NORTH BAY

Asset Management Plan 2022

Executive Summary

Community

North Bay is a vibrant community of 52,000 residents nestled between Lake Nipissing and Trout Lake making it the perfect location to live, learn, work and play.

The local economy is made up of diverse industries and services. North Bay offers the benefits of urban and rural living that can provide an ideal balance for work and family life.

The City has state of the art health care, a wide range of public and post-secondary education, specialty family services, retirement facilities, places of worship and cultural associations, accessible transportation, technology-infrastructure and more.

The natural environment provides the setting for all season recreational activities and special events.

The effective and efficient management of the City's assets will ensure that the benefits and services stated above, and provided and available to City residents, are delivered appropriately and at a cost that the Community can afford.

Regulation

The primary objective of this Plan is to ensure that the current assets owned and operated by the City of North Bay are effectively managed in terms of ongoing maintenance and renewal activity so that desired levels of service are met now and into the future.

In December 2017, the province passed an asset management planning regulation under the Infrastructure for Jobs and Prosperity Act 2015, Ontario Regulation 588/17.

See the link below for the detailed Regulation.
https://www.ontario.ca/laws/regulation/r17588

An Asset Management Policy is a core requirement of an Asset Management System. The Asset Management Policy lays out a set of principles that guides municipal administration to implement an Asset Management System.

The Asset Management System will guide asset management decision making.

North Bay's Asset Management Plan

The asset management planning process is driving a change in philosophy in regards to capital improvement projects: The old approach of "worst first" is being replaced with a more proactive approach focused on the rehabilitation within windows of opportunity and combined with reconstruction projects. This plan reflects on the current and desired condition of core infrastructure assets, levels of service, optimal asset management, and financial strategies; all based on the infrastructure information and data currently available for the City of North Bay's core assets. The asset classes included within this asset management plan are core infrastructure as defined by the Province and are funded by various sources as shown below:

Core Asset Category	Source of Funding
Water*	Rate Supported
Wastewater*	Rate Supported
Stormwater Management	Tax Levy
Roads	Tax Levy
Bridges & Culverts	Tax Levy

*Water and Wastewater includes linear, machinery and equipment as well as facility assets.

The City's data collection programs and data updating processes are ongoing, and as such, the plan will be updated over time as more data regarding condition, capacity, expansion, and risks become available. Each section contains a Data Confidence Scale in order to assist the reader in understanding the

recommendations.

This Asset Management Plan represents a snapshot in time and is based on the best available process, data and information at the City at that time. Strategic asset management planning is an ongoing and dynamic process that requires continuous support and dedicated resources. Several recommendations have been developed to guide the continuous refinement of the City's Asset Management Plan. These include:

- Asset inventory data review and validation
- The formalization of condition assessment strategies
- Implementation of risk-based decision-making as part of asset management planning and budgeting
- Continuous review, development and implementation of optimal life cycle management strategies
- Identification, establishment, maintenance and review of proposed levels of service

In summary, the estimated replacement cost of the City's core assets is $2.1 billion which requires $49 million in annual life cycle investments. Currently the City of North Bay is planning to invest on average $21.6 million annually; thereby, leaving an annual funding shortfall of $27.4 million.

The table below summarizes the above by asset category:

	Replacement Cost	Annual Requirement	Average Annual Funding Capital Budget (2022-2031)	Annual Funding Shortfall
Bridges & Culverts	91,379,508	1,218,393	195,000	1,023,393

Roads	531,903,911	26,262,217	10,100,581	16,161,636
Storm	266,286,039	3,430,239	1,621,500	1,808,739
Wastewater Network	671,307,205	8,611,789	5,908,000	2,703,789
Water Network	600,933,038	9,530,344	3,751,920	5,778,424
Total	**2,161,809,701**	**49,052,983**	**21,577,001**	**27,475,982**

The following table identifies the requirements outlined in Ontario Regulation 588/17 for municipalities to meet by July 1, 2022:

Requirement	O.Reg Section	AMP Section Reference	Status
Summary of assets in each category	S.5(2),3(i)	S.4 (4.1,4.2,4.3,4.4,4.5)	Complete
Replacement costs of assets in each category	S.5(2),3(ii)	S.5 (4.1,4.2,4.3,5.4,4.5).	Complete for core assets
Average age of assets in each category	S.5(2),3(iii)	S.4 (4.1,4.2,4.3,4.4,4.5)	Complete
Condition of core assets in each category	S.5(2),3(iv)	S.5 (4.1,4.2,4.3,4.4,4.5)	Complete
Description of municipality's approach to assessing the condition of assets in each category	S.5(2),3(v)	S.5 (4.1,4.2,4.3,4.4,4.5)	Complete
Current levels of service in each category	S.5(2),1(i-ii)	S.4 (5.1,5.2,5.3,5.4,5.5)	Complete
Current performance measures in each category	S.5(2),2	S.5 (4.1,4.2,4.3,4.4,4.5)	Complete
Life cycle activities needed to maintain current levels of service for 10 years	S.5(2),4	S.4 (4.1,4.2,4.3,4.4,4.5)	Complete
Cost of providing life cycle activities for 10 years	S.5(2),4	S.4 (4.2)	Complete
Growth assumptions	S.5(2), 5(i-ii) S.5(2), 6(i-vi)	S.5 (5.2)	Complete

The Asset Management Policy provides the framework that along with the City's annual budgets and financial plan is needed to support the best possible decisions with regard to City infrastructure management. The Asset Management Plan will also develop the baseline for the City's current asset management practices and will identify the funding gap to maintain the current service levels within the City. Asset Management helps protect and enhance the quality of life of the City's residents by making informed decisions about infrastructure assets in a way that provides targeted levels of service and manages risk in a cost effective manner.

1. Introduction

The primary objective of this Plan is to ensure that the current assets owned and operated by the City of North Bay (the "City") are managed in terms of ongoing maintenance and renewal activity and expenditure so that all desired levels of service are met now and into the future.

Asset Management objectives need to be achieved while also meeting a number of goals as outlined by Council:

- The effective management of the City's assets in line with corporate policies, strategies and objectives, statutory and legislative requirements and regulations;
- Ensuring that assets are safe, appropriately accessible, well maintained and meet citizens' needs in a manner that is sustainable;
- Recognizing appropriate levels and sources of capital investment required to meet the City's asset renewal and replacement needs;
- Maximizing the service potential of current assets by ensuring they are used and maintained appropriately;
- Achieving better value for money through evaluation processes that take into account life cycle costing;
- Minimizing the City's exposure to risk as a result of asset failures.

These goals and objectives are achieved by this Asset Management Plan because it will provide details to promote the best decisions possible on renewal, replacement, maintenance, disposal and expansion of the City's core assets. This will not include asset classes that are managed by Boards and Agencies that are funded by the Corporation of the City of North Bay. This plan provides the framework that functions along with annual budgets and financial planning needed to make the best possible decisions with regard to City infrastructure. Also, the plan will develop the baseline for our current asset practices and will also identify the funding gap to maintain our current service levels.

1.1. Asset Management Definition:

Asset management is the coordinated activity of an organization to realize value from its assets. This value is created by delivering services at an appropriate cost while managing long-term risks. (ISO –International Organization for Standardization)

This 'Asset Management Plan' document has been developed for the core infrastructure assets of the City of North Bay, which include Water, Wastewater, Stormwater, Roads, Bridges and Culverts. Future iterations of the plan will include Fleet, Facilities (not related to Water or Wastewater as they are part of the core infrastructure within this plan), Parks, Solid Waste and the North Bay Jack Garland Airport. The plan is intended to provide a comprehensive reference for renewing, operating, maintaining, building, replacing, and disposing of the City's core infrastructure assets. The plan is based on the guidelines provided in the Province of Ontario Ministry of Infrastructure's Building Together Guide for Municipal Asset Management Plans and Ontario Regulation 588/17.

The current asset stock of the City consists of some 32,359 individual assets including Roads, Water, Wastewater, Bridges and Culverts, Facilities, Stormwater, Buildings, Vehicles and Land including Parks. In total this asset portfolio has a replacement value of approximately $2.5 billion.

Asset management helps protect and enhance quality of life by making the best possible decisions about the City's assets in a way that provides targeted levels of service and manages risk in a cost-effective manner.

Good asset management means making decisions based on the lowest long-term cost over the entire life cycle of the asset and also managing assets in a way that balances service levels, risk and cost rather than short-term savings.

Why is Asset Management important?

- Establishes processes for Corporate Asset Management.

- Signifies that the City is committed to implementing an Asset Management business model and continual improvement.
- Builds awareness of what the City regards as good practice Asset Management and sets strong direction and clear expectations.
- Provides a strong mandate and catalyst for business improvement activities where required.
- Provides a basis to develop Asset Management related objectives that align with the City's overarching strategic objectives.

As identified in the City's Official Plan and Corporate Strategic Plan the viability of the City is highly dependent on the infrastructure and how it supports economic activity and improves the quality of life for its citizens. These assets are essential for the City to deliver quality municipal services to residents, businesses, and community partners by enhancing the physical, leisure, economic, and environmental quality of life for the community and region that is affordable, sustainable and relevant.

The Asset Management Plan is a living document which will require regular review and updating as more data becomes available and the levels of service required by the community are defined through public consultation. It is anticipated that the life cycle strategies will be reviewed by staff annually and adjusted accordingly to ensure that it reflects the current priorities of Council and the community; the Asset Management Plan will be updated on a five-year cycle to incorporate all adjustments identified within the annual reviews. This fluid plan will be revised and updated as required by legislation, as revisions become available and as the Asset Management process matures. All updates will be published to the City's website.

Through the implementation of the City’s Official Plan, it is the goal of Council and the community to grow and develop North Bay in a sustainable manner. The term "sustainability" means that the community will continue to work towards maintaining and enhancing its attributes and improve conditions that lead to a better quality of life for future generations. The three elements of sustainable development

(economic, social/cultural and environmental) are considered in an integrated manner by Council in order to make planning decisions.

The Official Plan concludes that the City of North Bay is well positioned to experience steady residential and non-residential growth over the medium and long term forecast period. Over the 22-year forecast period covered by the City's Official Plan, the City's total number of households is forecasted to increase from 22,962 in 2009 to 26,081 in 2031, a total increase of approximately 3,119 units. It should be noted that approximately 15,000 of the current households are serviced by water and sewer.

This growth will add new assets to the City's infrastructure portfolios which will increase the challenges of funding the maintenance and replacement of these assets in the future. Therefore, it is essential to recognize that the funding challenges outlined in the Asset Management Plan only deal with the existing assets and do not account for the assets associated with the projected growth.

1.2. Maturity of Asset Management Progress

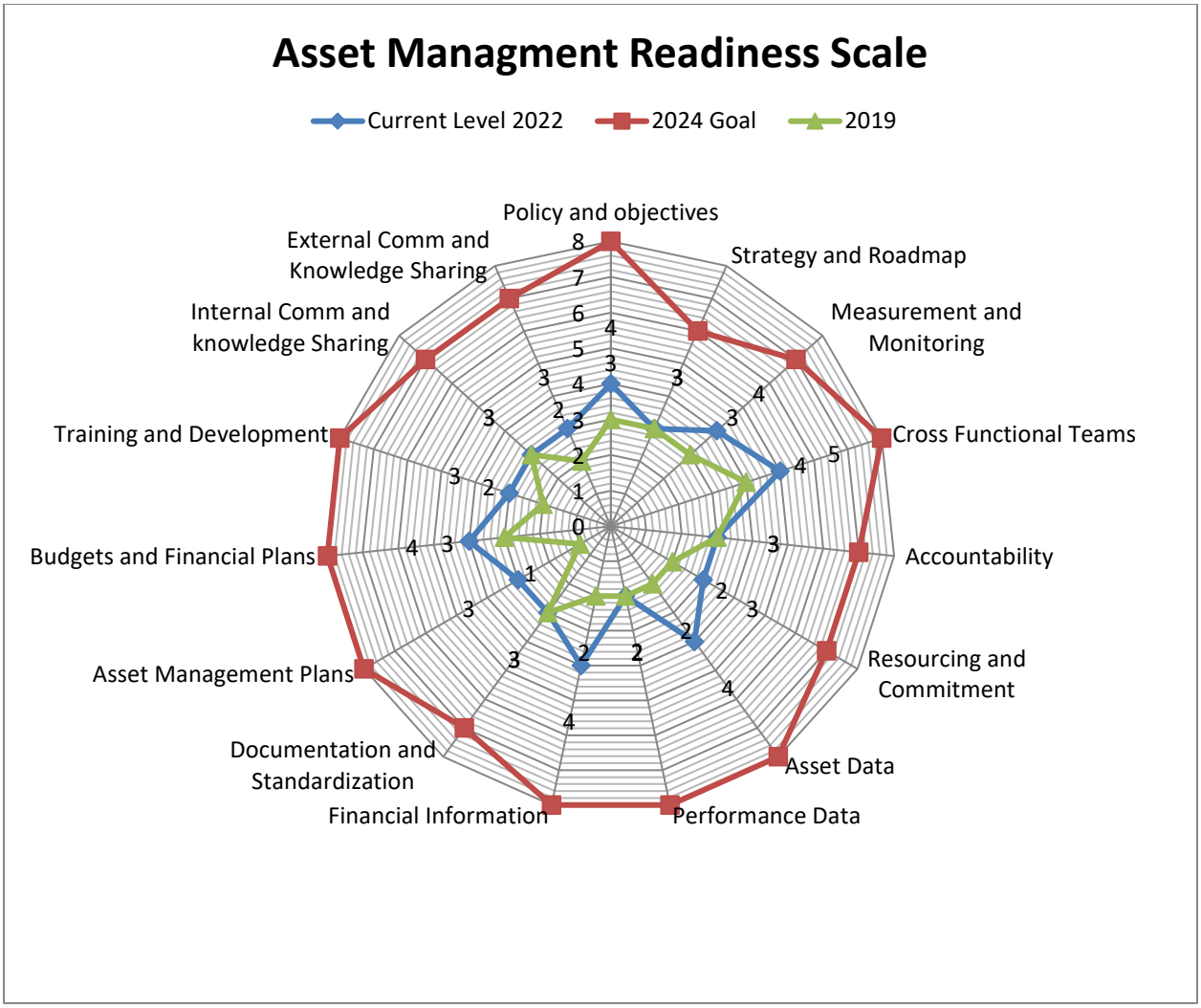
The Federation of Canadian Municipalities (FCM) has developed an Asset Management Readiness Scale to assist municipalities in determining their level of maturity so they can adopt business practices that better support decisions about investing in infrastructure assets such as roads, bridges, water and wastewater systems.

The readiness scale helps:

- Assess current asset management practices in a municipality.
- Identify opportunities to adopt new practices, or formalize asset management activities that may already be occurring, into documented business practices.
- Measure and track the progress of a municipality's asset management practices and activities.

The readiness scale is designed for staff and elected officials in any municipality or local government organization across Canada. Municipalities can use the scale as a framework to guide actions to improve asset management practices.

The blue line in the spider graph below outlines the City of North Bay's current Asset Management maturity. As Asset Management maturity develops, the outcomes move from the inner points ie "0" on the web scale to the outer points. The objective is to achieve the highest maturity level of "8" by 2024.



1.3. Asset Management Roadmap

Year	Goal	Action
2022	First Asset Management Plan (Phase 1).	Includes Core Infrastructure: Water, Wastewater, Roads, Bridges and Culverts, Stormwater.
2024	Second Asset Management (Phase 2).	Addition of Fleet, Facilities, Parks, and Solid Waste. (not related to Water or Wastewater)
2024	Define Target Levels of Service (LOS)	Development of LOS options for Council approval.
2025	Third Asset Management Plan (Phase 3).	Phase in of O.Reg.588/17 complete.
	Ongoing	Continuous improvement monitoring of Asset Management Planning.
	Ongoing	Revisions to Plan, Policies, and Strategy as needed.

1.4. Corporate Asset Management Policy

An Asset Management Policy represents a statement of the principles guiding the municipality's approach to asset management activities. It aligns with the organizational strategic plan and provides clear direction to municipal staff on their roles and responsibilities as part of the asset management program.

The City adopted its Strategic Asset Management Policy on July 1, 2019 in accordance with Ontario Regulation 588/17. As required by this regulation the policy includes statements with respect to strategic alignment, guiding principles, fiscal responsibilities, public input/council direction, governance and continuous improvement. Specifically, the policy includes the following objectives:

- Provide a consistent framework for implementing asset management throughout the organization.
- Provide transparency and accountability and to demonstrate to stakeholders the

legitimacy of decision-making processes which combine strategic plans, budgets, service levels and risks.

See the link below for the City's Strategic Asset Management Policy

https://www.northbay.ca/media/5osiawpa/corporate-asset-management-policy.pdf

2. Risk Background

The City of North Bay engaged PSD Citywide as an asset management consultant to guide and develop life cycle strategies, levels of service and risk frameworks for core assets (Water, Wastewater, Stormwater, Roads, Bridges and Culverts). The project's first area of focus was the development of risk frameworks. This report provides an overview of risk and then discusses the risk framework for each of the asset classes.

PSD conducted initial collaboration sessions with staff to develop risk frameworks. Risk and criticality models are key elements of good asset management practices and programs. Through their use, asset owners can rank and rate the level of business risk associated with each infrastructure asset. This customized analysis is generally based on the asset type and the attributes and considerations specific to it. Risk assessment can be conducted across all asset types and reviewed for all assets or at the individual asset level.

2.1. Approach to Risk

Municipalities generally take a worst-first approach to infrastructure spending. Rather than prioritizing assets based on their importance to service delivery; assets in the worst condition are fixed first, regardless of their criticality. However, not all assets are created equal. Some are more important than others and their failure poses more risk to the community than that of others. For example, a road with a high volume of traffic that provides access to critical services poses a higher risk than a low volume rural road. Therefore, these high value assets should receive funding before others.

