Future-Ready Roadmap

ASSET MANAGEMENT PLAN
PHASE TWO: ALL ASSETS

May 2024

CITY OF Thunder Bay
Superior by Nature

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Acronyms and Abbreviations Quick Reference

BCI: Bridge Condition Index

BWA: Boil Water Advisory

CCTV: Closed Circuit Television Video

EUL: Estimated Useful Life

FCI: Facility Condition Index

GHG: Greenhouse Gas

LOS: Level of Service

OCI: Overall Condition Index

O.Reg 588/17: *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure*

Plan: Asset Management Plan

Regulation: See O.Reg 588/17

TCA: Tangible Capital Asset

WPCP: Wastewater Pollution Control Plant

WTP: Water Treatment Plant

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LAND ACKNOWLEDGEMENT

This document was prepared on the traditional territory of the Ojibwa Anishinabek, which includes Fort William First Nation, signatory to the Robinson-Superior Treaty of 1850, and the Métis peoples. We respectfully acknowledge these nations as the caretakers of the lands and waters on which the City of Thunder Bay is now present.

The Future-Ready Roadmap is a pathway to improve relationships with the land and the people with who we share it as we work together toward truth and reconciliation and achieving sustainable services through asset management.
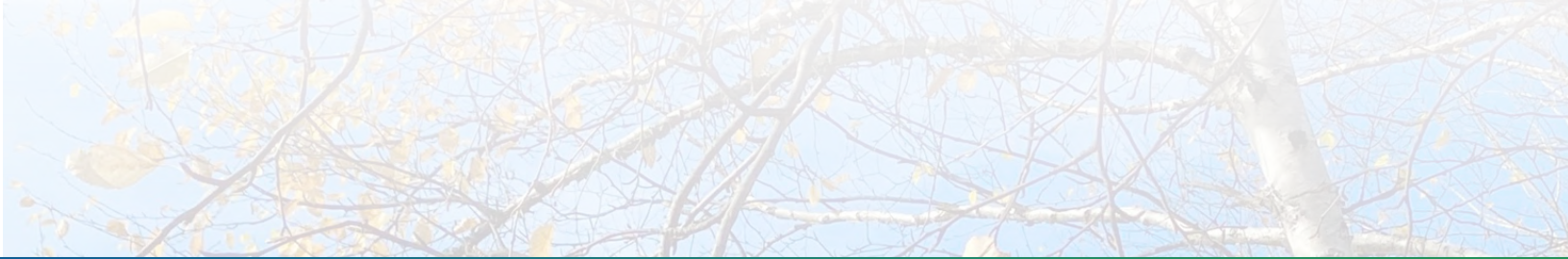
EXECUTIVE SUMMARY
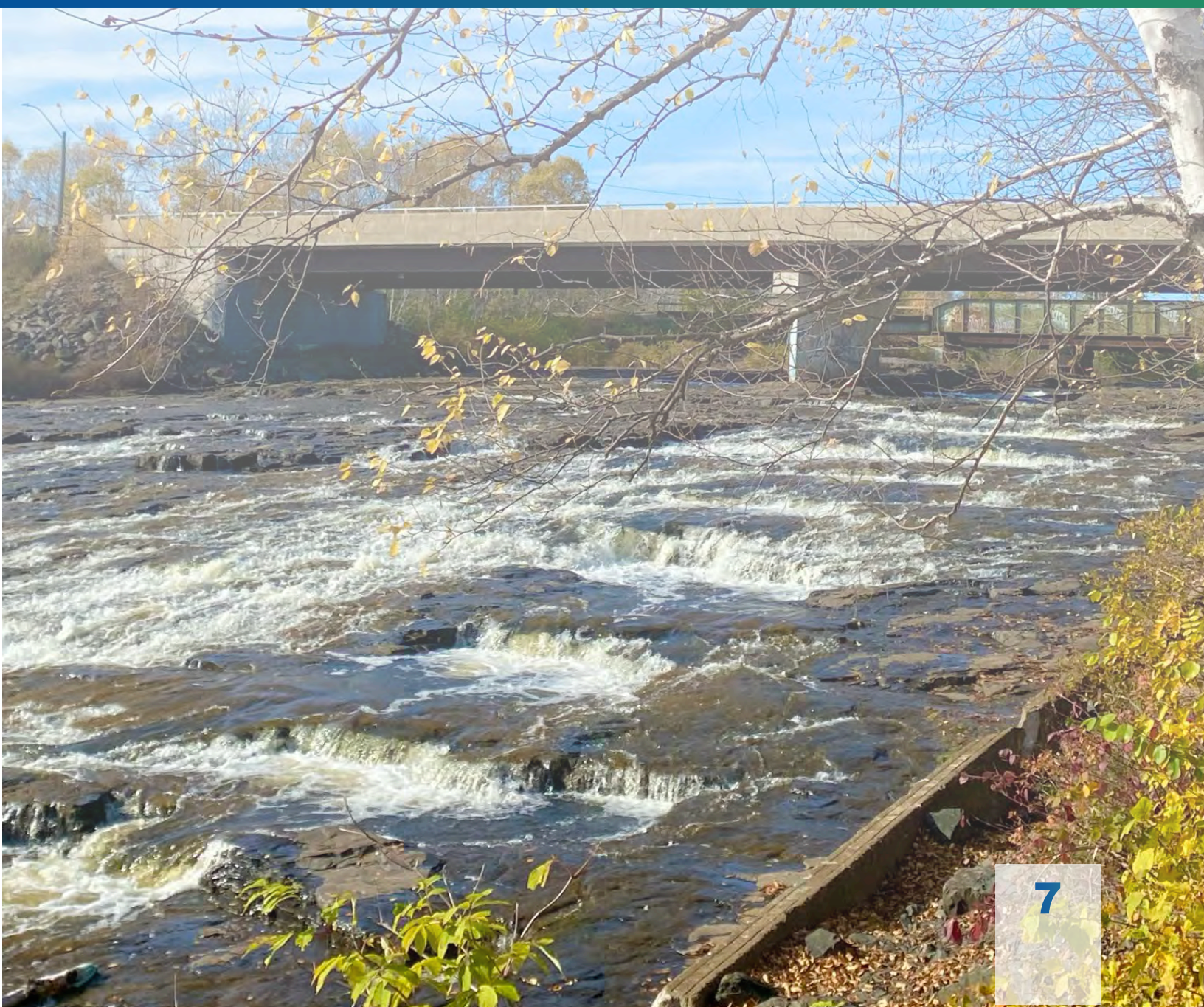
EXECUTIVE SUMMARY

The City of Thunder Bay (the City) boasts a diverse population with strong rooted history. Residents and visitors connect to our community through the use of programs and services offered by the City. To deliver those services, the City must own, operate and maintain a wide range of assets.

Assets are valuable, long-lasting, and require investment. They can be found delivering services throughout our City; whether drinking clean water, biking on a multi-use trail or driving on plowed roadways, assets are used every day to maintain and deliver a high quality of life. To support the delivery of services the City has developed the Future-Ready Roadmap as a long-term planned and integrated approach to managing these assets. The Asset Management Plan is used as a support document when making strategic and financial decisions, helps to reduce overall risk to our services and promotes sustainability. The Plan will be used in conjunction with other municipal strategies and planning documents to move key strategic initiatives forward. The Future-Ready Roadmap is our ongoing asset management program that will see continuous improvement to the City's Asset Management Plan.

The development of this Plan works towards the sustainability goal of the 2023 - 2027 Maamawe, Growing Together Strategic Plan to improve long term financial sustainability by maximizing return on community investments.

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ONGOING IMPROVEMENT

This Asset Management Plan (AMP) is a living document which has been developed in compliance with *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure* under the *Infrastructure for Jobs and Prosperities Act, 2015 (Regulation).* This *Regulation* sets out to provide greater standardization and consistency to municipal asset management planning across the Province, improve the comprehensiveness of the plans, establish a format and a tool that can be used by the provincial and federal governments to determine appropriate allocation of grant funding, and establish asset management plans as budgeting tools for municipalities to address infrastructure funding deficits and prioritize capital projects.

Updated revisions of the Plan have been and will continue to be developed in phases (Figure E1), each with key strategic actions to comply with the *Regulation*. The Future-Ready Roadmap was developed to map out the stops needed to collect, compile and complete key strategic actions.

CORE ASSETS
Document and review core asset inventory.
Document core asset levels of service.
Document core asset lifecycle analysis.

FINANCE THE PLAN
Expand and build on Phase Two to include financial strategy and proposed levels of service.

Phase One

July 2024

Phase Three

July 2022

Phase Two

July 2025

ALL ASSETS
Expand and build on Phase One to include all asset categories.
Public engagement and development of levels of service.

Figure E1: Timeline of Phases for developing the Asset Management Program

EVALUATION & IMPROVEMENT (Ongoing)

Annual review of the capital budget and plan implementation	An update every two (2) to four (4) years of the State of Infrastructure Report	An update every four (4) to five (5) years of the AMP	A review every five (5) years of the Asset Management Policy

Table E1: Evaluation and Improvement

Phase Two: All Assets

Phase Two of the Asset Management Plan includes all assets within the municipal inventory that comply with the Tangible Capital Asset (TCA) policy. The Plan is divided into sections based on the eight major asset classes: Transportation, Drinking Water, Wastewater, Stormwater, Facilities, Fleet and Machinery, Equipment and Land Improvements.

Asset Overview

Asset Class	Replacement Value	Average Age	Average Condition	Annual Deficit	Percent Funded
Transportation	$1,665,394,000	28 years	**Fair**	-$15,106,000	55%
Drinking Water*	$887,672,000	55 years	**Fair**	-	100%
Stormwater	$372,260,000	39 years	**Fair**	-$1,194,000	73%
Wastewater*	$708,395,000	63 years	**Fair**	-	100%
Facilities	$727,618,000	46 years	**Fair**	-$6,356,000	55%
Fleet and Machinery	$126,336,000	11 years	**Fair**	-$2,989,000	73%
Equipment	$62,818,000	14 years	**Fair**	-$2,235,000	64%
Land Improvements	$256,071,000	28 years	**Fair**	-$4,085,000	48%
Total	$4,806,564,000	45 years	**Fair**	**-$31,965,000**	69%

Table E2: Overview of Assets Classes in the Asset Management Phase Two Plan

* Financial plans are in place for both the Drinking Water System and the Wastewater System to achieve financial sustainability, full-cost recovery, and affordability for consumers, while maintaining existing and regulated service levels.

Asset Valuation

The value of an asset can be considered in terms of benefit to the community as well as the financial value such as replacement cost. The method used for determining the current replacement costs for the City's assets varies based on asset type and class as well as available information. In some cases, the Consumer Price Index or Non-Residential Building Consumer Price Index is applied based on the date the asset was put into service and the historical costs. In other cases, more refined replacement costs are calculated and provided by subject matter experts. The replacement cost of an asset may not be a simple like for like value due to technical or safety standard changes. Linear assets such as watermain or stormwater sewers will use information from subject matter experts such as recent contract award bid prices to create, a "per-unit" cost that can be applied based on criteria such as length, width, diameter, etc.

$1,665M	$888M	$372M	$708M
TRANSPORTATION	DRINKING WATER	STORMWATER	WASTEWATER
$728M	$126M	$62M	$256M
FACILITIES	FLEET AND MACHINERY	EQUIPMENT	LAND IMPROVEMENTS

TOTAL ESTIMATED REPLACEMENT VALUE:

$4.8 BILLION

Asset Condition

As assets age understanding the overall health and physical condition of the asset is important to plan for future repair, renewal or replacement at the appropriate times. Inspections are routinely performed based on technical and/or internal standards. Where direct inspections cannot be performed, condition ratings can be estimated based on samples within the same asset class and applied to assets of similar type and age, or they can be estimated based strictly on age and expected life.

Asset Age

Each asset has an estimated useful life (EUL) which is the estimated longevity and design life of an asset. As assets age the appropriate lifecycle activities such as maintenance may allow an asset to exceed its EUL; however, if the proper activities are not completed the asset may fail or require replacement before the end of its EUL.

Lifecycle of the Asset

For each asset there are ideal times where investments, even small, can increase an asset's life span and lower the overall operating cost of the asset. Activities can range from simple, low-cost preventative maintenance procedures to more expensive rehabilitations. The key is to understand that doing reactive replacement of assets in the poorest condition (worst first methodology) generally has the highest life cycle cost of all options available.

The continued use of assets beyond their EUL and without appropriate life cycle maintenance will force the City to accept a lower standard of infrastructure along with higher lifecycle and operating costs. It also means accepting a higher level of risk for asset failure; however, assets will always be maintained to meet regulatory requirements, such as environmental protection, public health and road safety.

Levels of Service

The City owns and maintains assets to provide services to the public. A Level of Service (LOS) is how an asset performs in delivering a service. Target LOS may be legislated, based on industry standards and best practices, community engagement or may be set to support the strategic goals of the City of Thunder Bay.

The City of Thunder Bay recognizes the importance of providing the community with desirable and valued services. Robust community engagement has, and will continue to, provide education on the City's Asset Management Program and will collect the feedback needed to support the development of target LOS.

Investing in the Asset

To perform the required lifecycle activities the proper level of funding is needed. Sustainable funding is the amount of annual funds required to be spent and saved to manage the expected costs to maintain the assets at their current levels of service. When a deficit occurs and an asset is underfunded the asset does not receive the proper repair, renewal, or replacement, and typically a backlog of work will occur. Through asset management planning, sustainable funding strategies will help reduce the infrastructure deficit, clear the backlog of work and set aside funding for the future life of the asset.

Infrastructure deficit = annual dollar amount that remains unfunded when comparing the sustainable funding and the five year average capital budget spend and any money saved in reserves for future work.

The City currently has a total annual infrastructure deficit of over

$31.9 MILLION

Climate Change Considerations

Asset management directly supports the City's climate and environmental sustainability goals. As the importance of resilient and sustainable assets increases, it is important to identify the climate risks, adaptation and mitigation opportunities for the assets. Using this Plan, climate change considerations can be integrated into municipal asset management to aid in informing decision-making and strategic long-term investments to reduce the risks associated with climate change impacts and capitalize on adaptation and mitigation opportunities.

The development of this Plan works towards the sustainability goal of the 2023 - 2027 Maamawe, Growing Together Strategic Plan to 'take decisive action to respond to the climate emergency'.

PHASE TWO

1.0 Introduction

1.1 What is an Asset

The City of Thunder Bay (City) owns a wide range of assets in order to provide services to the citizens of Thunder Bay. Physical assets, and infrastructure, such as a water treatment plant, roads, buildings, vehicles, and natural assets, such as parks and trees are required to provide services including clean drinking water, transportation systems, recreation and emergency services.

Assets are important; they are essential to providing the services that contribute to a high quality of life within Thunder Bay. These assets contribute to the economic health of our community, allowing us to attract new businesses and increase employment.

1.2 What is Asset Management

Asset management is a process that allows Thunder Bay to implement a long-term approach for managing and investing in assets. It includes the planning, design, construction, operation, maintenance, and replacement of assets and infrastructure used to provide City services and is used to prioritize investment in each phase of an asset's life.

Asset management involves collecting data on all assets to understand their condition, expected life, risk of failure, rehabilitation options, and other information to be able to make informed decisions to manage the lifecycle of each asset. Asset management is fiscally responsible, reduces risks, helps the City be sustainable and meet the needs of the community. By maintaining the City's assets, we reduce our environmental impact while increasing day-to-day safety throughout our community. Decisions related to assets affect the types of services that are available to the community. This is why asset management must occur in a planned and integrated manner that maximizes the value of the City's assets.

The current estimated cost to replace all City assets is:

$4.8 BILLION

1.3 Purpose of the Future-Ready Roadmap for Asset Management

The City of Thunder Bay has called our asset management program the Future-Ready Roadmap (Roadmap). The purpose of the Roadmap is to provide sustainable services through asset management. Building a resilient community with valued, sustainable services is the ultimate goal. A Roadmap (Figure 1.1) depicts the path to creating the Asset Management Plan including the requirements of future iterations. The Roadmap is made up of many elements including an asset and infrastructure inventory, measurable levels of service, community involvement and consultation, a financial strategy, and a decision making process which includes setting priorities. The results from these steps will produce the Asset Management Plan which will be a living document continuously upgraded as more information is collected on the City's assets to made better informed decisions.

