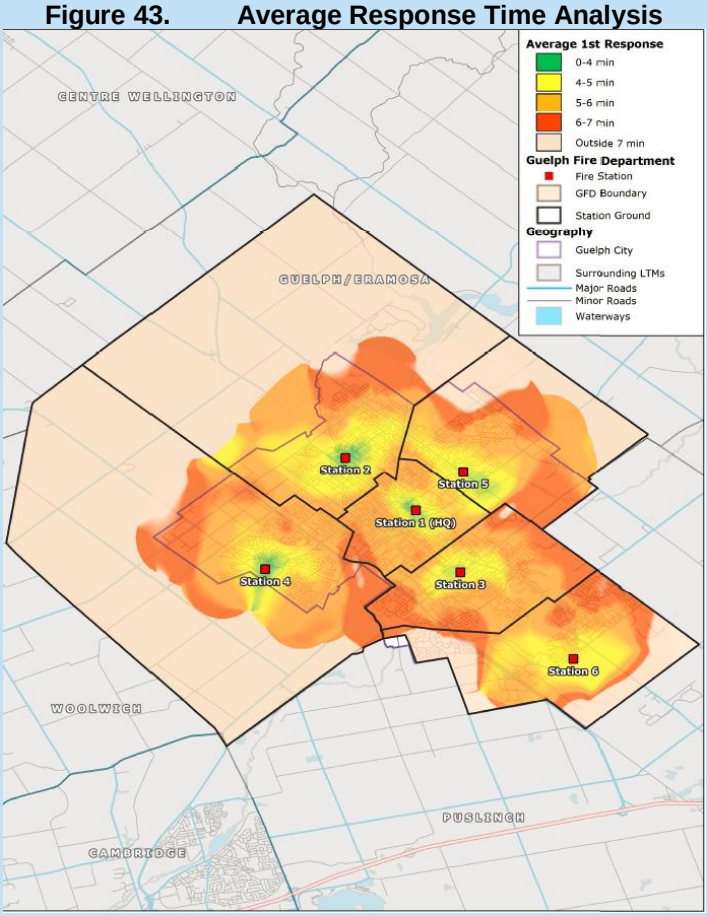
[21] *Ontario Good Roads Association (2009) Pavement Condition Index 101, OGRA's Milestones V9#4,pp 30-42. [Online: http://hawaiiasphalt.org/wp/wp-content/uploads/PCI-101.pdf]. Retrieved November 27, 2016.*

Case Study 3. Emergency Services Response Time Optimization

Operational Research in Health Limited has undertaken an analysis and modeling review for the Emergency Services Department in order to identify the optimal resource deployment for ambulance and fire resources in the future.

The department is made up of Guelph-Wellington Emergency Medical Service (EMS) which covers the City of Guelph and the County of Wellington, and the Guelph Fire Department which covers the City of Guelph and part of the Guelph Eramosa Township. The review involved data collection, data analysis, demand forecasting and simulation modeling combined with regular consultation with City, County, and Township representatives through a Steering Committee.

Figure 43. Average Response Time Analysis



The key findings of the analysis were:

- In 2015, the Fire department responded to an average of just under 20 incidents per day, 12 of which were Medical incidents. For EMS there were 47 incidents per day on average – 30 in the City and 17 outside the City in the County.
- For all Fire incidents the 90th percentile response time is 11.0 minutes when just one appliance is required, and 8.3 minutes when it is the first of two.
- EMS assigns each EMS-related incident a priority. Response performance is measured against relevant targets for each code. The targets are broadly being met, although performance for some were under target by around three per cent in 2015.
- From the start of 2016, on average 1,722 operational vehicle hours per week were deployed across nine stations and one rest stop. A nonsupervisory Emergency Response Unit (ERU) in the City was introduced in October 2015.
- For EMS, historical demand rates per 1000 population were calculated for each age group and then projected forward and combined with the population estimates. This gave a predicted increase in demand of 43.5 per cent between 2016 and 2026.

A range of scenarios were modeled against current and future demand to establish the optimal deployment strategy in 2026, and this was then subject to sensitivity modeling. For EMS, each Lower Tier Municipality was assigned a minimum target response performance (80 per cent within 8, 10 or 15 minutes) depending on the relative rurality of the area. Resources were added until these targets were met against 2026 demand. An additional 672 ambulance and 125.5 RRU hours per week are required. This is a 46 per cent increase from the 2016 base position.

Case Study 4. Solid Waste Key Performance Indicators

The Solid Waste Resources Annual report provides an overview of the operations and activities related to the management of waste at the City of Guelph. The report provides an operational summary related to the collection, processing and disposal of waste, providing year-over-year comparisons where applicable.
Solid Waste Resources plays a vital role in facilitating the processing, diversion and disposal of waste generated within the City of Guelph and delivers public services better by finding innovative ways to manage Guelph's organic, recyclable, household hazardous and other solid waste. The department provides integrated waste management services to residential and commercial customers. These services are provided in compliance with all provincial legislation and regulations and build on Guelph's leadership in waste management for a sustainable, service focused and economically viable future.

The 2015 SWR scorecard visually demonstrates how the business is performing against its strategy. The scorecard metrics followed from the understanding that the SWR strategy focused around three key themes:

1. Maintaining compliance with regulations;
2. Maximizing diversion of incoming waste away from landfill while minimizing operating costs; and
3. Reviewing, monitoring and promoting programs to reduce waste generation to both residential and commercial customers.

The metrics that are monitored in the scorecard are grouped into three key areas of performance:

- Regulatory compliance;
- Operational Excellence; and
- Customer Service and Community Engagement.

The scorecard, shown on in **Figure 44**, provides information on:

- 2015 Actuals;
- 2016 Targets;
- Explanatory notes, where applicable; and
- Status with Trend.

Figure 44. Example Solid Waste Report Card

	Indicator	Measure	2014 Actuals	2015 Target	2015 Actuals	2016 Target	Trend	Notes
Operational Excellence	Financial Viability	To be within 5% of the approved operating budget (- is favourable)	12.6%	+/- 5%	25.0%	+/- 5%	-	Reductions in prices for recyclable commodities resulted in not achieving sale of goods revenue targets.
		Increase volume of third party waste into Transfer Station (tonnes/month)	3,600	3,780	3,956	4,154	+	Increase by 5% over previous year
	Minimize operating costs of waste processing	Total SWR department costs funded by tax base per household per week	$4.30	$4.10	$4.89	$4.50	-	Based on 51,553 houses
		Cost per Tonne processed – Materials Recovery Facility	$114.13	$114.00	$142.72	$114.00	-	
		Cost per Tonne collected - Collections	$180.27	$175.00	$169.70	$175.00	=	
		Unplanned employee absenteeism at SWR (hours)	6,316 hours	3,375 hours	6701 hours	6701 hours	-	Based on 129 FTEs, the average sick days was approximately 7 per employee below the City average of 11.6
Community	Customer Service	Customer collection complaints per 1000 households	5	7	4	5	+	Includes waste not collected and driver complaints only.
		Wait time for residents at PDO	No Data	TBD	No Data	TBD		We will measure when new PDO is operational in 2016 to set metric for 2017.
	Maximize diversion of incoming waste away from landfill.	Annual residential diversion rate %	67%	68%	63%	63%	-	The 2015 figure has not yet been audited by Waste Diversion Ontario.
Regulatory Compliance	Maintain compliance with environmental and labour regulations	SWR Work Well Audit Score	84%	85%	85%	85%	+	Measures the effectiveness of our H&S program based on WSIB workwell program standards, which requires 75% to obtain a passing score.
		Number of verified odour complaints per year	0	0	10	0	=	During 2015, there were 31 odour investigations from 39 complainants received by staff at the Waste Resource Innovation Centre (WRIC). All complaints were investigated. Of the 39 complaints received, 10 were confirmed to have originated from the WRIC site.
		Charges from MOE or MOL	0	0	0	0	=	

3.1.3 Regulatory Requirements and Agreements

While not specifically levels of service, regulatory requirements often dictate levels of service provided, and therefore must be considered. Overall, the City aims to meet all regulatory requirements. Below is a summary of some of the key regulatory requirements and documented agreements for each of the asset categories. The 2017 level of service initiative will evaluate the specific level of service criteria and performance indicators related to meeting the levels of service.

Some regulations have influence over the entire asset portfolio, whereas others are more specific to a particular area. General regulatory requirements that are applicable to the entire portfolio are as follows:

- O. Reg 424/97 : Commercial motor Vehicle Operators Information (under the Highway Traffic Act, R.S.O. 1990)
- MOECC Reg 347: General – Waste management (hazardous material transport)
- Ontario Building Code
- National Fire Code
- Ontario Fire Code (Ontario Regulation 67/87)
- National Building Code
- Ministry of Labour – Occupational Health & Safety Act
- Accessibility for Ontarians with Disabilities Act (AODA)
- Municipal Act, 2001, S.O. 2001, c. 25
- Environmental Assessment Act, R.S.O. 1990, c. E.18
- Environmental Protection Act, R.S.O. 1990, c. E.19

Some of the key regulatory requirements that heavily influence a particular asset system are summarized in **Table 15** below. The table also includes documented agreements and strategies that dictate levels of service. In 2017, as part of the level of service framework development, the City will document the specific level of service criteria, and related customer level of service statements.

Table 15. Applicable Regulations and Documented Service Agreements

Asset System	Regulatory Requirements	Documented Agreements / Requirements
Administrative Facilities	▪ Environmental Protection Act, R.S.O. 1990, c. E.19	▪ Zoning Bylaws ▪ Buildings Bylaw ▪ FADM/Accessibility Requirements
Contaminated Sites	▪ O. Reg. 153/04: RECORDS OF SITE CONDITION - PART XV.1 OF THE ACT under Environmental Protection Act, R.S.O. 1990, c. E.19 ▪ Clean Water Act, 2006, S.O. 2006, c. 22 ▪ Brownfields Statute Law Amendment Act (2001) and O. Reg. 153/04	▪ Guidelines for the Development of Contaminated and Potentially Contaminated sites in the City of Guelph ▪ City of Guelph: Brownfields Redevelopment Community Improvement Plan
Corporate Vehicles and Equipment	▪ Public Vehicles Act, R.S.O. 1990, c. P.54 ▪ O. Reg. 199/07: COMMERCIAL MOTOR VEHICLE INSPECTIONS under Highway Traffic Act, R.S.O. 1990, c. H.8 ▪ R.R.O. 1990, Reg. 629: ACCESSIBLE VEHICLES under Highway Traffic Act, R.S.O. 1990, c. H.8	▪ Winter Control Standards Bylaw
Culture and Recreation	▪ Physical Activity and Sport Act, S.C. 2003, c. 2	▪ Tree Bylaw
Emergency Services	▪ Emergency Management and Civil Protection Act, R.S.O. 1990, c. E.9 ▪ Ambulance Act, R.S.O. 1990, c. A.19 ▪ Fire Protection and Prevention Act, 1997, S.O. 1997, c. 4 ▪ Police Services Act, R.S.O. 1990, c. P.15	▪ Commission on Fire Accreditation International ▪ Response Time Bylaws ▪ Center for Paramedic Education and Research

Asset System	Regulatory Requirements	Documented Agreements / Requirements
Information Technology	▪ Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. F.31	▪ Single Domain Name Policy ▪ Corporate Guiding IT Policy ▪ Responsible Computing ▪ Mobile Usage Policy
Parking	▪ O. Reg. 413/12: INTEGRATED ACCESSIBILITY STANDARDS filed December 14, 2012 under Accessibility for Ontarians with Disabilities Act, 2005, S.O. 2005, c. 11	▪ Accessible Parking Bylaw ▪ parking
Solid Waste	▪ Ontario Regulation 542 Waste Diversion Act, 2002	▪ Solid waste bylaw ▪ Solid Waste Management Master Plan
Stormwater	▪ Ontario Water Resources Act, R.S.O. 1990, c. O.40	▪ Stormwater Disposal Bylaw ▪ Stormwater Management Master Plan ▪ GRCA
Transit	▪ Public Vehicles Act, RSO 1990, c. P.54 - Ontario	▪ Transit Master Plan
Transportation	▪ O. Reg. 104/97: STANDARDS FOR BRIDGES under Public Transportation and Highway Improvement Act, R.S.O. 1990, c. P.50 ▪ Municipal Act, 2001, Ontario Regulation 239/02 Minimum Maintenance Standards for Municipal Highways ▪ Highway Traffic Act, R.S.O. 1990, c. H.8	▪ OSIM Inspections ▪ Transportation Master Plan
Wastewater	▪ Ontario Water Resources Act, R.S.O. 1990, c. O.40 ▪ Public Lands Act, R.S.O. 1990, c. P.43	▪ Wastewater Master Plan ▪ Rates bylaw ▪ Sewer Use bylaw
Water	▪ Conservation Authorities Act, R.S.O. 1990, c. C.27 ▪ Lakes and Rivers Improvement Act, R.S.O. 1990, c. L.3 ▪ Water Opportunities and Water Conservation Act, 2010 ▪ Clean Water Act, 2006, S.O. 2006, c. 22 ▪ Nutrient Management Act, 2002, S.O. 2002, c. 4 ▪ Sustainable Water and Sewage Systems Act, 2002, S.O. 2002, c. 29 ▪ Safe Drinking Water Act, 2002, S.O. 2002, c. 32 ▪ Municipal Water and Sewage Transfer Act, 1997, S.O. 1997, c. 6, Sched. A ▪ Canadian Environmental Protection Act (CEPA) ▪ Canadian Water Quality Guidelines ▪ Provincial Water Quality Objectives ▪ Ontario Water Resources Act	▪ Water Bylaw ▪ Water Supply Master Plan ▪ National Water and Wastewater Benchmarking Initiative
Digital and Non-Digital Records	▪ Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. F.31	▪ Records and Information Management Strategy

3.2 External Trends and Issues

There are many factors that may impact the level of service provided, and the cost of providing that service level. These will also be developed as part of the 2017 level of service initiative. Some key parameters that are foreseen to impact levels of service in the future are as follows:

- **Climate Change:** Higher intensity weather patterns.
- **Market Fluctuations:** Particularly in service areas that are dependent on assets from international currency and local material and equipment cost escalation.
- **Changing regulations:** Such as AODA standards and MOECC requirements.

The impacts of these external trends on the levels of service provided will be evaluated as part of the future level of service framework project.

3.3 Corporate Levels of Service Framework

In 2017, the City of Guelph undertook a Levels of Service (LOS) Framework Development project, the first phase of which will be completed by year end of 2018. This project considered all assets owned, operated and maintained by the City. The objective was to develop a comprehensive level of service framework that addresses all services provided by the City reliant on infrastructure assets to be delivered.

The findings of this work reflect Phase 1 of the Levels of Service project. During this phase, internal stakeholders were consulted to identify and document current performance, and the practices and procedures in place to maintain the current level of service. Phase 2 is proposed for 2019 onwards, which will look at establishing targets and engaging a broad group of stakeholders, both internal and external, in the conversation around levels of service within the City of Guelph. This work will be, much like the Levels of Service Frameworks, a living process that will undergo reviews and regular updates to ensure that these vital documents remain current and applicable, and reflect the changing needs of the City.

Phase 1 of the Levels of Service project represents a cornerstone of Corporate Asset Management at the City. It consisted of the following tasks:

1. Service Inventory Review/Update: A background review of the asset data and operating and capital budgets to identify the services provided by the City. A preliminary list identified 44 categories, with 16 considered asset-intensive and included in the scope of work for this project. The services included are as follows:
    I. Culture, Tourism and Community Investment
    II. Facilities Management
    III. Fire Rescue
    IV. Fleet
    V. Information Technology (IT)
    VI. Paramedic Services
    VII. Parking
    VIII. Parks, Forestry and Open Spaces
    IX. Police
    X. Recreation
    XI. Roads and Right-of-Way
    XII. Solid Waste
    XIII. Stormwater
    XIV. Transit

XV. Wastewater

XVI. Water

2. International Best Practice Review of LOS Frameworks: LOS frameworks from different municipalities around the globe were reviewed to provide perspective on LOS approaches that have already been established and ensure that the City of Guelph's LOS Frameworks will align with international practices.
3. Development of Public Engagement Strategy: A public engagement strategy was developed to consult the public on their infrastructure priorities and values so they can be used as part of the process to develop capital and operational expenditure plans.
4. Service Level Agreements: Service level agreements define the services that will be provided to the customer and establish the relationship between the service provider and customer.
5. Key Service Attributes: The LOS frameworks include key service attributes, which are phrases that describe the service that will be provided.
6. Level of Service Statements: The LOS frameworks include LOS statements, which are short sentences that describe the outputs of the service that align with the key service attributes. Some key service attributes may have more than one LOS statement.
7. Performance Measures: Customer and technical performance measures were developed and are SMART (specific, measurable, achievable, relevant, and time-bound).
8. Risk Assessment: Risk assessments for all services identified in the service inventory review were completed.
9. 10 Year Roadmap: A 10-year implementation plan was developed with recommendations on how to update and improve existing levels of service information.

The City of Guelph is planning to undertake a second phase of the Level of Service project. During this phase, the City will develop targets for each of the aforementioned Service Categories for identified metrics found in the Levels of Service Frameworks. This will be achieved by engaging both internal and external stakeholders in a dialogue around the desired level of service, considering both the cost of the level of service and the desired output.

3.4 Current Performance Relative to Targets

In each of the 16 categories the performance of the asset portfolio was analysed to identify its current performance. This information was projected out over 25 years to allow the City to review the network performance over time. Five categories had current condition data that was used to measure the performance of the assets. These categories include:

- Parks, Forestry, and Open Spaces
- Roads and ROWs: bridges, overpasses, roads, road signs, sidewalks
- Stormwater linear assets
- Wastewater linear assets
- Water linear assets

The remaining categories were analyzed based on age. All performance data was converted to a consistent scale for performance scoring analysis, and integrated into the performance scoring analysis, that can be seen in **Table 16** below.

Table 16. Performance Score Rating Table and Definition

Condition Category	Description
Excellent	**Fit for the Future -** The assets in the system are generally in very good condition, typically new or recently rehabilitated.
Good	**Adequate for Now** - Some elements of assets exhibit general signs of deterioration that require attention. A few elements exhibit deficiencies.
Fair	**Requires Attention -** The assets in the system exhibit general signs of deterioration and require attention with some elements exhibiting significant deficiencies.
Poor	**At Risk** - The assets in the system are in poor condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration.
Very Poor	**Unfit for Sustained Service -** The assets in the system are below standard condition with widespread signs of advanced deterioration. Many components in the system exhibit signs of imminent failure, which may be affecting service or increasing risks.

The outputs of this analysis was then correlated to the Programs of Work proposed through the Capital Budget process. It aligned the 16 categories into the following high-level categories:

- Corporate Projects;
- Emergency Services;
- Open Spaces, Recreation, Culture and Library;
- Solid Waste Services;
- Stormwater Management;
- Transportation Systems;
- Wastewater Services; and,
- Water Services.

The following sections provide the current performance identified through the Levels of Service project, and provide some insight into the potential risks and opportunities the City will be faced with over the upcoming 25 years. They are based on the proposed 2019 capital budget.

3.4.1 Corporate Projects

The Corporate Project program of work includes Corporate Facilities, Corporate Fleet and Information Technology assets. These assets have a range of life expectancy and service needs, and support a broad range of services.

Figure 45. Current performance of Corporate Project Program

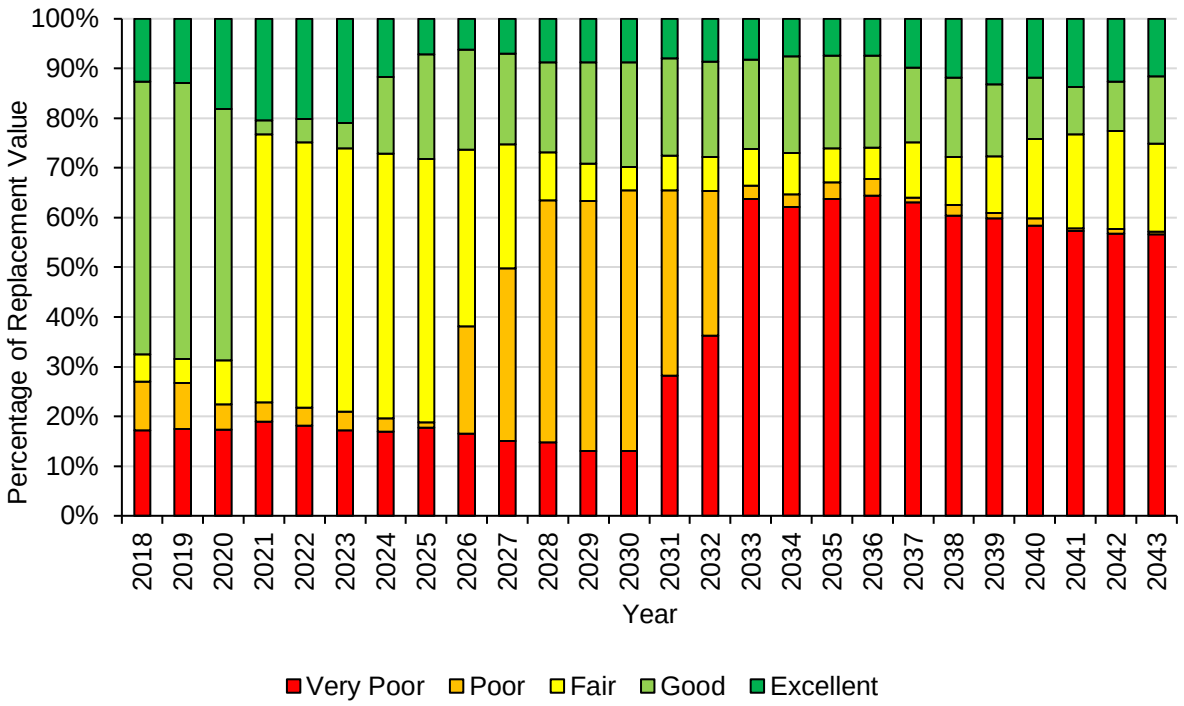


Figure 45 indicates that between 2020 and 2031 approximately 40 per cent of the assets move from good to fair or poor ratings. In 2031, these assets begin transitioning into the very poor rating category, meaning that they will be nearing the end of their life and are likely to show signs of reduced performance. Starting in 2038, the assets are forecasted to improve slightly with 5 per cent moving from the very poor rating category to excellent. This is the result of some of the assets at the end of their life being replaced with new assets.

By the end of 25 years, the current forecasts suggest that the performance of approximately 50 per cent of assets will decrease as they near the end of their lives. As a result, the reliability and performance of assets will decrease in areas such as City Hall office spaces, information technology systems including both public and internal networks, as well the ability to manage the overall operations of the organization.

To manage this risk, identifying critical assets and targeting them to ensure reduction in the likelihood of failure is planned. In addition, the City has plans to improve the knowledge of risks and reliability through detailed condition assessments and maintenance planning.

3.4.2 Emergency Services

The Emergency Services program includes Fire Rescue, Paramedic Services, and Police Services. Within this program all facilities, fleet and equipment assets are included. **Figure 46** shows the forecasted levels of service in the emergency service assets based on current funding levels. They are forecasted to be sustainable over the next 25 years, with some increased investment required in 2041 to 2043.

Figure 46. Current performance of the Emergency Services Program

From 2029 to 2040, it is projected that approximately 50 per cent of the assets will move to the fair and poor performance categories.

Fire and Paramedic services make up the majority of the assets in the very poor category between the years of 2019 and 2040, this is mainly driven by aging facilities that require replacement over that timeframe.

Performance should be relatively consistent over this time, however there may be decreases in asset performance, primarily within the facilities where the majority of poor condition assets can be found. Risks associated with this reduction in performance include unexpected asset failures which can delay response times and result in unplanned expenditures.

To manage this risk, identifying critical assets and targeting them to ensure reduction in the likelihood of failure is planned. In addition, the City has plans to improve the knowledge of risks and reliability through detailed condition assessments and maintenance planning.

3.4.3 Open Spaces, Recreation, Culture and Library

The Open Spaces, Recreation, Culture and Library program includes a wide range of assets, such as parks play equipment, splash pads, trails and facilities. All of these assets typically experience long service lives, and are also relatively costly to replace.

Figure 47. Current Performance of the Open Spaces, Recreation, Culture and Library Program

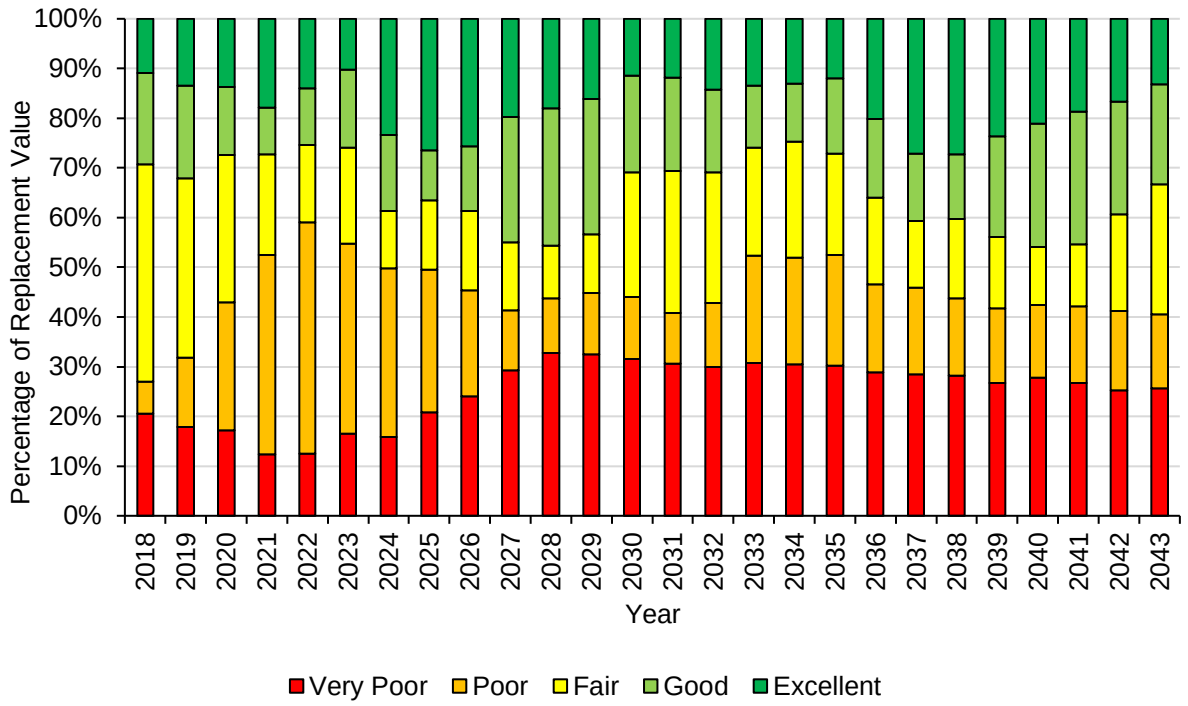


Figure 47 shows that overall performance of the program assets will deteriorate from 2021 to 2028, with around 15 per cent of assets moving into the very poor rating category, meaning that they are nearing the end of their useful lives.

In the years 2028 to 2040, between 30 per cent and 25 per cent of assets are near the end of life and would require major renewal or replacement.

By the end of 25 years, the current forecasts suggest that the performance of approximately 15 per cent of assets will decrease as they near the end of their lives. As a result, the reliability and performance of assets will decrease. This is seen in particular in the recreation and cultural facilities, and as a consequence, the likelihood of unplanned facility closures or service disruptions increases.

During the declining performance, the risks faced by this program of work is primarily service interruptions, whether in the closure of facilities or parks, or portions of the facilities or parks. To manage this risk, identifying critical assets and targeting them to ensure reduction in the likelihood of failure is planned. In addition, the City has plans to improve the knowledge of risks and reliability through detailed condition assessments and maintenance planning.

3.4.4 Solid Waste

The Solid Waste program consists of the facilities, fleet and equipment that support the solid waste service.

