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SAULT STE. MARIE

CITY OF SAULT STE. MARIE

ROADWAY APPURTENANCE ASSET MANAGEMENT PLAN

FINAL | 60735219 | June 2025

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AECOM: 2015-04-13

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
Draft	February 21st, 2024	Draft Report – Roadway Appurtenances AMP Phase II		Christiaan Lombard	Project Manager
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Table of Contents

Figures

Tables

List of Abbreviations

Abbreviation	Description
AM	Asset Management
Ea.	Each
ESL	Expected Service Life
GIS	Geographic Information System
LoS	Level of Service
m^2	Square meter
O&M	Operations and Maintenance
O. Reg.	Ontario Regulation
RSL	Remaining Service Life

1. Introduction

AECOM Canada ULC (AECOM) was retained by The City of Sault Ste. Marie (the "City") to update the asset management plan developed in 2022 to comply with the third phase (Phase III) of the Ontario Regulation 588/17 (O. Reg. 588/17) requirements in respect to its core municipal infrastructure assets. The scope of work is outlined in AECOM's proposal dated September 20, 2024, and subsequent project correspondence.

1.1 Background

Sault Ste. Marie is a city located on the St. Mary's River, north of the United States of America, bordering three of the Great Lakes with an estimated population of 72,051 (2021). The City provides a wide range of public services to their constituents, with the public expectation that these services function efficiently at a certain level. The provision of these services requires the management of the physical assets to meet desired service levels, manage risks, and provide long-term financial sustainability. These assets include, but are not limited to roads, bridges, sidewalks, wastewater assets, stormwater management assets, landfill, fleets, buildings, and parks.

In accordance with the terms of reference for this assignment, it is understood that the City is proceeding with an asset management plan to comply with the third phase of the regulatory requirements in respect to its non-core municipal infrastructure assets, in accordance with O. Reg. 588/17, by July 1, 2025. The non-core assets to be covered in the scope, as defined by the regulation, include the City's protection services, solid waste, parks and cemetery, facilities, fleet, roadway appurtenances, and active transportation.

1.2 Objectives

In 2015, the City's first Asset Management Plan (AMP) was published. In 2019, by the City Council approval, the Strategic Asset Management (AM) Policy for the City came into effect. In 2022, the City published its core asset AMPs. Following that, the City developed the AMPs for its non core assets in 2024.

Organizations that implement good AM practices will benefit from improved business and financial performance, effective investment decisions, and better risk management. Stakeholders can expect lower total asset life cycle costs, higher asset performance, and confidence in sustained future performance.

The AMPs capture the City's infrastructure assets and deliver a financial and technical roadmap for the management of the City's assets. The intent of this plan is to provide the means for the City to maximize value from its assets, at the lowest overall expense while, at the same time, enhance service levels for its residents.

The objective of Phase III is to update all the core and non-core AMPs to comply with the July 1st, 2025, deadline set by O. Reg. 588/17. Phase III will update the AMP by incorporating the latest asset information, with a focus on:

- Updating the current AMPs to integrate proposed Levels of Service (LoS).
- Defining the lifecycle activities and associated costs required to achieve those LoS.
- Identify the available funding and any funding shortfalls.
- Document the risk(s) of failing to meet the proposed LoS for all asset classes over a 10-year period.

This AMP is an update of the 2024 AMP for the City's roadway appurtenances. All other core and non-core AMPs are presented under separate reports.

1.3 Asset Management Provincial Requirements

The O. Reg. 588/17 came into effect in 2018 and stipulates specific AM requirements to be in place within Ontario municipalities by certain key dates (see **Table 1-1**). The development of this AMP is one of the steps to guide the City towards meeting the July 1st, 2025 deadline.

Table 1-1: O. Reg. 588/17: AM Planning for Municipal Infrastructure

Deadline Date	Regulatory Requirement
July 1st, 2019	All municipalities are required to prepare their first Strategic AM Policy.
July 1st, 2022	All municipalities are required to have an AM Plan for its entire core municipal infrastructure (i.e., water, wastewater, stormwater, roads, and bridges & culverts).
July 1st, 2024	All municipalities are required to have an AM Plan for infrastructure assets not included under their core assets.
July 1st, 2025	All AM Plans must include information about the LoS that the municipality proposes to provide, the lifecycle activities and associated costs needed to achieve those LoS, available funding, any funding shortfalls, and the risk of failing to meet the proposed LoS.

1.4 Scope

The following elements are included within the scope of this AMP:

- Asset hierarchy, a summary of the asset inventory, including the replacement cost of the assets, the average age of the assets, the condition of the assets, and data gaps analysis (**Section 2**).
- The City's level of service objectives, stakeholder identification, current levels of service (LoS) determined in accordance with the qualitative descriptions and technical metrics outlined in O. Reg 588/17, proposed service levels, LoS forecast, and future demand drivers (**Section 3**).
- Asset lifecycle management strategies, lifecycle activities and funding needs to achieve proposed LoS, risk of not meeting proposed LoS, available funding and funding gap, and alternative (non-financial) strategies to manage funding shortfall (**Section 4** and **5**).

1.5 Relationship to Other Corporate Documents

This AMP is a tactical plan which links "top-down" strategic objectives with "bottom-up" operational activities. **Figure 1-1** demonstrates the line-of-sight between AM strategic objectives and tactical and operational AM elements, including the relationship this AMP has to the other plans in the City's hierarchy of documents.

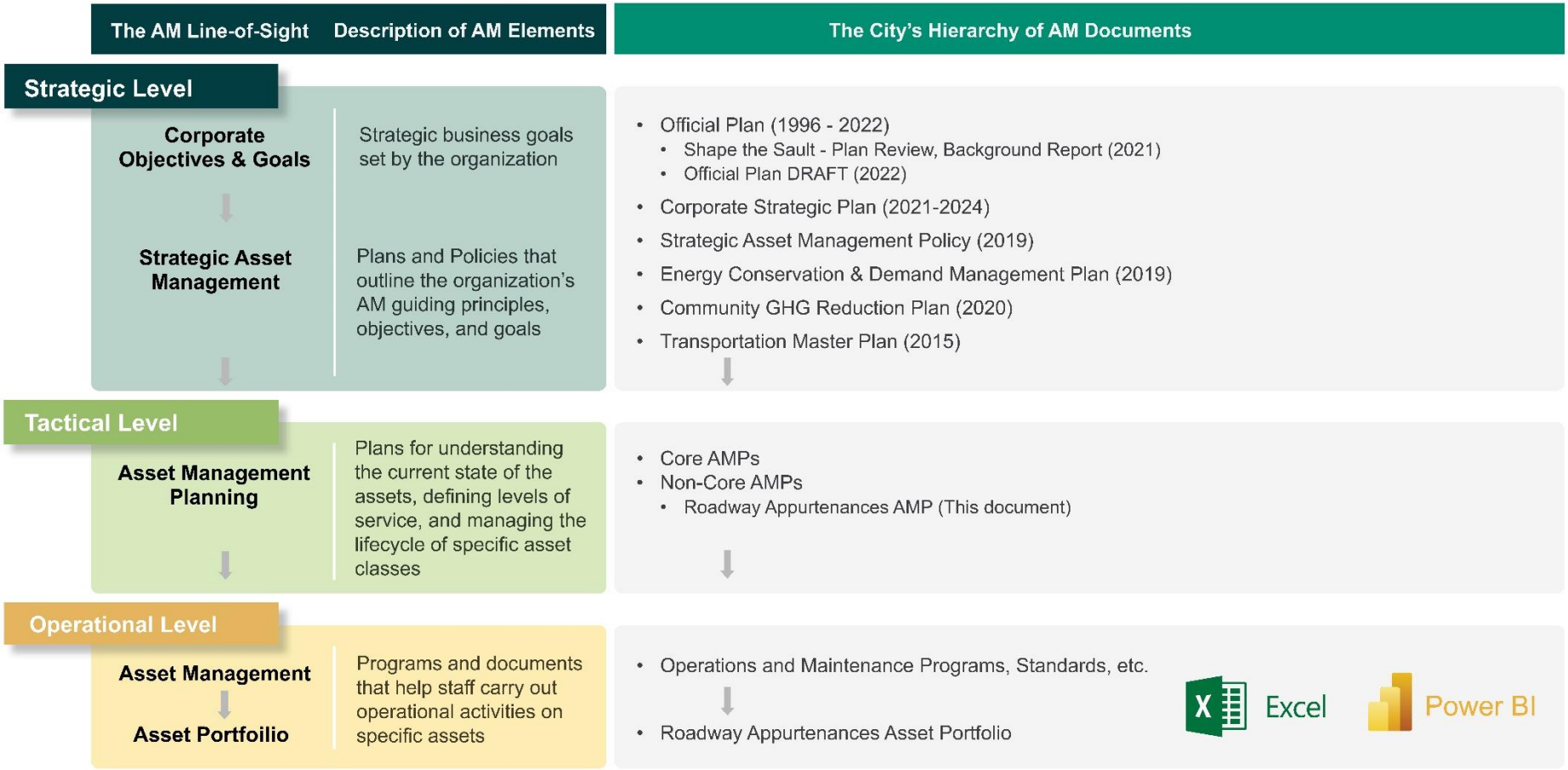


Figure 1-1: The City's Asset Management Line of Sight

2. State of Infrastructure

Roadway appurtenances encompass a diverse range of auxiliary elements crucial to the functionality and safety of roadways. The City's roadway appurtenances include traffic signals, signage, railway crossings, parking lots, and various supporting structures. The inventory of roadway appurtenances is a comprehensive catalog detailing the quantity, condition, and specifications of these components within the City. By analyzing the inventory and assessing the data gaps, this section facilitates informed decision-making and strategic resource allocation, providing essential insights into the maintenance needs and financial requirements.

2.1 Asset Hierarchy

To fulfill the requirements of O. Reg. 588/17 and to pave the way for robust long range AM planning, the City necessitates a logically segmented asset breakdown structure (hierarchy) within the ambit of this AMP. Achieving this requires a sufficiently granular classification of roadway appurtenances, enabling the identification of individual assets due for renewal. Striking the right balance is also crucial, as there is a fine trade-off between ensuring adequate granularity to provide essential information and avoiding excessive granularity that could make the effort to collect and manage information more burdensome than the usefulness derived from it.

In **Figure 2-1**, the hierarchy of roadway appurtenances is illustrated, showcasing five main categories: traffic signals, traffic equipment, traffic signs, parking lots, and railway crossings. Each category is further broken down into subcategories. This asset hierarchy establishes a logical indexing of the City's roadway appurtenances, categorizing them into primary (parent) and secondary (child- and grandchild) assets. Such a structure forms the foundational framework for subsequent discussions and analysis, enabling the drill-down to a specific asset within the hierarchy to support maintenance planning or track costs at the asset level or higher levels.

