Sustainability and
Asset Management

2025 Asset Management Plan

City of Markham

MARKHAM

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Definitions

Asset

An item, thing or entity that has potential or actual value to an organization. The value can be tangible or intangible, financial or non-financial, and includes consideration of risks and liabilities.

Asset Category

A category of municipal infrastructure assets that is an aggregate of assets.

Asset Hierarchy

A logical digital index of assets and asset information.

Asset Management

Planned actions and coordinated activities of an organization to optimally and sustainably manage its assets that will enable the assets to provide the desired level of service in a sustainable way, while managing their risk at the lowest lifecycle cost. It encompasses all asset types, tangible or intangible, individual components or complex systems, and all activities involved in the asset's lifecycle from acquisition/creation, through maintenance to renewal or disposal.

Asset Management Plan (AMP)

A strategic document (long-term) that states how a group of assets is to be managed over a period of time. The plan describes the characteristics and performance of infrastructure assets, the levels of service expected from them, planned actions to ensure the assets are providing the expected level of service, and financial strategies to implement the planned actions. Specific criteria to be included is defined in Ontario Regulation 588/17.

Asset Management Policy

Mandated requirements, overall intentions/principles and framework for control of asset management. An Asset Management Policy guides the overall direction of the asset management system, providing direction to the appropriate focus and level of asset management practice expected. It shall establish key principles, overall vision for the program, and align other municipal plans.

Asset Management Strategy

Documents the intended approach by which the assets and other resources will be used to achieve the agreed upon objectives within the agreed Policy framework. It provides clear direction, intentions and rationale. It also identifies the organizational readiness, including identification of barriers and appropriate implementation plans to overcome the barriers.

Backlog

Backlog refers to the value of immediate work that is required (not including additional work that may occur over the forecast periods) based on asset needs. This work could include asset replacements that are required when an asset has passed the end of its life. It may also include rehabilitations that are required immediately. The City understands the term “backlog” to mean those assets that have been identified as having needs (either rehabilitation or replacement) but are also not identified in the City’s Lifecycle Reserve Study.

Backlog (Managed)

Managed backlog refers to the value of immediate work that is required (not including additional work that may occur over the forecast periods) based on asset needs that the City has identified and has planned to complete. These items include both rehabilitations and replacements (i.e. renewals), and they are identified in the City’s Lifecycle Reserve Study.

Building Together – Guide for Municipal Asset Management Plans

A document, released by the Government of Ontario, which explains the importance and the features of an AMP.

Community (Customer) Levels of Service

Community Levels of Service (also known as Customer Levels of Service) measures are typically expressed in non-technical terms and describe the general public’s understanding of services being provided by infrastructure systems. Community LoS measures are typically related to the service that is provided by the overall system supporting the service delivery, rather than the specific assets.

Core Asset

Includes any municipal infrastructure asset that is a:

- water asset that relates to the collection, production, treatment, storage, supply or distribution of drinking water;
- wastewater asset that relates to the collection, transmission, treatment or disposal of wastewater, including any wastewater asset that from time to time manages stormwater;
- stormwater management asset that relates to the collection, transmission, treatment, retention, infiltration, control or disposal of stormwater;
- road; or,
- bridge or culvert.

Current Replacement Value (CRV)

The amount that an entity would have to pay to replace an asset of the same function and capacity at the present time, according to its current worth, including costs related to removal, installation, excavation, design, engineering, contingencies, disposal, material and labour.

Deterioration Curve

A mathematical representation used to model and predict the change in performance of an asset over time. These curves can be plotted on a graph, with the x-axis representing time (age), and the y-axis representing performance values (or ratings).

Estimated Service Life (ESL)

The estimated period of time (usually in years) that an asset is in use or is expected to be available for use, assuming perfect construction and general maintenance is carried out. ESLs may vary according to material type or functional component.

Infrastructure

The physical structures and associated facilities that form the foundation of development, and by or through which a public service is provided.

Infrastructure Deficit

A spending shortfall in comparison to an established need. This can include the accumulated deficit that results year over year due to financial shortfalls.

Key Performance Indicator (KPI)

A quantifiable measure used to evaluate the success of an organization, employee, asset, etc. in meeting objectives for performance.

Level of Service (LoS)

The parameters or combination of parameters that reflect the social, political, economic, and environmental outcomes the organization delivers. Level of service statements describe the outputs or objectives of the organization's activities that are intended to be delivered to the community.

Lifecycle Activity

Activities undertaken with respect to an infrastructure asset over its service life, including constructing, maintaining, renewing, operating, and decommissioning, and all engineering and design work associated with those activities.

Lifecycle Cost

The total cost of ownership over the life of an asset. This may include but is not limited to capital costs, operating costs, maintenance costs, renewal costs, replacement costs, environmental costs, and user delay.

Lifecycle Management Strategy

The set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost.

Long-Term Financial Plan

A plan that projects a forecast of financial performance and position over a period of at least five years. The Long-Term Financial Plan should be consistent with actions required to implement strategies proposed in other plans/documents.

Maintenance

Activities that allow assets meet their required performance objectives, including regularly scheduled inspection and activities associated with unexpected or unplanned events.

Missing Assets

Missing assets are assets that have been built and are currently in-service. These assets are not captured within the City's database system(s) or asset registry and are not captured in the City's Lifecycle Reserve Study.

Non-core Asset

All other municipally owned assets not included in the definition of a core asset (as per O. Reg 588/17).

Non-infrastructure Lifecycle Activities

Actions, studies, master plans or policies that are not capital in nature, which result in the lowering of costs and/or extend the useful life of an asset.

Ontario Regulation 588/17

Under the Infrastructure for Jobs and Prosperity Act, 2015, principles are set out by the provincial government to regulate asset management planning for municipalities. On December 27, 2017, O. Reg. 588/17 was released which regulates asset management planning for municipal infrastructure.

Operations

Regular, routine or regularly scheduled activities that are required or regularly anticipated as part of the assets service (for example, fueling a vehicle, completing an inspection or condition assessment, winter control, staffing/overhead).

Performance

A measure of how well an asset is fulfilling its intended purpose and meets the defined levels of service for its users and stakeholders.

Preventive Maintenance

Regular, routine or regularly scheduled maintenance activities that are intended to keep assets in good working order and prevent or minimize unplanned failures or downtime.

Rehabilitation

Significant repairs designed to extend the life of an asset. Rehabilitations are considered renewal lifecycle activities. They provide a significant improvement in an asset's performance, as opposed to maintenance activities that could occur more frequently and are designed to maintain functionality and performance as opposed to improve or restore it. For example, the re-lining of a length of sewer pipe can be considered a rehabilitation activity, whereas a spot repair may be considered maintenance.

Renewal/Replacement

Major rehabilitation or replacement of an existing asset to an equivalent capacity, function and/or performance.

Risk

The effect of uncertainty on an organization's objectives. It considers financial, socioeconomic and environmental variables and is determined by assigning a numeric rating for the likelihood of an asset failing and the consequence if it does.

Risk Management Strategy

A Risk Management Strategy details the methodology and framework used to assess an asset portfolio. It details the methodology and results used to assign Likelihood of Failure, Consequence of Failure and Risk Ratings to assets, which assists in understanding asset criticality, and prioritizing assets for rehabilitation or replacement.

Technical Levels of Service (LoS)

Technical LoS are technical measures applied against assets and overall systems that define the performance requirements to support Community Levels of Service and are used to determine which criteria will be used to drive business decisions. Technical LoS are often expressed in quantitative or numerical terms.

Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
AM	Asset Management
AMP	Asset Management Plan
AODA	Accessibility for Ontarians with Disabilities Act
BCI	Bridge Condition Index
BMFT	Building Markham's Future Together
CIPI	Costing Climate Change Impacts to Public Infrastructure
COF	Consequence of Failure
CRV	Current Replacement Value
DSS	Decision Support System
ESA	Environmentally Sensitive Area
ESL	Estimated Service Life
FAO	Financial Accountability Officer
FCI	Facility Condition Index
GHG	Greenhouse Gas
ISO	International Organization for Standardization
KPI	Key Performance Indicator
LCRS	Life Cycle Reserve Study
LOF	Likelihood of Failure
LoS	Levels of Service
OP	City's Official Plan
O. Reg. 588/17	Ontario Regulation 588/17
PCI	Pavement Condition Index
PCP	Partners for Climate Protection
SOTI	State of the Infrastructure

Assumptions and Limitations

The analysis, findings, and recommendations presented in this AMP contain certain assumptions and limitations. Throughout this AMP, where assumptions have been made or limitations exist (i.e., data availability, data granularity, etc.) it has been noted. The purpose of this section is to summarize these assumptions and limitations into a single, referenceable location. This section contains general and specific assumptions and limitations.

General Assumptions and Limitations

Asset Information – The detail, quantity, and quality of asset information varies across the City's different asset classes. As the City's asset management program continues to develop, asset data will also continue to improve over time. Where assumptions have been made due to the state of the available asset information, it has been noted.

Furthermore, it is noted that to complete the analyses that are reported in this AMP, the City utilized a combination of 2023, 2024 and 2025 asset and financially based data sources. No dataset is without errors and/or gaps. Therefore, the findings in this AMP are based on the best information available, and as a result, output reports and modeling results are subject to change as this data improves.

Since the 2024 AMP development, asset registers have been updated to revise ESLs, conditions, and installation dates for some assets. In addition, assets that have been decommissioned have been removed from the register and some newly acquired or renewed assets have also been updated in the register. The City should continue to update its asset registers to reflect the most up to date asset attributes for future asset management analyses and iterations of the AMP.

Decision Support System (DSS) – The DSS is a software model that generates a financial needs-based forecast over a forward-looking planning horizon. The DSS applies interventions (i.e., renewals, replacements, etc.) to assets at set trigger points (condition or age), and captures the cost of the intervention and post-intervention condition state of the asset. The interventions, their timing (i.e., trigger point), cost, and post-intervention condition state rely on input from subject matter experts. At the same time, the condition values used to trigger interventions is an estimated condition. Therefore, the financial forecast created by the DSS (any DSS) provides a best practice-based estimate of future costs and asset performance.

Having said this, forecasts are based upon a computational modeling exercise underpinned by assumptions and information that is subject to change and refinement as part of the annual resource and budget planning process.

Improvement and Monitoring Plan – It is assumed that the City will resource and action the elements of the improvement and monitoring plan. However, the rate at which the plan's components can be actioned will limit the rate at which future AMPs and the City's overall asset management program can mature.

Specific Assumptions and Limitations

Estimated Service Life (ESL) – is an asset management best practice that assigns a lifespan to an asset. It is a key datapoint that enables forecasting of asset performance and costs over time.

- Assumptions: as defined in the Definitions section (above), ESL assumes every asset is constructed perfectly and receives a regular maintenance regime over its entire service life. Many assets are not constructed perfectly. Furthermore, many assets exist in hostile environments (i.e., are exposed to salt water, corrosives, temperature extremes, etc.) or experience heavy utilization (i.e., heavy construction vehicle traffic on paved roads). As a result, actual service life can vary from estimated service life.
- Limitations: The ESL is typically assigned to an asset based on a combination of input from subject matter experts, direct experience with assets, and published service lives (City's Tangible Capital Asset Policy, from manufacturers or industry standards and guidelines). Small changes in ESL can have compounding impacts on forecasts that contain large volumes of assets and/or span long time planning horizons.

Lifecycle Activity Costs – are defined in Section 9.2 and listed in Table 9-2 and are annual operation costs related to non-infrastructure solutions, asset acquisitions, asset operation, and service improvements. These costs are incorporated into the financial forecasts within this AMP where appropriate.

- Assumptions: **all monetary values in this report are presented in 2025 dollars and exclude inflationary increases**. It is assumed that non-renewal based lifecycle activity costs (non-infrastructure, and service improvement primarily) will remain constant over future time periods, with the exception of roads and growth scenarios as outlined. The funding for non-renewal lifecycle activity costs from the City's 2025 capital budget were used from 2026 to 2051 in the long-term forecasting model. For road assets, the operating costs to keep 70% of roads in good or better condition, asset acquisition, and lifecycle renewal were determined and included in the proposed LoS forecasting. For growth scenarios, acquisition, operating and lifecycle renewal costs were determined.

- Limitations: because no year over year escalation is applied to the lifecycle activity costs portion of the forecasts, users of this AMP should limit their interpretation of the forecasts and related decision making with this in mind.

Lifecycle Reserve Study (LCRS) – The City's 2025 LCRS determines the available renewal activity funding year over year for each service area from 2025 to 2051. The LCRS outflows for asset renewals have been used as an input in the DSS model to determine if the City's anticipated renewal funding is sufficient to maintain assets at an appropriate LoS.

- Assumptions: all monetary values are presented in 2025 dollars. The LCRS outflows were first calculated in 2024 dollars and inflated to 2025 dollars.
- Limitations: the required funding determined in the LCRS is based on asset needs over the next 26 years. The accuracy of the LCRS will decrease year by year as it is sometimes difficult to forecast asset needs as assets do not always require renewals as forecasted. The LCRS should be used by the City as a tool to help determine an approximate amount of funding that will be needed year by year. Knowing this, the City updates the LCRS annually with up to date asset data and stakeholder input.

Likelihood of Failure (LOF) – Likelihood of Failure is defined in Section 7 – Risk Management Framework. The LOF of an asset is a key metric that guides its management approach.

- Assumptions: the LOF value assigned to assets is currently based on either observed condition or the asset's age (either known or estimated).
- Limitations: many assets do not fail based on condition or age (i.e., an asset can fail due to obsolescence, lack of capacity, poor efficiency, regulatory requirements, etc.). Further, when LOF is based on age, the rating is based upon the remaining Estimate Service Life, which is exactly that – an estimate. Therefore, users of this AMP should limit their interpretation of risk information presented in the AMP and any related decision making with this in mind.

As the City advances its asset management program and new or improved information becomes available, assumptions, limitations and outputs may be subject to change as needed by the City to ensure we continue to manage our assets to meet their service level expectations.

1 Executive Summary

1.1 Introduction

The City of Markham's 2025 Asset Management Plan (AMP) provides an overview of the asset management practices and processes undertaken by the City in order to provide services to its residents and businesses, as well as maintain the assets that support these services in a state of good repair.

The 2025 AMP was developed in alignment with the Ontario Regulation 588/17 (O.Reg.588/17) and key strategic documents, such as the City's Official Plan, Strategic Plan, Building Markham's Future Together (BMFT), the Greenprint, Markham's Community Sustainability Plan, and more.

This AMP formally documents the City's approach to performing sound asset management for the asset portfolio. The AMP contains the following content:

1. **Introduction:** provides a brief description of the City's asset management objectives, and the scope of the AMP.
2. **Alignment with Organization Goals:** documents the City's asset management journey and how the AMP is aligned with the City's strategic goals, objectives, and vision.
3. **Future Demand**: outlines internal and external factors that may influence future demand and how growth has been considered in this AMP.
4. **State of the Infrastructure:** provides an overview of the assets owned and maintained by the City, including asset valuation, quantities, average age and current performance.
5. **Levels of Service (LoS):** documents the established LoS measures and performance indicators used by the City to assess if adequate service is being provided to the community.
6. **Risk Management Strategy:** details the City's approach to evaluating risk, as well as the risks associated with the current state of assets.
7. **Lifecycle Management Strategy:** documents the lifecycle activities performed by the City to maintain their assets.
8. **Financial Strategy:** details the funding that is required based on asset needs and lifecycle management strategies to maintain current LoS and achieve proposed LoS. Provides a summary of the City's finances, projected into the

future, with the perspective of maintaining service levels, achieving proposed LoS, accommodating for growth, and identification of any funding gaps.

9. **Improvement Plan**: provides recommendations and initiatives for the City to undertake to improve their AM program and future iterations of this AMP.

In addition to this information, this AMP is organized by providing more detailed analysis on major service areas. **Appendices A to K** contain chapters for each service area that include the following sections/information at a more granular level:

a. **State of the Infrastructure**
b. **Levels of Service**
c. **Risk Management Strategy**
d. **Lifecycle Management Strategy and Forecasting**

This AMP includes all infrastructure assets that are owned by the City and that the City is responsible for maintaining. The City's asset hierarchy, provided in Figure 1-1, details these service areas and associated assets.

To complete the analyses that are reported in this AMP, the City utilized a combination of 2023, 2024 and 2025 asset and financially based data sources. As a result, any planned renewal work that the City undertakes in 2025 is not reflected in the outputs of this AMP. Please refer to the Assumptions and Limitations section for further details.

ARTS & CULTURE

ARTS & CULTURE
Includes facilities and furnishings, fixtures and equipment assets that support programs and service delivery.

FIRE & EMERGENCY SERVICE

FIRE & EMERGENCY SERVICE
Includes fire stations and furnishings, fixtures, and equipment assets that support service delivery.

FLEET
Includes fire apparatus and fire fleet.

GENERAL SUPPORT SERVICE

ADMINISTRATION
Includes facilities and furnishings, fixtures & equipment that support programs and service delivery.

FLEET
Includes fleet, furnishings, fixtures, and equipment that support service delivery.

INFORMATION TECHNOLOGY
Includes fleet, furnishings, fixtures, and equipment that support service delivery.

LIBRARY

LIBRARY
Includes library branches and the furnishings, fixtures, and equipment assets that support programs and service delivery.

NATURAL ASSETS

NATURAL ASSETES
Includes terrestrial natural assets (e.g. forests, woodlands, wetlands, meadows/prairies, open bluffs, beach bars), manicured open spaces and agricultural land assets.

PARKS

PARKS
Includes park amenities, barriers (fencing and retaining walls), facilities (warehouses, washrooms, works yards), furnishings, fixtures & equipment, lighting, and site servicing (irrigation system) assets that support service delivery.

POTABLE WATER

WATER DISTRIBUTION
Includes water distribution devices (suspended watermain insulation), mainline assets (valves and watermains), and services (fire hydrants and meters).

WATER MANAGEMENT
Includes water management devices such as auto flushing stations, bulk water sales stations, and sampling stations.

RECREATION

RECREATION
Includes facilities such as community centres, sports facilities, warehouses, etc. and furnishings, fixtures & equipment that support programs and service delivery.

SOLID WASTE MANAGEMENT

SOLID WASTE COLLECTION
Includes collection facilities, fleet, and furnishings, fixtures & equipment that support and service delivery.

STORMWATER MANAGEMENT

STORMWATER COLLECTION
Includes pump stations and mainline assets (appurtenances and storm sewers) that convey stormwater.

STORMWATER MANAGEMENT
Includes stormwater management devices (hickenbottoms, orifice control, and rain gauges) and stormwater management facilities.

TRANSPORTATION

ACTIVE TRANSPORTATION
Includes municipal structures (boardwalks, bridges, and culverts) and walking and cycling assets (pathways, sidewalks, and trails).

VEHICULAR TRANSPORTATION
Includes barriers, lighting, municipal structures (bridges and culverts), roads, and traffic management assets (signals and equipment, signage and mounting systems, traffic calming assets, and markings).

WASTEWATER

WASTEWATER COLLECTION
Includes pump stations and mainline assets (maintenance holes and sanitary sewers).

Figure 1-1: Service areas in scope.

1.2 State of the Infrastructure

The City's total asset portfolio is valued at $17.5B. This value is based on the assets' current replacement cost, which represents the cost required to replace the assets like-for-like. To align with the data, which was a combination of 2023, 2024 and 2025 asset and financially based data sources, this value is reported in 2024 dollars. Table 1-1 provides a summary of the asset portfolio, including replacement values and average asset performance by service.

Table 1-1: Summary of assets by service.

Service	Current Replacement Value	Overall Performance	Percentage of Replacement Value
Arts and Culture	$94M	Good	0.5%
Fire & Emergency Service	$83M	Good	0.5%
General Support Service	$280M	Good	1.6%
Library	$51M	Fair	0.3%
Natural Assets	$170M	Good	1.0%
Parks	$106M	Good	0.6%
Potable Water	$1,926M	Fair	11.0%
Recreation	$988M	Very Good	5.7%
Solid Waste Management	$2M	Very Good	<0.1%
Stormwater Management	$3,229M	Good	18.5%
Transportation	$7,903M	Good	45.2%
Wastewater	$2,671M	Good	15.3%
Total	**$17.5B**	**Good**	**100.0%**

Figure 1-2 provides a visualization of the total asset replacement value by service.

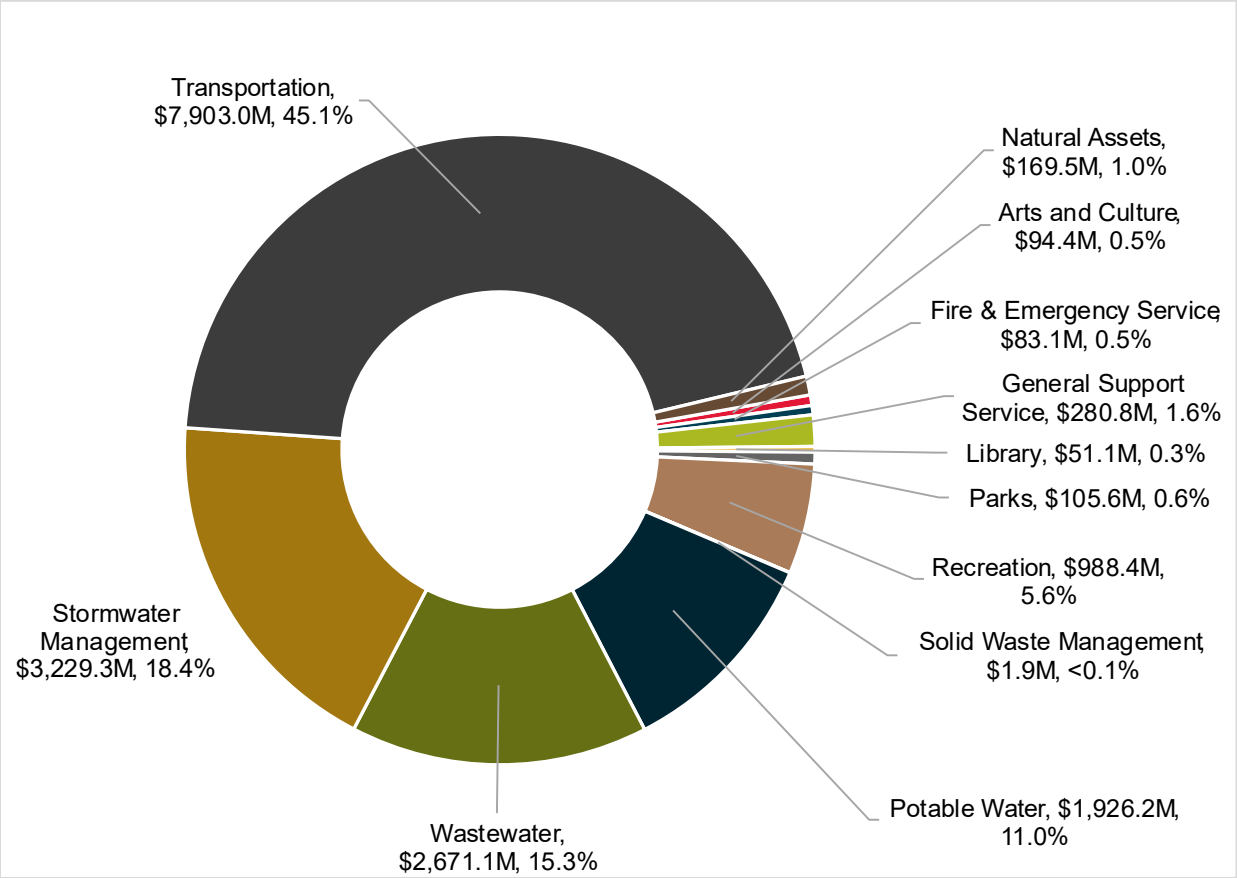

Figure 1-2: Replacement value distribution by service.

Figure 1-3 provides a visualization of the average asset age as a proportion of the average asset estimated service life (ESL), by service[1].

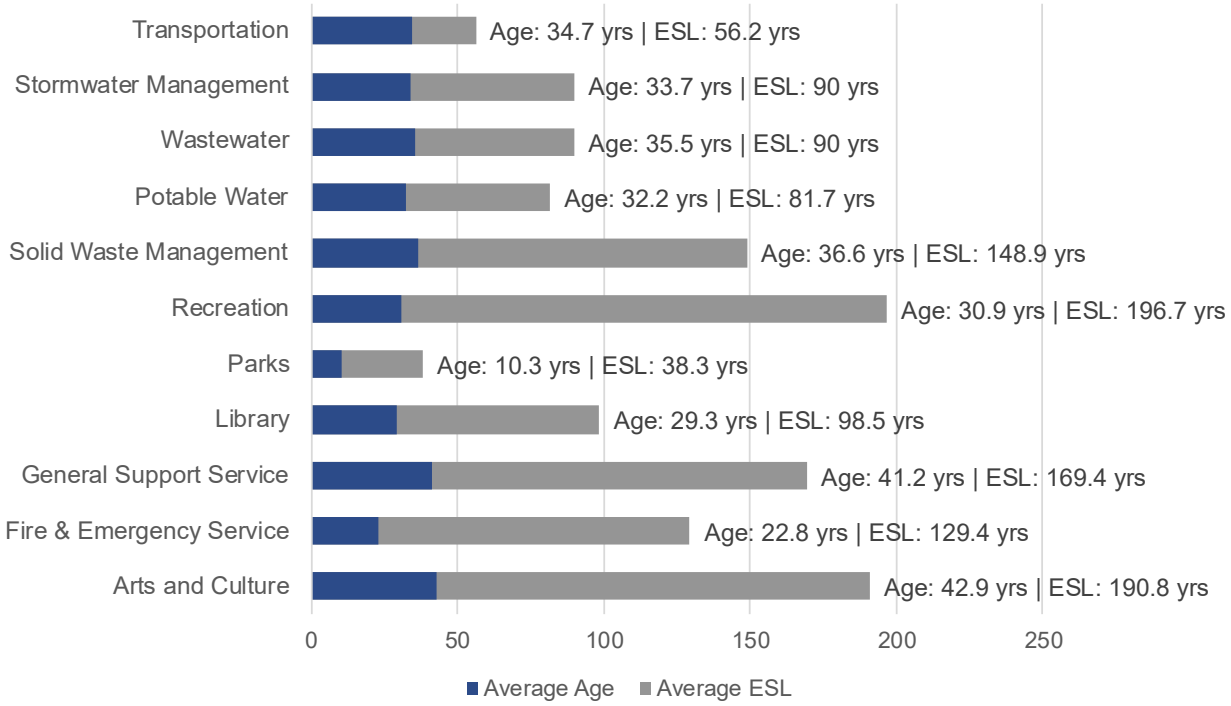

Figure 1-3: Average age as a proportion of average estimated service life (ESL) by service.

[1] Natural assets are not included in this figure, as the City's Natural Assets Inventory and Evaluation Study did not provide installation dates, ages, or service life for these assets.

The following figure provides a visualization of the value of major asset acquisition, by decade, within each service[2].

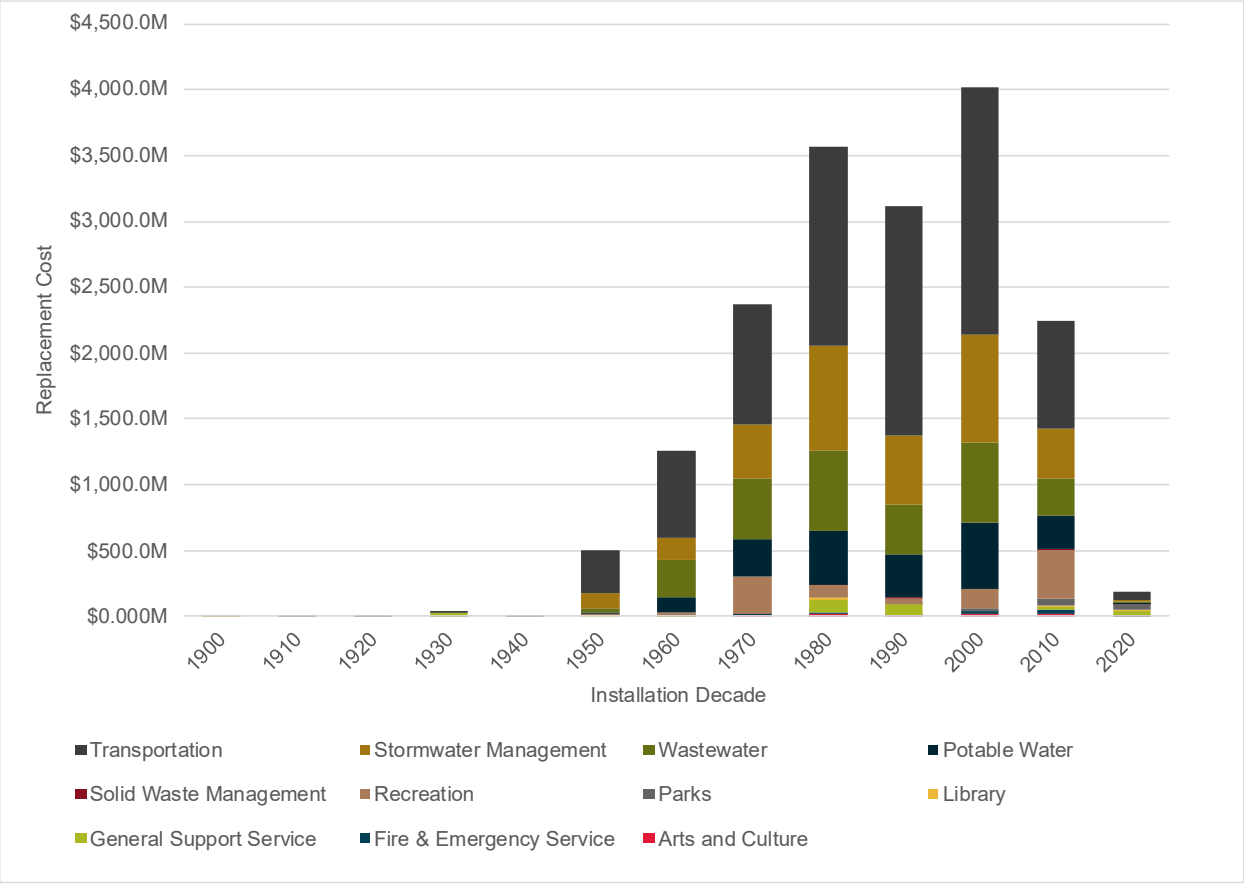

Figure 1-4: Age distribution by installation decade of all assets.

[2] Natural assets are not included in this figure, since the City's Natural Assets Inventory and Evaluation Study did not provide installation dates are for these assets.

The following figures provide a visualization of the distribution of asset performance considering either asset age or rated physical condition over five (5) performance categories for the City as a whole, and then by service. Definitions of condition performance are provided in **Section 5** in the AMP.