Figure 48. Current performance of the Solid Waste Program

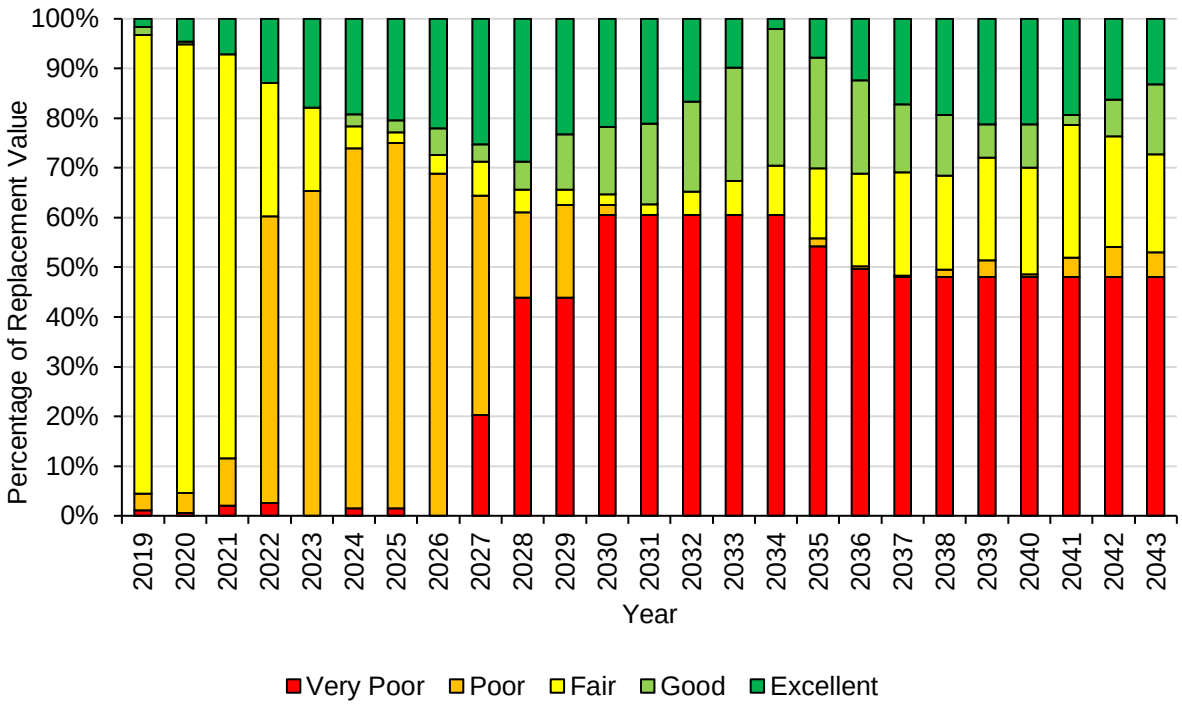


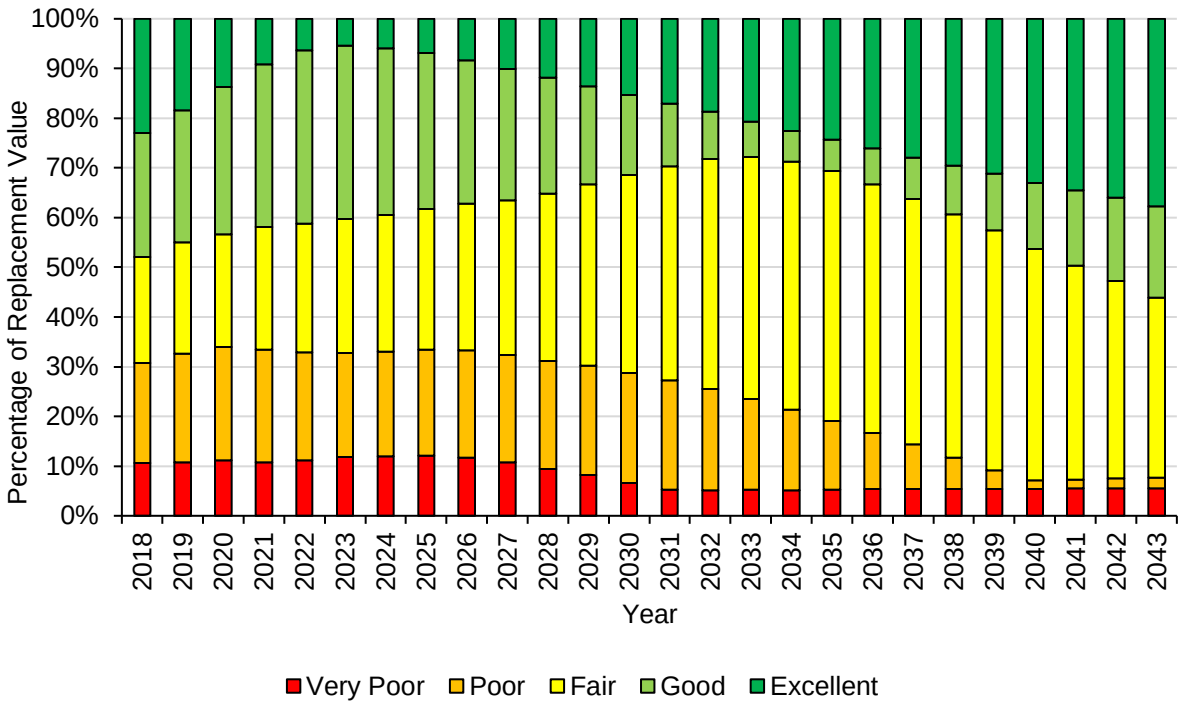
Figure 48 above indicates that, from 2019 to 2026, the assets stay in a stable state with some improvement towards 2028. Beginning in 2028 the overall forecasted performance declines as major facilities reach their expected end of life and require significant upgrades and/or replacement. Between 2027 and 2043 approximately 50 per cent of assets are projected to move into the very poor or poor rating categories.

This would potentially lead to downtime at the processing facility which could result in delays for both City collection vehicles and public drop off. It may also lead to decreased diversion and increased costs of disposal. A condition assessment, including a risk assessment and development of a detailed maintenance plan, is currently underway. This will provide vital information to update this assessment with, and is anticipated to greatly clarify the needs of this Program. Capital repair and replacement mitigates risks related to unbudgeted disposal costs from equipment and process failure, and non-compliance with provincial requirements for site operations.

3.4.5 Stormwater

The stormwater program includes the ponds, sewers, culverts and outfalls that support the stormwater service. **Figure 49** suggests that the stormwater network is generally in fair to good condition, and should experience performance levels reflecting that. To manage this risk, identifying critical assets and targeting them to ensure reduction in the likelihood of failure is planned. In addition, the City has plans to improve the knowledge of risks and reliability through detailed condition assessments and maintenance planning.

Figure 49. Current performance of the Stormwater Program



Between 2018 and 2032, approximately 20 per cent of the assets move from good to the fair or poor rating categories. Between 2025 to 2031, 5 per cent of assets in the very poor category are renewed resulting in an overall improvement in performance. This is the result of funding levels reaching sustainability. From 2033 onwards, increased investment results in assets in the fair and poor rating categories being renewed, and represents the reduction of the investment backlog due to increased investment.

By the end of 25 years, the current forecasts suggest that the performance of approximately 15 per cent of assets will decrease as they near the end of their lives. The reliability and performance of approximately 20 per cent of assets will increase in areas such as storm sewer replacement and stormwater management ponds. This will reduce the likelihood of stormwater surface flooding during storms and emergency repairs on storm sewers and culverts.

3.4.6 Transportation

The Transportation program includes the roads, sidewalks, traffic and parking assets across the City. This is one of the largest programs of work, and assets within the program generally have long service lives and high costs of replacement. For this report, Transit, which is typically included within this program, has been separated out. It can be found below, in **section 3.4.7**.

Figure 50. Current performance of the Transportation Program

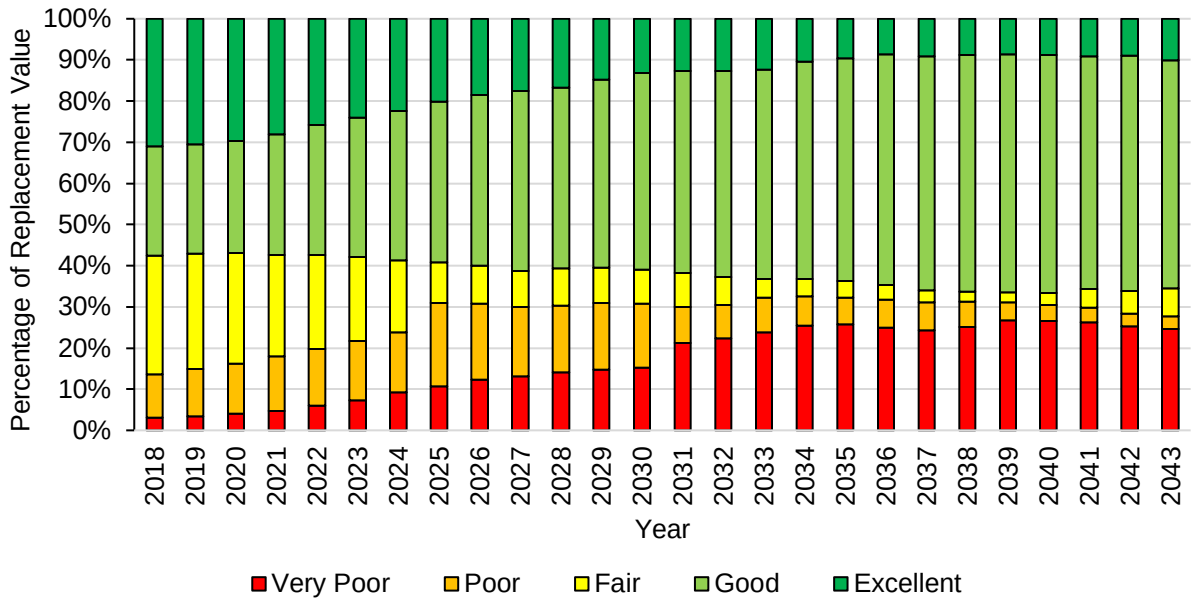


Figure 50 shows that, while a over 50% of the Transportation Program remains in good to very good condition over the 25 years of the analysis, an increasingly larger portion of the enters very poor. Between 2018 and 2034, approximately 20 per cent of the assets move from fair and poor rating categories to the very poor rating category. This means that the assets are nearing the end of their lives. During this period, the assets in the good category also increase, which is due to increased planned early rehabilitation programs such as road resurfacing. From 2039 onwards, the assets in the very poor category remain consistent due to the funding reaching sustainable levels.

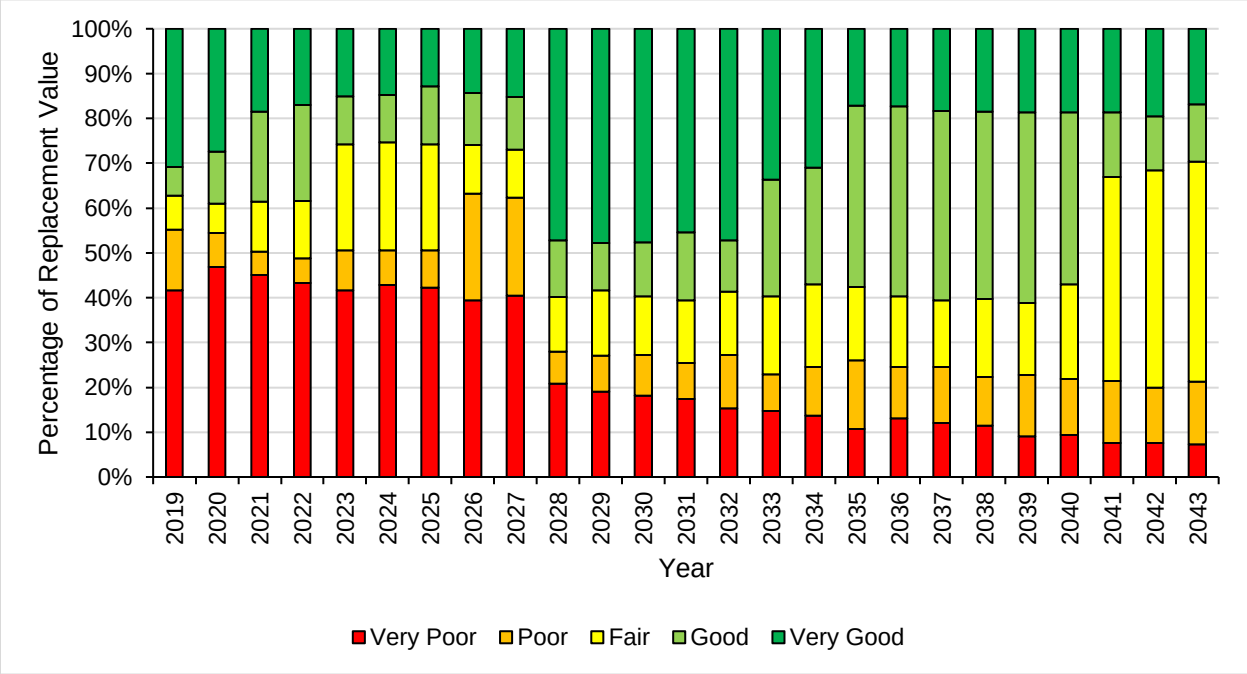
By the end of 25 years, the current forecasts suggest that the performance of approximately 20 per cent of assets will decrease as they near the end of their lives. On the other hand, due to planned increases in early rehabilitation in roads, the quantity of assets in the good and very good category is forecasted to increase from 55 per cent to 63 per cent. Overall, this means that there will be less assets in the fair rating category.

The risks associated with assets in the very poor condition category are primarily deteriorated roads, sidewalks and parking structures and unexpected failures of traffic infrastructure. This would potentially result in unexpected road or parking facility closures and an overall reduction of user experience (for example, increased pot holes and rough road surfaces). To manage risks associated with this portfolio, the City is identifying critical assets, developing preventative maintenance and rehabilitation strategies, and improved understanding of the condition of these assets.

3.4.7 Transit

The Transit Service is comprised of facility and fleet assets. This includes bus stops, terminals, buses, hoists, administrative facilities, and a number of assets that support the service, and ensure continued operations. demonstrates the average performance of the entire Transit asset network.

Figure 51. Current Performance of Transit Service assets



As indicated by **Figure 51** above, the average performance of the network is expected to remain fairly stable in its expected performance level until 2027. The assets found in the very poor category are primarily aging equipment and the facilities reaching the end of their life cycle. Meanwhile, the fleet is in primarily good condition.

In 2028, a significant renovation is planned for the administrative facility and garages. At that time 47% of the network will be in good to very good condition, with the remainder dispersed across the other categories. This suggests that the funding is generally sustainable for the needs of the inventory at this time.

Potential risks associated with this decline include unanticipated delays in the service and deteriorated assets. In particular, the aging administrative and garage facility which houses all the fleet assets, may experience failures to critical assets such as high-speed overhead garage doors. As the facility ages, unexpected equipment failures may occur (for example, bus washing being reduced due to failures of the system, and repairs and maintenance activities being limited due to hoist failures). The likelihood of these events will be reduced 2028 onwards, due to investment strategies that result in a consistent reduction of the percentage of assets in the very poor category.

To manage the risks associated with this portfolio, the City plans to conduct condition assessments and develop risk management strategies and detailed maintenance plans to target critical assets.

3.4.8 Wastewater

The Wastewater program includes treatment facilities, pumping stations and sewers.

Figure 52. Current performance of the Wastewater Program

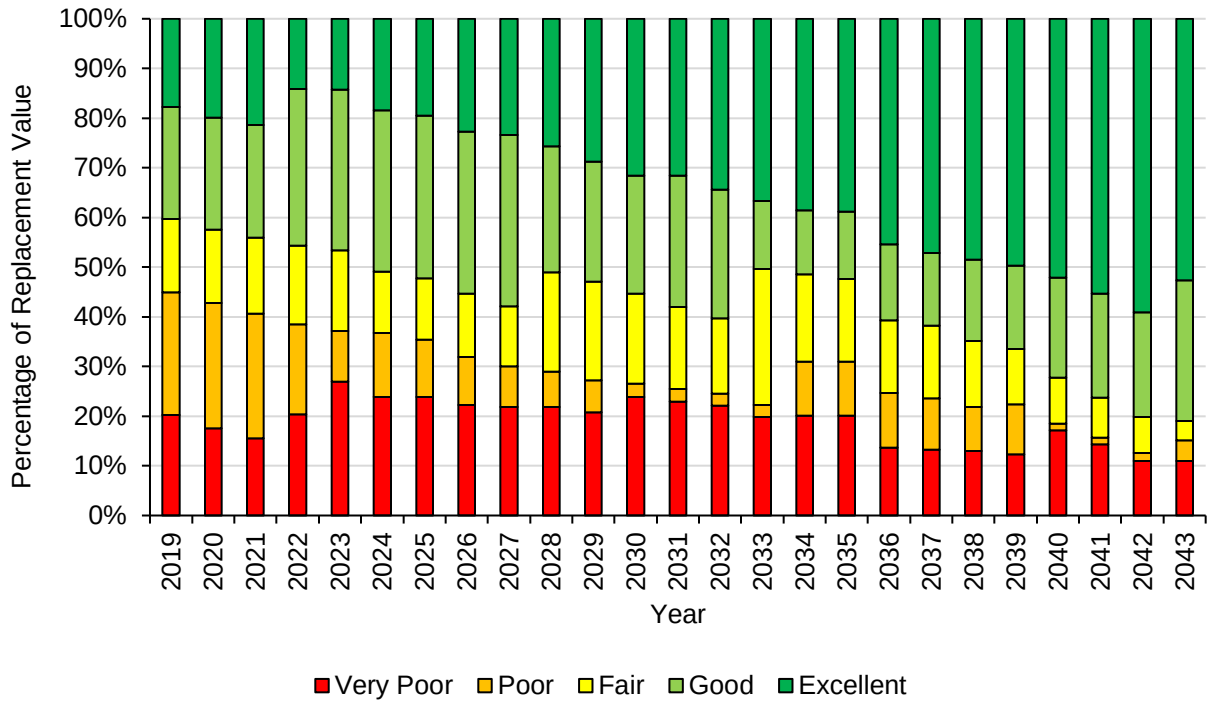


Figure 52 Figure 52 indicates that the network is in generally improving performance, with assets consistently moving from the poor and very poor conditions into the very good and good over the next 25 years. This reflects the replacement of assets at the end of their anticipated life cycles, and reflects a network that is overall in good and sustainable condition.

Investments in the wastewater collection network are planned to increase between 2019 and 2024 in order to mitigate the risk of service disruptions. Meanwhile, significant investment will be required in wastewater facilities between 2022 and 2035. An in-progress condition assessment will provide a prioritized investment strategy. This investment will improve overall system reliability by reducing unexpected breakdowns in addition to being well positioned to meet the anticipated tighter effluent discharge compliance limits

Risks faced by this asset portfolio include collection system reliability reductions and treatment facility asset reliability reductions. To manage the risks associated with this portfolio, the City is in the process of conducting condition assessments and the development of risk management strategies and detailed maintenance plans to target critical assets.

3.4.9 Water

The Water Program includes the treatment facilities, pumping stations and water mains associated with the water service.

Figure 53. Current performance of the Water Program

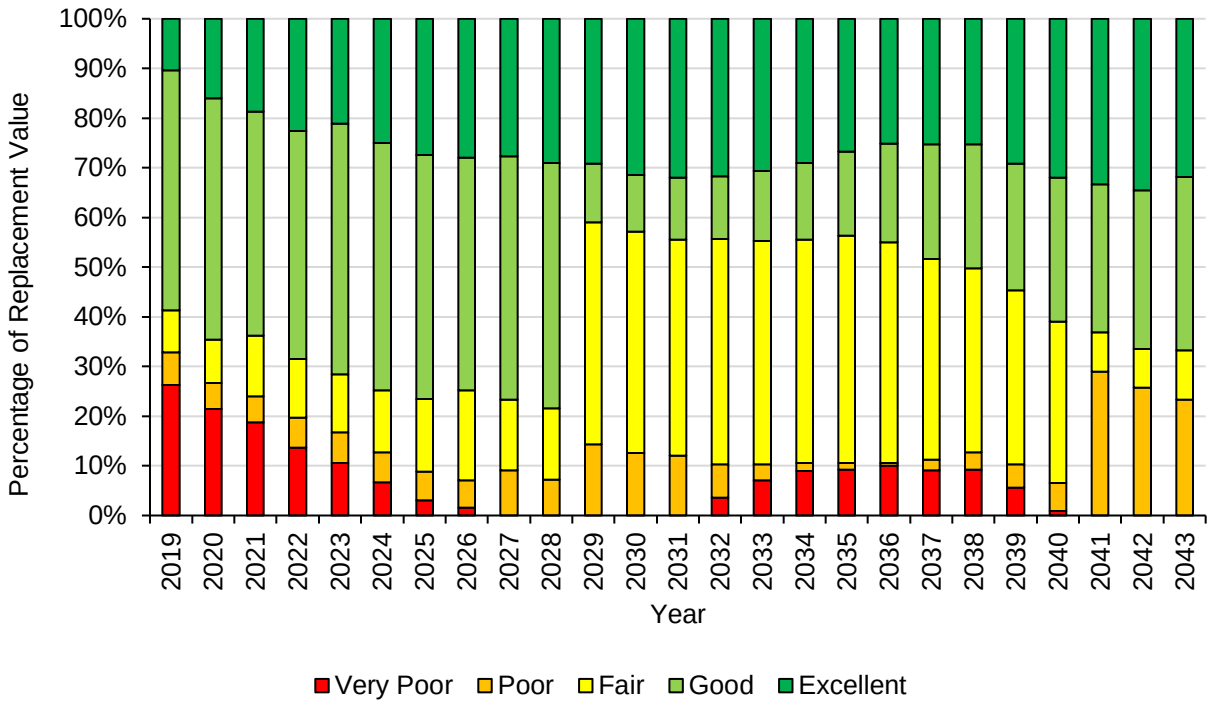


Figure 53 indicates that the network is in good condition, with assets appearing to be in poor and very poor during 2019-2025 and 2032-2040 due to reaching the end of their estimated service life and then being renewed. While there is a growing rate of assets in fair condition, these are expected to still provide reliable service. Significant investment will be required in water facilities between 2032 and 2040, and current funding levels are sufficient.

Risks faced by this asset portfolio are primarily service disruptions to the water service due to watermain breaks and the transportation service as repairs are carried out, on the vertical assets reduced reliability may result in service disruptions and emergency repairs. To manage the risks associated with this portfolio, the City is in the process of conducting condition assessments and the development of risk management strategies and detailed maintenance plans to target critical assets.

4 Lifecycle Management Strategy

Many City departments and community stakeholders are involved in various aspects of each asset's lifecycle. Often those responsible for delivering the service will identify the need for new assets. After a need has been identified, the asset will be acquired or constructed. The asset then is operated and maintained on an ongoing basis, until heavier renewal would be required. As the asset nears the end of its life, a plan is established to replace, decommission or upgrade the asset to meet the future needs. These activities collectively represent the asset's lifecycle. In asset management, the focus is on using a full lifecycle approach when planning. An asset lifecycle management strategy is the set of planned actions throughout the asset's full lifecycle that will enable the assets to provide desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost. As specified in the Building Together Guide, the lifecycle management strategies can be broadly grouped into the following key categories:[22]

- **Non-infrastructure solutions**: Actions or policies that can lower costs or extend asset life (e.g., better integrated infrastructure planning and land use planning, demand management, insurance, process optimization, managed failures).
- **Maintenance activities**: Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events.
- **Renewal/rehabilitation activities**: Significant repairs designed to extend the life of the asset. For example, the lining of iron watermains can defer the need for replacement.
- **Replacement activities**: Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehabilitation is no longer an option.
- **Disposal activities** – the activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality.
- **Expansion activities** – planned activities required to extend services to previously un-serviced areas – or to expand services to meet growth demands.

4.1 Summary of Planned Actions

Asset lifecycle activities are the planned actions carried out through each stage of the asset's life, from planning to disposal. Within this section, the planned actions for each asset type are provided. In addition, opportunities for improvement have been identified to assist in continuous improvement programs. The

[22] *Extracted from the Ministry of Infrastructure (2012) Building Together Guide for Municipal Asset Management Plans*.

following planned initiatives apply to all asset types, and therefore have not been included in each section:

- Development of levels of service (planned for 2017);
- Evaluation of asset risks and priority (planned for 2017-2018); and
- Clarification and documentation of asset responsibilities.

The planned actions and opportunities for administrative facilities are provided in **Table 17**.

Table 17. Current and Planned Actions – Administrative Facilities

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Structural Condition Assessments ▪ Building Condition Assessments ▪ Space Needs Studies	▪ Update Building Condition Assessments
Maintenance activities	▪ Detailed preventative and corrective maintenance programs ▪ Level of service agreements developed for some areas	▪ Review preventative and corrective maintenance programs and funding requirements. ▪ Update level of service agreements with key service areas.
Renewal/rehabilitation activities	▪ Driven by condition assessments and annual meetings with service area groups.	▪ Establish formal risk and level of service-based prioritization process for project selection to supplement condition assessments.
Replacement activities	▪ Driven by condition assessments and annual meetings with service area teams.	▪ Establish formal risk and level of service-based prioritization process for project selection to supplement condition assessments.
Disposal activities	▪ Disposal of demolished assets as part of replacement of the structure. ▪ No special requirements or salvage value.	▪ Investigate potential material re-use.
Expansion activities	▪ Based upon identified need or space needs study	▪ Conduct a space needs study.

Table 18 provides an overview of the current and proposed planned actions for contaminated sites.

Table 18. Current and Planned Actions – Contaminated Sites

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Site investigations and monitoring.	▪ Remediation/risk assessment ▪ Risk management measures; monitoring and inspections;
Maintenance activities	▪ Site monitoring and inspections on a case by case basis	

Planned Action	Current Activity Notes	Opportunity
Renewal/rehabilitation activities	▪ Site monitoring and inspections on a case by case basis	repairs of monitoring wells, site security etc. ▪ Repair and replacement (monitoring wells, site security etc.) ▪ Potential redevelopment of the sites
Replacement activities	▪ Site monitoring and inspections on a case by case basis	
Disposal activities	▪ Site monitoring and inspections on a case by case basis	
Expansion activities	▪ Site monitoring and inspections on a case by case basis ▪ Review of findings of the Development Charges study.	

Table 19 provides an overview of the current activities, and identified opportunities for corporate vehicles and equipment.

Table 19. Current and Planned Actions – Corporate Vehicles and Equipment

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Vehicle lifecycle analysis conducted on a regular basis. ▪ Maintenance resourcing analysis conducted internally	▪ Vehicle condition assessment/condition reporting framework ▪ Establish level of service agreements
Maintenance activities	▪ Preventative maintenance is conducted as per manufacturer or regulatory requirements. ▪ Corrective maintenance is conducted as identified. ▪ Data is currently managed in Oracle Work and Asset Management.	▪ Update and track purchase and maintenance details in WAM documents
Renewal/rehabilitation activities	▪ Rehabilitation is conducted as per manufacturer or regulatory requirements, or user identified needs.	▪ None identified at this time.
Replacement activities	▪ Replacement is conducted as per predefined lifecycles as determined by the fleet lifecycle analyst.	▪ Update and track purchase and maintenance details in WAM documents
Disposal activities	▪ Vehicles and equipment are auctioned where possible.	▪ None identified at this time.
Expansion activities	▪ Additional vehicles and equipment are identified through stakeholder requests. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ None identified at this time.

Table 20 provides an overview of the current activities, and identified opportunities.

Table 20. Current and Planned Actions – Culture and Recreation

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Parks Master Plan ▪ Recreation Master Plan ▪ Trails Master Plan ▪ Structural Condition Assessments ▪ Building Condition Assessments	▪ Update master plans as required ▪ Update inventory and condition assessments
Maintenance activities	▪ Seasonal, corrective and preventative maintenance carried out as per regulatory requirements and identified needs.	▪ Conduct maintenance activity, costing and resourcing review to determine future requirements.
Renewal/rehabilitation activities	▪ Assets are renewed or replaced as required, based on lifecycle, condition assessments or regulatory requirements.	▪ Develop renewal and rehabilitation plans based upon condition assessments and lifecycle analysis
Replacement activities	▪ Assets are replaced as required, based on lifecycle, or regulatory requirements.	▪ Develop 10-year lifecycle renewal plan based on asset condition assessments
Disposal activities	▪ Disposal completed as part of construction.	▪ Evaluate material re-use or sale.
Expansion activities	▪ Expansion activities developed based on needs, or master plan recommendations ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ Establish level of service criteria for key programs and assets.

The current and planned actions for the emergency services asset system (including related facilities, vehicles and equipment) is shown in **Table 21**.

Table 21. Current and Planned Actions – Emergency Services

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Structural Condition Assessments ▪ Building Condition Assessments ▪ Space Needs Studies ▪ Service Performance Reviews	▪ Update Building Condition Assessments and Structural Assessments
Maintenance activities	▪ Maintenance programs of vehicles and equipment as per manufacturer recommendations. ▪ Preventative maintenance programs established for facilities.	▪ Update asset inventory as needed

Planned Action	Current Activity Notes	Opportunity
Renewal/rehabilitation activities	▪ Based on lifecycle analysis and need for vehicles and equipment. ▪ Based on facility condition assessments for facilities.	▪ Update asset inventory as needed ▪ Develop renewal and rehabilitation plans for inventory
Replacement activities	▪ Based on lifecycle analysis and need for vehicles and equipment. ▪ Based on facility condition assessments for facilities.	▪ Develop replacement plans for inventory ▪ Establish formal risk management plan in event of facility failure
Disposal activities	▪ Auction of Vehicles when possible	▪ None identified at this time.
Expansion activities	▪ Expansion as need arises, and service area studies on response time. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ None identified at this time.

The current and planned actions for the information technology asset system are shown in **Table 22**.

Table 22. Current and Planned Actions – Information Technology

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ IT Strategic Plan	▪ Update IT Strategic Plan
Maintenance activities	▪ As required	▪ None identified at this time.
Renewal/rehabilitation activities	▪ Due to the short lifespan, many assets are run-to-failure. Therefore, are replaced either based on lifecycle, obsolescence, or user request.	▪ None identified at this time.
Replacement activities	▪ Due to the short lifespan, many assets are run-to-failure. Therefore, are replaced either based on lifecycle, obsolescence, or user request.	▪ None identified at this time.
Disposal activities	▪ Some assets and devices are auctioned.	▪ Evaluate and document disposal procedures
Expansion activities	▪ As required or as per the IT strategic plan ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ Update the IT strategic plan

Table 23 provides an overview of the current activities, and identified opportunities for the parking asset system.

Table 23. Current and Planned Actions – Parking

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Parking master plan ▪ Parkade condition assessments.	▪ Parking lot condition assessments
Maintenance activities	▪ Maintenance is conducted as identified by staff and based on recommendations from the parkade condition assessments.	▪ None identified at this time.
Renewal/rehabilitation activities	▪ Rehabilitation is often identified through the parkade condition assessments. ▪ Parking lots are resurfaced on a five-year cycle.	▪ Develop 10-year capital plan based on condition assessments
Replacement activities	▪ Parkades are demolished and replaced approximately every 50 years based on condition. ▪ On the occurrence that a parking lot's base is failing, a full reconstruction may be scheduled.	
Disposal activities	▪ Disposal of demolished assets as part of replacement of the structure. ▪ No special requirements or salvage value.	▪ Investigate material re-use.
Expansion activities	▪ Parking lots and parkades are expanded as per the parking master plan. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ None identified at this time.

Table 24 provides an overview of the current activities, and identified opportunities for the solid waste asset system.

Table 24. Current and Planned Actions – Solid Waste

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Service review study ▪ Solid waste master plan ▪ Key performance indicator development	▪ Condition assessment and inventory development.
Maintenance activities	▪ Preventative and corrective maintenance program in place.	▪ None identified at this time.
Renewal/rehabilitation activities	▪ Renewal and rehabilitation activities conducted as required or as determined by staff or regulations.	▪ None identified at this time.

Planned Action	Current Activity Notes	Opportunity
Replacement activities	▪ Replacement activities conducted as required or as determined by staff or regulations	▪ None identified at this time.
Disposal activities	▪ Currently disposal is determined on a case by case basis.	▪ Review the potential for auctioning or reuse of decommissioned assets.
Expansion activities	▪ Expansion activities as per the solid waste master plan or determined requirements. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ None identified at this time.

Table 25 provides an overview of the current activities, and identified opportunities for the stormwater asset system.

