City of Guelph
2021 Core Asset Management Plans

May 2021

Document History

Date	Comment
January 8, 2021	Begin the begin
March 16, 2021	First internal CAPM team review
April 2, 2021	Second internal CAPM team review
April 16, 2021	Revisions incorporating comments from service area staff

Contributors

Several people and groups within the City of Guelph have provided input and feedback through the process of preparing this document. The following table summarizes the roles and responsibilities of those who were involved.

Table 1. List of Contributors to the Core AMPs

Stakeholder Team	Staff	Roles and Responsibilities
Corporate Asset and Project Management	Kevin Nelson Anil Sigdel Charles Knight Jessica Angers Monica Silva Spencer Stroszka-Li Tracey Lesage	• Coordinate and manage the work plan. • Collate asset data (including GIS) • Compile and reconcile asset inventory • Complete analysis of asset values, conditions ages and lifecycle needs • Research levels of service and current asset management strategies • Arrange meetings with asset management working groups • Develop draft and final plan • Address comments with other City Staff • Prepare and publish the final plan
Engineering and Transportation Services, Infrastructure Development and Enterprise	Crystal Kaminski	• General assistance and administrative support
Finance	Greg Clark Karen Newland Tara Baker	• Contributing relevant financial and budget information; reviewing and analysing the 2021-2045 Capital Plan • Analysing the Sustainability Target
Asset Management Steering Committee	All Members	• Provide direction to the overall asset management work plan • Support the development of the asset management plan through ensuring staff availability where required

Stakeholder Team	Staff	Roles and Responsibilities
Executive Management	Stephen O'Brien – DCAO, Infrastructure, Development and Enterprise Services Terry Gayman - General Manager, Engineering and Technical Services	• Review and provide comment on the draft asset management plan • Approve the final asset management plan
City Council		• Endorse and approve the final asset management plan • Approve the final asset management plan for publication.
Service Area Staff		
Roads, Bridges, Traffic	Terry Dooling Bryan Ho-Yan Tracey Lesage Steve Anderson Paul Hutchinson Jennifer Juste Ken Vanderwal	• Provided commentary on asset inventory and condition information • Provided clarity on climate change impacts to the infrastructure • Provided input and metrics for the levels of service analysis • Reviewed draft versions of final report
Water	Bryce McDonald Tara Roumelloitis Wayne Galliher Amanda Pepping Andrea Harvie Annette Indoe	
Stormwater	Terry Dooling Mary Angelo	
Wastewater	Tim Robertson Adam Geldart Jeffrey Beatty	

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Executive Summary – Core Asset Management Plans

Quick Facts

The core asset types – roads (and related assets such as sidewalks, street lighting and traffic controls), bridges, water services, wastewater services and stormwater management – comprise more than 80% of the total infrastructure asset base owned and managed by the City of Guelph. From the analysis completed for the 2020 Corporate AMP the core asset infrastructure is estimated to have a current replacement value (CRV)[1] of $3,585,760,138 out of a total City asset CRV of $4,324,685,333.

The CRV of each asset class included in the Core AMPs is outlined below. For comparison the sum value of all the other asset classes in the City inventory are included in **Table 2** and **Figure 1** below.

Table 2. Core Asset Inventory CRV

Asset Category	2020 CRV	% of Total City Inventory
Roads and Bridges	$ 1,222,163,378	28.19%
Water	$773,972,981	17.85%
Wastewater	$679,843,708	15.68%
Stormwater	$852,780,071	19.67%
Core Assets	**$3,528,760,138**	**81.39%**
All Other Asset Classes	$806,925,196	18.61%

Asset Category	2020 CRV	% of Total City Inventory
Total City Assets	**$ 4,335,685,333**	

Figure 1. Core Assets Inventory CRV
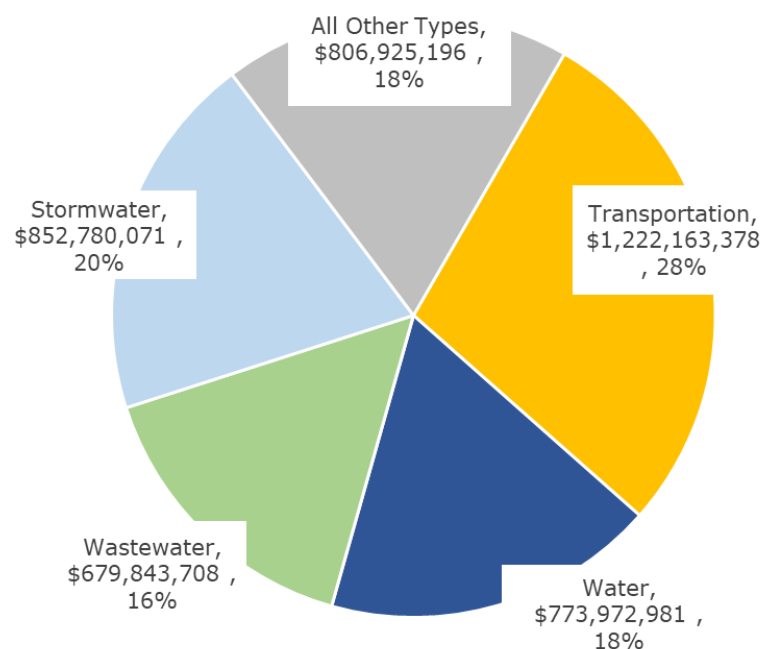
Funding for roads and bridges is provided from tax revenue. Funding for stormwater, water and wastewater is provided through revenue from user rates.

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[1] For a complete definition of asset management terminology used in this report refer to Appendix A.

State of the Core Assets

In general, as seen in Table 2, the distribution of the asset conditions is fairly even across the condition rating categories. This represents a normal and balanced asset inventory – a good situation for the City to be in.

The majority of the core assets are in "fair" or better condition, with 65% of the assets falling in that range. About 6% of the assets with an estimated replacement value of $202M are considered in "past due" condition, indicating that according to either their age or a recent assessment the asset should have been replaced prior to 2020. While the "past due" value is a small percentage of the total inventory, it remains a significant value that will present challenges to address.

Another 38% or $1B worth of assets are in "poor" or "very poor" condition.

Without intervention – such as renewal or replacement – assets in these categories can move into a different condition rating category. While a move from "very good" to "good" may not be a concern, a move from "very poor" to the "past due" can be.

In response to this, the City is aligning capital planning activities with the asset needs identified through the asset management planning process, captured in plans like these. As the analysis process is refined, the City will be better able to identify, and plan for, the most at-risk assets. Because of the very balanced ratio within each condition category, the City is well positioned to plan for, and manage, the asset needs. Funding and general resource constraints must always be considered, but, as asset

management processes mature, and enhanced understanding of asset condition – such as risk ratings and levels of service impacts – the City will be able to develop targeted plans that will provide best return on the investment. Already, the City has taken major steps to implementing this planning process that will be discussed more in later sections.

Figure 2. Condition of Core Assets by CRV
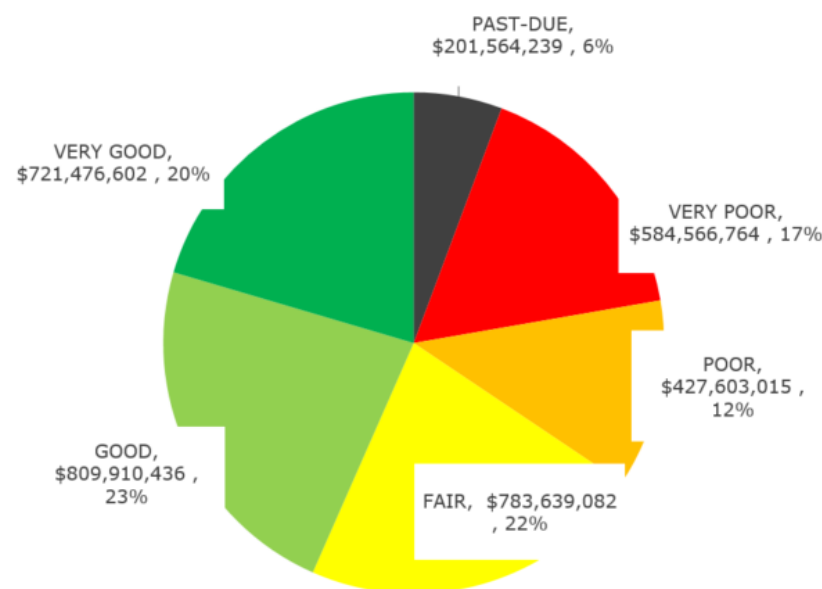
Lifecycle Management and Planning

Renewal and Major Rehabilitation

By summing the 25-year forecast renewal and rehabilitation needs of each asset class in the core asset groups we are able to estimate the funding required over a 25-year period. This includes activities like asset replacements or major renewals as a result of assets reaching the end of their expected useful lifecycle (EUL). It does not include maintenance and growth.

The 25-year estimated total funding need is $1,689M ($1.67B) or an annual average need of $66.8M over the next 25 years from 2021 to 2045.

The ten-year total estimated funding needs – between 2021 and 2030 – are $689M with an annual average of $68.9M over ten (10) years.

The value of work that is considered as "past due" – work that should have been completed prior to 2020 but was not - is estimated at $201.6M, or about 5.7% of the total core assets portfolio value. The overall condition of the core assets is "fair", but the past-due value remains a significant challenge to lower.

Table 3 summarizes both the value of past-due work by core asset type, and the corresponding total costs over both a 25- and 10-year timeframe. This will later be compared to the currently approved 25- and 10-year budget. It is a graphic representation of the annual funding needs for all core assets based the analysis completed by the City. The 2020 past-due value is included in this analysis and has been equally distributed over the next ten (10) years in order to reduce the potential impact of trying to fund the entire value of past-due work in a shorter time period. Strategic planning will help prioritize the past-due needs.

Additional analysis is needed to determine what, if any, impacts the currently approved funding levels will have on being able to address past-due requirements.

The graph shows that the lifecycle needs of the core assets are not evenly distributed across the 25-year period. There are three years – 2026, 2028 and 2040 – that have forecast needs significantly higher than the average value. The needs identified for these years will require distribution across other years to balance resource capacity.

Table 3. 25- and 10- Year Forecast Renewal and Rehabilitation Funding Needs for Core Asset Types

|	2020 Past-due	25-Year Total	25-Year Average	10-Year total	10-Year Average
Roads, Bridges and other Transportation	$12,139,743	$434,594,805	$17,383,792	$23,134,820	$2,313,482
Water Services	$126,994,386	$465,963,493	$18,638,540	$323,301,227	$32,330,123
Wastewater Services	$28,748,172	$343,008,281	$13,720,331	$128,440,462	$12,844,046
Stormwater Services	$33,681,938	$425,583,461	$17,023,338	$214,253,838	$21,425,384
Totals	**$201,564,239**	**$1,669,150,040**	**$66,766,002**	**$689,130,347**	**$68,913,035**

Table 4 during the ten years prior to 2021 the average annual actual spending on capital renewal work of the core assets was $29.75M annually.

For the ten years beyond 2021 the average annual forecast budget for this same work is estimated at $74.47M – an increase of 150%. This number reflects the currently identified and planned-for work in the core asset types.

This future average is higher than the forecast 10- and 25-year average funding needs ($68.9M and $66.7M respectively). The positive trend of capital renewal spending indicates that, overall, the City aware of, and planning for, the needs of the core assets.

Table 4. Comparison of 10-Year Average Historical and Future Capital Renewal Budget

	Historical 10 Year Average (Actuals)	Future 10 Year Average (Budget)	% of 2020CRV (future average)	Rate of Change	10-Year Trend
Roads, Bridges etc.	$10,454,126	$18,452,668	1.51%	76.51%	↗
Water	$9,306,169	$25,252,860	3.26%	171.36%	↗
Wastewater	$7,319,063	$22,022,247	3.234%	200.89%	↗
Stormwater	$2,672,032	$8,738,022	1.02%	227.02%	↗
Totals	**$ 29,751,389**	**$74,465,797**	**2.11%**	**150.29%**	↗

Figure 3. Core Assets - 25 Year Forecast Renewal and Major Rehabilitation Requirements
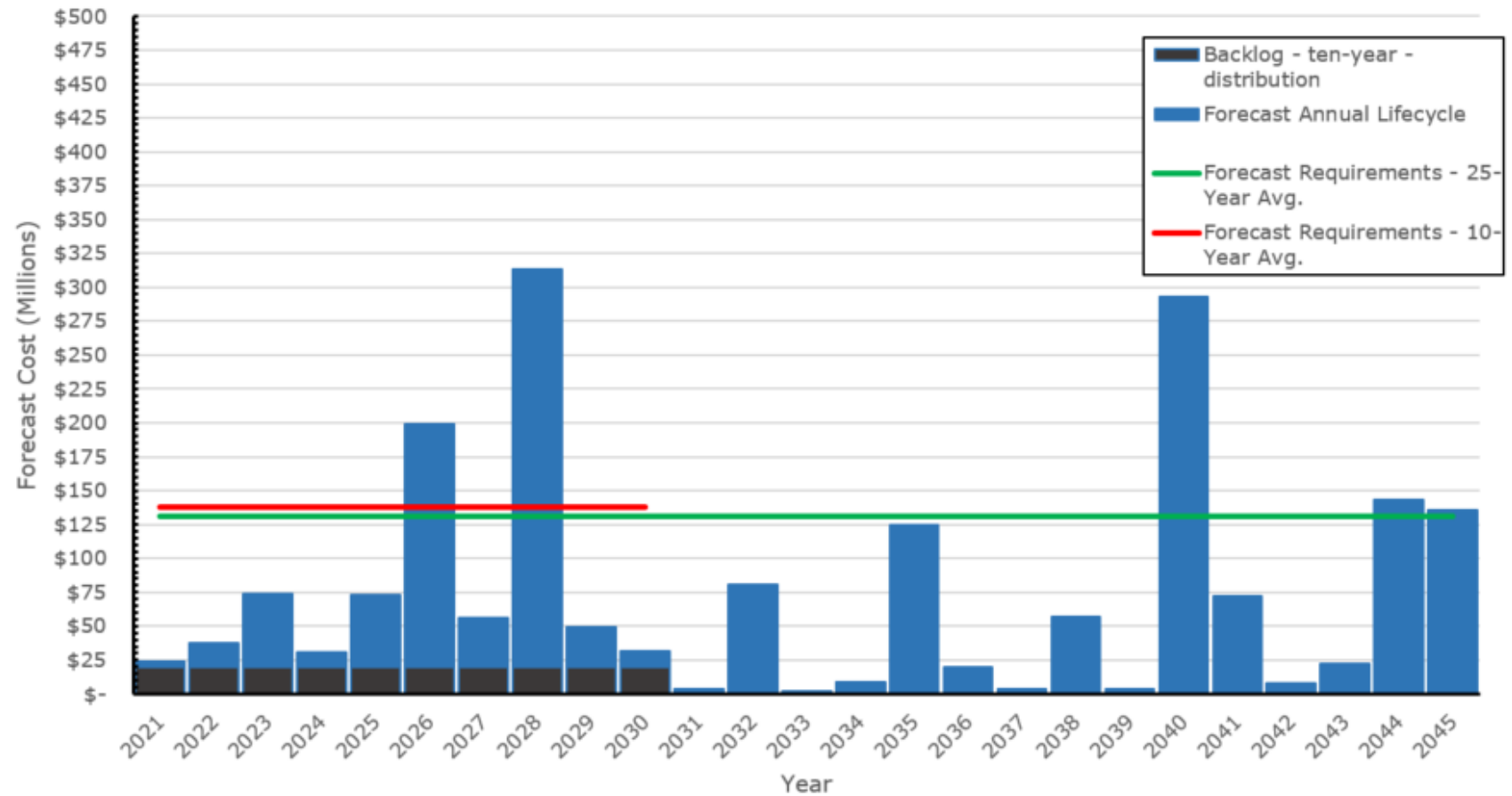
Capital Plans

Actual capital renewal budget values from 2017 (the year of the first City Corporate Asset Management Plan) have been

Table 5 below.

The approved capital renewal budget reflects the prioritization process that the City as a whole undergoes each year as it works through the budget process for all service areas within the City. While Water, Wastewater and Stormwater are funded through dedicated rates, the Transportation assets are funded through taxes collected that must be fairly distributed across numerous service areas.

This analysis shows that from 2017 to 2021 the sum of the approved capital renewal budgets for the core assets

compared to the approved capital renewal budget for 2021 and summarized in

increased by a total of 58%, from $32.49M in 2017 (in 2020$) to $51.41M in 2021. The most significant – i.e. a range of 43% to 130% – increases are in the rate-supported categories, however, the transportation category also saw a noteworthy increase of 20%.

The 2021 capital renewal budget value equates to 1.46% of the total core asset CRV, and approximately $850 per household.

Table 5. Comparison of Actual Capital Renewal Budgets in 2017 and 2021

	2017 Actual Budget (2020$)	2017 Cost Per Household	2021 Actual Budget 2020$	2021 Cost Per Household	% of Total CRV	Trend	Rate of Change
Transportation	$10,707,211	$ 188	$ 12,868,448	$ 213	1.053%	↗	20.185%
Water	$11,130,054	$ 195	$ 17,164,519	$284	2.218%	↗	54.218%
Wastewater	$7,036,126	$ 123	$ 16,187,812	$268	2.381%	↗	130.067%
Stormwater	$3,612,353	$63	$5,193,380	$ 86	0.607%	↗	43.767%
Totals	**$32,485,745**	**$570**	**$ 51,414,159**	**$850**	**1.457%**	↗	**58.267%**

Downtown Infrastructure Revitalization Program

The City is currently at the planning stages of an infrastructure improvement and upgrade program in the downtown core. This work is expected to occur over ten years and will include reconstruction and improvements to the roads, sidewalks, water, wastewater and other related infrastructure in the downtown core. A total value and detailed work plan is not yet finalized for the program.

As this program progresses and assets change or are added to the City inventory the appropriate changes in the asset management planning will be made.

New Assets / Expansion

The growth of the City will bring new residential subdivisions and business areas. These in turn will include new transportation assets like roads and sidewalks, as well as possibly requiring changes or expansion to some of the existing assets.

Upgrades to the City water collection, distribution and treatment assets are underway or planned, and the same is true for the wastewater system assets. New stormwater assets will also be included with the renewal or addition of new roads, and with the development of new residential and commercial areas.

The exact details of the number and types of new assets is not yet determined. These are being developed in conjunction with City staff and developers responsible for the growth. Some years will have larger growth, bringing many new assets, while in other years the growth may be slower.

Disposals

No major asset disposals are forecast at this time, although as individual assets reach the end of their EUL they will be disposed of and replaced with a new asset that performs the same function.

Operations and Maintenance

Operations and maintenance activities on any type of asset are critical in ensuring that the assets are able to support their intended service delivery. Without these activities asset breakdowns could occur unexpectedly, and increasing rates as condition deteriorates, resulting in costly unplanned replacements and repairs.

Maintenance on core assets are highly visible activities performed by the City, and have a major impact on residents and community members.

Historic spending trends can help provide an understanding of the current condition of assets. Corporate Asset Management is engaging in several initiatives to better understand both the current and future state of these activities.

Early analysis, documented in

Table 6 below, shows that operating budgets that address these types of activities have increased overall by 2.6% for core assets between the years of 2017 and 2021. This reflects the growing maturity of asset management across the City, and the benefits brought by early intervention through maintenance activities. It also reflects the impacts of growth, as new assets are brought online to support densification strategies and new subdivisions.

Actual operations budgets from 2017 have been compared to the approved operations budget for 2021. The total 2021 operations budget equals $53.17M and 1.5% of the total core asset CRV. Per household this represents approximately $879.

While the annual operations budget has increased since 2017, the cost per household has decreased as a result of the number of households increasing. In 2017 there were an estimated 59,500 households while in 2021 there are an estimated 60,500.

This information has been used to develop a "maintenance rate" that is a percentage of the total asset value for the assets. Each core asset type has a different maintenance rate explained in the section for each type.

The estimated maintenance budget for 2021 - determined using historical data and extrapolating current available information - it is calculated that the 2021 average cost per household for maintenance activities is $429 for the core asset types.

Table 6. Comparison of 2017 and 2021 Operating Budgets for Core Asset Service Areas

	2017 Actual Budget (2020$)	Cost Per Household	2021 Actual Budget 2020$	Cost Per Household	% of Total CRV	Trend	Rate of Change
Transportation	$13,467,340	$236	$13,859,462	$229	1.134%	↗	2.912%
Water	$18,298,896	$321	$17,556,122	$290	2.268%	↘	-4.059%
Wastewater	$18,747,857	$329	$19,176,922	$317	2.821%	↗	2.289%
Stormwater	$1,331,539	$23	$2,581,300	$43	0.302%	↗	93.858%
Totals	**$51,845,632**	**$910**	**$53,173,806**	**$879**	**1.507%**	↗	**2.562%**

Financial Analysis

In Oct. 2020 City Council approved a new Capital Budget that included forecast available funding for the next 25-years. Through this process, staff propose projects and programs of work, along associated budgets, to target renewal, rehabilitation, maintenance and operational activities. The City as whole works together to prioritize the project lists to fit within the available funding. As planning gets further out in the time frame (e.g. 10+ years), the accuracy of project needs, and available funding, becomes more theoretical. The currently available funding from years 2021 to 2046 is summarized in **Table 7**, and mapped in

Figure 4 below (indicated by the black line).

Likewise, forecast funding required over the entire lifecycle of the asset is calculated using industry best practices to develop costs for renewal, rehabilitation, maintenance and operation of the assets. This provides the full picture of all asset needs (and therefore, all asset costs) for the duration of the asset life. This is presented graphically in

Figure 4 below. Despite the findings of the previous sections that demonstrate increases in funding for both renewal and rehabilitation planning, and operations and maintenance activities, when comparing the forecast funding required

to the forecast approved funding, there is a gap. This was originally identified in the 2020 Corporate AMP, and has been reaffirmed in the completion of the Core AMP.

As indicated in **Table 7** and displayed in

Figure 4 below, over the 25-years there is an expected $1,937M ($1.9B) funding gap, or an average of $77.5M per year. Over the next 10-years the predicted funding gap totals $1,049M ($1.05B), or $105M per year.

In response to this gap, and discussed in further detail in a later section, the City has identified a sustainable funding target to close the gap. The target remains that the gap will be closed by 2037. Further analysis is required to update these sustainable funding targets to reflect this new understanding. Additionally, the City is planning to complete studies that will refine the assumptions used to inform the values for the forecast funding requirements for the assets. This will provide a more in-depth understanding of these activities, particular as pertains to industry best practices. Findings will be used to further refine the sustainable funding targets.

Table 7. All Core Asset Types – Forecast Approved Funding Compared to Forecast Requirements

CORE ASSETS ONLY	25-year total	25-year average	10-year total	10-year average
FUNDING	$2,020,602,110	$80,824,084	$627,842,095	$62,784,209
Sum of forecast requirements	$3,958,312,007	$158,332,480	$1,676,340,827	$167,634,083
GAP	$(1,937,709,897)	$(77,508,396)	$(1,048,498,732)	$(104,849,873)

Figure 4. Forecast Asset Funding Requirements Compared to Forecast Budget Funding
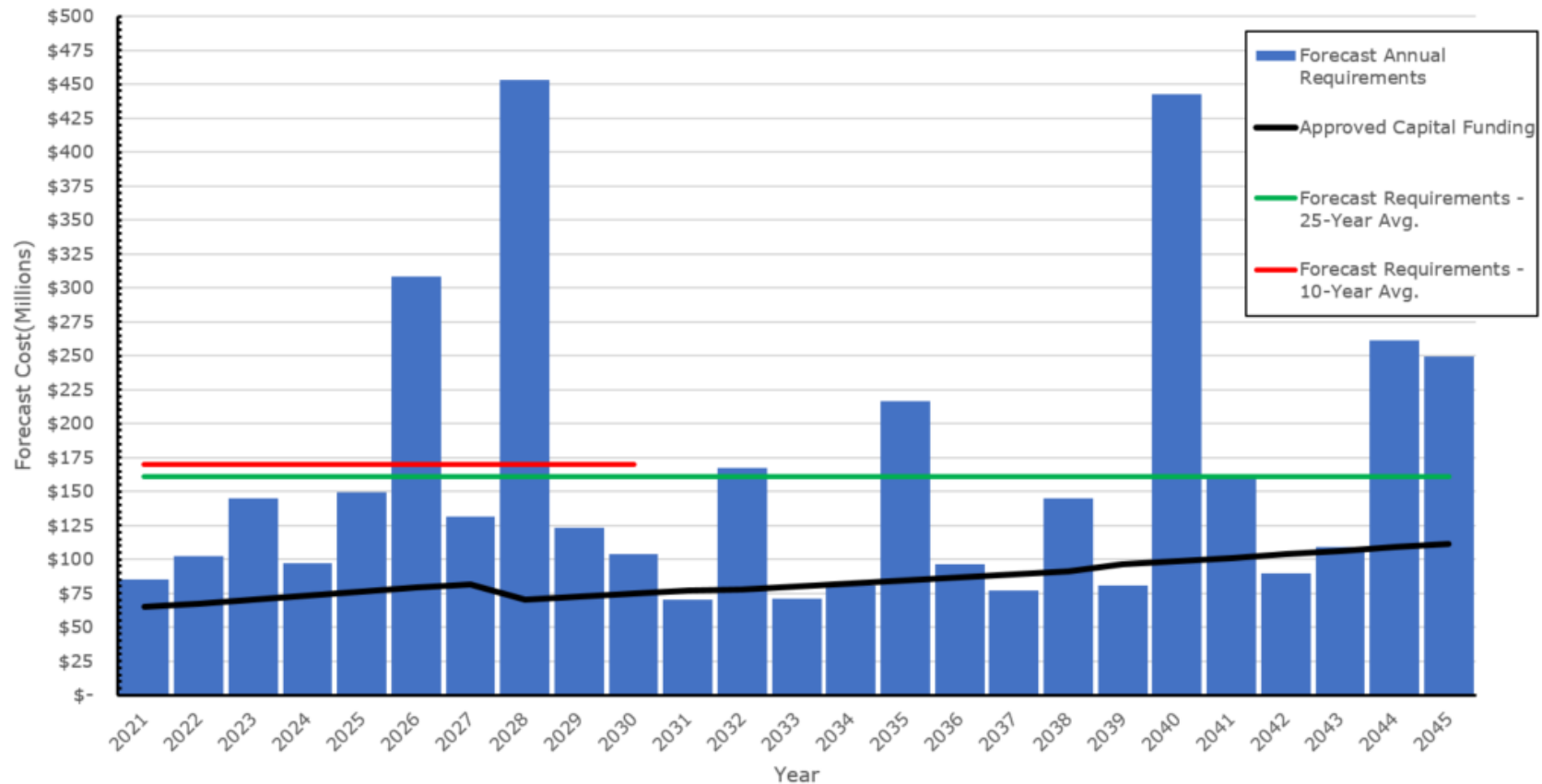
Note: This graph is based on currently approved funding strategies and funding levels, and does not reflect the findings discussed in **Sustainable Funding Targets**. Once an updated strategy is approved, this will be modified to reflect the new strategy.

Sustainable Funding Targets

Since 2017, the City has been using asset management data to make better informed decisions on achieving sustainable capital renewal funding levels. The sustainable funding targets currently focus on supporting the renewal and replacement of assets, and do not include maintenance or growth funding requirements. This work is being done with direct assistance of the City Financial Department staff.

As part of the 2020 Corporate AMP a detailed analysis of the progress of the City towards the sustainability goal was done. For the City as a whole, progress towards the target sustainable funding, which includes annual operating transfers to capital renewal reserve funds for tax and non-tax services as well as reliable annual funding from other levels of government, specifically Federal and Provincial Gas Tax Funding programs, has increased by 8%. This is due to a better understanding of inventories and expected useful life of assets.

Table 8 outlines the estimated total value for required annually to achieve sustainable funding for the core asset groups. The analysis is based on the same goal as identified in previous years; to achieve sustainable funding for all City assets by 2037.

To achieve the 2037 sustainable funding timeframe, non-tax funded services - Stormwater, Wastewater and Water - saw significant changes in the identified targets for their annual sustainable funding levels. Wastewater estimates decreased by 30% while Stormwater and Water have increased 76% and 69% respectively.

The tax supported assets – in this case, the transportation assets including roads, bridges and structures, sidewalks, traffic control and streetlights – also saw a modest increase of 0.5% in the target for sustainable funding levels.

In response, the City is reviewing its funding strategy to incorporate these findings and ensure that the sustainable funding goals are still achieved. This will be presented as part of the 2021/2022 budget cycle, and will then be incorporated into asset management planning.

Table 8. Sustainability Funding Comparison 2017 to 2020

Funding	2017 Estimate	2020 Estimate	% Change
Tax [2]	22,685,851	23,925,000	0.5%
Stormwater[3]	11,100,000	19,576,800	+76%
Wastewater	24,600,000	17,305,200	-30%
Water	13,400,000	22,614,900	+69%

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[2] Tax Funding Comparison includes transportation and all other asset types except water, wastewater and stormwater. Parking services funding is a combination of rate based and tax revenue.

[3] Stormwater target was updated in the 2019 budget due to revised inventories since 2017

Infrastructure Funding Progress

The infrastructure funding gap is the difference between the funding needed in a given year to build, maintain, repair and replace infrastructure and the amount of funding made available to complete that work. Current projections show an annual funding gap however once the City's goal of reaching a sustainable funding scenario for the infrastructure is reached and asset data is fully matured the funding gap will close and the value of the past-due requirements will remain constant.

The need to increase the sustainable funding targets from 2017's Corporate AMP is driven by the recent findings indicated in **Table 7** and graphically demonstrated in **Figure** 4. This analysis uses the known, currently approved funding amounts and compares them to the forecast whole-lifecycle asset needs, and, in this case, identifies a funding gap.

The next step is to then look at what would represent a sustainable funding amount. The change in funding amounts is captured in **Table 8**. Using the same timeframe for analysis – 25 years - it indicates that there is need to increase the funding targets currently identified in the sustainable funding strategy.

What this means for the tax funded assets is that there needs to be an increase of 0.5% based on the most recent analysis. The current tax supported infrastructure renewal strategy was introduced in 2017 to move the City towards sustainable funding over a planned 10 year implementation phase, through the first four years of the strategy the increase in annual tax funding directed to infrastructure renewal is $7,583,189 with a cumulative amount of $19,099,115. While this is distributed across all tax-supported assets, it does mean that, after the 10 year period of time the strategy is ramping up in, tax supported assets will achieve sustainable levels.

The main drivers for the changes in sustainable funding targets are, in fact, the rate supported (i.e. non-tax) asset categories captured in this plan.

Capacity to Deliver the Capital Program

The City has taken steps to increase funding towards asset management sustainability to ensure infrastructure renewal projects are able to be funded up to and beyond the 25 year horizon. As the Capital Budget funding levels have been growing, the unspent capital budget figure has also been increasing. This trend speaks to a need to increase staffing capacity to deliver projects.

City staff are developing a strategy to address these resourcing concerns including the increasing number of temporary project managers within the City. This need will be presented to Council in 2021.

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Introduction

Background

In December 2017 the Ontario Provincial Government released O.Reg 588/17 Asset Management Planning for Municipal Infrastructure[4]. Under the umbrella of the **Infrastructure for Jobs and Prosperity Act, O. Reg 588/17** identifies key requirements, one of which is the development of asset-specific asset management plans. With a phased approach for development, the first phase focuses on "core" asset types, which are defined by the Province as roads and bridges (plus related ancillary assets like traffic signals, sidewalks and street lighting etc.), domestic water supply and distribution assets, wastewater (sanitary) collection and treatment assets and stormwater collection assets[5]. These must be completed by July 1st, 2022 and submitted to the province.

The City of Guelph has been proactive in addressing asset needs and since 2016 the Corporate Asset Management team has been leading efforts to meet and exceed the Provincial requirements. An update to the 2017 Corporate Asset Management was released and approved in 2020. Now the City begins its journey to address the asset-specific plans in response to the requirements in O. Reg 588/17.

Goals and Objectives

The 2021 Core Asset Management Plans seek to accomplish the following:

- Satisfy the requirements of O. Reg 588/17 Asset Management Planning for Municipal Infrastructure.
- Establish a baseline of current asset management practices for core asset types to inform strategies for continual improvement
- Enhance understanding of the needs of core asset types.
- Provide increased transparency related to the City's asset management practices, challenges and opportunities.
- Create a central information source for core asset types to assist in daily operations and long-term planning.

Using the data developed for the 2020 Corporate Asset Management Plan, the 2021 Core Asset Management Plans (Core AMPs) will take a deeper look into each asset type. Focus will be on details related to:

- Lifecycle planning, including a review of financial needs.
- Levels of Service (LoS) as defined by O. Reg 588/17.
- State of the assets.
- Recommendations for future improvement of the Plan.

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[4] O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure, filed December 27, 2017 under Infrastructure for Jobs and Prosperity Act, 2015, S.O. 2015, c.15:

[5] Through this document these five asset type descriptions will be referred to as the "core asset types"

Comparison to the 2020 Corporate Asset Management Plan

Since publishing the 2020 Corporate AMP staff have continued efforts to improve the asset inventory including adding assets to the dataset, improving the information about each asset, and refining the analysis tools and procedures that are used. These efforts have occurred with both the City GIS information and the stand-alone asset details consolidated to complete the Core AMPs analysis. All refinements and findings were completed with staff and stakeholder consultation.

To maintain a consistent comparison between both reports, the same analysis will be used in the Core AMPs as was done in the 2020 Corporate AMP. The number and types of changes to the asset data since Nov. 2020 are not considered significant enough to make a major difference to the analysis of the Core assets.

Subsequent versions of the City and Core AMPs will be completed using the most current asset inventories and information available at the time those documents will be prepared.

Evaluating Assets

Understanding the current condition of an asset is an essential step in identifying the future needs of that asset. By summarizing the information for each asset the future needs of the City can be predicted. The same approach as was used in the 2020 Corporate Asset Management Plan

was applied in the Core AMPs. Details for this approach can be found in the Corporate AMP, and in **Appendix A**.

Current Year Valuation

Unless otherwise stated, all financial values in the Core AMPs are described in 2020 dollar values. This includes the values associated with the asset replacement costs, and the forecast replacement, renewal, maintenance and growth costs.

If a value used in the Core AMPs were sourced with a different year's present value, that value was inflated to 2020 values using information published by StatsCan and based on the historical rates for the Consumer Price Index (CPI). [6]

Limitations and Constraints

While significant efforts and improvements in the City's asset management programs have been accomplished since 2016 when the program began, there remain areas for improvement.

Inventory and condition data is essential to analysis. As such, the Corporate Asset Management team is constantly working to improve data quality, with a focus on continuous improvement. Several efforts are underway to reach this goal, and these are outlined in the 2020 Corporate AMP in more detail.

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[6] The following StatsCan table was used for this reference: "Table: 18-10-0004-02, Consumer Price Index by geography, all items, monthly, percentage change, not seasonally adjusted, Canada, Provinces, Whitehorse, Yellowknife and Iqaluit". Results for Ontario selected. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000402

Levels of Service

Understanding how well assets are performing their intended functions is done by measuring that performance against a series of metrics known as Levels of Service (LOS). Typically, they are divided into two categories – Technical and Community. Technical metrics are described through regulatory and legislated requirements, and industry best practices. Community metrics are developed through engagement activities, which the Corporate Asset Management team is currently planning as part of future initiatives.

LOS metrics used by the City are defined in two sources:

    i.   O.Reg 588/17 includes Technical and Community LOS that all municipalities are required to address

    ii.   City defined Technical and Community LOS metrics, developed in consultation with City Staff, capture requirements of existing regulations and legislation as well as metrics that gauge the community's perspective on the assets.

The LOS metrics are specific to each asset category and presented in the appropriate sections.

Operations and Maintenance

Throughout the Core AMPs reference will be made to operations and maintenance activities and requirements.

These are important activities that are essential to successful asset management, and are vital to support service delivery.

Operations and maintenance activities are separate from capital replacement and renewal activities, and are normally funded through dedicated budgets.

The operations and maintenance budgets and forecast needs are analyzed separately for each of the core assets types, then combined with the forecast lifecycle needs in order to evaluate the total forecast funding requirements for the assets over the period of time this AMP covers.

Lifecycle Management and Planning

A preliminary asset lifecycle replacement plan for the core asset types has been developed using the current replacement values of each asset and determining when the asset will require replacement based on its condition rating. The City uses a 25-year forecast period between 2021 and 2045. Year 2020 is considered year 0 – any assets assigned a replacement year of 2020 are considered as part of the past-due maintenance or capital work that should have been done prior to 2020.

The forecast replacement year is assigned uses the same methods applied in the 2020 Corporate Asset Management Plan. Additional details can be found **Appendix B.**

The City of Guelph

Our Community Today

Geographically situated within the Southern Ontario region, near Toronto and several other municipalities that provide significant contributions to the Canadian and Ontario economies, the City is home to a major university, several businesses leading the agri-food and environmental sectors among others, host to award-winning festivals, vibrant communities and unique cultural events.