1.4 Purpose of an Asset Management Plan

An Asset Management Plan provides a comprehensive reference for the construction, maintenance, rehabilitation, disposal, and replacement of the City's assets based on sound asset management practices and principles. It provides information on the condition (where applicable), level of service and required funding for each asset category and will serve as a support document for strategic and financial decisions.

1.5 Assets Included in this Plan

In compliance with *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure* under the *Infrastructure for Jobs and Prosperities Act, 2015*, Phase Two of the Asset Management Plan includes all assets owned by the City of Thunder Bay that comply with the Tangible Capital Asset Policy of individual assets over $10,000 and pooled assets over $50,000 in value. The Assets are categorized by asset class as follows: Transportation, Drinking Water, Stormwater, Wastewater, Facilities, Fleet and Machinery, Equipment, and Land Improvements.

'Creating an asset management plan can help your municipality address specific infrastructure needs while also preparing for climate change. It can help identify the infrastructure investments that make the most financial sense in the long run.'

– Federation of Canadian Municipalities

CITY OF Thunder Bay
Superior by Nature

Future-Ready
Roadmap

The goal of the Future Ready Roadmap is to provide sustainable services for the citizens of Thunder Bay. A number of components must be in place to realize that goal.This may not happen all at the same time for each asset type. This roadmap outlines the steps that the City of Thunder Bay will take for each asset to develop the Asset Management Plan.

STEP 2
Level of Service
Measurable performance of assets, and the services they provide to the citizens

STEP 3
Community Engagement
Consulting with the citizens of Thunder Bay to determine the present and future service needs

STEP 4
Financial Strategy
Alternatives for funding asset repair and replacement

STEP 1
Inventory
A comprehensive database of the assets owned by the City, their condition and value

STEP 7
Continuous Improvement

STEP 6
Asset Management Plan

STEP 5
Decision Making
The priorities, costs and steps needed to ensure long-term asset and service performance

Future-Ready
Roadmap

Sustainable Services
Through Asset Management

Website getinvolvedthunderbay.ca/asset-management
Youtube youtube.com/CityThunderBay

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Figure 1.1: The Future Ready Roadmap

CITY OF
Thunder Bay
Superior by Nature

The City of Thunder Bay provides a wide range of **services** to the citizens of Thunder Bay such as clean drinking water, transportation systems, recreation opportunities, and emergency services. These services are provided by physical components such as roads, bridges and a water treatment plant. **These physical components are called assets. The City's assets exist to enable the provision of services.**

Valuable

Assets owned by the City of Thunder Bay are usually paid for over time.

Long-Lasting

Most assets are semi-permanent, and have a relatively long life span.

Requires Investment

Maintenance and repair help to prolong the life of the asset.

Assets Enable Services

Assets are necessary to provide the services that offer a high quality of life for our citizens, such as playgrounds and sports fields for recreation, and bike lanes and buses for transportation. They also contribute to the economic health of our community, allowing us to attract new businesses and increase employment. By ensuring that these assets are well maintained, we also reduce our environmental impact, while increasing the day to day safety throughout our community.

City Hall
(Buildings)

**Canada
Games Complex**
(Pools)

Trowbridge Falls
(Parks)

Ambulance
(Emergency Vehicles)

Future-Ready
Roadmap

Sustainable Services
Through Asset Management

Website getinvolvedthunderbay.ca/asset-management
Youtube youtube.com/CityThunderBay

WHAT IS ASSET MANAGEMENT?

CITY OF Thunder Bay
Superior by Nature

Asset management is a **long-term approach** for managing and investing in assets. Decisions related to assets affect the types of services available to our citizens. That is why asset management must occur in a planned manner, that maximizes the value to the community.

$4.8 BILLION DOLLARS

Estimated replacement value of all City assets

Many of the City of Thunder Bay's assets are quite old, and are now starting to show their age. As assets age, there are increased costs associated with the upkeep and eventual replacement of these important assets. By investing in maintenance and repair at the right time, asset management **increases the life and reduces the lifecycle cost of assets.**
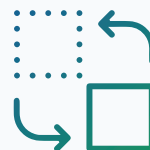
Maintain → **Repair** → **Replace** → **Manage**

Asset Management Benefits

Promotes Sustainability

Is Financially Responsible

Preserves Assets & Services

Meets Community Needs

Future-Ready Roadmap

Sustainable Services Through Asset Management

Website getinvolvedthunderbay.ca/asset-management
Youtube youtube.com/CityThunderBay

1.6 Relationship to Other Municipal Plans

The Asset Management Program and Plan directly support the strategic priority of "improve long term financial sustainability by maximizing return on community investments." as outlined in the 2023 - 2027 Maamawe, Growing Together Strategic Plan.

Asset management supports key strategic priorities from other City planning and policy documents. The role of asset management is to integrate the asset-based items that will assist with moving forward other City goals.

The other plans include but are not limited to:

- 2023 - 2027 Maamawe, Growing Together Strategic Plan
- Accessibility Plan
- Active Transportation Plan
- Clean Green and Beautiful Policy
- Climate Ready City: City of Thunder Bay Climate Adaptation Strategy
- Climate-Forward City: Thunder Bay Net-Zero Strategy
- Corporate Energy Management Plan
- Digital Strategy
- Drinking Water System Financial Plan
- Indigenous Relations & Inclusion Strategy
- Fit Together: Recreation and Facilities Master Plan
- Pollution and Prevention Control Plan
- Stormwater Management Plan
- Transportation Master Plan
- The City of Thunder Bay's Official Plan
- Urban Design Guidelines
- Urban Forest Management Plan
- Wastewater System Financial Plan

These documents complement each other and provide direction to achieve long-term social, environmental, and economic sustainability.

For a brief description of these plans, please see Appendix E.
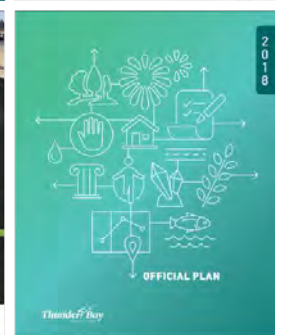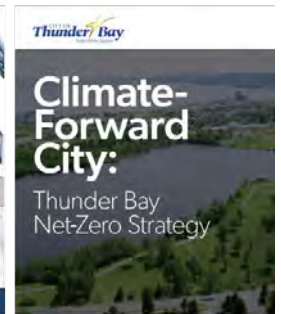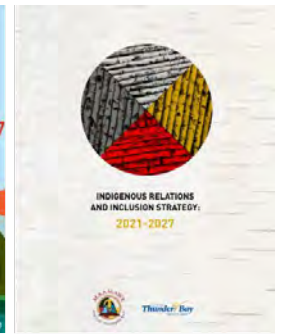
1.6.1 Asset Management in Action: Link to the Indigenous Relations and Inclusion Strategy

Through asset management, the City will collaborate on new place-making initiatives and opportunities for welcoming spaces in the city, conduct research in collaboration with academic and Indigenous partners to identify Indigenous heritage recognition opportunities in City spaces and maintain and enhance existing place-making spaces.

Managing our assets in such a way will support the **Indigenous Relations & Inclusion Strategy 2021-2027:** Pillar 3, Commitment 8: Honour & celebrate Indigenous space and place:

- 8.1 Collaborate with staff on City-led initiatives that promote Indigenous inclusion
- 8.2 Honour Indigenous history and culture in City spaces through exhibits and activities.
- 8.3 Collaborate on new place-making initiatives and opportunities for welcoming spaces in the city.

One example of this is the new Northwood Splash Pad. During consultation the splash pad was identified as an opportunity for reconciliation using the theme "Water is Life", an important Anishinaabe teaching. The process for creating this splash pad involved extensive consultation with the Indigenous community and partners in every step of the project.

1.7 Plan Development and Continuous Improvement

Asset management planning in Thunder Bay is a work in progress and is becoming more robust as the City works to meet the requirements of *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure* under the *Infrastructure for Jobs and Prosperities Act, 2015.* This *Regulation sets* out to provide greater standardization and consistency to municipal asset management planning across the Province, improve the comprehensiveness of the plans, establish a format and a tool that can be used by the provincial and federal governments to determine appropriate allocation of grant funding, and also serve as budgeting tools for municipalities to address infrastructure funding deficits and prioritize capital projects.

As a first step towards compliance with the *Regulation*, Council approved a new Strategic Asset Management Policy in February 2019 (Appendix D). This work is supported by an Executive Lead, Project Manager and Steering Committee, along with Working Groups comprised of subject matter experts (Appendix F).

Due to the impact of COVID-19 pandemic on municipalities, *Ontario Regulation 193/21: Asset Management Planning for Municipal Infrastructure* was introduced to revoke and replace sections of *O.Reg 588/17.* The new *Regulation* extends all timelines by one (1) year. The Phase One plan for core assets was presented to Council in December 2021. The Phase Two plan for all other assets must be completed by July 1, 2024. A financing strategy to fund the asset management plan at a defined level of service, to be established by Council and informed through public consultation, must be approved by Council by July 1, 2025. The Asset Management Plan is a living document and will require an annual evaluation and review as the City's Asset Management Program evolves.

CORE ASSETS
Document and review core asset inventory.
Document core asset levels of service.
Document core asset lifecycle analysis.

FINANCE THE PLAN
Expand and build on Phase Two to include financial strategy and proposed levels of service.

Phase One

July 2024

Phase Three

July 2022

Phase Two

July 2025

ALL ASSETS
Expand and build on Phase One to include all asset categories.
Public engagement and development of levels of service.

Figure 1.4: Timeline of Phases for developing the Asset Management Program

1.8 A Growing City

The City of Thunder Bay is a single-tier municipality with a total land area of 328km[2] located on the north shore of Lake Superior and embraced by the Nor'Wester Mountain range. The City is home to a diverse population and boasts a strong rooted history.

Thunder Bay's population is an estimated 108,843(2021). The Community Economic and Development Commission (CEDC) Base Case estimates that the population will increase to 124,200 by 2051.[1] A growth in population will be driven by labour force turnover and ongoing economic development efforts. The CEDC Base Case estimates employment in Thunder Bay to approach 59,700 jobs by 2051 within industry segments such as health and social services, accommodation and food, education, and transportation and warehousing.[2]

Additionally, Thunder Bay's economy is expected to modestly grow, expand and diversify. Growth in sectors such as health and medicine, research and innovation, retail services and tourism will be supported through investing in infrastructure and public realm improvements. [3]

This Plan assumes a modest annual growth of approximately 1%. For the purposes of this Plan it has been assumed no new asset creation, acquisition or expansion will be required for increased services due to increased population. However, the City of Thunder Bay has been awarded up to $20.7 million in funding from the Government of Canada through the Housing Accelerator Fund (HAF) to fast-track the development of over 600 new housing units over the next three years, to reach a total of 1,691 new permitted homes by February 2027.

The funding is intended to support the delivery of eight initiatives under the City Council approved HAF Action Plan, including Secondary Planning & Infrastructure Planning in Support of Housing Strategy (Initiative 6)[4]. This initiative will fund new infrastructure intended to address current servicing gaps in the Urban Settlement Area.

In addition, the City has a Provincial target of 2,200 new housing units by 2031 and has already received funding from the Building Faster Fund ($870,000) to invest in housing- or community-enabling infrastructure. These targets and funds suggest that new infrastructure will be required in the coming years to support the housing needs.

1.9 Additional Asset Management Information

To learn more about the City of Thunder Bay's Asset Management Program, including the Future-Ready Roadmap and Strategic Asset Management Policy, and the current Asset Management Plan please visit the Get Involved website (https://getinvolvedthunderbay.ca/1asset-management). Additional supporting documents will be available in accordance with *O. Reg. 588/17* upon request.

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[1] Thunder Bay Employment Land Strategy, 2020
[2] Thunder Bay Employment Land Strategy, 2020
[3] Official Plan
[4] Housing Accelerator Fund Action Plan

2.0 State of Infrastructure

This section provides an overview of the City's assets. Sections 3.0 to 10.0 provide the specific information for each asset category. Table 2.1 below lists the subsections found in each chapter and provides a high-level guide of how to read this Plan.

Asset Overview	This section will provide a high-level summary of the asset information.
Asset Valuation	This section will provide the replacement costs for the asset.
Asset Condition	This section will provide the overall asset condition and rating system used.
Asset Age	This section will provide the average age of the asset and the estimated useful life.
Lifecycle of the Asset	This section will provide information on the lifecycle activities for the asset.
Levels of Service	This section will provide information on community and technical levels of service as determined by the *Regulation*.
Investing in the Asset	This section will provide information on the sustainable funding required and the infrastructure deficit.
Climate Change Considerations	This section will provide information reviewing climate risks, adaptation and mitigation opportunities for the asset.

Table 2.1: Subsections found in each chapter of the Plan

2.1 Asset Overview

The Phase Two Plan assets are categorized by asset class: Transportation, Drinking Water, Stormwater, Wastewater, Facilities, Fleet and Machinery, Equipment, and Land Improvements.

Asset Class	Replacement Value	Average Age	Average Condition	Annual Deficit	Percent Funded
Transportation	$1,665,394,000	28 years	Fair	-$15,106,000	55%
Drinking Water*	$887,672,000	55 years	Fair	-	100%
Stormwater	$372,260,000	40 years	Fair	-$1,194,000	73%
Wastewater*	$708,395,000	63 years	Fair	-	100%
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Equipment	$62,818,000	14 years	Fair	-$2,235,000	64%
Land Improvements	$256,071,000	28 years	Fair	-$4,085,000	48%
Total	$4,806,564,000	45 years	Fair	-$31,965,000	69%

Table 2.2: Overview of Assets

* Financial plans are in place for both the Drinking Water System and the Wastewater System to achieve financial sustainability, full-cost recovery, and affordability for consumers while maintaining existing and regulated service levels.

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2.1.1 ASSET VALUATION – HOW ASSETS ARE VALUED

The value of an asset can be considered in terms of benefit to the community as well as the financial value such as replacement cost. The method used for determining the current replacement costs for the City's assets varies based on asset type and class as well as available information. In some cases, the Consumer Price Index or Non-Residential Building Consumer Price Index is applied based on the date the asset was put into service and the historical costs. In other cases, more refined replacement costs are calculated and provided by subject matter experts. The replacement cost of an asset may not be a simple like for like value due to technical or safety standard changes. Linear assets such as watermain or stormwater sewers will use information from subject matter experts such as recent contract award bid prices to create, a "per-unit" cost that can be applied based on criteria such as length, width, diameter, etc.

TOTAL ASSET VALUE
4.8 BILLION

Equipment 1%
Land Improvements 5%
Fleet and Machinery 3%
Facilities 15%
Transportation 35%
Wastewater 15%
Stormwater 8%
Water 18%

Figure 2.1: Breakdown of total asset value

2.1.2 ASSET CONDITION

Accurately assessing the condition of an asset is critical for asset management and is required under the *Regulation*. The condition of an asset is used to determine the overall health and physical condition and provides an estimate on how long before repair, renewal or replacement is required. Without accurate condition information, a detailed analysis of what maintenance/renewal methods or procedures and at what time those actions should be completed becomes unreliable.

The City routinely performs inspections of the assets against technical standards (when applicable) or standards developed internally and informed by best practices. While the best option for inspections are direct visual inspections, for some assets this method is either unavailable or cost prohibitive. In those situations conditions are estimated based on inspections completed on select samples of the asset class and then extrapolated to assets of similar type and age or based on other criteria that have been shown to have a direct correlation to the condition of the asset. When inspections are completed or replacements are necessary, the estimated useful life predictions are adjusted based upon physical data.

A five-point rating scale (Figure 2.2) is used along with a condition conversion scale to accurately represent condition ratings of all core asset categories in this Plan. Ratings range from Very Good (1) to Very Poor (5). The use of this scale is common practice in asset management, which will allow the City to benchmark the condition of our assets to other municipalities, as well as provide a common understanding so that condition performance can be compared, analysed, and reported consistently across asset classes.