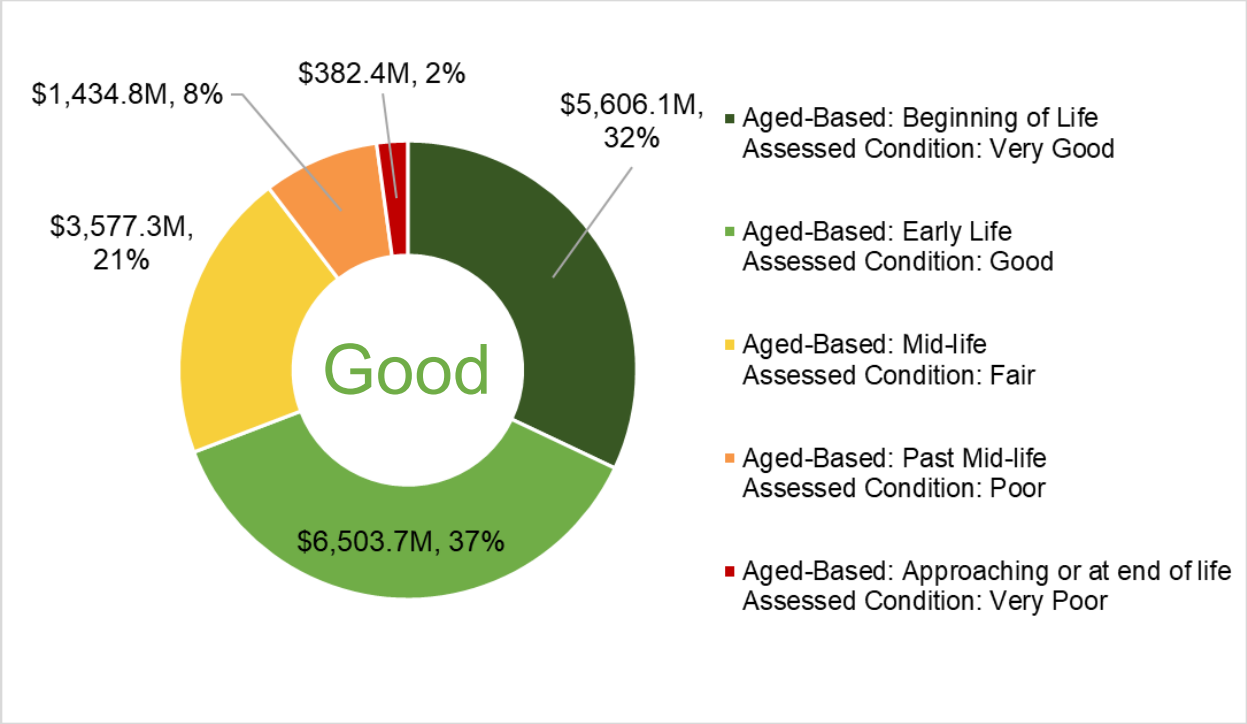

Figure 1-5: Condition distribution of all assets.

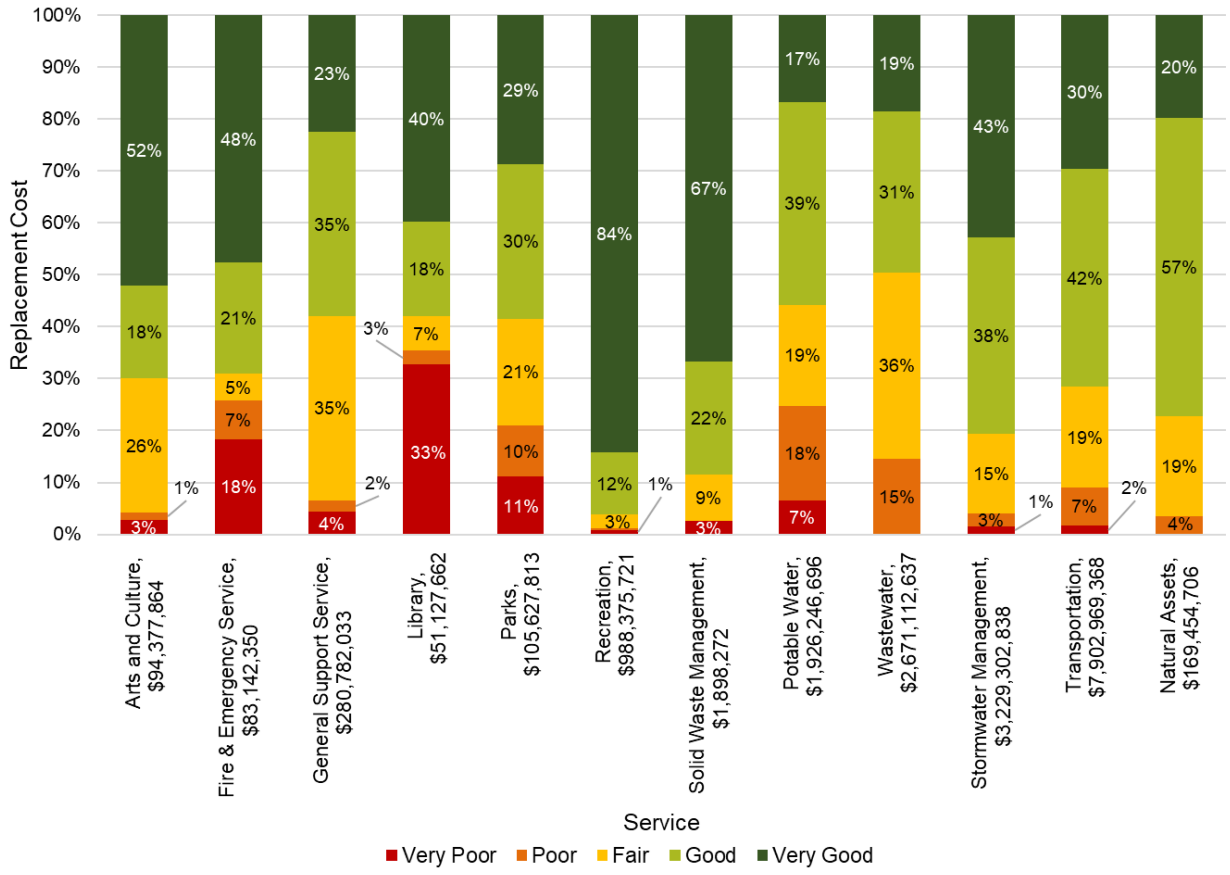

Figure 1-6: Condition distribution of all assets by service.

Overall, assets remain in a **"GOOD" state of performance** since last reported in the City's 2024 Asset Management Plan, where:

- Assets in a Fair or better state **improved to 90% or $15.7B** (from 88% or $15.4B) and are performing as intended
- Assets in a Poor and Very Poor state was **reduced to 10% or $1.8B** (from 12% or $2.1B) and are subject of planned maintenance or renewal

1.3 Levels of Service

Levels of Service (LoS) are a measure of the degree to which an asset meets functional or user requirements. Levels of service reflect documented approved or endorsed performance or service measures, which are articulated or reflected in a number of policy documents (i.e. plans or studies). The City has developed an LoS strategy and framework, which documents the approach the City takes to monitor and report on these LoS. As part of that strategy, Levels of Service are regularly reviewed and updated to ensure that they reflect the current landscape at the City, which may take

into account items such as Council directives, changes in policy or resource/funding constraints.

LoS measures were established for each service area to determine if service levels are being met. These measures were developed to be asset-focused and based on customer expectations and values, available asset data, and factors that support decision-making. Typically, LoS are measured in terms of parameters that reflect social, political, legislative, environmental, and economic outcomes that an organization delivers.

The full suite of LoS measures for each service area are presented in **Appendix A to Appendix K** of this AMP document. The current performance reported in these sections take into account data for year ending 2024, unless otherwise stated. The LoS framework is presented as three tables within this AMP:

- Customer Values: summarizes the different customer expectations of each service
- Customer LoS: contains a suite of LoS measures that focus on customer experiences that use language that is familiar to the community.
- Technical LoS: details measures that the City uses to understand if it is managing assets to the level appropriate to meet community expectations. Note that technical LoS are linked to significant activities within the asset lifecycle and include the following: Acquisition, Operation, Maintenance, Renewal, Disposal, Service Improvement and Non-Infrastructure.

This AMP also reports on the City's proposed levels of service (PLoS). The PLoS for each service area is documented in **Appendix A** to **Appendix K.** PLoS have been established in the LoS tables as well as in the lifecycle forecasting to determine the levels of funding required for the City to achieve these PLoS.

1.4 Risk Management Strategy

As part of the development of this AMP, a risk management strategy was developed to assess the risk of the City's asset portfolio to meet LoS goals. This was done by evaluating the likelihood of failure (LOF) and consequence of failure (COF) of each asset using a standardized framework. The risk management strategy was developed to provide the City with a formal and standardized methodology in assessing asset risk across all assets and service areas.

LOF represents the likelihood of an asset failing, relative to a specific failure event. For the purposes of this AMP, asset failure refers to failure due to poor performance, resulting in the asset no longer functioning as intended, and/or inability to provide its intended service. Therefore, the LOF of an asset is linked to its performance.

The COF framework defines the consequences that may occur should an asset fail or stop providing its intended service. The City's COF framework contains evaluation criteria, which were developed using a "triple bottom line" analysis, which evaluates the financial, social, and environmental consequences of asset failure.

Using the LOF and COF frameworks, LOF and COF scores can be assigned to each asset, on a 5-point rating scale. When the LOF and COF ratings are combined, an overall asset risk score ranging from 1 to 25 is determined. Detailed definitions of LOF, COF, risk, and the associated frameworks/rating scales are provided in Section 7.

The following risk matrix summarizes the risk scores for all assets within the scope of this AMP. It detailed the total replacement value of assets within each combination of LOF and COF ratings.

The City's Risk Management strategy has identified some assets that are considered "high" risk and none that are "very high" risk. Through regular business and operational planning processes, the City ensures that attention is given to critical or high-risk assets, and that initiatives are implemented to ensure that the needs of critical asset are addressed so as not to compromise the safety of the public, legislative compliance or other matters of concern.

Table 1-2: Risk score distribution for all in-scope assets.

	COF 1	COF 2	COF 3	COF 4	COF 5	Subtotal
LOF 1	$55,363,970 (0.3%)	$2,440,088,836 (13.9%)	$2,913,006,738 (16.6%)	$164,364,658 (0.9%)	None	**$5,572,824,202 (31.8%)**
LOF 2	$123,915,863 (0.7%)	$2,632,937,739 (15.0%)	$3,478,430,609 (19.9%)	$266,615,694 (1.5%)	None	**$6,501,899,906 (37.1%)**
LOF 3	$103,379,801 (0.6%)	$1,651,302,401 (9.4%)	$1,793,921,239 (10.2%)	$63,638,391 (0.4%)	$2,831,182 (<0.1%)	**$3,615,073,015 (20.7%)**
LOF 4	$59,857,828 (0.3%)	$815,323,358 (4.7%)	$546,272,762 (3.1%)	$10,725,619 (0.1%)	None	**$1,432,179,566 (8.2%)**
LOF 5	$64,437,213 (0.4%)	$203,325,971 (1.2%)	$110,074,092 (0.6%)	$4,603,993 (<0.1%)	None	**$382,441,270 (2.2%)**
Subtotal	**$406,954,675 (2.3%)**	**$7,742,978,305 (44.2%)**	**$8,841,705,441 (50.5%)**	**$509,948,355 (2.9%)**	**$2,831,182 (<0.1%)**	**$17,504,417,959 (100.0%)**

Table 1-3: Risk score mapping legend.

Legend		
Very Low	1 – 5	Fit for the Future
Low	6 – 10	Adequate for Now
Moderate	11 – 15	Requires Attention
High	16 – 20	At Risk
Very High	21 – 25	Unfit for Sustained Service

1.5 Lifecycle Management Strategies

The City's lifecycle strategy is a set of planned actions or activities performed on assets to provide LoS in a sustainable way, while managing risk, and at the lowest lifecycle cost. These activities include major asset renewals (such as rehabilitations and replacements), operations and maintenance, disposals, acquisitions and service improvements. These lifecycle activities work together to extend asset life, reduce overall lifecycle costs, minimize risk, and achieve other objectives such as environmental goals.

Lifecycle model forecasting uses logical assumptions about an asset's expected or intended behaviours over time to predict future financial requirements for maintaining those assets in good working condition to provide services. These models incorporate the City's lifecycle activities, such as rehabilitation and replacements. As part of the City's lifecycle strategy, a set of models have been developed to project future asset needs. These models are integrated with the City's LoS and risk management strategies that inform decision-making into a decision support system (DSS) tool. This decision support tool combines the City's asset inventories and current performance data with the lifecycle, risk, and LoS strategies to forecast future investment (i.e., renewals) required to meet asset performance goals (which in turn enables achievement of LoS goals).

1.6 Financial Strategy

This section presents the City's projected funding levels, as identified in the Lifecycle Reserve Study, alongside the funding required to maintain current service levels and the additional funding needed to achieve the proposed levels of service based on planned lifecycle activities. Establishing funding needs for each service area will help the City sustain healthy reserve balances, secure the necessary staffing resources to keep assets in a state of good repair, support the development of new infrastructure, and guide the annual capital budgeting process. Note that acquisitions of new assets are not included in this section and are included in Sections 1.6.2 and 9.5.3.

1.6.1 Forecasted Operating and Capital Budgets

The City's 2025 budget was reviewed to determine the City's anticipated funding towards each lifecycle activity and service area. The City categorizes their budget into the following groups:

- **Operating budget:** This supports the day-to-day activities and functions to provide City Services. Operating expenses include equipment maintenance, materials supply, facilities services, and contributions to reserves; all of which are expensed in the current fiscal year.

- **Capital budget:** This includes a comprehensive financial plan that addresses the financial requirements needed for growth, major rehabilitations, and major replacements of existing infrastructure.

To provide a forecast of required operating and capital needs, an analysis was used that incorporates the results of the City's lifecycle forecasts and other forecasts to understand future projections. To forecast the operating budget, the City's 2025 operating budget of $495.8M was applied to the entire 26-year forecast. To forecast the capital budget, renewals were obtained from the City's LCRS. For non-renewal lifecycle activities (including non-infrastructure solutions, service improvements, etc.) forecasts were developed by looking at the City's 2025 line-item budget to determine recent spending amounts.

The following table summarizes the forecasted capital and operating expenditures, based on required asset replacements, rehabilitations, and operations and maintenance activities for the City to continue meeting current service levels (acquisition expenditures are not included). Note that natural assets are not included in Table 1-4 since forecasting for these assets was completed separately in the City's Natural Assets AMP and have not yet been considered nor deliberated to any degree, and of which may be addressed incrementally through future updates to either the Natural Assets AMP or this AMP.

Table 1-4: Forecasted capital expenditures (Life Cycle Reserve Study and capital budget) and operating expenditures.

Year	Renewal (LCRS) and Non-Renewal (Capital Budget)	Operating Budget	Total Expenditures
2026	$123.3M	$495.8M	$619.1M
2027	$106.9M	$495.8M	$602.7M
2028	$76.7M	$495.8M	$572.5M
2029	$95.2M	$495.8M	$591.0M
2030	$106.1M	$495.8M	$601.9M
2031	$75.3M	$495.8M	$571.1M
2032	$84.3M	$495.8M	$580.1M
2033	$96.8M	$495.8M	$592.6M
2034	$76.9M	$495.8M	$572.7M
2035	$91.1M	$495.8M	$586.9M
2036	$80.1M	$495.8M	$575.9M
2037	$84.5M	$495.8M	$580.3M
2038	$83.5M	$495.8M	$579.3M
2039	$87.7M	$495.8M	$583.5M
2040	$91.7M	$495.8M	$587.5M
2041	$73.7M	$495.8M	$569.5M

Year	Renewal (LCRS) and Non-Renewal (Capital Budget)	Operating Budget	Total Expenditures
2042	$89.7M	$495.8M	$585.5M
2043	$83.0M	$495.8M	$578.8M
2044	$89.9M	$495.8M	$585.7M
2045	$87.6M	$495.8M	$583.4M
2046	$80.5M	$495.8M	$576.3M
2047	$88.1M	$495.8M	$583.9M
2048	$79.8M	$495.8M	$575.6M
2049	$70.0M	$495.8M	$565.8M
2050	$88.2M	$495.8M	$584.0M
2051	$73.1M	$495.8M	$568.9M
Total	**$2,263.8M**	**$12,890.8M**	**$15,154.6M**
Equivalent Average Annual	**$87.1M**	**$495.8M**	**$582.9M**

Table 1-5 below shows the annual expenditures from the 2025 capital budget by lifecycle activity. It was assumed that these annual expenditures are sufficient to provide current LoS from 2026 to 2051. These annual expenditures were used to forecast the non-renewal expenditures from 2026 to 2051.

Table 1-5: Forecasted capital expenditures (non-renewal activities).

Lifecycle Activity Type	2025 Budget
Non-Infrastructure Solutions (Capital)	$3.8M
Operation (Capital)	$9.0M
Maintenance (Capital)	$4.2M
Service Improvement (Capital)	$10.6M

The operating and capital budgets (planned funding) are the City's current LoS. Through the development of this AMP, asset performance was forecasted based on the proposed LoS to determine and compare the total lifecycle costs to the City's current LoS.

1.6.2 Lifecycle Forecasting

For this AMP, the required funding levels to achieve proposed LoS including maintaining current performance levels and accommodating growth, were determined. These funding levels were then compared to the City's current LoS (planned budget) to determine if there is an infrastructure funding gap, and the amount of funding that would be required by the City to accommodate future population and employment growth objectives.

The forecasting model is primarily related to capital renewal needs. The City employs two primary renewal strategies: asset replacements, which consider the removal of an existing asset and its replacement with a like asset; and rehabilitations, which include major retrofits and other significant works that extend asset life.

The following scenarios were forecasted:

- **Current Level of Service – Planned Funding Levels:** The current LoS is the City's planned funding as identified through the City's LCRS for the years 2026 to 2051. For this modelling exercise, the City's LCRS financial forecasts and current operating and capital budgets were used as upset limits or constraints, to model an asset performance forecast over the planning horizon.
- **Proposed Levels of Service – Maintain Current Performance**: determine the funding required using the lifecycle models in conjunction with the City's LoS and risk management strategies. The forecasting was performed using the following parameters:
    - For road assets, maintaining 70% of roads in good or better condition.
    - For all other assets, needs were determined as assets that are beyond their service life or in a condition that is considered unfit to provide service. These assets are renewed in the forecast following the lifecycle management strategies detailed in Appendix A to Appendix K.
- **Proposed Levels of Service – Impact of Growth Scenario #1 (Official Plan Objectives):** determine the funding required for the City to accommodate for growth in population and employment in alignment with the OP.
- **Proposed Levels of Service – Impact of Growth Scenario #2 (Realistic Growth Objectives):** determine the funding required for the City to accommodate for growth in population and employment based on historic actuals which represents achieving approximately 63% of the OP's growth objectives.

The detailed forecast results are presented in Section 9.5. To determine the costs for the City to achieve proposed service levels, maintaining current performance was established as PLoS. This means that the City is setting a target to maintain current service levels for all asset groups (excluding roads) and to maintain 70% of roads in good or better condition. The following figures illustrate the spending forecast for capital renewal and replacement for the scenarios listed above and the expected asset performance for the current LoS (planned funding levels) and proposed LoS (maintain current performance) scenarios.

Note that these forecasts do not include natural assets, since forecasting for these assets was completed separately in the City's Natural Assets AMP and have not yet

been considered nor deliberated to any degree, and of which may be addressed incrementally through future updates to either the Natural Assets AMP or this AMP. Furthermore, as noted above, the outputs reported herein are subject to change as the City advances its asset management practice and data maturity capabilities.

1.6.2.1 Current Level of Service – Planned Funding Levels

Figure 1-7 illustrates the City's planned funding levels to maintain current service and performance over the planning horizon spanning 2026-2051. The total planned budget is approximately **$15.15B**, or an equivalent average annual expenditure of **$582.9M**. The total operating portion of this budget is approximately **$12.89B**, or an equivalent average annual expenditure of **$495.8M**. The capital portion of this budget is approximately **$2.26B**, or an equivalent average annual expenditure of **$87.1M**, is planned to fund asset renewal, service improvements and other life cycle activities noted in Table 1-5. Of this amount, approximately **$1.55B**, or an equivalent average annual expenditure of **$59.5M** is planned exclusively for asset renewals. Figure 1-8 illustrates the anticipated asset performance results that is related to this spending forecast. Each bar of this graph illustrates a performance distribution for a given year of the forecast.

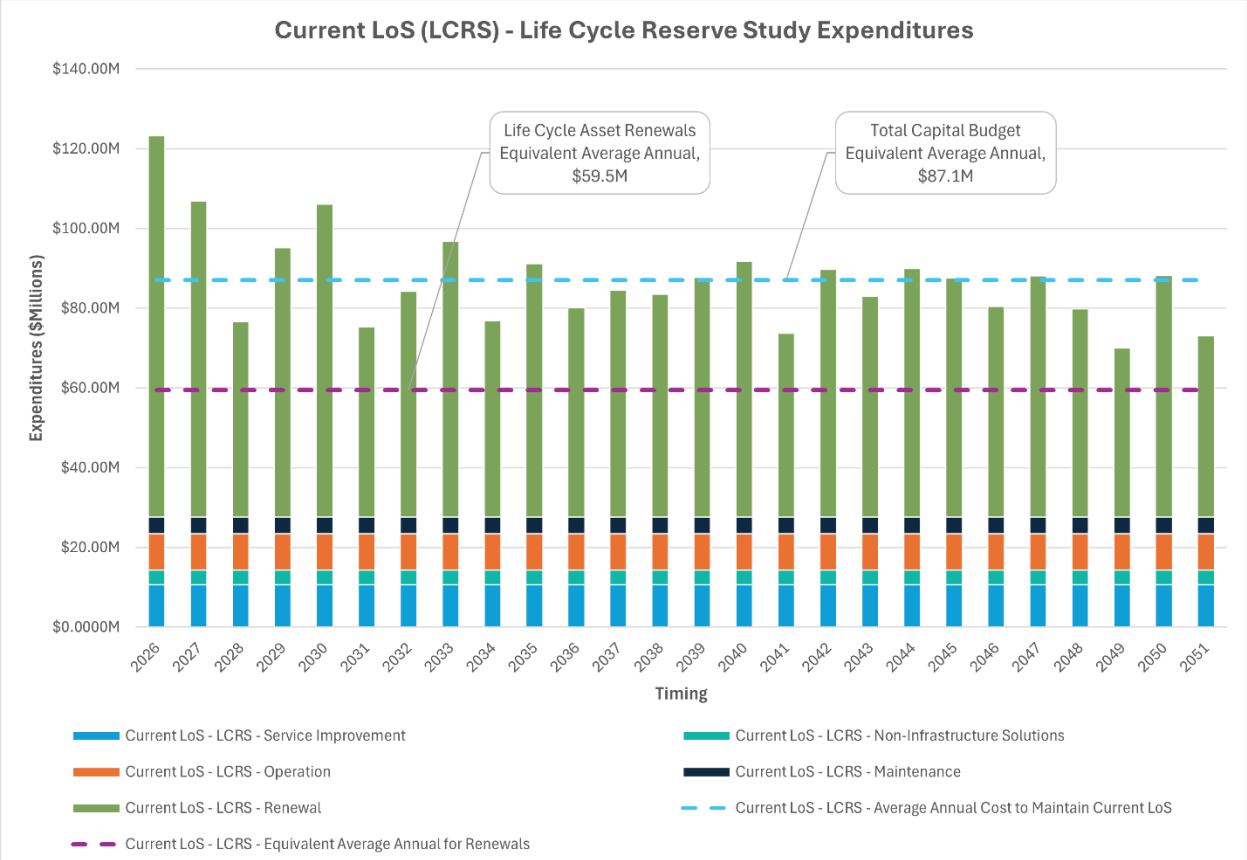

Figure 1-7: Current levels of service – 2024 Life Cycle Reserve Study expenditures.

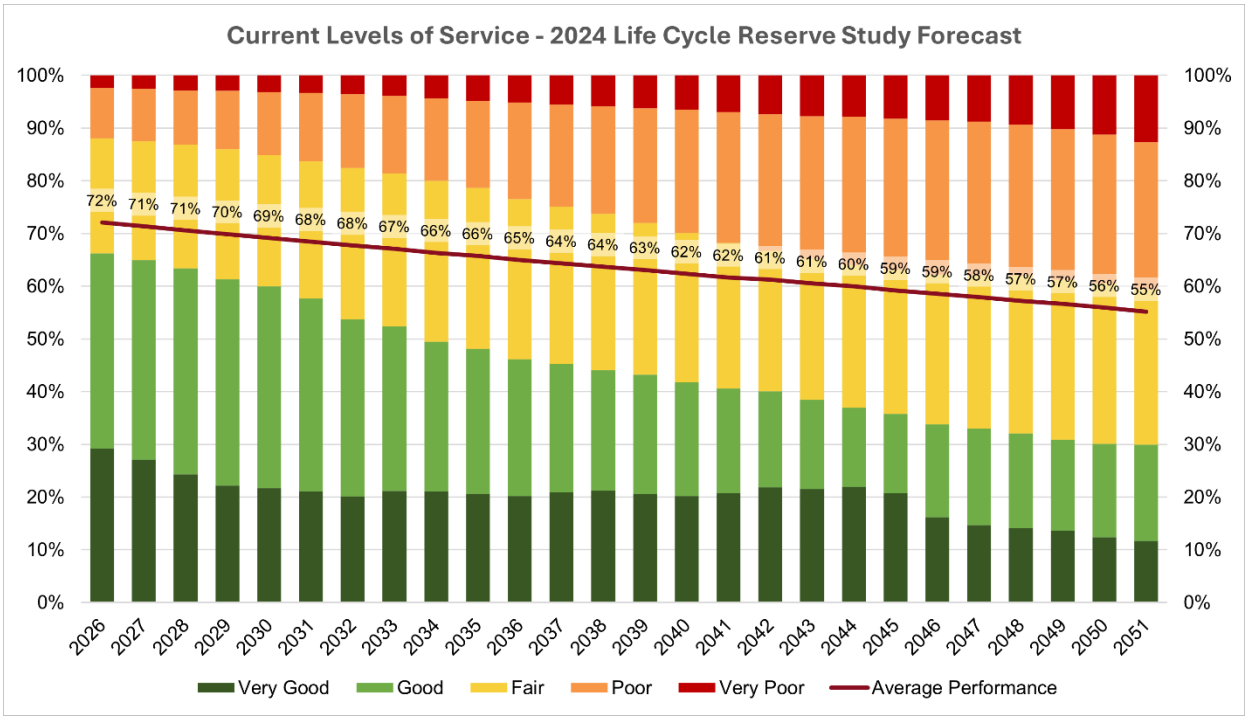

Figure 1-8: Current levels of service – 2024 Life Cycle Reserve Study forecast.

The results illustrated in Figure 1-8 indicate that the City's 2024 LCRS, which forecasts planned funding levels totaling approximately **$1.55B** (excluding inflationary increases) over the planning horizon, may result in a **decline in asset performance**. By 2051, performance may decline to:

- **59.4% or $10.30B** of assets performing as intended
- **40.6% or $7.03B** of assets are subject of planned maintenance or renewal

This anticipated decline in performance represents **approximately 30.6%** of assets shifting from a Fair or better state of performance to a Poor or Very Poor state of performance. An analysis of appropriate funding levels required to maintain current performance levels is discussed further Sections 1.6.2.2 and 9.5.2.

1.6.2.2 Proposed Levels of Service – Maintain Current Performance

Figure 1-9 below illustrates the funding needed to maintain current performance levels through to 2051. The figure illustrates each years' projected asset renewal needs. These needs are forecasted using a computational model based on the City's lifecycle forecasting logic and anticipated renewal costs. Figure 1-10 illustrates the anticipated resulting asset performance that is related to the spending forecast to maintain current performance. Each bar of this graph illustrates a performance distribution for a given year of the forecast.

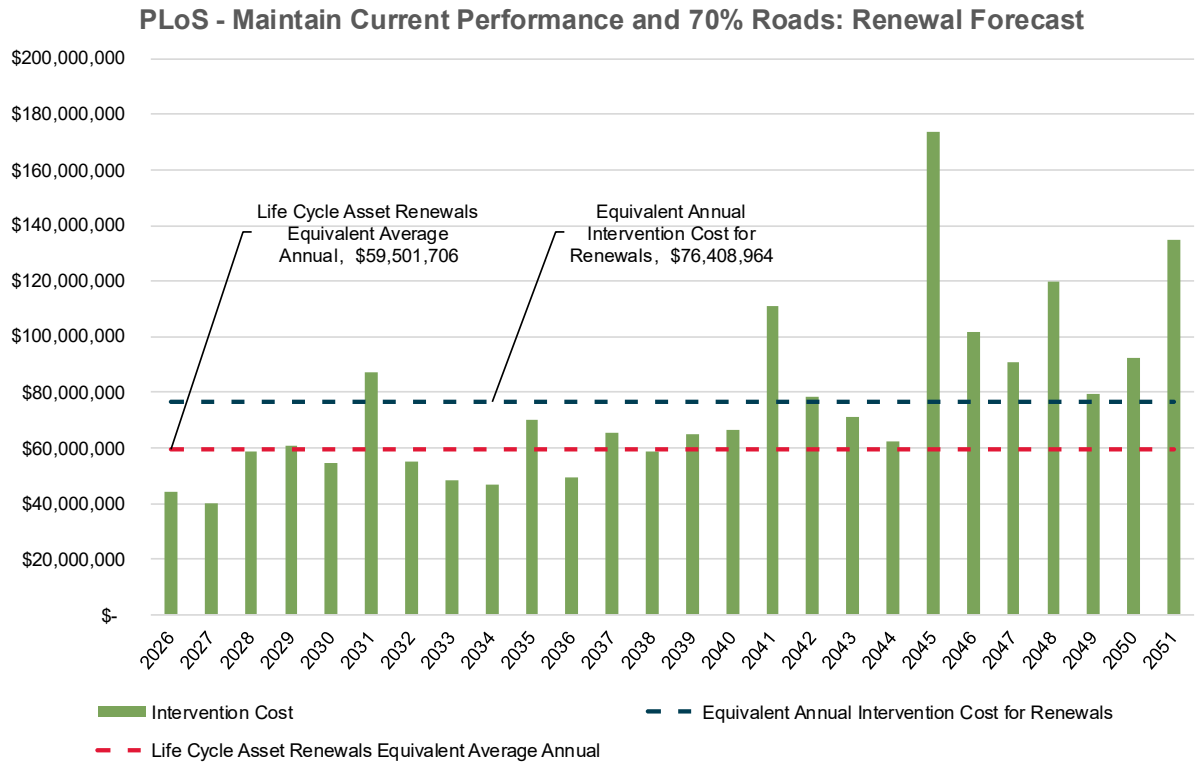

Figure 1-9: Proposed levels of service – maintain current performance and 70% roads: renewal forecast.