Infrastructure development has proceeded in stages consistent with the growth and expansion of the City. This includes roadways, water treatment facilities and distribution networks, wastewater collection assets and treatment facilities, stormwater control and management systems, which are the focus of the 2021 Core Asset Management Plans (Core AMPs)

All of these services and assets are managed by the City Government through a combination of tax revenue and user charges.

Future Growth

Like the majority of Canadian Cities Guelph saw significant growth through the 20th century, particularly in the post World War II years. From a population of about 25,000 in 1946 Guelph currently has an estimated population of 147,200 people. By 2051 the City population is expected to be slightly more than 200,000. Since 2011 the City has been growing at a rate of about 1.6% per year.

More detail on growth within the City of Guelph can be found in the 2020 Corporate Asset Management Plan.

Climate Change

A key focus of these Core AMPs is to identify the potential impacts of climate change. The full effects of climate change are difficult to predict, but it is that there will be impacts to the City infrastructure and perhaps some of the services delivered by the City. To be proactive, in 2018 City Council introduced the City of Guelph Corporate 100% Renewable Energy Target that states "The Corporation will strive to achieve one hundred percent of its energy needs through renewable sources by 2050". [7]

According to the latest reported information the City is currently using:

- 23.6% renewable energy
- 75.6% non-renewable energy

There remains much room for improvement, and making appropriate choices with regards to the infrastructure assets will contribute to that improvement.

At the same time, some climate change issues may present direct risks to the physical assets. Occurrences like stronger rain storms may overload the City stormwater management infrastructure. The risk of increased flooding may require prevention measures to protect assets. Droughts may negatively affect the domestic water supply system. Hotter average yearly temperatures may require the installation of more and stronger cooling and ventilation systems for facilities.

There are many potential risks that can be attributed to climate change. Careful asset planning to anticipate and address the risks before they occur will result in better long-term benefits for the City. Throughout the various service areas City staff are working to do this, and while specific projects are not addressed in this Core AMPs the financial

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[7] City of Guelph Energy and Climate Change webpage

analysis includes the funding requirements that relate to those projects.

COVID-19

The City of Guelph has been affected by the global Covid-19 pandemic that began in the spring of 2020. As of the writing of this AMP Provincial Government and Health Authority orders that restrict what activities community members are allowed to do remain in effect with an unknown end date. Many of these services are provided by the City through various facilities and services, and the resulting operational changes to the City work processes are having an impact to how the City assets are being used and managed.

Full details of how the Covid pandemic may affect the services provided by the assets, and therefore the needs of the assets, remain unknown. Likewise, any financial impacts to the City budgets are being closely monitored. The City asset management will be required to remain flexible for the duration of the pandemic. Future iterations of this and other AMPs will address the needs of the assets once the full impacts of COVID are more clearly understood.

Transportation Assets (Roads, Sidewalks, Bridges and Other)

Inventory

General Description

The City of Guelph has nearly 600km of roads that allow the flow of people and goods to cross the City. In this analysis, only those roads owned and operated by the City are included.

Guelph is also connected to other communities by railroads with both freight and passenger trains serving the City. The City does not own any of these railroad lines however.

Asset Types in the Transportation System

The transportation assets owned by the City include roads, bridges, cycling infrastructure, and related ancillary assets

like street-lighting and signage. Large culverts (defined as those with a span greater than 3m) and retaining walls are included in this category because the Provincial government includes them in the same mandatory inspection program that dictates the bridge inspections.

The total estimated current replacement value of the assets included in the Transportation Category is $1,218,133,397[8]. The types of assets and their respective values are summarized in

Table 9.

Table 9 Inventory of Transportation Assets

Asset Class	Sub-Class	Total CRV	Total Length	Total # records[9]	Comments
Road	Arterial	$227,417,461	122.18 km	591	
Road	Collector	$102,883,698	67.35 km	429	
Road	Local	$518,029,947	356.92 km	2223	
Road	Laneway	$14,716,213	10.14 km	128	
Road	Bridge - Arterial	$2,902,973	1848.64 m	20	
Road	Bridge - Collector	$993,278	657.73 m	5	
Road	Bridge - Local	$304,077	201.28 m	2	

[8] This value does not include roadway directional signage or paint markings. See recommendations at the end of this section for further details.

[9] Total records refers to the number of individual roads segments (i.e. intersection to intersection, or intersection to end of road) and not the total number of uniquely named roadways. The same applies to Sidewalks.

Asset Class	Sub-Class	Total CRV	Total Length	Total # records[9]	Comments
Road	Overpass - Arterial	$2,296,131	1293.72 m	10	
Road	Overpass - Collector	$1,495,489	871.85 m	6	
Road	Underpass - Local	$322,916	222.49 m	2	
Sidewalk	All Subclasses	$188,293,246	706.83 km	5072	
Streetlights	All Subclasses	$10,127,994	N/A	0	
Traffic	Controller	$3,165,047	N/A	188	
Traffic	Intersection	$29,501,157	N/A	189	
	Roads etc. Summary CRV	**$1,102,449,629**			
Bridges and Structures	Vehicle Bridge	$50,904,824	0.00 m	18	
Bridges and Structures	Culvert	$34,960,648	265.64 m	42	
Bridges and Structures	Pedestrian Bridge	$4,878,600	328.17 m	14	
Bridges and Structures	Dam	$4,237,654	41.73 m	2	
Bridges and Structures	Retaining Wall	$22,533,740	51.02 m	25	The total inventory of retaining walls is not yet complete, and the indicated value is low as a result.
Bridges and Structures	Other	$2,198,283	19.90 m	9	This sub-class includes large stairways, River Run observation platform and other miscellaneous items.
	Bridges and Structures Summary CRV	**$119,713,748**			
	Total Transportation Assets Inventory	**$1,222,163,378**			

Other Inventory Information

Non-City Roads

Within the Guelph City limits and included in the City GIS system are roads that are not owned or maintained by the City.

Foremost among these is the Hanlon Expressway (Provincial Highway 6) with a total indicated[10] length within the City limits of 31.5km.

The University of Guelph campus has a total of 10.5km of roads or laneways.

These roadways have not been included in the analysis for this Core AMP.

Cycling Infrastructure

As part of the City's efforts to promote healthy living and reducing greenhouse gas emissions, cycling has been increasingly promoted as a means of transportation. To assist with that goal the City has constructed specialized cycling infrastructure throughout the City, summarized in **Table 10**.

Table 10 City Cycling Infrastructure Inventory

Asset Type	Length (km)
Bike Lane	50.48
Cycle Track	1.05
Multi-Use Blvd	2.77
Shared Lane	2.97
Shared Lane Arterial	3.66
Total Length	**60.94 km**

Some of the cycling infrastructure does not consist of a separate asset per-se: bike lanes are often created by painting specialized markings on already existing roads so the majority of the value of these items is included already with another asset (i.e. the road). It is important to identify cycling assets separately as they help the City achieve climate change goals, and have unique characteristics that require maintenance and care.

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[10] Sum of the road segments comprising the Hanlon Expressway

State of the Transportation Assets

The condition of the transportation assets are affected by many factors, including the age of the assets, the type of materials in use, the traffic volume on a particular segment of road and because the assets are exposed, weather. Transportation assets can also be affected by the City operations that ensure they remain serviceable throughout the year. Salt, sand and de-icing material contribute the degradation of the materials used. Finally, the condition of transportation assets can be affected as a result of use – for example, vehicle collisions can cause damage to the assets. Street lighting and traffic control poles are particularly affected by this factor.

To determine the condition rating for road assets, the City engages a third-party engineering company to complete an assessment that uses established standards for evaluating roads and determining a pavement condition index (PCI). The PCI is then converted to an equivalent 5-point score for the analysis.

Bridges, retaining walls and other structures are assessed every 2-years in accordance with the protocols in the Ontario Structure Inspection Manual (OSIM).

City sidewalks, traffic control assets, signage and other ancillary type assets are normally assessed by City staff on a cyclical basis. The condition of the assets are compared against the City design standards.

The condition scores are then grouped based on category, i.e. Very Good, Good, Fair, Poor and Very Poor or Past Due, and presented based on total CRV of all assets within that condition rating.

Condition of the Assets

Overall, the Transportation assets are in an average Good condition. **Table 11** summarizes the overall condition score for the currently documented asset classes within the Transportation Service.

Table 11. Average Condition of Transportation Asset Class

Asset Type	Total CRV	Average Condition
Roads	$904,028,389	Good
Sidewalks	$188,293,246	Fair
Streetlights	$10,127,994	Good
Bridges and Structures	$119,713,748	Good

Further breakdown of the subclasses within the Transportation Assets category (i.e. roads, sidewalks, streetlights, traffic, bridges and structures) can be found in **Table 13** and **Table 14**. A City map that presents the road network displayed by the condition of each road segment is included in **Appendix E**.

Table 12 and **Figure 5** demonstrate that while 91% of the transportation assets are in Fair condition or better, the remaining 8% with a total CRV of approximately $98M are in Poor and Very Poor condition category. The assets falling within the Poor and Very Poor will require the most immediate attention, and will be the targets for specific interventions to improve rating condition – and therefore service delivery.

There is an estimated $12.1M in Past Due assets (1.0% of the total portfolio). This indicates that those assets have already exceeded their expected useful lifecycle and should have already been replaced, or rehabilitated.

10

The calculated value of past-due work is very low compared to the total value of the portfolio which indicates that effective management and maintenance practices are in place to ensure the assets lifecycle will be maximized with minimal impact to the levels of service they provide.

Table 12. Condition of the Transportation Assets by CRV

Condition	CRV
Past Due	$12,139,743
Very Poor	$12,596,047
Poor	$85,272,058
Fair	$308,856,272
Good	$407,263,095
Very Good	$396,036,163

Figure 5. Average Condition of Transportation Assets by CRV

Good, $407,263,095, 33%

Very Good, $396,036,163, 33%

Fair, $308,856,272, 25%

Poor, $85,272,058, 7%

Very Poor, $12,596,047, 1%

Past Due, $12,139,743, 1%
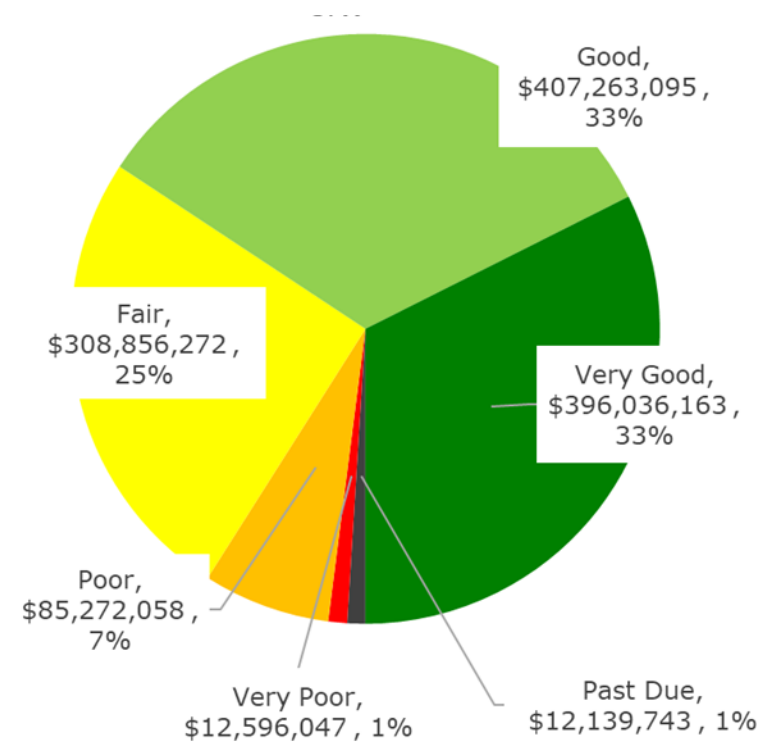
Table 13. Transportation System Roads, Sidewalks and Traffic Summary Information

Class	Subclass	Total CRV	% of total Portfolio CRV	Total # records	Total Length (km)	Average Condition Rating
Roads	Arterial	$227,417,461	19%	591	122.18	Good
Roads	Collector	$102,883,698	8%	429	67.35	Good
Roads	Local	$518,029,947	42%	2223	356.92	Good
Roads	Laneway	$14,716,213	1%	128	10.14	Fair
Roads	On Bridge - Arterial	$2,902,973	0.24%	20	1.85	Very Good
Roads	Bridge - Collector	$993,278	0.08%	5	0.66	Very Good
Roads	On Bridge - Local	$304,077	0.02%	2	0.20	Very Good
Roads	Overpass - Arterial	$2,296,131	0.19%	10	1.29	Good
Roads	Overpass - Collector	$1,495,489	0.12%	6	0.87	Very Good
Roads	Underpass - Local	$322,916	0.03%	2	0.22	Very Good
Sidewalk	All Subclasses	$188,293,246	15%	5072	706.83	Fair
Streetlights	All Subclasses	$10,127,994	0.83%	2	0	Good
Traffic	Controller	$3,165,047	0.26%	188	0	Very Poor
Traffic	Intersection	$29,501,157	2%	189	0	Poor
Total CRV: Roads, Sidewalks, Traffic and Streetlights		**$1,102,449,629**	**90%**		**Average Condition**	**Good**

Table 14. Transportation Assets Bridges and Structures Summary Information

Class	Subclass	Total CRV	% of total Portfolio CRV	Total # records	Total Length (km)	Average Condition Rating
Bridges and Structures	Vehicle Bridge	$50,904,824	4.17%	18	0.00	Good
Bridges and Structures	Culvert	$34,960,648	2.86%	42	0.27	Good
Bridges and Structures	Pedestrian Bridge	$4,878,600	0.40%	14	0.33	Good
Bridges and Structures	Dam	$4,237,654	0.35%	2	0.04	Fair
Bridges and Structures	Retaining Wall	$22,533,740	1.84%	25	0.05	Good
Bridges and Structures	Other	$2,198,283	0.18%	9	0.02	Good
	Total CRV:	**$119,713,748**	**10%**		**Average Condition**	**Good**

Figure 6. Average Condition of Roads, Sidewalks, Streetlights and Traffic by CRV

Good, $315,041,135 , 28%

Fair, $296,249,246 , 27%

Very Good, $384,382,613 , 35%

Poor, $83,629,967 , 8%

Very Poor, $11,006,924 , 1%

Past Due, .2,139,743 , 1%
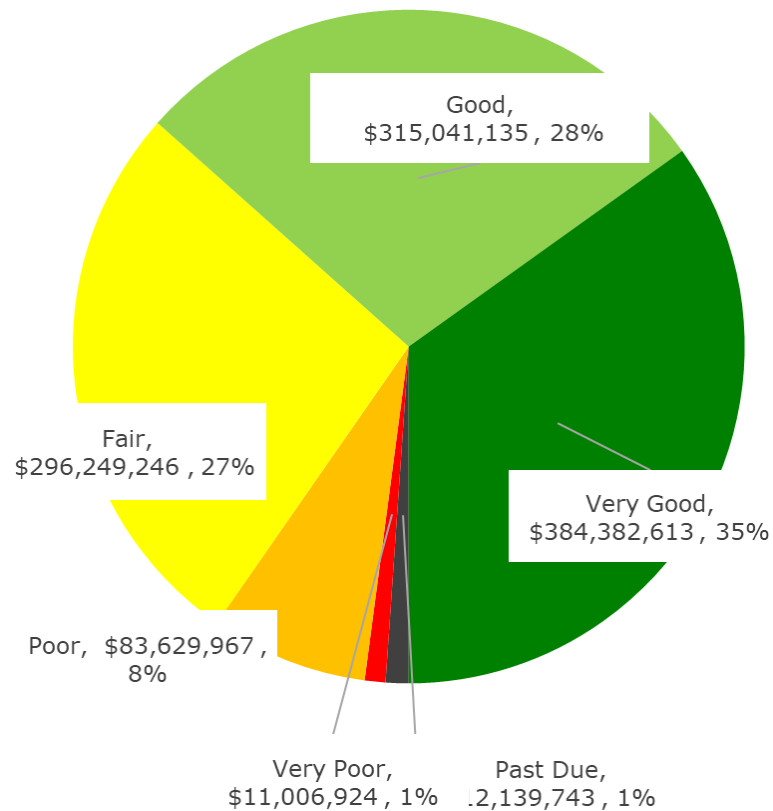
Figure 7. Average Condition of Bridges and Structures by CRV

Good, $92,221,960 , 77%

Fair, $12,607,026 , 11%

Very Good, $11,653,549, 10%

Poor, $1,642,091 , 1%

Very Poor, $1,589,122 , 1%

Past Due, $0, 0%
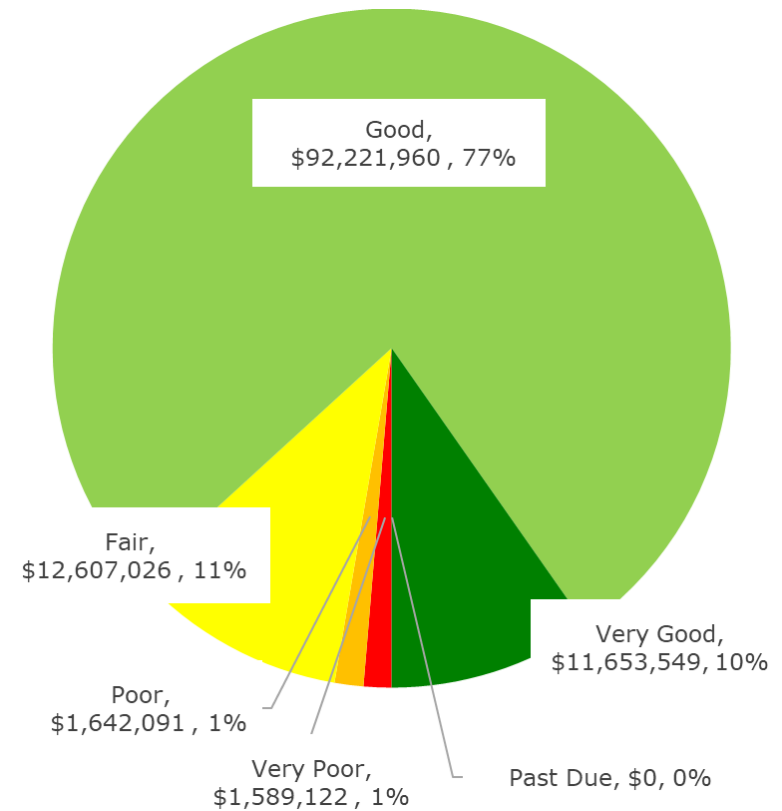
Asset Ages

The age of an asset is used as an indicator for the possible condition (and therefore functional performance) of an asset where an independent condition assessment is not available. It also an estimated guide to identify in what year an asset should be replaced. The current age of an asset is compared to its EUL to accomplish this analysis.

The average age of the assets in the roads class is as shown in **Table 15.** Within each of the major asset classes in the Transportation category, all assets are within their EUL.

The traffic control infrastructure is on average nearing the end of its EUL. Staff are planning necessary upgrades that are scheduled to be implemented within the next 2-5 years to address this need.

Table 16 shows the average age of each road type in red when compared to the expected useful life (in blue). Again, the chart clearly shows that the average age of the sub-class assets is below the EUL. Included in this analysis is the road surface that goes over a bridge or structure.

The bridges and structures seen in **Table 17** are older than the roads assets, however, it is normal that these types of assets have long useful lifecycles. The following graph presents the ages of the bridges and structures.

Within the sub-classes vehicle bridges have an average age greater than their EUL. However all vehicle bridges are inspected on a two-year cycle in accordance with Provincial Government regulations, and all bridges were found to be in good or better condition, so their ages are not considered to be a negative factor in determining their needs. This is an example of successful maintenance activities extending the useful life of the asset.

The assets within the "other" sub-class are also on average older than their EUL. As with bridges, these types of assets also have long EULs, and recent assessments indicate that they are all in Fair or better condition.

Table 15. Average Age of Transportation Assets

Asset Class	Average Age	Estimated Useful Life
Roads	17	40
Sidewalks	18	40
Streetlights	1	20
Bridges and Structures	46	48
Traffic	16	21

Table 16. Average Age of Transportation Assets by Roads Subclass

Roads Asset Subclass	Average Age	Estimated Useful Life
Underpass - Local	17	40
Overpass - Collector	17	40
Overpass - Arterial	15	40
Over Bridge - Local	17	40
Over Bridge - Collector	17	40
Over Bridge - Arterial	16	40
Laneway	14	40
Local	16	40
Collector	16	40
Arterial	15	40

Table 17. Average Age of Transportation Assets by Bridges and Structures Subclass

Bridges and Structures Asset Subclass	Average Age	Estimated Useful Life
Vehicle Bridge	59	50
Pedestrian Bridge	45	50
Culvert	44	50
Retaining Wall	40	48
Dam	40	50
Other	52	44

Critical Assets

Within the City transportation network the critical assets include the following:

- All vehicle bridges
- Arterial roads
- Roadways where emergency services facilities are located

While all of the roads, bridges and other transportation assets are important, those that are included in this list are identified due to the consequences that will occur if they fail.

Findings

Though the analysis of the asset information did not provide a detailed review of every individual asset, there were no significant areas of concern presented.

Critical assets that would present a major consequence in the event of failure - like bridges and major arteries - are indicated to be well within acceptable condition levels.

There will be normal maintenance and repair issues that will require attention, but these are mostly minor in nature and corrected with only a minor impact to the City. Larger projects such as road resurfacing or rehabilitation occur on planned cycles and are well planned and managed.

The lack of major concerns with respect to the transportation assets indicates that they are being well managed.

Levels of Service – Transportation Services

O.Reg 588/17 LOS

As required by O.Reg 588/17 the following tables outline the City's compliance with the mandatory Levels of Service reporting. These LOS are based on requirements outlined in O.Reg 588/17, and in the Minimum Maintenance Standards that govern these assets, and are determined by the Provincial Government.

Table 18. Extract from O.Reg 588/17 Table 4 – Part 1: Community LOS for Roads

Service attribute	Community levels of service (qualitative descriptions)	City of Guelph Response
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity.	The City road network covers approximately 600km and all sections of the City. Major highway connections to Provincial highways include Highway 6 to Highway 401, and Highway 7. Refer to the "Transportation Assets - State of the Assets" section for more details and Appendix E for a map presenting the City road network.
Quality	Description or images that illustrate the different levels of road class pavement condition.	The City of Guelph adheres to and follows the standards and best practices described the Ontario Good Roads Association (OGRA) when defining pavement condition. The definitions provided by OGRA are followed by the third-party consultants engaged by the City to perform the pavement inspections. Ratings provide from those inspections are converted to a five point scoring system that is consistent with the asset management analysis tools used by the CAM team.

Table 19. Extract from O.Reg 588/17 Table 4 – Part 2: Technical LOS for Roads

Service attribute	Technical levels of service (technical metrics)	City of Guelph Response
Scope	Number of lane-kilometres[11] of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the municipality[12].	Number of Lane km: Arterial: 282.55 – 1.069% of total land area Collector: 140.50 – 0.532% of total land area Local: 702.51 – 2.658% of total land area
Quality	For paved roads in the municipality, the average pavement condition index value.	3.0 / 5 - Fair
	For unpaved roads in the municipality, the average surface condition (e.g. excellent, good, fair or poor).	3.0 / 5 - Fair

Table 20. Extract from O.Reg 588/17 Table 5 – Part 1: Community LOS for Bridges

Service attribute	Community levels of service (qualitative descriptions)	City of Guelph Response
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	All of the vehicle bridges are capable of supporting all classes of vehicles. None of the bridges have load limit capacity restrictions.

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[11] "Lane-kilometre" means a kilometre-long segment of roadway that is a single lane in width; lane width is estimated at an average width of 3.3m;

[12] The City of Guelph has a reported land Area of 87.22 km^2

Service attribute	Community levels of service (qualitative descriptions)	City of Guelph Response
Quality	Description or images of the condition of bridges and how this would affect use of the bridges.	City of Guelph follows the standards and best practices outlined in the Ontario Structure Inspection Manual in order to determine the condition of the bridges and their component parts. Third party consultants who are expert in the design and assessment of bridges are engaged to complete these assessments.
	Description or images of the condition of culverts and how this would affect use of the culverts.	Culverts larger than 3m diameter (or those considered to present high risks to the City of Guelph are treated as bridges and so the condition assessments follow the standards and best practices outlined in the Ontario Structure Inspection Manual in order to determine the condition of the bridges and their component parts. Third party consultants who are expert in the design and assessment of bridges are engaged to complete these assessments.

Table 21. Extract from O.Reg 588/17 Table 5 – Part 2: Technical LOS for Bridges

Service attribute	Technical levels of service (technical metrics)	City of Guelph Response
Scope	Percentage of bridges in the municipality with loading or dimensional restrictions.	Zero (0) – no bridges are indicated as having loading or dimensional restrictions
Quality	1. For bridges in the municipality, the average bridge condition index value.	Vehicle Bridges: 3.83 / 5 - Good Pedestrian Bridges: 4.00 / 5 - Good
	2. For structural culverts in the municipality, the average bridge condition index value.	4.00 / 5 - Good

City Defined LOS

In the Spring of 2018 the City began efforts to define LOS metrics to measure the functional performance of the assets. As with the O.Reg mandated LOS metrics these are divided into "customer" and "technical" focussed metrics. The following tables identify the LOS metrics in these two categories.

It is important to note that work remains to be done on finalizing the LOS metrics. These metrics focus on requirements outlined in regulatory and legislative documents that currently guide the Water industry.

There are presently no targets established. Establishing these is part of a larger initiative that will work through engagement activities with all stakeholder groups within the community.

LOS Service Statement: Efficiently providing operational and accessible roads and right-of-ways at the appropriate quality that support drivers, cyclists and pedestrians.

Table 22. City Defined Customer Focused Performance Measures for Transportation Assets

Key Service Attribute	LOS Statement	Performance Measure	Current Performance
Reasonable Traffic Flow/Movement	Providing a transportation network with reasonable traffic flow and movement.	Operational cost per resident per year	$94
Quality	Providing a transportation network at the appropriate material quality	Overall condition of road network	3.89 / 5 (Good)
Accessible	Providing an accessible transportation network	% of transportation network that is FADM/AODA compliant	City is developing a Connectivity Index that will measure the ability of person to travel through the City seamlessly. Data related to this index is not yet available but will be reported in future AMPs.
Environmental Stewardship	Providing a transportation network that is environmentally conscious	% of streetlights that are energy efficient	95% (approximately)

Table 23. City Defined Technical Performance Measures for Transportation Assets

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data Source)
Reasonable Traffic Flow/Movement	Providing a transportation network with reasonable traffic flow and movement.	# of complaints about traffic flow	Value not available.
Operational	Providing an operational road network that is safe for drivers, pedestrians and cyclists	% of bridges and structures in poor or very poor condition	2.70%
		% of sidewalks in poor or very poor condition	2.24%
		% of roads/paved area in poor or very poor condition	15.18%
Quality	Providing a transportation network at the appropriate material quality	% of roads/paved area that meet the target quality level	The condition of the assets is reported in the "State of the Assets" section. Target quality levels are in development; future AMPs will report on these points
		% of gravel roads that meet the target quality level	
		% of sidewalks that meet the target quality level	
		% of cycling facilities that meet the target quality level	
Quality		% of bridges that meet the target quality level	
Accessible	Providing an accessible transportation network	% of sidewalks that are FADM/AODA compliant	Value unknown:

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data Source)
		% of pedestrian crossings that are FADM/AODA compliant	Any new or rehabilitated sidewalks since ~2008 will meet the requirements.
Accessible	Providing an accessible transportation network	% of traffic signals with APS	80%
		% of cycling routes completed	60% (increase from 57% in mid 2017)
Environmental Stewardship	Providing a transportation network that is environmentally conscious	% of streetlights with LED or low energy fixtures	About 90% Major project in 2019/20 updated majority of streetlights to LED.

Lifecycle Management and Planning

Renewal and Major Rehabilitation

The 25-year total estimated funding required to accommodate the renewal and major rehabilitation needs of the transportation assets is estimated at $317.5M. A significant amount of this value - $271M or 85% of the total estimated amount – is required for the roads assets only. The yearly average for the 25-year period is estimated at $17.4M.

The ten-year total – between 2021 and 2030 – estimates total forecast capital costs of $19.7M, with a ten-year annual average of $2.3M. The breakdown of these findings is summarized in **Table 24** below.

The annual forecast costs associated with all renewal and major rehabilitation works are presented graphically in **Figure 8**. The graph includes the currently known 2020

past-due value of $12.14M distributed over the first ten years of the 25-year period ($1.2M per year). The 10-year distribution is intended to offset the financial impacts of trying to clear the past-due work at one time. The funding requirements are mapped in a later figure. Future analysis will look at the impacts of available funding on any potential past-due work that might exist past the year 2031.

While the ten-year total equals only 6% of the 25-year estimated total funding required forecast spikes in annual requirements in later years will be distributed over other years to better distribute the financial impact of the capital needs. This distribution will increase the indicated annual costs including during the first 10- years (but the annual average will not change).

Table 24. Transportation Services 10 and 25 Year Forecast Renewal and Major Rehabilitation Cost Summary

	2020 Past-due Estimate	25-Year Total	25-Year Average	10-Year total	10-Year Average
Roads	$4,777,081	$271,302,868	$10,852,115	$8,828,073	$882,807
Bridges and Structures	$0	$15,838,239	$633,530	$1,589,122	$158,912
All other Transportation Assets	$7,362,663	$30,370,984	$1,214,839	$9,259,446	$925,945
Total Transportation	**$12,139,743**	**$317,512,091**	**$17,383,792**	**$19,676,642**	**$2,313,482**

Figure 8. Transportation Assets Forecast Renewal and Major Rehabilitation Costs over 25 Years
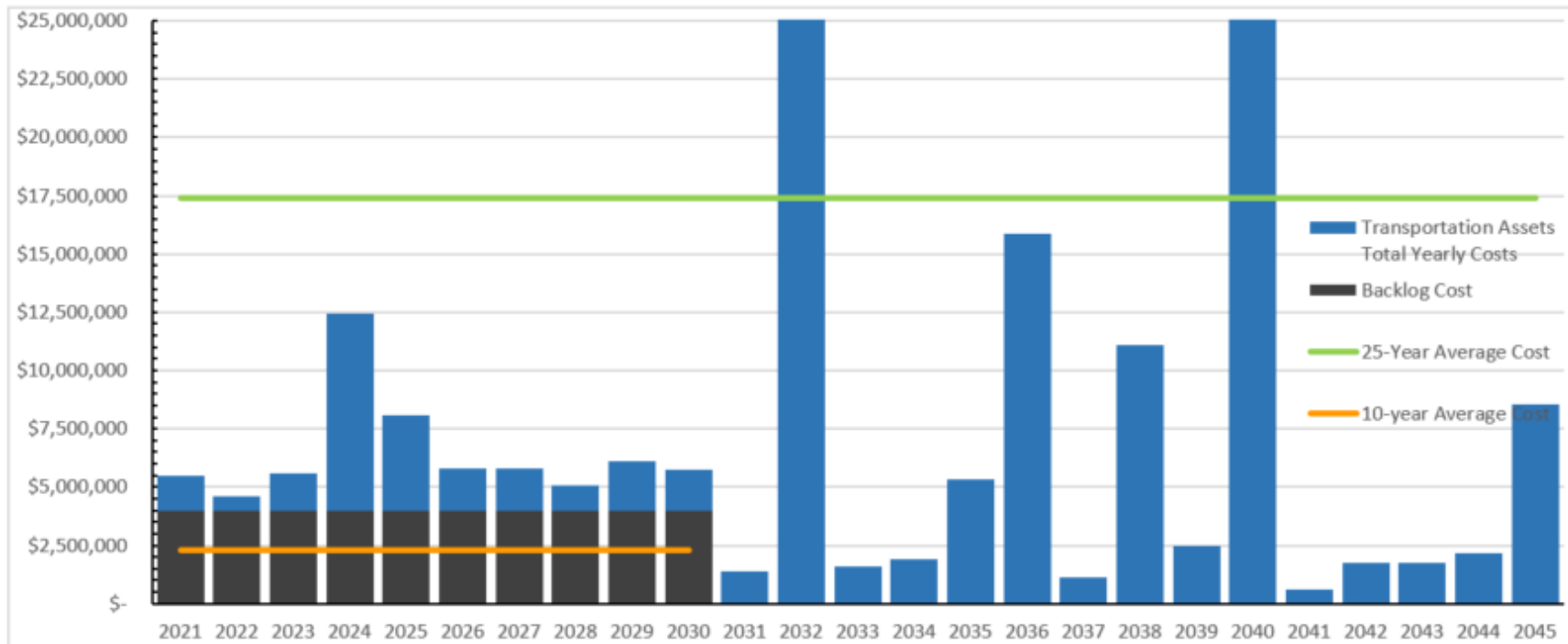
Note: the Y-axis ($) has been adjusted to fit the page layout. In 2032, the value for transportation is $78M. In 2040 the value for transportation is $282.7M

As previously mentioned, the 25-year forecast cost chart presented in **Figure 8** shows an unequal distribution of when the forecast work is required. There are four years with spikes in forecast requirements and two of those years are significantly higher than the others with forecast requirements greater than $70M in each of those years.

The capital requirements forecast is based on the condition ratings of the assets, and does not imply that the required work can only be done in the indicated year. Effective planning by City staff distributes the forecast work over many years will distribute the work evenly to better plan for resourcing needs.

Capital Plans

For the ten years prior to 2021 the average annual spending on capital renewal work was $10.45M (based on prior year's capital budgets). Proposed capital budgets for the ten years beyond 2021 have an average annual forecast amount of $18.45M – an increase of 76.5%.

Referring to **Table 24** it is clear the City is already working to evenly distribute the anticipated workload indicated in **Figure 8** across the years. The proposed budget of $18.45M is closely aligned to the anticipated renewal and rehabilitation costs identified in the 25-year average cost (of $17.83M).

Actual capital renewal budget values from 2017 (the year of the first City Corporate Asset Management Plan) have been compared to the approved budget for 2021. This analysis shows that from 2017 to 2021 the approved capital renewal budget increased by a total of 20%, from $10.71M in 2017 (in $2020) to $12.87M in 2021. The 2021 budget value equates to 1.05% of the total inventory CRV. See details in, also discussed in more detail in a later section.

New Assets / Expansion
The growth of the City will bring new residential subdivisions and business areas. These in turn will include new transportation assets like roads and sidewalks, as well as possibly requiring changes or expansion to some of the existing assets.

The exact details of the number and types of new assets is not yet determined. These are being developed in conjunction with City staff and developers responsible for the growth. Some years will have larger growth, bringing many new assets, while in other years the growth may be slower.

Using historical information the rate of growth for the roads, bridges and other transportation assets is set at 0.156% of the total portfolio inventory CRV.

Disposals
No major asset disposals are forecast at this time.

Operations and Maintenance Activities

Operations and maintenance activities on transportation assets represent critical functions that maximize benefits and performance of the assets. Proposed initiatives to better improve Corporate Asset Management's understanding of the costs, impacts and best practices are included in the **Recommendations** section of this document.

Operations

Typical operations for transportation assets include:

- Snow and ice control during winter months (vehicle fuel costs, salt, sand and other treatment material)
- Line painting
- Traffic control monitoring
- Hydro costs to operate traffic control devices and street lighting
- Utility costs for the facilities that support the required operations activities (hydro, natural gas, potable water)
- Landscape maintenance along rights-of-way

Historic spending trends can help provide an understanding of how operations needs have been addressed in the past and leads to better understanding of why the assets are in their current conditions. Unfortunately historic operations spending values are not available in sufficient detail to make this comparison at this time.

Actual operations budgets from 2017 (the year of the first major City Corporate Asset Management Plan) have been compared to the approved operations budget for 2021. This analysis shows that from 2017 to 2021 the approved operations budget increased by a total of 2.9%, from $13.46M in 2017 (in 2020$) to $13.86M in 2021. The 2021 budget value equates to 1.134% of the total inventory CRV or $229 per household. See **Table 6**

Maintenance

Typical maintenance activities associated with transportation assets include:

- Pothole patching
- Roadway crack sealing
- Repairs in response to vehicle accidents
- Regular roadway surface condition inspections
- Bi-annual bridge and structure inspections (mandated by Provincial government)
- Sign maintenance

While some of the maintenance activities can be considered preventive and therefore able to be planned for, others occur on an "as-needed" basis only. By reviewing historical occurrences and spending City staff have sufficient experience to generate annual estimates of what resources will be required in order to address the annual as-needed maintenance.

Using historical information the maintenance spending as a percentage of the total asset value for the roads, bridges and other transportation assets is set at 0.92% of the total portfolio inventory CRV.

Assumed Maintenance and Operations Costs

Forecast costs for operations, maintenance and growth are calculated using a percentage of the annual current replacement value. This method provides a baseline funding requirement, and follows industry best practices.