By identifying the various impacts of asset failure and the likelihood that it will fail, risk management strategies identify critical assets and determine where maintenance efforts and spending should be focused.

The City's Asset Management Plan includes a high level evaluation of the asset risk and criticality. Each asset has been assigned a probability of failure score and consequence of failure score based on available asset data. These risk scores can be used to prioritize maintenance, rehabilitation and replacement strategies for critical assets.

Risk is a product of two variables: the **probability** that an asset will fail and the resulting **consequences** of that failure event. It can be a qualitative or quantitative measurement that can be used to rank assets.

$$Risk = (Probability\ of\ Failure) \times (Consequence\ of\ Failure)$$

The City's approach relies on a quantitative measurement of risk. The probability and consequence of failure are each scored from 1 to 5, producing a minimum risk rating of 1 for the lowest risk assets and a maximum risk rating of 25 for the highest risk assets.

2.2. Risk Scales

Table 1

Probability of Failure	Consequence of Failure	Risk Rating
1 – Rare	1 – Insignificant	1 – Lowest
2 – Unlikely	2 – Minor	4 – Low
3 – Possible	3 – Moderate	9 – Medium

Probability of Failure	Consequence of Failure	Risk Rating
4 – Likely	4 – Major	16 – High
5 – Almost Certain	5 – Severe	25 – Highest

2.3. Probability of Failure (PoF)

Several factors can help decision-makers estimate the probability or likelihood of an asset's failure. For example, a bridge may be in good structural condition, but its structure type or usage (traffic volumes) may increase its susceptibility to failure.

For each asset class the risk model considers and accounts for various factors based on their respective weights. Weighting allows the model to recognize that each factor may impact the probability of failure to a different degree. Where the weight is higher, the impact that factor has on the model increases too.

2.4. Consequence of Failure (CoF)

The consequence of failure describes the overall anticipated effect of an asset's failure to the City and its asset management goals. Consequences of failure can range from insignificant to severe. For example, failure of an infrequently used bridge may affect only a small number of residents and/or inconvenience them slightly (i.e. minimal detour distance). Conversely, failure of a more significant bridge could create significant issues to industry transportation networks and affect residents' ability to access critical community services (i.e. hospitals and schools).

For each asset class the CoF parameters aim to comprehensively capture relevant consequences and align with the Triple Bottom Line (economic, social, and environmental) approach to risk management. When the various consequences of an asset's failure are identified and properly weighted, an asset's criticality can be approximated.

2.5. Types of Consequences

Inherent in the management of public infrastructure is the assumption of risk. The risks that the City may be exposed to are often wide ranging, and risks that materialize have a wide range of consequences. Generally, these consequences can be categorized as follows:

2.6. Consequence of Failure Classifications

Consequence	Description
Financial	Direct financial consequences are typically measured as the replacement cost of the assets affected by the failure event.
Economic	Economic impacts of asset failure may include disruption to local economic activity and commerce, service disruptions, revenue loss, etc. Whereas financial impacts can be seen immediately or within hours or days, economic impacts can take weeks, months and years to emerge.
Socio-political	Socio-political impacts are more difficult to quantify and may include inconvenience to the public and key community stakeholders, adverse media coverage and reputational damage to the community and the municipality.
Environmental	Environmental consequences can include pollution, erosion, sedimentation, habitat damage, etc.
Health and Safety	Health and safety impacts may include injury, fatality, or impeded access to critical services (i.e. hospitals).
Strategic	These include the effects of an asset's failure on the community's long-term strategic objectives, including economic development, tourism, etc.

2.7. Data Confidence Scale

Each asset category concludes with a data confidence scale which outlines the strengths or weaknesses of the data for that asset category. For example, in some cases, useful metrics have been added to the risk models, as placeholders, where the accompanying

data is not currently documented or tracked in the database. Where this occurs, the model will exclude the placeholder metrics from the calculation and redistribute its weighting into the other metrics. As seen in the example below, soil corrosivity is identified as a risk metric, but it has no data tagged to the assets, so its weighting gets reallocated to the other metrics. Asset Management Plans are as of a point in time; however, the data quickly changes and updates are always being considered in order to optimize the asset life cycle. The data confidence scale provides the reader with perspective with respect to accuracy and reliability of the data.

2.8. Life Cycle Management Strategies

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment. Asset deterioration has a negative effect on the ability of an asset to fulfill its intended function, and may be characterized by increased cost, risk and even service disruption.

To ensure that municipal assets are performing as expected and meeting the needs of citizens, it is important to establish a life cycle management strategy to proactively manage asset deterioration.

There are several field intervention activities that are available to extend the life of an asset. These activities can be generally placed into one of three categories: maintenance, rehabilitation and replacement.

The following table provides a description of each type of activity and level of cost:

Life Cycle Activity	Description	Example (Roads)	Cost
Maintenance	**Activities that prevent defects from occurring**	**Crack Seal**	**$**
Rehabilitation/Renewal	**Activities that rectify defects or deficiencies that are already present and may be affecting asset performance**	**Mill and Resurface**	**$$**
Replacement /Reconstruction	**Asset end of Life activities that often involve the complete replacement of assets**	**Surface and subsurface replacement and/or reconstruction**	**$$$**

Depending on initial life cycle management strategies, asset performance can be sustained through a combination of maintenance and rehabilitation, but at some point replacement is required. Understanding what affect these activities will have on the life cycle of an asset, and their cost, will enable staff to make better recommendations.

The City's approach to life cycle management is described within each asset category outlined in the AMP. Developing and implementing a proactive life cycle strategy will determine which activities to perform on an asset and when to optimize useful life at the lowest total cost of ownership.

2.9. Determining Replacement Costs

There are a range of methods to determine the replacement cost of an asset and some are more accurate and reliable than others. The AMP relies on two methodologies:

- **Unit Cost -** User-Defined Cost and Cost/Unit: Based on costs provided by municipal staff which could include average costs from recent contracts; information from engineering reports and assessments; staff estimates based on relevant information and experience.
- **Historical Cost Inflation -** Cost Inflation/CPI Tables: Historical cost of the asset is inflated based on Consumer Price Index or Non-Residential Building Construction Price Index.

User-defined costs based on reliable sources are a reasonably accurate and reliable way to determine asset replacement costs (recently purchased or replaced). Cost inflation is typically used in the absence of reliable replacement cost data. As assets age, and new products and technologies become available, cost inflation becomes a less reliable method.

2.10. Estimated Useful Life and Service Life Remaining

The estimated useful life (EUL) of an asset is the period over which the City expects the asset to be available for use and remain in service before requiring replacement or disposal. The EUL for each asset in this AMP was assigned according to condition assessments, experience of municipal staff and supplemented by industry standards.

By using an asset's in-service data and its EUL, the City can estimate the service life remaining (SLR) for each asset. Using condition data and the asset's SLR, the City can more accurately forecast when it will require replacement. The SLR is calculated as follows:

$$Service\ Life\ Remaining\ (SLR) = In\ Service\ Date + Estimated\ Useful\ Life (EUL) - Current\ Year$$

2.11. Asset Condition

An incomplete or limited understanding of asset condition can mislead long-term planning and decision-making. Accurate and reliable condition data helps to prevent premature and costly rehabilitation or replacement and ensures that life cycle activities occur at the right time to maximize asset value and useful life.

A condition assessment rating system provides a standardized descriptive framework that allows comparative benchmarking across the City's asset portfolio. The table below outlines the condition rating system used in this AMP to determine asset condition. This rating system is aligned with the Canadian Core Public Infrastructure Survey which is used to develop the Canadian Infrastructure Report Card. When assessed condition data is not available, service life remaining is used to approximate asset condition.

Condition	Description	Criteria	ServiceLife Remaining (%)
Very Good	Fit for the future	Well maintained, good condition, new or recently rehabilitated	80-100
Good	Adequate for now	Acceptable, generally approaching mid-stage of expected service life	60-80
Fair	Requires attention	Signs of deterioration, some elements exhibit significant deficiencies	40-60
Poor	Increasing potential of affecting service	Approaching end of service life, condition below standard, large portion of system exhibits significant deterioration	20-40
Very Poor	Unfit for sustained service	Near or beyond expected service life, widespread signs of advanced deterioration, some assets may be unusable	0-20

3. Levels of Service

A level of service (LOS) is a measure of what the City is providing to the community and the nature and quality of that service. Within each asset category in this AMP, technical metrics and qualitative descriptions that measure both technical and community levels of service have been established and measured as data is available.

These measures include a combination of those that have been outlined in O. Reg. 588/17 in addition to performance measures identified by the City as worth measuring and evaluating. The City measures the level of service provided at two levels: Community Levels of Service and Technical Levels of Service.

3.1. Community Levels of Service

Community levels of service are a simple, plain language description or measure of the service that the community receives. For core asset categories (Roads, Bridges & Culverts, Water, Wastewater, Stormwater) the Province, through O. Reg. 588/17, has provided qualitative descriptions that are required to be included in the AMP. For non-core asset categories, the City has determined the qualitative descriptions that will be used to determine the community level of service provided. The current levels of service have been established through past practice and historical public expectation. These descriptions can be found in the Levels of Service subsection within each asset category.

3.2. Technical Levels of Service

Technical levels of service are a measure of key technical attributes of the service being provided to the community. These include mostly quantitative measures and tend to reflect the impact of the municipality's asset management strategies on the physical condition of assets or the quality/capacity of the services they provide.

For core asset categories (Roads, Bridges & Culverts, Water, Wastewater, Stormwater) the Province, through O. Reg. 588/17, has provided technical metrics that are required to be included in the AMP. For non-core asset categories, the City has determined the technical metrics that will be used to determine the technical level of service provided. These metrics can be found in the Levels of Service subsection within each asset category.

3.3. Current and Proposed Levels of Service

The AMP focuses on measuring the current level of service provided to the community. Once current levels of service have been reviewed, the City plans to establish proposed levels of service over a 10-year period, in accordance with O. Reg. 588/17.

Proposed levels of service should be realistic and achievable within the timeframe outlined by the City. Proposed levels of service should be determined with consideration of a variety of factors or criteria including community needs and wants, fiscal capacity, regulatory requirements, corporate goals and long-term sustainability. Once proposed levels of service have been established, and prior to July 2024, the City must identify a life cycle management and financial strategy which allows these targets to be achieved and maintained.

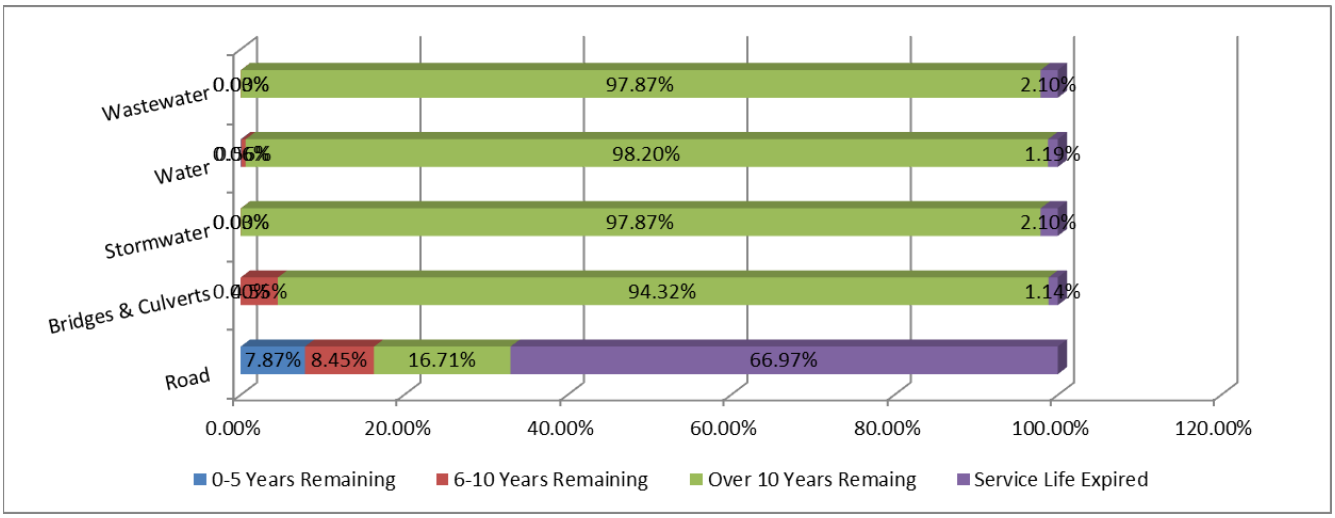
4. Core Assets

The 2022 Asset Management Plan includes all core infrastructure as required by O. Reg 588/17. As previously noted, additional assets will be included in future iterations of the Plan. The state of infrastructure provides the baseline for discussion of the infrastructure and is intended to be the beginning of good asset management decision making. A summary of the average age of asset and their respective average estimated useful life is in the table below.

	Replacement Cost	Average Age as of 2021	Average Estimated Useful Life
Bridges & Culverts	91,379,508	33 Years 7 Months	75 Years
Road	531,903,911	28 Years 4 Months	20 Years
Stormwater	266,286,039	42 Years 8 Months	76 years
Wastewater	671,307,205	46 Years 7 Months	78 Years
Water	600,933,038	42 Years 10 Months	75 Years

In conjunction with the average age is important to understand the service life remaining which is based on the asset age, assessed condition and estimated useful life. As can be noted in the graph below a majority of the assets have projected over 10 years of service life remaining. This provides the City with time to continue planning and implement further life cycle strategies that will provide the lowest long-term cost over the entire life cycle of the asset.

Remaining Service Life



The following are descriptions of the various assets in the City's core infrastructure, as defined in the Guide for Municipal Asset Management Plans.

4.1. Roads

Roads are a critical component of the provision of safe and efficient transportation services and represent the highest infrastructure gap asset category in the City’s asset portfolio. They include all municipally owned and maintained roadways in addition to supporting roadside infrastructure.

The City's roads and sidewalks are maintained by the Public Works Department which is also responsible for winter operations. The Asset Management Plan currently only includes the City's paved roads which are over 367,000 meters in combined length and have an estimated replacement value of $531 million.

The City's road system accounts for over one-half of the total asset portfolio. The roads are exposed to a number of stresses that contribute to accelerated deterioration (including winter freeze-thaw cycles and increased traffic loading); therefore, typically have lower life expectancies than other assets. As a result, the investment needs for rehabilitation and replacement of roads occur on a more frequent cycle.

The City's network average Pavement Quality Index (PQI) is currently calculated to be a value of approximately 55. The City has identified that its desired level of service for roads is to maintain its average network condition at its current state (i.e., at an average value of PQI=55). This goal is in line with the City's understanding of Community expectations and with currently available funding levels.

Within future iterations of this Asset Management Plan, further refinements will be made to the desired level of service for roads.

4.1.1. Life Cycle Management Strategy Roads

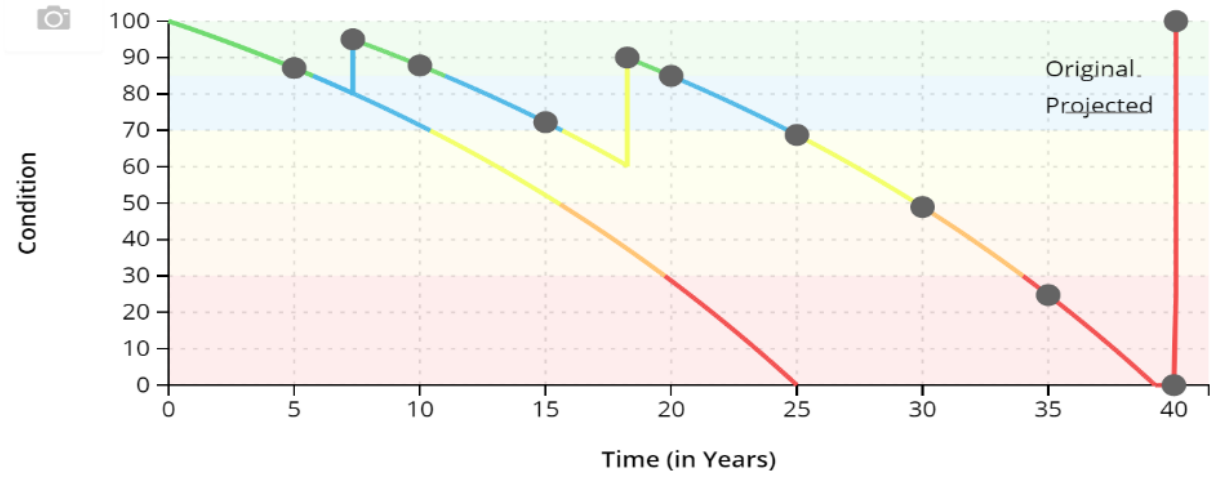
The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment.

The following life cycle interventions have been developed as a proactive approach to managing the life cycle of various design class roads. Instead of allowing the roads to deteriorate until replacement is required, strategic rehabilitation is expected to extend the service life of roads at a lower total cost than full replacement, thus optimizing life expectancy and costs.

Paved Roads

		Unit Cost (/m^2
Crack Sealing	**Preventative Maintenance**	**$12.00**
Chip Seal	**Preventative Maintenance**	**$5.30**
Pulverize and Overlay (50/100mm)	**Rehabilitation**	**$32.00/$58.50**
Mill, Removal, & Overlay(50/100mm)	**Rehabilitation**	**$31.00/56.50**
Overlay (50mm)	**Rehabilitation**	**$26.50**
Full Replacement (Arterial, collector)	**Replacement**	**$110**
Full Replacement (Local)	**Replacement**	**$90.00**

The implementation of a proactive life cycle strategy can lead to direct and indirect cost savings when compared to end-of-life replacement. Potential cost savings are influenced by current market costs, the coordination of multiple projects, and the criticality of the assets. The proactive strategy can also decrease the number of complaints, lower health and safety hazards and maintains the desired level of service that the City wants to sustain. Below is a sample graph illustrating a potential life cycle strategy application that includes: 1. Crack and Seal Applied at 5 year intervals and 2. Mill and Overlay applied at years 7 and 18; thereby extending the life from 25 years to 40 years before full replacement is required.

