AECOM

SAULT STE. MARIE

CITY OF SAULT STE. MARIE

SOLID WASTE ASSET MANAGEMENT PLAN

FINAL | 60735219 | June 2025

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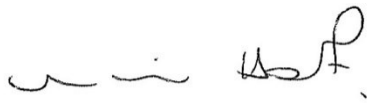

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
Draft V0	March 25th, 2024	Draft Report – Solid Waste AM Plan		Chris Lombard	Project Manager
Final	June 20th , 2024	Final Report – Solid Waste AM Plan		Chris Lombard	Project Manager
Revision 1	August 14th , 2024	Revision to account for SSO and Updated Business Plan		Chris Lombard	Project Manager
Revision 2 - Draft LoS Update	May 30th, 2025	Draft - Solid Waste AM Plan Update		Chris Lombard	Project Manager
Revision 2 - Final LoS Update	June 12th, 2025	Final Report - Solid Waste AM Plan Update		Chris Lombard	Project Manager

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List of Abbreviations

Abbreviation	Description
AM	Asset Management
AMP	Asset Management Plan
ARC	Arc Chambers
CCTV	Closed Circuit Television
CIBI	Canadian Infrastructure Benchmarking Initiative
CMMS	Computerized Maintenance Management System
Conveyance-FM	Conveyance – Force Mains
Conveyance-GRAV	Conveyance – Gravity Mains
Conveyance-MH & CHAM	Conveyance – Manholes and Chambers
Conveyance-SC	Conveyance – Service Connections
EA	Environmental Assessment
ESL	Expected Service Life
FIPPA	Freedom of Information and Protection of Privacy Act
FLSH	Flushing
GIS	Geographic Information System
ID	Internal Diameter
I&I	Inflow & infiltration
LoS	Level of Service
MFIPPA	Municipal Freedom of Information and Protection of Privacy Act
MHSW	Municipal Hazardous or Special Waste program
N/A	Not Applicable
NPRI	National Pollutant Release Inventory
O&M	Operations and Maintenance
O. Reg.	Ontario Regulation
OTS	Ontario Tire Stewardship
PUC	Public Utilities Commission
RSL	Remaining Service Life
SCADA	Supervisory Control and Data Acquisition
SSO	Source Separated Organics
WEEE	Waste Electrical and Electronic Equipment Program
WWTP-EE	Wastewater Treatment Plant East End
WWTP-WE	Wastewater Treatment Plant West End

1 Introduction

AECOM Canada ULC (AECOM) was retained by The City of Sault Ste. Marie (the "City") to update the Solid Waste Asset Management Plan developed in 2024 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 on two 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 expectation from the public that these services are expected to 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 to 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 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 Scope and 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 Solid Waste department, as shown in **Table 1-1**. There are several updates to the inventory, state of infrastructure and capital planning from the previous version. Other core and non core AMPs are presented under separate reports.

Table 1-1: In-Scope Solid Waste Assets

Asset Category	Sub-Assets
Storm/Ground Water	Pump stations, conveyance, other.
Sanitary	Conveyance, tanks.
Buildings	Office, maintenance and operational.
Leachate	Process mechanical (static and rotating), electrical, control and instrumentation.
Landfill Gas	Process mechanical (static and rotating), electrical, control and instrumentation.
Environmental Monitoring	Monitoring well equipment, erosion and sediment controls, weather stations.
Waste Collection	Waste handling, waste transport.
Landfill Infrastructure	Roads, pads and lots, land, scales, appurtenances and miscellaneous.
Landfill Equipment	Heavy equipment, material handling, light vehicles.
Liners & Capping	Landfill caps, landfill liners.

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 (**Sections 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 **Section 5**)

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 (**Table 1-2**). The development of this AMP is one of the steps to guide the City towards meeting the July 1st, 2025 deadline.

Table 1-2: 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.

2 State of Infrastructure

Solid waste sites and assets encompass a diverse range of equipment crucial to the functionality, safety, and reliability of the City's solid waste sites and services. The City's solid waste assets include heavy equipment, fixed infrastructure (such as roads and pipelines), gas and leachate collection, landfill cell cap and liners, as well as various supporting assets and structures.

The inventory of solid waste assets is a comprehensive catalog detailing the quantity, condition, and specifications of all of the relevant 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.

The current hierarchy is a revision of the version presented in the previous AM plan taking into account asset inventory changes and updates since the previous version.

2.1 Asset Hierarchy

To fulfill the requirements of O. Reg. 588/17 and to pave the way for robust long range asset management 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 solid waste assets, 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.

The inventory submitted and analysed within this AMP was created using the following sources as well as staff interviews and discussion with Solid Waste facility consultants currently working with the City.

- City of SSM (2021) Active Capital Assets
- City of SSM (2021) Business Plan revised June 28 2021, and November 2023 revision
- AECOM (2022) Site Development and Operations Report
- AECOM (2021) Final Business Plan Update Memorandum
- Dillon Consulting (2022) Monitoring Report (Final)
- AECOM (2023) Draft Final EA – June 30 2023
- City of SSM (2023) CMMS Work orders for Methane Field
- Comcor Environmental (2023) Annual Proposal
- Comcor Environmental (2023) LFGCS Field Inspection

Figure 2-1 shows the hierarchy of solid waste assets is illustrated, showcasing 10 main categories: storm/ground water, sanitary, buildings, leachate, landfill gas, environmental monitoring, waste collection, landfill infrastructure, landfill equipment, and liners & capping. Each category is further broken down into subcategories. This asset hierarchy establishes a logical indexing of the City's solid waste assets, 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.

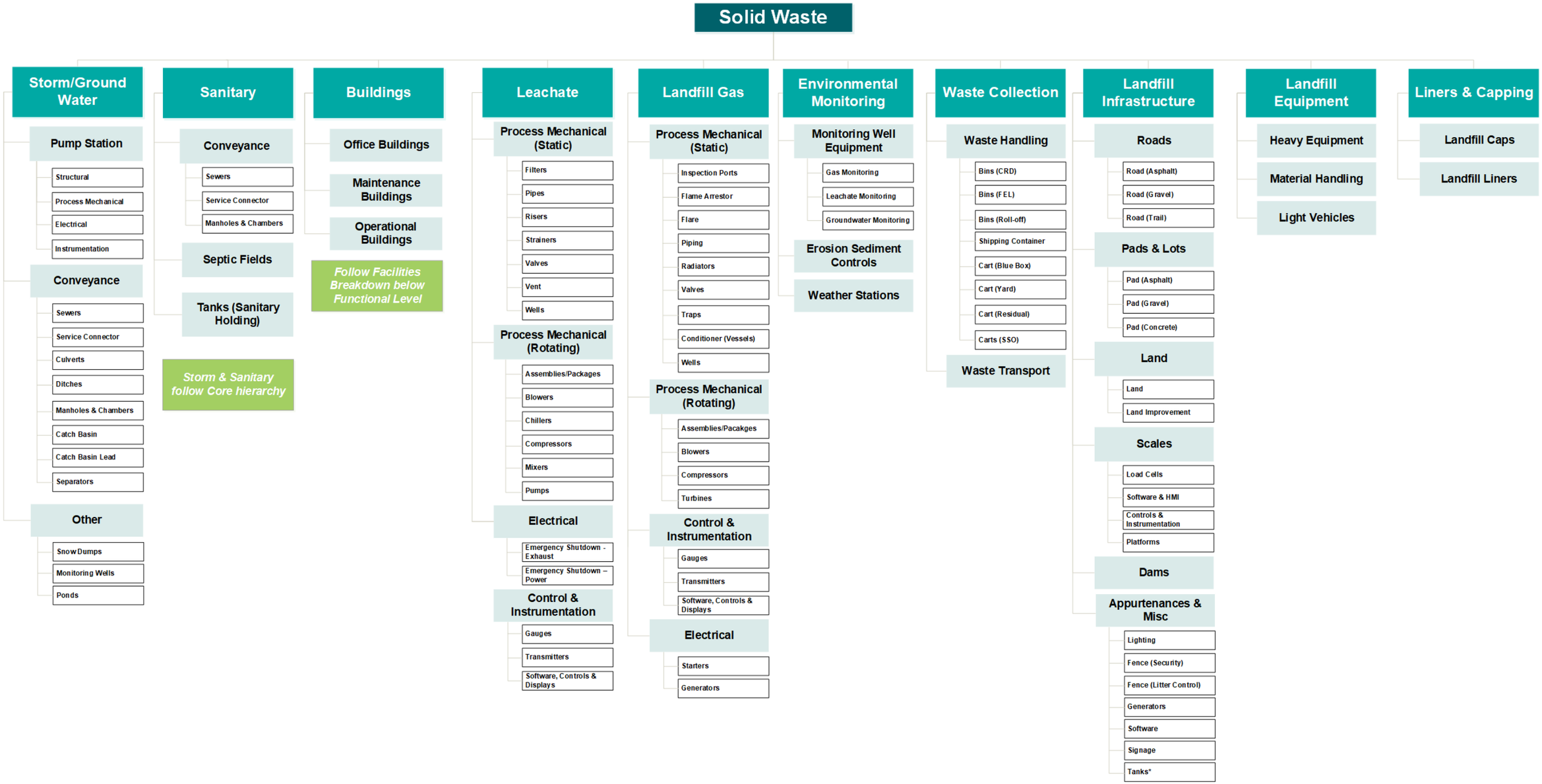

Figure 2-1: City of Sault Ste. Marie Solid Waste Asset Hierarchy

2.2 Current State of the Assets

2.2.1 Asset Inventory

Table 2-1 provides a summary of the Solid Waste asset inventory for each asset category within the responsibility of the City's Solid Waste department.

Table 2-1: Solid Waste Asset Inventory Summary

Asset Group	Asset Category	Count (Entries in Inventory)	Quantity (Sum of Assets in Inventory)	Unit of Measure
Solid Waste	**Buildings**	6	5,302	Sq. ft
	Environmental Monitoring	24	67	Ea.
	Landfill Equipment	18	21	Ea.
	Landfill Gas	29	1,317	Ea.
	Landfill Infrastructure	16	24,145	km, m^2, Ea.
	Leachate	27	677	Ea.
	Liners & Capping	1	16	Ha
	Sanitary	1	370	Ea.
	Storm/Ground Water	2	371	Ea.
	Waste Collection	21	745	Ea.

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 solid waste asset categories within the City excluding Land which has been excluded on the basis that its replacement is beyond the planning horizon of the AMP, to align contents with other AMPs produced for the City and as it is assumed that landfill expansion will be approved in 2025/26.

It should be noted that the total replacement values have been marked up by 45%, out of which 20% accounts for engineering and project management cost and 25% for contingency cost. This is the upper range for mark up and is used due to the immaturity of the asset inventory. As the inventory is used and further refined the City may decide to reduce the mark up applied to replacement values.

Table 2-2: Current Replacement Value

Asset Group	Asset Category	Unit Cost Range ($/Unit)	Total Replacement Value (2025)
Solid Waste	**Buildings**	$81 - $55,107	$1,871,000
	Environmental Monitoring	$14,934	$1,309,000
	Landfill Equipment	$67,500 - $632,579	$15,659,000
	Landfill Gas	$13,700 - $81,818	$4,565,000
	Landfill Infrastructure	$117 - $532,124	$7,116,000
	Leachate	$1,750 - $55,258	$3,238,000
	Liners & Capping	$635,777	$17,669,000
	Sanitary	$380	$225,000
	Storm/Ground Water	$215	$225,000
	Waste Collection	$11,868 - $283,134	$4,619,000
TOTAL			**$56,496,000**

The asset sub-categories with the largest replacement costs not including land are summarized in **Table 2-3**. It is noted that the landfill caps are unlikely to be replaced under the current operating model and will likely by only maintained and repaired.

Table 2-3: Current Replacement Value Sorted From High to Low by Asset Category

Asset Category	Asset Sub-Category	Total Replacement Value
Liners & Capping	Landfill Caps	$17,669,000
Landfill Equipment	Heavy Equipment	$9,358,000
Landfill Equipment	Material Handling	$5,868,000
Waste Collection	Waste Transport	$4,082,000
Landfill Infrastructure	Roads	$3,577,000
Leachate	Process Mechanical (static - LEA)	$3,196,000
Landfill Gas	Process Mechanical (static - LFG)	$3,180,000
Landfill Infrastructure	Pads & Lots	$1,618,000
Landfill Infrastructure	Appurtenances & Misc	$1,487,000
Environmental Monitoring	Monitoring Well Equipment	$1,309,000

2.2.2.1 Excluded Costs

It is worth noting that were it included, the most significant portion of the total replacement cost would be for landfill estimated land costs due to the consumable nature of land in solid waste use. There are several strategies available to extend the useful life of available land which the City is currently pursuing. Therefore, land values are currently excluded from this revision of the AMP as their replacement is beyond the planning horizon and ongoing maintenance and renewal costs are captured elsewhere in this plan. For information, the previous methodology used to calculate land value is provided below.