Table 25. Current and Planned Actions – Stormwater

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Stormwater CCTV Inspection Program. ▪ Storm Pond Maintenance Needs Assessment. ▪ Storm Pond Condition Assessments. ▪ Stormwater Master Plan ▪ Stormwater GIS data maintenance and updates.	▪ Stormwater benchmarking as part of the National Water and Wastewater Benchmarking Initiative ▪ Stormwater GIS data modelling
Maintenance activities	▪ Spot repair activities are identified through the stormwater CCTV inspection program. ▪ An annual pond maintenance program is currently in place as per the storm pond maintenance needs assessment.	▪ A storm sewer flushing program is planned to initiate in spring 2017. ▪ Develop program to reduce the backlog of spot repairs. ▪ Review existing standard operating procedures and update as required.
Renewal/rehabilitation activities	▪ A pipe renewal and lining program is in place driven by the CCTV inspection program. ▪ Pond sediment removal program is currently in place.	▪ Develop a 10-year storm sewer rehabilitation/repair program based on risk.
Replacement activities	▪ Strom sewer replacements are driven by the CCTV program, and operations and maintenance problem areas. ▪ The program is integrated and optimized with road and water projects.	▪ Continue to incorporate condition data into replacement analysis. ▪ Continually improve the risk evaluation and simulation techniques.

Planned Action	Current Activity Notes	Opportunity
Disposal activities	▪ Storm sewers are generally disposed of by the contractor as part of replacement projects. ▪ The City is currently working with the University of Guelph regarding the re-use of pond sediment.	▪ None identified at this time.
Expansion activities	▪ Expansion of storm infrastructure is driven by the stormwater master plan. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ Update the Stormwater Master Plan, and explore the possibility of integrating with the Water and Wastewater Master Plans to facilitate corridor coordination and optimization.

Table 26 provides an overview of the current activities, and identified opportunities for the transit asset system.

Table 26. Current and Planned Actions – Transit

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Transit master plan ▪ Transportation master plan ▪ Transit Service Review	▪ Transit facility and bus stop inventory and condition assessments ▪ Establish bus condition assessment framework
Maintenance activities	▪ Well defined maintenance program as per manufacturer requirements, regulatory guidelines and professional judgement.	▪ Establish risk-based maintenance program and strategy for the transit facility.
Renewal/rehabilitation activities	▪ Renewal is completed as per manufacturing guidelines.	▪ None identified at this time.
Replacement activities	▪ Replacement is completed based on condition and lifecycle	▪ Review lifecycle economic analysis.
Disposal activities	▪ Disposal of decommissioned facilities is completed as part of replacement projects. ▪ Vehicles are auctioned.	▪ None identified at this time.
Expansion activities	▪ Additional vehicles are purchased as suggested in the transit master plan, or based on identified needs. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ Facility and space needs review.

Table 27 provides an overview of the current activities, and identified opportunities for the transportation asset system.

Table 27. Current and Planned Actions – Transportation

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Biennial Ontario Structure Inspection Manual (OSIM) condition assessments ▪ Transportation Master Plan. ▪ Roadway condition assessment. ▪ Traffic system studies. ▪ Sidewalk condition assessment. ▪ Energy efficiency study and LED conversion.	▪ Update Bridge and Structure Inventory. ▪ Update Retaining Wall GIS Inventory. ▪ Development of Bridge Lifecycle Forecast Estimates. ▪ Conduct road socio-economic risk assessment. ▪ Establish roadway levels of service. ▪ Advance the intersection GIS inventory. ▪ Develop or obtain streetlight GIS inventory. ▪ Conduct streetlight lifecycle analysis.
Maintenance activities	▪ Bridge and structure corrective maintenance as identified through the OSIM Inspections. ▪ Bridge and structure preventative maintenance as per Minimum Maintenance Standard. ▪ Roadway and sidewalk maintenance is conducted as per the minimum maintenance standard. ▪ Crack sealing has not been in place since 2014. ▪ Streetlight maintenance completed by Guelph Hydro	▪ Formalize Bridge and Structure Preventative Maintenance Program. ▪ Conduct review of roadway lifecycle activities, and cost analysis. ▪ Reintegrate the crack-sealing program ▪ Determine levels of service for roads. ▪ Improve the traffic count data.
Renewal/rehabilitation activities	▪ Bridge and structure renewal and rehabilitation plan as recommended through the OSIM inspections. ▪ Transportation system renewal and rehabilitation is being conducted as part of a prioritized annual program, coordinated with water, wastewater and stormwater projects as required. ▪ Streetlight renewal/rehabilitation completed by Guelph Hydro	▪ Refine 10-year bridge and structure renewal and rehabilitation program based on 2016 OSIM inspection results. ▪ Conduct road lifecycle costing analysis

Planned Action	Current Activity Notes	Opportunity
Replacement activities	▪ Bridge and structure replacement as recommended through the OSIM Inspections ▪ Transportation system replacement is being conducted as part of a prioritized annual program, coordinated with water, wastewater and stormwater projects as required. ▪ Completed as part of energy efficiency projects, or full corridor reconstruction.	▪ Refine 10-year bridge and structure replacement program based on 2015 and 2016 OSIM inspection results. ▪ Conduct a road lifecycle analysis
Disposal activities	▪ Disposal of decommissioned assets as part of replacement projects. ▪ No special requirements or salvage value.	▪ The city is currently evaluating options for the storage and re-use of asphalt and other materials.
Expansion activities	▪ Expansion and improvements of existing transportation assets are determined through the transportation master plan and other studies. ▪ Transportation system and new lighting added as required as part of new development (such as subdivisions). ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ The transportation master plan, which is proposed to be carried out in 2017.

Table 28 provides an overview of the current activities, and identified opportunities.

Table 28. Current and Planned Actions – Wastewater

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Wastewater master plan ▪ Wastewater treatment master plan ▪ Water and Wastewater Development Charges Study Updates ▪ Servicing studies ▪ Wastewater CCTV condition assessments ▪ Wastewater network risk analysis ▪ Inflow and infiltration reduction program. ▪ Wastewater flow monitoring	▪ Benchmarking and key performance indicator development ▪ Forcemain, Syphon, and Trunk Sewer risk assessment. ▪ Wastewater facility inventory and condition assessment.
Maintenance activities	▪ Preventative maintenance programs are in place for the linear and vertical networks. ▪ Corrective maintenance is conducted as identified through inspections or condition assessments.	▪ Track maintenance activities to individual assets in GIS. ▪ Establish predictive maintenance programs. ▪ Develop program to reduce the backlog of spot repairs.
Renewal/rehabilitation activities	▪ A pipe renewal and lining program is in place driven by the CCTV inspection program. ▪ Facilities are rehabilitated as required and identified through operational needs.	▪ Develop a 10-year wastewater sewer rehabilitation/repair program based on risk.
Replacement activities	▪ Sewer replacements are driven by the CCTV program, and operations and maintenance problem areas. ▪ The program is integrated and optimized with road, water, and stormwater projects.	▪ Continue to incorporate condition data into replacement analysis. ▪ Continually improve the risk evaluation and simulation techniques. ▪ Develop 10-year wastewater facility rehabilitation and replacement program based on condition assessments.
Disposal activities	▪ Sewers and equipment are generally disposed of by the contractor as part of replacement projects.	▪ Review opportunities for material re-use. ▪ Review opportunities for testing of pipes for indications of deterioration.
Expansion activities	▪ Expansion activities are completed as recommended through master plans, servicing studies or identified needs. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ Update the Wastewater Master Plan, and explore the possibility of integrating with the Water and Strormwater Master Plans to facilitate corridor coordination and optimization.

Table 29 provides an overview of the current activities, and identified opportunities for the water asset system.

Table 29. Current and Planned Actions – Water

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Water facility and property acquisition master plan ▪ Water distribution master plan ▪ Servicing studies ▪ Water and Wastewater Development Charges Study Updates ▪ District Metering Areas and lead detection ▪ Source water protection program ▪ Water network risk analysis and condition assessment	▪ Benchmarking and key performance indicator development ▪ Critical infrastructure risk assessment ▪ Water facility inventory development and risk assessment.
Maintenance activities	▪ Preventative maintenance programs are in place for the linear and vertical networks. ▪ Corrective maintenance is conducted as identified through inspections or condition assessments.	▪ Track maintenance activities to individual assets in GIS. ▪ Establish predictive maintenance programs. ▪ Establish risk-based valve maintenance program
Renewal/rehabilitation activities	▪ A pipe renewal and rehabilitation program is in place driven by pipe vintage, historical failure patterns, risk and application. ▪ Facilities are rehabilitated as required and identified through operational needs and condition assessments.	▪ Establish risk and condition evaluation program for linear water assets. ▪ Investigate the possibility of standalone watermain replacement program.
Replacement activities	▪ Watermain replacements are driven by pipe vintage, historical failure patterns, risk and application. ▪ The program is integrated and optimized with road, wastewater, and stormwater projects. ▪ Water facility projects are driven by the water facility and property acquisition master plan.	▪ Continue to incorporate condition data into replacement analysis. ▪ Continually improve the risk evaluation and simulation techniques.
Disposal activities	▪ Pipes and equipment are generally disposed of by the contractor or staff as part of replacement projects.	▪ Review opportunities for material re-use. ▪ Review opportunities for testing of pipes for indications of deterioration.
Expansion activities	▪ Expansion activities are completed as recommended through master plans, servicing studies or identified needs. ▪ Incorporation of the recommendations for expansion as per the 2018 Development Charges study.	▪ Update the Water Master Plan, and explore the possibility of integrating with the wastewater and Strormwater Master Plans to facilitate corridor coordination and optimization.

Table 30 provides an overview of the current activities, and identified opportunities for records.

Table 30. Current and Planned Actions – Digital and Non-Digital Records

Planned Action	Current Activity Notes	Opportunity
Non-infrastructure solutions	▪ Records and information management (RIM) strategy ▪ Corporate Technology Strategic Plan	▪ Implementation of the RIM Strategy Action Plans
Maintenance activities	▪ Data maintenance	▪ Review of digital and non-digital data requirements. ▪ Evaluation of the risk of data as per the RIM strategy.
Renewal/rehabilitation activities	▪ N/A	▪ N/A
Replacement activities	▪ N/A	▪ N/A
Disposal activities	▪ Evaluation of the disposal process as per the RIM Strategy	▪ Review of data retention and disposal processes.
Expansion activities	▪ Expansion of data centres as required.	▪ Expansion of current facilities and data storage.

4.2 Integrated Capital Planning

The City is responsible for coordinating the planning of a diverse range of assets with varying levels of complexity. Naturally, some City-owned assets share a location, and, wherever practicable, adopting a coordinated approach to the projects for these assets ensures the greatest optimization of the proposed work. A prime example of this is assets owned within the municipal right-of-way. A right-of-way spans from property line to property line on each side of the street, and includes everything in between. At the City of Guelph approximately 72 per cent (by replacement value) of the overall asset portfolio exists within the road right of way as shown in **Figure 54**. These assets include:

- Boulevards;
- Bridges and Structures (such as bridges, retaining walls and culverts);
- Bus Stops;
- Fibre Optic Cables;
- Road Base and Surface;
- Sidewalks;
- Stormwater Sewers (and appurtenances such as catch basins);
- Streetlights;
- Street Furniture;
- Traffic Signals and Cabling;
- Wastewater Sewers (and appurtenances such as valves); and
- Watermains (and appurtenances such as hydrants).

In addition to the above, there are several underground utilities that are not owned by the City such as:

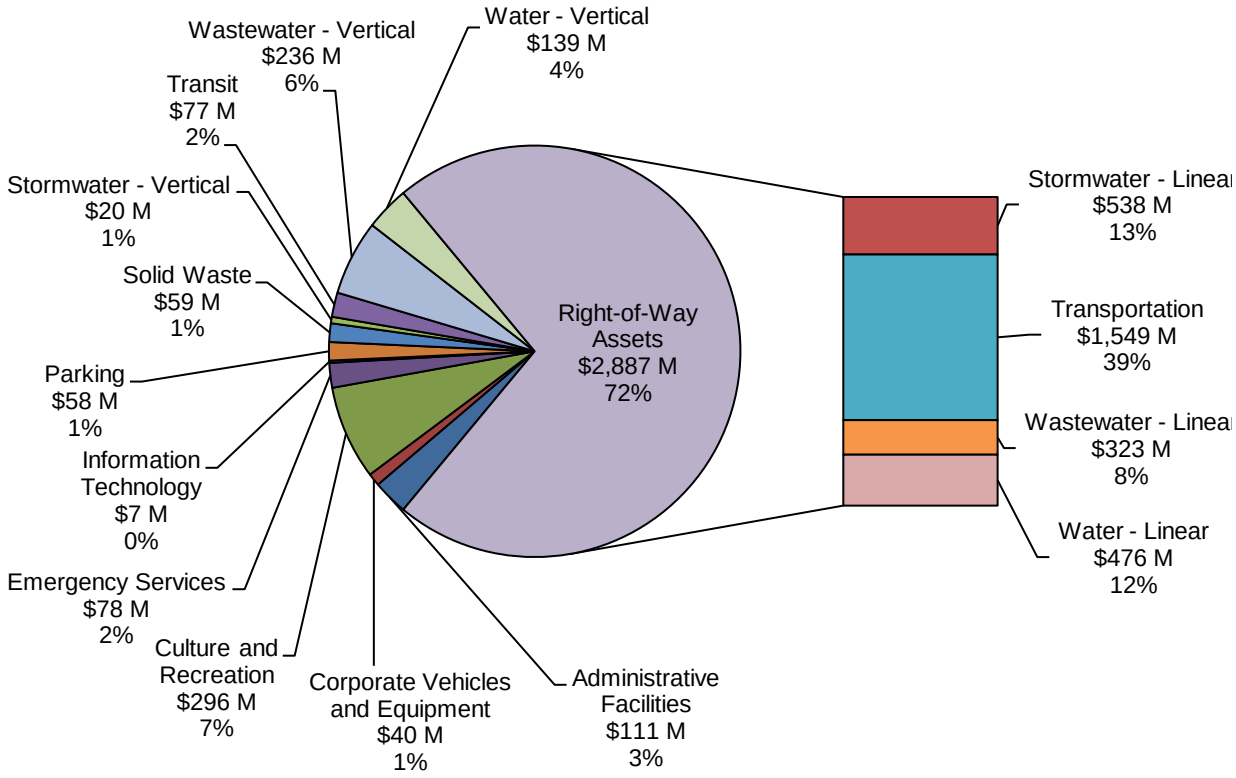
- Gas Lines;
- Telecommunication Lines; and
- Underground or above ground hydro Lines.

This high level of complexity and significant investment requirements within the right of way means that work within this area greatly benefits from an integrated approach to project planning. In the years

between 2012 and 2016, the right of way assets represented between 48 per cent and 64 per cent of the City's overall capital budget. Therefore, optimizing these investments would have a significant impact on the overall capital budgets over the long-term. Water, wastewater and stormwater are now on their way towards sustainable funding, however the roads funding is currently limited. The planning process is faced with the following challenges:

- The assets are located in the same physical space, therefore any intervention to one asset type, impacts the other assets in the right of way;
- Each of the asset systems are unique, with their own behaviours, failure modes, and service lives;
- Some of the assets, such as water, wastewater and stormwater, are from user pay funding sources, whereas the other asset types are funded from the tax levy. This means that typically projects on them are listed on different budgets;
- Due to the unique nature of the systems, many of them are operated and maintained by different departments; and
- Asset failures or projects within the right of way significantly impact the public and businesses.

Figure 54. Right of Way Assets as a Proportion of the Total Portfolio

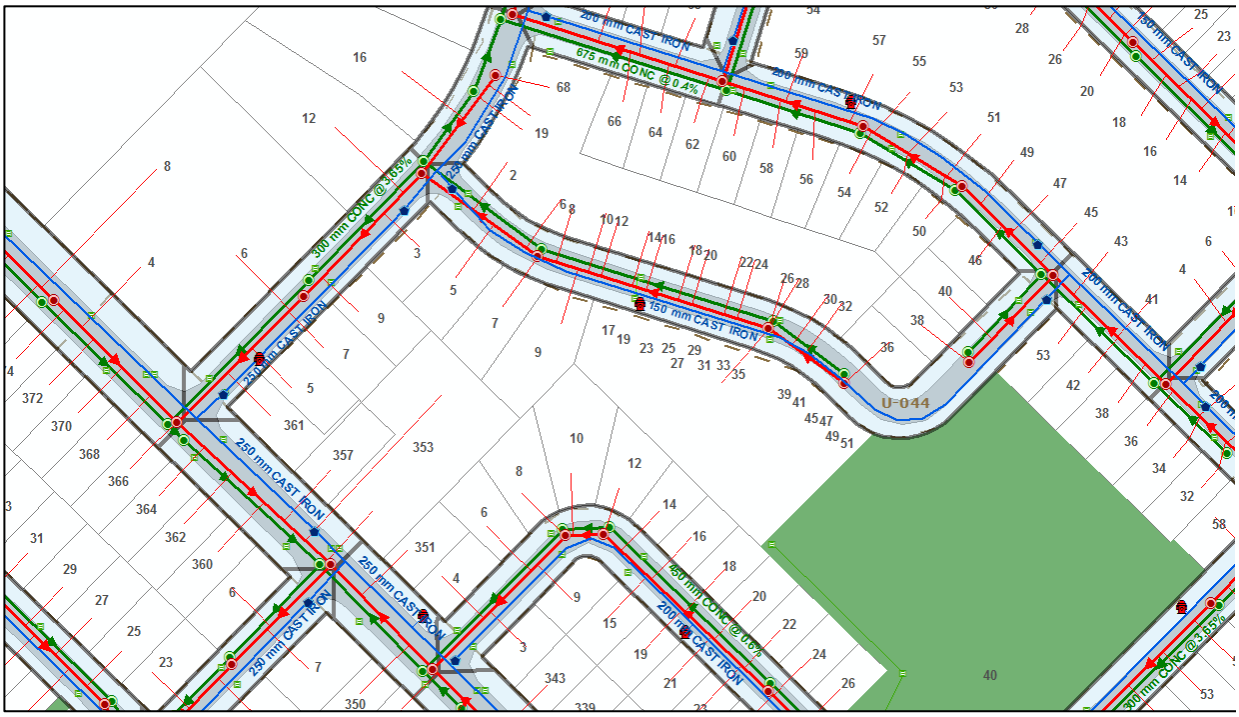


The coordination is a complex task – if you were to peel away the road surface, there would be an array of pipes, cables and conduits under the surface. In addition, the assets have varying service lives which means some assets need interventions sooner than others, each asset has a separate funding source, each with their own unique constraints, and in general, each has a separate operations and maintenance group.

One approach to managing these complex challenges is through adopting a process called integrated capital planning. Integrated planning is a process through which needs from two or more functions are coordinated to maximize value. When applied within the right-of-way, this means that the identified investment requirements – upgrades or replacements – within the corridor are coordinated, to ensure that the service outcomes of the assets are maximized, while minimizing the risk exposure in the most cost effective way. In some cases, this may mean that only a single asset, such as a sewer, is rehabilitated while not conducting interventions on the other assets. This way the City minimizes replacing assets that are still providing adequate service, while minimizing construction impacts. Not only does this maximize the lifecycle of the assets, it minimizes re-work and the impacts on the community and ensures the best return on investment.

The integrated planning approach used within the City is accomplished through dividing the City's right or ways into corridors from intersection to intersection as shown in **Figure 55**. Through this approach, any asset within each corridor can be analyzed as a composite of the corridor.

Figure 55. Utility Corridor Generation in GIS



Standardized business processes have been developed to identify whether each asset type is required to have an intervention completed, and then once the needs for each asset system are established, they are then aggregated to the corridor level. Each corridor is then analyzed to identify which asset types require intervention, and then a specific strategy is selected. For example, if the road is on poor condition, and the underground infrastructure is in good condition, then the road would become a resurfacing candidate. If only the wastewater sewer is in poor condition and other assets in good condition, then it would become a possible trenchless rehabilitation candidate. As another example, if all assets are in poor condition, then the corridor would become a full corridor reconstruction candidate. The list of project candidates is then prioritized based on risks and phasing.

4.3 Procurement Methods

Government procurement represents 12 per cent of Canada's GDP and is a potentially powerful policy tool for governments to wield. All levels of government rely on outside companies to provide a vast array of goods and services and at the City Guelph, most purchases over $35,000 are completed through a public "procurement" process. Current policy (local By-Laws, as well as Provincial, Federal and International policies, laws and agreements) and established practices in procurement are driven by principles like fairness, competition and confidentiality.

The City's Procurement By-Law is 2014 - 19771[23] under paragraph 3 of subsection 270(1) of the Municipal Act, 2001, S.O. 2001, c. 25. This is a By-law to establish policies for the sale and other disposition of land, hiring of employees, procurement of goods and services, public notice, accountability and transparency, and delegation of powers and duties, as required under section 270(1) of the Municipal Act, 2001.

The Guiding Principles that govern the City's procurement of Goods and Services are as follows:

a. Fairness;
b. Transparency;
c. Accountability;
d. Best Overall Value;
e. Competitive Bidding;
f. No Conflicts of Interest;
g. Environmental Sustainability;
h. Accessibility for Persons with Disabilities;
i. Ethics; and
j. Fair Trade.

In addition to the above, the City has developed a new procurement process under the name of "GuelphLab". This method of alternative procurement can unlock innovative solutions for the City and have the potential to create business development opportunities for companies working in "Civic Tech". GuelphLab uses a combination of workshops, process mapping, and dilemmas (trade-offs) working with businesses, business incubators and City Staff to develop innovative projects.

The Guide for Municipal Asset Management Plans states that 'to ensure the most efficient allocation of resources, best practice is for a number of delivery mechanisms to be considered — such as working with other municipalities to pool projects and resources, or considering an AFP model.' The design-build-finance-maintain AFP (Alternate Financing and Procurement) model takes a lifecycle perspective and builds effective asset management directly into the contract. The Guide also states that municipalities should have procurement bylaws in place to serve as the basis for considering various delivery mechanisms. The City of Guelph meets both of these requirements through existing by-laws and practices.

For example, numerous agreements with third parties exist to pool projects and resources, one of the most noteworthy being collaboration with the University of Guelph on many research and community-based projects. Emergency Services also operate under mutual aid agreements.

4.4 Risks Associated with the Strategy

Failure of this asset management plan would result in a hindered opportunity for the city to leverage the

[23] *City of Guelph (2014) By-Law 2014-19771 [Online: http://guelph.ca/wp-content/uploads/PurchasingBylaw.pdf]. Retrieved November 26, 2016.*

value from the assets. In addition, lack of formalized process may lead to reduced levels of service or increased risk due to insufficient planning or evaluation. Some risks associated with the strategy and risk management strategies are included in **Table 31.**

Table 31. Potential Risks Associated with the Strategy

Potential Risk	Likelihood	Consequences	Management Strategies
Lack of departmental buy-in and the plan is not followed	Medium	▪ Reactive maintenance and projects. ▪ Inefficient investments. ▪ Limited understanding of level of service and risks.	▪ Ensure active collaboration with each of the working groups ▪ Ensure that each group is represented on the asset management steering committee.
Lack of resources to implement and advance the plan	Medium	▪ Deferral of important preventative projects, therefore resulting in more urgent or reactive work. ▪ Poor planning efforts ▪ Missed opportunities ▪ Lack of cross-departmental coordination	▪ Through this plan, a number of needs have been identified. A resourcing assessment will be conducted to establish are there will be any resourcing challenges. ▪ The project list will be prioritized to tackle the most valuable and urgent items first.
Inadequate data and information	High	▪ Lower accuracy forecasts and analysis results. ▪ Lower ability to diagnose issues and make decisions	▪ Data improvement strategies are proposed including condition assessment and inventory development.
Regulatory changes	Low	▪ Non-compliance with new or planned projects. ▪ Mandatory investments and schedule	▪ Document existing levels of service, watch upcoming regulation, be primed to evaluate the impacts of upcoming regulations.
Insufficient Growth or inaccurate projections	Low	▪ Incorrectly sized and inefficient assets.	▪ Refine growth projections and update servicing studies

5 Financing Strategy

Several financing strategies are available to fund capital projects. These strategies vary on a project-by-project basis. The typical financing strategies used by the City are as follows:

- **Pay as you go:** Saving all funds in advance of building or acquiring an asset. This strategy is long range in nature and sometimes requires foregoing needs in the short term until enough capital has been saved to carry out the required project.
- **Reserve Accounts:** Contributing revenues to a reserve account, and drawing funds from the account. This strategy allows a reserve 'threshold' to be set to provide a buffer for unexpected expenditures. It also allows lifecycle contributions to be made on an annual basis which can be drawn upon when needed.
- **Debenture Financing:** A loan issued to the organization for building or acquiring an asset, which involves repayment annually with interest. The Province has limits on the total amount of debt which is based on an annual payment limit or 25 per cent of the municipality's source revenue.
- **Third-Party Contributions:** Contributions from parties external to the organization. This typically comes from contributions, subsidies and recoveries from development or grants from senior levels of government. This funding strategy impacts rates (except in the case of grants and subsidies).
- **User Fees:** Rates charged to the users of a service, which is typically based on a full cost recovery model.

In reality, the City uses a combination of the above funding strategies depending on the specific project. Guelph, like many other cities across Canada has historically seen increases in taxes and rates lower than inflation and the true cost of delivering the service, therefore actively seek alternative funding strategies to realize the greatest value for City residents. The City uses short- and long-term analyses with the goal of developing sustainable capital plans and financing strategies. These analyses include 100-year sustainability forecasts, 10-year capital budgets, and reserve fund forecasts.

5.1 Yearly Expenditure Forecasts

Long term asset investment forecasts provide insight into prospective investment requirements which may fall outside of the 10-year planning horizon typically used for capital budgeting processes. Large quantities of asset construction during a short time span, as seen in the 1990's, will require equally heavy investment once those assets reach the end of their service lives. If those investment requirements are not addressed appropriately, levels of service could potentially decline and operations and maintenance costs could increase. The 100-year forecast aims to cover the entire lifecycle of the assets, therefore allowing identification of such trends.

Funding and re-investment requirements were developed for each asset system based on the analysis to establish an average annual lifecycle cost. Each of the forecasts has been broken down into the following lifecycle activities, for consistency with **Section 4**, Lifecycle Management Strategies:

- Non-infrastructure solutions;

- Maintenance activities;
- Renewal/rehabilitation activities;
- Replacement activities;
- Disposal activities; and
- Expansion activities.

The investment forecast takes into consideration statistical parameters that utilize the condition, estimated service lives, replacement costs and lifecycle probability distributions to provide trends of sustainable costs on a given year. The replacement trends can then be used to develop short-term and long-term (25-year and 100-year) replacement requirements and average annual costs. The replacement costs are based on 2016 average tender prices, condition assessments, asset valuations, and insurance assessed values.

Figure 56 depicts the annual capital investment requirements across the city's entire asset portfolio. The figure shows that there are currently deferred investment needs of $502 million. The 'deferred investment needs' refers to an outstanding capital need, which arose in the past, but has not been addressed (i.e. assets that fall within the very poor rating category because their remaining service life is below zero). This could be related to asset deterioration, capacity shortfalls or required service standard upgrades. The figure also shows various spikes in the investment forecasts, which is typically due to large assets with high replacement value, or groups of assets being required to be rehabilitated or replaced in a given year. An example of this can been seen in areas of post-war growth where communities were built and developed en mass with significant investments in new assets made over a relatively short time period.

When developing the 100 Year Lifecycle Reinvestment Requirements, the total value of expansion in each year from 2018 through to 2037 was obtained from the results of the 2018 Development Charges Study. From the year 2038 onwards, an average percentage was calculated based on the Development Charge funding received for each of the asset categories in prior years. This was multiplied against the total value of the inventory, and forecasted out from 2038 until 2117.

As demonstrated in **Figure 56,** between the years of 2018 and 2033 the City will experience the highest growth rate, with growth numbers declining from there onwards. The highest growth rates can be found in the Transportation, Water, and Wastewater asset portfolios. Meanwhile, Culture and Recreation, Solid Waste, and Transit each have single high-expenditure years reflecting creation of large quantities of assets to improve service and address needs. The decline of the rates in 2033 coincides with the anticipated timeline for the City to reach build-out, thus the need for large investment in new fixed assets for previously un-serviced areas will decline.

Note that digital and non-digital records, and land assets have not been included in the analysis at this time.

