# TOWN OF LINCOLN
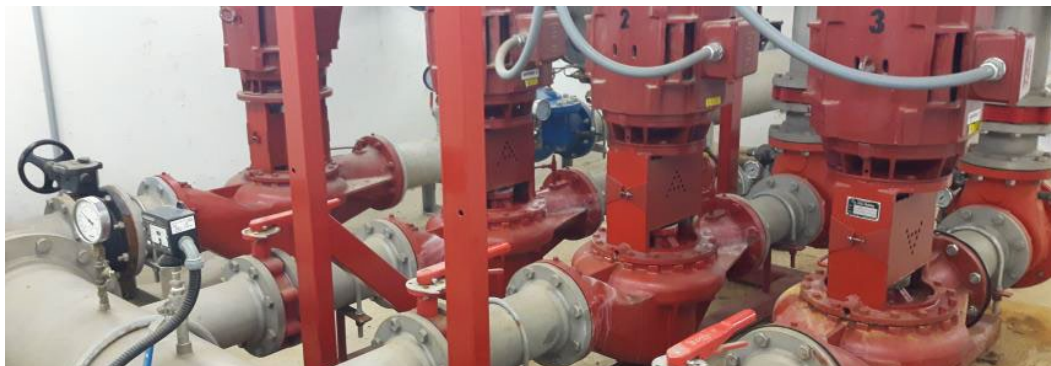


APRIL 28, 2022

# UTILITY ASSET MANAGEMENT PLAN

## TOWN OF LINCOLN

DRAFT
DATE: APRIL 2022

# TABLE OF CONTENTS

## APPENDICES

**A**    LIFECYCLE STRATEGIES

**B**    RESILIENCY ACTIONS

# 1  GOVERNANCE AND LEADERSHIP

## 1.1  OVERVIEW

The Town of Lincoln is located on the southern shore of Lake Ontario. The water distribution system and wastewater collection system are part of a network of infrastructure and operated by the municipality. They are used for supplying clean safe drinking water and collecting wastewater primarily within the urban boundary and are essential to a community's ability to function, grow and prosper. In Lincoln, the water and wastewater system is a two-tier system with the majority of watermains and sanitary sewers being under the jurisdiction of the Town of Lincoln, which include the Beamsville Water Distribution System and the Jordan-Vineland Water Distribution System. However, large diameter transmission mains, force-mains, sewage pumping stations, reservoirs and water and wastewater treatment plants are typically owned and operated by the Niagara Region.

These assets support the community's quality of life and its dynamic economy including agriculture, agri-tourism, viniculture, wineries, breweries, and industry.

The Town of Lincoln's water and wastewater services include the following core asset categories and asset types (Table 1):

**Table 1: Town of Lincoln Water and Wastewater Assets**

| Service Area Asset Management Plan – Water and Wastewater | |
|---|---|
| **Asset Category** | **Asset Type** |
| *Water* | Watermains (PVC, HDPE, Asbestos Cement (AC), Ductile Iron and Lined Cast Iron) |
| | Valves and Curbstops |
| | Hydrants |
| | Pumping and Booster Stations |
| *Wastewater* | Sanitary Sewers and Mains |
| | Maintenance Holes |

As Lincoln continues to experience growth, it is critical for the Town's water and wastewater infrastructure to be managed in a way that provides a high level of service for the lowest life cycle cost of these assets. This asset management plan also needs to account for the communities need to adapt and change as the Town continues to grow at a rapid pace, planning for future assets that connect properties within the Urban Boundary to water and wastewater infrastructure.

## 1.2  ROLES AND RESPONSIBILITIES

The **Chief Administrative Officer** (CAO) is responsible for oversight and administration of the Town's services. The CAO implements the policies and direction of Council. With support from the senior management team, develops strategic planning initiatives for the organization.

The **Town's Public Works Department** is responsible for the stewardship of all core asset categories outlined in the Water and Wastewater Asset Management Plan. The teams supporting this mandate are highlighted below:

1. **Environmental Services Department**: the monitoring and tracking the service condition of capital assets as well as planning the rehabilitation and/or replacement of these assets as required including financial planning. The Environmental Services team is also responsible for the day-to-day operation and maintenance of core water and wastewater assets as required under Ontario regulations.

2. **Technical Services Department**: responsible for supporting the monitoring and tracking of the service condition of capital assets as well as planning the rehabilitation and/or replacement of these assets as required. The engineering team also works with the Environmental Services Department for financial planning as it relates to lifecycle strategies for all core capital assets within the water and wastewater systems.

3. **Capital Services Department**: responsible for completing capital renewal and upgrade projects. Works closely with all other departments.

4. **Finance Department:** responsible for supporting development of water and wastewater financial plans and rate studies to ensure the water and wastewater systems are adequately funded.

5. **Planning and Development Department:** oversees planning initiatives to support effective and responsible growth and development in Lincoln. The department is responsible for a wide variety of functions associated with planning and land use including working with the Environmental Services Department to ensure that sufficient capacity is available to support growth.
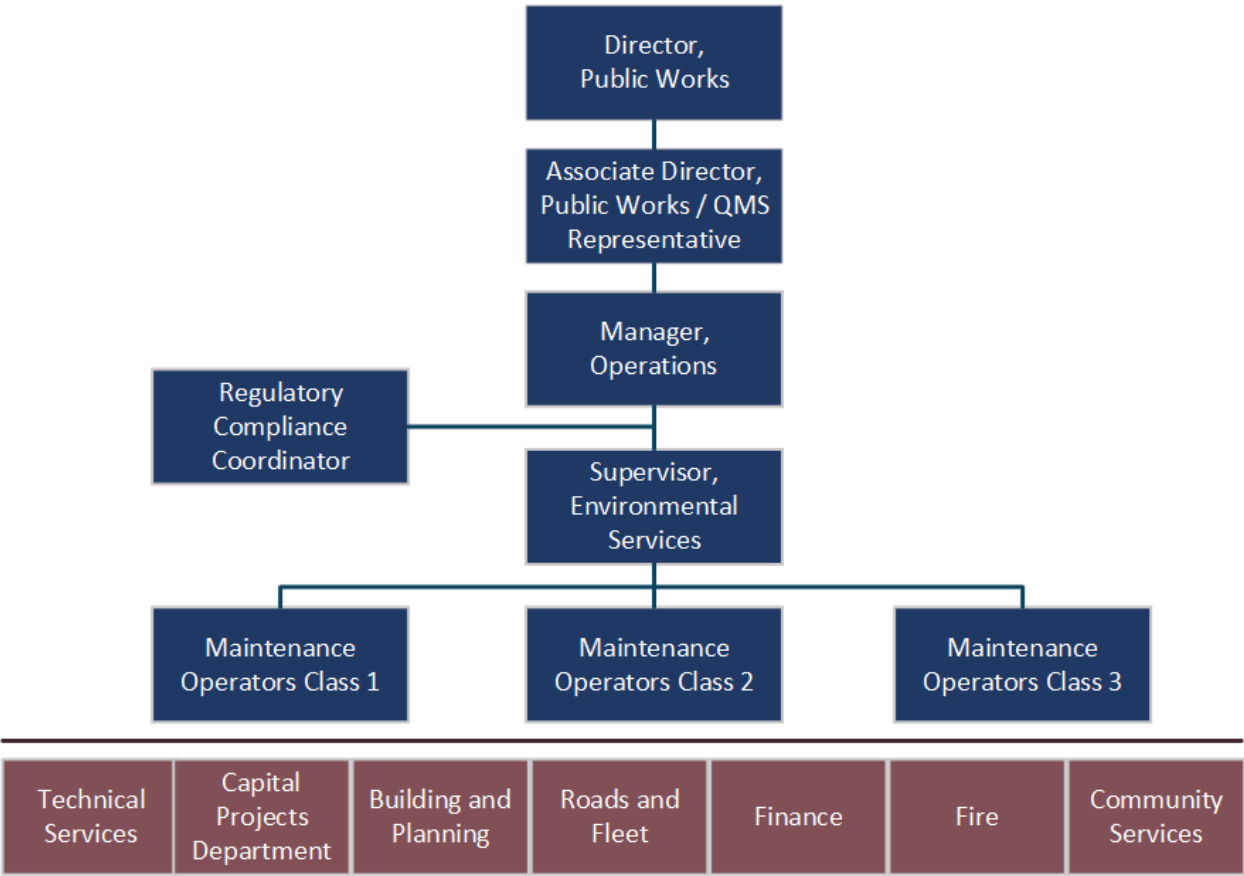
## 1.3  GOALS AND OBJECTIVES

The Town of Lincoln's strategic plan "A Future Fit Lincoln" describes its strategic priorities to build a welcoming, connected, vibrant and resilient community. The long-term vision statement for the Town is:



**A place to grow:**

Youth, aging in place, agriculture – growing crops, farming, greenhouse support, business growth, early childhood development (youth), proper planning and growing smart, growing your family here in Lincoln.

**A place to prosper:**

A place for small/medium businesses to succeed, opportunities, job creation, tourism, destination, local markets, festivals, beautification, industrial parks, prosperity, community vibrancy, innovation.

**A place to belong:**

Maintain community feeling, connectedness, more local events, support for families, history and heritage, local markets, local and unique festivals, moving around town, one community.

### 1.3.1 LINCOLN UTILITY GOALS

The Lincoln Utility Service is an essential service that supports achievement of the Town's vision (a place to grow; a place to prosper; and a place to belong).

The Corporation of the Town of Lincoln, as owner and operator of the Beamsville Water Distribution System, Jordan-Vineland Water Distribution System, and Sanitary service is committed to:

- Providing a consistent supply of clean, safe drinking water to consumers,
- Providing a reliable sanitary service that meets the needs of the community,
- Complying with applicable legislation and regulations, and
- Maintaining and continually improving its quality management system.

## 1.4 CONTEXT FOR ASSET MANAGEMENT PLAN DOCUMENT

### 1.4.1 RELATIONSHIP WITH OTHER DOCUMENTS

The Town recognizes the importance of proactive and responsible management of its water and wastewater infrastructure. Figure 1 shows the linkage and relationships between asset data and how it informs asset management plans, financial and master planning documents, corporate asset management plans, climate adaptation and mitigation plan and policy statements, which in the Utilities Service Area Asset Management Plan will strive to meet the goals of a *Future-Fit Lincoln*. These goals are to provide a reliable, effective, and supportive service in a financially responsible way that is aligned to the community vision.
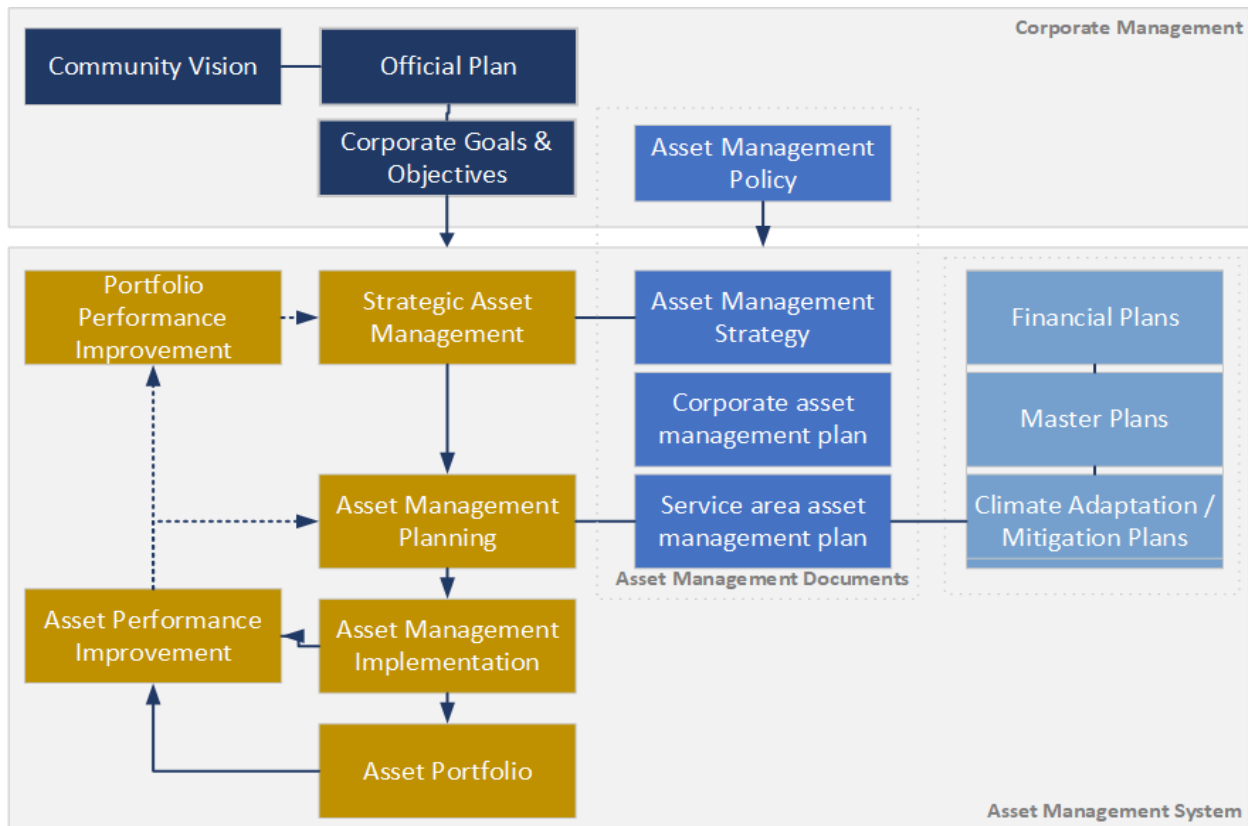
**Figure 1: Relationship to Corporate Documents**

### 1.4.2    REFERENCE DOCUMENTS

Additionally, the following other plans and strategies were referenced in the preparation of this Asset Management Plan

- Baker Road Pollution Prevention Control Plan
- Individual Area Inflow and Infiltration Reduction Plans
- Beamsville and Jordan-Vineland Drinking Water Quality Management System
- Sanitary Sewers Condition Assessment and Rehabilitation Work Plan
- Master Servicing Plan

### 1.4.3    LIMITATIONS AND ASSUMPTIONS

This Asset Management Plan has been prepared based on the best information available regarding inventory and costs of providing the service, adequate maintenance, and renewal of assets in a "whole of lifecycle" manner. Continuous improvement of Lincoln's asset management practices is essential to collect accurate asset information that supports quality planning and sustainable infrastructure management.

The limitations encountered in developing this plan are summarized in Table 2. Recognizing these limitations will help inform the continuous improvement process for future versions of the Asset Management Plan.

**Table 2: Limitations of the Asset Management Plan**

| Limitation | Impact |
|---|---|
| *Asset Data* | The Town's inventory is stored in multiple tables and databases and contains gaps and duplicates. A data management plan was developed in 2021 and recommends a centralized database be adopted for all asset inventory as well as the development of procedures for regularly updating the data. This is still to be implemented. |
| *State of the infrastructure* | The state of the infrastructure is based on currently available inventory data. |
| *Financial* | The costs associated with construction have increased at a higher rate than average annual inflation. This has been reflected in the average unit costs used to develop replacement costs and renewal forecast. The replacement costs should be reviewed as part of future updates to ensure the replacement costs remain accurate and reflect the state of the construction industry. |

### 1.4.4   IMPLEMENTATION AND REVIEW

The water and wastewater asset management plan forms part of Lincoln's continuous asset management improvement process. It documents current practices and information on:

- The quantity, age, condition, and value of the assets
- Current levels of service and performance measures
- Current practices for managing the assets
- Risks to service delivery
- Renewal plans and financial strategy

The asset management plan also documents improvement tasks that if addressed will increase the level of understanding of the service provided by the water and wastewater systems. It will empower decision-makers with accurate and complete information in an easy-to-understand format that will support well-informed, evidence-based decisions that can make the best use of available funding whilst meeting the interests of the Town residents. The implementation of this Asset Management Plan should therefore include regular review and update to keep the plan up to date with the latest information, understanding and projections.

The review cycle for implementing and updating the asset management plan is every five years as a minimum, and sooner of there is a significant change in costs, requirements, available data, or risks. Consideration must also be given in each asset management plan update to any changes in the Ontario Requirements 588/17: Asset Management Planning for Municipal Infrastructure.

# 2  KNOW YOUR ASSETS

## 2.1  CONTEXT FOR INFORMATION IN THIS SECTION

The following sections describe the current state of infrastructure for the water and wastewater services maintained by the Town of Lincoln.

The state of infrastructure for the water and wastewater services includes the following asset groups:

- Water Mains
- Service Lines
- Pressure Reducing Valves
- Water Stations
- Water Valves
- Check Valves
- Sewer Mains
- Sewer Maintenance Holes

A summary of state of infrastructure statistics for each asset group is reported in the next section of this plan. These statistics include the quantity of assets in each group, their average age, the total replacement value, graphs showing the condition profile and age profile of the assets, and a long-term financial forecast for replacing existing assets as they reach the end of their useful life.

### 2.1.1  INFRASTRUCTURE DATA SOURCE

The inventory data for utilities was sourced from CityWide and CGIS. Table 3 shows the asset groups and their respective data source.

**Table 3: Data Source by Asset Group**

| Asset Group | Data Source |
|---|---|
| *Water Mains* | Citywide |
| *Service Lines* | Citywide |
| *Pressure Reducing Valves* | CGIS |
| *Water Stations* | Citywide |
| *Water Valves* | CGIS |
| *Check Valves* | CGIS |
| *Sewer Mains* | Citywide |
| *Sewer Maintenance Holes* | CGIS |

## 2.1.2  *MINIMUM DATA REQUIREMENTS*

Currency and accuracy of asset data is critical to effective asset management, accurate financial forecasts, and informed decision-making. To produce the state of infrastructure section of the asset management plan, the following attribute data is required (where applicable):

- Unique asset identifier
- Asset owner
- Asset status (e.g., active, abandoned, not in use)
- Asset group
- Asset type
- Install Year
- Estimated useful life (EUL)
- Size 1 (e.g., diameter, width, height, power)
- Size 2 (e.g., length, width, height, quantity)
- Size 3 (e.g., area, quantity, depth)
- Material type (where applicable)
- Replacement cost or Unit rate

All assets currently have the minimum attribute information available.

## 2.1.3  *ASSET REPLACEMENT COSTS*

The asset replacement costs have either been based on recent construction projects or estimated by Town staff. The following key points (regarding assumptions and default values) are noted:

- The unit rates for pressure reducing valves, check valves, and water valves, are based on valves that are 200mm in diameter.
- The replacement costs for the large water station is based on recent construction costs.
- The unit replacement costs for the smaller water stations have been estimated by Town Staff.
- Unit replacement costs for maintenance holes are based on 1200mm diameter.
- An additional $70/m was added to all watermains to account for hydrants and service laterals.
- All unit costs reflect uncertainties in cost of materials and construction since the pandemic started.

## 2.1.4  *ASSET LIFESPANS*

The lifespans of all water and wastewater assets reflect the typical lifespan expected of the material the asset is made of. However, the water booster stations, have very short lifespans (20 years for the larger station and 15 years for the smaller stations). These lifespans would more closely reflect the lifespan of the pumps housed inside the booster stations rather than the stations as a whole.

It is recommended that the Town componentize the booster stations so that asset condition can be better tracked, and the accuracy of the renewal forecast for booster stations be improved.

## 2.1.5 ASSET CONDITION

The condition of assets is estimated based on the assets' age and remaining lifespan following the scale shown in Table 4. It is worth noting that a condition assessment of sewer pipes was completed in 2021. Each sewer pipe was assessed for defects and risk, but a condition score wasn't assigned therefore the results of this assessment have not been included in this asset management plan. The outcomes of the sewer assessment have been used to identify and repair and rehabilitation work planned for 2022 and 2023.

**Table 4: Age-based condition rating**

| SCORE | CONDITION RATING | % OF REMAINING USEFUL LIFE (RUL) | RATING DESCRIPTION |
|---|---|---|---|
| 1 | **Very Good:** Fit for the future | RUL ≥ 75% | The infrastructure in the system or network has greater than or equal to 75% of its remaining useful life. It is generally in very good condition, typically new or recently rehabilitated. |
| 2 | **Good:** Adequate for now | 75% > RUL ≥ 35% | The infrastructure in the system or network has less than 75% (and greater than or equal to 35%) of its remaining service life. It is in good condition. |
| 3 | **Fair:** Requires attention | 35% > RUL ≥ 13% | The infrastructure in the system or network has less than 35% (and greater than or equal to 13%) of its remaining service life. It is in fair condition. |
| 4 | **Poor:** At risk | 13% > RUL ≥ 3% | The infrastructure in the system or network has less than 13% (and greater than or equal to 3%) of its remaining service life. It is in poor condition and mostly below standard, with many elements approaching the end of their service life. |
| 5 | **Very Poor:** Unfit for sustained service | RUL < 3% | The infrastructure in the system or network has less than 3% of its remaining service life. It is in very poor, unacceptable condition and should be replaced or rehabilitated. |

## 2.1.6 DATA ASSUMPTIONS AND LIMITATIONS

The asset data used to produce the state of infrastructure has been sourced from multiple sources. The following assumptions were made where attributes were missing:

- Current pipe material was assumed to be PVC
- Pipes will all be replaced with PVC
- Size of valves was assumed to be 200mm
- Size of maintenance holes was assumed to be 1200mm
- Installation date was estimated based on the installation date of the closest road.

## 2.2 STATE OF INFRASTRUCTURE

Table 5 shows a summary of the existing Town's water and wastewater infrastructure.

- Category – Indicates the service area that the asset belongs to.
- Asset Type – Lists each asset type (group of similar assets).
- Quantity - The numbers listed in the "quantity" column of Table 5. represent the length of linear assets (water mains, service lines, and sewer pipes) or the number of point assets (valves, stations, and maintenance holes).
- Average Age - The average age of the water and wastewater assets at the Town of Lincoln ranges from 4 to 39 years. The average age is weighted for asset replacement cost.
- Average Expected Life - The average expected lifespan of the water and wastewater assets is based on the lifespans typical for the materials that they are made of. The lifespans for the booster stations are low when compared to the other asset types. This may be attributed to the lifespan of the pumps rather than the station as a whole.
- Average Condition - The average condition of the water and wastewater assets at the Town of Lincoln is Good (2). The average condition is weighted for asset replacement cost.
- Current Replacement Cost - The replacement costs were based on average unit rates as described in Section 2.1.3.

**Table 5: Current State of Infrastructure**

| Category | Asset Type | Quantity | | Average Age (yr.) | Average Expected Life (yr.) | Average Condition | Current Replacement Cost |
|---|---|---|---|---|---|---|---|
| *Water Service* | Water Lines | 81,378 | m | 26 | 78 | Good | $85,997,600 |
| | Service Lines | 1,453 | m | 28 | 79 | Good | $953,000 |
| | Pressure Reducing Valves | 17 | No. | 39 | 60 | Fair | $2,284,800 |
| | Water Station | 3 | No. | 4 | 19 | Very good | $2,850,000 |
| | Water Valves | 971 | No. | 35 | 50 | Good | $4,660,800 |
| | Check Valves | 14 | No. | 22 | 50 | Good | $112,000 |
| *Wastewater Service* | Pipes | 85,072 | m | 32 | 78 | Good | $86,680,500 |
| | Maintenance Holes | 1,127 | No. | 29 | 75 | Good | $22,540,000 |
| ***Asset Total*** | | | | **29** | **76** | **Good** | **$206,078,700** |

The total current estimated replacement costs for the water and wastewater assets are estimated at $206M (in 2021 dollars).

Figure 2 shows the summary condition and age profile for water and wastewater assets combined.

The percentages in the condition profile are based on the total replacement cost of assets in each condition category. Most of the assets are in very good or good condition (83%). 9% of the assets are in fair condition, 6% of the assets are in poor condition, and the remaining 2% are in very poor condition.

The assets in poor and very poor condition are nearing or beyond their estimated useful lifespan and includes mostly maintenance holes. It is recommended that the Town complete condition assessments of these assets and revise the condition ratings and remaining life in the state of infrastructure tool and report revised values in the next iteration of this asset management plan.
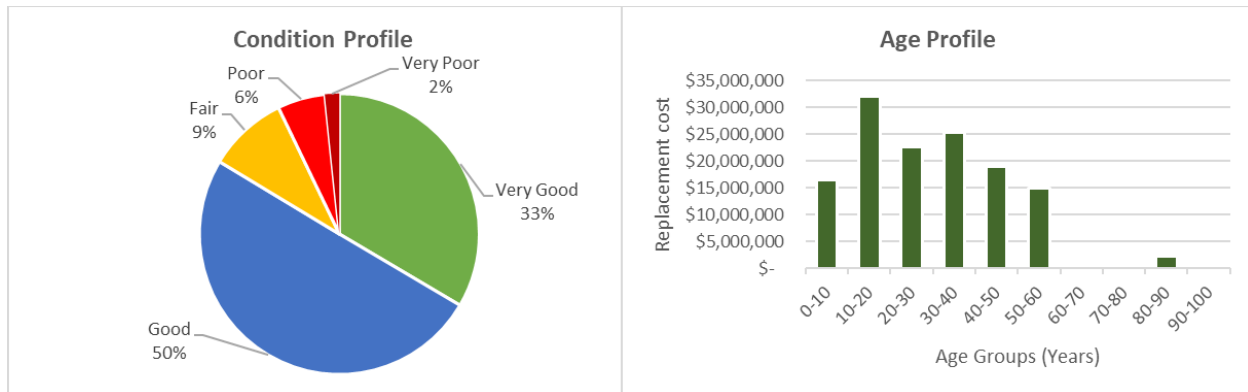


**Figure 2: Age and Condition Profile**

Figure 3 shows the 100-year renewal forecast of existing assets based on asset age and estimated replacement cost. Based on the current inventory, there are approximately $3.6M worth of assets indicated for replacement in the first year of the forecast period. These renewals comprise of $2.4M of maintenance holes and $1.2M of valve replacements (pressure reducing valves, check valves, and water valves). These assets should be inspected to verify condition, confirm timing for replacement, and update replacement cost estimate for site specific details.