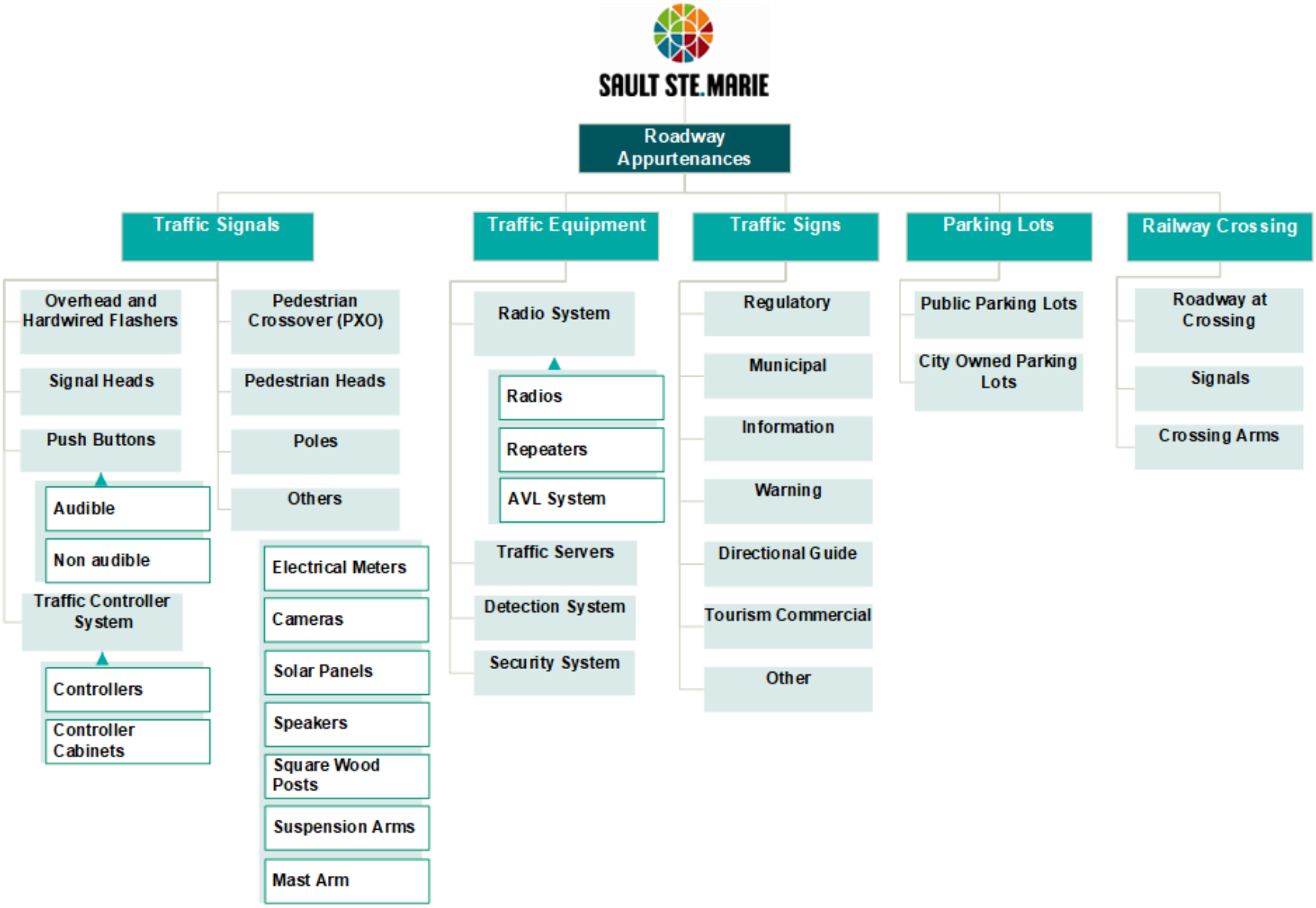


Figure 2-1: City of Sault Ste. Marie Roadway Appurtenances Asset Hierarchy

2.2 Current State of the Assets

2.2.1 Asset Inventory

Table 2-1 presents the summary of the City's roadway appurtenances inventory.

Table 2-1: Roadway Appurtenance Inventory Summary

Asset Group	Asset Category	Quantity	Unit
Roadway Appurtenances	**Traffic Signs**	13,172	Ea.
	Traffic Signals	2,301	Ea.
	Traffic Equipment	279	Ea.
	Railway Crossings	52	Ea.
	Parking Lots	46,932	m^2

2.2.2 Current Asset Replacement Value

The asset replacement value is the estimated cost that would be incurred to replace an existing asset with a new one of similar functionality, at current market prices or construction costs. This value represents the monetary amount required to reproduce or procure an asset equivalent to the one being assessed. Examining the distribution of asset replacement values allows the City to comprehend which asset categories hold the highest value for both the City and the public.

Table 2-2 presents the unit replacement cost and the total replacement value for distinct roadway appurtenance asset categories within the City. Notably, railway crossings constitute the most significant portion, accounting for a replacement value of approximately $12 million, followed by parking lots at $10 million, traffic signs and traffic signals at $9 million and $8 million respectively, and traffic equipment at $0.8 million. The combined replacement value for all these categories amounts to approximately $41 million.

It is worth noting that the total replacement values have been marked up by 45%, out of which 15% accounts for engineering and project management cost and 30% for contingency cost.

Table 2-2: Current Replacement Value

Asset Group	Asset Category	Unit Replacement Cost ($/Unit)	Total Replacement Value (2025)
Roadway Appurtenances	**Traffic Signs**	$458 - $17,174 / Ea.	$9,094,000
	Traffic Signals	$114 - $85,868 / Ea.	$7,988,000
	Traffic Equipment	$1,211 - $20,674 / Ea.	$910,000
	Railway Crossings	$171,735 / Ea.	$12,493,000
	Parking Lots	$160 / m^2	$10,524,000
Total			**$41,010,000**

2.2.3 Age and Remaining Service Life

The asset age is based on the install year of the assets and the remaining service life (RSL) is estimated by considering both the age and the expected service life (ESL) in years. In practice, different assets will deteriorate at varying rates, and their deterioration may not necessarily follow a linear pattern over time. However, it is crucial to consider the level of effort required to predict failure in relation to the asset value. For highly valuable assets, more sophisticated

deterioration modeling may be justified. Conversely, for low-value assets, the cost of deterioration modeling might surpass the replacement cost of the asset. Moreover, the actual service life can vary significantly from the ESL. ESL is defined as the period over which an asset is available for use and able to provide the required LoS at an acceptable risk and serviceability (i.e., without unforeseen costs of disruption for maintenance and repair). In some instances, a variation in expected vs. actual service life is evident due to the following factors:

- **Operating Conditions and Demands:** Some assets are operated intermittently or even infrequently or are being operated at a lower demand than their designed capacity. Thus, the actual operating "age" of the asset is reduced.
- **Environment:** Some assets are exposed to very aggressive environmental conditions (e.g., corrosive chemicals), while other assets are in relatively benign conditions; thus, the deterioration of assets is affected differently.
- **Maintenance:** Assets are maintained through renewal or replacement of components, which prolongs the service life of the asset.
- **Technological Obsolescence:** Some assets can theoretically be maintained indefinitely, although considerations such as cost to maintain the asset, its energy efficiency, and the cost to upgrade to an updated technology that would result in cost savings are likely to render this approach uneconomical.

Table 2-3 and **Figure 2-2** show the weighted average asset age and RSL as a proportion of average ESL for traffic signs (including all subcategories), traffic signals (including traffic controller systems and solar flashers), and traffic equipment (including radio systems). Other asset categories or subcategories are excluded due to missing installation date information. It is recommended that the City collect such data to enable their inclusion in future iterations of the AMP.

Since each asset category may include various subcategories with differing functions, materials, usage patterns, and operational conditions, both asset age and ESL are weighted by replacement value to ensure a representative analysis. It should also be noted that the age of traffic signs is represented by an estimated apparent age derived from condition assessment scores.

Table 2-3: Roadway Appurtenance Assets Average Age, ESL, and Remaining Service Life

Asset Group	Asset Category	Weighted Average Age	Weighted Average ESL	Remaining Service Life
Roadway Appurtenances	Traffic Signs	12	15	3
	Traffic Signals	21	27	5
	Traffic Equipment	7	24	17

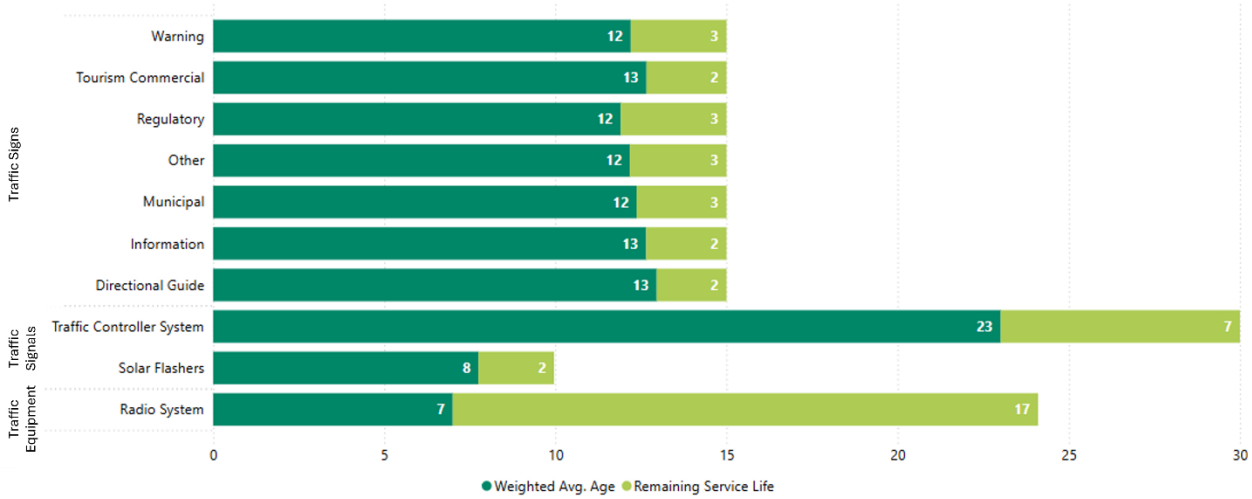


Figure 2-2: Roadway Appurtenance Weighted Average Age and Remaining Service Life

Figure 2-4 shows the installation profile of the City's roadway appurtenance assets by asset category. As previously mentioned, a significant portion of these assets lack installation date information. Among the assets with available data, approximately $1.9 million were installed before 2000, while $4.3 million were installed after 2000.

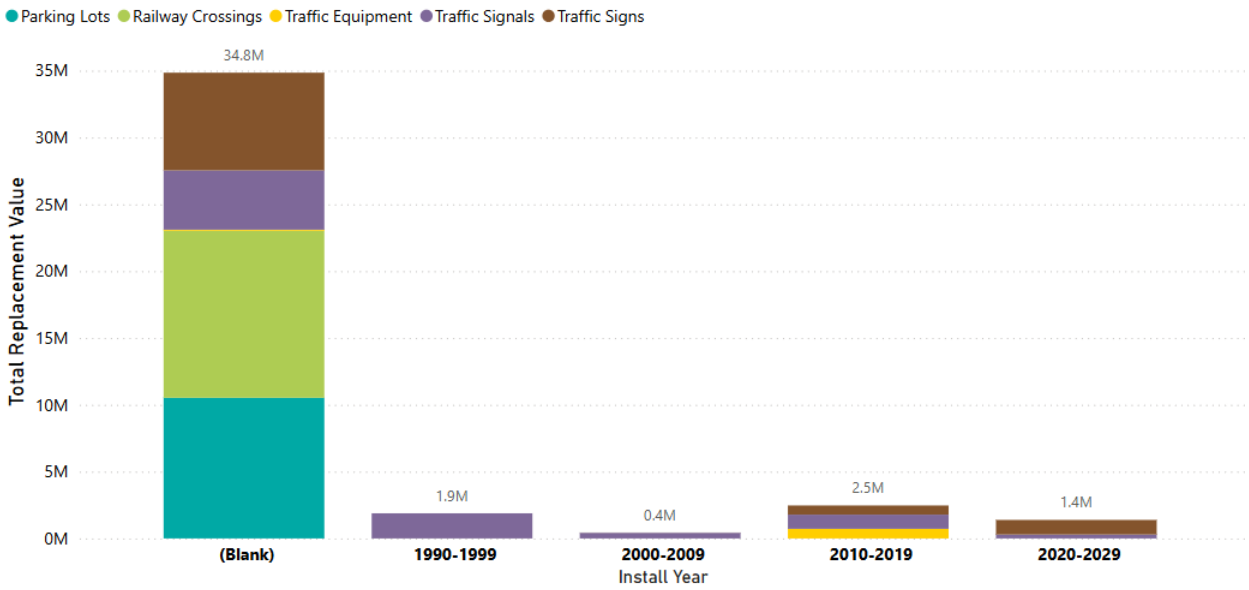


Figure 2-3: Roadway Appurtenance Installation Profile

2.2.4 Asset Condition

Regular field condition assessments for traffic signs are conducted as mandated by the O. Reg. 239/02: Minimum Maintenance Standards for Municipal Highways under Municipal Act. For other asset categories that do not have field condition assessment results, the two-parameter Weibull distribution function was used to assess the current condition and to project the future condition of the City's roadway appurtenances. The Weibull distribution has been used extensively in reliability studies and lifetime prediction models in industries ranging from automotive to the oil & gas and provides a suitable distribution for this type of analysis.

The underlying premise of the Weibull-shaped deterioration is that while some assets fail prematurely due to severe conditions or improper installation, other assets are very long-lived and function well beyond their theoretical ESL. In order to perform a high order network-level analysis, it was assumed that assets would fail (and require replacement) within a deterioration envelope / curve approximated by a Weibull probability distribution. The two-parameter Weibull cumulative distribution has two parameters for scale and shape, as set out in Equation [1]:

$$f(x;\alpha,\beta) = e^{-\left(\frac{x}{\beta}\right)^{\alpha}} \quad [1]$$

Where: x = Age
α = Shape parameter (or slope)
β = Scale parameter

A set of Weibull cumulative distribution functions were leveraged to simulate a set of deterioration curves for assets with different ESLs as shown in **Figure 2-4**.

