Meeting Date:	Monday, June 13, 2022
To:	Mayor Mills and Members of Council
From:	**Carey Holmes, Director of Financial Services / Treasurer**
Report:	Financial Services 2022-08
Subject:	**Asset Management Plan June 2022 Update**

Recommendation

BE IT RESOLVED THAT Council receives report FS 2022-08;

AND FURTHER THAT Council adopts the June 2022 Asset Management Plan Update in accordance with Ontario Regulation 588/17.

Background and Analysis

The Town's Asset Management Plan (AMP) was updated and prepared by Public Sector Digest Inc. in December 2016. A copy of the 2016 AMP is available on the Town's Website at the following link [2016-asset-management-plan.pdf (shelburne.ca)]

In December 2017, the passing of Ontario Regulation 588/17 required municipalities to develop a Strategic Asset Management Policy (SAMP) by July 1, 2019. The purpose of the SAMP was to outline how the organization would approach Asset Management and to establish the basic requirements and objectives for sustainable asset administration. The Town's SAMP was adopted May 27, 2019 by By-Law 33-2019 and is available on the Town's Website at the following link [Strategic-Asset-Management-Policy.pdf (shelburne.ca)]

The requirements outlined in Ontario Regulation 588/17, also provided for phased in updates to existing Asset Management Plans (AMP). Those dates were originally set to be July 1, 2021, July 1, 2023 and July 1, 2024.

In 2021 the Province extended the July 1, 2021 timeline out by one year and all subsequent timelines by one year given the resource constraints that municipalities faced as a result of the Covid-19 Pandemic.

The July 1, 2022 update to Asset Management Plans in accordance with O.Reg 588-17 is as follows:

All municipal governments are to have an adopted asset management plan for core assets (roads, bridges and culverts, water, wastewater, and stormwater management) that discusses current levels of service and the cost of maintaining those services. The regulation sets out both qualitative descriptions and technical metrics for each of the core assets.

To meet the new July 1, 2022 deadline, the Town has utilized existing staff rather than contracting the AMP update out to a consultant. The Town's GIS Coordinator has prepared and will present to Council the required updates to the existing 2016 AMP.

The June 2022 AMP document is attached as Appendix 1.

Financial Impact

There are no financial implications derived from the passing of this plan except for being able to achieve better efficiencies and effectiveness of Asset Management planning and handling moving forward.

The approval will also assist the municipality in securing funding opportunities due to most Provincial grants requiring Municipalities to be in compliance with O. Reg 588/17.

Policies & Implications

Ontario Regulation 588/17

Strategic Asset Management Policy 2019-03

2016 Asset Management Plan

5 Year Capital Plan 2022-2026

Development Charge Study 2020

Consultation and Communications

Senior Management and Asset Management Committee
Other Municipal Asset Management Plans

Council Strategic Priorities

Council's Strategic Priorities has three Goals - Sustainable, Engaged and Livable. There is a total of 12 targets within the three Goals.

This report aligns with the Sustainable Goals within the Targets:

Target T1 Develop a Long-Term Financial Plan

Target T2 Municipal Services Review and Evaluation

Target T3 Invest and Fund Critical Infrastructure for Future

Supporting Documentation

Appendix 1 - Town of Shelburne Asset Management Plan June 2022

Prepared in conjunction with:

Chad Smith, GIS Coordinator

Respectfully Submitted:

Carey Holmes, Treasurer

Reviewed by:

Denyse Morrissey, CAO

Appendix 1 to FS 2022-08

Town of Shelburne

Asset Management Plan

June 2022 Update

Presented June 13, 2022

Prepared by Chad Smith, GIS Coordinator, Town of Shelburne

A People Place, A Change of Pace
SHELBURNE
ONTARIO, CANADA

Contents

Figures

Section 1 – Executive Summary

1.1 Introduction

Asset management is a strategic business approach to the administration of capital assets. The goal of asset management is to minimize the cost to maintain an asset throughout its lifecycle, understand the risks associated with the management strategy, and maximize the value customers receive from assets and the essential services they provide.

The goal of Shelburne's Asset Management Plan (AMP) is to provide Council, staff, and the public with an understanding of the state of municipal infrastructure and the Town's approach to managing its assets. Each update to the Town's AMP is intended to compliment the previous version. For example, the 2016 AMP and June 2022 update should be referred to simultaneously due to the different information contained in each document.

1.2 Asset Management Legislation

Filed under the Infrastructure for Jobs and Prosperity Act of 2015, Ontario Regulation 588/17 (O. Reg. 588/17) titled Asset Management Planning for Municipal Infrastructure sets forth the expectations and deadlines for municipalities to report on their asset management progress. Figure 1-1 outlines the timelines below.

Figure 1-1: Ontario Regulation 588/17 Timelines

Reporting Document	Due Date
Strategic Asset Management Policy	July 1, 2019
Asset Management Plan Update (Phase 1)	July 1, 2022
Asset Management Plan Update (Phase 2)	July 1, 2024
Asset Management Plan Update (Phase 3)	July 1, 2025

In terms of compliance, Shelburne passed its Strategic Asset Management Policy on May 27, 2019, and by passing this update to the AMP, will continue to compliant with O. Reg. 588/17. If the above asset management deadlines are not met, the Town is at risk of becoming ineligible to apply for many provincial and federal funding opportunities.

1.3 State of Local Infrastructure

Assets legislated to be in scope of the June 2022 update to the Town's AMP are bridges, culverts, roads, stormwater, wastewater, and water. Asset categories in the 2016 AMP that are not required under Provincial Legislation for the July 2022 deadline have been excluded and will be reintroduced as they are mandated by regulation. This strategy allows the Municipality to refine a management program focused on a smaller range of assets that can be evaluated for suitability before additional asset categories are brought into scope.

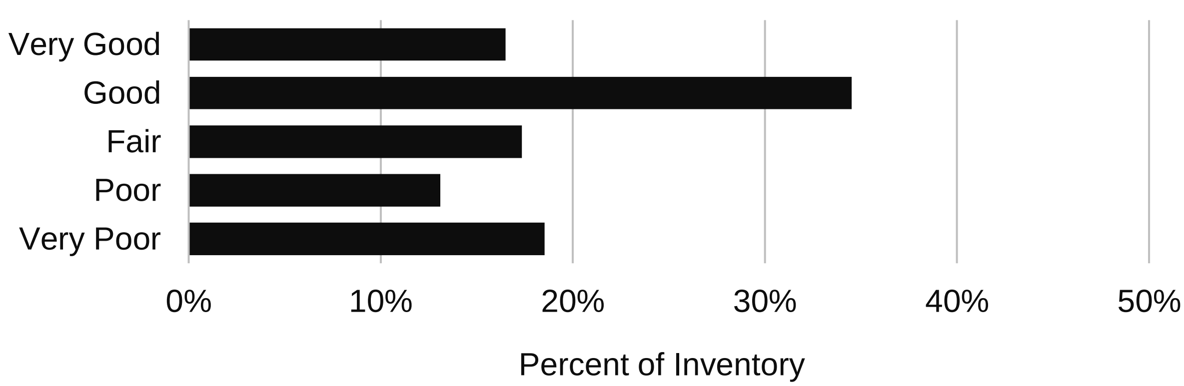
The replacement cost for each category is displayed in Figure 1-2. Some categories have a cost-per-unit strategy using financial data from reports and studies published in 2020, while other categories have their historical costs inflated to the year 2021.

Figure 1-2: Replacement Cost by Category

Asset Category	Replacement Cost	Cost Year
Bridges and Culverts	$3,129,494	2020
Roads	$23,556,772	2020
Stormwater	$17,292,221	2021
Wastewater	$40,739,115	2021
Water	$29,496,892	2021
Total	**$114,214,494**	**-**

Shelburne regularly conducts field condition assessments on its infrastructure. In the absence of a field inspection program for an asset category, the condition is estimated using software-generated calculations based on the number of years an asset has been in service. Figure 1-3 summarizes the condition of the asset inventory.

Figure 1-3: Asset Inventory Condition Rating



1.4 Asset Management Strategy

Community and operational expectations for each asset category are established and monitored using level of service metrics and key performance indicators (KPIs). These quantitative and qualitative measures are utilized for verifying the infrastructure is delivering a level of service that meets the needs of the community.

The level of service metrics to be monitored, at minimum, are governed by asset management legislation. The metrics focus on scope and operational indicators such as the number of properties connected to the municipal water distribution system or the average pavement condition index for local, collector, and arterial roads. The data for each metric is recorded annually allowing for trends in scope and performance to be evaluated by Council, municipal staff, and other stakeholders.

Tracking performance in greater detail, the Municipality utilizes a series of KPIs tailored to each asset category. The indicators are set by referencing legislation, engineering reports, or operational recordkeeping that focus on the maintenance of infrastructure. For each KPI, the Municipality establishes a target that must be met for the asset category to deliver the required level of service. Identical to level of service metrics, the data supporting KPIs is collected and recorded annually.

Complimenting the level of service and KPIs, the Town assembles a list of preventative maintenance and rehabilitation activities for each infrastructure category as part of its asset management program to better understand the financial and operational requirements to maintain an asset from the time it enters service to replacement. These lifecycle activities, level of service metrics, and KPIs are summarized for each asset category throughout the AMP.

1.5 Planning for the Future

Outside of legislative requirements, Shelburne’s asset management program is heavily focused on ensuring reliable asset information is available to support decision making and the formation of long term financial and operational plans. Asset management staff regularly review the shortfalls for each category and determine a phased approach strategy for improvement. Commonly, strengthening the information available and establishing the link from assets in the inventory to physical infrastructure on or below the ground is the first step to furthering the asset inventory.

In addition, the AMP explores assumptions regarding population and economic growth. Reviewing these assumptions alongside the AMP is essential to understand the suitability of the current level of service and whether it will be sustainable for the future.

Section 2 – Definitions

2.1 Abbreviations and Acronyms

Figure 2-1: List of Abbreviations and Acronyms

Term	Description
AMP	Asset Management Plan
BCI	Bridge Condition Index
CCTV	Closed-Circuit Television
DMI	Distress Manifestation Index
GIS	Geographic Information System
HVAC	Heating, Ventilation, and Air Conditioning
ISO	International Organization for Standardization
MMS	Minimum Maintenance Standards
O. Reg.	Ontario Regulation
OCWA	Ontario Clean Water Agency
OSIM	Ontario Structure Inspection Manual
PCR	Pavement Condition Rating
PSAB	Public Sector Accounting Board
RCR	Ride Condition Rating

2.2 Definitions

"Amortization" means the allocation of the cost (less the residual value) of a tangible capital asset to operating periods as an expense over its useful life in a rational and systematic manner appropriate to its nature and use (PSAB 3150 Policies).

"Asset" is a tangible or intangible item or entity that has value to an organization. An asset may also refer to a group of assets, such as a tractor and its attachments.

"Asset Management" is the coordinated activity of an organization to realize value from assets (ISO 55000:2014). It is a business approach to minimize the cost of asset ownership while maintaining acceptable levels of service.

"Asset Management Program" refers to the activities of an organization to manage assets.

“Category” refers to a group of related assets. For example, the water category contains related assets such as water distribution mains, service lines, wells, and valves.

“Core Infrastructure Asset” means a municipal infrastructure asset that is a bridge, culvert, road, or relates to the conveyance of stormwater, wastewater, or water (Ontario Regulation 588/17).

“Field Condition Assessment/Inspection” is an on-site visual and detailed inspection of an asset or infrastructure.

“Level of Service” means the parameters, or combination of parameters, which reflect social, political, environmental and economic outcomes that the organization delivers (ISO 55000:2014). The level of service outlines the intended quality or quantity of the service that will be provided to the end user.

“Lifecycle Activities” refers to the activities and financial resources required to maintain an asset or group of assets from the time they enter service to their replacement.

“Segment” refers to the sub-category of assets within one asset category. For example, the fire hydrant or valve segment within the water asset category.

“Stormwater” is the asset category for infrastructure involved in the management or conveyance of stormwater, such as that produced from a rainfall or melt event.

“Useful Life” refers to an estimate of the number of years that an asset will remain in service before requiring replacement.

“Wastewater” is the asset category for infrastructure involved in the collection and treatment of wastewater, such as sewage.

“Water” is the asset category for infrastructure involved in the distribution of potable drinking water.

Section 3 – Introduction

Established in 1860 and amounting to 6.5 square kilometers of rural and urban landscape, the Town of Shelburne has a distinctive infrastructure portfolio built from a mixture of historic and contemporary neighbourhoods. As of 2021, the Town manages a catalogue of over 10,000 unique assets. From day-to-day operations to long-term financial planning, the ability for a municipality to make effective decisions for infrastructure and other capital investments rests on access to reliable and relevant asset data.

Asset management is a strategic business approach to the administration of capital assets. The goal of asset management is to minimize the cost of asset ownership, understand the risks associated with the management strategy, and maximize the value customers receive from assets and the essential services they provide.

3.1 Legislative Requirements

Filed under the Infrastructure for Jobs and Prosperity Act of 2015, O. Reg. 588/17 titled Asset Management Planning for Municipal Infrastructure sets forth the expectations and deadlines for municipalities to report on their asset management progress. The deadlines, inclusive of amendments as of June 2022, are outlined in Figure 3-1 below.

Figure 3-1: Ontario Regulation 588/17 Timelines

Reporting Document	Due Date
Strategic Asset Management Policy	July 1, 2019
Asset Management Plan Update (Phase 1)	July 1, 2022
Asset Management Plan Update (Phase 2)	July 1, 2024
Asset Management Plan Update (Phase 3)	July 1, 2025

Phase 1 of the Asset Management Plan (AMP) series of updates focuses on core infrastructure assets which include bridges, culverts, roads, stormwater, wastewater, and water assets. Phase 2 encompasses all other infrastructure assets while Phase 3 requires a detailed review of the projected level of service to be provided over a ten-year period. Each update to the Town's AMP must be endorsed by the CAO and passed as a resolution through Council. Following completion of the Phase 3 update in July 2025, the Town is required to begin conducting an annual review of its asset management strategy with Council, as well as update its AMP every five years.

In terms of O. Reg. 588/17 compliance, Shelburne passed a Strategic Asset Management Policy on May 27, 2019, and by passing this update to the AMP, will continue to be in compliance of current legislation. If asset management deadlines are not met, the Town is at risk of becoming ineligible to apply for many provincial and federal funding opportunities.

3.2 Purpose of the Asset Management Plan

The goal of the AMP is to provide Council, staff, and the public with an understanding of the state of municipal infrastructure and the Town's asset management strategy. The quantity, age, condition, level of service, and management technique for each asset category is reviewed, and recommendations as to how the inventory can be improved are outlined.