Over the 100-year forecast, there are some significant peaks in renewals costs forecasted with over $8.0M for 2060, 2070, 2080, 2087, 2089 and 2109. The average annual cost to sustainably fund the current assets is approximately $2.2M per annum over the next 50 years and $2.5M over the next 100 years. This information is intended to provide context to decision-makers on the overall level of investment required to sustainably fund asset renewals for the forecast period.
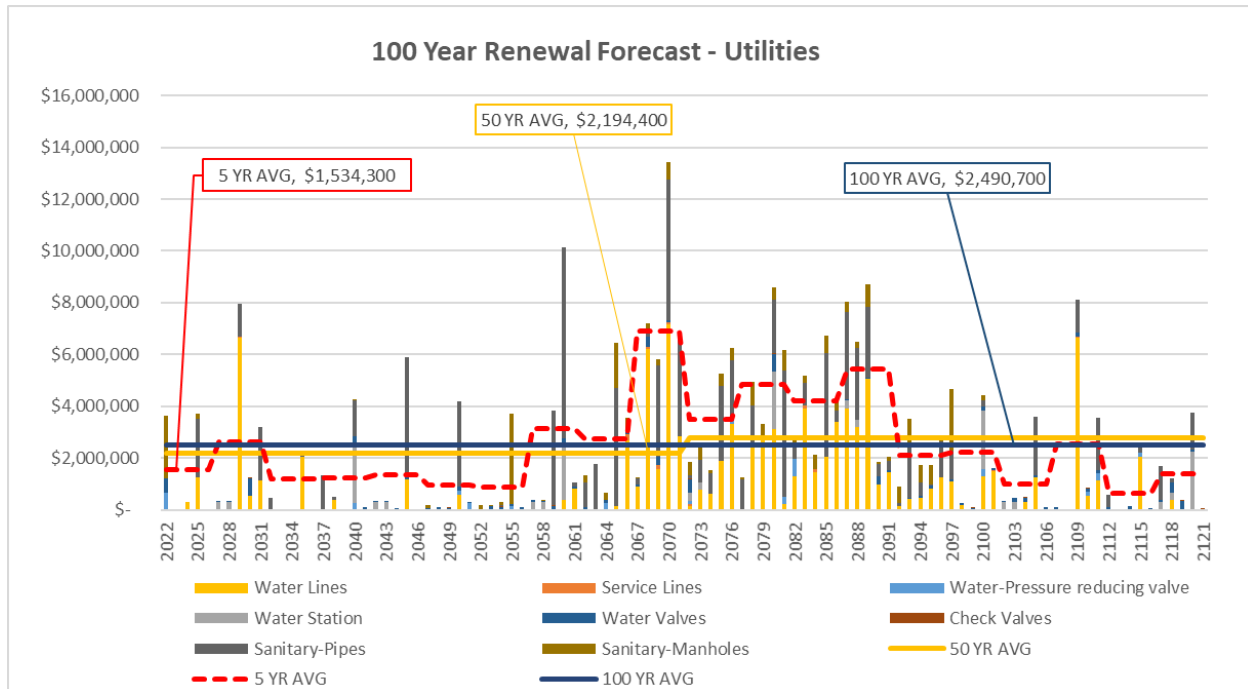
**Figure 3: Water and Wastewater 100-Year Renewal Forecast**

Note that more detailed analysis at the asset level and assessment of project options would be required for determining budgets for individual capital renewal projects and a consideration for expansion to support growth.

## 2.3 STATE OF THE INFRASTRUCTURE IMPROVEMENT PRIORITIES

Table 6 shows a prioritized list of improvements relating to asset data and state of infrastructure.

**Table 6: State of Infrastructure Improvement tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *1* | 2 | Asset Data | Develop and implement a plan to continuously verify and update data register. This includes adding assets that are currently not recorded, updating records when an asset is replaced and filling any current gaps where attributes are missing. | High |

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| 2 | 2 | Asset Data | Align asset identifiers for sewer mains in sanitary asset data with identifiers in condition assessment information. Update asset register with condition data every 5 years as per the asset management policy and revise the state of infrastructure section in the next iteration of asset management plan. | High |
| 3 | 2 | Asset Data | Update water asset inventory to componentize water booster stations (e.g., building or chamber assets, electrical and controls, pumps, valves, flow monitor, generator). | High |
| 4 | 2 | Asset Data | Update inventory to reflect current assets, including addressing any data gaps in the current inventory and adding any assets not captured, for example hydrants and sewer laterals. | High |
| 5 | 2 | Asset Data | Implement the recommendations included in the Data Management Plan, in particular:<br>• Developing a data standard and data hierarchy to ensure consistency<br>• Develop roles and assign responsibility of the management of data<br>• Adopt a database software to host data and have a single source of truth | High |
| 6 | 2 | Asset Data | Record the age of assets when they are replaced, and the reason for replacing them (e.g., deterioration, not performing as required). | Medium |
| 7 | 2 | Asset Data | Retain asset attributes for assets that are out of service. This information can be used once sufficient historical data is accumulated to gain a better understanding of performance trends, in particular for assets where the timing for replacement is not regulated. | Medium |
| 8 | 2 | Asset Data | Review unit costs against recent construction projects and market rates relevant at the time of the update. | High |

# 3 MANAGE SERVICE DELIVERY

## 3.1 LEVEL OF SERVICE

This section describes the Level of Service (LOS) for the water and wastewater service that the Town of Lincoln aims to deliver and defines the criteria, measures, and targets that will be used to report achievement.

LOS are the service outcomes that an organization delivers. They are a key driver for decisions on future investments in infrastructure assets. As such, they need to be clearly articulated in terms that end users and decision-makers can understand. Having well defined service levels will allow Lincoln to work with its internal stakeholders (other business units and service areas that use the municipal infrastructure), taxpayers and other stakeholders to find an appropriate balance between affordability and community expectations for level of service.

Performance measures indicate what the customers and stakeholders experience from the service that is delivered. Target values are set for performance measures to deliver the intended level of service. Comparison of performance delivered (measured results) to performance intended (target values) assists the Town in both strategic and operational decision making.

Table 7 presents a summary of the approach to describe LOS and performance measures.

**Table 7: Level of Service and Performance Measure Terminology**

| Concept | Definition | Example |
|---|---|---|
| *Level of Service (LOS) Statements* | Specific attributes of the service that the Town intends to deliver from the **customer point of view**. LOS attributes provide the link between higher level corporate and asset management objectives and more detailed technical and operational objectives. They must all align to give the customer the intended experience of the service. | Providing water services with minimal interruption |
| *Service Criteria* | These are the **specific attributes** or key characteristics that each stakeholder group is interested in, regarding the customer level of service | Reliability<br>Availability<br>Safety |
| *Performance measures* | Criteria that can be measured and provide an indication of how the organization is doing in delivering the intended LOS. These can be defined as:<br>- Customer performance measures: Measures describing **how the customer receives or experiences the service**.<br>- Technical performance measures: **Technical criteria the organization can measure** to indicate how the service being achieved. | Customer:<br>Number of complaints due to low water pressure<br>Customer satisfaction survey<br>Technical:<br>Maintenance records<br>Condition of assets<br>Compliance with water regulations |

| Concept | Definition | Example |
|---|---|---|
| *Performance Targets* | The required value (target), for each criterion that is being used as a performance measure. The expectation is that the intended LOS will be achieved if these targets are met. | Customer:<br>>80% satisfaction (from survey)<br>Technical:<br>Percentage of assets that are in poor or very poor condition |

### 3.1.1 LEVEL OF SERVICE DEVELOPMENT APPROACH

The Town of Lincoln Steering Committee participated in an initial round-table discussion to:

- Define the service criteria and relevant LOS statements; and
- Identify appropriate indicators for measuring performance.

### 3.1.2 WATER AND WASTEWATER LEVELS OF SERVICE

Table 8 presents the service criteria and associated level of service statements.

**Table 8: Service criteria and LOS statement**

| Asset | Service criteria | LOS statement |
|---|---|---|
| *Water* | Cost efficiency | Providing water services in an efficient manner |
| *Water* | Safety | Water system supports community fire protection |
| *Water* | Safety | Water system provides safe potable drinking water |
| *Water* | Quality | Providing high quality water to residents |
| *Water* | Reliability | Providing water services with minimal interruptions |
| *Water* | Environmentally conscious | Providing a water service that is environmentally conscious |
| *Wastewater* | Cost efficiency | Providing wastewater services in an efficient manner |
| *Wastewater* | Reliability | Providing wastewater services with minimal interruptions |
| *Wastewater* | Environmentally conscious | Providing wastewater services that have minimal impacts on the environment |
| *Wastewater* | Scope | Providing adequate wastewater services to the community |

The performance measures associated with the service criteria are summarized in Table 9 and Table 10.

**Table 9: Water - levels of service performance measures**

| Service Criteria | Performance Measures | | | | | |
|---|---|---|---|---|---|---|
| | Technical | Current | Target | Customer | Current | Target |
| Cost efficiency | Operating budget for water service | $2,323,540 | TBD | Annual cost to provide water service ($/household) | $648 | TBD |
| Cost efficiency | 10-year average water linear asset renewal budget as a % of replacement value | TBD | TBD | | | |
| Safety | # of watermains attributed to causing a fire flow deficiency | 0 | 0 | % of community with sufficient fire flow protection | 100% | 100% |
| Safety | % compliance with all applicable water quality regulations | 100% | 100% | % of community with acceptable risk of experiencing adverse water quality | 100% | 100% |
| Safety | # of confirmed adverse water quality tests | 0 | 0 | | | |
| Quality | % of system serviced by sources that provide substandard water | 0% | 0% | | | |
| Quality | % of system that is unlined CI/DI | 0% | 0% | # of complaints due to rusty/discoloured water | 1 | 0 |
| Quality | % of system with low pressure | 0% | 10% | # of complaints due to low pressure | 4 (since 2016) | TBD |
| Reliability | % of watermains in poor or very poor condition | 9.2% | 0% | % of customers where service is interrupted above target frequency | TBD | TBD |
| Reliability | % of facility assets in poor or very poor condition | 0% | 0% | | | |
| Reliability | % of critical assets below target condition | TBD | TBD | | | |
| Reliability | % of non-critical assets below target condition | TBD | TBD | | | |
| Reliability | # of WM breaks | 15 | 10 | | | |

| Service Criteria | Performance Measures | | | | | |
|---|---|---|---|---|---|---|
| | Technical | Current | Target | Customer | Current | Target |
| *Reliability* | # of watermains above target break rate | 5 | 0 | | | |
| *Reliability* | # of watermains prone to frozen water services | 1 | 0 | | | |
| *Reliability* | # of unplanned failures resulting in service interruption/reduction | 15 | 10 | | | |
| *Environmentally conscious* | Infrastructure Leakage Index (ILI) | TBD | TBD | Water consumption L/cap/day | 262 | TBD |
| *Scope* | | | | % of residents satisfied with water services | TBD | TBD |

**Table 10: Wastewater levels of service performance measures**

| Service Criteria | Performance Measures | | | | | |
|---|---|---|---|---|---|---|
| | Technical | Current | Target | Customer | Current | Target |
| *Cost efficiency* | Operating budget for wastewater services | $1,195,375 | TBD | Cost to provide service ($/household) | $533 | TBD |
| *Cost efficiency* | Annual operating and maintenance cost/km of sewer | $1,937 | TBD | | | |
| *Cost efficiency* | 10 Year average wastewater linear asset renewal budget as a % of replacement value | 29.0% | TBD | | | |
| *Reliability* | km of sewers in poor or very poor condition | 3.04km | TBD | # of customers that experience a service interruption | 15 | 5 |
| *Reliability* | % of sewers in poor or very poor condition | 4% | TBD | | | |
| *Reliability* | % of the system surcharged within 1.8 m of the ground elevation during a 25-year wet weather event | TBD | TBD | | | |
| *Reliability* | % of the system with adequate resiliency to accommodate the impacts of climate change | TBD | TBD | | | |

| Service Criteria | Performance Measures | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | Technical | Current | Target | Customer | Current | Target |
| *Reliability* | # of sewers with operational issues likely to cause service interruptions | 0% | TBD | | | |
| *Reliability* | % of preventative maintenance activities completed on schedule | TBD | TBD | | | |
| *Reliability* | # of locations with FOG issues or prone to blockages | TBD | TBD | | | |
| *Environmentally conscious* | # of overflow occurrences | 2 | 0 | % of wastewater flows that meet environmental objectives when discharged | 100 | TBD |
| *Environmentally conscious* | Total volume of untreated wastewater discharged into the natural environment via sewer network overflows within past 12 months | 2995.8m$^3$ | 0 | | | |
| *Environmentally conscious* | % compliance with all applicable regulatory requirements | 100 | 100 | | | |
| *Scope* | | | | % of residents satisfied with the wastewater system | TBD | 95 |

Table 11 summarizes the community levels of services required by Ontario Regulations for Asset Management (O.Reg.588/17).

**Table 11: O.Reg. Customer Levels of Service for Utilities**

| Asset | Service Criteria | O.Reg. Requirement | Description |
| --- | --- | --- | --- |
| *Water* | Scope | Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system. | See Figure 4 and Figure 5 |
| *Water* | Scope | Description, which may include maps, of the user groups or areas of the municipality that have fire flow. | See Figure 4 and Figure 5 |

| Asset | Service Criteria | O.Reg. Requirement | Description |
|-------|------------------|--------------------|-------------|
| *Water* | Reliability | Description of boil water advisories and service interruption. | Water Advisories are related to an adverse test result. All past events have likely been caused by operator error after completing resampling as per ministry and PH requirements.<br><br>Service interruptions are typically related to watermain breaks or construction works that require a section of watermain to be isolated. |
| *Wastewater* | Scope | Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system. | See Figure 6 and Figure 7 |
| *Wastewater* | 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. | The Town does not have any combined sewers. Most overflow events from I/I in the system are managed by overflow structures in the Region owned SPSs. The Town manages overflow events immediately upstream of the Bridgeport SPS and the Campden SPS. |
| *Wastewater* | Reliability | Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches. | There are no overflows that happen in or around beaches. The events that we do have at Bridgeport and Campden are during significant wet weather events. These are rare:<br><br>Between 2017-20: average 1/year<br><br>Some damaged cleanouts were located in Campden, along with some rehabilitation works on sewers and maintenance holes that addressed both Jordan Station and Campden. At the time of presenting this AMP, the Town also has an approved pilot program for removing private side sources in Jordan Station (sumps, foundation drains, downspout connections and cracks in laterals). |

| Asset | Service Criteria | O.Reg. Requirement | Description |
|-------|------------------|--------------------|-------------|
| *Wastewater* | 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. | All stormwater enters as I/I into the system. This can be from cracked pipes, seams in MHs, MH covers, damaged lateral connections, sump pumps and foundation drains (grandfathered) and illegal downspout connections. |
| *Wastewater* | Reliability | Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in paragraph 3. | Some sewers have higher levels of I/I in the system area and are prone to surcharging beyond a 2 year storm. The Town is working to remove sources of I/I to improve system capacity to support growth and a 5 year return storm. |
| *Wastewater* | Reliability | Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system. | The treatment plant is owned by the Region of Niagara. The Region is also responsible for testing. |
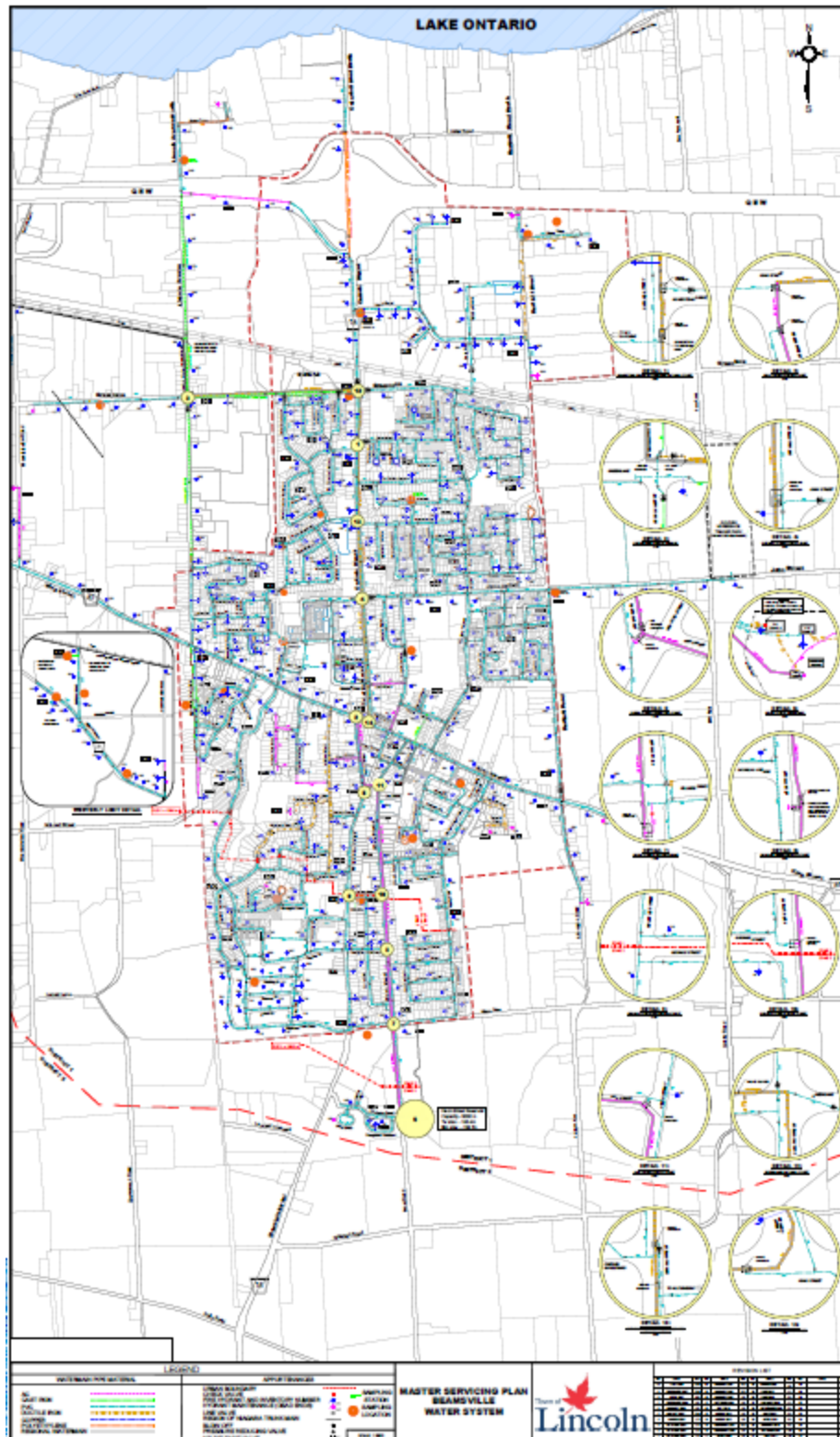
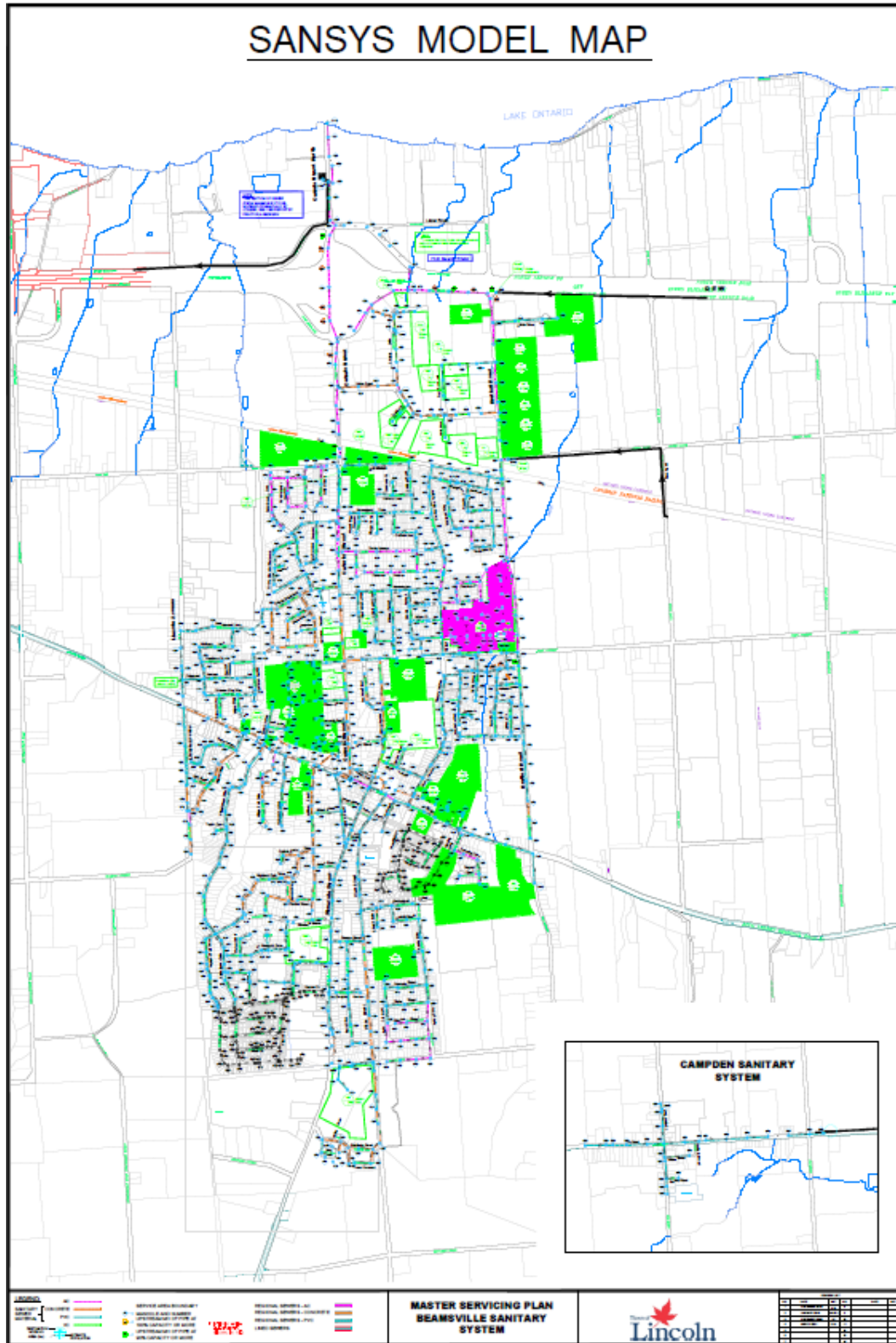**Figure 4: Beamsville water system**
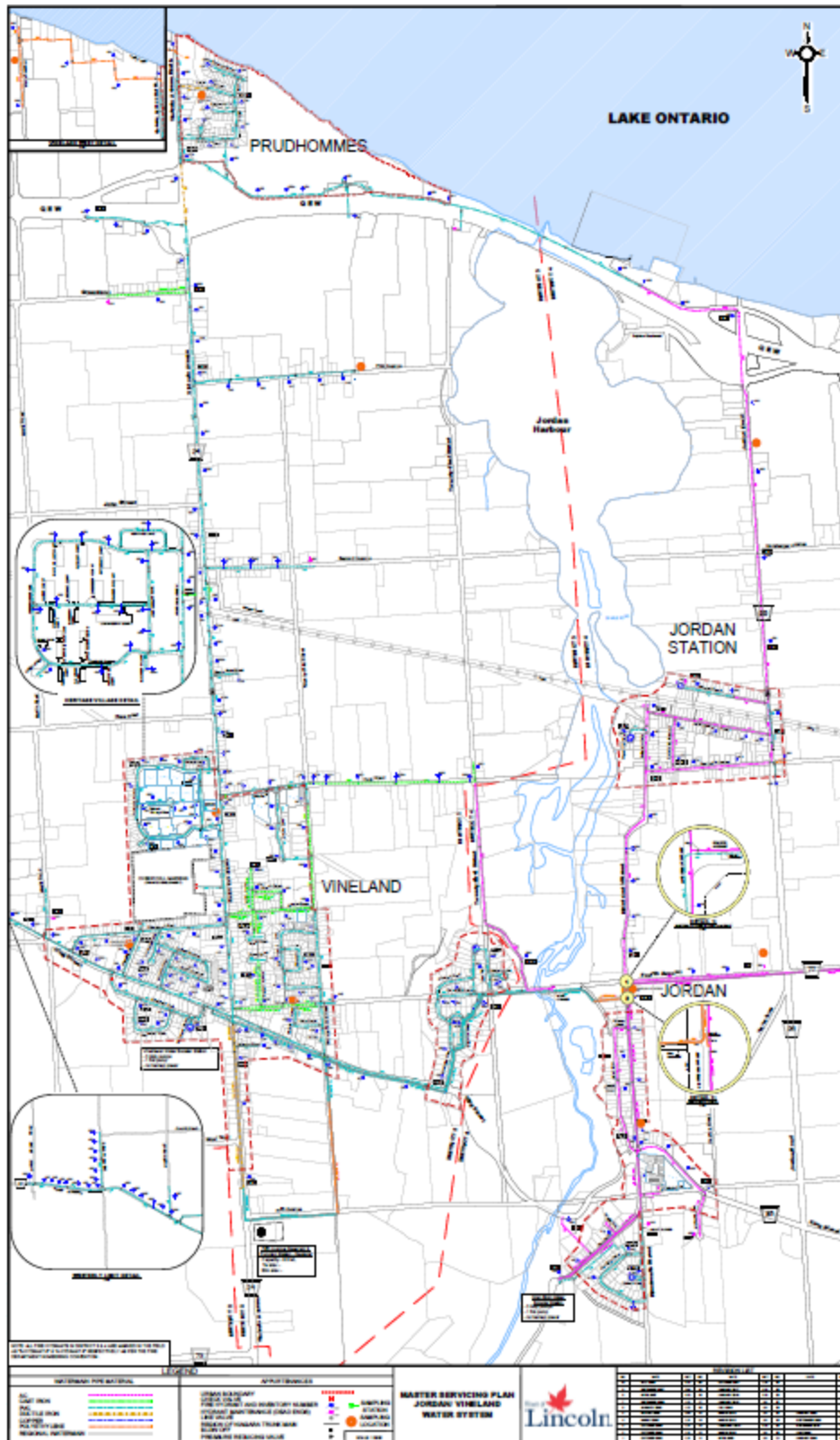
**Figure 5: Jordan Vineland water system**

**Figure 6: Beamsville wastewater system**

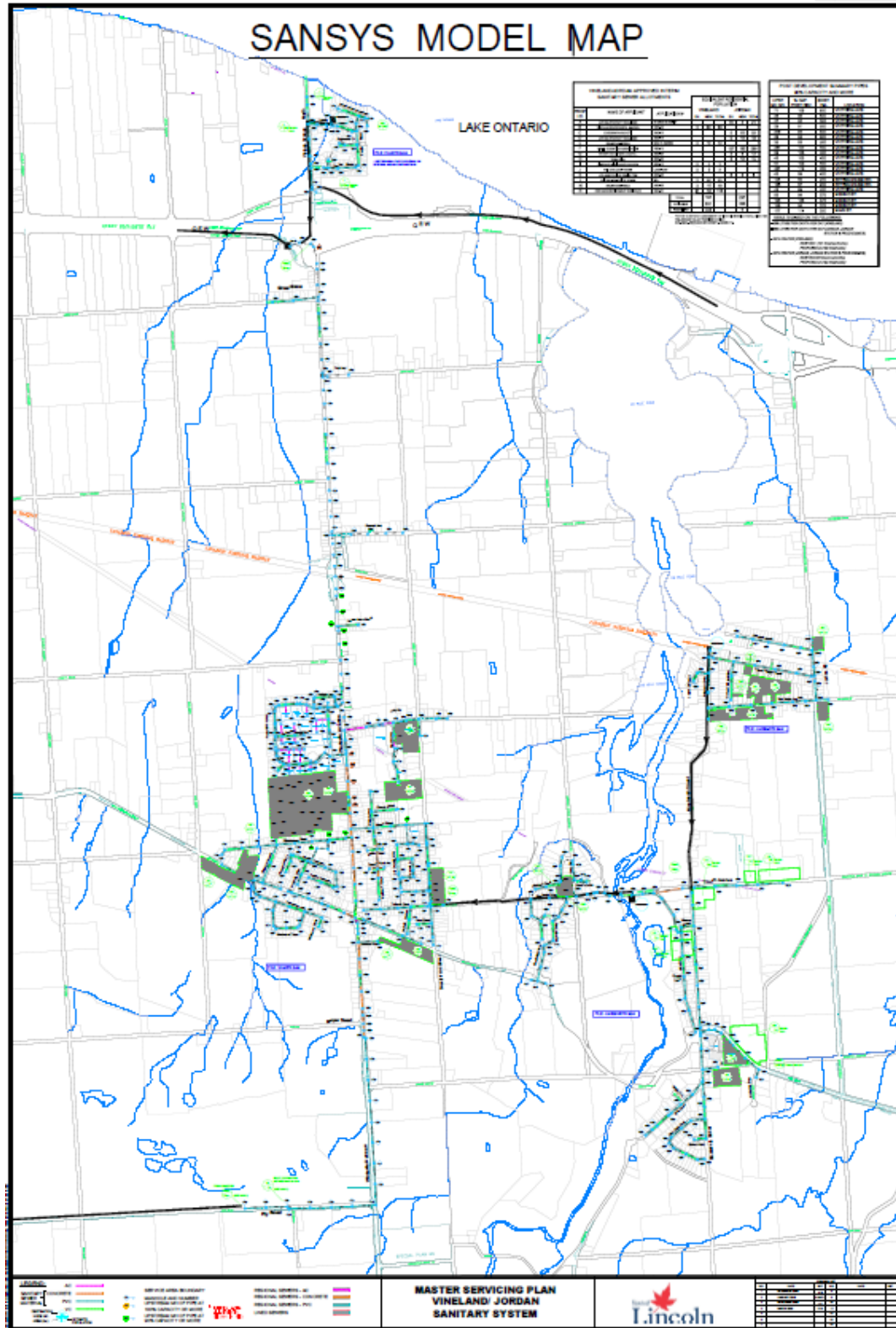**Figure 7: Vineland Jordan wastewater system**

Table 12 presents the technical levels of service required by the Ontario Regulations for Asset Management (O.Reg.55/17) and current performance.