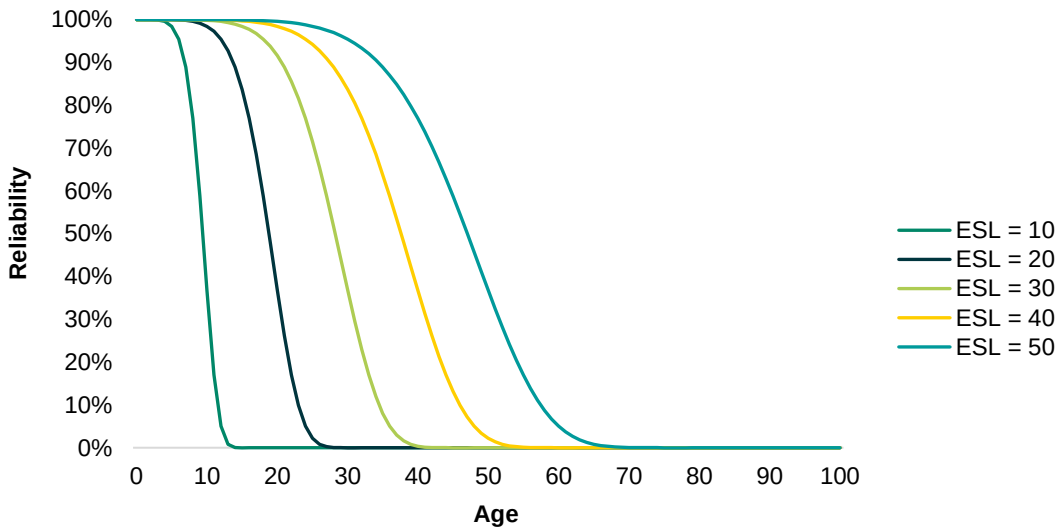


Figure 2-4: Asset Deterioration Curve Samples

Table 2-4 and **Figure 2-5** present the condition ratings of the City's roadway appurtenances with respective replacement values. As stated previously, a substantial number of roadway appurtenances assets lack installation date information. Therefore, a significant data gap exists for assets labelled as "Unknown" condition, representing 69% of the total replacement value. The known condition ratings span from "Very Good" to "Very Poor," with "Very Good" and "Good" collectively contributing 9% to the overall replacement value.

Table 2-4: Roadway Appurtenances Condition Summary

Rank	Condition Rating	Replacement Value	% of Replacement Value
1	Very Good	$2,816,000	7%
2	Good	$856,000	2%
3	Fair	$5,612,000	14%
4	Poor	$1,442,000	4%
5	Very Poor	$2,151,000	5%
6	Unknown	$28,134,000	69%
Total		**$41,010,000**	**100%**

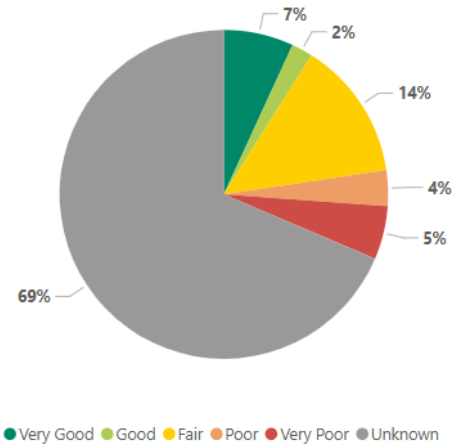


Figure 2-5: Roadway Appurtenances Asset Condition Weighted by Replacement Value

Figure 2-6 and **Table 2-5** granulate the condition of the assets based on asset categories / subcategories and their respective replacement values. Similarly, only the condition of traffic signs (including all subcategories), traffic signals (including traffic controller systems and solar flashers), and traffic equipment (including radio systems) has been assessed. The data gap for other subcategories still requires attention and completion.

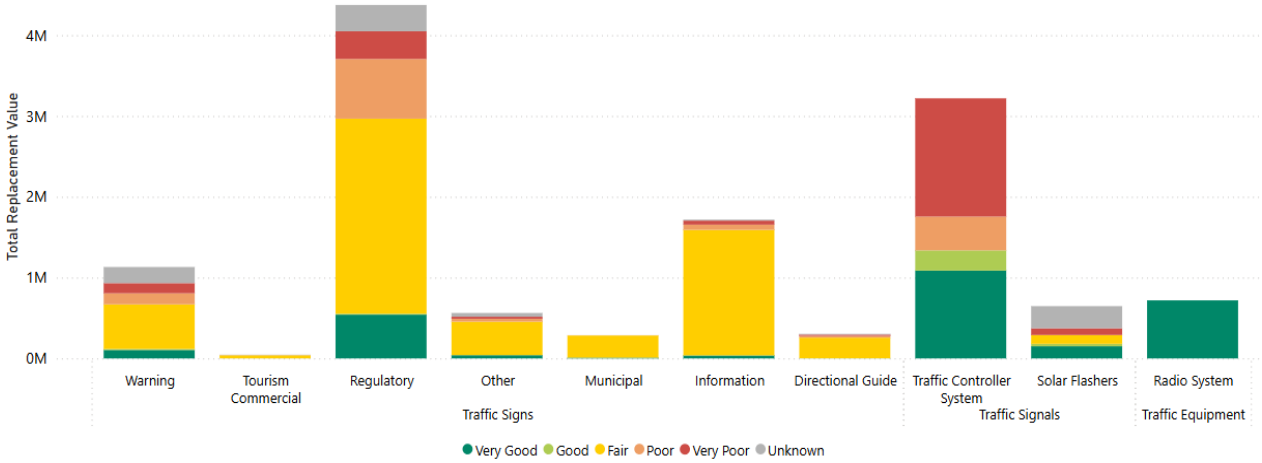


Figure 2-6: Distribution of Roadway Appurtenances Asset Condition

Table 2-5: Distribution of Condition for Roadway Appurtenance Asset Categories

Asset Category	Very Good	Good	Fair	Poor	Very Poor	Unknown
Parking Lots	-	-	-	-	-	26%
Railway Crossings	-	-	-	-	-	30%
Traffic Signs	2%	0%	0%	0%	0%	0%
Traffic Signals	3%	1%	0%	1%	4%	11%
Traffic Equipment	2%	1%	13%	2%	1%	1%
Total	**7%**	**2%**	**14%**	**4%**	**5%**	**69%**

2.3 Asset Data Gap Analysis

This section summarizes the current state of the City's asset data by assessing the quality of the asset inventory. Specifically, this section identifies existing data gaps, determines the overall confidence in the current asset data, and introduces good practices of data management.

2.3.1 Data Gap Observations

The City's roadway appurtenances were previously stored across multiple spreadsheets and GIS database. This project has successfully centralized the data into a single inventory. Additionally, it has addressed and filled gaps in key data, such as expected service life and replacement costs, achieving a 100% completeness rate. **Table 2-6** provides a summary of data completeness levels in the compiled roadway appurtenance inventory across key data attributes. It is recommended that the City continue to work on filling any remaining gaps, ensuring an up-to-date database.

Table 2-6: Asset Data Completeness

Asset Group	Inventory Completeness (%)					
	Asset ID	Location	Install Date	Condition (for Traffic Signs)	Expected Service Life	Replacement Cost
Roadway Appurtenances	85%	8%	20%	92%	100%	100%

2.3.2 Data Confidence

The quality of asset data is critical to effective AM, accurate financial forecasts, and informed decision-making. For this reason, it is important to know what the reliability of the information is for the State of Infrastructure analysis of the roadway appurtenances. **Table 2-7** provides a description for the data confidence grades used to classify the reliability of the asset data. This can serve as a reference for the City to assess the quality of their asset data.

Table 2-7: Data Confidence Grading Scale

Confidence Grades	Description
A - Highly reliable	Data is based on sound records, procedures, investigations and analysis, documented properly and agreed as the best method of assessment. Dataset is complete and estimated to be accurate ± 2%
B - Reliable	Data is based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example some of the data is old, some documentation is missing and/or reliance is placed on unconfirmed reports or some extrapolation. Dataset is complete and estimated to be accurate ± 10%
C - Uncertain	Data is based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data are available. Dataset is substantially complete but up to 50% is extrapolated data and accuracy is estimated ± 25%
D - Very Uncertain	Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete, and most data is estimated or extrapolated. Accuracy ± 40%
E - Unknown	None or very little data held.

Table 2-8: Data Confidence Grading Scale

Asset Group	Data Confidence Average Grade		
	Inventory	Install Date	Condition (for Traffic Signs)
Roadway Appurtenances	B	B	B

2.3.3 Data Management Practice

The asset data lifecycle is a sequence of stages that data goes through from its initial build (i.e., data capture and entry) to its eventual archival and/or deletion at the end of its useful life[1]. A clear definition and understanding of the organization's process for acquiring, storing, utilizing, assessing, improving, archiving, and deleting data (see **Figure 2-7**) will ensure good data management practices and help to sustain levels of data quality required to support AM activities.

[1] TechTarget Network, Definition: Data Life Cycle, 2020.

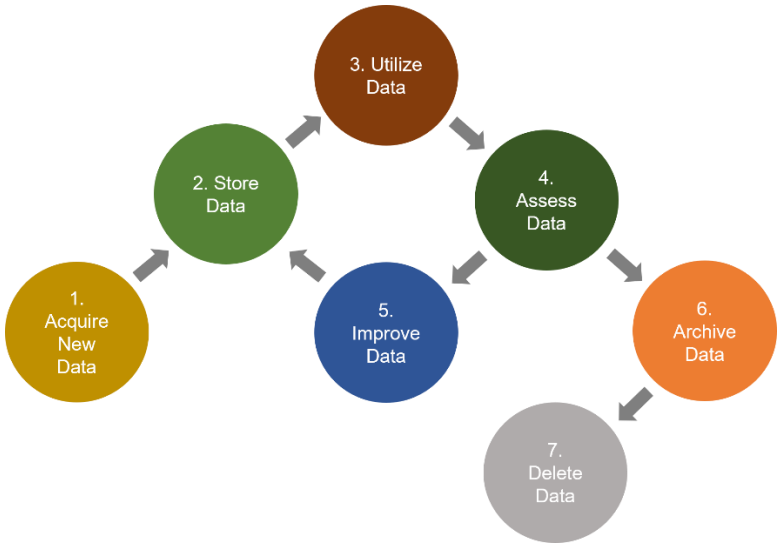


Figure 2-7: Asset Information Lifecycle

The seven key stages of the asset data lifecycle are described in more detail below:

Acquiring New Data: The majority of new asset data arises from asset creation, refurbishment and overhaul activities. New data may also come by way of inheritance or transfers from other business units, organizations, or third parties. As such, it is important to have clearly defined processes in place not only to add or update asset data, but to migrate and merge data from other sources.

Storing Data: The way asset data is stored is an important consideration for overall data quality. Having a planned approach to data storage will inevitably reduce the likelihood of duplication and inconsistencies across datasets within the organization. Depending on the needs of the organization, this stage may involve procuring a new software to adequately house the data, along with a data backup and recovery plan to ensure that the necessary data protection and privacy standards are met.

Utilizing / Analysing Data: This aspect of the asset information lifecycle is where users encounter the data to support data-driven activities within the organization. Data can be viewed, processed, edited, and published to allow users to access the data outside the organization. Critical data that has been modified should be fully traceable to maintain the integrity of the data. As such, it is important to communicate to the users why asset data is so important, and how it is used to inform decisions within the organization.

Assessing Data: Assessing the data quality helps to determine the level of confidence in the information and ensures that decision-makers are making informed decisions based on the quality of data available to them. Moreover, it is important to fully understand the availability and quality of the asset data before issuing information publicly. Some of the results of data degradation, due to improper or lack of assessment, may include:

- Poor asset performance due to lack of information and understanding of asset behaviour.
- Non-compliance with statutory regulations or safety requirements.
- Safety incidents due to risks not being identified or reported.
- Asset failure due to gaps in maintenance planning.

Improving Data: Improving data quality involves establishing clear targets which are intended to be communicated widely across the organization. It is imperative that the organization understands the costs, benefits, and risks associated with any data improvements since the cost of the improvement may outweigh the overall benefit. It is also important to note that *more* data does not necessarily mean *better* data. It is very possible to collect data that does not add value to the organization. As such, it is critical that the organization aligns its data improvement targets with its AM objectives and considers the data-driven decisions staff need to make at the operational and strategic level, to ensure that the *right* data is being improved upon.