Figure 56. 100-Year Lifecycle Investment Requirements – Overall

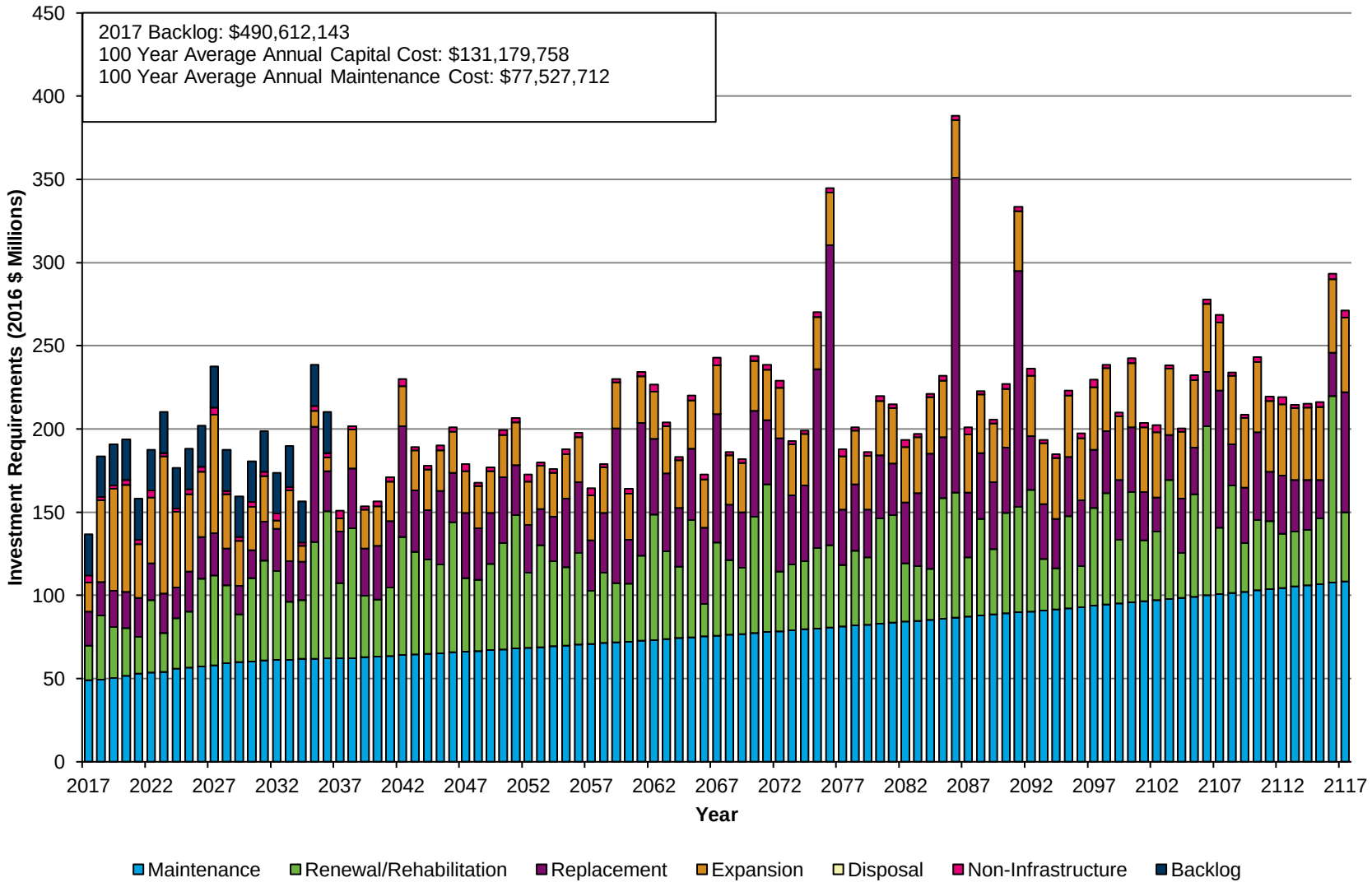


Figure 57. 100-Year Lifecycle Investment Requirements – Administrative Facilities

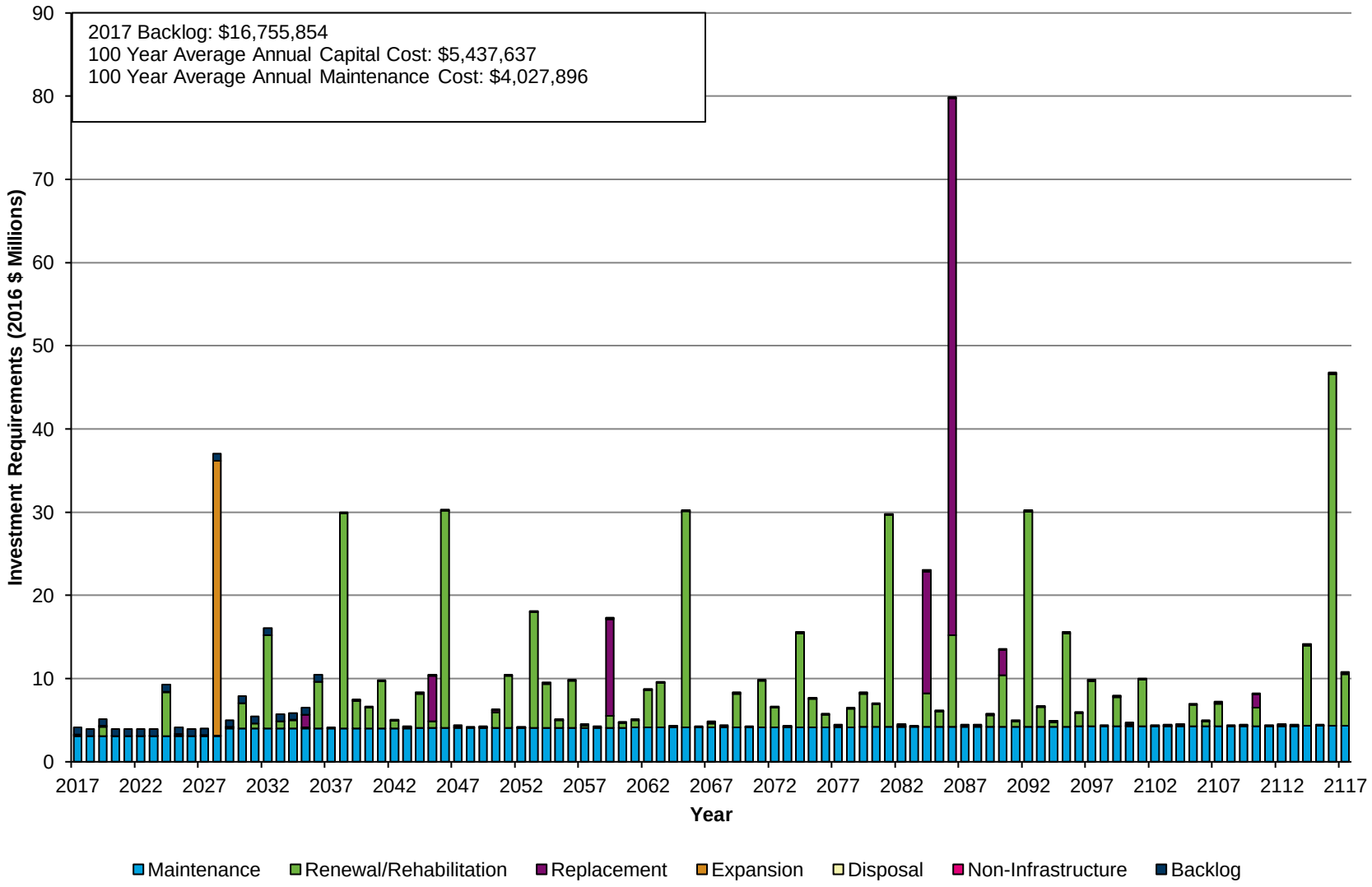


Figure 58. 100-Year Lifecycle Investment Requirements – Corporate Vehicles and Equipment