The AMP should be regarded as a source of reference when weighing decisions regarding infrastructure, as well as in the development of financial and operational plans. While the best available asset data is included in each AMP, its purpose is not to provide an exhaustive strategy for managing municipal infrastructure as the aim of the information presented is to establish a general understanding. Unpredictable events and expenses, such as legislative changes for operations, can abruptly shift the Town's approach to managing infrastructure and these factors must be realized when reviewing the AMP.

3.3 Relationship to Existing Asset Management Policies and Plans

Shelburne's Strategic Asset Management Policy, passed in May 2019, was written with the purpose of guiding the Town's asset management activities to ensure ongoing compliance with O. Reg. 588/17, and that the Town would be able to produce effective AMPs moving forward. This and future update to Shelburne's AMP, will adhere to the statements, roles, principles, and other applicable content found in the Strategic Asset Management Policy.

Each update to the AMP builds on and is related to the previous version. The most recent AMP was passed in 2016 and included the below asset categories in its review:

Bridges	Road Network
Buildings	Stormwater
Culverts	Vehicles
Equipment	Water
Land Improvements	Wastewater

As a result of O. Reg. 588/17 outlining a three-phase approach to encompassing all asset categories in AMPs, this document excludes the categories in the 2016 AMP that are not required under Provincial Legislation for the July 2022 deadline. These categories will be reintroduced as they are mandated by regulation. This approach allows the Municipality to develop a management strategy focused on a smaller range of assets that can be evaluated for suitability before additional asset categories are brought into scope.

As mentioned in Section 3.2, each update to the Town's AMP is intended to compliment the previous version. For example, the 2016 AMP and June 2022 update should be referenced simultaneously due to the nature of the information contained in each. The 2016 AMP provided a similar overview of the Municipality's infrastructure but also heavily focused on identifying gaps in the Town's asset management program and providing recommendations for large-scale improvements in the management strategy. In contrast, the goal of the June 2022 update is to communicate the current status of infrastructure and the management techniques utilized by the Town.

Several other planning documents work in tandem with the AMP. The December 2017 Official Plan discusses strategies for growth and how decisions regarding infrastructure should be guided. In March 2020, the Development Charges Study reviewed a forecast for the level of capital investment to be expected over a ten-year period. Information and statistics found in the study were factored into this plan where applicable. The Municipality presented its 5-Year Capital Plan in February 2022 that reviewed capital purchases to be expected from 2022 to 2026, encompassing not only infrastructure but also general capital such as vehicles and equipment. It is vital for these documents to be reviewed alongside any edition of the Town's AMP to fully understand current financial and operational approaches to the management of municipal infrastructure.

3.4 Data Availability and Limitations

Assembling an AMP requires data to be available from the Town's asset inventory. While the Town does maintain a robust catalogue of assets, some of the information stems from historical sources that predate the Town's current asset management strategy. Frequently, data from these sources is incomplete or otherwise inadequate for the standards currently followed by the Town, which requires staff to manually update the inventory asset-by-asset through a process involving the correction, validation, or sourcing of information. While typically straightforward, this process is time-consuming. As discussed in Section 3.3, this contributes to the reasoning behind introducing asset categories to subsequent updates of the AMP as they are required under Provincial Legislation rather than all at once.

Second, as asset data is improved, it is likely that future AMPs may present information relating to the quantity, replacement cost, and condition of asset categories that conflicts with previous versions of the same data. This would be the result of the Municipality deploying data improvement initiatives which, in addition to correcting errors, build the framework for introducing more comprehensive asset management strategies such as utilizing cost-per-unit replacement cost methods or field inspected condition assessments rather than assumptions generated by software. Additionally, from 2020 to June 2022, spikes in material and labour costs have occurred. It is highly probable the impact of this on replacement costs will be visible in the next update to Shelburne's AMP.

Third, Provincial Legislation dictates that certain sections of the AMP are permitted to be formed using asset data from up to two calendar years prior to the year in which the AMP is published. Instances of this have been deployed throughout the June 2022 AMP update. For example, if the Municipality is in possession of extensive asset information in the form of a report from 2020 or 2021, the other financial and condition data presented in the same section may be modified to mirror the year of the report for consistency. All figures in this document include the year of the data in their title to communicate instances such as this.

Lastly, as required under O. Reg. 588/17, each AMP must indicate how the information used to assemble the quantity, average age, replacement cost, and condition statistics for each asset category will be made available to the public. Quantity and average age were calculated using data from the Town's asset inventory. Replacement cost and condition information was sourced from reports and studies publicly available on the Town of Shelburne website, or from data generated by asset management software. Annual Audited Financial Statements are posted on the Town's website for exploring detailed asset valuation data. Additional information is available upon request. Data sourcing strategies as they relate to the preparation of this AMP are discussed in detail in Section 4.

Section 4 – Methodology

4.1 Quantity, Useful Life, and Age

The quantity and average age of each asset category was determined using data from the Town's asset management software. Quantity represents how many assets fall under each segment, and average age is calculated by averaging the number of years the assets in each segment have been in service. In the inventory, each piece of infrastructure, or capital asset, is represented by one unique asset entry organized by a category and segment. This entry houses the financial, condition, and lifecycle data for one asset. Structuring the inventory in this way allows staff to export entire asset categories and perform calculations to summarize the quantity and average age.

The useful life for each segment represents an estimate of the number of years the infrastructure is expected to remain in service before requiring replacement. The Town's asset management program establishes the useful life that is to be used for each segment based on an assessment of the type of infrastructure, its material, and how similar assets have performed historically. As construction methods change, new materials are developed, and a larger number of assets are replaced and have their service life reviewed, the useful life for each segment may be increased or decreased as needed.

4.2 Condition and Replacement Cost

Asset condition and replacement cost was determined using two methods. First, the Municipality prepares and receives a wide range of reports and studies that review the Town's infrastructure. These documents typically include an assessment of the asset's condition as well as an estimate of the replacement cost often in the form of a cost-per-unit. Second, if the asset category was not included as part of a report or study, age-based condition assumptions and inflation-based replacement costs were generated by the Town's asset management software.

If a cost-per-unit or replacement cost was available for an asset category from a report or study, it was used to assemble the discussions and visualizations in this AMP. Occasionally, Shelburne's asset inventory contains missing or inadequate information for some assets due to the presence of older or improperly structured data sources. This may prevent Town staff from reliably assigning a cost-per-unit to the asset if critical information, such as a pipe's diameter or material, is missing or likely to be incorrect. In these situations, the historical cost for each asset was inflated to the applicable year as substitution for a defined replacement cost.

The condition of infrastructure followed a similar strategy to replacement cost. Reports often include field condition assessments of infrastructure by a member of staff or the Town's contract engineering firm. If a field condition assessment for a segment of assets was available, it was used to formulate condition information. In situations where a field condition assessment was not available, or if the asset it relates to could not be reliably located, the Town's asset management software estimated the condition of the asset based on the number of years remaining until it had depleted its useful life.

Some condition visualizations isolate assets that meet specific criteria, such as infrastructure with a condition rating or poor or lower. Occasionally, an asset category may not have an asset from each segment that satisfies the criteria. In this case, that segment would not appear in the visualization.

4.3 Level of Service and Performance

Level of service and key performance indicators were established from reports and studies that already tracked the same metrics, or from meeting with staff from the applicable service area.

Some documents, such as the 2020 update to the Roads and Sidewalks Needs Study or the 2020 Bridge and Culvert Inspection Action Report, followed the level of service metrics mandated by O. Reg. 588/17 as part of their condition assessment method. When this information was available, the metric was sourced from the report. In situations when the metric did not appear in another document, the required information was discussed with staff in the relevant department.

Key performance indicators were established through meeting with operational and engineering staff. The Municipality regularly refers to a wide range of indicators for each category of assets determined by industry-standard approaches to infrastructure management or legislated monitoring requirements such as the Ontario Minimum Maintenance Standards for roads.

4.4 Lifecycle Activities

Similar to Section 4.3, assembling a list of lifecycle activities for each asset category was completed by meeting with municipal and engineering staff. These activities, also commonly referred to as preventative maintenance or rehabilitation, were already performed by each department as part of the Town's commitment to maintaining its infrastructure. In situations where maintenance on an asset category was not typically determined or conducted by municipal staff, such as bridges and culverts, the AMP explained the exception and relevant lifecycle activity procedure in place to address the category.

4.5 Recommendations

Each asset category was accompanied by a unique list of recommendations with the goal of improving the quality and quantity of information that can be extracted from the Town's asset inventory.

The suggestions reflect an informed assessment of the shortfalls that applies to each asset category or segment by municipal asset management staff, and which improvements would form the framework for the category to become more robust. Most commonly, this included linking the infrastructure to the Town's GIS and establishing a strategy for field condition assessments.

The recommendations found throughout this document are written with the intention of short-term implementation. Depending on the type of infrastructure, or the magnitude of missing or inadequate information, a suggestion could require multiple years to complete. Regardless of the timeline, as mentioned above, adhering to these guiding statements will contribute to bringing each asset category to where it can begin to participate in more developed phases of the Town's asset management program, such as such as field condition assessments, and be referenced reliably in the creation of long-term plans.

Section 5 – Bridges and Culverts

5.1 Quantity and Replacement Cost

Figure 4-1 showcases the quantity and replacement cost of the bridge and culvert inventory.

Figure 5-1: Bridge and Culvert Quantity and Replacement Cost (2020)

Category	Quantity	Replacement Cost
Bridges	3 assets	$596,450
Culverts	142 assets	$2,533,044
Total	**145 assets**	**$3,129,494**

The replacement cost for the category references a combination of cost-per-unit and inflation-based estimates. The cost-per-unit strategy uses the estimated material and construction costs to replace each structure as found in the October 2020 Bridge and Culvert Inspection Action Report, prepared by the Town's contract engineering firm S. Burnett & Associates Limited. The most recent cost-per-unit estimates are outlined in Figure 5-2.

Figure 5-2: Bridge and Culvert Cost-Per-Unit (2020)

Structure Type	Replacement Cost (per m^2)
Bridge	$6,000
Corrugated Steel Pipe Culvert	$3,500
Rigid Frame Concrete Culvert	$4,500

The Bridge and Culvert Inspection Action Report, following Provincial Legislation, reviews bridge and culvert structures with a span greater than three meters. Over 95% of Shelburne's bridge and culvert assets do not fall under this criterion and were therefore not in scope of the report. While the report did suggest a construction cost that could be applied to other bridge and culvert assets, roughly 85% of the culvert inventory is missing the information required to confidently assign a replacement value without first conducting a field investigation. This is due to much of the data stemming from older sources that predate the Town's current asset management strategy. Assets such as these were assigned a replacement cost by inflating their historical cost to 2020 in order to mirror the year of the Bridge and Culvert Inspection Action Report.

5.2 Useful Life and Age

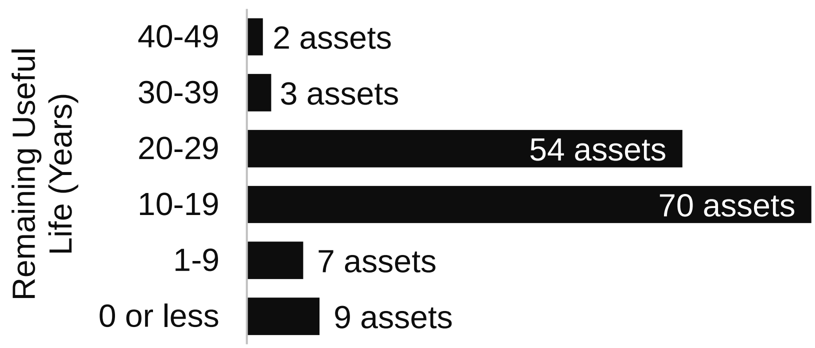
Shelburne's bridge and culvert assets are assigned a useful life ranging from 40 to 50 years depending on the material of the asset. Figure 5-3 outlines the useful life by category and segment, as well as highlighting the average age of the assets.

Figure 5-3: Bridge and Culvert Useful Life and Average Age (2022)

Category	Segment	Useful Life	Average Age
Bridges	Pedestrian Bridge	50 Years	7 Years
Culverts	Corrugated Steel Pipe Culvert	40 Years	24 Years
	Rigid Frame Concrete Culvert	50 Years	31 Years

Further investigating the age of the infrastructure, Figure 5-4 summarizes the number of assets by the number of years remaining before their useful life has been reached.

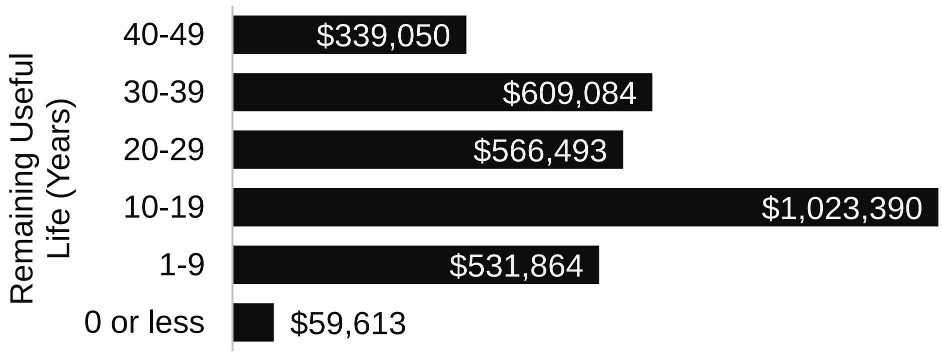
Figure 5-4: Bridge and Culvert Remaining Useful Life (2022)



It is important to remember that assets which have depleted their useful life do not necessarily require immediate replacement but have a higher probability of failure as a result of their advanced age. Field condition assessments are the single most important strategy that can provide insight as to whether assets meeting this criterion in the category should be prioritized for replacement.

On the following page, Figure 5-5 repeats the previous figure, except substitutes the number of assets with their total replacement cost. Factoring in the replacement cost when reviewing the remaining useful life provides insight as to the level of investment that might be required over the next 5-10 years. Considering that near 60% of the inventory will be exceeding its useful life within 20 years stresses the importance of exploring the data in this way.

Figure 5-5: Bridge and Culvert Remaining Useful Life (2022) with Replacement Cost (2020)



From the above chart, the substantial replacement cost of assets reaching the end of their useful life within the next 20 years is seen. Adding the 0 or less, 1 to 9 and 10-19 useful life categories together brings the total replacement cost over the next 20 years to $1,614,867. It is vital to remember replacement costs are as of 2020, which suggests the actual replacement cost of these assets will be higher.

5.3 Condition

Similar to replacement cost, the condition of Shelburne's bridge and culvert assets has been determined using a combination of field inspections from the 2020 Bridge and Culvert Inspection Action Report and age-based assumptions for assets not included in the report.

One metric referenced throughout the report is the Bridge Condition Index (BCI). The BCI is described as a "…planning tool that helps the Ministry of Transportation schedule maintenance and upkeep". From the report, the BCI was split into the condition categories shown in Figure 5-6.