Archiving Data: Archiving data is the process of storing data that is no longer active or required but is able to be retrieved in case it is needed again. Data that is archived is stored in a location where no usage or maintenance occurs. It is recommended that a data archive strategy exists within an organization in order to lay out the data archival requirements, which includes the following factors:

- Consider what data should be archived and articulate the reasons behind the archival decisions.
- Examine any legal obligations pertaining to the retention of data records.
- Determine the appropriate duration for retaining different categories of data records.
- Evaluate the risks associated with the inability to retrieve specific data records.
- Specify the authorized individuals or entities who should have access to archived data records.
- Establish the expected timeframe for retrieving archived data records.
- Communicate these requirements across the organization to ensure staff understand why records are being archived, how they can access archived data records, and for how long archived data records can still be accessed.

Deleting Data: The deletion of data is the final component of the asset information lifecycle. Typically, within organizations there is a resistance to permanently delete data, otherwise known as data “squirrelling”, due to the overall capacity of storing data increasing and the cost decreasing. However, within the organization’s data archive strategy, a retention period should be specified to indicate when data should be deleted, along with any processes to follow, such as obtaining prior authorization.

3. Levels of Service

3.1 Purpose

Level of Service (LoS) supports every aspect of the overall AM System. The objective of establishing clearly defined service levels is to help the City meet stakeholder values, achieve its strategic goals, make informed decisions, and implement effective asset lifecycle activities.

Documenting LoS is a proven practice that will enable the City to:

- Link corporate strategic objectives to customer expectations and technical operations.
- Balance customer needs and expectations while evaluating the effectiveness of operations and whether the right LoS is being provided at the right cost.
- Transition from an “Asset Stewardship” approach that focuses on making decisions based on maintaining assets in an acceptable condition to a “Serviceability” approach that is geared towards making decisions based on balancing the costs, risks, and goals for the LoS being provided by the City’s assets.
- Communicate the physical nature of infrastructure that the City owns and is financially responsible for while promoting the use of LoS to enable effective consultation with stakeholders regarding alternative funding options according to desired LoS outcomes.
- Make recommendations on strategies that the City can take now to minimize future renewal costs while ensuring that adequate LoS can be delivered without burdening future generations.
- Assess internal (e.g., program changes) and external (e.g., climate change) factors that have the potential to impact the City’s ability to deliver services and how these factors may impact the LoS being provided.
- Implement a corporate continuous improvement program to further optimize AM across all service areas.

The O. Reg. 588/17 requires that all AMPs include the current and proposed LoS being provided, determined in accordance with the qualitative descriptions and technical metrics provided (see **Section 1.3**).

3.2 Objectives

Defining LoS objectives is important for drawing a line of sight between the City’s corporate objectives and the tangible asset performance outcomes. To do so, the LoS objectives must take into consideration stakeholder interests to develop asset performance measures that aim to meet the needs and expectations of the community. By doing this, the City will ensure that their assets are striving towards optimal performance, not only operationally, but economically, socially, and sustainably as well.

Every stakeholder has certain interests in the service being provided and in general. The City’s corporate objective is to lift up the community and build pride, and attract people (visitors, employers and employees). The City’s Comprehensive Background Report[2] for the New Official Plan outlined the overarching themes that reflect the City’s value, as shown in **Table 3-1**. Each overarching theme is also assigned a corporate service objective.

The development of level of service targets should be aligned with these corporate objectives which will be addressed in the next iteration of the AMP.

[2] City of Sault Ste Marie. 2021. Comprehensive Background Report.

Table 3-1: The City's Overarching Themes and Objectives

Overarching Themes	Corporate Objective
Healthy Community	Supports healthy living, active transportation, access to passive and active recreation, social interaction and the creation of spaces that are comfortable, safe and accessible for all ages and abilities (the "8 to 80 Cities" concept).
Environmental Sustainability	Supports energy conservation and efficiency, improved air quality, reduced greenhouse gas emissions and climate change adaptation.
Integrated Mobility	Supports accessibility and choice of a diversity of transportation modes.
Sense of Place	Fosters a welcoming place for all that establishes connection and provides a memorable experience to visitors.
Sustainable Growth	Stimulates reinvigoration of neighbourhoods to provide a complete range of housing, services, employment and recreation.
Economic Resiliency	Supports the growth and diversification of the city's economy.
Social Equity	Contributes to creating a welcoming and inclusive community, focusing on the removal of systemic barriers so that everyone has access to an acceptable standard of living and can fully participate in all aspects of community life.
Cultural Vitality	Celebrates the Sault's history, diverse communities and natural and cultural heritage, with the Downtown as the Sault's core destination for arts and culture.

3.3 Stakeholder Identification

A stakeholder is any person or organization that can affect, be affected by, or perceive themselves to be affected by a decision or an activity. Stakeholder analysis is the process of understanding stakeholder needs, expectations, and perceptions relative to the stakeholder's level-of-interest and level-of-influence over the organization. The organization typically engages with their stakeholders to:

- Establish which activities or services matter most to them.
- Understand their risk appetite and risk threshold.
- Understand their willingness to pay for services.

Stakeholders can take many forms and may be internal (i.e., staff, Council) or external (i.e., the public, regulatory agencies, suppliers, neighbouring municipalities, etc.) to the organization. The following groups were identified as key stakeholders for roadway appurtenances at the LoS workshops. This is not intended to be an exhaustive list; however, the following groups provide a good starting point for the City to move forward to the next stage:

- Residential Customers
- Regulatory Agencies
- Neighbouring Municipalities
- Environmental Groups
- Internal City Departments
- Railway Companies

3.3.1 Legislated and Regulatory Requirements

It is recommended that the City refer to key legislative requirements to ensure minimum standards are met and that appropriate practices are in place to maintain roadway safety, accessibility, and functionality. A selection of important federal and provincial legislative requirements relevant to roadway appurtenances is outlined in **Table 3-2**.

Table 3-2: Legislated and Regulatory Requirements

Federal	Provincial
• Canada Transportation Act • Railway Safety Management System Regulations • Railway Safety Act • Grade Crossings Regulations • Canadian Rail Operating Rules	• Highway Traffic Act – Ontario Regulation 615 – Traffic Signs – Ontario Regulation 402 – Pedestrian Crossover Signs – Ontario Regulation 408 – Traffic Control Signal Systems – Ontario Regulation 626 - Traffic Control Signal Systems • Municipal Act – Ontario Regulation 239 – Minimum Maintenance Standards for Municipal Highways • Public Transportation and Highway Improvement Act • Ontario Traffic Manual

3.4 O. Reg 588/17 Levels of Service Metrics

Currently, O. Reg 588/17 only identifies levels of service metrics for core assets. Several key LoS performance measures have been identified for roadway appurtenance assets through consultation and workshops with City staff, (see **Section 3.5**).

3.5 Proposed Levels of Service

Establishing LoS targets is an important part of continual improvement and performance management. Without targets, it is difficult to ascertain whether goals are being met, or the extent of the gap if they are not. Incorporating targets into the City's LoS Framework helps to ensure that targets are reasonable, aligned with customer expectations, and evaluated on an objective basis by considering cost-benefit trade-offs.

One of the key challenges in setting targets in a municipal environment is that they can often become biased and/or politically motivated. Therefore, it is important to review LoS targets with internal and external stakeholders, especially the customers who will be impacted the most by changes in service delivery. An important aspect of evaluating LoS targets is determining how willing the user is to pay for the service. Regulatory requirements are an exception; however, they only provide the minimum service standard. Cost is still an important parameter to consider when assessing the merits of service improvements. To deal with the financial realities, it is necessary to:

- Calculate how much the service costs based on current LoS.
- Determine the lifecycle activities and cost associated with varying the LoS.
- Assess the customers' willingness to pay.

It is important that any targets set be realistic and achievable. O. Reg. 588/17 requires AMPs to include proposed LoS by July 1, 2025.

A summary of the City's roadway appurtenances service level metrics is presented in **Table 3-4**. Each metric was presented with its current trend and proposed trend for the next 10 years, represented by legends, taking into account the nature of the measure, data availability, and whether the trend impacts positively or negatively on the proposed LoS. The LoS trend legends are described in **Table 3-3**.

Table 3-3: LoS Trend Legend

Symbol	Name	Description
↑	Positively Increasing	KPI is improving steadily over time, showing progress toward goals.
→	Positively Stable	KPI is at a strong, desirable level and consistently maintained.
↓	Positively Decreasing	KPI is improving as lower values indicate better performance.
↑	Negatively Increasing	KPI is worsening over time, signaling a need for corrective action.
→	Negatively Stable	KPI remains poor with no improvement or further decline.
↓	Negatively Decreasing	KPI is declining in a way that reflects worsening performance.

Table 3-4: Roadway Appurtenances Current and Proposed Levels of Service

LoS #	Service Area	LoS Measure	Unit of Measure	LoS Category	Current Performance	Performance Trend		Lifecycle Activities to Meet Proposed LoS	Budget Impact to Meet Proposed LOS	Risk of Not Meeting Proposed LoS
						Current	Proposed			
1	Roadway Appurtenances	Frequency of inspecting regulatory signs *	# of inspections / year	Technical	1	→	→	The City typically conducts inspections of regulatory signs every summer, employing summer students to carry out this work. To ensure effective inspections, it is essential for the City to maintain up-to-date equipment.	Low	• Non-compliance with regulations can lead to fines or penalties imposed by government authorities. • Damaged signs can lead to driver confusion, increasing the likelihood of accidents. • If poorly maintained signs contribute to accidents, the City may face lawsuits for negligence.
2	Roadway Appurtenances	% of Assets in Fair or Better Condition	%	Technical	23%	N/A **	N/A **	• Regular condition assessment • Replace aged assets	Low to Moderate	• Generally lower risk, but aging or underperforming assets still require attention.

** Reg. 239/02 requires that regulatory and warning signs be inspected at least once per calendar year to ensure they meet the retro-reflectivity requirements of the Ontario Traffic Manual, with no more than 16 months between inspections.*

*** The performance trend is not available because this is a new LoS metric. However, it should become available in future iterations of the AMP as the City continues to collect installation dates and update condition scores for roadway appurtenance assets.*

Performance Trend Legend:

↑ Positively Increasing	→ Positively Stable	↓ Positively Decreasing	↑ Negatively Increasing	→ Negatively Stable	↓ Negatively Decreasing

3.6 Future Demand Drivers

Demand management is a critical component of managing the desired LoS in a sustainable manner, now and into the future. Understanding demand drivers enables the City to proactively develop effective, long-term strategies that are suitable for the City's unique political, environmental, social and technological landscape.

A summary of factors identified through consultation with City staff that may impact roadway appurtenance service levels includes, but is not limited to, the following:

- Technology
- Growth
- Speed Management
- Funding level

On November 2, 2021, the City of Sault Ste. Marie's Planning Division released the Comprehensive Background Report[3] for updating the Official Plan[4]. The City's Official Plan guides the local decision-making on land use, development and public infrastructure over the next 20 years. The City's population is expected to reach approximately 80,000 residents by 2031 and 83,300 by 2036. Employment is projected to increase by approximately 6,000 jobs, rising from about 31,000 in 2016 to 36,900 in 2036.

When additional assets to accommodate this population and employment growth are introduced to the City's portfolio, additional human resources, training and funding are required to maintain and operate, and renew or replace those assets. O. Reg. 588/17 requires municipalities by July 1, 2025, to estimate capital expenditures and significant operating costs to achieve the proposed LoS and accommodate projected increases in demand caused by population and employment growth. This includes the estimated capital expenditures and significant operating costs related to new construction and / or to upgrade existing municipal infrastructure assets. This has been addressed in **Section 5.2.3**.

[3] City of Sault Ste Marie. 2021. Background Report. Compressed OP Background Report 2022April.pdf
[4] City of Sault Ste Marie. 1996. Official Plan

4. Asset Management Strategies

4.1 Asset Lifecycle Management Introduction

Asset lifecycle management focuses on the specific activities that should be undertaken during all phases of the asset lifecycle. Considering the entire asset lifecycle ensures that the City makes sound decisions that take into account present and future service delivery needs.

The overarching goal of lifecycle management is to maximize the long-term benefits and services that the City's assets deliver while minimizing the associated costs and risks in the long run. Every asset has a lifecycle cost, which is the total cost of all activities undertaken throughout its service life. Part of the purpose of the asset management planning process is to fully understand and predict the long-range financial requirements for the City's infrastructure, facilitating planning and resource management in the most cost-effective manner possible. **Figure 4-1** illustrates how costs typically accumulate over an asset's life. It is worth noting that the ongoing operations and maintenance, renewal & replacement, and disposal costs accumulate to many multiples of the initial acquisition costs. As such, it is important to fully understand the entire lifecycle costs before proceeding with asset acquisition.