Several approaches that can be taken towards the valuation of the land costs. Options considered include the current market value based upon similar land sales (used as a basis in this AMP), the Municipal Property Assessment Corporation (MPAC) value, and the capacity use cost:

1. Use of the current market range for industrial land (found to be between $1.2 and $3.5 per square foot in January 2024 based upon available market data for similar land). Due to limitations on land and the relatively strong negotiation position of any seller the 75th percentile value of this range can be used. This is the preferred option but does have the drawback of lack of consideration for full replacement of landfill assets as a result of relocation.
2. MPAC value. This value is dated January 1, 2016 and is done on a cost approach basis. This value is unreliable as the majority of land improvements cannot be seen by the MPAC and the land value is outdated. The current land value is $1.35 million for the main landfill area (not including additional land) which equates to approximately $0.09 per square foot which is significantly below the current market range for industrial land. This option also has a lack of consideration for full replacement of landfill assets as a result of relocation.
3. Capacity usage cost. By determining the cost per cubic meter of landfill capacity and forecasting the volume used annually a pro-rata cost for replacement land per year can be arrived at. The drawback to this value is that while it can assist in apportioning expenditure to land replacement value it does not give a forecast expenditure point for acquisition which is a key component of the financial forecast.

The capacity use cost would provide an accurate cost for the total replacement of land and the requisite upgrades but currently there is insufficient information to determine and end date for the useable life of the land as mining operations are planned to prolong life. If the City reaches a point where further life extension of the current site is no longer feasible, the capacity use cost may serve as an approximate estimate of the land acquisition and site upgrade costs required to develop a new, suitable site.

Replacement land costs were estimated in the previous AMP revision to be approximately $70 million based upon method number 1.

2.2.3 Age and Remaining Service Life

The asset age is based on the install year of the assets or the assumed year if not available 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:** Cell usage is determined by how much waste is produced by the City and its residents. With increased focus on recycling (through the source separated organics plant) and reuse the cell usage could be reduced. Thus, the actual operating “age” of the asset is reduced. It should also be noted that estimates of the volume of industrial and commercial wastes deposited at the SSM landfill are heavily impacted by the regulation, tipping fees and Canadian to US dollar exchange rate. Due to these, significant producers of waste are able to dispose for a lower cost in the United States.
- **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. The City’s experience of the typically more aggressive services within the landfill (such as leachate) are still at the upper end of estimated serviceable life compared to other landfills within Canada. As the waste disposed of becomes more refined the corrosive nature of the landfill is expected to change although the extent and rate cannot be forecast.
- **Maintenance:** Assets are maintained through renewal or replacement of components, which prolongs the service life of the asset. Critical assets are maintained (some through service contracts) but many are yet to experience failure and require replacement.

- **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. The majority of solid waste assets are solid infrastructure that does not become technologically obsolete. Those assets at risk are software systems and instrumentation (such as the weigh scales). Some areas of technology may arise and become legislatively necessary such as landfill gas emissions control (either through recapture or flaring) or odour control.

Table 2-4 and **Figure 2-2** show the weighted average asset age and RSL as a proportion of average ESL for the asset subcategories. It is recommended to collect accurate installation date information for all assets and include it in the next iteration of the AMP. There are several classes that are approaching or at the end of their ESL, however the ESL used in this AMP are reduced values of those used in the core asset AMPs due to increased rate of wear. These values may be increased based upon the experience of the City for all solid waste assets and therefore may present an improved asset condition.

Table 2-4: Solid Waste Average Age, ESL, and Remaining Service Life

Asset Group	Asset Sub-Category	Weighted Average Age	Weighted Average ESL	Remaining Service Life
Solid Waste	Buildings	34	50	16
	Environmental Monitoring	24	16	0
	Landfill Equipment	8	17	9
	Landfill Gas	15	24	9
	Landfill Infrastructure	50	36	0
	Leachate	23	57	34
	Liners & Capping	55	100	45
	Sanitary	55	80	25
	Storm/Ground Water	55	40	0
	Waste Collection	11	10	0

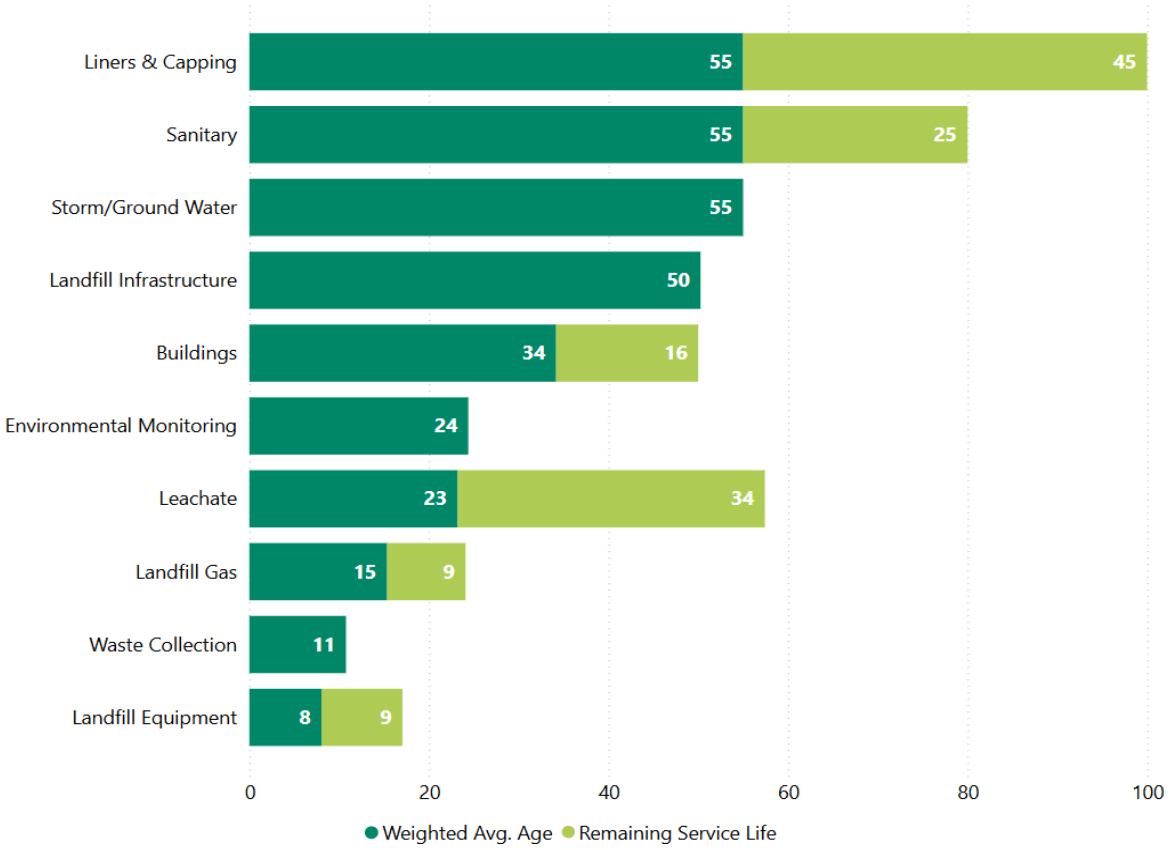

Figure 2-2: Solid Waste Asset Weighted Average Age and Remaining Service Life

Figure 2-3 and **Figure 2-4** illustrate the acquisition profile of assets within the responsibility of the solid waste department. For the purposes of detailed analysis, the solid waste fleet vehicles are reported separately because of the asset class specific capital funding that has been dedicated to it for the next five years. Significant investment is evident in 1970-1979 when the City took over responsibility for the landfill, however it should be noted that 1970 was used as a default date for assets with an unknown installation date. Other periods of large investment are 2010-2019 which saw investment in the landfill gas systems and the solid waste fleet. Based on the City's vehicle management strategy it is expected that there will be a rolling investment in vehicles approximately every 10-15 years which due to the number of assets within solid waste will present as a large spike at set frequencies.

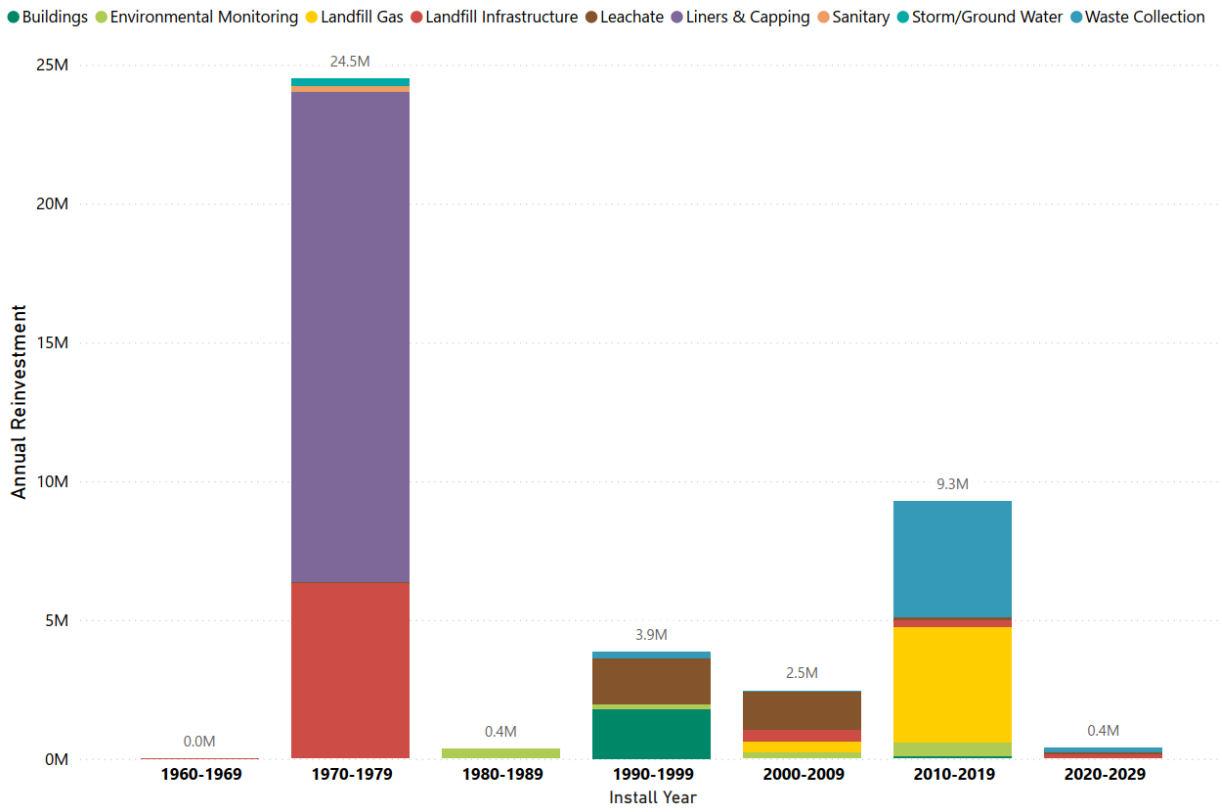

Figure 2-3: Asset Acquisition Profile – Solid Waste

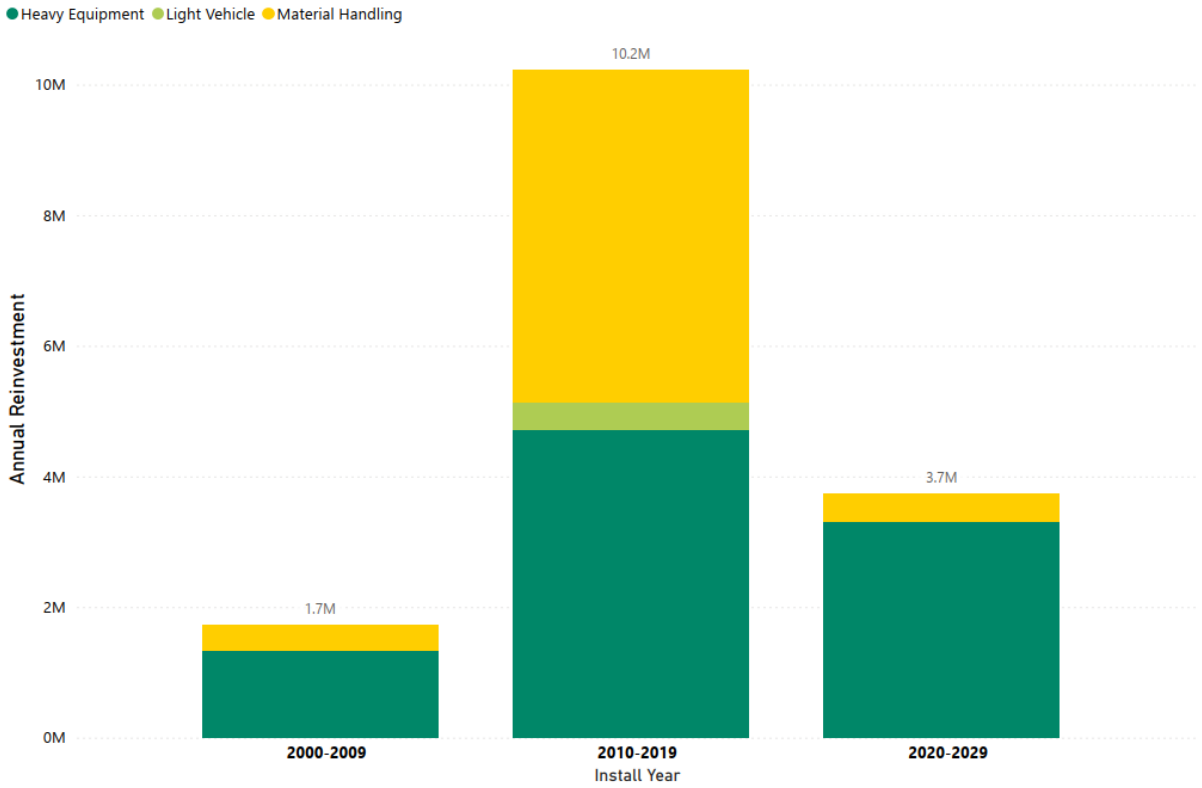

Figure 2-4: Asset Acquisition Profile – Solid Waste Fleet

2.2.4 Asset Condition

All assets are expected to deteriorate over their lifetime, and their assigned condition reflects the physical state of the asset. The 2025 conditions used herein are all estimates based on the following methodology.