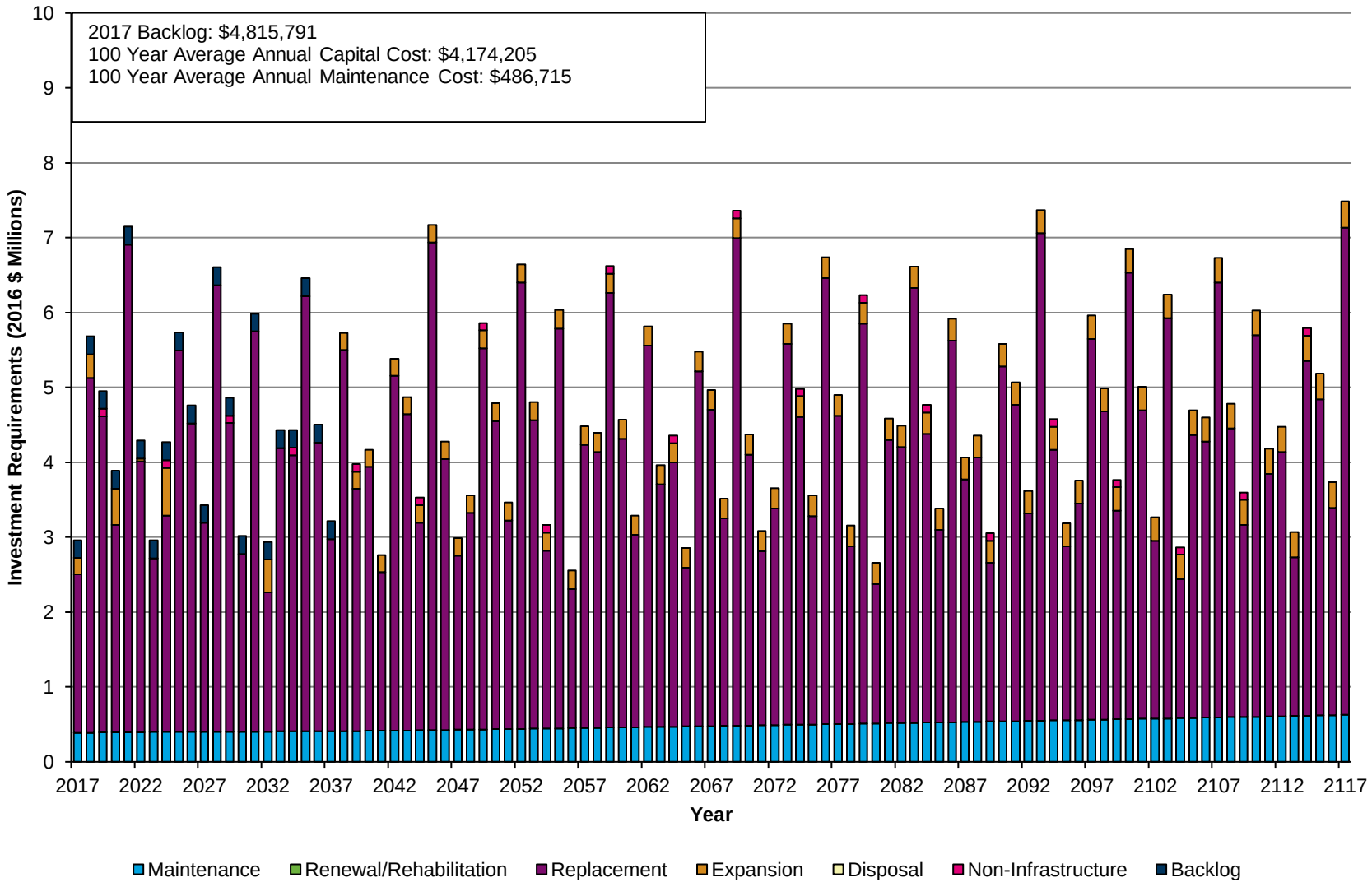


Figure 59. 100-Year Lifecycle Investment Requirements – Culture and Recreation

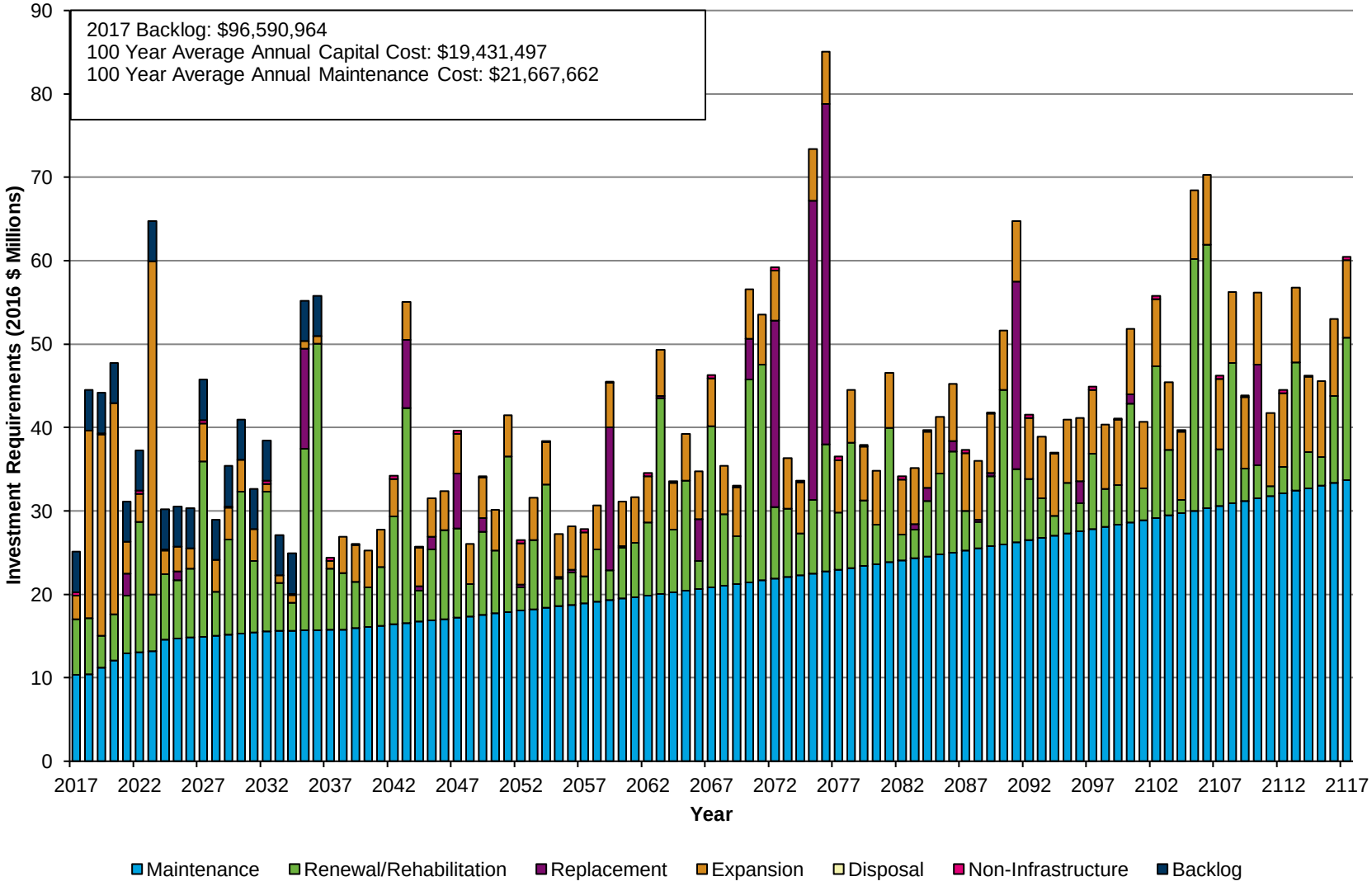


Figure 60. 100-Year Lifecycle Investment Requirements – Emergency Services

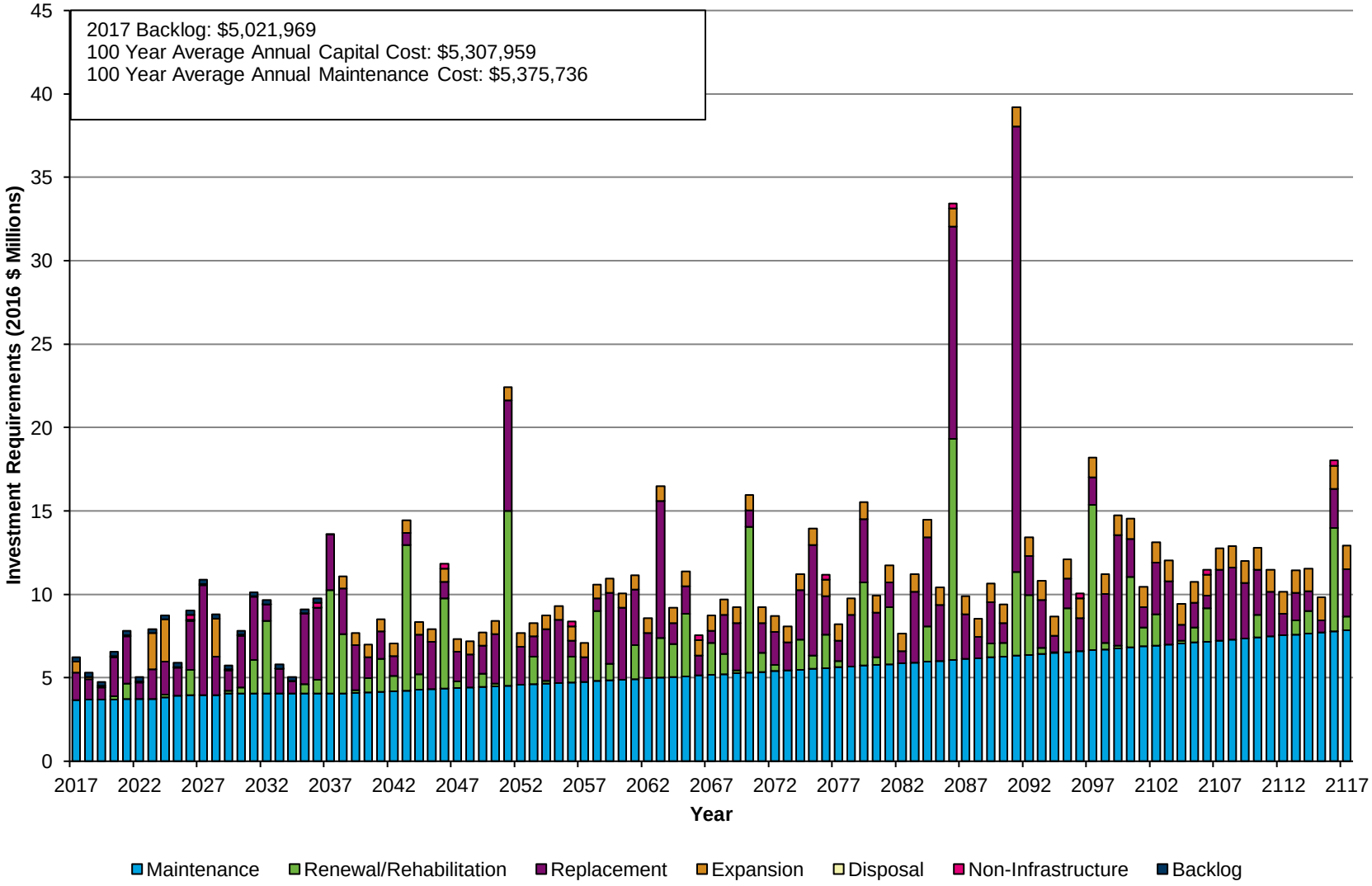


Figure 61. 100-Year Lifecycle Investment Requirements – Information Technology

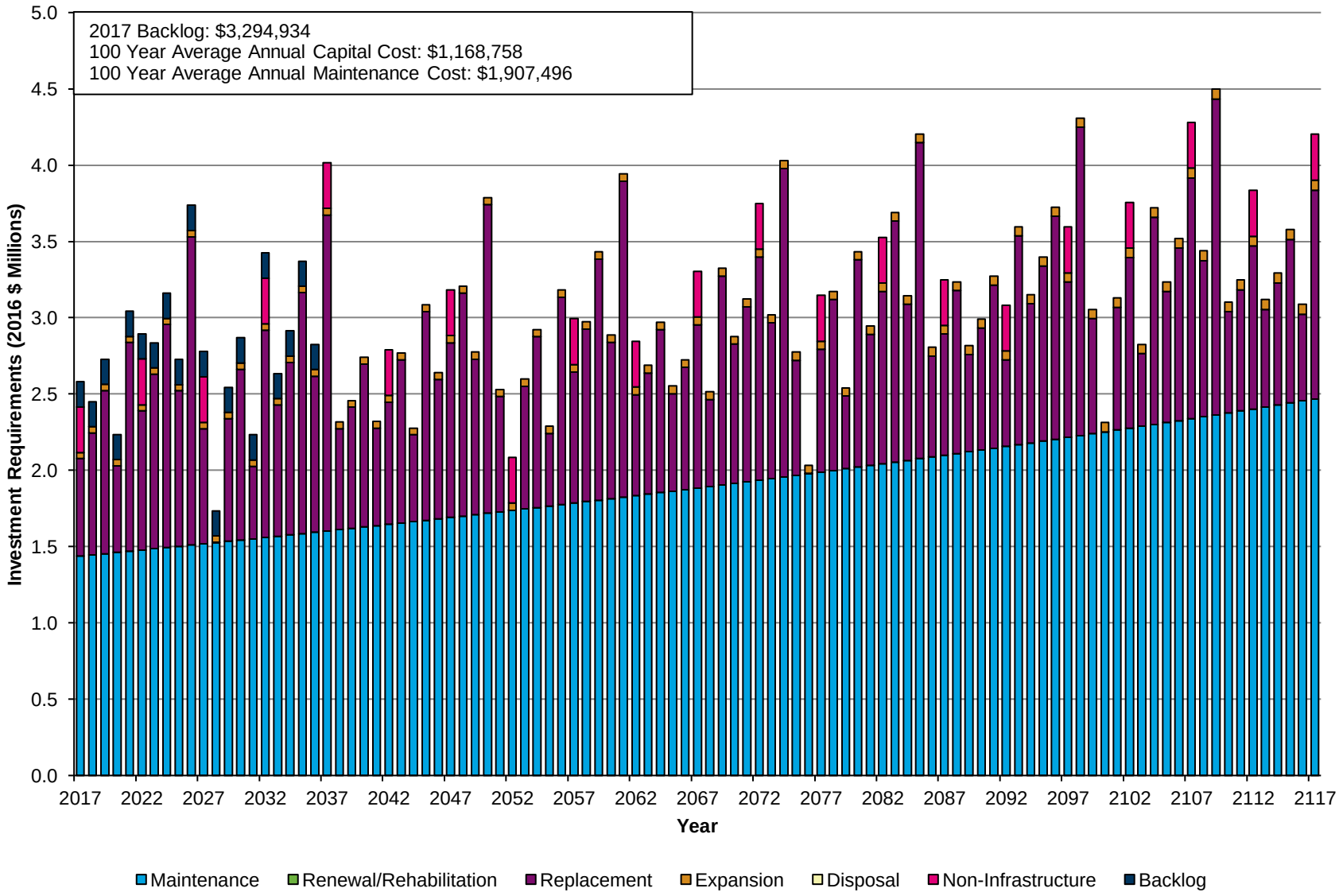


Figure 62. 100-Year Lifecycle Investment Requirements – Parking

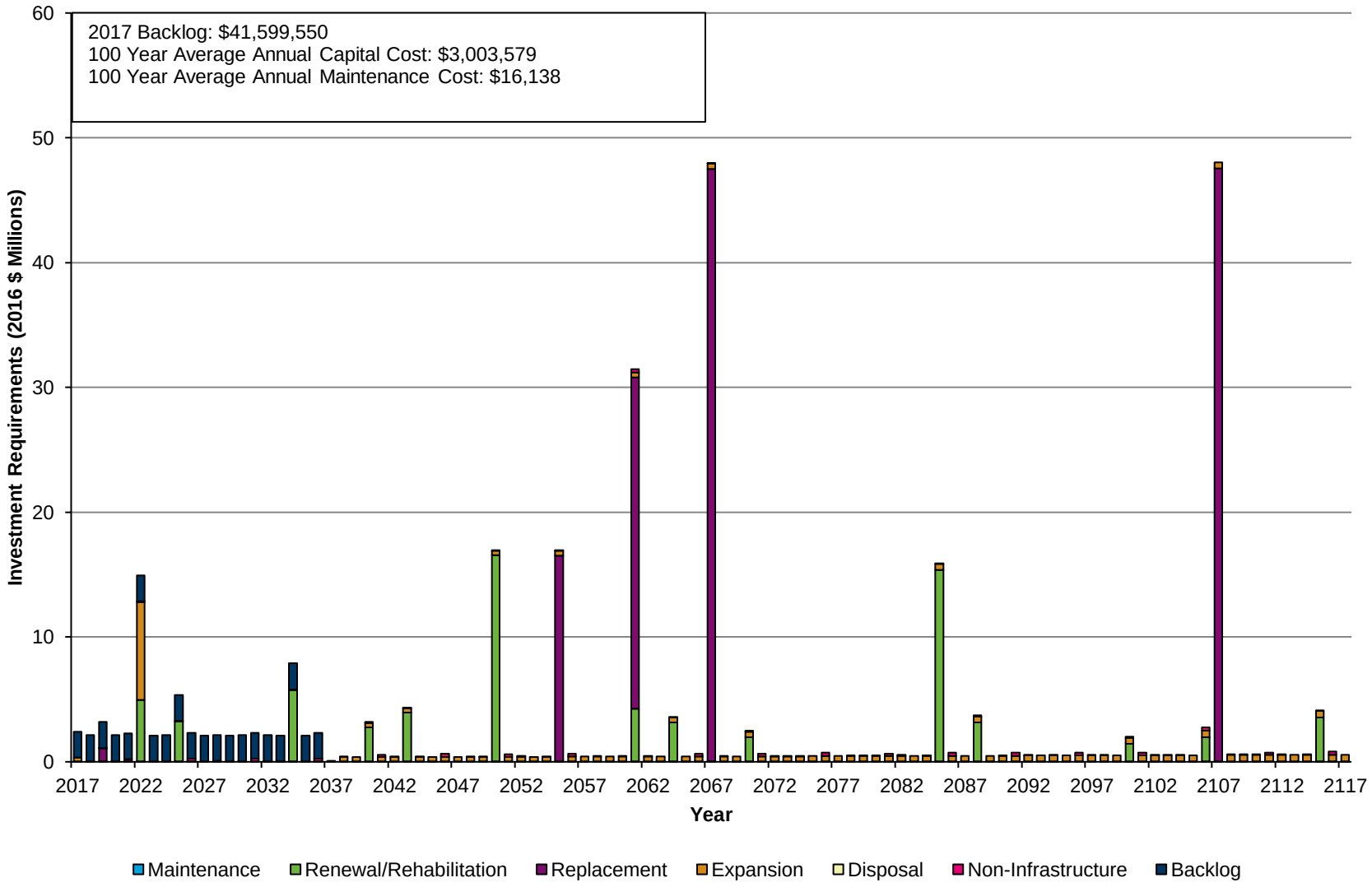


Figure 63. 100-Year Lifecycle Investment Requirements – Solid Waste

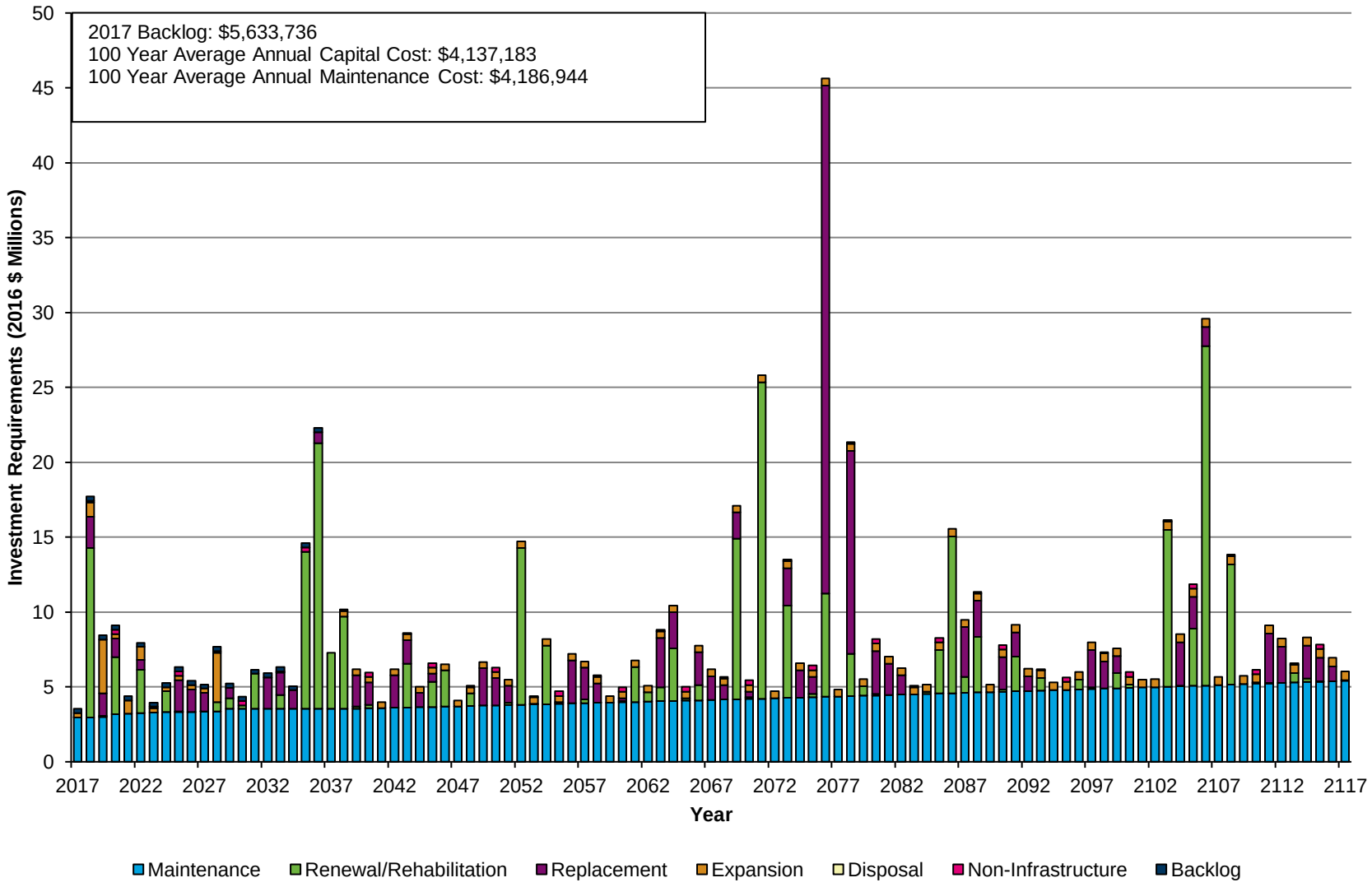


Figure 64. 100-Year Lifecycle Investment Requirements – Stormwater

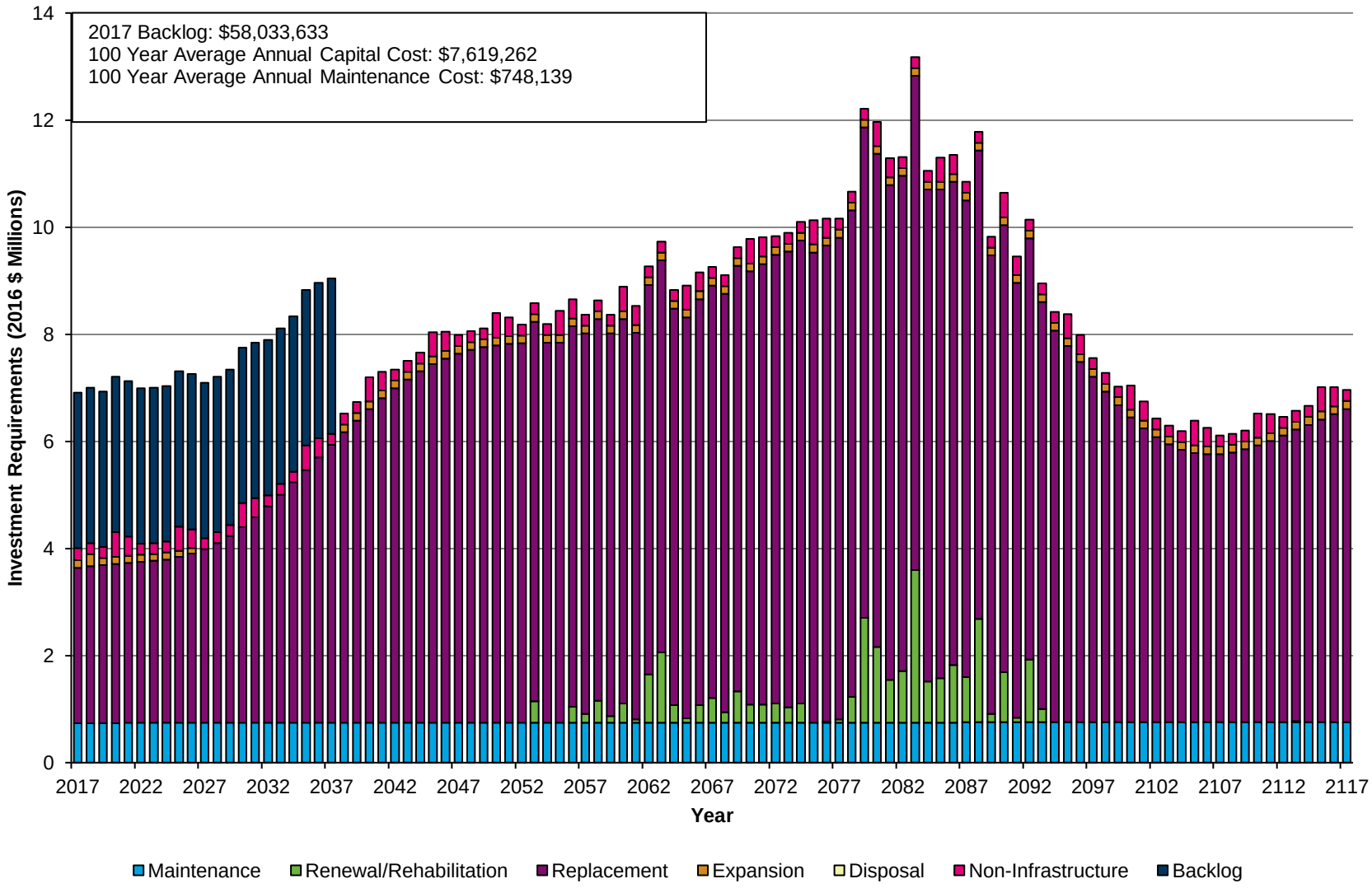


Figure 65. 100-Year Lifecycle Investment Requirements – Transit

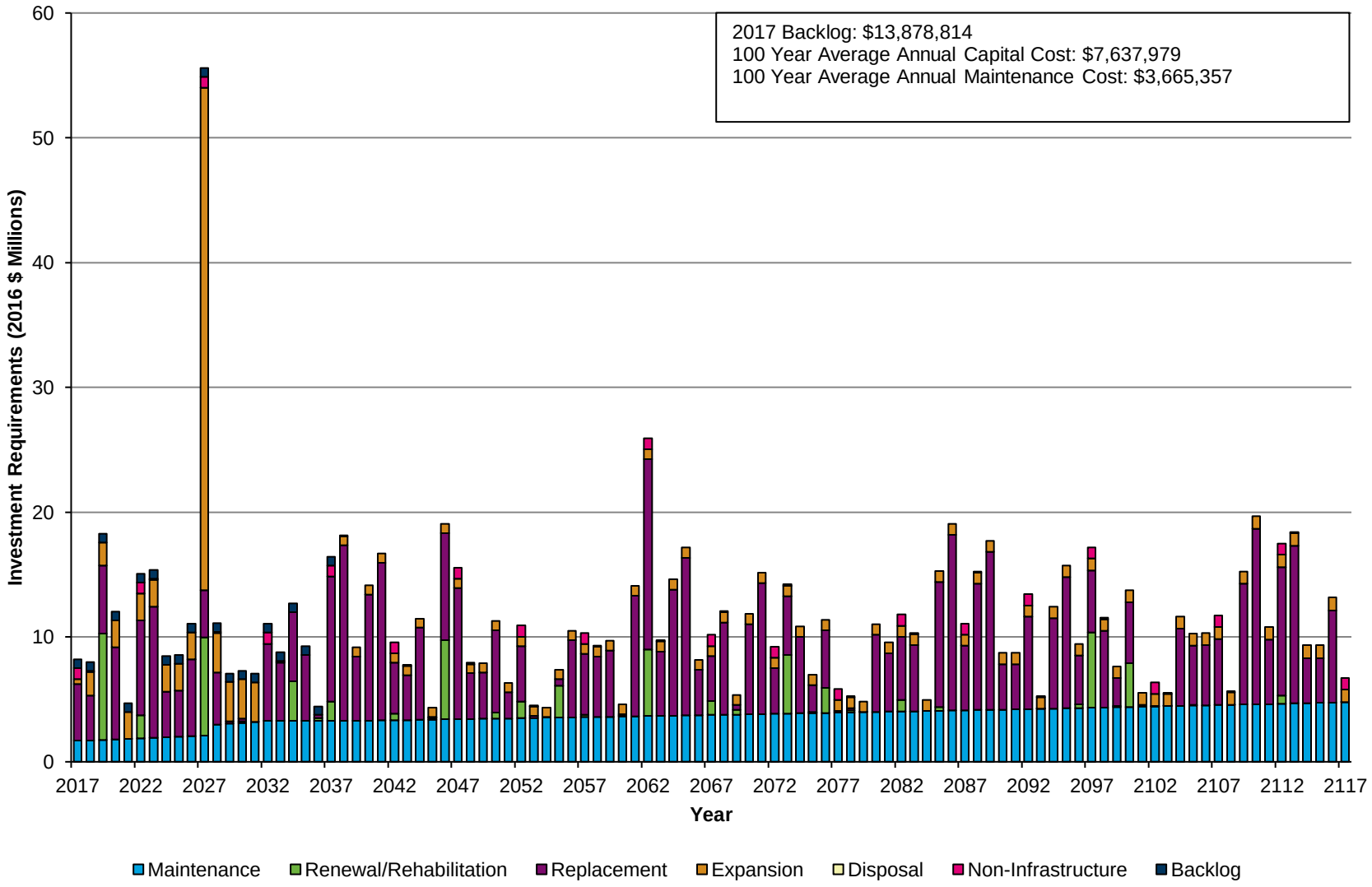


Figure 66. 100-Year Lifecycle Investment Requirements – Transportation

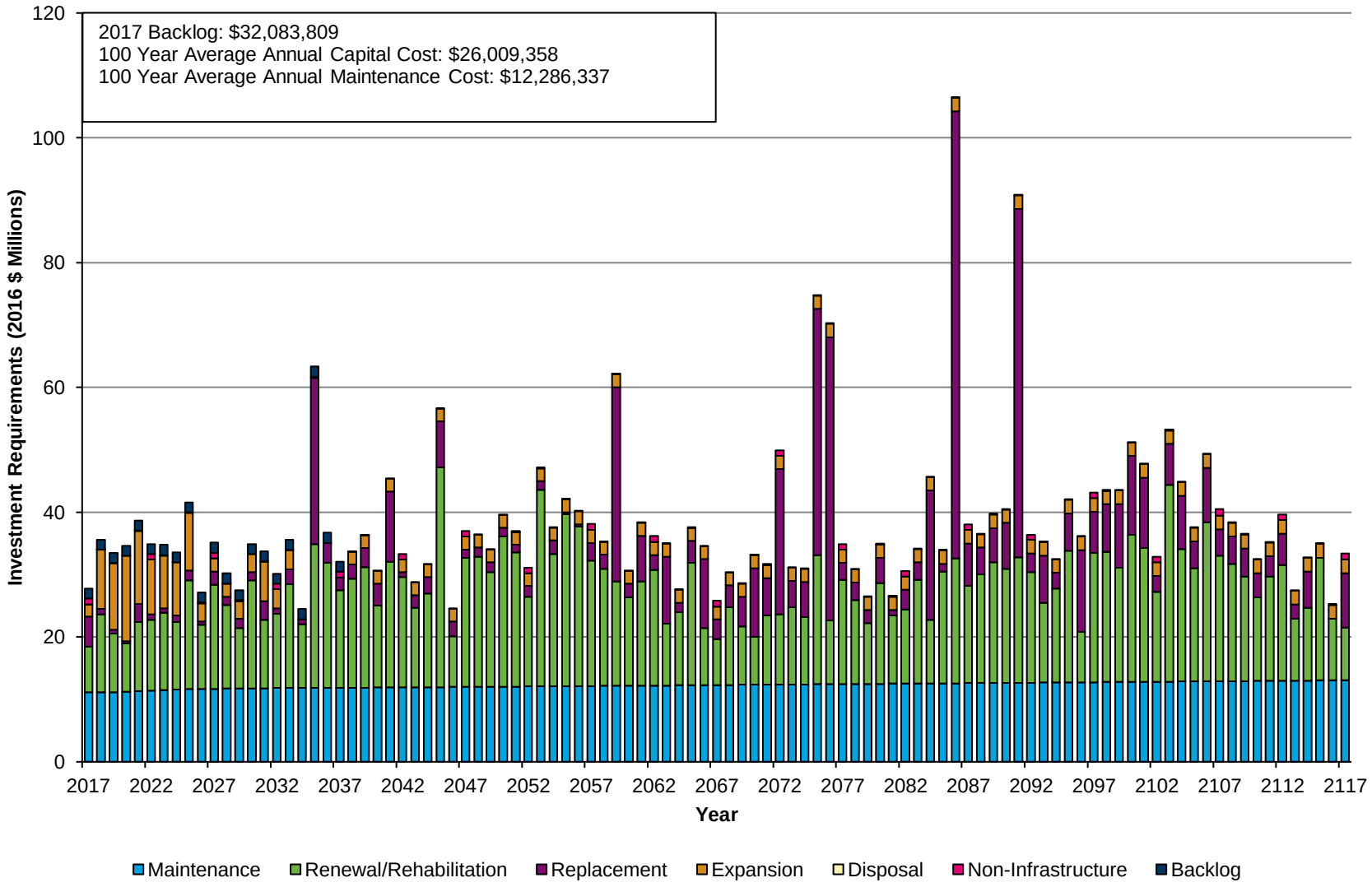


Figure 67. 100-Year Lifecycle Investment Requirements – Wastewater

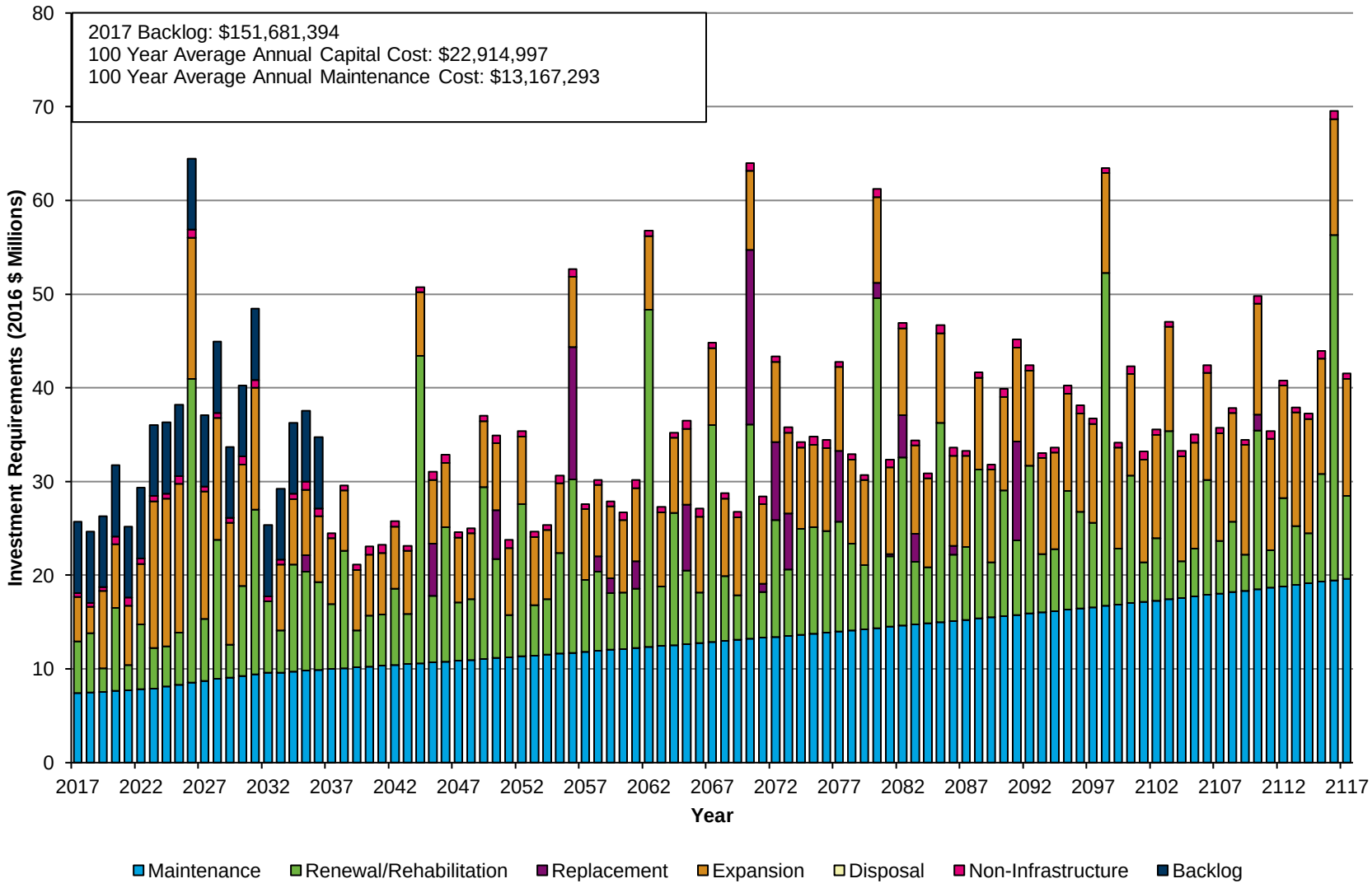
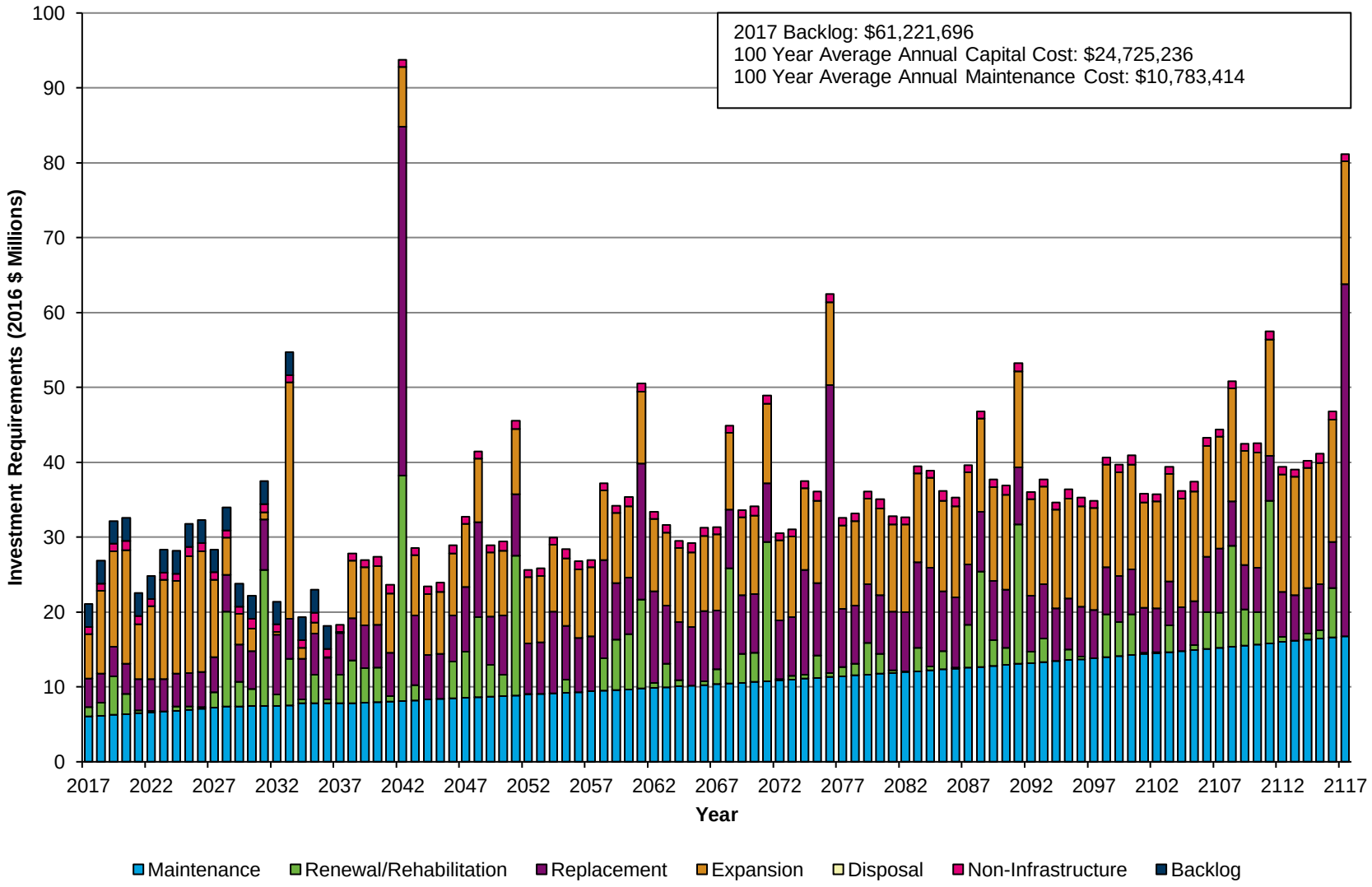


Figure 68. 100-Year Lifecycle Investment Requirements – Water



5.3 Council Approved Capital Budget for the Past Six Years

The Council approved capital budget for each asset system from the previous six years is provided in **Table 32**.

Table 32. Historical Capital Investment Trend by Asset Type ($'000)

Asset System	2012*	2013*	2014*	2015*	2016*	2017*
Administrative Facilities	119	1,529	1,554	2,057	1,603	1,272
Contaminated Sites	50	100	1,400	270	267	3,685
Corporate Vehicles and Equipment	3,523	2,572	1,057	2,406	3,825	2,857
Culture and Recreation	3,285	2,673	7,409	19,092	6,363	13,200
Emergency Services	15,303	4,321	23,911	2,420	6,400	3,402
Information Technology	1,432	2,309	1,228	3,028	2,894	2,893
Parking	0	175	0	13,370	23,420	360
Solid Waste	369	3,495	938	950	760	2,270
Stormwater	1,233	2,425	2,400	3,870	3,775	9,151
Transit	3,100	950	105	3,027	2,737	8,758
Transportation	8,052	8,395	17,206	15,991	12,039	16,094
Wastewater	27,249	8,211	6,498	17,724	12,791	6,799
Water	12,117	13,397	17,394	22,766	15,137	19,0969
Digital and Non-Digital Records	0	0	0	0	0	0
Total	**75,831**	**50,551**	**81,098**	**106,970**	**92,009**	**89,836**

Note:

* *Shown budget amounts exclude non-asset related budgets.*

5.4 Breakdown of Revenues by Confirmed Source

For the purposes of analysis, the 2017 capital budget was utilized. The yearly breakdown of capital revenues by confirmed source is provided in **Table 33**.

Table 33. Yearly Breakdown of Capital Revenues by Confirmed Source ($'000)*

Capital Revenue Source	2012	2013	2014	2015	2016	2017
Tax Funded Adjusted	19,534	15,825	19,822	27,469	23,913	34,384
Rate Funding	21,806	13,738	17,077	23,777	17,834	17,834
Grants & Subsidies	7,995	8,756	6,941	5,920	8,424	24,283
Donations & Own Revenue	280	252	304	393	244	211
Developer & Partner	1,106	594	1,452	1,119	1,164	531
Development Charges	14,043	11,397	11,840	35,903	26,688	12,592
Debt	11,067	-11	23,663	12,391	13,740	0
Total	**75,831**	**50,551**	**81,098**	**106,970**	**92,009**	**89,836**

Note:

* *Revenue by confirmed source excludes non-asset related revenues.*

5.5 Key Assumptions and Alternative Scenarios

As with any initial plan, a variety of gaps and opportunities were identified when developing the financial analysis. These gaps will direct future improvements in the documenting and reporting process, and will be fine-tuned as Guelph's Corporate Asset Management Program matures.

5.5.1 Key Assumptions

This asset management plan was developed based on the best available information and making assumptions using professional judgment to address gaps. The analysis conducted in this lifecycle assessment is based upon the following key assumptions:

- Assets degrade linearly, except for water, wastewater, and stormwater pipes, which used a Weibull probability distribution;
- Installation dates, where they were unavailable, were assumed;
- Total replacement costs of facilities have been allocated based on the percentage allocation of Section E "Gross Building Costs – Representative Samples" from the Hanscomb. (2016). *'Yardstick for Costing: Cost Data for the Canadian Construction Industry'* to the various sub-components (such as substructure, structure, exterior enclosure, partitions & doors etc.) due to the differing life expectancies of each component;
- All assets perform based on industry standard service lives;
- Use of age-based condition assessment in the absence of actual condition information; and
- Estimates of costs based on professional judgment where cost information was unavailable.
- Where any of the above assumptions have been used, a corresponding action item has been developed to close any gaps in the future.

5.5.2 Alternative Scenarios

The forecasts do not include inflation, however where it was used, inflation was assumed at an average annual rate of 3.7 per cent (which is the average annual NRBCPI increase from 1981 to 2015). Over the course of 100 years, the financial analysis shows a steady increase in the funding gap. The backlog work is dispersed over a 20-year period in all analysis to reflect a realistic approach to addressing the work.

There are techniques that can disperse costs over the years to reduce immediate impacts. One approach would be extending assumed service lives. The typical industry practice is to assume

extensions in service lives of 10 per cent increases. This would reduce capital expenditures as well as spread out significant maintenance costs (such as replacing large motors, finishes, surfacing on roadways and sidewalks, etc.). However, the consequences for this would be an increase in regular maintenance costs (more repairs to motors, more partial finish replacements in buildings, more potholes requiring fixing on roadways, etc.). Additionally, it is likely that the overall levels of service would be impacted, and likely reduced.

This leads into another potential solution, which would be to re-evaluate the required levels of service. If, in general, the desired level of service is reduced then associated costs can also be reduced. Lowering the levels of service will result in reduced capital and maintenance costs (for example, all roads can be of poor condition or better rather than maintaining all roads in fair condition or better). Of course, it is essential to balance the desired levels of service against costs, and risks.

Asset management seeks to determine the optimal approach to lifecycle management. This includes reviewing levels of service to determine acceptable performance in all areas of the asset lifecycle. The decision-making process includes determining key performance indicators and standard levels of performance that will inform capital and maintenance planning. Over the next two years, the City aims to determine, at least at a conceptual level, what these levels of service will be to allow for better informed decision making.

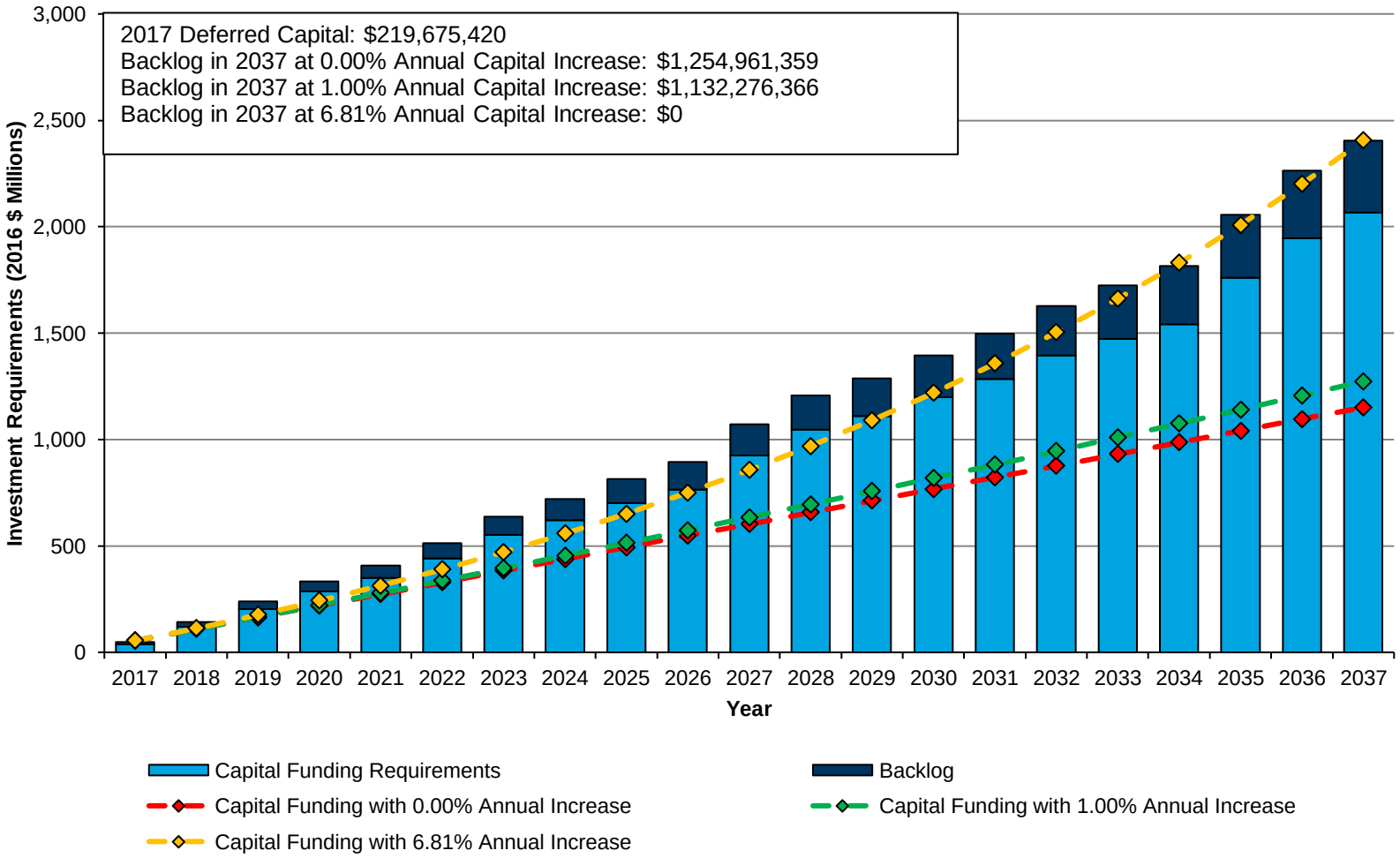
5.6 Funding Shortfalls

Figure 69 and **Figure 70** provide a comparison of various funding levels against the cumulative lifecycle funding requirements for 20 years. **Figure 69** includes tax-supported assets, and excludes the water, wastewater and stormwater asset systems. In 2017, there is approximately $220 million in deferred capital, which has been spread over 20 years for the purpose of the analysis, resulting in an additional $11 million per year to address deferred capital requirements. The red line represents the 2017 funding levels with a zero per cent annual increase, which would result in a backlog of $962 million by 2037. The green line represents the 2017 funding levels with a one per cent annual increase, which would result in an $839 million backlog by 2037. The yellow line represents the funding requirements in order to have no backlog by 2037, which would require a 5.68 per cent annual capital increase.

Figure 70 includes the rate supported water, wastewater and stormwater asset systems. In 2017, there is approximately $271 million in deferred capital, which has been spread over 20 years for the purpose of the analysis, resulting in an additional $14 million per year to address deferred capital requirements. The red line represents the 2017 funding levels with a zero per cent annual increase, which would result in a backlog of $772 million by 2037. The green line represents the required annual increase of 4.9 per cent, which would be required to maintain the current backlog of $271 million by 2037. The yellow line represents the funding requirements in order to have no backlog by 2037, which would require an 6.64 per cent annual capital increase.

It should be noted that the analysis considers only capital funding, and does not consider the current reserve position. Therefore, the percentage annual increase does not specifically correlate to a direct increase to rates or the tax levy, and could potentially be funded from a variety of sources, including but not limited to existing reserves or grants and subsidies. In future plans, further analysis is be completed by asset system to evaluate options for funding.

Figure 69. 20-Year Cumulative Capital Investments vs. Revenues (Tax Supported)

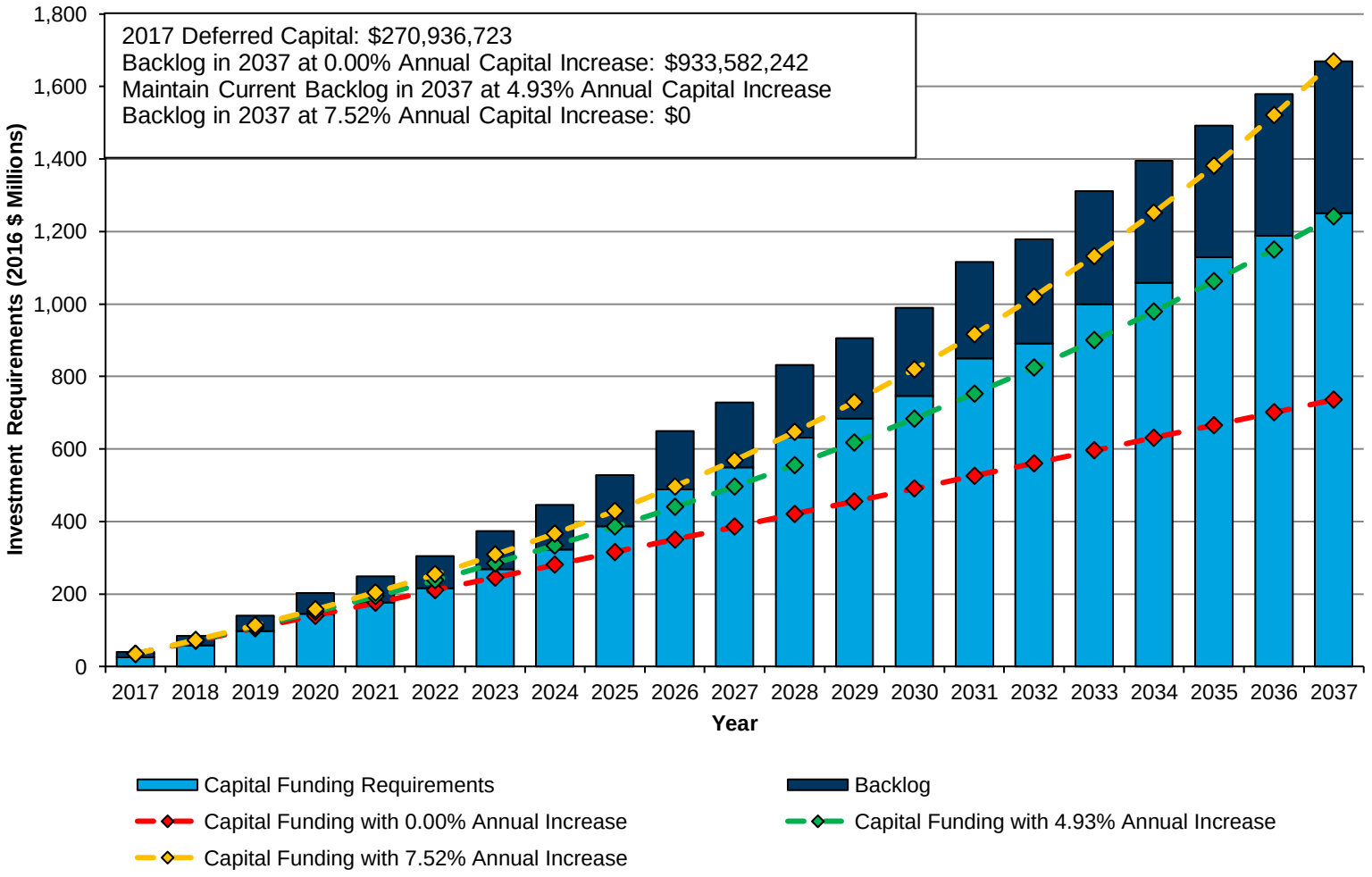


Note:

* *Revenues include various funding sources including the tax base, development charges, and grants and subsidies. This forecast does not include water, wastewater or stormwater asset systems or revenues.*

** *1982-2015 average annual Non-Residential Building Construction Price Index (NRBCPI) increase of 3.7 per cent applied to future investment needs to account for inflation.*

Figure 70. 20-Year Cumulative Capital Investments vs. Revenues (Rate Supported)



Note:

* *Revenues include various funding sources including the water, wastewater, and stormwater rates, development charges, and grants and subsidies. This forecast only includes water, wastewater or stormwater asset systems and revenues.*

** *1982-2015 average annual Non-Residential Building Construction Price Index (NRBCPI) increase of 3.7 per cent applied to future investment needs to account for inflation.*

The assumption of the analysis does not consider impacts to levels of service, and the associated acceptable levels of performance from the assets needed to support these services. It assumes, instead, industry standard timeframes for major rehabilitation or replacement work to the asset to ensure performance. Levels of Service can dictate these timeframes through a process of determining preferred levels of service, and acceptable asset performance in supporting these services. Reducing the acceptable level of service can reduce the funding gap. Reduction of the levels of service, however, can also result in other negative consequences and increased risks.