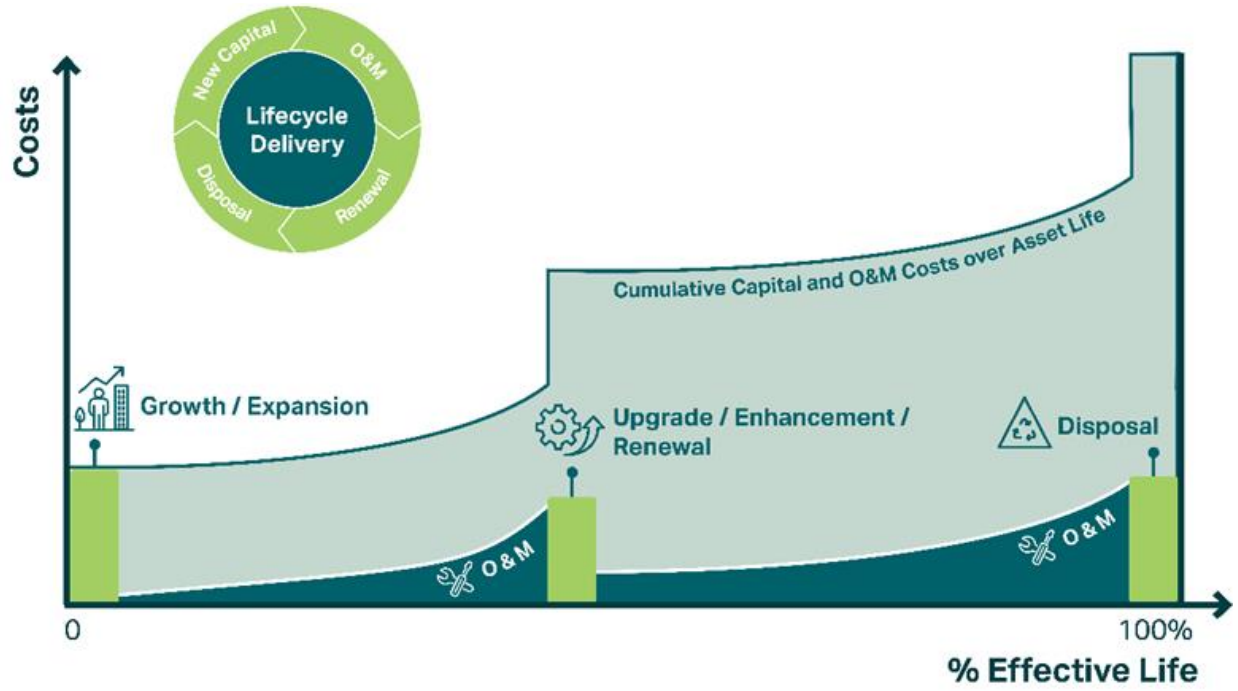


Figure 4-1: Lifecycle Cost Accumulation Over Asset Life

Asset lifecycle management strategies are typically organized into the following categories.

1. **Asset Acquisition / Procurement / Construction**: Acquisition includes expansion activities and upgrading activities to extend services to previously unserved areas or meet the demands of growth and functional requirements. When acquiring new assets, the City should evaluate credible alternative design solutions, considering how the asset will be managed at each of its lifecycle stages. Asset management and full lifecycle considerations for the acquisition of new assets include, but are not limited to, the following:
    - The asset's operability and maintainability.
    - Availability and management of detours.

- Staff skill and availability to manage the asset.
- The manner of the asset's eventual disposal.

2. **Asset Operations and Maintenance (O&M)**: As new infrastructure is commissioned, the City assumes the responsibility of operating and maintaining the infrastructure according to O&M standards to ensure its safety and reliability. The operations staff provides the necessary day-to-day support for operating the assets. Maintenance expenses include periodic preventive maintenance to ensure that the infrastructure can provide reliable service throughout the life of the asset and corrective maintenance that is required to repair defective assets as needed. Inadequate funding for O&M will adversely impact the lifespan of assets. The number of O&M resources required in any period is a function of the current inventory of infrastructure and the total O&M needs for each asset. As the inventory of infrastructure grows, total O&M requirements will also increase.

3. **Renewal and Replacement:** The third aspect of full lifecycle costing pertains to the renewal and replacement of assets that have deteriorated to the point where they no longer provide the required service. Renewal or rehabilitation costs may be incurred during the life of an asset where an investment is made to improve its condition and/or functionality, for example, resurfacing a parking lot. Replacement activities are expected to occur once an asset has reached the end of its useful life, and rehabilitation is no longer a viable option.

4. **Decommissioning and Disposal:** There will inevitably come to a point in time when an asset must be removed from service, and depending on the type of asset, there may be significant costs associated with its decommissioning and disposal. Factors that may influence the decision to retire an asset include changes to leading to non-compliance, the inability of the asset to handle increased service levels, technological advances rendering the asset obsolete, the cost of retaining the asset exceeding the benefits gained, the current risk associated with the asset's failure being tolerable, assets negatively impacting service delivery or the environment.

Normally, major costs that may be incurred during disposal and decommissioning derive from the environmental impact of the disposal and, if required, the rehabilitation and decontamination of land. However, some cost savings may be achieved through the residual value of the asset or by exploring alternative uses for the asset. In all cases, it is important to consider disposal and decommissioning as the strategy employed has the potential to attract significant stakeholder attention. For that reason, the costs and risks associated with disposal and decommissioning should be equally considered in the City's capital investment decision-making process.

4.2 Asset Acquisition Strategies

The City's pursuit of new roadway appurtenances is primarily fueled by their growth. With the expansion of both population and infrastructure, there arises a need for updated and enhanced road features to cater to the rising traffic and facilitate efficient transportation. The City's commitment to complying with traffic and safety regulations is equally crucial, ensuring that the transportation infrastructure aligns with current standards, thereby improving overall road safety. This input prompts targeted improvements in response to resident concerns. Last but not least, the City's dedication to sustainability initiatives propels the adoption of smart, energy-efficient technologies, contributing to environmentally friendly solutions in the transportation system.

Table 4-1 summarizes the acquisition activities associated with the City's roadway appurtenances.

Table 4-1: Acquisition Activities for Roadway Appurtenances

Asset Group	Activities Undertaken by the City	Guiding Documents
Roadway Appurtenances	• New Intersections Development: Accompanied by the creation of GIS data and drawings. • Cameras: New installations to Improve timing of traffic signals and contribute to a reduction in customer complaints.	• Official Plan • Transportation Master Plan • Corporate Strategic Plan • Energy Conservation & Demand Management Plan • Community Greenhouse Gas Reduction Plan • Strategic Asset Management Policy

4.3 Asset Operations and Maintenance Strategies

Effective O&M of assets is crucial for sustainable performance and longevity. Managing O&M costs involves developing comprehensive strategies that optimize resource utilization while ensuring asset reliability. Proactive maintenance schedules and condition monitoring can help identify potential issues before they escalate, reducing unplanned downtime and minimizing repair costs. Implementing energy-efficient technologies and best practices in roadway appurtenances management also contributes to cost-effectiveness over the asset's lifecycle. It is worth noting that currently the City has not established maintenance targets for roadway appurtenances; instead, they rely on the minimum maintenance standards as the guiding document.

Table 4-2 summarizes the O&M activities associated with the City's roadway appurtenances.

Table 4-2: O&M Activities for Roadway Appurtenances

Asset Group	Asset Category	Activities Undertaken by the City	Note
Roadway Appurtenances	Traffic Signals	• Regular monitoring of signal functionality. • Inspection and repair of traffic signal poles. • Implementation of software updates and hardware repairs. • Repairs of LED lamps: – Entire LED segments are replaced rather than repairing individual bulbs. – Daily inspections to ensure signal functionality. – Conducting visual and digital inspections, documenting any defects found.	Challenges in Traffic Signals O&M: • Managing the high volume of maintenance work at each intersection poses tracking difficulties, requiring ongoing efforts for documentation. • Addressing staffing and budget constraints is crucial for effective maintenance operations. • The short operational season, from May to the beginning of November, demands focused efforts to optimize maintenance activities. • Conducting maintenance internally is the current approach; there are challenges in utilizing external contractors for specialized work. • The installation of PXOs has been delayed for a few years due to their lower priority.
	Traffic Equipment	• Regular calibration and cleaning of equipment. • Inspection and repair of hardware. • Updates of software: – It is an ongoing process for traffic signals. – Updates are typically required for most controllers, traffic controllers cabinets, and any hardware in the field.	The ongoing calibration, cleaning, inspection, repair, and software updates required for traffic equipment highlight the need for proactive and systematic asset management practices to ensure equipment reliability, extend service life, and support safe and efficient traffic operations. This includes maintaining detailed asset inventories, scheduling regular maintenance, and budgeting for periodic technology upgrades.

Asset Group	Asset Category	Activities Undertaken by the City	Note
	Traffic Signs	• Regular inspections. • Cleaning and repairing signs. • Replacing faded or damaged signs. • Conducting a reflectivity study each summer for regulatory and warning signs. • Conducting annual reflectivity studies to comply with regulatory standards. • Conducting bi-yearly inspections alongside bridge inspections for overhead signs.	• The O&M of traffic signs is mandated by the Municipal Act, which stipulates specific requirements that must be met. This involves conducting regular inspections and testing, with a commitment to proving compliance with the established standards and regulations. • The City document sign inspections results in GIS.
	Parking Lots	• Regular cleaning and surface repairs. • Repairing lighting, signage, and markings. • Winter maintenance such as snow clearing. • Repairing markings for parking spaces.	These activities underscore the importance of routine maintenance planning and condition assessments within asset management. These activities are essential to ensure safety, accessibility, and prolong the service life of parking lot infrastructure.
	Railway Crossing	• Inspecting and maintaining signal equipment. • Inspecting barrier functionality and safety mechanisms. • Testing traffic signals at railway crossing interconnections annually through collaborative efforts between the City and the railway company.	• The City needs to address public complaints arising from offset rails, with the responsibility for action falling on the railway companies. The difficulties lie in coordinating and communicating with railway companies to establish proactive maintenance plans, adding a layer of complexity to ensuring the safety and functionality of railway crossings.

4.4 Renewal and Replacement Strategies

Renewal often involves upgrading or refurbishing existing assets to extend their lifespan, while replacement entails acquiring new assets. The costs associated with these activities include not only the direct expenses of acquisition but also indirect costs such as downtime during the transition, training for new technologies, and potential disposal or recycling costs. .

Table 4-3 summarizes the renewal and replacement activities associated with the City's roadway appurtenances.

Table 4-3: Renewal and Replacement Activities for Roadway Appurtenances

Asset Group	Asset Category	Activities Undertaken by the City	Note
Roadway Appurtenances	Traffic Signals	• Replacement at the end of life.	• The City has undertaken the replacement for overhead flashers for sustainability purposes. • The City is in the process of replacing cabinets, and the replacement process is being facilitated through the capital road transportation program. • The re-lamping process has been completed, utilizing exclusively LED bulbs with a 10–15 years lifecycle; however, the City currently lacks a plan for end-of-life replacements.
	Traffic Equipment	• Replacement at end of life.	• The City is implementing smart traffic system by adding more intersections online.
	Traffic Signs	• Replacement at end of life.	• A replacement program is in place, and replacements of regulatory and warning signs are documented in GIS. • South facing signs may require more frequent replacement.

Asset Group	Asset Category	Activities Undertaken by the City	Note
	Parking Lots	• Resurfacing (currently not budgeted for regular resurfacing)	• Currently, there is no plan on replacement of parking lots assets.
	Railway Crossing	• Replacement at end of life (currently unplanned).	• The renewal and replacement activities are determined by the railway company, with maintenance requests communicated to the City, which provides funds for the maintenance.

4.5 Decommissioning and Disposal Strategies

Effective asset decommissioning and disposal are integral components of strategic asset management. As the City's roadway appurtenances approach the end of their lifecycle or become obsolete, a systematic methodology to their removal and decommissioning is essential. This process involves careful planning, environmental considerations, and adherence to the City's regulatory requirements. **Table 4-4** summarizes the decommissioning and disposal activities associated with the City's roadway appurtenances.

Table 4-4: Decommissioning and Disposal Activities for Roadway Appurtenances

Asset Group	Activities Undertaken by the City
Roadway Appurtenances	• Recycling metal, plastic, electronic components, and asphalt and concrete. • Ensuring proper disposal of batteries and electronic waste. • Providing hazardous waste depots. • Participating in metal recycling, receiving some funds in return.