Figure 5-6: BCI Ranges

BCI Range	Condition
70-100	Good
60-70	Fair
Less than 60	Poor

To mirror the BCI ranges as closely as possible, Shelburne's asset management software utilizes a five-step condition rating scale, which is found in Figure 5-7 on the following page.

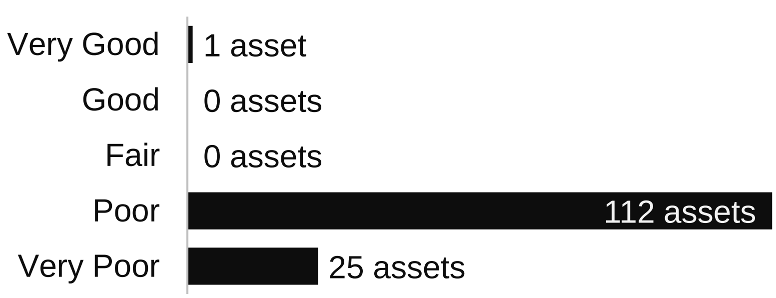
Figure 5-7: Bridge and Culvert Condition Rating Scale

Condition	Rating	Description
Very Good	90.00 and above	Maintenance work is not usually required within the next five years.
Good	70.00 and above	Maintenance work is not usually required within the next five years.
Fair	60.00 and above	Maintenance work is usually scheduled within the next five years.
Poor	20.00 and above	Maintenance work is usually scheduled within approximately one year.
Very Poor	0.00 and above	Maintenance work is usually scheduled within approximately one year.

A summary of the number of assets in each condition category is found below. Assets within scope of the 2020 Bridge and Culvert Inspection Action Report that received a field inspection by a member of the Town's engineering team are visualized in Figure 5-8 while assets with a condition rating solely based on their age are separated into Figure 5-9.

Figure 5-8: Bridge and Culvert Field-Inspected Condition Rating (2020)

Figure 5-9: Bridge and Culvert Age-Based Condition Rating (2020)



In terms of the value of assets within each condition category, assets in Figure 5-8 total just under $2.0 million while structures in Figure 5-9 account for the remaining $1.15 million of the inventory’s 2020 replacement cost. It is important to be mindful that the “Poor” condition includes ratings ranging from 20 to 59, which is why a large portion of structures fall under this category.

5.4 Level of Service

O. Reg. 588/17 outlines the level of service metrics municipalities are required to report on for bridge and culvert assets. The technical metrics are found in Figure 5-10 below.

Figure 5-10: Bridge and Culvert Technical Level of Service

Service Attribute	Technical Metric	Level of Service (2020)
Scope	Percentage of bridges in the Municipality with loading or dimensions restrictions.	0%
Quality	For bridges in the Municipality the average bridge condition index value.	73.0
Quality	For structural culverts in the Municipality, the average bridge condition index value.	70.2

While providing insight to the condition of the category, the 2020 Bridge and Culvert Inspection Action Report reviewed the importance of not referencing the BCI as the sole measure of the structure’s condition. The report mentions the BCI to be an economic indicator that is calculated using the current value and replacement cost of the asset and highlights factors that can result in a structure having a BCI that does not reflect its overall condition.

The legislated community (qualitative) level of service metrics are located in Figure 5-11 on the following page.

Figure 5-11: Bridge and Culvert Community Level of Service (Table 1 of 2)

Service Attribute	Qualitative Description	Level of Service (2020)
Scope	Description of the traffic that is supported by municipal bridges.	Shelburne maintains an inventory of three pedestrian bridges. Each bridge provides connectivity along the Town's sidewalk and trail networks supporting leisure and recreational activities for pedestrians.
Quality	Description or images of the condition of bridges and how this would affect use of the bridges.	The 2020 Bridge and Culvert Inspection Action Report identified 1 of 3 bridges to be in fair condition with a BCI of 70, and 2 of 3 bridges to be in good condition with BCIs of 73 and 76. Suggested maintenance items included the installation and upgrading of railings, approach grading, and re-painting of a bollard. The recommended timeline for these items ranged from 1 to 5 years. These condition notes did not impact the usability of bridges.
Quality	Description or images of the condition of structural culverts and how this would affect use of the structural culverts.	The 2020 Bridge and Culvert Inspection Action Report stated 3 of 5 structural culverts to be in fair condition with BCIs ranging from 68 to 70, and 2 of 5 structural culverts to be in good condition with BCIs of 72. Recommended maintenance to be performed within 1 to 5 years included the repair of gabion baskets, sidewalk cracks, and spalling, as well as the installation of hazard markers and guide rails. Urgent maintenance was limited to upgrading two guide rails on one structure. The condition rating of these structural culverts did not impact their use or functionality.

5.5 Performance

Bridges and culverts play a critical role in supporting transportation and stormwater networks. To ensure these structures are delivering the required level of service, Shelburne refers to a set of key performance indicators that provide a high-level summary of the category. An example of the indicators utilized by the Municipality are found in Figure 5-12.

Figure 5-12: Bridge and Culvert Key Performance Indicators

Performance Category	Statement	Metric	Target
Reliability	Bridges and structural culverts provide a safe and reliable crossing environment.	Percent of structures with a BCI of 60 or better.	100% of structures
Reliability	Bridges and structural culverts meet the transportation needs of our customers.	Percent of structures assigned a load restriction that is abnormal for the structure's rated capacity.	0% of structures
Responsiveness	Municipal Staff are available to answer bridge and culvert inquiries from customers.	Time for municipal staff to respond to a customer inquiry.	1 business day when contacted via phone or email

The performance of bridge and culvert assets has a direct impact on the community. Pedestrian bridges provide connectivity along sidewalk and trail networks, supporting leisure and recreational opportunities for residents. Structural culverts along key transportation routes support a range of traffic from personal vehicles on neighbourhood streets to heavy transportation vehicles on Provincial Highways. In addition, both structure types are essential for the safe and efficient conveyance of stormwater.

5.6 Lifecycle Activities

As discussed in section 5.2, Shelburne assigns a useful life between 40 and 50 years to its bridge and culvert assets. To ensure the assets can remain in service and continue to provide the required level of service, maintenance and rehabilitation is required throughout the life of the structures.

The variety in the architecture and purpose of each bridge and culvert creates challenges when outlining lifecycle activities that can be applied to the inventory as a whole over a ten-year period, as required for asset management planning under O. Reg. 588/17. External factors, in addition to deterioration from age, can suddenly impact the integrity of a bridge or culvert such as increases in traffic volume and damage due to vehicular accidents.

As a result, the maintenance performed on assets in this category are determined by the recommendations from structure inspections discussed in documents such as the 2020 Bridge and Culvert Action Report. The inspections follow the Ontario Structure Inspection Manual (OSIM) and document deficiencies, along with photographs, and are used to assemble a prioritized list of maintenance including an estimated cost for each item.

An example of the maintenance, or lifecycle activities, that may be required to maintain Shelburne's bridge and culvert inventory over the next 10 years are listed in Figure 5-13.

Figure 5-13: Bridge and Culvert Lifecycle Activities

<table>
<tr><th>Activity Name</th><th>Activity Type</th><th>Interval</th><th>Cost per Instance (est.)</th></tr>
<tr><td>OSIM Inspection</td><td>Preventative Maintenance</td><td>Every 2 Years</td><td>Engineering staff labour as required.</td></tr>
<tr><td>Approach Grading</td><td>Preventative Maintenance</td><td>As Needed</td><td rowspan="4">As noted in OSIM inspection report. Varies by structure.</td></tr>
<tr><td>Concrete Patching</td><td>Preventative Maintenance</td><td>As Needed</td></tr>
<tr><td>Guide Rail Repair</td><td>Preventative Maintenance</td><td>As Needed</td></tr>
<tr><td>Rebar Replacement</td><td>Preventative Maintenance</td><td>As Needed</td></tr>
</table>

To maximize the value gained from investment in infrastructure, and to continue to deliver the required level of service, it is vital that recommendations from structure inspections are followed. Regular maintenance will ensure Shelburne's bridges and culverts continue to perform as needed for the lowest possible lifecycle cost rather than permitting them to deteriorate to the point that significant rehabilitation or replacement is the sole option. Due to the nature of these structures providing crossings over hazards such as ditches or waterways along transportation routes, the consequence of a structure taken out of service would likely have a significant impact on residents and local businesses.

5.7 Recommendations

As a result of legislated structure inspections, the bridge and culvert categories present a mixture of assets with highly detailed condition and replacement cost information, and assets with missing or significant information gaps. As an introduction to improving the practicality of the category for long term financial and operational planning, three recommendations have been listed.

First, focus on linking culvert assets in the inventory to known infrastructure in the Town's GIS software. While structures that fall under the criterion for OSIM inspections are easily identified both on the ground and in the inventory, the majority of assets in the culverts category are low-value and paired with absent location information. A strategy to reasonably estimate which culvert in the inventory corresponds to which culvert on the ground must first be developed as linking each structure will require assumptions due to the missing information.

Second, as low-value culvert assets are linked to known infrastructure in the GIS database, establish a strategy to assess the condition of these structures and, due to the source of information for some of the assets, verify each is still in service. While low in value, these assets play an important role in the conveyance of stormwater and impact replacement cost reports generated by the Town's asset management software, which are relied upon in the development of long-term plans.

Third, determine a strategy to integrate OSIM inspections with information from the asset inventory. Providing inspectors with structure data the Municipality has available may provide information that is beneficial to the inspection process. Alternatively, it is highly probable the agency conducting structure inspections possesses more complete structure data, which will allow the asset inventory to be expanded. The final component to this suggestion is that OSIM inspectors should be provided with the asset ID for each structure so that it can be referenced on the condition assessment documentation. This will reduce the amount of time required to import condition assessment data into the Town's asset management software.

Section 6 – Roads

6.1 Quantity and Replacement Cost

Shelburne's road assets are catalogued using one asset for the road base, and one asset for the road surface since these parts of a roadway do not have the same service life. As a result, one section of roadway, such as Main Street East from Dufferin Street to Greenwood Street, would account for a total of two assets. This is discussed further in section 6.2.

In an ideal scenario, this inventory strategy would result in an equal number of road base and surface assets. However, if a roadway is only partially resurfaced a duplicate surface asset is created to accurately represent the condition and age of both parts of that section of road. For this reason, there are a higher number of road surface than road base assets in the Town's inventory.

Figure 6-1 showcases the quantity and total replacement cost of Shelburne's road assets as of 2020. To assist in the interpretation of this data, the length each segment accounts for has been provided.

Figure 6-1: Roads Quantity and Replacement Cost (2020)

Segment	Quantity	Length	Replacement Cost
Asphalt Road Base	202	34.80 km	$12,452,110
Asphalt Road Surface	232		$10,579,807
Gravel Road	20	4.10 km	$524,855
Total	**454**	**38.90 km**	**$23,556,772**

Please note the length depicted above refers to the length of roads. The total lane kilometers of roadways in the asset inventory was 70.74 kilometers as of 2020.

The replacement cost for asphalt and gravel roads was generated using the rehabilitation and reconstruction cost-per-unit found in the 2020 update to the 2016 Roads and Sidewalks Needs Study, completed by S. Burnett & Associates Limited, the Town's contract engineering firm. This costing method was applied to 96% of assets in the roads category, with the remaining 4% having their replacement cost calculated by inflating their historical cost to 2020 due to missing or inadequate asset information.

Rehabilitation and reconstruction costs listed in the report are replicated in Figure 6-2 below on the following page.

Figure 6-2: Roads Replacement Cost-Per-Unit (2020)

Segment	Replacement Cost (per m^2)
Asphalt Surface (Arterial Roads)	$51.01
Asphalt Surface (Local and Collector Roads)	$34.31
Base	$47.11

The difference in replacement cost for local, collector, and arterial roads is the asphalt thickness required for roads with higher volumes and heavier traffic. Road base cost-per-unit is uniform for all road assets, regardless of traffic volume.

6.2 Useful Life and Age

The useful life and average age for each segment of the road inventory is summarized in Figure 6-3 below.

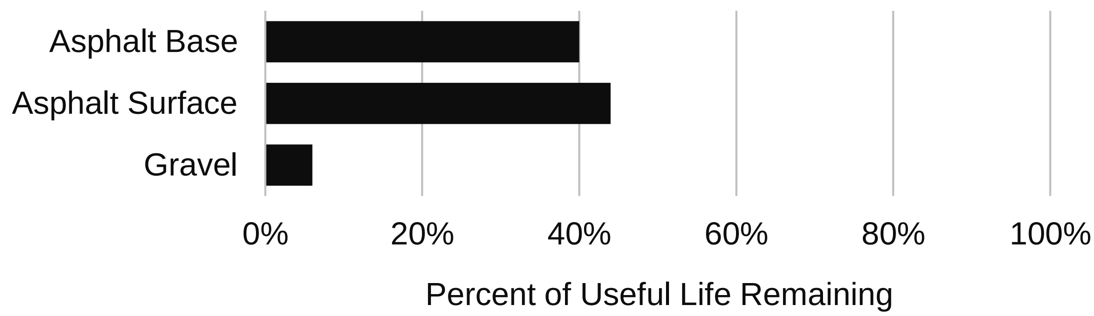
Figure 6-3: Roads Useful Life and Average Age (2022)

Segment	Useful Life	Average Age
Asphalt Road Base	50 Years	33 Years
Asphalt Road Surface	25 Years	22 Years
Gravel Road	50 Years	91 Years

The drastically higher average age compared to the useful life for the gravel road segment is due to the nature of the lifecycle management strategy for those assets. This is discussed in Section 6.6.

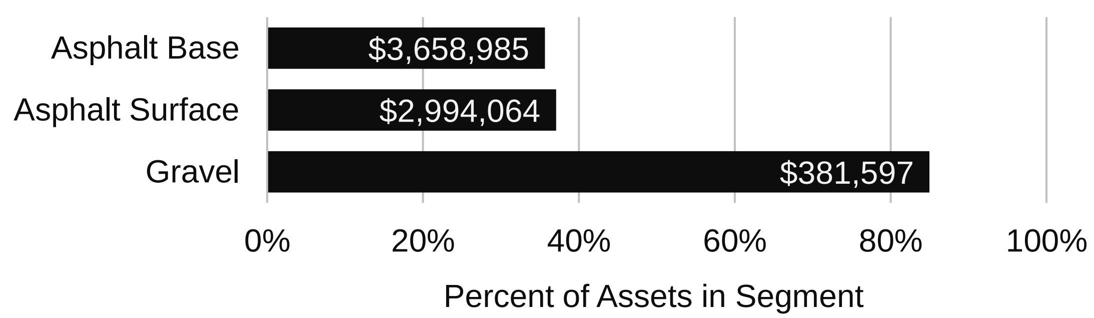
On the following page, Figure 6-4 summarizes the average remaining useful life for assets in the roads category, expressed as a percentage of the total useful life assigned to each segment as outlined in Figure 6-3 above. The remaining useful life is calculated by comparing the year in which an asset has reached the end of its useful life to the year 2022.