Computational modelling suggests that, exclusively for renewals, an overall increase to forecasted funding levels noted in Section 1.6.2.1 of **$439.6M** over the planning horizon, or an equivalent average annual expenditure of **$16.9M** (representing 0.1% of the total replacement value, excluding natural assets) is required to maintain current asset performance levels through to 2051. Non-renewal-based capital and operating forecasted costs were held to current levels for this analysis. The proposed funding levels shown in Figure 1-9 results in the anticipated performance forecast shown in Figure 1-10.

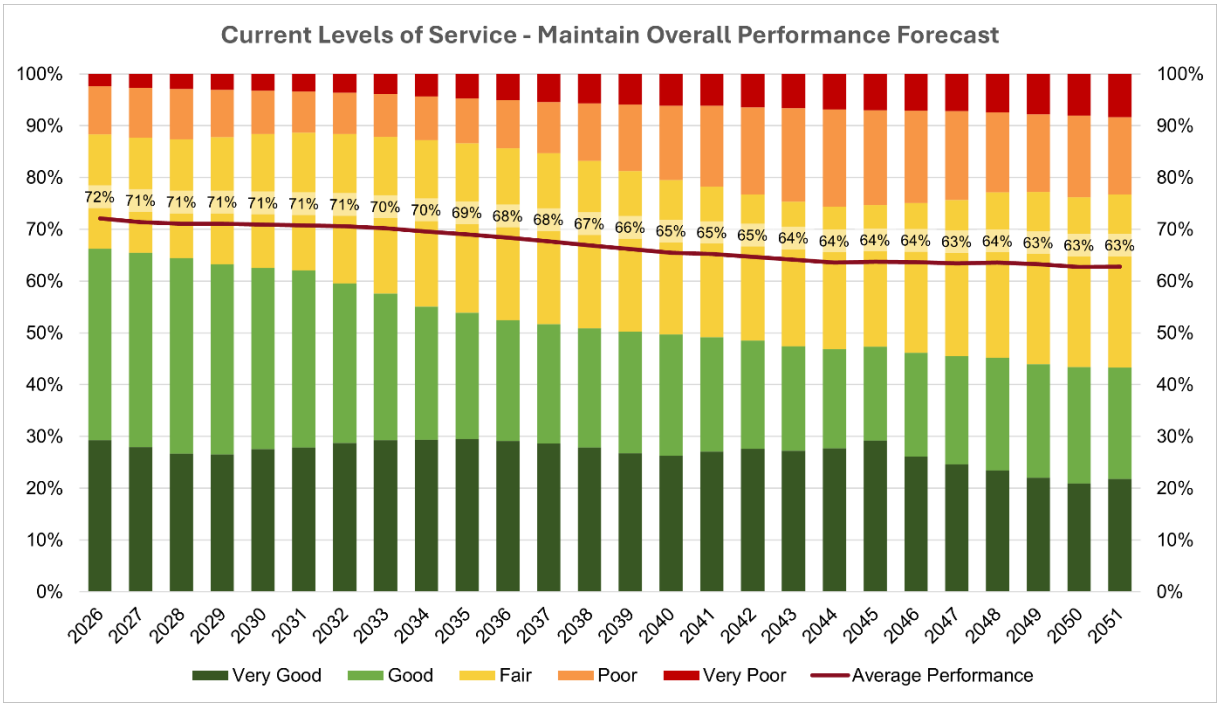

Figure 1-10: Proposed level of service – maintain overall performance forecast.

Assuming funding levels are incrementally increased over time to meet these performance level targets, the overall performance forecast shown in Figure 1-10 suggests that by 2051:

- **76.7% or $13.30B** of assets performing as intended
- **23.3% or $4.04B** of assets are subject of planned maintenance or renewal

While these forecasted results are lower than the current state of performance by approximately **13.3%**, the overall performance outlook at 2051 rates the City's assets at the cusp of the Good and Fair categories, of which represent assets that are performing as intended and may require some form of normal attention and/or maintenance.

By adjusting the performance target for roads from 85% PCI to 70% of roads performing in good or better condition, the City will be able to better maintain performance and at a lower annual cost increase.

1.6.2.3 Proposed Levels of Service – Impact of Growth Scenario #1 (Official Plan Objectives)

In Growth Scenario #1 (OP Objectives), by 2051, and based upon the modelling conducted, the City may acquire approximately **$6.89B** worth of additional assets in order to meet the City's intended growth objectives. For this scenario, the City would be required to fund approximately **$2.69B** in acquisition costs.

To fund these acquisitions and subsequent renewal and operating budget impacts, would require an overall increase to forecasted funding levels noted in Section 1.6.2.1 of approximately **$3.10B** over the planning horizon, or an equivalent annual expenditure of **$119.29M** to maintain current service and performance levels while accommodating growth objectives through to 2051. Figure 1-11 illustrates the additional funding required by the City to meet the OP growth objectives. Performance modeling was not completed for the growth scenarios. However, performance will be the same or likely better than the proposed level of service scenario as the proportion of new assets increases.

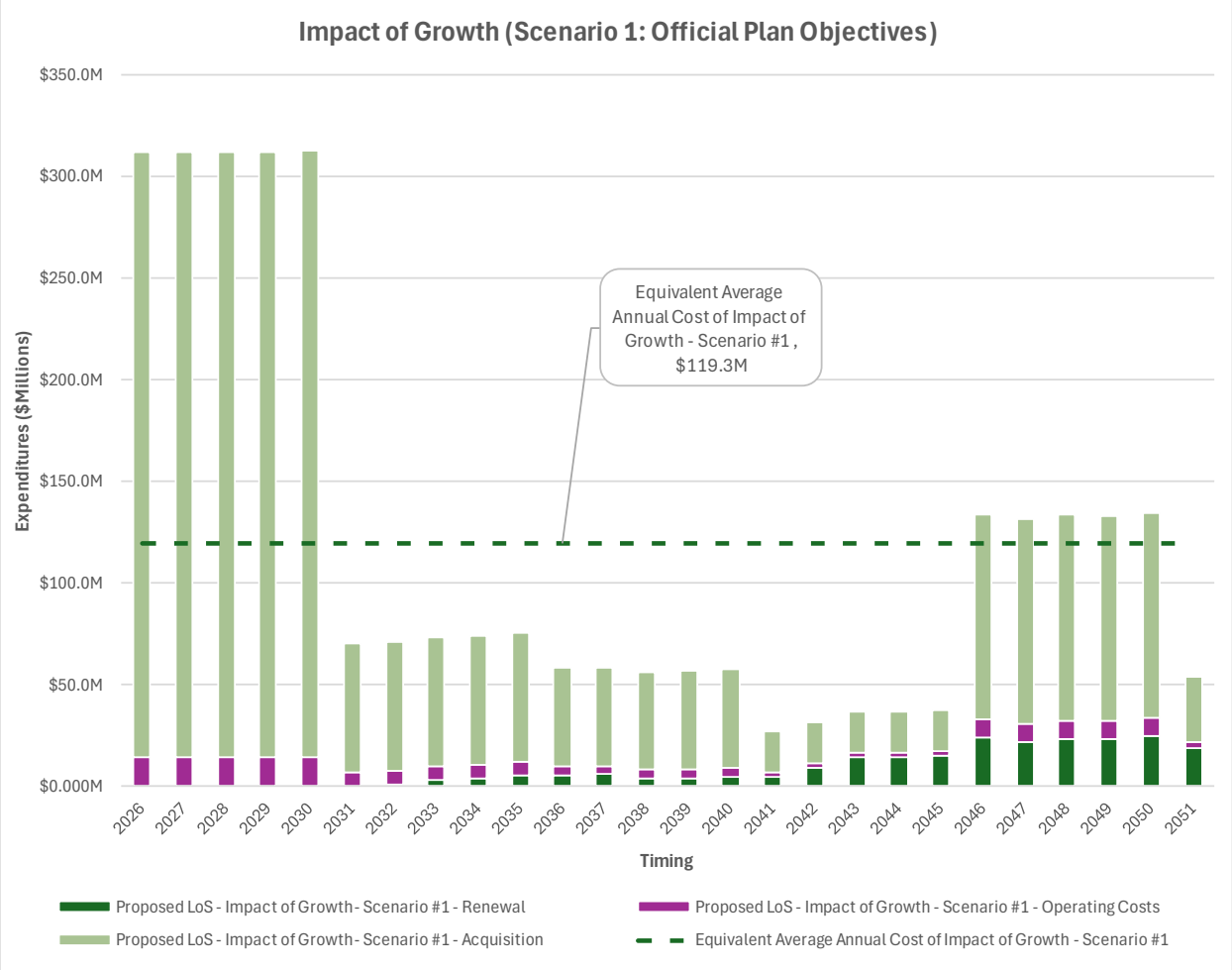

Figure 1-11: Impact of Growth (Scenario 1: Official Plan Objectives).

1.6.2.4 Proposed Levels of Service – Impact of Growth Scenario #2 (Realistic Growth Objectives)

In Growth Scenario #2 (Realistic Growth Objectives), by 2051, and based upon the modelling conducted, the City may acquire approximately **$4.83B** worth of additional assets in order to meet the City's intended growth objectives. For this scenario, the City would be required to fund approximately **$1.98B** in acquisition costs.

To fund these acquisitions and subsequent renewal and operating budget impacts, would require an overall increase to forecasted funding levels noted in Section 1.6.2.1 of approximately **$2.23B** over the planning horizon, or an equivalent annual expenditure of **$85.93M** to maintain current service and performance levels while accommodating growth objectives through to 2051.

Figure 1-12 illustrates the additional funding required by the City to meet the realistic growth objectives. Performance modeling was not completed for the growth scenarios. However, performance will be the same or likely better than the proposed level of service scenario as the proportion of new assets increases.

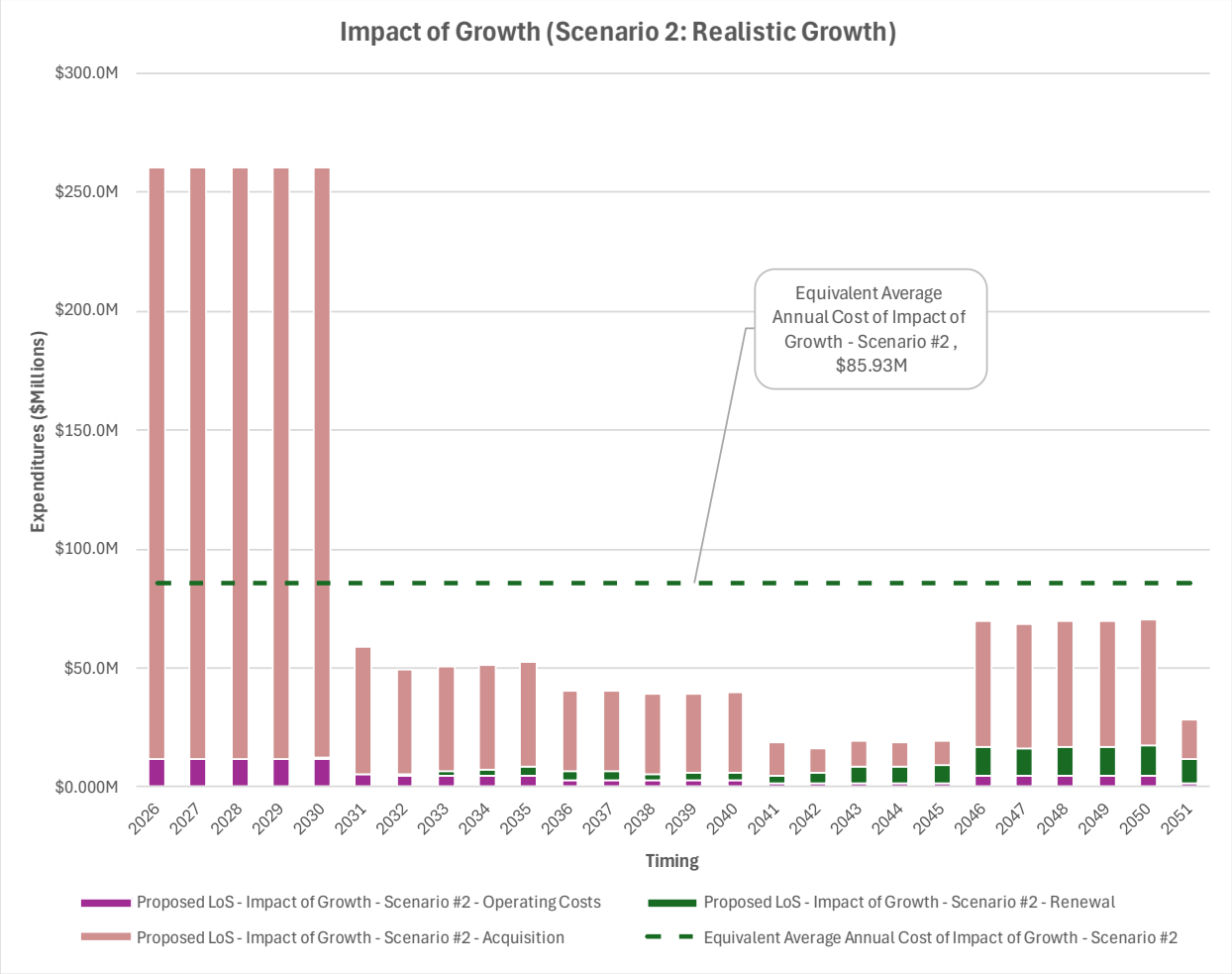

Figure 1-12: Impact of Growth (Scenario 2: Realistic Growth Objectives).

1.6.3 Financial Summary and Comparison

The City's current LoS (planned funding), proposed LoS to maintain current performance, and proposed LoS to achieve growth objectives are summarized and compared in the tables below.

Table 1-6: Current levels of service and proposed levels of service scenarios comparison and annual average infrastructure gap.

	Current LoS - Planned Funding	Proposed LoS - Maintain Current Performance
Total Capital Expenditures (2026 to 2051)	$2,263.8M	$2,703.4M
Overall Funding Gap	**-**	**$439.6M**
Equivalent Average Annual Capital Expenditures	$87.1M	$104.0M
Equivalent Average Annual Capital Funding Gap	**-**	**$16.9M**
Annual Operating Expenditures	$495.8M	$495.8M
Annual Total Expenditures (CAPEX+OPEX)	$582.9M	$599.8M
Total Average Annual Funding Gap	**-**	**$16.9M**

Table 1-7: Impact of growth scenarios comparison.

	Proposed LoS - Impact of Growth (Scenario #1: Official Plan Objectives)	Proposed LoS - Impact of Growth (Scenario #2: Realistic Growth)
Total Value of Acquisitions	**$6,893.5M**	**$4,830.1M**
City Funded Acquisitions	$2,686.1M	$1,976.7M
Operating Budget	$183.5M	$128.6M
LC Renewals	$232.0M	$128.8M
Total Impact of Growth	**$3,101.6M**	**$2,234.1M**
Equivalent Average Annual Impact of Growth	**$119.3M**	**$85.9M**

Table 1-6 summarizes the total capital expenditures required for each scenario from 2026 to 2051, and the funding gaps. To achieve the proposed LoS of maintaining the current performance, an additional **$439.6M** is required, which represents an equivalent average annual funding gap of **$16.9M**.

Over the planning horizon (2026 to 2051), an additional **$3,101.6M** over the planning horizon (including initial acquisition costs) may be required to accommodate for growth to achieve the Official Plan growth objectives. Under the realistic growth scenario, an additional **$2,234.1M** over the planning horizon (including initial acquisition costs) may be required.

1.7 Improvement Plan

As part of its Asset Management program, the City has completed a detailed maturity assessment on their AM processes and practices. The maturity assessment was performed against the City's AM Framework, provided in Figure 2-1. The purpose of the maturity assessment was to identify areas to advance the City's AM System and program. The assessment framework was aligned to the Institute of Asset Management's Maturity Assessment Framework. This framework was used to assign ratings of 0 (Innocent) through 5 (Excellent) to each major AM process. The full methodology of the maturity assessment will be detailed in the City's forthcoming *Asset Management Strategy* document which is currently being developed.

Overall, the City's current state of practice when analyzed using this framework was rated ranging from "1 – Aware", to "2 – Developing". The City aspires to mature its asset management planning capabilities to a "3 – Core" rating.

The results of this assessment in conjunction with the development of this AMP were used to identify areas for improvement. The Improvement Plan of this AMP summarizes the key activities and initiatives for the City to undertake to continually improve the City's asset management system and future iterations of the AMP.

The City has identified draft improvement themes that will increase the maturity of its AM system, and by extension, better integrate and improve the practice of asset management in Markham, as well as its reporting outputs through future iterations of this AMP. The following themes have emerged:

- Defining and evaluating asset management governance, roles and responsibilities
- Consistent and formalized standards, processes and procedures
- Improved data and information
- Formalized resource planning
- Improved demand/ growth analysis
- Stakeholder engagement
- Implement/develop supporting systems, tools and integrations (ex. decision support systems)

As the City undertakes and completes these initiatives, the overall maturity of the AM System will improve and the confidence of the AM analyses that support this AMP will increase.

Part of the City's AM program is to adopt a culture of continual improvement to ensure that AM planning processes are reviewed regularly to evolve as needed to suit the City's changing landscape, as well as improve the confidence in the AM analyses that support this AMP and future AMPs. The City's improvement plan is a significant step forward in adopting this culture.

1.8 Closing Remarks

The City of Markham is a relatively young municipality, evidenced by Figure 1-4 which illustrates that the majority of its assets have been constructed/acquired since the 1970s. As a young municipality, the majority of the City's asset portfolio on average is within the early stages of its service life (refer to Figure 1-3). Overall, the City's infrastructure is in a "Good" performance state (Figure 1-5), which is a reflection not only of the fact that the City is relatively young, but also that the City has been successful in managing its assets to ensure that they are fit for service and providing value to the community.

The City has a robust, annual lifecycle planning process, which has been put in place to assist the City in taking a proactive approach to planning for and managing its state of infrastructure well into the future. The resulting asset performance noted in this document is a reflection of the success of this process.

Although the City has some assets in a poor and very poor performance state, it is important to note that this does not necessarily mean that assets are not fit for service. Through condition assessments and other asset monitoring exercises, the City identifies if any needs are required to ensure that these assets can remain in service. As assets near the end of their life, and enter poor or very poor performance states, the frequency of monitoring and maintenance may increase compared to assets that are near the beginning of their life or are in very good or good performance states. This is a normal practice that occurs in all municipalities.

The City always operates in a manner to ensure that services are provided safely by managing and maintaining its poor/very poor performance assets. City staff pay close attention to assets that have poor/very poor performance states and/or are high risk, to ensure that they implement appropriate initiatives to protect the safety of the public, meet legislative compliance and address any other matters of concern.

Note that within this AMP, assets have been included that are considered consumables, which have a short service life where information was available. The City's Asset Management program can assist the City in understanding how to manage these assets

by developing processes and data to better-understand consumable asset risk and ensuring that the City's investments minimize risks and maximize levels of service.

The forecasting exercise completed in this AMP provides the City with an estimate of financial needs over the next 26-years. Note that the forecast is based on a modelling exercise that is underpinned by assumptions and asset information that is subject to change. As the City continues to refine the information that supports this AMP during annual resource and budget planning processes the fidelity of the models will improve.

As part of the closing remarks this AMP reiterates the following points:

- The City pays close attention to, and implements initiatives as part of, normal business to ensure assets are safe, meeting legislative compliance, etc.
- The forecasts are based on a modelling exercise underpinned by assumptions and information subject to change and refinement as part of the annual resource / budget planning process.
- As part of the future updates to the 2025 AMP and continuous improvement efforts, there will be an opportunity to review and refine assumptions, estimates, etc.

A key piece of this AMP is the Improvement Plan. It sets up a series of actions for the City's AM program to mature and provide better data/analyses to support better decision-making. Through continual improvement initiatives, including future iteratives of this AMP, the City has an opportunity to revise and refine the information and assumptions that underpin this AMP.

Furthermore, this AMP represents a significant step forward in the City's AM journey. It has introduced key asset management analyses that support better decision-making. Particularly, the City has enacted a framework to record and monitor levels of service, which is paired with performance and financial forecasts. The City will continue to monitor its levels of service against its spending, to better understand how services are being delivered, and how assets are being managed. Asset management is a journey, and the processes and data that it provides will ensure the City continues to keep a proactive approach to providing services to the community.

2 Introduction

The City of Markham (the City) is a municipality located in the Region of York (the Region), adjacent to Toronto's northern border, part of the Greater Toronto Area (GTA), and has a land area of approximately 212 square kilometres. Markham is located in the south of the Region and shares borders with five (5) other municipalities: the City of Richmond Hill; the Town of Whitchurch-Stouffville; the City of Vaughan; the City of Pickering; and the City of Toronto. In 2024, population and employment are estimated to be 363,549 and 184,645 respectively.

Due to its proximity to Toronto, Markham has experienced significant development over the last several decades. As a result, Markham's population has grown substantially, particularly after the opening of Highway 404 in the mid-1970s. The City is projected to grow to approximately 610,500 residents and host 301,600 jobs by 2051.

The June 2015 House of Commons Report of the Standing Committee on Transport, Infrastructure and Communities; Updating Infrastructure in Canada: An Examination of Needs and Investments notes that across Canada, the municipal share of public infrastructure has increased from 22% in 1955 to nearly 60% in 2013. The federal government's share of critical infrastructure stock, including roads, water and wastewater, has declined by nearly 80% in value since 1963. Ontario's municipalities own and manage more infrastructure assets in the province than both the provincial and federal governments combined.[3]

As a result of this growth, and as part of its planning practices, the City has taken a proactive approach to asset management planning. Asset management planning assists the City in understanding the ways in which it should maintain its infrastructure, with the objective of delivering high quality services to the community.

The City first formally documented some of its asset management planning practices as part of its original Asset Management Plan (AMP) – developed in 2016. The development of this AMP was driven by the 2014 renewal of the Municipal Funding Agreement. As part of this renewal, municipalities were mandated to create an AMP by December 31, 2016 to be eligible for Canada Community Building Funds.

In January of 2018, Ontario Regulation 588/17 (O.Reg. 588/17): Asset Management Planning for Municipal Infrastructure came into effect. The regulation sets out requirements for municipal asset management planning to help municipalities better understand their infrastructure needs and inform infrastructure planning and investment decisions. This regulation offered the City another opportunity to continue developing its

[3] House of Commons Report of the Standing Committee on Transport, Infrastructure and Communities, Updating Infrastructure in Canada: An Examination of Needs and Investments

asset management practices through the advancement of its asset management program and further documentation of AM practices in a series of AMPs. In 2021, the City prepared an AMP in compliance with O. Reg. 588/17, which exceeded the minimum scope requirements of the regulation by including additional asset classes over and above what was mandated.

The last major milestone of O. Reg. 588/17 includes the development of an AMP that includes both core and non-core asset groups and reports on the funding required to provide the City's PLoS. The AMP is an output of several AM processes as well as a guiding document for service delivery and continual improvement for the AM Program. Relevant documents that support the Asset Management Program include the following, which can be made available upon request.

- City of Markham Strategic Plan
- City of Markham Official Plan and Secondary Plans
- City of Markham Asset Management Policy
- City of Markham Asset Management Plan
- Integrated Leisure Master Plan
- Digital Markham Strategy
- Greenprint, Markham's Community Sustainability Plan
- Library Strategic Plan
- Active Transportation Master Plan
- Pathways and Trails Master Plan
- Corporate Energy Management Plan
- Municipal Energy Plan
- Region of York Transportation, Water and Wastewater Master Plans
- Region of York Official Plan

Figure 2-1 below is the City's asset management framework. It provides a visual representation of the various processes and activities within the City that make up all of its Asset Management practices. Note that it details the cyclical processes that form part of service delivery at the City, illustrating the feedback loop wherein the outputs of service delivery feed into the business drivers that drive further planning work.

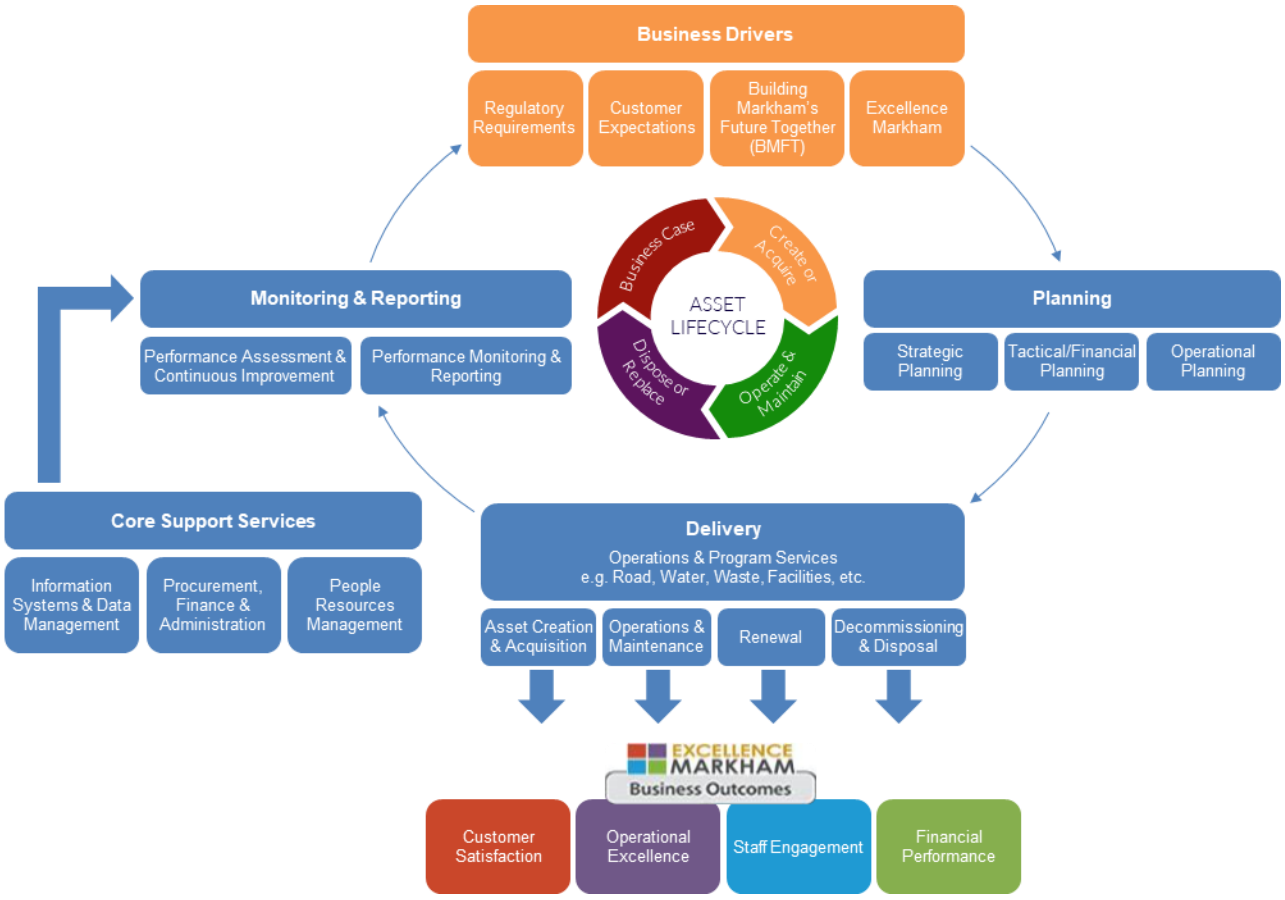

Figure 2-1: The City of Markham's Asset Management Framework.

2.1 Objectives

The City of Markham is actively working to improve its Asset Management (AM) Program through various initiatives. By maturing the AM Program, the City will continue making data driven decisions in order to meet its strategic goals and deliver services in a responsible and sustainable manner which support the livelihood of its residents, attracts businesses, and maintains the vibrancy of the City.

One such initiative is this Asset Management Plan (AMP), which has been developed in compliance with O.Reg.588/17 and in alignment with the City's 2020-2026 Strategic Plan.

This AMP was developed in alignment with the organizational objectives outlined in the City's Strategic Plan, the current LoS being provided, and the asset management activities and processes currently performed to provide the intended LoS to the community.

2.2 Purpose

Asset management (AM) is the coordinated effort of the City of Markham to realize value from its assets in the form of the services they provide. It includes an integrated set of business processes that support decision making regarding acquiring, operating, maintaining, renewing, replacing, and disposing of infrastructure assets. It is an ongoing practice that is not limited to individual studies or reports. It is a way of doing business that provides the means through which the City's high-level strategic goals relate to the day-to-day activities of staff. The AMP helps guide the next step in the City's asset management journey to further develop and mature the City's AM program.

The purpose of this AMP is to:

- Meet the requirements of O. Reg. 588/17.
- Support the line of sight between the organization's strategic objectives, Council approved plans and initiatives, and asset investment needs.
- Report on and understand the current state of the City's assets.
- Document the City's current LoS, proposed LoS, and related performance measures.
- Document lifecycle management strategies that the City applies to assets to maintain service levels and achieve PLoS.
- Determine the funding required for the City to undertake lifecycle management strategies, sustain current levels of service, and achieve PLoS.
- Determine any funding shortfalls between planned spending and required funding.
- Provide recommendations to meet future O. Reg. 588/17 requirements and to continually improve the City's asset management processes.

2.3 Scope

The assets included within the scope of this AMP are illustrated in Figure 2-2. The assets are organized into an asset hierarchy that details the relationship between the assets and the services that they support. The following figure details the services that the City provides and their associated assets. Detailed asset hierarchies are provided in **Appendices A to K.**

To complete the analyses that are reported in this AMP, the City utilized its asset inventory data that was current to year-end 2024.

Figure 2-2: Asset hierarchy of in-scope assets.

2.4 Planning Horizon

This AMP covers a planning horizon of 26 years ending in 2051. This horizon aligns with the City's Official Plan. Note that the requirements of O. Reg. 588/17 require asset management plans to cover a 10-year time horizon. This AMP looks beyond the minimums specified by the regulation.

O. Reg 588/17 requires municipalities to prepare an AMP at least once every five (5) years following the completion this AMP. As part of the City's asset management approach, the City endeavors to review its AM practices on a more regular basis to continually assess appropriate levels of service and integrate improved condition assessment strategies so the AMP can be used to support long-term planning.

It should also be noted that the anticipated growth in population and employment for the City has been summarized in Section 4, from 2021 to 2051, as established in the Region of York's Official Plan. However, the Current LoS – Planned Funding, Proposed LoS – Maintain Current Performance, and Proposed LoS – Impact of Growth scenarios each cover the 26-year planning horizon as mentioned above, from 2026 to 2051. The annual funding required for each scenario was determined through to 2051.

The Markham Official Plan, 2014 (the "Official Plan") was adopted by Markham Council on December 10, 2013, and modified and approved by York Region on June 12, 2014. Since that time, York Region has updated their Official Plan, which aligns population and employment projections, and a planning horizon to 2051, with objectives outlined by the Province of Ontario. The City is updating the Markham Official Plan, 2014, starting in 2025.

Figure 2-3 and Table 2-1 show the areas and years of where growth in population and employment is anticipated.