**Table 12: O.Reg. Technical Levels of Service for Utility Service**

| Asset | Service criteria | Technical Levels of Service | Current Performance | Target |
|---|---|---|---|---|
| *Water* | Scope | Percentage of properties connected to the municipal water system. | 70% | TBD |
| *Water* | Scope | Percentage of properties where fire flow is available. | 7100 | TBD |
| *Water* | 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 | 0 |
| *Water* | Reliability | The number of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system. | TBD | TBD |
| *Wastewater* | Scope | Percentage of properties connected to the municipal wastewater system. | 71% | TBD |
| *Wastewater* | 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. | TBD | 0 |
| *Wastewater* | Reliability | The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system. | 0% | 0 |
| *Wastewater* | 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 | 0 |

### 3.1.3   LEGISLATIVE REQUIREMENTS

The services provided by municipal assets must meet the legislative requirements at the municipal, provincial, and federal levels.

Key legislative requirements applicable to municipal organizations as well as the various services and asset groups, are included in Table 13 and Table 14.

**Table 13: Key Legislative Requirements**

| Legislation | Requirement |
|---|---|
| *Municipal Government Act (2001)* | Sets out role, for 443 of 444 Ontario Municipalities and recognizes them as a responsible and accountable level of government. The Act gives municipalities broad powers to pass bylaws and govern within their jurisdiction. The Act also outlines requirements for municipalities including:<br><br>• Practices and procedures<br>• Accountability and transparency<br>• Finance |
| *Infrastructure for Jobs and Prosperity Act* | The purpose of this Act is to establish mechanisms to encourage principled, evidence-based, and strategic long-term infrastructure planning that supports job creation and training opportunities, economic growth, and protection of the environment, and incorporate design excellence into infrastructure planning. |
| *Municipal Bylaws* | Regulations approved by Council to safeguard and protect persons and properties. |
| *Occupational Health and Safety Act* | Rules governing health and safety in Ontario's workplaces. |
| *Fisheries and Oceans Canada (DFO)* | Provides guidelines and laws to protect fisheries habitat in proximities to roads and bridges. |
| *Planning Act* | Provides Direction on municipal planning activities. |
| *Building Code Act* | Provides the requirements to adhere to construction safety practices. |
| *Accessibility of Ontarians with Disabilities Act* | The purpose of this Act is to benefit all Ontarians by developing, implementing, and enforcing accessibility standards. |
| *Environmental Protection and Enhancement Act* | Provides for orderly development of roadway systems while protecting the environment. |
| *Police Services Act* | Provides the principles related to Police services. |
| *Fire Protection and Prevention Act* | Defines municipal responsibilities for fire protection services. |

**Table 14: Utilities Legislation**

| Legislation | Requirement |
|---|---|
| *Water Act* | Provides provincial guidance to better manage and protect its water and to streamline water-related administrative processes. |
| *Canada Water Act* | Contains provisions for formal consultation and agreements with the Provinces. |
| *Clean Water Act* | Provincial legislation for potable water. |

### *3.1.4   LEVEL OF SERVICE IMPROVEMENT PRIORITIES*

Table 15 shows a prioritized list of improvements relating to levels of service.

**Table 15: Levels of Service Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *9* | 3.1 | Level of service | Review levels of service to determine if they are relevant and useful to support decision-making, in particular the ones where performance is not currently measured. | High |
| *10* | 3.1 | Level of service | Develop an approach for collecting and collating data / information for each performance measure that has been identified in Table 9 to Table 12 and labeled as "TBD". | High |
| *19* | 3.1 | Level of service | Review existing targets and set targets for the performance measure where a target is currently not defined based on measured results or regulatory requirements as appropriate. This may include improving work order management system to support identification of LOS targets. | High |

## 3.2  LIFECYCLE STRATEGIES

Assets of different types have different lifecycle lengths, deteriorate at different rates, and require different strategies for optimum performance and cost-efficiency over their life cycle.

A lifecycle strategy sets out the planned actions and intended maintenance management methods for an asset throughout its life. The purpose of lifecycle strategies is to maintain assets in an appropriate way that will deliver the required level of service for the least overall cost, while keeping risk at a level acceptable to the Town.

### 3.2.1  MANAGEMENT APPROACH

An asset's lifecycle strategy typically includes the phases shown in Figure 8. However, not all assets have the same management approach. Early life interventions are usually only appropriate for a few asset types where reliability is a major factor. Other assets have a "run to fail" approach where relevant maintenance is completed as and when required and the asset is replaced at the end of its life. Many assets benefit from mid-life and later-life interventions (component replacements, refurbishments, or major overhauls) so that expected asset lifespan can be achieved or can be extended beyond original lifespan.
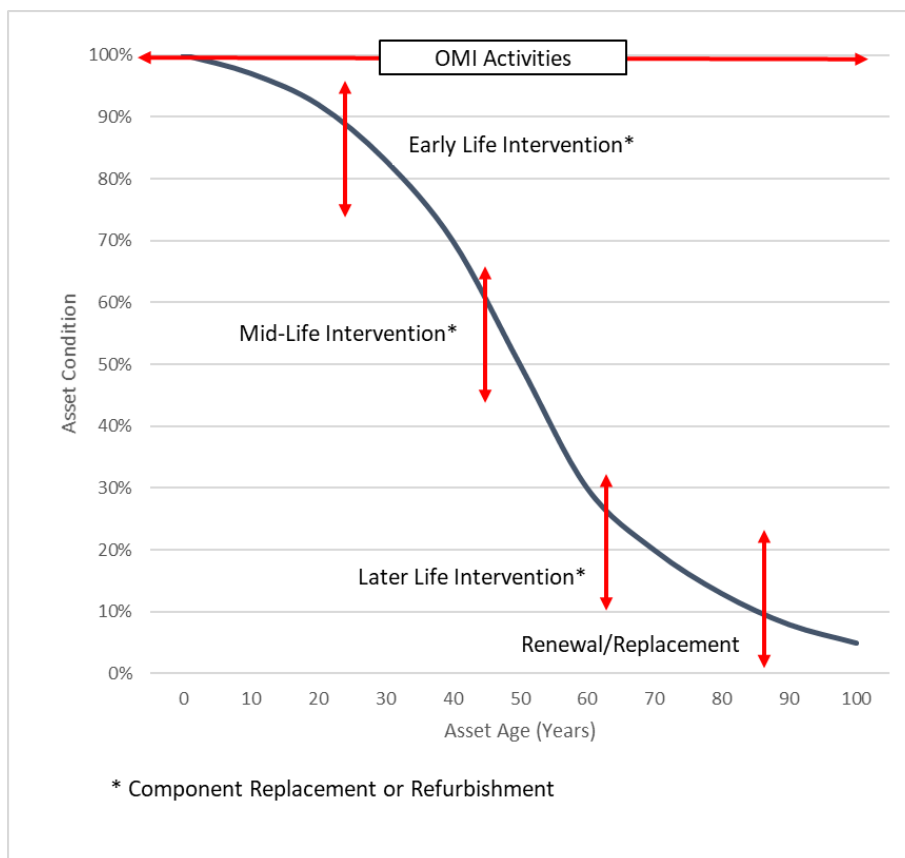


**Figure 8: Lifecycle and intervention strategies for assets**

The management approach for all assets in this Asset Management Plan has been identified and listed in Table 16.

**Table 16: Management Approach Overview**

| Asset Type | Management Approach | Typical Treatment Types |
|---|---|---|
| *Water Mains* | Run to Fail | • Repair Water Main breaks |
| *Service Lines* | Run to Fail | • Repair Service Line breaks |
| *Booster Stations* | Mid/Late life interventions | • Pump Rebuilds<br>• Pump Replacements |
| *Pressure Reducing Valves* | Run to Fail | • Replace when failed |
| *Check Valves* | Run to Fail | • Replace when failed |
| *Water Valves* | Run to Fail | • Replace when failed |
| *Sewer Mains* | Mid/Late life interventions | • Pipe Lining<br>• Pipe Repairs |
| *Maintenance Holes* | Run to Fail | • Replace when failed |

Note: All assets are subject to OMI activities (Operations, Maintenance, and Inspections)

### 3.2.2   *LIFECYCLE STRATEGY TERMINOLOGY*

The current business practices for lifecycle management have been identified under the following work categories.

- **Operations, Maintenance & Inspections (OMI)**
    − Preventive Maintenance
    − Inspections
    − Operations
    − Reactive Maintenance
- **Renewal and Rehabilitation (R&R)**
    − Early-life Intervention
    − Mid-life Rehabilitation
    − Later-life Rehabilitation
    − End of life

Table 17 shows the definitions of the terminology used for the lifecycle strategy work categories.

**Table 17: Lifecycle Strategy Work Categories**

| Terminology | Definition |
|---|---|
| *Preventative Maintenance* | These are regularly scheduled activities, completed whilst the asset is still in an "operational" condition. The purpose of preventative maintenance (when they are required), is to ensure the asset achieves its expected life (i.e., does not fail early). Not all assets require or benefit from preventative maintenance activities. |
| *Inspections* | There are different types of inspections that can occur throughout the lifecycle of an asset. Some are for checking the asset is operating as planned – these provide early warning for any issues that can then be remedied quickly and less expensively than if the problem remained undetected for some time. Other inspections are for measuring or observing the condition of the assets, or for measuring performance. These provide information for planning renewals and determining if performance targets will be met. Inspections may also be required by legislation, departmental policy, or completed based an industry standard or manufacturers recommendation. |
| *Operations* | These are routine activities necessary for the correct operation of the assets. They differ from Preventative Maintenance (PM) activities in that are operational tasks or activities that must occur, or the asset will cease to function as intended (i.e., cease to operate or operate inadequately), whereas an asset will usually continue to operate even if PM tasks are not done, but the overall lifespan of the asset could be reduced, and the asset may fail early. |
| *Reactive Maintenance* | These activities are physical repairs to an asset that has broken down or is not functioning as required or expected. The repair reinstates the asset to its normal "operating" condition but does not significantly extend the overall life of the asset e.g., it is a repair not a full replacement nor is it an upgrade or major rehabilitation. Maintenance repairs are expected as assets age and are part of the overall lifecycle management, to keep the asset operational for as long as physically and economically viable. |
| *Early Life Interventions* | These are treatment options that may be considered when an asset is in the first quarter of its lifespan. Typically, they are rare for most asset types, but some assets do require replacement of component parts at frequent intervals throughout the overall lifespan of the asset. |
| *Mid-Life Interventions* | These are treatment options that may be considered when an asset is in the second or third quarter of its lifespan. Most common forms of mid-life rehabilitation are the replacement or refurbishment of component parts that have a shorter lifespan than the overall asset. |
| *Later Life Interventions* | These are treatment options considered to be still viable even when an asset is in the fourth quarter of its lifespan. They can include replacement or refurbishment of component parts the same as might be considered for Mid-Life Rehabilitation. However, Later Life Rehabilitation should only be undertaken if it is cost-effective given the potentially short remaining life of the overall asset. |

| Terminology | Definition |
|---|---|
| End of Life | These are treatment options considered when an asset is approaching or at the end of its lifespan. Typical options include replacement (renewal) of the asset with an equivalent new asset, major rehabilitation that returns the asset to new or near new status, disposal (removal) of the asset without replacement, retirement of the asset (with or without disposal), divestment of the asset (sale or gift to another's ownership), or upgrade (replace with new asset that will provide an increase in level of service e.g., a bigger asset or higher specification). |

The lifecycle strategies for the water and wastewater assets are included in Appendix A.

### 3.2.3  LIFECYCLE STRATEGY IMPROVEMENT PRIORITIES

Table 18 shows a prioritized list of improvements relating to lifecycle strategies.

**Table 18: Lifecycle Strategy Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *12* | 3.2 | Lifecycle Strategy | Develop lifecycle strategies for any new assets that become part of the water and wastewater systems. | Medium |
| *13* | 3.2 | Lifecycle Strategy | Review and revise lifecycle strategies if maintenance approaches change (including where new technologies are employed) and include more details and costs and specify decision processes. | Medium |

## 3.3 RISK PROFILE

Risk is evaluated at both the **service level** and the **asset level**. The importance of this is to provide early warning of all potential issues that could adversely affect delivering the level of service. When risks are known and have a rating, staff can prioritize activities to focus on assets with high or very high-risk ratings.

### 3.3.1 SERVICE LEVEL RISK

Service level risks are the risks generated by events or circumstances other than individual asset failures, that affect the delivery of the service to the Town's customers.

The service objectives for Lincoln's Environmental Services Department regarding the water and wastewater services, is to:

- Operate and maintain water distribution system that provides a reliable source of safe drinking water for residents and water at a sufficient pressure for fire-fighting services, and
- Operate and maintain a sanitary collection system that is efficient and environmentally conscious.

Service level risks are grouped and reported in 5 categories. The categories and examples of the risks in each category are shown in Table 19.

**Table 19: Service Level Risk Categories**

| Category | Description of Common Risk Events |
|---|---|
| *Planning* | Regulatory changes, Council changing strategic priorities, demand management, etc. |
| *Management* | Lack of resources (people) to implement or advance Asset Management, reputational risk, data security risk, etc. |
| *Service Delivery* | Outdated or unsupported software or hardware failures, power outages, inadequate stakeholder communication/engagement, etc. |
| *Assets (In General)* | Security and safety of physical or information assets from theft/vandalism/cyberattacks, inadequate maintenance and rehabilitation programs to preserve asset value and longevity, etc. |
| *Hazards and Environmental* | Extreme weather events, climate change, improper storage, or usage of hazardous or toxic materials, etc. |

### 3.3.2 CONNECTION OF RISK TO LEVEL OF SERVICE

The connection between risk and level of service starts with looking at how the potential risk events from each of the 5 categories affect the service commitments made in Section 3.1 and defining a risk outcome (e.g., stating how the risk event would affect the service commitment). For example, a lack of staff resources (which is a management risk) can affect the reliability of water and wastewater services (which is a service commitment). Therefore, the risk outcome is that a lack of resources will mean that some necessary activities will not get done and water and sanitary infrastructure will not be fully maintained to the required standards, this will adversely impact asset condition and reduce service reliability.

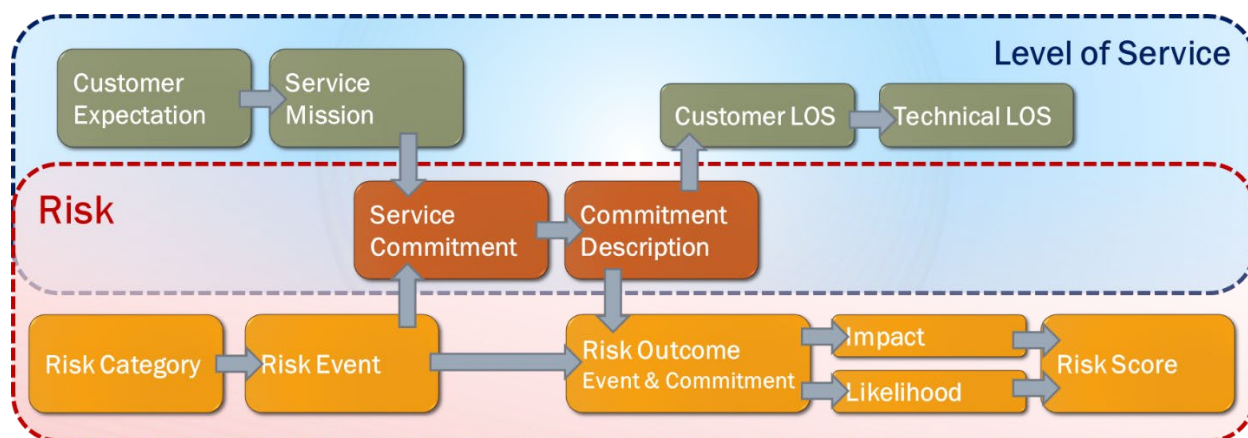Figure 9 shows the connection of risk to levels of service.

**Figure 9: Connection of Risk to Level of Service**

### 3.3.3 SERVICE LEVEL RISKS – UTILITIES

The service risks are characterized by the impact to service delivery and the likelihood of that impact event occurring. The Town has assessed the service level risks in each risk category that are relevant to the water and sanitary systems and identified an appropriate action for each risk, as shown in Table 20.

**Table 20: Risk level and action**

| Risk level | Recommended action |
|---|---|
| *Very low* | Accept: These risks can be tolerated. They should be assessed annually to determine whether the level of risk has changed. |
| *Low* | Accept: These risks can be tolerated. They should be assessed annually to determine whether the level of risk has changed. |
| *Medium* | Monitor: These risks require a balanced approach to management. They should be included in future risk mitigation plans and assessed at least annually to determine whether levels of risk have changed. |
| *High* | Mitigate: These risks should be prioritized. Existing mitigation programs and plans should be modified to include these risks, and where new risks are identified, update mitigation programs and plans. An assessment of the effectiveness of the mitigation programs and plans must be conducted annually and updated as appropriate. |
| *Very High* | Take action: These risks cannot be tolerated as they are critical to service delivery. Immediate corrective actions to mitigate risk should be taken. A risk level monitoring program should be developed to reduce or prevent potential reoccurrence of the risk. |

### 3.3.3.1 RESULTS OF RISK RATINGS

The number of risks rated in each category and the respective scores before risk mitigation are shown in Table 21.

**Table 21: Service-Level Risk Ratings (Pre-Mitigation) – Utilities**

| Risk Category | Very Low | Low | Medium | High | Very High | Count |
|---|---|---|---|---|---|---|
| *Planning* | 0 | 6 | 4 | 1 | 3 | **14** |
| *Management* | 0 | 5 | 1 | 0 | 0 | **6** |
| *Service Delivery* | 0 | 8 | 5 | 0 | 0 | **13** |
| *Physical Assets* | 0 | 2 | 4 | 1 | 0 | **7** |
| *Hazard - Environmental* | 2 | 2 | 4 | 5 | 0 | **13** |
| *Total* | **2** | **23** | **18** | **7** | **3** | **53** |

The results of the risk ratings are also shown in a graphical format in Figure 10.
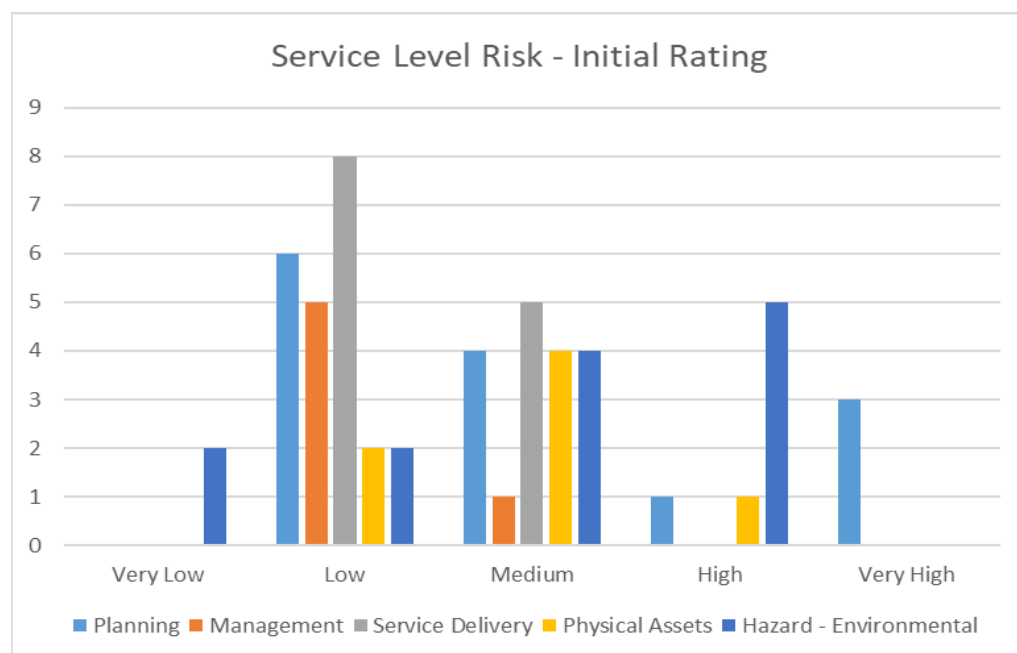


**Figure 10: Service-Level Risk (Pre-Mitigation) - Utilities**

*PLANNING RISKS*

The results of the risk ratings showed that 14 planning risks were identified and rated. 10 of the 14 planning risks were rated very low to medium, 1 of the risks rated as high, and the remaining 3 risks were rated as very high.

The risks that were rated medium relate to the decrease in revenues affecting the Town's ability to effectively deliver water and wastewater services and the affect on the whole-life costs for the delivery of the water and wastewater services. Medium risks are required to be monitored and the Town monitors funding on an annual basis.

The high-scoring risk relates to the procurement strategy affecting the purchase of materials and or external resources to maintain the water and wastewater networks. through residential and commercial/industrial developments.

The risks rated as very high relate to the increase in demand from growth in residential areas and industry needs affecting the reliability and costs to provide water and wastewater services.

High and very high risks need to be mitigated, and the mitigation strategies and revised risk scoring post mitigation are described further in this section (refer to Table 22 and Figure 11).

### MANAGEMENT RISKS

The results of the risk ratings showed that 6 management risks were identified and rated. 5 of the 6 were rated as low-risk and 1 management risk rated as medium risk. The risk rated as medium risk relates to whether the Town has enough resources to effectively deliver water and wastewater services.

Medium risks are required to be monitored and as part of this asset management plan, the Town has completed a resource plan and based on the results in Section 3.4, the Town has enough resources to deliver the water and wastewater services effectively.

### SERVICE DELIVERY RISKS

The results of the risk ratings showed that 13 service delivery risks were identified and rated. 5 risks out of the 13 were rated as a medium risk. The risks identified as medium related to:

- Lack of stakeholder consultation affecting the effective supply of water to the fire service for example by not targeting the appropriate condition levels.
- The increase in service delivery costs affecting the Town's ability to deliver water and wastewater services to the same level as currently provided.
- The lack of staff or resources (plant and materials) to react effectively to major disruptions to the water or wastewater services.

These risks have a high impact but a low probability of occurring.

Medium risks are required to be monitored and the Town frequently monitors the costs to manage and operate the water and wastewater services and revise their budgets accordingly. For resourcing requirement, the town have completed an assessment of their resource needs which are further described in Section 3.4 of this asset management plan.

### PHYSICAL ASSET RISKS

The results of the risk ratings showed that 8 physical risks were identified and rated. 3 risks out of the 8 were identified as a medium risk and 1 identified as high-risk. The risks rated as medium related to the potential of the Town failing to mitigate any high or very high risks that could affect asset condition and the risk of assets in poor or very poor condition affecting service delivery.