Very Good	The infrastructure in the system or services is generally in **Very Good** condition, typically recently rehabilitated. A few elements show general signs of deterioration that require attention.
Good	The infrastructure in the system or services is in **Good** condition; some elements show general signs of deterioration that require attention. A few elements exhibit significant deficiencies.
Fair	The infrastructure in the system or services is in **Fair** condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies.
Poor	The infrastructure in the system or services is in **Poor** condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration.
Very Poor	The infrastructure in the system or services is in **Very Poor** condition with widespread signs of advanced deterioration. Many components in the system exhibit signs of imminent failure, which is affecting service.

Figure 2.2: Five-point rating scale: Aligns with the Canadian Infrastructure Report Card (CIRC), produced by the Federation of Canadian Municipalities (FCM), Canadian Construction Association, Canadian Public Works Association and Canadian Society of Civil Engineering.
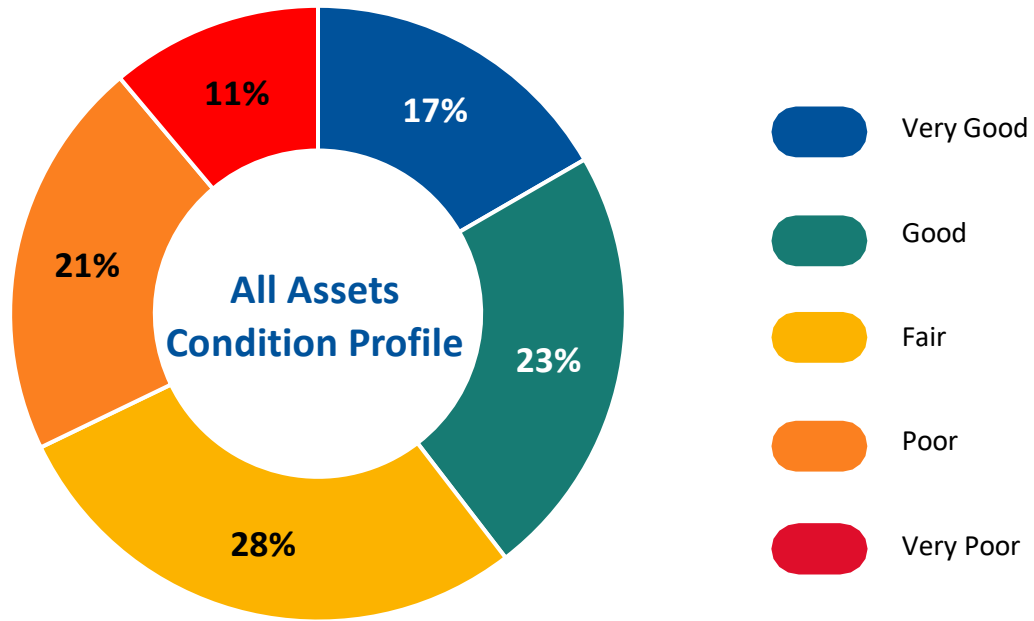
Figure 2.3: All Asset Condition Profile

Condition Profile of All Assets by Class
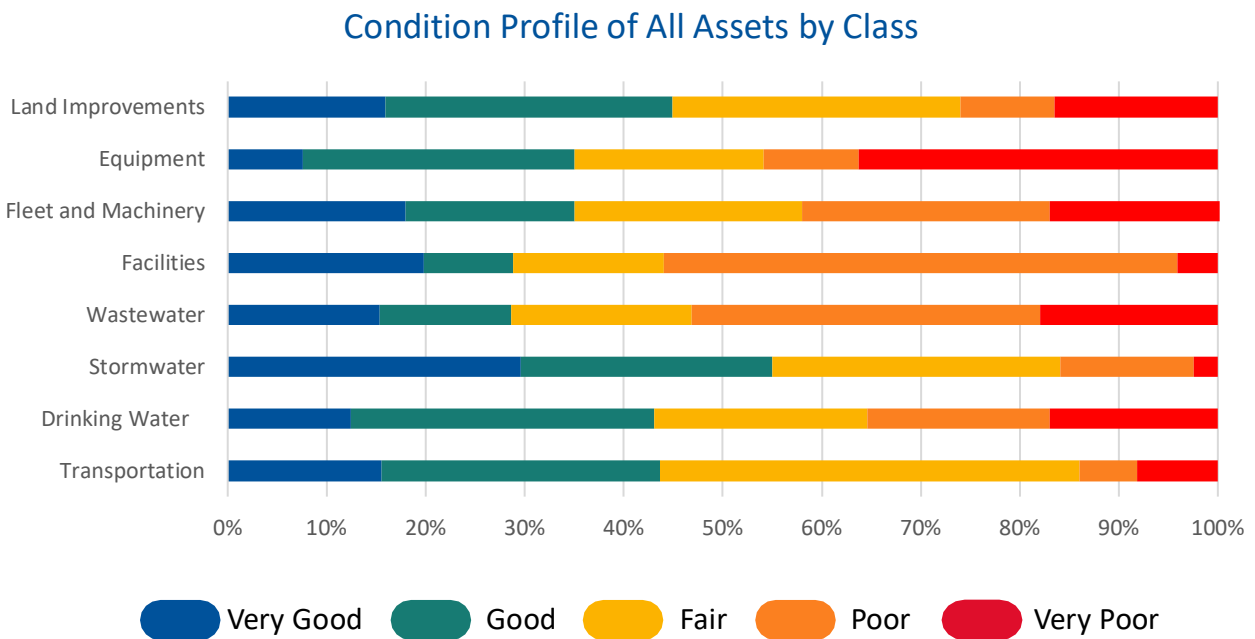
Figure 2.4: Condition Profile of All Assets by Class

2.1.3 ASSET AGE AND ESTIMATED USEFUL LIFE

It is important to know the age of each asset and project into the future how long the asset should remain in service. Asset age and estimated useful life (EUL) are used to determine the condition of an asset along with other factors such as past performance, design life, expert judgement, condition ratings and inspections. Each asset type has a different expected life. The EUL of an asset can be extended and provide valued services when well-built and maintained. However, the opposite can be possible with a poorly constructed or maintained asset that may fail or require replacement before the end of its EUL. The continued use of assets beyond their EUL and without appropriate life cycle maintenance will force the City to accept a lower standard of infrastructure, along with higher lifecycle and operating costs. It also means accepting a higher level of risk for asset failure; however, assets must be maintained to meet regulatory requirements such as environmental protection, public health, and road safety.
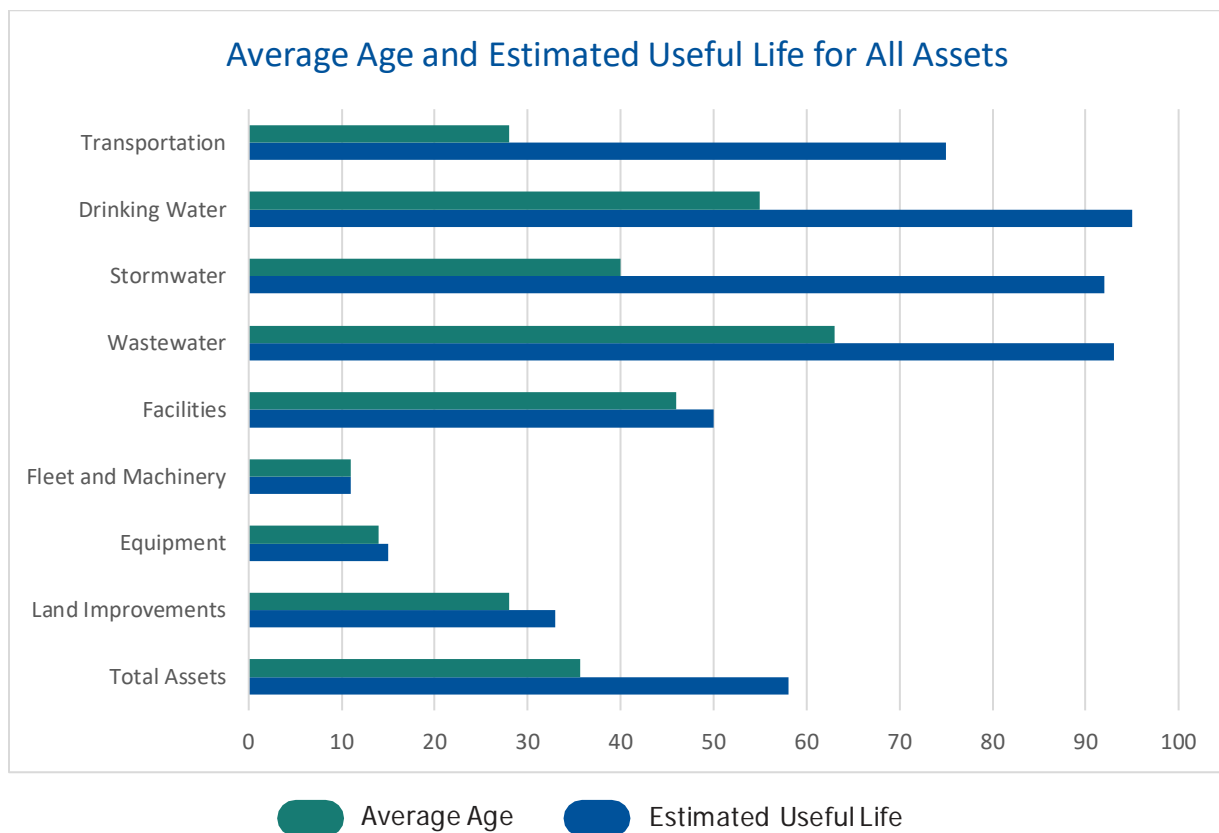
Figure 2.5: Average Age and Estimated Useful Life for All Assets

22% of all assets are near or beyond their estimated useful life

2.2 Lifecycle of the Asset

The *Regulation* requires municipalities to identify lifecycle activities based on the options they have considered. The analysis must consider the entire lifecycle and associated costs related to the assets, risks, and the financial viability of the options considered.

For each asset class there are ideal times within the life cycle where smaller investments can increase an asset's life span and lower the overall operating cost of that asset. Activities can range from simple, low cost preventative maintenance procedures to more expensive rehabilitations. The key is to understand that waiting and doing reactive replacement of assets in the poorest condition (worst-first methodology) generally has the highest life-cycle cost of all options available.

The City has created methods and models that predict the deterioration of assets over time. Using these models, the City is able to identify at what point minor or major intervention would be required. Multiple factors dictate when the need for these events are "triggered". Some of those factors are maintaining an acceptable level of service, prolonging the assets effective useful life and a cost benefit analysis.

There are four major lifecycle activities that happen to extend an asset's life:

Maintenance

- All actions necessary for retaining an assets performance excluding rehabilitation or renewal. Maintenance does not increase the service potential of the asset or keep it in its original condition; it slows down deterioration and delays when rehabilitation or replacement is necessary. There are challenges with completing planned maintenance activities and regularly scheduled inspections while managing the need to execute reactive maintenance activities.

Rehabilitation (major or minor)

- Works to rebuild or replace parts or components of an asset to restore it to a required functional condition and extend its life which may incorporate some modification.
- Generally involves repairing the asset to deliver its original level of service (i.e. milling and paving of roads, lining of sewers) without resorting to significant upgrading or replacement, using available techniques and standards.

Replacement / Reconstruction

- The complete replacement of an asset that has reached the end of its life so as to provide a similar or agreed alternative level of service.

Disposal

- The complete removal of an asset that is no longer required and safe disposal of materials associated with the asset.

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Figure 2.6 below shows the normal deterioration of an asset represented by the solid line. Once that drops below a rehabilitation threshold it has reached the end of its estimated useful life. Completing lifecycle events such as a minor and major rehabilitation shows how the estimated useful life of an asset, represented by the dotted line, can be extended.

Intervention Thresholds and Treatments
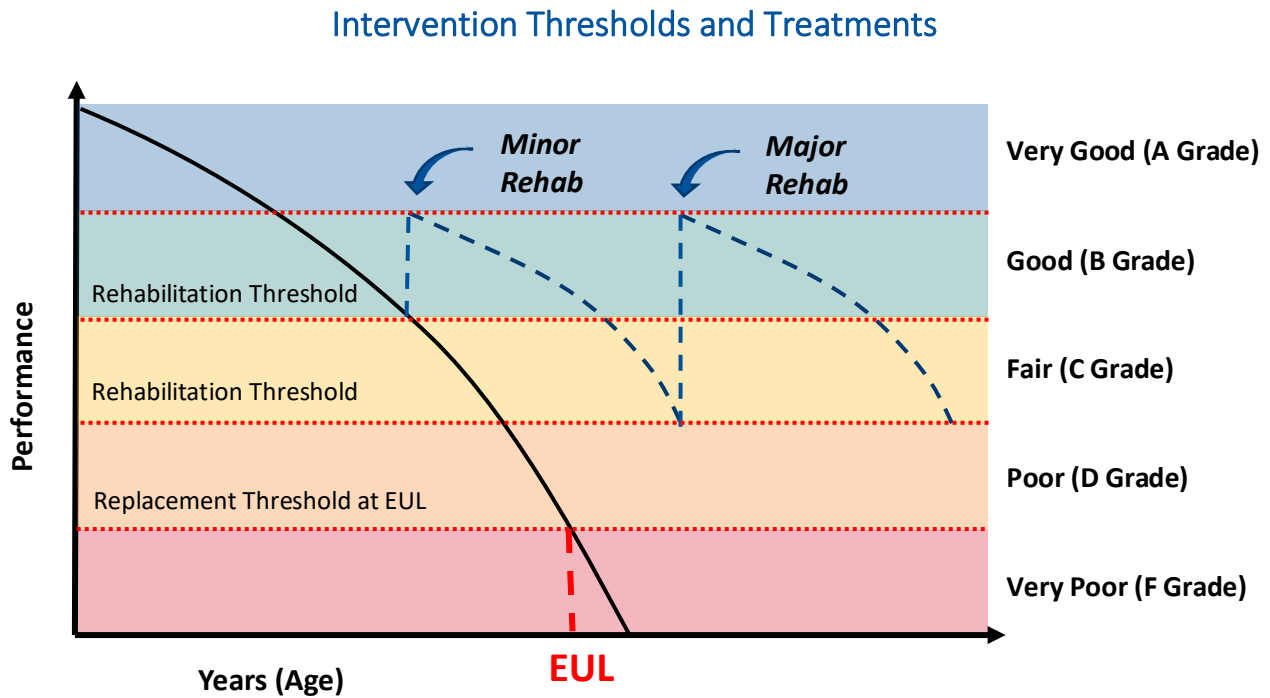
Figure 2.6: Intervention Thresholds and Treatment

2.3 Levels of Service

Levels of service (LOS) describe how an asset performs. The safe and acceptable target LOS for each asset must be identified. This includes clear and measurable performance indicators to meet service expectations of citizens as well as compliance with governmental regulations.

The *Regulation* requires municipalities to identify the current LOS being provided for all assets. The LOS metrics are prescribed in the *Regulation* for core assets and are developed by the municipality for non-core assets. LOS are measured based on performance over the previous two (2) years. These metrics help to explain the performance of assets and include both community (qualitative) and technical (quantitative) metrics.

Community LOS are qualitative, non-technical descriptions. An example is a description of the traffic that is supported by municipal bridges (e.g. heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists). Some community LOS metrics are legislated such as for the core asset categories.

Technical LOS are quantitative descriptions. An example is the percentage of bridges in the municipality with loading or dimensional restrictions. LOS metrics may be legislated, City service objectives, or industry standards.

Levels of service will help to:

- Inform citizens on the assets required to provide services;

- Identify the cost, affordability and benefit of the services;

- Evaluate the suitability and equity of the services; and

- Assess the effectiveness of this Plan.

The Phase Three Asset Management Plan will document the current LOS and the cost to sustain them, the desired LOS and the cost to achieve them, and the financial strategy to fund the expenditures necessary to achieve the desired LOS. Proposed LOS and performance measures of energy usage and operating efficiency will be developed by July 1, 2025 for each of the 10 years following the year in which the current LOS are reported.