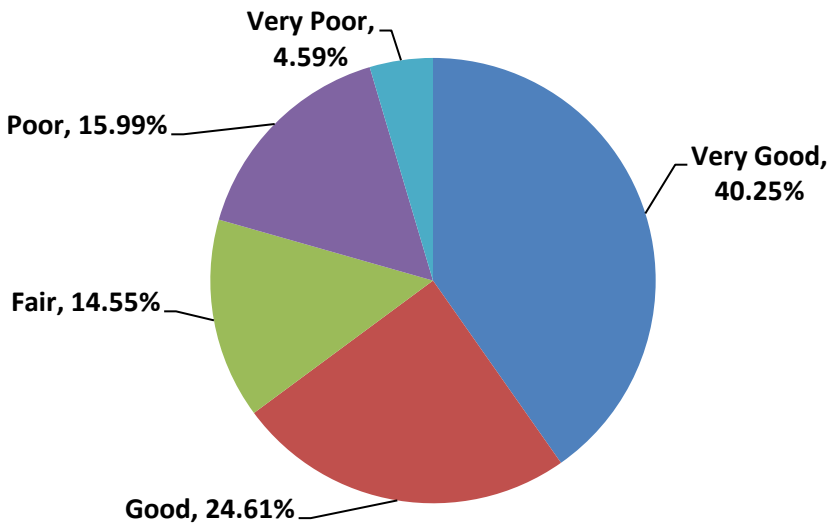


4.1.2. Condition

The pie chart below identifies the percentage of road assets in very good, good, fair, poor, very poor condition. The City's approach to condition data includes the following:

- Completion of a Road Needs Study every 5 years. In 2021 the City engaged with GM Blue Plan Engineering Limited to complete an assessment of 100% of the roads. Pavement Quality Index (PQI) values were collected and updated in the RoadMatrix system and then uploaded to the corresponding road assets in Citywide.
- Pothole patching is applied as per Maintenance Standards (MM) requirements to repair pothole formations.
- Resurfacing program of approximately $3.6 million annually that includes the following treatments:
    - Capital expenditures
    - Crack sealing
    - Patching - Sheathing
    - Double Mill & Pave Treatment

Road Condition as of December 31, 2022: % of assets in very good, good, fair, poor, very poor condition:

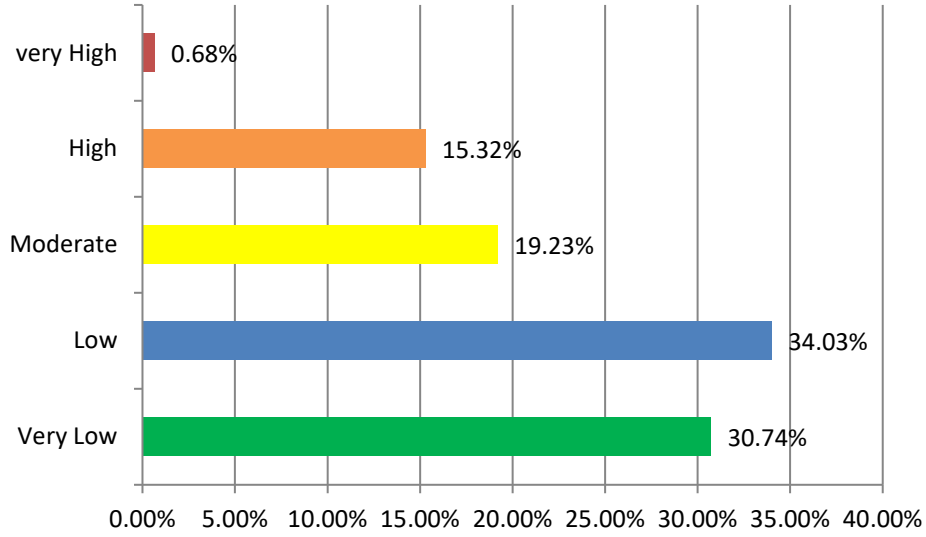


Refer to appendix 9.2 for sample pictures of road conditions.

4.1.3. Roads Risk

The bar chart below distributes the percent of the road assets in each of the risk profiles. The roads probability of failure is based on condition, drainage and subgrade strength. Consequence of failure is based on replacement cost, road class, bus route, Average Annual Daily Traffic (AADT) and pavement type.

Risk: % of assets in very low, low, moderate, high, very high risk profiles



4.1.4. Levels of Service

The following tables show the City's current level of service for the roads. Metrics include the community and technical levels of service metrics that are required as part of O.Reg 588/17 as well as any additional performance measures that the City has selected for the AMP.

4.1.5. Community Levels of Service

The table below outlines the qualitative descriptions that determine the community levels of service provided by the roads:

Core Value	Level of Service Statement	Community Level of Service
Accessible & Reliable	Roads are accessible to the whole community and unplanned service disruptions are minimized.	The City maintains urban arterial, collector and residential roads as well as rural roads. See Appendix 9.4 for map of the roads. Road pictures are also included in appendix 9.2 to demonstrate various road conditions.
Safe & Regulatory	Roads meet all minimum maintenance standards	The City completed a Road Condition assessment in November 2021. Every road section received a surface condition rating which then was converted into a PQI measurement. PQI between 0 and 50 exhibits poor to very poor deterioration and requires renewal or full replacement within 0-10 years. PQI surface is in good condition or has been recently re-surfaced. Renewal or reconstruction is not required for X to x years
Affordable	Roads are managed cost-effectively for the expected level of service	Crack sealing, chip seal, mill, removal and overlay, full replacement.
Sustainable	There are long-term plans in place for the sustainability of roads	See Appendix for Description or images that illustrate the different levels of road class pavement condition

4.1.6. Technical Levels of Service

The table below outlines the quantitative metrics that determine the technical level of service provided by the roads.

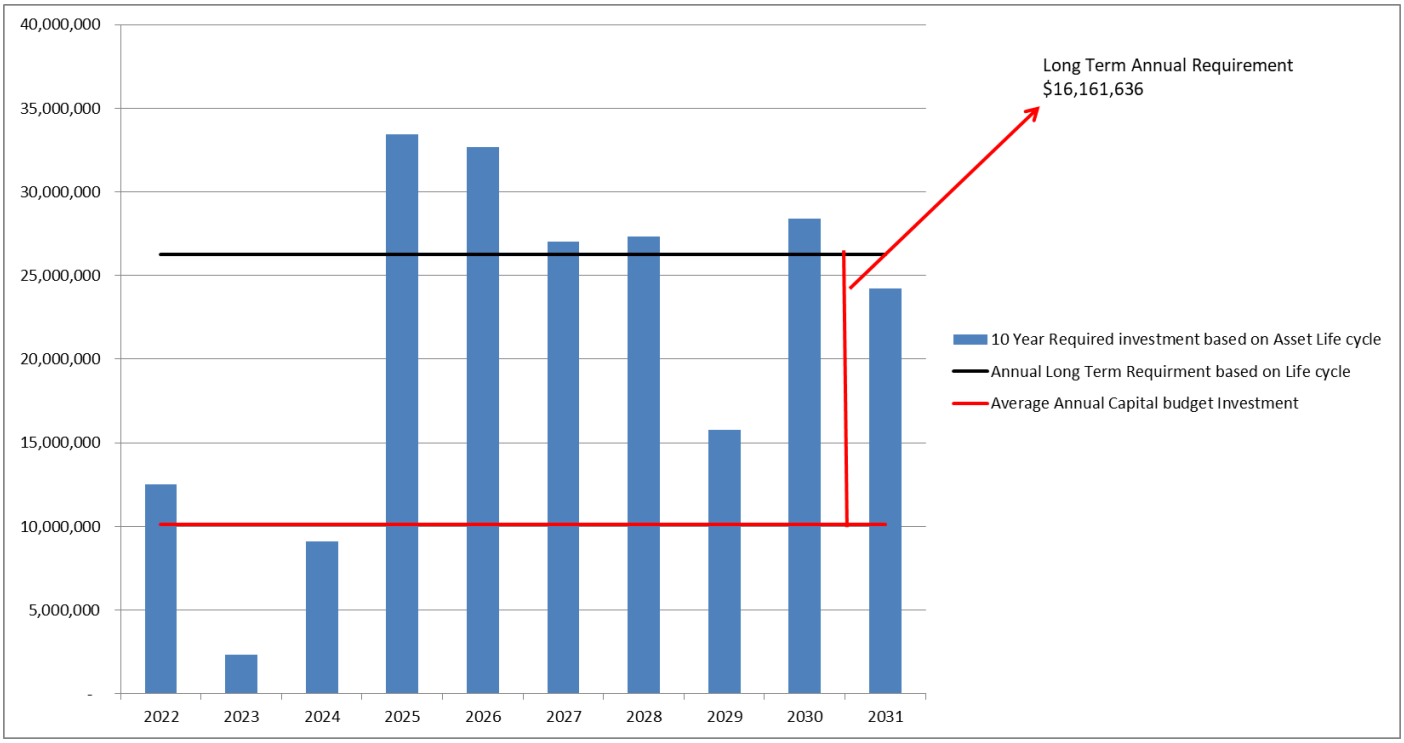
Core Value	Level of Service Statement	Technical Level of Service	2021
Accessible & Reliable	Roads are accessible to the whole community and unplanned service disruptions are minimized	Lane-km of arterial roads (MMS classes 1 and 2) per land area in the municipality (km/km^2)	147km/771,000km^2
		Lane-km of collector roads (MMS classes 3 and 4) per land area in the municipality (km/km^2)	103km/771,000km^2
		Lane-km of local roads (MMS classes 5 and 6) per land area in the municipality (km/km^2)	454km/771,000km^2
Affordable	Roads are managed cost-effectively for the expected level of service	Current reinvestment rate vs target reinvestment rate	1.9 : 4.94
Sustainable	There are long-term plans in place for the sustainability of the roads	Average pavement condition index for paved roads in the municipality	55.1%
		Average surface condition for unpaved roads in the municipality	Very Poor

4.1.7. Roads Risk Matrix

The below risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within the roads as of December 31, 2021. The identification of the critical assets allows the City to determine appropriate risk mitigation strategies and treatment options. It should be noted that the assets highlighted in red may not necessarily require immediate renewal or replacement.

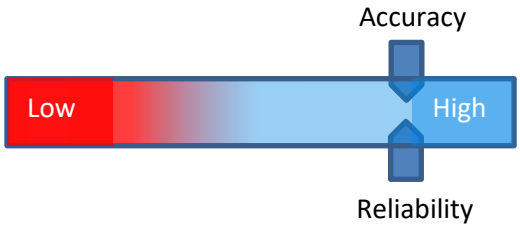
4.1.8. Roads Infrastructure Gap

The infrastructure gap for roads is $16.1 million annually; however, in the short term (3years) the annual investment is within budget allocations. This will provide the City with time to implement some of the financing strategies contained within the AMP. The City's approved 2022 capital budget plans to invest approximately $10 million a year into the roads. As can be noted below this investment is sufficient in the shorter term; however, the annual long term requirement based on life cycle management would require an annual investment of $26.2 million.



The notable investments in 2025 and 2026 include, Cedar Heights Road, Golf Club Road, Springdale Drive, Collins Drive, Barnett Road, and Larocque Road. The type of investment identified may influence the ultimate investment requirement.

4.1.9. Data Confidence Scale



Roads have undergone extensive condition reports and the data is mapped in great detail to the GIS system making the data accuracy very high. The data obtained from the condition assessment was loaded into Roadmatrix then uploaded into Citywide. The life cycle strategies within Citywide are not as complex as in Roadmatrix; therefore, the outer years

may be less reliable. The roads life cycle strategies within Citywide will require improvements as the City matures in the Asset Management Planning program and integrates the results into the 10 year Capital Budget.

4.1.10 Recommendations

Asset Inventory

Roads include non-core asset categories such as sidewalks and street lighting. The inventory of these assets is included within Citywide; however, the life cycle strategies require development for the issuance of the next AMP. The inventory for sidewalks and street lighting also requires final validation and departmental sign off to ensure completeness.

Condition Assessment Strategies

The City anticipates continuing its practice of completing comprehensive assessments of the roads every five years. Condition assessment strategies for sidewalks and street lighting require finalization. Continued linkage to GIS of all road assets is also recommended.

Life Cycle Management Strategies

Continue to transition life cycle management strategies from Roadmatrix into Citywide to maximize the linkage to the capital budget plan by implementing the identified life cycle management strategies for paved roads to realize potential cost avoidance and maintain a high quality of road pavement condition.

Evaluate the efficacy of the City's life cycle management strategies at regular intervals to determine the impact cost, condition, and risk.

Risk Management Strategies

Continue to transition risk models from Roadmatrix into Citywide as well as review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.

Levels of Service

Continue to measure current levels of service in accordance with the metrics identified in O. Reg. 588/17 and those metrics that the City believes to provide meaningful and reliable inputs into asset management planning.

Provide public input opportunities to designate different levels of service for collector, residential and arterial roads.

4.2. Stormwater

The City is responsible for maintaining a stormwater network of 122 kilometres of storm mains, catch basins, culverts (less than 3m diameter) and other supporting infrastructure such as manholes, drains, pump stations, storm pond systems.

Staff is working towards improving the accuracy and reliability of Stormwater inventory to assist with long-term asset management planning. Estimated Useful Life (EUL) is based on a combination of industry standards and staff knowledge. Average Age (AA) of the assets is based on the number of years the asset has been in service. The average service life remaining represents the difference between the EUL and the Average Age, except where an asset has been assigned a condition rating; this could potentially increase or decrease the average service life remaining.

4.2.1. Life Cycle Management Strategy Stormwater

Accurate and reliable condition data allows staff to more confidently determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The storm water system has a maintenance system that includes a scheduled flushing, cleaning and inspection program. CCTV inspections are conducted as a diagnostic tool to better inform capital rehabilitation or replacement activities.

Activity Type	Description of Current Activity
Maintenance	Maintenance activities are completed to a lesser degree compared to other underground linear infrastructure
Maintenance	Primary activities include catch basin cleaning and storm main flushing, but only a small percentage of the entire network is completed per year

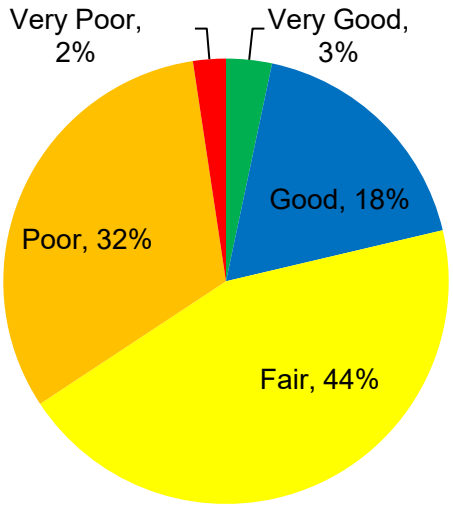
Assessment	CCTV inspections and cleaning is completed as budget becomes available and this information will be used to drive forward rehabilitation and replacement plans
Rehabilitation	Trenchless re-lining reduces total life cycle costs, but requires a formal condition assessment program to determine viability
Replacement	Without the availability of up-to-date condition assessment information replacement activities are purely reactive in nature

The City's life cycle strategy involves the following activities and events at the following projected costs.

Event	Event Class	Cost /m
Flushing	Preventative maintenance	$5/m
CCTV Inspection	Preventative maintenance	$8/m
Trenchless Re-lining	Rehabilitation	$200/m

4.2.2. Condition

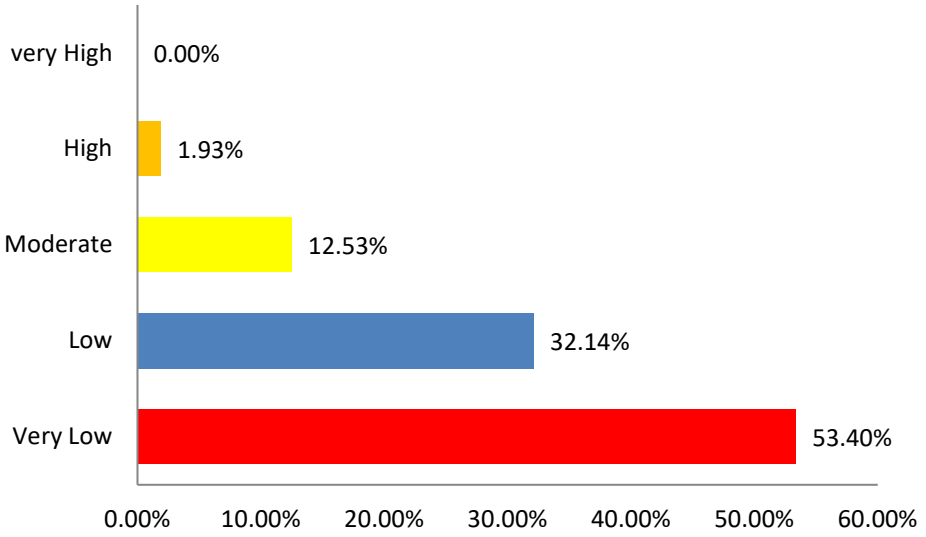
The pie chart below is primarily based on asset age as a city wide CCTV program has not yet been implemented. A majority of storm assets remain in good to fair condition.



4.2.3. Stormwater Risk

A combination of condition and pipe material is used to indicate the probability of failure. The ranking is based on a scale of 1-5 in accordance with the NASSCO Pipeline Assessment Certification Program (PACP) rating system. The City of North Bay has assigned a weighting factor of 70% to condition and 30% to pipe material. With respect to consequence of failure, the stormwater mains have weighted financial risk at 50%, community service risk at 30% and environmental risk at 20%.