The risk identified as high-risk relates to the potential of under-designed assets not being able to cope with future demand changes resulting from growth or climate change.

High and very high risks need to be mitigated, and the mitigation strategies and revised risk scoring post mitigation are described further in this section (refer to Table 22 and Figure 11).

*HAZARD & ENVIRONMENTAL RISKS*

The results of the risk ratings showed that 13 hazard and environmental risks were identified and rated. Out of the 13 risks, 4 risks were rated as a medium, 5 risks were rated as high. The medium rated risk related to the potential of extreme weather events including high winds and snow or freeze/thaw events affecting the Town's ability to restore services if asset failures occurred during the weather events.

The high-scoring risks relate only to the wastewater service and the effect of flooding causing infiltration issues.

### 3.3.3.2   *MITIGATION STRATEGIES*

*PLANNING RISKS*

The high-scoring planning risk relating to the procurement strategy affecting the purchase of materials and or external resources to maintain the water and wastewater networks have been mitigated through the Town having enough stock of replacement assets.

The very high-scoring planning risks relating to the increase in demand from growth in residential areas and industry needs is mitigated through the Town upsizing existing connections to new developments to cope with additional demand. Additionally, continual modelling work and planning assessments are being undertaken to monitor any changes and adjust accordingly.

*PHYSICAL ASSET RISKS*

The risk identified as high-risk that relates to the potential of assets designed with lower capacity and not being able to cope with demands applies to the wastewater system only. The risk is mitigated through a monitoring system where the Town constantly monitor levels and if required either bypass sewer into the environment (rare), or program system for upgrades.

*HAZARD & ENVIRONMENTAL RISKS*

The high-scoring risks relating to the effects of flooding are only applicable to the wastewater service. The risks are mitigated through a monitoring system where the Town constantly monitor levels and if required either bypass sewer into the environment (rare), or program system for upgrades.

Table 22 shows a summary of the utility risk by score and category after mitigation.

**Table 22: Service Level Risks (Post Mitigation) - Utilities**

| Risk Category | Very Low | Low | Medium | High | Very High | Count |
|---|---|---|---|---|---|---|
| *Planning* | 0 | 7 | 7 | 0 | 0 | **14** |
| *Management* | 0 | 5 | 1 | 0 | 0 | **6** |
| *Service Delivery* | 0 | 8 | 5 | 0 | 0 | **13** |
| *Physical Assets* | 0 | 2 | 5 | 0 | 0 | **7** |
| *Hazard - Environmental* | 2 | 2 | 9 | 0 | 0 | **13** |
| *Total* | **2** | **24** | **27** | **0** | **0** | **53** |

Figure 11 shows the number of risks in each category after mitigation measures. The mitigated risks now rate as medium and will therefore need to be monitored regularly, but will not need further mitigation unless the risk rating increases (which can happen over time for example as the likelihood of a risk occurring may increase).
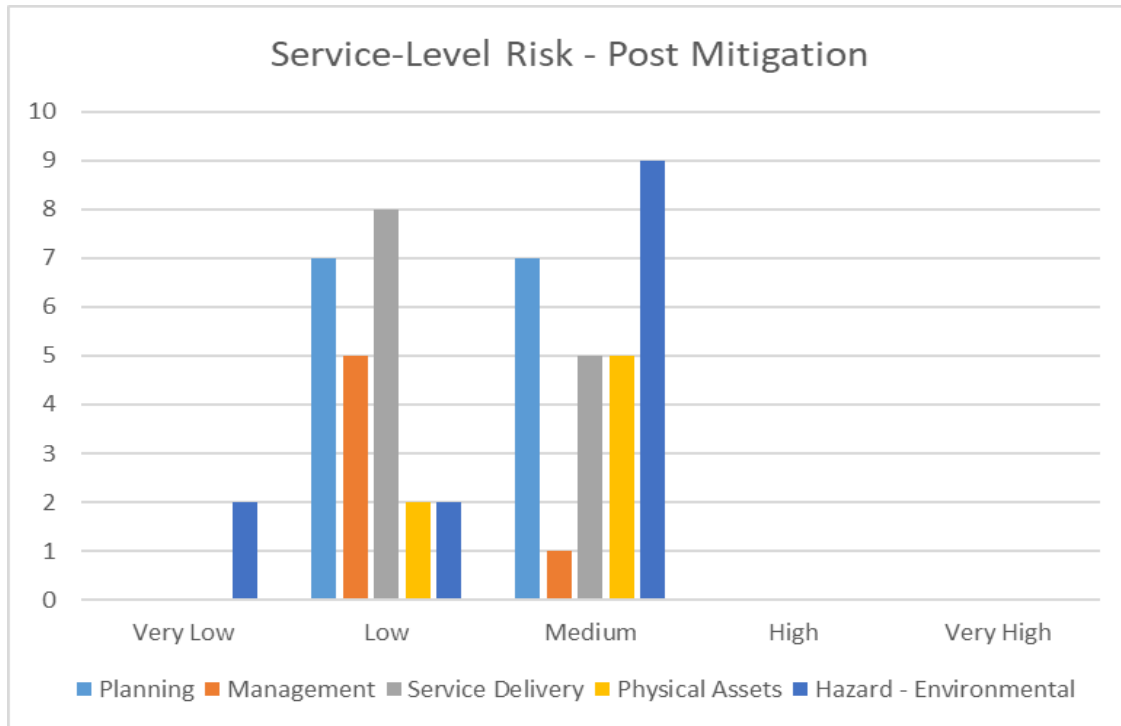


**Figure 11: Service-Level Risks (Mitigated) – Utilities**

Note that the reduction in demand risk rating shown in Figure 11 will not be realized until the proposed mitigation measures are implemented.

### 3.3.4  ASSET LEVEL RISKS

The results of **asset level risk** assessments are considered when reviewing lifecycle strategies to determine the most appropriate treatments, preventative maintenance, and inspection frequencies for a particular asset or group of assets. Both asset level risk and service risks are considered in prioritizing capital works projects and other funding decisions.

Asset level risks are calculated by multiplying the individual consequence of failure for each asset with the likelihood of that asset failing. For an initial assessment, the likelihood and consequence of failure for the assets are a 1-5 rating based on:

- Likelihood of failure: uses the 1-5 age-based condition rating or 1-5 measured condition state that is based on physical condition assessments (see Table 4).
- Consequence of failure: uses the 1-5 criticality rating for each asset (see criticality ratings in section Table 23).

*SUMMARY OF ASSET RISKS*

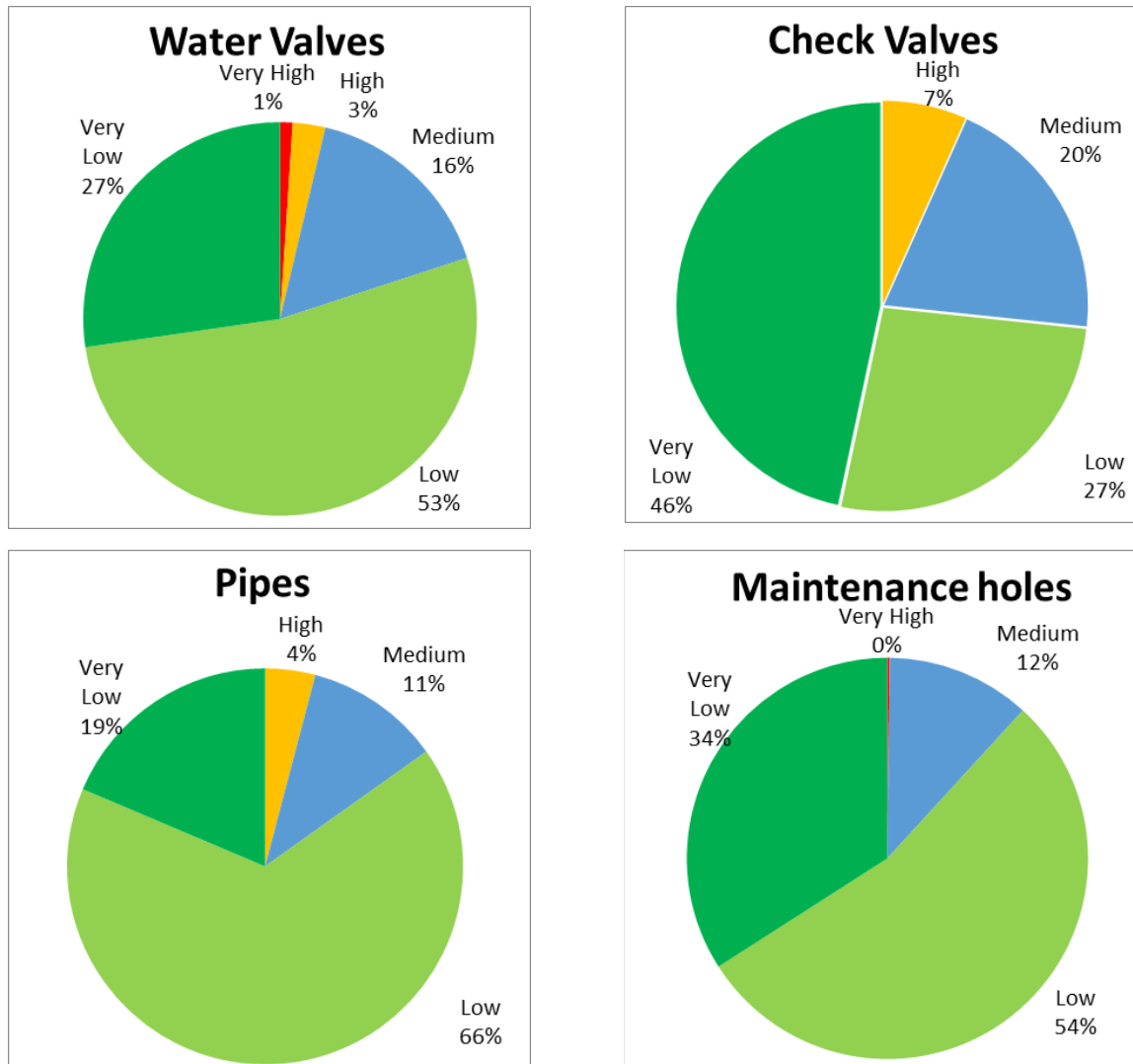The results from the asset level criticality ratings are shown in Figure 12:
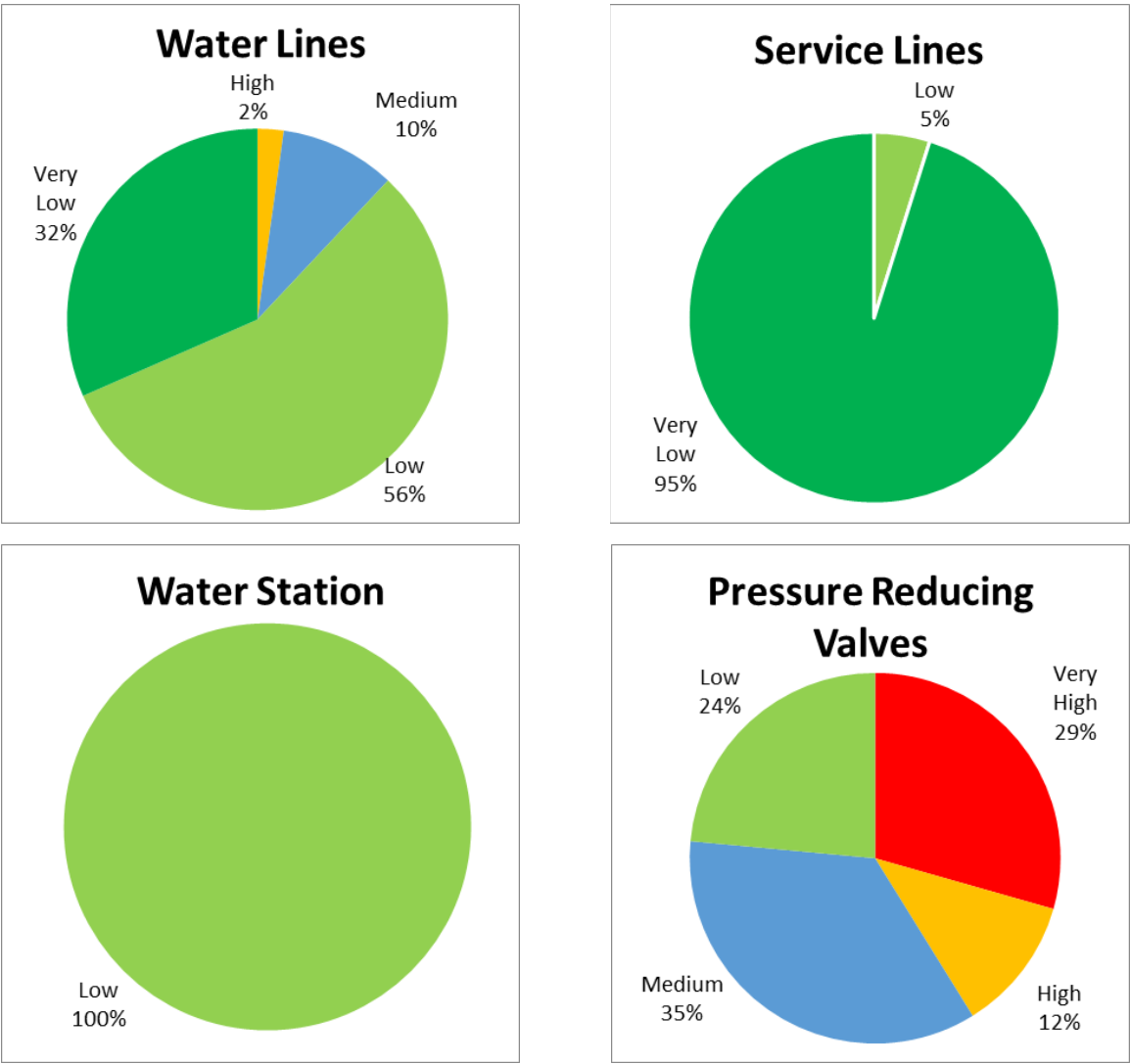
**Figure 12: Asset risk**

The results of the asset risk ratings show that there are high-risk assets in the water mains, pressure reducing valves, valves, check valves, sewer mains, and maintenance holes.

*DESCRIPTION OF HIGH-RISK ASSETS*

The detailed results show that some of the water mains that have been rated as high-risk are very high criticality and others are medium criticality. Both groups of mains have the same overall risk rating because the mains that are very high criticality are all in fair condition based on their age, so the likelihood of failure is lower and moderates the overall risk. Whereas the mains that are medium criticality are all in poor condition based on their age, so the likelihood of failure is higher, increasing overall risk.

The pressure reducing valves have all been identified as very high criticality assets. The pressure reducing valves rated as high risk are in fair condition, whereas the valves rated as very high risk are in very poor condition based on their age (those valves have a higher likelihood of failure).

The water valves rated as high and very high risk have all been identified as very high criticality assets as they are all located on the long-term care homes water lines. The valves rated as high-risk are in fair condition, whereas the valves rated as very high-risk are in very poor condition based on their age.

The check valve rated as high risk is located on a long-term care homes water line and is in poor condition.

The sewer mains that have been rated as high-risk have been identified as high criticality or very high criticality assets. The sewer pipes rated as high criticality are larger diameter pipes. The sewer pipes rated as very high criticality are part of the sewer line for the long-term care homes. The larger diameter pipes have been rated as high risk as they are high criticality but in poor in condition whereas the smaller diameter pipes are very high criticality but in fair condition.

The maintenance holes rated as very high risk are high criticality as they are located on the long-term care homes sewer line and in very poor condition based on their age.

### *Mitigation*

To mitigate the high and very high rated asset level risks, it is recommended that the Town review the condition of the assets and revise the condition in the State of Infrastructure dashboard.

## 3.3.5   CONNECTION TO ASSET CRITICALITY

The criticality of the asset or component of an asset is defined by its effect on the operation of an asset system if the asset failed. For example, if a pressure reducing valve was to fail, there is a high probability that the water main or customer plumbing would burst leading to damage to the road and adjacent properties and severe disruptions to service.

The assets in the scope of this Asset Management Plan have been rated for criticality using the criteria in Table 23.

**Table 23: Criticality criteria**

| Asset Type | Asset Criteria | Criticality Rating |
|---|---|---|
| *Water Mains* | Pipe Diameter – 40 to 100mm | 1 – Very Low |
| | Pipe Diameter – 100 to 200 mm | 2 – Low |
| | Pipe Diameter – 200 to 300 mm | 3 - Medium |
| | Pipe Diameter – 400+mm | 4 – High |
| | Service to long-term care homes | 5 – Very High |
| *Water Valves* | Pressure Reducing Valves | 5 – Very High |
| | Check Valves | 2 - Low |
| | Water Valves | 2 - Low |
| | Service to long-term care homes | 5 – Very High |
| *Water Stations* | Larger Station | 5 – Very High |
| | Smaller Station | 2 - Low |
| *Sewer Pipes* | Pipe Diameter – 40 to 100mm | 1 – Very Low |
| | Pipe Diameter – 100 to 200 mm | 2 – Low |

| Asset Type | Asset Criteria | Criticality Rating |
|---|---|---|
| *Sewer Pipes* | Pipe Diameter – 200 to 300 mm | 3 - Medium |
| | Pipe Diameter – 400+mm | 4 – High |
| | Service to long-term care homes | 5 – Very High |
| *Sewer Maintenance Holes* | All Maintenance Holes | 2 - Low |
| | Service to long-term care homes | 5 – Very High |

## 3.3.6   *RISK IMPROVEMENT PRIORITIES*

Table 24 shows a prioritized list of improvements relating to risk.

**Table 24: Risk improvement tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *14* | 3.3 | Risk | Complete condition assessments on assets to improve understanding of likelihood of failure for asset level risks. Where asset level risks remain high or very high, add assets into renewal or rehabilitation programs. | High |
| *15* | 3.3 | Risk | Review and revise asset level risks in State of Infrastructure Dashboard and report in next iteration of this Asset Management Plan. This includes considering other aspects of consequence in addition to service delivery and analyses failure likelihood in more detail including failure on functionality and capacity as well as physical failure, to derive a more detailed risk analysis. | High |
| *16* | 3.3 | Risk | Continue to monitor all medium service-level risks and update risk register if risk levels change, for example following any changes in climate change predictions. | Medium |

## 3.4  RESOURCE NEEDS

This section compares available resource demand versus capacity and identifies whether there is enough capacity for the existing staff to take on new tasks or if additional resources are required.

### 3.4.1  EXISTING CAPACITY AND NEEDS

The first step in identifying resource needs is to understand the current available hours for all staff and what tasks are currently completed as part of the Water and Wastewater Services.

For reporting purposes, the activities are grouped into the following categories:

- Administration
- Operations
- Asset Management
- Contract Management
- Capital Projects

Table 25 shows the number of available hours for all departments associated with the water and wastewater services.

**Table 25: Available Hours for Staff Categories**

| Staff Type | Public Works | Operations | Regulatory Compliance | Billing | Technical Services |
|---|---|---|---|---|---|
| *No. of Staff (FTE equivalent)* | 0.8 | 8.3 | 0.75 | 1.0 | 0.5 |
| *Available Hours* | 1,536 | 15,936 | 1,440 | 1,680 | 960 |

The next stage is to record the hours spent on each of the activities in each category over a year.

### 3.4.2  COMPARING RESOURCE NEEDS AND CAPACITY

A comparison was made between required resources to deliver the level of service and current resource availability.

The resource demand shown in Figure 13 indicates that resources for the operations, regulatory compliance, environmental services, technical services departments are very close to requirements for current service levels. The public works and billing departments are over utilized. There are several options that could be investigated to resolve this gap including:

- Reassess activities and reduce resource demand wherever possible
- Obtain additional resources and reassign activities
- Outsource some activities under contract
- Share activities with neighbouring authorities or agencies
- Reduce service level (usually this is not desired, and reduction is limited under legislation)
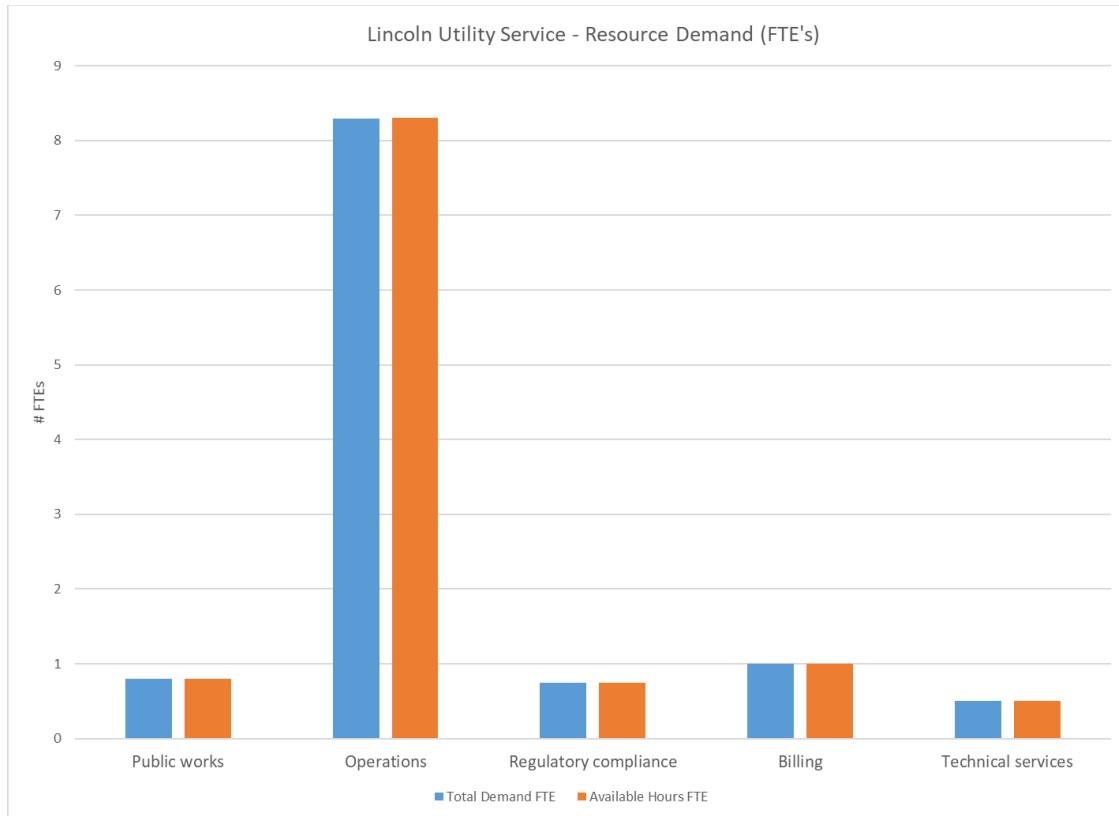
**Figure 13: Resource Demand compared to Availability**

Figure 14 shows the demand detail for each activity type. Most of the resourcing needs is for operational activities (78.7%).
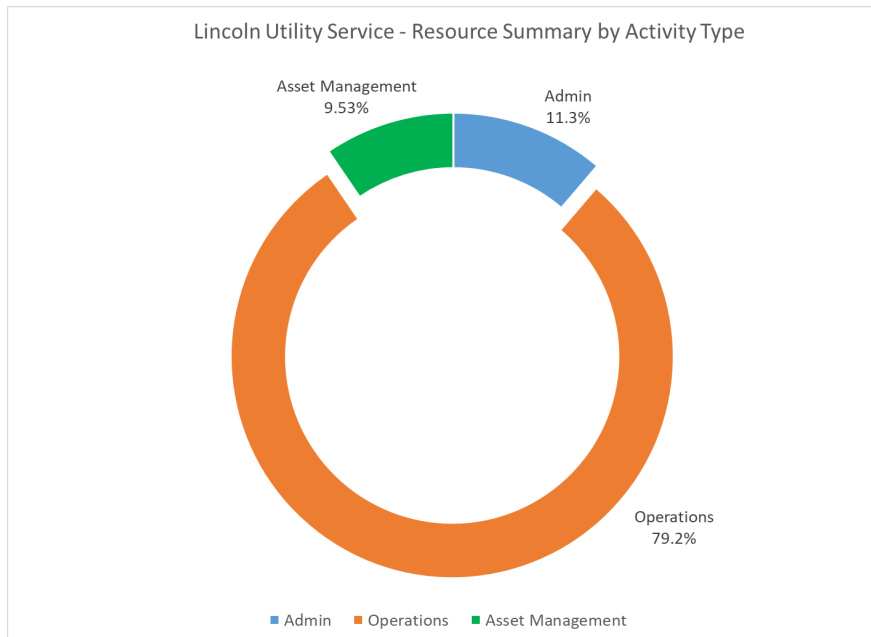


**Figure 14: Summary of Needs by Activity Type**

### 3.4.3   RESOURCE IMPROVEMENT PRIORITIES

Table 26 shows the improvement relating to resource needs.

**Table 26: Resource Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *17* | 3.4 | Resources | Re-assess resourcing requirements every 2 to 3 years and report resource levels. | Low |

# 4 FUTURE READY

## 4.1 DEMAND MANAGEMENT

Drivers affecting demand include things such as population change, regulations, changes in demographics, seasonal factors, climate change, consumer preferences and expectations, technological changes, economic factors, agricultural practices, and environmental awareness.

The main demands for new services are created by growth and development. Growth is a critical infrastructure demand driver for most infrastructure services. As such, the Town must not only account for the lifecycle cost for its existing asset portfolio, but those of any anticipated and forecasted capital projects associated specifically with growth.

Lincoln is one of the fastest growing municipalities in Niagara. During the 25 years between 1986 and 2011 the population of the Town increased by about 8,100 people or at an annual rate of 1.4%. Currently, the Town of Lincoln has a population of ~25,000 and is expected to grow by 50% by 2031.

In conjunction with raw population growth, demographics change can also dictate how the Town will allocate its infrastructure investments. As the demographics change and the Town assumes responsibility of new infrastructure, the level of strain on various critical and supplementary infrastructure services will shift to reflect the needs of the residents.