There are no regular field condition assessments for any solid waste assets that produce reliable condition gradings for AM purposes. To fill the gap with an interim data set to enable any financial forecasting to take place, the two-parameter Weibull distribution function was used to assess the current condition and to project the future condition of the City's solid waste assets. 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. 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 2-5**.

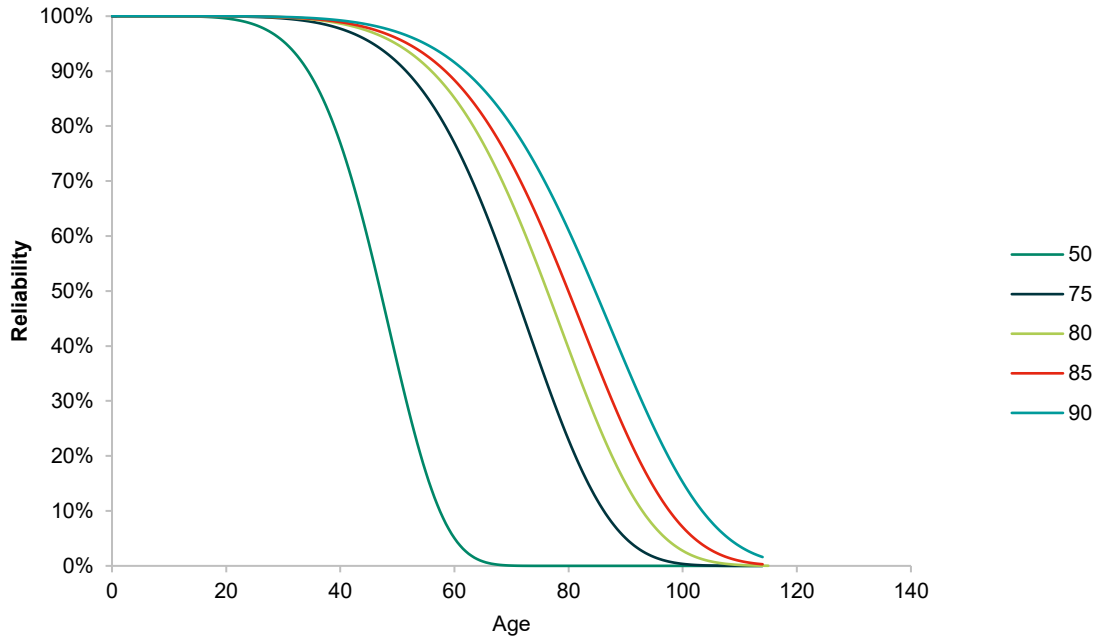

Figure 2-5: Asset Deterioration Curve Samples

Table 2-5 summarizes the condition grade of the City's solid waste infrastructure with associated replacement values. 72% of the assets are in the very good condition, with total replacement value of approximately $40.7 million. It should be noted that this figure is heavily influenced by landfill equipment, and liners and capping. 21% of the infrastructure is in the very poor condition with total replacement value of $11.6 million. Roads, parking lots and appurtenances account for 12% of this value and could be addressed by condition assessment to refine the actual condition. Good condition accounts for 6% of the existing infrastructure, having a replacement value of around $3.6 million. Fair and poor condition assets make up 1% respectively.

Table 2-5: Solid Waste Condition Summary

Rank	Condition Rating	Replacement Value	% of Replacement Value
1	Very Good	$40,711,000	72%
2	Good	$3,644,000	6%
3	Fair	$582,000	1%
4	Poor	$ 0	0%
5	Very Poor	$11,558,000	21%
Total		**$56,495,000.00**	**100%**

Additionally, **Figure 2-6** and **Table 2-6** further illustrates the condition of the assets based on different asset sub-categories and their corresponding replacement values. Considering the age-based calculations, landfill infrastructure and landfill equipment is expected to dominate the capital investment due to value of assets in very poor conditions, although as stated previously a condition assessment of these assets will refine the capital investment requirements with greater reliability.

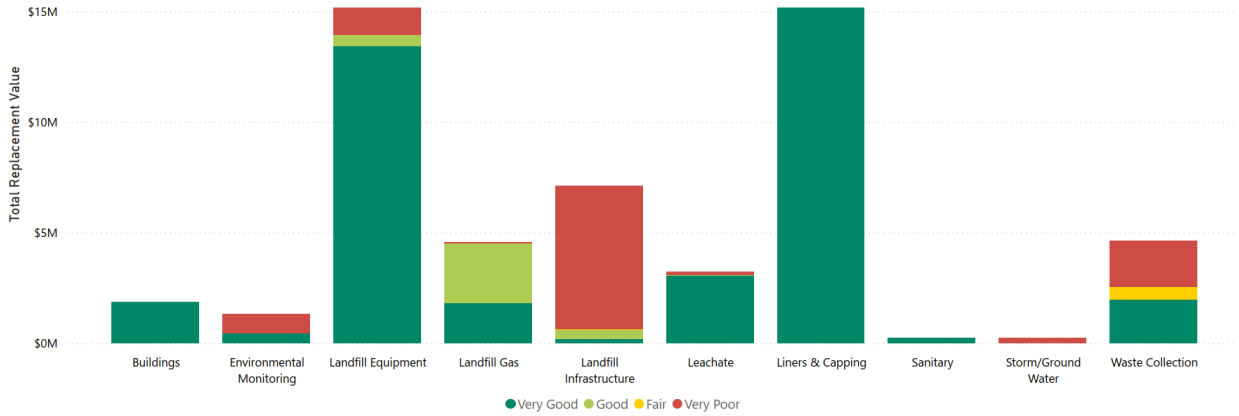

Figure 2-6: Solid Waste Condition Summary for Asset Categories

Table 2-6: Distribution of Condition for Solid Waste Asset Categories

Asset Category	Very Good	Good	Fair	Poor	Very Poor
Buildings	3%	0%	0%	0%	0%
Environmental Monitoring	1%	0%	0%	0%	1%
Landfill Equipment	24%	1%	0%	0%	3%
Landfill Gas	3%	5%	0%	0%	0%
Landfill Infrastructure	0%	1%	0%	0%	12%
Leachate	5%	0%	0%	0%	0%
Liners & Capping	31%	0%	0%	0%	0%
Sanitary	0%	0%	0%	0%	0%
Storm/Ground Water	0%	0%	0%	0%	0%
Waste Collection	3%	0%	1%	0%	4%
TOTAL*	**72%**	**6%**	**1%**	**0%**	**20%**

**Due to rounding the sum of the total percentages is less than 100%*

The top items by estimated replacement value in Very Poor condition are as follows:

1. Access Road (unknown installation data and condition), estimated replacement cost $2.2 million. It is probable that this has been maintained in fair condition, but no assessment was available.
2. Compost Pad (unknown installation data and condition), estimated replacement cost $1.4 million. Similar to the access road it is probable that this has been maintained in a better condition than the Weibull assessment has forecast.
3. Internal Access Road (unknown installation data and condition), estimated replacement cost $1.0 million.
4. Security Fencing (unknown installation date and condition), estimated replacement cost $1.0 million
5. Maintenance Garage (unknown installation date and condition), estimated replacement cost $0.84 million.

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 solid waste assets were not previously stored in a single inventory prior to the first revision of the AMP. The multiple spreadsheets and GIS databases that did exist only housed a partial listing of the City's assets. This project has used the 3rd party reports provided to AECOM such as the annual monitoring report, the environmental assessment and the annual site development report, as well as consulting the authors of those reports to build the first solid waste asset inventory. Additionally, it has addressed and filled gaps in key data where available, such as expected service life and replacement costs based upon the City's own experience. This has been supplemented by additional data sources such as RS Means and experience from other solid waste operations.

Table 2-7 provides a summary of data completeness levels in the compiled solid waste inventory across key data attributes. It is recommended that the City continue to work on filling any remaining gaps, ensuring a comprehensive and up-to-date database.

Table 2-7: Observations on Asset Data Completeness

Asset Group	Inventory Completeness (%)						
	Asset ID	Name / Location	Install Date	Inspection Date	Condition	Expected Service Life	Replacement Cost
Solid Waste	30%*	100%	88%	0%*	8%*	100%	100%

* This % reflects the data supplied by the City. These gaps have been supplemented with estimates previously outlined.

Note that installation date value does not include any asset with a date of installation equal to January 1, 1970 as this value is used as a placeholder based upon the original construction to baseline any asset installations not available.

Improvement activities that support continuous improvement of the asset inventory are:

- Asset ID: Add asset ID to new assets identified in the asset inventory and not previously recognized in the list of capital assets.
- Installation year: It is recommended to collect accurate installation date information for all assets and include it in the next iteration of the AMP. Assets with an unknown installation date account for replacement value in excess of $22 million (39%).
- Installation date: Review all assets with a 1970-01-01 installation date and refine as far as practicable based upon available information.
- Condition Assessment: Consider a routine condition assessment program or address assessment on a cost risk basis for items which are of significant cost and of unknown condition.

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 solid waste assets. **Table 2-8** provides a description for the data confidence grades used to classify the reliability of the asset data used in this data gap analysis. Through consultation with City staff during a State of Infrastructure Workshop, the asset attribute data for the in-scope solid waste assets were assigned the grades outlined in **Table 2-9**.

Table 2-8: 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 2-9: High-Level Asset Data Confidence Grades

Asset Category	Data Confidence Average Grade					
	Asset ID	Location	Install Date	Condition	Expected Service Life	Replacement Cost
Solid Waste	N/A	A	C	N/A	B	B

- Location data has been reviewed and confirmed by the City. The majority of asset entries are located within the fenced boundary of the City's main landfill site. By total% a significant volume is at unique locations not recorded as they are individual bins provided to City residents, as a result these location is not entered or considered.
- Installation dates as mentioned previously have been assumed to be 1970-01-01 where not available. The accuracy of the data to the year of installation where available is high but over 20% are assumed resulting in a lower confidence grade.
- Condition assessment data is graded E as all is extrapolated from the installation data (which itself has a confidence grade of C).
- ESL is deemed to be reliable as it is founded on available data accumulated for such a purpose (professional construction cost estimating software) and is supplemented with the City's own experience for specific assets that are not on available databases.
- Replacement cost is also graded reliable as it is derived from a combination of professional construction cost estimating software and supplemented with the City's own purchasing data. To include a tolerance for the imperfect data the upper range for mark up is used due to the immaturity of the asset inventory. As the inventory is used and further refined the City may decide to reduce the mark up applied to replacement values.

2.3.3 Data Management Practice

The asset data lifecycle is a sequence of stages that data goes through from its initial creation (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.

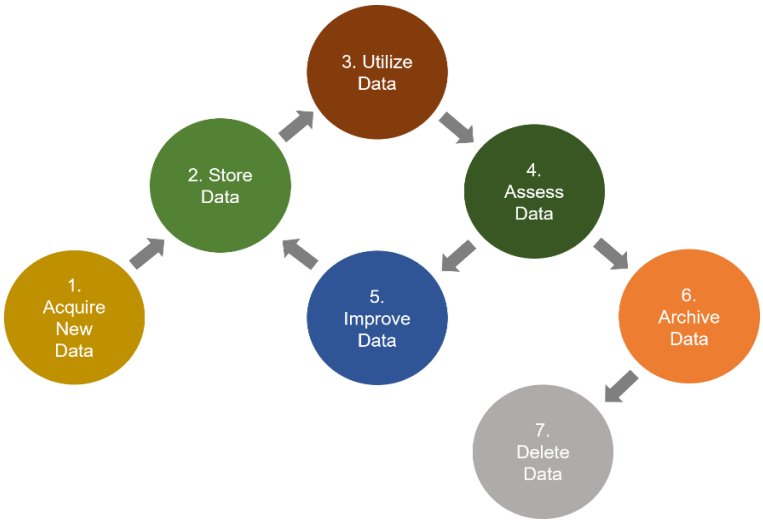

Figure 2-7: Asset Information Lifecycle

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

1. **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.
    - **Relevance to Solid Waste:** New assets for solid waste should be consistently added to the inventory and a minimum required data set defined to maintain inventory accuracy and reliability.
2. **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.
    - **Relevance to Solid Waste:** Assets are typically stored in either the CMMS or the GIS. For solid waste assets, due to the relative lack of linear infrastructure and the fact that the majority of assets are within the fence line, and those that aren't are located at private residences the GIS is not required but should be considered for use to align with other asset classes.
3. **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.
    - **Relevance to Solid Waste:** Currently no analysis of the use of solid waste assets is carried out. Use of the core asset AM plans (such as sanitary and water) and mature inventoried non-core (such as fleet) should be considered to drive a better understanding of solid waste asset performance. This includes improved understanding of estimated serviceable life and true replacement cost value from the City's experience.