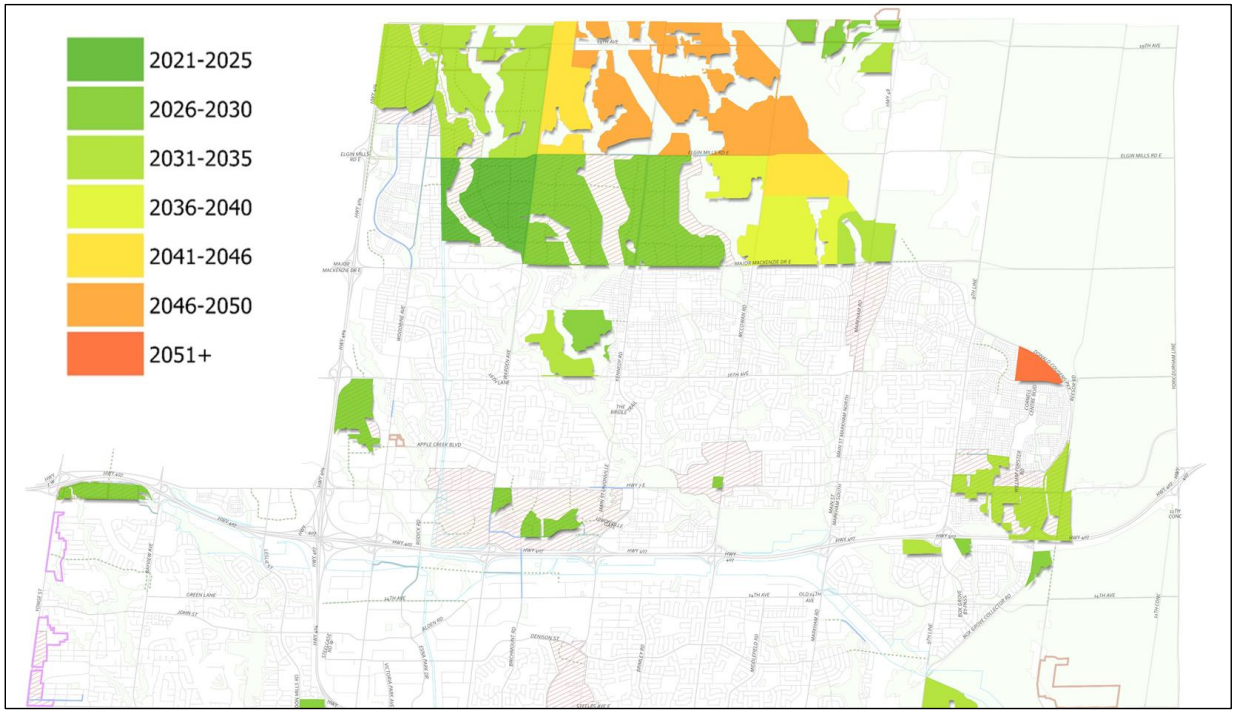

Figure 2-3: Areas of anticipated population and employment growth.

Table 2-1: Official Plan population and employment objectives.

Sum of Area (ha)	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051+
Employment	**193,200**	**208,600**	**224,000**	**243,000**	**262,000**	**281,850**	**301,700**
Employment Area Subtotal	**n/a**	**83.29**	**529.73**	**n/a**	**143.67**	**n/a**	**n/a**
2014 OP	**n/a**	83.29	529.73	**n/a**	**n/a**	**n/a**	**n/a**
NEW OP	**n/a**	**n/a**	**n/a**	**n/a**	143.67	**n/a**	**n/a**
Population	**351,800**	**383,950**	**416,100**	**460,300**	**504,500**	**556,500**	**608,500**
Urban Area Subtotal	**214.6**	**682.61**	**336.9**	**257.67**	**106.41**	**539.15**	**34.41**
2014 OP	214.6	631.26	241.93	**n/a**	**n/a**	**n/a**	34.41
NEW OP	**n/a**	51.35	94.97	257.67	106.41	539.15	**n/a**

The differences in employment, employment areas, population, and population areas are shown in Table 2-1. The City now anticipates growth in more employment and urban areas.

2.5 AMP Overview

The AMP is structured to provide consistency and ease of understanding for readers. The structure and content within this AMP are influenced by several guidelines and best practices, including:

- Province of Ontario Guide: Building Together – Guide for Municipal Asset Management Plans,
- Institute of Public Works Engineering Australia (IPWEA) guidelines and resources, and,
- Institute of Asset Management (IAM) guidelines.

All of these resources and guidelines are in alignment with the International Organization for Standardization (ISO) 55000 series of standards pertaining to asset management.

Sections 5 to 9 provide the overall State of the Infrastructure (SOTI) analysis, levels of service (LoS), risk management strategies, lifecycle management strategies, lifecycle forecasting, and financial strategy for the City as a whole.

Appendices A to K provide the SOTI analysis, LoS, risk management strategies, lifecycle management strategies, and lifecycle forecasting for each individual service area, further broken down by specific asset classes.

2.6 What's new in the 2025 AMP?

This AMP retains the same service area structure as the 2024 Plan; however, it reflects several key updates and enhancements. These include refinements to the asset data and information previously used, as well as the integration of Proposed Levels of Service (PLoS). The specific changes are detailed below.

2.6.1 Ontario Regulation 588/17 Requirements

The 2024 and 2025 AMPs were developed in compliance with O. Reg. 588/17. Table 2-2 summarizes the main differences and similarities between the 2024 and 2025 requirements. The 2024 Plan required the same information previously reported on for Core assets due in 2022. The 2025 Plan was required to be completed for all assets.

Table 2-2: Ontario Regulation 588/17 requirements for asset management plans.

2024 Requirements	2025 Requirements
Non-core assets	All assets
Document current levels of service (CLoS)	Document proposed levels of service and explain why the proposed levels of service (PLoS) are appropriate, including:

	• Lifecycle activities that are required to achieve them • How are the PLoS different from the CLoS? • Can the City afford the PLoS? • Are the PLoS achievable? • Were the PLoS developed to support the City in achieving their long-term sustainability goals?
Report on current performance	Report on proposed performance
Provide cost to maintain CLoS over 10-years	Provide cost to maintain CLoS over 10-years
Forecast asset performance based on the City's anticipated budget	• Provide an estimate of the annual funding projected to be available • How will the City manage the risks if PLoS cannot be achieved?

2.6.2 Asset Inventories and State of the Infrastructure

Table 2-3 summarizes the changes in the reported asset condition and asset valuations between 2024 and 2025. In general, there have been minor changes to the City's overall asset portfolio. The changes are due to updates to the asset inventory, where new assets have been added to the inventory, decommissioned assets have been removed, and replacement values have been updated.

In addition, there are changes to the overall condition of some service areas. This may be due to assets continually degrading, renewal projects that have taken place, and updates to asset condition upon further investigation/assessment.

Table 2-3: 2024 and 2025 asset condition and replacement value comparison by service area.

Service	2024 Performance	2025 Performance	2024 Replacement Value	2025 Replacement Value
Arts & Culture	Good	Good	$94,377,864	$94,377,864
Fire & Emergency Service	Good	Good	$83,236,115	$83,142,350
General Support Service – Administration	Good	Good	$238,407,707	$238,407,707
General Support Service – Fleet	Poor	Fair	$27,348,548	$34,828,925
General Support Service –	Fair	Fair	$7,864,811	$7,545,401

Information Technology				
Library	Very Good	Fair	$51,575,488	$51,127,662
Natural Assets	Good	Good	$169,493,517	$169,454,706
Parks	Fair	Good	$105,739,510	$105,627,813
Potable Water	Fair	Fair	$1,926,246,695	$1,926,246,696
Recreation	Very Good	Very Good	$988,375,721	$988,375,721
Solid Waste Management	Good	Very Good	$1,887,449	$1,898,272
Stormwater Management	Good	Good	$3,229,302,838	$3,229,302,838
Transportation	Good	Good	$7,902,969,362	$7,902,969,368
Wastewater	Good	Good	$2,671,112,637	$ 2,671,112,637
Total	**Good**	**Good**	**$17,497,938,261**	**$ 17,504,417,959**

The overall performance for libraries, parks, potable water, and solid waste management assets has changed from the 2024 AMP. The performance for library assets has declined from very good to fair as the asset inventory data, specifically for library collections, has been updated with their performance evaluation based upon age and estimated service life. Age and estimated service life methodology is typically used as a proxy in the absence of actual physical condition ratings, of which were not available at the time of this AMP's development. The performance of parks, potable water, and solid waste management assets has improved due to recently completed renewals and the updating of age, estimated service life, and physical condition ratings.

2.6.3 Levels of Service

This AMP requires the City to establish PLoS, and determine the costs required to achieve those PLoS, while the regulation required the 2024 AMP to report on the costs required to **maintain current levels of service**.

Through the 2024 AMP, LoS frameworks were developed for each service area. These LoS frameworks included sets of customer values, customer performance metrics, and technical performance metrics that were used to determine the current levels of service (CLoS). In this AMP, the same LoS frameworks have been applied and the current performances for each metric have been updated. Recommended (proposed) performances have also been established and documented within the technical LoS.

The recommended performance represents the target considered by the City to achieve over the planning horizon. These proposed performance targets were established through discussions with key stakeholders from each service area, customer expectations, asset performance, current backlog, the City's available resources, affordability, and achievability.

3 Alignment with Organization Goals

3.1 Asset Management Policy

In 2019, the City established their AM Policy documenting their commitment to practice sound asset management principles and practices to meet strategic goals and objectives. The City aims to deliver services in a socially, economically and environmentally responsible manner. The City is in the process of updating the policy as part of its requirements to update the document every 5-years under O.Reg. 588/17.

By practicing asset management, the City hopes that customers are confident in how the City manages assets, that assets are considered across all related services, that asset risk is considered when prioritizing projects, that lifecycle costs and risks are reduced while providing services at appropriate levels of service, and that decisions made today will put the City in a position for assets to meet future challenges.

The City's AM Policy identifies the objectives and goals of the AM Program to guide AM at the City. These include:

A. **Align Asset Management practice** with the City of Markham's Strategic Plan, Building Markham's Future Together (BMFT), and other key strategic documents, including the Greenprint, Markham's Community Sustainability Plan, and the Official Plan;

B. **Ensure strong governance, accountability and transparency by:**

    a. Demonstrating to owners, customers and stakeholders that services are delivered effectively and efficiently;

    b. Providing a transparent and auditable basis for making service/risk/cost trade-off decisions; and

    c. Improving accountability for the use of resources through performance and financial metrics.

C. **Make effective and long-term sustainable decisions by:**

    a. Having robust information/documentation to support evidence-based decisions;

    b. Considering viable options and all aspects of decisions; and

    c. Ensuring total cost of ownership is the basis of decision-making processes, so that emphasis is placed on sustainable long term efficiencies rather than short term gains.

D. **Provide customer service by:**

a. Defining level of service in consultation with stakeholders; and

b. Ensuring service delivery meets the defined level of service.

E. Manage risk effectively by:

a. Understanding the risks related to asset management and service delivery and applying a framework to prioritize risk mitigation

b. Developing and implementing risk management strategies; and

c. Demonstrating compliance with legal and regulatory requirements;

F. Demonstrate fiscal stewardship and financial efficiency through:

a. Balancing cost, risk and service performance to achieve the lowest total cost of ownership; and

b. Updating the Life Cycle Reserve Study annually to determine if there are sufficient funds in the reserve to sustain the future replacement and rehabilitation requirements of the City's assets for the next 25 years based on known inflows and outflows.

G. Provide excellent sustainable community planning and infrastructure management to accommodate growth

3.2 2020 – 2026 Strategic Plan

Building Markham's Future Together is the City of Markham's 2020-2026 Strategic Plan. The Strategic Plan was approved on May 1, 2024 following months of consultation with Members of Council, Markham staff, community and business stakeholders and the general public. The Strategic Plan is the blueprint for how City Council and Senior Staff will make thoughtful decisions about the City's future to ensure its success.

In 2019 and 2023, the City conducted community engagement with residents, businesses, and community stakeholders. There were over 2,000 survey responses which informed the strategic priorities established by the City. This resulted in the 2020-2023 Strategic Plan and the revised 2020-2026 Strategic Plan. The Strategic Plan focuses on four goals:

- **Goal 1 - Exceptional Services by Exceptional People:** We embrace a bold and innovative culture that empowers and inspires excellent services within a collaborative and healthy work environment.
- **Goal 2 - Engaged, Diverse, Thriving & Vibrant City:** We are an inclusive city, engaging everyone in building a livable, caring and culturally vibrant community while respecting our past. We enable a strong economy; we proactively work to

attract investment in our community; and we effectively manage change to meet future needs.

- **Goal 3 - Safe, Sustainable & Complete Community:** We strive to achieve complete communities with an excellent quality of life. We ensure community safety and enhance the natural environment and built form through sustainable integrated planning, infrastructure management, and services.
- **Goal 4 - Stewardship of Money & Resources:** We demonstrate exceptional leadership using sound, transparent and responsible fiscal & resource management, and policy development to mitigate risks while enabling efficient and effective service delivery.

The Strategic Plan outlines the actions the City will undertake to achieve each goal. These include holding more community events, implementing strategies and master plans, the implementation of new technology, and many more. The City has also documented a number of metrics to report against (e.g., overall customer satisfaction (internal and external services) taken from Department Surveys completed each year) for each goal so the City can measure their success.

This AMP was developed using a service-centric approach, and by doing so it aligns asset management to service delivery, which in turn is connected to the City's Strategic Plan. All the frameworks and strategies that have been put in place to support this AMP have been completed in alignment with the Strategic Plan.

3.3 2024 Citizen Survey

In 2024 a citizen survey was conducted. This survey asked questions focused on satisfaction with living in Markham and service delivery. The survey had the following parameters:

- Telephone survey
- Random sample of 300 residents, weighted to ensure representation.
- Identical questionnaire used in 2022 and 2024
- Current survey results update 2022 results
- Survey conducted July 30 to August 22, 2024
- Margin of error +/- 5.7%, 19 times out of 20
- Survey conducted in English

The survey questions were focused on the following themes:

- Satisfaction with life in Markham

- Cleanliness
- How Markham supports various demographics
- Accessibility of services and facilities
- Supporting the physical and mental well-being of citizens through services, outdoor areas, programs, and events
- Service delivery
- Climate change
- How the City communicates with citizens and addresses concerns
- Cost of living
- Safety

Overall, attitudes and satisfaction levels have not changed significantly since 2022. The following summarizes the results from the 2024 survey:

- Satisfaction with life in Markham is high, both generally and with specific services and programs
- Nine in ten strongly (57%) or somewhat (36%) agree that they are satisfied with life in Markham.
- The City gets high marks on:
    - Cleanliness
    - Accessibility and Diversity
    - Culture, library and recreation
    - Parks and green spaces
    - Protecting heritage
- As in 2022, there are some areas where majorities are still satisfied but with less enthusiasm (lower strongly held positivity):
    - Services: communicating, delivering, representing good value
    - Planning development of livable communities
    - Tackling climate change
    - Interacting with the City of Markham
- Areas worth monitoring where results are more concerning:
    - A comparably high level of dissatisfaction

        - Markham's efforts to bring affordable and rental housing to the City
    - A significant decline since 2022 in strongly held satisfaction:
        - Great place for both residents and businesses (down 14 points)
        - Markham is a safe city (down 12 points)
    - Roads in good condition (down 10 points)
- There is enthusiasm about life in Markham
- Attitudes are generally positive with respect to many services and programs

As the City continues to grow and expand service delivery while providing appropriate LoS to the existing population, it is important that feedback from citizens is collected to understand the changing needs of the citizens and that the City is growing in a sustainable way. The City should continue to track levels of satisfaction with life in Markham and incorporate survey results into asset management processes.

3.4 Ontario Regulation 588/17

In January of 2018, Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure came into effect. The regulation sets out requirements for municipal asset management planning to help municipalities better understand their infrastructure needs and inform infrastructure planning and investment decisions.

The regulation will be phased in over a total of six years; and, in 2025, will culminate in the development of an AMP that addresses the investment needs for all infrastructure assets owned by the City. Key legislative deadlines for all Ontario municipalities are provided in Table 3-1 below.

Table 3-1: O. Reg. 588/17 milestones and timelines.

Date	Milestone	City Status
July 1, 2019	Prepare and publish a strategic asset management policy.	Complete
July 1, 2022	Develop an Asset Management Plan that details the cost to maintain current service levels for core infrastructure assets.	Complete
July 1, 2024	Develop an Asset Management Plan that details the cost to maintain current service levels for all other assets (i.e. non-core Assets).	Complete
July 1, 2025	Expand the City's 2024 AMP to provide further details on all infrastructure assets, including proposed levels of service and the revenue and expenditure plan to achieve them.	Completed herein

This AMP has been developed in line with the requirements of O. Reg. 588/17 and meets the requirements for the July 1, 2025, milestone. This AMP addresses these requirements as follows:

i. It applies to all assets (including those that are defined as “core assets” in O. Reg. 588/17).

ii. It details the current and target performances for Community and Technical LoS specified in O. Reg. 588/17 (for core assets).

iii. It details current and target performances for the Community and Technical LoS established by the City (for all assets).

iv. It includes a summary of replacement costs, average age, and performance (age or physical condition based) of all assets.

v. It includes a description of the City’s approach to assessing the condition of assets.

vi. It includes a description of the lifecycle activities that need to be undertaken to maintain current LoS and achieve PLoS, as well as noting any risks in the delivery of services as appropriate.

vii. It includes population and employment forecasts as set out in the Region of York’s 2022 Official Plan.

viii. It includes the estimated capital expenditures and operating costs related to the lifecycle activities required to maintain current LoS, achieve PLoS, and accommodate growth.

ix. It applies a 26-year horizon to these activities and projections (the regulation requires a 10-year horizon).

x. It is supported by the best available data at the City from within the last two calendar years (data has been collated as of year-end 2024).

xi. It will be made available to the public via the City’s website.

3.5 Legislative Requirements

There are many legislative requirements relating to the management of assets. Legislative requirements that impact the delivery of the services are outlined in Table 3-2.

Table 3-2: Other legislative requirements.

Legislation	Requirement
Municipal Act, 2001	Municipalities are created by the Province of Ontario to be responsible and accountable governments with respect to matters within their jurisdiction and each municipality is given powers and duties under this Act and many other Acts for the purpose of providing good government with respect to hose matters. The powers of a municipality under this or any other Act shall be interpreted broadly so as to confer broad authority on the municipality to enable the municipality to govern its affairs as it considers appropriate and to enhance the municipality's ability to respond to municipal issues. A lower-tier municipality and an upper-tier municipality may pass by-laws, subject to the rules set out in subsection (4), respecting the following matters: Governance structure of the municipality and its local boards. Accountability and transparency of the municipality and its operations and of its local boards and their operations. Financial management of the municipality and its local boards. Public assets of the municipality acquired for the purpose of exercising its authority under this or any other Act. Economic, social and environmental well-being of the municipality, including respecting climate change. Health, safety and well-being of persons. Services and things that the municipality is authorized to provide under subsection (1). Protection of persons and property, including consumer protection. 2006, c.32, Sched. A, s.8; 2017, c.10, Sched.1, s.2.
Planning Act, R.S.O. 1990, c. P.13	The purposes of this Act are: (a) to promote sustainable economic development in a healthy natural environment within the policy and by the means provided under this Act: (b) to provide for a land use planning system led by provincial policy, (c) to integrate matters of provincial interest in provincial and municipal planning decisions, (d) to provide for planning processes that are fair by making them open, accessible, timely and efficient, (e) to encourage co-operation and co-ordination among various interests, (f) to recognize the decision-making authority and accountability of municipal councils in planning.
Infrastructure for Jobs and Prosperity Act, 2015, and	The purpose of this Act is to establish mechanisms to encourage principled, evidence-based and strategic long-term infrastructure planning that supports job creation and training opportunities, economic growth and

Legislation	Requirement
Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure	protection of the environment, and incorporate design excellence into infrastructure planning. Furthermore, to provide a framework for the development and implementation of the City's Corporate Asset Management Program. It is intended to guide the consistent use of asset management practices across the organization, to facilitate logical and evidence-based decision- making for the management of municipal infrastructure assets and to support the delivery of sustainable community services now and in the future. By using sound asset management practices, the City will work to ensure that all municipal infrastructure assets meet expected performance levels and continue to provide desired service levels in the most efficient and effective manner. Linking service outcomes to infrastructure investment decisions will assist the Town in focusing on service, rather than budget driven asset management approaches.
Ontario Regulation 239/02: Minimum Maintenance Standards for Municipal Highways	The purpose of this Regulation is to clarify the scope of the statutory defence available to a municipality under clause 44 (3) (c) of the Act by establishing maintenance standards which are non-prescriptive as to the methods or materials to be used in complying with the standards but instead describe a desired outcome by setting out the minimum standards of repair for highways under municipal jurisdiction.
Development Charges Act, 1997, S.O. 1997, c. 27	The council of a municipality may by by-law, impose development charges against land to pay for increased capital costs required because of increased needs for services arising from development of the area to which the by-law applies.
Ontario Regulations 104/97, 160/02 and 472/10: Standards for Bridges	These regulations clarify the procedures and standards that must be adhered to when designing, inspecting and maintaining the integrity of municipal structures in Ontario. It specifies the requirements and standards for bridge designs, evaluation, construction and rehabilitations. It also mandates the structural integrity, safety and condition of every bridge must be determined by at least one inspection every second calendar year, under the direction of a professional engineer and in accordance with the Ontario Structure Inspection Manual (OSIM).
Safe Drinking Water Act, 2002, S.O. 2002, c. 32, Ontario Regulation 163/03: Ontario Drinking Water Quality Standards and Ontario Regulation 170/03: Drinking Water Systems	The purposes of this Act are to recognize that the people of Ontario are entitled to expect their drinking water to be safe and to provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing.
Ontario Water Resources Act, R.S.O. 1990, c. O.40	The purpose of this Act is to provide for the conservation, protection and management of Ontario's waters and for their efficient and sustainable use, in order to promote Ontario's long-term environmental, social and economic well-being.

Notably, Ontario Regulation 588/17 has mandated specific levels of service that apply to core assets. These are provided within the Appendices for each applicable service area.

3.6 Climate Change Adaptation

O. Reg. 588/17 requires municipalities to state how they will consider climate change in their Asset Management Policy. The City's 2021 AMP recognized that future iterations of the AMP should consider climate change through the asset management strategies. The City currently undertakes climate change adaptation and mitigation initiatives, and it is important that these current initiatives are recognized and considered, and that the City continues to forecast initiatives that will be needed in the future to adapt its infrastructure to become more resilient to the effects climate change. Adapting infrastructure proactively will result in less funding required in overall operations and maintenance, rehabilitations, and renewals of assets.

3.6.1 Costing, Climate Change Impacts to Public Infrastructure Report

In 2023, the Financial Accountability Officer (FAO) published a report analyzing the cost impacts of climate change on Ontario's provincial and municipal infrastructure. This report was developed through the FAO's *Costing Climate Change Impacts to Public Infrastructure* (CIPI) project. Through the CIPI project, $708 billion of public infrastructure was analyzed. This included buildings and facilities, transportation infrastructure, and linear storm and wastewater infrastructure.

It is predicted that the province will experience more frequent and intense extreme rainfall and extreme heat, and fewer freeze-thaw cycles. These climate hazards will impact the infrastructure by accelerating asset deterioration, resulting in the need for higher capital investments, more frequent rehabilitations, earlier asset renewals, and more operations and maintenance activities.

Three strategies were explored in the CIPI project:

- No adaptations;
- Reactive adaptation: assumes that assets are adapted when replaced at the end of their useful lives; and
- Proactive Adaptation: assumes asset stewards will adapt infrastructure either during an assets' next major rehabilitation or upcoming renewal.

The CIPI report concluded that the following additional funding would be required annually to maintain Ontario's public infrastructure:

- **No Adaptations:** $4.1 billion per year on average.
- **Reactive Adaptation:** $3.5 billion per year on average.
- **Proactive Adaptation:** $3.0 billion per year on average.

The proactive adaptation strategy results in the lowest additional required funding per year and adapts almost all public infrastructure by 2050. The reactive adaptation strategy leaves most of Ontario's public infrastructure vulnerable to climate risk though to the mid-2060s. Adapting infrastructure can reduce the risk of climate-related infrastructure service disruption.

3.6.2 The City's Climate Change Initiatives

The City has been undertaking a variety of climate change initiatives, such as policies and plans to support the mitigation and adaptation of climate change, achieving $2M in utility savings and $1.6M in revenue, and is recognized for its leadership in sustainability, energy, and climate action through receiving over a dozen rewards. The City recognizes the urgency of climate change and is committed to implementing and completing climate change mitigation and adaptation initiatives.

The City's current climate change initiatives include:

- Net Zero Facility Program;
- Erosion site inspections;
- Condition inspections of suspended watermains;
- LEED Silver certification for new buildings;
- Installing LED fixtures for streetlights;
- The 30-year city-wide Flood Control Program to improve storm drainage and limit surface and basement flooding risks in urban areas;
- Using solar and geo-thermal energy sources and building automation;
- The development of a community-scale distributed geothermal energy system for heating, cooling and domestic hot water in the Berczy-Glen neighbourhood; and
- Planting new trees to reach a target of 30% tree canopy.

The City's climate change mitigation goals are laid out in the following documents:

- **Building Markham's Future Together (BMFT):** ensure business continuity of our services and infrastructure, and enable community resilience and safety.
- **The Greenprint: Markham's Community Sustainability Plan:** a 50- to 100-year plan for the City to achieve an environmentally, economically, socially and culturally vibrant community. This plan documents a total of 12 sustainability priorities and 23 objectives that the community will work towards to meet its vision of sustainability. These objectives include creating a culture of walking, cycling, and transit usage, reaching 30% tree canopy and vegetation coverage city-wide, achieving net-zero energy, water, waste, and emissions by 2050, and more.
- **Municipal Energy Plan:** targets to achieve net zero energy emissions by 2050.
- **Corporate Energy Management Plan:** 5-year plan to improve energy management and reduce greenhouse gas (GHG) emissions for the City's corporate operations.

3.6.3 Partners for Climate Change Protection (PCP) Program

As of February 24, 2023, the PCP program has recognized the City of Markham with Milestone 5 for its corporate assets. This is the final milestone of the PCP framework demonstrating leadership on energy and greenhouse gas emissions management.

Milestone 5 includes monitoring and reporting results to determine if the City's initiatives are working and if targets will be met. Since 2013, the City has implemented more than 200 initiatives that are saving energy, GHGs and utility costs. The PCP framework is provided below.

Figure 3-1: Partners for Climate Change Protection Framework.

3.7 Stakeholder Engagement and Future Challenges

A series of working sessions was held with stakeholders from each service area. Proposed LoS were discussed in the working session, along with the current challenges that each service area faces and future challenges that the service areas will face based on ongoing trends. The feedback from the stakeholders was used to develop common themes on current and future challenges and future desires which will inform the development of future proposed LoS and asset management planning. The following customer values and customer LoS attributes were discussed:

Customer values (what do these mean to the stakeholder?)

- Safe and reliable
- Convenient
- Sustainable
- Accessible
- Available
- Aesthetic quality

- Customer LoS
    - Condition
    - Function
    - Capacity
    - Accessibility

The following are common challenges amongst most or all of the service areas:

- Aligning master plans with the City's growth objectives as outlined in the OP
- Being able to conduct condition assessments through a program to ensure that assets are in a state of good repair (limitations being budget and resources)
- Technology advancements – the City needs to continue learning about new technologies and implementing them
- A drop in LoS due to growth
- Sustainability – having energy efficient assets and reducing consumption
- Keeping assets modern so people want to continue using them
- Accessibility – making facilities and services more accessible and AODA compliant where possible
- Offering services that continue to evolve with the community to meet needs (e.g., ageing populations, changing demographics, etc.)
- Upgrading capacity to be able to accommodate for growth

The challenges specific to each service area are provided in the Levels of Service sections of Appendices A to L.

4 Future Demand

4.1 Demand Drivers

Drivers of demand include items such as population change, regulations, changes in demographics, seasonal factors, vehicle ownership rates, consumer preferences and expectations, technological changes, economic factors, agricultural practices and environmental awareness.

4.2 Demand Forecasts

The Region of York's 2022 Official Plan guides growth and development across the nine municipalities within the Region, including the City of Markham. The Plan provides the policies to be followed in partnership with the local municipalities to achieve the Region's vision of creating "Strong, Caring, Safe Communities". The Official Plan includes seven goals:

1. To provide an overview of the Purpose, Regional Vision, Goals, Objectives, and Key Guiding Principles of the Plan.
2. To enhance York Region's urban structure through a comprehensive integrated growth management process that provides for healthy, sustainable, complete communities with a strong economic base.
3. To protect and enhance the natural environment for current and future generations so that it will sustain life, maintain health and provide a high quality of life.
4. To enhance York Region's urban system through city building, intensification, and compact and complete communities including employment areas.
5. To protect the Agricultural, Rural and Holland Marsh Specialty Crop Areas and support the agricultural industry as essential components of the Regional fabric.
6. To provide the services required to support York Region's residents and businesses to 2051 and beyond, in a financially and environmentally sustainable manner.
7. To ensure resiliency and the ability to adapt to changing economic and environmental conditions and increasing social diversity.

The Region's Official Plan outlines the population and employment forecasts to 2051 in Table 4-1.

Table 4-1: Population and employment forecasts for the City of Markham (Region of York Official Plan).

Markham	2021	2031	2041	2051
Population	349,000	416,300	496,700	610,500
Employment	190,300	221,200	258,500	301,600

From 2021 to 2051, these forecasts represent a population growth of 75% over 30 years and an employment growth of 58% over the same period. Growth within Markham will primarily be accommodated through development within designated growth areas (typically green fields) and intensification within strategic growth areas (Yonge Street corridor, etc.).

To support asset management requirements and inform more granular financial planning, City staff developed growth projections that align the City's land use policies with the population and employment projections noted above. For the 2021-2051 planning horizon, overall preliminary projections suggest possible asset growth needs averaging a 74% increase across all portfolios with resource-hour equivalency needs averaging a 70% increase. Further granularity of growth projections is shown in Figure 4-1 and Table 4-2 below.