4.6 Risk Associated with Lifecyle Activities

In the context of AM, risk is defined as the consequence or impact of uncertainties on AM objectives. These uncertainties span a spectrum of events, including financial market fluctuations, unexpected asset failures, changes in regulatory environments, and other factors capable of influencing the performance or condition of assets. Risk management, developed to handle uncertainties in a systematic and timely manner, is a practical framework that ensures thoughtful decision-making and protects the achievement of goals. The risk management process generally follows a series of steps, as outlined in **Table 4-5**.

Table 4-5: Key Steps in the Risk Management Process

Step	Description
1. Establish the context	• Define the scope of the risk management process and the objectives that the City seeks to achieve through effective risk management. • Consider the City's internal and external factors, and understand stakeholder expectations.
2. Risk identification	• Identify potential risks that could impact the City's AM objectives.
3. Risk analysis	• Utilize qualitative or quantitative analysis methods to assess risks.
4. Risk evaluation	• Evaluate the likelihood and impact of identified risks. • Prioritize risks based on their criticality.
5. Risk treatment	• Develop strategies to reduce the likelihood and impact of identified risks. • Implement preventive measures to address potential issues proactively. • Establish contingency plans for managing risks that cannot be eliminated.
6. Monitor and review	• Regularly update risk assessments to reflect evolving circumstances. • Develop KPIs and monitoring tools to track the effectiveness of risk treatment strategies. • Learn from the City's past experiences and continuously improve risk management strategies.

Over the course of an asset's service life, the accelerating rate of deterioration with age poses inherent risks, inevitably leading to a corresponding increase in maintenance costs. **Figure 4-2** illustrates a general asset deterioration curve. This trend becomes particularly pronounced in the final phase of the asset's service life, where the cost of maintenance experiences a rapid escalation, highlighting the financial risks associated with prolonged neglect. This phenomenon underscores the critical importance of preventive maintenance in the early stages of an asset's service life. By addressing risks proactively during these initial periods, the potential financial burden tied to accelerated deterioration in later stages can be effectively mitigated.

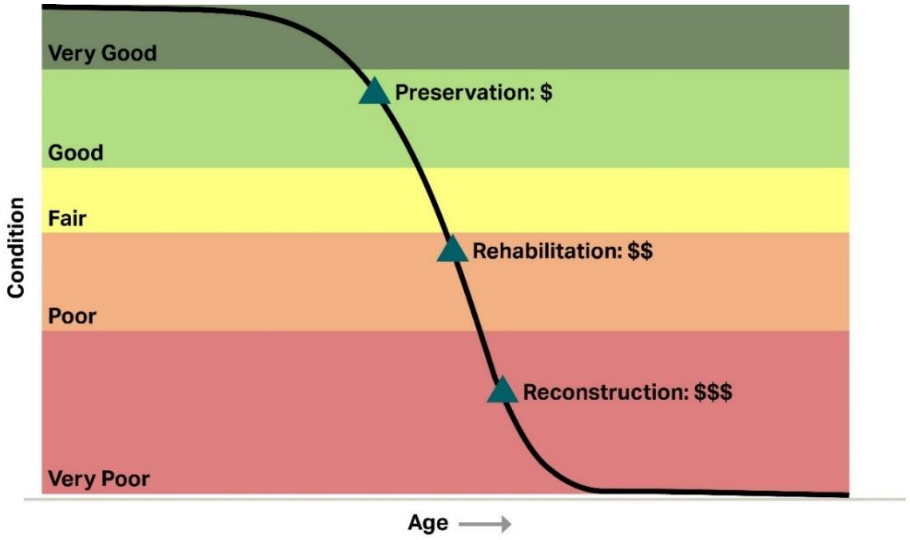


Figure 4-2: Asset Deterioration Curve and Rehabilitation Costs

Beyond the general guidance, the City's approach to risk management should be tailored to their overarching goals, financial resources, and willingness to tolerate uncertainties. It is important to note that failure to meet the proposed LoS also poses several risks, including fines or penalties imposed by government authorities, driver confusion, and increased likelihood of accidents. To help shape the City's risk management process, AECOM recommends taking into account the following key considerations:

1. Legislation Ambiguity for Railway Crossings

Managing roadway appurtenances involves navigating uncertainties in legislation, especially when responsibilities for railway crossings are ambiguous. The division of duties and obligations between the rail company and the City may not always be clearly delineated, presenting a potential challenge in terms of accountability and decision-making. This lack of clarity in legislation can lead to difficulties in establishing a comprehensive and streamlined approach to managing roadway appurtenances at railway crossings, potentially resulting in delays, disputes, or suboptimal maintenance practices.

2. Growing Accessibility Requirements

As the demand for higher levels of service grows, the City faces an increased need to ensure that roadway appurtenances align with accessibility standards, accommodating the diverse needs of the community. However, the City's aging infrastructure poses an additional risk, as some equipment may not meet evolving standards, potentially resulting in accessibility gaps. To address these challenges, the City should adopt a holistic approach that combines technological innovation, policy adjustments, and systematic infrastructure upgrades.

3. Regulatory Traffic Sign Inspections

Maintaining traffic signs is crucial for keeping the City's streets safe. Not only does neglecting them pose a safety hazard, but it can also lead to costly lawsuits against the City. The City is now fully compliant with the regulatory requirements for the upkeep of traffic signs inspections.

4. Increased Maintenance Costs

Regular maintenance of roadway appurtenance assets is a cost-effective strategy that prevents the escalation of minor issues into major repairs or replacements (see **Figure 4-2**).

5. Funding Need Analysis

Financial forecasting and capital planning are a critical element of ensuring the efficient and sustainable management of infrastructure. This involves estimating future financial needs and developing a strategic plan to secure the necessary funding for maintaining, renewal, or expanding assets. By accurately forecasting financial requirements and implementing a well-structured capital plan, the City can not only ensure the long-term viability of their infrastructure systems but also effectively manage costs, reduce environmental risks, and protect public health.

The financial projections presented in the subsequent sections provide visualizations of the results from the financial model. The subsequent sections are structured as follows:

Section 5.1 summarizes historical capital and O&M expenditures, along with budget forecasts for the next 10 years (2024–2033).

Section 5.2 outlines the assumptions used in the financial model to guide reinvestment and replacement decisions for each roadway appurtenance subcategory and estimates the annual funding requirements over the 10-year period. The projected levels of service over this period are also presented.

Section 5.3 presents the full funding needs for the next 10 years, including capital, O&M, and disposal costs.

Section 5.4 summarizes the risk of funding gaps and **Section 5.5** explores possible funding sources and alternative strategies to address funding gaps.

5.1 Capital and Operating Budget

5.1.1 Capital Budget - Historical Expenditure and Future Forecast

The City has budgeted $200,000 for traffic controller system replacements for the years 2025–2029, as summarized in **Table 5-1**. Capital budget details for other asset categories and subcategories were not available at the time this AMP was developed. However, it should be noted that certain capital costs associated with roadway appurtenances are covered within the O&M budget, as discussed in **Section 5.1.2**.

Table 5-1: Capital Budget Forecast

Asset Class	Asset Category	Asset Sub-Categories	2025-2029 5-Year Average Reinvestment Budget
Roadway Appurtenances	Traffic Signal	Traffic Controller Systems	$200,000

5.1.2 Operating Budget - Historical Expenditure and Future Forecast

Table 5-2 presents the forecasted 10-year average budgets from the previous AMP (2024) and the approved 2025 budgets for roadway appurtenances. In the previous AMP, operating budget forecasts were developed based on input from the City, the replacement value of assets without installation dates, and their ESLs. When compared with the City's published 2025 O&M budget, it is observed that while the approved budgets for parking lots and general traffic and communications are slightly lower than the forecasted values, they remain within a comparable range. As such, this AMP continues to use the forecasted operating budgets from the 2024 AMP, adjusted for inflation to reflect future dollar values.

Table 5-2: Operating Budget Forecast

Asset Class	Asset Category	Details	Previous AMP 10 yr. Avg. Forecast (Inflated)	2025 Budget [5]	10 yr. Avg. Forecast (Inflated) from 2025 to 2034
Roadway Appurtenances	Traffic Signal and Traffic Equipment	Budget for replacement, excluding traffic controller systems and radio systems	$278,000	Not available	$311,000
	Traffic Signs	Budget for replacement, excluding regulatory signs	$432,000	Not available	$20,000 *
	Parking Lots	-	$274,000	$203,581	$252,000
	General	Traffic & Communications O&M	$2,454,000	$2,030,298	$2,262,000
Total					**$2,845,000**

** Note that the adjusted operating forecast for traffic signs is significantly lower than in the previous AMP. This change is due to the availability of condition assessment scores for the majority of traffic signs (92%), which allow for the estimation of their apparent ages. As a result, the replacement of these signs is now scheduled at the end of their service life and categorized under capital reinvestment needs, while operating costs account for the maintenance and replacement of the remaining 8% of traffic signs.*

5.2 Capital Reinvestment Funding Needs Analysis

This section outlines the capital funding scenarios analyse approach, assumptions, and presents service level trends regarding asset condition under various budget scenarios.

5.2.1 Lifecycle Model Approach and Assumptions

The lifecycle analysis was performed using a Power BI model, integrating key asset attributes such as asset inventory, age, expected service life, replacement values, and condition data to develop theoretical asset replacement cycles. The analysis also incorporates condition assessment results for traffic signs. A financial dashboard was developed to effectively visualize and communicate the lifecycle modeling outcomes.

The annual reinvestment needs for the roadway appurtenance assets were determined based on their age and ESL in years (i.e., replacing assets that have exceeded their ESL) in inflated dollar values, incorporating the following assumptions:

- Base year: The base year used is 2025. Any historic asset replacement values have been inflated using the experienced inflation rate from Non-Residential Building Construction Price Index (NRBCPI).
- Inflation rate: the inflation rates adopted for the financial model are presented in **Table 5-3**. The inflation for 2025 and later years is determined based on the City's input.

Table 5-3: Inflation Rate [6]

Year	Inflation Rate
2023	7.1%
2024	6%
2025 - 2034	2%

[5] 2025 Final Operating Budget Summary. City of Sault Ste. Marie. 2025 Final Operating Budget Summary for Website.xlsx
[6] Past inflation data obtained from NRBCPI using the non-residential; yearly result taken from an average of quarterly results. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810027601

- Markup: The project management and engineering, and contingency mark ups are 15% and 30% respectively.
- Disposal Rate: 1% of the annual reinvestment is used as an allocation for disposal costs.

In cases where the installation date and condition assessment scores are unavailable, an annual reinvestment rate is applied to estimate the asset replacement need. Detailed reinvestment assumptions for those assets or assets requiring a specific renewal approach are provided in **Table 5-4**.

Table 5-4: Roadway Appurtenances Asset Capital Reinvestment Assumptions

Asset Categories	Reinvestment Strategy	Assumption	Annual Reinvestment Rate (2025-2034)
Parking Lots	Resurface every 25 years	4% of parking lots resurfaced annually with a unit cost of $80/m^2	1.6%
Railway Crossings	Replace assets for a life cycle of 30 years	3.3% of railway crossing replaced annually	3.3%

5.2.2 Budget Scenarios Settings

Table 5-5 outlines the budget scenario settings used in the model for roadway appurtenance assets. Scenario 1 (S1) represents a “Do Nothing” approach with zero expenditure. Scenario 2 (S2) reflects an ideal, unconstrained budget scenario, where the City is able to replace assets at the end of their service life as needed. Since a defined capital budget for roadway appurtenances is not yet available, a constrained budget scenario was not applied. However, the model is designed to accommodate additional budget scenarios in the future as more budget information is provided.

Table 5-5: Roadway Appurtenance Budget Scenarios

Scenario	Description	Budgets
S1 Do Nothing	Spend Nothing	$0 Million
S2 Unlimited Budget	Replace assets at end of life	Unlimited

5.2.3 Roadway Appurtenance Budget Scenarios & 10-Year Service Level Forecast

This section presents the budget scenario results and the 10-year service level forecast for roadway appurtenance assets.

5.2.3.1 Roadway Appurtenance Assets Funding Needs

In the unconstrained budget scenario (S2), the City's roadway appurtenances require an average annual reinvestment rate of $1.8 million (in inflated dollar values) from 2025 to 2034, as presented in **Figure 5-1**. This is equivalent to a total of approximately $18 million over the next 10-year period. A significant portion of this funding is associated with the replacement of traffic signs projected for 2028. However, since the age of traffic signs is estimated based on condition assessment scores, it is important for the City to re-evaluate their condition in the coming years before proceeding with large-scale replacements. In addition, railway crossings notably contribute to the reinvestment needs in most years. However, due to legislative ambiguity, there may be opportunities for the City to share these costs with senior levels of government and railway companies.