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

4. **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.
5. **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.
6. **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 considers the following:
   - What data should be archived and why?
   - Are there any legal obligations for retaining data records?
   - How long should data records be retained?
   - What is the risk associated with not being able to retrieve data records?
   - Who should be able to access archived data records?
   - What is the expected timeframe to retrieve archived data records?

   Clearly communicating these requirements across the organization is key to ensuring staff are educated on why records are being archived, how they can access archived data records, and for how long archived data records can still be accessed.
7. **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 missing period.
   - **Relevance to Solid Waste:** The retention period is driven by best practice for solid waste as the life of the asset is in far in excess of defined regulation or profession bylaw (such as Engineering document retention).

2.3.3.1 Current Data Management State

The City is following the mandate in records retention procedures for municipalities as per Freedom of Information and Protection of Privacy Act (FIPPA) and the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA).

2.3.3.2 Future Data Management State

The City will develop and implement a software strategy that helps streamline data management following this AMP. Eventually, the City plans to have a clear and efficient data management process and comprehensive and robust asset inventory to support their AM decision making. The implementation plan for data improvement is presented in **Section 6**.

3 Level 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, 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] (2021) 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 LoS Objectives

Overarching Themes	LoS 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.
- 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 solid waste service 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. For example, single family homes for waste collection and landfill usage. Multifamily homes are not considered as a stakeholder for waste collection as City bylaws require their waste collection to be contracted to an external agency.
- Industrial, Commercial & institutional (ICI) Customers. The most considerable potential customer from an ICI perspective currently does not utilize City facilities. Currently, exporting the waste to the USA is a more cost-effective solution. Should the exchange rate swing considerably or there is external regulatory change limiting waste transport across the border then ICI usage of the landfill may increase. This increase is accounted for as the worst-case scenario in the City's business plan.
- Regulatory Agencies.
- Neighbouring Municipalities.
- Developers.
- First Nations
- Environmental Groups
- Internal City Departments

3.3.1 Legislated and Regulatory Requirements

Solid waste assets are critical to the City's ability to provide essential services to the community, and for protecting the health and safety of the public. As such, key legislative requirements exist for the City's infrastructure assets, which ensure that minimum requirements are met and standards are in place that promote a high quality of life (i.e., clean drinking water and safe roads, etc.). A sample of key Federal and Provincial legislated requirements are outlined below in **Table 3-2**. Monitoring and development programs relevant to solid waste assets are also listed.

Table 3-2: Legislated and Regulatory Requirements

Federal	Provincial

• Canadian Environmental Protection Act (CEPA)
• Canadian Environmental Assessment Act (CEAA)
• Canadian Food Inspection Agency (CFIA)
• Migratory Birds Convention Act and Regulation
• Fisheries Act
• Fertilizers Act
• Environmental Contaminants Act
• Transportation of Dangerous Goods Act
• Federal Weight and Measures Act
• Canadian Food inspection Agency for composting
	• Environmental Protection Act (EPA)
	  − Ontario Regulation 347 – General – Waste Management
	  − Ontario Regulation 232 – Landfilling Sites
	  − Ontario Regulation 267 – Compost
	  − Ontario Regulation 103 – Industrial, Commercial and Institutional Source Separation Programs
	• Waste Diversions Transition Act (WDTA)
	• Pesticides Act
	• Ontario Drainage Act
	  − Ontario Water Authority Ontario
	  ▪ Water Resources Act
	  ▪ Ontario Regulation 903 – Wells
	  ▪ Regarding monitoring of wells
	• Resource Recovery and Circular Economy Act
	  − Food and Organic Waste Policy Statement

3.3.1.1 Regulatory Change Impacts

The Food and Organic Waste Policy Statement (2018)[3] was issued to provide policy direction in reaching Ontario's interests of a circular economy. The policy statement aims to support the province's goals of zero waste and zero greenhouse gas emissions from the waste sector. In support of these goals, the policy statement has established waste reduction and recovery targets for municipalities and relevant sectors within Ontario. The policy statement targets and timelines relevant to the City are summarized below in **Table 3-3.** The impact of this change has led the City to plan and initiate the design and construction of a Source Separated Organics (SSO) facility (also referred to as the Biosolids Management Facility), the cost of which is split across City departments.

Table 3-3: Food and Organic Waste Policy Statement Targets

Person or entity	Targets and Timelines
Municipalities subject to policy 4.1	70% waste reduction and resource recovery of food and organic waste generated by single-family dwellings in urban settlement areas by 2023
Multi-unit residential buildings subject to policy 4.10	50% waste reduction and resource recovery of food and organic waste generated at the building by 2025
Industrial and commercial facilities subject to policy 4.14	70% waste reduction and resource recovery of food and organic waste generated in the facility by 2025
Industrial and commercial facilities subject to policy 4.15	50% waste reduction and resource recovery of food and organic waste generated in the facility by 2025
Educational institutions and hospitals subject to policy 4.18	70% waste reduction and resource recovery of food and organic waste generated in the facility by 2025

[3] Food and Organic Waste Policy Statement. (2018). Pursuant to section 11 of the Resource Recovery and Circular Economy Act (2016). Government of Ontario. https://www.ontario.ca/page/food-and-organic-waste-policy-statement. Retrieved on March 15, 2024.

Additional benefits of the new facility are summarized as follows:

- Biosolids processing will increase projected landfill longevity and reduce the impact of the shortage of earthen cover materials for use at the landfill.
- Mitigation of off-site environmental impacts, especially odour, water contamination, dust, noise and vermin.
- The design has sufficient redundancy and capacity to allow for routine maintenance of all equipment, equipment breakdowns and operational anomalies.

3.4 O. Reg. 588/17 Levels of Service Metrics

Currently, O. Reg 588/17 only identifies levels of service metrics for core assets. A number of key LoS performance measures for solid waste assets have been identified in consultation with City staff through workshops, are detailed in **Section 3.5**.

3.5 Current and 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 levels of service by July 1, 2025. A summary of the City's solid waste service level metrics is presented in **Table 3-5**. Each metric was indicated 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 3-4**.

Table 3-4: 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 3-5: Solid Waste 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	Solid Waste	Total volume of curbside residential waste per capita to landfill.	kg/person/year	Customer	• Static although due to population growth total volume is increasing. Approximately 450 kg/person/year. • (From Datacall Reporting)	→	↓	• SSO • Curbside diversion	High	• Regulatory risk, negative environmental impacts, decreasing landfill capacity
2	Solid Waste	% Amount of waste diverted from landfill (all products).	%	Technical	• 30%	→	↑	• SSO, methods of diversion like a new biosolids facility • Recycling	High	• Regulatory risk, odour, not meeting climate action plan
3	Solid Waste	GHG emissions from landfill and solid waste assets.	tCO2e	Technical	• TBD	→	↓	• Expand landfill gas system • Reduce usage of FF • Establish SSO/Biosolids plant	High	• Low risk. National Pollutant Release Inventory (NPRI) thresholds
4	Solid Waste	Remaining capacity of Landfill	Years	Customer	• +25 years if expansion is approved	↓	→	• Receive EA and technical approval, develop cells	High	• Not enough landfill capacity leading to decrease in service, environmental risk.
5	Solid Waste	% of Assets in Fair or Better Condition by replacement value	%	Technical	• 75.9% (Fleet 89%)	→	↑	• Fund and proactively replace	High	• Reduction in availability

Performance Trend Legend:

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

3.6 2025-2034 10-Year Levels of Service Forecast

Considering the City's characteristics, growth projections, and strategic objectives, the proposed performance trend for each LoS metric for the next 10 years is projected and outlined in **Table 3-6**. This table indicates whether each measure is expected to trend upward, downward, or remain stable, considering the nature of the measure, data availability, and whether the projected trend impacts positively or negatively on the proposed LoS.

Table 3-6: 2025-2034 10-Year Solid Waste Levels of Service Forecast

LoS #	Service Area	LoS Measure	Unit of Measure	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Proposed Trend	Basis for Forecast
1	Solid Waste	Total volume of curbside residential waste per capita to landfill.	kg/person/year	Approximately 450 kg/person/year and lower										→	SSO plant reduces landfill
2	Solid Waste	% Amount of waste diverted from landfill (all products).	%	30% upwards										↑	Ongoing recycling improvement.
3	Solid Waste	GHG emissions from landfill and solid waste assets.	tCO2e	TBD										↓	SSO plant reduces GHG generating landfill material.
4	Solid Waste	Remaining capacity of Landfill	Years	TBD										→/↓	Once expansion is approved a stable to slow reduction in remaining capacity is based upon ongoing use.
5	Solid Waste	% Amount of waste diverted from landfill (all products).	%	75.9%	78.2%	80.9%	81.3%	73.3%	78.0%	81.3%	82.3%	80.2%	80.6%	↑	Lifecycle Modeling (Based on City's Forecasted Budget Scenario, see **Figure 5-6**)

Performance Trend Legend:

↑ Positively Increasing	→ Positively Maintain	↓ Positively Decreasing	↑ Negatively Increasing	→ Negatively Maintain	↓ Negatively Decreasing

3.7 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 from the LoS workshop that would impact Solid Waste service levels include, but are not limited to, the following:

- **Growth**. Projected growth anticipated to come predominantly from multi-family house holds which are a lower contributor to landfill capacity due to bylaw impacts previously stated and commercial design making by ICI stakeholders. General population growth is expanded upon below.
- **Inflation and Cost of Living**. Reduced disposable income due to interest rate rises and inflation for the life of this plan will negatively impact waste production as stakeholders become less likely to replace and more likely to repair, repurpose or reuse items that would typically go to landfill.
- **Technology**. Increasing use of electronics containing printed circuit boards will increase the volume of waste that cannot be recycled.
- **Electrification**. Predicted to have minimal impact on waste generation but will impact the waste collection fleet and the fueling costs. Regulations published by Federal Government in 2023 laid out plans to phase out passenger vehicles powered only by gasoline or diesel in 2035. As these vehicles are replace the City should be mindful of the increased maintenance and purchase costs of Hybrid Electric Vehicles (HEV) and Plug-In Electric Vehicles (PEV).
- **Funding level**. The future levy determined by the City for use will have an impact on total usage and fly-tipping around the city.
- **Climate Change**. Increase rainfall levels may require additional leachate control should levels occur beyond that which can be processed by existing equipment.
- **Per- and Polyfluorinated Substances (PFAS) contamination.** Limited impact to solid waste due to low occurrences on City land (except Fire service training pad near the airport).
- **Regulatory Changes**. Future changes to the source separated organics and other recycling regulation will impact the demand for solid waste service and the type of services required.

On November 2, 2021, the City's Planning Division released the Comprehensive Background Report for updating the Official Plan[4]. The City's Official Plan guides local decision-making on land use, development, and public infrastructure over the next 20 years. The City's population is expected to reach 80,000 by 2031, and 83,300 people by 2036. Employment is projected to grow by approximately 6,000 jobs, from 31,000 jobs in 2016 to 36,900 jobs 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 5.3**.

[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 entire asset lifecycles can ensure that the City makes sound decisions that consider present and future service delivery needs.

The overarching goal of lifecycle management is to maximize the long-term benefits and services that our 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 the 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 to facilitate 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 accumulation of the ongoing operations and maintenance, renewal & replacement and disposal costs is many multiples of the initial acquisition costs. As such, it is important to fully understand the entire lifecycle costs across an asset's entire life before proceeding with asset acquisition.

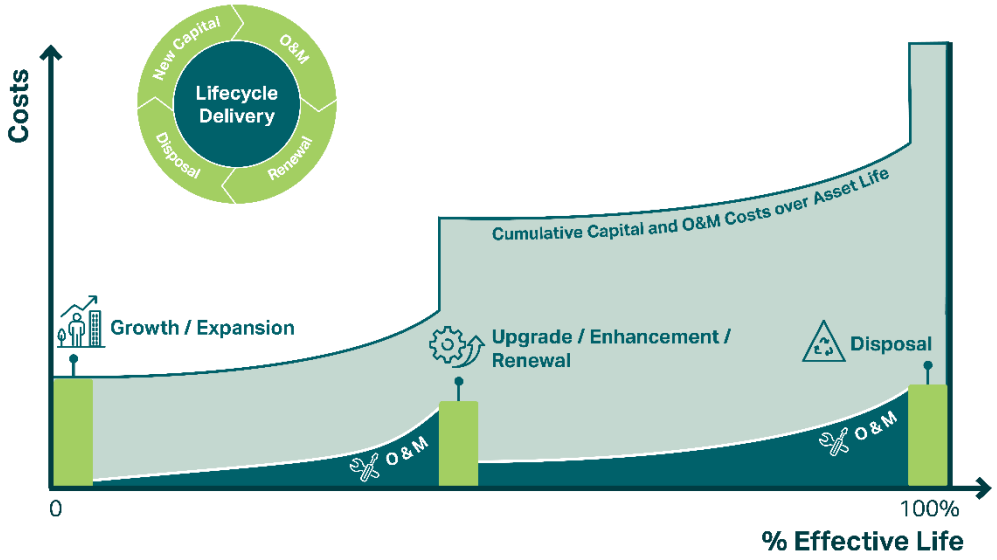

Figure 4-1: Lifecycle Cost Accumulation Over Asset Life

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 expand services to meet growth demands and to meet functional requirements. When acquiring new assets, the City should evaluate credible alternative design solutions that consider how the asset is to be managed at each of its lifecycle stages. Asset management and full life cycle 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 spares.
   - Staff skill and availability to manage the asset.
   - The manner of the asset's eventual disposal.