Risk: % of assets in very low, low, moderate, high, very high risk profiles



4.2.4. Levels of Service

The following tables show the City's current level of service for the roads. Metrics include the community and technical levels of service that are required as part of O.Reg 588/17, as well as any additional performance measures that the City has selected for the AMP.

4.2.5. Community Levels of Service

The following table outlines the qualitative metrics that determine the community level of service provided by Stormwater.

Core Value	Level of Service Statement	Community Level of Service
Accessible & Reliable	Stormwater system protects property and people from the impacts of flooding	Appendix 9.6 contains a map of the Stormwater system
Affordable	Stormwater system is affordable and managed cost-effectively for the expected level of service	Activities including flushing, CCTV inspection, localized repairs, pipe lining and end of life replacement

Sustainable	Stormwater assets are managed efficiently and long-term plans are in place for the sustainability of Stormwater infrastructure	Current condition would be mostly based on age and material type

4.2.6. Technical Levels of Service

The table below outlines the quantitative metrics that determine the technical level of service provided by Stormwater:

Core Value	Level of Service Statement	Technical Level of Service	2021
Accessible & Reliable	Stormwater system protects property and people from the impacts of flooding	% of properties in municipality resilient to a 100-year storm	87%
		% of the municipal Stormwater management system resilient to a 5-year storm	70%
Affordable	Stormwater system is affordable and managed cost-effectively for the expected level of service	Current reinvestment rate vs target reinvestment rate	0.61:1.29
Sustainable	Stormwater assets are managed efficiently and long-term plans are in place for the sustainability of stormwater infrastructure	% of the Stormwater system that is in good or very good condition	18.99%
		% of the Stormwater system that is in poor or very poor condition	35.33%

4.2.7. Stormwater Risk Matrix

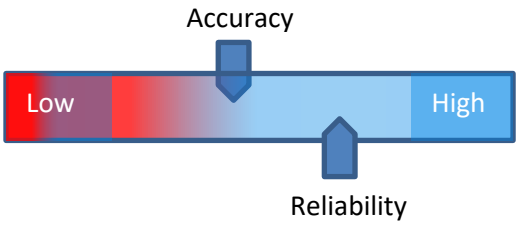
The risk matrix below provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within Stormwater as of December 31, 2021. The identification of the critical assets allows the City to determine

appropriate risk mitigation strategies and treatment options. It should be noted that the assets within Stormwater have a low probability and consequence of failure.

4.2.8. Stormwater Infrastructure Gap

Stormwater has a projected $1.8 million annual shortfall. In the next 10 years this asset category has no funding gap. With the current life cycle strategies, the annual shortfall begins to develop shortly after 10 years. Prudent planning and financial resource allocations are recommended to begin now in order to prevent increased competing resources and a significant funding gap in the future.

4.2.9. Data Confidence Scale



As noted in the life cycle strategies the development of a CCTV program will increase the accuracy of the data specifically as it relates to condition.

4.2.10. Recommendations

Condition Assessment Strategies

Implement annual inspections and maintenance of the municipal drains to reduce surface ponding issues. Activities typically include ditch and vegetation maintenance, and realignment.

Implement a network wide CCTV program phased over several years (ie 10-15) to allow for annual inspections of a select percentage of the network. Focus on problematic areas first and use results of inspection to inform future life cycle activities.

Risk Management Strategies

Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.

Life Cycle Management Strategies

Document and review life cycle management strategies for Stormwater on a regular basis to achieve the lowest total cost of ownership while maintaining adequate service levels.

Levels of Service

Continue to measure current levels of service in accordance with the metrics that the City has established in the AMP. Additional metrics can be established as they are determined to provide meaningful and reliable inputs into asset management planning.

Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

4.3. Bridges and Culverts

The City is responsible for 63 structural bridges and culverts with an average age of 36.5 years. Life cycle activities are based on recommendations supplied through the biennial Ontario Structural Inspection Manual (OSIM) reports. The most recent OSIM report was completed in 2020. Life cycle activities are also influenced from staff input and expertise. The City has enhanced practices which include inspections of non-structural culverts which have their own set of life cycle events. City staff performs visual inspections on a regular basis, between OSIM inspections to ensure the condition/performance of the structures is not deteriorating unexpectedly. The OSIM report provides a Bridge Condition Index (BCI) value which is calculated using asset management principals based on the remaining economic worth of the bridge. It is based on the premise that a bridge starts at a new condition and deteriorates to a lower condition with time. It uses actual inspection data from various bridge elements and as the elements deteriorate they have a lower economic value. Essentially, the BCI is a weighted average of all elements (since not all elements are of equal value to the bridge) and all condition states (since each condition state represents a

certain degree of loss of value to the element). The goal of the City of North Bay is to maintain a BCI level of 65 or greater for Structural Bridges and Culverts.

The BCI begins at a score of 100 when the bridge is in a new condition and theoretically becomes a score of 0 as all elements become fully in poor condition. Practically, it is impossible for the BCI to fall to a score of 0 since the entire bridge does not become poor before rehabilitation work is performed. The BCI score is based on the current value and replacement value of all the elements in a bridge.

4.3.1. Life Cycle Management Strategy

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a life cycle management strategy to proactively manage asset deterioration.

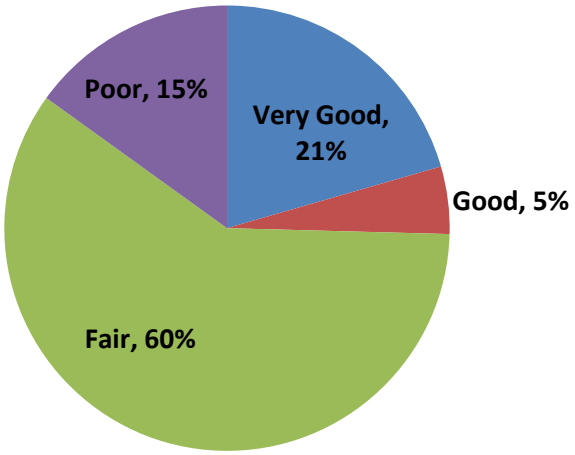
The following table outlines the City's current life cycle management strategy:

Activity Type	Description of Current Strategy
Maintenance, Rehabilitation and Replacement	All life cycle activities are driven by the results of mandated structural inspections competed according to the Ontario Structure Inspection Manual (OSIM). The report may lead to the need for a more detailed condition assessment on individual structures to identify a more detailed scope of required rehabilitation work.
Inspection	The most recent inspection report was completed in 2020

4.3.2. Condition

The pie chart below is developed on the current average condition for Bridges and Culverts. One hundred percent of bridges and culverts were assessed in 2020 with 85% of the assets in this category as being in above fair condition. Due to the health and safety aspects of this asset category it is positive that no assets have a very poor condition and only 15% are in poor condition.

Condition: % of assets in very good, good, fair, poor, very poor condition.

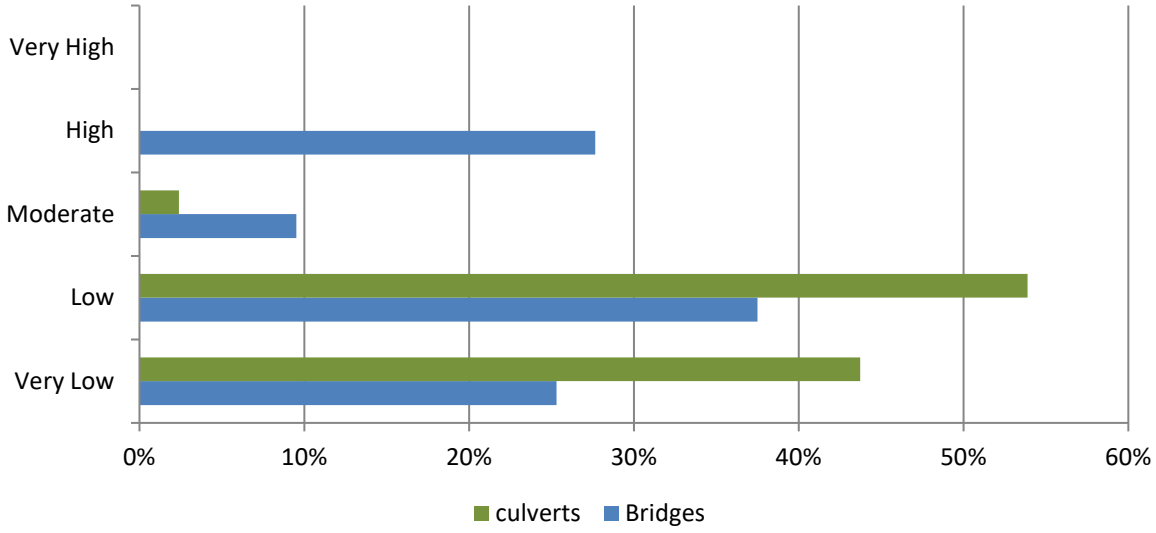


Refer to appendix 9.1 for sample pictures of pictures of Bridges and Culverts conditions.

4.3.3. Bridges and Culverts Risk

The bar chart below distributes the percent of the Bridges and Culverts' assets in each of the risk profiles. As noted in the overview, risk is the probability of failure times the consequence of failure.

Risk: % of assets in very low, low, moderate, high, very high risk profiles.



4.3.4. Levels of Service

The following tables identify the City's current level of service for Bridges and Culverts. These metrics include the technical and community level of service metrics that are required as part of O. Reg 588/17 as well as any additional performance measures that the City has selected for this AMP.

4.3.5. Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by Bridges and Culverts:

Core Value	Level of Service Statement	Community Level of Service
Accessible & Reliable	Bridges and culverts provide reliable access to the roads for vehicles and/or pedestrians	Bridges and structural culverts are a key component of the municipal transportation network. Only two of the municipality's structures (Stanley over Chippewa Creek and Third over Chippewa Creek) have loading or dimensional restrictions meaning that some types of vehicles, including heavy transport, motor vehicles, emergency vehicles and cyclists cannot cross them.
Safe & Regulatory	Bridges and Culverts provide safe vehicular and/or pedestrian passage, and all structures are fully compliant with regulatory requirements	Every two years the City contracts out the OSIM report as well as visual inspections are performed by staff on a regular basis to ensure the condition of the structures are not deteriorating unexpectedly.
Affordable	Bridges and Culverts are managed cost-effectively for the expected level of service	Maintenance and rehabilitation activities include: removing debris from expanding joint seals and bearing seats, implement erosion control measures to shoulders and side banks, repair asphalt on approaches, concrete crack injection, patch work, bearing replacement, deck replacement.

Sustainable	There are long-term plans in place for the sustainability of all Bridges and Culverts	See Appendix 9.2 for photos

4.3.6. Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by Bridges and Culverts:

Core Value	Level of Service Statement	Technical Level of Service	2021
Accessible & Reliable	Bridges and Culverts provide reliable access to the road for vehicles and/or pedestrians	% of bridges in the municipality with loading or dimensional restrictions	3.92%
Safe & Regulatory	Bridges and Culverts provide safe vehicular and/or pedestrian passage, and all structures are fully compliant with regulatory requirements.	% of bridges inspected every two years	100%
Affordable	Bridges and Culverts are managed cost-effectively for the expected level of service	Current reinvestment rate vs target reinvestment rate	0.21:1.33

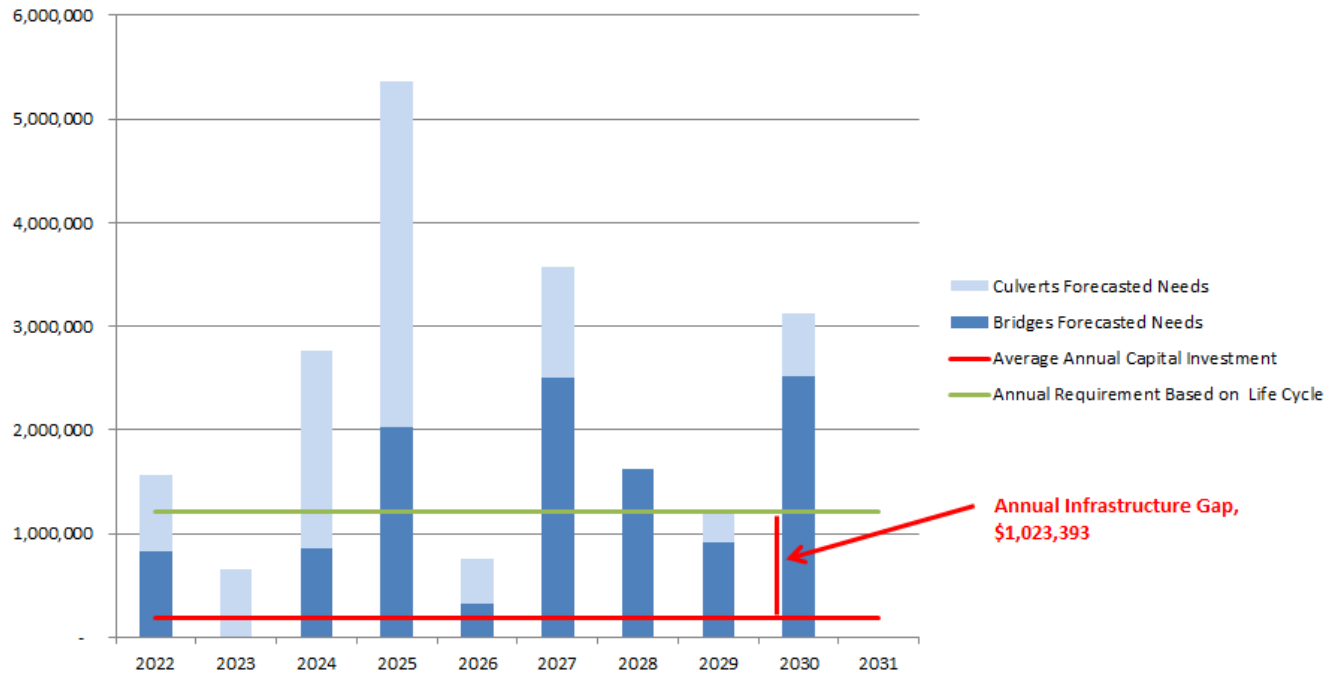
Sustainable	There are long term plans in place for the sustainability of all bridges and culverts	Average bridge condition index value for bridges in the municipality	68.3%
Sustainable	There are long-term plans in place for the sustainability of all bridges and culverts	Average bridge condition index value for bridges in the municipality	68.3%
		Average bridge condition index value for structural culverts in the municipality	66.5%

4.3.7. Bridges and Culverts Risk Matrix

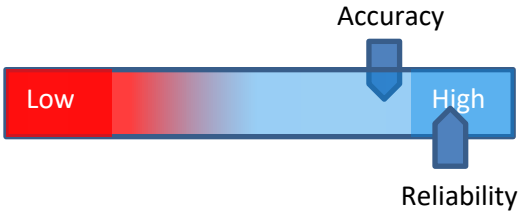
The matrix below provides a visual representation of the relationship between the probability of failure and the consequence of failure for Bridges and Culverts. Probability of failure is modeled on factors such as condition, structure type, truck route and bus route. Consequence of failure is modeled on financial replacement cost, road class, access, rise, Average Annual Daily Traffic (AADT) and number of spans.

4.3.8. Infrastructure Gap

The 2022 approved 10 year capital budget averages an annual investment in bridges and culverts of $195,000. Applying life cycle strategies the Asset Management Plan requirements are an annual investment of $1.2 million generating the annual infrastructure gap for bridges and culverts of $1,000,000. The graph below highlights that in the next two years the annual requirements are less than $2 million with the most significant investment required in 2025 when the following most notable investments become due for replacement; Booth over Jessop's Creek Culvert, Duke over Chippewa Creek Culvert and Queen over Chippewa Bridge.



4.3.9. Data Confidence Scale



Bridges and Culverts undergo extensive condition reports every two years. The reports also include anticipated replacement data. The last OSIM report was completed in 2020. The data is also mapped in great detail to the GIS system making the data accuracy very high.

4.3.10. Recommendations

Data Review/Validation

Continue to review and validate inventory data, assessed condition data and replacement costs for all bridges and structural culverts upon the completion of OSIM inspections every 2 years.

Risk Management Strategies

Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.

Life Cycle Management Strategies

The AMP includes capital costs associated with the major rehabilitation/reconstruction of bridges and culverts as estimated by the OSIMs contractors. Ongoing review of replacement values and life cycle strategies is required to ensure changes in information remains accurate. Staff is working to develop and implement an ongoing preventative maintenance program to improve efficiency and effectiveness of life cycle strategies with the overall objective of optimizing the life of the asset in a cost effective manner.

Levels of Service

Continue to measure current levels of service in accordance with the metrics identified in O. Reg. 588/17 and those metrics that the City believes to provide meaningful and reliable inputs into asset management planning.

Work towards public consultation and input into levels of service.

4.4. Water

Water Systems are rated based on a Class system created by the Ministry of Environment Conservation and Parks (MECP). Systems can be rated from Class 1 (less complex) to Class 4 (most complex).

The construction of North Bay's Water Treatment Facility began in April 2006 and the Facility became operational February 17, 2010. The Water Treatment Plant is a Class 3 facility while the water distribution system is Class 4. The Facility operates using a multi-barrier approach to meet its treatment goals.

The primary barrier in this Facility is a microfiltration system, which is made up of 11 parallel membrane racks, each equipped with dozens of pressure vessels that house thousands of hollow-fibre membranes. These membranes provide an effective barrier to physically separate the various contaminants in the City's drinking water.

The secondary treatment barrier is the UV disinfection system, which inactivates any organisms that are present in the water, using high intensity light. The water is then injected with chlorine, to kill off any viruses and bacteria that are able to bypass the previous systems. The raw water for the Facility is drawn from an intake pipe that extends 300 metres off the shore, into Trout Lake. An average of 20 million litres (ML) of water run through the facility every day, with a design capacity of 79.5ML day.