2.4 Investing in the Assets

For each asset category, an overview of the funding required to maintain the LOS is provided. The annual required funding is based on 2022 information and is compared against the five-year average capital budget including reserve fund contributions for future work to calculate the annual infrastructure deficit. A five-year budget average is used as the amounts can vary year to year due to priority projects or changes in funding. Information provided in each section includes the infrastructure deficit and the sustainable funding required over a 50-year projection.

When an infrastructure deficit occurs, or an asset is underfunded the asset does not receive the proper repair, renewal, and replacement and typically a backlog of work will occur. Through asset management planning sustainable funding strategies will help reduce the infrastructure deficit, clear the backlog of work, and set aside funding for the future life of the asset.

The Financial Strategy will be completed in Phase 3 of the AMP. The Financial Strategy will identify if the proposed LOS are both achievable and affordable and identify what lifecycle activities can be completed. If the municipality cannot complete all the activities, it will recommend which activities to undertake, as well as how to manage the risks associated with not undertaking those activities.

PHASE ONE PLAN

PHASE TWO PLAN

$

FINANCIAL STRATEGY
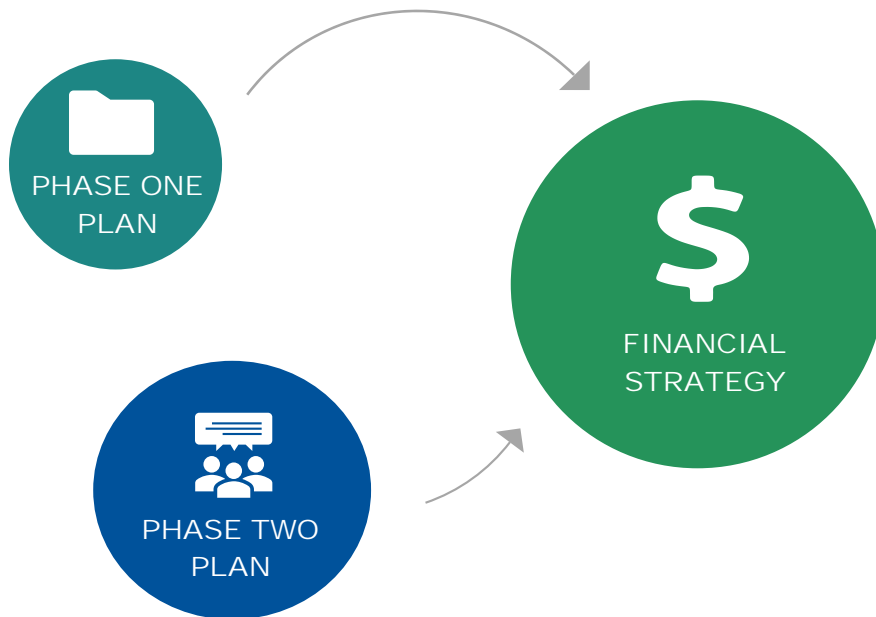
Asset Class	Sustainable Funding	5 Year Budget Average	Funding Deficit	% Funded
Transportation	$33,746,000	$18,640,000	-$15,106,000	55%
Drinking Water*	$14,051,000	$14,051,000	-	100%
Stormwater	$4,350,000	$3,156,000	-$1,194,000	73%
Wastewater*	$13,509,000	$13,509,000	-	100%
Facilities	$13,995,000	$7,639,000	-$6,356,000	55%
Fleet and Machinery	$11,182,000	$8,193,000	-$2,989,000	73%
Equipment	$6,148,000	$3,913,000	-$2,235,000	64%
Land Improvements	$7,769,000	$3,711,000	-$4,085,000	48%
TOTAL ALL ASSETS	**$104,777,000**	**$72,812,000**	**-$31,965,000**	**69%**

Table 2.3 Funding Profile for All Assets

* Financial plans are in place for both the Drinking Water System and the Wastewater System to achieve financial sustainability, full-cost recovery, and affordability for consumers while maintaining existing and regulated service levels.

ANNUAL INFRASTUCTURE DEFICIT

$31.9 MILLION

2.5 Integrating Climate Change Considerations into Asset Management

Sustainability has long been a community value in Thunder Bay. Sustainable asset management involves understanding and making informed decisions about trade-offs between delivering service, managing risk and reducing cost throughout the lifecycle of the asset without compromising the services provided to future generations.

Thunder Bay has been impacted by climate change in recent years including hail and wind storms, heavy rains, extreme cold temperatures, and severe winter storms and heat waves. Climate projections for the Thunder Bay region include an increase in extreme weather, temperature fluctuations, frequent high intensity rainfall events, and drought conditions in the summer. The impacts of climate change pose immediate and long-term threats to the City's infrastructure.

This Plan serves to integrate climate considerations into municipal asset management to aid in informing decision-making and strategic long-term investments to reduce the risks associated with climate change impacts and capitalize on mitigation opportunities. This supports Goal #4 of the Climate Adaptation Strategy to "consider climate change impacts in the design, construction and maintenance of physical infrastructure while considering affordability and co-benefits".

In the face of challenging local and global environmental issues, increasing costs and changing economies, the City must consider new ways to incorporate sustainability and long-term financial planning into all activities. The Climate Change Considerations sections in this report outline the work the City of Thunder Bay is or will be doing to align asset management with the City's climate and environmental sustainability goals.

'For every dollar invested in making Canada's infrastructure more resilient against severe weather events, three to five dollars are saved in recovery costs.'

- Public Safety Canada

Each asset is impacted by climate change in its own way. The repair, renewal, and replacement of all assets as a whole consider the following climate risks, adaptation, and mitigation opportunities.

Climate Risks Identified for All Assets:

- Potential increased service disruptions with more frequent and severe weather events.
- Potential increased maintenance and replacement costs due to damage and impact of severe weather.

Future Climate Adaptation Measures:

- Consider climate change impacts when designing, constructing, and maintaining assets, while considering affordability and co-benefits.
- Consider technology and best practices to minimize service disruption and increase resiliency.
- Consider altering inspections and renewal to support resiliency.
- Consider regulation changes and best practices in the industry.

Future Climate Mitigation Opportunities:

- Invest in assets that will provide environmental benefits and reduce wear and tear on existing assets.
- Invest and retrofit assets and services to support the objectives of the Thunder Bay Net-Zero Strategy.
- Invest in technology to increase efficiency of the assets.

TRANSPORTATION

Assets that relate to the transportation system, including paved roads, bridges, any cross culverts larger than three meters in diameter, sidewalks, traffic signals, streetlights, and pedestrian crossovers.

3.0 Transportation Assets

The City of Thunder Bay's Transportation Assets includes roads, bridges, culverts, sidewalks, streetlights, and traffic signals.

Residents and visitors use our transportation system to commute to work, bike to get groceries, drive to visit friends and family or to access destinations such as Prince Arthur's Landing. Transportation Assets help the City to provide services to its residents such as emergency services, public transit, and solid waste collection. The continuity of transportation in the City relies on well maintained and functioning assets. Transportation assets have a total replacement value of $1,665,394,000.

3.1 Asset Overview

Transportation in the City is connected through 1,905 lane-kilometers of paved roads which include 38km of bike lanes, 25 lane-kilometers of chip sealed roads, 184 lane-kilometers of gravel roads, 61 bridges, six (6) railway owned bridges on which the City maintains road infrastructure, 33 cross culverts (over 3 m in diameter), 519 km of sidewalks, 106 intersections with traffic signals, and over 13,313 streetlights. Table 3.1 outlines the inventory, replacement cost, average age, and condition for each of the transportation assets.

Asset Class	Asset Sub-Class	Replacement Value	Asset Totals	Average Age	Average Condition
All Transportation Assets		1,665,394,000	See below	28 years	**Fair**
Roads					
Urban Roads	Arterial	$171,904,000	1,322,610 Sq. m (336 lane-km)	17 years	**Fair**
	Collector	$108,880,000	548,037 Sq. m (112 lane-km)	22 years	**Fair**
	Residential	$495,753,000	3,955,256 Sq. m (822 lane-km)	30 years	**Fair**
Rural Roads	Arterial	$49,239,000	905,288 Sq. m (245 lane-km)	18 years	**Fair**
	Collector	$12,565,000	159,777 Sq. m (74 lane -km)	14 years	**Fair**
	Residential	$51,220,000	1,053,733 Sq. m (316 lane-km)	26 years	**Fair**
	Chip Seal	$420,000	46,611 Sq. m (25 lane-km)	5 years	**Good**
Other and Pool Assets		$6,586,000			**Good**
	Total	$896,567,000	7,911,312 Sq.m (1,930 lane-km)		
Sidewalks					
Sidewalks		$231,118,000	519 km	27 years	**Good**
Traffic Control and Street Lighting					
Traffic Signals		$12,372,000	106 intersections with traffic signals; 23 pedestrian crossovers	10 years	**Fair**
Streetlights		$57,400,000	13,313 Streetlights	5 years (for LED lights)	**Fair**
Bridges and Culverts					
Bridges		$429,074,000	61	35 years	**Good**
Culverts		$38,863,000	33	41 years	**Fair**

Table 3.1: Transportation Services Asset Overview

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3.1.1 ASSET CONDITION
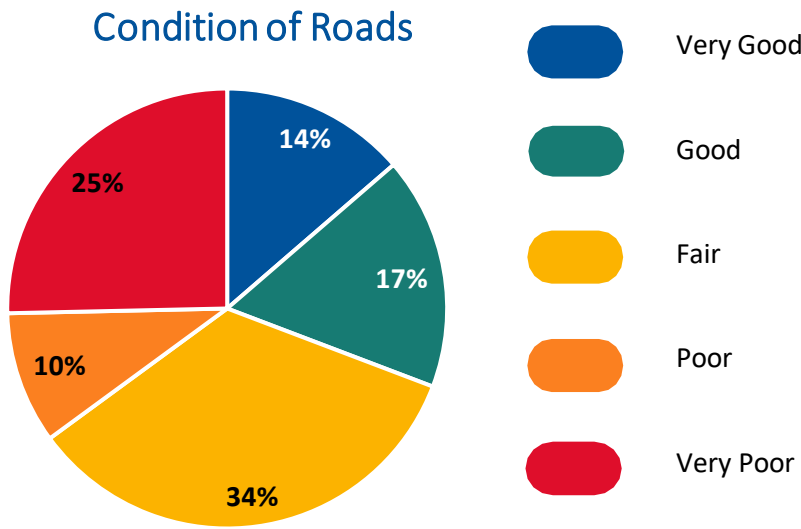
Figure 3.1: Condition Profile of Roads broken down as percentage of total replacement cost.

The City of Thunder Bay conducts pavement condition inspections on a five (5) year cycle. Every paved road is inspected for relative roughness of the pavement and defects such as cracking. With the measurement, an overall condition index (OCI) is developed which rates the pavement on a zero (0) to ten (10) scale. This data is then uploaded into the City's pavement management system (PMS) for analysis and prioritization. From the inspection in 2020, the average OCI for roads was 7.9 which corresponds to an average FAIR rating. Gravel roads are inspected on an annual basis. Inspections include measuring the road crown, identification of deficiencies such as wash boarding, ruts, potholes, and any indication of base failures. Due to the sensitivity of drainage on gravel roads, ditches are also visually inspected for any blockages.
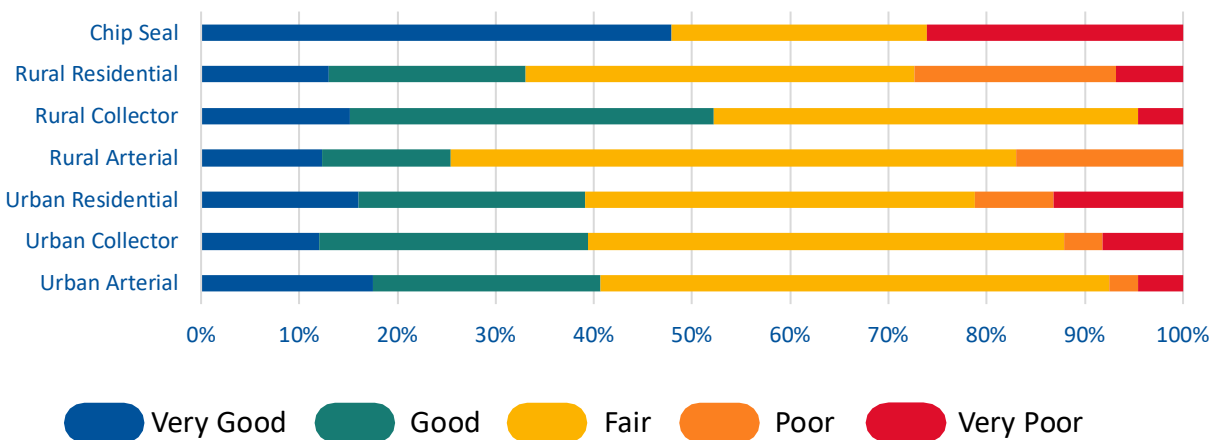
Figure 3.2: Condition Profile of Roads Sub-Assets broken down as percentage of total replacement cost.

Examples of OCI Road Condition Rating Categories

Condition Grade	Typical Road Example
Very Good (OCI = > 9 to 10)	
Good (OCI = >8 to 9)	
Fair (OCI = >6 to 8)	
Poor (OCI = >5 to 6)	
Very Poor (OCI = 0 to 5)	

Figure 3.3 Examples of Road Condition Ratings.

Condition of Sidewalks

Legend:
- Very Good
- Good
- Fair
- Poor
- Very Poor

Pie chart values: 29% (Very Good), 38% (Good), 29% (Fair), 2% (Poor), 2% (Very Poor)
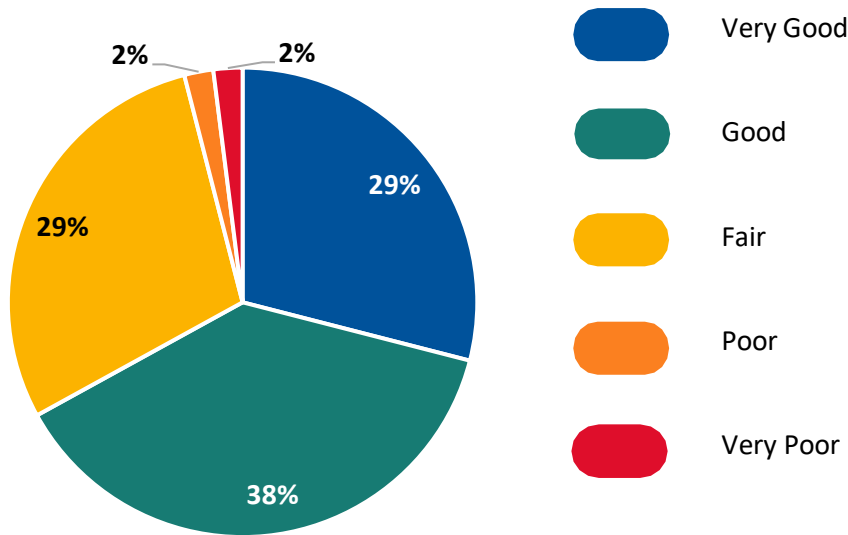
Figure 3.4: Condition Profile of Sidewalks broken down as percentage of total replacement cost.

The City of Thunder Bay developed a sidewalk inspection program in 2014. The program notes defects such as trip edges, depressed or heaved areas, as well as cracked and deteriorated slabs. A rating system was developed on a one (1) to ten (10) scale that identifies the percentage of slabs that are defective within each sidewalk segment. The City conducts the sidewalk inspections on a five (5) year cycle. From the 2022 sidewalk inspection the average sidewalk condition was 8.7 which corresponds to an average GOOD rating.