The following asset acquisition activities have been identified relating to solid waste.

i. The City is actively pursuing landfill expansion as a strategy to accommodate future demand. An answer on the submitted environmental assessment and overall expansion plan is due within 12 months.

ii. The City is also constructing a Biosolids and Source Separated Organics (SSO) plant that will be jointly funded by the waste and solid waste departments with the aim of reducing waste processing volumes such as leaf and yard waste.

2. **Asset Operations and Maintenance (O&M)**: As new infrastructure is commissioned, the City accepts the responsibility of operating and maintaining the infrastructure according to O&M standards to ensure that the infrastructure is safe and reliable. Operations staff provide the day-to-day support required to operate infrastructure. In few cases, operation costs are minor, but for most there are significant increases. For example, underground pipes require almost no operational support while a facility such as a pump station requires full-time staff to operate the facility safely and efficiently. 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 and when needed. Inadequate funding for O&M will have an adverse impact on the lifespan of assets. The amount of O&M resources required in any period is a function of the current inventory of infrastructure and total O&M needs required for each asset. As the inventory of infrastructure grows, total O&M requirements will also grow.

The following asset O&M activities have been identified relating to solid waste.

i. The City has accounted for O&M for it's exsting assets and has accounted for addiitonal funding once construciton of the SSO plant is complete along side additional birgding funidng while it becomes fully operational.

3. **Renewal and Replacement:** The third portion of full life cycle costing relates to the renewal and replacement of infrastructure that have deteriorated to the point where it no longer provides the required service. Renewal cost is sometimes incurred during the life of an asset where an investment is made to improve the condition and / or functionality of the asset e.g., re-lining of a pipe. Replacement activities that are expected to occur once an asset has reached the end of its useful life and rehabilitation is no longer an option.

The following asset renewal and replacement activities have been identified relating to solid waste.

i. The City is proactivly renewing plant and equipment as the condition necessitates.

4. **Decommissioning and Disposal:** There will inevitably come 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 remove an asset from service include changes to legislation that cause the asset to be in non-compliance, the inability of the asset to cope with increased service levels, technology advances that render the asset obsolete, the cost of retaining the asset is greater than the benefit gained, or the current risk associated with the asset's failure is not tolerable.

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. In some cases, there will be residual liabilities and risks to consider if a decision is made to partially abandon the asset as opposed to fully disposing of its components (e.g., leaving a non-functioning pipe in the ground, or an inactive building standing). 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.

The following asset decommissioning and disposal activities have been identified relating to solid waste.

i. The City is proactivly planning for site closure and has up to date studies for closure and post closure obligations.

4.2 Asset Acquisition Strategies

The City has completed a Waste Management Environmental Assessment report and submitted it to the Ministry of the Environment Conservation, and Parks for review and approval. According to the report, the current landfill is projected to reach maximum capacity in 2027. As a solution, an expansion has been proposed to provide an additional disposal capacity of approximately 1.78 million tonnes of waste over a planning period of 25 years[5]. The comprehensive report is available on the City's website, and **Table 4-1** summarizes key activities associated with the proposed expansion.

Table 4-1: Acquisition Activities for Solid Waste Assets

Asset Group	Asset	Activities Undertaken by the City	Guiding Documents
Solid Waste	Storm/Gound Water	• Planning to build two separate pump stations at the landfill in conjunction with landfill expansion. – Leachate collection system for abandoned landfill site will require two pump stations installed as flow increases. – One main station to be built within the next 5 years. Additional smaller pump station for leachate collection as part of the expansion, dependent on waste disposal rates over time. The final need will be assessed post-installation of the new station. • Planning to add stormwater management ponds as part of landfill expansion. – One will begin construction within the next 5 years, while the other two are proposed as part of the overall site and will be constructed based on need.	• Official Plan • Corporate Strategic Plan • Energy Conservation & Demand Management Plan • Community GHG Reduction Plan • Strategic Asset Management Policy • Development & Operating Report • Monitoring Report • Environmental Assessment • Solid Waste Business Plan • Post Closure Plan
	Buildings	• Planning to demolish the existing buildings and initiate the construction of new facilities over the next 15 to 20 years.	
	Landfill Gas	• Acknowledging that more landfill gas wells are needed as part of landfill expansion.	
	Landfill Infrastructure	• Planning to hard surface a section of the road to manage dust emissions and may utilize asphalt millings from other reconstruction projects.	
	Landfill Equipment	• Ongoing update and revision of the business plan to reflect biosolids handling.	

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 solid waste AM also contribute to cost-effectiveness over the asset's lifecycle. **Table 4-2** summarizes the O&M activities associated with the City's solid waste assets.

[5] Solid Waste Management EA Final Report. (2024). City of Sault Ste. Marie. Solid Waste Management EA Final Report - City of Sault Ste. Marie (saultstemarie.ca). Retrieved on February 22nd, 2024.

Table 4-2: O&M Activities for Solid Waste Assets

Asset Group	Asset Category	Activities Undertaken by the City
Solid Waste	Storm/Ground Water	• Ongoing maintenance program for groundwater and purge wells, managed by an external contractor. • An alert system to notify if purge wells are offline, requiring field staff to check and identify issues.
	Buildings	• Maintenance completed internally through public works facilities team. – A building maintenance expert for the upkeep of air conditioning systems, heaters, plumbing, etc. – Annual check on air conditioning units, which may involve topping up refrigerant or necessitate an upgrade due to availability.
	Leachate	• Public works checks (frequency not specified). • Regular pump checks: – Contractors will remove, clean, and re-install pumps. – Cleaning is conducted on a regular basis. – Overhaul is based on run-hours and condition. • Periodic forcemain flushing.
	Environmental Monitoring	• Utilizing computer equipment to measure methane gas readings for environmental report. • Sampling and testing at monitoring wells, documented in annual reports. • Monitoring equipment within buildings, calibrated once a year as part of ventilation system inspections.
	Landfill Equipment	• Biosolids trailer washing is completed once a week on Fridays as a preventative measure.

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 solid waste assets.

Table 4-3: Renewal and Replacement Activities for Solid Waste Assets

Asset Group	Asset Category	Activities Undertaken by the City
Solid Waste	Storm/Gound Water	• Pump Station renewal. • Pump overhaul and replacement.
	Buildings	The buildings will be reconstructed as part of landfill expansion.
	Leachate	• Pump replacement. • Handling system replacement.
	Landfill Gas	• Prefab well head and kanaflex replacement. • Well replacement due to collapse. • Occasional hose replacement if damaged. • Welding material to extend the well to continue filling the landfill. • Valve stem extension.
	Landfill Infrastructure	• Pads repair based on condition.

4.5 Decommissioning and Disposal Strategies

Effective asset decommissioning and disposal are integral components of strategic asset management. As the City's solid waste assets 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.

In the realm of solid waste AM, the disposal of landfill sites necessitates additional considerations due to potential environmental impacts. The Province of Ontario has established regulatory requirements in O.Reg 232/98 under the Environmental Protection Act to address these concerns[6].

Site closure activities entail the progressive closure of portions of the fill area as they reach final approved contours. For smaller sites like natural attenuation sites, completion of the final soil cover and limited post-closure monitoring may suffice. In contrast, larger, highly engineered sites would likely require the completion of various constructed works and significant ongoing monitoring and maintenance. Regardless of the site's size, the overarching goal for all closure activities is to ensure the outcomes are aesthetically pleasing and can provide long-term protection to the environment.

Post-closure care is also mandatory, with the duration depending on factors such as the environmental setting, the level of engineering, the required service lives of any engineered works, and the type of waste and remaining contaminant concentrations. This post-closure period may extend from many decades to several hundred years.

Table 4-4 summarizes the decommissioning and disposal activities associated with the City's solid waste assets.

Table 4-4: Decommissioning and Disposal Activities for Solid Waste Assets

Asset	Asset Category	Activities Undertaken by the City

Solid Waste	Buildings	• The demolition is planned as part of the Waste Management Environmental Assessment report.
		  – Asbestos may present challenges during the process.
		  – Demolition and rebuild is required during Cell #3 mining operations.

	Roads	• Road demolition and reconstruction will also be required during expansion and mining operations.
	Waste Collection	• Recycle or landfill carts. • Sell the old vehicles for residual value or scrapping. There is a market for old but functional municipal vehicles in smaller townships and villages that cannot afford or do not require brand new vehicles.

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**.

[6] Landfill standards: A guideline on the regulatory and approval requirements for new or expanding landfilling sites. (2012). Government of Ontario. Landfill standards: A guideline on the regulatory and approval requirements for new or expanding landfilling sites | ontario.ca. Retrieved on February 22nd, 2024.

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.

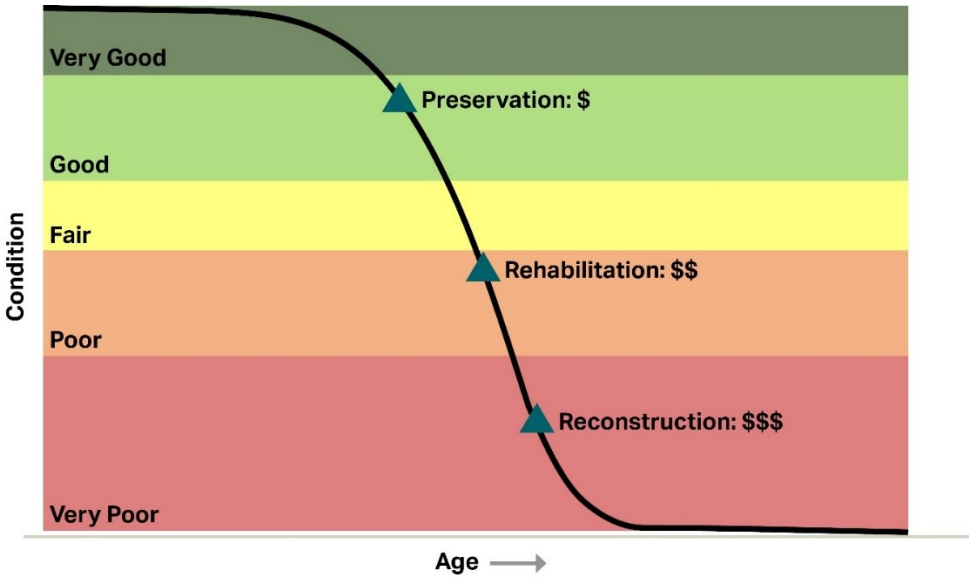

Figure 4-2: Asset Deterioration Curve and Rehabilitation Costs

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. To help shape the City's risk management process, AECOM recommends considering the following:

1. **Limited Specialist Vendors**: Specialist vendors for specific equipment maintenance are typically reliant on ongoing contracts and due to their size and specialist nature are more sensitive to losses of custom. Key vendors which are identified as of high importance to the City should be engaged proactively to build an improved relationship. Vendors which are identified as of high importance, and where the City is of significant

importance to them, should be engaged proactively for a strategic relationship that can encourage improved efficiencies and reliability.

2. **Increasing Maintenance Costs**: By implementing consistent and proactive maintenance schedules for landfill assets, the City can identify and address potential issues before they escalate. This preventive approach reduces the likelihood of major breakdowns or emergency repairs, ultimately minimizing the overall O&M expenses. Additionally, regular maintenance extends the lifespan of assets, enhances their efficiency, and ensures that they comply with safety standards, contributing to a more sustainable and cost-effective management of municipal resources.

3. **Specialized Parts and Limited Vendor Pool**: The supply chain for specialty equipment, like waste collection trucks, often rely on a limited pool of specialized vendors, while few of them are located within Ontario. In many instances, the required parts need to be shipped from overseas. This dependency can result in vulnerability to disruptions, such as production delays, supply shortages, or unexpected events affecting the vendor's operations. Consequently, it may lead to longer lead times and potential delays in maintenance. Addressing these challenges requires a strategic approach to enhance local capabilities, streamline vendor dependencies, and optimize the supply chain, ensuring the efficient operation and maintenance of crucial fire service assets within the City.

4. **Stringent Safety Standards and Changes in Regulations**: Specialty equipment is subject to rigorous safety standards and regulations; however, regulatory frameworks are dynamic and prone to change due to technological advancements, lessons learned from incidents, and evolving societal expectations. Therefore, staying ahead of these changes is crucial for the City to proactively identify and mitigate potential risks associated with non-compliance.

5 Funding Need Analysis

The following section outlines the funding needs for Solid Waste for the next 10-year period.

5.1 Capital and Operating Budget

5.1.1 Capital Budget - Historical Expenditure and Future Forecast

Historical capital expenditures for solid waste assets have typically included large asset acquisition with some asset renewal or replacement. Notable recent expenditures from the last five-years have been land acquisition for landfill expansion, Environmental Assessment (EA) and Options Report for expansion, and the Biosolids/SSO facility design. Table 5-1 present the five year capital reinvestment budget forecast.

