8.2.2 Sanitary Sewer

8.2.2.1 What do we own and what is it worth?

Please refer to section 5.1.1 for general context and appropriate asset management interpretation of this section's specifics.

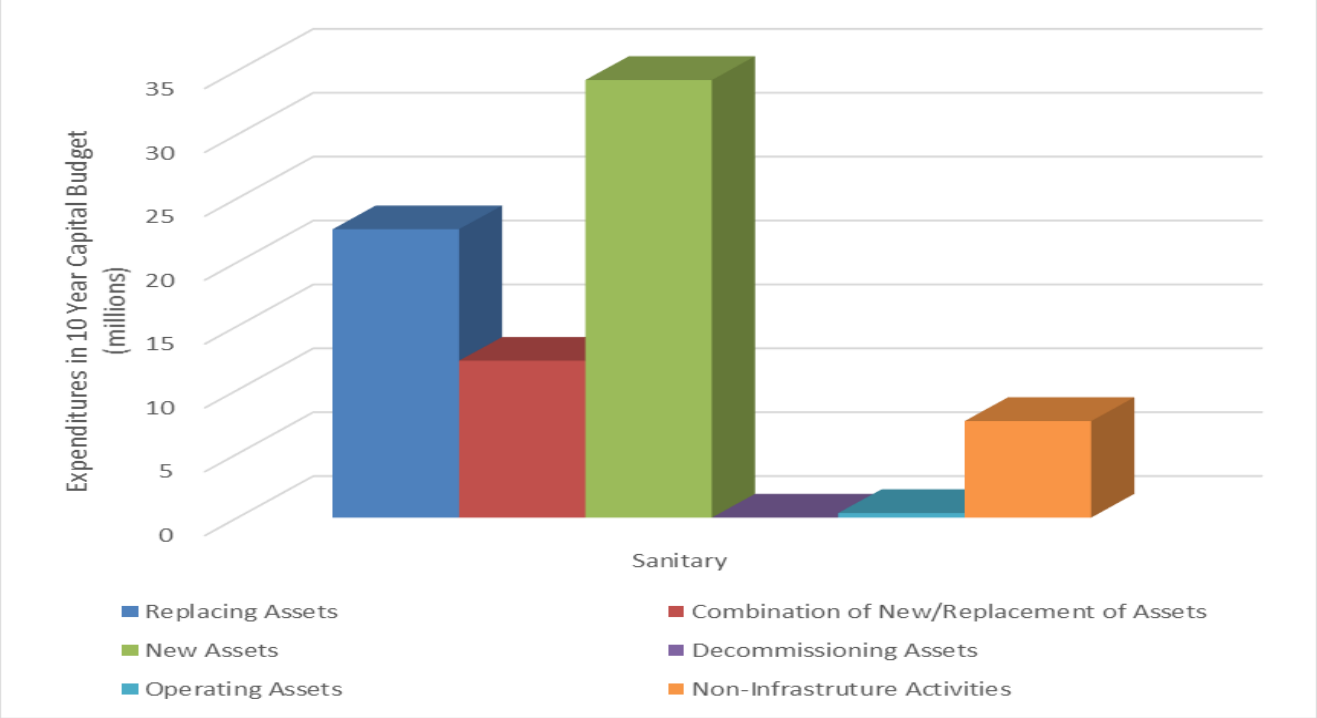
The sanitary sewer collection network is comprised of approximately 417 km of pipes and 6 sanitary wastewater pumping stations. The total replacement value of the sanitary network is approximately $424 million. The pipe network accounts for 96% of the replacement value of the sanitary sewer collection network; the sanitary wastewater pumping stations account for the other 4% of the replacement value.

8.2.2.2 Allocation of Infrastructure Funding

Please refer to section 5.1.2 for general context and appropriate asset management interpretation of this section's specifics.

As indicated in Section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Sanitary pipes and pumping stations assets have an estimated $77 million in funding allocated in the Approved 2020-2022 Capital Budget and 2023-2029 Capital Forecast. The distribution of the funding is shown in **Figure 20**. The new infrastructure for Sanitary Collection is mainly related to the expenditures for Beaver Creek Meadows, Ira Needles bypass and Platinum Drive.