Condition of Traffic Signals and Street Lights

Pie chart values: 21% (Very Good), 19% (Good), 16% (Fair), 20% (Poor), 24% (Very Poor)
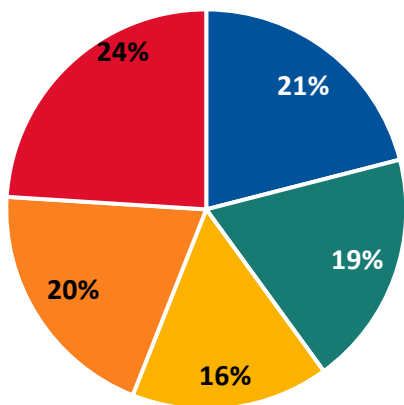
The City of Thunder Bay developed a streetlight inspection program in 2023. A rating system was developed on a one to ten scale and identifies the defects in poles, wires, and lights. The City will conduct the traffic and streetlight inspections on a five (5) year cycle. From the 2023 traffic and streetlight inspection the average condition was 6.4 which corresponds to an average FAIR rating.

Legend: Very Good | Good | Fair | Poor | Very Poor

Figure 3.5: Condition Profile of Sidewalks broken down as percentage of total replacement cost.

Condition of Bridges

1% 0% 5%
34%
60%

Legend: Very Good, Good, Fair, Poor, Very Poor
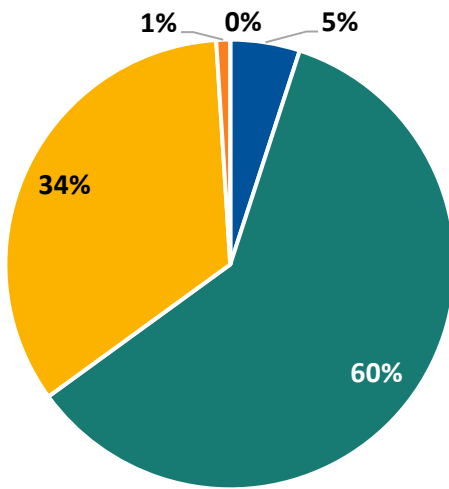
Figure 3.6: Condition Profile of Bridges broken down as percentage of total replacement cost.

Condition of Culverts

1% 1% 2%
31%
65%
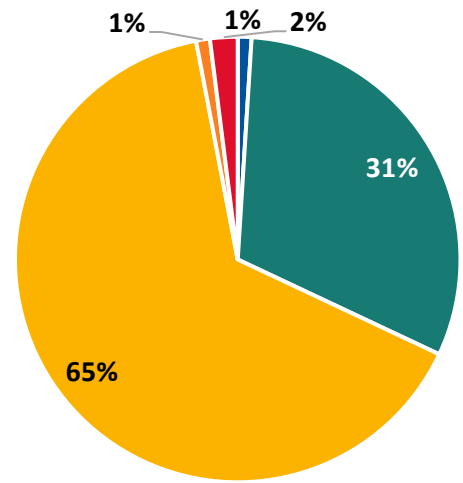
Figure 3.7: Condition Profile of Culverts broken down as percentage of total replacement cost.

The City uses a Bridge Condition Index (BCI) based on the Ministry of Transportation (MTO) rating system to rate bridges and culverts over 3m in diameter. Individual structure ratings are updated during biannual inspections to monitor the structure's performance over time. Structures are considered in good condition with a rating over 70, fair condition (in need of some rehabilitation work) with a rating between 60 and 70, and in poor condition (in need of significant rehabilitation work/replacement) with a rating below 60. Examples of Bridge and Culvert rating categories can be found on the following two pages.

From the inspection in 2023, the average BCI for bridges is 70.4 which corresponds to a GOOD rating and for structural culverts is 68.1 which corresponds to a FAIR rating.

Examples of BCI Bridge Condition Rating Categories	
Condition Grade	Typical Bridge Example
Very Good (BCI = >85 to 100)	
Good (BCI = >70 to 85)	
Fair (BCI = >60 to 70)	
Poor (BCI = >30 to 60)	
Very Poor (BCI = 0 to 30)	

Figure 3.8 Examples of Bridge Condition Ratings.

Examples of Culvert Condition Rating Categories

Condition Grade	Typical Culvert Example
Very Good	
Good	
Fair	
Poor	
Very Poor	

Figure 3.9 Examples of Culvert Condition Ratings.

3.1.2 ASSET AGE

Asset Average Age and Estimated Useful Life for Roads Asset Sub-Classes

- Chip Seal: Average Age 4, EUL 7, EUL with Lifecycle Events 15
- Rural/Arterial: Average Age 19, EUL 25, EUL with Lifecycle Events 68
- Rural/Collector: Average Age 15, EUL 30, EUL with Lifecycle Events 81
- Rural/Residential: Average Age 28, EUL 40, EUL with Lifecycle Events 74
- Urban/Arterial: Average Age 18, EUL 25, EUL with Lifecycle Events 64
- Urban/Collector: Average Age 23, EUL 30, EUL with Lifecycle Events 77
- Urban/Residential: Average Age 31, EUL 40, EUL with Lifecycle Events 89

Legend: Average Age (years) | EUL (years) | EUL with Lifecycle Events (years)

Figure 3.10: Average Age and Estimated Useful Life of Roads Sub-Assets.

Figure 3.10 shows the average age and estimated useful life (EUL) of the roads asset sub-classes. The overall average age of paved roads is 26 years. As roads age there are lifecycle events that should be implemented in order to extend the EUL. Figure 3.10 also shows the EUL with lifecycle events if they are completed at the appropriate time. Should the road fall into too poor of a condition before the lifecycle events occur, a full reconstruction is required which would set the age back to zero (0). Lifecycle events for roads can be found in section 3.2. The age of gravel roads are not tracked as they are in a state of continual renewal with yearly grading, gravel additions, compaction, ditch clearing and minor sub-base repair as required.

Average Age and Estimated Useful Life for Sidewalks
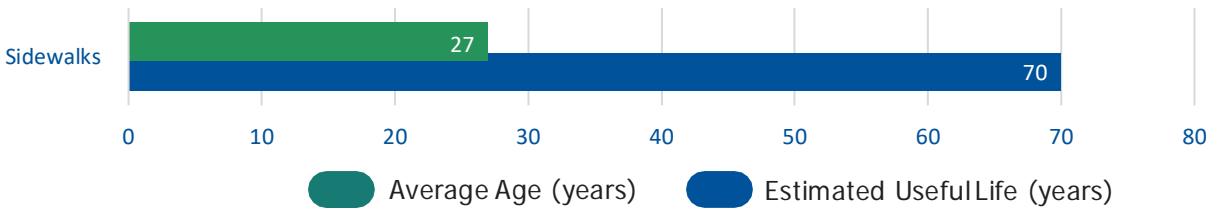
Figure 3.11: Average Age and EUL of Sidewalks

Figure 3.11 shows the average age and estimated useful life (EUL) of the sidewalk network. The overall average age of sidewalks is 27 years.

Average Age and Estimated Useful Life for Traffic and Streetlights
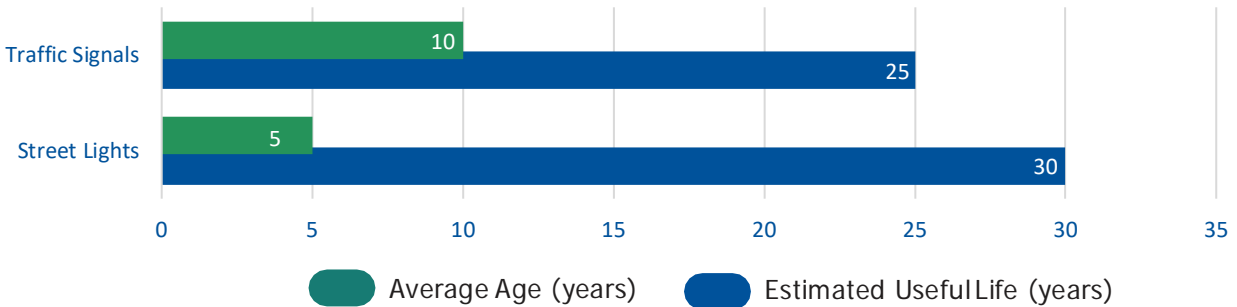
Figure 3.12: Average Age and EUL of Traffic Signals and Streetlights

Figure 3.12 shows the average age and estimated useful life (EUL) of traffic and streetlights. The overall average age of traffic signals is 10 years, and streetlights is 5 years. The age of streetlights is based on the LED replacement program.

Average Age and Estimated Useful Life for Bridges and Culverts
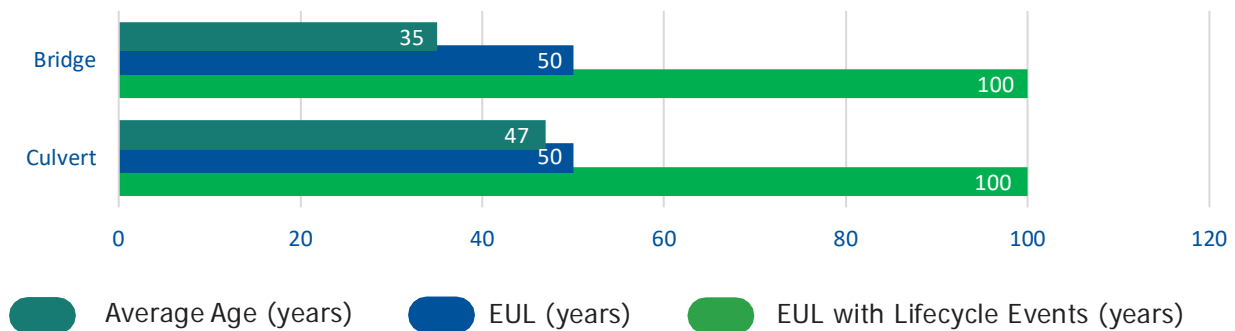
Figure 3.13: Average Age and EUL of Bridges and Culverts

Figure 3.13 shows the average age and estimated useful life (EUL) of the bridges and culverts over 3m in diameter. The overall average age of bridges is 35 years and culverts is 47 years. As bridges age there are lifecycle strategies that should be implemented to extend the EUL. This figure shows the EUL with lifecycle events if they are completed at the appropriate time. Lifecycle events for bridges can be found in section 3.2.

3.2 Lifecycle of the Asset

3.2.1 ROADS LIFECYCLES

The road network requires the proper lifecycle activities to extend the useful life of the roads so that safe and effective transportation services are prolonged. If the proper lifecycle activities do not occur, there is a potential of premature asset failure which may result in consequences such as impact to commuters or delays in critical services, such as emergency services. The road network has five main lifecycle activities:

Maintenance

- Roads which are rated as good or very good will only receive maintenance. Activities include inspections, monitoring, crack sealing, sweeping, and winter control.

Rehabilitation (minor)

- Roads which are rated as fair, will receive minor rehabilitation. Activities include maintenance activities, minor pothole filling, and capital works such as mill and pave, and lane section repairs.

Rehabilitation (major)

- Roads which are rated as poor, will receive major rehabilitation. Activities include maintenance and minor rehabilitation activities, patching road sections, and capital works such as strip and pave, and pulverize and pave.

Replacement / Reconstruction

- Roads which are rated as very poor, will be reconstructed. Activities include maintenance, minor rehabilitation, major rehabilitation, padding of rutted and severe deformation sections, and capital work such as removal and replacement of the road base and asphalt. Road reconstruction is aligned with underground utility replacements whenever possible.

Disposal

- Roadway disposals are in line with best practices and regulation. Roads are disposed of when they are no longer needed in the transportation services due to realignment or construction of an alternate corridor. Opportunities to reduce pavement widths are considered during road reconstruction projects.

Using a value-based engineering approach, a pavement management system calculates a yearly pavement rehabilitation strategy with user defined inputs, decision trees, and multiple iterative steps. Road segments are prioritized based on the level of impact and cost. Roads with high traffic volumes requiring less expensive rehabilitation receive priority compared to roads with low traffic volumes requiring expensive full reconstruction. Sometimes road conditions alone may dictate if a road is prioritized for rehabilitation; when possible, road reconstruction is scheduled with underground utility reconstruction.

3.2.1.2 ROADS LIFECYCLE STRATEGY

The following lifecycle strategy has been developed as a proactive approach to managing the lifecycle of paved 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.
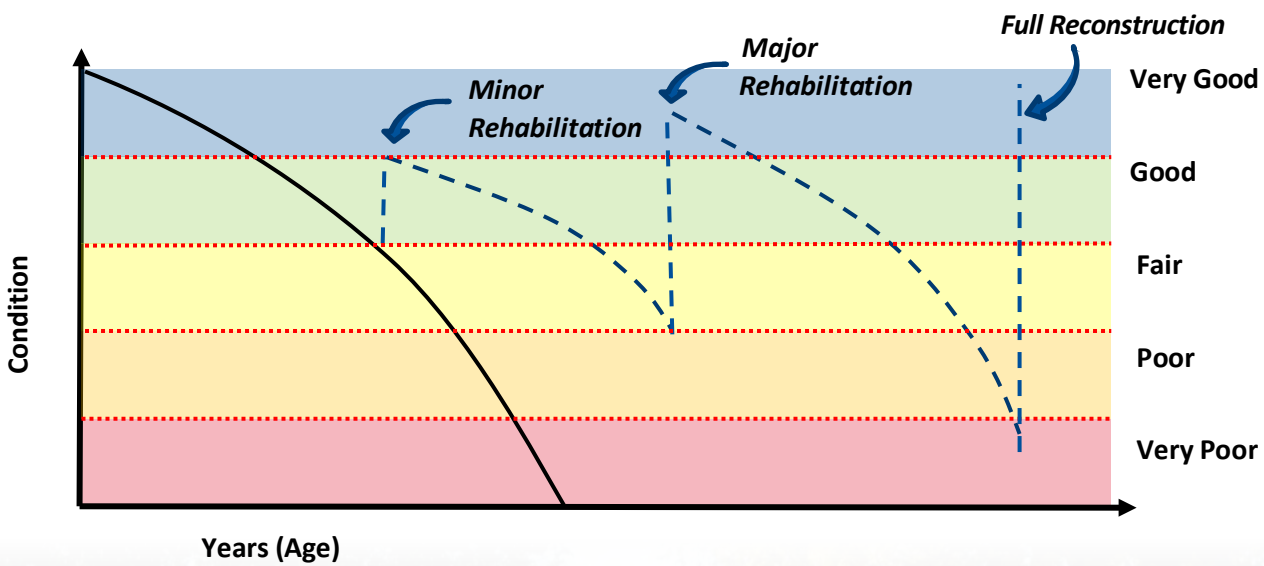
Figure 3.14: Examples of Road Lifecycle Strategy

3.2.2 SIDEWALKS LIFECYCLES

The sidewalk network requires maintenance of sidewalk slabs and complete replacement when they reach the end of their useful life. If the proper maintenance activities do not occur there is a potential risk of asset failure which may result in sidewalks being inaccessible and other negative impacts, especially to pedestrians using assisted devices.

Maintenance

- Maintenance activities such as inspections, trip edge grinding, lifting and leveling, slab replacement and winter control are completed utilizing the Infrastructure, Development, and Operations operating budget.

Replacement / Reconstruction

- Sidewalks which are rated as very poor, will be reconstructed.

Disposal

- Sidewalk disposals are in line with best practices and regulations. Sidewalk sections are disposed of when changes in usage make them unnecessary.

3.2.3 TRAFFIC AND STREETLIGHT LIFECYCLES

Traffic signals and streetlights generally have four main lifecycle activities:

Maintenance

- Planned activities such as inspection, monitoring, etc. The Traffic Control Signal System Sub-System is inspected, tested and maintained annually.

Rehabilitation

- Street light luminaire replacements are done when three or more consecutive luminaires on a roadway are not functioning, or if 30% or more of the luminaires on any kilometer of roadway are not functioning. Traffic signals that are non-functioning are addressed as soon as possible after becoming aware of the fact.

Replacement

- Traffic signals have an expected life of 25 years and are replaced at end of useful life. Street lights have an expected life of 30 years and are replaced at end of useful life including the poles, wiring and luminaire.

Disposal

- Traffic signals and Street lights are disposed of when road services changes or changes in usage make them unnecessary.

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3.2.4 BRIDGE & CULVERT LIFECYCLES

Bridges and culverts require the proper lifecycle activities to maintain safe and effective transportation services. If the proper lifecycle activities do not occur there is a potential risk of asset failure which may result in consequences such as impact to commuters or delays in critical services such as emergency services.