### 4.1.1 DEMAND ASSESSMENT

The Town has assessed the following drivers for the water and wastewater systems:

- Legislative change
- Population growth
- More people working from home
- Change in household size
- Increase in Commercial/Industrial Development
- Loss or a lower supply of water due to regional outages.
- Increase drought events increasing water usage.
- Storm of flooding events increasing risk of I&I.

The drivers are assessed for impacts to health and safety of the Town's residents and of the businesses and the impact the growth drivers have on the assets that provide water and wastewater services and the ability of the Town to continue to provide required levels of service.

The results of the assessment are shown in Table 27.

**Table 27: Initial Demand Assessment Results**

| Demand Driver | Very Low | Low | Medium | High | Very High | Count |
|---|---|---|---|---|---|---|
| *Water* | 0 | 5 | 2 | 1 | 0 | **8** |
| *Wastewater* | 0 | 1 | 4 | 2 | 0 | **7** |
| ***Total*** | **0** | **6** | **6** | **3** | **0** | **15** |

The drivers that were identified as high impact were increase in population for both water and wastewater, and the impact of flooding affecting wastewater system capacity.

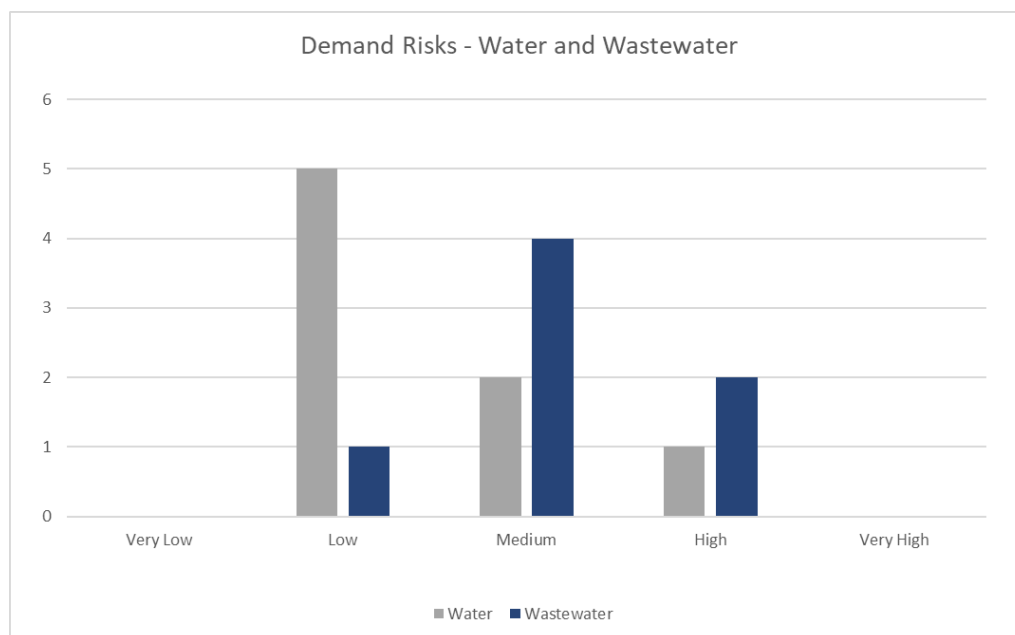The results are also shown in graphical form in Figure 15.



**Figure 15: Initial Demand Assessment Results**

---

*MITIGATION*

As part of the demand assessment, any high impacts were mitigated.

The impact of population growth in the Town is mitigated by upgrading the affected parts of the water and wastewater systems to cope with future demands.

The impact of increased rain events leading to flooding and capacity issues for the wastewater system is mitigated by addressing sources of I/I in the system.

Table 28 shows the impacts to the water and wastewater systems after mitigation.

**Table 28: Mitigated Demand Assessment Results**

| Demand Driver | Very Low | Low | Medium | High | Very High | Count |
|---|---|---|---|---|---|---|
| *Water* | 0 | 5 | 3 | 0 | 0 | **8** |
| *Wastewater* | 0 | 1 | 6 | 0 | 0 | **7** |
| *Total* | **0** | **6** | **9** | **0** | **0** | **15** |

Note that the reduction in demand risk rating shown in Table 28 will not be realized until the proposed mitigation measures are implemented.

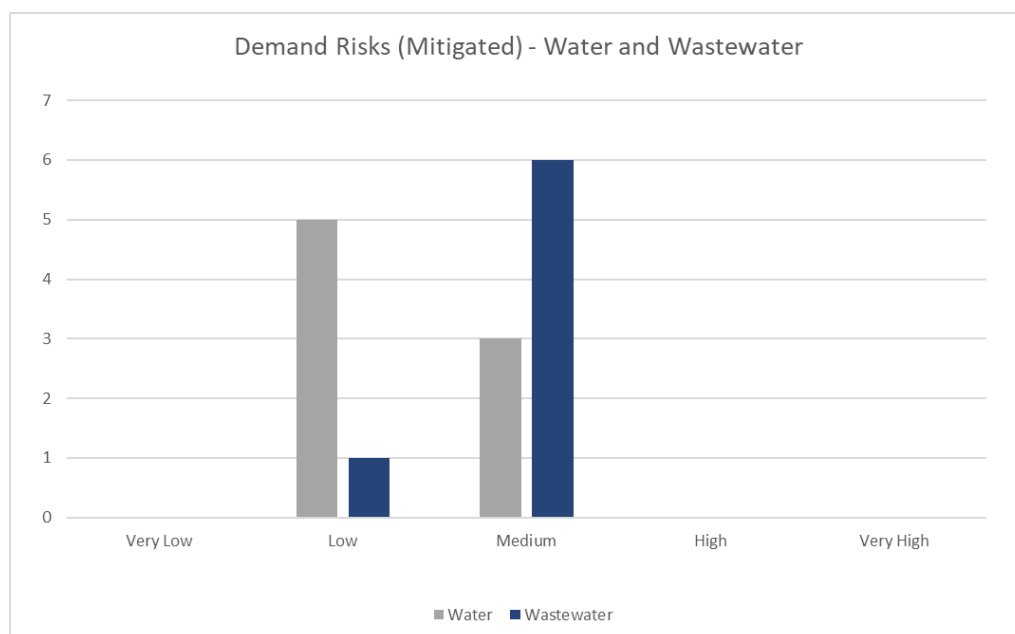The results are shown graphically in Figure 16.



**Figure 16: Mitigated Demand Assessment Results**

### 4.1.2   DEMAND IMPROVEMENT PRIORITIES

Table 29 show the improvements identified based on the current understanding of demands, sustainability and the climate adaptation and resilience requirements.

**Table 29: Demand Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *18* | 4.1 | Demand management | Revise the demand risk as mitigation measures are implemented and at least annually to update for changes in demand drivers. | Low |

# 4.2 RESILIENCY AND ADAPTATION

The resilience of our critical infrastructure is vital to our customers and the services we provide. To adapt to changing conditions and grow over time we need to understand our capacity to respond to possible disruptions and be positioned to absorb disturbance and act effectively in a crisis to ensure continuity of service. Resilience is built on aspects such as response and recovery planning, financial capacity, and crisis leadership.

## 4.2.1   GROWTH

Asset management planning must consider potential future impacts on the services being delivered. Demand for new services will be managed through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand and demand management. Demand management practices can include non-asset solutions, insuring against risks and managing failures.

The Niagara Region also supports growth management of water and wastewater services in the Town of Lincoln. The Baker Road Wastewater Treatment Plant PPCP & MSP Update aims to provide the Region and Municipalities with a strategic plan along with sewer management recommendations. This reports states that Lincoln has existing and growth-related wet-weather capacity deficits in most catchments and that existing sewer network has capacity to meet design criteria wet-weather flows; however, actual wet-weather flows exceed sewer capacity in several areas. This report identifies upgrades and improvements related to precipitation and accounts for growth, including infrastructure upgrades and I/I removal.

## 4.2.2   CLIMATE CHANGE

The Town has completed a Corporate Climate Adaptation Plan (CCAP) as a guideline to support and inform climate adaptation at the Corporate municipal level. It outlines how the municipality will adapt its assets, operations, and services to the current and future impacts of climate change.

The development of a CCAP for the Town of Lincoln is supported by the 2016 Asset Management Plan which states, "infrastructure is inextricably linked to the economic, social and environmental advancement of a community" and that "broader environmental and weather patterns have a direct impact on the reliability of critical infrastructure services".

The Town's 2014 Official Plan also affirms, "reviewing opportunities for reducing the impact of climate change, meeting the challenges of climate change and other environmental issues through integrated solutions, and incorporating low impact design and other site design strategies to mitigate environmental impacts".

The development of a CCAP is also driven and supported by the 2017 Growth Plan for the Greater Golden Horseshoe, of which a guiding principle is to "integrate climate change considerations into planning and managing growth such as planning for more resilient communities and infrastructure – that are adaptive to the impacts of a changing climate".

Climate projections shown in Table 30 for the Town of Lincoln are based on RCP 8.5 climate models from climatedata.ca, a collaboration between Environment and Climate Change Canada, the Computer Research Institute of Montréal, Ouranos, the Pacific Climate Impacts Consortium, the Prairie Climate Centre, and Habitat Seven.

**Table 30: Climate Projections for Lincoln based on RCP 8.5 models from climatedata.ca**

| Variable | Sub-Variable | Average (1976-2005) | 2050 Projection | 2100 Projection | Trend |
|---|---|---|---|---|---|
| **Temperature** | Hottest day °C | 33 | 37 | 40 | ↑ |
| | Mean Temp °C | 9 | 12 | 15 | ↑ |
| | Min. Temp °C | 4 | 7 | 11 | ↑ |
| | Max. Temp °C | 13 | 16 | 19 | ↑ |
| | Days Over 30 °C | 11 | 47 | 91 | ↑ |
| | Coldest Day °C | -20 | -13 | -8 | ↑ |
| | Days Below -15°C | 8 | 0 | 0 | ↓ |
| | Days Below -25°C | 0 | 0 | 0 | ↓ |
| | Frost Days | 124 | 85 | 46 | ↓ |
| | Cooling Degree Days | 328 | 670 | 1200 | ↑ |
| | Growing Degree Days 10°C | 1390 | 1996 | 2725 | ↑ |
| | Growing Degree Days 5°C | 2390 | 3096 | 3977 | ↑ |
| | Cumulative Degree Days >0 °C | 3657 | 4440 | 5526 | ↑ |
| | Heating Degree Days | 3402 | 2669 | 2011 | ↓ |
| | Ice Days (below 0°C) | 48 | 24 | 6 | ↓ |
| | Tropical Nights >18°C | 26 | 61 | 106 | ↑ |
| | Tropical Nights >20°C | 10 | 39 | 84 | ↑ |
| | Tropical Nights >22°C | 2 | 18 | 60 | ↑ |
| **Precipitation** | Total Precipitation | 864 | 1016 | 955 | ↑ |
| | Max 1 Day Total mm | 39 | 39 | 38 | ↓ |
| | Wet Days >10mm | 26 | 33 | 32 | ↑ |
| | Wet Days >20mm | 6 | 9 | 9 | ↑ |

The overall risk and vulnerability of the Town to each projected impact was assessed to determine its priority and if action to address the impact would be taken. By assessing vulnerability and risk, the following climatic threats were identified as a top priority to the Town of Lincoln, within the corporate scope (refer Figure 17).
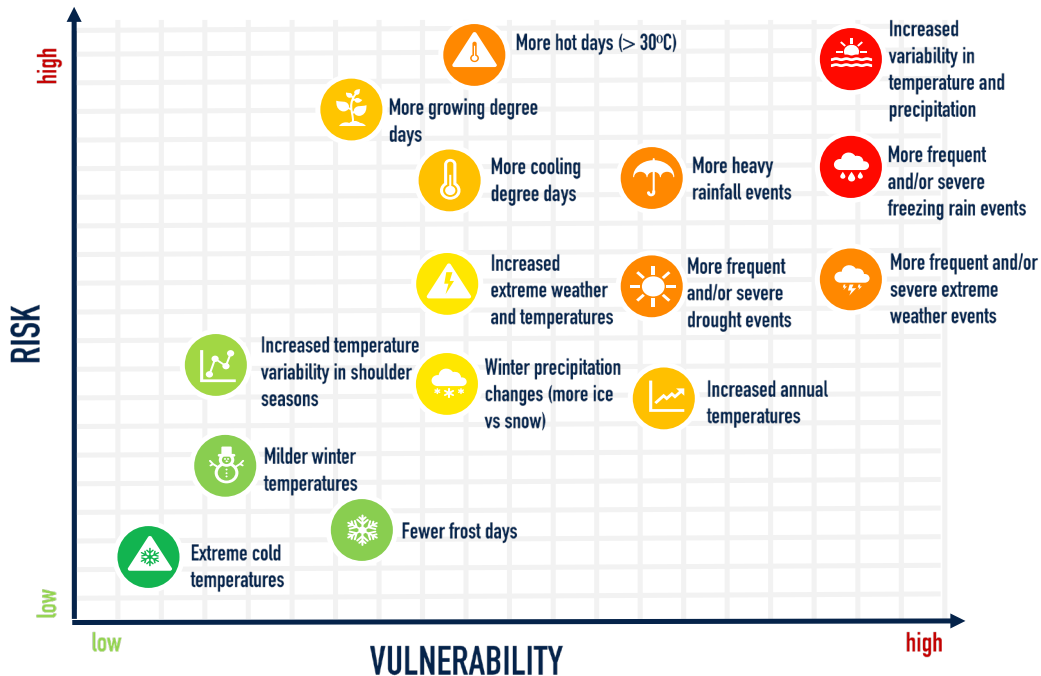
**Figure 17: Vulnerability and risk of climatic threats**

### 4.2.3  MITIGATION ACTIONS

Several actions based on the current understanding of demands and the climate adaptation and resilience requirements have been identified.  These are included in Appendix B.

*GROWTH*

In order to manage growth, the Town can investment more into service areas and/or reduce the need for investment by considering the following strategies:

- **Extending service lives of assets through better maintenance** – Targeted preventative maintenance, and operational practices that preserve the asset can extend an asset's lifespan and reduce long term costs.

- **Earlier interventions with lower lifecycles costs** – Early, low-cost interventions in an asset lifecycle may lengthen service lives. Failing to do early interventions and replacing assets when they fail are generally more expensive.

- **Accept reduced service levels** –Lower levels of quality, availability, consistency, and/or reliability of service or less consistency of service may be acceptable in order to lower operational and capital costs.

- **Fewer services** – Eliminating services saves on operating and capital costs.

- **Alternative revenues** – Alternatives to tax increases may include development cost charges or user fees as examples.

*CLIMATE*

The Town of Lincoln is committed to providing its community with an equitable, sustainable, and prosperous quality of life. In order to adapt, manage, and reduce the impacts of climate change, the Town has committed to 47 actions that the municipality will undertake to adapt to climate change. Adapting assets and the asset management process to anticipated climate change are included in the following goals:

- **Goal 1:** Integrate climate change considerations into Town strategies, plans, policies, procedures, operations, & services.

- **Goal 2:** Increase resiliency & adaptive capacity within economic development, community services, parks, & recreation.

- **Goal 3:** Protect natural resources, promote ecosystem services, & minimize environmental degradation.

- **Goal 4:** Mitigate harmful consequences of extreme weather & emergency events.

- **Goal 7:** Consider climate change impacts in built infrastructure & asset management.

- **Goal 8:** Increase climate change literacy among staff & public.

## *4.2.4 RESILIENCY AND ADAPTATION IMPROVEMENT PRIORITIES*

Table 31 show the improvements identified based on the current understanding of demands, sustainability and the climate adaptation and resilience requirements.

**Table 31: Resiliency and Adaptation Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *19* | 4.2 | Resiliency and adaptation | Review climate change forecasts regularly and modify adaptation plan if appropriate. | Low |

# 4.3 SUSTAINABILITY

For this inaugural asset management plan, the water and wastewater services have been assessed for the first time using the Service Sustainability Assessment Tool (SSAT) which was prepared by Asset Management BC (AMBC). This tool highlights where the service sustainability may be threatened and provides feedback on performance of business practices that contribute to service sustainability. This first assessment provides a benchmark for the Town, Assessments in future years can be compared to this assessment to report if the level of sustainability for each service area is being maintained, improving or declining.

Service sustainability requires balancing service delivery with good governance and strong finances. Many communities have a strong understanding of service delivery itself, that is, how services are delivered, in what quantity, to whom, and where. In fact, much of the work of local government is in the delivery of services. Good governance provides consistent and transparent decision-making that takes a long-term view. Strong finances are key to being able to deliver a service affordably over time.

By assessing the three components of sustainable service delivery together, the SSAT provides clear feedback on strengths and gaps for each component.

## 4.3.1 ASSESSMENT

Lincoln's Environmental Services Department completed the Service Sustainability assessment by rating statements that correspond to the current situation of the water and wastewater services and to their level of future preparedness.

## 4.3.2 CURRENT PERFORMANCE

The results of the Service Sustainability Assessment are reported in 3 lenses:

- Elected Officials (Council/Public)
- Directors (Senior Management)
- Managers (Service Delivery Team)

### WATER

The results of the assessments for the water service are shown in Figure 18.



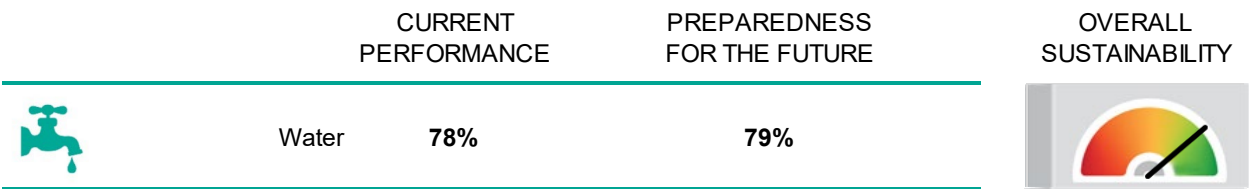| | CURRENT PERFORMANCE | PREPAREDNESS FOR THE FUTURE | OVERALL SUSTAINABILITY |
|---|---|---|---|
| Water | 78% | 79% | |

Figure 18: Sustainability Results - Water

The results of the Service Sustainability Assessment show that the current level of sustainability of the water service is 78%. From a service delivery perspective, the water service is reliable with no major disruptions occurring and water quality meets legislative requirements. Water supply is accessible for Town

residents, but greenbelt restrictions prevent accessibility for rural residents. Financially, there are sufficient reserves to fund renewals and there are reliable revenue sources to ensure sustainable operations.

The results for preparedness for the future for the water service is 79%. The Town has an up-to-date master water plan and a formal preventative maintenance plan in place. Both of these are fully funded. Climate change impacts have been considered in design standards and operations and maintenance practices.

*WASTEWATER*

The results of the assessments for the wastewater service are shown in Figure 19.

| | | CURRENT PERFORMANCE | PREPAREDNESS FOR THE FUTURE | OVERALL SUSTAINABILITY |
|---|---|---|---|---|
| | Wastewater | **72%** | **82%** | |
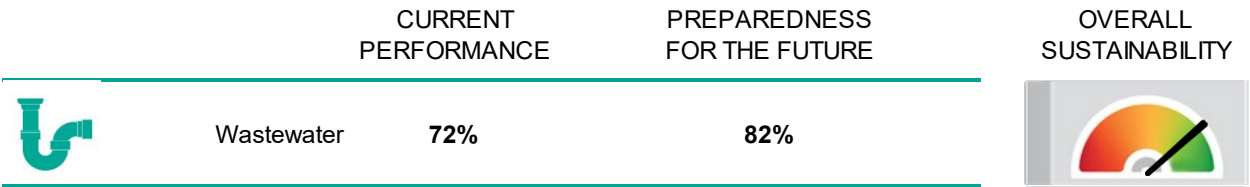
**Figure 19: Sustainability Results - Wastewater**

The results of the Service Sustainability Assessment show that the current level of sustainability of the wastewater service is 72%. For service delivery, the wastewater service is reliable and a high proportion of the system in good condition but there are rural residents that do not have access to the wastewater system due to greenbelt restrictions. Financially, there are sufficient reserves to fund the financial plan and the Town has a reliable source of revenue for sustainable operations.

The results for future preparedness for the wastewater system are 82%. The Town has an up-to-date wastewater master plan and a formal GHG reduction plan in place, and funding sufficient to fully implement plans is available.

### 4.3.3  IMPROVEMENT PRIORITIES

Table 32 show the improvements identified based on the current understanding of demands, sustainability and the climate adaptation and resilience requirements.

**Table 32: Sustainability Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *20* | 4.3 | Sustainability | Water and Wastewater service staff to annually re-assess service against AMBC Sustainable Service Assessment Tool (SSAT). | Medium |

# 5  FINANCIAL SUMMARY

## 5.1  CONTEXT FOR INFORMATION IN THIS SECTION

This section provides an overview of the revenues and costs to provide the services, including operations and maintenance forecasts and capital renewal forecasts as well as new assets and upgrades to support growth. The information included in the financial reflects the 2021-2030 Capital budget and the renewal forecasts from Section 2.2.

## 5.2  FINANCIAL FORECASTS

### 5.2.1  FINANCIAL RENEWAL FORECAST (CAPITAL PLAN)

The renewal forecast capital plan includes for replacement with like-for-like of **existing** assets only and is based on the forecasts in the proposed 2022-2031 Capital budget.

The replacements costs from the capital plan shown in Figure 20 for water and wastewater services have been forecasted over the next 10 years.
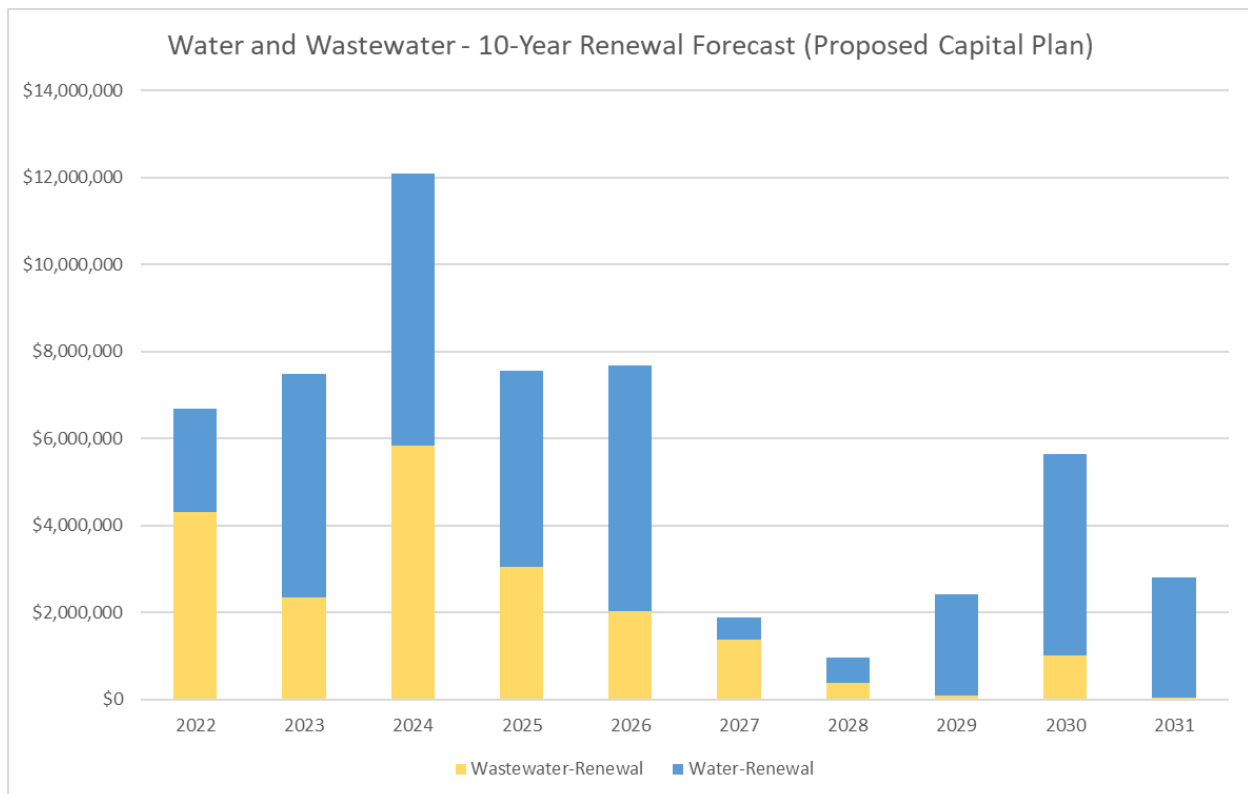


**Figure 20: Utility 10-year capital budget**

The budget for the 10-year capital forecast period is $55.2 million, with $20.4 million allocated to wastewater related renewals and $34.8 million to water related renewals.

## 5.2.2   OPERATIONS, MAINTENANCE, AND INSPECTIONS BUDGET FORECAST

The operations budget forecast includes operations, preventative maintenance, reactive maintenance, and inspections activities.