Figure 20: 2020-2029 Capital Funding Distribution for Sanitary Sewer Assets



The City also spends money on infrastructure through its annual operating budget.
Table 7 in Section 4.3 provides a summary of the planned expenditures in the 2020-2022 operating budget. Approximately $1.5 million or 0.8% of the operating budget is considered to be directly related to treating Sanitary assets. For example, the Sanitary operating budget includes $156,000 for sanitary pumping station treatments each year.

8.2.2.3 Rehabilitation or Replacement Strategies

Please refer to section 5.1.3 for general context and appropriate asset management interpretation of this section's specifics.

- Sanitary sewers
  Can be either rehabilitated or replaced. The current strategy in Waterloo is to replace sanitary sewers that are in poor or very poor condition (i.e. a forecasted performance between 0% and 40%, with confirmed deterioration information) in coordination with the replacement of the road surface and other subsurface infrastructure, such as watermains or storm sewers.

  Large, critical trunk sewers with a diameter of 400 mm or greater are replaced/rehabilitated when they reach a forecasted performance of 40% (with confirmed deterioration information). Sub-trunk sewers with a diameter of 250 mm to 400 mm are replaced/rehabilitated when they reach a forecasted performance of 20% (with confirmed deterioration information). Local sewers with a diameter of less than 250 mm are replaced/rehabilitated when they reach a forecasted performance of 0% (with confirmed deterioration information).

  The decision-making regarding when to rehabilitate poor or very poor condition sanitary sewers is based on a detailed review of the observations from camera inspections that help the City's SMEs determine when rehabilitation is preferred over replacement.

- Sanitary wastewater pumping stations
  Are rehabilitated on an as-needed basis as components in each facility reach the end of their useful life (i.e. reach a performance of 0%).

8.2.2.4 Lifecycle Management Activities

Please refer to section 5.1.4 for general context and appropriate asset management interpretation of this section's specifics.

For Sanitary pipe maintenance the following lifecycle management activity options exist, but are not limited to:

- Flushing
- Spot repair

For Sanitary pipe rehabilitation the following lifecycle management activity options exist, but are not limited to:

- Lining

For Sanitary pipe reconstruction or replacement the following lifecycle management activity options exist, but are not limited to:

- Replacement

For Sanitary Pumping Station maintenance the following lifecycle management activity options exist, but are not limited to:

- Scheduled maintenance (Inspect, clean, lubricate)
- Unclogging pump

For Sanitary Pumping Stations rehabilitation the following lifecycle management activity options exist, but are not limited to:

- Pump parts refurbishment
- Pump parts replacement

For Sanitary Pumping Station replacement the following lifecycle management activity options exist, but are not limited to:

- Pump replacement

The Waterloo DSS is used to forecast the Sanitary asset class performance and corresponding expenditure over a 25-year span. Once the forecast activities are within the one to three year span, SMEs determine the appropriate treatment within the forecasted general categories above. In doing so, all available information relating to the items listed in **Table 10** and **Table 11** is considered by the SMEs in order to determine the treatment of optimal cost/benefit to the community. It is not atypical to adjust treatments and costs from the original forecast. This is because more information becomes available closer to the start of the project (i.e. through surveying, detailed design, etc.). However, the total projected performance and expenditure for the year are not impacted. This is because the limits of scientific forecasting occur at the aggregate level of asset class performance and spending.