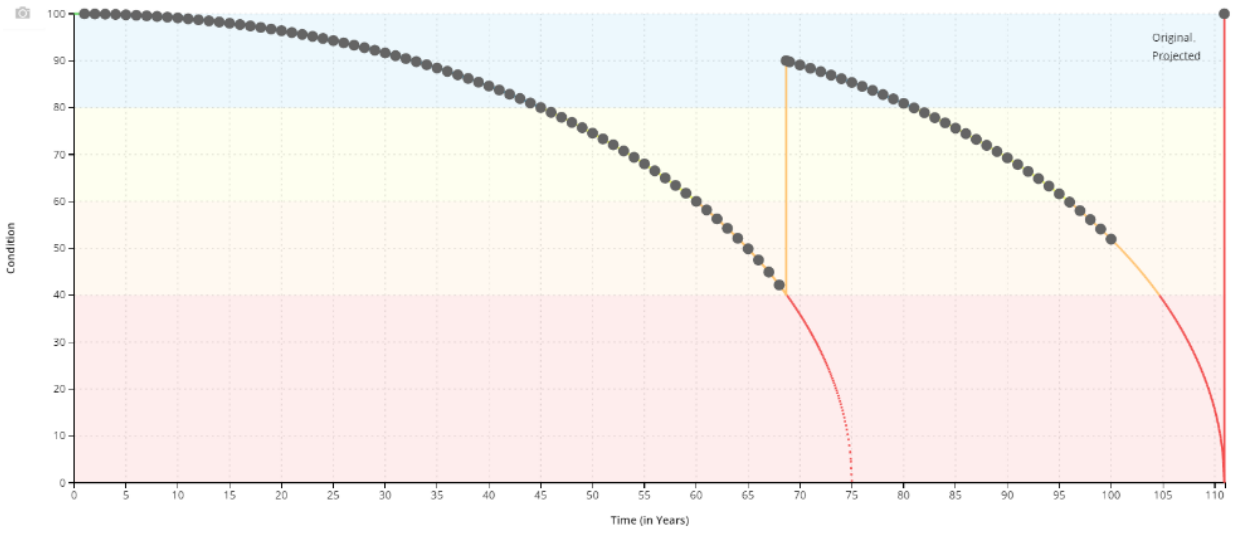
These treatment facilities consist of a group of components, including building structures, pipes, valves, pumps, Supervisory Control and Data Acquisition (SCADA) systems, and so forth. The State of the Infrastructure analysis of these components was based upon existing inventories.

4.4.1. Life Cycle Management Strategy

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset’s characteristics, location, utilization,

maintenance history and environment. The following life cycle strategy has been developed as a proactive approach to managing the life cycle of water mains.

Water Mains Event Name	Event Class	Event Trigger
Valve Exercising	Maintenance	Every 4 years
Large Diameter valve (16"+)	Maintenance	Every 2 years
Uni-directional flushing	Maintenance	Every 4 Years
Cathodic Protection	Preventative Maintenance	New Construction
Trenchless Re-lining	Rehabilitation	Condition
Full Reconstruction	Replacement	Condition/New Development
Dead End Flushing	Preventative Maintenance	Twice Annually(spring/fall)
Hydrant Maintenance	Preventative Maintenance	Every 4 years
Trenchless Relining	Rehabilitation	Condition

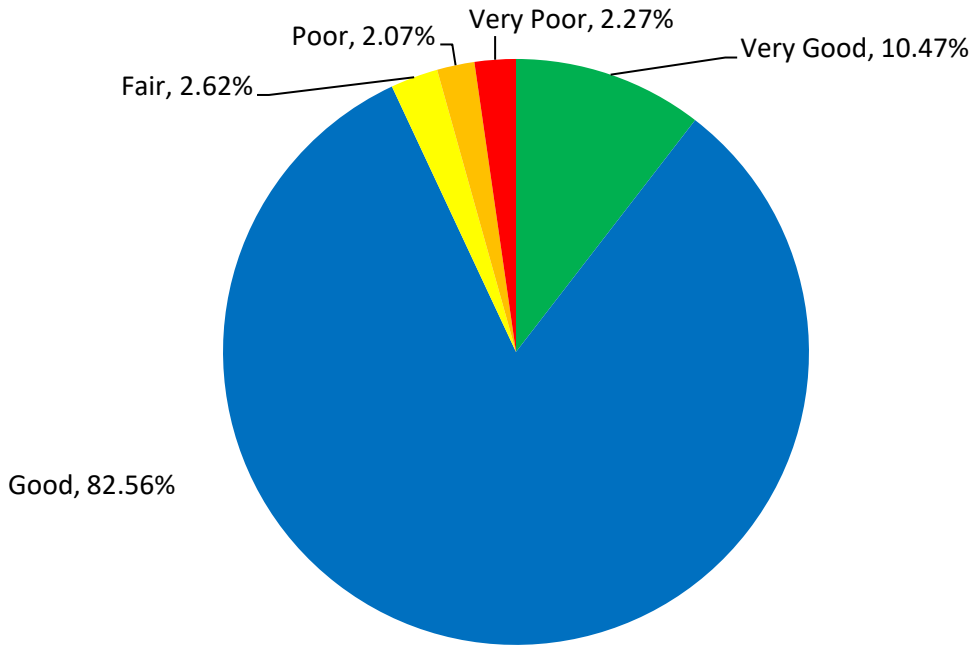


4.4.2. Condition

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets more confidently. The following describes the municipality's current approach:

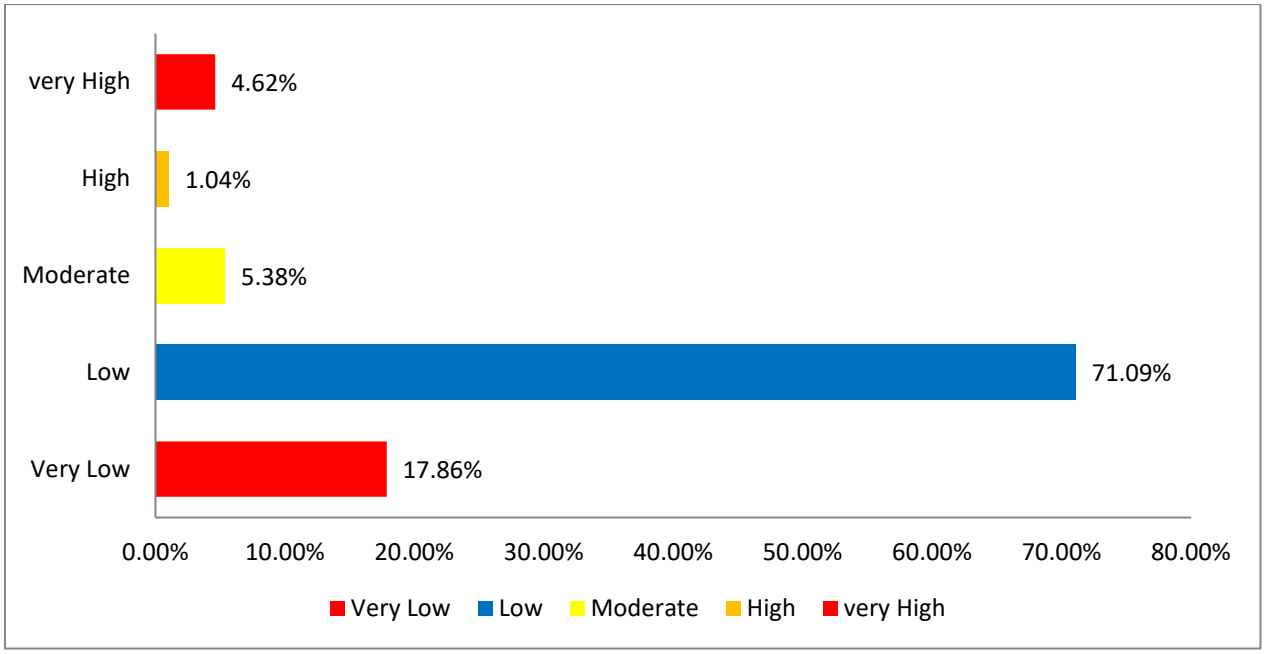
- Staff primarily relies on the age, pipe material, break history, and dirty water complaints to determine the projected condition of water mains.
- A Trenchless water relining is used as a rehabilitation method where deemed appropriate.
- Main flushing and valve turning is completed on the network (300 valves/year). Hydrant valves are exercised regularly
- Fire flow and pressure testing is performed as required for infrastructure upgrades and new development. Uni-directional flushing is performed over a four year cycle.

The pie chart below illustrates the % of assets in very good, good, fair, poor, very poor condition.


Very Poor, 2.27%
Poor, 2.07%
Very Good, 10.47%
Fair, 2.62%
Good, 82.56%

4.4.3. Water Risk

The bar chart below distributes the percent of the water assets in each of the risk profiles. The majority of water assets have low risk assessments due to the built in redundancy within the water processes.



4.4.4. Levels of Service

The following tables identify the City's current level of service for Water. These metrics include the technical and community level of service metrics that are required as part of O. Reg 588/17 as well as any additional performance measures that the City has selected for the AMP.

4.4.5. Community Level of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by water:

Core Value	Level of Service Statement	Community Level of Service
Accessible & Reliable	A reliable water supply is provided with minimal service disruptions	See Appendix 9.5 for map of municipality connected to water system and fire flow.
Safe & Regulatory	Water supply is safe to drink and meets all regulatory requirements	One watermain break that affected five properties which were on boil water advisory from December 3 to December 6, 2021.
Affordable	Water services are affordable and household charges are fair and reasonable; infrastructure is managed cost effectively for the expected level of service	Life Cycle activities include valve exercising, uni-directional flushing, cathodic protection, dead end flushing, trenchless relining, and full reconstruction.
Sustainable	Water resources are used efficiently and long-term plans are in place for the sustainability of the water supply and all water infrastructure	The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an assets characteristics, location, utilization, maintenance history and environment. Life cycle strategies are used as a proactive approach to having a sustainable system.

4.4.6. Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by water assets:

Core Value	Level of Service Statement	Technical Level of Service	2021
Accessible & Reliable	A reliable water supply is provided with minimal service disruptions	% of properties connected to the municipal water system	83%
		% of properties where fire flow is available	83%
		# of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system	248 Connection days due to water main breaks compared to 16779 properties connected to municipal water
Safe & Regulatory	Water supply is safe to drink and meets all regulatory requirements	# of connection-days per year where a boil water advisory or drinking water advisory notice is in place compared to the total number of properties connected to the municipal water system	15 connection days due to boil water advisory compared to 16779 properties connected to municipal water
Affordable	Water services are affordable and household charges are fair and reasonable; infrastructure is managed cost-effectively for the expected level of service	Avg. annual residential water bill	$563.78
		Current reinvestment rate vs target reinvestment rate	0.62 : 1.59

Sustainable	Water resources are used efficiently and long-term plans are in place for the sustainability of the water supply and all water infrastructure	% of the water system that is in good or very good condition- confirm with client if just distribution	89.80%
		% of the water system that is in poor or very poor condition- confirm with client if it is just distribution	8.71%

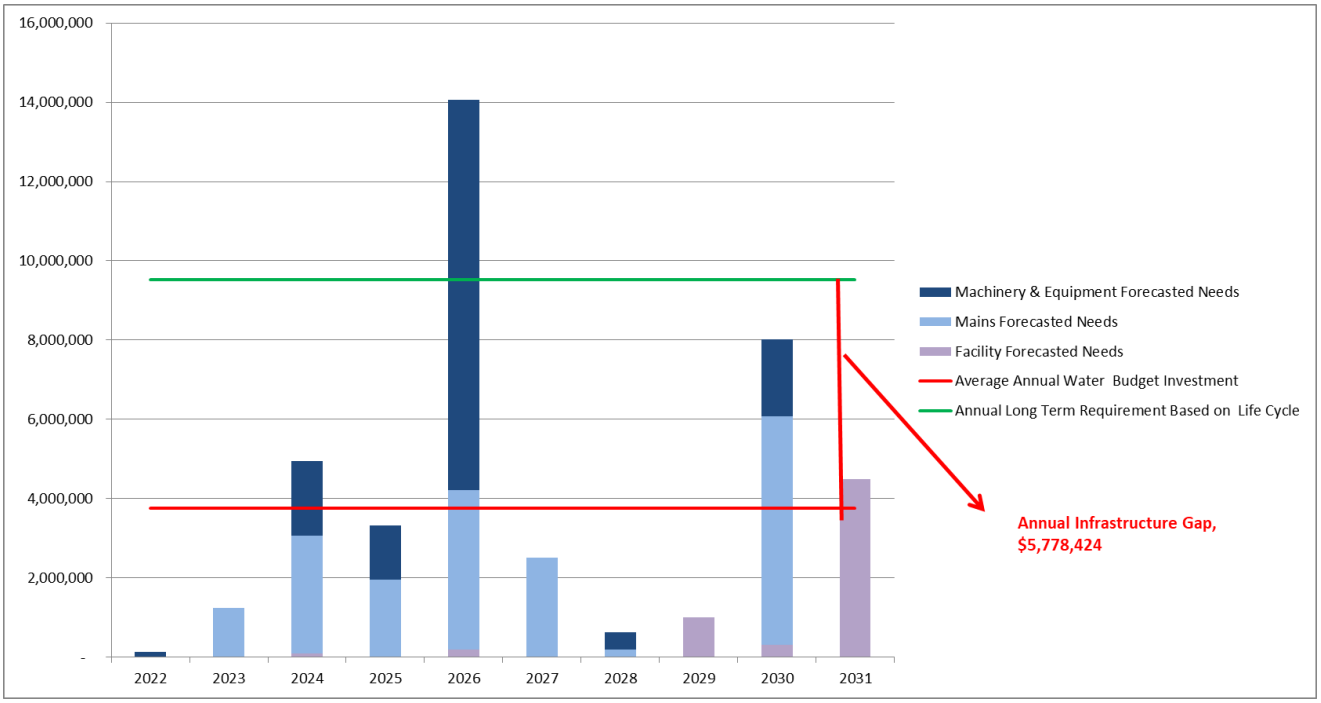
4.4.7. Water Risk Matrix

The matrix below provides a visual representation of the relationship between the probability of failure and the consequence of failure for the water assets as of December 31, 2021. The identification of the critical assets allows the City to determine appropriate risk mitigation strategies and treatment options. For example the matrix identifies one asset for $7.6 million (membranes) at the water treatment facility that has exceeded its expected life of 10 years and is scheduled for replacement in 2024/2025.

4.4.8. Water Infrastructure Gap

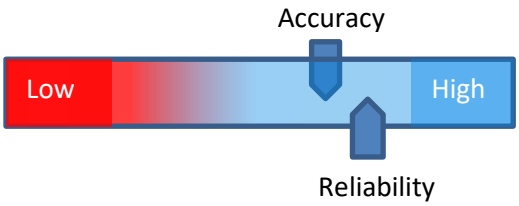
The City of North Bay invested in a new water treatment facility which opened in 2010. The water treatment facility has a 75 year estimated useful life. The most notable investment is with the Machinery and Equipment to replace the membranes that have exceeded the anticipated 10 year life. The graph below highlights that in the short term (approximately 10 years) the current annual budget appears to be sufficient; however, over the longer term (estimated useful life of the assets) the water network is underfunded by approximately $5.7

million a year. This gives the City time to pivot and implement the financial strategy recommendations contained within the AMP.



4.4.9. Data Confidence Scale

This asset class has undergone extensive condition reports and the data is mapped in great detail to the GIS system making the data reliability very high.



4.4.10. Recommendations

Condition Assessment Strategies

Identify condition assessment strategies for high value and high-risk equipment and centralize within CityWide.

Review assets that have surpassed their estimated useful life to determine if immediate replacement is required or whether these assets are expected to remain in-service. Adjust the service life and/or condition ratings for these assets accordingly.

Risk Management Strategies

Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.

Levels of Service

Begin measuring current levels of service in accordance with the metrics that the City has established in the AMP. Additional metrics can be established as they are determined to provide meaningful and reliable inputs into asset management planning.

Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

4.5. Wastewater

The wastewater system including sanitary mains, 17 lift stations, manholes, force mains and services contain approximately 270 kilometers of sanitary main, 15,000 services and 3,500 sanitary maintenance holes. The City of North Bay Wastewater Treatment System has a design capacity of 54,500 m3/day and is a Class 4 Wastewater Treatment Plant with a Class 2 wastewater collection system. The conventional activated sludge facility uses

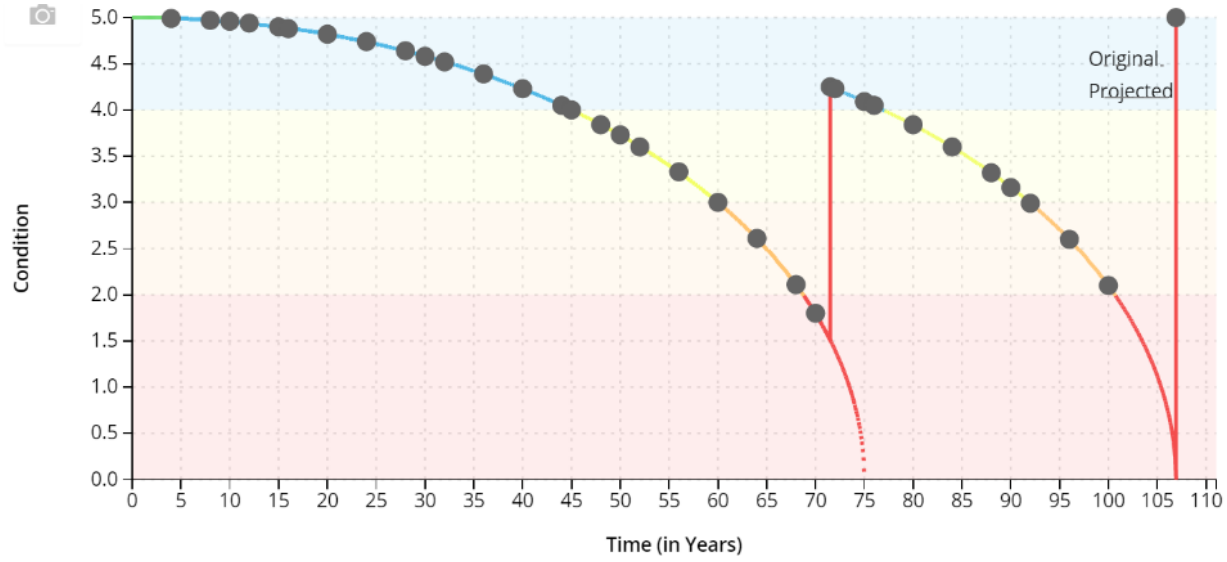
biological oxidation, anaerobic digestions and centrifugation. The Wastewater Plant is located on Memorial Drive and is used to treat all of North Bay's Wastewater/Sewage. The original Wastewater Treatment Facility was built in 1962 and was expanded in 1973 and 1984. The Facility is a conventional activated sludge facility, which uses the following treatment processes: raw sewage pumping, sewage grinding and screening, grit removal, primary settling, aeration, final settling, chemical phosphorus removal and chlorination for effluent disinfection.