The operations and maintenance forecast in Figure 21 shows the proposed funding allocated for operations and maintenance activities to be completed on utility assets over the next 10 years. The values between 2023 and 2031 have been estimated using an escalation factor of 3% per annum to reflect expected growth.
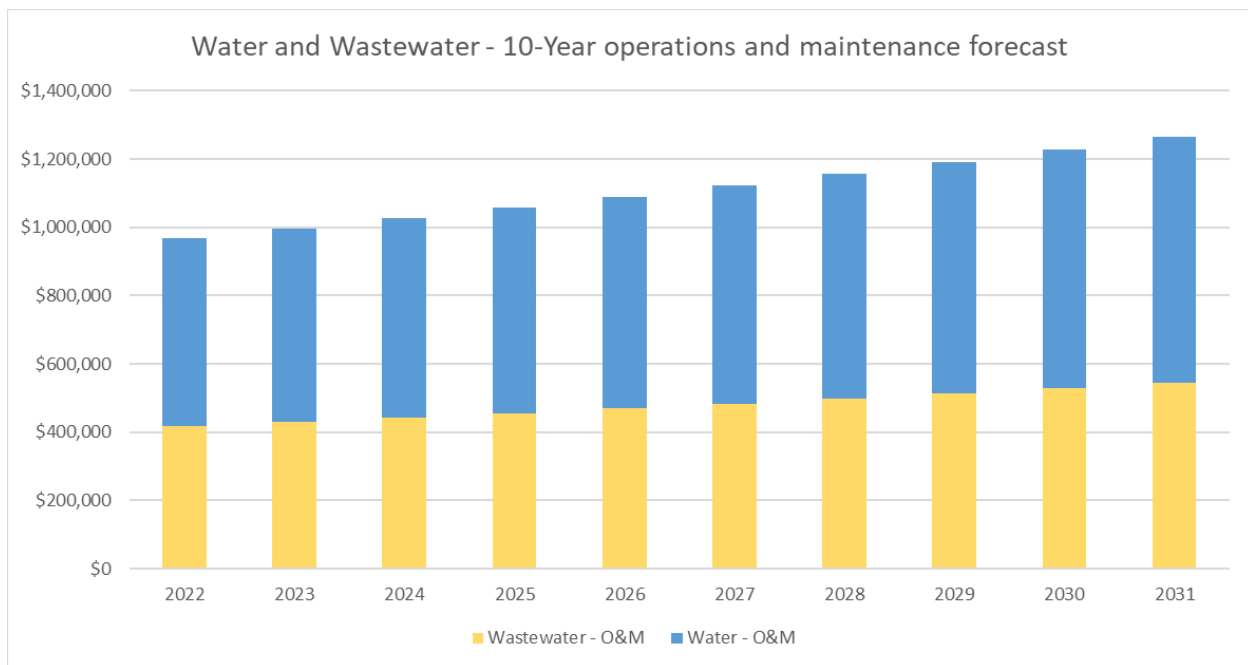


**Figure 21: 10-year operations and maintenance budget**

## 5.2.3   STATE OF INFRASTRUCTURE CAPITAL RENEWAL FORECAST

The State of Infrastructure (SOI) Capital Renewal Forecast includes for replacement with like-for-like of existing assets only and the forecast values are based on the state of infrastructure analysis as described in Table 4. The forecast is shown in 2021 dollars.

Figure 22 shows the SOI capital renewal forecast over the next 10 years. It is important to note that this renewal forecast is based on lifecycle timing only at this time.
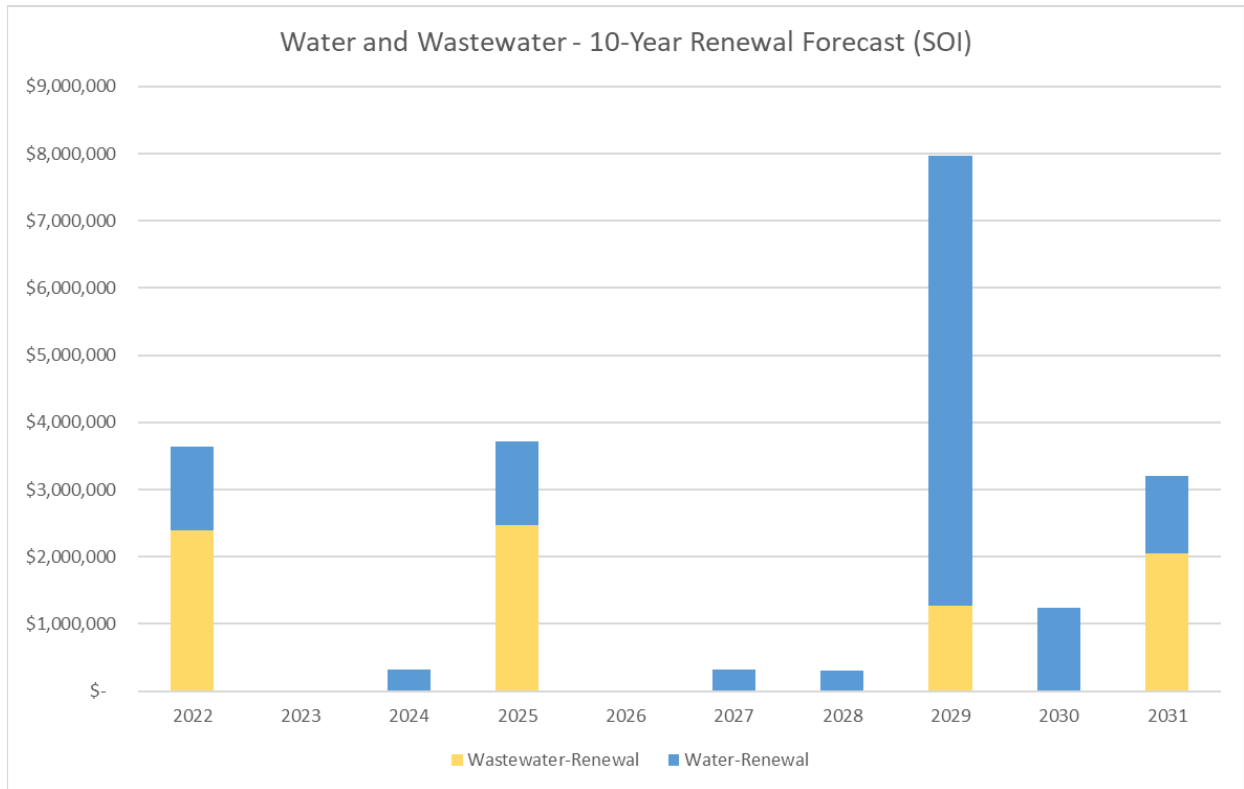
**Figure 22: Utility 10-year age-based renewal forecast**

The costs of the capital renewals over the next 10-year period equate to $20.7 million.

Figure 23 shows a comparison of the forecast renewal and rehabilitation projects in the 2022-2031 Proposed Capital Plan to the forecast asset renewals identified in the State of Infrastructure. The Proposed Capital Plan includes projects based on lifecycle, upgrades to support growth and renewals based on observed condition or operational concerns.
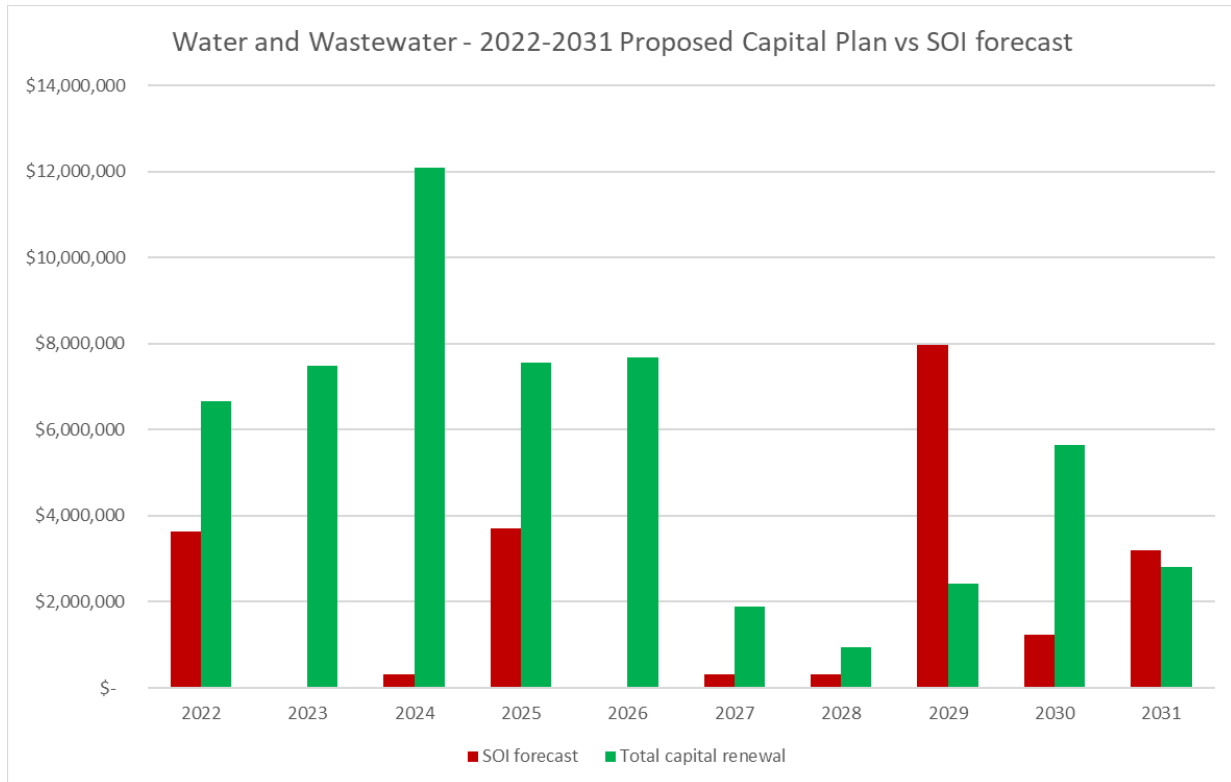
**Figure 23: Comparison between the 10-year capital budget and the SOI renewal forecast**

The total 10-year Proposed Capital Plan for renewals is 2.5 higher than the 10-year renewal forecast from the State of the Infrastructure forecast ($55.2M vs $20.7M). Some of the water and wastewater renewal projects have been driven by growth, expansion or coordination with a wider road renewal project. In these instances, the water or wastewater asset may not be at the end of its useful life but to minimize disruption to users and avoid duplicating reinstatement efforts, the water or wastewater assets is renewed before the asset reaches the end of its useful life.

## 5.2.4 *CAPITAL NEW ASSET FORECAST (NEW/UPGRADE/IMPROVE/AUGMENT)*

The Capital New Asset forecast includes new assets added to the water and wastewater systems, as well as upgrades to support growth, improvements, and augmentation of the existing infrastructure as opposed to renewals that are a replacement of an existing asset with the equivalent. These are typically identified in response to growth and are included in the Proposed Capital Plan.

Figure 24 shows the 10-year forecasted upgrades of existing assets and new assets to support growth.
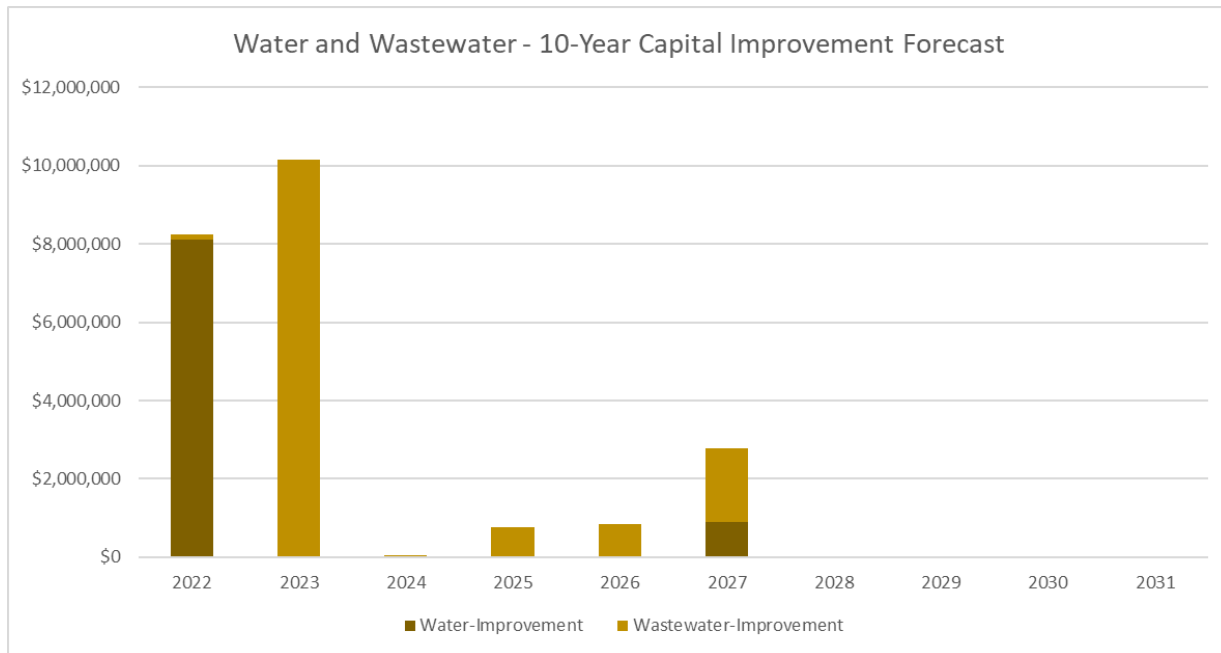
**Figure 24: Water and wastewater 10-year forecast of new assets and upgrades**

### 5.2.5  REVENUE

Capital works, operations and maintenance of water and wastewater services are currently funded by the following sources of revenues:

- Development charges
- Rates
- Grants

A rate study and financial plan update are currently underway.  The initiatives include an in-depth review of sources of revenues and levels of rates. The information will be included in the next iteration of the asset management plan. A development charge study will also be completed in 2023 to include additional projects identified to support growth.

## 5.3  FUNDING STRATEGY

The total planned expenditures (Figure 25) are approximately $89.2 million and includes Proposed Capital Plan as well as operations and maintenance.

Outcomes of the rate study and financial plan will be incorporated in a future iteration of the asset management plan and compared against forecasted expenditures.
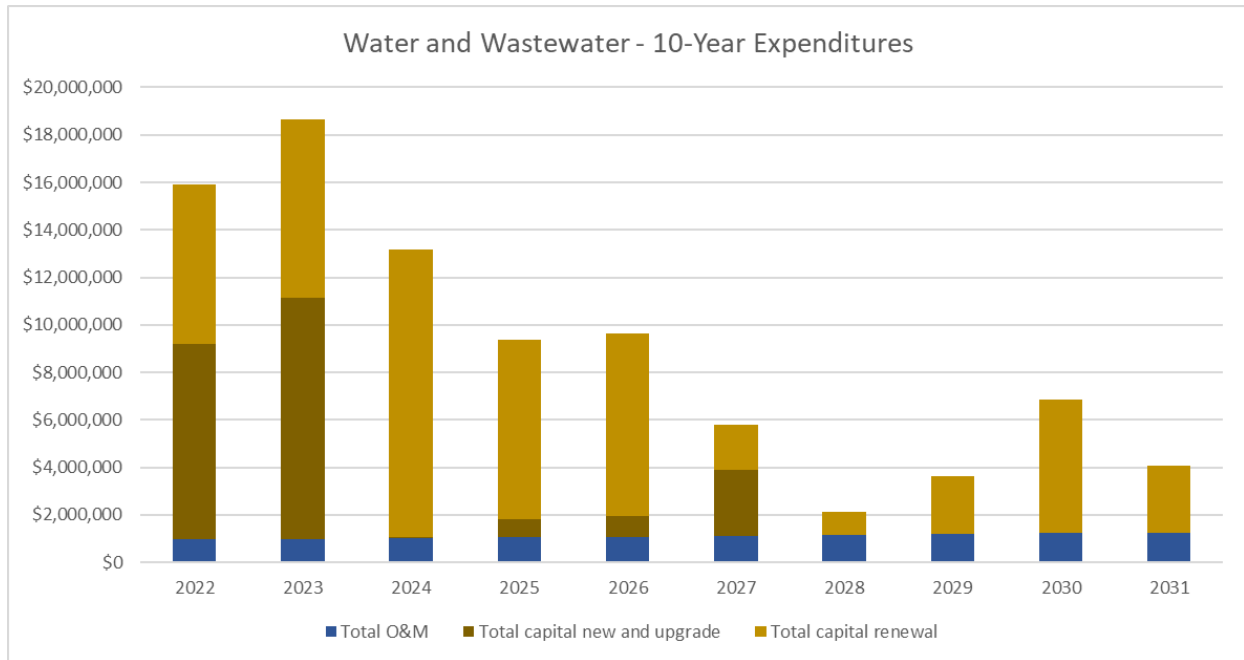
**Figure 25: 10-year total forecasted expenditures**

## 5.4 FINANCIAL IMPROVEMENT PRIORITIES

Table 33 shows the prioritized improvements relating to financial summary.

**Table 33: Financial Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *21* | 5 | Finance | Incorporate the financial sections with update revenues, including reserves forecast once the financial plan is completed. | High |
| 22 | 5 | Finance | Develop a structured process for long-term budgeting decisions to be made considering costs of service delivery and meeting levels of service. | High |
| 23 | 5 | Finance | Review unit rates at a minimum for each new iteration of the asset management plan and update replacement costs as appropriate | High |
| 24 | 5 | Finance | Update the asset management plan with the 10-year capital forecast once approved by Council | High |
| 25 | 5 | Finance | Develop a process to track and separate operations, preventative and reactive maintenance, and inspections costs. | Medium |
| *26* | 5 | Finance | Develop a process to track and separate capital renewals and rehabilitation costs from capital upgrades to support growth, improvements, and new assets. | Medium |
| 27 | 5 | Finance | Record actual costs as assets are replaced to provide local information for unit cost reviews to improve accuracy of financial forecasts for asset renewals. | Medium |
| *28* | 5 | Finance | Evaluate target levels for capital reserve funding, that more closely align to the long-term investment requirements of the service areas that make up the Town's infrastructure portfolio as part of the Water and Wastewater Rate Study and Financial Plan Updates | Medium |
| 29 | 5 | Finance | Establish a formalized prioritization method for evaluating investment alternatives for the Town's capital program. An objective assessment of the risk, service priority and strategic alignment for each investment alternative is one common method to accomplish this. | Medium |
| 30 | 5 | Finance | Where appropriate, coordinate asset management planning with neighbouring municipalities and the region | Medium |
| 31 | 5 | Finance | Develop a formal project prioritization (investment prioritization) and decision-making process | Medium |

# 6 CONTINUOUS IMPROVEMENT

## 6.1 ASSET MANAGEMENT MATURITY ASSESSMENT

An assessment of the water and wastewater service's asset management practices was completed to evaluate service area capabilities and develop a work plan towards enhanced asset management maturity. The results are scored from 1 to 4 based on eight key improvement categories:

1.  Leadership and Commitment
2.  Financial Capacity
3.  Know Your Assets
4.  Know Your Financial Situation
5.  Understand Decision Making
6.  Manage Asset Lifecycle
7.  Know the Rules
8.  Monitor Sustainability

The rating for each question was based on the scale shown in Table 34.

**Table 34: Maturity Rating Description**

| Rating | Description |
|--------|-------------|
| *1* | None: does not exist or has not been started at this stage |
| *2* | Started: some work has begun, or some parts of the asset management practice are available, but progress is less than 40% complete |
| *3* | Progressing: work is underway, and progress is more than 40% complete, but there is still more to do |
| *4* | Complete: the required targets, standards, and/or outcomes for the asset management practice are completed, available, and in use in the business |

### 6.1.1 ASSESSMENT RESULTS - WATER

Assessment results were recorded in a spreadsheet designed for benchmarking the Town's asset management practices. Staff can use the spreadsheet tool to re-evaluate asset management maturity in subsequent years and report progress.

Figure 26 provides a radar chart completed in 2020 that shows the maturity scores of the Water Service.
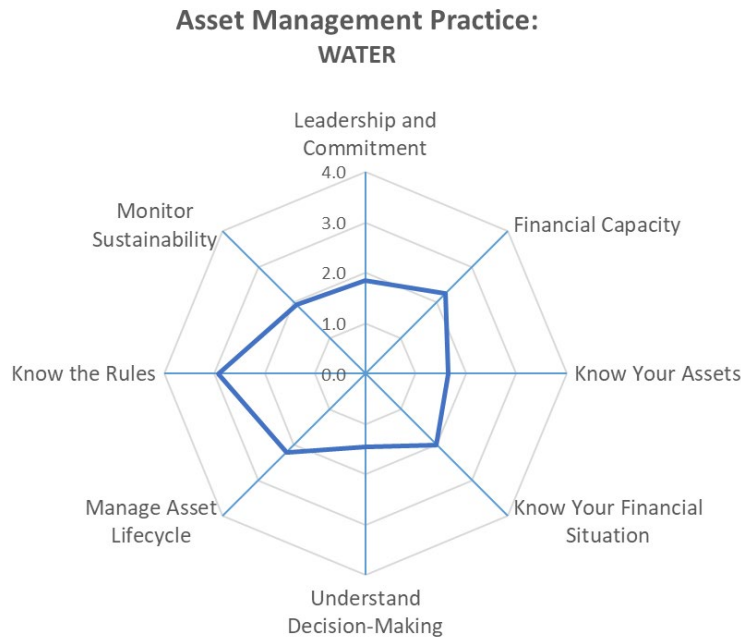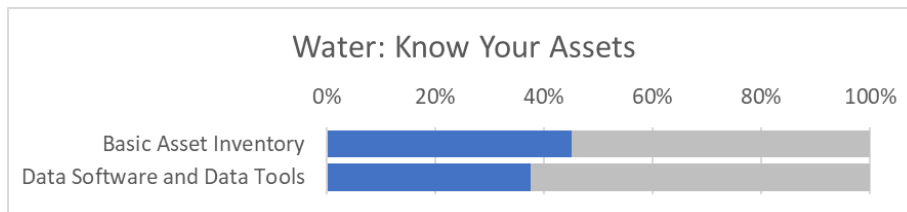
**Asset Management Practice:**
**WATER**



**Figure 26: Maturity Assessment Water Service 2020**

The leadership and commitment and financial capacity criteria of the maturity assessment were assessed at a corporate level rather than by service area. The results for asset management practices for the water service are described below.

*AM PRACTICES & INFORMATION - WATER*

The assessment for the remaining six categories of Asset Management Practice and Information were completed in 2020 for the water service. The following section provides comments on the key points.

- **Know Your Assets:** Datasets exist for key assets via a mix from the corporate GIS system, CityWide and in various spreadsheets. The data has assumed values for asset age and has assets of different types combined together. Consistent data records and processes will need to be developed to ensure that asset information for all groups is consistent, current, and accurate.



- **Know Your Financial Situation:** The water service has anecdotal information available to evaluate the current and future financial situation for service delivery. The asset replacement costs are based on assumed values and useful life information based on industry lifespans rather than what is experienced in the field. There is cost information regarding operations and maintenance activities but not recorded at an asset level.
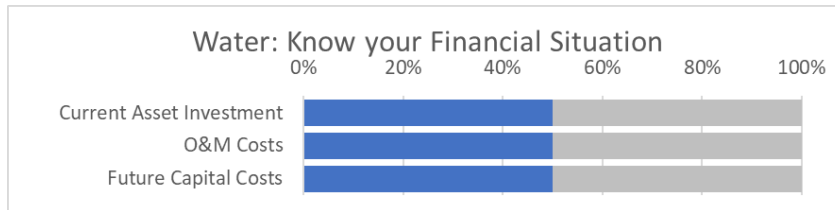
- **Understand Decision-Making:** Decision-making processes across most asset groups are informal and based on the knowledge from background information and expert judgment of experienced staff. Most decision processes and criteria are not documented, although the outcome of decisions and some rationale is reported on a case-by-case basis. At the time of the assessment, an asset management plan had not been developed, but has been addressed with the development of this plan.
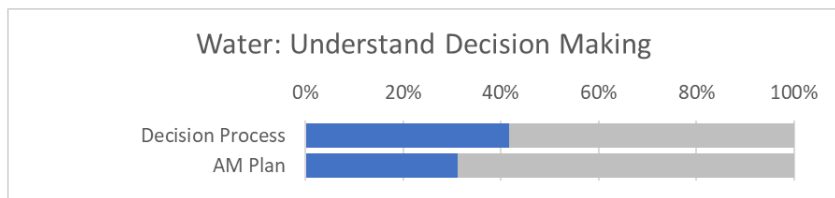


- **Manage Asset Lifecycle:** Current condition data is not available, and any asset renewals are based on main breaks or material rather than planned. Service statements exist for the water service, but detailed service levels do not yet exist for monitoring or measurement purposes. There is risk register and formal risk assessments are completed annually. The water service has a preventative maintenance program in place and some tracking processes.
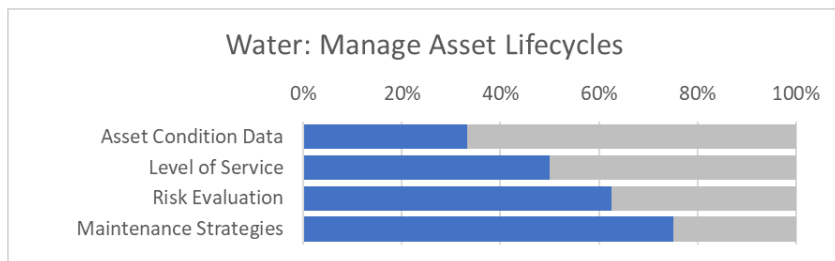


- **Know the Rules:** The water service has a very good understanding of the legislation and rules relating to the assets they manage. Communication protocols need to be developed to disseminate relevant information across the organization for improved awareness, coordination, and efficiencies. Performance measurement processes should be implemented to ensure that this happens, and that the communications are effective.
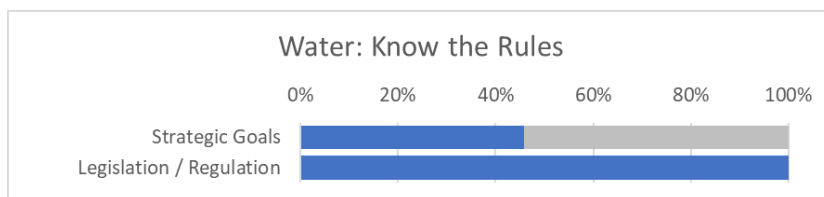
- **Monitor Sustainability:** Sustainability goals are yet to be developed for the water service. Asset management assessments for environmental, financial, and social sustainability need to be undertaken in the future when suitable measured information is available.
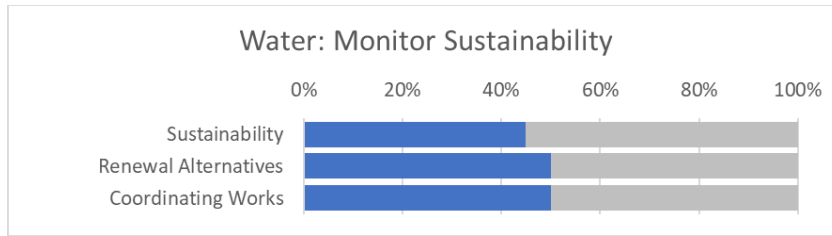


- **Leadership and Commitment:** Lincoln has an asset management policy but does not yet have an asset management strategy or a defined asset management framework. There is an established asset management focus group and there is a strong culture of teamwork across the service areas, however the group does not have any terms of reference and the roles and responsibilities for asset management are still in the development phase. The leadership team is empowering staff to deliver asset management practices but dedicated resources have not been established and asset management practices to identify and report o key issues are in early phase of development. There is no formalized data governance document or data structure model.
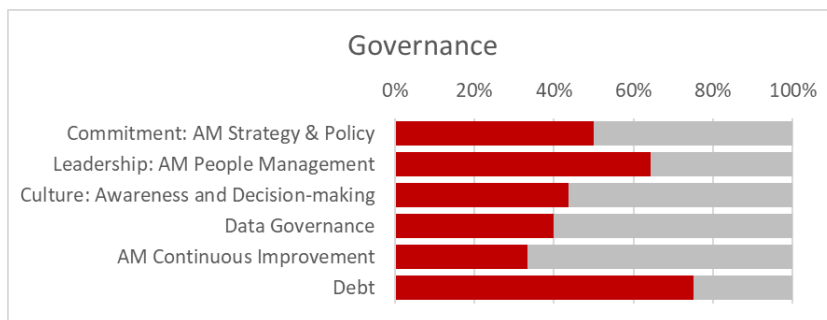


- **Financial Capacity:** Lincoln produces short term (5-10 years) financial plans. Plans rarely consider long term planning horizons of 20-30 years or more. The level of current revenue is deemed adequate in the short term but there is no supporting information available too if they are adequate for longer term financial sustainability and service delivery. Some reserves are in place but there is not sufficient information to understand if they are adequate. Similarly, there is insufficient information to determine if revenues are adequate for the long-term. Debt levels have been rated as reasonable and stable, but long-term sustainability is uncertain because a long-term assessment and plan are still to be established. Funding sources for the short to medium term are well understood and there is medium to low risk of significant change, but little is understood of longer-term risks or vulnerabilities.
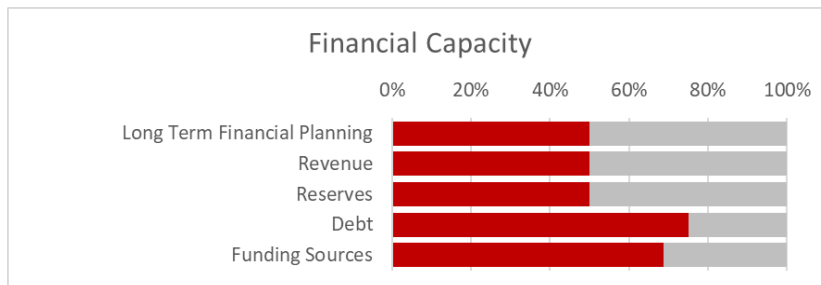
## 6.1.2 ASSESSMENT RESULTS – WASTEWATER

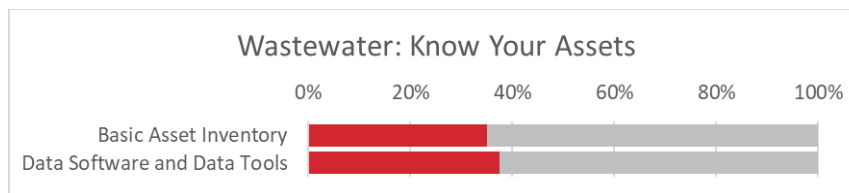Figure 27 provides a radar chart completed in 2020 that shows the maturity scores of the Wastewater Service.