Figure 6-4: Roads Average Remaining Useful Life (2022)



To provide insight as to the level of investment that may be required over the next 5 years, Figure 6-5 outlines the percent of assets in each segment that have less than 5 years of useful life remaining. The replacement cost for assets that meet the criterion is included in the chart.

Figure 6-5: Percent of Segment with Less than 5 Years of Remaining Useful Life (2022) with Replacement Cost (2020)



With just under 40% of the asphalt road inventory having its useful life depleted within 5 years, it is critical for the Town to continue its regular investment in infrastructure. It is important to remember the base and surface assets shown in Figure 6-5 do not necessarily relate to the same section of roadway. For example, one road may be resurfaced multiple times without reconstructing the base.

Gravel roads, as mentioned previously, have a unique lifecycle management strategy which is discussed in Section 6.6. The indication that over 80% of the gravel road inventory will be nearing the end of its useful life within 5 years should not be interpreted as those assets will require replacement at that time.

6.3 Condition

The condition of Shelburne's road network is monitored on a regular basis through operational patrols guided by the Ontario Minimum Maintenance Standards. An extensive assessment aimed to take place every 5 years for the purpose of long-term planning takes shape in the form of a Roads and Sidewalks Needs Study. The study establishes a condition rating for every section of road and sidewalk in Town, suggests where rehabilitation or reconstruction is required, the estimated timeframe before work is needed, and an estimated cost. As mentioned, the most recent Roads and Sidewalks Needs Study was completed in 2016, with an update to the study being conducted in 2020 by the Town's contract engineering firm, S. Burnett & Associates Limited.

Engineering staff describe the methodology in the study as having three steps. First, a Ride Condition Rating (RCR) is determined to quantify the comfort level while inside a vehicle on the road. Second, a visual inspection is conducted to establish a Distress Manifestation Index (DMI) which evaluates signs of distress on the pavement. Finally, the RCR and DMI are used to calculate a Pavement Condition Rating (PCR) which provides an overall condition rating for the road. As noted in the report, the PCR rating system is aligned with the Ministry of Transportation's 2013 Roads and Rehabilitation Manual.

The PCR scale is mirrored almost identically in the Town's asset inventory for rating the condition of a roadway and is found in Figure 6-6 below and on the following page.

Figure 6-6: Road Condition Rating Scale (Table 1 of 2)

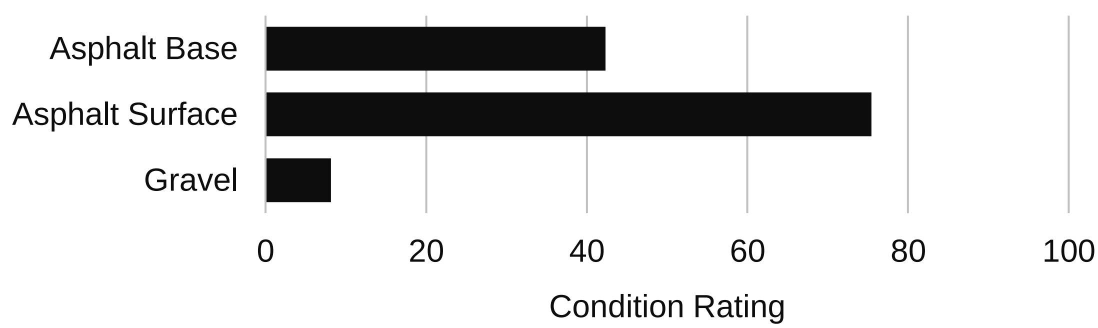
Condition	Rating	Description
Very Good	90.00 and above	Pavement is in excellent condition with few cracks. Rideability is excellent with few areas of slight distortion.
Good	75.00 and above	Pavement is in good condition with frequent very slight or slight cracking. Rideability is good with intermittent rough and uneven sections.
Fair	50.00 and above	Pavement is in fair condition with intermittent moderate and frequent slight cracking, and with intermittent slight or moderate alligatoring and dishing. Rideability is fair and surface is slightly rough and uneven.

Figure 6-6: Road Condition Rating Scale (Table 2 of 2)

Condition	Rating	Description
Poor	20.00 and above	Pavement is in poor to fair condition with frequent moderate alligatoring and extensive moderate cracking and dishing. Rideability is poor to fair and surface is moderately rough and uneven.
Very Poor	0.00 and above	Pavement is in very poor to poor condition with extensive severe cracking, alligatoring and dishing. Rideability is poor and the surface is very rough and uneven.

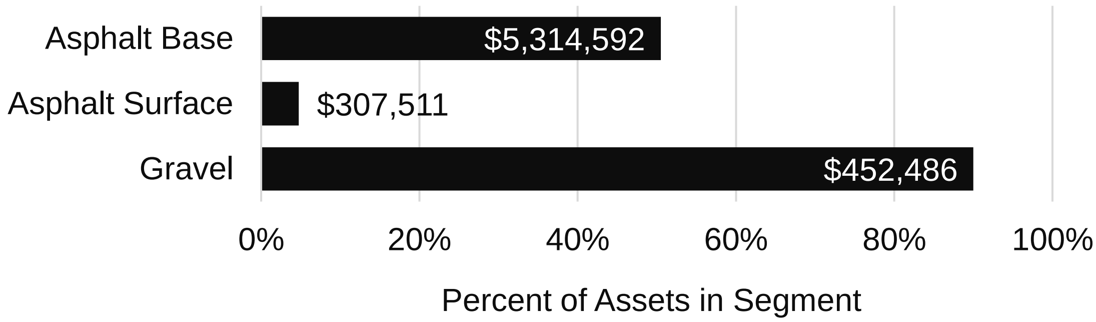
The average condition rating for each segment of the roads category is visualized below in Figure 6-7. Please note, only asphalt surface assets are eligible for a rating in the Roads and Sidewalks Needs Study. Asphalt base and gravel assets, or any asphalt surface assets with inadequate location information, have a condition rating calculated by the Town's asset management software based on remaining useful life. Regardless of the source, all condition ratings for roads follow the above scale.

Figure 6-7: Roads Average Condition Rating (2020)



Building on the average condition rating of road assets, the percent of assets in each segment with a condition rating of poor or lower is depicted in Figure 6-8 on the following page. Replacement cost is included for reference.

Figure 6-8: Percent of Road Assets with a Condition Rating of Poor or Lower (2020) with Replacement Cost (2020)



The high percentage of asphalt base compared to asphalt surface assets in poor or lower condition can be attributed to the fact that field condition assessments often rate assets as being in better condition than the condition assumption generated by asset management software based on an asset's age. For example, if age-based condition assessments were used for all asphalt surface assets, the percent of assets in with a condition or poor or lower would increase from 5% to 33%.

6.4 Level of Service

As stated in O. Reg. 588/17, municipalities are required to report on technical and community (qualitative) level of service metrics for their core infrastructure assets. Technical metrics for roads are found in Figure 6-9 and qualitative metrics in Figure 6-10 on the following page.

Figure 6-9: Roads Technical Level of Service (Table 1 of 2)

Service Attribute	Technical Metric	Level of Service (2020)
Scope	Number of lane-kilometers of arterial roads as a proportion of square kilometers of land area of the Municipality.	1.02
Scope	Number of lane-kilometers of collector roads as a proportion of square kilometers of land area of the Municipality.	1.95
Scope	Number of lane-kilometers of local roads as a proportion of square kilometers of land area of the Municipality.	7.56

Figure 6-9: Roads Technical Level of Service (Table 2 of 2)

Service Attribute	Technical Metric	Level of Service (2020)
Quality	For paved roads in the Municipality, the average pavement condition index value.	76.00
Quality	For unpaved roads in the Municipality, the average surface condition.	Very Good

Figure 6-10: Roads Community Level of Service

Service Attribute	Qualitative Description	Level of Service (2020)
Scope	Description, which may include maps, of the road network in the Municipality and its level of connectivity.	The Town of Shelburne offers 40 kilometers of roadways (80 lane kilometers) connecting 106 unique streets and laneways. The network primarily consists of asphalt surface with gravel laneways accounting for less than 7% of total system length. Two Provincial Highways and two County Roads offer connectivity for residents and businesses to neighbouring communities, as well as other major road transportation networks.
Quality	Description or images that illustrate the different levels of road class pavement condition.	Photographs found in Figures 6-11 to 6-14 on the following page showcase an asphalt road surface with various condition ratings. The photos were extracted from the 2020 update to the 2016 Roads and Sidewalks Needs Study, completed by S. Burnett & Associates Limited in July 2020.

Please note in Figure 6-10 the length of roadways includes all roads within Shelburne's municipal boundary regardless of ownership. For this reason, the value does not match Figure 6-1.

Figure 6-11: Poor Condition (PCR < 60)

Figure 6-12: Fair Condition (PCR 60 - 70)

Figure 6-13: Good Condition (PCR 70 - 85)

Figure 6-14: Very Good Condition (PCR > 85)

6.5 Performance

A road network that is reliable, safe, and offers effective transportation routes is fundamental for the development of a community and for businesses to thrive. Shelburne references a variety of key performance indicators to ensure the adequacy of its road infrastructure. Examples of these indicators are displayed in Figure 6-15 on the following page.

Figure 6-15: Road Key Performance Indicators (Table 1 of 2)

Performance Category	Statement	Metric	Target
Reliability	The road network provides a safe and reliable driving environment.	Roads are patrolled at the frequency defined by the Ontario Minimum Maintenance Standards.	100% compliance
Safety	The road network provides a safe and reliable driving environment.	Snow and ice accumulation on roads is addressed within the time-limit defined by the Ontario Minimum Maintenance Standards.	100% compliance
Safety	The road network provides a safe and reliable driving environment.	Surface defects are repaired within the time-limit defined by the Ontario Minimum Maintenance Standards.	100% compliance
Safety	The road network provides a safe and reliable driving environment.	Luminary deficiencies are identified and resolved within the frequency and time-limit defined by the Ontario Minimum Maintenance Standards.	100% compliance
Safety	The road network provides a safe and reliable driving environment.	Sign deficiencies are identified and resolved within the frequency and time-limit defined by the Ontario Minimum Maintenance Standards.	100% compliance
Safety	The road network provides a safe and reliable driving environment.	Traffic control signal system deficiencies are identified and resolved within the frequency and time-limit defined by the Ontario Minimum Maintenance Standards.	100% compliance

Figure 6-15: Roads Key Performance Indicators (Table 2 of 2)

Performance Category	Statement	Metric	Target
Safety	The road network provides a safe and reliable driving environment.	Road and pavement marking deficiencies are identified and resolved within the frequency and time-limit defined by the Ontario Minimum Maintenance Standards.	100% compliance
Responsiveness	Municipal staff are available to answer road network inquiries from customers.	Time for municipal staff to respond to a customer inquiry.	1 business day via phone or email

These key performance indicators provide reassurance that Shelburne's roads can be relied upon, are safe for use, and meet the needs of the community. Additionally, many of these metrics are linked to Provincial Legislation which can be referenced by the public for insight as to the operational decisions a municipality makes when managing its roads.

6.6 Lifecycle Activities

To maximize the value of investment in infrastructure and to ensure roadways can remain in service throughout the useful life that is assigned to them, several preventative maintenance and rehabilitation strategies are utilized. The absence of maintenance will allow minor deficiencies to become substantial and begin to impact structural elements of the roadway. This leads to an accelerated degradation of the road and results in early and expensive reconstruction work.

The options for deciding which lifecycle activities to undertake each year depend on annual budgets, the class of road, overall condition, and deficiencies present. Documents such as the Roads and Sidewalks Needs Study are essential to long-term planning as the rehabilitation and replacement needs of the road network are prioritized by year.

On the following page, Figure 6-16 and 6-17 showcase the preventative maintenance and rehabilitation activities that will or are likely to be employed over a ten-year period for road assets.

Figure 6-16: Road Preventative Maintenance Lifecycle Activities

Component	Activity Name	Interval	Description	Result	Funding Source	Cost Per Instance (est.)
Asphalt Surface	Cold Asphalt Pothole Patching	Weekly or As Needed	Application of cold patch asphalt for pothole repair during winter months.	Prolonged life of infrastructure.	Operating	$1,500 to $1,750
Asphalt Surface	Hot Asphalt Pothole Patching	Weekly or As Needed	Application of hot patch asphalt for pothole repair during summer months.	Prolonged life of infrastructure.	Operating	$500 to $750
Gravel	Dust Suppression	Annually or As Needed	Application of magnesium chloride to road surface.	Reduced frequency and volume of dust.	Operating	$10,000
Gravel	Grading	Annually	Regrading and recrowning of gravel roads.	Prolonged life of infrastructure and improved ride quality.	Operating	$1,250 to $1,750
Gravel	Pulverization	Monthly or As Needed	Pulverization of compacted gravel for isolated repairs.	Improved condition, ride quality, and drainage.	Operating	Staff labour at 1 hour per road, on average

Figure 6-17: Road Rehabilitation Lifecycle Activities

Component	Activity Name	Interval	Description	Result	Funding Source	Cost Per Instance (est.)
Asphalt Surface	Resurfacing	25 Years or As Needed	Partial or complete resurfacing of roadway.	Prolonged life of infrastructure.	Capital	$35 to $55 per square meter
Gravel	Restructuring	As Needed	Addition and restructuring of granular materials for abnormal defect repair.	Improved condition, ride quality, and drainage.	Operating	Staff labour at 1 hour per instance, on average

6.7 Recommendations

The roads category is one of the most comprehensive asset inventories maintained by the Town. This is partly due to the continual flow of condition information and rehabilitation events due to the nature of road management. Three recommendations are listed below to improve the information available in the category.

First, continue to add new assets to the inventory in a manner that adheres to the Town's current asset management practices. One road, from intersection to intersection, must be represented by one asset. When historical instances of grouping have been identified, focus on splitting the asset to allow for condition ratings and secondary information to be maintained accurately.

Second, the inconsistency of road assets linked to the Town's GIS software must be addressed. As the inventory becomes more streamlined from initiatives such as the above recommendation, prioritize linking those assets to the GIS so subjects such as condition can be quickly visualized for decision making.

Third, explore options for field inspections to reference the asset ID of each roadway on inspection results. This will significantly reduce the amount of time required for municipal staff to import field inspection results and improve the ability to cross-reference between the inventory and reports.

Section 7 – Stormwater

7.1 Quantity and Replacement Cost

Stormwater assets are organized into six segments, as visualized in Figure 7-1. Where applicable, the length each segment accounts for has been included in addition to the quantity of assets.