For example, consider a reduction in the frequency of servicing a recreation centre's dehumidification centre, and a plan to run to fail of this item. Lowering the frequency of inspections, and associated minor repairs, will result in an immediate cost reduction, allowing the funding allocated to this item to be reallocated to other initiatives. However, by reducing the maintenance, the performance of the system is also likely to be reduced. This can mean that occupant comfort will be reduced, resulting in an increase in complaints concerning temperature and humidity, or even higher frequencies of asset failures. All surrounding equipment and finishes will be exposed to higher levels of humidity, potentially resulting in quicker decay and failure. The asset itself will experience a shortened life span because critical issues may go unnoticed, or unresolved, and the dehumidification system itself may fail unexpectedly, resulting in loss of revenue and negative publicity. It is essential to carefully assess all decisions, and potential consequences, before committing to a course of action, and to balance out the risks, levels of service, condition requirements, and costs with one another.

The tax-funded capital work, in particular, will struggle with shortfalls of funding that cannot be compensated for, either through reductions of services or condition expectations, and will be untenable to mitigate through debt financing. In these instances, it will be particularly important to engage in risk analysis to identify these areas beforehand, and allow staff to prioritize investment funding in advance. This will allow identification of which assets are low priority, or can be run to failure if the need arises, and where funding can be redirected from with the least negative consequences.

Page intentionally left blank.

6 Improvement and Monitoring

One of the goals of this asset management plan was to establish a baseline of the current asset management practices, to inform a work plan for continuous improvement of the Corporate Asset Management Program. Any assumptions made and opportunities identified have been documented to serve as the basis for continuous improvement. This section, presents the proposed continuous improvement program in terms of two components:

- Actions related to improving future asset management plans; and
- Actions to advance the City's overall asset management capabilities.

Where possible, the benefits and costs of the proposed actions are included to support planning processes.

9.1 Improving Future Asset Management Plans

The future improvement initiatives to minimize gaps in this asset management plan are categorized by section, and identified below:

9.1.1 Improvements to Existing Sections

9.1.1.1 Section 1: Introduction

- None at this time.

9.1.1.2 Section 2: State of the Assets

The majority of the actions related to the state of the assets section are based upon improving data accuracy, in particular:

- Conducting condition assessments on key asset groups;
- Establishing a centralized asset inventory;
- Updating and improving cost estimates for all key assets; and
- Improving lifecycle analysis tools for more automation and incorporation of various deterioration curves.

9.1.1.3 Section 3: Desired Levels of Service

Incorporate the following key sub-sections:[24]

- Customer Research and Expectations:
  - Background and customer research undertaken and proposed approach to future consultation; and
  - Details of how knowledge of customer requirements has been considered in setting levels of service.
- Strategic and corporate goals:

[24] *Adapted from the IPWEA (2015) International Infrastructure Management Manual, p. 4|37*

    - Organization strategic goals and impacts on levels of service.
- Legislative Requirements:
    - Incorporate additional background legislation or regulations that will affect asset operation or require certain levels of service.
- Current Levels of Service:
    - Define current levels of service being provided by the assets;
    - Identify related performance measures; and
    - Incorporate how the City compares to other organizations.
- Desired Levels of Service:
    - Provide details on the level of service desired if different from what is being provided, and what options have been considered in determining that level of service; and
    - Provide details of the differences between current and desired levels of service and how these gaps will be progressively closed.

9.1.1.4 Section 4: Lifecycle Management Strategies

Addition of the following sections:

- Non-Infrastructure:
    - Detailed forecast and itemized list of non-infrastructure projects and initiatives.
- Operations and Maintenance:
    - Documentation of trends (i.e. past expenditures, complaints) and issues;
    - Maintenance decision making processes (planned and unplanned);
    - Defining maintenance strategies, methods to meet the required levels of service;
    - How maintenance tasks are prioritized;
    - Risks associated with alternative maintenance standards;
    - Forecast of planned and unplanned operations and maintenance work cost; and
    - Quantification of deferred maintenance and associated risks.
- Renewal/Replacements:
    - Define how replacements/renewals are identified and to what standards they are replaced (i.e. modes of failure, options for treatment, risk);
    - End of life projections; and
    - Renewal decision making processes.
- Expansions:
    - Selection criteria: Formal procedure to rank asset creation/acquisition projects.
    - Capital Investment strategies: Strategies to ensure the new asset best meets the needs of the organization and are complete on time to the required standard and cost, covering:
        - Value management during the design phase;
        - Procedures and criteria for assessment of design options (including consideration of lifecycle costs, optimized renewal decision making and risk assessment);
        - Project management procedures and project review;
        - Quality assurance and audit trails for design and project management; and
        - Risks associated with alternatives and how these will be managed.
- Disposals:
    - Forecast future disposal of assets including timing and costs; and
    - Cash flow forecast of income/expenditure from asset disposal.

9.1.1.5 Section 5: Financial Strategy

Add the following sections:

- Valuation Forecasts:

    - Forecast the future value of asset and valuation methodology
    - Forecast depreciation.
- Key Assumptions made in the Financial Forecasts:
    - Documentation of the key assumptions made in the forecasts and the risks that they might change.
- Forecast Reliability and Confidence:
    - Sensitivity analysis quantifying the variations in the forecasts resulting from possibly scenarios relating to variations of the key assumptions.

9.1.1.6 Section 6: Improvement and Monitoring

Include the following:

- Status of Asset Management Practices:
    - Current and desired state of Asset Management processes, data and systems.
- Improvement Program:
    - Details of actions proposed and timetables for improving accuracy and confidence in the asset management plan, indicating responsibility of each actions; and
    - Details of resources required to implement the improvement program.
- Monitoring and Review Procedures:
    - Procedures and timetable for performance reporting (e.g. independent audits, self-assessments etc.).
    - Timetable for external audit and review (of process, data integrity and level of service).
- Performance Measures:
    - Outline performance measures for the asset management system; and
    - Describe hoe the effectiveness of the asset management plan will be measured.

9.1.2 New Sections to be added

9.1.2.1 Future Demand (to be added before Section 4: Lifecycle Management Strategies)

This new section will provide details of growth forecasts which affect the management and utilization of assets, and will include:

- Demand Drivers:
    - Factors influencing demand – anticipated changes in customer expectations, changes in technology, population changes, economic changes, etc.
- Demand Forecasts:
    - Details of projected growth or decline of demands on services.
- Demand Impacts on Assets:
    - Impacts of changes in demand on assets (utilization/capacity, load/condition).
- Demand Management Plan:
    - Non-asset solutions available as alternatives to asset-based solutions (i.e. demand management, insurance, managed failures).
- Asset Programs to Meet Demand:
    - Major programmes and costs. Details to be linked with the “Expansions” categories in the Lifecycle management plan.

9.1.2.2 Risk Management Plan (to be added before Section 7: Financial Summary)

This new section will detail the processes of identifying risks that may affect the ongoing delivery of services from infrastructure, including the risk context (probability, consequence, and risk rating tables):

- Critical Assets:
    - How critical assets are identified and managed.

- Risk Assessment:
    - Approach to assessing risks, referencing the City's Enterprise Risk Management Framework; and
    - Top risks and how they will be managed.
- Risk Management and Resilience:
    - A summary of the approaches and strategies to manage the risks and resilience (such as business continuity planning, new infrastructure, assessments etc.); and
    - A summary of the key outcomes of the above, including cost/benefit analysis.

9.2 Advancing Corporate Asset Management Capabilities

As has been mentioned earlier in this document, there are a number of industry standards for asset management that have been released in recent years including:

- ISO 55000;
- International Infrastructure Management Manual, 2015; and
- BSI PAS55:2008.

Each of the above standards have been developed over a number of years based on international collaboration, and are widely regarded as best practices in the field of asset management. Each of them defines the key principles of asset management maturity, and includes frameworks upon which an organization can evaluate its maturity and diagnose opportunities to advance maturity and capabilities in asset management.

The Global Forum on Maintenance and Asset Management[25] defines asset management maturity as:

> *"The extent to which the capabilities, performance and ongoing assurance of an organisation are fit for purpose to meet the current and future needs of its stakeholders, including the ability of an organisation to foresee and respond to its operating context."*

In order for the City to evaluate the current capabilities and develop a work plan towards asset management maturity, the City plans to conduct periodic internal audits of the asset management system. In 2016, an audit was completed by the Corporate Asset Management Division according to the Institute of Asset Management's Self-Assessment Methodology Plus[26] (Institute of Asset Management, 2015) and the maturity scale from the 2015 International Infrastructure Management Manual (IPWEA, 2015).[27]

The outcome of the assessment is a rigorous analysis that identifies performance gaps and strengths across a range of domains and will help guide the City on our maturity path. Separate detailed assessments have been completed against the International Infrastructure management Manual, 2015, which also is based upon ISO 55000, as well as a specific assessment against the ISO 55000 clauses. **Figure 71** provides a radar chart that shows the evaluated current maturity, against the overall target maturity. This chart provides a visual tool to evaluate gaps against targets for the asset management system. It should be noted that this represents a corporate-wide perspective, and it is challenging to generalize across all asset systems. A formal review with each asset system is planned to be completed in 2017 to 2018 to detail work plans by asset system. An overall work plan has been developed to work

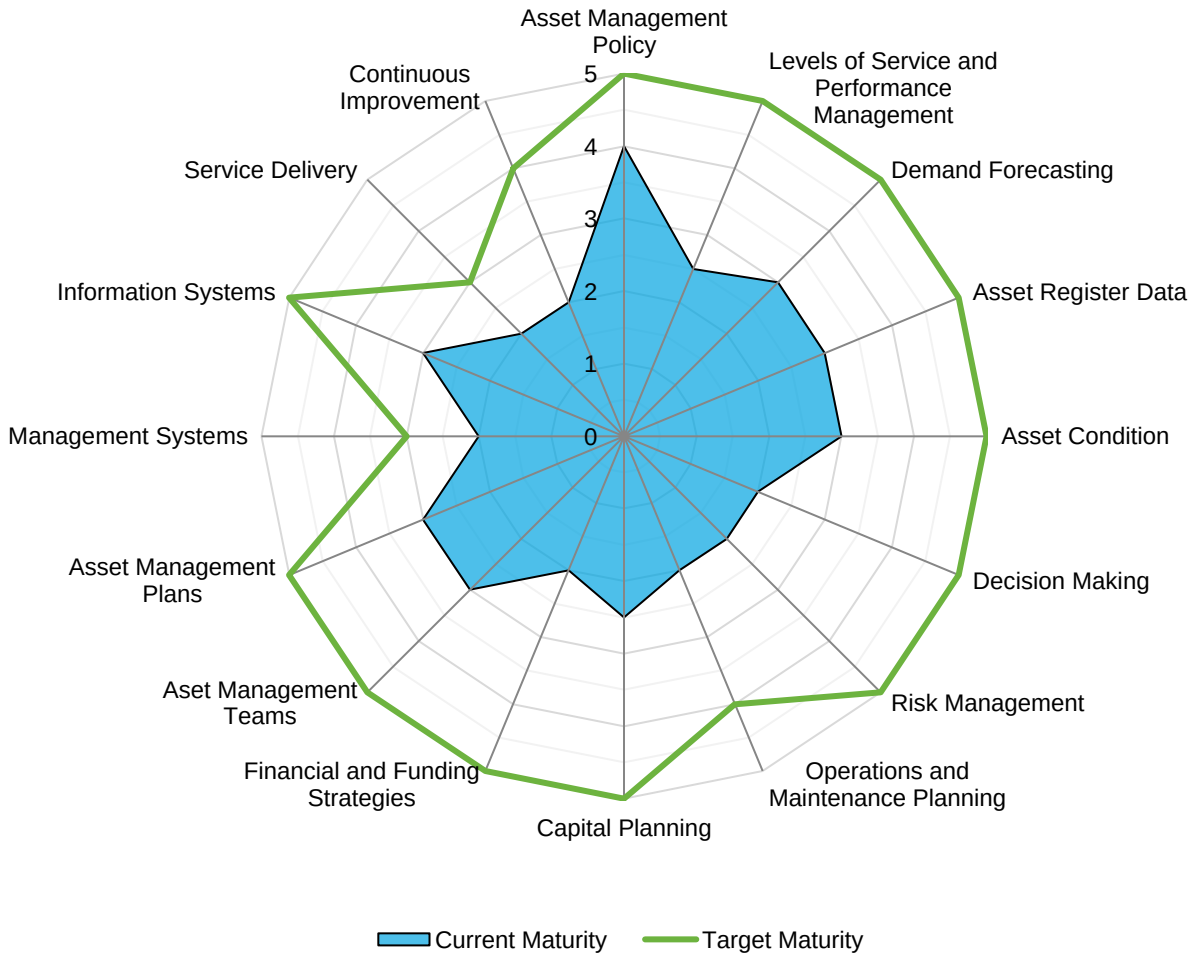
[25] *GFMAM. (2015). Asset Management Maturity - A Position Statement. Global Forum on Maintenance and Asset Management. Zürich: Global Forum on Maintenance and Asset Management. doi:978-0-9870602-4-2, p.5*

[26] *Institute of Asset Management. (2015). The Self-Assessment Methodology Plus. London: The Institute of Asset Management.*

[27] *IPWEA. (2015). International Infrastructure Management Manual, International Edition. Institute of Public Works Engineering Australasia. North Sydney: IPWEA.*

towards advancing asset management maturity as shown in **Figure 72**. A description of the current and target maturity, as well as the related work plan items are included in **Appendix D**.

Figure 71. Current and Target Asset Management Maturity based on the IIMM and ISO55000



The proposed work plan aims to build upon the City's existing strengths to develop a leading Corporate Asset Management Program that balances costs, opportunities and risks against the desired levels of service, to achieve the organizational objectives. The long-term vision is that the Asset Management activities are fully developed, embedded and integrated across all departments, and continuously being improved.

As an outcome of the internal reviews, and development of this plan, key opportunities for asset management improvement initiatives to advance the City's alignment with global industry best practices have been identified. These opportunities have been used as the basis to develop the Corporate Asset Management work plan presented in the next section. Each opportunity, the targeted benefits, the proposed timeline, and estimated costs are presented in **Table 34**. As previously mentioned, a description of the current and target maturity, as well as the related work plan items are included in **Appendix D**.

Table 34. 2016-2020 Asset Management Work Plan Initiatives

ID	Work Plan Item	Timing	Targeted Benefits	Estimated Costs*
1.1	Asset Management Governance Structure	2016 (Complete)	▪ Facilitates knowledge sharing, collaboration, coordination of works, and asset management improvement activities. ▪ Clearly defines roles and responsibilities. ▪ Promotes collaboration and reduces silos.	Internal
1.2	Asset Management Policy	2016-2017 (Complete)	▪ 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.	Internal
1.3	Corporate Asset Management Plan	2016-2017 (Complete)	▪ Clarifies the vision for Asset Management and provides a mandate and direction for City staff. ▪ Forms the basis of discussion with Council regarding the impact on levels of service and changes to the capital works budget. ▪ Provides a business case for the long term financial forecasts. ▪ Provides a commitment to long term planning and improvement to Asset Management.	Internal
1.4	Asset System Management Plans	2018-2020	▪ Establishes long term plans (typically 20 years or more for infrastructure assets) that outline the asset activities for each asset system, and resources to provide a defined level of service in the most effective way. ▪ Establishes detailed road map for future asset management activities by asset system.	Internal
1.5	Asset Management Policy Update	2018	▪ Updates to incorporate any best practices, strategic document, or regulatory changes.	Internal
1.6	Corporate Asset Management Plan Update	2019	▪ Updates to incorporate improvement initiatives (identified in section 9.1.1, p. 111).	Internal
2.1	2017-2026 Capital Budget	2016 (Complete)	▪ Development of detailed decision making frameworks and tools for engineering budget. ▪ Development of Engineering Capital Project Inventory, to enable forecasting for 10-15 years.	Internal
2.2	2018-2027 Capital Budget	2017	▪ Development and incorporation of results from asset management initiatives and asset system management plans.	Internal
2.3	2019-2028 Capital Budget	2018		Internal

ID	Work Plan Item	Timing	Targeted Benefits	Estimated Costs*
2.4	2020-2029 Capital Budget	2019	▪ Comprehensive, prioritized 10-15 year forecasts for all asset systems.	Internal
2.5	2021-2030 Capital Budget	2020		Internal
3.1	Asset Full Lifecycle Costing Models	2017	▪ Quantification of full project lifecycle costs, based on assumed unit rates for use in options analysis.	Internal
4.1	Integrated Capital Planning Process Development	2016-2017 (in progress)	▪ Improved efficiency running integration analysis. ▪ Optimization of approximately 60 per cent of the City's overall capital budget.	Internal
4.2	Decision Support System Functional Review	2018	▪ Identification of functional requirements for a potential decision support system. ▪ Understanding of the needs prior to selecting preferred system.	$100,000
4.3	Asset Management Decision Support System	2019-2020	▪ Facilitates faster analysis, and will result in internal analysis efficiencies. ▪ AM staff can spend more time optimizing and analyzing, rather than collating data. ▪ Improved confidence in analysis results.	$500,000
5.1	Asset Responsibility Review	2017-2018	▪ Clear understanding of who is responsible for what aspect of the asset lifecycle. ▪ Establishment of budget requirements based on defined responsibilities.	Internal
6.1	Water, Wastewater and Stormwater Master Plan	2020	▪ Understanding of future demands and expansion requirements. ▪ Coordinated long range plan to address demand and expansion requirements.	$500,000
7.1	Asset Hierarchy and Register	2016-2018 (in progress)	▪ Provides a robust database for enabling most asset management functions. ▪ Increase the confidence in recommendations and decisions. ▪ Facilitate coordination between departments and service areas. ▪ Improved planning of budgets due to improved historical data and analysis capabilities.	Internal
7.2	Water, Wastewater, and Stormwater GIS Data Modelling	2017	▪ Improving the confidence in recommendations and decisions. ▪ Reduce call-outs for locates in locations where there are no known assets. ▪ Improve capital budgeting analysis.	$250,000
8.1	Enterprise Asset Management (EAM) Implementation (CMMS)	2017-2018	▪ Tracking of maintenance activities and resources to assets and locations. ▪ Facilitates advanced lifecycle analysis of assets.	Internal
8.2	Continuous EAM Improvement, Operationalization and Support	2019-2020	▪ Support to ensure that the business processes are implemented, and ensure quality of data. ▪ Development of analysis dashboards and tools.	Internal
9.1	Corporate Level of Service Framework	2017-2018	▪ Outlines the required service outputs from each asset.	$200,000

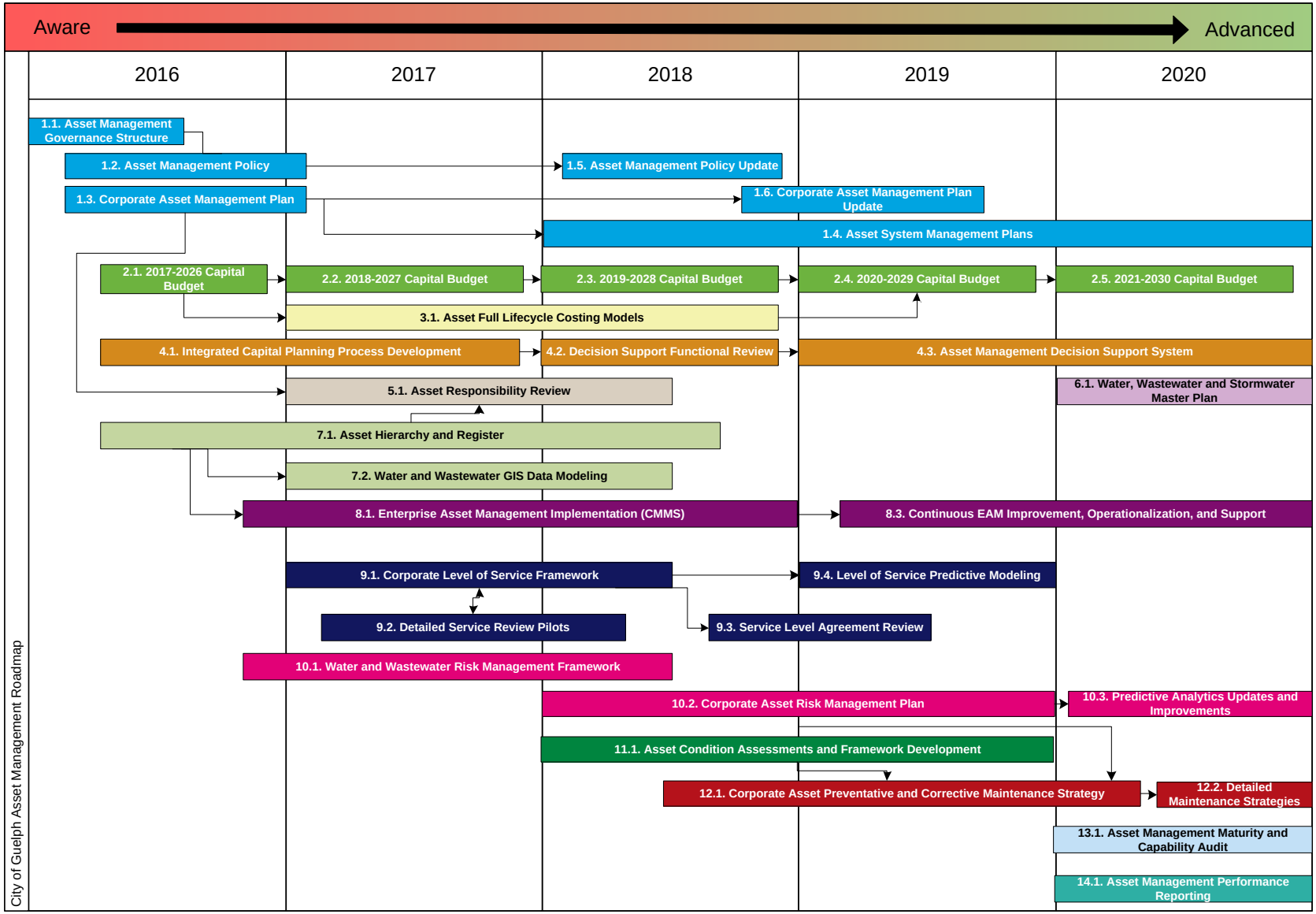
ID	Work Plan Item	Timing	Targeted Benefits	Estimated Costs*
9.2	Service Reviews and Corporate Accountability Framework	2017-2018	▪ Identifies service output targets to support organizational objectives. ▪ Provides mechanism to balance the cost of service and the quality (or level) of service.	Internal
9.3	Service Level Agreement Review	2018-2019	▪ Review and development of service level agreements within the City to assist in clarifying roles and responsibilities.	Internal
9.4	Level of Service Predictive Modelling	2019	▪ Provides tools to simulate the long-term impacts of decisions on levels of service and key performance indicators.	Internal
10.1	Water, Wastewater and Stormwater Risk Management Framework	2017-2018	▪ Clear understanding of risks and critical infrastructure. ▪ Develops strategies to minimize the risk of catastrophic failure of assets which could cost millions to repair. ▪ Develops tools to predictively forecast risks.	$350,000
10.2	Corporate Asset Risk Management and Prioritization Framework	2017-2018	▪ Enables clear evaluation and communication of risks. ▪ Enables identification of critical and vulnerable infrastructure. ▪ Enables development of targeted risk management strategies. ▪ Enables identification of potential failures and generation of proactive capital and maintenance programs. ▪ Facilitates management and tracking of levels of service	$150,000
10.3	Predictive Analytics Updates and Improvements	2019-2020	▪ Advances and improves tools to enable more efficient and effective analysis.	Internal
11.1	Asset Condition Assessment Framework Development	2018-2019	▪ Identifies frequencies to better understand assets and levels of service. ▪ Enables clear analysis of current condition of assets, which directly feeds into informed decision-making. ▪ Assists in allocating funding to the most critical assets and assists in risk management.	Internal
12.1	Corporate Asset Preventative and Corrective Maintenance Strategy	2018-2019	▪ Establishes current maintenance activities, best practices activities, frequencies and budget impacts. ▪ Aims to extend asset lifecycles through preventative maintenance strategies. ▪ Maps out resource and financial requirements to meet agreed upon levels of service.	Internal
12.2	Detailed Maintenance Strategies	2020	▪ Based upon 12.1, development of details maintenance strategies, standard operating procedures, and business processes to ensure successful and enduring implementation.	$130,000

ID	Work Plan Item	Timing	Targeted Benefits	Estimated Costs*
13.1	Asset Management Maturity and Capability Audit	2020	▪ Independent audit of asset management system maturity and capabilities to develop an improvement work plan for the next five years. ▪ Understanding of key gaps, opportunities, and a work plan moving forward.	$100,000
14.1	Asset Management Performance Reporting	2020	▪ Mechanisms to report progress on asset management to the Executive Team. ▪ Tools, techniques and KPIs to report annual progress and opportunities. ▪ Cost benefit analysis of level of asset management sophistication.	Internal

Note:

* *Costs are conceptual estimates only and are subject to change as the scope and purpose is defined.*

Figure 72. Proposed Asset Management Work Plan 2016-2020



7 Conclusions

The City of Guelph's 2017 Corporate Asset Management Plan is the first asset management plan developed and published by the City. This Plan outlines processes and practices in place to ensure the delivery of the City's services over the next 10 years. Although various service areas have developed mature processes with respect to asset management, the City's overarching asset management practices are relatively early in development, with a number of targeted strategies identified to advance the overall level of practice over the next few years.

Table 35 provides an overview of the replacement value and condition rating of City-owned assets. Overall, the City's asset portfolio has approximately 46 per cent remaining service life (weighted by replacement value). Of the portfolio, approximately 30 per cent, or $1.2 billion in assets are within the poor and very poor rating categories. Of these, $491 million are beyond their typical service lives.

Table 35. Asset System Ratings Based on Service Life and Condition

Asset System	2016 Replacement Value	Remaining Service Life (%)	Rating Category	Assets Below 40 Per cent Remaining Service Life	
				%	2016 Replacement Value
Administrative Facilities	$110.7 million	54%	Fair	17%	$19.3 million
Contaminated Sites	N/A	N/A	N/A	N/A	N/A
Corporate Vehicles and Equipment	$39.6 million	46%	Fair	33%	$13.3 million
Culture and Recreation	$295.8 million	-2%	Very Poor	52%	$155.1 million
Emergency Services	$77.8 million	71%	Good	12%	$9.4 million
Information Technology	$7.2 million	-1%	Very Poor	52%	$3.7 million
Parking	$57.8 million	-5%	Very Poor	72%	$41.6 million
Transportation	$1,549.3 million	61%	Good	13%	$195.9 million
Solid Waste	$58.7 million	44%	Fair	25%	$14.6 million
Stormwater	$558.2 million	52%	Fair	28%	$156.0 million
Transit	$76.7 million	22%	Poor	64%	$49.0 million
Wastewater	$559.7 million	31%	Poor	45%	$250.2 million
Water	$615.5 million	43%	Fair	45%	$279.6 million
Digital and Non-Digital Records	N/A	N/A	N/A	N/A	N/A
Total	**$4,007.0 million**	**46%**	**Fair**	**30%**	**$1,187.6 million**
Replacement Value Per Household	**$75,886**				**$22,492**

Note:

* *Value used in the financial analysis and condition rating. A reduced number was used due to missing information such as installation dates.*

In 2017, the City is embarking on several key initiatives that will help define levels of service over the long term. The vision is that the City will establish the key level of service requirements, and better understand the relationship between the levels of service and costs to provide the service. The City is developing tools and techniques to predictively model levels of service over time. The key initiatives that are currently or planned to be underway include: A corporate level of service initiative (Corporate Asset Management); Service reviews (Project Management Office and Corporate Asset Management); and corporate performance and accountability framework (Chief Administrative Officer's Office).

This plan also highlights lifecycle activities which are tied to lifecycle funding forecasts. The activities were categorized into non-infrastructure, maintenance, renewal/rehabilitation, replacement, disposal, and expansion activities. A comparison of various funding levels against the cumulative lifecycle funding requirements for 20 years was completed. In 2017, tax-supported asset systems have approximately $220 million in deferred capital, which has been spread over 20 years for the purpose of the analysis, resulting in an additional $11 million per year. Annual increases of zero per cent and one per cent would result in backlogs of $962 million, and $839 million by 2037, respectively. A 5.68 per cent annual capital investment increase would be required to eliminate the backlog by 2037.

Rate supported asset systems (namely, water, wastewater and stormwater asset systems), have approximately $271 million in deferred capital, which has been spread over 20 years is an additional $14 million per year. A zero per cent annual increase would result in a backlog of $772 million by 2037. An 6.64 per cent annual capital increase would be required to eliminate the backlog by 2037.