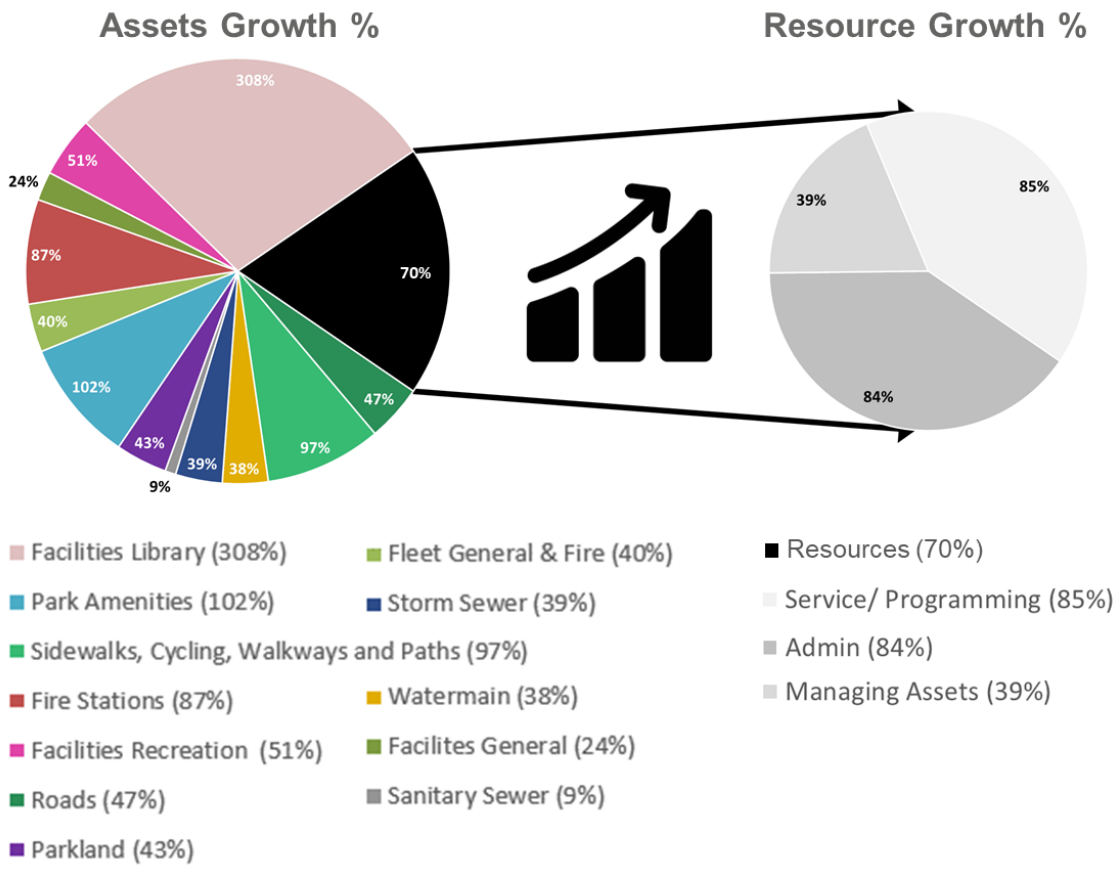

Figure 4-1: Growth and resource projections.

Table 4-2: Growth projections by service or subservice.

Service	Subservice	Anticipated Growth %
All	Not Applicable	Admin (84%)
All	Not Applicable	Managing Assets (39%)
All	Not Applicable	Service/ Programming (85%)
Transportation	Vehicular Transportation	Roads (47%)
Transportation	Active Transportation	Sidewalks, Cycling, Walkways and Paths (97%)
Potable Water	Not Applicable	Watermain (38%)
Stormwater Management	Not Applicable	Storm Sewer (39%)
Wastewater	Not Applicable	Sanitary Sewer (9% under review)
Parks	Not Applicable	Parkland (43%)
Parks	Not Applicable	Park Amenities (102%)
General Support Service	Fleet	Fleet General & Fire (40%)
Fire & Emergency	Not Applicable	Fire Stations (87%)
General Support Service	Facility	Facilities General (24%)
Recreation	Facility	Facilities Recreation (51%)
Library	Facility	Facilities Library (308%)

This growth in asset base will require additional funding and resourcing to adequately support acquisition, operations, maintenance and renewal pressures. The effects of growth using historical budgeting trends on capital and operating expenditures are detailed in the financial summary section of this report. Outputs from the previously noted growth modelling and resulting financial projections that have been further evaluated specifically for this AMP cover the **2026 to 2051 planning horizon**, as part of the City's regulatory obligation to assess proposed levels of service for July 1, 2025. These are detailed in Section 9.5.

4.3 Demand Impact and Demand Management Plan

The impact of demand drivers that may affect future service delivery and use of assets are provided in Table 4-3.

Demand for new services will be managed through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand and demand management. Demand management practices can include non-infrastructure solutions, insuring against risks and managing failures.

Opportunities identified to date for demand management are provided in Table 4-3. Further opportunities will be developed in future revisions of this asset management plan.

Table 4-3: Demand Management Plan.

Demand driver	Current position	Projected position	Impact on services	Demand Management Plan
Population Intensification in Existing Areas and Population Growth in New Areas	Ongoing implementation of projects to accommodate for new and existing growth	The City will continue to implement projects to accommodate for new and existing growth	Increase cost pressure for acquisition, operation, maintenance and renewal	Develop a program to ensure resources are available to acquire new infrastructure, maintain existing and new infrastructure, and provide levels of service.
Capacity	Population intensification and growth may result in services not being available to all users.	Projects to alleviate capacity and congestion issues are identified through the City's Growth Model and studies.	Overall increase in usage due to growing customer base, need for projects to increase capacity	Implementing infrastructure and upgrading existing infrastructure as recommended through the City's Growth Model and studies.

4.4 Asset Programs to Meet Demand

Asset acquisition is required to meet future demand from rising population and employment. These acquisitions will require the City to allocate more resources towards the operations, maintenance, and the renewal of assets for the entirety of their lifecycle. The costs associated with new assets in previous years were identified in the City's capital budgets and used to forecast costs associated with acquiring new assets for the 26-year planning horizon. These additional costs are detailed in Section 9.5.

5 State of the Infrastructure

The State of the Infrastructure section summarizes the assets included in each service area. This subsection illustrates the current performance of all assets, provides an asset inventory and valuation and provides a summary of asset age and useful life. The asset inventory was aligned to the City's asset hierarchy. The following figure illustrates the structure of the City's asset hierarchy. Granular versions of the hierarchy, aligned to specific services, are provided in **Appendix A to L**.

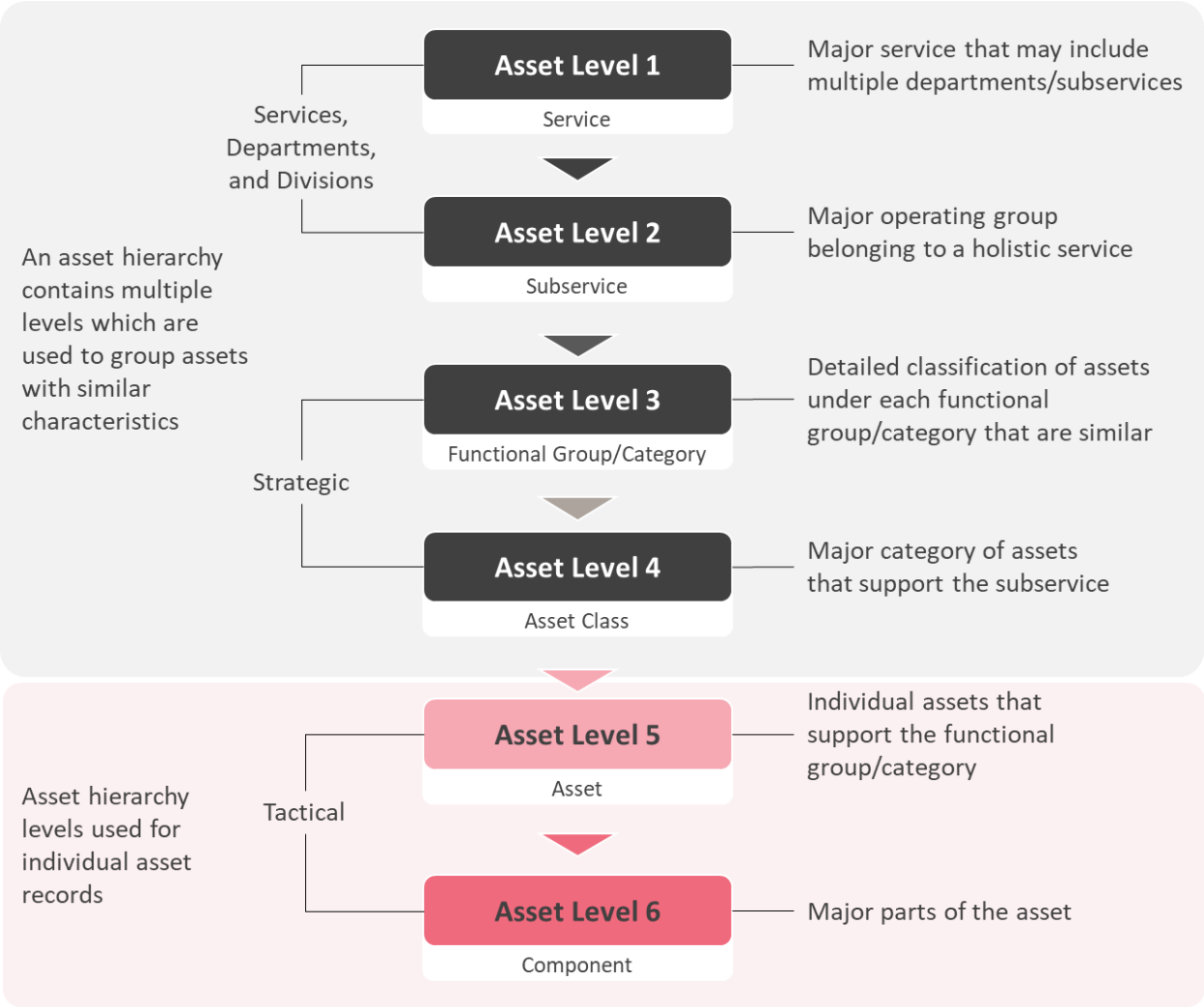

Figure 5-1: Asset hierarchy structure.

5.1 Asset Inventory and Valuation

The first subsection within the State of the Infrastructure section reports on the inventory and valuation of the in-scope assets. This is documented in a table with the following columns:

- **Subservice** details the applicable subservice of each asset that is being reported, as per the City's Asset Hierarchy (refer to Figure 2-2).
- **Asset Category** details the general category of assets that is being reported within each subservice, as per the City's Asset Hierarchy (refer to Figure 2-2).
- **Asset Class** groups together similar types of assets that are organized within each asset category that is being reported, as per the City's Asset Hierarchy (refer to Figure 2-2).
- **Replacement Value** details the total estimated replacement value (replacement cost) of the assets for the given asset class in 2023 dollars. This value represents the full project cost of replacing an asset on a like-for-like basis, including construction costs, material costs, design/engineering, project management and contingencies.
- **Quantity** details the total quantity of assets for the given asset class.
- **Average Performance** details the average age based on physical condition of the assets for the given asset class. This condition is a weighted average that is weighted by replacement value (see **Subsection 5.3** below for a description of performance categories).

As noted above, the analyses that are reported in this AMP use a combination of 2023, 2024, and 2025 asset and financially based data sources. As a result, any planned renewal work that the City undertakes in 2025 is not reflected in the outputs of this AMP.

5.2 Age and Estimated Service Life

A summary of asset age and installation dates is reported through two figures. The first reports on average age and average estimated service life (ESL) by asset class, an example of which is provided below. The average age in this figure is represented by the horizontal blue bar, and the average ESL is by the horizontal grey bar. Average age and ESLs are weighted by replacement value for each asset class. This figure is useful to provide context to the reader regarding the average state of the network in terms of its age. While age is not always a predictor of an asset's performance, in general, most assets begin to deteriorate and require replacement or rehabilitations as they advance

in age. As is illustrated in the following figure, nearly all of the City's assets are relatively young on average when compared to their estimated service lives.

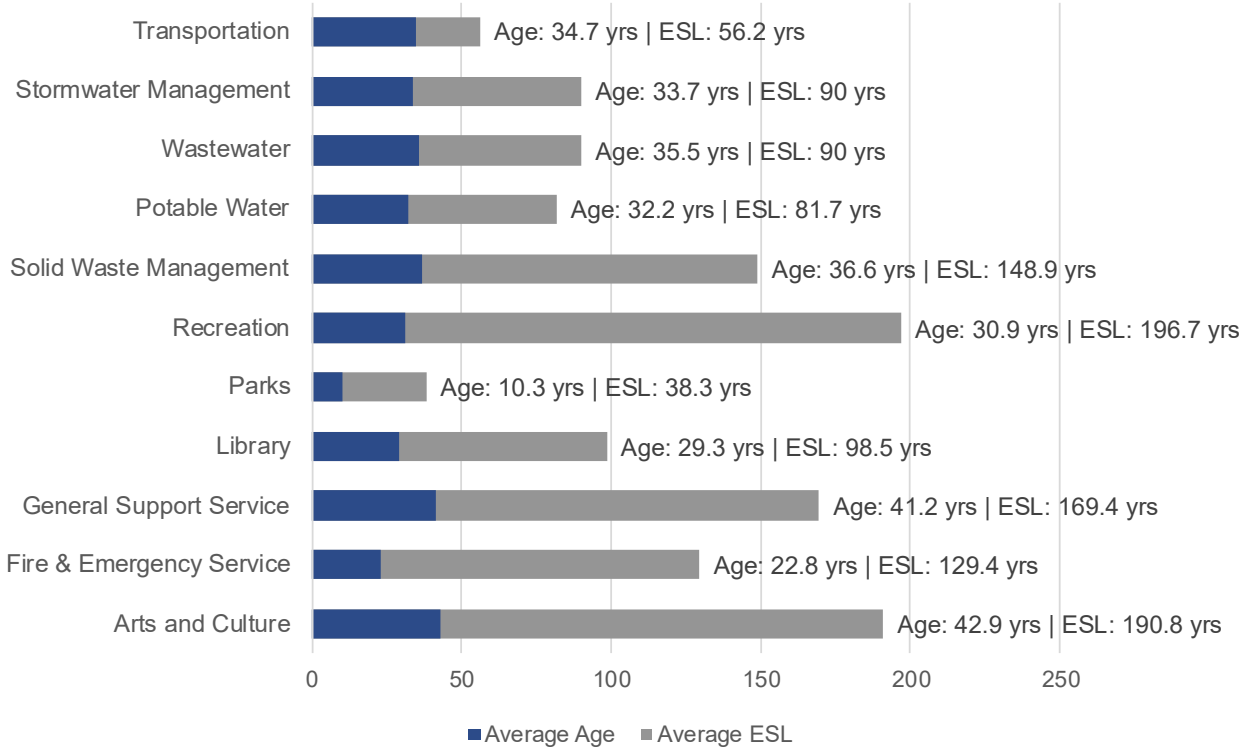

Figure 5-2: Average age/average estimated service life for each service area.

A figure reporting on installation dates follows, an example of which is provided below. The years are separated into installation decades, which helps to visualize the value of assets by the decade that they were constructed/installed or procured. Note that each decade of installation may have a corresponding decade in the future where the infrastructure could reach its end of life and will result in a large financial burden for replacement needs. In decades with significant construction, the City can expect significant renewal needs to occur in the future once these assets become aged and near the end of their service lives. For assets with long lifecycles, many of these needs are beyond the 26-year forecast included in this AMP. Note that asset performance will drive the need for major rehabilitation or replacement activities regardless of installation year (i.e., some long lived assets will experience short service lives for a variety of reasons).

The following figure illustrates that the City has seen its most significant asset acquisitions in the 1980s, 1990s and 2000s.

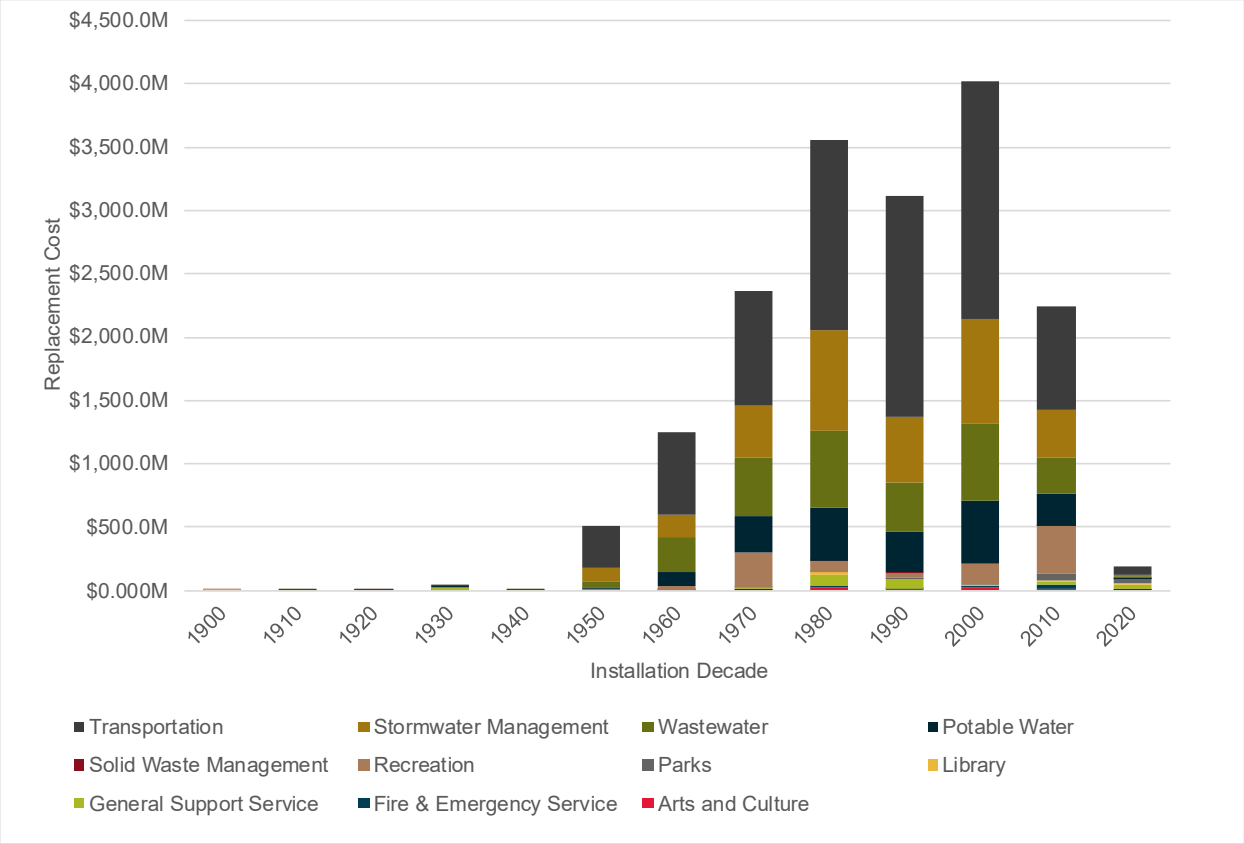

Figure 5-3: Age distribution by installation year of all service areas.

5.3 Asset Condition

Categories, describing asset physical condition or age state (i.e. performance), were assigned to all assets across each service area using a common 5-point categorical rating scale. This scale is aligned to the Canadian Infrastructure Report Card condition rating scale. Since methods for determining asset performance vary amongst different asset classes, all existing asset information, whether it be condition ratings or age-based assessments, were converted to the common 5-point categorical scale for a standardized and consistent basis to understand asset performance within the AMP.

Table 5-1 illustrates the definitions for each category, aligned to the age-based or assessed condition state of the assets. Using these categories, Figure 5-4 illustrates the performance distribution for all assets within the City and Figure 5-5 displays the same information, further subdivided by the City's service areas.

Table 5-1: Overall condition rating scale with examples.

Age-Based	Assessed Condition	Description	Useful Service Life Consumed	Example Condition Rating
Beginning of Life	Very Good	Asset is typically new or recently rehabilitated.	0% to 20%	1
Early Life	Good	Condition of assets is acceptable. Assets are generally in the early stages of their service life. Assets may show early signs of deterioration and may require attention or minor maintenance.	20% to 40%	2
Mid-Life	Fair	Assets are at the mid-point of their service life. Assets show some signs of deterioration that may require attention and maintenance.	40% to 60%	3
Past Mid-life	Poor	Assets show signs of deterioration and are beyond the mid-point of their service life. Ongoing monitoring and maintenance may be required.	60% to 80%	4
Approaching or at end of life	Very Poor	Assets are approaching the end or are beyond their useful service life and may shows signs of advanced deterioration. Assets may exhibit signs of imminent failure that can affect service or increased risk. Extensive monitoring, rehabilitation and/or replacement likely required in the near future.	>80%	5

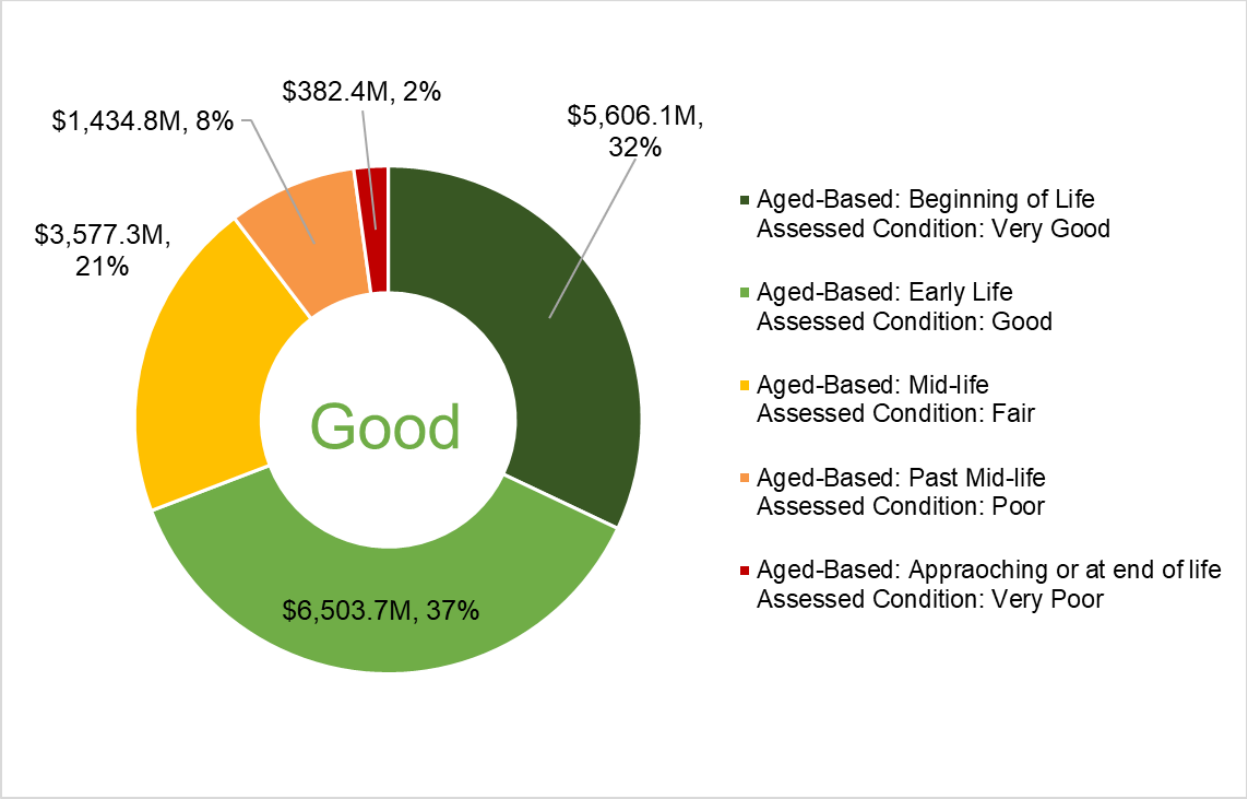

Figure 5-4: Condition distribution of all assets.

Overall, assets remain in a **"GOOD" state of performance** since last reported in the City's 2024 Asset Management Plan, where:

- Assets in a Fair or better state **improved to 90% or $15.7B** (from 88% or $15.4B) and are performing as intended
- Assets in a Very Poor and Poor state was **reduced to 10% or $1.8B** (from 12% or $2.1B) and are subject of planned maintenance or renewal

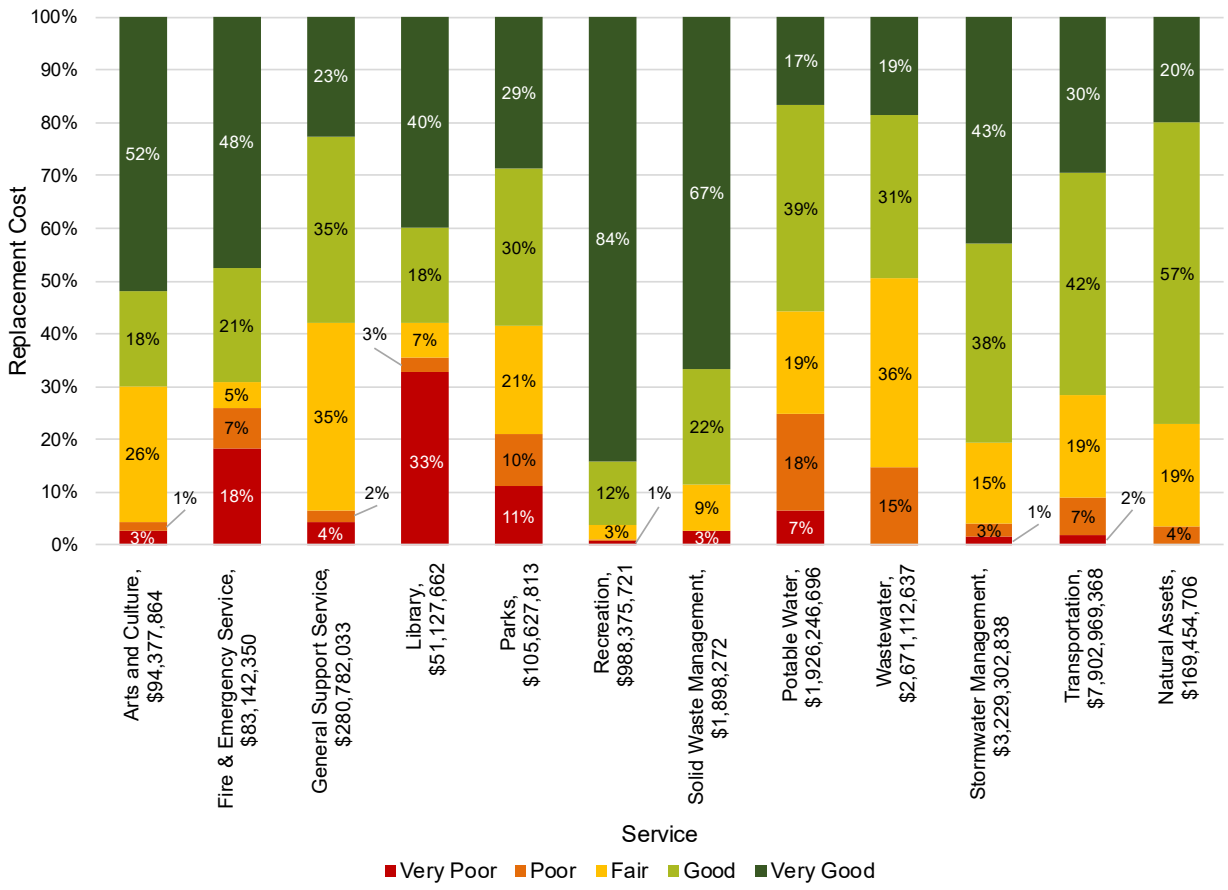

Figure 5-5: Condition distribution for all assets by service area.

For each service area, the same performance information is reported at a more granular level in the appendices. The appendices also contain information on how performance is assessed for each major asset class, as well as the alignment between asset data and each of the 5 categories listed above.

As noted above, the analyses that are reported in this AMP utilizes a combination of 2023, 2024, and 2025 asset and financially based data sources. As a result, any planned renewal work that the City undertakes in 2025 is not reflected in the outputs of this AMP.

6 Levels of Service

The following section describes the City's approach to monitoring and reporting on levels of service. The purpose of the LoS framework is to provide each service area with a set of performance measures that can be used to monitor asset performance and service delivery using measures that are relevant to each service area and will assist the City in determining if current LoS are adequate, and in the next iteration of the AMP, what proposed LoS should be. The City's initial work in developing LoS has resulted in the development of an LoS framework and a series of preliminary measures. A preliminary suite of measures has been reported in this AMP, however, the City expects to build these out and enhance them as it continues to mature its asset management practice.

Customer Research and Expectations

Subject matter experts and other stakeholders were engaged to introduce the concept of LoS and present a proposed framework, as well as a series of measures that will be used to monitor service delivery across asset classes. These experts provided context regarding customer needs relevant to the service areas. The initial suite of performance measures, as well as additional measures that are under consideration (but are not yet reported in the City's AMP) have been designed to align to customer expectations.

Strategic and Corporate Goals

The LoS framework and performance measures were developed in alignment with the City's strategic and corporate mission, vision, and goals. The City's 2020-2026 Strategic Plan focuses on four goals:

- Goal 1 – Exceptional Services by Exceptional People
- Goal 2 – Engaged, Diverse, Thriving & Vibrant City
- Goal 3 – Safe, Sustainable & Complete Community
- Goal 4 – Stewardship of Money & Resources

Mission

Working with the community to provide high-quality municipal services that meet, if not exceed, the expectations of residents and businesses.

Vision

Markham, the leading Canadian municipality - embracing technological innovation, celebrating diversity, characterized by vibrant and healthy communities - preserving the past and building for the future.

Values

- Cooperation and teamwork
- Focus on continuous improvement
- Respect for the individual
- Process-driven and prevention-based strategic planning
- Primary focus on the customer
- Responsibility to society
- Leadership through involvement
- Factual approach to decision-making
- People encouraged to make a contribution

Customer Values

Service levels are defined in three ways, customer values, customer levels of service and technical levels of service. Customer Values indicate:

- What aspects of the service are important to the customer;
- Whether customers see value in what is currently provided; and,
- The likely trend over time based on the current budget provision.

The City's customers refer to anybody who is using the service, including internal and external customers. Several common themes for Customer Values were identified across service areas and are documented in the table below.

Table 6-1: Common themes for customer values and applicable services.

Customer Value Theme	Applicable Services
Service assets are safe and reliable to use	All service areas (including Arts and Culture, Fire and Emergency Services, General Support Services, Library, Parks, Potable water, Recreation, Solid Waste Management, Stormwater Management, Transportation, Wastewater Collection).
Service assets are convenient to use	All service areas.
Aesthetic Quality	• Arts and Culture • Fire and Emergency Services • General Support Services • Library • Parks • Recreation • Transportation
Environmentally sustainable	All service areas.

Customer and Community Levels of Service

Customer and Community LoS have been developed to report on several key aspects of service delivery. These aspects include condition, function, capacity, and accessibility.

- **Condition:** How good is the service? What is the condition or quality of the service?
- **Function:** Is it suitable for its intended purpose? Is it the right service?
- **Capacity or Use:** Is the service over or under-utilized? Do we need more or less of the assets that make the service possible?
- **Accessibility:** Is the service convenient and/or available to use? Is the service easy to use?

Technical Levels of Service

Technical Levels of Service are required to deliver the customer values, impact the achieved Customer Levels of Service, and are operational or technical measures of performance. These technical measures relate to the activities and allocation of resources to best achieve the desired customer outcomes and demonstrate effective performance.