Figure 9 demonstrates the findings of this analysis, and captures the gradual costs of maintenance and growth over the 25-year period. The 10- and 25-year annual costs are the same as was described in **Table 24.**

Figure 9. Forecast Maintenance and Growth Costs for Transportation Assets Over 25 Years
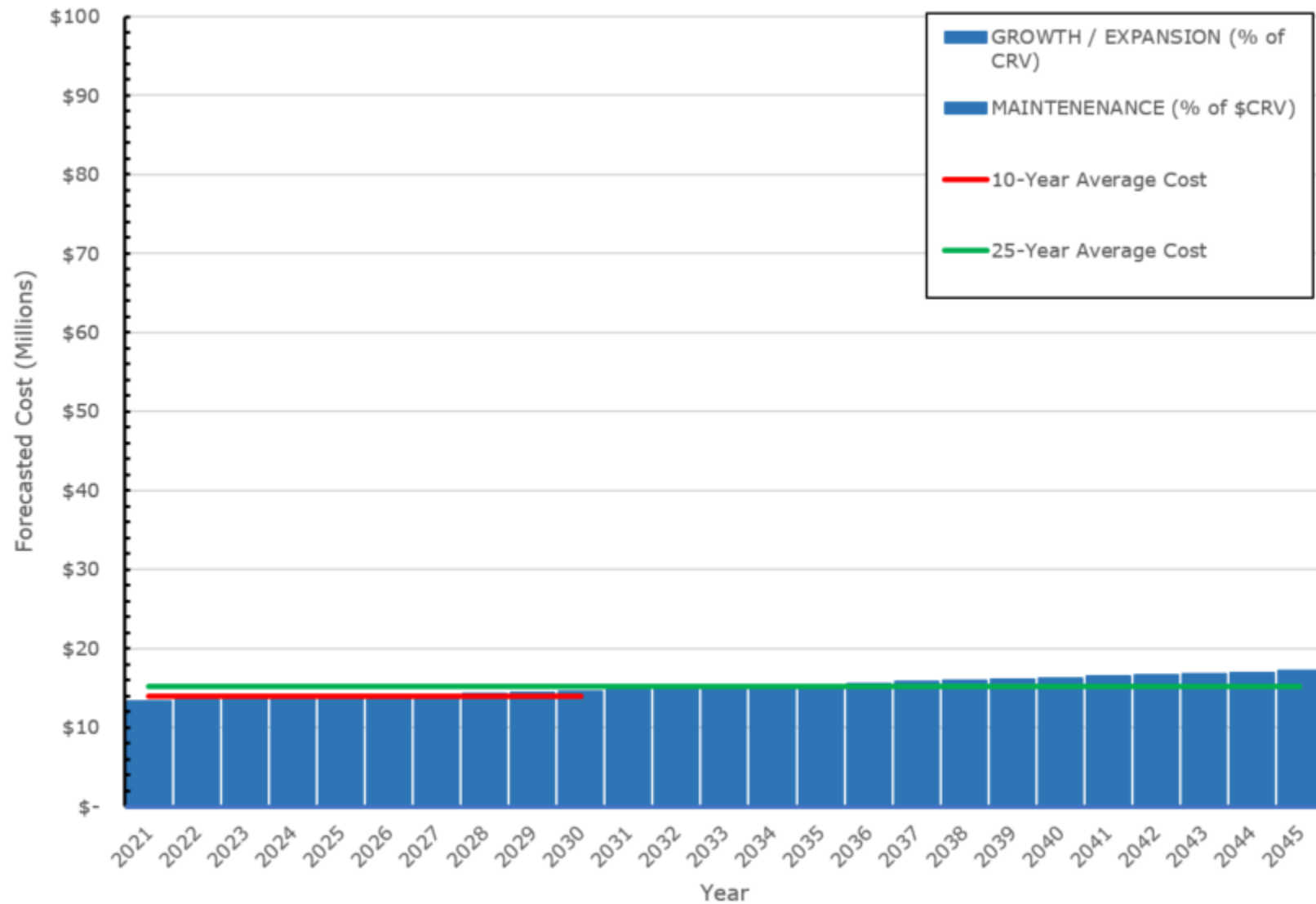
Financial Analysis

The following financial analysis includes renewal and rehabilitation costs (often considered Capital costs at the City), operations and maintenance requirements, and the impacts on asset inventory of growth using projected growth values for the next 25-years (i.e. 2021-2045).

The forecast funding requirements have been summed, analyzed and plotted against the currently approved funding values provided by staff in the City finance department. The results of this analysis are presented in **Table 25**.

The total 25-year forecast funding requirements for all asset activities is based on the sum of all the needs of the assets – capital renewal and rehabilitation costs, operating and maintenance costs and costs associated with investing in growth of the asset portfolio. This whole lifecycle cost for the assets equals $1,032M ($1.03B) over the next 25 years or $41.28M per year. In nearly all years the forecast funding available is less than the forecast cost requirements and on average there is expected to be an annual funding gap of approximately $16.8M per year. Only prior to 2026 is the approved funding greater than the forecast needs.

Figure 10 is a combination of the findings in **Figure 8** and **Figure** 9, summing all of the forecast cost needs of the assets in the Transportation category. These costs are compared to the currently approved funding available over the next 25 years. The first ten years have a total forecast requirement of $218.5M or $21.85M per year. This is approximately 21.2% of the total funding requirements for the 25-year period.

Figure 10 shows that in years 2021 through 2026, there is an anticipated gap of approximately $4M in funding when compared to forecast needs. There is also a steady increase in asset needs, demonstrated by the continuous, gradual increase. Starting in 2030, funding begins to exceed forecast cost requirements. That said, two significant spikes in forecast work in years 2032 and 2040 will require strategic planning to distribute the forecast needs across other years, and addressing anything deferred due to the 6 year funding gap in 2021 to 2026. The analysis doesn't yet include the findings of the updated sustainable financial strategy that is currently under development, which is anticipated to bring the Transportation category to a sustainably funded level.

Table 25. Summary of Renewal, Rehabilitation, Operations and Maintenance Requirements for Transportation Assets

Roads, Bridges and Transportation	25-year total	25-year average	10-year total	10-year average
FUNDING	$612,936,742	$24,517,469.68	$191,322,428	$ 19,132,242.78
Sum of forecast requirements	**$1,032,124,077**	**$41,284,963**	**$218,523,127**	**$21,852,313**
GAP	$(419,187,335)	$(16,767,493)	$(27,200,699)	$(2,720,070)

Figure 10. Forecast Capital, Operations, Maintenance and Growth Requirements Compared to Forecast Funding for Transportation Assets
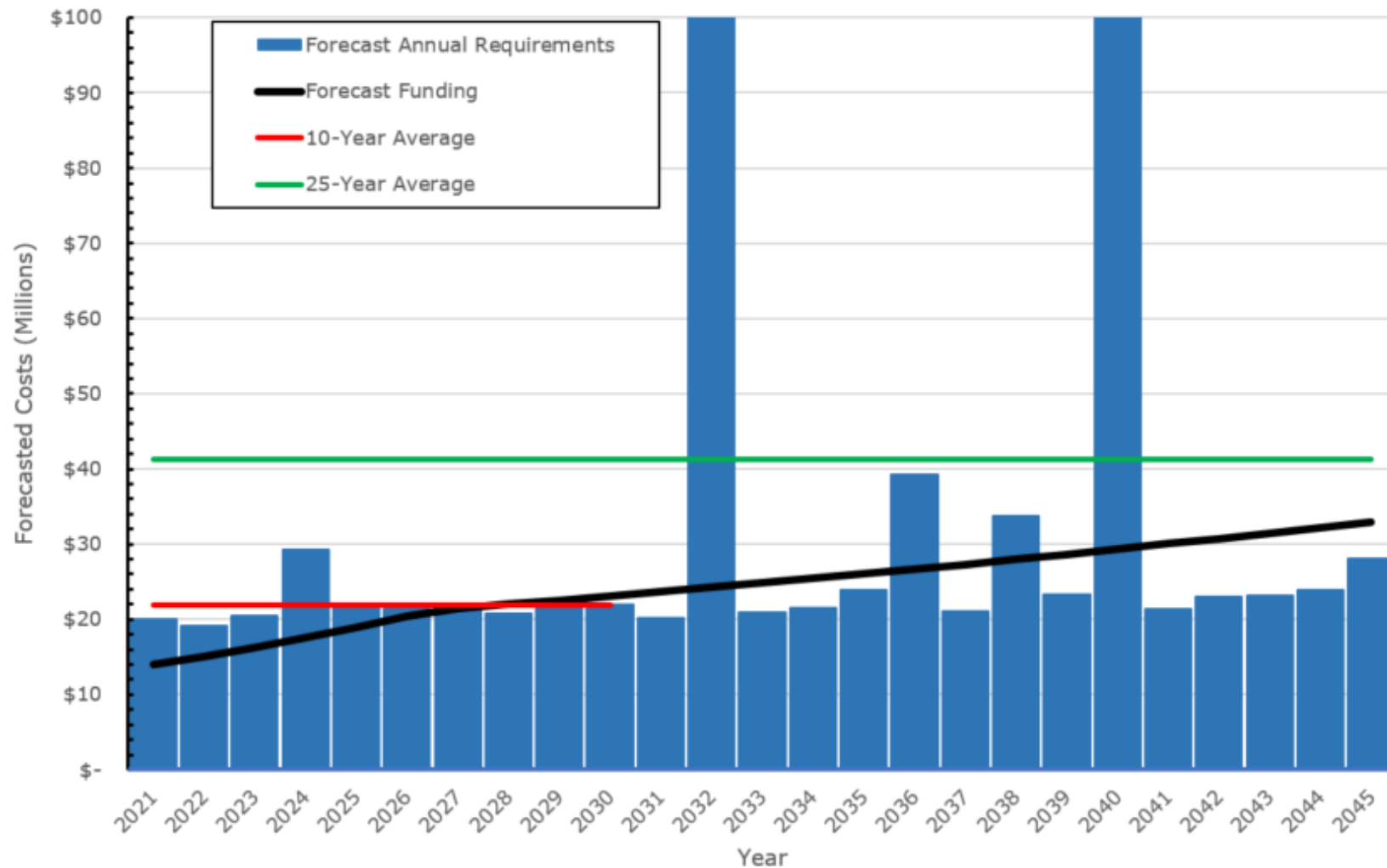
Note: Graph Y scale ($) modified to suit page layout. Forecast requirements in 2032 = $116.4M; 2040 = $373.7M

Financial Sustainability Analysis

Funding for the transportation system assets is provided mostly from the City's tax revenue with additional contributions from other Government levels through grants. The target funding levels are determined partly based on the analysis completed in the 2020 Corporate AMP.

Table 26 captures the finding of the analysis completed in 2020, and indicates that the sustainable funding target in 2020 has grown, compared to what was determined in 2017.

Currently, the tax funding levels identified for the Transportation assets will require an increase of 0.5% to achieve sustainable levels. Further investigation into the supporting financial strategies is under way to determine what this means for funding levels.

Table 26. Sustainable Funding Target Changes for Transportation Assets

Funding	2017 Estimate	2020 Estimate	% Change
Tax [13]	22,685,851	23,925,000	0.5%

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[13] Tax Funding Comparison includes transportation and all other asset types except water, wastewater and stormwater. Parking services funding is a combination of rate based and tax revenue.

Impact of Climate Change

Potential impacts to the roads and bridges that are related to climate change factors are discussed below.

What is known

Recent history shows an increased number of freeze-thaw cycles through winter months in the Guelph region. Moisture in or on the road surface will freeze and melt with each of these events causing pavement surfaces to experience more potholes and cracking. This type of damage can be described as a "breakdown" requiring unplanned repair work to correct. An increased frequency of preventive crack sealing during summer months is a possible method to reduce the unplanned work during winter months. Future studies are being planned to take the impacts of this event into consideration to allow for better understanding of impacts on renewal, rehabilitation and maintenance activities.

There has also been a trend of more extreme summer and winter weather events. The increasing intensity of winter storms may require increased snow and ice control operations immediately after these events, but at a lower frequency across winter season. Stronger and more intense rain storms bring an increase in the risk of flooding. Roads at low elevations relative to a body of water nearby can be susceptible to this risk in the form of water washing out the road base structure, or covering the entire roadway surface impacting traffic flow and requiring emergency operations to manage.

A formal risk assessment that identifies specific roads or areas prone to potential flooding has not been completed, but staff responsible for managing the roads are familiar with the needs and maintain a list of risk areas that is used to help plan future work. The City is also looking at future work to better clarify these risks.

Climate change risks to many of the City roads and bridges are directly related to the risks associated with the other asset classes due to the installation of those other assets in the road right-of-way. These will be discussed in the following sections.

Alternative solutions

As another way of addressing the changing climate, the City is encouraging alternate means of transportation for the community including cycling. Cycling specific infrastructure is already in place along many of the roadways, and more is planned to be constructed in the future.

This is an area of particular interest to Corporate Asset Management, and staff involved in the lifecycle activities associated with this asset group. Proposed future initiatives to better understand the impacts of climate change are included in the **Recommendations** section of this plan.

Summary and Risk Assessment

The Transportation category of assets is in overall Good condition. The value of assets in the "past-due" condition category a small part of the total portfolio, with the majority of assets being in Fair or better condition. The financial analysis showed that there are two risks facing the transportation assets.

The first is a small funding gap of approximately $4M spanning the years 2021 to 2026. The second is two spikes in forecast asset needs in years 2032 and 2040. The available funding will exceed forecast needs for many of the years following 2030, however, those two spike years do represent significant volumes of work that will require distribution across other years to smooth planned projects and resource demands. It is important to note that this analysis will be updated when a revised sustainable funding strategy is developed, and as asset management practices mature across the City.

As assets age the maintenance needs especially tend to increase, and much of the roadway network is currently at the midpoint of its expected life span. The current average age of the transportation assets is slightly less than 50% of the average EUL – this implies that in future years the City should expect an increase in maintenance needs.

Sound operations and maintenance planning will help alleviate future capital needs, provided that the funding for these activities is adequate. Corporate Asset Management is developing improved methods to track and analyze operations and maintenance activities. This will result in stronger datasets and improved asset plans in the future.

The findings of this plan, and current low past-due work value, already demonstrate the benefits of proactive maintenance practices.

Recommendations

1. **Update Inventory**

   The inventory used in the analysis for the 2021 Core AMPs are the same as was used for the 2020 Corporate AMP. As part of a continuous improvement process, the inventory and condition data quality will be enhanced through numerous initiatives. Some proposed projects to address this are:

   i. Continued collection and incorporation of road condition assessment information.
   ii. Completion of inventory and assessment work on retaining walls and other miscellaneous stand-alone structures.
   iii. Inclusion of roadway directional signage and paint markings.
   iv. Update to the sidewalk condition assessments.
   v. Inventorying and assessment of Guardrails, Fences and Handrails
   vi. Review of traffic control inventory and condition information.

2. **Implement Integrated Corridor Analysis**

   Future iterations of the Core AMPs will consider the assets as part of an "integrated corridor" – a combination of all the assets that would be found within a road right-of-way including the roadway, sidewalks, street-lighting, traffic control, water, wastewater and stormwater assets.

   The City began developing the integrated corridor concept in 2018 and work is progressing to implement it for planning purposes. The integrated corridor analysis will be able to provide a comprehensive approach to identifying and prioritizing asset needs.

3. **Standardize approach to calculating replacement values.**

   Development of a standard set of unit costs for the assets used by the City that also include a consistent approach for incorporating project costs would create a more robust replacement value.

4. **Clarify capital, repair, rehabilitation, operational, maintenance and growth activities and costing**

   The values included in the lifecycle capital forecast include a mix of asset replacement costs and identified repair or rehabilitation costs. These values are important to understanding of the needs of the assets but represent different needs of the assets at different stages of their lifecycles. Development of standard definitions and methodologies for assessing the different activity costs would allow for consistent and improved understanding of what is included for both financial planning purposes, and asset activities.

5. **Document As-Is and To-Be operational and maintenance activities**

   Both operational and maintenance activities are critical to successful asset management. Documentation of current practices, including cost and needs analysis, and future needs provide a vital baseline for understanding asset condition, both immediate and long-term. Documenting best practice recommendations for both operation and maintenance activities will allow the City to identify gaps and opportunities, and develop robust maintenance programs. This, in turn, allows the City to realize maximum return on investment, and service delivery, from its assets.

Water Services

Inventory

General Description

The City of Guelph supplies water to residents and industry within the City. The water is sourced from 21 groundwater sources, collected and then treated for safe consumption by approximately 44,000 metered customers connected to the City's water distribution system.

A majority of the water supplied to the City users is collected at the Arkell Spring Grounds via the Glen Collector System – a series of wells, pumps and perforated pipes tat collect shallow groundwater which is then transported to the F.M. Woods Water Treatment Plant (WTP) for centralized treatment and distribution throughout the City. Approximately 70% of the water used by the City is supplied direct from F.M Woods Treatment plant while the other 30% is supplied via direct-to-system wells at other locations across the city.

A unique feature of the Arkell Spring Grounds is the seasonal recharging of the groundwater with water pumped from the Eramosa River through an infiltration collector system into the ground for future water supply. A set of specialized assets are installed and managed to support this activity.

In 2016 an update to the Water Supply Master Plan was completed that included a forecast of predicted water usage and preferred water supply project alteratives in the City of Guelph to meet population growth forecasts for a planning horizon ending in 2041. Based on the release of the release of the "A Place to Grow" planning document for the Greater Golden Horseshoe that used a planning period extending until 2051 the City's Water Supply Master Plan is being

updated to as part of the City Municipal Comprehensive Review Process to assess the ability and preferred projects to meet future growth demands over the planning period.

Asset Types in the Water System

The water system assets can be broadly classified into two categories:

- Linear: the distribution pipe network, including the connectors, valves, meters and related parts required in such a network[14].
- Vertical: the buildings and facilities required to ensure the water system functions. These include the F.M. Woods WTP, the various well and pump stations, water towers and the assets at the Arkell Spring Grounds.

Groundwater is collected by wells or at the Arkell Spring Grounds and then sent for treatment either at the F.M. Woods plant, or directly on site at the well stations. The treated water is distributed through the City for use by the customers through the network of supply and distribution watermains, which also include three (3) above ground storage towers, 2 below grade storage reservoirs and 4 booster stations.

A series of eight (8) groundwater wells (six (6) at Arkell and two (2) at Carter Well Station) collect the water. Some of these well stations have on-site treatment and distribute water directly to customers from the well station.

The water distribution network comprises about 70% of the total replacement value of the water system assets with an estimated replacement value of $540M. The facility type

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[14] Not included in the inventory of pipes are any lateral connections due to concerns with the quality of data for

those items. City GIS staff advised that efforts are underway to mitigate these issues for future analysis

assets have a total estimated replacement value of about $234M, or 30% of the total water system replacement value.

Water Services follows the Provincial regulations related to municipal public water supply, treatment and distribution to ensure that all of the required operations and maintenance activities related to the water infrastructure is meeting compliance and fully funded.

State of the Water Assets

The physical condition and functional performance of the assets in the water system are affected by age, materials of construction, environmental conditions and frequency of use. In broad terms, linear assets like the watermains are designed to be very durable and provide good performance through long lifecycles – up to, and beyond, 70 years.

Watermains operate in a closed and buried system to protect drinking water from contamination introduced by outside sources. This means that it can be difficult to complete condition assessments similar to those of many other asset groups. It is possible, and worthwhile, to complete these assessments on critical assets, and where the distribution system design permits.

Instead of physical assessment information, actual asset ages compared to their EUL are used to develop a preliminary understanding of watermain condition: older assets will generally be in worse condition and pipes of different materials have different EULs. Studies that assess pipe breakage data and material testing are also used to help inform the understanding of the expected service life of the assets.

Other water asset types, like storage tanks, pump equipment, and the buildings or structures that house these assets, are generally assessed by either the City, or third-party consultants and contractors.

The speciality assets in the water system, like the Arkell aqueduct and the groundwater collection system, are assessed by third party consultants at a defined frequency to ensure fit state of repair.

Facility assets tend to have shorter lifecycles, and because many of the components in the facility class are mechanical in nature their functional performance will be more affected by age and usage compared to linear assets. Some assets within the facility class have lifecycles less than ten years.

Facility type assets require more regular maintenance than linear assets.

For both the pipes and other asset types, if no assessment information is available an age based condition is assigned based on the remaining EUL of the asset. The City is developing new protocols for ensuring the assets are assessed to have more accurate information.

Work is currently underway to update condition information on the facilities assets, and future work is planned to assess critical linear assets.

Condition of the Assets

When examined at the whole system level, the water system is determined to be in Poor condition. Most of the linear water assets have been assigned a condition rating based on their age. The overall rating is consistent with the distribution mains having an average age with less than 40% of their expected functional life remaining. This does not imply that the watermains are not functional or need to be replaced in the short-term future, but it does imply that the City should strategically plan for improving the watermains in the mid-term future (5-15 years) so that the average condition does not worsen.

There is an estimated $127M of assets determined to be "past-due" in 2020. **Table 27** and **Figure 11** present the value of the assets in each condition category.

Approximately 64% of the water system assets (by CRV) with a total estimated replacement value of $369M are determined to be in Poor or Very Poor condition. With consideration that many of the assets do not have an assessed condition rating, and an age-based condition rating may not truly represent the actual condition of the assets, this is still a significant portion of the total asset portfolio.

City staff have already begun work that examines the asset needs in detail and develops priorities for project and program work to mitigate potential risks related to the condition of the assets in accordance with infrastructure review and provision requirements of the Province's Drinking Water Quality Management System, which forms part of the City's Municipal Drinking Water License.

A City map that presents the watermain network displayed by the condition of each pipe segment is included in Appendix E.

Table 27. Condition of Water Assets by CRV

Condition	CRV
Past Due	$126,994,386
Very Poor	$306,536,754
Poor	$62,683,254
Fair	$59,919,653
Good	$127,349,256
Very Good	$90,489,679

Figure 11. Average Condition of Water System Assets by CRV
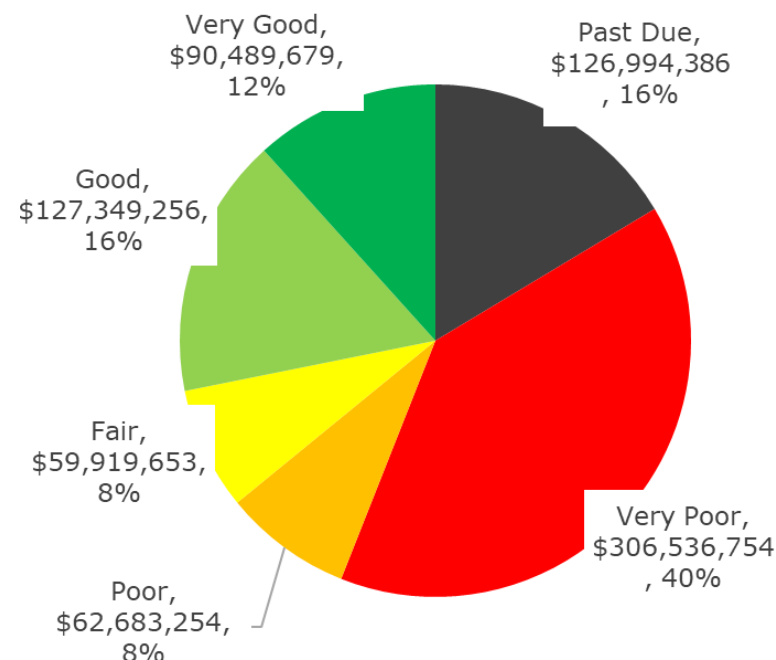
Table 28 and **Table 29** summarize the inventory information into the major classes within the water asset category, and provide details on each classes CRV and average condition score.

Table 28. Water Assets Summary Information

Asset System	Total CRV	Average Condition, all WATER Assets
Water	**$773,972,981**	**Poor**

Table 29. Water System Linear Assets Summary Information

Class	Subclass	Total CRV	% of total Portfolio CRV	Total # records	Total Length (km)	Average Condition Rating
Water - Distribution	Watermain	$509,646,248	65.85%	4847	582.00	Poor
Water - Distribution	Hydrant[15]	$28,910,973	3.74%	3328	N/A	Fair
Water - Distribution	DMA meters	$1,377,238	0.18%	52	N/A	Very Good
	Total CRV:	**$539,986,582**	**69.77**		**Average Condition**	**Poor**

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[15] A small number of hydrants are described as "out of service" but still remain in place: their values are not included in this analysis

Table 30. Water Facility Assets Summary Information

SUBCLASS	SUBCLASS 2	Total CRV	% of total Portfolio CRV	Average Condition Rating
Water - Facility	Booster Pumping Station	$21,616,055	2.79%	Poor
Water - Facility	Booster Station / Reservoir	$10,967,369	1.42%	Very Poor
Water - Facility	Booster Pumping Station / Water Treatment	$3,882,212	0.50%	Very Poor
Water - Facility	Well Station[16]	$16,578,119	2.14%	Fair
Water - Facility	Well Station / Water Treatment	$40,289,569	5.21%	Poor
Water - Facility	Groundwater Recharge System	$53,362,847	6.89%	Fair
Water - Facility	Diversion Chamber	$372,649	0.05%	Good
Water - Facility	Water Tower	$16,401,660	2.12%	Poor
	Total CRV:	**$163,470,480**	**21%**	**Poor**
Water - Facility	WTP - Admin	$60,819,067	7.86%	Fair
Water - Facility	WTP - Treatment	$6,318,058	0.82%	Fair
Water - Facility	WTP - Storage	$160,676	0.02%	Poor
	Total CRV:– F.M. Woods Facility	**$67,297,802**	**9%**	**Fair**

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[16] Two well stations are listed as "out of service" but the assets remain installed. The value of these assets is not included in this analysis.

Water Distribution (Linear Assets)

Through a desktop study approximately 87% of the water distribution (linear) assets have a condition score that was determined using the age based approach combined with references from staff familiar with the assets. The results of the analysis result in an estimated $300M or 55% of the linear assets (by replacement value) are considered to be Poor or Very Poor. $69M, or 13% are considered Past Due.

The condition of the linear asset types according to their CRV is presented in **Figure 13**. The large percentage of watermains considered to be in Very Poor condition is clearly visible.

Figure 12. Average Condition of Water System Linear Assets by Replacement Value

Poor, $38,345,289, 7%

Fair, $29,400,239, 5%

Very Poor, $261,558,018, 48%

Good, $68,571,118, 13%

Very Good, $72,697,182, 14%

Past Due, $69,414,736, 13%
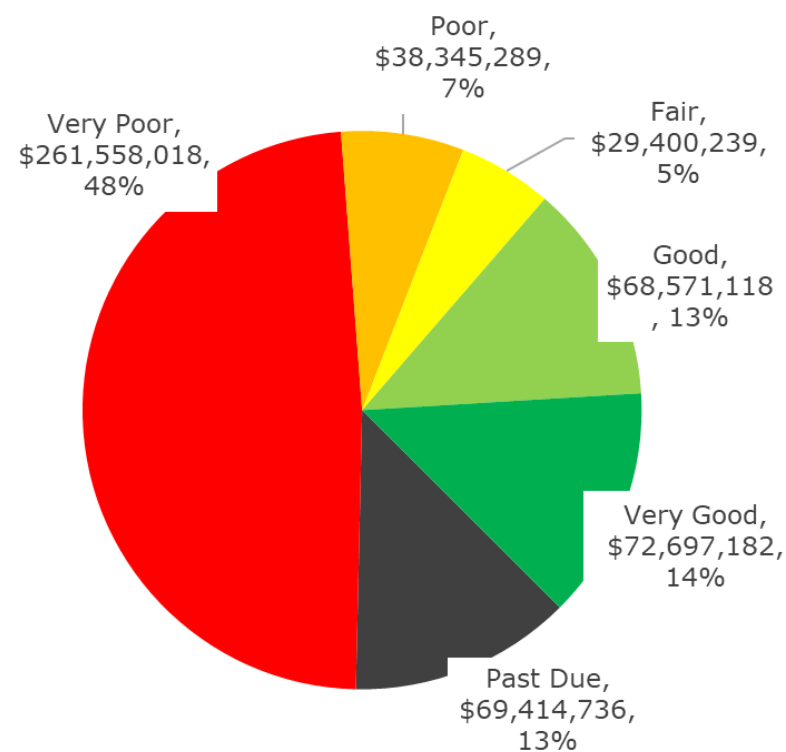
Figure 13. Percentage of Water System Linear Assets in Condition Rating Category by CRV[17]
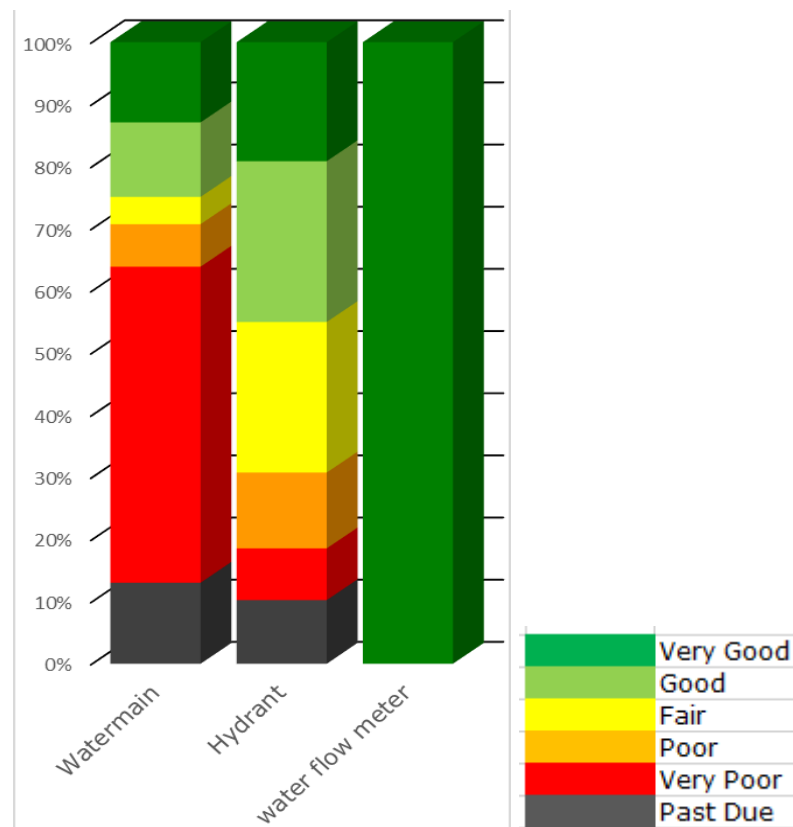
Water System Facilities

A replacement value of approximately $69M or 29% of the facility assets are considered in Poor or Very Poor condition. An additional $58M, or 25%, are considered to be Past-due.

Figure 14. Average Condition of Water System Facility Assets by Replacement Value
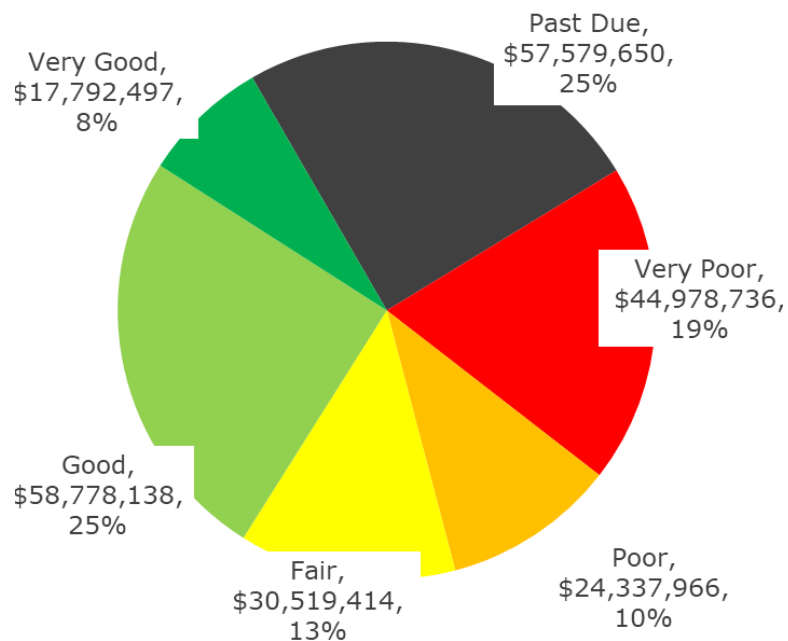
The chart in **Figure 15** highlights the relatively large percentages of each asset type in Very Poor condition or worse.

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[17] Throughout the analysis "water flow meters" refer to DMA meters and not the individual service meters that measure flow at each customer location

Note: In 2020 an assessment of the Arkell aqueduct system was undertaken. The detailed results of that assessment were not available in time to refine the analysis completed for this AMP but staff have indicated that the assessment found the aqueduct and related assets to be in **good** condition. With this in mind the value of the assets in poor or worse condition in the sub-category described as "groundwater recharge system" will be reduced by an estimated $25M-$35M across the three condition categories with the condition ratings for the relevant assets and their indicated values moving to a higher rating. Once the detailed condition data is available the AMP data will be updated.

In 2021 Work is underway to assess the physical condition of the facility assets as part of the Facility Needs Assessment previously discussed. The results of that assessment will be included in future updates to City AMPs.

Figure 15. Condition of Water Facility Asset Types by CRV

45
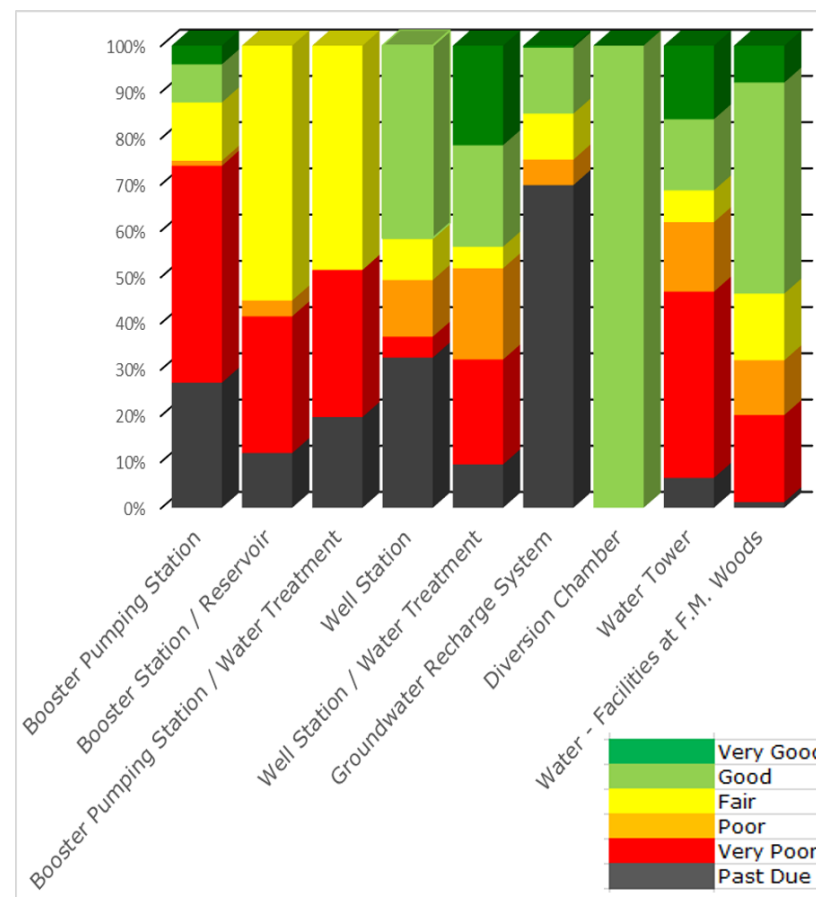
Asset Ages

Overall, the average age of the water system assets is approximately 35 years out of an average EUL of 60 years. It is important to remember that age does not necessarily reflect condition of the assets, or their ability to provide the required service levels. That said, where a physical condition assessment is not completed, age is often used to determine condition based on the EUL.

Table 31 summarizes the overall average ages of the two major classes with the Water Asset category. This highlights the differences in EUL between the linear assets and the facility assets. Overall, linear assets are still well within their EUL, with 43% of their EUL remaining. Facilities have approximately 29% of their EUL remaining.

Table 31. Average Age of Water Assets

Asset Class	Average Age	Estimated Useful Life	% Remaining EUL
Water Linear Assets	35	61	43%
Water Facility Assets	24	34	29%

The typical renewal period for a watermain is approximately 70 years and that EUL is generally related to the materials they are made of: older pipes made of cast iron or ductile iron have shorter lifecycles than pipes constructed of other materials.

Table 32 details the current average age of the water linear subclasses, and their remaining EUL. Overall, the water linear assets are at approximately 60% of its remaining EUL. Other asset types, such as the DMA meters and hydrants, have an average age approximately the same as

the overall water system. These types of assets have an average age of 35 years out of an average EUL of 61 years.

Table 32. Average Age of Linear Water Assets by Subclass

Asset Subclass	Average Age	Estimated Useful Life	% Remaining EUL
Watermain	42	70	39%
Hydrant	25	50	50%
Water Flow Meter	4	50	91%

Table 33 displays the current average age of the water facilities. Overall, the water facility assets are at approximately 32% of their remaining EUL. The facility assets have a shorter average EUL at 33.5 years. The average age of the facility assets is 24years. This indicates that the majority of the facility assets are about 72% through their expected lifecycles. Each facility asset type can have very different EUL values as presented in Table 33 below.