It should be noted that the analysis considers only capital funding, and does not consider the current reserve position. Therefore, the percentage annual increase does not specifically correlate to a direct increase to rates or the tax levy, and could potentially be funded from a variety of sources, including but not limited to existing reserves or grants and subsidies. In future asset management plans, further analysis is to be completed by asset system to evaluate options for funding.

One of the goals of this asset management plan was to establish a high-level baseline of the asset management practices, which will inform a work plan to continually improve the asset management maturity. Throughout this process, any assumptions and opportunities have been documented to serve as the basis of a continuous improvement program. This plan presented a proposed continuous improvement program in terms of two components:

- Actions related to improving future asset management plans; and
- Actions to advance the City's overall asset management capabilities.

Asset management will continue to provide a mechanism for reliable, repeatable, and transparent decision making. However, asset management is more than just a project, and to realize the full benefits, the principles should be systematically developed, embedded and integrated across all asset-owning departments, and be continuously improved

.

8 Works Cited

[1] "Canada's Best Places to Live". Canadian Business Online. Archived from the original on 2012-02-24. Retrieved 2008-03-18.

[2] "Guelph recognized as one of Canada's top ten cities". Guelph.ca. 2009-04-16. Archived from the original on 2008-12-25. Retrieved 2012-02-20.

[3] Statistics Canada. Table 282-0135 - Labour force survey estimates (LFS), by census metropolitan area based on 2011 Census boundaries, 3-month moving average, seasonally adjusted and unadjusted, monthly (persons unless otherwise noted) [Online: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=2820135&&pattern=&stByVal=1&p1=1&p2=37&tabMode=dataTable&csid=]. Retrieved November 19, 2016.

[4] Statistics Canada (2016) Table 3 – Police-reported Crime Severity Index and crime rate, by census metropolitan area [Online: http://www.statcan.gc.ca/daily-quotidien/160720/t003a-eng.htm]. Retrieved November 19, 2016.

[5] ISO/IEC. (2014). ISO International Standard ISO/IEC 55000:2014(E) – Asset management – Overview, principles and terminology. Geneva, Switzerland: International Organization for Standardization (ISO)

[6] Ministry of Infrastructure Ontario (2012) Building together – Guide for municipal asset management plans [Online: https://www.ontario.ca/page/building-together-guide-municipal-asset-management-plans]. Retrieved November 19, 2016.

[7] AECOM (2012) The City of Guelph Sustainable Infrastructure Report. AECOM, Kitchener, Ontario. [Online: http://guelph.ca/wp-content/uploads/SustainableInfrastructureReport_ExecSummary_Sept2012.pdf]. Retrieved November 26, 2016.

[8] City of Guelph (2015) 2015 Infrastructure Report Card, Infrastructure, Development and Enterprise Committee. City of Guelph, Ontario [Online: http://guelph.ca/wp-content/uploads/info_items_103015.pdf]. Retrieved November 26, 2016.

[9] The Canadian Infrastructure Report Card Website [Online: http://canadianinfrastructure.ca/en/index.html]. Retrieved November 26, 2016.

[10] Statistics Canada (2016) Table 327-0043 Price indexes of non-residential building construction, by class of structure, annual [Online: http://www5.statcan.gc.ca/cansim/a47]. Retrieved November 22, 2016

[11] Canadian Construction Association (CCA), the Canadian Public Works Association (CPWA), the Canadian Society for Civil Engineering (CSCE) and the Federation of Canadian Municipalities (FCM) (2016) Canadian Infrastructure Report Card: Informing the Future. Figure 5. [Online: http://canadianinfrastructure.ca/downloads/Canadian_Infrastructure_Report_2016.pdf#page=5]. Retrieved November 26, 2016.

[12] For more details, see [Online: http://www.mto.gov.on.ca/english/highway-bridges/ontario-bridges.shtml]. Retrieved November 26, 2016.

[13] City of Guelph (2012) CAO-A-1203 Enterprise Risk Management Framework. Staff Report. [Online: http://guelph.ca/wp-content/uploads/EnterpriseRiskManagementStaffReport.pdf] Retrieved November 26, 2016

[14] For a full description of the NWWBI performance indicators visit [Online: http://www.nationalbenchmarking.ca/]. Retrieved November 26, 2016.

[15] PCI surveying processes and calculation methods have been standardized by ASTM for both roads and airport pavements:
- ASTM D6433 - 11: Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys
- ASTM D5340 - 11: Standard Test Method for Airport Pavement Condition Index Surveys

[16] Google Maps. (May 2015). Webster St retrieved 27 November 2016 https://www.google.ca/maps/@43.5802732,-80.267371,3a,75y,330.3h,82.13t/data=!3m6!1e1!3m4!1sm0rbQXZgMSt7A9dWtuOPOw!2e0!7i13312!8i6656

[17] Google Maps. (June 2014). Applewood Crescent, retrieved 27 November 2016.https://www.google.ca/maps/@43.5419679,-80.2794756,3a,90y,308.83h,87.78t/data=!3m6!1e1!3m4!1sio3yrEytqUV4T5WVcgsBxg!2e0!7i13312!8i6656

[18] Google Maps. (June 2016). Alma St retrieved 27 November 2016 https://www.google.ca/maps/@43.5371157,-80.2643913,3a,75y,127.97h,81.16t/data=!3m6!1e1!3m4!1sbN3advEKFyOx8Af2yyyl5A!2e0!7i13312!8i6656!6m1!1e1

[19] Google Maps. (June 2016). Ironwood Road retrieved 27 November 2016 https://www.google.ca/maps/@43.5157588,-80.2305419,3a,75y,213.45h,64.66t/data=!3m6!1e1!3m4!1sR7R92KuS-bbOz7gJiJizxQ!2e0!7i13312!8i6656

[20] Google Maps (June 2014) Bristol Street, retrieved on November 27, 2016 https://www.google.ca/maps/@43.5372817,-80.2515195,3a,75y,93.28h,59.92t/data=!3m6!1e1!3m4!1sLYPxcUw247Ec7BnISw6GeQ!2e0!7i13312!8i6656

[21] Ontario Good Roads Association (2009) Pavement Condition Index 101, OGRA's Milestones V9#4,pp 30-42. [Online: http://hawaiiasphalt.org/wp/wp-content/uploads/PCI-101.pdf] Last Accessed November 27, 2016.

[22] Extracted from the Ministry of Infrastructure (2012) Building Together Guide for Municipal Asset Management Plans.

[23] City of Guelph (2014) By-Law 2014-19771 [Online: http://guelph.ca/wp-content/uploads/PurchasingBylaw.pdf] Retrieved November 26, 2016.

[24] Adapted from the IPWEA (2015) International Infrastructure Management Manual, p. 4|37

[25] GFMAM. (2015). Asset Management Maturity - A Position Statement. Global Forum on Maintenance and Asset Management. Zürich: Global Forum on Maintenance and Asset Management. doi:978-0-9870602-4-2, p.5

[26] Institute of Asset Management. (2015). The Self-Assessment Methodology Plus. London: The Institute of Asset Management.

[27] IPWEA. (2015). International Infrastructure Management Manual, International Edition. Institute of Public Works Engineering Australasia. North Sydney: IPWEA.

Appendix A

Strategic Asset Management Policy

Page intentionally left blank.

Appendix B

Condition Assessment Status Summary

Page intentionally left blank.

CORPORATE POLICY AND PROCEDURE

POLICY	**Strategic Asset Management Policy**
CATEGORY	Corporate
AUTHORITY	All Departments
APPROVED BY	City Council
EFFECTIVE DATE	May 07, 2018
REVISION DATE	April 05, 2018

Alternative formats are available as per the Accessibility for Ontarians with Disabilities Act by contacting Daryush Esmaili at 519-822-1260 extension 2765.

1 TERMS AND DEFINITIONS

For consistency, terminology in all official asset management documents shall be consistent with ISO 55000:2014(E) – International Standard for Asset Management[1].

For the purposes of this document, the following definitions apply:

TERM	DEFINITION
Asset	An Item, thing or entity that has potential or actual value to an organization. Note: Value is the importance, worth, or usefulness of something. Potential value is the value of the asset that is contingent on the occurrence of stated assumptions.
Asset Management	Coordinated activity of an organization to realize value from assets.

[1] *ISO/IEC. (2014). ISO International Standard ISO/IEC 55000:2014(E) – Asset management – Overview, principles and terminology. Geneva, Switzerland: International Organization for Standardization (ISO).*

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.
Asset Management System	The people, processes, tools and other resources involved in the delivery of asset management.
Asset System	Set of assets that interact or are interrelated.
Corporate Asset Management	The application of asset management principles at a corporate level to maximize consistency among diverse asset groups. Corporate asset management creates efficiency by harmonizing service levels and business processes wherever possible.
Lifecycle	Stages involved in the management of an asset.
Level of Service	Parameters or a combination of parameters, which reflect social, political, environmental and economic outcomes that the organization delivers.

2 BACKGROUND

The City of Guelph is responsible for provision of a diverse array of services which are dependent on over $4 billion in assets. An integral component of ensuring reliable service is creating an effective approach to managing existing and future municipal assets. Effective asset management aims to manage assets in a way that balances levels of service, risk, and cost effectiveness throughout the entire asset lifecycle. Ultimately, adopting effective and comprehensive asset management strategies across the organization will support the long term sustainability and efficiency while maintaining levels of service.

The City produced its first Corporate Asset Management Policy in 2013, which detailed the City's key objectives for asset management, and established a baseline that Guelph has continued to build on. In the summer of 2016, the Corporate Asset Management division was formed to coordinate the development and advancement of the City's Corporate Asset Management system.

3 POLICY STATEMENT

This policy details the principles and general framework for a systematic and coordinated approach to asset management in order to achieve the organization's asset management objectives, guided by the Corporate Administrative Plan 2016-2018.

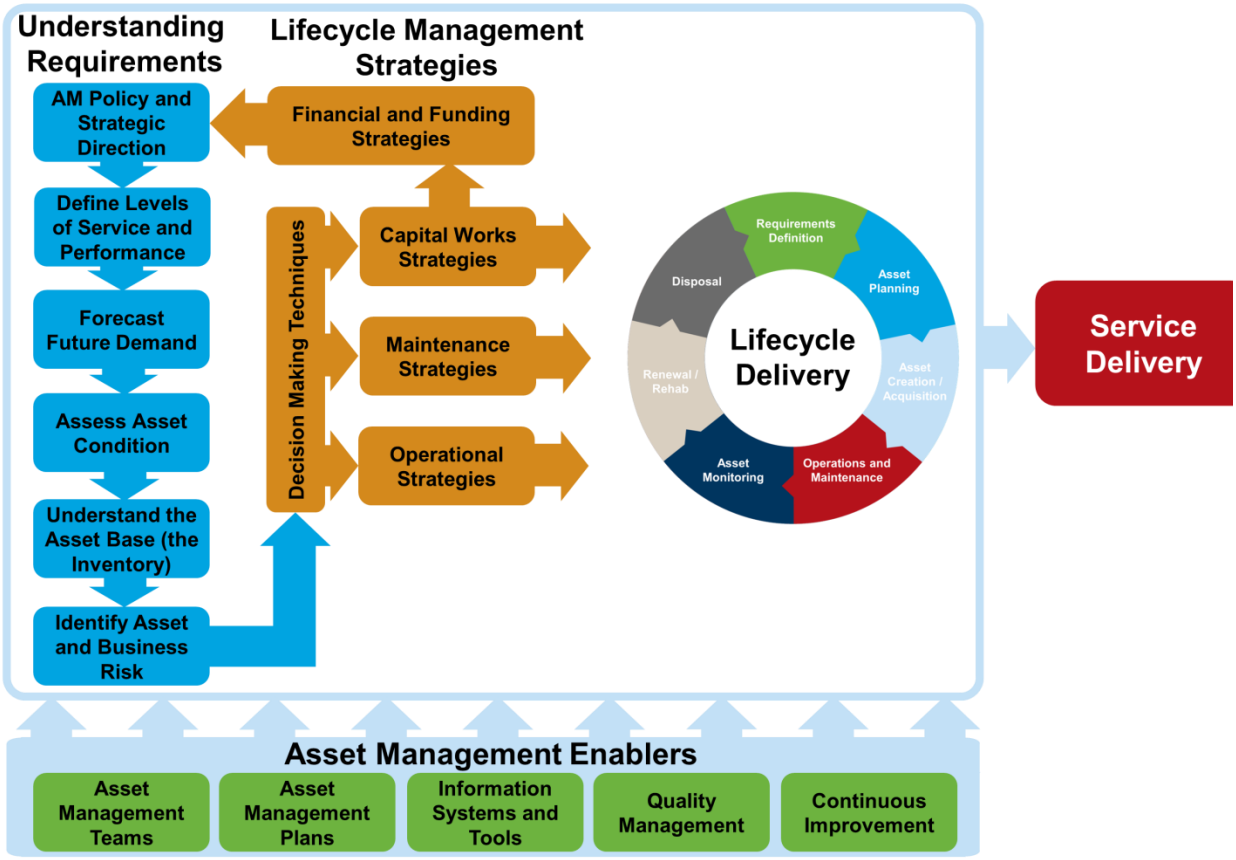
4 SCOPE OF THE ASSET MANAGEMENT SYSTEM

4.1 Components of the Asset Management System

The City's asset management system can be categorized into the key processes and resources shown within **Figure 1**. The asset management processes include:

- **Functional Processes:** The processes involved in understanding and defining requirements, and asset lifecycle management strategies; and
- **Enabling Processes/Resources:** The supporting processes and resources that make the functional processes possible.

Figure 1. The Asset Management Process



4.2 Key Documents in the Corporate Asset Management System

The Asset Management System will incorporate the development and implementation of several documents. The key documents within the City's asset management system are depicted in **Figure 2**, and described in sections **4.2.1** to **4.2.4**.

Figure 2. Key Documents in the Asset Management System

4.2.1 Strategic Asset Management Policy

The Asset Management Policy shall guide the overall direction of the asset management system, providing clear direction as to the appropriate focus and level of asset management practice expected. It shall establish the key principles, overall mission and goals for the program, and be guided by the Organizational Strategic Plan and the Corporate Administrative Plan.

4.2.2 Asset Management Strategy

The Asset Management Strategy documents the intended approach by which the assets and other resources will be used to achieve the agreed upon objectives within the agree Policy framework. It provides clear direction, overall intentions and rationale. In addition, the asset management strategy identifies the organizational readiness to achieve the objectives, including identification of barriers and appropriate implementation plans to overcome the barriers.

4.2.3 Corporate Asset Management Plan

The Corporate Asset Management Plan shall detail the intended asset management programs at a corporate level to allow the City to understand and target service levels and the asset portfolio's capability to meet those requirements. This plan shall be developed to meet the requirements of the Building Together – Guide for

Municipal Asset Management Plans,[2] and the guidelines within the International Infrastructure Management Manual, 2015.[3]
Asset management plans are also to be developed based on consideration of principles outlined under section 3 of the Infrastructure for Jobs and Prosperity Act, 2014, and be informed by:

- An understanding of current and future asset condition, needs and costs,
- An understanding of risks and the City's ability to manage risks relating to assets, including disaster planning and any required contingency planning;
- Accessibility standards and other related standards;
- Changing demographics, including population growth or decline; and
- Ontario's land-use planning framework, including any relevant policy statements issued under subsection 3 (1) of the Planning Act, any provincial plans as defined in the Planning Act and the municipality's official plan.

As part of asset management planning, the following considerations are to be included:

- The actions that may be required to address the vulnerabilities that may be caused by climate change to the municipality's infrastructure assets, in respect of such matters as:
    - Operations, such as increased maintenance schedules;
    - Levels of service; and
    - Lifecycle management.
- The anticipated costs that could arise from the vulnerabilities described above;
- Adaptation opportunities that may be undertaken to manage the vulnerabilities described above;
- Mitigation approaches to climate change, such as greenhouse gas emission reduction goals and targets; and
- Disaster planning and contingency funding.

Assets in the asset management plan are not to be subject to a capitalization threshold, and are to be included based upon judgement of whether the asset has value to the organization. The capitalization threshold applied in the municipality's tangible capital asset policy is $10,000.

[2] *Infrastructure Ontario (2016) Building Together – Guide for Municipal Asset Management Plans. Ottawa, Canada. Queen's Printer of Ontario.*
[3] *IPWEA (2015) International Infrastructure Management Manual. North Sydney, Australia. IPWEA.*

Asset management plans shall identify activities to be undertaken, with consideration of the full lifecycle of assets, for at least the ten years following the preparation of that plan or update. In addition, they will document key assumptions made within the plan. Asset management plans are to be updated at no longer than 4 year intervals.

4.2.4 Asset Portfolio Management Plans

Asset Portfolio Management Plans shall be specific, targeted plans developed through collaboration with the departments who manage each aspect of the asset lifecycles and service. These plans shall further refine the Corporate Asset Management Plan to allow a customized, targeted plan that best supports the daily functions, service and demand levels, and anticipated needs for that asset system. The asset system plans will detail budget requirements and projects that will feed into the City's overall budget.

4.2.5 Relationship between Asset Management Plans, Budgets and Financial Plans

The outcomes and background data generate through the development of the asset management plans shall form the basis for infrastructure-related long-term financial plans. During the annual budgeting process, projects and funding levels shall be reviewed against the background data and results of the asset management plans. The City's asset management planning should be aligned with any of the following financial plans:

- Financial plans related to the City's water assets including any financial plans prepared under the Safe Drinking Water Act, 2002.
- Financial plans related to the City's wastewater assets.

5 ASSET MANAGEMENT MISSION, GOALS AND PRINCIPLES

5.1 Asset Management Mission

Our mission is to protect and enhance the quality of life in Guelph by making the best possible decisions regarding our assets in a way that provides targeted levels of service and manages risk in a cost-effective manner throughout the entire asset lifecycle.

5.2 Asset Management Goals

- Provide levels of service that meet expectations and ensure a high quality of life for the community through:
    - Defining levels of service in consultation with stakeholders;
    - Evaluating and communicating the cost of providing the service; and
    - Quantifying the impacts of decisions on service.

- Managing risks through:
    - Understanding risk exposure;
    - Understanding potential vulnerabilities to climate change;
    - Establishing the organization's risk appetite;
    - Developing risk management strategies;
    - Implementing appropriate condition assessment, inspection, and performance evaluation strategies for all relevant assets; and
    - Implementing appropriate climate change adaptation and mitigation strategies.

- Demonstrating sustainable, full lifecycle planning through:
    - Quantifying and tracking the full lifecycle costs for assets;
    - Ensuring budgets are supported by asset management practices; and
    - Bridging the gap between capital and operational budgets.

- Ensuring accountability, transparency and engagement through:
    - Documenting asset management business processes;
    - Publicising asset management documents such that they are accessible to all stakeholders; and
    - Developing stakeholder engagement strategies to ensure that internal and external stakeholders are able to participate, influence, and contribute to asset management initiatives, where appropriate.

5.3 Guiding Principles

The City of Guelph strives to provide exceptional municipal service and value. Asset management at the City is to be guided by the following principles:

Service excellence: Achieving quality and showing results.

- Adopt a whole-organization, all asset approach to asset management that holistically considers the interdependencies between asset systems and services throughout their full lifecycle;

- Meet and comply with all relevant legislation, regulatory and statutory requirements and with other requirements to which the organization subscribes;

- Corporate asset management documents are derived from, and be consistent with, the organizational strategic plan, council shared agenda, long-term municipal goals, organizational policies, budgets, financial plans, and the organization's overall risk management framework;

- Asset management documents are communicated and made available to all relevant stakeholders, including contracted service providers, where there is a requirement that these persons are made aware of their asset management-related obligations; and

- Approach asset management from a collaborative, cross-disciplinary perspective while also regularly engaging with relevant stakeholders to maximize value from the assets and services.

- Provide opportunities for municipal residents and other interested parties to provide input into the municipality's asset management planning.

- Coordinate planning for asset management, where municipal infrastructure assets connect or are interrelated with those of other municipalities, neighbouring municipalities or jointly-owned municipal bodies.

Financial stability: Managing our resources to achieve maximum public value.

- Ensure that asset management principles are applied to tangible and intangible assets, and that value is considered holistically, in aspects such as financial, social (quality of life, community wellbeing, heritage) and environmental.

- Develop and implement an evidence-based, systematic approach to asset management that is transparent and customer-centric;

- Optimize asset decisions based on lowest lifecycle cost, acceptable risk levels and desired levels of service to allow for long-term planning that will enhance service and sustainability while also ensuring resilience and adaptability; and

- Provide an annual update to Council on asset management planning progress, factors affecting the ability to meet commitments outlined in the plan, and a strategy to address any shortcomings.

Innovation: Modernizing our services and how we work.

- Integrate asset data systems where possible to minimize duplication of effort and improve overall information confidence;

- Strive for asset management practices, processes and capabilities to be in-line with current industry best practices;

- Commitment to continual improvement in asset management, the asset management system, asset management maturity, and asset management performance;

- Performance monitoring and benchmarking internally and against other similar organizations;

- Implement and periodically review asset management documents, objectives, and requirements to ensure that they remain relevant and consistent with the organizational plans and other relevant organizational policies; and

- Annual internal reviews and an independent audit of the asset management system at no longer than 5 year intervals.

6 REVIEW PERIOD

The policy is to be reviewed by the Asset Management Steering Committee annually, and following any changes in regulatory requirements, or updates to the Corporate Strategic Plan or Corporate Administrative Plan.

City Staff shall report to Council on asset management progress and on or before July 1 in each year. The annual review must address:

- The City's progress in implementing its asset management plan;
- Any factors impeding the City's ability to implement its asset management plan; and
- A strategy to address the identified factors.

7 ROLES & RESPONSIBILITIES

7.1 Council

- Approve the strategies and plans as proposed by the Corporate Asset Management Division by a resolution passed by the City Council;

- Serve a representatives of stakeholder and community needs; and

- Approve funding for both capital and operating budgets associated with Asset Management through the annual budget.

7.2 Executive Team and Executive Lead

- Review and approve documents and strategies proposed by the Asset Management Steering Committee, where the implications are organization-wide or external;

- Endorse every asset management plan and policy;

- Participate in the process of aligning asset management strategies and plans with organizational strategies and objectives; and

- Communicate the vision of asset management at a corporate level, encourage engagement with the processes, and provide the guidance necessary to ensure alignment and integration across the organization.

7.3 Corporate Asset Management Steering Committee

- Provide corporate support for asset management;

- Coordinate financial, strategic planning, information technology and asset management activity;

- Establish policies and practices that ensure uniformity of approach across the organization;

- Encourage information sharing and collaboration across departments;

- Provide a corporate pool of asset management expertise that can build capability in areas of lower experience;

- Provide input and direction to Corporate Asset Management work plans to ensure consistency with other initiatives;

- Establish and peer review asset management policies, practices, plans, and other related documents;

- Disseminate Steering Committee information within their department where necessary;

- Champion the asset management process within the respective department;

- Ensure organization-wide accountability for achieving and reviewing corporate asset management goals and objectives;

- Coordinate with other related steering committees where required; and

- Lead the effective implementation of corporate asset management initiatives.

7.4 Corporate Asset Management Division

- Liaise with other departments in service areas relating to asset management, including convening asset management teams (specific to each service area), and ensuring project work is consistent with asset management objectives;

- Liaise with external stakeholders in relation to asset management matters;

- Develop an overall corporate asset management policy, strategy, and confirm the implementation plan/resource requirements;

- Coordinate the development of asset management plans and facilitate peer reviews;

- Coordinate asset management improvement programs including writing briefs for asset management improvement projects and preparing, monitoring and reporting on the overall asset management planning budgets;

- Carrying out selected asset management improvement tasks as appropriate;

- Lead the development of asset inventories, condition assessments, risk assessments and related asset management initiatives in line with industry best practices;

- Work with asset management information systems staff to ensure systems development and functionality meets asset management needs; and

- Continuous improvement of the City's Asset Management capabilities.

7.5 Asset System Working Groups and Service Providers

- Provide input on needs of department, current status of assets, and current levels of service;

- Support and comply with data collection requirements related to their areas of expertise;

- Participate in the development of the Asset Management Work Plans pertaining to their areas of expertise; and

- Participate in the regular review of all documentation, data, and asset measurement tools to ensure continued relevance and applicability of existing policies and practices as pertains to their area of expertise.

7.6 Residents, Stakeholders and Customers

- Participate in public information sessions, and stakeholder engagement initiatives, where possible;

- Provide feedback related to levels of service, service experience, and service expectations; and

- Notify the City, via appropriate means, when service deficiencies or failures are observed.

8 PERSONS RESPONSIBLE FOR ASSET MANAGEMENT PLANNING

8.1 Executive Lead

Scott Stewart, C.E.T.,
Deputy Chief Administrative Officer
Infrastructure, Development and Enterprise Services
Phone: 519-822-1260, ext. 3445
Email: scott.stewart@guelph.ca

8.2 Corporate Asset Management Sponsor

Kealy Dedman, P.Eng.,
General Manager/City Engineer
Engineering and Capital Infrastructure Services
Phone: 519-822-1260, ext. 2248
Email: kealy.dedman@guelph.ca

8.3 Corporate Asset Management

Daryush Esmaili, M.A.Sc., PMP.,
Manager of Corporate Asset and Project Management
Engineering and Capital Infrastructure Services
Phone: 519-822-1260 ext. 2765
Email: Daryush.Esmaili@guelph.ca

9 CONTACT INFORMATION

For more information about this policy, or questions related to asset management at the City, please contact:

Daryush Esmaili
Manager of Corporate Asset and Project Management,
City of Guelph
1 Carden St, Guelph, ON, N1H 3A1
Phone: 519-822-1260 ext. 2765
Email: Daryush.Esmaili@guelph.ca

Appendix B. Condition Assessment Status Summary

Asset System	Level 2	Level 3	O&M Inspections	Target Condition Assessment Type and Frequency	Rating Scale / Index	Most Recent Assessment	Assessment Update Required?
Administrative Facilities	Civic	City Hall	Daily	Five-year non-destructive assessment	FCI	2010 (Partial)	Yes
		Courthouse	Daily	Five-year non-destructive assessment	FCI		Yes
		Operations Facility	Daily	Five-year non-destructive assessment	FCI	2010	Yes
	Commercial	Commercial Buildings	As required	Five-year non-destructive assessment	FCI	2010 (Partial)	Yes
		Daycare Centre	As required	Five-year non-destructive assessment	FCI	2010	Yes
Contaminated Sites			As per EPA guidelines			Ongoing	
Corporate Vehicles and Equipment	Signs	Construction Signs	As required	Annual retroreflectivity assessment	Custom / Age	2015	Yes
	Equipment	Heavy Equipment	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
		Medium Equipment	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
		Small Equipment	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
		Generators	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
	Vehicles	Heavy Vehicles	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
		Medium Vehicles	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
		Light Vehicles	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
Culture and Recreation	Cultural Facilities and Spaces	Libraries	Monthly	Five-year non-destructive assessment	FCI	2007	Yes
		Museums	Monthly	Five-year non-destructive assessment	FCI	2010 (Partial)	Yes
		Theatres	Monthly	Five-year non-destructive assessment	FCI	2006	Yes

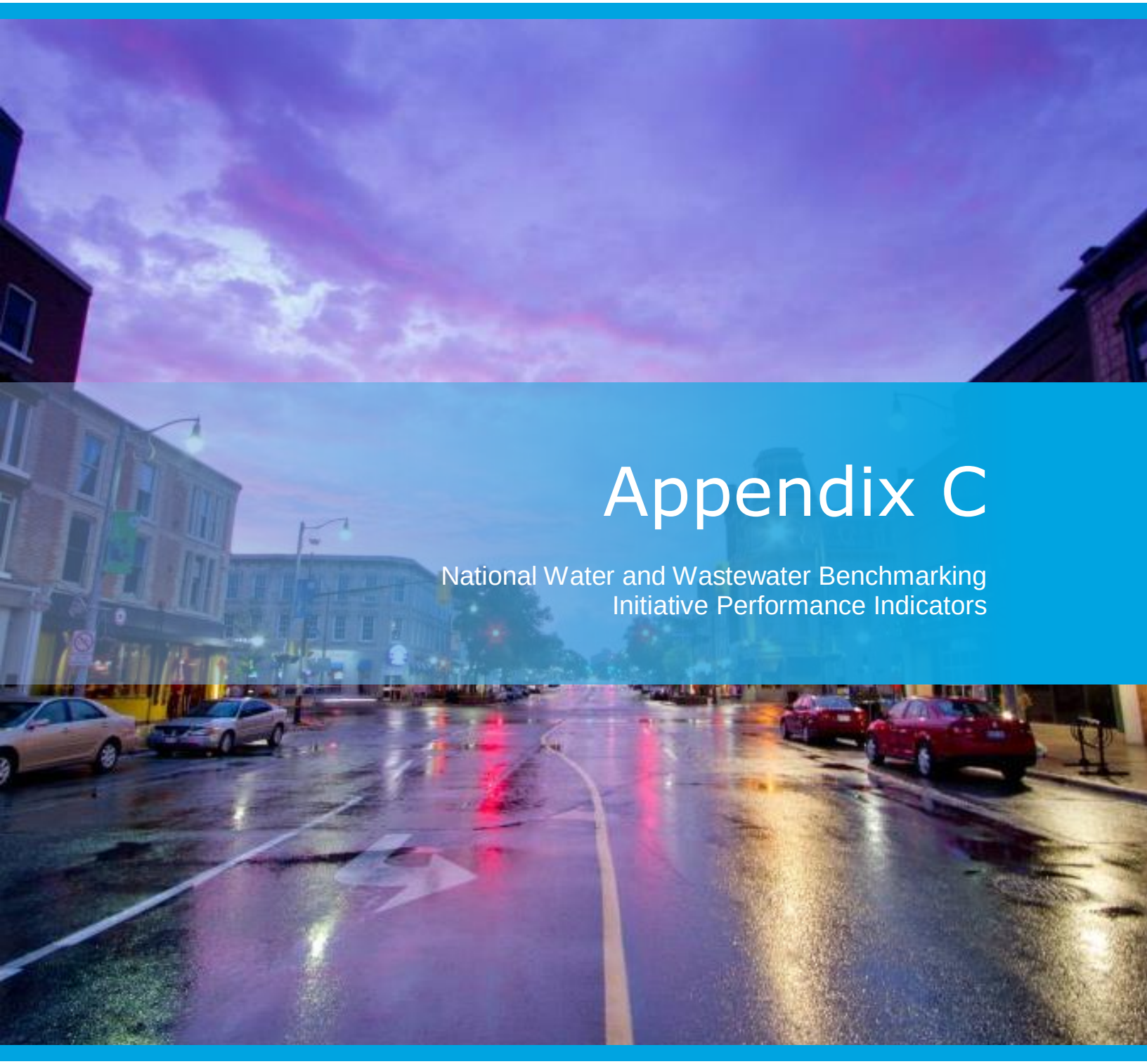
Asset System	Level 2	Level 3	O&M Inspections	Target Condition Assessment Type and Frequency	Rating Scale / Index	Most Recent Assessment	Assessment Update Required?
		Bandshell	Monthly	Five-year non-destructive assessment	FCI	2014	Yes
	Equipment	Equipment	Manufacturer	Manufacturer / Regulation			
	Forestry	Trees	Yearly			2016	
	Open Space	Parks	Weekly				
		Natural Space	As required				
	Sports and Recreation	Community Centre	Daily	Five-year non-destructive assessment	FCI	2006	Yes
		Recreation Centre	Daily	Five-year non-destructive assessment	FCI	2006	Yes
		Arena	Daily	Five-year non-destructive assessment	FCI	2006	Yes
		Stadium	Daily	Five-year non-destructive assessment	FCI	2010	Yes
		Skate Parks	Daily (seasonal)	Five-year non-destructive assessment	FCI	N/A	In 2021
		Washrooms, Change Rooms and Concessions	Daily	Five-year non-destructive assessment	FCI	2014	Yes
	Trail Network	Paved Trails	Per MMS	Five-year non-destructive assessment	PCI		Yes
		Unpaved Trails	Per MMS	Five-year non-destructive assessment	PCI		Yes
	Water Features	Fountains	Daily (seasonal)		Custom / Age		Yes
		Splash Pads	Daily (seasonal)		Custom / Age		Yes
Emergency Services	EMS	EMS Station	Monthly	Five-year non-destructive assessment	FCI		Yes
		EMS Vehicles	Manufacturer / Regulatory		Custom / Age		
	Fire	Fire Equipment	Manufacturer / Regulatory		Custom / Age		
		Fire Vehicles	Manufacturer / Regulatory		Custom / Age		