Bridge and culvert services have five main lifecycle activities:

Maintenance
- Some Bridge and Culvert maintenance is scheduled annually including cleaning and minor repairs to the wearing surface (crack sealing/potholes), some is on an as needed basis based on condition such as minor concrete repairs, deck joint seal replacements.

Rehabilitation (minor)
- Every 25 to 75 years, a bridge/culvert requires minor rehabilitation. Activities include maintenance activities, waterproofing, minor concrete repairs and deck joint seal replacement, a full repair of the bridge deck and other areas of deterioration on the structure.

Rehabilitation (major)
- Every approximately 50 years, a bridge/culvert requires major rehabilitation. Activities include, deck overlays and deck joint repairs or replacements or a full replacement of the bridge deck and repairs to other areas of deterioration.

Replacement / Reconstruction
- A bridge/culvert has an expected life of 100 years and is replaced at the end of its useful life.

Disposal
- Bridge/culvert disposals are in line with best practices and regulations. Structures are disposed of when road services change or changes in usage make them unnecessary.

Bridges and culverts are inspected regularly in accordance with the Ontario Structure Inspection Manual (OSIM). Vehicular bridges are inspected every two (2) years; pedestrian bridges and culverts over 3 m in diameter, or multiple culvert groupings with individual culverts over 2 m in diameter, are inspected every four (4) years.

3.3 Levels of Service

To maintain safe and functioning transportation services, the City of Thunder Bay has established Road Maintenance Standards, revised and re-approved by City Council in 2016. These Standards provide trigger points when maintenance needs to be done either by frequency or based on a physical field condition. Some examples of maintenance provided on road assets include plowing and sanding, street sweeping, dust suppressants, crack sealing and pothole repairs.

The *Regulation* provides metrics to measure the current community (qualitative) and technical metrics (quantitative) Levels of Service (LOS). Additionally, public survey responses were collected to aid in collecting further data for measuring levels of service. Survey response reports can be found in Appendix G.

3.3.1 ROADS LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description, which may include maps of the road services in the municipality and its level of connectivity.	The City of Thunder Bay's road network is connected through 1,905 lane-kilometers (l-km) of paved roads, and 184 l-km of gravel roads. Roads are classified as arterial, collector, or local. A map has been provided on page 61
Scope	Order in which survey respondents most often interact with the roads in thunder bay while in a motorized vehicle.	The 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey asked respondents how they interact with the roads. They responded from most (1) to least (3) with the following: 1. Driver 2. Passenger in a private vehicle 3. Passenger on public transit.
Scope	Percentage of survey respondents who cycle through urban areas (on the roads/streets and /or use bike lanes and buffered bike lanes) at least once a week.	29.0% of the 2023 Active Transportation Levels of Service Survey respondents cycle through urban areas either every day or a few times a week.

Quality	Description or images that illustrate the different levels of road class pavement condition, maintenance, rehabilitation, and reconstruction.	For paved roads an Overall Condition Index (OCI) is used to measure defects in the pavement. The OCI rating falls between one (1) and ten (10) and is used to determine if a road is classified as requiring maintenance, rehabilitation or replacement. - 8-10 Rating: Generally in the maintenance cycle not requiring capital work but being maintained, crack sealing and patching to maintain their condition. - 7-8 Rating: Generally considered in the minor rehabilitation range (i.e. milling and paving of the road surface/ in place recycling) - 5-7 Rating: Generally considered in the major rehabilitation range (i.e. stripping the road surface, minor granular and/or drainage repairs and repaving) - 5 or Below Rating: Generally considered to be within the reconstruction range requiring a full rebuild of the granular base and pavement surface. Photo examples of each OCI rating have been provided on page 41.
Quality	Percentage of survey respondents that are satisfied with FAIR (current) as the average condition for the roads.	24% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents feel somewhat or very satisfied with FAIR as the average condition for the roads.
Quality	Percentage of survey respondents that feel more than 40% of roads should be in good or very good condition.	57% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents feel that more than 40% of the roads should be in good or very good condition.
Quality	Percentage of survey respondents that would be willing to pay more taxes to increase the average condition of the roads.	45% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents would be willing to pay more taxes to increase the average condition of the roads in Thunder Bay.
Quality	Percentage of survey respondents that feel the	59% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents feel the City budget for roads should be increased.

	roads budget should be increased.	
Quality	Percentage of survey respondents that feel adequate communication and notifications are given when road closures occur for maintenance or construction.	47% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents feel the City always or most of the time provides adequate communication and notification regarding road closures. Suggestions for more communication included better road signage, web maps, more social media and radio.
Quality	Percentage of survey respondents that have reported a pothole to the City.	58% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents have reported a pothole to the City. 29% of those respondents felt that the pothole was fixed in a timely manner.
Safety	Percentage of survey respondents that feel safe while using the roads in Thunder Bay in a motorized vehicle.	52% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondent feel somewhat or very safe using the roads in Thunder Bay in a motorized vehicle.
Safety	Survey respondents' top reasons for feeling unsafe using a motorized vehicle on the roads in Thunder Bay.	1. Surface condition (e.g. Significant cracking, potholes) 2. Driver Compliance (e.g. Vehicles not stopping at stop signs / red lights, speeding, etc.) 3. Operational issues (e.g. Snow or ice not cleared, debris frequently not cleared)
Safety	Percentage of survey respondents that feel safe while cycling through urban areas.	33% of the 2023 Active Transportation Levels of Service Survey respondents feel somewhat or very safe cycling through urban areas in Thunder Bay.
Safety	Survey respondents' top reasons for feeling unsafe cycling through urban areas in Thunder Bay.	1. Driver Compliance (e.g. Vehicles not stopping at stop signs / red lights, speeding, etc.) 2. Poor connectivity (e.g. Bike lanes ending abruptly, sidewalks missing, curb cuts not available, roads frequently closed etc. 3. Infrastructure Design (e.g. Not enough safety features or separation, poor drainage, steep slope, slippery when wet etc.)

Table 3.2: Community Levels of Service for Roads. Survey responses from the 2023 Roads, Street Lighting, and Traffic Signals and Active Transportation Levels of Service Survey can be found in Appendix G.

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Number of lane-kilometers of each arterial road, collector road, and local road as a proportion of square kilometers of land areas of the municipality. (km/km^2)	The City of Thunder Bay has a total land area of 328 km^2. - Arterial roads total 581 l-km, as a proportion of total land area: 1.77 - Collector roads total 186 l-km, as a proportion of total land area: 0.57 - Local Roads total 327.27 l-km, as a proportion of total land area: 3.47
Function	Number of reports to dispatch of potholes.	There were 2,781 reported potholes in 2022.
Quality	For paved roads in the municipality, the average pavement condition index value.	The average pavement condition index value for paved roads in the City of Thunder Bay is 7.9 which corresponds to an average FAIR rating.
Quality	For gravel roads in the municipality, the average surface condition (e.g. very good, good, fair, poor, or very poor).	The average surface condition of gravel roads in the City of Thunder Bay is very good. The condition for gravel roads is determined by a City of Thunder Bay developed inspection process.
Performance	Capital re-investment rate vs. target re-investment rate	1.26% vs. 2.17%

Table 3.3: Technical Levels of Service for Roads.

3.3.2 SIDEWALKS LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description, which may include maps of the sidewalk network in the municipality and its level of connectivity.	The City of Thunder Bay's sidewalk network is connected through 519 kilometers (km) of sidewalk. A map has been provided on page 62
Scope	Percentage of survey respondents that use sidewalks at least once a week.	82% of the 2023 Active Transportation Levels of Service Survey respondent use sidewalks either every day, or 1 - 3 times a week.
Quality	Description of the condition of sidewalks.	From the 2022 sidewalk inspection the average sidewalk condition was 8.7 which corresponds to an average GOOD rating.

55

Quality	Percentage of survey respondents that feel that the sidewalk network should be maintained at a GOOD (current) rating.	50% of the 2023 Active Transportation Levels of Service Survey respondent feel that sidewalks should be maintained at a GOOD rating.
Quality	Percentage of survey respondents that feel that the City spends an adequate amount on sidewalks.	56% of the 2023 Active Transportation Levels of Service Survey respondents feel that the City spends an adequate amount on sidewalks.
Quality	Percentage of survey respondents that would be willing to pay more taxes to increase the average condition of the sidewalks.	64% of the 2023 Active Transportation Levels of Service Survey respondents would be willing to pay more taxes to increase the average condition of the sidewalks in Thunder Bay.
Safety	Percentage of survey respondents that feel safe while using sidewalks.	71% of the 2023 Active Transportation Levels of Service Survey respondents feel somewhat or very safe while using sidewalks. 73% of those that use a mobility device feel safe using the device on City Sidewalks.
Safety	Survey respondents' top reasons for feeling unsafe using sidewalks.	1. Operational issues (eg. Snow or ice not cleared, debris frequently not cleared) 2. Surface condition (eg. Significant cracking, tripping hazards) 3. Poor connectivity (eg. Sidewalks missing, curb cuts not available for mobility devices, sidewalk frequently closed etc.)

Table 3.4: Community Levels of Service for Sidewalks. Survey responses from the 2023 Active Transportation Levels of Service Survey can be found in Appendix G.

Service Attribute	Performance Measure	2022/2023 Performance
Function	Number of reports to dispatch of sidewalk issues.	There were 125 reports to dispatch regarding sidewalk issues in 2022.
Quality	For sidewalks in the municipality, the average condition.	The 2022 sidewalk inspection resulted in an average condition rating of 8.7 which corresponds to an average GOOD rating.
Performance	Capital re-investment rate vs. target re-investment rate	0.42% vs. 1.43%

Table 3.5: Technical Levels of Service for Sidewalk network.

3.3.3 STREET LIGHTING AND TRAFFIC SIGNALS LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description, which may include maps of the street lighting services in the municipality.	A map of the City of Thunder Bay Street lighting service is provided on page 63
Scope	Description, which may include maps of the traffic signal services in the municipality.	The City of Thunder Bay traffic signals service is comprised of 106 intersections and 23 signaled pedestrian crossings.
Function	Percentage of survey respondents that are satisfied with the current lighting of City Streets at night.	48% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents feel somewhat or very satisfied with the current lighting of streets at night. Those that were dissatisfied noted that many lights are out, are strobing, or not repaired in a timely manner. Many noted that new lights are not bright enough.
Quality	Survey responses regarding traffic congestion.	2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey asked residents how they feel about traffic/congestion on the roads in Thunder Bay. The following are the results: • 27% of respondents feel traffic levels are acceptable. • 49% of respondents are neutral, congestion happens sometimes but it is infrequent/causes little impact. • 16% of respondents feel traffic is unacceptable – congestion happens too much and too often. 8% said Other. The majority of the 'other' responses included the suggestion that synced traffic lights would aid in congestion and reduce idling. Others noted that making active travel easier would reduce congestion.

Table 3.6: Community Levels of Service for Street Lighting and Traffic Signals. Survey responses from the 2023 Roads, Street Lighting, and Traffic Signals and Active Transportation Levels of Service Survey can be found in Appendix G.

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Total number of traffic signal heads, pedestrian signal heads, Direction protective left turn signals, and direction protective/permissive left turn signals.	The City of Thunder Bay Traffic Signal inventory consist of the following: - 828 Traffic signal heads - 774 Pedestrian signal heads - 8 Direction protective left turn heads - 53 Direction protective/permissive left turn heads - 23 Pedestrian crossovers
Scope	Total number of streetlights in the street lighting network.	The City of Thunder Bay street lighting inventory consists of: - 13,313 Street light luminaires - 7,000 City owned poles
Function	Number of work orders for single street light outage or full block outage.	There were 629 work orders for single streetlight outages and 451 reports for full block streetlight outages in 2022.
Quality	For streetlights in the municipality, the average condition rating.	The average condition rating for streetlights in the City of Thunder Bay is 7.9 which corresponds to a GOOD rating.
Quality	For traffic signals in the municipality, the average condition rating.	The average condition rating for traffic signals in the City of Thunder Bay is 5.6 which corresponds to a FAIR rating.
Performance	Capital re-investment rate vs. target re-investment rate	2.77% vs. 3.45%

Table 3.7: Technical Levels of Service for Street Lighting and Traffic Signals.

3.3.4 BRIDGES AND CULVERTS LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description of the traffic that is supported by municipal bridges (e.g. heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	The City of Thunder Bay owns numerous vehicular and pedestrian bridges, and culverts over 3 m in diameter. The City also maintains road infrastructure on six (6) railway bridges. The bridge and culvert services consists of: - 60 bridges totaling approximately 31,000 m^2 of bridge deck area, and - 33 large diameter culverts consisting of 12,000 m^3 of culvert volume. These structures support traffic for the general public and commercial purposes, consisting of heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians and cyclists. A map has been provided on page 64
Quality	Description or images of the condition of bridges and how this would affect the use of the bridges.	Bridges are inspected in accordance with the Ontario Structure Inspection Manual (OSIM) and rated based on results of inspections. If bridge conditions fall to an unacceptable level a lane and/or load reduction may be put in place or the structure may become unusable or fail. Vehicular bridges are inspected every two-years. Pedestrian bridges are inspected every four-years. Photo examples of bridge conditions have been provided on page 44.
Quality	Description or images of the condition of culverts and how this would affect the use of the culverts.	Culverts over 3 m in diameter or multiple culvert groupings with individual culverts over 2 m in diameter are inspected every four years. Large culverts are inspected regularly in accordance with the Ontario Structure Inspection Manual (OSIM) and rated based on results of inspections. If the culvert conditions fall to an unacceptable level a lane and/or load reduction may be put in place or the structure may become unusable or fail. Photo examples of bridge conditions have been provided on page 45.

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Quality	Percentage of survey respondents that feel the City spends an adequate amount on bridges and culverts.	60% of the 2023 Bridges and Culverts Levels of Service Survey respondents feel that the City spends an adequate amount on bridges and culverts.
Quality	Percentage of survey respondents that would be willing to pay more taxes to increase the average condition of the bridges and culverts.	52% of the 2023 Bridges and Culverts Levels of Service Survey respondents would be willing to pay more taxes to increase the average condition of the bridges and culverts in Thunder Bay.
Safety	Percentage of survey respondents that feel safe while travelling over bridges and culverts in the City.	79% of the 2023 Bridges and Culverts Levels of Service Survey respondent feel somewhat or very safe while travelling over bridges and culverts in the City.
Safety	Percentage of survey respondents that feel that the bridges and culverts should be maintained at a GOOD (current) rating.	72% of the 2023 Bridges and Culverts Levels of Service Survey respondents feel that bridges and culverts should be maintained at a GOOD rating.

Table 3.8: Community Levels of Service for Bridges and Culverts. Survey responses from the 2023 Bridges and Culverts Levels of Service Survey can be found in Appendix G.

Service Attribute	Performance Measure	2022/2023 Performance
Quality	Percentage of bridges in the municipality with loading or dimensional restrictions.	The City of Thunder Bay has three (3) bridges with loading or dimensional restrictions; this totals five (5)% of the bridge network. They are: - Grand Trunk Pacific Bridge (15 Tonnes) - Paquette Road Bridge (6,12,19 Tonnes-Triple Load Posting) - McKellar River Bridge (Single lane)
Quality	For bridges in the municipality, the average bridge condition index value.	The average bridge condition index (BCI) value for bridges is 70.4 which corresponds to an average GOOD rating.
Quality	For culverts in the municipality, the average culvert condition rating value.	The average culvert condition rating value for culverts is 68.1 which corresponds to an average FAIR rating.
Performance	Capital re-investment rate vs. target re-investment rate	0.94% vs. 1.84%

Table 3.9: Technical Levels of Service for Bridges and Culverts.