Table 5-1: Capital Reinvestment Budget Forecast

Asset Class	Asset Group	Asset Type	2025-2029 5-Year Average Reinvestment Budget
Solid Waste	All except below	Buildings, Environmental Monitoring, Landfill Gas, Landfill Infrastructure, Leachate, Liners & Capping, Sanitary, Storm/Ground Water, Waste Collection. New Biosolids/SSO.	$1,383,000
	Landfill equipment	Heavy vehicles, light vehicles.	$486,000
		Total	**$1,869,000**

Note: Fleet vehicles are separated for the purposes of this AMP due to separate capital budget availability

5.1.2 Operating Budget - Historical Expenditure and Future Forecast

The City's historical operating expenditures for solid waste assets (Table 5-2) have centered on routine and corrective maintenance. These values have been determined using the selected business plan requirements.

Table 5-2: Operating Budget Forecast

Asset Class	Asset Category	Asset Type	2025-2029 5-Year Average O&M Budget
Solid Waste	All	Buildings, Environmental Monitoring, Landfill Gas, Landfill Infrastructure, Leachate, Liners & Capping, Sanitary, Storm/Ground Water, Waste Collection. New Biosolids/SSO. Heavy vehicles, light vehicles.	$1,705,000
		Total	**$1,705,000**

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 implemented within an PowerBI Model. The analysis involves integrating key asset attribute information including asset inventory, age, expected service lives, replacement values, and condition to create a theoretical asset replacement cycle for each asset. The other relevant capital upgrade needs information (e.g., the City's current Biosolids/SSO facility) were also considered in the lifecycle model. No condition assessment results of were available to incorporate into the analysis. A financial dashboard was developed to present the lifecycle modeling results.

The annual reinvestment needs for the solid waste 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 on inflations:

- 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 is determined based on the City's input.

Table 5-3: Inflation Rate[7]

Year	Inflation Rate
2022	7%
2023	7.1%
2024	6%
2025	2%
2026	2%
2027	2%
2028	2%
2029	2%
2030 - 2034	2%

Table 5-4 presents the proposed reinvestment targets for solid waste infrastructure from 2025 to 2034. It outlines the intervention measures and target percentages for each asset type, along with the resulting average annual reinvestment rates over the 10-year period.

[7] 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

Table 5-4: Solid Waste Reinvestment Assumptions

Asset Category	Asset Sub-Category	Measure	Target	Resulting 10-Yr. Annual Avg. Reinvestment Rate (2025- 2034)
Buildings	All	Planned for replacement during landfill expansion and cell works. Assumed timeline of 2040.	100%	**3.0%**
Environmental Monitoring	All	Percentage of monitoring equipment exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
Landfill Equipment	All	Percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
Landfill Gas	All	Percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
Landfill Infrastructure	Appurtenances & Misc	Fences are assigned a repair cost annually.	1% of replacement value	
		All other assets based upon a percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
	Pads & Lots	Concrete and asphalt pads and lots are assigned with a repair cost annually.	1% of replacement value	
	Roads	Access roads are assigned a repair cost annually based upon the roads AMP.	0.4% of replacement value	
		The perimeter road is assigned a repair cost annually based upon the current maintenance expenditure.	1% of replacement value	
	Scales	Percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
Leachate	All	Percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
Liners & Capping	Landfill Caps	Landfill caps are assigned a repair cost annually based upon the forecast amount during post closure (removing the well maintenance cost from the annual forecast).	0.35% of replacement value	
Sanitary	All	Percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
Storm/Ground Water	All	Percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	
Waste Collection	All	Percentage of assets exceeding their expected service life, that are replaced in 2025 and thereafter.	100%	

In the future, when condition assessment programs are implemented, conditions will be used to update the renewal and replacement forecast to better inform asset reinvestment needs.

5.2.2 Solid Waste Assets Budget Scenarios & 10-Year Service Level Forecast

This section presents the budget scenario analysis and the 10-year service level forecast for solid waste assets.

5.2.2.1 Budget Scenarios Setting for Solid Waste Assets (excluding Landfill Equipment

Table 5-5 budget scenarios setting for all assets. Scenario 1 (S1) is a “Do Nothing” approach with zero expenditure; S2 assumes an ideal, unconstrained budget enabling asset replacement at end-of-life; and S3 reflects the City’s defined budget at $1.2 million annually (note this is an annual budget taken over 10 years as provided by the City).

Table 5-5: Solid Waste Assets Budget Scenarios (excluding landfill equipment)

Scenario		Description	Budgets
S1	Do Nothing	Spend Nothing	$0 million
S2	Unconstrained Budget	Replace assets at end of life	Unlimited
S3	City's Planned Budget	City's Current Planned Budget	$1.2 million annual budget

5.2.2.2 Solid Waste Assets Funding Need

The average annual reinvestment estimates for the City's solid waste assets (excluding landfill equipment) is $1.2 million over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $12 million over the next 10-year period, as presented in **Figure 5-3**. The City should note that there are several waste collection trucks in backlog for reinvestment as they have exceeded their ESLs. This theoretical expenditure spike is presented in the year 2025 in **Figure 5-3.**

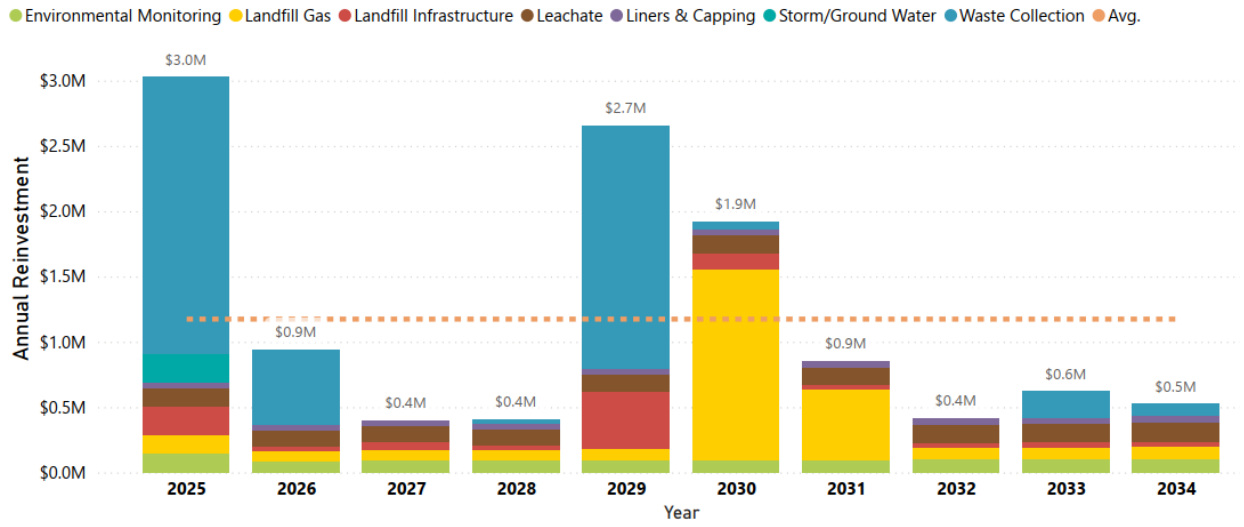

Figure 5-1: 10-Year Funding Need for Solid Waste Assets – Unlimited Budget Scenario

The detailed 10-year reinvestment needs all Solid Waste assets excluding landfill equipment in **Table 5-6** in inflated dollar values.

Table 5-6: Solid Waste Assets 10-Year Total and Annual Average Capital Reinvestment Need

Asset Type	Annual Average Need	10-Year Total
Buildings	$0	$0 (if replaced in 2040)
Environmental Monitoring	$104,000	$1,040,000
Landfill Gas	$271,000	$2,710,000
Landfill Infrastructure	$105,000	$1,050,000
Leachate	$132,000	$1,320,000
Liners & Capping	$48,000	$480,000
Sanitary	$0	$0
Storm/Ground Water	$23,000	$230,000
Waste Collection	$491,000	$4,910,000
Total	**$1,174,000.00**	**$11,740,000.00**

5.2.2.3 Solid Waste Assets 10-Year Service Level Trend Forecast

Figure 5-2 presents the projected condition of solid waste assets (excluding landfill equipment) under three funding scenarios over a 10-year period. Currently, 76% of assets are in fair or better condition. Under the "Do Nothing" scenario, the service level declines steadily to 59% by 2034. With an unlimited budget of approximately $1.17 million annually, the asset condition improves to 81%. Under the City's current budget, the service level achieves the same end goal with the only difference being backlog being address quicker with an unlimited budget.

These projections indicate that the City's current funding is sufficient to sustain current service levels for solid waste assets over the long term. Additional investment or complementary strategies may be needed to support assets with no required funding in this forecast and to optimize expenditures of assets which may be disposed of during landfill expansion.

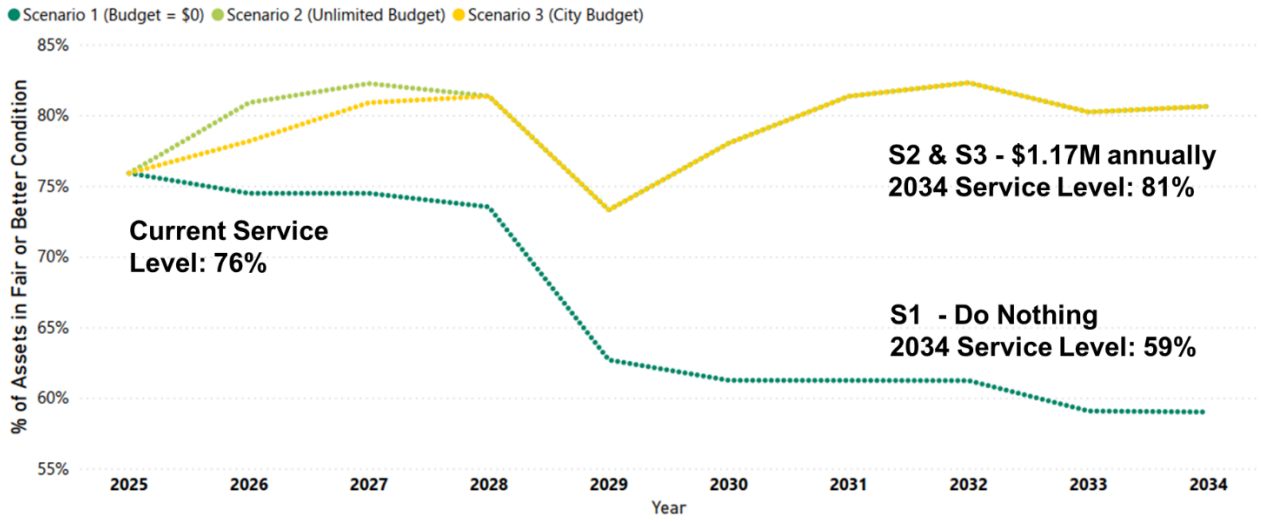

Figure 5-2: Solid Waste Assets Levels of Service Trend in the Next 10-Year for All Budget Scenarios

Figure 5-3 illustrates the projected condition distribution of solid waste assets from 2025 to 2034, assuming the City maintains its current annual investment of $1.2 million. Currently, 67% of assets are in very good condition, however there are 24% rated as poor or very poor. Under continued funding at this level, the condition of the asset base is expected to increase steadily. By 2034, only 19% of assets are projected to be in poor and very poor condition, while the share of assets in fair or better condition increases from 76% to 81%.

This indicates that the current funding requirement of the business plan that has been committed to by the City is sufficient to maintain current levels of service. It should be noted however that this conclusion is limited by the estimates made in condition and installation date for all assets within scope and ongoing refinement of the asset inventory will have significant bearing on the actual requirements.

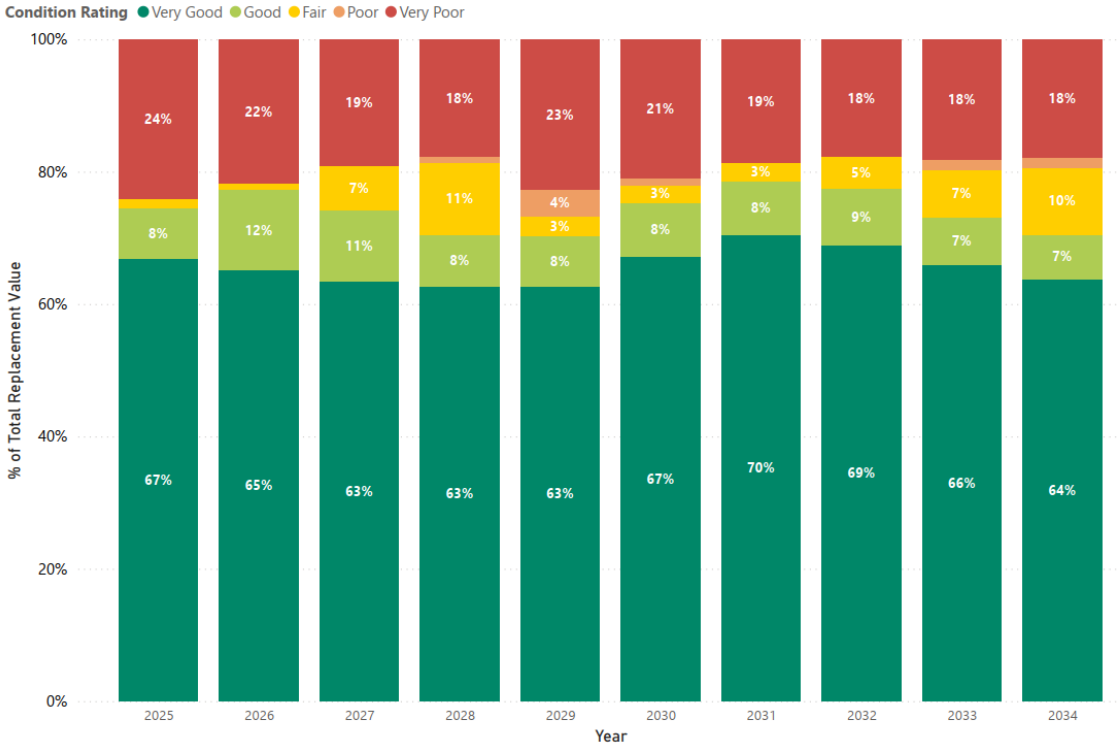

Figure 5-3: Solid Waste Assets Condition Projection under Scenario 3 - City's Planned Budget

5.2.3 Solid Waste Landfill Equipment Budget Scenarios & 10-Year Service Level Forecast

This section presents the budget scenario results and the 10-year service level forecast for landfill equipment (heavy equipment, light vehicles and material handling. These assets are separated from the forecast above due to their separate capital line requested in the current budget to allow direct comparison.