Figure 7-1: Stormwater Quantity and Replacement Cost (2021)

Segment	Quantity	Length	Replacement Cost
Catch Basins	719	-	$2,764,856
Discharge Points	18	-	$168,509
Fittings	29	-	$157,474
Gravity Mains	810	32.8 km	$9,365,298
Maintenance Holes	271	-	$2,131,078
Network Structures	8	-	$890,943
Service Lines	944	-	$1,814,063
Total	**2,799**	**32.8 km**	**$17,292,221**

The stormwater inventory is largely composed of asset information from older data sources, such as spreadsheets that predate the Town's asset management software. As a result, some of the inventory may have missing or inaccurate secondary information such as the length, size, and material of the infrastructure. For this reason, the replacement cost of the stormwater inventory has been determined by inflating the historical cost of each asset to 2021.

7.2 Useful Life and Age

In figure 7-2 on the following page, the useful life and average age of stormwater assets is summarized. Identical to other asset categories in the AMP, the average age is based on the number of years an asset has been in service, while the useful life is established by the Town's asset management program based on a reasonable estimate of how many years assets in the segment are likely to perform.

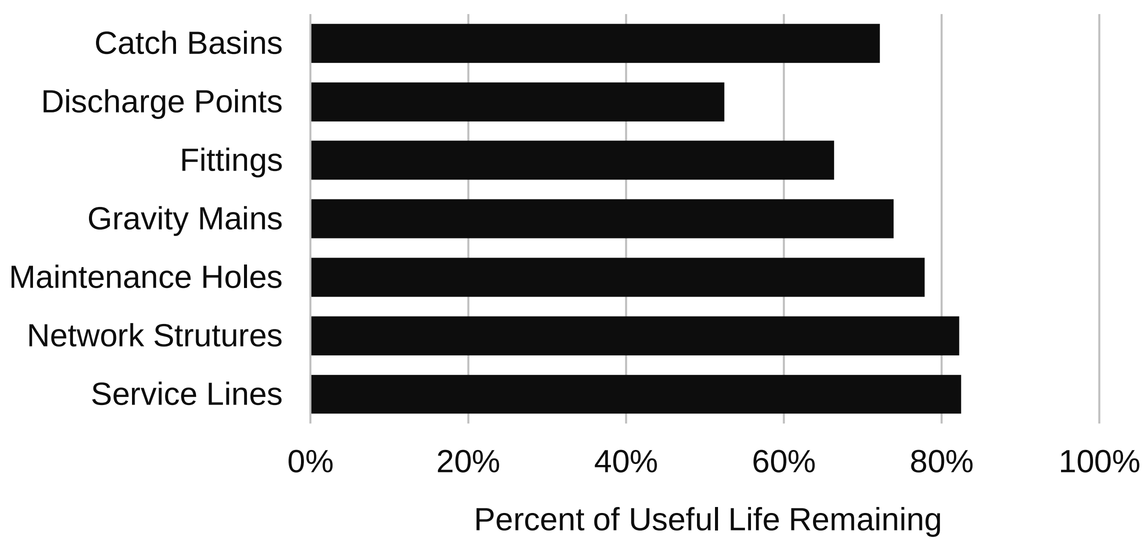
Figure 7-2: Stormwater Useful Life and Average Age (2022)

Segment	Useful Life	Average Age
Catch Bains	100 Years	28 Years
Discharge Points	50 Years	25 Years
Fittings	100 Years	33 Years
Gravity Mains	100 Years	26 Years
Maintenance Holes	100 Years	22 Years
Network Structures	100 Years	18 Years
Service Lines	100 Years	18 Years

The relatively low average age of several segments in the category is due to the high number of stormwater assets added to the inventory with the completion of new residential developments. While Shelburne's older neighbourhoods are also serviced by the stormwater system, new developments are accompanied by more detailed as-built servicing drawings which allow for a greater number of assets to be captured in a higher level of detail.

Figure 7-3 below compliments the above table by displaying the average remaining useful life as a percentage of the total useful life assigned to each segment. The remaining useful life is calculated using the year an asset reaches the end of its useful life compared to the year 2022.

Figure 7-3: Stormwater Average Remaining Useful Life (2022)



Unlike other asset categories in the AMP, the stormwater inventory does not report a significant quantity or value of infrastructure reaching the end of its useful life within the next five years. A total of 1 discharge point, 1 fitting, and 4 gravity mains fall under this criterion with a replacement cost of $70,882.

As mentioned above, the stormwater inventory may be missing or present some inaccurate data. Therefore, data from field inspections of the infrastructure should be relied upon when constructing operational and capital plans, as opposed to information solely provided by this document.

7.3 Condition

Shelburne evaluates the condition of its stormwater assets through preventative maintenance activities such as gravity main flushing and CCTV inspections. Although these activities provide detailed insight for an isolated section of the system, the performance of one component can be an indicator of an issue up or downstream. Maintenance activities for the category are outlined in detail in Section 7.6.

In addition to gaining an understanding of the condition of the infrastructure through maintenance, stormwater networks utilize above ground conveyance strategies, such as culverts, open drains, and stormwater management ponds. This allows for visual indicators to be used to inspect the condition of the system.

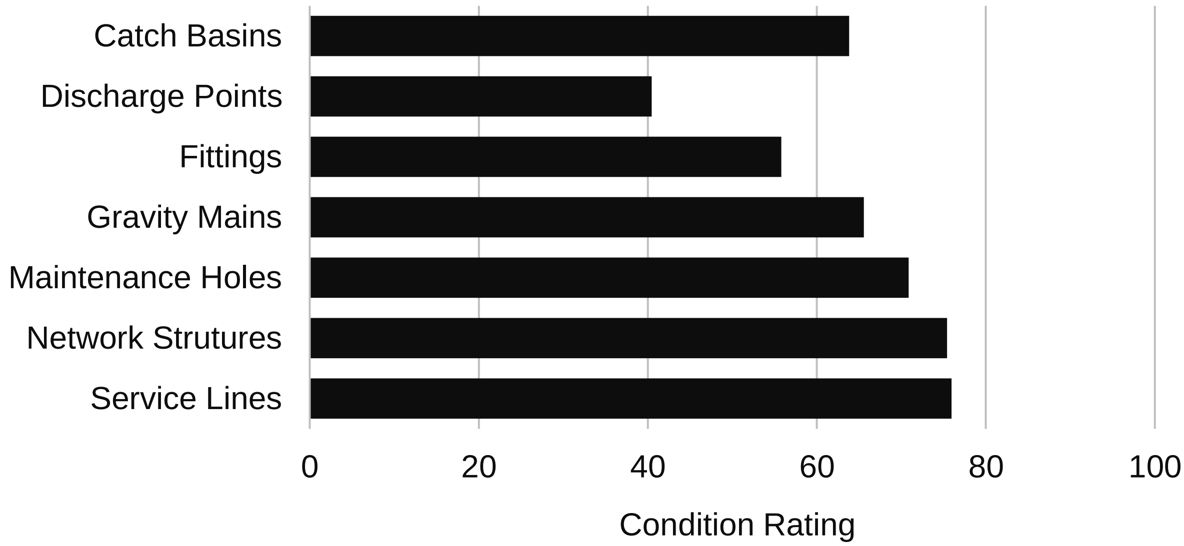
The condition rating scale for stormwater assets is shown below in Figure 7-4. Since the category does not utilize a field inspection system for condition assessments at this time, the rating scale was created for use with age-based condition data.

Figure 7-4: Stormwater Condition Rating Scale

Condition	Rating
Very Good	80.00 and above
Good	60.00 and above
Fair	40.00 and above
Poor	20.00 and above
Very Poor	0.00 and above

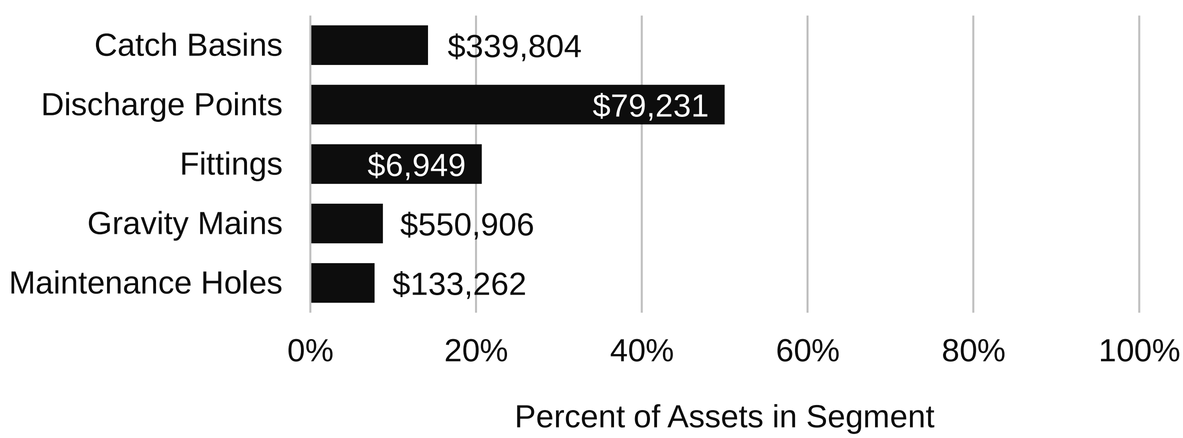
The average condition for each segment in the stormwater category is showcased in Figure 7-5 on the following page. As mentioned above, the data used to produce this graphic is limited to assumptions of the asset's condition based on its remaining useful life as opposed to field condition assessments.

Figure 7-5: Stormwater Average Condition Rating (2021)



Expanding on the average condition rating illustrated above, Figure 7-6 highlights the percent of assets in each segment with a condition rating of poor or lower. As mentioned in section 3.4, if a segment is absent from the chart, it does not have any assets falling under these criteria. Replacement cost is included for reference.

Figure 7-6: Percent of Stormwater Assets with a Condition Rating of Poor or Lower with Replacement Cost (2021)



Although the discharge point category does not present the highest average age, it does score lowest in average remaining useful life, average condition rating, and has the highest percent of assets with a condition rating of poor or lower. This is partly due to the fact the segment utilizes the lowest useful life in the category.

7.4 Level of Service

Outlined in O. Reg. 588/17, the technical level of service metrics for stormwater are found below in Figure 7-7 and the community (qualitative) metrics in Figure 7-8.

Figure 7-7: Stormwater Technical Level of Service

Service Attribute	Technical Metric	Level of Service (2021)
Scope	Percentage of properties in the Municipality resilient to a 100-year storm.	Data not available
Scope	Percentage of the municipal stormwater management system resilient to a 5-year storm.	100%

The level of service depicted in Figure 7-7 is based on the best available stormwater data in the asset inventory. As mentioned, data inaccuracies may be present.

Figure 7-8: Stormwater Community Level of Service

Service Attribute	Qualitative Description	Level of Service (2021)
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	The Town of Shelburne relies on a variety of infrastructure to manage stormwater across its 6.5 square kilometers of urban and rural landscape. Gravity mains, culverts, and open drains safely guide stormwater to a series of detention ponds and discharge points. These conveyance structures are found throughout the Municipality with urbanized sections utilizing subsurface infrastructure, such as gravity mains, and rural neighbourhoods more frequently relying on surface management techniques, such as culverts and ditches. Working with local Conservation Authorities and its team of urban planners and engineers, the Town ensures design standards are followed when constructing new or replacing existing stormwater infrastructure that protects residents and businesses from flooding during high-volume rainfall and melt events.

7.5 Performance

The key performance indicators referenced by the Town for stormwater assets are found in Figure 7-9.

Figure 7-9: Stormwater Key Performance Indicators

Performance Category	Statement	Metric	Target
Safety	The stormwater management system operates in a manner that protects the environment.	Number of pond overflow or collection main failure events that resulted in downstream flooding or stormwater backups.	0 events
Responsiveness	Municipal staff are available to answer stormwater network inquiries from customers.	Time for municipal staff to respond to a customer inquiry.	1 business day via phone or email

The safe and efficient conveyance of stormwater is critical to protecting personal property and the environment. During rainfall and melt events, the consistent use of visual indicators provide insight if there are any issues impeding the performance of the system, such as debris or other obstructions.

7.6 Lifecycle Activities

To maintain the stormwater system, several preventative maintenance activities are required to ensure catch basins, gravity mains, and detention ponds are free from obstructions or other issues that may impede the performance of the network. An increased rate of structure deterioration, blockages that reduce the flow of stormwater, and localized flooding are some of the risks if maintenance activities are neglected.

Figure 7-10 on the following page outlines the maintenance that would be required to ensure the network can continue to deliver its level of service over a ten-year period.

Figure 7-10: Stormwater Lifecycle Activities

Component	Activity Name	Interval	Description	Result	Funding Source	Cost Per Instance (est.)
Catch Basins	Debris Removal	Annual	Debris settled at base of catch basin is removed.	Improved conveyance of stormwater.	Operating	$10,000 to $15,000, shared with gravity mains
Catch Basins	Moduloc Maintenance	Annual	Re-parging or replacement of catch basin moduloc.	Prolonged life of infrastructure.	Operating	Staff labour at 3 hours per catch basin, on average
Gravity Mains	CCTV Inspection	As Needed	Video camera is placed inside the mains to check for deficiencies.	Improved awareness of infrastructure condition.	Operating	$200-300 per hour, on average
Gravity Mains	Flushing	Annual	Water is flushed through the gravity main, and debris removed.	Improved conveyance of stormwater.	Operating	$10,000 to $15,000, shared with gravity mains
Headwalls	Debris Removal	Monthly	Debris settled at headwall outlet is removed.	Improved conveyance of stormwater.	Operating	Staff labour at 30 minutes per headwall, on average
Open Drains	Grading	As Needed	Open drain systems are regraded to ensure proper runoff and conveyance.	Improved conveyance of stormwater.	Operating	Staff labour at 1 hour per location, on average

7.7 Recommendations

The stormwater inventory, while reasonably comprehensive, does present some shortfalls. Three items are recommended to advance the state of the category.

First, continue to pursue the best available data in order to link assets to infrastructure in the Town's GIS software. This will allow staff to fully utilize asset data by knowing the location of the item that information corresponds to. Completing this step will open opportunities for further developments to the category such as collecting more detailed secondary data and factoring in field condition assessments.

Second, explore the options to improve the data available to the Town relating to storm events, stormwater conveyance, and floodplain analysis. While Shelburne is not located adjacent to a significant body of water, having this information readily available is not only requested under provincial asset management legislation, but also beneficial to developing emergency management strategies.

Third, devise a plan for conducting or collecting information from existing field condition assessments that can be translated into quantitative results used to assign a condition rating for stormwater assets, such as information from CCTV inspections. Additionally, review the opportunities for creating a condition rating scale specialized to stormwater infrastructure with detailed descriptions of each condition level.

Section 8 – Wastewater

8.1 Quantity and Replacement Cost

Shelburne's wastewater assets are organized into seven segments. Figure 8-1 outlines the quantity, length (if applicable), and replacement cost for each.