Technical Levels of Service can also be referred to as dials or levers that when increased or decreased, should improve or reduce the state of overall asset performance documented within the Customer/ community Levels of Service section.

Technical service measures are linked to the activities carried out over the asset lifecycle and include the following:

- **Acquisition** – the activities to provide a higher level of service (e.g. widening a road, paving a gravel road, replacing a pipe with a larger size) or a new service that did not exist previously (e.g. a new library).
- **Operation** – the regular activities to provide services (e.g. opening hours, cleaning, mowing grass, energy, inspections, etc.).
- **Maintenance** – the activities necessary to retain an asset as near as practicable to an appropriate service condition. Maintenance activities enable an asset to provide service for its planned life (e.g. road patching, gravel road grading, building and structure repairs).
- **Renewal** – the activities that return the service capability of an asset up to that which it had originally provided (e.g. road resurfacing and reconstruction, pipe replacement and building component replacement).

- **Disposal** – the activities that are required when it is removed from service (e.g. decommissioning of a well, demolition of a building, ongoing testing and monitoring of a decommissioned waste landfill site, etc.).
- **Service Improvement** – activities to improve or upgrade services to meet changing business drivers, such as a change in community needs or regulatory requirements (ex. upgrading assets to meet Accessibility for Ontarians with Disabilities Act (AODA) requirements, converting to green fleet, etc.)
- **Non-Infrastructure** – actions or policies that can lower costs, reduce risk of asset or service delivery failure, or extend asset life (ex. reducing water demand, reducing traffic on roads, etc.).

In compliance with Ontario Regulation 588/17, this AMP also reports on the City's proposed levels of service (PLoS) and consists of the cost to maintain current service and performance levels, an assessment of the Impact of Growth for all service areas and specifically establishing a target PLoS for road pavement management. The PLoS for each service area is documented in **Appendix A** to **Appendix K.** PLoS have been established in the technical LoS tables as well as in the lifecycle forecasting to determine the levels of funding required for the City to achieve these PLoS.

7 Risk Management Strategy

As part of the development of this AMP, the City developed a risk management strategy to assess the risk of each asset by evaluating its likelihood of failure (LOF) and consequence of failure (COF). The risk analysis will help the City assess and compare the risk assessment commonly across all services and can be incorporated into future operation, maintenance, and capital strategies.

LOF represents the probability (or likelihood) that an asset will fail, relative to a specific failure event. For the purposes of this AMP, LOF represents a failure of an asset due to its performance rating and therefore the LOF framework directly relates to the asset's physical condition or age. Simply put, it is assumed that an asset with poorer performance rating is more likely to fail than an asset with a better performance rating. The LOF framework is defined in the following table.

Table 7-1: Likelihood of failure framework.

Age-Based	Assessed Condition	Likelihood of Failure Rating	Description
Beginning of Life	Very Good	1	Failure Almost Impossible
Early Life	Good	2	Failure Unlikely
Mid-life	Fair	3	Failure Possible
Past Mid-life	Poor	4	Failure Likely
Approaching or at end of life	Very Poor	5	Failure Imminent/Failed

COF of an asset is assessed using a "triple bottom line" analysis to evaluate consequence of failure based on the three following characteristics of risk:

- **Financial–** the direct costs (such as costs associated with replacing failed assets) and indirect costs (such as loss of revenue) of the failure that are borne by the City.
- **Socio-Economic–** the impacts to the community.
- **Environmental–** the impacts to the natural environment or the environmental objectives of the City.

These consequence of failure categories are intended to capture the range of considerations that account for the consequence of an asset failing and in turn affecting the intended service level.

COF ratings were developed for each category on a 5-point scale with one (1) being minimal, and five (5) being extreme. This assessment was completed for individual

assets throughout the City and paired to the asset data. Table 7-2 below illustrates the City's COF framework, which details the definitions for assigning COF Ratings for each category.

Table 7-2: Consequence of failure framework.

Rating	Direct Financial	Environmental	Socio-Economic
5 – Extreme	Cost to City: > $5M	Irreparable damage	• Death • Severe impact to critical customers • Public inquiry/inquest • Severe negative impact on city reputation, international media coverage • 3-month disruption to local businesses or transportation routes • More than 2,000 people/businesses affected
4 – Major	Cost to City: $500k - $5M	Some permanent damage, Major and extensive clean-up efforts required	• Serious injuries • Major impact to critical customers • Criminal charges or public trial • Major negative impact on city reputation, national media coverage • 1-to-3-month disruption to local businesses or transportation routes • 500 to 2,000 people/businesses affected
3 – Moderate	Cost to City: $50k - $500k	Important non-permanent damage, Important clean-up efforts required	• Moderate injuries • Moderate impact to critical customers • Continuous litigation • Moderate negative impact on city reputation, important local media coverage • 1-to-4-week disruption to local businesses or transportation routes • 100 to 500 people/businesses affected
2 – Minor	Cost to City: $5k – $50k	Minor non-permanent damage, Minor clean-up effort required	• Minor injuries • Minor impact to critical customers • Potential lawsuits • Minor negative impact on city reputation, some media coverage • 1-to-7-day disruption to local businesses or transportation routes • 10 to 100 people/businesses affected
1 – Minimal	Cost to City: < $5k	Trivial, No remedial action required	• No injuries • Minimal impact to critical customers • Routine claims • Minimal negative impact on city reputation, minimal media coverage • < 1 day disruption to local businesses or transportation routes • Less than 10 people/businesses affected

For each major asset grouping, one or many criteria for assessing COF was used to determine the appropriate COF ratings to align with the definitions laid out in the COF framework in Table 7-2. At least one criterion was selected for each of the three major COF categories (Direct Financial, Socio-Economic, and Environmental). Figure 7-1 below demonstrates the procedure taken to calculate an asset grouping's COF rating.

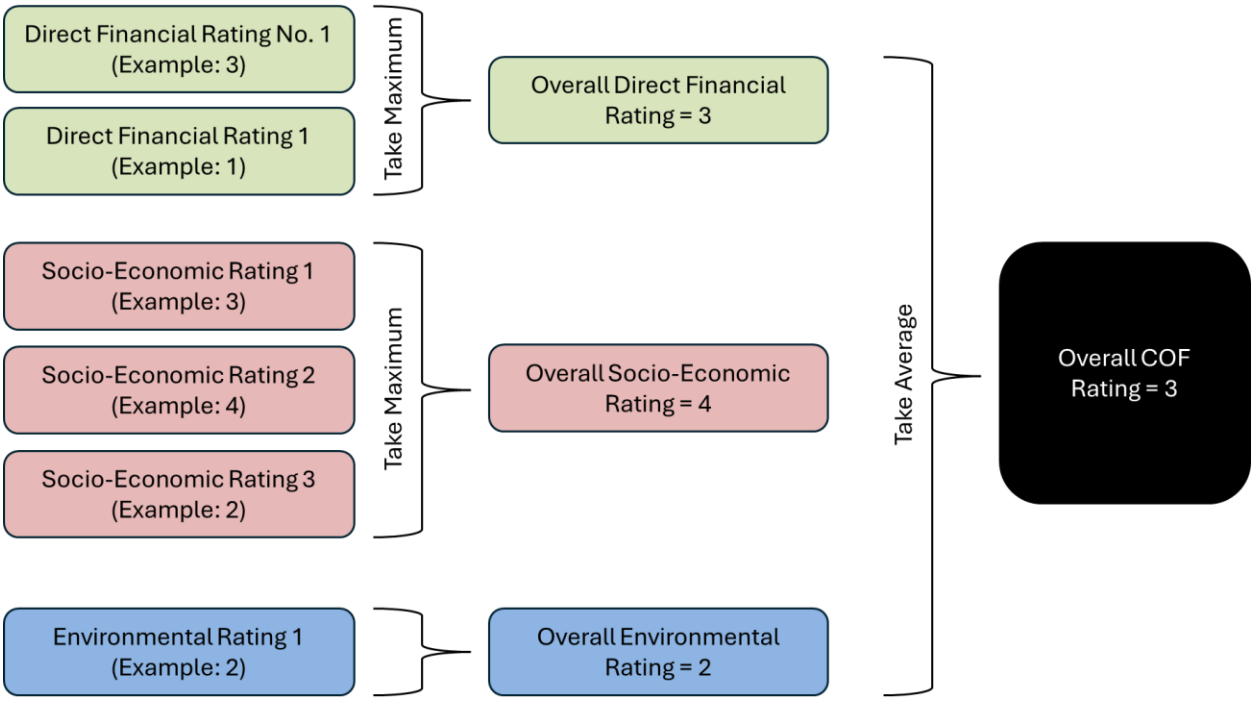

Figure 7-1: COF rating calculation methodology.

Individual COF models were developed for each in scope asset class. The criteria used to evaluate COF are summarized in tables for each asset class. Within each COF category of Direct Financial, Socio-Economic and Environmental, there are several different criteria that can be evaluated for an asset class.

For Direct Financial, the main criterion is Replacement cost. As asset failure will result in capital expenditures for emergency repairs and asset replacement, the rating for this criterion will increase as replacement cost is greater. Another criterion used in this category was also Revenue Loss. Assets that generate revenue and go offline will cost the City money in lost revenue, and therefore, add to the City's COF. These criteria are applicable to all assets.

For Socio-Economic, the criteria used to evaluate COF are Land Use, Asset Type, Asset Size, and Road Class. Generally, these criteria pertain to the number of people they service, and the more users an asset has, the higher the COF rating will be. It is also important to note an asset and the land it is situated on or nearby. If an asset is

closer to open/unused land, the COF rating will be lower as opposed to it being closer to institutional land (e.g. a hospital) and or railway tracks, its failure will affect a greater and more at-risk population.

For Environmental, the criteria used to evaluate COF are Proximity to environmentally sensitive areas (ESA), Public Recreational Area, Watercourse, or Habitat.

Once LOF and COF were determined, the Risk Rating was calculated by using the following equation:

$$Risk\ Rating = LOF\ Rating \times COF\ Rating$$

Equation 1: Risk rating formula.

Both LOF and COF ratings range from 1 to 5, yielding a Risk rating between 1 and 25. Three categories of Low, Medium and High are associated with these scores and are illustrated in Table 7-3 and Table 7-4 below.

Table 7-3: Risk score matrix.

	COF 1	COF 2	COF 3	COF 4	COF 5	Subtotal
LOF 1	$55,363,970 (0.3%)	$2,440,088,836 (13.9%)	$2,913,006,738 (16.6%)	$164,364,658 (0.9%)	None	**$5,572,824,202 (31.8%)**
LOF 2	$123,915,863 (0.7%)	$2,632,937,739 (15.0%)	$3,478,430,609 (19.9%)	$266,615,694 (1.5%)	None	**$6,501,899,906 (37.1%)**
LOF 3	$103,379,801 (0.6%)	$1,651,302,401 (9.4%)	$1,793,921,239 (10.2%)	$63,638,391 (0.4%)	$2,831,182 (<0.1%)	**$3,615,073,015 (20.7%)**
LOF 4	$59,857,828 (0.3%)	$815,323,358 (4.7%)	$546,272,762 (3.1%)	$10,725,619 (0.1%)	None	**$1,432,179,566 (8.2%)**
LOF 5	$64,437,213 (0.4%)	$203,325,971 (1.2%)	$110,074,092 (0.6%)	$4,603,993 (<0.1%)	None	**$382,441,270 (2.2%)**
Subtotal	**$406,954,675 (2.3%)**	**$7,742,978,305 (44.2%)**	**$8,841,705,441 (50.5%)**	**$509,948,355 (2.9%)**	**$2,831,182 (<0.1%)**	**$17,504,417,959 (100.0%)**

Table 7-4: Risk score mapping legend.

Legend		
Very Low	1 – 5	Fit for the Future
Low	6 – 10	Adequate for Now
Moderate	11 – 15	Requires Attention
High	16 – 20	At Risk
Very High	21 – 25	Unfit for Sustained Service

The risk matrix illustrated above indicates the following:

- **48.9% or $8.6B** of all assets assessed as **Very Low risk or fit for future use**
- **46.9% or $8.2B** of all assets assessed as **Low risk or adequate for now**
- **4.1% or $722.8M** of all assets assessed as **Moderate risk or may require attention**
- **0.1% or $15.3M** of all assets assessed as **High risk or at risk or requires attention**
- **No assets** are assessed as **Very High risk or unfit for sustained service**

COF and Risk Ratings can provide additional functions when completing evaluations at the asset level. They can be used to assign different Technical Levels of Service thresholds, by managing assets with higher COF scores at higher target performance states. For instance, a critical asset may be replaced at an earlier time than a non-critical asset of the same type, due to a higher consequence of failure. On the other hand, assets with lower COF and Risk Ratings may be allowed to reach lower target performance states.

Another important use for these ratings is to assist the City with its selection of capital projects. When completing an annual capital planning exercise, Markham can incorporate risk ratings developed through these strategies to understand how much risk will be reduced for each planned project. Therefore, utilizing these strategies as a tool to help prioritize projects or determine tiebreakers when analyzing capital projects for inclusion of the forthcoming capital plan.

As the City matures its asset management practice, further consideration can be given to using the cost of treatment and risk-reduction combined to determine an incremental cost-benefit ratio as a means to rank assets from those with the greatest return on investment through to those with the least return on investment.

It should be noted that since likelihood of failure is tied to asset performance, it is expected to change as asset performance changes over time. As a result, risks may vary. Assets that are renewed or maintained may experience a reduction in risk, whereas those that age may experience an increase in risk. The City responds to these changes through regular activities that they employ to manage assets such as operation, maintenance and renewal programs.

8 Lifecycle Management Strategies

The City's lifecycle management strategy is a set of planned actions and activities performed on its assets over their service lives to provide LoS in a sustainable way, manage the risk of failures and manage lifecycle costs. These activities include acquisition of assets and service improvements, operations and maintenance, major asset renewals (including rehabilitations and replacements), and disposals. Lifecycle activities work together to extend asset life, reduce overall costs, minimize risk, and can help achieve strategic, social, environmental, and fiscal goals. Documentation on the planned lifecycle activities for each asset is provided as part of the City's technical levels of service framework. These Technical Levels of service detail the activities that the City undertakes to ensure that its assets are providing services at target levels.

A series of lifecycle modelling logic was also developed as part of a computational forecasting tool used to project asset needs forward over the planning horizon of 2026 through to 2051 (26 years) based on their intended and expected behaviours over the course of their service lives. Using these models, forecasting can be completed to understand the relationship between financial investment levels and anticipated resulting performance (maintaining assets in a state of good repair) and the reduction of risk.

9 Financial Strategy

This section presents the City's projected funding levels, as identified in the Lifecycle Reserve Study, alongside the funding required to maintain current service levels and the additional funding needed to achieve the proposed levels of service based on planned lifecycle activities. Establishing funding needs for each service area will help the City sustain healthy reserve balances, secure the necessary staffing resources to keep assets in a state of good repair, support the development of new infrastructure, and guide the annual capital budgeting process.

Markham takes pride in its overall Financial Strategy that has resulted in one of the lowest tax rates in the Greater Toronto Area, while being virtually debt-free. A major component of the broader financial strategy is how the City manages planning and allocating financial resources to manage its assets at set service levels.

The Asset Management Plan (AMP) is required to maintain the City's compliance with Ontario regulation 588/17 and is meant to guide Markham's ongoing success in asset management through its execution of the annual budget process and Life Cycle Reserve updates over the past 20+ years. Keeping assets in a state of good repair, while being cognizant of the total cost of ownership, is of tantamount importance to Markham. "Value for Money" is a key tenet of planning and decision-making over the four major components of asset ownership:

1) Planning and Acquisition
2) Operating and Maintenance
3) Repair, Rehabilitation, and Replacement
4) Disposal and ongoing liabilities

9.1 Acquisition of New Assets

Municipalities acquire new assets mainly through purchasing, construction, or assumption. Assumption of assets occurs through the development process where developers build infrastructure for their developments and then transfer ownership to the City after a defined period of time. If the City is purchasing or constructing an asset, the City has to identify a funding source, often through the annual budget process. While there are numerous funding sources for new assets, such as taxes, Community Benefits Charges, grants, and various reserves, the main funding source for new assets is Development Charges. Markham operates on the principle that growth should pay for growth.

Development Charges

Development Charges (DCs) are fees levied by municipalities on new residential and non-residential developments to help pay for the infrastructure needed to support growth. DCs are intended to ensure that new development contributes to the cost of municipal services, like roads, water, and community centres, that are required to support the new growth.

To set the DC rates, a municipality must undertake a Development Charges Background Study, and update their associated by-laws, at a minimum of every ten years. A Background Study outlines the growth-related capital program for eligible infrastructure, through the planning horizon chosen by the municipality. Markham's current DC Background study and by-laws have a planning horizon through to 2031 and was endorsed by Council in 2022.

The growth-related assets that Markham funds through DCs include:

- water supply services, including distribution and treatment services
- wastewater services, including sewers and treatment services
- storm water drainage and control services
- services related to a highway as defined in subsection 1 (1) of the *Municipal Act, 2001*
- waste diversion services
- fire protection services
- services provided by a board under the *Public Libraries Act*
- parks and recreation services, but not the acquisition of land for parks

It is a requirement that when Council approves a DC Background study that they are "in principle" endorsing the capital program contained within. However, the actual approval to implement these projects is subject to the annual budget process. This is important as the actual growth patterns and changing priorities often differ from projections and capital programs and need to be adjusted to account for this, as well as any changes to legislation.

Staff note that the timelines identified in the current Development Charges Background Study and by-law are not in alignment with the Region's Official Plan, and by extension, the City's current growth targets, of which are to be integrated within the proposed update to the City's Official Plan.

9.2 Operating Costs

Once a new asset is in place, the next step is to provision for the operating costs. The operating budget requirements provisioned for each year encompass staffing resources, 3rd party service contracts and contract escalations, and related supports for new growth. Markham utilizes specific methodologies to incorporate the incremental budget impacts each year which are primarily funded through property tax levies. Below are just a couple of examples of how the City addresses the operating costs of its assets.

9.2.1 Parks

Each year, Urban Design provides a forecast of the new parks coming into service in the following year(s) along with the size of each park. In prior years, a unit cost was then applied to the new hectares of parks in any given year. This unit cost was derived by dividing the current Parks operating budget (personnel, non-personnel & revenue) less the budget relating to storm water management ponds and natural areas, by the total number of hectares of parks across the City. This figure, although not 100% accurate, was an indicator of the required maintenance cost per new hectare of parks and was added to the Parks operating budget for the forthcoming year.

Staff have taken the recommendation from a recent external audit of the Cornell Community Park project, and where appropriate, will be adopting an amenity-based costing model to calculate the growth costs effective for the future budgets. The amenity-based model is meant to more accurately reflect the changing landscape of the City's parks growth in recent years, whereby more concentrated amenities within less hectares of land are the result of development trends towards condominium builds in the face of limited developable land. The amenity-based model provides a more accurate figure required for future on-going maintenance as it is based on the actual assets contained within each park. In addition, the model is updated annually to reflect updated pricing for asset maintenance and other related parks expenditures.

9.2.2 Roads, Sidewalks, and Trails

On an annual basis, the unit cost to maintain one lane kilometre of the City's road network (including winter maintenance) is calculated by dividing the Roads operating budget (personnel, non-personnel & revenue; excluding winter maintenance) by the total number of lane kilometres of the City's road network and adjusted for cost escalations. As new lane kilometres of roads are added, the operating budget is incrementally increased based on the calculated unit cost. Additional vehicles are purchased, or added to the City's contracts with external vendors, when required to address the operating requirements for roads.

A similar approach is taken for the City's sidewalk and trail inventory.

9.3 Repair, Rehabilitation, and Replacement

Markham manages the repair, rehabilitation, and replacement of assets through its Life Cycle (LC) Reserve Strategy and associated reserve that was first adopted by Council in 2004. The Life Cycle Strategy is a critical component of how the City manages and funds its asset renewals to maintain service levels. Keeping assets in a state of good repair has always been important to Markham, and the need to fully understand what this entailed was the driving force behind the establishment of this strategy. After examining several options for a Life Cycle strategy, Council approved a rolling 25-year funding model. Essentially, the model is updated on an annual basis to ensure the City has the proper funding to address the next 25 years of repair, rehabilitation, and replacement costs, and can be expressed by the following formula:

[Starting LC Reserve Balance + inflows over 25 years = outflows over 25 years]

This proactive approach ensures that the City has at least 25 years to fund any single asset replacement and smooths out year to year fluctuations in inflows and outflows, while having the added benefit of better allocating the financial responsibility between current and future taxpayers.

At the beginning of each Council term, a forecast is undertaken to determine the projected funding requirements over the upcoming four years in order to smooth out any budget impacts. Then in the subsequent years, the model is adjusted to account for changes in assumptions and actual experience.

Each year, departments are engaged in updating the City's known asset inventory information (price and useful life), using a combination of the following methodologies:

- Historical trending
- 3-year average price
- Most recent awarded price or vendor quote
- Industry standard pricing and useful life
- Condition assessment

These annual inventory updates are submitted to Finance in Q1/Q2 to analyze, and the information is used to update the Life Cycle model's outflow projections, as well as form the current year's Capital Budget for Life Cycle funded projects.

When the Life Cycle study is updated, there is usually a funding shortfall, or adjustment that would need to be addressed as part of the annual budget / financial planning process. This funding discrepancy is due to:

- Inflation
- Past Growth
- New Assets

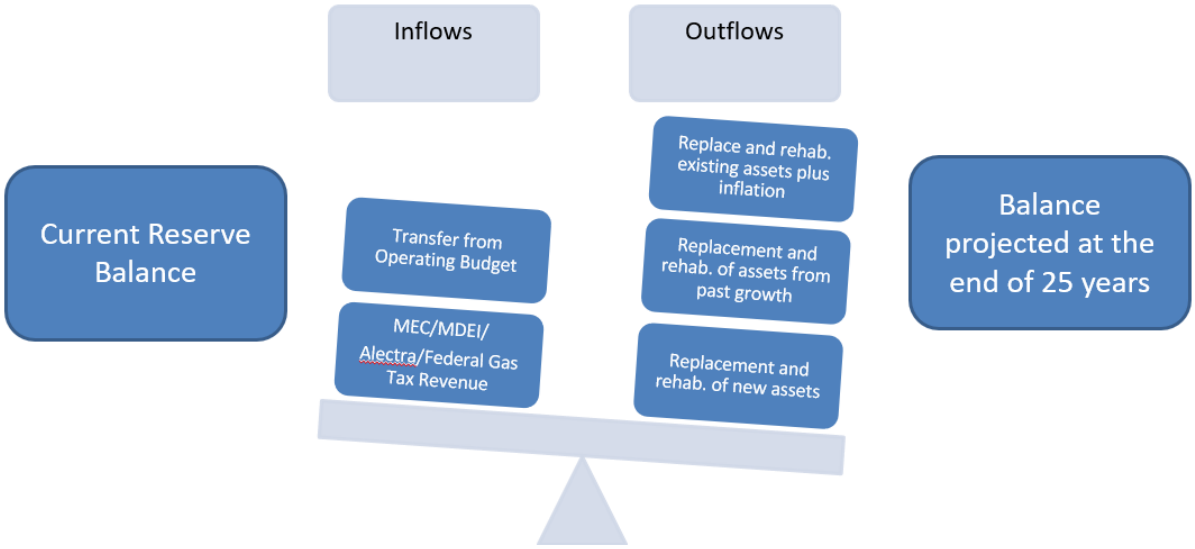

Figure 9-1: Balance of inflows and outflows projected at the end of 25 years.

If there is a shortfall (i.e. the projected balance of the reserve at the end of year 25 is negative), staff identify potential cost savings or incremental revenue tools to get the Year 25 balance to $0.

The City has a diversified set of funding sources for the Life Cycle Reserve, such as:

- Annual transfer from the operating budget (mainly through property taxes)
- Annual Council adopted incremental infrastructure investment
- Federal and Provincial grants, including Canada Community-Building Fund
- Investment Income and Dividends from the City's interests in Markham Enterprises Corporation (full owner of Markham District Energy and part owner of Alectra)
- City's share of the Municipal Accommodation Tax
- Various lease revenues on City-owned property
- Unspent funds from closed capital projects and year-end surplus as per the City's Financial Planning and Budgeting policy
- Interest earned on the Reserve balance

Markham's asset base is continuously growing due to new assets being built as well as new assets being assumed from developers. Therefore, the inflows into the Life Cycle Reserve need to continuously grow as well. However, most of the growing inflows are allocated to funding existing asset renewal needs over the 25-year planning period and are already included in the model.

The main methodology to address new assets being added to the Life Cycle is a tax-funded infrastructure investment which is ramping up to an incremental 1% each year

by 2027. The 2025 budget included a 0.8% infrastructure investment, which is equivalent to approximately $1.5M/year. This becomes part of the City's base budget so the $1.5M/year (x 25 years) gets added to the model to help pay for any work that needs to be done on those new assets over the next 25 years. Based on the current plan the proposed 2026 Budget will include an incremental 0.9% infrastructure investment, and the 2027 Budget, and every subsequent budget, is expected to include, at a minimum, an incremental 1% infrastructure investment in perpetuity. The infrastructure investment will be reviewed each year as part of the Life Cycle Reserve Study update and may need to be increased in future years.

9.3.1 Future Life Cycle Reserve Study Updates

In alignment with the City's 2020-2026 Strategic Plan goals, and in conjunction with the next Council term (2027-2030), the City will continue to recalibrate lifecycle requirements as part of the annual Reserve Study update.

Along with regular Life Cycle updates related to pricing, volume and newly assumed assets, Departments will refine their Life Cycle submissions to reflect the City's approved levels of service. In the immediate term (2026), this work will include:

- Incorporation of past growth for road and pavement lane kilometre inventory
- Cost update to annual asphalt program to achieve a minimum target of 70% of the City's road network to be in a "good" or better state of performance, and subject to funding and resource availability, work towards an aspirational target of 75% of the City's road network to be in a "good" or better state of performance
- Addition of, or reasonable placeholders for known missed assets (ie. exterior assets, backlogged streetlight poles and their modernization LED technology)
- Adjustment of annual program budgets to reflect current levels of service

The outcome of the refinement work will be included in the projected outflows to the Life Cycle Reserve model, and any shortfalls will be addressed as part of the City's Financial Strategy and future budgets.

As referenced in this document, levers to balance outflow pressures can include increasing the Life Cycle contribution from operating budget, increasing the annual incremental infrastructure investment, reprioritizing the capital plan, incorporating the risk management strategy into operation, maintenance and capital strategies to reduce outflows and exploring additional revenues such as applying for grants and reviewing the Stormwater fee to increase inflows.

9.3.2 Water & Wastewater Assets

In 2002, the Province introduced the *Safe Drinking Water Act Ontario* that sought to ensure that all households receive clean drinking water, free from contaminants. The

Act establishes a licensing regime for municipal drinking water systems under its Licensing of Municipal Drinking Water Systems Regulation (O. Reg. 188/07), along with a Financial Plans Regulation (O. Reg. 453/07), that requires financial plans from municipal drinking water systems in order to obtain the necessary licenses.

A component of the Act is that water & wastewater revenues can only be used to fund water & wastewater costs. As such, the City of Markham implemented a similar 25-year Life Cycle strategy for water & wastewater assets prior to 2004.

Similar to the City's main Life Cycle Reserve Study, the Waterworks Reserve Study is updated annually to determine the required increase in the annual water rate charged on a per cubic metre of consumption.

As part of the annual Waterworks Reserve Study, the water rate is calibrated to raise sufficient revenues for the following main expenditures:

1. Cost to purchase water from the Region for both City residents and businesses
2. Operating Costs – the on-going maintenance costs related to the City's water & wastewater infrastructure, including personnel costs
3. Capital Investment – rehabilitation and replacement of existing water & wastewater assets

9.4 Forecasted Operating and Capital Budgets

By analyzing the City's 2025 budget, it was determined how much funding the City has and anticipates to allocate towards each respective lifecycle activity and service area.

The City categorizes their budget into the following groups:

- **Operating budget**: This supports the day-to-day activities and functions to provide City Services. Operating expenses include equipment maintenance, materials supply, facilities services, and contributions to reserves; all of which are expensed in the current fiscal year.
- **Capital budget**: This includes a comprehensive financial plan that addresses the financial requirements needed for growth, major rehabilitations, and major replacements of existing infrastructure.

The expenditures from the budget data were projected forward and compared with forecasted financial lifecycle needs which were developed from the City's lifecycle models. The forecasts cover projections from 2026 through to 2051 (26 years), and in alignment with the City's Official Plan. All forecasted results are reported in present day dollars. It should be noted that with inflation and economic pressures, these costs are anticipated to rise.

To provide a forecast of required operating and capital needs, an analysis was used that incorporates the results of the City's lifecycle forecasts and other forecasts to understand future projections. To forecast the operating budget, the City's 2025 operating budget of $495.8M was applied to the entire 26-year forecast.

To forecast the capital budget, renewals anticipated were obtained from the City's LCRS. For other lifecycle activities (including non-infrastructure solutions, service improvements, etc.) forecasts were developed by looking at the City's 2025 line-item budget to determine recent spending amounts. These amounts were carried forward using the assumption that spending will be the same in these categories if service levels are maintained moving forward.

The following table summarizes the forecasted capital and operating expenditures, based on required asset replacements, rehabilitations, and operations and maintenance activities for the City to continue meeting current service levels (acquisition expenditures are not included). Note that natural assets are not included in Table 9-1 since forecasting for these assets was completed separately in the City's Natural Assets AMP and have not yet been considered nor deliberated to any degree, and of which may be addressed incrementally through future updates to either the Natural Assets AMP or this AMP.

Table 9-1: Forecasted capital expenditures (Life Cycle Reserve Study and capital budget) and operating expenditures.

Year	Renewal (LCRS) and Non-Renewal (Capital Budget)	Operating Budget	Total Expenditures
2026	$123.3M	$495.8M	$619.1M
2027	$106.9M	$495.8M	$602.7M
2028	$76.7M	$495.8M	$572.5M
2029	$95.2M	$495.8M	$591.0M
2030	$106.1M	$495.8M	$601.9M
2031	$75.3M	$495.8M	$571.1M
2032	$84.3M	$495.8M	$580.1M
2033	$96.8M	$495.8M	$592.6M
2034	$76.9M	$495.8M	$572.7M
2035	$91.1M	$495.8M	$586.9M
2036	$80.1M	$495.8M	$575.9M
2037	$84.5M	$495.8M	$580.3M
2038	$83.5M	$495.8M	$579.3M
2039	$87.7M	$495.8M	$583.5M
2040	$91.7M	$495.8M	$587.5M
2041	$73.7M	$495.8M	$569.5M
2042	$89.7M	$495.8M	$585.5M

Year	Renewal (LCRS) and Non-Renewal (Capital Budget)	Operating Budget	Total Expenditures
2043	$83.0M	$495.8M	$578.8M
2044	$89.9M	$495.8M	$585.7M
2045	$87.6M	$495.8M	$583.4M
2046	$80.5M	$495.8M	$576.3M
2047	$88.1M	$495.8M	$583.9M
2048	$79.8M	$495.8M	$575.6M
2049	$70.0M	$495.8M	$565.8M
2050	$88.2M	$495.8M	$584.0M
2051	$73.1M	$495.8M	$568.9M
Total	**$2,263.8M**	**$12,890.8M**	**$15,154.6M**
Equivalent Average Annual	**$87.1M**	**$495.8M**	**$582.9M**

Table 9-2 below shows the annual expenditures from the 2025 capital budget by lifecycle activity. It was assumed that these annual expenditures are sufficient to provide current LoS from 2026 to 2051. These annual expenditures were used to forecast the non-renewal expenditures from 2026 to 2051. Note that acquisitions are not included in this section and are included in Proposed Levels of Service – The Impact of Growth.