Table 33. Average age of Water Assets by Facility Subclasses

Asset Class	Average Age	Estimated Useful Life	% Remaining EUL
Booster Pumping Station	25	35	28%
Booster Station / Reservoir	28	35	18%
Booster Pumping Station / Water Treatment	30	36	16%
Well Station	19	28	33%
Well Station / Water Treatment	24	35	30%
Groundwater Recharge System	19	32	39%
Diversion Chamber	6	15	60%
Water Tower	26	36	27%
Facilities at FM Woods	14	23	39%

Past-due Maintenance and Capital Needs

The calculated value of past-due work in 2020 for the water linear asset types is estimated at $69M with a further $300M value of assets in Very Poor or Poor condition. Much of the past-due work is determined by the age of the assets rather than condition assessments, and this in turn results in most of the watermains – the largest part of the water system asset inventory - being rated according to their age.

Cast-iron materials, used in many of the older watermain assets, are susceptible to weather related damage – their resiliency to changing temperatures is not as good as modern materials such as PVC – and pipe breakages do occur without warning requiring costly emergency repairs. Many of the pipes made of these older materials are included in the past-due work requirements.

There are techniques available that can extend the lifecycle of cast iron or ductile iron pipes that do not require complete replacement. These have been effectively used by the City, but even with these rehabilitation steps strategic planning will be required to address the needs of the older assets.

There is a preference to replace all of the older cast iron and ductile iron pipes with pipes using modern materials. This will require extensive planning and several years to accomplish. The result will be long term benefits through reduced emergency repairs due to unanticipated breakages or other problems, reduced risks of negative impacts to the community, and reduced water revenue loss due to leakage.

The past-due work value for the facilities is estimated at about $58M with a further $69M estimated in Very Poor or Poor condition. The water facility assessment work discussed previously and underway will provide further details on requirements and priorities for project work. The full results of this assessment will be included in future AMPs.

Areas of Concern
The large value of assets in Poor or worse condition present a situation where significant capital resources will be required within the next ten years. The consequences of any part of the water system failing can be major and include risks to the health and safety of residents.

City staff work diligently to ensure these potential risks are minimized and that all regulatory and legislative requirements are met to ensure the safety of the community. Priorities for future project and program work will be developed that mitigate potential risks related to the condition of the assets in accordance with infrastructure review and provision requirements of the Province's Drinking Water Quality Management System, which forms part of the City's Municipal Drinking Water License.

The changing climate also presents a risk to the City water system. This point is addressed in a separate section.

Critical Assets

The provision of safe drinking water is an essential asset to the entire community and while all parts of the system are considered essential, there are certain assets in the supply and distribution system that perform a more significant role than others.

Foremost among these is the Arkell Springs groundwater collection system, and the related groundwater recharge system. The groundwater aquifer is a naturally occurring asset and is irreplaceable. The City is dependent upon ground water for its water supply, and protecting these assets, as well as the supply, is essential.

About 70% of the City's water supply is sourced from Arkell springs where it is collected then transferred via the Arkell Aqueduct to the F.M. Woods Water Treatment Plant for eventual distribution throughout the City. The aqueduct and related assets were assessed during 2020 and found to be in good condition.

The F.M. Woods WTP is also a critical asset. The facility is well maintained and regular capital and maintenance works are undertaken on the assets at the facility in order to ensure that risk of failure to the treatment process is minimized as much as possible. However, about 32%, or assets with a value of $22M that are part of the total facility were identified in Poor or worse condition. City water staff have already begun work to make necessary repairs and

renewals to the WTP assets and in the next City AMP there will be an improvement in the condition rating compared to the results here. The FNA underway in 2021 will also highlight further details and identify specific needs. The results of that work will be reported in future AMPs and projects will be developed that address any identified needs.

There are some water customers in the City where the supply of water should never be compromised. City Water Services staff have compiled a detailed list that is included in Appendix F. Some of the customers on this list are in the following sectors:

- Health Care Facilities
- Children & Youth Care Facilities
- Food Services
- Hotels
- Private and Public Schools
- All Other Customers

The infrastructure assets that directly serve these customers must be considered critical assets that will receive increased priority for renewal, repair and maintenance compared to other parts of the water system. Identifying the specific assets serving these customers is underway and will help aid future efforts at identifying priority work.

Levels of Service

O.Reg 588/17 LOS

As required by O.Reg 588/17 the following tables outline the City's compliance with the mandatory Levels of Service reporting.

Table 34. Extract from O.Reg 588/17 Table 1 – Part 1: Community LOS for Water Services

Service attribute	Community levels of service (qualitative descriptions)	City of Guelph Response
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system.	Water Services is a municipally-owned and operated water utility, established in 1879. The Guelph Drinking Water System (Guelph DWS) consists of water supply and treatment facilities and a water distribution system. The Guelph DWS is a Class II Water Treatment Subsystem and Class IV Water Distribution Subsystem.

Refer to the "State of the Assets" section for more details. |
| | Description, which may include maps, of the user groups or areas of the municipality that have fire flow. | All customers connected to the City water system have adequate supply for fire fighting. |
| Reliability | Description of boil water advisories and service interruptions. | There have been no boil water advisories in 2019 or 2020. |

Table 35. Extract from O.Reg 588/17 Table 1 – Part 2: Technical LOS for Water Services

Service attribute	Technical levels of service (technical metrics)	City of Guelph Response
Scope	Percentage of properties connected to the municipal water system.	There are approximately 44,000 metered water service connections to the Guelph water system. Several properties and customers have more than one connection to the property, but available data is not suitable to compare the total number of properties to the number of properties with water service connections.
	Percentage of properties where fire flow is available.	All customers connected to the City water system have adequate supply for fire fighting.
Reliability	The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system.	Zero (0)
	The number of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system.	Zero (0)

City Defined LOS

In the Spring of 2018 the City began efforts to define LOS metrics against which the functional performance of the assets can be measured. As with the O.Reg mandated LOS metrics these are divided into "customer" and "technical" focussed metrics. The following tables identify the LOS metrics in these two categories.

It is important to note that work remains to be done on finalizing the LOS metrics. These metrics focus on requirements outlined in regulatory and legislative documents that currently guide the Water industry.

There are presently no targets established. This is part of a larger initiative that will work through engagement activities with all stakeholder groups within the community.

LOS Service Statement:
Efficiently providing safe, high quality and reliable water services with adequate pressure and flow.

Table 36. City Defined Customer Focused Performance Measures for Water Services

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data Source)
Quality	Providing high quality water to residents	# of complaints due to rusty/discoloured water	119
		# of complaints due to low pressure	61
Reliable	Providing water services with minimal interruptions	% of customers where service is interrupted above target frequency	Zero (0)
Environmental Stewardship	Promoting the Efficient Use of Water Resources	Water consumption L/cap/day	2020 data not available; 2019 residential 165L/cap/d

Table 37. City Defined Technical Focused Performance Measures for Water Services

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data Source)
Safe	Water system provides safe potable drinking water	% compliance with all applicable water quality regulations	100%
		# of confirmed adverse water quality tests	Zero (0)
		% of system with low pressure (<30 psi)	Zero (0)
Reliable	Providing water services with minimal interruptions	# of connection-days where service is interrupted due to water main breaks	Zero (0)
		# of watermain breaks resulting in unplanned failures and service interruption/reduction	51 (2019)
		# of days with suitable water tower volume	365 days
Environmental Stewardship	Providing a water service that is environmentally conscious	Infrastructure Leakage Index (ILI)	2.03 (based on 2019)

Lifecycle Management and Planning

Renewal and Major Rehabilitation

Renewal and major rehabilitation activities are those activities that result in either the full replacement of the asset at the end of its lifecycle, or restoration of the asset to like-new condition. This analysis follows the same time span as the City's financial strategy, and looking at both a 25-year and 10-year timeframe. The analysis is based on industry best practice of replacement and rehabilitation timeframes, and is based on the theoretical needs of the assets as indicated by the condition.

The 25-year total funding required to accommodate the renewal and major rehabilitation needs of the water assets is estimated at $482M. $315M is required for the linear assets, and $167M for the facilities over that time frame. This equates to a combined average need of $19.3M per year over the 25-year period.

The ten-year total – between 2021 and 2030 – estimates total forecast funding needs of $325M, with an annual average of $32.6M over the 10-year period. **Table 38**

summarizes these findings for both 10- and 25-year periods.

This means that 69% of the forecast renewal and major rehabilitation work for the water system is estimated to take place within the next ten years. This correlates to the overall condition rating of Poor for the water asset category. The annual forecast costs associated with all renewal and major rehabilitation work is presented graphically in **Figure 14.**

The 2020 calculated past-due maintenance and capital renewal work value is $126.9M, or about 16.4% of the total water services portfolio value. This value has been distributed across the next ten years (2021-2030) as a means of reducing the impact of trying to correct all the past-due issues at one time. This represents an annual commitment of $12.7M over that period of time.

Table 38. Water Services 10 and 25 Year Forecast Renewal and Major Rehabilitation Cost Summary

	2020 Past-due	25-Year Total	25-Year Average	10-Year total	10-Year Average
Water – Linear	$69,414,736	$307,201,437	$12,288,057	$261,558,018	$26,155,802
Water - Facility	$57,579,650	$158,762,056	$6,350,482	$61,743,209	$6,174,321
Total – Water Services	**$126,994,386**	**$465,963,493**	**$18,638,540**	**$323,301,227**	**$32,330,123**

Figure 16. Water Assets Renewal and Major Rehabilitation Forecast
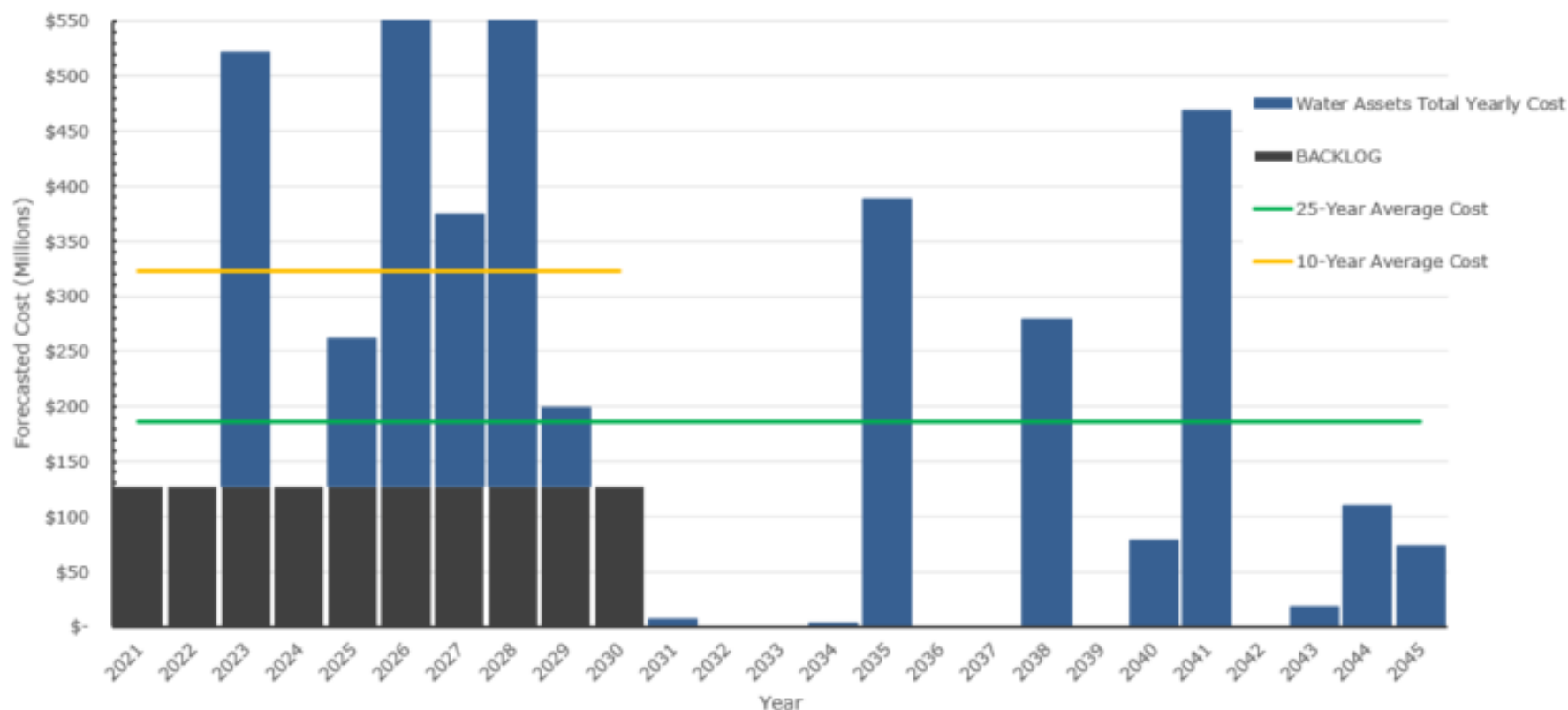
Note: the Graph Y-axis ($) has been adjusted to fit the page layout. In 2026 water distribution = $127M; total = $133M. In 2028 water distribution = $104M; total = $106M

As is apparent in **Figure 16** there are years forecast with significantly higher volumes of work. Smoothing these spikes will be necessary to ensure an even distribution of projects and resources. Two years in particular have higher than average forecast work. 2026 and 2028 are anticipated to have renewal and major rehabilitation works that will cost in the area of $127M and $133M, respectively. The work does not necessarily have to take place in the forecast year, and staff are already prioritizing and sequencing these project needs.

Capital Plans

For the ten years prior to 2021 the average actual annual spending on capital renewal work was approximately $9.3M. For the ten years beyond 2021 the average anticipated annual budget for this same work is estimated at $25.25M – an increase of 171%. Despite this large increase, this anticipated annual budget is lower than the forecast 10-year average renewal and major rehabilitation needs of $32.3M identified by the analysis.

The 10-year anticipated budget average is greater than the 25-year forecast renewal and major rehabilitation funding requirements of $18.6M per year.

This indicates two things. Firstly, this is a good indication that reducing the 2020 past-due value in the water assets would be possible if those funding levels are met. Secondly, it also demonstrates that City staff are building capital plans (which typically incorporates renewal and major **Table** 5 for more details.

Expansion of the water system will occur with the expansion of the City, particularly as new residential areas are developed. Using historical information the rate of growth for the water system assets is set at 0.816% annually of the total portfolio inventory CRV.

The 2008 Water and Wastewater Linear Master Plan identified several broad needs and some specific project recommendations to support community growth and sustain LOS experienced by customers. These include:

- Reinforce existing mains in City core (Zone 1): proposed transmission main loop around downtown area
- New East-West and North-South transmission mains in Zone 1 to improve water supply transmission from Woods PS
- New Zone 3, south of Clair road with storage facility and booster pumping station (from zone 1)

rehabilitation activities, among some maintenance programs) that target the City's most at-need assets, and are aligned with the recommendations of asset management. These plans will require further evaluation as they proceed through the capital planning process. Projects and programs of work will be refined, and a more precise understanding of costs and impacts, particularly in those later-year projects, will be developed.

Actual capital renewal budget values from 2017 (the year of the first major City Corporate Asset Management Plan) have been compared to the approved capital budget for 2021. This analysis shows that from 2017 to 2021 the approved capital renewal budget increased by a total of 43.8%, from $11.1M in 2017 (in 2020$) to $17.2M in 2021. The 2021 budget value equates to 2.22% of the total inventory CRV. Refer to

- New East West transmission across zone 2 (along speed vale) and additional Zone 2 storage Modifications to pressure zone boundaries to address high and low elevation issues

Specific requirements identified the need for "completion of the downtown transmission main to service intensification (Exhibition/ Dublin) and to transmit water from new water supply facilities."

The plan also included non-infrastructure recommendations including strategies to reduce the future water uses and wastewater needs by promoting efficiency water use and appropriately managing the extent, density, type and location of future development in the City.

The total forecast costs to implement the 2008 recommendations included $72.7M for linear assets, and $27M for facilities, a total of $99.7M ($123.3M in $2021)

The Water Services department has engaged a consultant to complete a new Functional Needs Assessment (FNA) that will explore the current physical condition of the water system facilities, the functional and capacity performance, and provide recommendations for capital needs. This FNA study is expected to be delivered to the City in late 2021.

Potential projects arsing from the study will be incorporated into planning activities in the following years, including a more accurate description of the forecast rate of growth of the asset inventory. This information will be incorporated into future AMP work.

The addition of new assets will require additional funding for the operation and maintenance activities required to ensure that the assets remain functional through their entire EUL.

Operations and Maintenance Activities

Operations

Active operations at the water treatment plant are complex and include:

- Utility costs for the buildings and treatment equipment to function (hydro, natural gas, potable water)
- Chemical costs for treatment processes
- Labour resource costs for staff to manage the facility
- General property maintenance (building maintenance, landscaping, snow and ice control etc.)

Historic spending trends can help provide an understanding of how assets have been maintained. Unfortunately historic operations spending values are not available in sufficient detail to make this comparison.

Actual operations budgets, which fund a mixture of operations and maintenance activities, from 2017 (the year of the first major City Corporate Asset Management Plan) and these have been compared to the approved operations budget for 2021. This analysis shows that from 2017 to 2021 the approved operations budget decreased by about 4.1%, from $18.3M in 2017 to $17.6M in 2021 as part of changes in operational practices and found efficiencies through continuous improvement studies. The 2021 budget value equates to 2.3% of the total inventory CRV, or $290 per household.. See

Table 6.

Maintenance

Typical maintenance activities associated with water assets include:

- maintenance of booster pumps and other mechanical equipment
- Valve and hydrant inspection and exercising
- Preventative maintenance on electrical systems and back-up generators
- Regular calibration of in-situ process analyzers
- repairs to any damaged pipes or other assets

Non-responsive maintenance is performed at regular planned intervals in accordance with the terms of regulations and/or equipment supplier recommendations. This ensures the proper long-term performance and function of the assets and level of service to customers.

Using historical information the maintenance spending as a percentage of the total asset value for the roads, bridges and other transportation assets is set at 0.83% of the total portfolio inventory CRV

Assumed Maintenance and Operations Costs

Forecast costs for operations, maintenance and growth are calculated using a percentage of the annual current replacement value. This method provides a baseline funding requirement, and follows industry best practices. The findings of this analysis are summarized in **Table 39** and are used in **Figure 17** which can be found on the following page.

Figure 17 captures the findings of this analysis, and demonstrates the gradual increase to the maintenance and growth costs over a 25-year period.

The 10-year average funding requirement for maintenance, operations and growth requirements is estimated at $14M per year. The 25-year average is higher at $16M per year. The assumed percentage used to estimate the cost of maintenance for the analysis is conservative so as to not overestimate the costs until further studies can be completed that will refine the value of required maintenance and operations forecasts.

Table 39. Water Assets 10 and 25 Year Forecast Maintenance, Operations and Growth Cost Summary

	25-Year Total	**25-Year Average**		**10-Year total**	**10-Year Average**
Water Total	$396,528,979	$15,861,159		$139,517,803	$13,951,780

Figure 17. Water Assets Forecast Maintenance and Growth Costs over 25 Years
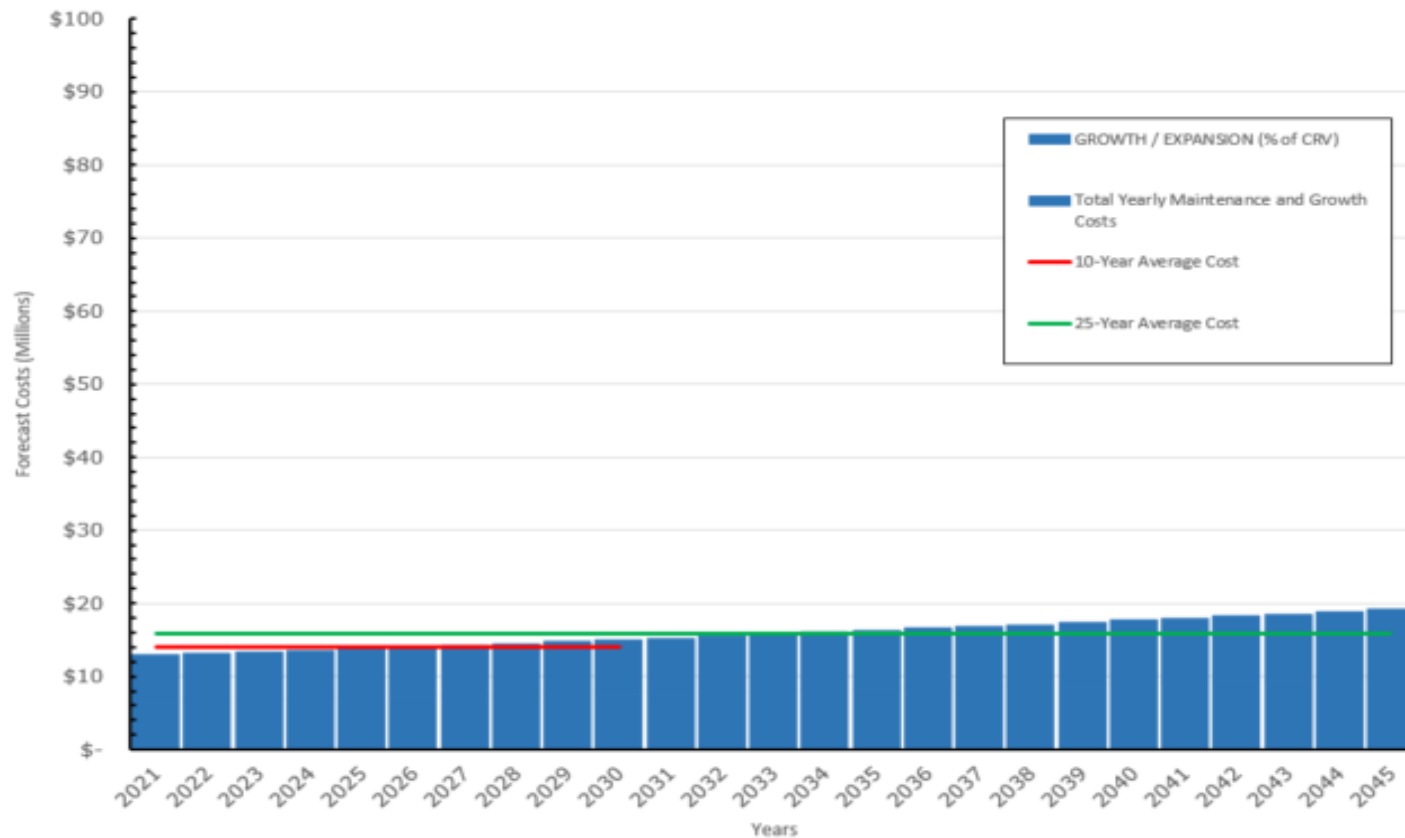
Financial Analysis

The following financial analysis includes renewal and rehabilitation costs (often considered Capital costs at the City), operations and maintenance requirements, and growth using projected growth values for the next 25-years (i.e. 2021-2045).

The forecast funding requirements have been determined using the values described in previous sections. An additional amount has been included for contingency in this analysis that has not previously been included in earlier sections of this plan. The findings of this total lifecycle forecast funding needs is then analyzed and compared against the currently approved funding values provided by staff in the City finance department. The results of this analysis are presented in **Table 40**

The total 25-year forecast funding requirements for all asset activities based on the whole lifecycle of the assets equals $1,203M ($1.2B), or $48.13M per year. There is a funding gap until 2031, with a few years beyond that where forecast funding requirements exceed available forecast funding (i.e. 2035, 2038, 2044 and 2045). With the exception of those years, there is, in fact, a surplus.

Table 40. Summary of Renewal, Rehabilitation, Operations and Maintenance Requirements for Water Assets

Water Services	25-year total	25-year average	10-year total	10-year average
FUNDING	$517,483,765	$20,699,350.58	$169,696,769	$16,969,676.94
Sum of forecast requirements	**$1,203,236,595**	**$48,129,464**	**$721,116,601**	**$72,111,660**
GAP	$(685,752,830)	$(27,430,113)	$(551,419,832)	$(55,141,983)

Figure 18 is a combination of the findings in **Figure 16** and **Figure 17** and presents the total forecast cost requirements for all of the assets in the water category.

The same chart captures the currently approved funding available over the next 25 years, and overlays that information on the forecast costs by using a black line. The first ten years has a total forecast funding requirement of $721M, or $17M per year, which is approximately 60% of the value for the total funding requirement forecast over a 25-year period.

The analysis shows that the majority of the forecast work is expected prior to 2030. The first ten-year total forecast requirement is $721M or $72.1M per year – 60% of the total 25-year sum. The average amount of the funding gap is $27M, but this does not apply to all years. As was previously mentioned, from 2031 onwards there are years where forecast funding exceeds forecast requirements, however, work planned for those later years will still require strategic planning, and forecast funding will be, on average, below the required amount.

Two years - 2026 and 2028 - have forecast requirements far greater then the average requirements. Strategic project planning will allow the requirements in these two "spike" years to be spread out, removing the need for excessive capital funding in any single year.

There is a steady increase in asset needs demonstrated by the continuous, gradual increase seen overall. This is due to anticipated increasing maintenance needs, and general growth of the water asset category due to densification and new development.

It is important to note here that it was previously identified that the past-due work requirements could be addressed by

current project and program plans. This suggests that the gap is caused by the forecast funding needs of the maintenance, operations and growth components. Further analysis to validate this, and identify a strategy for addressing this, is required. Likewise, the findings of the sustainable funding targets found in **Table 41** indicate the need to increase funding availability. When the strategy incorporating the findings for the sustainable funding levels is finalized, the financial analysis will be updated to reflect the most current version of the budget.

Figure 18. Forecast Capital, Operations, Maintenance and Growth Requirements for Water Assets Compared to Forecast Funding
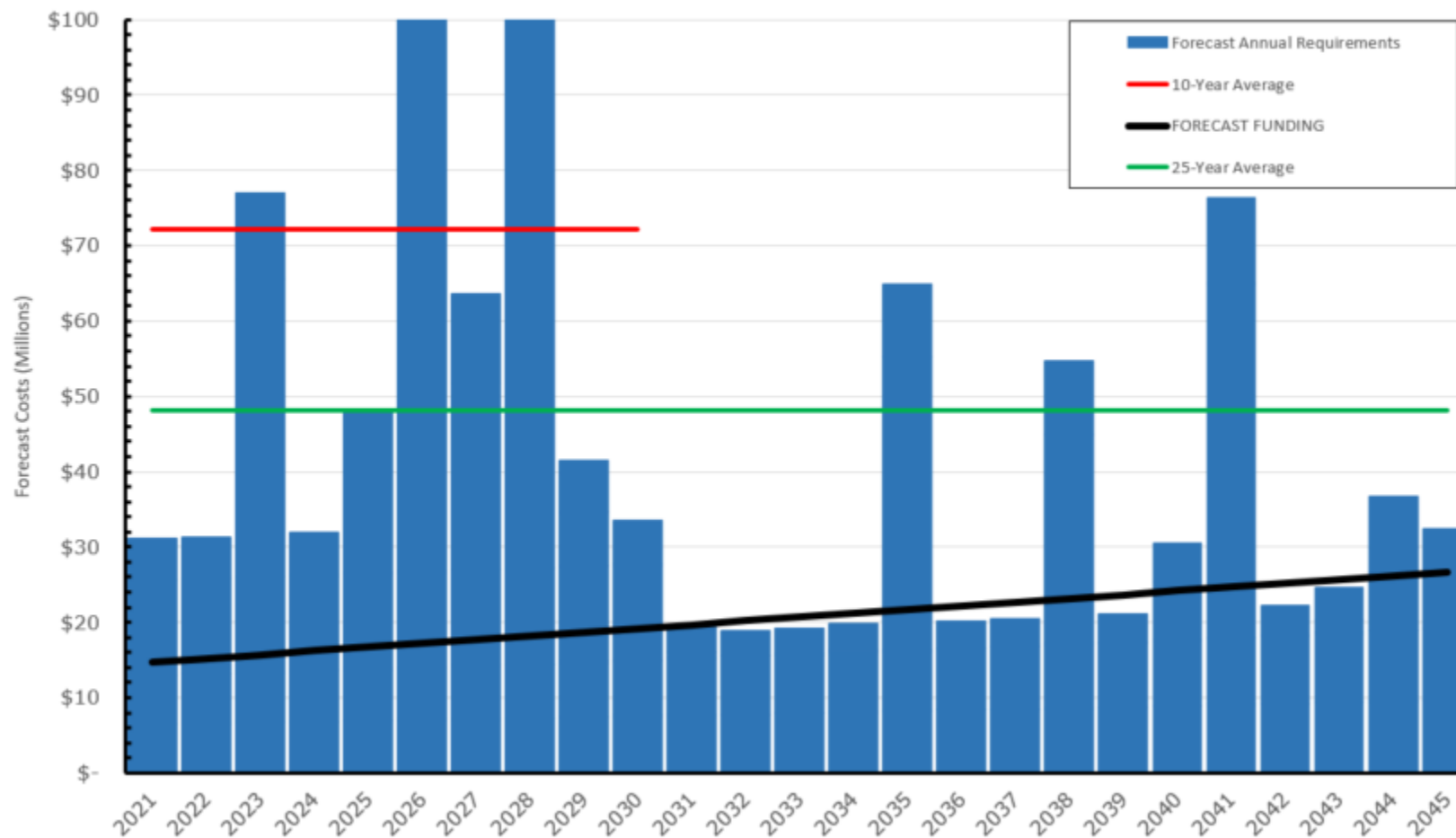
*Graph Y scale ($) modified to suit page layout. Forecast requirements in 2026 = $197.9M; 2040 = $164.7M

Financial Sustainability Analysis

Funding for the water system assets is intended to be provided entirely from user fees (i.e. rate based). The target funding levels are determined partly based on the analysis completed in the 2020 Corporate AMP. **Table 41** captures the finding of the analysis completed in 2020, and indicates that the sustainable funding target in 2020 has grown, compared to what was determined in 2017.

As was identified in the section detailing the financial analysis, there is a need to increase the funding amount to achieve a sustainable funding level. The City is working on a new Sustainable Funding Levels strategy based on the findings of the 2020 Corporate AMP. Once finalized, this information will be included in future AMP financial analysis.

Table 41. Sustainable Funding Target Analysis

Funding	2017 Estimate	2020 Estimate	$ Change
Water	13,400,000	22,614,900	+69%

Impact of Climate Change

To be proactive in preparing for potential climate change risks, the City is introducing programs that educate and inform the community on what they can do to help. Water Services has completed a Tier 3 groundwater model that was used to assess the impact of climate change.[18] Other measures being introduced include:

- Environmental Monitoring Programs that continuously monitor water quality/quantity around production wells
- Hazard Tree Inspection and Removal that identifies and removes hazardous trees that may be susceptible to wind and ice damage that could impact operations
- Frozen Services Program monitors and tracks weather patterns each winter to gauge the likelihood of water services freezing. Customers that have had previously identified frozen services customers may be eligible for financial grants that can be used to install the water service deeper, which would provide improved protection against the possibility of freezing.
- Facility and Roof Inspection Program: Severe weather events with strong winds may damage roofs and cause significant damage to critical infrastructure facilities that are part of the City water system. These facilities are inspected annually
- Well Performance Testing programs monitors well quantity to identify yield trends and provide better information that can be used for making informed maintenance decisions
- Well Inspection and Rehabilitation Program is designed to maintain and restore well yield that may be related to climate change

- Eramosa River / Groundwater Recharge system monitoring: The City monitors river flows to prepare for and prevent environmental impacts or other issues that may affect downstream users
- Educational Water Efficiency Programs focused on lowering water demand in order to prolong the life of an asset and defer the addition of new assets. These programs can also help lower the annual per user water usage rates.

These types of programs have already proven successful. According to the "Water and Wastewater Long Range Financial Plan" prepared in Feb. 2019[19] "Over the past 15+ years, water production has been declining despite growth in the municipality. This is a result of the success of the water conservation program, climate change, and customer driven efficiencies encouraged by increasing rates."

Future work directly related to managing climate change impacts to the City water services will be part of the new Water Supply Master Plan that is being prepared in 2021.

In response to potential periods of drought that may affect the City, a new Drought Response Operational Plan (DROP) is being prepared in 2021. This plan will include protocols and triggers for when the plan will be required to be put into effect as well as changes to the Outdoor Water Use (OWU) Bylaw.

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[18] The report from this study can be accessed at https://www.sourcewater.ca/en/source-protection-areas/resources/Documents/Grand/15072-527-Climate-Change-R-2018-11-21-final-V1.0.pdf

[19] https://guelph.ca/wp-content/uploads/Water-and-Wastewater-Long-Range-Financial-Plan2.pdf

Summary and Risk Assessment

The water assets have an overall condition rating of Poor, with an estimated value of past-due work calculated at $127M. With nearly 70% of the water distribution network (linear assets) and 54% of the facility assets considered to be in Poor or worse condition there are risks to individual pipes and facility assets that will require unplanned repairs and decreased levels of service in the event of failure.

Emergency repairs to broken pipes can be done with only short term impacts to users, but these are types of occurrences that not only require unplanned spending but also pose risks to customer relationships and safety.

Analysis of available capital budgets show that staff are engaged in a planning process that would target past-due work should those funding levels be met. However, when a full lifecycle approach is taken – that is, operations, maintenance and growth assumptions considered as the whole lifecycle cost requirements for the assets - a funding gap is identified. Further analysis will need to be completed to refine the financial analysis of this plan to determine what is contributing to that gap.

Sound operations and maintenance planning will help alleviate future capital needs, provided that the funding for these two essential activities is adequate. Currently all regulatory and legislatively required activities are being completed to ensure the service delivery of the assets, however, as assets age the maintenance needs increase. Many of the water system assets are older than 50% of their EUL – this implies that in future years the City should expect an increase in maintenance needs and costs.

Approximately 50% of the existing watermain distribution network was constructed using cast iron or ductile iron pipes. While these types of pipes were normal at the time those sections were installed as they age they become more prone to breakages or leaking. These types of problems result in lost revenue, unplanned spending to make repairs, and negative impacts to the City. Water services staff are aware of the issue and a program is in place to upgrade old sections of pipe.

Guelph relies on groundwater sources for the majority of its water supply and the changing climate may impact those sources.

City staff are aware of these risks and have been working proactively and diligently to ensure the probability of any problems in the water system occurring are minimized. Further planning work that is already underway by City staff will reinforce these efforts.

Recommendations

Asset management planning is a process of continuous improvement. The following points identify opportunities for continuous improvement to this plan.

1. **Integrated Corridor Analysis**

   Inclusion of water assets, in particular the water distribution assets (pipes) in the integrated corridor analysis that was described in the Transportation assets section will help streamline asset management at the City.
   While this coordination is valuable it will not always be possible due to the criticality of some of the pipe replacements that are required. Water pipe replacements without work on other assets in a corridor will continue to be done.

2. **Complete Detailed Needs Assessments**

   The Full Needs Assessment being completed in 2021 will provide comprehensive details on the needs of the water assets. The findings will be included in future iterations of this plan and analysis.

3. **Update inventory and condition information.**

   The inventory used in the analysis for the Core AMPs is the same as was used for the 2020 Corporate AMP. Areas within the Water asset class that would benefit from additional inventory and condition assessment work are:

   i.   Inventory and Condition assessment of booster stations and wells.
   ii.   Development of inventory of water lateral services (underway in 2021)

iii.   Condition assessment of critical assets within the distribution network (expected to be completed as part of the Full Needs Assessment in 2021).
iv.   Review of 2021 Water Masterplan work and identify any additional areas to be addressed (future)

4. **Develop a standardized replacement value strategy**

Prior work to review tender pricing and third party assessments were used to develop initial current replacement value data, however, developing a standardized replacement value method with input from staff responsible for the assets will result in a more robust costing mechanism that reflects total asset cost. This project is underway.

5. **Clarify capital, repair, rehabilitation, operational, maintenance and growth activities and costing**

The values included in the lifecycle forecast include a mix of asset replacement costs and identified repair or rehabilitation costs. Both of these values are important to the total understanding of the needs of the assets but represent different needs of the assets at different stages of their lifecycles. Development of standard definitions and methodologies for assessing lifecycle, operational, maintenance and growth costs and activities would allow for consistent understanding of what is included for both financial planning purposes, and asset activities.

6. **Document As-Is and To-Be operational and maintenance activities**

Both operational and maintenance activities are critical to successful asset management. Documentation of current practices, including cost and needs analysis provide a vital baseline for understanding immediate and long-term asset needs. Documenting best practice recommendations for both operation and maintenance activities allow the City to identify gaps and opportunities, and develop robust maintenance programs. This, in turn, allows the City to realize maximum return on investment, and service delivery, from its assets.

City water services staff have recognized this need and are developing program documentation, performance targets and key performance indicators for the operational programs, where operational KPIs may not already exist.

7. Refined Financial Analysis – Past-due Work

Currently the value of past-due work used in the financial analysis only considers the requirements previous to and including 2020. The financial analysis would benefit from further consideration of the impacts of funding availability on how the past-due value of work would change. This work is currently planned for 2021.

Wastewater Services

Inventory

General Description

Sanitary wastewater generated by the residents and businesses in the City of Guelph and the Town of Rockwood is collected in a network of collection pipes and delivered for treatment at the Guelph Wastewater Treatment Plant (WWTP) on Wellington St. The collected sanitary waste is filtered, treated and clean effluent is released into the Speed River, with the entire treatment process completed in accordance with strict standards and processes as mandated by the Ontario Provincial Government.