ROAD CLASSIFICATIONS

Engineering & Operations Division
Engineering Department

CITY OF Thunder Bay
Superior by Nature

LEGEND

— COLLECTOR
— EXPRESSWAY
— LOCAL ROAD
— MAJOR ARTERIAL
— MINOR ARTERIAL
— NOT CLASSIFIED
— PROPOSED COLLECTOR
— PROPOSED LOCAL ROAD
— PROPOSED MAJOR ARTERIAL
— PROVINCIAL HIGHWAY
— RURAL ARTERIAL
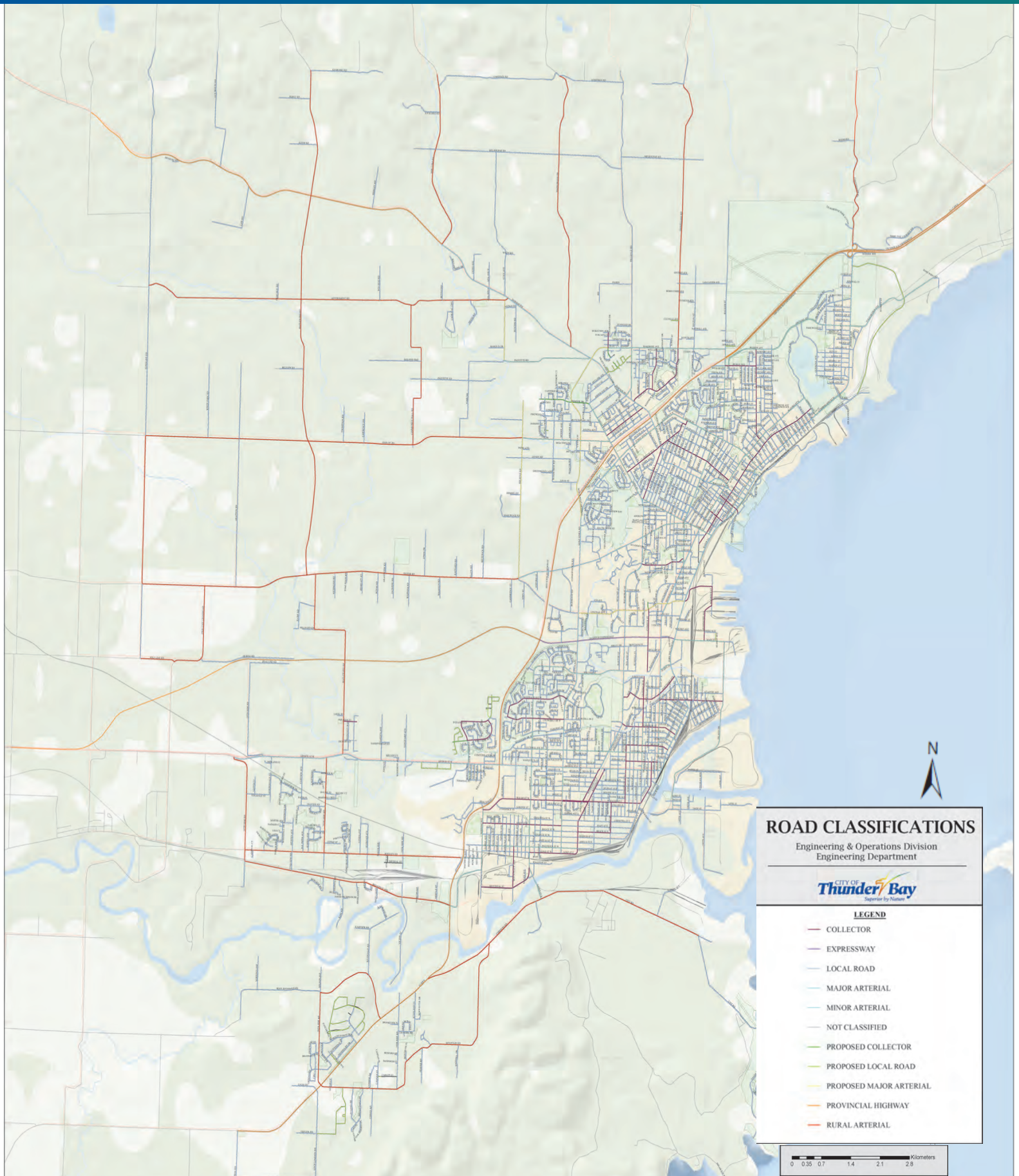
Map 3.1 Thunder Bay Road Classification Map

SIDEWALKS
Engineering & Operations Division
Engineering Department

Thunder Bay

LEGEND

—— SIDEWALKS

0 0.13 0.25   0.5   0.75   1
Kilometers
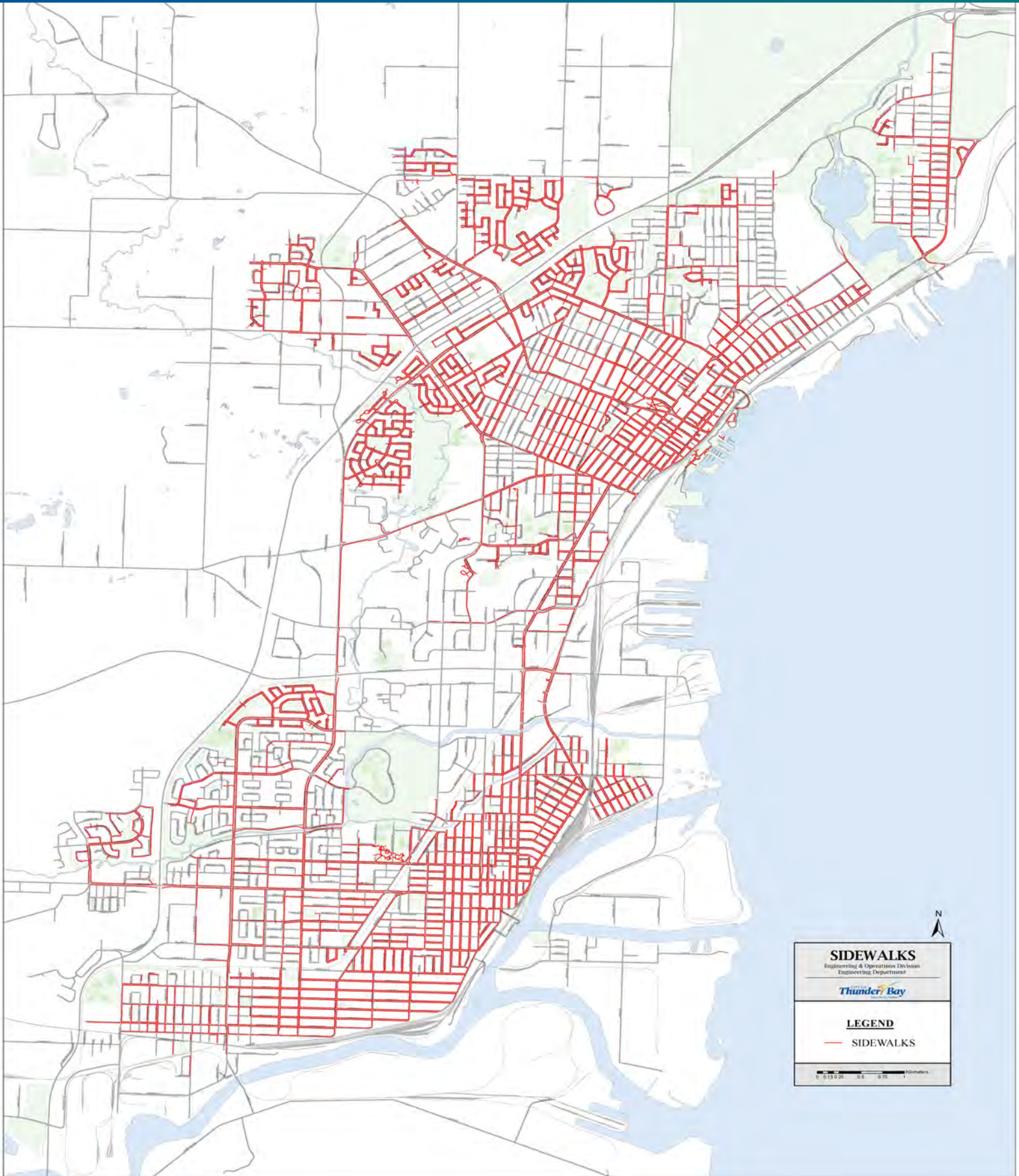
Map 3.2: Thunder Bay Sidewalks Map

N

CITY OF THUNDER BAY

TRAFFIC & STREETLIGHTS

LEGEND
● LIGHTS
● LIGHTS - OTHER

0 0.25 0.5   1   1.5
Kilometers
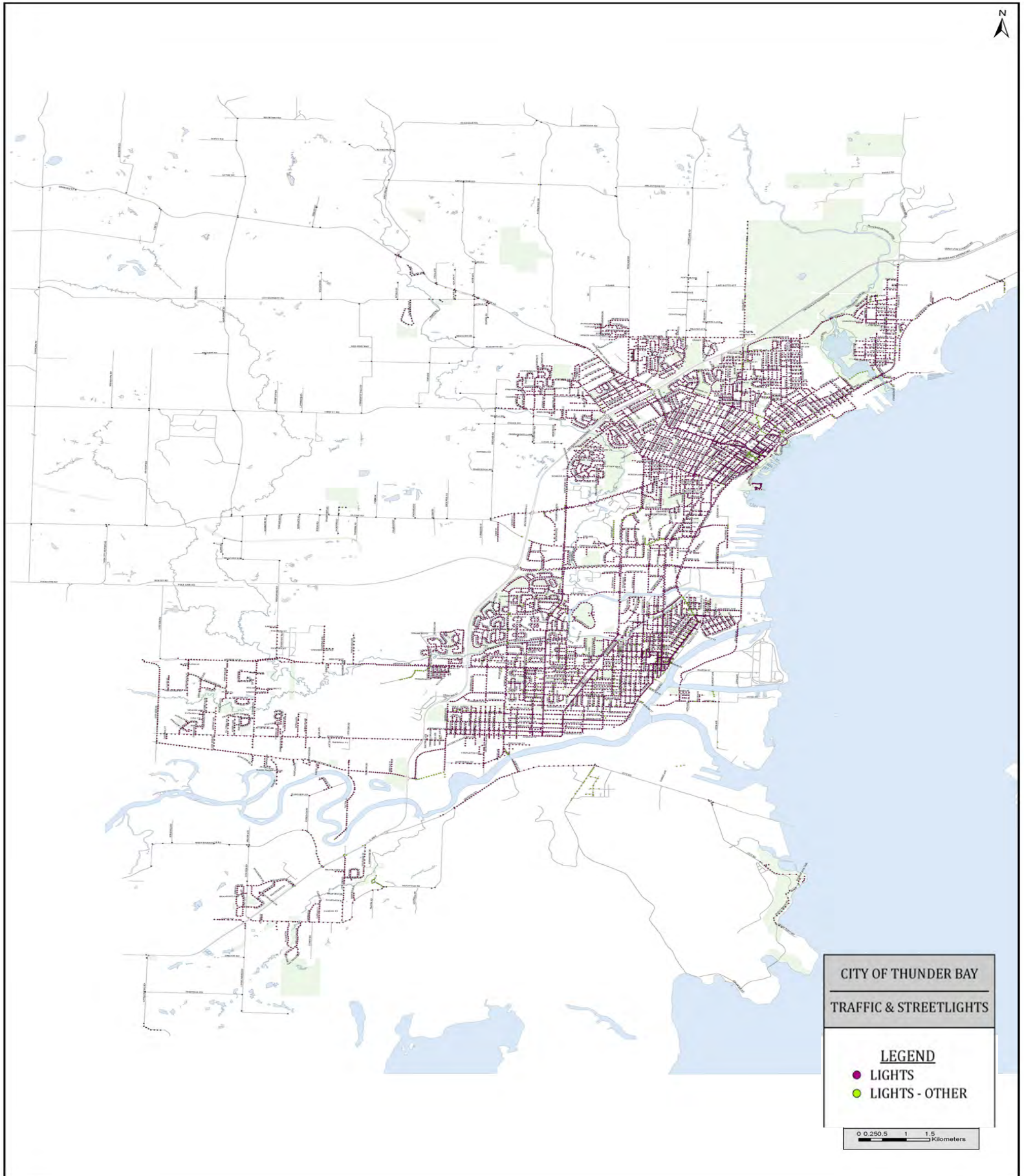
Map 3.3: Thunder Bay Street Lights Map

CITY OF THUNDER BAY
BRIDGES & CULVERTS

LEGEND
○ BRIDGES
📍 CULVERTS > 3M
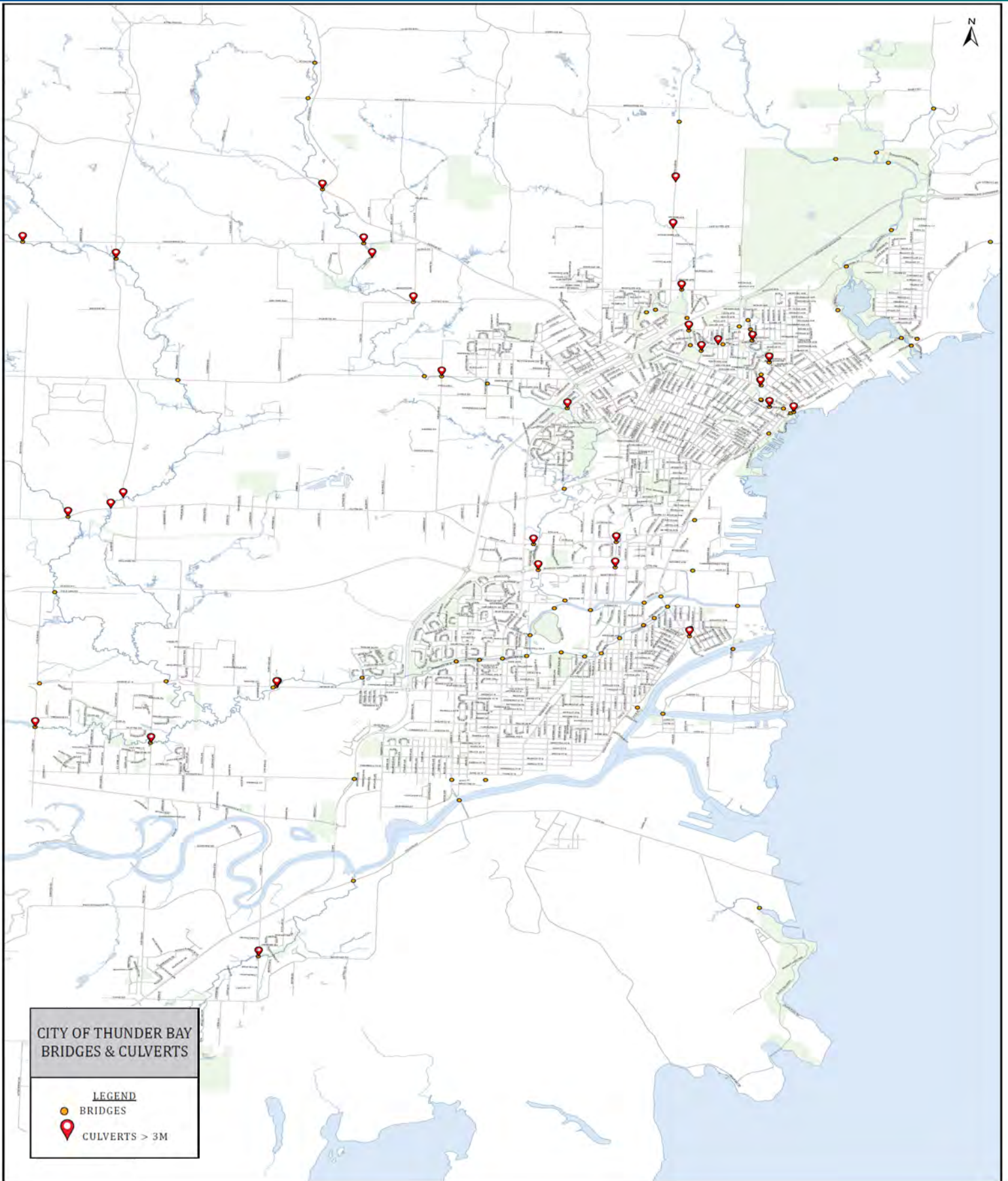
Map 3.4: Thunder Bay Bridges and Culverts Map

3.4 Investing in the Assets

To maintain the proper level of repair, renewal and replacement of roads, the annual sustainable funding amount is $19,423,000. The 5 year historical budgeted funding allocated to the road assets was $11,332,000. This means that there is an infrastructure deficit, or shortfall, of $8,091,000.