4.5.1. Life Cycle Management Strategy

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment. The following life cycle strategy has been developed as a proactive approach to managing the life cycle of sanitary mains.

Example Life Cycle Strategy:

Condition deteriorates until a betterment to the asset is done in order to extend the useful life. A betterment in this example is complete at approximately year 70.

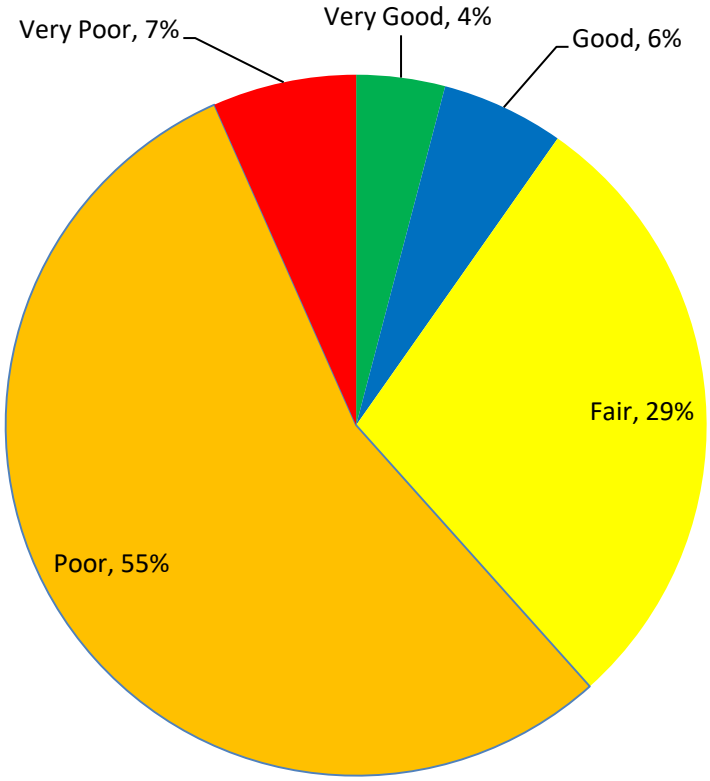


4.5.2. Condition

Accurate and reliable condition data allows staff to more confidently determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The following describes the municipality's current approach:

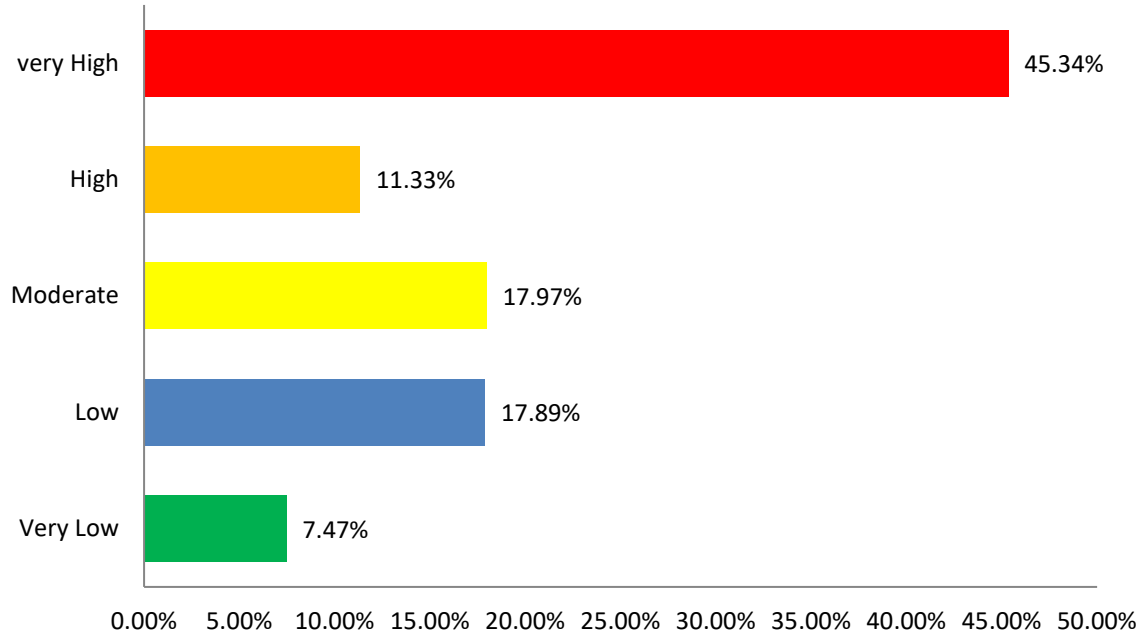
- CCTV inspections are completed for sanitary mains to determine the condition of the infrastructure and troubleshoot reported issues.
- Rehabilitation projects are prioritized by growth and capacity considerations, in addition to condition.
- Trenchless re-lining program is in place.
- System flushing is performed as needed.

The pie chart below illustrates the % of assets in very good, good, fair, poor, very poor condition.



4.5.3. Wastewater Risk

The bar chart below distributes the percent of the wastewater assets in each of the risk profiles. There are several assets in the high risk profile because of the much older age of the infrastructure within the wastewater assets.



4.5.4. Levels of Service

The following tables identify the City's current level of service for Bridges and Culverts. These metrics include the technical and community level of service metrics that are required as part of O. Reg 588/17 as well as any additional performance measures that the City has selected for the AMP.

4.5.5 Community Level of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by wastewater:

Core Value	Level of Service Statement	Community Level of Service
Accessible & Reliable	A reliable wastewater service is provided with minimal service disruptions	See Appendix 9.8 for Wastewater Distribution Network.

Safe & Regulatory	Wastewater is managed without risk or hazard to public health; there is full compliance with all regulatory requirements	Sanitary sewers are designed to meet the City of North Bay Design Guidelines, Provincial AODA Guidelines, and MECP Design Guidelines for Sewage Works.
Affordable	Wastewater services are affordable and household charges are fair and reasonable; infrastructure is managed cost-effectively for the expected level of service	CCTV inspections are completed for wastewater to determine condition of the infrastructure and trouble reported issues. Rehabilitation projects are prioritized by growth and capacity considerations, in addition to condition.
Sustainable	Wastewater resources are used efficiently, and long-term plans are in place for the sustainability of wastewater treatment and infrastructure	Accurate and reliable condition data allows staff to more confidently determine the remaining service life of assets and identify the most cost effective approach to managing assets.

4.5.6. Technical Levels of Service

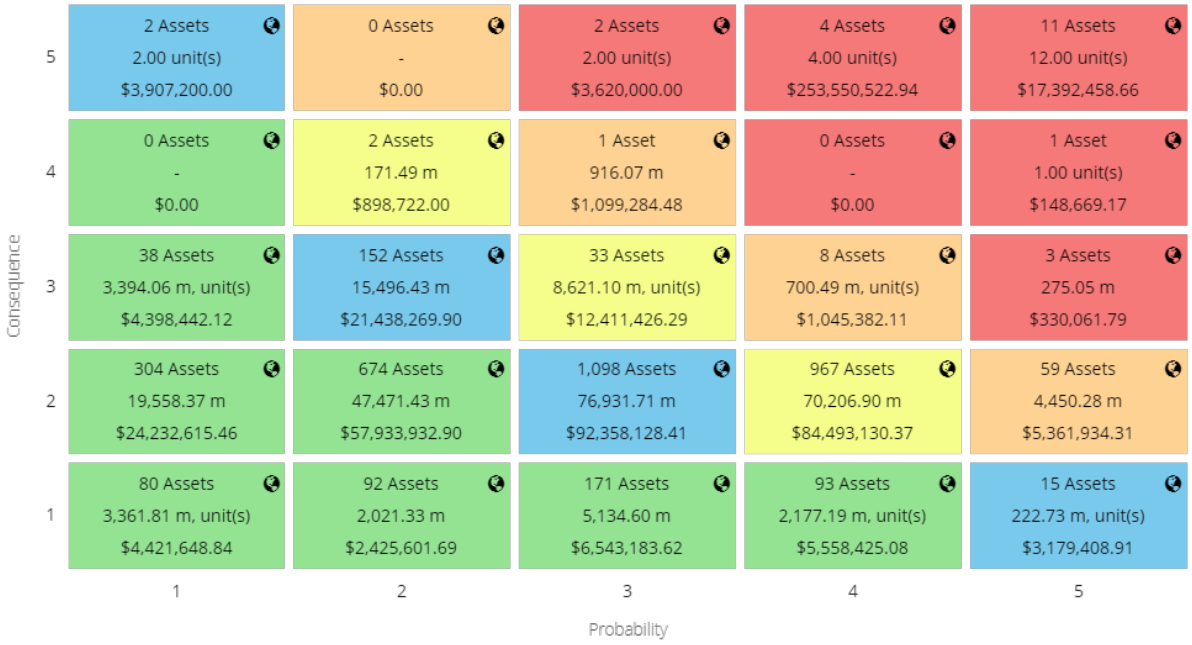
The following table outlines the quantitative metrics that determine the technical level of service provided by wastewater:

Core Value	Level of Service Statement	Technical Level of Service	2021
Accessible & Reliable	A reliable wastewater service is provided with minimal service disruptions	% of properties connected to the municipal wastewater system	83%
Safe & Regulatory	Wastewater is managed without risk or hazard to public health; there is full compliance with all regulatory requirements	# of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compare to the total number of properties connected to the municipal wastewater system	N/A – City does not own combined sewers
		# of connection days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system	48 connection day backups in 2021 compared to 16648 properties connected to municipal wastewater
		# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	There was 1 effluent violation due to wastewater discharge compared to 16,648 properties

Affordable	Wastewater services are affordable and household charges are fair and reasonable; infrastructure is managed cost-effectively for the expected level of service	Current reinvestment rate vs target reinvestment rate	0.88: 1.28
Sustainable	Wastewater resources are used efficiently, and long-term plans are in place for the sustainability of wastewater treatment and infrastructure	% of the wastewater system that is in good or very good condition % of the wastewater system that is in poor or very poor condition	12.46% 51.22%

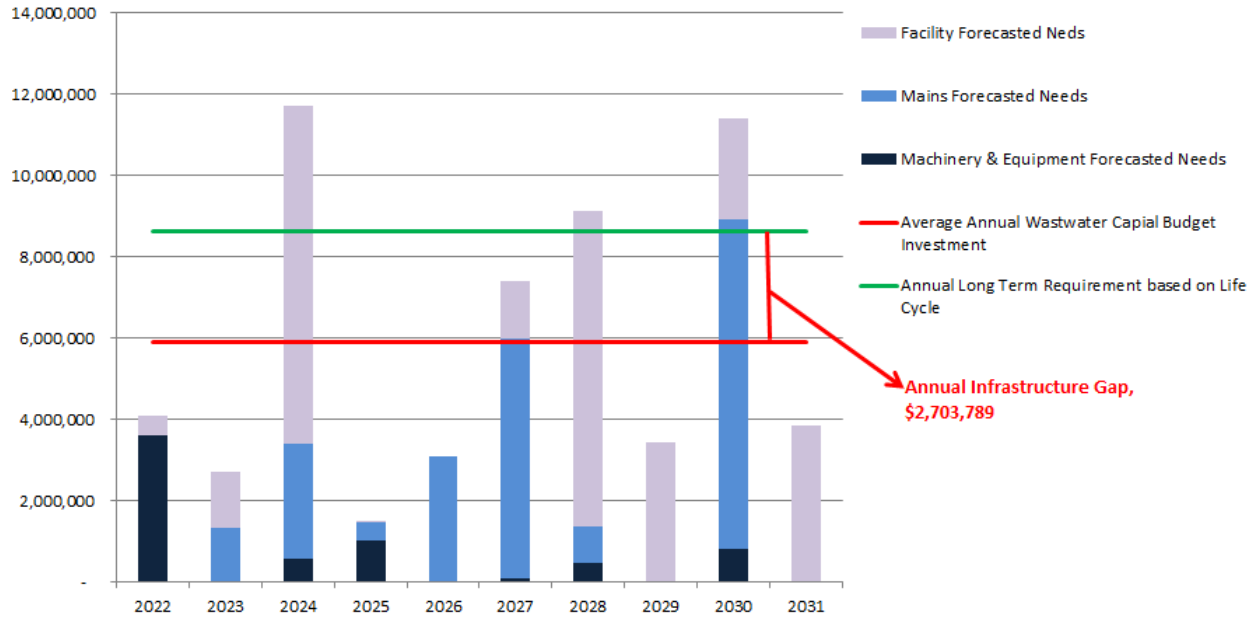
4.5.7. Wastewater Risk Matrix

The matrix below provides a visual representation of the relationship between the probability of failure and the consequence of failure for the wastewater assets as of December 31, 2021.

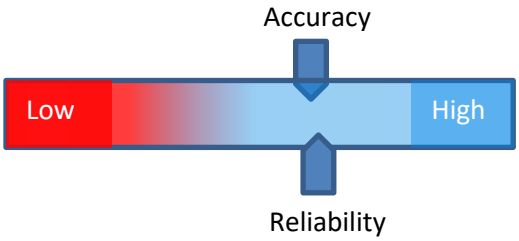


4.5.8. Wastewater Infrastructure Gap

Wastewater assets are sufficiently funded in the short term; however, it is important for the City to slowly increase the funding towards infrastructure renewal, as demonstrated by the graph below. The longer term annual funding gap is approximately $2.7 million. The wastewater plant is much older and requires several renewal projections in the next 10 years. Most notably in 2024 there is reconstruction of the intake Chamber, the pumping station and structural repairs at the facility. It is noted in the Capital Budget section above, that there are significant wastewater budget funds designated as growth related; however, the funds are projected to be required to implement a new treatment process which will require expansion of the facility. The graph below captures only assets currently operating within the wastewater network. Depending on the timing, details and design requirements of the legislative change, some of the 'growth' related funds may be reallocated to fund the identified infrastructure gap thereby reducing the pressures to increase the rate funded capital requirements.



4.5.9. Data Confidence Scale



This asset class has undergone extensive condition reports and the data is mapped in great detail to the GIS system making the data accuracy high. Improvements are yet to be gained in reliability.

4.5.10. Recommendations

Identify condition assessment strategies for high value and high-risk water network assets.

Implement risk-based decision-making as part of asset management planning and budgeting processes. This should include the regular review of high-risk assets to determine appropriate risk mitigation strategies.

Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.

Continue to measure current levels of service in accordance with the metrics that the City has established in the AMP. Additional metrics can be established as they are determined to provide meaningful and reliable inputs into asset management planning.

Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

5. Financing Strategy

5.1. Background

This section contains the financial requirements associated with the management of the City's assets over the AMP period. The financial projections and annual averages presented in this section are based on the best available information at this time (ie. approved 2022 10 year Capital Budget). Improving the quality of information and the planning process will be an integral part of the City's Corporate Asset Management Program going forward and is covered in the recommendations below.

The effectiveness and meaningfulness of an asset management plan is dependent on the integration with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow the City of North Bay to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, legislative requirements and projected growth requirements.

This version of the AMP is primarily focused on the City's asset lifecycle needs, specifically the expenditure required to maintain the current level of service to the City's community. A funding shortfall, however, is not assessed for growth and service enhancement needs. Growth and service enhancement needs are to be updated in a future AMP as the City's capacity and expertise in AMP develops. As growth and new assets are considered, an analysis of full life cycle costing costs may also form part of the decision making process. Therefore, the funding shortfalls discussed within this Asset Management Plan refer only to the needs and funding available for existing core assets to maintain the current levels of service and do not include any new infrastructure identified in the 10 year Capital Budget.

Working within current funding levels, the City has to continuously prioritize expenditures between asset sustainability, growth demands and changes in service levels. The objective of the Asset Management Plan is to ensure there is an increased

focus on asset renewal needs. The AMP forecasts a shortfall in annual funding levels required for several assets to sustain their current expected level of service. This is a common challenge for cities across Canada including the City of North Bay. The AMP will inform development of a financial plan that:

- Identifies the financial requirements for existing assets
- Utilizes existing services levels
- Identifies the traditional sources of municipal funds; and
- Explores alternative and/or sources of municipal funds (reallocated budgets, partnerships)

If the financial plan component results in a funding shortfall, the Province requires the inclusion of a specific plan as to how the impact of the shortfall will be managed. In determining the legitimacy of a funding shortfall, the Province may evaluate a City's approach to close the funding shortfall gap. For example:

A. In order to reduce financial requirements, consideration has been given to potentially revising service levels downward.
B. All asset management and financial strategies have been considered. For example:
    - If a zero-debt policy is in place, is it warranted?
    - Has the use of debt been considered?
    - Do user fees reflect the cost of the applicable service? If not, increased user fees should be considered.