The collection pipe network consists of a mix of gravity-flow pipes and forcemains. A series of pumping stations located throughout the City are in use to provide the needed pressure to ensure good flow or to lift the wastewater from a low-point in the system to a location where it will enter a gravity flow main.

The Wastewater Treatment Plant (WWTP) facility located on Wellington St. West along the shore of the Speed River is a complex Class IV facility that includes multiple process buildings and unit processes to treat and produce a best in class liquid and solid end product. Wastewater services has recently conducted a major facility needs assessment that has contributed to bettering the knowledge of the condition and future needs of the WWTP.

Asset Types in the Wastewater System

The wastewater system assets can be broadly classified into two categories:

i.   Linear: the collection pipe network, including the maintenance holes, connectors, valves, meters and related parts required in such a pipe network[20]. Collector pipes are of two types - gravity mains where wastewater flows without assistance, and forcemains where the flow is assisted by the booster pumps. Some of the forcemains are classed as siphons.

ii. Vertical (facilities): the WWTP facility (and the multiple buildings, structures and site infrastructure that facility is comprised of) plus the pumping stations. Included in this sub-class are the assets that are part of the treatment process, as well as the assets that are components of the buildings or sites

The assets within the pipe network comprise the largest portion of the City wastewater system representing about 66% of the total inventory based on replacement value. Approximately 533km of pipes, 8,258 maintenance holes and other components part of the pipe network with a total value of about $446.2M are installed across the City.

The WWTP facility has an estimated replacement value of about $210M, or about 34% of the total value of the portfolio. This consists of the buildings, the components that are part of the treatment process like settling tanks, pumps, digesters etc., and the infrastructure on the grounds of the WWTP property.

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[20] Not included in the inventory of pipes are any lateral connections due to concerns with the quality of data for those items. City GIS staff advised that efforts are underway to mitigate these issues for future analysis

State of the Wastewater Assets

Condition of the Assets

The physical condition and functional performance of the assets in the wastewater system are affected by age, materials of construction, environmental conditions and frequency of use. The linear assets like the gravity and forcemains are designed to be very durable and provide good performance through design lifecycles that can be 70 years or greater.

The condition of pipes can be determined by completing camera inspections (CCTV) of the pipe interior. Third party companies that specialize in this type of work are engaged by the City on a cyclical basis to perform assessments on part of the pipe network each year. The findings during these assessments are compared to established standards in order to assign a condition rating. The assessed rating is converted to a 5-point scale for use by the City in the asset analysis.

Other wastewater asset types, like pumping equipment, settling tanks, digesters, storage tanks and the buildings or structures that house these assets are assessed by either City staff or third-party consultants. The assessments take note of the physical condition of the assets and how they are functioning. These findings are compared against performance standards in order to assign a condition rating. The assets at the WWTP were assessed by a third-party engineering company in 2018/2019 and the results of that assessment have been incorporated in the analysis for this AMP.

Facility assets tend to have shorter lifecycles and because many of the components in the facility class are mechanical in nature their functional performance will be more affected by age and usage compared to linear assets. Some assets in the facility class have lifecycles less than ten years. Facility type assets require more regular maintenance than linear assets.

For both the pipes and other asset types, if no assessment information is available an age based condition is assigned based on the remaining EUL of the asset. The City is developing new protocols for ensuring the assets are regularly assessed in order to have more accurate information.

The information in **Table 42** provides a summary of the various asset types, their value and average conditions.

Table 42. Asset Types in the Wastewater Category with CRV and Average Conditions per Type

Class	Subclass	Total CRV	% of total Portfolio CRV	Total # records	Total Length (km)	Average Condition Rating
Linear Asset Types						
Maintenance Hole	Maintenance Hole	$43,743,187	6.43%	8258	N/A	Fair
Sanitary Gravity Main	Gravity Main	$393,274,177	57.85%	8517	519.00	Fair
Sanitary Forcemain	Forcemain	$6,001,914	0.88%	34	11.28	Fair
Sanitary Forcemain	Siphon	$3,202,141	0.47%	62	3.06	Poor
	Total CRV: Wastewater Linear	**$446,221,418**	**65.64%**		**Average Condition**	**Fair**
Facility Asset Types						
Wastewater Treatment Plant Facility	Wastewater Treatment Plant Facility	$222,086,038	32.67%	4506	N/A	Poor
Wastewater Pumping Stations	Wastewater Pumping Stations	$11,398,527	1.68%	609	N/A	Fair
	Total CRV: Wastewater Facility	**$233,484,566**	**34.36%**		**Average Condition**	**Fair**
All Wastewater Assets						
	Total CRV	**$679,705,984**			**Average Condition**	**Fair**

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Average condition ratings are based on the individual condition of all the assets in a class. In 2019, the WWTP and other facilities were assessed as part of a Facilities Needs Assessment study by a third party. This has resulted in nearly 100% of the facility assets having a recorded assessment score.

Assessment of the linear assets is still under way. Approximately 44% of the gravity mains and 70% of the forcemains have an assessment record. The remaining pipes were assessed using age-based analysis.

Figure 19 shows the condition rating of all assets within the wastewater asset category. These findings are summarized in **Table 43**.

About 32% of the wastewater system assets are in Poor or worse condition, including 4% that are considered beyond their normal lifecycle (Past Due). The assets in Poor, Very Poor or Past Due conditions have a total CRV of $215.6M. This represents the total expenses the City may need to plan for within the next 0-10 years to ensure that the assets in Poor or Very Poor condition do not further deteriorate.

Table 43. Condition of Wastewater Assets by CRV

Condition	CRV
Past Due	$28,748,172
Very Poor	$106,224,525
Poor	$80,659,495
Fair	$265,366,862
Good	$129,431,770
Very Good	$69,275,160

Figure 19. Condition of Wastewater Assets by CRV

Good, $129,431,770 , 19%
Very Good, $69,275,160 , 10%
Past Due, $28,748,172, 4%
Very Poor, $106,224,525 , 16%
Poor, $80,659,495 , 12%
Fair, $265,366,862 , 39%
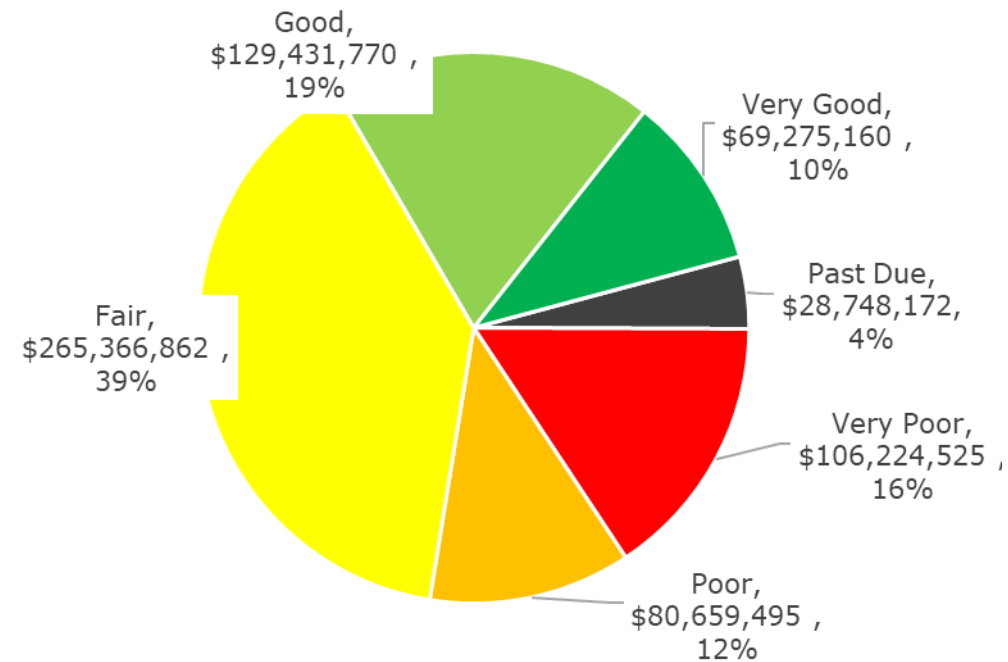
Figure 20 shows that approximately 33% ($146M) of the linear assets are in Poor or worse condition, and approximately $29M are considered Past Due. This does not necessarily indicate the pipes are not functioning properly, but it does indicate that within the short to mid-term future (1-5 years) the City should examine in more detail the needs of the assets in the pipe network to properly plan for degrading assets.

Maintenance holes (MH) are included in the linear class of assets - the age data for the MH assets was incomplete so an assumption was made that all of the MH assets were

50% through their lifecycles. In reality, this is not likely to be the case, and a condition assessment is planned for 2021 and 2022 to provide updated data. Given that MHs are installed in conjunction with pipes, it is probable that the actual condition of the MH assets is similar to the sewer pipes they are part of.

A City map that presents the linear wastewater assets in the network displayed by the condition of each road segment is included in Appendix E.

Figure 20. Condition of Wastewater Linear Assets by CRV
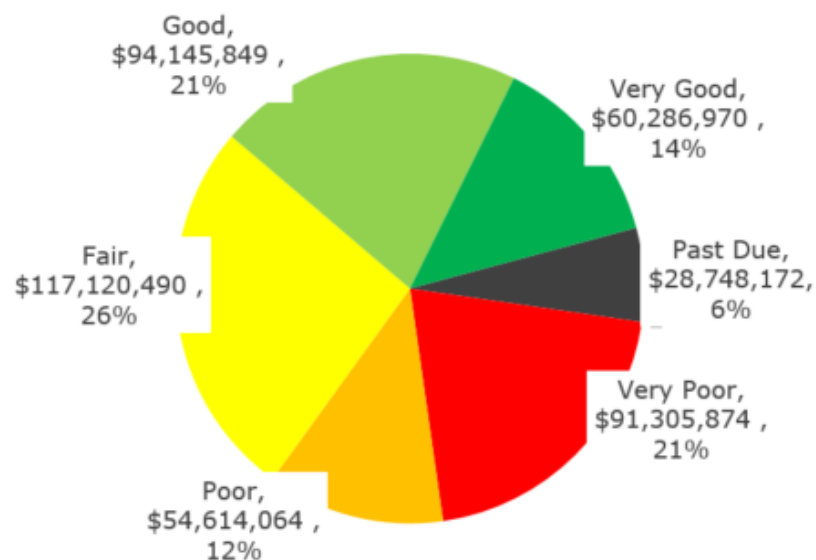
The recent assessments of the facility assets resulted in findings that about 17% ($41M) of the assets in Poor or Very Poor condition, with none identified in Past Due condition, as shown in **Figure 21**. The majority of the facility assets are in Fair condition.

Figure 21. Condition of Wastewater Facility Assets by CRV
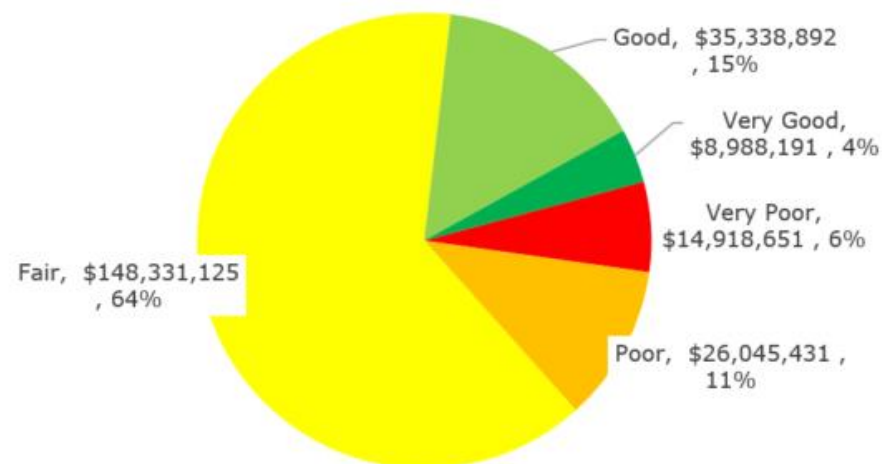
Asset Ages

Table 44 summarizes the average age of both linear and facility assets within the wastewater asset category. The average age of the linear asset types is 33 years and have 44% of their remaining EUL. Meanwhile, facility assets have shorter lifecycles, with facility assets having an average age of 27 years, with approximately 29% of their remaining EUL available.

Table 44. Average Age of Wastewater Assets

Asset Class	Average Age	Estimated Useful Life	% Remaining EUL
Wastewater Linear Assets	33	60	44%
Wastewater Facility Assets	27	39	29%

Wastewater linear assets tend to have long lifecycles, as highlighted by **Table 45** which summarizes the average age and remaining EUL for all linear assets within the wastewater asset category. Pipes are constructed of durable materials and gravity mains have a function that is more passive than active, reducing the effects of wear and tear from normal use compared to other asset types, and see average EULs of 70 years. Meanwhile, maintenance holes are estimated to have an EUL of 50 years, and are subject to separate inspections and maintenance activities from the pipes within the linear class.

Table 45. Average Age of Wastewater Assets by Linear Subclass

Asset Subclass	Average Age	Estimated Useful Life	% Remaining EUL
Maintenance Hole	25	50	51%
Sanitary Gravity Main	42	70	40%
Sanitary Forcemain	32	70	53%
Sanitary Forcemain	42	70	40%

The facility assets have shorter lifecycles and therefore more frequent renewal needs. Some of the assets in the facilities have very short to medium length lifecycles (5 to 20 years). As with the linear assets, the probability of the assets remaining functional until they reach their forecast lifecycles is dependant on good regular maintenance being completed.

The average age of the facility assets by type is shown in **Table 46**. The assets at the WWTP have an average age of approximately 28 years, with approximately 26% of their remaining EUL available. Wastewater pumping stations are, on average, 20 years old, with approximately 49% of the remaining useful life available to them.

**Table 46. Average Age of Wastewater Assets by
Facility Subclass**

Asset Subclass	Average Age	Estimated Useful Life	% Remaining EUL
Wastewater Pumping Stations	20	40	49%
Wastewater Treatment Plant Facility	28	38	26%

Past-due Maintenance and Capital Needs

There are currently an estimated $29M of wastewater assets in the Past Due category, all within the wastewater linear asset class. This means that they required replacement before 2020, and are now considered beyond their normal service life. In the linear assets, another $146M sit in the Poor and Very Poor categories, which will require increasing maintenance and operational activities to maintain service delivery.

While the facility type assets has no identified past-due work, there are $40M of assets classified as Poor and Very Poor. Like the linear assets, these will move between condition ratings over the next 10 years, and, if appropriate attention is not given to them their condition will worsen to a state where the volume of past-due work may increase.

Areas of Concern

The large percentage of the pipe assets (gravity mains and forcemains) identified in Poor or worse condition presents a potential risk. The Wastewater industry is a highly regulated one, and the City ensures that all assets meet both the regulatory and the legislated requirements, for the safety of the community and the environment. That said, as the assets age, the maintenance and operational activities will require increasing funding to continue ensuring that the assets are able to provide their service safely, and there is an increase risk of unexpected failure which will lead to emergency repairs, which can be both expensive and disruptive.

Critical Assets

The WWTP and all of the assets that are part of the treatment process are essential assets. This facility must be maintained so that the City meets the legislated requirements related to the treatment of sanitary waste and the return of treated wastewater to the Speed River.

Lift stations that take wastewater from low points in the pipe network to gravity mains, and pumping stations that ensure proper wastewater flow is maintained are also considered critical assets within the wastewater system.

Wastewater Services staff have indicated that any sewer main greater than 450mm in diameter (i.e. trunk sewers) should be considered a critical asset.

Levels of Service – Wastewater Assets

O.Reg 588/17 LOS

As required by O.Reg 588/17 the following tables outline
the City's compliance with the mandatory Levels of Service
reporting.

Table 47. Extract from O.Reg 588/17 Table 1 – Part 1: Community LOS for Wastewater Services

Service attribute	Community levels of service (qualitative descriptions)	City of Guelph Response
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system. "See above, and	533 km of sanitary pipe, 4 wastewater pumping stations (+1 new station coming online in Oct. 202), 8258 maintenance hole , siphons, water treatment plant facility A map of the wastewater collection assets (linear assets) can be found in Appendix E.
Reliability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.	Not Applicable (No Combined Sewers)
	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.	Not Applicable (No Combined Sewers)
	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.	Inflow (e.g. Maintenance Hole covers) and Infiltration (e.g. sanitary pipe joints and cracks permitting groundwater in)
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in paragraph 3.	Ontario Sewage Design Guidelines City of Guelph Linear Infrastructure Design Standards

Service attribute	Community levels of service (qualitative descriptions)	City of Guelph Response
Reliability	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system.	Tertiary treatment plant meeting ECA requirements

Table 48. Extract from O.Reg 588/17 Table 1 – Part 2: Technical LOS for Wastewater Services

Service attribute	Technical levels of service (technical metrics)	City of Guelph Response
Scope	Percentage of properties connected to the municipal wastewater system.	There are approximately 44,000 metered water service connections to the Guelph water system Available GIS data is not able to identify the total number of services that are only connected to the wastewater system and not the water system: not all metered services are both water and wastewater so the 44,000 customer value is also used as an estimate for the number of wastewater customers. Several properties and customers have more than one connection to the property, but available data is not suitable to compare the total number of properties to the number of properties with water service connections.
Reliability	The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.	Zero (0) / Not Applicable (No Combined Sewers)
	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	Insufficient Data

Service attribute	Technical levels of service (technical metrics)	City of Guelph Response
	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	Zero (0)

City Defined LOS

In the Spring of 2018 the City began efforts to define LOS metrics against which the functional performance of the assets can be measured. As with the O.Reg mandated LOS metrics these are divided into "customer" and "technical" focussed metrics. The following tables identify the LOS metrics in these two categories.

It is important to note that work remains to be done on finalizing the LOS metrics. These metrics focus on requirements outlined in regulatory and legislative documents that currently guide the Wastewater industry.

There are presently no targets established. This is part of a larger initiative that will work through engagement activities with all stakeholder groups within the community.

LOS Service Statement: Providing wastewater services that are reliable and efficient.

Table 49. City Defined Customer Focused Performance Measures for Wastewater Assets

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data source)
Reliability	Providing wastewater services with minimal interruptions	# of customers that experience a service interruption due to main blockages	12
Environmentally Conscious	Providing wastewater services that have minimal impacts on the environment	% of Landfill divergent for biosolids removal	100%

Table 50. City Defined Technical Focused Performance Measures for Wastewater Services

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data Source)
Reliability	Providing wastewater services with minimal interruptions	km of sewers in poor or very poor condition	224 km (39.1% of total)
		% of wastewater facility assets in poor or very poor condition	17.5%
		# of sewage pumping stations with standby power	4 of 4 (100%)
		Current rated capacity of treatment plant	64 MLD
Environmentally Conscious	Providing wastewater services that have minimal impacts on the environment	Total volume of untreated wastewater discharged into the natural environment via treatment plant bypass	Zero (0)
		Total volume of untreated wastewater discharged into the natural environment via pumping station overflows	Zero (0)

Lifecycle Management and Planning

Renewal and Major Rehabilitation

Renewal and major rehabilitation activities are those activities that result in either the full replacement of the asset at the end of its lifecycle, or restoration of the asset to like-new condition. This analysis is follows the same time span as the City's financial strategy, and looking at both a 25-year and 10-year timeframe. The analysis is based on industry best practice of replacement and rehabilitation timeframes, and is based on the theoretical needs of the assets as indicated by the condition.

The 25-year total forecast funding required to support the renewal and major rehabilitation of the wastewater assets identifies $343M in forecast activity costs for the wastewater system assets. This equates to an average cost of $13.7M yearly.

The 10-year forecast funding requirements total – between 2021 and 2030 – estimates total forecast activity costs of $128M, with a ten-year average of $12.8M yearly. These findings are summarized in **Table 51**.

The graph in **Figure 22** presents the annual forecast capital renewal and rehabilitation work over the next 25 years. The estimated $28.8M in past-due work in 2020 represents approximately 4.2% of the total portfolio value. This value has been distributed across the next ten years to minimize

the impact of trying to complete all of the past-due work in a single year.

The majority of the forecast lifecycle work is estimated to be required after 2030.

This correlates to the overall condition ratings that identified the average condition of the wastewater system assets in Fair condition, which generally means assets with between 40%-60% of their useful life remaining.

Despite linear assets having long lifecycles, this does not mean no capital work per year is required. The majority of the forecast renewal and major rehabilitation needs are required on the linear assets. Strategic management of the wastewater system will include some capital work on the linear assets every year. This will distribute the needs of the assets over time and minimize any single year with very high expenses.

Figure 22 shows that there are clear spikes in requirements in some years. Effective project planning will distribute the requirements identified in those years over many years so as to minimize the impact to capital budgets in any single year.

Table 51. Wastewater Assets 10- and 25-Year Forecast Renewal and Major Rehabilitation Cost Summary

	2020 Past-due	25-Year Total	25-Year Average	10-Year total	10-Year Average
Wastewater - Linear	$28,748,172	$178,123,481	$7,124,939	$90,239,654	$9,023,965
Wastewater - Facility	$0	$164,884,800	$6,595,392	$38,200,807	$3,820,081
Total Wastewater	**$28,748,172**	**$343,008,281**	**$13,720,331**	**$128,440,462**	**$12,844,046**

Figure 22. Wastewater Assets Renewal and Major Rehabilitation Forecast
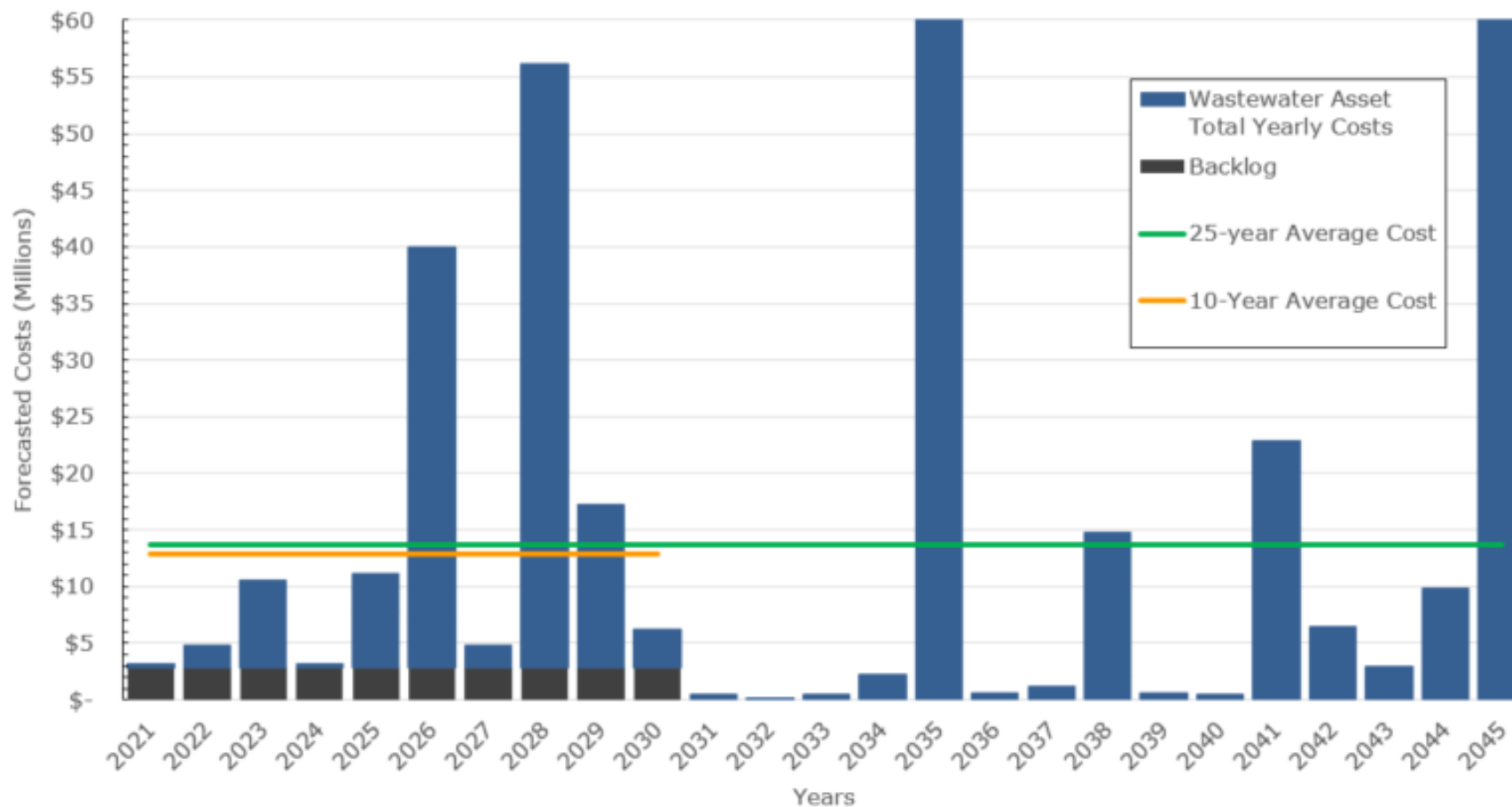
Note: Graph Y-Axis ($) has been adjusted for the page layout. In 2035 wastewater facility = $66.8m and wastewater distribution = $3.28M (total $70.1M). In 2045 Wastewater linear = $48.6M; total = $81.3M

Figure 22 clearly demonstrates that there are years forecast with significantly higher volumes of work compared to the average. Smoothing these spikes will be necessary to ensure an even distribution of projects and resources. Three years in particular have higher than average forecast work. 2026 has forecast needs totalling $33M, 2028 has forecast needs totalling $51M, 2035 has forecast needs totalling $70M, and 2045 has forecast needs totalling $81M. The work does not necessarily have to take place in the forecast year, and staff are already prioritizing and sequencing these project needs.

Capital Plans

For the ten years prior to 2021 the average annual spending on capital renewal work was $7.32M annually. For the ten years beyond 2021 the average annual forecast budget for this same work is estimated at $22.0M – an increase of 200%. This is greater than the forecast 25-year average renewal and major rehabilitation funding needs of $13.7M per year, and also greater than the forecast 10-year average funding needs of $12.8M per year.

This indicates two things. First, this is a good indication that reducing the value of the past-due work in the wastewater assets would be possible if those funding levels are met. Second, it demonstrates that City staff are building capital plans (which typically incorporates renewal and major rehabilitation activities, among some maintenance programs) that target the City's most at-need assets, and are aligned with the recommendations of asset management. These plans will require further evaluation as they proceed through the capital planning process. Projects and programs of work will be refined, and a more precise understanding of costs and impacts, particularly in those later-year projects, will be developed. From this, a final, prioritized capital list that reflects the year implementation will be developed, and any impacts from this process will be incorporated into these plans.

Actual capital renewal budget values from 2017 (the year of the first major City Corporate Asset Management Plan) have been compared to the approved capital budget for 2021. This analysis shows that from 2017 to 2021 the approved capital renewal budget increased by a total of 130%, from $7.01M in 2017 (in 2020$) to $16.2M in 2021. The 2021 budget value equates to 2.4% of the total inventory CRV.

Expansion of the wastewater system will occur with the growth of the City, particularly as new residential areas are developed. Using historical information the rate of growth

for the water system assets is set at 1.31% of the total annual portfolio inventory CRV.

The development of new residential subdivisions and business areas will include new waste collection pipes and in some locations booster and/or lift stations. These new assets will be constructed in accordance with City specified and approved designs and standards. The capital costs of those assets is normally covered by the developers, but upon completion and commissioning of the assets they will become City assets to operate and maintain.

Within the short term future a new pumping station at Nima Trails will be brought on-line and become part of the wastewater system inventory in Oct. 2021. The long-term maintenance of the facility will begin at that time and will be included in operations and maintenance budget planning.

In 2008 the City completed a Water and Wastewater Linear Assets Servicing Master Plan that was aligned with the City Asset Management plans in place at that time. This work identified several broad needs and recommended some specific projects to be completed. These include:

- Reinforce City core gravity sewers around downtown area to service intensification
- Upgrades/replacement of sub-trunk sewers
- Install new gravity sanitary sub-trunks to service new growth areas which feed into existing conveyance system
- Options to provide storage to provide moderation of peak flows to WWTP; these options include:
    - Equalization tanks at the WWTP

Included in the recommended project options in the 2008 plan was:

- Replacement of the main trunk sewers (York, Waterloo, Speed River)
- A new main pumping station from York Trunk to the WWTP

The same plan also included non-infrastructure recommendations including strategies to reduce the future wastewater needs by limiting the extent, density, type and/or location of future development in the City, along with encouraging a reduction of water use that will help alleviate infiltration and inflow (I/I) issues. City staff have further identified the need to develop a robust program that reduces the effects of I/I.

The total estimate in 2008 for the recommended work was $63.7M for improvements to the linear infrastructure, and $10M for improvements to the wastewater facilities, for a total of $73.7M ($91.2M in $2021).

The completion of a new master plan in 2021 will reconfirm the recommendations from 2008, and likely include new recommendations.

Operations and Maintenance Activities

The wastewater collection and treatment processes involve a wide variety of assets of differing types.

Operations

Active operations at the wastewater treatment plant are complex and include:

- Utility costs for the buildings and treatment equipment to function (hydro, natural gas, potable water)
- Chemical costs for treatment process
- Labour resource costs for staff to manage the facility
- Plus more

Historic spending trends can help provide an understanding of how well operations needs have been addressed in the past which can lead to better understanding of why the assets are in the status-quo condition. Unfortunately historic operations spending values are not available in sufficient detail to make this comparison.

Actual operations budgets from 2017 (the year of the first major City Corporate Asset Management Plan) and these have been compared to the approved operations budget for 2021. These budgets account for both costs in operational and maintenance activities. This analysis shows that from 2017 to 2021 the approved operations budget has increased by about 2.3% from $18.75M in 2017 to 19.2M in 2021. The 2021 budget value equates to 2.8% of the total inventory CRV or $317 per household.

Maintenance

Typical maintenance activities associated with wastewater assets include:

- sediment or other material removal from the pipes, filters, pumps and other components of the collection system

- maintenance of lift pumps and other mechanical equipment
- regular monitoring and inspection of the assets to ascertain their performance levels and functionality
- repairs to any damaged pipes or other assets

Most of these activities are performed at regular planned intervals. This will ensure the proper long-term performance and function of the assets and the safe collection and treatment of the sanitary waste.

Using historical information the maintenance spending as a percentage of the total asset value for the wastewater linear assets is set at 1.16% of the total portfolio inventory CRV, while the facility maintenance spending rate is set at 0.008%.

While the calculated value of past-due work for the wastewater assets is a small percentage of the total value of the inventory, the large percentage of assets in Poor or worse condition will experience increasing maintenance needs to meet all regulatory, legislated and safety requirements.

The addition of new assets will require additional funding for the operation and maintenance activities required to ensure that the assets remain functional through their entire EUL.

Assumed Maintenance and Operations Costs

Forecast costs for operations, maintenance and growth are calculated using a percentage of the annual current replacement value. This method provides a baseline funding requirement, and follows industry best practices, but has been kept at a conservative rate so as to not over-estimate the forecast costs. Further studies are planned to refine the required forecast costs in this section.

The findings of this analysis are presented in **Figure 23** which can be found on page 91.

The forecast maintenance and operations costs for 2021 are estimated to equal $17M, which closely corresponds to the 2021 approved operating budget of $19M (see Table 6).

The 10 year average maintenance and operating requirement is estimated at $18.3M, again, aligned with 2021's budget, and a gradual increase is seen in the 25-year average, up to $22M.

Table 52. Wastewater Assets 10- and 25-Year Forecast Maintenance, Operations and Growth Cost Summary

	25-Year Total	**25-Year Average**	**10-Year total**	**10-Year Average**
Wastewater Total	$550,584,356	$22,023,374	$188,880,954	$18,256,158

Figure 23. Forecast Maintenance and Growth Costs for Wastewater Assets Over 25 Years
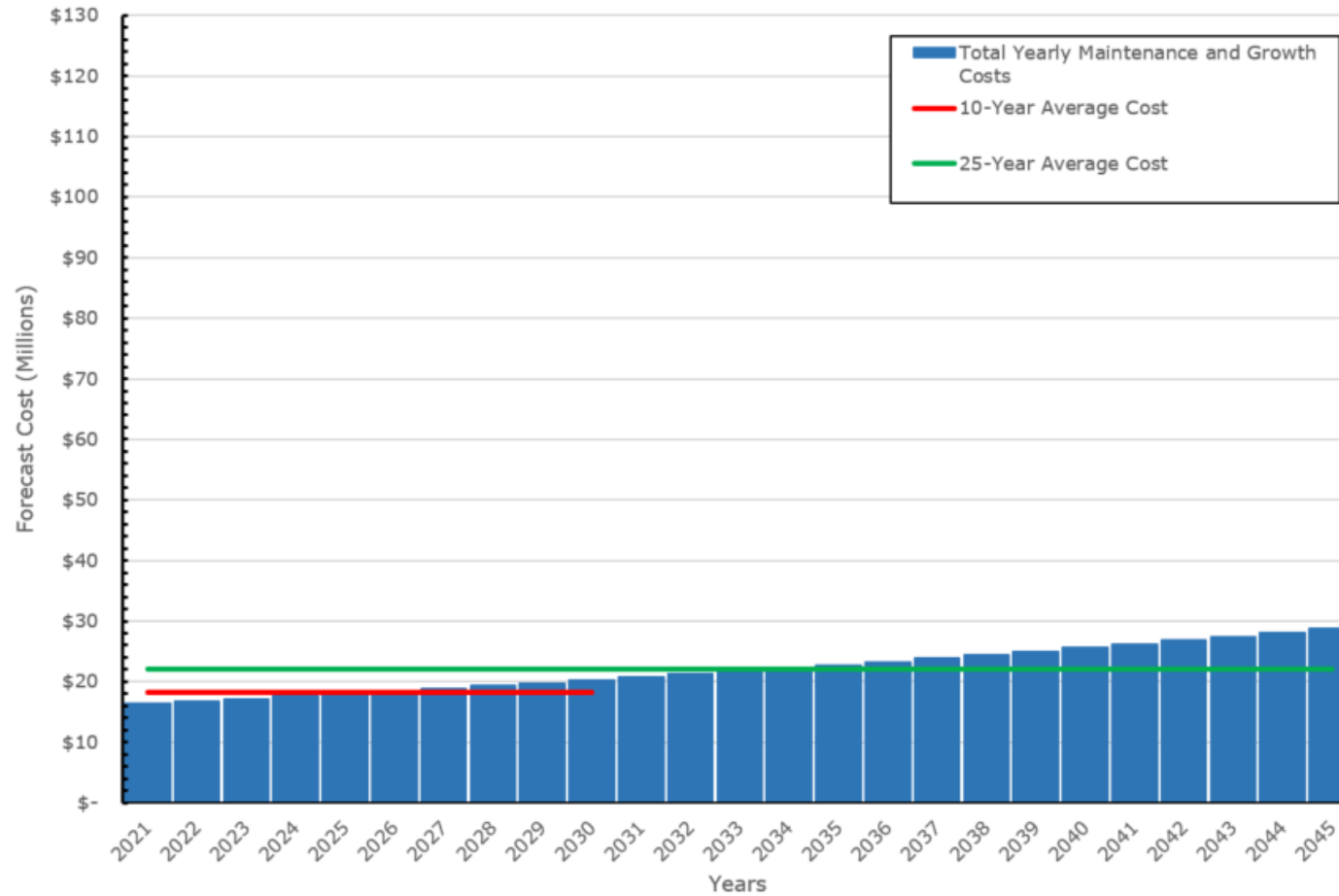
Financial Analysis

The following financial analysis includes renewal and rehabilitation costs (often considered Capital costs at the City), operations and maintenance requirements, and growth using projected growth values for the next 25-years (i.e. 2021-2045).

The forecast funding requirements have been summed up based on the previous sections. An additional amount has been included for contingency in this analysis that has not previously been included in earlier sections of this plan. The findings of this total lifecycle forecast funding needs were then analyzed and compared against the currently approved funding values provided by staff in the City finance department. The results of this analysis are presented in **Table 53**.

The total, 25-year funding requirements have been forecast to equal $1,119M ($1.12B) or $45M per year. In all years the approved funding is less than the funding requirements. On average there is expected to be an annual funding gap of approximately $25M per year.

As **Table 53** shows, the forecast requirements in the next 10-years are $415M or $41.5M per year – 37% of the total 25-year sum. The 10-year funding gap is nearly the same as the 25-year funding gap - $25M per year.

There are four years – 2026, 2028, 2035 and 2045 – that have forecast requirements far greater then the average requirements. Strategic project planning will allow the requirements in these spike years to be spread out removing the need for excessive capital funding in any single year.