Asset System	Level 2	Level 3	O&M Inspections	Target Condition Assessment Type and Frequency	Rating Scale / Index	Most Recent Assessment	Assessment Update Required?
		Fire Halls	Monthly	Five-year non-destructive assessment	FCI	2007	Yes
	Police	Police Station	Monthly	Five-year non-destructive assessment	FCI		Yes
		Police Vehicles	Manufacturer / Regulatory		Custom / Age		
Information Technology	Devices	Communication Device	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Computer	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Computer Accessory	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Display	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Storage Device	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Power Device	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Printing and imaging	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
	Networks	Network Accessories	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Network Cabling	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Network Device	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Server	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
		Server Chassis	Manufacturer / SLA	Manufacturer / SLA	Custom / Age		
Parking	Equipment	Meter	Manufacturer / Regulatory	As required	Custom / Age		
	Spaces	Parking Garage	Monthly	Two-year non-destructive assessment	FCI	2016	
		Parking Lot	Monthly	Annual pavement assessment	PCI	2016	

Asset System	Level 2	Level 3	O&M Inspections	Target Condition Assessment Type and Frequency	Rating Scale / Index	Most Recent Assessment	Assessment Update Required?
		Street Parking	Daily	As required	N/A	N/A	
Solid Waste	Facilities	Landfill	Daily		N/A	Ongoing	
		Waste Resource Innovation Centre	Monthly	Two-year non-destructive assessment	FCI		Yes
	Vehicles	Heavy Vehicles	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
Stormwater	Stormwater Drainage	Culverts (<3m)	As required	Annual risk-based CCTV program	PACP	2016	
		Pipes and appurtenances	As required	Annual risk-based CCTV program	PACP	2016	
		Inlets/Outlets	As required	As required	PACP		
	Stormwater Management	Channel/Ditch	As required	As required	Custom		Yes
		SWM Pond	Monthly	Five-year non-destructive assessment	Custom	2015	
		Oil and Grit Separator	Annually	Annual assessment	Custom	2016	
Transit	Facilities	Station	Monthly	Five-year non-destructive assessment	FCI	2010	Yes
		Terminal	Monthly	Five-year non-destructive assessment	FCI	2010	Yes
		Operations Yard	Monthly	Five-year non-destructive assessment	FCI	2010	Yes
		Bus Stop	As required	Five-year non-destructive assessment	FCI	2010	Yes
	Vehicles	Bus	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
		Light Vehicle	Manufacturer / Regulatory	Manufacturer / Regulatory	Custom / Age		
Transportation	Bridges	Bridge	Per MMS	OSIM every two years	BCI	2015/16	
	Structures	Culverts (>3m)	Per MMS	OSIM every two years	BCI	2015/16	
		Façade	As required	Five-year non-destructive assessment	Custom		Yes
		Inlet/Outlet	Annual	As required	Custom		Yes
		Platform	Per MMS	OSIM every two years	BCI		Yes

Asset System	Level 2	Level 3	O&M Inspections	Target Condition Assessment Type and Frequency	Rating Scale / Index	Most Recent Assessment	Assessment Update Required?
		Retaining Wall	Per MMS	OSIM every two years	BCI	2015 (Partial)	Yes
		Ruins	As required	As required	N/A		Yes
		Steps	Per MMS	OSIM every two years	Custom		Yes
		Tunnel	Per MMS	OSIM every two years	BCI	2016	
	Pavement	Laneway	Per MMS	Two-year automated assessment	PCI	2016	
		Roads	Per MMS	Two-year automated assessment	PCI	2016	
	Railway Crossings		Per MMS	Annual visual assessment	Custom / Age	2016	
	Sidewalks	Asphalt	Per MMS	Annual visual assessment	Custom	2016	
		Brick	Per MMS	Annual visual assessment	Custom	2016	
		Concrete	Per MMS	Annual visual assessment	Custom	2016	
	Signs	Overhead Signs	Per MMS	Two-year OSIM inspection	Custom	2015	
		Pole Mounted Signs	Per MMS	Annual retroreflectivity assessment	Custom	2015	
	Streetlighting	LED	As required	As required	Age		Yes
		High pressure sodium	As required	As required	Age		Yes
	Traffic	Controller	Per MMS	As required	Age		
		Intersection	Per MMS	As required	Age		
		Traffic Duct	Per MMS	As required	Age		
Wastewater	Facilities	Pump Station	Monthly	Five-year non-destructive assessment	FCI / Custom	2010	Yes
		Wastewater Treatment Plant	Daily	Five-year non-destructive assessment	FCI / Custom	2010	Yes
	Pipe Network	Wastewater Collection	As required	Annual risk-based CCTV program	PACP	2016	
Water	Facilities	Water Treatment Plants	Daily	Five-year non-destructive assessment	FCI / Custom	2016	
		Water Storage Facilities	Monthly	Five-year non-destructive assessment	FCI / Custom	2016	

Asset System	Level 2	Level 3	O&M Inspections	Target Condition Assessment Type and Frequency	Rating Scale / Index	Most Recent Assessment	Assessment Update Required?
		Water Pumping Facilities	Monthly	Five-year non-destructive assessment	FCI / Custom	2016	
	Pipe Network	Water Distribution System	As required	Annual desktop assessment and leak detection program	Custom	2016	



Appendix C

National Water and Wastewater Benchmarking Initiative Performance Indicators

Page intentionally left blank.

Appendix C-1. Water Utility Benchmarking Data

Goal	Performance Measure
Ensure Adequate Capacity	# of Hours of Treated Water Storage Capacity at Average Day Demand
Meet Service Requirements with Economic Efficiency	Cost of Water Quality Monitoring / Population Served
	Cost of Customer Billing (Water) / Total # of Service Connections
	Total Cost to Provide Water / Population Served
	Administrative Overheads / Population Served
Protect the Environment	Cost of Water Conservation Program / Population Served
	# of Days of Water Restrictions
	Per Capita Average Day Consumption for Residential Customers
Have Satisfied and Informed Customers	# of Water Quality Customer Complaints / 1,000 People Served
Protect Public Health and Safety	*Connections Affected by Boil Water Advisory / 1000 Service Connections*

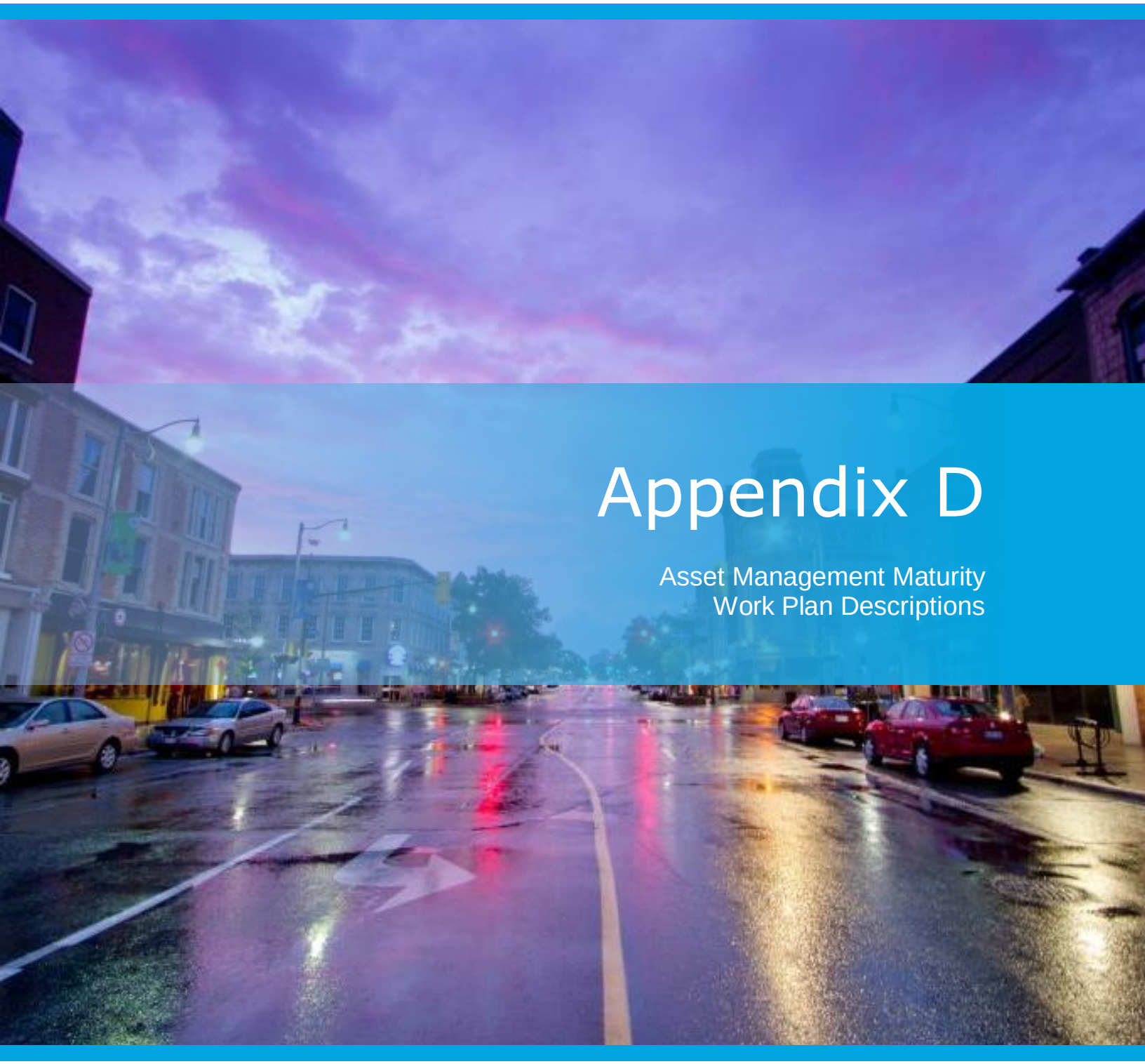
Appendix C-2. Water Distribution System Benchmarking Data

Goal	Performance Measure
Provide Reliable Service and Infrastructure	# of Main Breaks / 100 km Length
	% of Valves Cycled
	% of Inoperable or Leaking Valves
	Non-Revenue Water (L/connection/day)
	% of Hydrants Inspected and Winterized
	% of Inoperable or Leaking Hydrants
	# of Emergency Service Connection Repairs & Replacements / # of Service Connections
	# of Unplanned System Interruptions / 100 km Length
	Total Customer Days without Service / Total # of Service Connections
	5-Year Running Average Capital Reinvestment / Replacement Value
	Total Corrective Maintenance Hours / Total Maintenance Hours
	Total Maintenance Hours / km Length
	System Length Tested for Leakage / km Length
Meet Service Requirements with Economic Efficiency	# of O&M FTEs / 100 km Length
	Total # of FTEs / 100 km Length
	# of Inhouse Metering Field FTEs / 1,000 Meters
	O&M Cost ('000) / km Length
	Pump Station O&M Cost ('000) / Total Pump Station Horsepower
	Pipes O&M Cost ('000) / km Length
	Metering O&M Cost / # of Meters
	Pump Station Energy Consumed kWh / Total Pump Station Horsepower
	Cost of Fire Hydrant O&M / # of Fire Hydrants
Provide a Safe and Productive Workplace	# of O&M Accidents with Lost Time / 1,000 O&M Labour Hours
	# of Lost Hours Due to O&M Accidents / 1,000 O&M Labour Hours
	# of Sick Days Taken per O&M Employee
	Total Available O&M Hours / Total Paid O&M Hours
	Total Overtime O&M Hours / Total Paid O&M Hours
Have Satisfied and Informed Customers	# of Water Pressure Complaints by Customers / 1,000 People Served

Goal	Performance Measure
Protect Public Health and Safety	% of Cumulative Main Length Cleaned
	Average Value for Turbidity (NTU)
	# of Total Coliform Occurrences
	Average Value for THMs (mg/L)

Appendix C-3. Water Treatment Plant Benchmarking Data

Goal	Performance Measure
Provide Reliable Service and Infrastructure	5-Year Running Average Capital Reinvestment / Replacement Value
	Unplanned Maintenance Hours / Total Maintenance Hours
Ensure Adequate Capacity	Average Day Demand / Existing Water License Capacity
Meet Service Requirements with Economic Efficiency	# of O&M FTEs / 1,000 ML Treated
	O&M Cost / ML Treated
	Energy Consumed in kWh / ML Treated
	Chemical Cost / ML Treated
Protect Public Health and Safety	Average Value for Turbidity (NTU)
	# of Occurrences of Total Coliforms
	Median Value for Nitrates (mg/L)
Provide a Safe and Productive Workplace	# of O&M Accidents with Lost Time 1,000 O&M Labour Hours
	# of Lost Hours due to O&M accidents / 1,000 O&M Labour Hours
	# of Sick Days Taken per O&M Employee
	Total Available O&M Hours / Total Paid O&M Hours
	Total Overtime O&M Hours / Total Paid O&M Hours



Appendix D

Asset Management Maturity Work Plan Descriptions

Page intentionally left blank.

Appendix D-1. Asset Management Maturity Work Plan

Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Asset Management Policy Development	AM System scope is defined and documented. Strategic context (internal, external, customer environment) analyzed and implications for the AM System documented In the Strategic AM Plan	AM Policy and Strategic AM Plan fully integrated into the organization's business processes and subject to defined audit, review and updating procedures.	The City's Asset Management Policy is included in **Appendix A** of this plan. As the Asset System Management Plans are developed in 2018-2019, they will incorporate detailed work plans, resources, responsibilities and timeframes.	2018-2019
Levels of Service and Performance Management	Asset contributions to organization's objectives and some basic levels of service have been defined. Customer Groups defined and requirements informally understood.	Customer communications plan in place. Levels of service are integral to decision making and business planning.	A comprehensive level of service strategy is planned for 2017, which will meet the target requirements. 2017 Capital Project: **Corporate Level of Service Framework**	2017-2018
Demand Forecasting	Demand forecasts on robust projections of a primary demand factor (e.g.: population growth) and extrapolation of historic trends. Risk associated with demand change broadly understood and documented. Demand management considered as an alternative to major project	A range of demand scenarios is developed (e.g. high/medium/low). Demand management is considered in all strategy and project decisions. Risk assessment of different demand scenarios with mitigation actions identified.	Simulation of various demand scenarios is currently being completed across the City. Through the development of a water and wastewater risk management project, planned for 2017, asset vulnerability and criticality will be assessed based on various demand scenarios. Demand scenarios for other asset systems will be developed as required. 2017-2018 Capital Project: **Water and Wastewater Risk Management Plan**	2017-2018

Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Long Range Funding and Financial Strategies	Assets re-valued in compliance with financial reporting and accounting standards. 10-year financial forecasts are based on extrapolation of past trends and broad assumptions about the future. Expenditure categories compliant with FRS.	Asset revaluations have a 'B' grade data confidence. 10-year+ financial forecasts based on current comprehensive AMPs with detailed supporting assumptions / reliability factors. Asset Expenditure easily linked to finance databases. Advanced financial modeling provides sensitivity analysis, demonstrable whole of life costing and cost analysis for level of service options.	The corporate asset management division is currently developing whole life costing models for the City's assets. Tools and techniques to advance the confidence are being developed. Through the Enterprise Asset Management System Implementation project, a two-way integration between the CMMS, GIS, financial system, and human resource system will be created, which will enable better full lifecycle and resource analysis at an asset level.	2017-2019
Asset Register Data	Sufficient information to complete asset valuation (basic attributes, replacement cost and asset age/life) and support prioritization of programs (criticality). Asset hierarchy, identification and attribute systems documented. Metadata held as appropriate.	Information on work history type and cost, condition, performance etc. recorded at asset component level. Systematic and fully optimized data collection program with supporting metadata.	An organization-wide effort is currently underway to develop a reliable register of physical and financial attributes recorded in an information system with data analysis and reporting functionality. Systematic and documented data collection process are being developed to ensure a high level of confidence in critical asset data. Following the EAM project, it will be vital to ensure that the data is maintained over the long term. Current Project: **EAM Implementation**	2017-2019

Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Asset Condition	Condition assessment at asset group level ('top-down). Supports minimum requirements for managing critical assets and statutory requirements (e.g. safety). Condition and performance information is suitable to be used to plan maintenance and renewals to meet over the short term.	The quality and completeness of condition information supports risk management, lifecycle decision-making and financial / performance reporting. Periodic reviews of program suitability carried out. The type, quality and amount of data are optimized to the decisions being made. The underlying data collection program is adapted to reflect the assets' lifecycle stage.	Currently, condition data is limited or out of date for most asset systems. Updates to the assessments are a key recommendation out of this plan, with proposed frequencies included in **Appendix B**. It is proposed that standardized condition assessment protocols be developed, and that a coordinated approach be utilized, to ensure that assessments are based on a benefit- cost analysis of options. Data management is to be defined, with data validation process in place. 2018 Capital Project: **Condition Assessments (multiple asset systems)**	2017-2020
Decision-Making	AM decisions are based largely on staff judgment. Corporate priorities incorporated into decision making.	AM objectives/targets are set based on formal decision making techniques (multi-criteria-analysis/Benefit-cost analysis), supported by the estimated costs and benefits of achieving targets. The framework enables projects and programs to be optimized across all activity areas. Formal risk-based sensitivity analysis is carried out.	Formal decision making and prioritization techniques are proposed to be developed in 2017 at a high level. Through the development of the Asset System Management Plans, opportunities to apply them to all operational and capital asset programs within each main budget category will be evaluated. Tools to conduct sensitivity analysis will be developed in order to simulate risks and levels of service over time. 2017-2018 Capital Project: **Water and Wastewater Risk Management Plan** 2018 Capital Project: **Corporate Asset Risk Management Plan** Internal Projects: **Asset System Management Plans**	2017-2020

Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Risk Management	Risk management is identified as a future improvement. Risk framework developed. Critical services and assets understood and considered by staff involved in maintenance / renewal decisions.	Resilience strategy and program in place including defined levels of service for resilience. Formal risk management policy in place. Risk is quantified and risk mitigation options evaluated. Risk is integrated into all aspects of decision making.	The City currently has an Enterprise Risk Management Framework in place, and a project delivery risk management framework has been implemented. The Corporate Asset Management Division is working on developing risk analysis tools and frameworks in 2017 to assist in key asset management risk-based decision-making. This will set the stage for an overall corporate asset risk management plan to be recommended for 2018, which will aim to develop tools to quantitatively evaluate risks and prioritize consistently across the asset portfolio. 2018 Capital Project: **Corporate Asset Risk Management Plan**	2018-2019
Operations and Maintenance Planning	Operating procedures are available for critical operational processes. Operations organizational structure in place and roles assigned. Compliant with legislation and regulations. Maintenance records maintained.	Risk and opportunity planning completed operational objectives and intervention levels defined and implemented. Alignment with organizational objectives can be demonstrated. Contingency plans for all maintenance activities, Asset failure modes understood. Frequency of major preventative maintenance optimized using benefit-cost analysis. Maintenance management software implemented.	A formalized framework for asset deterioration and predictive modeling is planned for 2017/2018. In addition, a preventative maintenance review is recommended for 2018-2019 to evaluate and map out current and best practice maintenance frequencies. The timing would align well with the full implementation of the Oracle Work and Asset Management System. 2018 Capital Project Recommendation: **Corporate Preventative and Corrective Maintenance Plan**	2018-2019

Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Capital Planning	Capital investment projects are identified during annual budget process. There is a schedule of proposed capital projects and associated costs for the next three to five years, based on staff judgment of future requirements.	Formal options analysis and business case development has been completed for major projects in the three to five-year period. Major capital projects for the next 10-20 are conceptually identified and broad cost estimates are available. Long-term capital investment programs are developed using advanced decision techniques such as predictive renewal modeling.	The City has made significant advancements in capital planning in 2016. Through the development of detailed Asset System Management Plans, decision-making and predictive modeling techniques will be incorporated to support long term capital investment planning. Currently, advanced decision making techniques and predictive modeling tools are being developed for right-of-way assets, ready for full implementation in 2018. Internal Projects: **Annual Capital Budget and Asset System Management Plans**	2017-2020
Financial and Funding Strategies	Assets re-valued in compliance with financial reporting and accounting standards. 10-year financial forecasts are based on extrapolation of past trends and broad assumptions about the future. Expenditure categories compliant with FRS.	Asset revaluations have an 'A' grade data confidence 10-year+ financial forecasts based on comprehensive, advanced AM plans with detailed underlying assumptions and high confidence in accuracy. Advanced financial modeling provides sensitivity analysis, demonstrable whole of life costing and cost analysis for level of service options.	Current financial estimates are based on a number of assumptions and require revising in order to increase confidence. An initial lifecycle forecast has been developed for each asset system, and these will be thoroughly reviewed and updated as part of the development of Asset System Management Plans. Full lifecycle costing models are planned to be developed in 2017. Internal Projects: **Asset Full Lifecycle Costing Models.**	2017

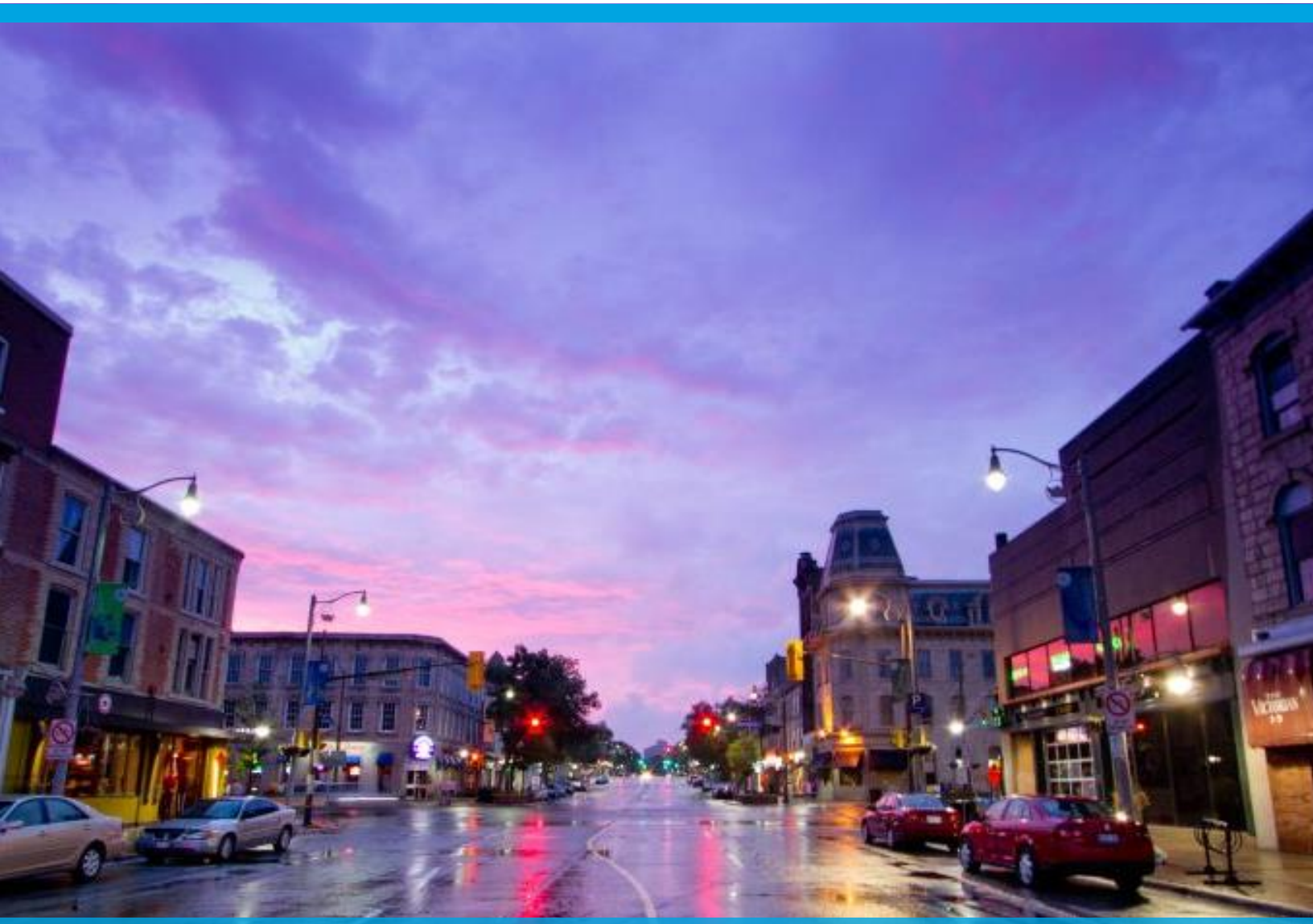
Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Asset Management Teams	Cross-Organization coordination occurs through a Steering Group or Committee. AM training occurs for primary staff. The executive team has considered options for AM functions and structures. Position descriptions incorporate AM roles AM coordination processes established Ownership and support of AM by leadership Awareness of AM across most of the organization	All staff in the organization understands their role in AM, it is defined in their job descriptions, and they receive supporting training aligned to that role. Roles reflect AM requirements and defined in all relevant position descriptions. Formal documented assessment of AM capability and capacity requirements to achieve AM objectives. Demonstrable alignment between AM objectives, AM systems and individual responsibilities	An asset management steering committee and governance structure has been established, and is functioning successfully within the organization. In addition, service area working groups have been established. The roles of each stakeholder are to be established further in the Asset System Management Plans. Training and competency requirements are to be established internally and further through an asset management maturity audit. Internal Projects: **Asset System Management Plans** 2020 Capital Project: **Asset Management Maturity Audit**	2018-2020
Asset Management Plans	AM objectives are defined with consideration of strategic context. Approach to risk and critical assets described, top-down condition and performance assessment, future demand forecasts, description of supporting AM processes, 10-year financial forecasts, three-year AM Improvement plan.	Evidence of programs driven by comprehensive Optimized Decision Making techniques, risk management programs and level of service/cost trade-off analysis. Improvement programs largely complete with focus on ongoing maintenance of current practice.	Through the development of the Asset System Management Plans, along with the improvement plan outlined in Section 7 of this asset management plan, optimized decision making techniques, levels of service, maintenance strategies and ongoing improvement initiatives are to be developed. Internal Projects: **Asset System Management Plans**	2018-2020

Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Management Systems	Simple process documentation in place for service-critical activities.	Process documentation Implemented in accordance with the AM System to appropriate level of detail. Internal management systems are aligned.	An accountability framework is currently in development. An asset management quality management system is in development to align with ISO 55000. Internal audits have been completed; it is recommended that an external asset management maturity audit be completed in three years, to establish a future work plan. 2020 Capital Project: **Asset Management Maturity Audit**	2020
Information Systems	Asset register enables hierarchical reporting (at component to facility level). Customer request tracking and planned maintenance functionality enabled. System enables manual reports to be generated for valuation, renewal forecasting.	Financial, asset and customer service systems are integrated and all advanced AM functions are enabled. Asset optimization analysis can be completed.	The current EAM implementation will enhance the City's CMMS, Financial System, and Human Resource System. There are other initiatives that are operating in parallel such at a new Customer Relationship Management system, project management tools, and GIS improvements. However, none of the City's existing systems provide the ability for automated statistical forecasting and analysis required on a wide range of information. The City is currently reviewing asset management decision support systems on the market, to evaluate business requirements and viability. 2019/2020 Capital Project: **Asset Management Decision Support System**	2019
Service Delivery	Contracting approaches reviewed to identify best delivery mechanism. Tendering / contracting policy in place. Competitive tendering practices applied. Service delivery roles clearly allocated (internal and external), generally following historic approaches.	Core functions defined Procurement strategy / policy in place. Internal service level agreements in place with the primary internal service providers and contract for the primary external service providers.	Following the level of service review project in 2017, key stakeholder groups will be identified, level of service statements developed, and requirements for service level agreements proposed. Any service level agreements currently in place will be reviewed for alignment with the overall Corporate Asset Management Programs.	2018-2019

Asset Management Component	Current Maturity	Target Maturity	How We Plan to Get There	Timing
Continuous Improvement	Improvement actions identified and allocated to appropriate staff.	Improvement plans specify key performance indicators (KPIs) for monitoring AM improvement and these are routinely reported.	Formal monitoring and reporting mechanisms to report on asset management KPIs is to be developed for communication to the Asset Management Steering Committee and Executive Team (where required). Project briefs are to be developed for all key improvement actions.	2020

Note: *Any projects are conceptual only and are subject to approval from Council through the City's annual budgeting process.*

Page intentionally left blank.



Do you have questions about asset management?

If so, we can help! Please feel free to call the Corporate Asset Management Division at 519-822-1260 x 2765 or visit guelph.ca/assets

Making a Difference

Guelph's vision is to be the city that makes a difference…acting locally and globally to improve the lives of residents, the broader community and the world

CITY OF Guelph
Making a Difference