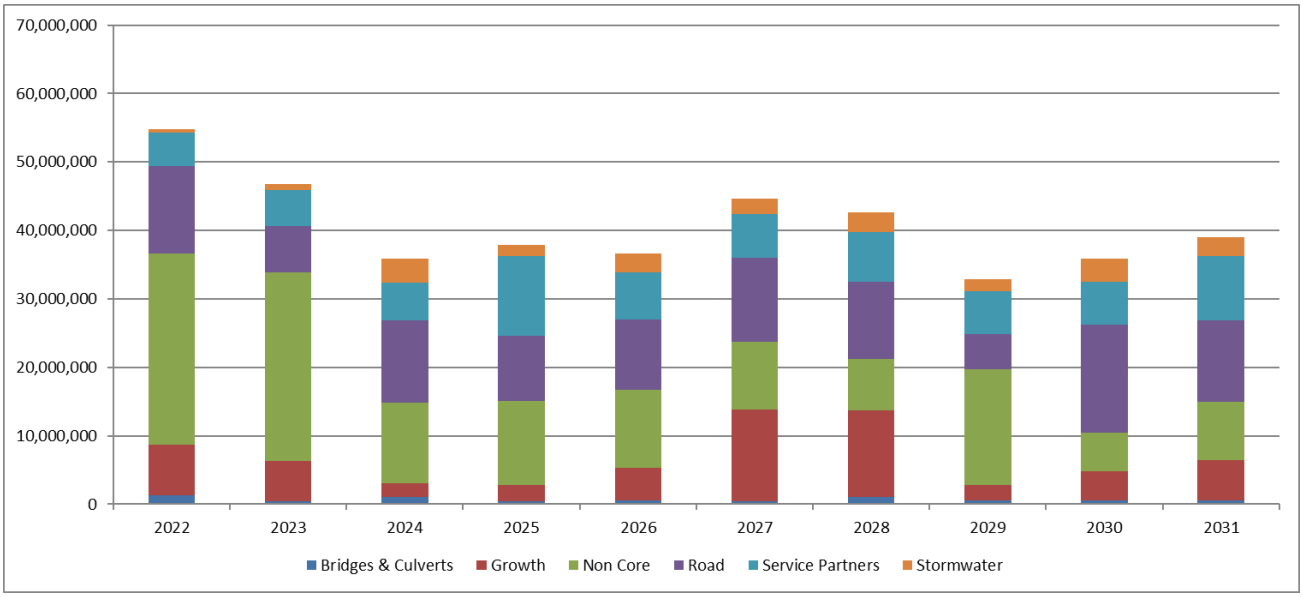
5.2. Capital Budget Forecast

Capital budget forecasts for the AMP period are based on the City's 2022 10 year Capital Budget, which meets the requirement of O.Reg 588/17. A multi-year capital budget plan is presented to Council on an annual basis. Generally, Council approves year one of the capital budget and approves, in principle, the remaining years.

The selection, project development and prioritization processes for the projects within the 10 year Capital Budget plan are reviewed with the Service Areas to assess the program needs, trends and priorities. The review includes actual costs incurred in the past for similar projects, as well as current costs to date for projects in progress. Capital project information is gathered from the Service Areas to provide justification for recommended projects.

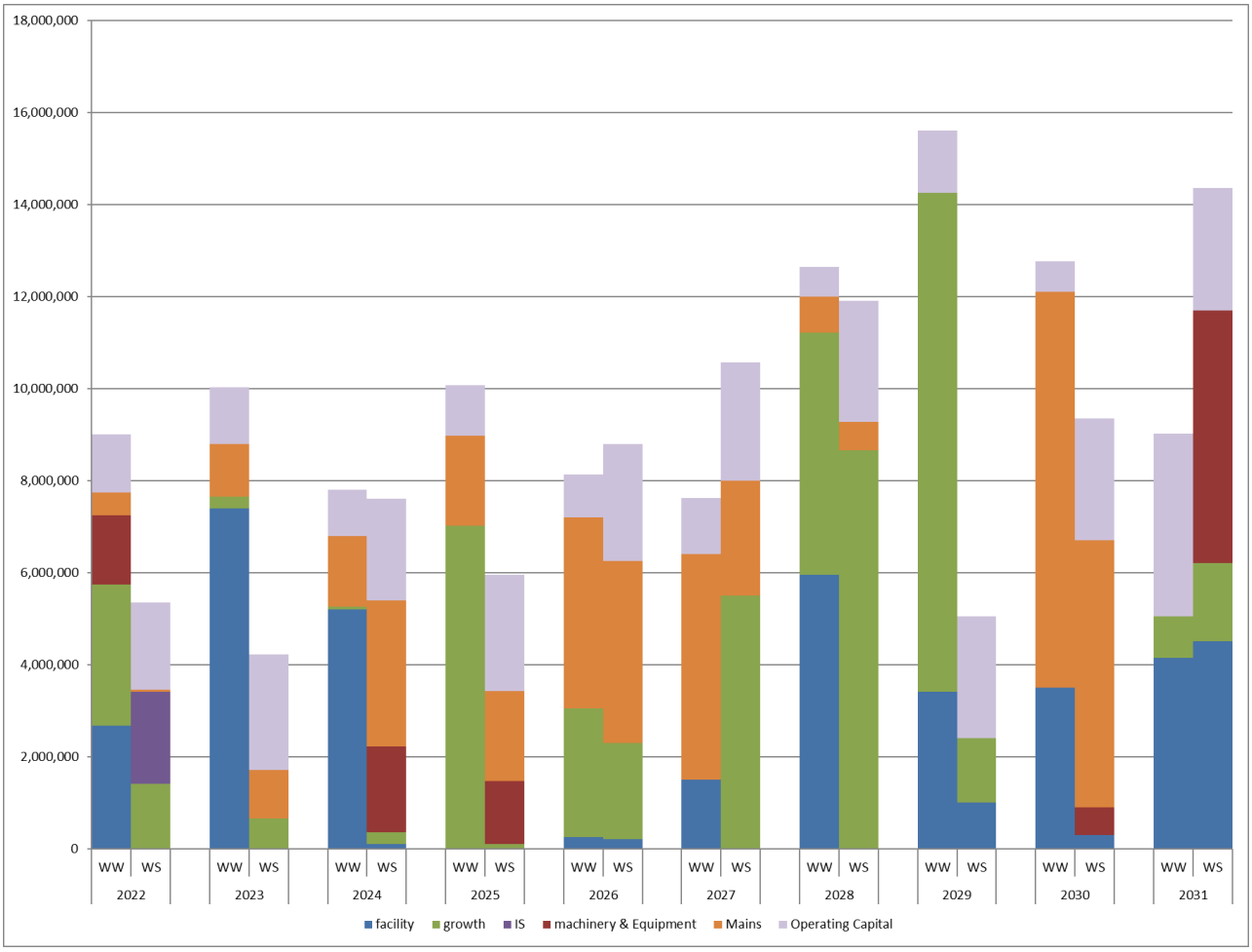
The graph below illustrates the 2022 10 year Capital Budget. For this AMP the 2022-2031 General Capital Budget (tax levy funded) has been separated out into Core Assets (Roads, Stormwater, Bridges & Culverts), Non-Core Assets (Parks, Facilities, IT, Fleet) and, Operating Capital (routine maintenance/repairs), Growth and Service Partners. This additional level of detail was necessary to provide clarity on the average annual funding allocated to Core Assets reported in this AMP thereby enhancing the accuracy and reliability of funding level shortfall projections.

2022-2031 General Capital Budget



The Water and Wastewater Budget is included within the Asset Management Plan and is funded by water and wastewater rates. The graph below reflects the 2022 10-year capital budget for Water and Wastewater.

2022-2031 Water and Wastewater Budget



**WW means wastewater, and WS means water system

It's important to note that the significant growth investment in wastewater in 2029 is a result of an anticipated legislative change with respect to how wastewater will be required to be treated. The plant will require a new process in order to accommodate the legislative change.

5.3. Operating Budget

In preparing the Operating Budget the Capital Budget forecast is taken into consideration. This ensures that sufficient funding is available to operate, repair and maintain any new assets that were created in the previous year or are subject to significant renewal projects. Maintaining infrastructure in good condition continues to be a priority. In developing the annual Operating Budget, there is an annual transfer to the Capital Budget called PAYGO (Pay as you go) that represents the cash payments collected through the tax levy or through water and wastewater rates for capital investments.

In accordance with the City's Long Term Capital Funding Policy, moderate increases to the tax levy are necessary to ensure funding for capital investment and payment of principle and interest on debt. City Council continues to recognize and support the need for increased transfers to fund the Capital Budget due to inflationary pressures as well as funding increases required to address municipal transformation projects. Operating Budgets are developed with consideration of the capital requirements needed to address the City's assets.

The components related to the PAYGO funding of the Capital Budget will continue to be reviewed in conjunction with the needs identified in this AMP. There will also be an increased focus on the best life cycle solutions for maintaining the asset base and continued delivery of current or improved LOS.

Maintaining assets is more than investments in capital. As discussed in section 4, life cycle strategies include operating investments that ensure the assets are delivering the intended LOS. Therefore, long term sustainable funding for maintenance and repairs is foundational to address challenges in infrastructure deficits because it is often preventative and will optimize the life of the assets. Generally, wages and materials for repairs are reported within the Operating Budget; however, there is also Operating Capital (routine maintenance / repairs) within the Capital Budget. The Average Annual Operating Capital in the table below represents the investment in routine maintenance activities for the assets reported in

this AMP and are calculated from the 2022 10 Year Capital Budget. It is recommended that a transition plan be developed to move these expenditures of routine maintenance and repairs from capital to operating.

Asset	Average Annual Operating Capital
Roads	$108,900
Bridges and Culverts	$ 489,500
Storm	$ 355,800
Water	$1,337,000
Wastewater	$2,483,855

5.4. Capital Investment Revenue

The City obtains funding for its operating and capital expenditures from a number of sources. A significant portion of revenue is derived from property taxes. The City has adopted a Long Term Capital Funding Policy that balances the traditional pay-as-you-go financing approach with debt and third party funding sources. As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period of the AMP. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included OCIF (Ontario Community Infrastructure Fund) formula-based funding, as well as Canada Community Building Fund, since these funding formulas are multi-year commitments. With regards to the funding of capital projects, the main sources of current funding for the City are as follows:

- *Pay As You Go / PAYGO*
    - General Operating Budget (tax levy)
    - Water and Wastewater (user rates)
- Debt Financing
- Discretionary Reserves
    - General Completed Capital Reserve
    - Water Completed Capital Reserve
    - Wastewater Completed Capital Reserve

    - Other Reserves
- Development Charges
- External Sources
    - Provincial Transit Funding
    - Canada Community Building Funding
    - Various Grants including, but not limited to: Public Transit Infrastructure Funding, NOHFC, FEDNOR, OCIF, Disaster Mitigation and Adaption Fund
    - Developer Contributions
    - Other One-time Third-Party Recoveries

Funding sources available for capital over the 2022 – 2031 planned periods are detailed in the Table below. Despite the City's continued increases in capital funding, it is clear that to successfully deal with the infrastructure deficit, municipalities will need significant ongoing reliable funding and Provincial and Federal assistance. While the City continues to pursue all grant opportunities for capital projects, by their nature they are not sustainable nor predictable. As such, the use of grants will continue to be used to leverage funding and where applicable make available City funding for other projects. The tables below summarize the funding plan within the 2022 10 year Capital Budget

Planned and Projected Funding Sources for General Capital (in millions)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Capital Levy in Operating Budget PAYGO	**15.16**	**15.12**	**15.76**	**17.24**	**18.24**	**18.92**	**19.62**	**20.18**	**21.04**	**22.44**
Debenture and Long-term Debt**	**8.50**	**6.25**	**8.50**	**8.50**	**8.50**	**8.50**	**8.50**	**8.50**	**8.50**	**8.50**
Special Debt for Community Centre**	**8.12**	**15.78**								
Canada Community Building Fund for Community Centre	**6.92**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Canada Community Building Fund	**3.27**	**3.41**	**3.41**	**3.41**	**3.41**	**3.41**	**3.41**	**3.41**	**3.41**	**3.41**
Development Charges / Reserves	**1.61**	**1.04**	**0.30**	**1.84**	**0.35**	**0.30**	**0.50**	**-**	**0.25**	**1.12**

Ontario Community Infrastructure Fund (OCIF)	**5.63**	**2.63**	**2.63**	**2.63**	**2.63**	**2.63**	**2.63**	**2.63**	**2.63**	**2.63**
Grants and Other Funding	**5.60**	**2.30**	**4.53**	**4.26**	**3.40**	**11.20**	**7.92**	**-**	**-**	**-**
Total	**54.81**	**46.53**	**35.13**	**37.88**	**36.53**	**44.96**	**42.58**	**34.72**	**35.83**	**38.10**

** Debt is not a revenue source but rather an important capital financing tool

Planned and Projected Funding Sources for Water and Wastewater Capital (in millions)

*	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Capital Levy in Operating Budget PAYGO	9.89	10.73	11.82	12.86	14.14	15.35	16.63	17.69	19.13	20.34
Debenture and Long-term Debt**	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Development Charges / Reserves	1.47	0.48	0.60	-	-	-	5.08	-	-	-
Total	14.36	14.21	15.42	15.86	17.14	18.35	24.71	20.69	22.13	23.34

** Debt is not a revenue source but rather an important capital financing tool

PAYGO revenues allow for maximum flexibility when funding projects. As can be seen in the table above, the tax supported funding is planned to achieve 59% total funding from PAYGO by 2031 whereas the rate supported PAYGO is planned to achieve 87% in 2031. The amounts included in the capital budget are to fund all capital projects. Therefore, in order to determine the funding gap for core infrastructure only adjustments were required to remove the funding required for non-core assets, operating capital (routine maintenance and repairs), growth related projects as well as capital allocated to support the City's Service Partners. Examples of projects within the growth category include investments in projects such as the Extension of Four Mile Lake Road, Leachate Management future cells, Innovation Hub and Pinewood Park and Lakeshore Intersection, as well as investments in projects such as cycling infrastructure, Parks Master Plan and various studies. Lastly, capital requirements and funding for Service Partners has significantly increased in recent history. Of particular note is the importance of completing an amendment to this AMP in order to ensure the Airport's Plan is included in the City's AMP. This will allow optimization of the Canada Community Building Fund.

In many cases, projects can be a combination of growth and maintenance and as such project funding is split between these two categories to capture the true nature of the total investment. For the purposes of this AMP, if a project is split in nature, the project was classified as one or the other. This is an area of improvement as the City modifies its Capital Budget process and Asset Management practices.

5.5. Reserves

Reserves play a critical role in long-term financial planning. The benefits of having reserves available for infrastructure planning include:

a) the ability to stabilize tax rates and water / wastewater rates when dealing with variable and sometimes uncontrollable factors
b) financing one-time or short-term investments
c) accumulating the funding for significant future infrastructure investments
d) managing the use of debt
e) normalizing infrastructure funding requirement

The table below identifies examples of some of the capital related reserves currently available to support capital initiatives:

Reserve Name	Balance as of Dec 31, 2021 (unaudited) less council commitments
General Completed Capital	$3,429,520
Water Completed Capital	$4,428,073
Sewer Completed Capital	$3,054,603

Most municipalities in the Province of Ontario fund capital projects through their reserves and therefore hold reserve accounts by asset category. The City of North Bay funds capital projects directly from the tax levy or rate support levy PAYGO, debt issuance or other sources of funding. Capital reserves are established for one-time expenses or one-time revenues. The capital reserve target is established by the City's Reserve Policy and the

above noted reserves are intended to be used for emergency capital costs or as a funding tool for unexpected capital project contingencies. The reserves are funded primarily by savings experienced in completed capital projects. Recommended amendments to the Reserve Policy to transition to reserves for each asset category to ensure sustainability is maintained for all asset categories will provide enhanced infrastructure gap reporting.

There is considerable debate in the municipal sector as to the appropriate level of reserves that a City should have on hand. There is no clear guideline that has gained wide acceptance. Factors that municipalities should consider when determining their capital reserve requirements include:

a) breadth of services provided
b) age and condition of infrastructure
c) use and level of debt
d) economic conditions and outlook
e) internal reserve and debt policies
f) transition or phase in guidelines

5.6. The Infrastructure Gap

The 2014 AMP was contracted out and represented an inflationary adjustment to the 2010 AMP. Since 2014, the City has embraced best practices with investments in an Asset Management full time position as well as an investment in City Wide, an Asset Management program. The implementation of the system has consolidated the records within Finance and the operating departments as well as provided for the analytics contained within the AMP.

This AMP is focused on reporting on the core assets while continuing to ensure the assets included in the report are able to be sustained at current service levels. While there have been many improvements made creating an overall positive change, not all of the individual asset categories display these same positive trends. This AMP is focused on determining

the annual funding level required to sustain these assets going forward. This ensures consideration of the annual funding required to appropriately apply maintenance, rehabilitation, replacement and reconstruction activities which maintain and/or extend the life of the assets.

The AMP defines the City's Core Infrastructure Gap as the shortfall between required annual needs to sustain current service levels over the life of the assets and the average annual funding levels projected based on the 2022-2031 Capital Budget. The table below provides a summary of the results by asset type and the overall infrastructure gap of approximately $27M annually.

The annual requirement (with events) in the table below represents the amount the City should allocate annually to each asset category to meet replacement needs as they arise, prevent infrastructure backlogs and achieve long-term sustainability through the implementation of the life cycle strategies. As previously noted, the life cycle strategies are continuously being improved and is subject to change based on new more objective condition data, impacts of climate change, and unexpected external factors. Each asset category has been considered with the best information available at the time of this report, and considers the following:

- Appropriate maintenance and rehabilitation activities which can be undertaken to extend the useful life
- The risks associated with running the assets to failure
- Average annual capital funding from 2022-2031
- Average annual needs for reconstruction / replacement

The Average Annual Funding Capital Budget (2022-2031) in the table below represents the portion of the planned and projected funding sources that have been earmarked for each of the asset categories less funding currently attributable to growth, and operating capital (routine maintenance/repairs).