Table 9-2: Forecasted capital expenditures (non-renewal costs).

Lifecycle Activity Type	2025 Budget
Non-Infrastructure Solutions (Capital)	$3.8M
Operation (Capital)	$9.0M
Maintenance (Capital)	$4.2M
Service Improvement (Capital)	$10.6M

A summary of the anticipated capital budget (LCRS) is provided in Figure 9-2. The capital budget expenditures were compared to the forecasted capital needs, which is illustrated in Figure 9-2 and Figure 9-3.

The operating and capital budgets (planned funding) are the City's current LoS. Through the development of this AMP, asset performance was forecasted based on the proposed LoS to determine and compare the total lifecycle costs to the City's current LoS. This forecasting is explained further in Section 9.5.

9.5 Lifecycle Forecasting

For this AMP, the required funding levels to achieve proposed LoS (Maintain Current Performance) and accommodate growth were determined. These funding levels were

then compared to the City's current LoS (planned budget) to determine if there is an infrastructure funding gap, and the amount of funding that would be required by the City to accommodate for future population and employment respectively.

The forecasting model is primarily related to capital renewal needs. The City employs two primary renewal strategies: asset replacements, which consider the removal of an existing asset and its replacement with a like asset; and, prominent rehabilitations, which include major retrofits and other significant works that extend asset life.

The following subsections illustrate the City's planned funding levels and funding required to achieve the established proposed LoS.

9.5.1 Current Levels of Service – Planned Funding Levels

The current LoS is the City's planned funding as identified through the City's LCRS for the years 2026 to 2051. The planned funding was evaluated to determine if the City is reinvesting the right amount of money, at the right time, to maintain current performance levels for each service area. For this modelling exercise, the City's LCRS financial forecasts and current operating and capital budgets were used as upset limits or constraints, to model an asset performance forecast over the same planning horizon.

Figure 9-2, illustrates the City's planned funding levels to maintain current service and performance over the planning horizon spanning 2026-2051. The total planned budget is approximately **$15.15B**, or an equivalent average annual expenditure of **$582.9M**. The total operating portion of this budget is approximately **$12.89B**, or an equivalent average annual expenditure of **$495.8M**. The capital portion of this budget is approximately **$2.26B**, or an equivalent average annual expenditure of **$87.1M**, is planned to fund asset renewal, service improvements and other life cycle activities noted in Table 9-2. Of this amount, approximately **$1.55B**, or an equivalent average annual expenditure of **$59.5M** is planned exclusively for asset renewals.

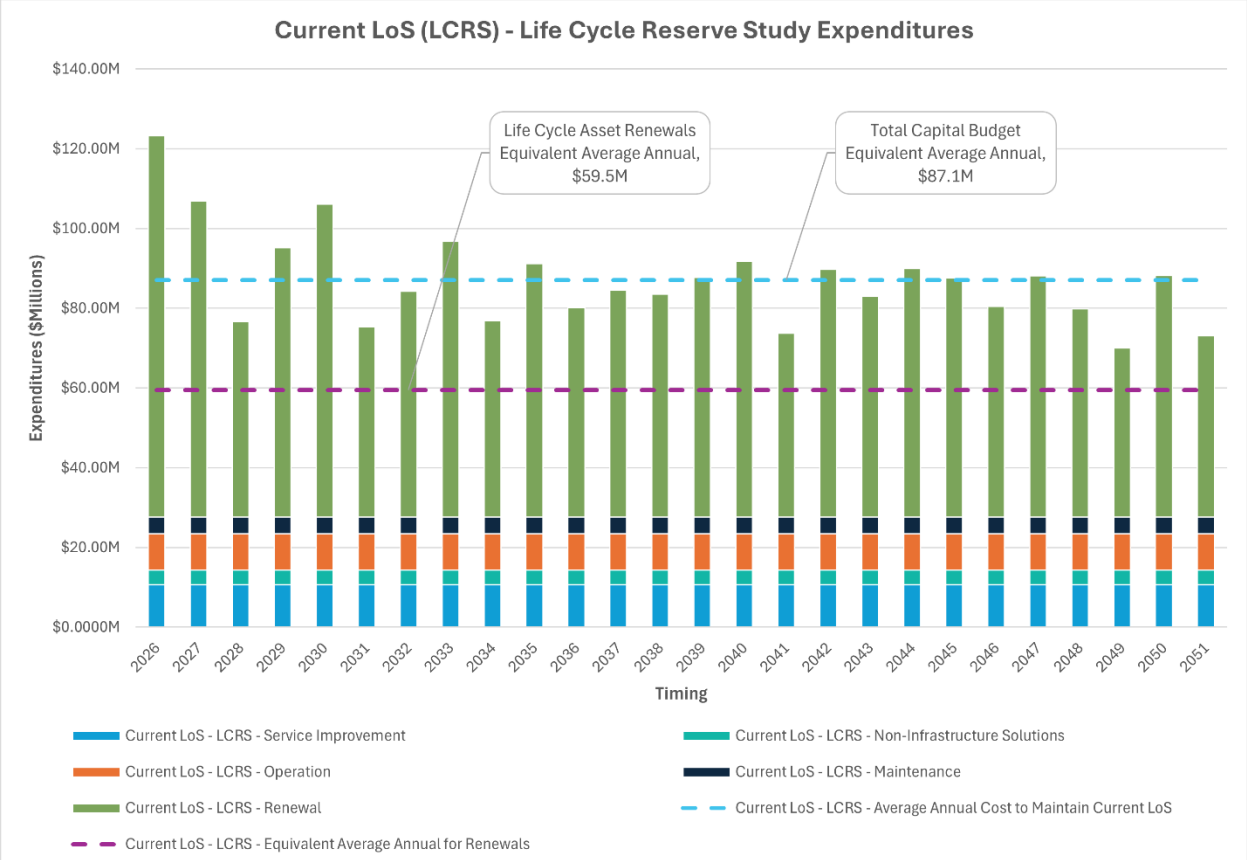

Figure 9-2: Current levels of service – 2024 Life Cycle Reserve Study expenditures.

The results illustrated in Figure 9-3 indicate that the anticipated resulting performance based upon planned renewal funding levels totaling approximately **$1.55B** (excluding inflationary increases) over the planning horizon, may result in a **decline in asset performance**. By 2051, performance may decline to:

- **59.4% or $10.30B** of assets performing as intended
- **40.6% or $7.03B** of assets are subject of planned maintenance or renewal.

This anticipated decline in performance represents **approximately 30.6% or $5.3B** of assets shifting from a Fair or better state of performance to a Poor or Very Poor state of performance, which are unacceptable outcomes for the City. Therefore, an analysis of appropriate funding levels required to maintain current performance levels was developed as an alternative scenario and is discussed further Section 9.5.2.

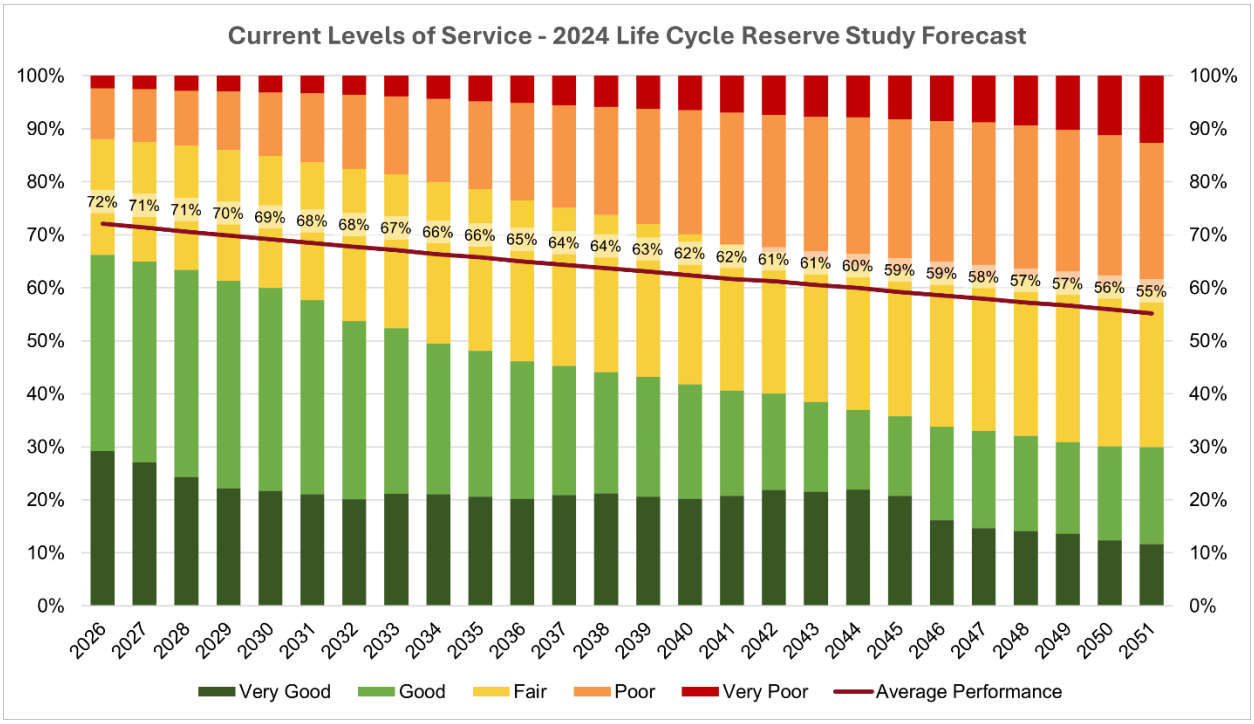

Figure 9-3: Current levels of service – 2024 Life Cycle Reserve Study forecast.

9.5.2 Proposed Levels of Service – Maintain Current Performance

As a part of the City's lifecycle strategy, a series of models were developed to forecast assets needs over a 26-year period (from 2026 to 2051). The lifecycle models in conjunction with the City's LoS and risk management strategies were implemented in the decision support system (DSS) tool. The DSS tool pairs the City's asset inventory and current performance of respective assets with the lifecycle, LoS and risk management strategies logic to analyze the relationship between planned capital investment levels and anticipated resulting asset performance under various scenarios. In this instance, the model was set to determine the funding levels required to sustain current performance levels over the planning horizon.

The road assets replacement value was updated in the 2024 AMP and as a result, the City has conducted an in-depth review of the funding and performance of the asset and determined that there are gaps and opportunities for improvement.

The forecasting was performed using the following parameters:

- For roads assets, the funding required to maintain 70% of roads in good or better condition, adjusted from 85% Pavement Condition Index. See Appendix D for more information.

- For all other assets, needs were determined for assets that are beyond their service life or in a condition state that is considered unfit to provide service. These assets are renewed in the forecast following the lifecycle management strategies detailed in Appendix A to Appendix K.

Figure 9-4 and Figure 9-5 show the annual funding requirements exclusively for renewals and the anticipated resulting performance distribution over a 26-year period to maintain the current performance levels. Note that this forecast does not include natural assets, since forecasting for these assets was completed separately in the City's Natural Assets AMP.

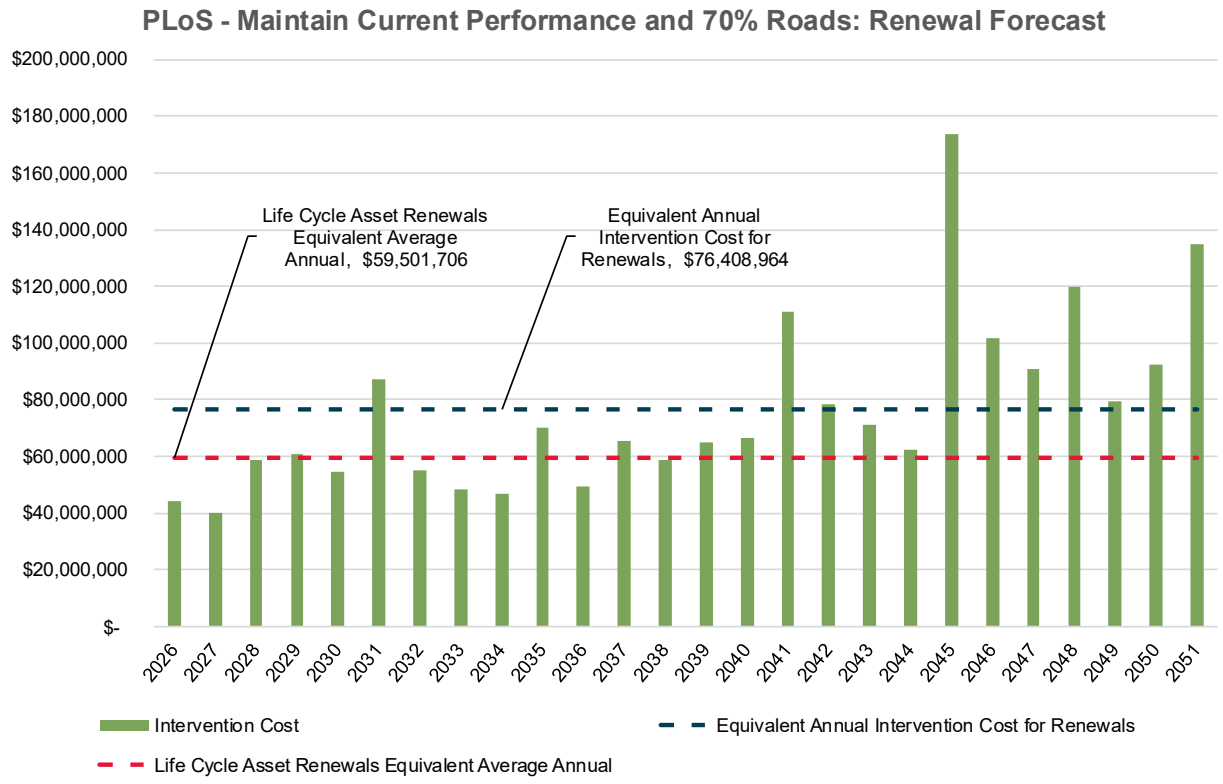

Figure 9-4: Spending forecast (for renewals) to maintain current performance for all City's assets to 2051.

Computational modelling suggests that, exclusively for renewals, an overall increase to forecasted funding levels noted in Section 9.5.1 of **$439.6M** over the planning horizon, or an equivalent annual expenditure of **$16.9M** (0.1% of the total replacement value, excluding natural assets) is required to maintain current asset performance levels through to 2051. Non-renewal-based capital and operating forecasted costs were held to current levels for this analysis. The funding in Figure 9-4 results in the anticipated performance forecast shown in Figure 9-5.

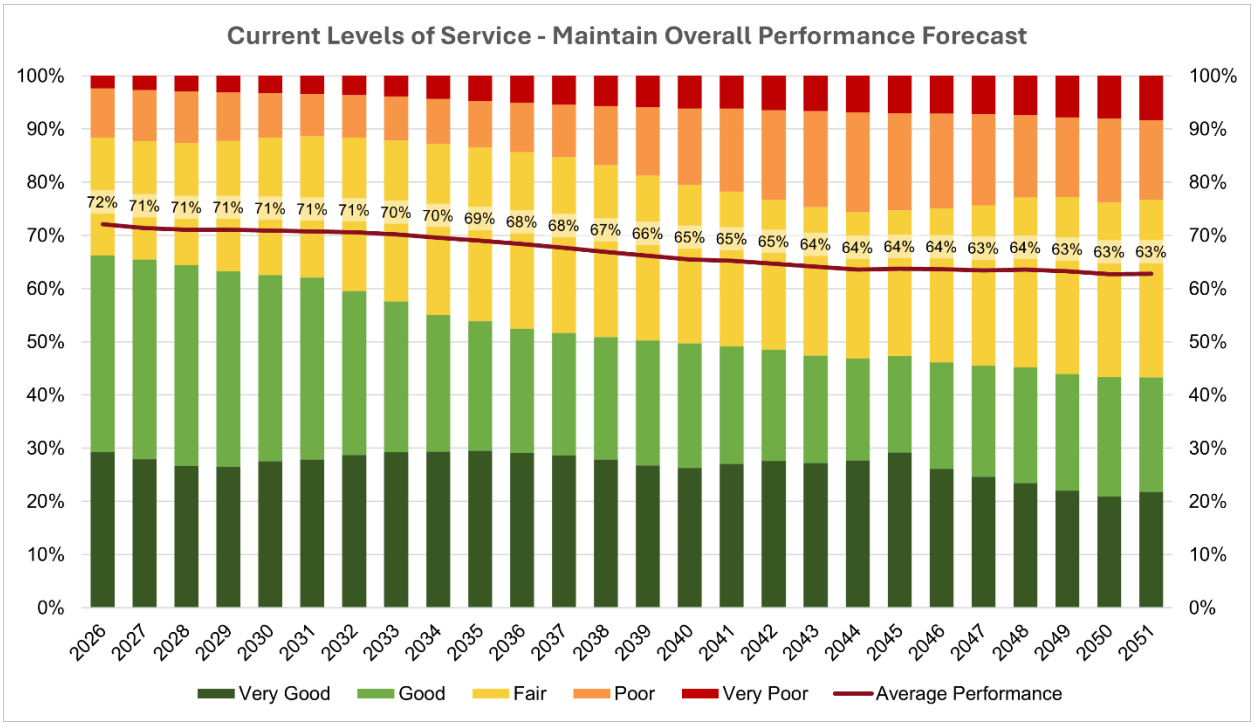

Figure 9-5: Proposed levels of service – maintain overall current performance forecast.

Assuming funding levels are incrementally increased over time to meet these performance level targets, the overall performance forecast shown in Figure 9-5 suggests that by 2051:

- **76.7% or $13.30B** of assets performing as intended
- **23.3% or $4.04B** of assets are subject of planned maintenance or renewal

While these forecasted results are lower than the current state of performance by approximately **13.3%**, the overall performance outlook at 2051 rates the City's assets at the cusp of the Good and Fair categories, of which represent assets that are performing as intended and may require some form of normal attention and/or maintenance.

By adjusting the performance target for roads from 85% PCI to 70% of roads performing in good or better condition, the City will be able to better maintain performance and at a lower annual cost increase.

9.5.3 Proposed Levels of Service – The Impact of Growth

Two (2) growth scenarios were modelled to forecast the level of funding required for additional people resources, acquiring new assets, and maintaining and operating those assets. The two scenarios are:

- **Scenario #1: Official Plan Objectives** – population and employment growth in alignment with the OP.
- **Scenario #2: Realistic Growth** – population and employment growth based on historic actuals and represents achieving approximately 63% of the OP's growth objectives. Scenario 2 was developed to forecast a growth scenario that the City is more likely to achieve as the OP objectives in scenario 1 are considered ambitious.

The following figure illustrates the combined population and employment projections from 2026 to 2051 for both scenarios.

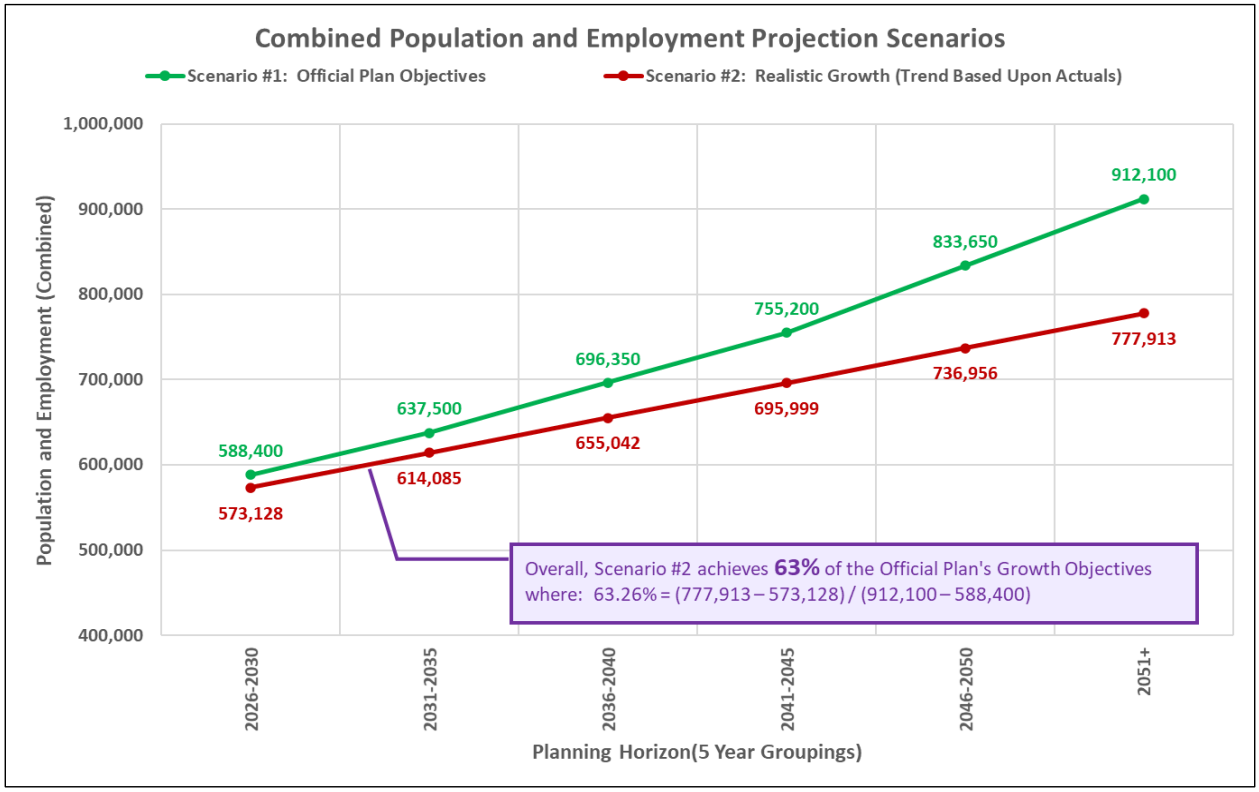

Figure 9-6: Scenario 1 and Scenario 2 combined population and employment projections.

Figure 9-7 and Table 9-3 show the areas and years of anticipated growth. Significant acquisitions are anticipated from 2026-2030, shown in Table 9-4 and Table 9-5.

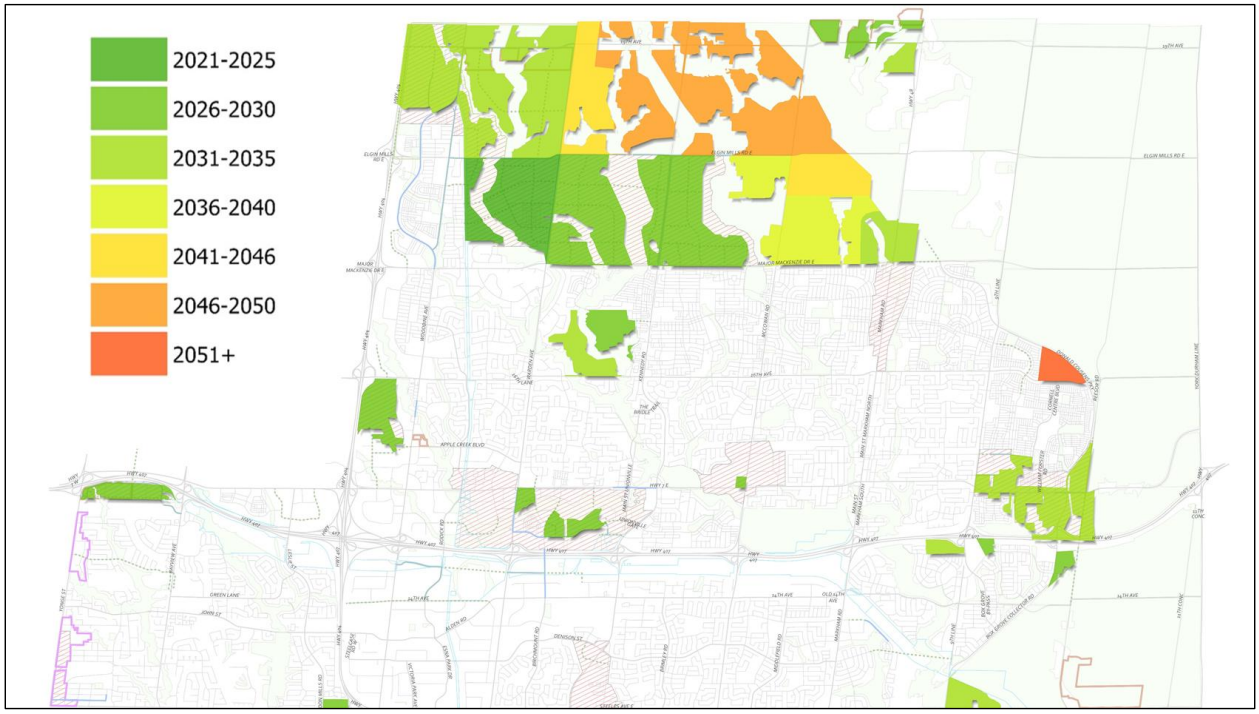

Figure 9-7: Areas of anticipated population and employment growth.

Table 9-3: Official Plan population and employment objectives.

Sum of Area (ha)	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051+
Employment	193,200	208,600	224,000	243,000	262,000	281,850	301,700
Employment Area Subtotal		**83.29**	**529.73**		**143.67**		
2014 OP		83.29	529.73				
NEW OP					143.67		
Population	351,800	383,950	416,100	460,300	504,500	556,500	608,500
Urban Area Subtotal	**214.6**	**682.61**	**336.9**	**257.67**	**106.41**	**539.15**	**34.41**
2014 OP	214.6	631.26	241.93				34.41
NEW OP		51.35	94.97	257.67	106.41	539.15	

The City modelled growth asset acquisition quantities, costs and their timing, following the areas and corridors outlined in Figure 9-7 and the guiding principles and criteria outlined in many of the City's strategies, master plans, planning policies and current engineering design criteria. Contributions to the City's LCRS were determined for assets with an estimated service life of 12 years or less, as any asset with an estimated service

life greater than 12 years would fall outside of this AMP's planning horizon. The growth asset's acquisition cost was used to determine the cost of the contribution. Operating costs were determined by establishing an **Operating Budget to Asset CRV Ratio of 0.0266**, which was developed by using the City's current operating budget compared with the replacement value of assets in service. This ratio was then applied to the value of growth assets starting in their year of anticipated acquisition. All impact of growth costs were compiled into a financial summary.

The following subsections illustrate the impact of growth for Scenario 1 and Scenario 2, which includes the costs to acquire the new assets, renew and operate those assets, and the operating budget.

9.5.3.1 Growth Scenario #1: Official Plan Objectives

For Growth Scenario #1 (OP Objectives), by 2051, and based upon the modelling conducted, the City may acquire approximately **$6.89B** worth of additional assets in order to meet the City's intended growth objectives. For this scenario, the City would be required to fund approximately **$2.69B** in acquisition costs.

To fund these acquisitions and subsequent renewal and operating budget impacts, would require an overall increase to forecasted funding levels noted in Section 9.5.1 of approximately **$3.10B** over the planning horizon, or an equivalent annual expenditure of **$119.29M** to maintain current service and performance levels while accommodating growth objectives through to 2051. Performance modeling was not completed for the growth scenarios. However, performance will be the same or likely better than the proposed level of service scenario as the proportion of new assets increases.

Table 9-4 summarizes the forecasted growth expenditures that may be required to achieve the City's Official Plan growth objectives, as prescribed by the York Region's 2022 Official Plan.

Table 9-4: Forecasted growth expenditures (Scenario 1: Official Plan Objectives).