Table 53. Summary of Lifecycle Requirements for Wastewater Assets

Wastewater Services	25-year total	25-year average	10-year total	10-year average
FUNDING	$491,531,604	$19,661,264.16	$167,362,898	$16,736,289.82
Sum of forecast requirements	**$1,119,762,876**	**$44,790,515**	**$415,232,602**	**$41,523,260**
GAP	$(628,231,272)	$(25,129,251)	$(247,869,704)	$(24,786,970)

City staff have previously prepared a capital plan that identified a strategy to address the past-due work which may suggest that the forecast funding gap is mainly due to the funding needs required to address the maintenance, operations and future growth needs of the wastewater system. More detailed budget analysis is required to fully understand this. Completion of that analysis will help identify an improved strategy to address the funding gap.

Likewise, the findings of the sustainable funding targets found in **Table 54** also indicate the need to increase funding. When the strategy incorporating the findings for the sustainable funding levels is finalized, the financial analysis will be updated to reflect the most current version of the budget.

Figure 24. Forecast Capital, Operations, Maintenance and Growth Requirements Compared to Forecast Available Funding for Wastewater Assets
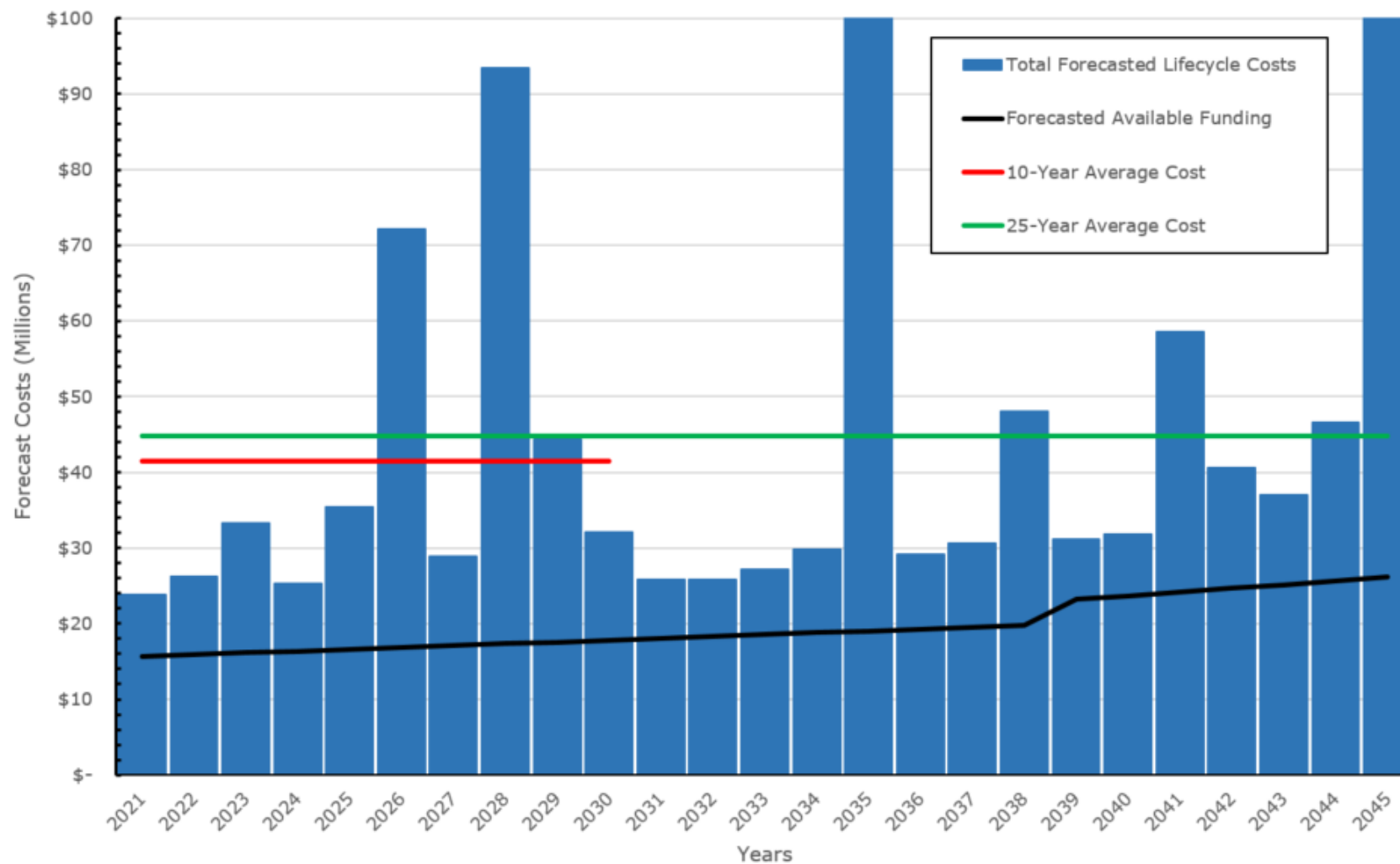
*Graph Y scale ($) modified to suit page layout. Forecast requirements in 2035 = $108.7M; 2045 = $133.4M

Financial Sustainability Analysis

Funding for the wastewater assets is intended to be provided entirely from user fees (i.e. rate based) with the target funding levels determined partly based on the analysis completed in the AMP. **Table 54** – completed as part of the 2020 Corporate AMP - indicates that the sustainable funding target in 2020 has been reduced, compared to what was determined in 2017.

The previous forecast funding used to complete the analysis in

Figure 24 and **Table 53** does not reflect the finding of the sustainability analysis. Additionally, the sustainable funding amounts only reflect renewal and major rehabilitation-type activities which are typically included in the capital budget at the City. Further analysis will be completed to assess why the gap indicated in

Figure 24 exists.

Some contributions to the change in the anticipated sustainable funding targets includes updated inventory data for both linear and facility assets that better clarified understanding of condition. This, in turn, has a significant impact on the forecast funding requirements that look at renewal, major rehabilitation, maintenance and operation cost values. Further work in these areas, in particular for maintenance and operation analysis, will provide a more robust approach to this analysis.

Table 54. Sustainable Funding Target Analysis

Funding	2017 Estimate	2020 Estimate	$ Change
	24,600,000	17,305,200	-30%

Impact of Climate Change

Potential short-term flooding as a result of rain storms of increasing intensity may create problems with overloading the capacity of the wastewater system and lead to basement flooding. High intensity storms can also lead to increased flows at the Wastewater Treatment Plant which impacts treatment and has a potential compliance risk.

Other potential risks may not affect the wastewater assets directly but where the wastewater assets share a corridor with roads, stormwater and water assets the risks affecting those systems will have related consequences for the wastewater system.

Summary and Risk Assessment

The state of the assets in the wastewater category are overall in Fair condition. There is approximately $29M in past-due work, all within the wastewater linear asset subclass. Likewise, the wastewater linear asset subclass has approximately $146M in Poor and Very Poor. Meanwhile, the wastewater facility subclass only has approximately $40M in Poor and Very Poor.

The main risk is unexpected failure of assets. This is faced primarily by assets considered past-due for replacement or renewal, but is an increasing risk for assets in Poor and Very Poor condition. Emergency repairs to broken pipes can be done with only short term impacts to users, but these are types of occurrences that not only require unplanned spending but also pose risks to customer relationships and safety

Due to the criticality of the WWTP and other wastewater system assets the City has developed plans to complete needed and recommended rehabilitation and replacement work. These projects have been represented in the capital planning activities in future years.

The City is proactive in its maintenance and repairs to ensure that the wastewater assets continue to meet all regulatory and legislative requirements. Continuing with preventive maintenance activities like flushing the mains to remove material from the sewers that could contribute to blockages of the pipes and regular maintenance of mechanical equipment will help mitigate the risks.

The forecast gap between currently budgeted funding for renewal, major rehabilitation, operations, maintenance and growth needs, indicates that it is possible that the value of past-due work will increase in future years. Further analysis is required to confirm the nature and extent of the funding gap, and how the value of past-due work may change in time. Strategic planning and prioritizing the recommended work will help to lower this risk and staff are actively involved in this.

Recommendations

1. **Update Inventory and Condition Data**

    The inventory used in the analysis for the Core AMPs is the same as was used for the 2020 Corporate AMP and is based on data that is no longer fully current. City staff are constantly updating the asset inventory, particularly with the City GIS database. Future versions of AMPs will use a new download of the GIS data pertaining to each of the asset types in order to ensure the most current inventory is used for asset planning. Targeted areas for improvement include:

    i.   Inventory and analysis of lateral connections (planned).
    ii. Continued CCTV inspections of wastewater sewers (on-going)
    iii. Revision of asset management analysis using findings of recent GIS data clean-up project (currently under way)

2. **Increase Maintenance Resources**

    Increasing preventive maintenance activities (which can include condition assessments) will help minimize the risk of asset failures related to aging and overuse.

    Historic information indicates that reaching all the maintenance goals and requirements has been difficult to achieve and the condition of the assets demonstrates this.

    i.   Fully configure computerized maintenance management system to better facilitate documentation and analysis of maintenance activities to provide data for assessing needs of maintenance programs (under way).
    ii. Review asset condition and risk scores to identify possible programs of work that strengthen

    maintenance activities, and provider greater understanding of need.

3. **Standardize approach to calculating replacement values.**

    Development of a standard set of unit costs for the assets used by the City that also include a consistent approach for incorporating project costs would create a more robust replacement value.

4. **Implement Integrated Corridor Analysis**

    Future iterations of the Core AMPs will consider the assets as part of an "integrated corridor" – a combination of all the assets that would be found within a road right-of-way including roads, sidewalks, street-lighting, traffic control, water, wastewater and stormwater assets.

    The City began developing the integrated corridor concept in 2018 and work is progressing to implement it for planning purposes. The integrated corridor analysis will be able to provide a more thorough overview of the asset needs in combination compared to analyzing one asset type at a time.

5. **Clarify Lifecycle vs operational vs maintenance vs growth activities and costing**

    The values included in the lifecycle forecast include a mix of asset replacement costs and identified repair or rehabilitation costs. Both of these values are important to the total understanding of the needs of the assets but represent different needs of the assets at different stages of their lifecycles. Development of standard definitions and methodologies for assessing lifecycle, operational, maintenance and growth costs and activities would allow for consistent understanding of what is included for both financial planning purposes, and asset activities.

6. **Refined Financial Analysis – Past-due Work**

   Currently the value of past-due work used in the
   financial analysis only considers the past-due
   requirements up to and including 2020. The financial
   analysis would benefit from further consideration of the
   impacts of how available funding might affect the
   volume of past-due work. This analysis work is currently
   planned for 2021.

Stormwater Services

Inventory

General Description

Managing rain water (stormwater) is essential in reducing the risk of flooding, and the risk of damage to properties and infrastructure within the City of Guelph. It is also an important step in protecting the quality of the water in the natural aquifers from which the City draws its drinking water.

To manage stormwater the City has constructed an integrated series of stormwater collection ponds, channels, collection pipes and ancillary equipment that work together to ensure the risks of flooding and damage are minimized. Most stormwater collected is returned to a natural waterway.

Stormwater flows to the management ponds, collection channels and to the collection pipe network using gravity to propel it. Engineered oil and grit separators are located throughout the stormwater network to remove foreign objects and debris from being discharged to the natural waterways where the stormwater outflows are located. Regular and emergency maintenance is performed on the assets to ensure they continue to meet service delivery needs.

While the City of Guelph owns and maintains the stormwater network much of the system has been constructed in partnership with private sector developers responsible for new residential and commercial development in the City. This work is done in accordance with City defined standards and specifications and helps offset initial high capital costs associated with constructing assets.

Asset Types in the Stormwater Inventory

The City of Guelph stormwater asset inventory can be broadly sorted in two categories:

- Linear assets (i.e. pipes, culverts, channels etc.)
- stormwater management ponds

The stormwater collection pipe networks comprise the largest percentage of the stormwater inventory, totalling approximately 80% by replacement value of the total inventory, with approximately 495km of pipes. Sewer grates and catch basins along the roadways and other locations are part of this inventory, as are the discharge points where the stormwater is returned to natural waterways.

Stormwater management ponds comprise the next largest grouping of asset types with a value of about $126M or 15.7% of the total, and 119 individual ponds identified. Other stormwater management equipment like oil and grit separators, and culverts[21] complete the inventory.

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[21] Culverts with a diameter or width greater than 3m are considered a bridge type structure and included in the analysis of that asset class.

State of the Stormwater Assets

The condition of stormwater pipes can be determined by completing camera inspections (CCTV) of the pipe interiors. Third party companies that specialize in this type of work are engaged by the City on a cyclical basis to perform these assessments on part of the pipe network each year. Condition scores are assigned based on the findings of this assessment.

Other stormwater asset types like outfall structures, stormwater ponds, catch basins and oil and grit separators are assessed by either City staff or third-party consultants.

For both the pipes and other asset types, if no assessment information is available an age based condition is assigned based on the remaining EUL of the asset.

The average condition of each asset sub-class is included in **Table 55** on the following page. It also contains the value of the assets in the stormwater inventory.

The physical condition of stormwater assets is most affected by the age of each asset, and environmental factors related to where the asset is located. Since most of the assets types in the stormwater system are passive in nature there is limited degradation as a result of mechanical factors.

According to the data available, nearly all of the assets in the stormwater inventory have been assessed and have a condition rating based on that assessment. The exception to this is the stormwater ponds – none of the ponds have an assessment record listed in the data and so the age-based assessment has been used. Future work is planned to complete more detailed assessments of these assets.

As can be seen in **Table 55**, the condition rating of the stormwater asset category as a whole presents a balanced distribution. The volume of assets in each of the five rating levels from Very Poor to Very Good is relatively even, with only 4%, or $34M, being identified as Past Due. This distribution is more clearly shown in

Figure 25**.**

Table 55. Condition of Stormwater Assets by CRV

Condition	CRV
Past Due	$33,681,938
Very Poor	$159,209,438
Poor	$198,988,207
Fair	$149,411,543
Good	$145,813,344
Very Good	$165,675,600

Figure 25. Overall Condition of Stormwater Assets by CRV
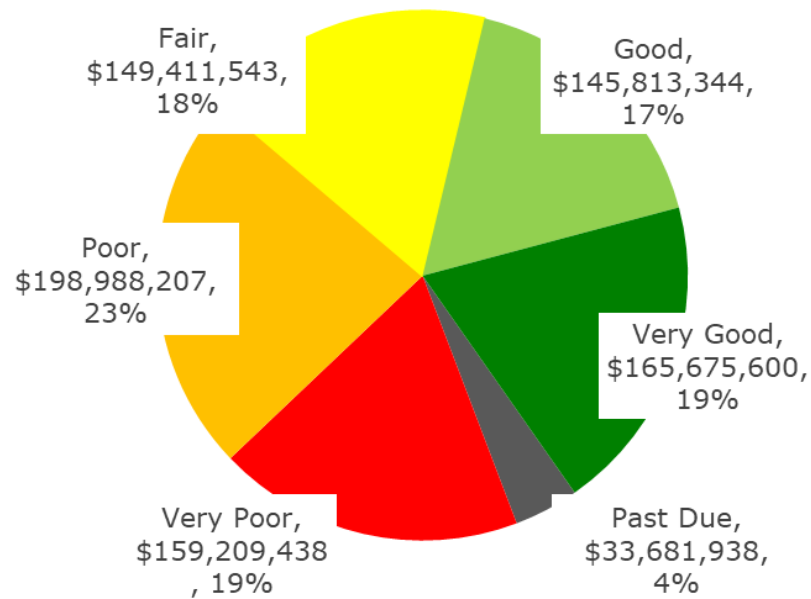
This even distribution is reflected in the asset subclasses as well, with none of the asset subclasses standing out as particularly in need. Both **Figure 26** (for all stormwater pipe assets) and **Figure 27** (for all other stormwater assets) clearly illustrate the condition, CRV and percentage of the portfolio each condition rating represents.

Table 56. Stormwater Assets in City Inventory

Asset Class	Sub-Class	Total CRV	% of total Portfolio CRV	Total # records	Total Length	Average Condition Rating
Stormwater Pipes						
Stormwater Linear Network	Stormwater Pipe	$681,457,417	80%	9445	494.44	Fair
	Total CRV: Pipes	**$681,457,417**	80%			**Fair**
Stormwater	**All other subclasses**					
Stormwater Linear Network	Stormwater Channels	$12,493,030	1.46%	25	10.73	Fair
Stormwater Linear Network	Stormwater Culvert (<3m Span)	$23,170,318	2.72%	916	15.94	Fair
Stormwater Linear Network	Stormwater Oil And Grit Separator	$2,098,808	0.25%	187	N/A	Poor
Stormwater Management Ponds	Stormwater Management Ponds	$133,560,499	15.66%	119	N/A	Poor
Stormwater all other subclasses	**Total CRV:**	**$171,322,654**				**Fair**
All Stormwater Assets	**CRV**	**$852,780,071**		**Average Condition**	**all stormwater assets**	**Fair**

Figure 26 and **Figure 27** show the overall distribution of asset conditions within the major classes of the stormwater asset category. The condition distribution in the stormwater pipe class is very even, with no past-due requirements identified, as seen in **Figure 26**.

The condition of assets in all other classes within the stormwater asset group is more varied. Approximately 52% of the value of these other assets ($88.5M) considered in poor or very poor condition and a further 20% ($33.7M) past-due.

Figure 26. Condition of Stormwater Pipes by CRV

Figure 27. Condition of Other Stormwater Assets by CRV

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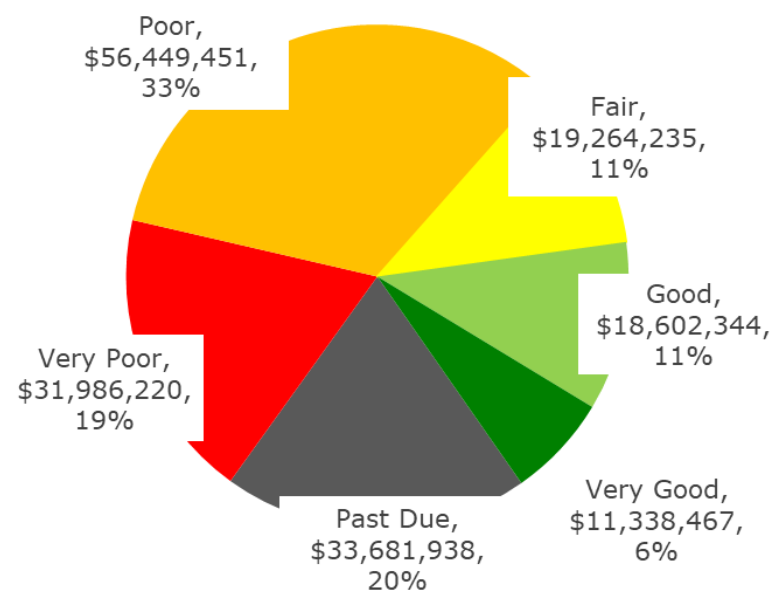
Asset Ages

On average, the assets in the stormwater inventory are about halfway through their expected lifecycles. **Table 57** summarizes the average age and remaining useful life estimates for both Stormwater Pipes and Stormwater – All Other Classes. **Table 58** shows the breakdown of tall the other subclass assets in the category. With the exception of Stormwater Management Ponds, which have 13% remaining EUL and are the closest asset subclass to have moved through their full lifecycle, all other assets are still well within their anticipated EUL. As there is no further distinction in the Stormwater Pipes into subclasses there is no table included for it.

Table 57. Average Age of Stormwater Asset Classes

Asset Class	Average Age	Estimated Useful Life	% Remaining EUL
Stormwater Pipe	35	78	55%
Stormwater All Others	23	51	54%

Table 58. Average Age of Stormwater Subclass - All Other Assets

Asset Class	Average Age	Estimated Useful Life	% Remaining EUL
Stormwater Channels	22	94	77%
Stormwater Culvert (<3m Span)	31	55	44%
Stormwater Oil And Grit Separator	20	30	35%
Stormwater Management Ponds	22	25	13%

Maintenance and Capital Needs Past-due Requirements

Stormwater assets with an estimated value of $33.7M have been identified as being past-due for replacement or renewal prior to and including in 2020. This work represents about 4% of the total inventory, or $29M. Most of the value is attributed to stormwater ponds that are described as being older than their EUL. These types of assets likely would not require replacing, but major maintenance activities that will ensure their long functional life. A more detailed review of the ponds should be done to determine a revised and more accurate needs assessment including cost estimates.

Areas of Concern

With the exception of stormwater ponds, a review of the condition of the stormwater assets did not reveal any concerns that would affect the stormwater inventory as a whole.

The overall condition of the ponds should be considered in the context of the type of maintenance and rehabilitation these assets require. The large percentage of the ponds in poor or worse condition does not indicate that the ponds need replacing (or reconstruction) but does represent the need for regular dredging and silt clean-out from the ponds.

A City map that presents the linear assets in the Stormwater collection network displayed by condition is included in Appendix E.

Levels of Service – Stormwater Services

O.Reg 588/17 LOS

As required by O.Reg 588/17 the following tables outline the City's compliance with the mandatory Levels of Service reporting.

Table 59. Extract from O.Reg 588/17 Table 1 – Part 1: Community LOS for Stormwater Services

Service attribute	Community levels of service (qualitative descriptions)	City of Guelph Response
Scope	Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	The City storm water network covers approximately 495 km storm water pipes, 25 storm water channels, 916 storm water culverts, 187 oil and grit separators and 119 storm water management ponds. A map of the stormwater system collection pipe network is presented in **Appendix B**.

Table 60. Extract from O.Reg 588/17 Table 1 – Part 2: Technical LOS for Stormwater Services

Service attribute	Technical levels of service (technical metrics)	City of Guelph Response
Scope	1. Percentage of properties in municipality resilient to a 100-year storm.	The 2021 SW Master Plan project will be able to partly address this metric, but it is not yet clear if the Master Plan work will fully address this point. The SWMP will not be delivered in time to meet the Core AMPs deadline. When storm water design is undertaken consideration is given to 100-year storm events (and other storm events) and any new subdivision or land development are asked to comply with City design standards.

Service attribute	Technical levels of service (technical metrics)	City of Guelph Response
	2. Percentage of the municipal stormwater management system resilient to a 5-year storm.	It is not clear from available data if this question can be answered. The SWMP may partly address this. When new stormwater sewers are designed they are typically designed to meet the forecast effects of a 5-year storm.

City Defined LOS

In the Spring of 2018 the City began efforts to self-define LOS metrics against which the functional performance of the assets can be measured. As with the O.Reg mandated LOS metrics these are divided into "customer" and "technical" focussed metrics.

It is important to note that work remains to be done on finalizing the LOS metrics. These metrics focus on requirements outlined in regulatory and legislative documents that currently guide the Wastewater industry.

There are presently no targets established. This is part of a larger initiative that will work through engagement activities with all stakeholder groups within the community.

Stormwater Service Statement: Efficiently providing reliable stormwater services that protect the community and natural environment

Table 61. City Defined Customer Focused Performance Measures for Stormwater Assets

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data source)
Reliability	Providing stormwater services with minimal impact to the community	# of locations in the City prone to flooding during wet weather events	No current records; will be addressed during SWMP review
Environmental Stewardship	Providing stormwater services that protect the environment	% of community with stormwater quality control	No current records; will be addressed during SWMP review

Table 62. City Defined Technical Focused Performance Measures for Stormwater Services

Key Service Attribute	LOS Statement	Performance Measure	Current Performance (Data Source)
Reliability	Providing stormwater services with minimal impact to the community	# of complaints of flooding during a wet weather event	140 (2019)
		% of storm sewers in poor or very poor condition	39.59%
		% of other stormwater assets in poor or very poor condition	71.28%
Environmental Stewardship	Providing stormwater services that protect the environment	In 2019 the City started a multi-year comprehensive monitoring program of some of its stormwater management facilities to try and understand the facility function relative to stormwater objectives and design criteria as well as their associated impact on the Natural Heritage System. The program has three main components including surface water monitoring, rainfall/precipitation monitoring and benthic invertebrate monitoring. The intent of the surface water monitoring component is to provide an understanding of surface water flow, water quality and thermal condition for stormwater management and the natural watercourse systems.	Initial results from this work are not yet available: future AMP reporting will include these.

Lifecycle Management and Planning

Renewal and Major Rehabilitation

Renewal and major rehabilitation activities are those activities that result in either the full replacement of the asset at the end of its lifecycle, or restoration of the asset to like-new condition. This analysis is follows the same time span as the City's financial strategy, and looking at both a 25-year and 10-year timeframe. The analysis is based on industry best practice of replacement and rehabilitation timeframes, and is based on the theoretical needs of the assets as indicated by the condition.

The 25-year total forecast funding required to support the renewal and major rehabilitation of the stormwater assets totals $425M in forecast activity costs. This represents an approximate annual average of $17M over the 25 year timeframe.

The forecast funding requirements in the next 10-years– between 2021 and 2030 – estimates a total cost of $214M or 50.3% of the 25-year total, with a 10-year annual average of $21.4M. These findings are summarized in **Table 63**.

The $33.7M value of required work considered as past-due has been distributed over the next 10-years at an average of $3.7M per year to reduce the impact of trying to reduce the past-due value in one year. Future analysis will be

completed that assesses the impact of the currently approved funding against the potential change in the past-due value for years beyond 2020. These findings will be included in future AMPs.

Figure 28 presents the annual forecast capital renewal and rehabilitation costs for the next 25 years. In 2028 there is a forecast need of $136M, in 2044, it is $120M, and in 2045 it's forecast at $42M. The work does not necessarily have to take place in the forecast year, and staff will smooth these spikes to allow for even distribution of resources as the City approaches the timeframe where this work must take and provide a more balanced work program.

The majority of the forecast lifecycle work is estimated to be required before 2030. This correlates to the overall condition ratings that identified the whole stormwater system asset portfolio in Fair condition overall, a rating that generally can represent assets with between 40%-60% of their useful lifecycles remaining.

The majority of the forecast lifecycle needs are required on the linear assets – i.e. the collection pipes and related components. This corresponds to the linear assets comprising the majority of the system asset portfolio.

Table 63. Stormwater Asset 10- and 25-Year Forecast Renewal and Major Rehabilitation Cost Summary

	2020 Past-due Estimate	25-Year Total	25-Year Average	10-Year total	10-Year Average
Stormwater Services	$33,681,938	$425,583,461	$17,023,338	$214,253,838	$21,425,384

Figure 28. Stormwater Assets 25-Year Lifecycle Forecast
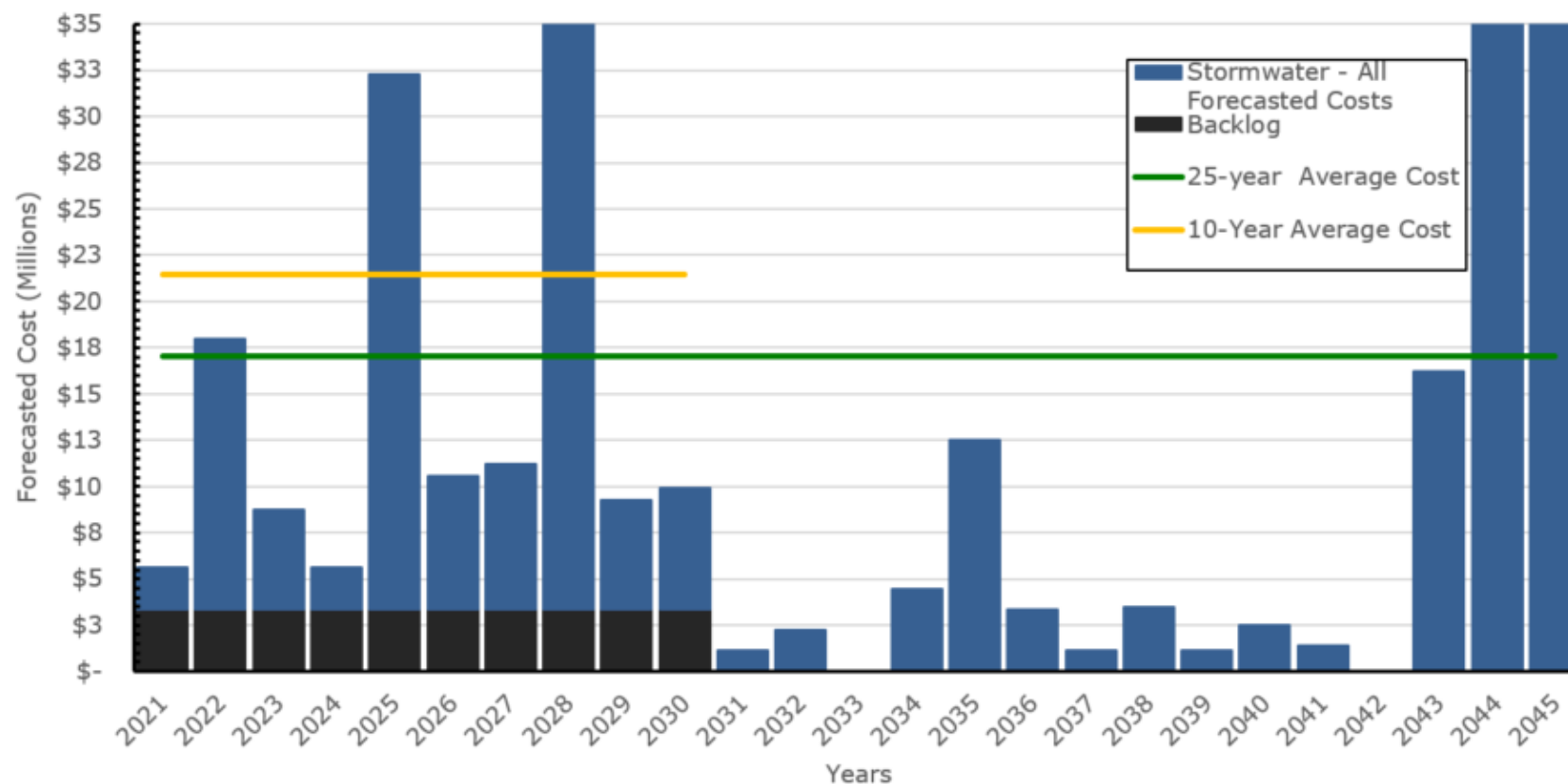
Note: the Y-axis ($) has been adjusted to suit the page layout. In 2028 lifecycle need = $133.4M; total = $136.7M. In 2044 lifecycle needs = $120.1M. In 2045 lifecycle needs = $41.6M.

Capital Plans

For the ten years prior to 2021 the average annual spending on capital renewal work was $2.67M. For the ten years beyond 2021 the planned average annual budget total for this same work is estimated at $8.74M – an increase of 227%. Despite this, the planned total work is lower than the forecast 10-year average lifecycle need of $21M. The City has been planning work on the stormwater assets that have reflected the funding constraints faced by them while meeting all regulatory, legislated and safety requirements. Further work on assessing the sustainable funding targets, and updates to the financial strategy, will be integrated into these plans, and the analysis used here will be updated. This will provide the City with greater capacity to address the forecast asset needs.

Actual capital renewal budget values from 2017 (the year of the first major City Corporate Asset Management Plan) have been compared to the approved capital budget for 2021. This analysis shows that from 2017 to 2021 the approved capital renewal budget increased by a total of 44%, from $3.61M in 2017 (in 2020$) to $5.19M in 2021, and reflects the City's efforts towards attaining sustainable funding levels. The 2021 budget value equates to 0.61% of the total inventory CRV.

Expansion of the stormwater system will occur with the growth of the City, particularly as new residential and commercial business areas are developed. Complete details of the assets that will be added to the system are not available, but using historical information the rate of growth for the water system assets is set at 0.018% per year of the total portfolio inventory CRV. The capital costs of those assets is normally covered by the developers, but upon completion and commissioning of the assets they will become City assets.

The addition of new assets will require additional funding for the operation and maintenance activities required to ensure that all of the assets remain functional through their entire EUL.

Operations and Maintenance Activities

Stormwater assets tend to be passive in nature – few of the stormwater assets have mechanical components that would increase the wear and tear on the system This does not imply that there are no operational or maintenance requirements.

The level of operations and maintenance activities for stormwater assets is dependant on the type of asset. Stormwater ponds require sediment removal at a low frequency, but oil and grit separators would require preventive maintenance work at increased frequencies.

Operations

Historic spending trends can help provide an understanding of how well operations needs have been addressed in the past which can lead to better understanding of why the assets are in the status-quo condition. Unfortunately historic operations spending values are not available in sufficient detail to make this comparison.

Actual operations budgets, which do include maintenance activities, from 2017 (the year of the first major City Corporate Asset Management Plan) and these have been compared to the approved operations budget for 2021. This analysis shows that from 2017 to 2021 the operations budget has nearly doubled, changing by 94% from $1.33M in 2017 (2020$) to $2.58M in 2021. The 2021 budget value equates to 0.3% of the total inventory CRV or $43 per household. See

Table 6.

Maintenance
Typical maintenance activities associated with stormwater assets include:

- sediment removal from ponds, catch basins and oil and grit separators
- maintenance of vegetation around stormwater facilities
- maintenance of any valve equipment
- ensuring protective devices at stormwater outflows are in good working order
- pipe flushing
- regular monitoring and inspection of the assets to ascertain their performance levels and functionality

Some of these activities can be performed on an "as-needed" basis. Monitoring and inspection actions should be done at least annually if not more frequently.

Using historical information, the maintenance spending as a percentage of the total asset value for the stormwater assets is set at 0.30% per year of the total portfolio inventory CRV.

The estimated value of past-due work for the stormwater assets is $33.7M in 2020, about 4% of the total portfolio value. Approximately 42% of assets are in Poor or worse condition.

City staff responsible for stormwater management have developed plans and processes to accomplish these tasks and prepare annual work plans to address and implement them.

Assumed Maintenance and Operations Costs
Forecast costs for operations, maintenance and growth are calculated using a percentage of the annual current replacement value. This method provides a baseline funding requirement, and follows industry best practices, but has been kept at a conservative rate so as to not over-estimate the forecast costs. Further studies are planned to refine the required forecast costs in this section.

The findings of this analysis are summarized in **Table 64**, and are used in **Figure 29**.

The forecast maintenance and operations funding requirement for 2021 is $2.7M, which closely corresponds to the approved operating budget for 2021. Overall, the 10 year average operating funding requirement is estimated at $2.8M, again, aligned with the value of the 2021 budget. A slight increase is seen in the 25-year average, up to $2.8M per year.

Table 64. Stormwater Assets 10- and 25-Year Forecast Maintenance, Operations and Growth Cost Summary

	25-Year Total	**25-Year Average**	**10-Year total**	**10-Year Average**
Stormwater Total	$70,601,875	$2,824,075	$27,570,770	$2,757,077

Figure 29. Forecast Maintenance and Growth Costs for Stormwater Assets Over 25 Years
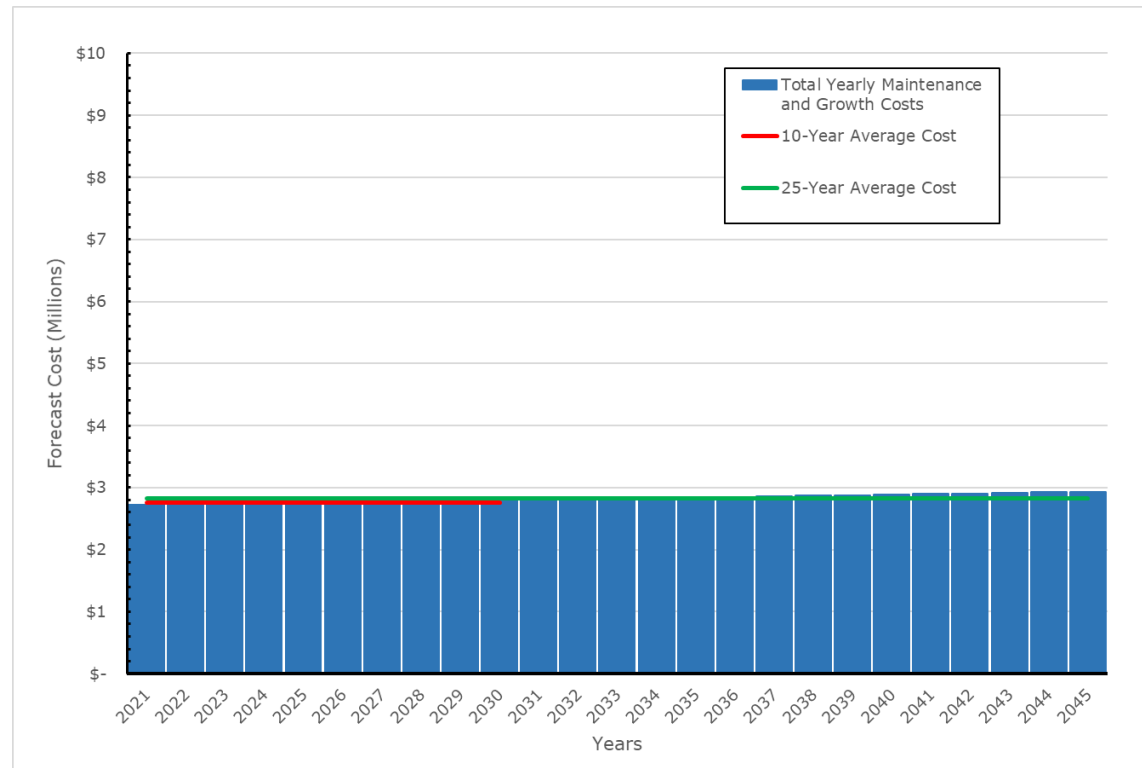
Financial Analysis

The following financial analysis includes renewal and rehabilitation costs (often considered Capital costs at the City), operations and maintenance requirements, and growth using projected growth values for the next 25-years (i.e. 2021-2045).