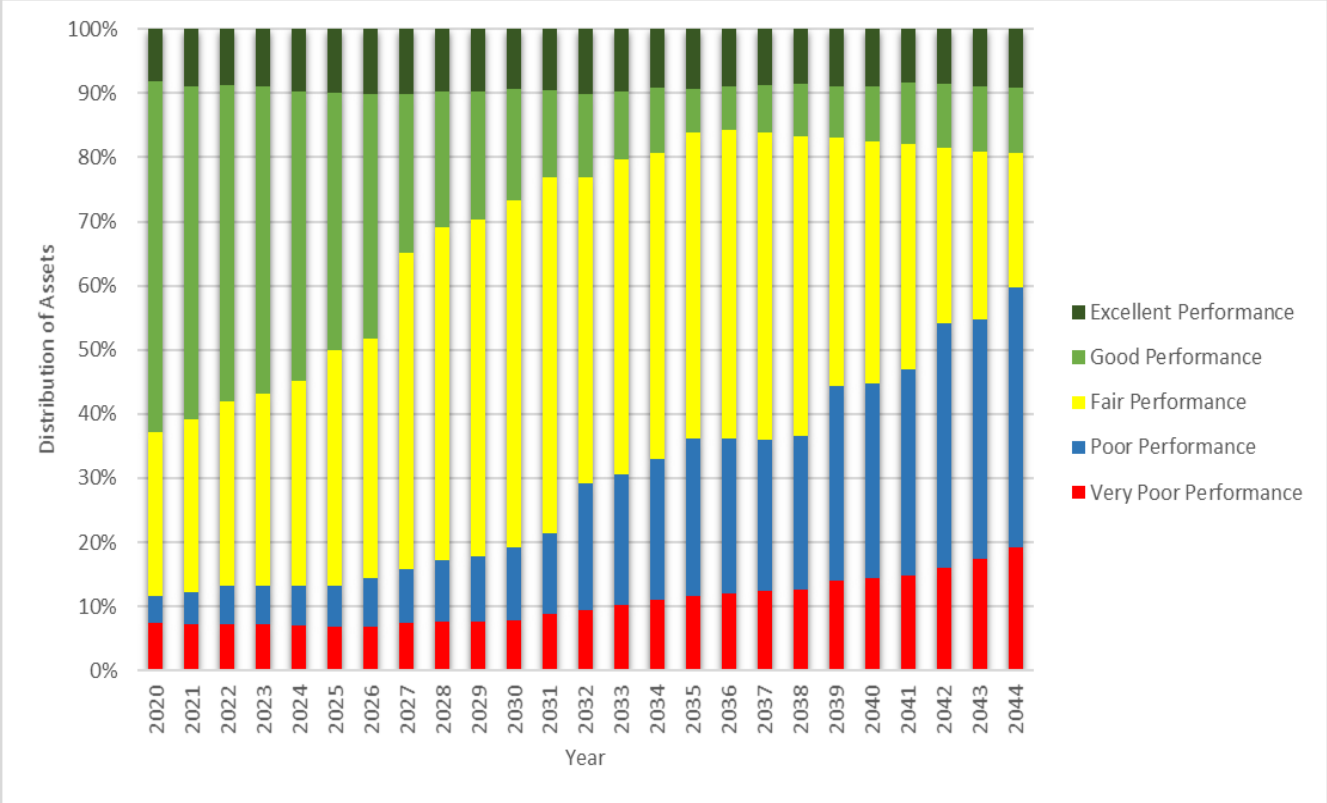
8.2.2.5 Levels of Service

Please refer to section 5.1.5 for general context and appropriate asset management interpretation of this section's specifics.

8.2.2.5.1 Current Performance and Projected impact of Budgeted Capital Expenditures

There are currently just over 10% of sanitary sewer collection assets exhibiting poor or very poor performance profiles as identified in **Figure 21**. The average annual budgeted capital expenditures of approximately $2.5 million will result in a decline in the performance profile over the next 25 years that may be an unacceptable level of service to most stakeholders. The proportion of the sanitary sewer collection asset class with fair, good, and excellent performance decreases from 89% to 40% over the 25-year span. The remaining portions of the asset class are in the poor and very poor performance categories for the same time span.