5.2.3.1 Budget Scenarios Setting for Landfill Equipment Assets

Table 5-8 shows budget scenario setting for landfill equipment. S1 is a "Do Nothing" approach with zero expenditure; S2 assumes an ideal, unconstrained budget enabling asset replacement at end-of-life or rehab where applicable; and S3 reflects the City's defined budget at $0.7 million annually (note this is in comparison to the $0.486 million figure previously identified in **Table 5-1**). It should be noted that this expenditure is currently planned to be over 5 years with no additional capital currently in plan post 2029.

Table 5-7: Landfill Equipment Assets Budget Scenarios

Scenario		Description	Budgets
S1	Do Nothing	Spend Nothing	$0 million
S2	Unconstrained Budget	Replace assets at end of life or rehab where applicable	Unlimited
S3	City's Planned Budget	City's Current Planned Budget	$0.7 million annual budget

5.2.3.2 Landfill Equipment Funding Need

The average annual reinvestment estimates for the City's solid waste facility is $0.6 million over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $5.7 million over the next 10-year period, as

presented in **Figure 5-4**. The reinvestment needs vary significantly from year to year. A funding need spike is observed in 2025 and 2032, where total reinvestment needs are primarily driven by heavy equipment replacement.

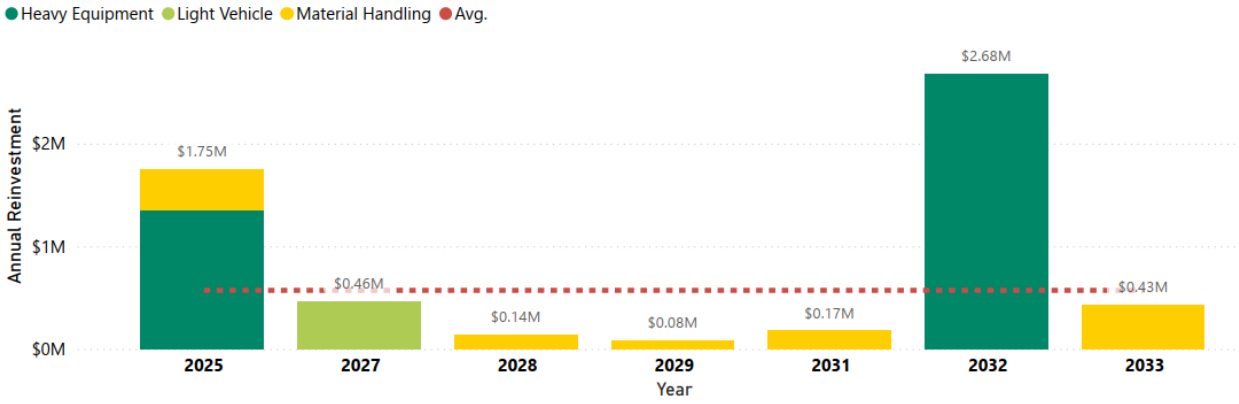

Figure 5-4: 10-Year Funding Need for Landfill Equipment Assets – Unlimited Budget Scenario

The detailed 10-year reinvestment needs for landfill equipment is presented in **Table 5-8** in inflated dollar values.

Table 5-8: Solid Waste Landfill Equipment Assets10-Year Total and Annual Average Capital Reinvestment Need

Asset Type	Annual Average Need	10-Year Total
Heavy Equipment	$403,000	$4,030,000
Light Vehicle	$46,000	$460,000
Material Handling	$122,000	$1,220,000
Total	**$571,000**	**$5,710,000**

The current period that the budget is planned over is condensed over five years and therefore some assets may be replaced ahead of their ESL based upon their condition using a Weibull analysis.

5.2.3.3 Landfill Equipment 10-Year Service Level Trend Forecast

This analysis models the service level in terms of condition of solid waste facility assets over a 10-year horizon under three funding scenarios shown in **Figure 5-5**. Currently, approximately 89% of the City's landfill equipment assets are in fair or better condition. In a "do nothing" scenario, the condition of the asset base declines significantly, with only 61% of assets projected to remain in fair or better condition by 2034. In a scenario assuming unlimited funding results in a stabilized condition level of approximately 93% by 2034. Notably, the City's current budget scenario yields identical results, due to the current plan matching forecasts made by the current business plan.

This finding indicates that the City's current level of capital investment in landfill equipment assets is adequate for maintaining asset condition over the next decade.

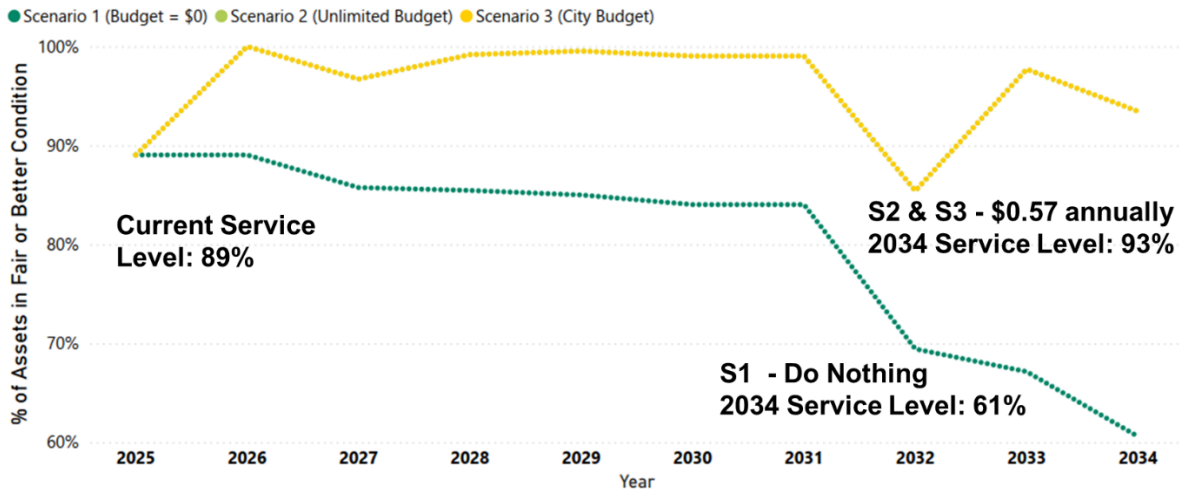

Figure 5-5: Landfill Equipment Levels of Service Trend in the Next 10-Year for All Budget Scenarios

Figure 5-6 shows the detailed condition distribution profile under the City's planned budget scenario for landfill equipment assets. Notably, the percentage of assets in poor and very poor condition remains low until 2032, reflecting the impact of single, high value aging assets. From 2029 onward, the condition profile becomes less dominated by very good assets indicating the start of an optimized approach to replacement and expenditure.

This indicates that the City's current level of investment is sufficient to maintain overall system performance, provided that assets are renewed in a timely and strategic manner.

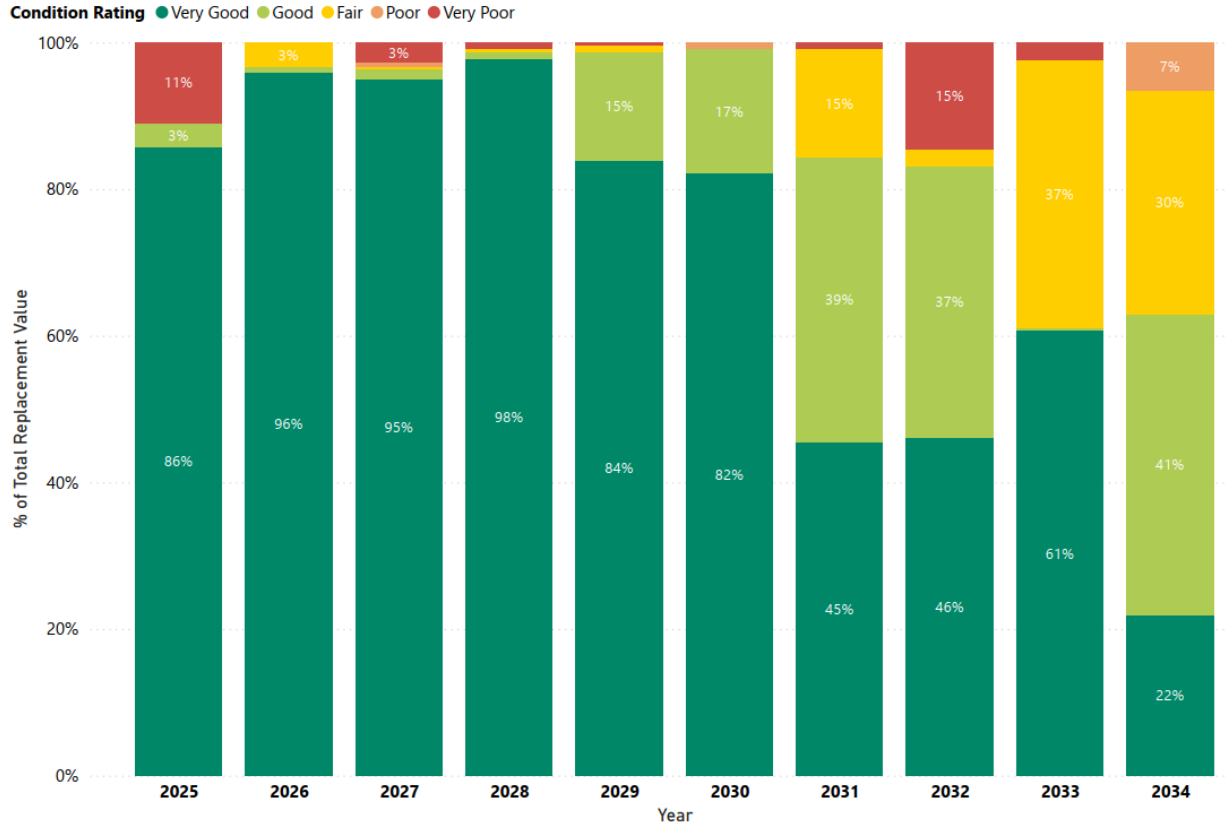

Figure 5-6: Solid Waste Assets Condition Projection Under Scenario 3 - City's Planned Budget

5.3 Growth Related Capital and O&M Funding Need

The growth-related capital funding for solid waste services include a need to acquire the Biosolids Management Facility, landfill pump station upgrades, and Cell 1 construction.

Biosolids / SSO: Capital costs are estimated at $43.8 million over 2025–2029. Base O&M costs are estimated at $1.5 million (in 2023-dollar values)—allocated 80% to wastewater and 20% to solid waste—and will be adjusted for inflation. Due to a learning curve, the first two years of operation (2027–2028) will incur costs at 150% of the base rate. Consequently, an additional annual O&M budget of approximately $0.32 million (in 2025 dollars) is needed for solid waste services, rising to about $0.4 million during the first 10 years of operation years with an additional $0.16 million (2025 dollars) in 2027 and 2028 to account for additional early operating costs. This translates to a total of $4 million in O&M funding needs over the next 10 years for the Biosolids Management Facility. The O&M costs are accounted for in the business plan within Waste Collection and Disposal costs. The overall increase is approximately $0.25 million lower than without the SSO plan as sewage sludge disposal management costs are no longer incurred.

Landfill Pump Station: Capital costs are estimated to be $1.8 million. No additional O&M costs are currently identified at this time although minor impact to the AMP will be incurred due to a reset of asset condition.

Cell 1 Mining: Capital costs are estimated to be $10.5 million. No additional O&M costs are currently identified at this time although minor impact to the AMP will be incurred due to a reset of asset condition and potential changes to ESL of installed equipment based upon available technology.

5.4 Full Funding Profile

Figure 5-7 shows a full picture of the City's solid waste funding need forecast over the next 10 years, which provides the City the funding requirements in order to perform effective financial planning activities. The total annual reinvestment cost from **Figure 5-1** has been split between capital expenditure (split into committed projects, rehabilitation, replacement, and disposal) and O&M costs (waste collection and disposal costs, diversion material collection and processing costs, and general costs). The allocation for asset disposal costs is based on 1% of the replacement and rehab costs.

The City's solid waste full funding requirement varies between approximately $6.4 million and $19.3 over the next 10 years. It should be noted that there is currently a significant drop off in identified capital spend in 2032 as current plans accounted for are the five year City plan and the large capital requirements identified in the business plan (that cease in 2031). Post 2031 the only capital costs identified by the City are annual engineering costs. See **Section 5.3** for the current estimated funding need for growth.