All forecast funding requirements indicated in earlier sections of this plan are summed and compared against the currently approved funding values provided by staff in the City finance department. An additional amount has been included for contingency in this analysis that has not

previously been included in earlier sections of this plan. The results of this analysis are presented in **Table 65**

The total 25-year forecast funding requirements equal $603M or $24M per year. On average there is annual funding gap of $8.2M per year over the 25 year period.

Table 65. Summary of Lifecycle Requirements for Stormwater Assets

Stormwater Services	25-year total	25-year average	10-year total	10-year average
FUNDING	$398,650,000	$15,946,000.00	$99,460,000	$9,946,000.00
Sum of forecast requirements	$603,188,459	$24,127,538	$321,468,497	$32,146,850
GAP	$(204,538,459)	$(8,181,538)	$(222,008,497)	$(22,200,850)

The analysis shows that in the first ten (10) years the forecast funding available is less than the forecast funding requirements. The total forecast funding for this time period totals $99M or $9.9M per year which is 53% of the total 25-year funding. The majority of the forecast funding requirements, identified in the Renewal and Major Rehabilitation and the Operations and Maintenance sections, are in the first ten years with a forecast average need of $32.1M per year. This results in a funding gap estimated at $22M per year for those first ten (10) years.

From 2031 to 2043 the forecast available funding is higher than the forecast requirements except for two years. This is particularly apparent in **Figure 30**, where a large spike in requirements in the 24th and 25th year of the analysis (2044 and 2045) result in a funding gap of $129M and $30M respectively.

There are four years – 2025 at $35M, 2028 at $139M, 2044 at $123M and 2045 at $44M as seen in **Figure 30** – that have forecast requirements far greater then the average

requirements. Strategic project planning will allow the requirements in these "spike" years to be spread out, removing the need for excessive capital funding in any single year.

Figure 30. Forecast Capital, Operations, Maintenance and Growth Requirements Compared to Forecast Available Funding for Stormwater Assets
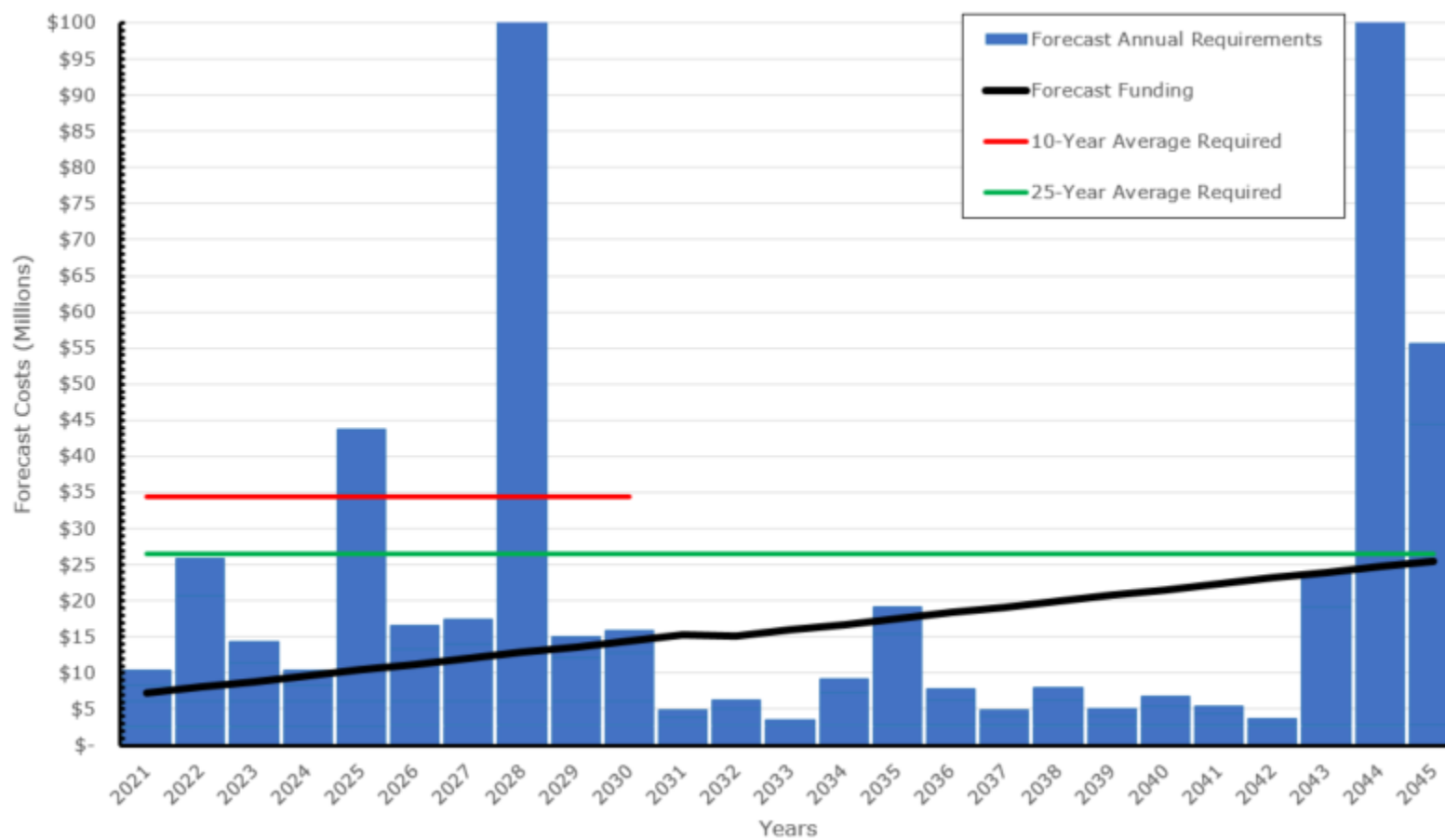
*Graph Y scale ($) modified to suit page layout. Forecast requirements in 2025 = $108.7M; 2045 = $133.4M

Financial Sustainability Analysis

Funding for the stormwater assets is intended to be provided entirely from user fees (i.e. rate based) with the target sustainable funding levels determined partly based on the analysis completed in the Corporate AMP. The following analysis and table – completed as part of the 2020 Corporate AMP - indicates the sustainable funding target in 2020 has grown, compared to what was determined in 2017.

The analysis summarized in **Table 66** that the sustainable funding target for stormwater assets has increased by 76%. This is attributed to continuous improvements in data quality**.**

Table 66. Sustainable Funding Target Analysis

Funding	2017 Estimate	2020 Estimate	$ Change
	11,100,000	19,576,800	+76%

Impact of Climate Change

As weather events become more extreme, the stormwater system is critical in providing a safe, livable community. Much of the functionality of the storm system is integrated with naturally occurring systems, such as wetlands, rivers and lakes. Along with the unpredictable nature of weather events, predicting how the existing stormwater system will manage the effects of changing climate is a complicated process. That said, a growing body of knowledge around potential climate change impacts is facilitating broader conversation about the potential planning methods for stormwater system resiliency. City staff are actively involved in this work.

While the stormwater systems is designed to manage a storm up to and including a 100-year event, a warming climate can impact both the severity and the frequency of storm events. The risks associated with these changes are typically an increased risk of flooding and erosion damage that would require emergency resources and funding to repair.

A potential solution is the oversizing of the stormwater sewers. This must be carefully balanced with cost and sizing limitations, as there is limited room within some of the road rights-of-way to accommodate this.

Another strategy that has proved successful in reducing the impacts of extreme rain events is to reduce the number of hard surfaces (impermeable surfaces) in the City. Natural surfaces like grassy areas, treed areas and using permeable materials for pathways, are better able to absorb rainfall, and also help direct rainfall back into the groundwater aquifer. Considering the stormwater system not just in the context of constructed structures, but also as part of the natural environment can be an effective planning tool for determining future risks.

In late 2021 a project that provides a more complete inventory of natural areas and the condition of those areas will be complete. This work will result in a better understanding of natural assets - i.e. the wetlands, marshes, forests, and grass fields – that exist within the City boundary. These assets are critical in many regards, but, as relates to the stormwater system, they provide additional and effective stormwater control services in addition to the engineered assets.

On all fronts, staff are working to better understand the impacts of climate change on the existing stormwater system, how to strengthen it, and how to design it for future needs while reducing risks to the City.

Summary and Risk Assessment

The stormwater assets have been assessed to have an overall condition of Fair. Approximately $360M or 42% of the total asset inventory is in Poor or Very Poor condition, with another $33M, or 4% considered as past-due for renewal or replacement.

Overall, the stormwater assets are assessed to be 46% of the way through their EUL, with an average age of 35 years. Age does not always correspond directly to condition and some of those assets the furthest along in their expected useful lives, such as storm ponds, would require maintenance actions rather than replacement to ensure that the assets reach their intended EUL.

Stormwater management assets play a significant role in lowering the risks of, and mitigating consequences of flooding– a potential concern as a result of climate change impacts. The City is mindful of this and is actively engaging in several initiatives to better plan for the long-term needs of the system and determine what actions to take that will minimize these risks.

The present funding allocation for stormwater operations and maintenance is insufficient to complete all identified required work. Further analysis examining the impacts of the current funding levels for renewal and major rehabilitation activities as well as maintenance and operation activities is proposed or under way.

Recommendations

1. **Updates to the inventory and condition information.**

   The inventory used in the analysis for the Core AMPs is the same as was used for the 2020 Corporate AMP. City staff are constantly updating the asset inventory, particularly with the City GIS database. Some recommended work to improve the robustness of the data set includes:

   i. Review current asset inventory and complete GAP analysis.
   ii. Complete inventory and condition assessments on assets not yet assessed.

2. **Improve understanding of Climate Change impacts.**

   The City has engaged a consultant that specializes in "green" infrastructure – natural areas, man-made park spaces and stormwater retention systems – in order to provide a more complete inventory of these spaces, including assigning a proper value to them. The results of this work are expected in late 2021 or early 2022 and will contribute to improving the information available to better manage the stormwater assets.

   i. Incorporate findings of Natural Assets Study.
   ii. Review and incorporate findings of Stormwater Masterplan.

3. **Review of Useful Life assumptions.**

   The provided normal expected useful lifecycles (EUL) for some of the assets in the stormwater inventory require closer examination in order to provide improved analysis of future needs. Recommended work includes:

   i. Review of all expected useful life assumptions used in AM analysis and document standard methodology for all asset classes.

4. **Create standardized approach to replacement values.**

   Prior work to review tender pricing and third party assessments were used to develop initial current replacement value data, however, developing a standardized replacement value method with input from staff responsible for the assets would result in a more robust costing mechanism that reflects total asset cost.

   i. Clarify capital, repair, rehabilitation, operational, maintenance and growth activities and costing

   The values included in the lifecycle forecast include a mix of asset replacement costs and identified repair or rehabilitation costs. Both of these values are important to the total understanding of the needs of the assets but represent different needs of the assets at different stages of their lifecycles. Development of standard definitions and methodologies for assessing lifecycle, operational, maintenance and growth costs and activities would allow for consistent understanding of what is included for both financial planning purposes, and asset activities.

5. **Document As-Is and To-Be operational and maintenance activities**

   Both operational and maintenance activities are critical to successful asset management. Documentation of current practices, including cost and needs analysis provide a vital baseline for understanding immediate and long-term asset needs. Documenting best practice recommendations for both operation and maintenance activities allow the City to identify gaps and

opportunities, and develop robust maintenance programs. This, in turn, allows the City to realize maximum return on investment, and service delivery, from its assets.

6. **Implement Integrated Corridor Analysis**

Future iterations of the Core AMPs will consider the assets as part of an "integrated corridor" – a combination of all the assets that would be found within a road right-of-way including roads, sidewalks, street-lighting, traffic control, water, wastewater and stormwater assets.

The City began developing the integrated corridor concept in 2018 and work is progressing to implement it for planning purposes. The integrated corridor analysis will be able to provide a more thorough overview of the asset needs in combination compared to analyzing one asset type at a time.

Corporate Asset Management Recommendations and Next Steps

Improving the Asset Management Plan

Asset Management is a never ending cycle of improvement that City staff are actively engaged in. Figure 31 presents a visual representation of the steps involved in this cycle.

Assets change over time, as do some of the services expected of the City to deliver. As old assets age and new assets are commissioned the inventory must be managed to ensure the most current information is available. Changing

technology and software introduce new assets, but also new methods of managing and analysing the needs of the assets.

Finally, the City is mandated to produce AMPs, and occasionally there are changes in these requirements that will dictate changes in how the City is managing assets

Figure 31. The Asset Management Cycle
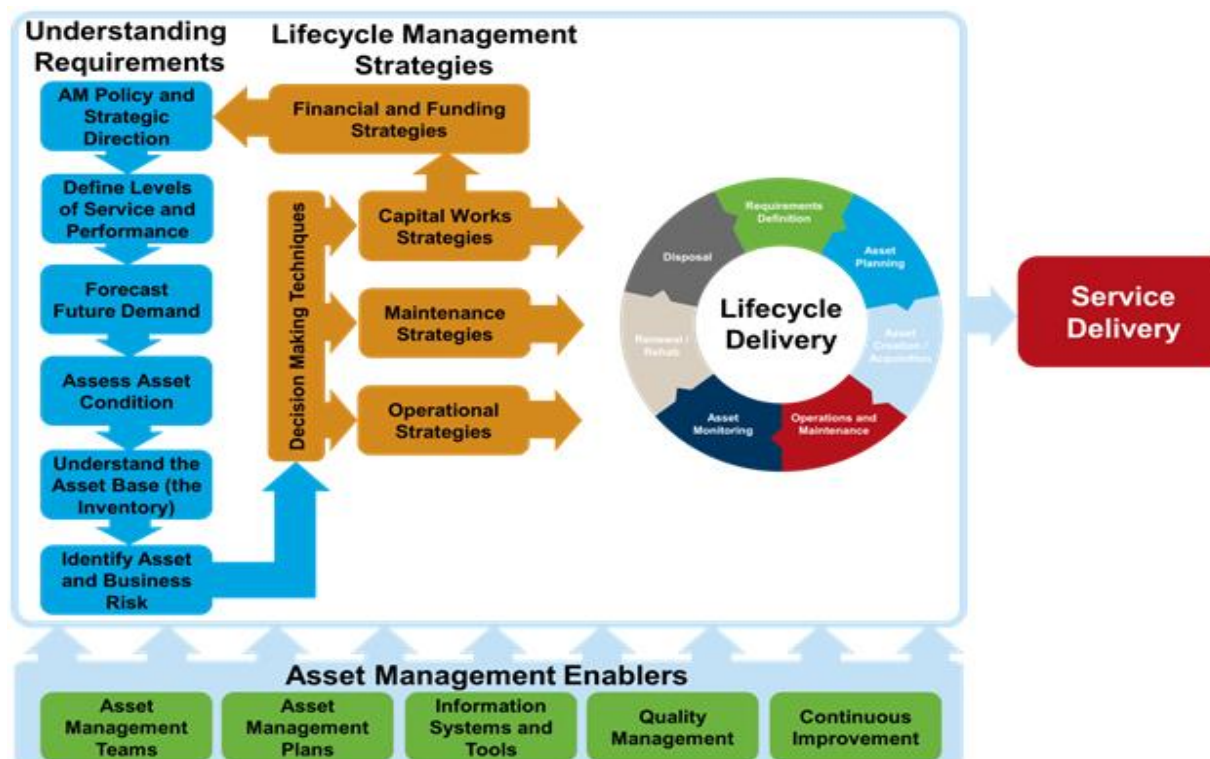
Risks to City Infrastructure Due to Climate Change

The full effects of the changing climate are very difficult to predict but some impacts to the City infrastructure are inevitable. Through the course of the analysis done during the preparation of this Core AMP attempts were made to identify what the City of Guelph is doing or planning to do in order to mitigate the effects of climate change on the City assets.

City staff are being proactive in identifying potential risks and recommended mitigation projects. In order to better understand these risks, and identify strategies to accommodate them it is recommended that:

i.   The City of Guelph establish a Climate Change Working Group that has a mandate to examine infrastructure issues through a "climate lens".

The benefits of such a working group are twofold:

i.   the City will have an improved understanding of potential risks facing the infrastructure, and
ii. The City may be able to take advantage of funding sources that have been established specifically to address climate change issues.

Project Management Resourcing

The City has taken steps to increase funding towards ensuring the water, wastewater and stormwater systems are resourced sustainability, and to ensure infrastructure renewal projects are able to be funded over the next 25-year horizon. However, as the Capital Budget funding levels have been growing, the unspent capital budget figure has also been increasing partly due to an insufficient number of project managers able to implement the work. This trend, coupled with the Plan's identified need to increase Capital Budgets, means that the City will be required to increase

the number of project managers in order to successfully complete the work.

Without an increase in staffing resources, unspent capital will likely continue to grow. Without executing an increasingly larger capital plan, aged assets will begin to fail causing significant concern to service continuity and community safety. Staff are developing a strategy to address these resourcing concerns including the increasing number of temporary project managers within the City, which will be brought to Council during 2021.

Understanding Maintenance and Operations Needs

Maintenance and operations needs and historic spending can be difficult to track. In some cases this is due to emergency maintenance work being done that may be charged against a non-maintenance budget, or sometimes due to a lack of clarity on what type of activity a particular task is. A shortfall of needed resources also results in maintenance work being funded from other budgets, or visa-versa.

Through the analysis completed as part of this AMP a clear theme has emerged that City staff responsible for maintenance and operations work do their best, but improvements and changes in the planning and tracking of these types of work would result in a better understanding of future needs, in turn resulting in better resource planning capability and a better understanding optimal investment relative to current investment.

In late 2020, the City engaged a third-party consultant to provided and implement a new Computerized Maintenance Management System (CMMS). In combination with the

existing GIS data the new CMMS will act as a central repository of asset information, including the ability to track historic work and costs associated with an asset. CMMS tools also provide excellent future planning forecasts.

The CMMS implementation is underway but will take 1-2 years before the progress of the project will result in the ability to use the data. However the long term benefits and promises from the CMMS are good.

Asset Inventory

Best efforts have been made to ensure the asset inventory and attributes of the assets are current and correct, however, it is known that there are missing pieces. Within the asset management field, especially with an inventory the size of the City of Guelph's, it is generally accepted that an inventory will never be 100% complete due to the constantly changing needs of the assets and the workflow processes in place to manage the transfer of information between the service areas and the AM staff.

Efforts have been focussed on ensuring the major assets and their attributes are identified in the inventory. Future efforts are focussing on the less-major assets being properly identified, and including them in the whole inventory.

In late 2020 following a public RFP the City selected a provider to implement a new Enterprise Asset Management (EAM) software system. This new system will provide multiple benefits, foremost among them the integration of multiple existing asset inventory sources into one consolidated inventory. This will result in consistent attributes for all asset classes, along with standardized attribute information. Further benefits of the EAM will result

in improved work order management, and the ability to more easily analyze the needs of the assets.

Parent assets

The asset inventory used in the 2020 Corporate AMP contained approximately 90,000 individual records ranging in scale from vehicle bridges to pumps within a building that circulate water. This level of data granularity is very good for understanding the full spectrum of asset needs, and should be able to be "rolled up" in order to understand the needs of the parent asset.

For example: The assets within buildings at the wastewater treatment plant (lighting, heating units, interior finishes etc.) are clearly identified[22]. These assets can be considered a "child" asset to the building asset as a whole – the "parent" asset. A similar hierarchical description can be applied to any asset class. While it is important to understand the needs of the individual child assets, it is equally important to understand the needs of the larger parent assets. It does not matter if a circulation pump within a building is in good condition when the rest of the building is in poor condition.

Unfortunately within the data the higher level parent assets were not always clearly or properly identified. During the EAM implementation efforts should be made to establish a clear inventory and description of the parent assets to allow the type of analysis required.

Asset Values

The current replacement value (CRV) is one of the most important attributes used in asset management. It is essential that the CRV be as accurate as possible so that proper analysis can be done. Within the data used for the

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[22] Child assets are sometimes referred to as components of a larger parent asset.

2020 Corporate AMP and subsequently this Core AMPs the majority of the assets in the inventory did have a CRV identified, but it was not always clear how that value was established, nor when it was determined.

Future asset management efforts should include the establishment of standardized processes to determine values of assets with clear criteria to do so. The new EAM system may be able to accommodate this need, but service area staff will be required to provide the necessary information related to valuations.

Master Plans

As noted through this document work is underway to update the Master Plans related to the water service area. A facility needs assessment for the wastewater services was completed in 2019 and that information is being reviewed and used to prepare new project plans. These new plans will not be completed in time to take advantage of their recommendations, therefore this Core AMPs will not have the most up to date information available. The timing of future AMPs and Master Plans can be better coordinated so that the two types of documents work together in presenting the needs of the infrastructure.

In addition to the timing coordination, if future master plans can be organized so that the information is collected and presented in a format that more closely matches how the asset inventory information is managed time savings and quality improvements in the analysis of the asset needs can be simplified. Likewise the asset management team can help identify how the information and assets included in a master plan can be identified and collected, thus improving coordination between the documents.

City asset management staff are working more collaboratively with service area staff and the benefits of these recommendations should be realized within the next 2-3 years.

Appendices

Appendix A Definitions and Terminology

Table A-67. Asset Management Terminology

Term	Definition
Asset	An item, thing or entity that has potential or actual value to an organization.
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.

Term	Definition
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.
Condition	A description of the state of an asset with regards to its appearance, quality and/or working performance. Refer to **Table B-69** for a description of the condition definitions used within this AMP
Continual Improvement	Recurring activity to enhance performance.
Core Asset	According to O.Reg 588/17 the infrastructure assets that support the following five service areas are to be considered Core assets for the purpose of asset planning • Roads • Bridges • Water Treatment

Term	Definition
	• Wastewater Treatment • Stormwater Management
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.
Current Replacement Value (CRV)	The cost to replace the asset with a new version of that asset that provides the same function, meets the same target service levels (or in the case of a building is the same size and function) and is built according to modern standards. Usually expressed in current year dollar value.
Effectiveness	extent to which planned activities are realized and planned results achieved
Expected Useful Lifecycle (EUL)	The length of time in years that an asset is expected to be able to provide effective service or meet expected performance targets
Intangible Assets	Non-physical assets, such as leases, brands, digital assets, use rights,

Term	Definition
	licenses, intellectual property rights, reputation or agreements.
Level Of Service (LOS)	Parameters, or a combination of parameters, which reflect social, political, environmental and economic outcomes that the organization or asset delivers.
Lifecycle / lifecycle planning	The different stages involved in the management of an asset. These include: • Needs identification • Planning / design • Acquisition / construction • Operating and maintaining while in use • Modification or upgrade (i.e. rehabilitation) • Disposal / demolition The lifecycle stages are normally expressed in the form of a continuous cycle emphasizing the need for sound planning
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

Term	Definition
	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,

Term	Definition
	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.
Remaining Service Lifecycle (RSL)	The length of time in years that an asset is expected to be able to continue to meet expected service levels or meet expected performance targets
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.

Term	Definition
Service Area Master Plan	A planning document specific to one service area or group of assets that highlights the current state of those assets and future capital needs or projects.
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.

Term	Definition
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
Whole Life Costing	The practice of using forecast costs through all stages of an asset's expected useful lifecycle when completing financial analysis (from planning / design, acquisition/construction, operating & maintenance, mid-life rehabilitation, disposal/demolition. Whole life costing is intended to provide an understanding of all of the costs associated with an asset, before, during and after the active service life of the asset.

Appendix B Assessment Methodology and Levels of Service

Evaluating Assets and Identifying Future Needs

Understanding the current condition of an asset is an essential step in identifying the future needs of that asset. By summarizing the information for each asset the future needs of the City can be predicted.

Ideally the condition of an asset is determined by completing a "hands-on", quantitative assessment of the asset in its normal functional capacity. This information is normally provided by third party consultants engaged by the City and using techniques suitable for each asset type. City staff review any submitted information and provide input in assigning a final condition rating to the asset. The condition rating score and definitions are outlined below.

In cases where no quantitative assessment was available the condition of the assets was determined using the age of the asset as a ratio of the normal, theoretical expected useful lifecycle (EUL) of similar asset types. The remaining service life (RSL) of the assets is calculated by subtracting the age of the asset from the EUL. The following table details the condition rating criteria for age based assessments.

Table B-68. Assigning Rated Condition Based on Age

Percentage of RSL / EUL	Rated Condition	Rating Score
80-100	Very Good	5
60-80	Good	4
40-60	Fair	3
20-40	Poor	2
0-20	Very Poor	1
<0	Past Due	0

The numerical Rated Condition score and Rating Category are defined in the following table.

Table B-69. Asset Condition Rating Criteria

Rating Category	Rating Score	% of Remaining Service Life	Definition
Very Good	5	80% - 100%	**Fit for the Future** - An asset in very good condition is typically new or recently rehabilitated. Regular maintenance should enable the asset to reach its full EULA few elements exhibit deficiencies; failure to complete intended or recommended maintenance will shorten the EUL and increase resources required to manage the asset.
Good	4	60% - 79%	**Adequate for Now** - Assets show general signs of deterioration from normal use but the asset is still able to provide its intended function without problems. Levels of service are not affected. Regular maintenance should enable the asset to reach its full EULA few elements exhibit deficiencies
Fair	3	40% - 59%	**Requires Attention** – The asset shows general signs of deterioration, likely from normal use but possibly as the result of another deficiency and require repair or some rehabilitation. Maintenance needs and costs will increase, but the asset should still reach its EUL if these tasks are performed when planned.
Poor	2	20% - 39%	**At Risk** – An asset in poor condition is approaching its EUL and likely can no longer provide its intended design function; levels of service will be negatively affected. Major repairs or rehabilitation will be required with full replacement possibly needed.
Very Poor	1	<20%	**Unfit for Sustained Service** – An asset in Very Poor condition will demonstrate evidence of advanced deterioration. Service levels will be negatively affected, and there may be a risk to health and safety of persons using the asset without mitigation in the form of major rehabilitation or replacement taking place.
Past Due	0	0% or less	**Past Recommended Replacement Date** – Based on age the asset is past its EUL - Or - Based on an actual assessment of the asset it has been determined that the asset is no longer able to provide its intended design function. In both situations, replacement or extensive rehabilitation is recommended.

When the condition is assessed as "Past Due" the replacement cost of the asset is considered part of a backlog of required renewal, replacement or maintenance work that should have been completed prior to 2020. The value of past-due work is an important metric in analyzing how well the City is managing the requirements of the assets.

Condition assessment information provided by third-party consultants often include recommendations for actions that should be completed in order to ensure the assets remain in good functional condition through their EUL. Normally these recommendations include an estimated cost to complete those actions, and a year in which the action should be completed. Sometimes the cost represents a recommended repair or renewal activity while more normally it represents a "replacement" cost – that is the cost to replace the asset with a new version of the asset that provides the same function. A lifecycle plan for the asset is produced by assigning the indicated action cost to the appropriate year. Completing this step for all the assets provides a lifecycle plan for the asset class as a whole, and subsequently the City as a whole.

For assets that have not been quantitatively assessed the condition rating determined using the RSL/EUL ratio of the asset is used to determine the recommended replacement year. Assets that are indicated to be older than their EUL are assigned a Past Due condition and the replacement year is set to 2020. Asset age does not necessarily indicate that an asset is no longer functional and must be replaced. It is not uncommon to have older assets assessed in good condition.

It is normal that during an asset assessment the condition of the asset will be determined to be different than what the age of the assets suggests the condition should be. Example: an asset that only has 20% of is EUL remaining would in theory be categorized in "Poor" condition but may have been assessed in "Good' condition. If a replacement

year is not identified during an assessment then an estimated replacement year is determined using the criteria in the following table.

Table B-70. Criteria Used to Determine Forecast Replacement Year

Condition Rating	Replacement Year (RY)
Past Due	2020
Very Poor	2020 + 10% of EUL
Poor	2020 + 30% OF EUL
Fair	2020 + 50% OF EUL
Good	2020 + 70% OF EUL
Very Good	2020 + 90% OF EUL

Example:

> If the Condition rating is Fair, and the EUL is 20 years,

$$RY = 2020 + 50\% \text{ of } 20$$
$$= 2020 + 10$$
$$= 2030$$

Therefore the replacement cost for the asset is assigned to 2030 as a forecast requirement in that year.

With the long, multi-year forecast period used in the AMP many assets would need to be replaced more than once in the forecast period – some assets would require replacing multiple times. The example above identifies the first required replacement. Subsequent required replacements would be determined by adding the EUL (in years) to the year of the first replacement. Continuing the above example:

$$RY(2) = 2030 + EUL$$
$$= 2030 + 20$$
$$= 2050$$

In accordance with capital project estimating best practices, a contingency value has been added to each annual replacement cost in order to account for variances in cost estimates, project soft costs like design, planning or project management, or future economic challenges that may affect the infrastructure construction and acquisition industry. The rate of the contingency varies depending on the asset type.

Including the contingency, forecast required costs included in this AMP should be considered class "D" estimates with a +/- 25% accuracy level. This is a typical strategy for estimating infrastructure costs in the high-level analysis that the AMP represents.

Current Year Valuation

Unless otherwise stated, all financial figures in the Core AMPs are described in 2020 dollar values. This includes the values associated with the asset replacement costs, and the forecast replacement, renewal, maintenance and growth costs.

If a value used in the Core AMPs was originally sourced with a different year's present value, that value was inflated to 2020 values using information published by StatsCan and based on the historical rates for the Consumer Price Index (CPI). [23]

[23] The following StatsCan table was used for this reference: "Table: 18-10-0004-02, Consumer Price Index by geography, all items, monthly, percentage change, not seasonally adjusted, Canada, Provinces, Whitehorse, Yellowknife and Iqaluit". Results for Ontario selected. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000402

Levels of Service

Understanding how well assets are performing their intended functions to the community is done by measuring that performance against a series of metrics known as Levels of Service (LOS). Setting LOS targets that are connected to the City's Strategic plan provides focus and direction to identifying the needs of the assets, in turn helping to identify where City resources should be committed. The LOS metrics should represent the expectations of the community while taking into consideration the costs to deliver those expectations.

The International Infrastructure Management Manual (IIMM) defines LOS as "the defined service quality for a particular service against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental, acceptability and cost".

The Municipal Finance Officers Association of Ontario (MFOA) Asset Management Framework document has identified three steps to the LOS Analysis as shown in the following figure.

LOS metrics are divided into two categories: Community LOS measure how the community receives the services using attributes like reliability, quality, safety, efficiency and capacity.

Technical LOS measure how well the services are being delivered using quantitative, operational and technical measures. Technical LOS often relate to attributes like cost to deliver services, levels of compliance with legislation, condition of the assets measured using design standards etc.

Figure 32. Level of Service Analysis Components
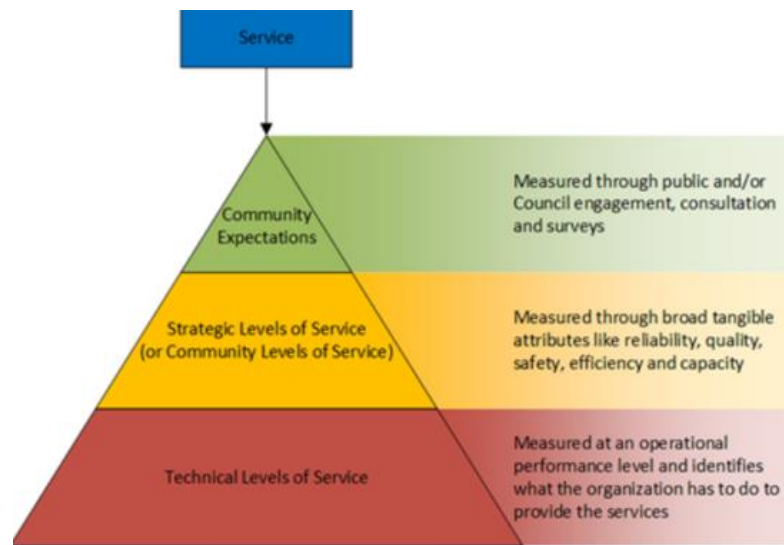
For the Core assets there are two sets of LOS metrics that the City must measure against – those defined by O.Reg 588/17 and specifically detailed in the regulation, and those developed in consultation with City Staff to capture requirements of existing regulation and legislation. .

The City Asset Management team began efforts to develop an internal LOS framework in late 2017 and early 2018. A separate LOS Framework document was developed for each service area. These frameworks form the baseline for the LOS presented in the Core AMPs.

The following tables demonstrate
suggested LOS metrics as described in the
MFOA Asset Management Framework.

**Table B-71. Sample Customer Levels of Service Part 1 - Extract from MFOA Asset
Management Framework**

Services	Applicable Assets	Community Expectations	Strategic LOS Expected (Customer Perspective)
Roads	Road base, surface, bicycle lanes, turning lanes, etc.	"Smooth roads that take me where I need to go without too much congestion"	Safe, reliable roads with adequate capacity
Bridges and Culverts	Structure, deck, surface, etc.	"Sturdy bridges that take me where I need to go without too much congestion"	Safe, reliable bridges with adequate capacity
Sidewalks	Sidewalks	"Sidewalks that I can walk safely on to key areas of the Community"	Safe sidewalks, access from subdivisions to downtown
Streetlights	Poles, fixtures, etc.	"Streetlights that work so I don't have to walk in the dark"	Reliable streetlights
Traffic Lights	Poles, lights, controllers, etc.	"Traffic lights are placed where needed to ensure smooth and safe traffic flow"	Reliable traffic lights
Transit	Vehicles, facilities, equipment, etc.	"Access to public transit to allow me to get where I need to go on a reasonable schedule"	Reliable and convenient transit services
Parking	Lots, lights, facilities, equipment, etc.	"Safe and convenient parking is available, where needed"	Convenient and secure parking locations
Winter Control	Vehicles, equipment	"Able to drive on roads safely in winter conditions"	Safe roads in winter

Table B-72. Sample Customer Levels of Service Part 2 - Extract from MFOA Asset Management Framework

Water Distribution	Water mains, wells, pumps, towers, valves, hydrants, etc.	"Clean water, when I need it, that tastes good, has adequate pressure, at a reasonable cost"	Quality and efficient water supply, with adequate capacity
Water Treatment	Treatment plant (treatment systems, chlorination, pumps, chemical injection and filtration, piping, SCADA, pump houses, etc.		
Wastewater Collection	Mains, pumping systems, manholes, etc.	"Wastewater systems that take my waste away and treats it with no harm to the environment"	Quality wastewater collection, with adequate capacity and no environmental impacts
Wastewater Treatment	Treatment plant (separators, aeration systems, pumps, chemical systems, SCADA, settlement ponds, facilities, etc.)		
Stormwater	Urban: Stormwater mains, catch basins, ponds, headwalls, etc.	"No flooding on our streets or properties"	Stormwater system with adequate capacity
	Rural: Open ditches, culverts, ponds, headwalls, etc.		

Table B-73. Sample Technical Levels of Service - Extract from MFOA Asset Management Framework

Services	Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)
Roads	Safe, reliable roads with adequate capacity	Average condition rating: Local (5/10), Collector (6/10), Arterial (7/10)
		Follow Minimum Maintenance Standards
Bridges and Culverts	Safe, reliable bridges with adequate capacity	Average condition rating: 7/10
		Follow Minimum Maintenance Standards
Sidewalks	Safe sidewalks, access from subdivisions to downtown	Average condition: 7/10
		Minimize complaints
Streetlights	Reliable streetlights	Minimize complaints
Traffic Lights	Reliable traffic lights	Minimize complaints
Transit	Reliable and convenient transit services	Inspect and perform maintenance on vehicles monthly
		Minimize complaints
Parking	Convenient and secure parking locations	Minimize complaints
Winter Control	Safe roads in winter	Follow MMS
Water Distribution	Quality and efficient water supply, with adequate capacity	Meet legislative requirements
Water Treatment		Unaccounted for water under 30%
		Less than 5 main breaks annually, per 100 customers
Wastewater Collection	Quality wastewater collection, with adequate capacity and no environmental impacts	Meet legislative requirements
		Minimize incidents of bypass
Wastewater Treatment		Less than 5 main breaks annually, per 100 customers
Stormwater	Stormwater system with adequate capacity	Minimize flooding incidents per 1,000 people

Appendix C Operations and Maintenance Details

Throughout the Core AMP reference will be made to operations and maintenance activities and requirements. These are important activities that are essential to successful asset management. The following definitions are used when referring to these types of tasks.

Operations and maintenance activities are separate from capital replacement and renewal activities, and are normally funded through dedicated budgets.

The operations and maintenance budgets and forecast needs are analyzed separately for each of the core assets types, then combined with the forecast lifecycle needs in order to evaluate the total forecast funding requirements for the assets over the period of time this AMP covers.

Operational Needs

According to the International Infrastructure Management Manual (IIMM) operations is defined as:

> "The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials."

In other words, operational needs and tasks are those required on a regular, sometimes daily basis, in order to ensure that assets continue to provide their intended functions and levels of service.