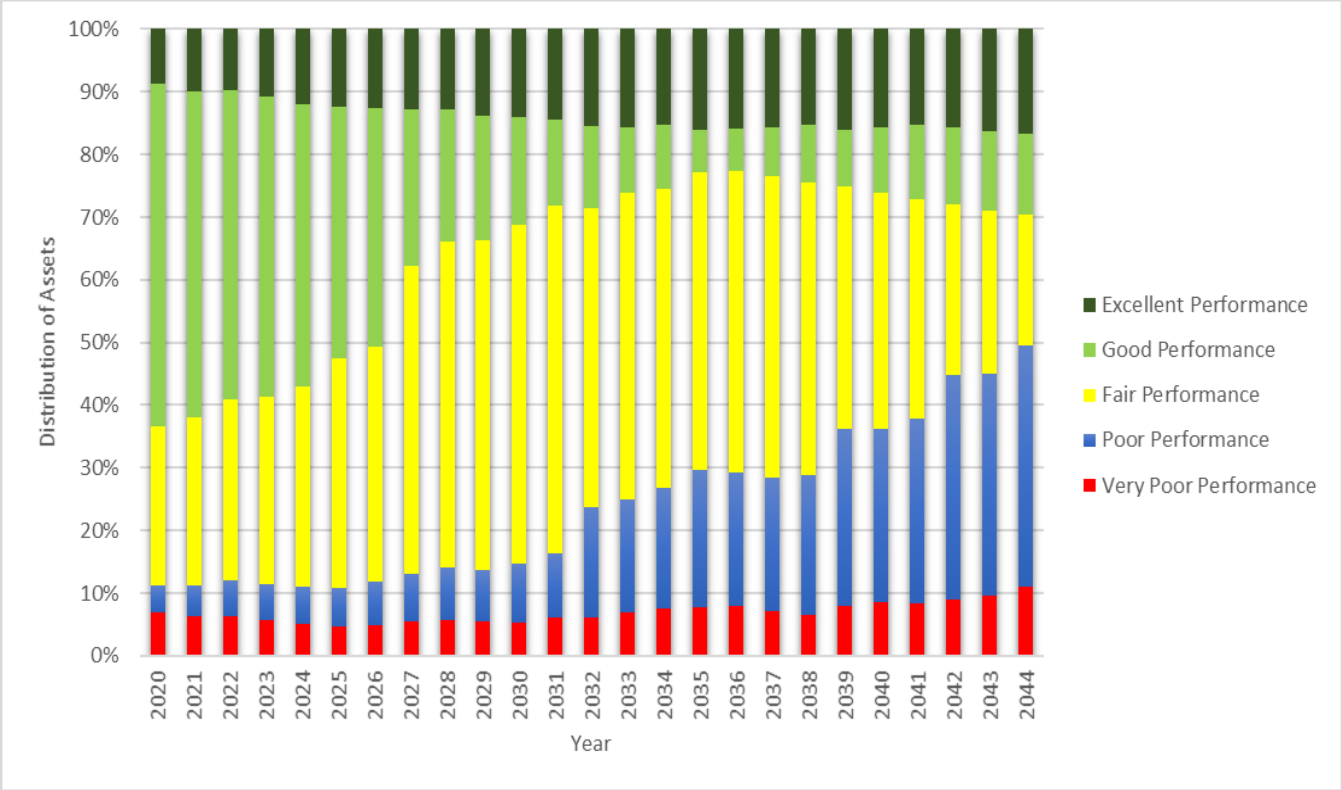
Figure 21: Annual Performance of Sanitary Assets in the Budget Scenario



8.2.2.5.2 Target Performance and Required Expenditures

An average annual expenditure of approximately $4.2 million over the next 25 years is required to achieve the target performance profile for the sanitary sewer collection asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance decreases from 89% to 50% over the 25-year span, although this is a greater percentage compared to the budget scenario (40%). The remaining portions of the asset class are in the poor and very poor performance categories for the same time span as illustrated in **Figure 22**.

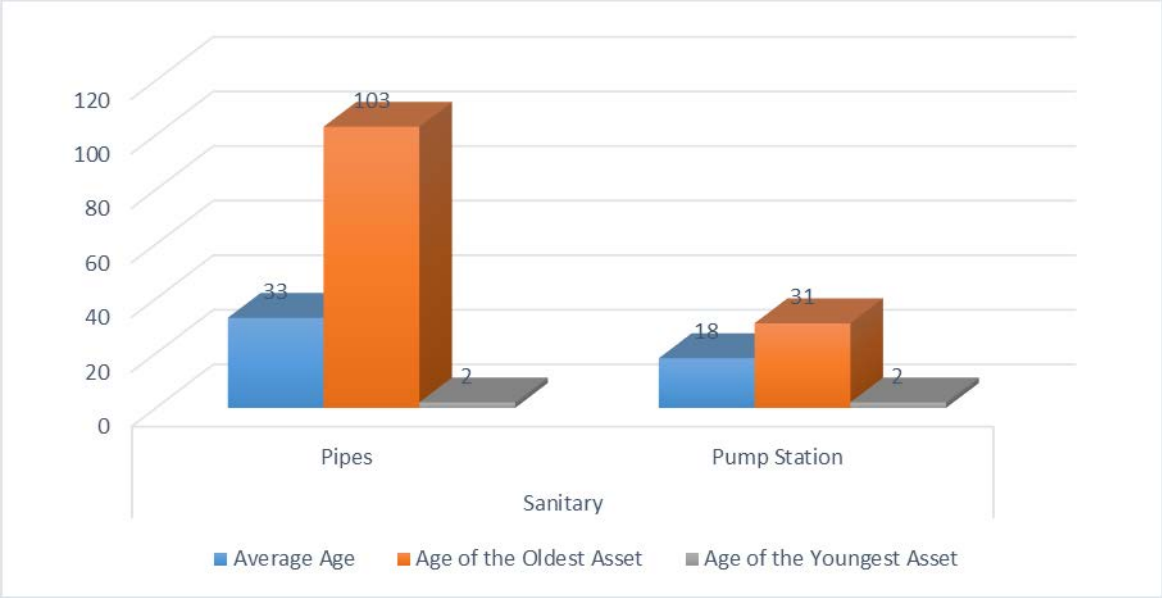
Figure 22: Annual Performance of Sanitary Assets in the Target Scenario