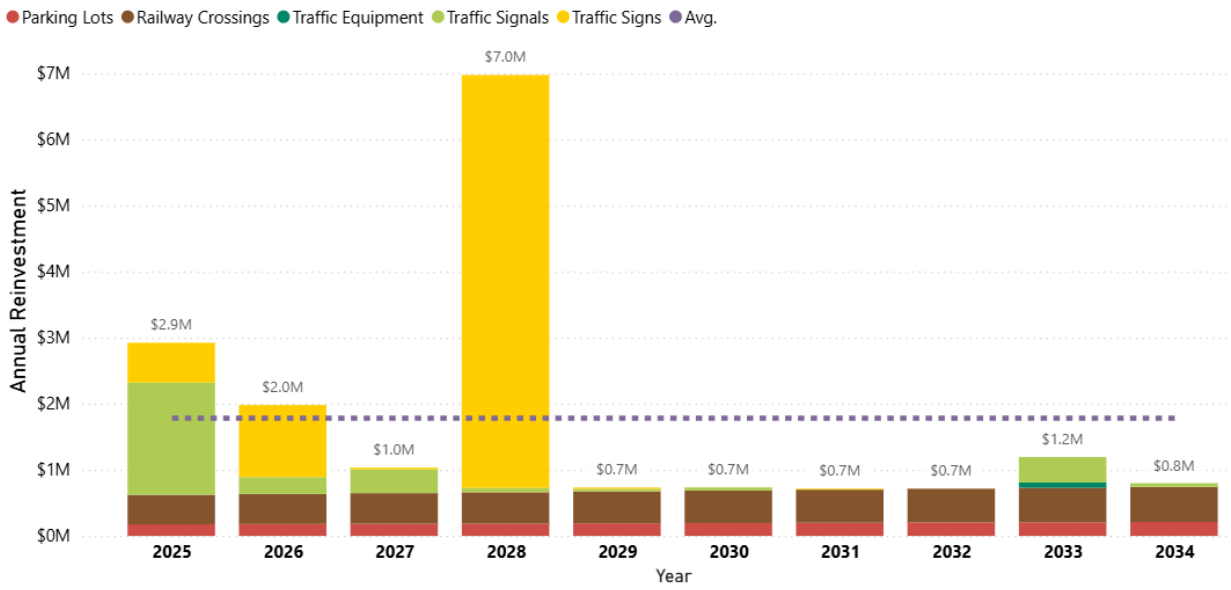


Figure 5-1: Roadway Appurtenances 10-Year Reinvestment Need

The detailed 10-year reinvestment needs for roadway appurtenances are presented in **Table 5-6** in inflated dollar values.

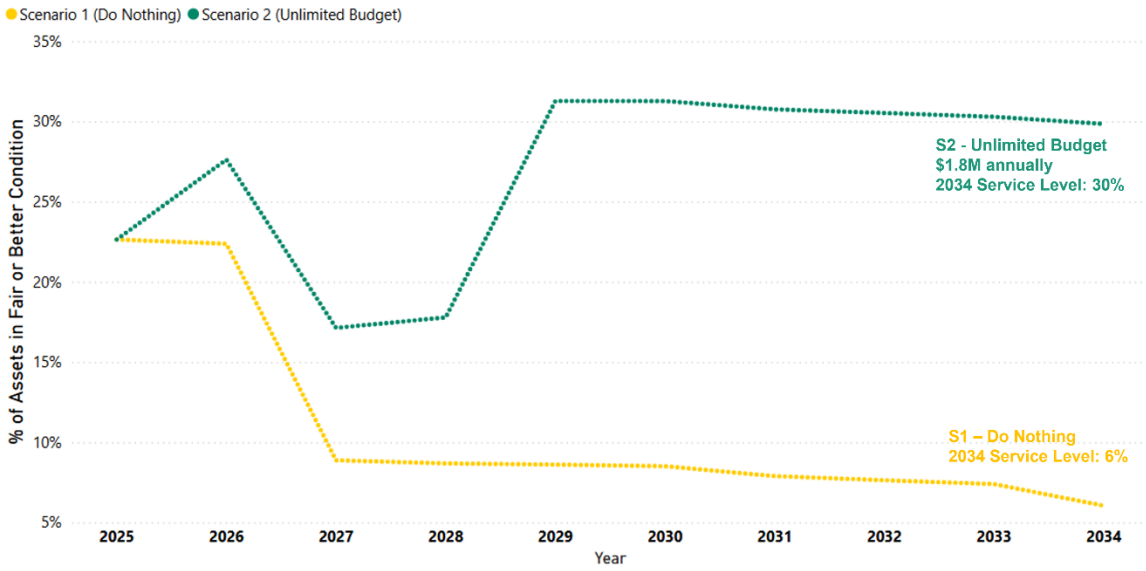
Table 5-6: Roadway Appurtenances 20-Year Total and Annual Average Reinvestment Need

Asset Category	Annual Average Need	10-Year Total
Parking Lots (City Owned and Public)	$194,000	$1,940,000
Railway Crossings	$488,000	$4,880,000
Traffic Equipment	$8,000	$80,000
Traffic Signals	$290,000	$2,900,000
Traffic Signs	$801,000	$8,010,000
Total	**$1,781,600**	**$17,816,000**

5.2.3.2 Roadway Appurtenance Assets 10-Year LoS Trend Forecast

Figure 5-2 presents the projected condition of roadway appurtenance assets under the two funding scenarios over the 10-year analysis period. Currently, 23% of roadway appurtenance assets are in fair or better condition. However, it should also be noted that the condition of assets that represent 69% of the total replacement value remains unknown due to missing install dates, highlighting a significant data gap in the overall assessment.

Under Scenario S1 – Do Nothing, the proportion of assets in fair or better condition declines to just 6% by 2034. In contrast, under Scenario S2 – Unlimited Budget, which equates to an average annual reinvestment of $1.8 million, the percentage of assets in fair or better condition improves to 30%. Given that the City's actual future budget is expected to fall somewhere between these two extremes, the resulting asset condition will likely fall within this range as well. This highlights the importance of strategic reinvestment planning to maximize asset performance within available funding levels.



Note: The service trend reflects only 31% of roadway appurtenance assets, weighted by replacement value, as the condition of the remaining assets is unknown.

Figure 5-2: Roadway Appurtenance Assets Levels of Service Trend for All Budget Scenarios

Figure 5-3 illustrates the projected condition distribution of roadway appurtenance assets from 2025 to 2034 under the unlimited budget scenario (S2). As S2 represents an ideal scenario in which the City can reinvest without financial constraints, the overall asset condition is projected to improve significantly. By 2034, 26% of roadway appurtenance assets are expected to be in very good condition. Once the City finalizes budget information for these assets, a more realistic condition distribution projection can be developed to reflect the City's actual financial capacity.

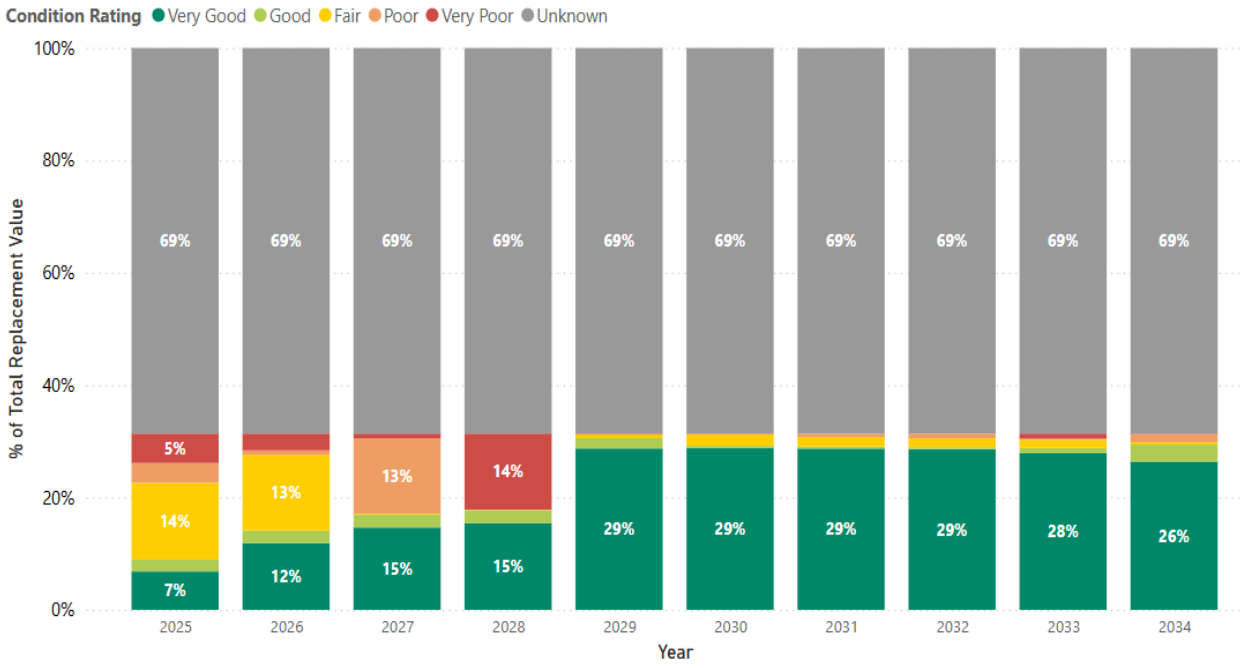


Figure 5-3: Roadway Appurtenance Assets Condition Projection under Scenario 2 - Unlimited Budget

5.3 Full Funding Need Profile

Figure 5-4 shows a full picture of the City's roadway appurtenances funding forecast for the next 10 years. This graph provides the City with clear understanding of the full funding requirements, essential for effective financial planning activities. Specifically, the reinvestment needs for Traffic Equipment, Traffic Signals, and Traffic Signs are categorized as "Replace," while those for Parking Lots and Railway Crossings are categorized as "Reinvest" (refer to **Table 5-6** for details). These reinvestment needs are presented alongside the City's projected roadway appurtenances O&M costs (refer to **Table 5-2** for details). Additionally, one percent of the annual replacement cost was added to account for the asset disposal cost. With these additions, the City's roadway appurtenances full funding requirement increases to approximately $46 million over the next 10 years, averaging $4.6 million per year in inflated dollar value.

In addition to the funding needs summarized above, the City also needs to account for the future funding requirements associated with the installation of Accessible Pedestrian Signals (APS) at signalized crossings. Expanding APS implementation would require substantial infrastructure upgrades at many intersections to meet current accessibility standards. Currently, few intersections are equipped with APS, primarily due to the incompatibility of existing infrastructure. The City has confirmed that the installation of APS will be categorized as capital construction projects and funded through Public Works, although the timeline and associated budgets are still pending approval. That being said, incorporating APS-related needs into long-term capital planning is fundamental to support the City's future progress toward accessibility and compliance with evolving standards. Proactively addressing these needs will help ensure that infrastructure upgrades align with broader City goals, while also improving safety and access for all road users.