Examples of operational needs include:

- Hydro fees for lighting and powering equipment.
- Natural gas fees for heating equipment.
- Employee salaries for staff to manage assets.
- Fuel costs for vehicles required to help manage assets.
- Snow clearing of roads and sidewalks, including salt/brine for ice melting.
- Grass cutting and other vegetation management.

- The cost of chemicals required in the water treatment process.
- Flushing of pipes.
- Removal of dirt, debris and grit.

These are essential actions that, if not completed, will result in partial or complete failure of an asset or system of assets.

Maintenance Needs

According to the International Infrastructure Management Manual (IIMM) maintenance is defined as:

> "All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal. Maintenance does not increase the service potential of the asset or keep it in its original condition, it slows down deterioration and delays when rehabilitation or replacement is necessary".

Maintenance activities can be divided into the following categories:

Planned: Planned maintenance activities are further categorized into Preventive and Predictive types.

Preventive maintenance tasks are those that should be performed based on defined, scheduled timeframes and are recommended to be completed as planned in order to ensure the reliability of the asset, and help it to meet its intended design lifecycle. Preventive maintenance activities are often defined in owners and manufacturer's user manuals. The time period between maintenance cycles can be set by metrics such as hours of use, numbers of cycles completed or seasonal changes.

Predictive maintenance uses condition monitoring of an asset to determine when and what maintenance tasks are required.

Unplanned (corrective, breakdown or emergency): Actions that are required as a result of full or partial failure of an asset to perform its intended function and return it to a suitable condition for service.

Deferred: maintenance activities (usually preventive types) that should have been completed but for some reason were not. Cumulative deferred maintenance items from one year are carried over to the next year and included in the cumulative sum of past-due work.

Ideally the City maintenance plans will include an emphasis on planned and preventive maintenance tasks as these are cost effective methods of ensuring assets reach their intended EUL without significant risk of failure with major consequences. An effective planned and preventive maintenance program will lower long-term costs associated with managing assets.

Each asset type has unique maintenance needs. With the number of different types of assets in the City inventory it is not feasible to present them all in this report, but examples will be provided for some of the major asset types when appropriate.

Appendix D Lifecycle Management and Planning

A preliminary asset lifecycle replacement plan for the City's asset inventory can be developed using the current replacement values of each asset and determining when the asset will require replacement based on its condition rating. The City uses a 25-year forecast period between 2021 and 2045. Year 2020 is considered year 0 – any assets assigned a replacement year of 2020 are considered as past-due and represent maintenance or capital work that should have been done prior to 2020.

The forecast replacement year is assigned using one of the following two methods:

i. If an asset does not have an assessed condition rating, the replacement year assigned is based on the year it was installed plus the estimated useful life (EUL) of that asset.

ii. If the asset does have an assessed condition rating, the assigned year is based on the condition rating and it's EUL, as described in the section of this AMP titled "Evaluating Assets".

Asset Management Plans do not typically identify specific projects nor specific project cost estimates. The 2020 CRV is used as a predictor for what the cost is estimated to be when the asset will require replacement. This analysis uses capital replacement costs only – operations, maintenance and repair costs are identified separately. As such, the costs used in this analysis are not suitable for project costing purposes, and are, instead, a helpful baseline for preliminary long-range financial planning to be refined as needs become more immediate.

The lifecycle needs have been summarized using ten-year and twenty-five year periods. The ten-year forecast represents those costs most likely to be required in that time period with a moderate to high degree of confidence (depending on the particular asset). The twenty-five year costs should be read with less confidence – significant changes to infrastructure and City needs can occur in that time period, but the forecast presented is the information as it is understood at the time of this report being prepared.

All of the forecast lifecycle costs are presented in 2020 current year dollar values and are not adjusted for inflation in future years. This is done in order to ensure consistent analysis across the entire time period the forecasts in the AMP cover.

Appendix E Core Asset System Maps

Figure 33. City of Guelph Roads Assets: Condition Ratings

▲

North

Legend

------- CityBoundary

Road
Condition

—— Very Good

—— Good

—— Fair

—— Poor

—— Very Poor

—— PAST DUE

—— Not Applicable

▨ Rivers

0 0.475 0.95 1.9 2.85 3.8
Kilometers
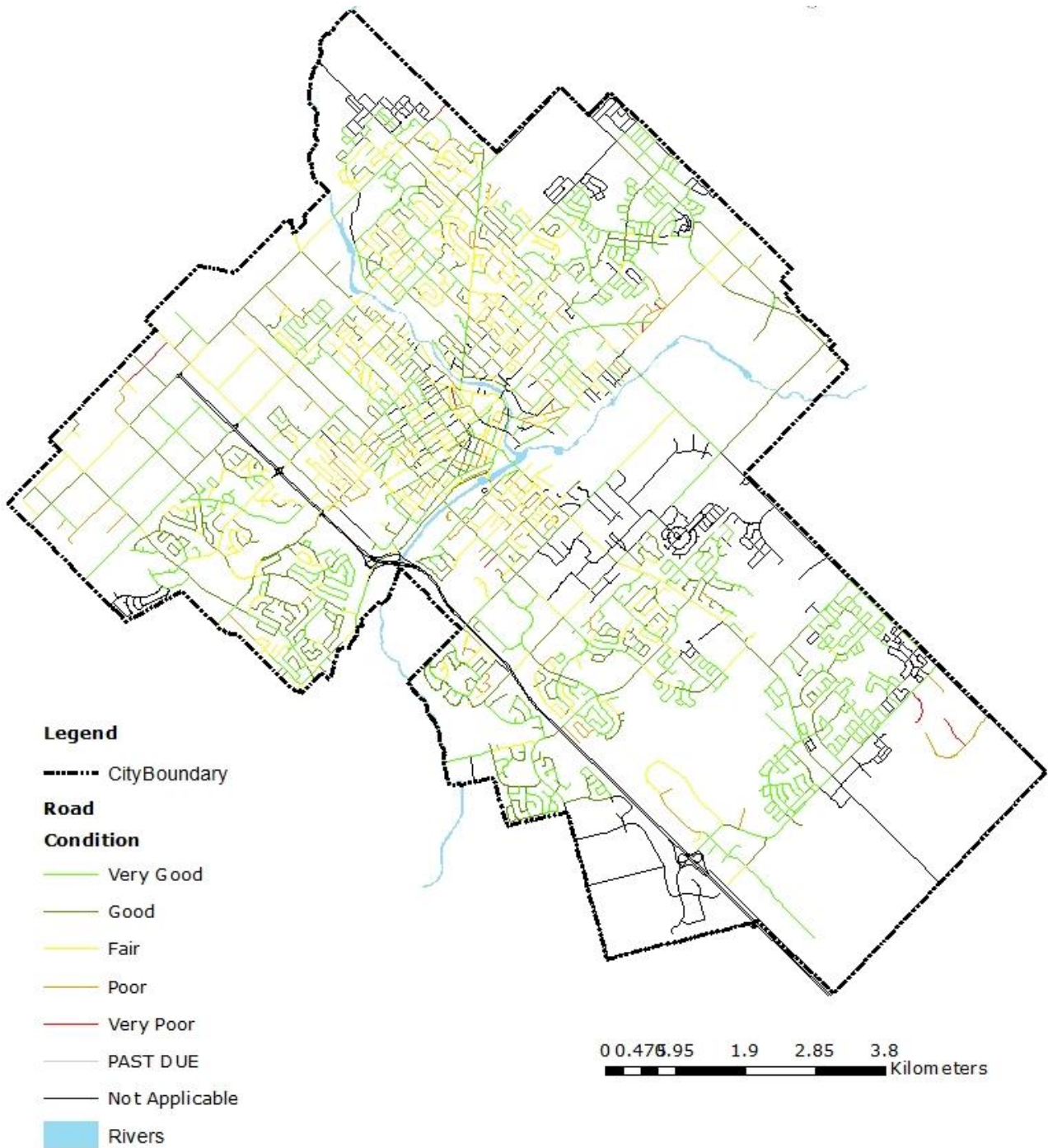
Figure 34. Water Distribution Assets: Condition Ratings

▲

North

Legend

----- CityBoundary

―― Road

WaterMain

Condition

―― Very Good

―― Good

―― Fair

―― Poor

―― Very Poor

―― PAST DUE

―― Not Applicable

▆ Rivers

0 0.5 1   2   3   4
                          Kilometers
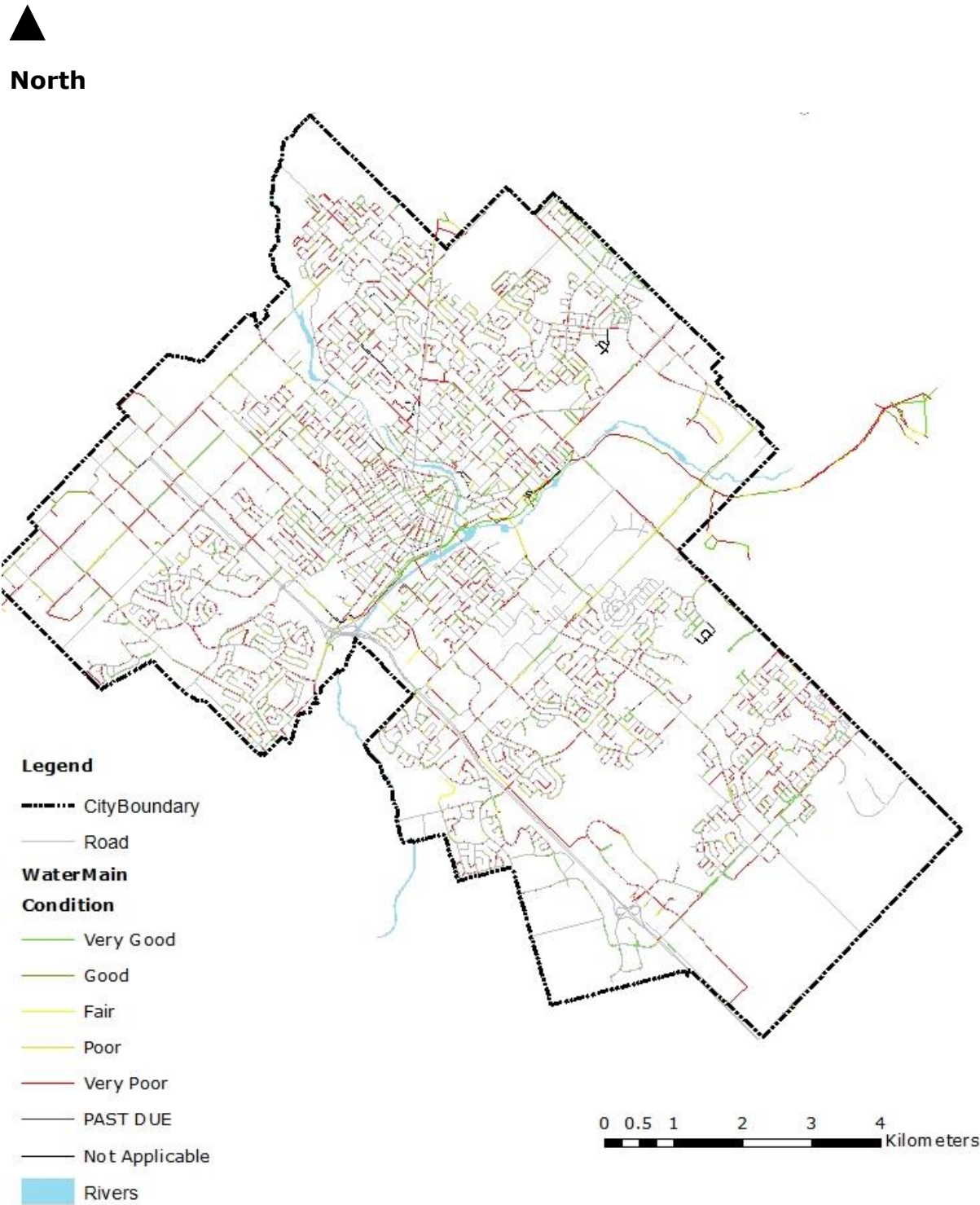
Figure 35. Wastewater Collection Assets: Condition Ratings

▲

North

Legend

- ····· CityBoundary
- —— Road

Wastewater Main Condition

- —— Very Good
- —— Good
- —— Fair
- —— Poor
- —— Very Poor
- —— PAST DUE
- —— Not Applicable
- ▇ Rivers

0 0.5 1   2   3   4
Kilometers
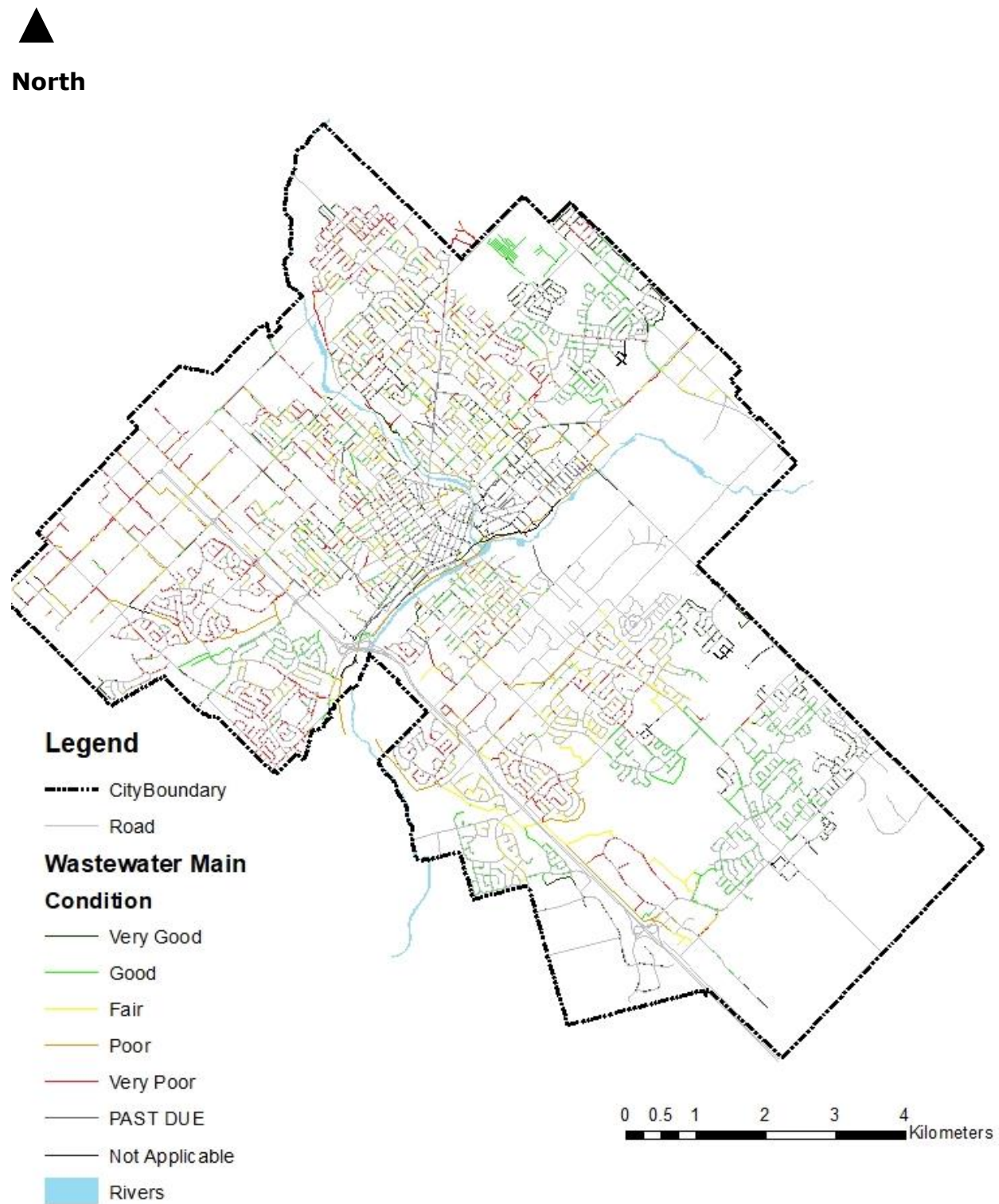
Figure 36. Stormwater Collection Assets: Condition Ratings

▲

North

Legend

----- CityBoundary

—— Road

**Stormwater Main
Condition**

—— Very Good

—— Good

—— Fair

—— Poor

—— Very Poor

—— Not Applicable

Rivers

0 0.5 1 2 3 4
Kilometers
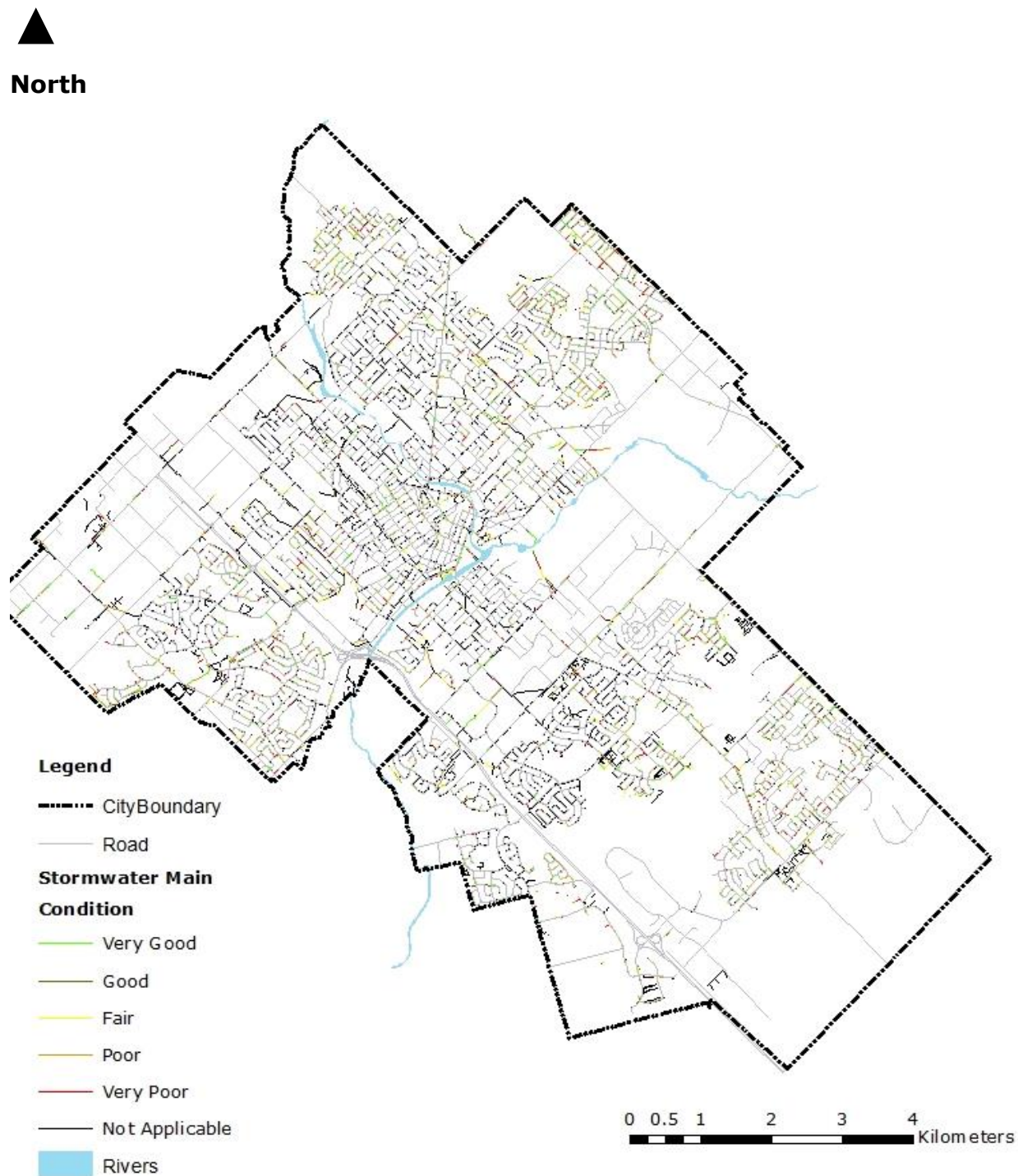
Appendix F Priority Customers for Water Services

The information in the following table was provided by Water Services staff in January 2021.

Table F-74. Priority Customers for Water Services

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
St. Ignatius of Loyola Catholic School	COLONIAL	Level 2	Private and Public Schools	Primary
St. John Bosco Secondary School - A Catholic Learning Community	NORTHUMBERLAND	Level 2	Private and Public Schools	Secondary
St. Michael Catholic School	McElderry	Level 2	Private and Public Schools	Primary
St. Patrick Catholic School	VICTORIA	Level 2	Private and Public Schools	Primary
Arbour Vista Public School	MCCANN	Level 2	Private and Public Schools	Primary
Arkell Walk-in Medical Clinic	ARKELL	Level 1	Health Care Facilities	Clinics
Bishop Macdonell Catholic High School	CLAIR	Level 2	Private and Public Schools	Secondary
Brant Avenue Public School	BRANT	Level 2	Private and Public Schools	Primary
Bulldog Interactive Fitness For Youth	GRANGE	Level 1	Children & Youth Care Facilities	Other
Campus Child Care Cooperative of Guelph	SOUTH RING	Level 1	Children & Youth Care Facilities	Daycares
Canadian Mental Health Association - Guelph	Waterloo	Level 1	Health Care Facilities	Other
Canadian Mental Health Association - Guelph - Centre for Mental Health	WYNDHAM	Level 1	Health Care Facilities	Other
Centennial Collegiate Vocational Institute	College	Level 2	Private and Public Schools	Secondary
Central Public School	Dublin	Level 2	Private and Public Schools	Primary

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Chartwell Retirement Residences - Guelph - Gordon St - Chartwell Royal on Gordon Retirement Residence	GORDON	Level 1	Health Care Facilities	Nursing/Retirement Homes
Chartwell Retirement Residences - Guelph - Janefield Ave - Chartwell Wellington Park Retirement Residence	JANEFIELD	Level 1	Health Care Facilities	Nursing/Retirement Homes
College Heights Secondary School	College	Level 2	Private and Public Schools	Secondary
Comfort Inn	SILVERCREEK	Level 2	Hotels	
Conestoga College - Guelph Campus	SPEEDVALE	Level 2	Private and Public Schools	College
Cornerstone Christian School	Forest	Level 2	Private and Public Schools	Primary
Couling Crescent Holding School at Tytler Public School	Ontario	Level 2	Private and Public Schools	Primary
Dawson Travel and Immunization Clinic	DAWSON	Level 1	Health Care Facilities	Clinics
Days Inn	GORDON	Level 2	Hotels	
Delta	STONE	Level 2	Hotels	
Dino and Kidz Early Learning Centre	Eastview	Level 1	Children & Youth Care Facilities	Daycares
École élémentaire catholique Saint-René-Goupil	SCOTTSDALE	Level 2	Private and Public Schools	Primary
École élémentaire L'Odyssée	BRIGHTON	Level 2	Private and Public Schools	Primary
École Guelph Lake Public School	WATSON	Level 2	Private and Public Schools	Primary
École King George Public School	LEMON	Level 2	Private and Public Schools	Primary

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Edward Johnson Public School	Stevenson	Level 2	Private and Public Schools	Primary
Edward Johnson Y School Age Program	Stevenson	Level 1	Children & Youth Care Facilities	Other
Elliott Community (The)	Metcalfe	Level 1	Health Care Facilities	Nursing/Retirement Homes
Fairfield Inn & Suites by Marriott	COWAN	Level 2	Hotels	
First Steps Daycare - School Age	DELHI	Level 1	Children & Youth Care Facilities	Other
First Steps Daycare Guelph Inc	SPEEDVALE	Level 1	Children & Youth Care Facilities	Daycares
Fred A. Hamilton Public School	Ironwood	Level 2	Private and Public Schools	Primary
Fred A. Hamilton Y Child Care	Ironwood	Level 1	Children & Youth Care Facilities	Other
G.S. Care - Sacred Heart	HURON	Level 1	Children & Youth Care Facilities	Other
G.S. Care - St.Ignatius	COLONIAL	Level 1	Children & Youth Care Facilities	Other
G.S. Care - St.John	VICTORIA	Level 1	Children & Youth Care Facilities	Other
G.S. Care - St.Patrick Catholic School	VICTORIA	Level 1	Children & Youth Care Facilities	Other
G.S. Care - St.Paul	CLAIRFIELDS	Level 1	Children & Youth Care Facilities	Other
G.S. Care St.Francis	IMPERIAL	Level 1	Children & Youth Care Facilities	Other
Gateway Drive Public School	GATEWAY	Level 2	Private and Public Schools	Primary
Gingerbread House Co-op Preschool	STEVENSON	Level 1	Children & Youth Care Facilities	Daycares
Gordon House Residence and Apartments	GORDON	Level 1	Health Care Facilities	Nursing/Retirement Homes

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Guelph Collegiate Vocational Institute	PAISLEY	Level 2	Private and Public Schools	Secondary
Guelph Community Christian School	COLLEGE	Level 2	Private and Public Schools	Primary
Guelph General Hospital	DELHI	Level 1	Health Care Facilities	Hospitals
Guelph Lake Commons	VICTORIA	Level 1	Health Care Facilities	Nursing/Retirement Homes
Guelph Lake Y School Age Program	WATSON	Level 1	Children & Youth Care Facilities	Other
Guelph Montessori School	WATERLOO	Level 2	Private and Public Schools	Primary
Guelph Walk-in Medical Clinic - Gordon St	GORDON	Level 1	Health Care Facilities	Clinics
Guelph Walk-in Medical Clinic - Speedvale Ave	SPEEDVALE	Level 1	Health Care Facilities	Clinics
Hampton Inn & Suites by Hilton	IMPERIAL	Level 2	Hotels	
Heritage House Heritage House	GORDON	Level 1	Health Care Facilities	Nursing/Retirement Homes
Holiday Inn Express & Suites	SILVERCREEK	Level 2	Hotels	
Holiday Inn Guelph Hotel & Conference Ctr	SCOTTSDALE	Level 2	Hotels	
Holy Rosary Catholic School	STEVENSON	Level 2	Private and Public Schools	Primary
Holy Trinity Catholic School	GRANGE	Level 2	Private and Public Schools	Primary
Holy Trinity Y School Age Program	GRANGE	Level 1	Children & Youth Care Facilities	Other
Homewood Health Centre - Assertive Community Treatment Team	DELHI	Level 1	Health Care Facilities	Other

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Homewood Health Centre - Community Mental Health Program	Delhi	Level 1	Health Care Facilities	Other
Homewood Health Centre Inc.	DELHI	Level 1	Health Care Facilities	Other
Hospice Wellington - Guelph - Scottsdale Dr	SCOTTSDALE	Level 1	Health Care Facilities	Other
Jack & Jill Daycare Centre	ARNOLD	Level 1	Children & Youth Care Facilities	Daycares
Jean Little Public School	Youngman	Level 2	Private and Public Schools	Primary
Jean Little Y Child Care	Youngman	Level 1	Children & Youth Care Facilities	Other
John F. Ross Collegiate Vocational Institute	MEYER	Level 2	Private and Public Schools	Secondary
John Galt Public School	LAURINE	Level 2	Private and Public Schools	Primary
John McCrae Public School	WATER	Level 2	Private and Public Schools	Primary
John McCrae Y School Age Program	WATER	Level 1	Children & Youth Care Facilities	Other
JOHNSON & JOHNSON	WOODLAWN	Level 1	Health Care Facilities	
June Avenue Public School	JUNE	Level 2	Private and Public Schools	Primary
Ken Danby Public School	GRANGE	Level 2	Private and Public Schools	Primary
Ken Danby Y Schoool Age Program	GRANGE	Level 1	Children & Youth Care Facilities	Other
Kensington Y Child Care	KENSINGTON	Level 1	Children & Youth Care Facilities	Other
Kids Come First Child Care Centre	GORDON	Level 1	Children & Youth Care Facilities	Daycares
King George Y School Age Program	LEMON	Level 1	Children & Youth Care Facilities	Other

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Kortright Hills Public School	PTARMIGAN	Level 2	Private and Public Schools	Primary
La Garderie de l'Arc-en-ciel	SCOTTSDALE	Level 2	Private and Public Schools	Primary
LaPointe-Fisher Nursing Home	METCALFE	Level 1	Health Care Facilities	Nursing/Retirement Homes
Les Etoiles Brillantes	BRIGHTON	Level 1	Children & Youth Care Facilities	Daycares
Lillian's Children Centre	WILLOW	Level 1	Children & Youth Care Facilities	Daycares
Lilliput Land Nursery School	NORFOLK	Level 1	Children & Youth Care Facilities	Daycares
Little Folks Montessori Inc	WILLOW	Level 1	Children & Youth Care Facilities	Daycares
Little Learners Daycare Centre	VICTORIA	Level 1	Children & Youth Care Facilities	Daycares
London House Bed & Breakfast	LONDON	Level 2	Hotels	
Mary Phelan Catholic School	BISHOP	Level 2	Private and Public Schools	Primary
Maxxam Analytics (Guelph)	LAIRD			
Midtown Urgent Care Clinic	CHANCELLORS	Level 1	Health Care Facilities	Clinics
Mitchell Woods Public School	WILLOW	Level 2	Private and Public Schools	Primary
Mitchell Woods Y School Age Program	WILLOW	Level 1	Children & Youth Care Facilities	Other
Montessori Academy Learning Centre	WATER	Level 1	Children & Youth Care Facilities	Daycares
Montessori School of Wellington	SUFFOLK	Level 1	Children & Youth Care Facilities	Other
Noah's Ark Childcare	CRIMEA	Level 1	Children & Youth Care Facilities	Daycares
Noel's Children's Centre	WOODLAWN	Level 1	Children & Youth Care Facilities	Daycares

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Norfolk Guest House Bed & Breakfast	ERAMOSA	Level 2	Hotels	
Norfolk Manor - Retirement Residence	Norfolk	Level 1	Health Care Facilities	Nursing/Retirement Homes
Organization: College Place Retirement Residence	COLLEGE	Level 1	Health Care Facilities	Nursing/Retirement Homes
Ottawa Crescent Public School	OTTAWA	Level 2	Private and Public Schools	Primary
Our Lady of Lourdes Catholic High School	Westmount	Level 2	Private and Public Schools	Secondary
Paisley Road Public School	Paisley	Level 2	Private and Public Schools	Primary
Paisley Road Y School Age Program	Paisley	Level 1	Children & Youth Care Facilities	Other
Parkview Daycare	SPEEDVALE	Level 1	Children & Youth Care Facilities	Daycares
Parkview Motel	WOOLWICH	Level 2	Hotels	
Priory Park Public School	SCOTTSDALE	Level 2	Private and Public Schools	Primary
Provincial Data Centre	SOUTHGATE	Level 4	All Other Customers	
RBC Data Centre	SOUTHGATE	Level 4	All Other Customers	
Resurrection Christian Academy	SPEEDVALE	Level 2	Private and Public Schools	Primary
Rickson Ridge Public School	RICKSON	Level 2	Private and Public Schools	Primary
Rickson Ridge Y Child Care	RICKSON	Level 1	Children & Youth Care Facilities	Other
Royal Brock Hotel	GORDON	Level 2	Hotels	
Royal City Co-Operative Preschool	DEAN	Level 1	Children & Youth Care Facilities	Daycares
Royal City Montessori Academy	DEVERE	Level 1	Children & Youth Care Facilities	Daycares
Royal Inn & Suites	MacDonnell	Level 2	Hotels	

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Sacred Heart Catholic School	HURON	Level 2	Private and Public Schools	Primary
Sir Isaac Brock Public School	COLONIAL	Level 2	Private and Public Schools	Primary
Sleeman Breweries	ADMIRAL	Level 2	Food Services	Processing Facilities
Sleeman Breweries	CLAIR	Level 2	Food Services	Processing Facilities
Sleeman Breweries	CLAIR	Level 2	Food Services	Processing Facilities
Sleeman Breweries	SOUTHGATE	Level 2	Food Services	Processing Facilities
St. Francis of Assisi Catholic School	IMPERIAL	Level 2	Private and Public Schools	Primary
St. James Catholic High School	VICTORIA	Level 2	Private and Public Schools	Secondary
St. John Catholic School	VICTORIA	Level 2	Private and Public Schools	Primary
St. Joseph Catholic School	GUELPH	Level 2	Private and Public Schools	Primary
St. Joseph's Health Care Centre Guelph	WESTMOUNT	Level 1	Health Care Facilities	Other
St. Paul Catholic School	CLAIRFIELDS	Level 2	Private and Public Schools	Primary
St. Peter Catholic School	WESTWOOD	Level 2	Private and Public Schools	Primary
St.Michael Y Child Care	McElderry	Level 1	Children & Youth Care Facilities	Other
Staybridge Suites Guelph	CORPORATE	Level 2	Hotels	
Stone Lodge Retirement Residence by Revera	Cole	Level 1	Health Care Facilities	Nursing/Retirement Homes
Super 8	WOODLAWN	Level 2	Hotels	
Taylor Evans Public School	Stephanie	Level 2	Private and Public Schools	Primary
The Salvation Army Nursery School	GORDON	Level 1	Children & Youth Care Facilities	Daycares

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Tim Hortons - TDL Group Corp.	SOUTHGATE	Level 2	Food Services	Processing Facilities
Trillium Waldorf School	VICTORIA	Level 2	Private and Public Schools	Primary
University of Guelph	STONE	Level 2	Private and Public Schools	University
University of Guelph Child Care and Learning Centre	Arboretum	Level 1	Children & Youth Care Facilities	Daycares
Victory Kids Club	EXHIBITION	Level 1	Children & Youth Care Facilities	Other
Victory Public School	EXHIBITION	Level 2	Private and Public Schools	Primary
Village of Arbour Trails	BAYBERRY	Level 1	Health Care Facilities	Nursing/Retirement Homes
Village of Riverside Glen	WOODLAWN	Level 1	Health Care Facilities	Nursing/Retirement Homes
Village of Riverside Glen - Retirement Home	WOODLAWN	Level 1	Health Care Facilities	Nursing/Retirement Homes
Walk-in Medical Clinic - Kortright Rd W	KORTRIGHT	Level 1	Health Care Facilities	Clinics
Walk-in Medical Clinic - Silvercreek Pkwy	SILVERCREEK	Level 1	Health Care Facilities	Clinics
Waverley Drive Public School	WAVERLEY	Level 2	Private and Public Schools	Primary
Wayfare Motel	Woodlawn	Level 2	Hotels	
Wellington Early Learning Centre	Stephanie	Level 1	Children & Youth Care Facilities	Daycares
Wellington-Dufferin-Guelph Public Health - Guelph	CHANCELLORS	Level 1	Health Care Facilities	Other
Western Hotel & Executive Suites	MACDONELL	Level 2	Hotels	
Westminster Woods PS	GOODWIN	Level 2	Private and Public Schools	Primary

Customer Name	Street Name	Priority Level	Grouping	Sub Grouping
Westwood Public School	WILLOW	Level 2	Private and Public Schools	Primary
William C. Winegard Public School	LEE	Level 2	Private and Public Schools	Primary
Willow Road Public School	WILLOW	Level 2	Private and Public Schools	Primary
Willowdale Child Care and Learning Centre	WILLOW	Level 1	Children & Youth Care Facilities	Daycares
Woodland Glen Y Child Care	WOODLAND	Level 1	Children & Youth Care Facilities	Other
Workside Early Childhood Education Centre I	WOOLWICH	Level 1	Children & Youth Care Facilities	Daycares
Workside Early Childhood Education Centre II	DELHI	Level 1	Children & Youth Care Facilities	Daycares

Appendix G Updates to Asset Information since 2020 Corporate AMP

Roads and Bridges

Upon review by City Staff it was discovered that roadway segments for the Hanlon Expressway (Highway 6) and the roads within the University of Guelph campus boundaries had been included in the 2020 inventory. These roads are not owned nor maintained by the City of Guelph and so they have been removed form the inventory and analysis for the Core AMPs. The difference in replacement value is approximately $61M or 4.7% of the total reported in 2020.

Water Services

City staff provided updated descriptions of the water system assets, in particular those related to facility infrastructure.

The total value and total count of the assets did not change, but a realigning of the asset descriptions resulted in an adjustment of the previously reported sub-total replacement values for both the facility and linear assets compared to the 2020 Corporate AMP.

Wastewater Services

As with the Water Services, City staff provided updated descriptions of the wastewater system assets, in particular those related to facility infrastructure such as the Pumping Stations and Forcemains including siphons.

A realignment of the asset descriptions resulted in an adjustment of the previously reported sub-total replacement values for both the facility and linear assets compared to the 2020 Corporate AMP.

Stormwater Services

No changes.

Appendix H Reference Documents

1. Employment Lands Strategy Shaping Guelph: [Growth Management Strategy November 27, 2020](#)
2. [Stormwater Management Planning and Design Manual](#), Ontario Ministry of the Environment, Conservation and Parks.
3. [International Infrastructure Management Manual (IIMM) 6th Edition](#), Institute of Public Works Engineering Australasia(IPWEA)
4. ISO 55000, 55001, 55002, Asset Management Overview
5. ISO 31000 – Risk Management

Municipal Finance Officers Association of Ontario (MFOA) Asset Management Framework [document](#).

END