8.2.2.5.3 Ontario Regulation 588/17

A requirement for O. Reg. 588/17 is the reporting of the average age of assets. **Figure 23** identifies the average age for both the pipe network and pumping stations.

Figure 23: Average Age (Years) for Sanitary



Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on. As a core asset, sanitary metrics are identified below in **Table** *18* and **Table 19.**

Table 18: Sanitary Sewer Community Levels of Service Metrics

Service Attribute	Community Level of Service Measure	Community LOS Performance
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system.	The City of Waterloo is largely built out to the municipal boundary, and provides wastewater collection to most properties within the urban areas while a small portion of the rural areas are serviced by private septic systems.
Reliability	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or homes.	Stormwater may enter the sanitary sewer through multiple sources: • Groundwater may enter sanitary sewers through defective pipe joints; • Broken pipes in areas with high groundwater elevation; • Through sump pump or roof drain connections All of the aforementioned sources could lead to an increased flow to the wastewater treatment plant.
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described above.	The City of Waterloo has a separate sanitary sewer system to prevent stormwater entering the wastewater system. The City uses flow monitors and rain gauges to monitor the status of the system as a method of identifying Inflow and Infiltrations issues. The City also has a camera inspection program to review internal structural condition and operational performance.

Table 19: Sanitary Sewer Technical Levels of Service Metrics

Service Attribute	Technical Level of Service Measure	2018	2019
Scope	% of properties connected to the municipal wastewater system.	98.8%	98.8%
Reliability	# of connection days per year due to wastewater backups compared to the total # of properties connected to the municipal wastewater system.	0.0%	0.0%
	# of effluent violations per year due to wastewater discharge compared to the total # of properties connected to the municipal wastewater system.	0.0%	0.0%

8.2.2.6 Demand Management Plan

Please refer to section 5.1.6 for general context and appropriate asset management interpretation of this section's specifics.

Demand for new services is are driven by various factors, such as population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

The Waterloo DSS will be used to assist Sanitary SMEs in demand management planning.

8.2.2.7 Risk

Please refer to section 5.1.7 for general context and appropriate asset management interpretation of this section's specifics.

Risk related to the Sanitary asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that the Sanitary Sewer's Level of Service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS allows staff to ensure that the future probability of underperforming infrastructure and its consequences is minimized.

In addition to their inherent expertise, in order to minimize risk, SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are include in **Table 11**. All corporate information related to Sanitary asset management is centralized within the Waterloo DSS, allowing staff to make comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

8.2.2.8 Conclusion and Next Steps

The difference between Budget (existing) and Target Levels of Service (i.e. infrastructure performance) over the next 25-years is relatively low when compared to other asset classes. In order to remedy the performance gap it is estimated that an additional $1.7 million per annum is required.

In order to ensure management of Sanitary assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous effort in increasing performance data collection capabilities
- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time with respect to sharing information required for the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class level) application of asset management principles
- Increasing awareness of general forecasting principles

Operational steps will include:

- Where applicable, developing data collection templates and means
- Continuous engagement with SMEs on progress
- Improving consumer-based modelling parameters