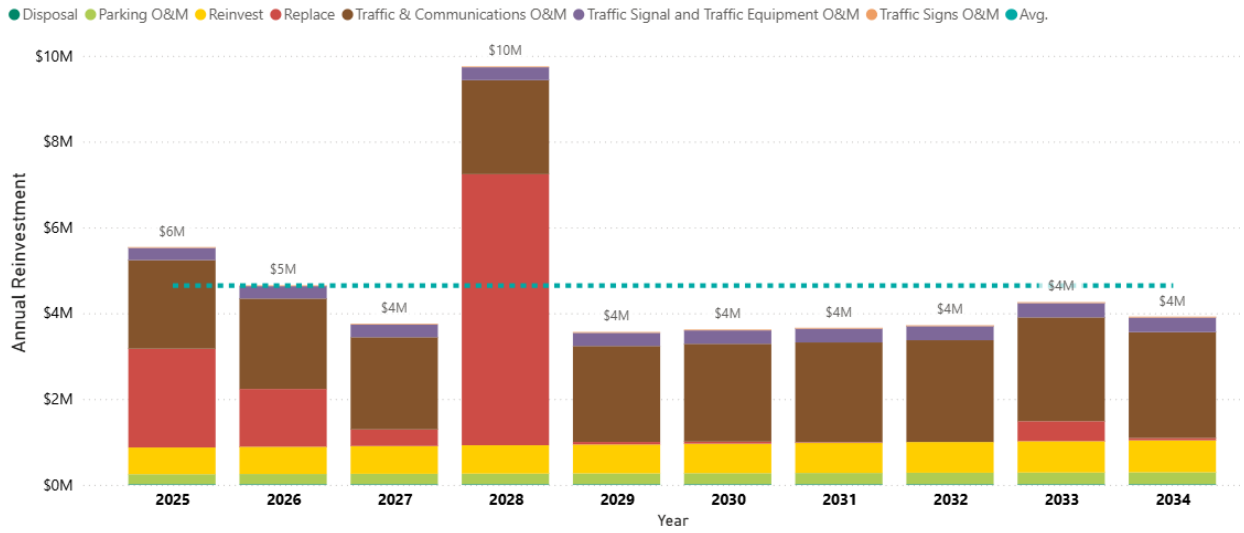


Figure 5-4: Roadway Appurtenances Full Funding Need Profile

5.4 Funding Gaps & Risk

Due to incomplete budget information, a comprehensive assessment of the funding gap for roadway appurtenance assets cannot be conducted at this time. However, the potential risks associated with inadequate funding should not be overlooked. These risks include accelerated asset deterioration, higher long-term maintenance and replacement costs, reduced service levels, and increased safety concerns. Once the City's budget information becomes fully available, it is recommended that a funding gap analysis be conducted to identify any shortfalls and support informed decision-making. This will enable the City to prioritize reinvestment needs effectively and ensure the long-term sustainability of roadway appurtenance assets.

5.5 Funding Sources & Alternative Strategies

The City primarily relies on tax levy for funding roadway appurtenances, supplemented by potential amounts from Ontario Community Infrastructure Funding (OCIF) and Canada Community-Building Fund (CCBF). In addition, AECOM suggests the following options that could be considered, acknowledging that the City's eligibility for these funds is subject to certain criteria:

- Investing in Canada Infrastructure Program
- Municipal Asset Management Program (MAMP)
- Enabling Accessibility Fund (EAF)

5.5.1 Investing in Canada Infrastructure Program

The Investing in Canada Infrastructure Program is a key component of the Government of Canada's broader Investing in Canada Plan. Administered by Infrastructure Canada, this program delivers long-term and stable funding to communities with the aim of addressing environmental challenges, fostering clean growth, and enhancing resilience to climate change. Through bilateral agreements, over $33 billion in funding is allocated to provinces and territories, supporting a diverse range of infrastructure projects nationwide[7].

The program encompasses investments across four targeted funding streams: the public transit stream, green infrastructure stream, community, culture, and recreation infrastructure stream, and the rural and northern communities' infrastructure stream. The public transit stream allocates funds for the construction, expansion, and enhancement of public transit infrastructure. The focus of these investments is on projects that aim to increase the capacity of public transit systems, enhance the quality and safety of existing or future transit infrastructure, and improve overall access to public transit systems. In pursuit of funding through this stream, the City has actively submitted proposals for the following projects[8]:

- Electrification of Transit System
- Transit Facility and Equipment Upgrades
- Purchase of Rolling Stock Assets
- Relocation of the Downtown Transit Terminal Construction and Renovation
- Transit Facility and Equipment Upgrades
- Purchase of Transit Ticket Vending Machines
- Purchase and Installation of Transit Bus Shelter

5.5.2 Municipal Asset Management Program (MAMP)

Municipal Asset Management Program (MAMP) is aimed at improving asset management practices within municipalities[9]. Designed to assist municipalities in gaining a better understanding, planning, and efficient and sustainable management of their infrastructure assets, the program may offer funding to support the development or improvement of asset management plans. This financial support is intended to incentivize municipalities to adopt and implement sustainable asset management practices.

[7]Investing in Canada Infrastructure Program. (2023). Infrastructure Canada. Infrastructure Canada - Investing in Canada Infrastructure Program. Retrieved on February 14th, 2024.

[8] Investing in Canada Infrastructure Program: Projects Under Review. (2022). Infrastructure Canada. Infrastructure Canada - Investing in Canada Infrastructure Program: Projects Under Review. Retrieved on February 14th, 2024.

[9] Municipal Asset Management Program. (n.d.). Federation of Canadian Municipalities. Municipal Asset Management Program | FCM. Retrieved on February 14th, 2024.

5.5.3 Enabling Accessibility Fund (EAF)

The Enabling Accessibility Fund (EAF) is a federal government program aimed at supporting projects that enhance accessibility for individuals with disabilities[10]. The fund provides financial assistance to eligible organizations for initiatives such as infrastructure improvements, renovations, and retrofitting to create more accessible spaces. Its goal is to contribute to a barrier-free and inclusive society by addressing physical barriers and promoting equal access in community spaces.

5.5.4 Alternative Strategies

Recognizing the constrains of internal funding and limitations and uncertainties associated with external funding, it becomes increasingly important to explore complementary approaches that do not depend solely on financial sources. In this context, alternative strategies play a critical role in enhancing the City's ability to manage service levels and asset performance within existing fiscal constraints. **Table 5-7** highlights some non-financial strategies that could help the City address the potential funding gaps for roadway appurtenance assets.

Table 5-7: Non-Financial Strategies to Address Potential Funding Gaps for Roadway Appurtenance Assets

Strategy	Description / Actions
Condition-Based Maintenance	Shift from time-based to condition-based and criticality-based maintenance where possible. Using condition assessments (e.g., visual inspections or performance metrics) helps extend asset life by targeting maintenance where it's most needed.
Preventive Maintenance Programs	Develop and implement preventive maintenance schedules to address minor defects before they lead to larger failures. Preventive measures often cost less than emergency repairs and can delay the need for full replacement.
Training and Knowledge Sharing	Provide training to O&M staff on best practices for maintaining different asset types. Encourage internal knowledge sharing to improve consistency and efficiency in asset care.
Community and Interdepartmental Engagement	Continuously collaborate with other City departments and the public to identify issues early and gather feedback on service levels. This can help align asset strategies with user needs and expectations.

[10] About Enabling Accessibility Fund. (2023). Government of Canada. Enabling Accessibility Fund - Canada.ca. Retrieved on Retrieved on February 14th, 2024.

6. Implementation Plan and Continuous Improvement

Continuous improvement is an important component of any AM program and is achieved through the implementation of recommended improvement initiatives which support sustainable service delivery. AECOM has identified a set of activities that represents the next stage of AM planning and implementation within the City, as shown in **Table 6-1**.

Table 6-1: Recommended AM Improvement Initiatives

Index	Improvement Initiative	Description
1.	Refine roadway appurtenances asset inventory.	• Continue to refine the asset inventory and close existing data gaps, to have a more accurate representation of the current state of the roadway appurtenances; and, ultimately, to make more informed and defensible decisions. – AECOM recommends the City to continue maintaining the roadway appurtenances inventory, keep updating the inventory as assets are acquired or disposed. – Continue collecting the installation date information of roadway appurtenance assets to better estimate their remaining service life. Once the gap is closed, the City will be able to conduct more accurate lifecycle analyses, forecast reinvestment needs with greater confidence, and enhance long-term asset management planning. – Develop and implement unique identifiers for all roadway appurtenance assets. It will enable more efficient asset tracking, condition monitoring, and lifecycle management.
2.	Use consistent condition grading schemes for roadway appurtenance assets and develop condition assessment process for all roadway appurtenance assets.	• The grading system should include a description directly tied to each condition grade, along with details about the asset's performance and the necessary level of corrective and preventive maintenance required for assets falling within a certain condition rating category. This process will enable the City to keep track of and better forecast asset renewal needs. – Currently, the City has condition data for regulated traffic signs, categorized as Poor, Fair, Good, and New. It is suggested that these condition categories be refined to align with the corporate-wide standard for consistency. • Prioritize condition assessments on the most critical assets. The City's execution of a controller cabinets age report has already proven to be instrumental in supporting this business case.
3.	Refine the LoS Framework and Setting LoS Target.	This AMP represents the City's LoS in alignment with the requirements of O. Reg. 588/17 July 1, 2025, deadline. The City should continue its efforts to: • Regularly record LoS performance measures to monitor changes over time and identify emerging trends. • Review and update performance measures as needed to ensure they remain relevant and effective. • Periodically assess proposed LoS to confirm alignment with shifting community expectations, regulatory changes, City priorities, available resources, and observed performance trends—supporting adaptive and responsive service delivery. Continuously enhance demand management by routinely evaluating future demand drivers that influence service delivery and asset use, integrating these insights into long-term capital planning to ensure LoS remains responsive to changing needs.
4.	Incorporate risk assessment for future iterations of the AM plan and use the risk assessment results to drive future condition assessments and financial needs forecasting.	• Conduct a criticality and risk assessment of assets to inform work prioritization. • Review risk attribute values periodically to ensure alignment with business objectives and risk appetite. • Overlay the risk model with the current state of the assets (i.e., condition) and the financial forecast. Using this approach, the City could focus its monitoring, maintenance, and renewal and replacement budget and activities on high-risk assets. Medium-risk infrastructure could be addressed through the mitigation of failure via regular monitoring, while low-risk assets could be accepted with caution.
5.	Establish a sustainable roadway appurtenances	• Establish and maintain detailed funding and budget information for roadway appurtenance assets to support effective asset management planning. Once this information is in place, it is recommended that the City re-run the financial model

Index	Improvement Initiative	Description
	funding model that fits the needs of the community	to assess funding gaps, update condition projections, and refine reinvestment strategies based on realistic budget scenarios. • In light of the annual funding need outlined in **Figure 5-4**, it is recommended that the City allocate an average of **$1.8 million** per year over the next 10 years for capital reinvestment in roadway appurtenances. Additionally, a total of **$2.8 million** should be budgeted for O&M expenditures during the same period. • Review financial modeling assumptions on reinvestment rate and replacement values and update the financial model with new information as it becomes available. The financial model is based on several key assumptions that could have a significant impact on the outcomes of the model. • To address legislative ambiguities concerning railway crossings, it is recommended that the City engage in dialogue with rail companies to clarify responsibilities and obligations. Establishing clear agreements or guidelines can help delineate duties, enhance accountability, and streamline decision-making processes. This proactive approach will mitigate potential delays, disputes, and ensure effective maintenance practices for railway crossings. • Explore funding resources and non-financial strategies that the City may take into consideration while performing strategic lifecycle and financial strategies.
6.	Continue to improve AM initiatives across the City by maintaining a high level of AM awareness through training, communication, and knowledge sharing.	• Conduct an AM Software Assessment to identify future system requirements that may include enhancing existing software, adding-on, or replacing. • Develop a Knowledge Retention Strategy & Internal Communications Plan to document staff AM knowledge and experience for reporting and succession planning purposes. Communicate AM improvement initiatives and enhance natural AM awareness internally through internal communication.
7.	Organize public and Council engagement activities	Establish a structured approach to public and Council engagement to ensure the AMP aligns with community expectations, supports informed decision-making, and enhances transparency, the City is committed to establishing a structured approach to public and Council engagement. While several engagement activities have already been undertaken, these efforts lay the foundation for a more consistent and strategic approach moving forward. • For Council engagement, the City has shared updates through presentations and media events. To further support elected officials, it is recommended that the City develop Councillor Tool Kits. These kits would provide clear, consistent messaging—covering topics such as infrastructure planning, investment priorities, asset management, service levels, and climate impacts—to help Councillors effectively respond to public inquiries. • On the public side, communication can be enhanced by creating a dedicated project webpage to centralize information such as FAQs, timelines, and contact details, while enabling two-way engagement. A targeted social media strategy, including sponsored posts on platforms like Facebook and Instagram, is also recommended to increase visibility and encourage community involvement.

APPENDIX A

Roadway Appurtenance Asset Inventory

A

Appendix A - Roadway Appurtenances Asset Inventory

The City's roadway appurtenance asset inventory is presented as a separate MS Excel file.

About AECOM

AECOM is the world's trusted infrastructure consulting firm, delivering professional services throughout the project lifecycle — from planning, design and engineering to program and construction management. On projects spanning transportation, buildings, water, new energy and the environment, our public- and private-sector clients trust us to solve their most complex challenges. Our teams are driven by a common purpose to deliver a better world through our unrivaled technical expertise and innovation, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities. AECOM is a *Fortune 500* firm and its Professional Services business had revenue of $13.2 billion in fiscal year 2020. See how we are delivering sustainable legacies for generations to come at aecom.com and @AECOM.