**Asset Management Practice**
**WASTEWATER**

*AM PRACTICES & INFORMATION - WASTEWATER*

The assessment for the remaining six categories of Asset Management Practice and Information were completed in 2020 for the wastewater service and the following section provides comment on the key points.

- **Know Your Assets:** Datasets exist for key assets via a mix from the corporate GIS system, CityWide and in various spreadsheets. The data has assumed values for asset age and has assets of different types combined together. Consistent data records and processes will need to be developed to ensure that asset information for all groups is consistent, current, and accurate.



- **Know Your Financial Situation:** The water service has anecdotal information available to evaluate the current financial situation and has identified future growth and future financial situation for service delivery in the master plan. The asset replacement costs are based on assumed values and useful life information based on industry lifespans rather than what is experienced in the field.

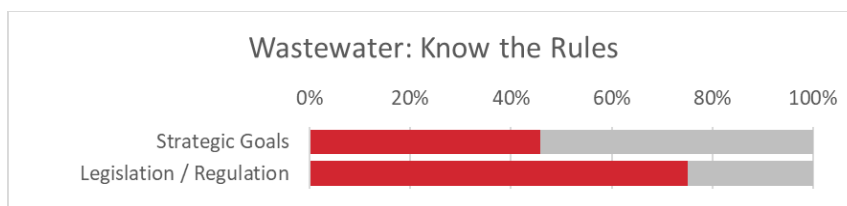There is cost information regarding operations and maintenance activities but not recorded at an asset level.
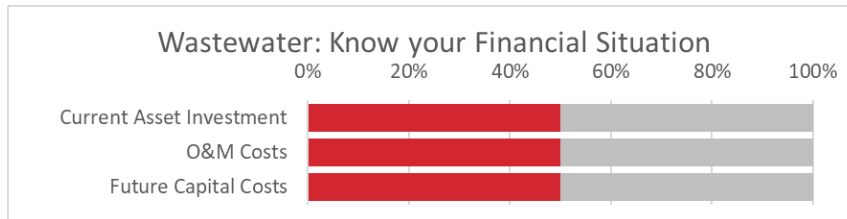


- **Understand Decision-Making:** Decision-making processes across most asset groups are informal and based on the knowledge from background information and expert judgment of experienced staff. Decision processes and criteria are not documented, although the outcome of decisions and some rationale is reported on a case-by-case basis. At the time of the assessment, an asset management plan had not been developed, but has been addressed with the development of this plan.
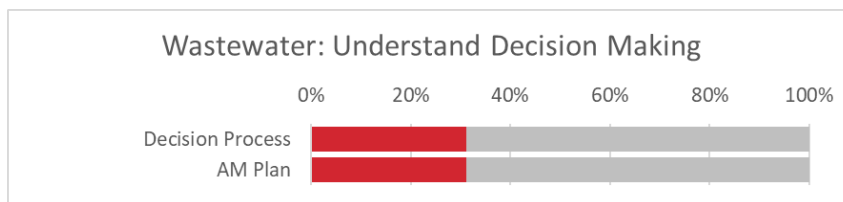


- **Manage Asset Lifecycle:** Current condition data is available for sewer mains but has no linkage to the segments listed in the GIS data. Service statements exist for the wastewater service, but detailed service levels do not yet exist for monitoring or measurement purposes. There is no formal risk assessment process developed for the wastewater service as the assets are managed more reactively. A preventative maintenance program is in development.
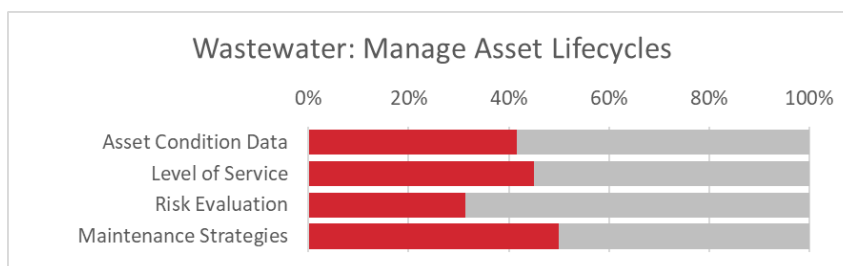


- **Know the Rules:** The wastewater service has a good understanding of the legislation and rules relating to the assets they manage. Communication protocols need to be developed to disseminate relevant information across the organization for improved awareness, coordination, and efficiencies. Performance measurement processes should be implemented to ensure that this happens, and that the communications are effective.

- **Monitor Sustainability:** Sustainability goals are yet to be developed for the wastewater service. Asset management assessments for environmental, financial, and social sustainability need to be undertaken in the future when suitable measured information is available.
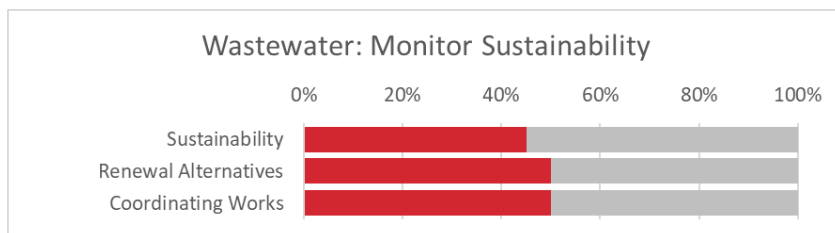


- **Leadership and Commitment**: Refer to 6.1.1

- **Financial Capacity**: Refer to 6.1.1

### 6.1.3  IMPROVEMENT STRATEGY (PRIORITY AREAS FOR IMPROVEMENT)

Table 35 shows the areas for improvement that were identified as part of the 2020 maturity assessment. Most of these tasks have been completed since doing the maturity assessment.

The remaining tasks were considered for recommended improvement actions for this asset management plan. The improvement action list is given in Table 36. Column "Action No." in Table 35, provides a link between the remaining maturity assessment tasks and the recommended improvement actions in Table 36, as relevant. Note that one task is not currently relevant but may be considered as a potential future task and another task will be included in the corporate asset management plan.

**Table 35: Asset Management Improvement Strategy Tasks (2020 AM Maturity Assessment)**

| Task No. | Category | Task/Activity | Description | Action No. |
|---|---|---|---|---|
| *1* | Data | Data Structure | Includes defining the core attributes to be recorded, data formats, naming conventions, etc. | 1, 3, 5 |
| *2* | Data | Data Governance | Includes the data structure and adds data roles & responsibilities plus the purpose and intended use of the data and the main standard business processes (or operating procedures) for creating, updating, and maintaining asset data. | 5 |

| Task No. | Category | Task/Activity | Description | Action No. |
|---|---|---|---|---|
| *3* | Data | Data Capture | Includes data gap assessment, prioritizing what to capture, defining method for data capture, and developing a data capture program (prioritized schedule of data capture work). | 2, 4, 6 |
| *4* | AMP | Renewal Forecast | Includes completing a State of Infrastructure (SOI) assessment based on the most up to date asset data and collaborating with Lincoln to define typical unit replacement costs and lifespans, then using this data to forecast the timing and cost of asset replacements for a long-term forecast. | Done |
| *5* | AMP | Basic Level of Service | This begins with a basic LOS description of expectations for each stakeholder group and identifying performance measures (what to measure and what targets to be achieved). | Done |
| *6* | AMP | Advanced Level of Service | This will build on the basic LOS details but will expand to include details on Customer LOS, Technical LOS, Operational LOS, and consider both current and future states. | Done |
| *7* | AMP | State of Infrastructure | This is an analysis of current asset data to determine the quantity, condition, and age of each asset, it expected lifespan and replacement value, its current book value, and its expected replacement year. | Done |
| *8* | AMP | Basic Lifecycle Strategies | This begins with a basic description of the lifecycle management of groups of assets detailing the types and frequency of inspections, any preventative maintenance activities, any significant rehabilitation treatments that will be done during its life and what happens at the end of its life (and how is replacement managed). | Done |
| *9* | AMP | Advanced Lifecycle Strategies | This builds on the basic lifecycle strategies and expands to provide more details and costs and specify decision processes and any data monitoring or analysis. | 13 |

| Task No. | Category | Task/Activity | Description | Action No. |
|---|---|---|---|---|
| *10* | AMP | Basic Risk Assessment | This begins with assigning a rating for the criticality of each asset in regard to delivering the service, combined with a rating for the likelihood of the asset failing (based on its age and expected remaining life) to generate a basic risk rating. | Done |
| *11* | AMP | Advanced Risk Assessment | This builds on the basic risk rating to consider other aspects of consequence in addition to service delivery and analyses failure likelihood in more detail including failure on functionality and capacity as well as physical failure, to derive a more detailed risk analysis. | 15 |
| *12* | AMP | Service Plan Documents | This is to collate AMP components into a Service Delivery Plan for each significant service area. | No longer relevant. Potential Future Task |
| *13* | AMP | Corporate Plan Document | This is to generate a summary corporate AMP document that provides highlights from each Service Delivery Plan and collated corporately significant data such as financial forecasts, state of the infrastructure, level of service performance, risk profiles and major issues or vulnerabilities. | See Corporate Asset Management Plan |
| *14* | People | Resource Plan | This is a detailed plan identifying the resources required to complete work and comparing these to available resources to quantify the gap (i.e., resources needed) and facilitate decisions on what tasks to do when and whether to use internal or external resource as well as providing evidence for requests for additional staff. It can be completed just for AM improvement work, or it can be for all work including operations and maintenance tasks required to deliver agreed levels of service as well as managing capital works programs and administrative tasks as well as other council initiatives as and when they are being considered or have been adopted. | Done |

| Task No. | Category | Task/Activity | Description | Action No. |
|---|---|---|---|---|
| *15* | Software Tools | Functional Requirements | This is the first step required before considering purchase of software to assist AM. It is a process of identifying and prioritizing what each department needs the system to do. This prioritized list of requirements can then be used as a measure for objective comparison and rating of software options from vendors. | Done |
| *16* | Governance | Goals and Objectives | This includes to identify the primary objectives of AM for the organization and key goals (with measurable targets) that will help the organization achieve those objectives. | Done |
| *17* | Business Management | Procedures and Decisions | The first step is to identify key decision processes that should have some controls or documentation to ensure they consider all relevant information, involve all the right people, and the decision made in a consistent way that can be explained. | Done |

## 6.2 ASSET MANAGEMENT PLAN IMPROVEMENT ACTIONS

Table 36 shows a prioritized list of improvement actions/tasks collated from each section of this asset management plan.

**Table 36: AMP Improvement Tasks**

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *1* | 2 | Asset Data | Develop and implement a plan to continuously verify and update data register. This includes adding assets that are currently not recorded, updating records when an asset is replaced and filling any current gaps where attributes are missing. | High |
| *2* | 2 | Asset Data | Align asset identifiers for sewer mains in sanitary asset data with identifiers in condition assessment information. Update asset register with condition data every 5 years as per the asset management policy and revise the state of infrastructure section in the next iteration of asset management plan. | High |
| *3* | 2 | Asset Data | Update water asset inventory to componentize water booster stations (e.g., building or chamber assets, electrical and controls, pumps, valves, flow monitor, generator). | High |
| *4* | 2 | Asset Data | Update inventory to reflect current assets, including addressing any data gaps in the current inventory and adding any assets not captured, for example hydrants and sewer laterals. | High |
| *5* | 2 | Asset Data | Implement the recommendations included in the Data Management Plan, in particular:<br><br>• Developing a data standard and data hierarchy to ensure consistency<br>• Develop a plan to populate missing asset attribute data<br>• Develop roles and assign responsibility of the management of data<br><br>Adopt a database software to host data and have a single source of truth. | High |
| *6* | 2 | Asset Data | Record the age of assets when they are replaced, and the reason for replacing them (e.g., deterioration, not performing as required). | Medium |

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *7* | 2 | Asset Data | Retain asset attributes for assets that are out of service. This information can be used once sufficient historical data is accumulated to gain a better understanding of performance trends, in particular for assets where the timing for replacement is not regulated. | Medium |
| *8* | 2 | Asset Data | Review unit costs against recent construction projects and market rates relevant at the time of the update. | High |
| *9* | 3.1 | Level of service | Review levels of service to determine if they are relevant and useful to support decision-making, in particular the ones where performance is not currently measured. | High |
| *10* | 3.1 | Level of service | Develop an approach for collecting and collating data / information for each performance measure that has been identified in Table 9 to Table 12 and labeled as "TBD". | High |
| *11* | 3.1 | Level of service | Review existing targets and set targets for the performance measure where a target is currently not defined based on measured results or regulatory requirements as appropriate. This may include improving work order management system to support identification of LOS targets. | High |
| *12* | 3.2 | Lifecycle Strategy | Develop lifecycle strategies for any new assets that become part of the water and wastewater systems. | Medium |
| *13* | 3.2 | Lifecycle Strategy | Review and revise lifecycle strategies if maintenance approaches change (including where new technologies are employed) and include more details and costs and specify decision processes. | Medium |
| *14* | 3.3 | Risk | Complete condition assessments on assets to improve understanding of likelihood of failure for asset level risks. Where asset level risks remain high or very high, add assets into renewal or rehabilitation programs. | High |

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *15* | 3.3 | Risk | Review and revise asset level risks in State of Infrastructure Dashboard and report in next iteration of this Asset Management Plan. This includes considering other aspects of consequence in addition to service delivery and analyses failure likelihood in more detail including failure on functionality and capacity as well as physical failure, to derive a more detailed risk analysis. | High |
| *16* | 3.3 | Risk | Continue to monitor all medium service-level risks and update risk register if risk levels change, for example following any changes in climate change predictions. | Medium |
| *17* | 3.4 | Resources | Re-assess resourcing requirements every 2 to 3 years and report resource levels. | Low |
| *18* | 4.1 | Demand management | Revise the demand risk as mitigation measures are implemented and at least annually to update for changes in demand drivers. | Low |
| *19* | 4.2 | Resiliency and adaptation | Review climate change forecasts regularly and modify adaptation plan if appropriate. | Low |
| *20* | 4.3 | Sustainability | Water and Wastewater service staff to annually re-assess service against AMBC Sustainable Service Assessment Tool (SSAT). | Medium |
| *21* | 5 | Finance | Incorporate the financial sections with update revenues, including reserves forecast once the financial plan is completed. | High |
| *22* | 5 | Finance | Develop a structured process for long-term budgeting decisions to be made considering costs of service delivery and meeting levels of service. | High |
| *23* | 5 | Finance | Review unit rates at a minimum for each new iteration of the asset management plan and update replacement costs as appropriate. | High |
| *24* | 5 | Finance | Update the asset management plan with the 10-year capital forecast once approved by Council. | High |
| *25* | 5 | Finance | Develop a process to track and separate operations, preventative and reactive maintenance, and inspections costs. | Medium |

| Action No. | AMP Section | AM Practice Area | Task Description | Action Priority |
|---|---|---|---|---|
| *26* | 5 | Finance | Develop a process to track and separate capital renewals and rehabilitation costs from capital upgrades to support growth, improvements, and new assets. | Medium |
| *27* | 5 | Finance | Record actual costs as assets are replaced to provide local information for unit cost reviews to improve accuracy of financial forecasts for asset renewals. | Medium |
| *28* | 5 | Finance | Evaluate target levels for capital reserve funding, that more closely align to the long-term investment requirements of the service areas that make up the Town's infrastructure portfolio as part of the Water and Wastewater Rate Study and Financial Plan Updates. | Medium |
| *29* | 5 | Finance | Establish a formalized prioritization method for evaluating investment alternatives for the Town's capital program. An objective assessment of the risk, service priority and strategic alignment for each investment alternative is one common method to accomplish this. | Medium |
| *30* | 5 | Finance | Where appropriate, coordinate asset management planning with neighbouring municipalities and the region. | Medium |
| *31* | 5 | Finance | Develop a formal project prioritization (investment prioritization) and decision-making process. | Medium |

# 6.3  IMPLEMENTATION PLAN

In addition to documenting current state and business practices for the management of the Town's water and wastewater services, the asset management plan provides recommended improvement tasks as described in Section 6.2. These improvement tasks will:

- Increase the level of understanding of the assets and services provided.
- Improve the accuracy of financial forecasts and risk assessments.
- Provide decision-makers with more accurate and complete information in an easy-to-understand format to assist them with making evidence-based decisions for the best use of available funding and the best interests of the community.

## 6.3.1  CONTINUOUS IMPROVEMENT PROCEDURES

The Town will adopt a continuous improvement approach as shown in Figure 28. A continuous improvement approach includes a regular review and adjustment process to keep the asset management plan up to date with the latest information, understanding, and forecasts.

This can also be described as a 'Plan, Do, Check, Adjust,' process (based on the Deming Cycle).

This four-step process can be used to generate on-going iterative improvements to the asset management plan and all business processes for the management of the assets and the delivery of the service, and to facilitate responsible adaptation to change. Each phase of the four-step process is described in Figure 28, starting with the implementation or 'Do' phase for this asset management plan as the development of this asset management plan was the first iteration of the 'Plan' phase.

The review cycle for implementing and updating the asset management plan should be done annually. However, it may be done every two years where little change has occurred. The timing for the asset management plan update is preferably prior to the annual budget process. This will facilitate consideration of outcomes and inclusion of updated forecasts into the financial planning process.
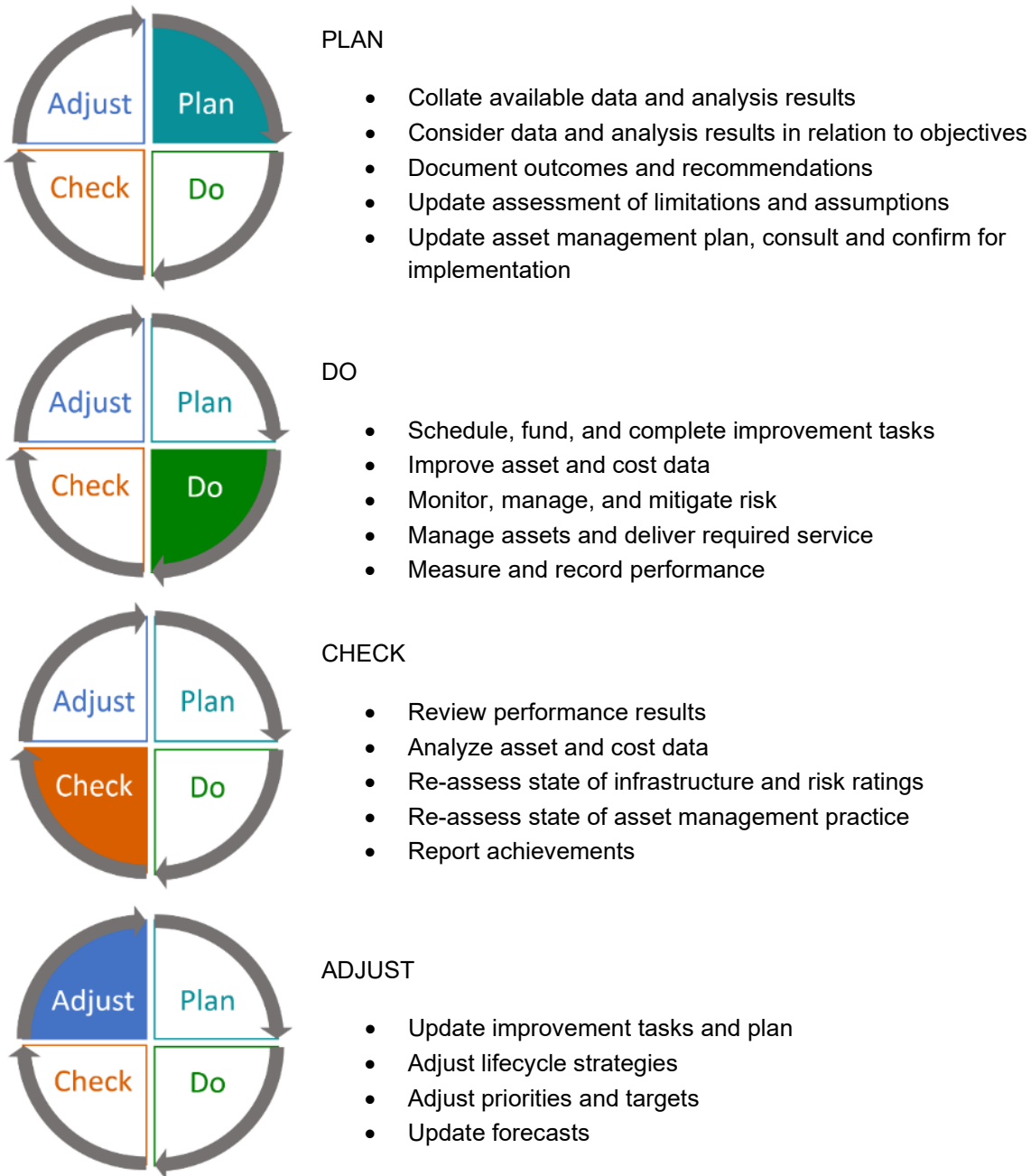
**PLAN**

- Collate available data and analysis results
- Consider data and analysis results in relation to objectives
- Document outcomes and recommendations
- Update assessment of limitations and assumptions
- Update asset management plan, consult and confirm for implementation

**DO**

- Schedule, fund, and complete improvement tasks
- Improve asset and cost data
- Monitor, manage, and mitigate risk
- Manage assets and deliver required service
- Measure and record performance

**CHECK**

- Review performance results
- Analyze asset and cost data
- Re-assess state of infrastructure and risk ratings
- Re-assess state of asset management practice
- Report achievements

**ADJUST**

- Update improvement tasks and plan
- Adjust lifecycle strategies
- Adjust priorities and targets
- Update forecasts

**Figure 28: Continuous Improvement Cycle**

## 6.3.2  CHANGE MANAGEMENT STRATEGY AND ACTION PLAN

The Town currently doesn't have a change management strategy and action plan. Several improvements have been identified in the asset management plan, in addition to the data management plan and overall asset management process currently being considered. It is recommended that a formal change management strategy is developed to provide a clear path.

*GENERAL CHANGE MANAGEMENT STRATEGY*

**Relationships**

Managing relationships within the Town is crucial for the successful implementation of asset management practices. Helping staff see the path, providing them with the resources they need to succeed, and clear communication will support the Town on its path to creating a cultural shift and ingraining asset management practices into all levels of the organization.

There are several strategies the Town can implement to increase the likelihood of effecting a change successfully. These strategies include:

**Establishing a Clear Vision**

Developing a clear and concise vision statement for how asset management will impact the organization is the first step toward general agreement on what the organization wants to achieve with the change. The vision will also support communicating the change to staff. Any communication should ultimately align with vision and will help staff to envision how their tasks align and support the organizational goal.

**Mapping the Journey**

One of the main reasons why implementing a change can fail is because an organization tried to implement too many change initiatives too quickly, and without prioritization. Being over ambitious can harm the process as people may need time to adjust to the change. Providing too many tasks without alignment to an objective can also confuse staff. Identifying areas of focus and mapping out the journey can help the team understand the steps needed to reach the end goal. Reviewing the implementation can provide a sense of how ambitious the Town intends to be in implement changes, what the changes are, which areas of the organization will be affected, and when. A strategy can then be prepared prior to rolling out the change to minimize staff resistance.