Figure 8-1: Wastewater Quantity and Replacement Cost (2021)

Segment	Quantity	Length	Replacement Cost
Cleanouts	1	-	$5,997
Fittings	30	-	$176,446
Force Mains	1	1.3 km	$145,003
Gravity Mains	472	35.3 km	$11,372,736
Maintenance Holes	432	-	$2,911,826
Network Structures	62	-	$23,312,822
Service Lines	1,704	-	$2,814,285
Total	**2,702**	**36.6 km**	**$40,739,115**

The large quantity of assets in the network structures segment is the result of the wastewater treatment plant being broken down into components such as clarifiers and lagoons. This is to model the age and condition of each element more accurately.

The wastewater inventory contains significant information from older data sources, such as spreadsheets predating the Town's asset management software. In some instances, this results in missing or inadequate information that prevents a cost-per-unit from being assigned to a segment reliably. As a result, and to maintain consistency with Section 7 regarding stormwater assets, the replacement cost for the wastewater category has been determined by inflating the historical cost of each asset to 2021.

8.2 Useful Life and Age

Figure 8-2 highlights the useful life and average age of wastewater assets. As mentioned in previous sections, the average age is based on the number of years an asset has been in service, while the useful life is established by the Town's asset management program based on a reasonable estimate of how many years assets in the segment are likely to perform before requiring replacement.

Figure 8-2: Wastewater Useful Life and Average Age (2022)

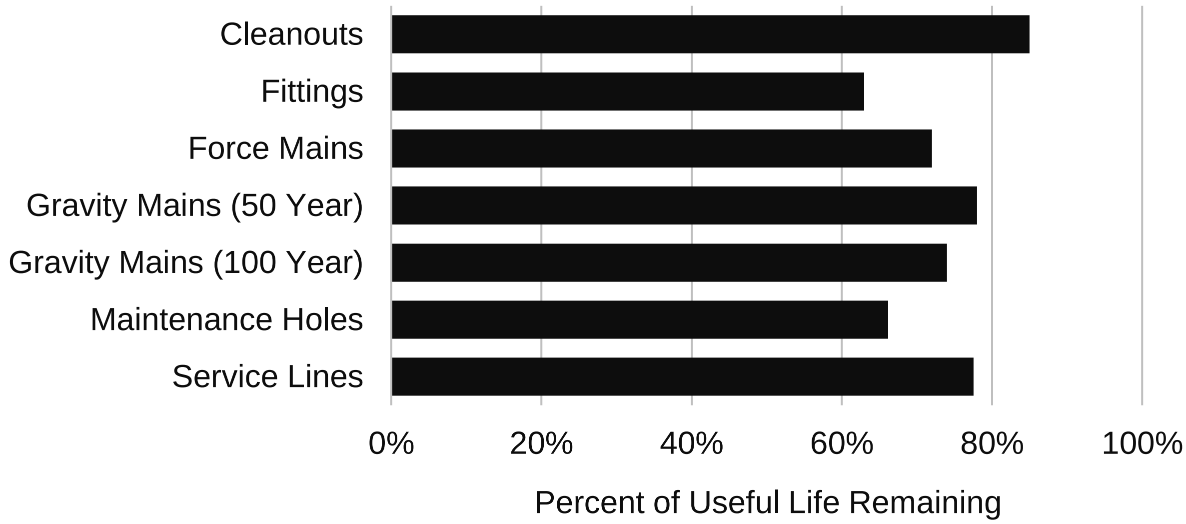
Segment	Useful Life	Average Age
Cleanouts	100 Years	15 Years
Fittings	100 Years	36 Years
Force Mains	100 Years	28 Years
Gravity Mains (50 Year)	50 Years	39 Years
Gravity Mains (100 Year)	100 Years	26 Years
Maintenance Holes	100 Years	34 Years
Network Structures	15-70 Years	21 Years
Service Lines	100 Years	36 Years

The useful life assigned to the network structures segment varies based on the asset. The reason for this is, as mentioned previously, is that many of the structures have been divided into components such as HVAC, shell and electrical allowing for a more accurate management of the structure in the asset inventory. As a result, these separate elements all must be assigned a different useful life.

Similarly, 44% of the gravity mains segment utilizes a useful life of 100 years, while the remaining 56% was assigned a value of 50 years. This is due to the presence of older data that predates the Town's current asset management program which is likely to have some inconsistency amongst the useful life assigned to assets in the segment. At this point, based on contemporary construction materials, the Town has determined that a 50-year useful life is suitable for wastewater gravity mains.

On the following page, Figure 8-3 showcases the average remaining useful life as a percentage of the total useful life assigned to each segment. Calculating the remaining useful life is completed by comparing the year an asset reaches the end of its useful life to the year 2022.

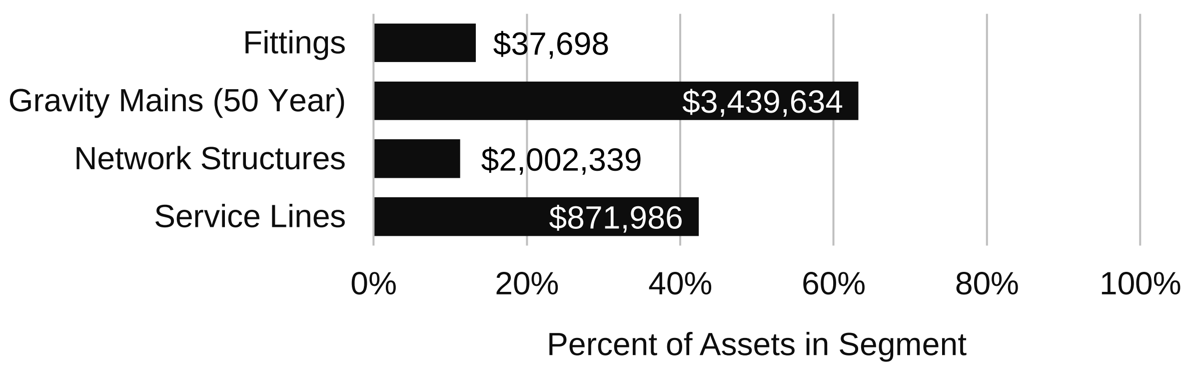
Figure 8-3: Wastewater Average Remaining Useful Life (2022)



The network structures segment has been excluded from Figure 8-3 due to the significant variation in useful life assigned to the assets.

Figure 8-4 illustrates the percent of assets in each segment that have less than 5 years of useful life remaining. The replacement cost has been included in the chart.

Figure 8-4: Percent of Segment with Less than 5 Years of Remaining Useful Life (2022) with Replacement Cost (2021)



In contrast to Figure 8-4, gravity mains with a 50 year stand out as potentially requiring attention within a 5-year period. The reason this result was not repeated in Figure 8-3 is due to the recent influx of assets from the Town assuming new residential developments. The gravity mains from these subdivisions utilize a 50-year useful life, which offsets the segment's average remaining useful life.

8.3 Condition

The condition of Shelburne's wastewater network is closely monitored by municipal and Ontario Clean Water Agency (OCWA) staff. A variety of inspections are conducted at regular intervals to ensure the infrastructure is free from deficiencies and able to accommodate its rated capacity. These activities are further discussed in Section 8.6.

As mentioned in Section 8.1, much of the wastewater asset inventory is accompanied by missing or potentially inaccurate secondary data, such as the material or diameter of a gravity main. In some cases, this prevents an entry in the asset inventory from being confidently assigned to a physical piece of infrastructure. As a result, it is not beneficial to factor in any field condition assessments with the wastewater inventory at this time, and age-based condition assessments are used as substitute.

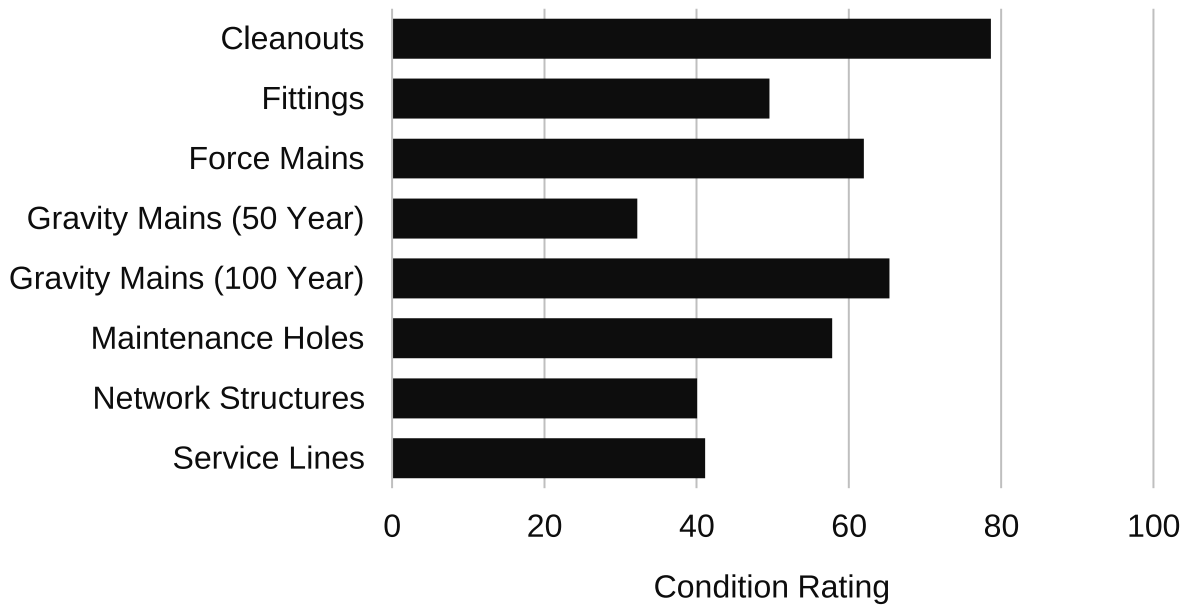
Figure 8-5 displays the condition scale utilized by the Town's asset management software.

Figure 8-5: Wastewater Condition Rating Scale

Condition	Rating
Very Good	80.00 and above
Good	60.00 and above
Fair	40.00 and above
Poor	20.00 and above
Very Poor	0.00 and above

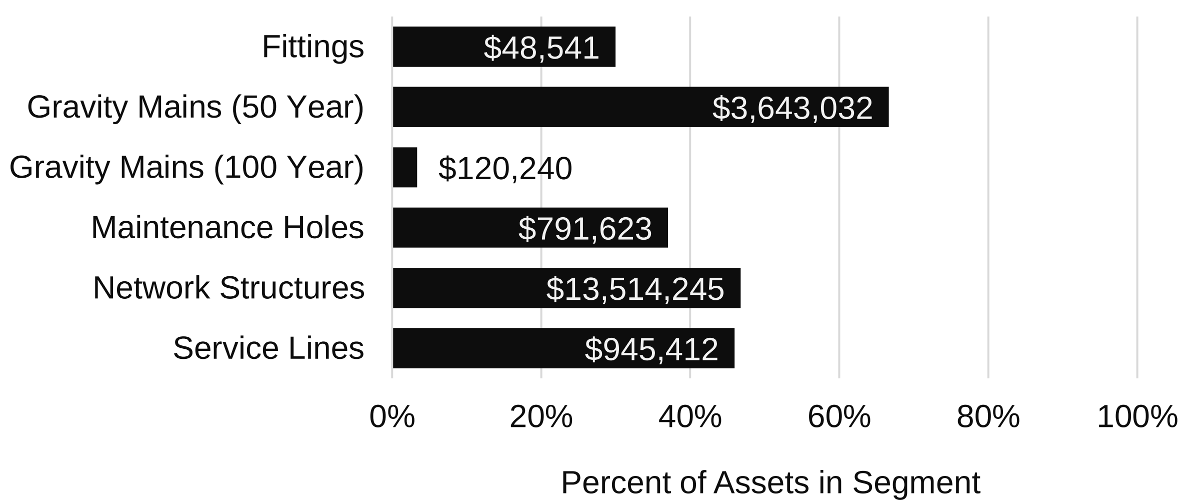
The average condition of each segment is shown in Figure 8-6 below.

Figure 8-6: Wastewater Average Condition Rating (2021)



Building on the average condition of the category, Figure 8-7 examines the percent of assets in each segment with a condition rating or poor or lower. If a segment is absent from the chart, it does not have any assets falling under these criteria. Replacement cost is added for reference.

Figure 8-7: Percent of Wastewater Assets with a Condition Rating of Poor or Lower with Replacement Cost (2021)



8.4 Level of Service

Figure 8-8 outlines the O. Reg. 588/17 technical level of service metrics for wastewater.

Figure 8-8: Wastewater Technical Level of Service

Service Attribute	Technical Metric	Level of Service (2021)
Scope	Percentage of properties connected to the municipal wastewater system.	91%
Reliability	The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.	0
Reliability	The number of connection-days per year having wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0.0008
Reliability	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	0.0008

The community (qualitative) level of service metrics are found in Figure 8-9 on the following two pages.

Figure 8-9: Wastewater Community Level of Service (Table 1 of 2)

Service Attribute	Qualitative Description	Level of Service (2021)
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are connected to the municipal wastewater system.	Municipal wastewater service is provided to approximately 2,650 properties through a network of 37 kilometers of gravity collection mains and 2 kilometers of force collection mains. As of 2021, the system is supported by two pumping stations and one wastewater treatment facility processing over 950,000 cubic meters of sewage during the year.
Reliability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.	As of 2021, the Town of Shelburne does not have any combined sewers.
Reliability	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.	As of 2021, the Town of Shelburne does not have any combined sewers.
Reliability	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.	Stormwater entering sanitary sewers can impact the performance of the wastewater collection network. Deficiencies in collection mains, such as cracks, can permit stormwater entry during high-volume rainfall or melt events. Municipal staff utilize a variety of resources, such as video inspections of the collection mains, to proactively identify and mitigate areas of concern in the infrastructure. Additionally, indirect connections such as weeping tiles and sump pumps that drain into a sanitary connection are responsible for routing stormwater into the wastewater network. High volumes of stormwater disrupt normal daily flows and can cause the wastewater treatment facility to temporarily exceed its rated capacity.

Figure 8-9: Wastewater Community Level of Service (Table 2 of 2)

Service Attribute	Qualitative Description	Level of Service (2021)
Reliability	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described above.	Shelburne's treatment facility has strategies in place for managing high-flow scenarios due to stormwater entering the wastewater system, such as utilizing its two lagoons to temporarily increase its intake capacity. When constructing new or replacing components of the wastewater network, the Town of Shelburne, in conjunction with its team of engineers, ensure design standards are followed that will allow the Town to continue providing a collection system its customers can rely on to be safe and sustainable.
Reliability	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system.	The Town's wastewater treatment facility samples discharged effluent on a regular basis to ensure compliance with environmental regulations. Effluent parameters CBOD5, suspended solids, phosphorous, ammonia nitrogen, and e. coli are monitored and summarized annually in a public performance report for the facility.