Lastly, the Annual Funding Shortfall represents the difference between the Annual Requirement and the Average Annual Funding Capital Budget (2022-2031).

Replacement Cost and Annual Funding Shortfall

	Replacement Cost	Annual Requirement	Average Annual Funding Capital Budget (2022-2031)	Annual Funding Shortfall
Bridges & Culverts	91,379,508	1,218,393	195,000	1,023,393
Roads	531,903,911	26,262,217	10,100,581	16,161,636
Stormwater	266,286,039	3,430,239	1,621,500	1,808,739
Wastewater	671,307,205	8,611,789	5,908,000	2,703,789
Water	600,933,038	9,530,344	3,751,920	5,778,424
Total	**2,161,809,701**	**49,052,982**	**21,577,001**	**27,475,982**

As the data used to calculated the annual funding shortfall is linked to the 2022 10 Capital Budget the average annual funding is aligned to the current Long Term Capital Funding Policy and the capital projects put forward without the details of the asset management system. It is recommended that future budgets have more emphasis put on ensuring project funding is clearly identified for maintenance/rehabilitation, growth, service enhancements and/or economic development. This will ensure any increased funding approved by City Council to support the recommendations in this report, addressing the sustainability of existing assets at current LOS, is allocated as approved.

5.7. Funding Options

The City has several options with respect to funding the projected annual infrastructure gap. As previously mentioned updating the Reserve Policy is an opportunity as well as updates to the Long Term Capital Funding Policy including the following:

A. Implementation of an Allocation Policy
B. Strategic use of debt limits
C. Modifying tax levy PAYGO funding

A. Implementation of an Allocation Policy

The identified infrastructure funding gap is not absolute due to several reasons; however, one factor is the current nature of the City's Long Term Capital Funding Policy. The current policy defines a total capital expenditure limit based on the sum of funds generated by the issuance of debentures and capital levy funding after principle and interest is paid. Allocation of development charges and federal and provincial grants as well as reserve transfers are completed at the project level to ensure appropriate requirements of the funding source are adhered to. The policy is silent on the basis of allocation between each of the asset categories as well as growth and maintenance type projects. In preparation of this plan, the assumption was that the allocation of funds within the 2022 10 year budget is representative of the allocation of funding between asset categories, growth and maintenance in the long term. Therefore, the identified funding gaps are subject to change with updates to the Long Term Capital Funding Policy. An allocation policy may also mirror or complement the recommended changes to the reserve policy. The City currently does not have an allocation or funding policy that designates funding by asset category. Therefore, there may be a need for a phased in approach to the policy.

B. Strategic Use of Debt limits

The current Long Term Capital Funding Policy allows for $8 million in debt to be issued annually to support tax levy assets with an additional $3 million in debt to be issued annually to support Water and Wastewater investments. The current policy attempts to balance the concepts of promoting intergenerational equity by spreading out the cost of a capital project over its useful life thereby allowing costs to be paid by today's and future users of the asset. The policy also allows for special debt issues to be approved by City Council to support transformational projects. Currently, City Council has supported the Cassellholme Home for the Aged redevelopment in which the City's portion will be reflected

as debt within the Financial Statements. City Council may also approve a special debt for the redevelopment of the West Ferris Community Center.

In the context of reducing the infrastructure gap, debt needs to be strategically used to avoid the risk of issuing too much debt which can impact that the financial sustainability of the municipality. Debt can also impose unreasonable additional costs on current and future members of the community as the municipality has to pay for the financing costs of borrowed funds (interest charges).

The City's current policy and the role of debt should be updated to reflect Council's debt management decisions with respect to reducing the infrastructure gap and other long term plans such as the reserve policy and development charges, as well as maintaining adherence to the legislative framework governing long-term municipal borrowing. Strategic use of debt focuses on enhancing services rather than maintaining the current asset and can be issued within the following guiding principles to finance projects that:

- Increase/new services to residents for new initiatives
- New, non-recurring infrastructure requirements
- Projects tied to third party funding
- Growth related project costs not recovered from Development Charges

Furthermore, Council decisions with respect to debt issuance should also be considered with financial indicators in the following areas:

- Sustainability Indicators – ability to maintain existing financial obligations both in respect to services and financial commitments without inappropriately increasing debt or tax burden relative to the economy. Examples may include: total discretionary reserve funds as a percent of municipal expenses; debt burden; total discretionary reserves per household.

- Flexibility Indicators – ability to change available sources of funding (debt, taxes, user fees) to meet financial obligations. Examples may include: debt servicing costs as a percent of Total Operating revenue, liquidity, property tax as a percent of household income
- Vulnerability Indicators – dependency on sources of revenue, predominantly grants from senior levels of government, over which it has no discretion or control. Examples may include: operating grants as a percent of total revenues, capital grants as a percent of total capital expenditures

Lastly, the Province regulates the amount of debt municipalities may issue by setting an Annual Repayment Limit (ARL) of 25% of a Municipality's own-source revenue as calculated on the Annual Financial Information Return (FIR). The City's current Long Term Capital Financing Policy has adopted a target of total annual debt servicing costs (including principal and interest) cannot exceed 15% of the sum of the City's budgeted municipal levy, water user fees and sanitary sewer user fees.

The annual debt issuances contained within the current Long Term Capital Financing Policy are linked more to annual limits that will stabilize the tax levy. It is also an important goal that the annual debt issue should also consider the perspectives of project type and overall ARL internal limit. These policy updates should be contemplated over the next several years in order to optimize the use of debt in maintaining and growing the City's infrastructure.

C. Modifying Tax Levy Pay-As-You Go Funding

PAYGO Tax Levy Funded

The current Long Term Capital Funding policy provides for 1% of the previous year's budgeted tax levy less the required principle and interest payments. The policy also

includes an adjustment for inflation to be applied to the previous year's long term capital funding allowance in the Operating Budget. For several years City Council has forgone the inflation adjustment. Given the insights from this Asset Management Plan the inflationary adjustment should be applied to prevent any further growth in the funding gap. The core asset infrastructure gap for tax levy assets is $19 million. If PAYGO was the only method of financing it would then translate into a required tax levy increase of 18.79%. The infrastructure gap graphs in section 4 calculate the funding gap over the life of the assets to ensure long term sustainability. Therefore, a balanced approach may consider a 10 year phase in of increasing the PAYGO component of capital financing. City Council supported an additional increase of 0.5% of the PAYGO in 2023 and 2024 with an increase of 0.4% in 2025 to build capacity to fund the Cassellholme redevelopment project. Leaving the policy at 1.5% for the 10 year period of 2024-2034 is projected to generate $5.8m more per year than otherwise would have been raised. This policy adjustment in conjunction with the other financial recommendations may be sufficient to establish sustainability.

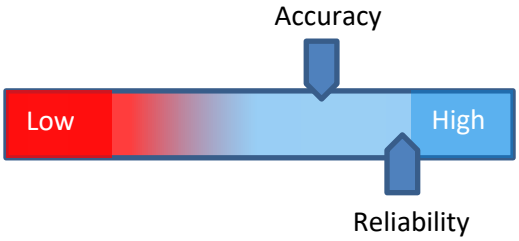
PAYGO Rate Supported Water and Wastewater

With respect to water and wastewater the Long Term Capital Funding policy allows for 2% of previous year's water and wastewater bill revenues. The policy also includes an adjustment for inflation to be applied to the previous year's long term capital funding allowance in the Operating Budget. For several years City Council has forgone the inflation adjustment. Given the insights from this Asset Management Plan the inflationary adjustment should be applied to prevent any further growth in the funding gap. There is opportunity for enhancements with respect to the allocation between water and wastewater. The current modeling allows for the allocation between water and wastewater to shift with the investment requirements. It is recommended that the 2% be allocated to water and wastewater independently rather than globally. Similar to the general capital, the funding sources are currently allocated based on the ten year identified capital projects; therefore, the current split between water and wastewater may not reflect the future funding requirements. The water funding gap is projected to be $5.7m and the wastewater gap is

projected to be $2.7m. If PAYGO was the only method of financing it would then translate into a required increase of 38.56% increase to water/wastewater rates. Increasing the 2% by 0.5% to 2.5% until 2031 will generate approximately 2m in additional revenue per year by 2031. The policy increase should be considered after the phase in and redistribution of the allocation policy.

In conclusion, the funding gap can be financed by increasing the tax levy or user rates in tax in water; however, this option may not be affordable to the community. The funding options presented in this AMP have several combinations that will contribute to reducing the infrastructure gap. Once feedback from the Community and City Council is received the possible outcomes will be modeled and brought forward with policy amendments.

5.8. Data Confidence Scale



Extensive work is required to break down the Capital Budget into more detail for clarity on the type of investments, funding allocations and assets being invested in. Administration does see further opportunity in this area for the next AMP as the capital budget process integrates in a more linear mapping from asset management to capital budgeting. Implementation of solutions to build the capital budget and the funding plan at the asset class level will help enhance the data confidence. This will also provide benefit to the annual financial statement process to capture and report on changes to the Tangible Capital Asset Data.

5.9. Recommendations

- Establish reserves for each asset category to ensure sustainability is maintained for all asset categories and allow enhance infrastructure gap reporting by asset category
- Modernize the Long Term Capital Funding policy to reflect funding through the asset category reserves
- Apply the Policy funding inflation adjustment on an annual basis
- Increase the tax levy PAYGO funding within the Long Term capital Funding Policy to 1.5% previous year's tax levy
- Revise the water PAYGO funding to 2% previous years water revenue
- Revise the wastewater PAYGO funding to 2% previous years wastewater revenue
- Evaluate increasing the water, wastewater PAYGO funding within the Long Term capital Funding Policy to 2.5% of the respective revenue
- Apply strategic use of debt principles to reflect eligible projects and financial indicators to support required annual debt issues
- Develop a plan to transition operating capital (routine maintenance / repairs) out of the 10 year Capital Budget and into the annual Operating Budget
- Enhance Capital Budget to clearly report maintenance, rehabilitation, growth and service level changes
- Implement a funding allocation policy

The phase in of the recommendations may take five years; therefore, the next major AMP plan will be able to determine if further adjustments are required.

6. Climate Change

The City is beginning to monitor the effects of climate change on its infrastructure assets. The data provided suggests that it is a possibility that there will be an increase in precipitation and an overall increase in mean temperature for the municipality. The climate

projection scenarios from climatedata.ca suggest that the increase in mean temperature within North Bay area may result in the possibility of a decrease of freeze-thaw days, additional summer days, more very hot days and additional tropical nights.

For the 1951-1980 period, the annual average temperature was 4.3 degrees Celsius. Under a high emissions scenario, annual average temperatures are projected to be 6.9 degrees for the 2021-2050 period, 9 degrees Celsius for the 2051-2080 period and 10.7 degrees Celsius for the last 30 years of this century.

Average annual precipitation for the 1951 -1980 period was 916mm. Under a high emissions scenario, this is projected to be 7% higher for the 2021-2050 period, 11% higher for the 2051-2080 period and 15% higher for the last 30 years of this century.

These predicted changes in temperature and precipitation need to be taken into consideration when building new assets or completing betterments to extend the life of the existing asset.

7. Next Steps

O. Reg 588/17 has a phased in approach with three timelines of July 1, 2021(adjusted to July1, 2022), July 1, 2023, and July 1, 2024. The July 1, 2021 and July 1, 2023 timeline is where ‘Core’ assets (Water, Wastewater, Stormwater, Road and Bridges and Culverts) and all City infrastructure assets, respectively will have an asset management plan documenting current levels of service. The final deadline is to document proposed levels of service and financial strategies to fund these expenditures. For directly-owned City infrastructure assets, the Asset Management Plan is compliant with the July 1, 2022 regulation requirements.

Timeline for O.Reg. 588/17

- Define Role of Council and senior management
- Integration with Budgets & Long-Term Financial Plan
- Alignment with Official Plan
- Alignment with Master Plans
- Community Engagement
- Climate Change Mitigation & Resiliency

- Phase 1: Roads, Bridges & Stormwater, Water, Wastewater
- Inventory of Assets
- Current Levels of Service
- Cost to Maintain Current Levels of Service

- Phase 2: All Assets
- Inventory of Assets
- Current Levels of Service
- Cost to Maintain Current Levels of Service

- Builds on Phase 1 & 2
- Proposed Levels of Service based on Sustainability & Affordability
- Life cycle Management
- Financial Strategy

- Annual Update to Council
- CAM Update every five years

8. Acronyms and Abbreviations

1. AMP – Asset Management Plan
2. CCTV (Closed Circuit Television) – Used to monitor and assess corporate infrastructure.
3. Core Assets – Ontario Regulation 588/17 defines these as;
    a) Water asset that relates to the collection, production, treatment,storage, supply or distribution of water,
    b) Wastewater asset that relates to the collection, transmission, treatment or disposal of wastewater, including any wastewater asset that from time to time manages stormwater.
    c) Stormwater management asset that relates to the collection, transmission, treatment retention, infiltration, control or disposal of stormwater.
    d) Roads, or
    e) Bridges and Culverts
4. Disposal – The processes involved in the removal of the TCA from use and from the TCA sub-ledger subsequent to: donation, sale, abandonment, or destruction.
5. FCM – Federation of Canadians Municipalities.
6. FIR (Financial Information Return) - A standard set of year-end reports which capture financial and statistical information for each municipality in the Province.
7. Historical Cost – The original cost to acquire an asset and/or make it operational. Includes all costs associated with the purchase (e.g. delivery, set-up).
8. LOS – Levels of Service
9. OSIM – Ontario Structure Inspection Manual.
10. PACP – Pipeline Assessment & Certification Program.
11. Replacement Cost – The cost to replace an asset today. All stated replacement costs are as of 2017 closing balances.
12. SCADA – Supervisory control and data acquisition system.

13. Sustainable – the approach to service delivery is financially achievable over the long term, is not wasteful of resources, minimizes or reverses environmental damage, continuously improves social and inter-generational equality. The approach for estimating asset investment need and developing AM strategies is based on achieving triple-bottom-line outcomes over the long term and considers the full life cycle of assets.
14. Useful Life – The period over which the municipality expects to use a tangible capital asset.
15. Ministry of Environment Conservation and Parks

9. Appendices

9.1. Pictures of Bridges and Culvert Conditions

Ski Club Road – ONR Underpass – Fair Condition Culvert

Very Good Condition – Lakeshore Overpass

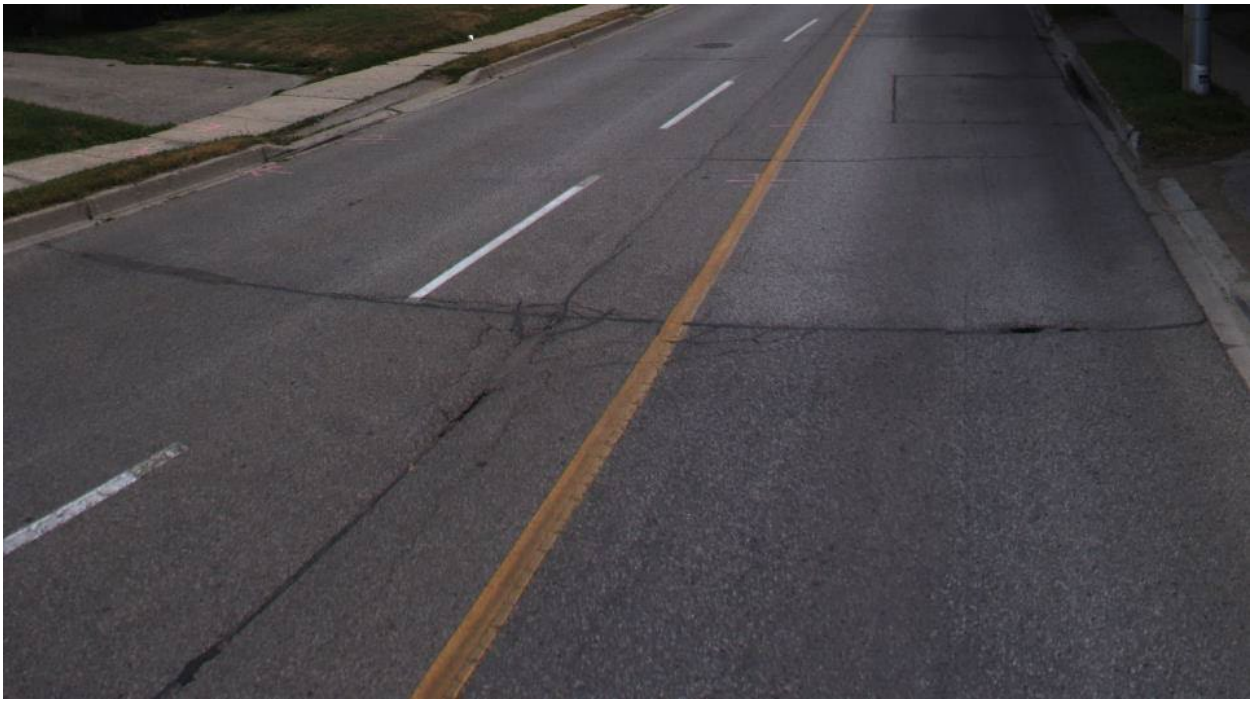
Trout Lake Overpass – Fair Condition

Kinsmen Pedestrian Overhead – Fair Condition

9.2. Pictures of Road Conditions

Poor Road Condition

Very Poor Condition



Fair Road Condition

Very Good Condition

9.3. Road Map

9.4. Fire Flow Map

9.5. Stormwater Map

9.6. Water Network Map

9.7. Wastewater Network Map