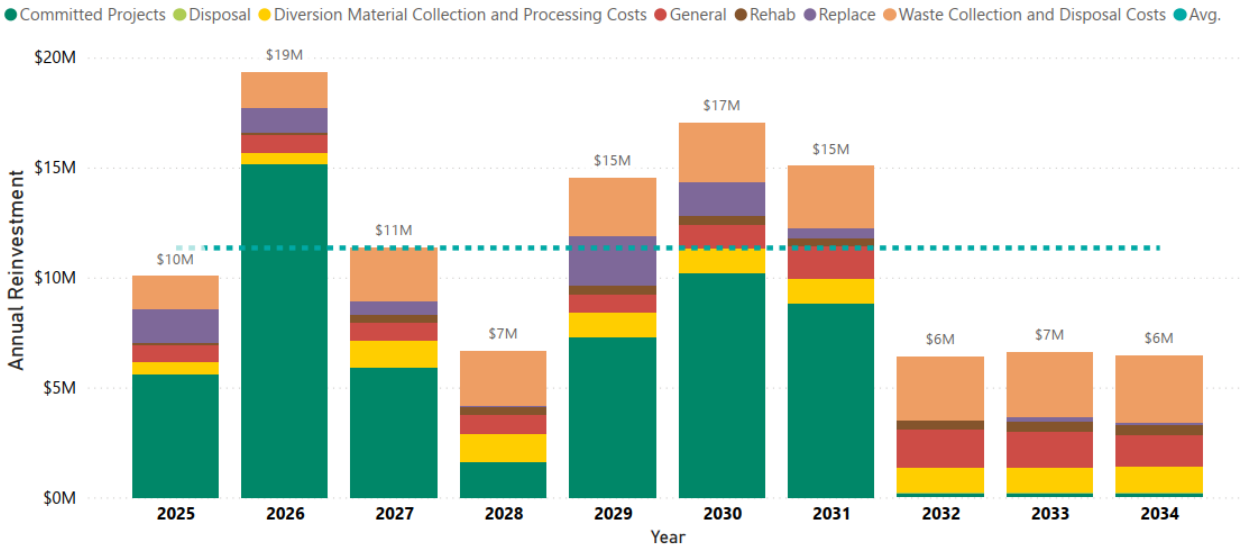

Figure 5-7: Full Funding Profile (City's Planned Capital Reinvestment Budget Scenario Included)

5.5 Funding Gaps & Risk

The City intends to continue to invest in the growth and renewal of the solid waste assets over the next 10 years. **Table 5-9** compares the City planned capital reinvestment budget against the capital reinvestment funding needs. The shortfall between the City planned capital reinvestment budget against the capital reinvestment funding needs is referred to as the "funding gap".

Table 5-9: Funding Gap – Capital Reinvestment Funding Needs vs. Budget Forecast

Asset Class	10-Year Need Total ($Million)	10-Year City Budget Total ($Million)	10-Year Gap Total ($Million)
All (excluding below)	$11.7	$11.2	Very Close to Adequate ($0.5 million
Landfill Equipment	$5.7	$6.6	Adequate

The growth-related capital funding need is outlined in **Section 5.3**, which is currently accounted for in the solid waste business plan.

As described in **Section 3.5**, risks are identified for each service level performance measure.

Table 5-10 provides a high-level overview of the key risks associated with funding gaps, as well as the potential consequences and impacts of not meeting the proposed service levels.

Table 5-10: Risk of Delayed Intervention for Solid Waste Assets

Key Risk	Asset	Potential Consequences/Impacts
Insufficient funding to keep up with population and demand increases	All solid waste assets (especially landfill infrastructure)	- Inability to consume waste generated by growth. Waste will have to be transferred to private landfill at expense to the City.
	Waste Handling	- Insufficient resources to collect waste from residential growth.
Insufficient funding for asset renewals (not currently a risk but recorded as an output of discussions with the City)	All solid waste assets	- Declining asset condition over time - Greater reliance on reactive maintenance - Reactive interventions are costlier than proactive actions - Increased frequency of service interruptions and asset failures - Compromised regulatory compliance - Reduced system resiliency and redundancy (particularly waste collection and landfill operations).
Higher vulnerability of assets to emergencies/ extreme weather events	All solid waste assets	- Damage to infrastructure from more frequent and severe weather due to climate change - This impact of severe weather (increased rainfall and rapid snow melt) can combine with normal landfill operation to increase leachate production.
Insufficient funding for operations and maintenance	All solid waste assets	- Increasing annual maintenance costs as infrastructure ages. This will be most felt in landfill equipment where routine maintenance allows equipment to meet ESLs. - Emergency responses divert resources from routine maintenance and equipment downtime can create operational backlog and potentially increase complaints if routine cover cannot be positioned. - More time spent responding to odour complaints.

5.6 Funding Sources & Alternative Strategies

The Funding Gap represents the shortfall between optimal and forecasted funding levels, currently there is a gap between the revenue produced by solid waste and the expenditure required to maintain services. Internal funding such as the general levy rate is more stable as it is under the City's direct control but is dependant on the forecast annual percentage increase of taxes. Fee mechanisms are also in use to supplement revenue, several are in use and for usage fees charged to the end user are based upon a 20% increase every 5 years. Other revenue sources such as the sale of scrap metal are also available, but the revenue generate is subject to market forces. Information supplied by the City as well as previous work carried out by AECOM has identified the following internal revenue sources.

- Bag fee. Currently $2 and increases by 20% every 5 years.
- Gate fee. Currently $14.40 and increases by 20% every 5 years.
- Scrap metal. Currently $364 per tonne and increased by inflation for planning purposes.
- General levy. Calculated as the last available year (2024) increased by 8.044%
- The sewage sludge tipping fee is applicable for 2025 and 2026 until the Biosolids plant comes online.

Note that Hazardous Special Waste (MHSW) and Waste Electrical and Electronic Equipment (WEEE) are captured under government grants as these fees are beyond the control of the City.

External funding, such as provincial or federal grants, is considered at risk as these external sources are subject to change based on policy shifts or economic conditions. Overreliance on such funding creates vulnerability, as any reduction can compromise planned infrastructure investments or service continuity. The current 5-year average grant received is approximately $0.67 million which equates to approximately 10% of the total revenue. The following government grants have previously been received by the City, their 5-year average is included below.

- Ontario grant - curbside recycling. 5-year average $0.6 million, received every year.
- Ontario grant - hazardous waste (MHSW). 5-year average $52,000, received every year.
- Ontario grant – Tires (OTS). 5-year average $159, received in 2020 only.
- Ontario grant – Electronic (WEEE). 5-year average $12,000, received every year.
- Canada grant - Canada works. 5-year average $1,400, received in 2022/23 only.

To manage any potential gap the City has explored several financial based approaches which are currently in use or may be used in the future.

- Planning – Solid waste relies upon a clear business and implementation (B&I) plan as a guide for budget request and to support plans for use of additional fees, levies and use of reserves. This has also supported cases over the course of time as new capital requirements have come to forefront and request have gone before council.
- Internal leasing - Currently vehicles are rented from Public Works (PW) and rental credits applied internally. This improves the bargaining power of the City as vehicles are contracted centrally.
- Policy - Funding from higher government that may be available to support expenditure on the SSO/Biosolids plant.
- Fee Setting – The intention of the fee setting is to attempt to maintain a surplus through fees. The City can consider a larger increase in fees or the same percentage split but enacted annually.

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 or non-financial strategies play a critical role in enhancing the City's ability to manage service levels and asset performance within existing fiscal constraints. **Table 5-11** highlights the City's non-financial strategies to address increase revenue, decrease expenditure and maintain a minimal funding gap. These strategies are designed to support long-term financial sustainability through alternative delivery methods, changes in practices or policies, and system optimization, without relying solely on increased funding.

Table 5-11: Non-Financial Strategies to Address Funding Gaps for Solid Waste Services

Category	Strategy	Description / Actions
Community Engagement	Social media and advertisements	Communicate benefits of reduced waste generation and improved diversion.
	University links	A combination of targeting education at a generation that will be producing waste for the longest period but who have the most to gain and promoting waste management as a potential career.
Operational & Engineering Solutions	Operational efficiencies	There are limited operational efficiencies available due to the current organizations size.
	Resource sharing	The new Biosolids/SSO could use resource sharing. Staff may be dual trained and some equipment will be shared.
	Optimize temporary staff	9-15 seasonal workers are currently required by the landfill. Due to seasonal swings in demand these roles could potentially be joint sourced with other temporary staff within the City to reduce hiring costs and reduce churn.
	Proactive condition assessment	Assess the condition of assets on a set frequency to improve accuracy and reliability of the AMP.
Partnership and collaboration	Waste collection	While having a financial impact, the benefits of the current contract are several. The current hybrid approach (split services between the City and private contractor) ensures operational resilience, keeps contractors cost competitive, and allows flexibility to upscale easily with several options. The intention is to keep the collection program as is.
	Wastewater department	SW have partnered with the wastewater department for the design, construction and operation of the SSO.
	Electricity generation	Previous work had been undertaken to attempt power generation from landfill gas. Dependant on landfill contents and gas production this option may reduce as biological and SSO waste is diverted to the new plant

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. While the City's solid waste assets are in a relatively good condition at the moment, there are future challenges that must be contended with considering projection presented previously. It is important to address these challenges thoroughly and promptly to leave a positive legacy for future generations

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 the asset hierarchy and inventory.	• Continue to refine the asset inventory and close existing data gaps, so as to have a more accurate representation of the current state of the solid waste assets; and, ultimately, to make more informed and defensible decisions. • A site validation exercise should be undertaken to confirm the site inventory. The site inventory for this AMP was created using desktop sources available to AECOM and are should therefore be validated.
2.	Develop a formalized solid waste assets condition assessment process and use consistent condition grading schemes for these 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. • Perform condition assessments on the most critical assets first. This ensures that assets are assessed using the same methodology and prioritized based on their criticality. It facilitates a more defensible business case when addressing issues of asset degradation with senior management and the Council. • A specific approach for usage of landfill capacity should be used when treating the land as an asset. In all other AMPs the land value is not treated as a capital asset that requires replacing as typically land can be re-used or replaced for a similar cost to that achieved in sale. Landfills and cemeteries by their nature treat land as a consumable asset, and therefore the condition and remaining ESL should be tied directly to the forecast remaining capacity and life expectancy.
3.	Refine the Levels of Service Framework.	• The AMP represents the City's LoS in alignment with the requirements of O. Reg. 588/17 July 1, 2025 deadline. The City will 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 comprehensive 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.

Index	Improvement Initiative	Description
5.	Funding Need	• The financial model is based on several assumptions previously outlined. It is recommended the City address each area to improve accuracy of the funding need projection. • The funding needs and gap are reported as $0.5 million over 10 years in **Sections 5.4** and **5.5.** Enhanced forecasting on the future demand is critical to financial planning. An understanding of the future growth of the City in relation to single family homes and multi family homes is required to accurately forecast the demand on waste collection services.
6.	Business plan update	At the next business plan update: • Include a full allowance for all assets within the equipment and infrastructure budgets. The outstanding costs not included within the current business plan are discussed within **Section 5.2**. • Account for forecasted growth within the City and consider the true impact of that particular growth (single family homes vs multi-family) on the demand for solid waste services. • Use a true reflection of inflation, interest and financing rates.
7.	Refine and Regularly Update the Solid Waste Lifecycle Funding Model.	• The current solid waste funding model is built on available data, assumptions, and generalized asset information, providing a high-level estimate of future funding needs. As such, it is essential to refine the model periodically by incorporating updated data—such as asset condition assessments, project cost information, and implementation schedules—to improve its accuracy. Project timing and costs should also be reviewed and adjusted as projects near execution to ensure realistic planning and budgeting.
8.	Continue to monitor growth needs and demand realities into the financial forecast and update the solid waste AM Plan as appropriate	• The volume of produced waste is expected to grow in line with an increase in the City's population. AECOM recommends that the City: • Includes growth-related capital needs as part of the capital budgeting. • Coordinates AM planning and development planning processes to ensure that the infrastructure systems that are built to serve new growth can be sustained over the long term. • Ensure that the solid asset inventory is always kept current as new assets are added and existing assets are refurbished or retired. • Update LoS values for waste capacity and production to allow future life calculation of landfill and requirement of assets.
9.	Continue to find ways 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, which may involve enhancing existing software, adding new features, or replacing the current system. • Develop a Knowledge Retention Strategy and Internal Communications Plan to document staff AM knowledge and experience for reporting and succession planning purposes. Communicate AM improvement initiatives and enhance AM awareness internally through internal communication.
10.	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.	• Hold presentations and conducted media events to share key project updates. • Develop Councillor Tool Kits to equip elected officials with clear and consistent messaging, including project overviews and frequently asked questions, to help them confidently respond to inquiries from residents. • A dedicated project webpage. This webpage would serve as a central hub for infrastructure planning updates, answering frequently asked questions, downloadable resources, project timelines, contact information, and an interactive feature to encourage two-way communication. • A targeted social media strategy is recommended to further broaden outreach—leveraging platforms such as Facebook and Instagram, including the use of sponsored posts to promote project milestones and public input opportunities.

APPENDIX A

Solid Waste Asset Inventory

A

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.