Additional information regarding the technical and community level of service reported can be found in the 2021 Shelburne Wastewater Treatment System Annual Report prepared by OCWA.

8.5 Performance

Consistent and reliable performance of the wastewater system is critical to sustaining the health of the community and protecting the environment. An example of the key performance indicators for the category are shown in Figure 8-10.

Figure 8-10: Wastewater Key Performance Indicators

Performance Category	Statement	Metric	Target
Reliability	The wastewater network provides consistent service to our customers with minimal service disruptions.	Number of wastewater backups due to municipal infrastructure.	0 backups
Reliability	The wastewater network provides consistent service to our customers with minimal service disruptions.	Number of emergency repairs to wastewater infrastructure.	0 emergency repairs
Safety	The wastewater network operates in a manner that protects the environment.	Number of effluent violations.	0 violations
Availability	The wastewater network is capable of providing the capacity required to serve our customers.	Average daily flow is less than 80% of rated capacity.	Less than 80%
Responsiveness	Municipal staff are available to answer wastewater network inquiries from customers.	Time for municipal staff to respond to a customer inquiry.	1 business day via phone or email

8.6 Lifecycle Activities

To prevent accelerated infrastructure deterioration and the development of deficiencies that require significant investment to resolve, regular maintenance is required on many elements of the network.

To compliment the maintenance activities performed by OCWA in operation of the wastewater treatment plant, Figure 8-11 on the following page highlights the lifecycle activities municipal staff will utilize to maintain the infrastructure over a 10-year period.

Figure 8-11: Wastewater Lifecycle Activities

Component	Activity Name	Interval	Description	Result	Funding Source	Cost Per Instance (est.)
Force Mains	Flushing	Annual	Water is flush through the main at a high velocity for debris removal.	Proper conveyance of wastewater and reduced odor.	Operating	$20,000 to $25,000, shared with gravity mains
Gravity Mains	CCTV Inspection	5 to 10 Years or As Needed	Video camera is placed inside the mains to check for deficiencies.	Improved awareness of infrastructure condition.	Capital	$100,000 for inspection and repairs
Gravity Mains	Flushing	Annual	Water is flush through the main at a high velocity for debris removal.	Proper conveyance of wastewater and reduced odor.	Operating	$20,000 to $25,000, shared with gravity mains
Pumping Stations	Debris Removal and Cleaning	Annual	Debris is vacuumed from the wet well and all components are washed.	Proper conveyance of wastewater.	Operating	$7,000 to $8,000 per pumping station
Pumping Stations	Float Cleaning	Bi-Weekly	Visual inspection, cleaning, and removal of obstructions from floats and inflow pipes.	Proper conveyance of wastewater.	Operating	Staff labour at 30 minutes, on average
Pumping Stations	Valve Exercising	Monthly	Valves in the wet well are open, closed, and cleaned.	Prolonged life of infrastructure.	Operating	Staff labour at 5 minutes per valve, on average
Relief Valves	Inspection	Bi-Annual	Relief valves are inspection and excess water is removed.	Prolonged life of infrastructure.	Operating	Staff labour at 30 minutes per valve, on average
Wastewater Treatment Plant	Flow Monitoring	Daily	Wastewater flows and pump hours are monitored and recorded.	Consistent performance of infrastructure.	Operating	Staff labour as needed

8.7 Recommendations

Improvements to the wastewater category are required in order for the data produced by the Town's asset management program to be fully utilized in the development of long term financial and operational planning. The following three recommendations can be treated as a starting point to better the category.

First, new assets added to the inventory must adhere to the parameters followed by the Town's current asset management program. A consistent useful life must be used unless an exception can be justified and the reason for the abnormality recorded in the notes section for each asset.

Second, linking assets to infrastructure in the Town's GIS software must be prioritized. Further improvements in the secondary data for each asset, such as pipe diameters and material, cannot be fully utilized if the location of the asset in the field is unknown. This is a precursor to several other opportunities for advancement, such as integrating data from reports created by other agencies.

Third, explore options for incorporating field condition assessment data to the inventory. Whether in the form of documenting information from visual inspections or developing a strategy to transform the data collected through lifecycle activities, such as CCTV inspections, into a condition rating, this recommendation will significantly improve the data that can be exported for the category and centralize the best available data for each asset.

Section 9 – Water

9.1 Quantity and Replacement Cost

The Town's water asset inventory is organized into seven segments. Figure 9-1 displays the quantity, length (if applicable), and replacement cost for each.

Figure 9-1: Water Quantity and Replacement Cost (2021)

Segment	Quantity	Length	Replacement Cost
Curb Stops	31	-	$1,570,152
Distribution Mains	291	50.3 km	$14,562,262
Fittings	52	-	$385,134
Hydrants	254	-	$2,876,897
Network Structures	77	-	$7,933,745
Service Lines	2,054	-	$1,418,040
Valves	338	-	$750,662
Total	**3,097**	**50.3 km**	**$29,496,892**

Similar to other categories regarding subsurface infrastructure, the water asset inventory presents instances of information sourced from older datasets, such as spreadsheets which predate the Town's asset management software. As discussed, these sources often contain data inaccuracies or omissions that are not consistent with the Town's current techniques for managing asset data. To reduce the likelihood of error, and to remain consistent with Sections 7 and 8, the replacement cost for water assets has been calculated by inflating the historical cost of each asset to 2021.

Additionally, an instance of data inaccuracy for the water category is visible in the number of curb stops compared to the number of service lines. These two pieces of infrastructure operate in tandem and therefore should have similar quantities. Given the replacement value of the curb stop segment, it is likely the quantity of 31 is composed of asset entries that account for more than one curb stop each.

9.2 Useful Life and Age

Figure 9-2 on the following page indicates the useful life and average age for assets in the water category. As outlined in Sections 7 and 8, the useful life assigned to each segment is determined by the Town's asset management program, and the average age references the number of years an asset has been in service.

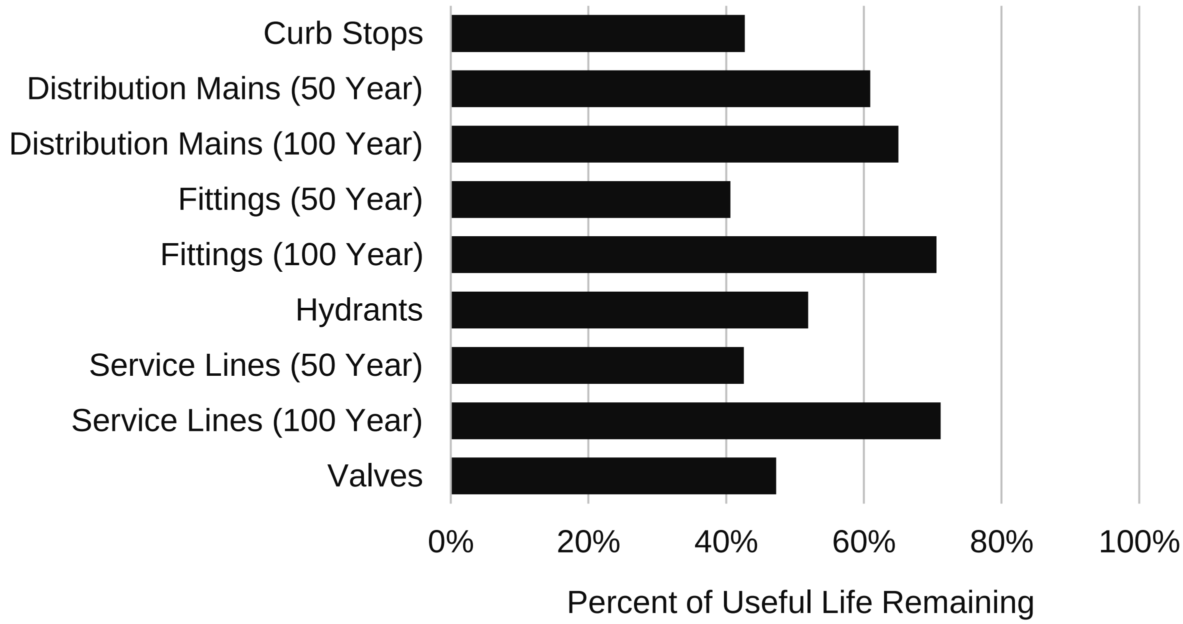
Figure 9-2: Water Useful Life and Average Age (2022)

Segment	Useful Life	Average Age
Curb Stops	50 Years	33 Years
Distribution Mains (50 Year)	50 Years	24 Years
Distribution Mains (100 Year)	100 Years	35 Years
Fittings (50 Year)	50 Years	33 Years
Fittings (100 Year)	100 Years	29 Years
Hydrants	50 Years	28 Years
Network Structures	10-50 Years	18 Years
Service Lines (50 Year)	50 Years	40 Years
Service Lines (100 Year)	100 Years	29 Years
Valves	25 Years	27 Years

Similar to the wastewater category, water network structures have been split into components, such as HVAC and electrical, to more accurately represent the different useful life of each element. Additionally, large amounts of asset data from sources predating the Town's current approach to asset management used an inconsistent useful life for distribution mains, fittings, and service lines. To avoid disrupting the amortization of these assets, and because information as to why a different useful life was used is unavailable, the useful life will not be adjusted. Moving forward, a single useful life value will be applied to each category whenever possible.

On the following page, Figure 9-3 highlights the average remaining useful life as a percentage of the total useful life assigned to each segment. The remaining useful life is calculated by comparing the year an asset reaches the end of its useful life to the year 2022.

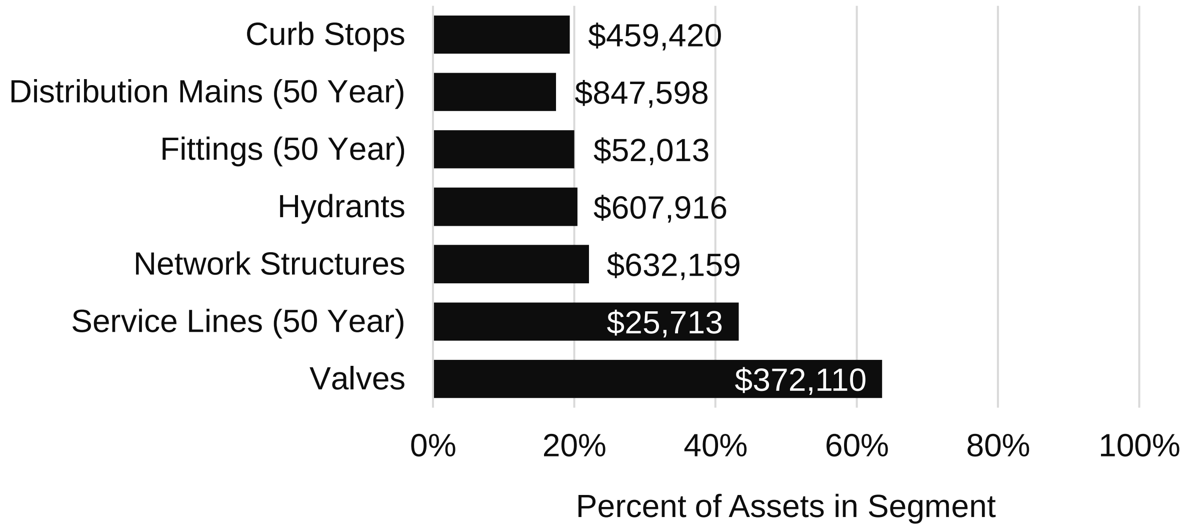
Figure 9-3: Water Average Remaining Useful Life (2022)



Network structures have been excluded from the above chart due to the segment's varying useful life. The assets that have been included are hovering around having 40% to 50% of their useful life remaining, on average. Segments utilizing a useful life of 100 years are an exception to this pattern.

Exploring this information further on the following page, Figure 9-4 isolates the percent of assets in each segment that have less than 5 years of useful life remaining. The replacement cost for those assets is included for reference. If a segment does not appear in the chart, it does not have any assets with less than 5 years of useful life remaining.

Figure 9-4: Percent of Segment with Less than 5 Years of Remaining Useful Life (2022) with Replacement Cost (2021)



As communicated in Figure 9-2, the valves segment presents the highest average age and has the highest percentage of assets with less than 5 years of useful life remaining in the above chart. A possible explanation for this is the presence of grouped assets in the inventory. The Town's current asset management program represents valves in the inventory as one asset equaling one valve to achieve the most accurate financial and condition data for each valve. In years that predate this approach, there are some instances where a construction project may have resulted in two to three valves being added to the inventory as one standalone asset. This causes the segment to be underrepresented in these visualizations due to the lower quantity of newer assets.

Resolving an instance of grouping in the inventory is not an issue in terms of disrupting financial or age-based condition data for the asset. Splitting a grouped asset is typically handled by fully disposing of and recreating the correct number of assets within the current reporting year. The reason this approach must be used rather than deleting the asset and recreating the correct quantity during the year the asset entered service is because previous asset management and amortization reports track the total number and value of assets added to the inventory each year. In addition to these reports being referenced by auditors, they are one of the several checks the Town deploys to ensure the correct number of assets have been accounted for each year. Therefore, changing the quantity for a previous year will cause these reports to no longer match the inventory for the year in question.

9.3 Condition

Similar to the wastewater category, Shelburne's water distribution network is managed by both municipal and OCWA staff. Highly regulated inspection and reporting standards, such as those outlined in O. Reg. 169/03 and 170/03, are followed on a regular basis to ensure the water meets the Ontario Drinking Water Quality Standards. These quality assurance strategies are discussed further in Section 9.5 regarding performance.

As outlined in Section 9.1, some parts of the water inventory were assembled before the Town's current asset management program using historical data sources and presents secondary data for select assets that may be inaccurate or missing. Without this information, it is challenging to reliably link an asset to a physical piece of infrastructure. Therefore, while regular research is conducted to resolve instances of unreliable or missing data, the category is not currently in a state where factoring in field condition assessments would be accurate or beneficial to long term planning. This results in age-based condition assessments being utilized.

To compliment the condition information produced by the Town's asset management software, OCWA prepares an Annual Report and Summary Report each year for the Town's water system. These reports discuss, in detail, the state of the water network and review topics such as flow rates and quality testing.

Figure 9-5 depicts the condition scale applied to the water category in the Town's asset inventory.

Figure 9-5: Water Condition Rating Scale

Condition	Rating
Very Good	80.00 and above
Good	60.00 and above
Fair	40.00 and above
Poor	20.00 and above
Very Poor	0.00 and above

The average age-based condition for each segment is displayed in Figure 9-6 on the following page. Additionally, Figure 9-7 summarizes the percent of assets in each segment that have a condition rating of poor or lower, along with their replacement cost. As mentioned in Section 9.2, if a segment is not included in Figure 9-7, it does not have any assets meeting these criteria.