Year	Acquisition	Renewal	Operating Costs	Total
2026	$297.9M	$0.0M	$14.3M	$312.2M
2027	$297.9M	$0.0M	$14.3M	$312.2M
2028	$297.9M	$0.0M	$14.3M	$312.2M
2029	$297.9M	$0.0M	$14.3M	$312.2M
2030	$297.9M	$0.4M	$14.3M	$312.6M
2031	$63.6M	$0.5M	$6.3M	$70.4M
2032	$63.6M	$1.1M	$6.3M	$71.0M
2033	$63.6M	$3.1M	$6.3M	$73.0M
2034	$63.6M	$4.0M	$6.3M	$73.9M

Year	Acquisition	Renewal	Operating Costs	Total
2035	$63.6M	$5.6M	$6.3M	$75.5M
2036	$48.3M	$5.6M	$4.2M	$58.1M
2037	$48.3M	$5.7M	$4.2M	$58.3M
2038	$48.3M	$3.8M	$4.2M	$56.3M
2039	$48.3M	$4.2M	$4.2M	$56.7M
2040	$48.3M	$4.8M	$4.2M	$57.3M
2041	$20.0M	$4.6M	$2.5M	$27.0M
2042	$20.0M	$8.8M	$2.5M	$31.3M
2043	$20.0M	$14.1M	$2.5M	$36.6M
2044	$20.0M	$14.1M	$2.5M	$36.5M
2045	$20.0M	$14.9M	$2.5M	$37.3M
2046	$101.0M	$24.0M	$8.8M	$133.8M
2047	$101.0M	$21.9M	$8.8M	$131.8M
2048	$101.0M	$23.6M	$8.8M	$133.4M
2049	$101.0M	$23.4M	$8.8M	$133.2M
2050	$101.0M	$25.0M	$8.8M	$134.8M
2051	$32.0M	$19.0M	$2.9M	$53.9M
Total	**$2,686.1M**	**$232.0M**	**$183.6M**	**$3,101.6M**
Equivalent Average Annual	**$103.3M**	**$8.9M**	**$7.1M**	**$119.3M**

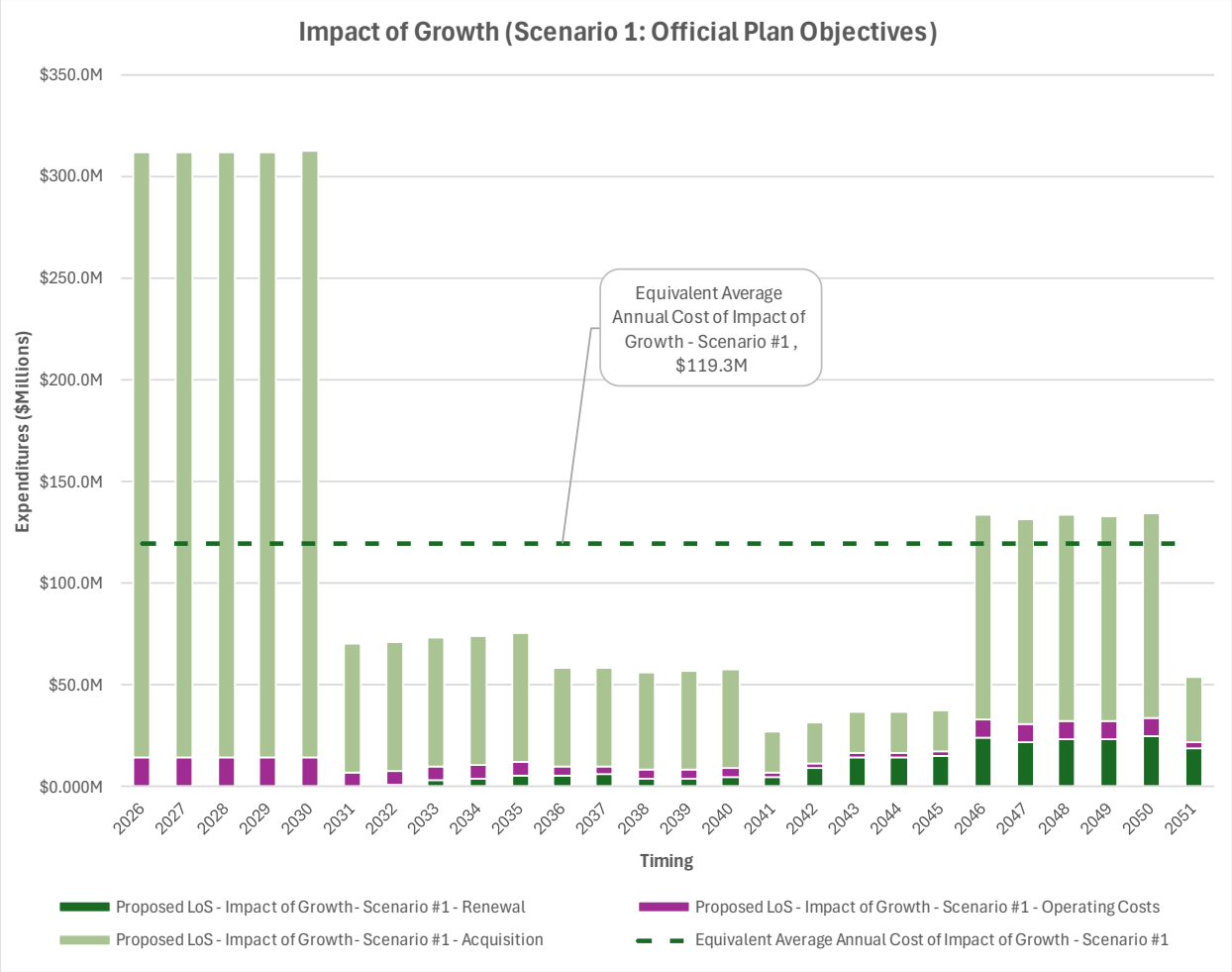

Figure 9-8: Impact of Growth (Scenario 1: Official Plan Objectives).

To accommodate the anticipated growth in population and employment, the City will need to acquire new assets as well as maintain and renew those assets. Figure 9-8 illustrates the additional funding required by the City to meet the OP's growth objectives.

9.5.3.2 Growth Scenario #2: Realistic Growth

For Growth Scenario #2, population and employment growth was determined based on historic actuals and represents achieving approximately 63% of the OP's growth objectives outlined in Scenario #1. Scenario #2 was developed to forecast a growth scenario that the City is more likely to achieve as the OP objectives in Scenario #1 are considered ambitious.

By 2051, and based upon the modelling conducted, the City may acquire approximately **$4.83B** worth of additional assets in order to meet the City's intended growth objectives.

For this scenario, the City would be required to fund approximately **$1.98B** in acquisition costs.

To fund these acquisitions and subsequent renewal and operating budget impacts, would require an overall increase to forecasted funding levels noted in Section 9.5.1 of approximately **$2.23B** over the planning horizon, or an equivalent annual expenditure of **$85.93M** to maintain current service and performance levels while accommodating growth objectives through to 2051. Performance modeling was not completed for the growth scenarios. However, performance will be the same or likely better than the proposed level of service scenario as the proportion of new assets increases.

Table 9-5 summarizes the forecasted growth expenditures to achieve the Realistic growth objectives.

Table 9-5: Forecasted growth expenditures (Scenario 2: Realistic Growth).

Year	Acquisition	Renewal	Operating Costs	Total
2026	$248.5M	$0.0M	$11.9M	**$260.4M**
2027	$248.5M	$0.0M	$11.9M	**$260.4M**
2028	$248.5M	$0.0M	$11.9M	**$260.4M**
2029	$248.5M	$0.0M	$11.9M	**$260.4M**
2030	$248.5M	$0.3M	$11.9M	**$260.7M**
2031	$53.0M	$0.4M	$5.3M	**$58.7M**
2032	$44.2M	$0.7M	$4.4M	**$49.4M**
2033	$44.2M	$2.2M	$4.4M	**$50.8M**
2034	$44.2M	$2.8M	$4.4M	**$51.5M**
2035	$44.2M	$3.9M	$4.4M	**$52.6M**
2036	$33.6M	$3.9M	$2.9M	**$40.4M**
2037	$33.6M	$4.0M	$2.9M	**$40.5M**
2038	$33.6M	$2.7M	$2.9M	**$39.2M**
2039	$33.6M	$2.9M	$2.9M	**$39.5M**
2040	$33.6M	$3.3M	$2.9M	**$39.9M**
2041	$13.9M	$3.2M	$1.7M	**$18.8M**
2042	$10.4M	$4.6M	$1.3M	**$16.3M**
2043	$10.4M	$7.4M	$1.3M	**$19.1M**
2044	$10.4M	$7.3M	$1.3M	**$19.1M**
2045	$10.4M	$7.8M	$1.3M	**$19.5M**
2046	$52.7M	$12.5M	$4.6M	**$69.9M**
2047	$52.7M	$11.4M	$4.6M	**$68.8M**
2048	$52.7M	$12.3M	$4.6M	**$69.7M**
2049	$52.7M	$12.2M	$4.6M	**$69.6M**
2050	$52.7M	$13.0M	$4.6M	**$70.4M**

Year	Acquisition	Renewal	Operating Costs	Total
2051	$16.7M	$9.9M	$1.5M	**$28.1M**
Total	**$1,976.7M**	**$128.8M**	**$128.6M**	**$2,234.1M**
Equivalent Average Annual	**$76.0M**	**$5.0M**	**$5.0M**	**$85.9M**

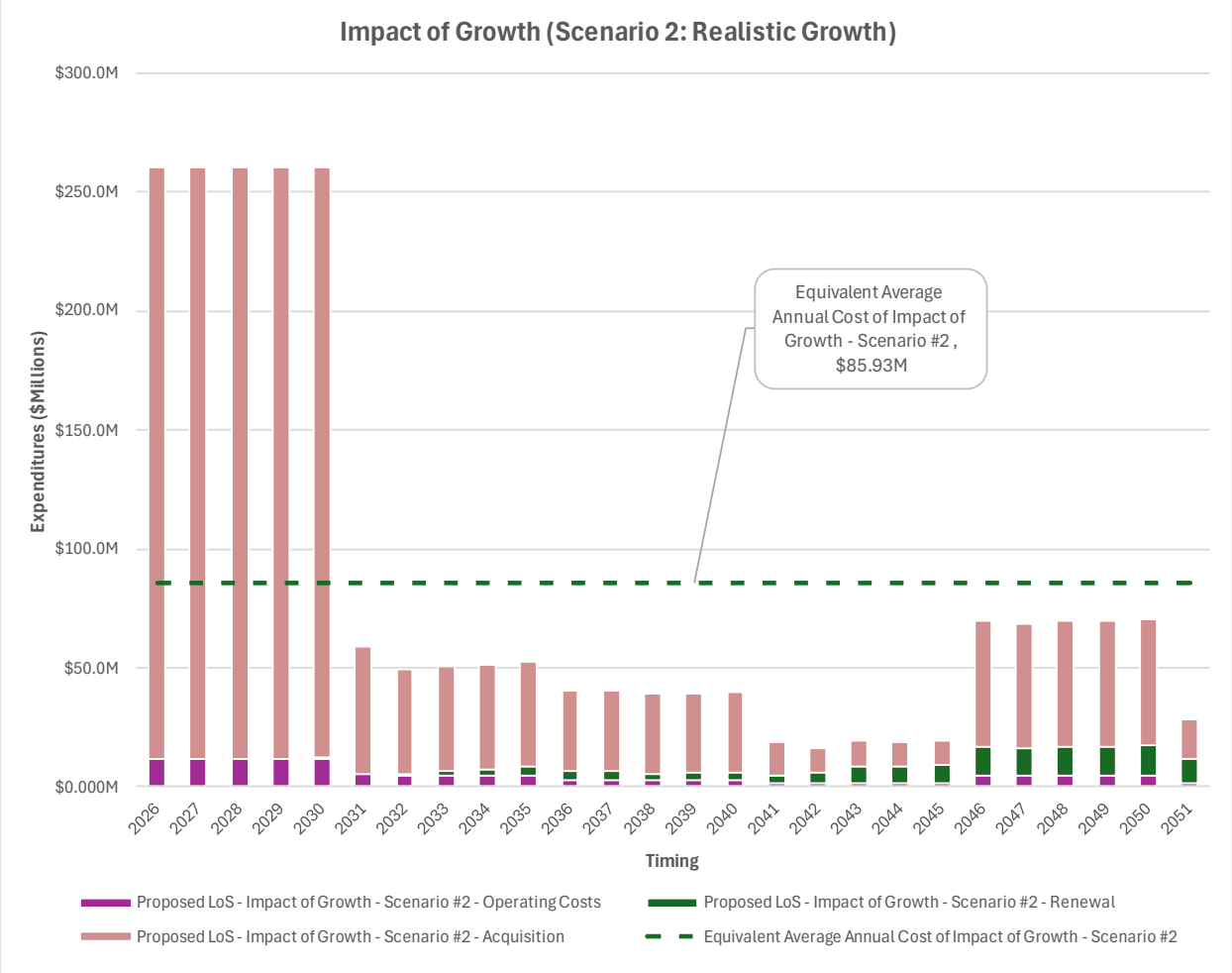

Figure 9-9: Impact of Growth (Scenario 2: Realistic Growth).

For the City to accommodate the anticipated growth in population and employment, the City will be required to acquire new assets as well perform maintenance on those assets and asset renewals. Figure 9-9 illustrates the additional funding required by the City to accommodate to meet the realistic growth objectives.

9.6 Financial Summary and Comparison

The City's current LoS (planned funding), proposed LoS (maintain current performance), and proposed LoS to achieve growth objectives are summarized and compared in the tables below.

Table 9-6 summarizes the total capital expenditures required for each scenario from 2026 to 2051 and identifies any potential funding gaps. To achieve the proposed LoS to maintain current performance levels, including maintaining 70% of the road network in a good or better state of performance, an additional **$439.6M** will be required over the planning horizon, or an equivalent average annual funding gap of **$16.9M**, when compared with the currently planned funding level over the same planning horizon.

Table 9-6: Current levels of service and proposed levels of service scenarios comparison and annual average infrastructure gap.

	Current LoS - Planned Funding	Proposed LoS - Maintain Current Performance
Total Capital Expenditures (2026 to 2051)	$2,263.8M	$2,703.4M
Overall Funding Gap	**-**	**$439.6M**
Equivalent Average Annual Capital Expenditures	$87.1M	$104.0M
Equivalent Average Annual Capital Funding Gap	**-**	**$16.9M**
Annual Operating Expenditures	$495.8M	$495.8M
Annual Total Expenditures (CAPEX+OPEX)	$582.9M	$599.8M
Total Average Annual Funding Gap	**-**	**$16.9M**

Table 9-7: Impact of growth scenarios comparison.

	Proposed LoS - Impact of Growth (Scenario #1: Official Plan Objectives)	Proposed LoS - Impact of Growth (Scenario #2: Realistic Growth)
Total Value of Acquisitions	**$6,893.5M**	**$4,830.1M**
City Funded Acquisitions	$2,686.1M	$1,976.7M
Operating Budget	$183.5M	$128.6M
LC Renewals	$232.0M	$128.8M
Total Impact of Growth	**$3,101.6M**	**$2,234.1M**
Equivalent Average Annual Impact of Growth	**$119.3M**	**$85.9M**

Table 9-7 summarizes anticipated cost increases related to supporting the City's growth objectives under both scenarios assessed. Over the planning horizon spanning from 2026 through to 2051, City funded acquisition costs may range from **$1,976.7M to $2,686.1M**. Anticipated increases to the Operating budget may range from **$128.6M to $183.5M**. Contributions to the City's Life Cycle reserve may range from **$128.8M to $232.0M**. The combined equivalent average annual impact of growth cost may range from **$85.9M to $119.3M**.

Note that the forecasts developed herein are based on a modelling exercise that is developed and supported by a series of assumptions. Therefore, these results are subject to change, as the information that supports this modelling is refined as part of the City's ongoing annual resource and budget planning process.

Based on the current financial strategy with respect to both existing and new assets, the City has a robust process and sufficient reserves to fund its assets for the next 25 years per the findings in the 2025 Asset Management Plan update.

Markham is also very aware that the costs to maintain its assets will continue to increase at an accelerated pace as new assets continue to be added and existing larger assets with longer useful lives begin to enter the 25-year life cycle horizon. Given staff's heightened attention to this issue, and the excellent track record of Council's commitment to funding the life cycle requirements on an annual basis, Markham is well positioned to deal with the complexities of keeping its assets in a state of good repair and delivering on its Asset Management plan, now and into the future.

10 Improvement and Monitoring Plan

As part of the City's Corporate Asset Management program, a detailed maturity assessment was completed for AM processes and practices.

The purpose of the maturity assessment is to identify and compare processes and practices with industry benchmarks in order to develop appropriate improvement strategies required to advance the City's AM maturity level and capabilities. The assessment framework was aligned to the Institute of Asset Management's Maturity Assessment Framework and scoring system, illustrated in Figure 10-1. This framework was used to assign ratings of 0 (Innocent) to 5 (Excellent) to each major AM process. The full methodology of the maturity assessment will be detailed in the City's forthcoming *Corporate Asset Management Strategy and Governance Framework project report*.

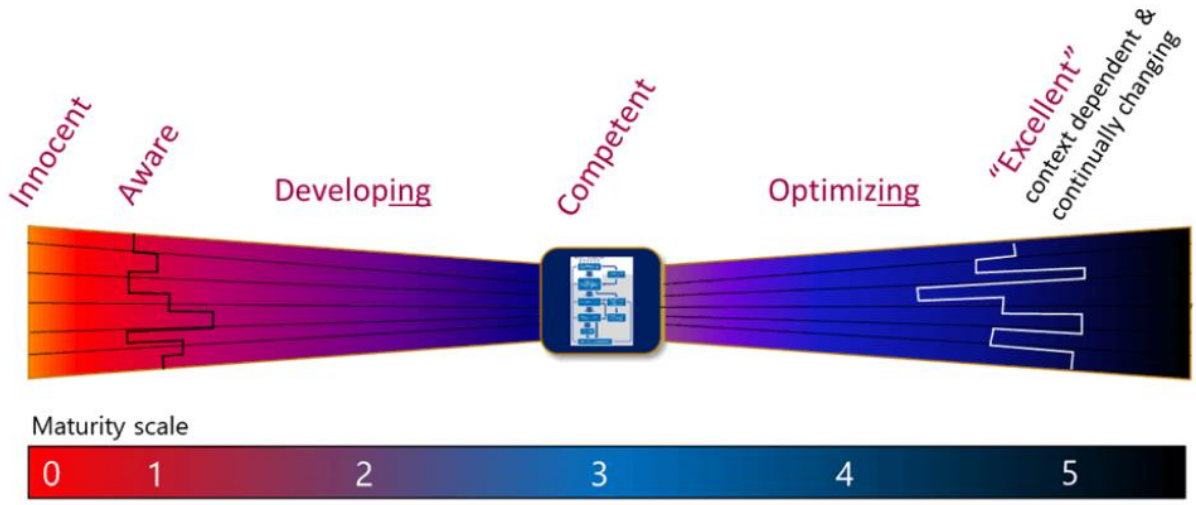

Figure 10-1: Institute of Asset Management Maturity Assessment Framework.

The asset management categories that were assessed in this maturity assessment were aligned to the City's AM Framework.

The maturity assessment was conducted on four (4) of the components in the AM Framework: Planning, Delivery, Monitoring & Reporting, and Core Support Services. The maturity of each process was assessed through a series of workshops held with City stakeholders.

The results from the assessment overlaid with the City's AM framework are illustrated in Figure 10-2.

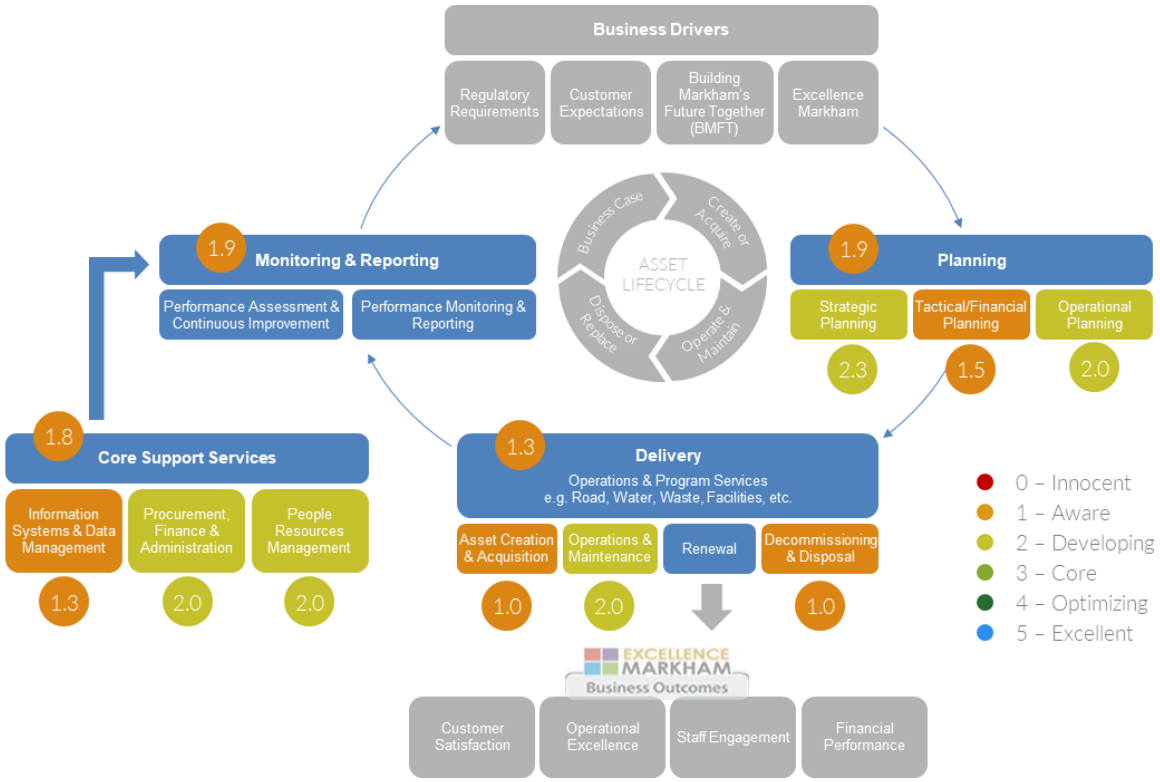

Figure 10-2: Maturity assessment results.

Overall, the City's current state of practice when analyzed using this framework was rated as "1 – Aware" to "2 – Developing", as shown in Table 10-1. Over time, the City aspires to mature its asset management planning capabilities to a "3 – Core" rating.

Table 10-1: Maturity assessment results by AM Framework category.

Category	Sub-Category	Maturity Score
Planning	Asset Management Planning	Developing
	Strategic Planning	Aware to Developing
	Tactical/Operational Planning	Developing
Delivery	Operations & Program Services	Aware to Developing
Monitoring & Reporting	Performance Assessment & Continuous Improvement and Performance Monitoring and Reporting	Aware to Developing
Core Support Services	Information Systems & Data Management	Aware to Developing
	Finance & Administration	Developing
	People Resources Management	Developing

The results of this assessment in conjunction with the development of this AMP were used to identify areas for improvement. The City has identified draft improvement themes that will increase the maturity of its AM system, and by extension, better integrate and improve the practice of asset management in Markham.

This assessment identified initiatives related to the following categories to increase the maturity of its AM system, and by extension, future iterations of this AMP and reporting outputs. While these initiatives have been formally endorsed along with the City's 2024 Asset Management Plan, City staff intend to complete their review and refinement through the completion of the *Corporate Asset Management Strategy and Governance Framework project report expected in late 2025 or early 2026*.

A high-level summary of improvements includes the following initiatives:

- Defining and evaluating asset management governance, roles and responsibilities
    1. Asset Management Strategic Documents Regulatory Reporting (Strategic Upkeep)
    2. Financial Planning Support and Regulatory Reporting Plan
- Consistent and formalized standards, processes and procedures
    3. Develop Emergency/Continuity Plans
    4. Develop an Asset Management Lifecycle Strategy/SOPs
    5. Develop Asset Condition and Performance Assessment Procedures
    6. Asset Management Strategies Maintenance
- Improved data and information
    7. Develop an Asset Data and Information Strategy
- Formalized resource planning
    8. Develop a Resourcing Strategy
- Improved demand/growth analysis
    9. Implement a Formalized Demand Analysis (i.e. Growth) planning process
- Stakeholder engagement
    10. Develop a Stakeholder Engagement Plan
- Implement/develop supporting systems, tools and integrations (ex. decision support systems)
    11. Implement a Decision-Support System and integrate it with the Lifecycle Planning Process
    12. Enterprise Asset Management (EAM) System Implementation & Integration:

The following table summarizes the initiatives and how completing each initiative will increase the maturity of the City's AM System to a "3 – Core" rating.

Table 10-2: Asset Management System improvement initiatives.

No.	Initiative	AM Framework Category	Description	Timeline

1	Asset Management Strategic Documents Regulatory Reporting (Strategic Upkeep)	Planning	• Establish guidelines and enact a process to continually update the Asset Management System:
			  ○ Update the AM Policy every 5 years
			  ○ Update the AM strategy (including governance framework) every 5 years
			  ○ Update the AMP every 5 years
			  ○ Perform a maturity assessment every 5 years
			• Identify the means for rolling out these procedures to the organization (i.e. cross-disciplinary collaboration)
				Ongoing

2	Financial Planning Support and Regulatory Reporting Plan	Core Support Services	• Establish roles and responsibilities from applicable service areas for various types of regulatory reporting. • Standardize frameworks to determine if regulatory reporting can be completed in-house or through consulting services. • Integrate regulatory reporting with AM program. • Provide a clear definition of Finance department's responsibilities to support AM processes. • Establish roles and responsibility to support finance in the lifecycle process. • Develop a corporate-wide framework to integrate the asset risk management strategies into the City's financial planning processes in order to prioritize projects using prioritization criteria to assist in the allocation of financial resources and decision-making.	Longer-Term

3	Develop Emergency/Continuity Plans	Planning	• Develop Business Continuity Plans, Emergency Management Plans, etc. for each service area, including:
			  ○ Procedures, roles and responsibilities
			  ○ Outlining highly critical assets
				Medium- to long-term

No.	Initiative	AM Framework Category	Description	Timeline
4	Develop an Asset Management Lifecycle Strategy/SOPs	Planning and Core Support Services	• Formally document the lifecycle procedures for each asset group. • Formally document processes for updating asset inventories with new assets including roles and responsibilities, i.e., when asset replacements or renewals take place, decommissioning, etc. ○ Tie processes to the City's lifecycle management strategy/activities • Address implementation and training of new procedures related to AM data management. • Implement a formal communication process to notify appropriate departments of changes to asset data that affect them (ex. onboarding new assets).	Medium-term
5	Develop Asset Condition and Performance Assessment Procedures	Monitoring & Reporting	• Formally develop condition assessment procedures and integrate across all service areas. • Develop a formal process for integrating condition data into AM data, processes and ensure it aligns with AM objectives. • Develop definitions for asset performance across all service areas.	Medium-term
6	Asset Management Strategies Maintenance	Monitoring & Reporting	• Develop processes and collect/improve asset data (identify data gaps and collect appropriate data/asset attributes to be used in a risk management strategy) to better understand consumable asset risk. Enhance the risk management strategy to include the updated asset data. • Implement the asset management strategies (LoS, lifecycle management, and risk management strategies) • Integrate a regular process of reporting on performance and levels of service to align with O.Reg. 588/17. Asset data should be formatted in a way so it is easy for staff to pull the required data for reporting. • Integrate the asset management strategies with each other. • Commit to continually updating the strategies (5-years). • Update the strategies to include climate change considerations.	Ongoing

No.	Initiative	AM Framework Category	Description	Timeline
7	Develop an Asset Data and Information Strategy:	All	• Define and establish the asset information systems that will be used, the data they will store, and how each system will link to one another to produce and formally establish one “source of truth”. • Formally document processes on maintaining the integrity of the “source of truth” and keeping it current (up to date). • Develop data standards indicating what information is required to support asset management analyses, reporting, and AM/organizational objectives. • Establish definitions for data quality and accuracy. • Establish QA/QC procedures to ensure that data is correct and in a consistent format. • Ensure the appropriate groups of people have access to the data and that data is in a usable format that supports other AM processes. • Define governance for various datasets.	Short-term
8	Develop a Resourcing Strategy	Core Support Services	• Implement the current growth model (under development) as part of identifying people resources to support this strategy. • Develop a formal process and resourcing strategy that identifies required staffing levels for the City to be able to meet its AM objectives.	Short- to medium-term
9	Implement a Formalized Demand Analysis (i.e. Growth) planning process	Planning	• Identify the types of demand analysis that need to be performed for each service area and their frequency (e.g., master plans, vs. others) • Adopt a regular cycle of updates to this process. • Integrate the demand analysis with future resource planning for growth (ex. impact of growth model). • Formally document processes, roles, and responsibilities across all service areas with respect to demand analysis. • Integrate this process with Asset Management objectives. • Perform the studies more frequently to understand how they are sequenced along with other related initiatives.	Short-term

No.	Initiative	AM Framework Category	Description	Timeline
10	Develop a Stakeholder Engagement Plan:	Monitoring & Reporting and Core Support Services	• Staff are educated on asset management, the asset management system, and are engaged in a combined effort to achieve the City's AM objectives. • Develop and implement a formal framework to engage both stakeholders and community members. • Develop a framework to implement stakeholder and community member feedback into current and future AM planning. • Hold community engagement events and incorporate feedback into decision-making processes and LoS.	Longer-term
11	Implement a Decision-Support System and Integrate it with the Lifecycle Planning Process	Planning, Delivery, and Core Support Services	• Formally document processes, roles, and responsibilities across all service areas for the lifecycle planning process. • Define and centralize the sub-processes of the lifecycle process. • Establish ownership of the lifecycle planning process via the AM group (or another neutral party). Coordinate the processes, policies and decision points. • Perform the AM analyses annually to support capital planning and budgeting. • Integrate the standardized risk framework into decision-making. • Integrate the lifecycle planning process with Asset Management objectives.	Short- to medium-term
12	Enterprise Asset Management (EAM) System Implementation & Integration:	All	• Continue to implement the EAM system and integrate it into day-to-day operations. • Incorporate the standardized risk framework to be incorporated into operations and maintenance strategies. • Develop a process or role to operationalize the EAM platform across all service areas. • Integrate the EAM system with a DSS system or AM planning activities.	Ongoing

These initiatives were prioritized based on:

- If the initiative targets lower maturity scores resulting a more significant impact/improvement to the overall maturity
- Appropriate sequencing: The downstream effect the project may have on other processes and projects (i.e., projects that are required to be completed first. For example, data is used for all AM analyses. Developing a data strategy for consistent data collection and understanding what data is available should be completed before developing a risk management strategy).
- The resources required for each initiative, including both internal and external resources.

As the City undertakes and completes these initiatives, the overall maturity of the AM system will improve and the confidence of the AM analyses and reporting outputs that support this AMP will increase.

Part of the City's AM program is to adopt a culture of continual improvement to ensure that AM planning processes are reviewed regularly to evolve as needed to suit the City's changing landscape, as well as improve the confidence in the AM analyses that support this AMP and future AMPs. The City's improvement plan is a significant step forward in adopting this culture.

11 Closing Remarks

The City of Markham is a relatively young municipality – the average age of its asset portfolio is approximately 34 years. The majority of the City's asset portfolio on average is within the early stages of its service life. Overall, the City's infrastructure is in "Good" state of performance, which is a reflection of the fact that the City has responsibly allocated financial resources to manage its assets, ensuring they remain fit for service, and provide exceptional services to the community.

The City has a robust, annual lifecycle planning process, which has been put in place to assist the City in taking a proactive approach to planning for and managing its state of infrastructure into the future. The City's overall asset performance reflects this process.

Although the City has some assets in poor and very poor performance, it is important to note that this does not necessarily mean that assets are not fit for service. The rating could simply mean that the assets are coming up for replacement under the City's planned life cycle model and will be addressed in the coming years, or are short-life consumable assets, or that they will be conditioned-assessed to determine if the useful service life can be extended beyond the prescribed industry standard useful life. This is a normal practice that occurs in all municipalities in their efforts to maximize the useful service life of an asset and the allocation of limited financial resources. The City always operates in a manner to ensure that services are provided safely by managing and maintaining its poor/very poor performance assets.

The City's Asset Management program can assist to create better understanding of how to manage these assets, by developing processes and data to better understand asset risk and ensure alignment that the City's investment analysis and decisions minimize risks and maximize levels of service.

A key piece of this AMP is the City's Improvement Plan. It sets up a series of actions for the City's AM program to mature and provide better data/analyses to support better decision-making. Furthermore, this AMP represents a significant step forward in the City's AM journey. It has introduced key frameworks and analyses that support better decision-making. Particularly, the City has enacted a framework to record and monitor levels of service, which is paired with an investment and performance forecast, and financial summary. The City should continue to monitor its levels of service against its spending, to better understand how services are being delivered, and assets are being managed. Asset management is a journey, and the processes and data that it provides will ensure the City continues to keep a proactive approach to providing exceptional services to the community.

Sustainability and
Asset Management

2025 Asset Management Plan

City of Markham

Appendices

Appendix A. Potable Water

Appendix B. Stormwater Management

Appendix C. Wastewater

Appendix D. Transportation

D.1 Vehicular Transportation

D.2 Active Transportation

Appendix E. Recreation

Appendix F. Solid Waste Management

Appendix G. Parks

Appendix H. Library

Appendix I. General Support Services

I.1 Administration

I.2 Fleet

I.3 Information Technology

Appendix J. Fire and Emergency Services

Appendix K. Arts and Culture

Appendix L. Natural Assets