**Prioritize People and Leverage the Champions**

Change is not possible without its people and changing an organization's culture takes time. People have different tolerances for embracing change and by identifying champions for change and empowering them to deliver results can be an effective strategy for change. The Town can identify a sponsor and create an asset management working group which can be open to anyone who is interested in leading the change. Facilitating weekly or monthly meetings to provide updates on quick wins, and schedules can keep momentum. By creating this collective group of passionate people who have bought into the change can increase the Town's likelihood of success.

**Anticipate and Manage Resistance to Change**

Any change can be disruptive to a person's role, and a person may resist a change for various reasons. Being aware of the reasons why people may resist a change and having a set of prepared response strategies can help to communicate a change in a positive way. For example, some individuals may think that Asset Management practices create unnecessary work that provides little value. A strategy to counteract this claim is to help the individual treat it as a new challenge to be solved. One could also reiterate how the practices will support better decision making. Table 37 includes some sample reasons why people resist change, sample scenarios, as well as strategies to minimize staff resistance.

**Table 37: Reasons why people resist change, and strategies to minimize resistance**

| Reasons People Resist the Change | Anticipated Scenario | Strategy to Minimize the Resistance |
|---|---|---|
| *Parochial self interest – Individuals are concerned with the implications for themselves* | Some individuals may become frustrated because they feel as though the new tasks will create unnecessary work. | It's a new challenge to be solved! Reiterate how the practices will support better decisions. |
| *Misunderstanding due to miscommunication or inadequate information* | Asset management can sound like a large undertaking, and some may not understand it. | When communicating, keep it simple. Leverage subject matter experts |
| *Low tolerance for change due to a sense of insecurity or lack of patience* | People may fear that their jobs are being replaced by technology. | Highlight that it is an opportunity for development. |
| *Different assessment of the situation – disagree over the need for change or the advantages.* | May have a different understanding for the level of effort vs the benefit. If they don't understand the benefit, the level of effort may not seem worth the time. | Opportunity to participate and shape the outcome. |
| *Individual challenges with implementing the change* | Some field staff do not enjoy working with computers daily and may resist the requirement to input data into a computer or system. | Pairing up a senior person with a data manager will support succession planning while reducing the need for a person being forced to learn new systems. |
| *Loss in momentum* | A member may have been on-board, but over time change was not seen and interest and momentum are lost. | Submit an internal anonymous survey that asks question to gauge the level of engagement. |

*GENERAL CHANGE READINESS ASSESSMENT*

**Assess the Town's Change Readiness**

A change readiness assessment can be completed to understand how prepared an organization is to undertake a major change. The assessment can consider how an organization manages its assets, and how it adapts to change. An Asset Management change readiness assessment can evaluate the organization's context for change based on the components in Table 38.

**Table 38: Sample change readiness assessment categories and components**

| Category | Component |
|---|---|
| *Employee readiness* | • Awareness and perception of change<br>• Support for and commitment to change<br>• Understanding the ability to implement the required skills and behaviours |
| *Organizational context* | • Goals and alignment<br>• Leadership Support<br>• Organizational structure and culture<br>• Authority and initiative for decision-making<br>• Communication and engagement<br>• Residual of previous change efforts<br>• Resources available for the change |

The feedback from this assessment can then inform a change management strategy that can accompany an asset management implementation plan.

## *GENERAL CHANGE COMMUNICATION*

### Communicate the Change

Before communicating a task to staff members, it is important to be clear on what you need them to do and how they'll succeed. Below are some considerations to help prepare and plan for discussions when implementing a change.

- **Consider who is involved** and why they may resist the change. Communicate what the AM benefits will be.
- **Align the task with the vision** to provide purpose to the change.
- **Does the team have what they need to be successful?** Do they need training, additional resources, or new software and tools?
- **Will their role change?** What do you think some of their fears will be? How can you support them through the change?
- **Be clear about the task** and communicate what is involved, what the proposed change is, why the change is needed, what the major effects will be, and how the process will be managed.

## *GENERAL CHANGE PROCESS*

### Develop a Change Management Team

Developing and implementing a change management team can support business process improvement initiatives and can help drive cultural transformation, focusing on building agility, accountability, and employee empowerment.

**Provide Training to Support Staff**

Implementing asset management can feel like a large undertaking to many. Providing training to introduce asset management concepts will allow staff to "speak the same language". Training staff on what AM can do for them creates a personal connection as they now understand how AM will make their role more effective.

**Monitoring**

The Town should schedule a recurring monitoring schedule to review progress. It should include metrics on how the organization plans to measure success and review whether the organization is achieving its objectives. A process for receiving staff feedback should be established to determine focus areas for adjustment. Lastly, upon reflecting on the progress to date, the Town should review whether additional support is needed.

## 6.3.3 PERFORMANCE MEASURES & EVALUATION PROCESS

### PERFORMANCE MONITORING

To inform and support improvement, it is necessary to monitor current performance, and to review performance outcomes compared to the intended outcomes. Performance Monitoring & Evaluation (PME) is therefore an integral part of implementing robust Asset Management.

Monitoring and evaluating the performance of the assets and services will help to improve the reliability and consistency of service delivery.

The primary objective for performance measurement is not reporting performance; it is managing performance to achieve a specific target.

This section describes the three key performance measurement processes for asset management that will evaluate whether the Utility management team are:

- Completing the asset management improvement tasks.
- Achieving asset management and the maturity targets, and.
- Improving asset data that will support evidence-based decisions.

### REPORTING PROGRESS ON IMPROVEMENT TASKS

At least annually review and report the percent complete for each improvement task. Compare results to the schedule of work planned for completion in that year. It would also be useful to compare the hours spent on each task and the total expenses for the year compared to budget hours and expenses. This will inform whether each task is on track for completion on time and to budget and identify areas of concern for any tasks that are not on track. However, the ability to do this detailed reporting will depend on whether records are kept of staff time and expenses for work done on each task throughout the year. The minimum requirement is to report annually on the overall percent complete for scheduled improvement tasks.

At least annually the schedule for asset management improvement tasks must be reviewed and revised. Completed tasks should be removed, and new tasks added where necessary. New completion dates should be agreed for tasks that are partially complete. All other tasks in the asset management improvement plan, including tasks that were scheduled for completion during the year but have not been started, should be reassessed for priority and where appropriate assigned new start and completion dates. Any tasks that are no longer required should be removed from the plan.

This annual review and updating of the improvement program should also consider the outcomes of re-assessment of asset management maturity and re-assessment of Asset Data quality.

*REPORTING PROGRESS ON ASSET MANAGEMENT MATURITY*

The asset management maturity assessment process is described in Section 6.1. To measure improvements of asset management maturity, a re-assessment should be completed (at least annually) and the results from each year compared to the previous year. Where appropriate, add a comparison to the first year of the program.

The step-by-step instruction for completing a re-assessment of asset management maturity using the assessment tools included in the "Notes" tab of that assessment tool. Each year a new copy of the analysis spreadsheet can be made so changes are easily tracked over time.
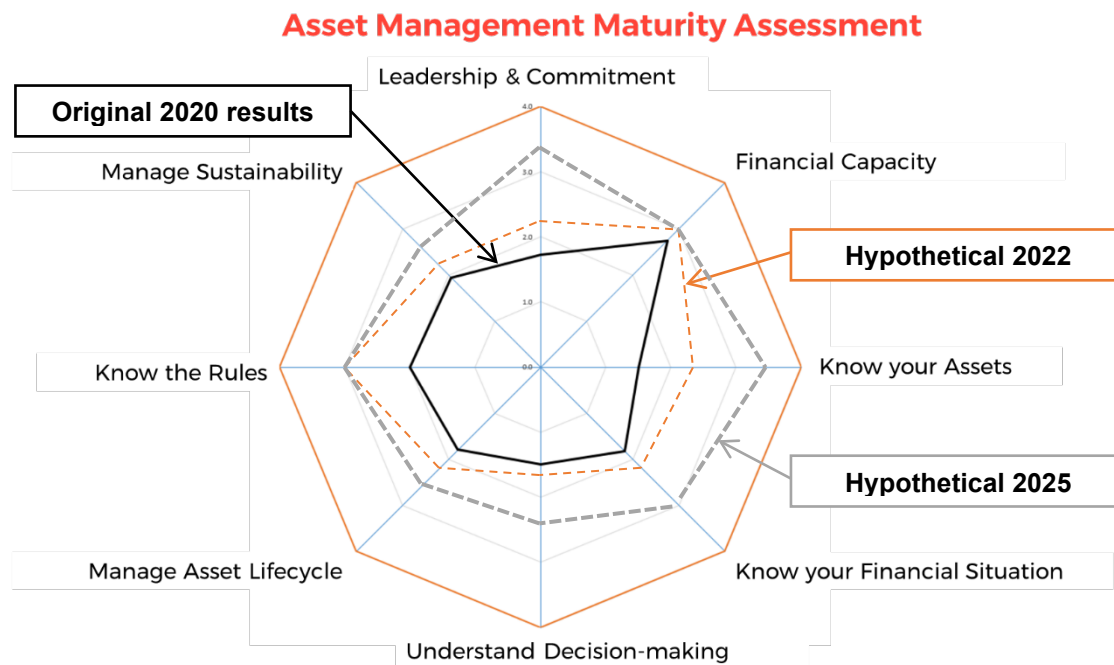


**Figure 29: Reporting Progress on AM Maturity - Example**

The Asset Management Maturity assessment tool provides several automated infographics and tables for reporting current results and comparing results to previous results and to any future targets if these have been set. The following diagram is an example.

The assessment tool provides further detail if required, for the results within each of the categories summarized in the graph above.

The results of the annual asset management maturity re-assessment provide important input to decisions on the continued relevance and the appropriate priority for asset management improvement tasks. Asset management maturity results should therefore be considered in the annual review and revision of the asset management improvement plan.

*REPORTING ON THE QUALITY OF ASSET DATA*

The currency and accuracy of asset data is critical to effective asset management, accurate financial forecasts, and informed decision-making. However, even more important than this is knowing what the reliability of the information is. Even data that is not highly accurate can be of benefit to decision-makers provided the accuracy is declared.

The Town has yet to develop a consistent data structure for recording asset information. A data management plan has been developed to support staff in understanding the attributes required to develop asset registers for all asset groups and locations and understand the significant impact on the accuracy of assessments for when each asset may need replacing and how much it will cost to replace.

As staff build their asset register and collate available asset information, the accuracy of these key attributes can be recorded in the relevant columns for confidence rating. This will facilitate measurement of the asset data quality and reporting on improvements in data quality.

The confidence ratings for asset data are a numerical value between 1 and 5, as appropriate to each asset record and each key attribute. A score of 1 indicates high confidence and 5 indicates low confidence. An example of how this is used would be, if the size of an asset (such as a hose) is known but its material type is not known, and its install date is not certain but has been reasonably assumed from the age of other assets in the station, then its confidence ratings would be 1 for the size attribute, 4 or 5 for material type and a 2 or 3 for install date depending on how compelling the supporting data is.

The general description for each confidence level is:

1. Data is verified as factual (accurate).
2. Data is known with a high level of certainty, but it may not be verified as factual (there is a small possibility of error).
3. Data has been reasonably assumed or determined from other known facts. There is a moderate level of certainty and a moderate possibility for error.
4. Data has been assumed or determined from some indicator, but the opportunity for error (at an asset level) is high.
5. Data is a default value assigned as a temporary measure until better information is available, because at this time, the correct data is not known, nor can it be reasonably assumed from known facts or some indicator.

Annually, an assessment should be made to determine the quantity (and completeness) of recorded asset data and the confidence profile for the recorded information.

The process will include to:

- Report the number of recorded assets.
- Calculate the percent (by value) of asset records that have confidence ratings 1 to 5.
- Graph results with comparison to the previous year's result.

The change in the number of assets recorded in the asset register will advise decision-makers of how complete the asset data is and any analysis results that are based on current asset data.

The change in the confidence ratings for key attributes will advise decision-makers of how accurate the asset data is and therefore, how confident they can be in any analysis results that are based on that asset data.

The following are examples of data quality graphs.

Both examples quantify the change (improvement) in data confidence from one year to the next. The graphs show a reduction in very low confidence records (rating of 5) and an increase in moderate and good confidence records (ratings of 3 and 2).
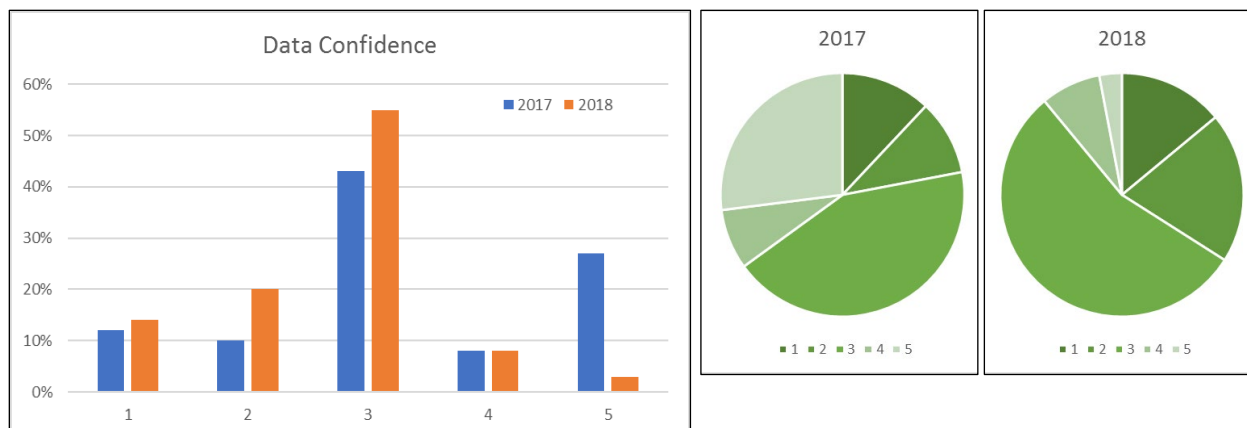


While staff are building their asset register, and until confidence ratings for key attributes have been recorded in the data register, it is recommended that a high-level data quality assessment is done.

Table 39 describes a set of data confidence grades (class A to class E) that can be used by the Utility management team for classifying data reliability at a high-level. This is different to the 1 to 5 confidence ratings that would be entered against each asset record in the asset register. The 1 to 5 ratings are for asset-level assessments whereas the A to E ratings is for an overall view when detailed data for asset-level assessments is not available.

The data quality assessment using the A to E ratings is a subjective assessment but based on knowledge of the accuracy and completeness of the data set (e.g., it is a judgement call made by a suitably experienced person or team who are very familiar with the dataset).

**Table 39: High-Level Data Confidence Ratings**

| Data Grade | Data Confidence | Description |
|---|---|---|
| A | Highly Reliable | An asset inventory exists and is appropriately structured with asset type and sub-type classifications; the inventory includes key attribute information* for every asset and this information is highly reliable. |
| B | Reliable | An asset inventory exists and is appropriately structured with asset type and sub-type classifications; the inventory includes reliable information for most key attributes of most assets; where information is missing or unreliable, a reasonable estimate can be made based on known values (i.e., based on values for similar assets connected to or located close to the asset, or an average of known values for assets of the same type etc.). |

| Data Grade | Data Confidence | Description |
|:---:|:---|:---|
| *C* | Some Uncertainty | An asset inventory exists but it may not be complete and it may or may not have an appropriate structure with asset type and sub-types, or these may not be fully populated; the inventory has a mixture of reliable and unreliable (or missing) information for key attributes for many assets; replacement costs may be based high-level average values or derived from purchase cost multiplied by an annual default percentage; useful life values may also be based on high-level average values or a default assumption. |
| *D* | Very Uncertain | An asset inventory exists but may not be complete and it may or may not have an appropriate structure; most key attribute information is missing or has low reliability; but some known, default, or assumed values do exist for some assets. |
| *E* | Unknown | An asset inventory does not exist, or it contains very little data. |

\*   *Key attribute information includes asset type and sub-type classification, install date, relevant size information, material type, and estimated unit cost and useful life values. Table 40 is an example of a high-level data quality report for facilities.*

**Table 40: Data Confidence Ratings example**

| Asset Group | Asset Type | Install Date | Relevant Size | Material | EUL | EUC |
|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| *Pumps* | B | B | D | D | B | D |
| *Maintenance holes* | B | B | C | A | B | C |
| *Watermains* | B | C | C | D | B | D |

The results for one year can be compared to previous year(s) and the change in data quality can be shown graphically (in the same way as reporting for asset-level data quality).

# 7 INDEX OF TABLES AND FIGURES

## 7.1 LIST OF TABLES

### TABLES

## 7.2  LIST OF FIGURES

### FIGURES

# APPENDIX

# A  LIFECYCLE STRATEGIES

# LIFECYCLE STRATEGIES - WATER MAINS

**Water System - Water Mains**

| | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|
| **OMI** | | Leak detection Monitoring | Annual flusing program | Repair breaks as they occur | Various | 150mm - $639.60 per metre<br>200mm - $670.80 per metre<br>250mm - $703.30 per metre<br>300mm - $737.70 per metre<br>400mm - $799.50 per metre |
| New → Replace | | | | | | |
| **R&R** | | | | Replace at end of life, ideally with a road reconstruction project, to meet future demand | Various | Asbestos Cement - 60 Years<br>Cast Iron - 70 Years<br>Cast Iron Cement Lined - 80 Years<br>Cast Iron PVC Lined - 80 Years<br>Ductile Iron - 80 Years<br>HDPE - 90 Years<br>PVC - 80 Years |
| | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

Current Activities

Future Improvement Activities

# LIFECYCLE STRATEGIES – SERVICE LINES

## Water System - Service Lines

| | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|
| **OMI** | | Leak detection Monitoring | Annual flusing program | Repair breaks as they occur | **Various** | 40mm - $390.00 per metre<br>50mm - $390.00 per metre<br>75mm - $390.00 per metre<br>100mm $530.00 per metre |
| **R&R** | | | | Replace at end of life, ideally with a road reconstruction project, to meet future demand | **Various** | Asbestos Cement - 60 Years<br>Copper - 65 Years<br>HDPE - 90 Years<br>PVC - 80 Years |
| | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

New — Replace

Current Activities

Future Improvement Activities

# LIFECYCLE STRATEGIES – BOOSTER STATIONS

**Water System - Booster Stations**

| | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|
| **OMI** | | Weekly routine inspections Weekly generator testing (where backup generator installed) Benchmark operations of pumps/VFDs | | Replace broken compenents | Various | Components vary |
| New ———— Replace | | | | | | |
| **R&R** | | Rebuild pump rotors | | Replace at the end of life | Various | Large Booster Station - $2,250,000.00 Smaller Booster Station - $300,000.00 |
| | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

Current Activities

Future Improvement Activities

# LIFECYCLE STRATEGIES – PRESSURE REDUCING VALVES

## Water System - Pressure Reducing Valves

| | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|
| **OMI** | | Annual valve exercising program Annual inpection and pressure test | | Replace valves when broken Repair valve stem/boxes Clean out valve boxes | $84,000.00 | Unit rate based on 20mm diameter valve |
| **New** — — — **Replace** | | | | | | |
| **R&R** | | | | Replace at end of life, ideally with a watermain replacement and road reconstruction project, to meet future demand | 60 Years | Location, frequency of operation and soil conditions impact EUL |
| | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

Current Activities

Future Improvement Activities

## LIFECYCLE STRATEGIES – CHECK VALVES

**Water System - Check Valves**

| | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|
| **OMI** | | Annual valve turning program | | Replace valves when broken Repair valve stem/boxes Clean out valve boxes | $3,575.00 | Unit rate based on 20mm diameter valve |
| **R&R** | | | | Replace at end of life, ideally with a watermain replacement and road reconstruction project, to meet future demand | 50 Years | Location, frequency of operation and soil conditions impact EUL |
| | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

New — Replace

Current Activities

Future Improvement Activities

# LIFECYCLE STRATEGIES – WATER VALVES

**Water System - Valves**

| | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|
| **OMI** | | Annual valve turning program | | Replace valves when broken<br>Repair valve stem/boxes<br>Clean out valve boxes | $3,000.00 | Unit rate based on 200mm diameter valve |
| **New → Replace** | | | | | | |
| **R&R** | | | | Replace at end of life, ideally with a watermain replacement and road reconstruction project, to meet future demand | 50 Years | location, frequency of operation and soil conditions impact EUL |
| | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

Current Activities
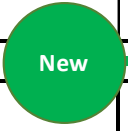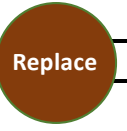
Future Improvement Activities

# LIFECYCLE STRATEGIES – SEWER MAINS

**Sanitary System - Sewer Mains**

| | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|
| **OMI** | | CCTV inspections | flushing of sanitary sewers every 1 to 2 years | Flush mains, as needed<br>Spot repairs | Various | 150mm - $617.69 per metre<br>200mm - $653.43 per metre<br>250mm - $693.48 per metre<br>300mm - $737.85 per metre<br>375mm - $812.49 per metre<br>400mm - $839.53 per metre<br>450mm - $896.84 per metre<br>525mm - $987.00 per metre |
| **New** | | | | | **Replace** | |
| **R&R** | | | Grouting or lining of sewers to reduce I/I | Replace at end of life, with a road reconstruction project, to meet future demand | Various | Asbestos Cement - 60 Years<br>Cast Iron - 70 Years<br>Cast Iron Cement Lined - 80 Years<br>Cast Iron PVC Lined - 80 Years<br>Ductile Iron - 80 Years<br>HDPE - 90 Years<br>PVC - 80 Years |
| | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

Current Activities

Future Improvement Activities

## LIFECYCLE STRATEGIES – SEWER MAINTENANCE HOLES

### Sanitary System - Sewer Maintenance Holes

| | | Preventative Maintenance | Inspections | Operations | Reactive Maintenance | EUC | Comments |
|---|---|---|---|---|---|---|---|
| **OMI** | | Increase preventative maintenance, based on future routine inspection<br>Clean out as required, based on future routine inspections | Routine inspections (5-year cycle) | | Rebuild the adjustment units<br>Repair benching and parging around pipes<br>Spot grouting or lining of walls<br>Clean out the debris | Various | Maintenance Holes are different depths and sizes.<br>Maintenance Holes are assumed to be 1200mm |
| New | | | | | | Replace | |
| **R&R** | | | Rebuild adjustment units, as part of road resurfacing | | Replace at the end of life | 100 years | Material is concrete |
| | | Early Life Interventions | Mid-life Rehab | Later Life Rehab Option | End of Life | EUL | |

Current Activities

Future Improvement Activities

# APPENDIX

# B RESILIENCY ACTIONS

**Actions identified following the climate adaptation and resilience requirements**

| CATEGORY | No | Task | Timeline |
|---|---|---|---|
| WATER | 1 | Leak Detection of Metallic Pipe Segments | 2 Years |
| | 2 | Update of asset costs/pipe segments | 1 Year |
| | 3 | Incorporate valves, PRV chambers and hydrants into AMP | 2 Years |
| | 4 | Improve physical information (i.e., locations, lengths, depths where available) | 3 Years |
| | 5 | Incorporate new planned assets associated with developments | 1 Year |
| | 6 | Upgrade appropriate to support growth | 1-10 Years |
| WASTEWATER | 1 | Develop:<br>• I/I reduction program<br>• sewer separation program (if applicable)<br>• water conservation programs<br>• wastewater master plan<br>• LWMP<br>• Emergency preparedness plan | 1-5 Years |
| | 2 | Develop an asset management program for all major wastewater assets and based on actual condition data (CCTV inspection or other) where possible. | 1-3 Years |
| | 3 | Develop a formal GHG reduction plan and fully funded. | 1-2 Years |
| | 4 | Complete policies requiring departmental C&E plans. Develop standard templates/procedures for developing C&E plans. | 1-5 Years |
| | 5 | Improve physical information (i.e., locations, lengths, depths where available) | 3 Years |
| | 6 | Incorporate new planned assets associated with developments | 1 Year |
| | 7 | Upgrade appropriate to support growth | 1-10 Years |
| CLIMATE CHANGE (Task No. And timeline correlated to CCAP) | 1.1 | Review plans, policies, & procedures for alignment with adaptation goals and update where appropriate | 1-10 Years |
| | 1.3 | Establish a Corporate Environmental Committee | 1-2 Years |
| | 1.4 | Develop & implement a Resiliency Lens & a database to track corporate plans, policies, & procedures that have been reviewed | 1-10 Years |
| | 1.5 | Ensure climate change impacts & risks are considered as part of Project & Risk Management frameworks | 1-10 Years |
| | 1.9 | Establish a Sustainability Advisory Committee | 1-2 Years |
| | 1.11 | Incorporate a Green Decision-Making Lens into current Procurement Policy | 1-2 Years |
| | 1.12 | Establish a process for reviewing localized climate projections at regular time intervals | 1-10 Years |
| | 1.13 | Continue to lobby provincial and federal governments to support adaptation initiatives at the municipal level. | 1-10 Years |

| | | | |
|---|---|---|---|
| | 1.14 | Continue to identify and take advantage of external funding opportunities | 1-10 Years |
| | 2.6 | Investigate climate proofed standards for design, construction, M&O of parks & facilities | 1-10 Years |
| | 3.1 | Conduct a Natural Assets Inventory (NAI) & an Ecosystem Services Assessment (ESA) | 1-2 Years |
| | 3.2 | Conduct a Tree Inventory, develop & implement canopy cover targets and an action plan | 1-2 Years |
| | 4.2 | Map areas vulnerable to heat extremes and use mapping to inform planning and programming initiatives | 1-2 Years |
| | 4.3 | Investigate the feasibility of community stormwater management programs | 1-2 Years |
| | 7.1 | Reduce inflow and infiltration (I/I) | 2-5 Years |
| | 7.2 | Develop Green Infrastructure/Low-Impact Development Design Guidelines | 1 Year |
| | 7.3 | Review & update engineering & development standards with consideration for climate change mitigation & adaptation to increase Green Infrastructure/Low-Impact Development implementation on public property and opportunities for permeable surfaces | 1-2 Years |
| | 7.4 | Ensure the consideration of climate impacts in asset management. | 1 Year |
| | 7.5 | Review & update Hazard Identification and Risk Assessments to include climate change considerations. | 1-10 Years |
| | 8.4 | Establish a public Green Infrastructure/Low-Impact Development education program | 1-10 Years |