Figure 9-6: Water Average Condition Rating (2021)

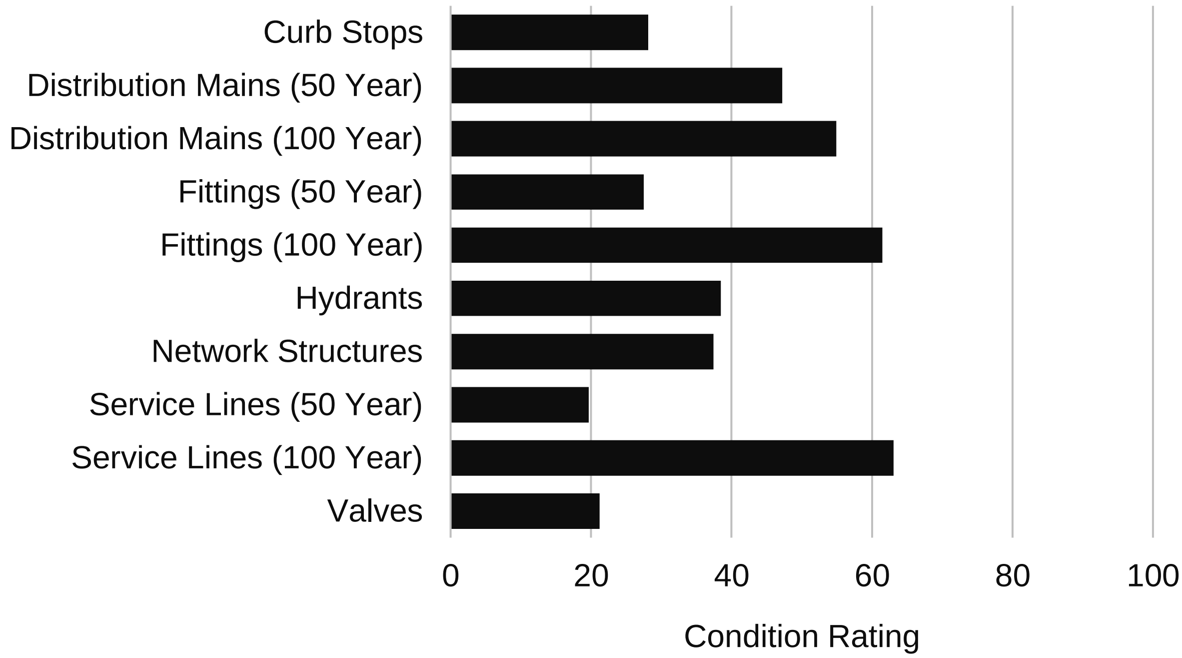
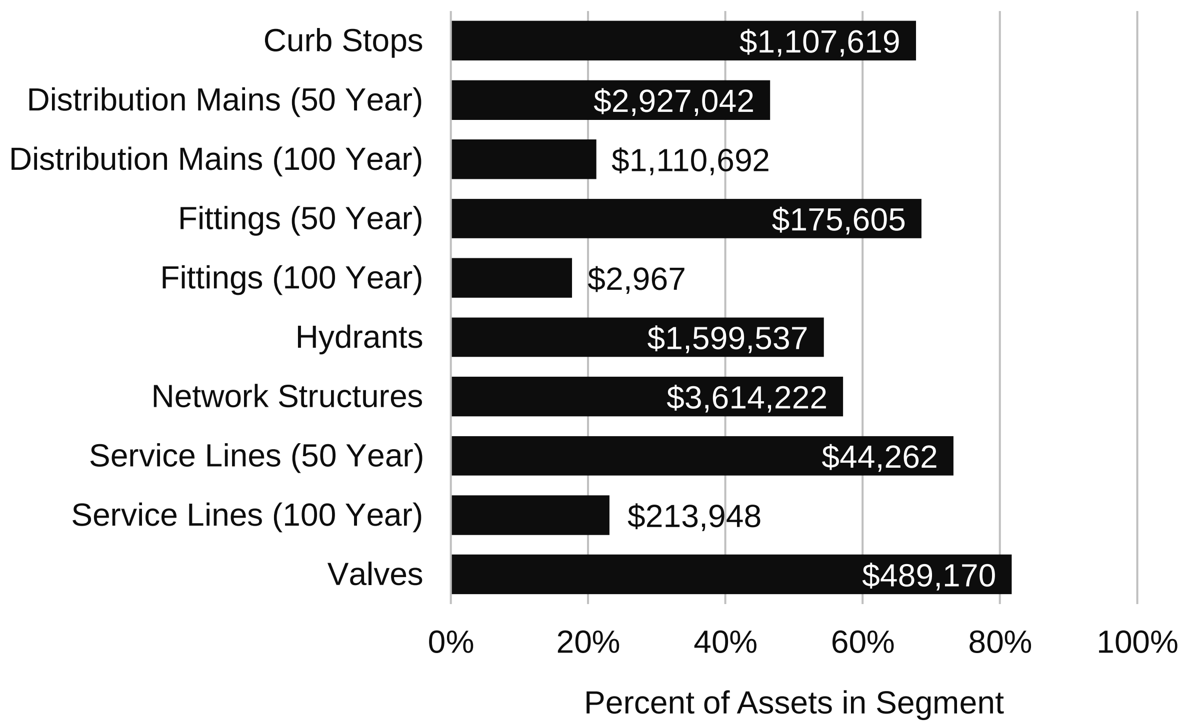


Figure 9-7: Percent of Water Assets with a Condition Rating of Poor or Lower with Replacement Cost (2021)



9.4 Level of Service

O. Reg. 588/17 outlines the technical and community (qualitative) level of service metrics for water assets. Technical metrics are found in Figure 9-8 below.

Figure 9-8: Water Technical Level of Service

Service Attribute	Technical Metric	Level of Service (2021)
Scope	Percentage of properties connected to the municipal water system.	92.4%
Scope	Percentage of properties where fire flow is available.	99.6%
Reliability	The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system.	0
Reliability	The number of connection-days per year where water is not available due to water main breaks compared to the total number of properties connected to the municipal water system.	0

Reviewing the technical level of service, it is important to note that despite the occurrence of water main breaks, there has not been an instance where positive water pressure was not maintained for customers in the impacted area between the years 2018 and 2021.

The community level of service metrics are found in Figure 9-9 on the following page.

Figure 9-9: Water Community Level of Service

Service Attribute	Qualitative Description	Level of Service (2021)
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are connected to the municipal water system.	As of 2021, the Town of Shelburne provides municipal water service to over 2,700 properties through 52 kilometers of distribution water mains which stem from six production wells and one water tower. As new residential homes are planned for construction in the next few years, the scale of Shelburne's water service will continue to grow.
Scope	Description, which may include maps, of the user groups or areas of the Municipality that have fire flow.	The Shelburne and District Fire Department provides fire protection services for the Shelburne community. The Municipality regularly inspects and maintains a network of over 300 fire hydrants to ensure a reliable high-pressure water flow is available to fire crews in the event of an emergency.
Reliability	Description of boil water advisories and service interruptions.	In 2021, the Town of Shelburne did not issue any boil water advisories and water service was available 24 hours a day, 7 days a week without interruption.

9.5 Performance

The consistent performance of Shelburne’s water network is critical to ensuring water is available both for consumption and for firefighting services, including during instances of higher-than-normal average daily flows.

In conjunction with those utilized by OCWA staff, Shelburne refers to key performance indicators to verify the system is delivering the required level of service and that any abnormalities are swiftly identified and resolved. On the following page, figure 9-10 showcases an example of key performance indicators for the water category.

Figure 9-10: Water Key Performance Indicators

Performance Category	Statement	Metric	Target
Reliability	The water network provides consistent service to our customers with minimal service disruptions.	Number of water main breaks that resulted in a loss of pressure or service.	0 breaks
Safety	The water network delivers water that is safe for consumption.	Microbiological and chemical samples meet regulatory requirements for water quality.	100% compliance
Availability	The water network is capable of providing the consumption required to serve our customers.	Average daily flow at each well is less than 80% of maximum capacity.	Less than 80%
Responsiveness	Municipal staff are available to answer water network inquiries from customers.	Time for municipal staff to respond to a customer inquiry.	1 business day via phone or email

9.6 Lifecycle Activities

To preserve the level of service provided by the water network and ensure there are not any shortfalls in quantity or quality, a series of preventative maintenance inspections and activities are conducted regularly by municipal staff. These activities are critical to protecting the safety of source water and reducing the rate of deterioration of the infrastructure. In addition, the OCWA deploys its own lifecycle activities for maintaining the system which can be found in the Operational Plan for the Shelburne Drinking Water System on the Town’s website.

The lifecycle activities that will be used to maintain water assets over a ten-year period are outlined on the following page in Figure 9-11.

Figure 9-11: Water Lifecycle Activities

Component	Activity Name	Interval	Description	Result	Funding Source	Cost Per Instance (est.)
Curb Stops	Curb Stop Inspection	As Needed	Curb stops are inspected for grade and structural deficiencies.	Prolonged life of infrastructure.	Operating	Staff labour at 10 minutes per curb stop, on average
Distribution Mains	Flushing	Bi-Annual	Water is released at a high velocity from hydrants.	Improved water quality.	Operating	Staff labour at 30 minutes per hydrant, on average
Elevated Storage	Structure Inspection	Quarterly	Visual inspection of components and general maintenance.	Prolonged life of infrastructure.	Operating	Staff labour as needed
Hydrants	Flushing	Bi-Annual	Water is released at a high velocity from hydrants.	Improved water quality.	Operating	Staff labour at 30 minutes per hydrant, on average
Hydrants	Inspection	Annually	Visual inspection of hydrants for structural and operational deficiencies.	Hydrants are in optimal operating condition in an emergency.	Operating	Staff labour at 30 minutes per hydrant, on average
Mainline Valves	Exercising	Annually	Valves are open, closed, and cleaned.	Prolonged life of infrastructure.	Operating	Staff labour at 15 minutes per valve, on average
Relief Valves	Inspection	Bi-Annual	Valves are inspected and excess water is removed.	Prolonged life of infrastructure.	Operating	Staff labour at 30 minutes per valve, on average
Wells	Inspection	Each Visit	Inspection of the area around external wells at each pumphouse.	Optimal water quantity and quality.	Operating	Staff labour as needed

9.7 Recommendations

Given that the nature of water assets is to provide a safe source of water for consumption as well as fire relief in the event of an emergency, this category should be prioritized as improvements to the asset inventory are undertaken. There are three introductory-level recommendations to address the shortfalls of the category that were identified in the AMP.

First, water assets must be added to the inventory following the strategy developed by the Town's current asset management program. This includes cataloguing infrastructure per-part, as opposed to in groups, and using a consistent useful life unless an exception due to the material or architecture of the asset can be justified. Exceptions to this rule must be documented in the notes section for each applicable asset. Additionally, if any existing assets are found to be inconsistent with this approach, action to rectify the data must be prioritized.

Second, continue to focus on collecting the best available information to link assets in the inventory to physical infrastructure in the Town's GIS software. This must be realized as a precursor to improving other areas of the category as the benefit of collecting detailed and reliable information for each asset can only be fully received if staff know which physical piece of infrastructure the data corresponds to.

Third, explore options to further integrate OCWA staff and the Town's engineering team into asset management program initiatives for water assets. This includes but is not limited to developing a strategy to share GIS information for the mutual improvement of geospatial information, discussing a method to add field condition assessments into the inventory, and creating a customized condition rating scale that is logical for each segment.

Section 10 – Population and Economic Change

O. Reg. 588/17 requires municipalities with a population of less than 25,000 to discuss assumptions regarding forecasted change in population and economic activity, and how those assumptions relate to the lifecycle management strategy for assets in the AMP.

10.1 Assumptions Regarding Growth

As released by Statistics Canada in February 2022, table 98-10-0002-01 regarding population and dwelling counts placed Shelburne at a 2021 population of 8,994 with 3,150 total private dwellings. Compared to a population of 8,126 and total private dwellings of 2,825 as reported in the 2016 census, the percent change vs 2021 is listed as a growth of 10.7% for population and 11.5% for private dwellings.

Shelburne is predicted to experience significant residential growth over the next 10 years. The Town's most recent Development Charges Study, completed in March 2020 by Hemson Consulting Ltd., discussed several assumptions on this subject. Figure 10-1 displays the population and occupied dwelling data included in the study.

Figure 10-1: Development Charges Study Population and Occupied Dwelling Forecast (March 2020)

Subject	2019 Estimate	2029 Estimate	Growth
Population	8,354	11,071	2,717
Occupied Dwellings	2,871	3,831	960

In addition, the study discussed how Shelburne's 2019 employment estimate of 2,447 was forecasted to grow by 806 to 3,253 by 2029. This employment growth was predicted to require 55,530 square meters of new floor space.

Alongside the Development Charges Study, Shelburne's Official Plan, dated December 2017, explores the development forecasted for the Town as well as the Municipality's ability to manage that growth. Figure 10-2 highlights the population and employment forecasts included in the Official Plan.

Figure 10-2: Town of Shelburne Official Plan Population and Employment Forecast (2017)

Subject	2016 Estimate	2026 Estimate	2031 Estimate	2036 Estimate
Population	7,650	9,500	10,000	10,000
Employment	2,855	3,311	3,760	3,760

10.2 Relationship to Asset Management

Growth assumptions present several challenges for a municipality's infrastructure. The impact on the lifecycle activities set forth for the categories in this AMP relates to the increased level of service Shelburne's infrastructure will be required to deliver. For example, a greater population and number of dwellings results in an increased quantity of water consumed, sewage produced, and vehicles on the roadway.

To increase the level of service provided by an asset, some lifecycle activities may be required to be conducted at shorter intervals to reflect the accelerated development of deficiencies due to more frequent and demanding use. This will result in an increase in the level of funding from capital and operating budgets. In addition, the importance for the Town to maintain regular investment in infrastructure is fundamental to prevent an extensive backlog of rehabilitation and replacement costs for assets that have depleted or are approaching the end of their service life.

Equally important is the continued use of the key performance indicators established as part of this update to the Town's AMP. While some indicators are intended as a high-level summary of a segment's performance, every indicator has the ability to function as an early warning that the category may be underachieving its required level of service. The Municipality must commit to the regular documentation of the data that relates to each indicator to allow for long-term reports regarding performance to be produced.

Finally, the implications of growth stress the importance of continuing to develop and strengthen an asset management strategy that is reasonable for the Town and achievable. A municipality that is equipped with detailed information regarding its infrastructure is able to make decisions and create long-term plans that are supported by reliable data and management strategies that have been clearly documented. Prioritizing the recommendations outlined for each asset category will steer the Town to resolving information gaps in the inventory and will allow future iterations of the Town's AMP to be assembled with a greater quantity of accurate data that can be translated into valuable infrastructure intelligence.

Town of Shelburne
Asset Management Plan
June 2022 Update