The shortfall has and will continue to create a backlog of work and will require significant funding to overcome. A 50 year projection of the annual asset replacement profile is shown below.
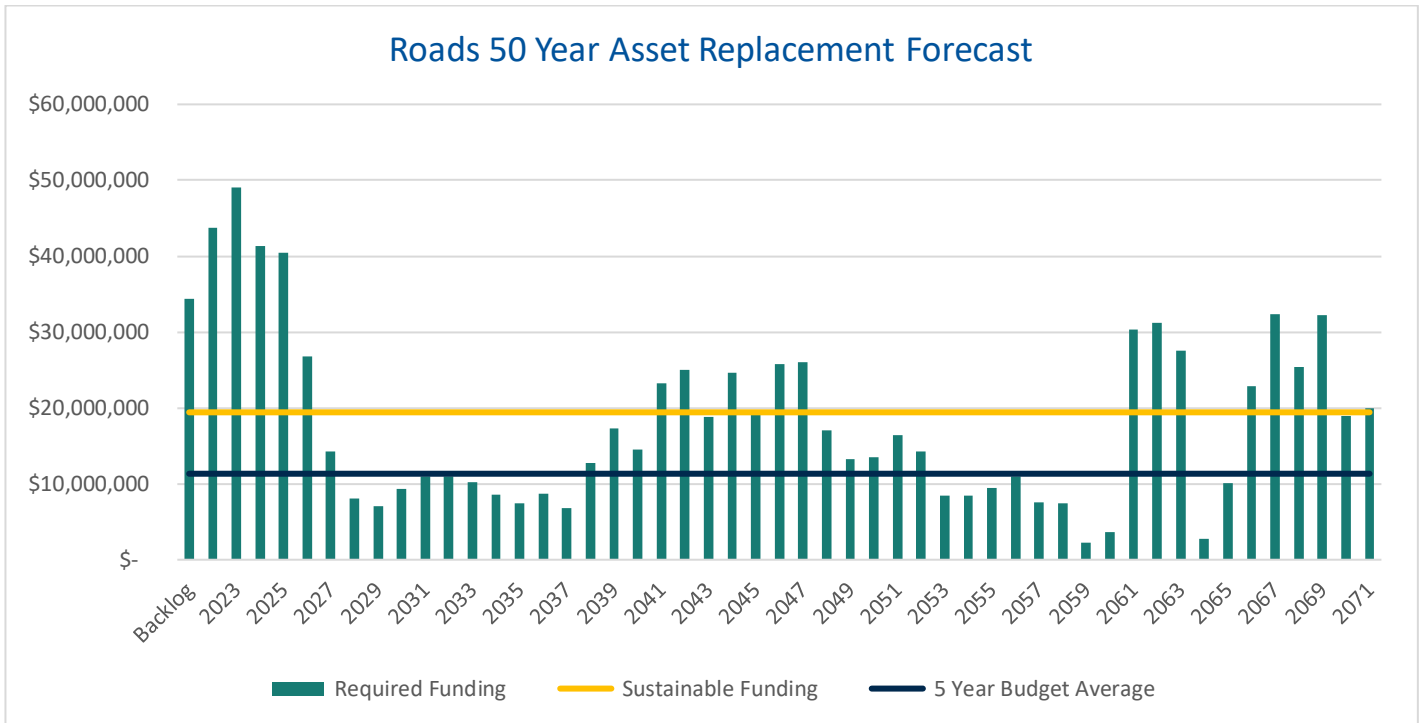
Figure 3.15: Roads 50 Year Asset Replacement Forecast

Roads Infrastructure Deficit:

$8,091,000

To maintain the proper level of repair, renewal and replacement of the sidewalk network, the annual sustainable funding amount is $3,302,000. The 5 year historical budgeted funding allocated to the sidewalk assets was $973,000. This means that there is an infrastructure deficit, or shortfall, of $2,329,000.

The shortfall has and will continue to create a backlog of work that cannot be fully funded and will require significant funding to clear it. A 50 year projection of the annual asset replacement profile is shown below.
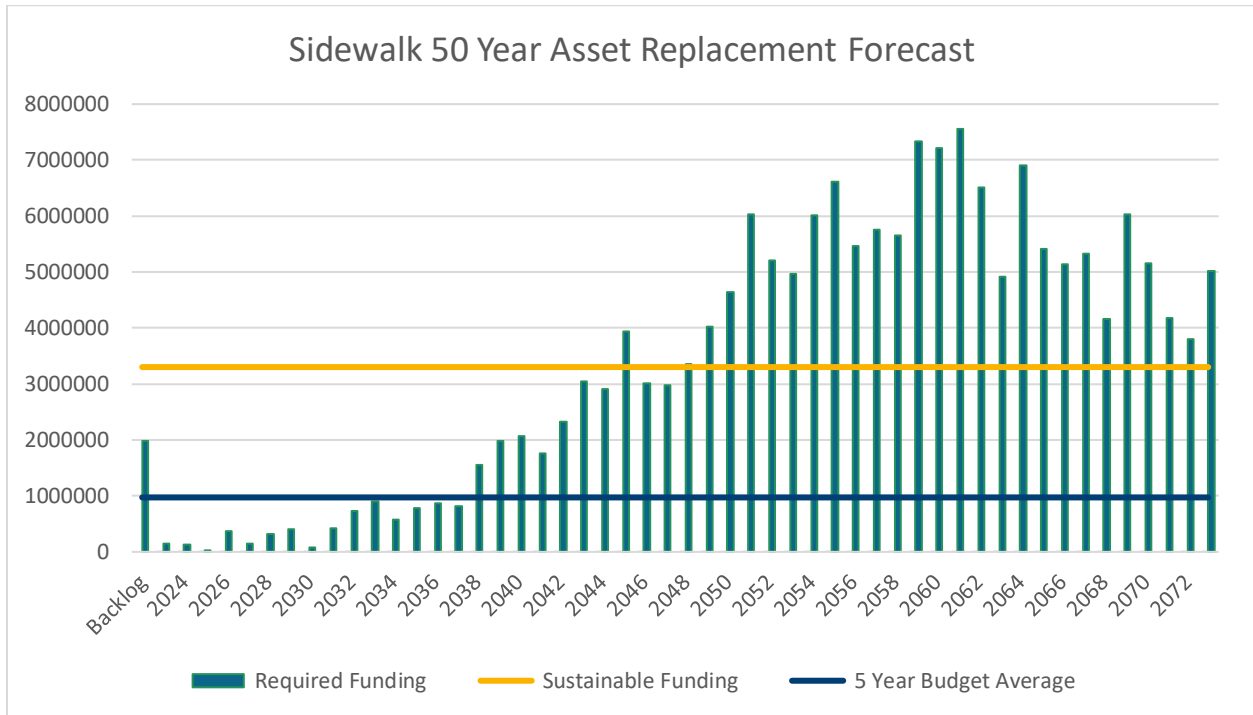
Figure 3.16: Sidewalks 50 Year Asset Replacement Forecast

Sidewalk Infrastructure Deficit:

$2,329,000

To maintain the proper level of repair, renewal and replacement of the Streetlights and Traffic Signals, the annual sustainable funding amount is $2,408,000. The 5 year historical budgeted funding allocated to the streetlights and traffic signals assets was $1,931,000. This means that there is an infrastructure deficit, or shortfall, of $477,000.

The shortfall will begin to create a backlog of work that cannot be fully funded and will require additional funding to clear it. A 50 year projection of the annual asset replacement profile is shown below.

Figure 3.17: Streetlight and Traffic Signal 50 Year Asset Replacement Forecast

Streetlight and Traffic Signal Infrastructure Deficit:

$477,000

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To maintain the proper level of repair, renewal and replacement of the bridges and culverts, the annual sustainable funding amount is $8,613,000. The 5 year historical budgeted funding allocated to the bridge and culvert assets was $4,404,000. This means that there is an infrastructure deficit, or shortfall, of $4,209,000.

The shortfall will create a backlog of work that cannot be fully funded and will require significant funding to clear it. A 50 year projection of the annual asset replacement profile is shown below.
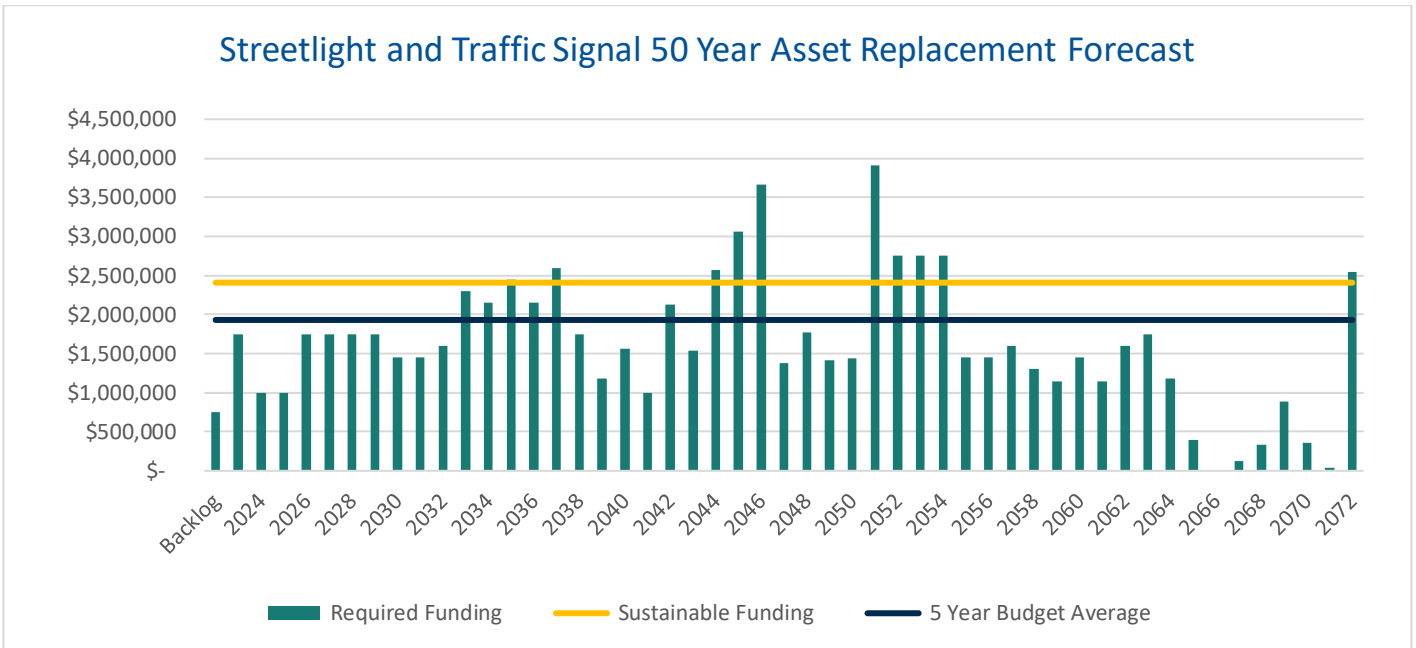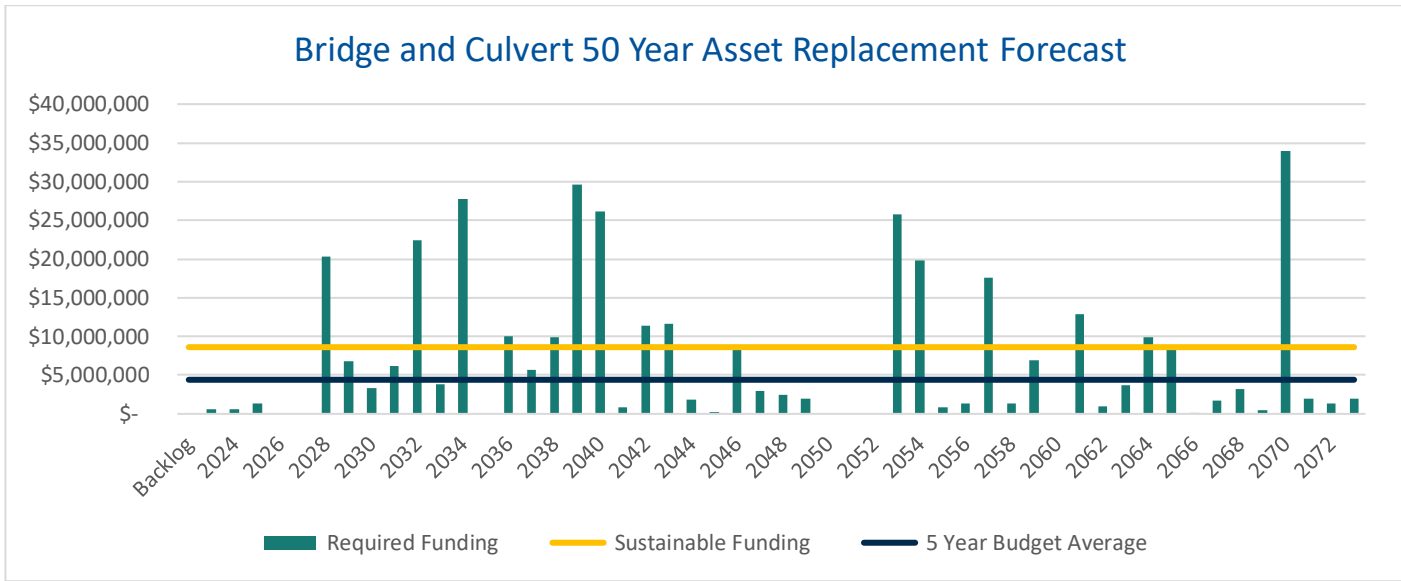

Figure 3.18: Bridge and Culvert 50 Year Asset Replacement Forecast

Bridge and Culvert Infrastructure Deficit:

$4,209,000

3.5 Climate Change Considerations

Transportation assets are directly exposed to the events and impacts of climate change. The Winter Control section of Roads Maintenance Standards is dedicated to maintaining roads during winter events from minor snowfalls to ice storms. The City manages a fleet of specialized vehicles and equipment to provide winter control services. Other weather events, such as a large amount of rainfall, can rapidly impact the function and condition of a roadway.

The repair, renewal and replacement of Transportation assets consider the following climate risks, adaptation, and mitigation opportunities:

Climate Risks Identified with Transportation Services:

- Potential increased service disruptions in the transportation services with more frequent and severe weather events.
- Potential increased maintenance and replacement costs as road, bridge, and culverts durability and lifespan decreases with more severe weather events and freeze and thaw cycles.
- Potential increased damage to roads, bridges, and culverts as more frequent and severe weather events increase stormwater flows through drainage infrastructure and overland flooding from storm water ponding in low-lying areas.
- Thermal expansion of bridges due to an increase in variability of summer and winter temperature can cause detours and traffic disruptions.

Future Climate Adaptation Measures:

- Consider Climate Change impacts in the design, construction and maintenance of the road services while considering affordability and co-benefits.
- Incorporate new technology and best practices in the design, construction and maintenance of new infrastructure to minimize service disruption and increase resiliency.
- Flood access and egress study to determine what road/culvert/bridge/flood plain mitigation works and what funds would be required to meet the Ministry of Natural Resources and Forestry Technical Guide requirements.
- Bridges that span over bodies of water need to be inspected and renewed as necessary to avoid impeding flow, which could lead to upstream flooding, bridge damage, and shortened asset life.
- Infrastructure is inspected and updated to comply with changing regulations regarding municipal flood planning

Future Climate Mitigation Opportunities:

- Reducing vehicular traffic, or vehicle kilometres travelled, not only leads to reductions in Greenhouse Gas (GHG) emissions but may also reduce wear and tear on the road services.
- Investing in complete, connected cycling and pedestrian networks in the short to medium term (aligns with Objective #13, Thunder Bay Net-Zero Strategy).
- Assess embodied carbon of materials used in infrastructure projects and explore opportunities to use materials and construction methods with lower embodied carbon.

DRINKING WATER

Assets that relate to the production, treatment, storage, supply, or distribution of drinking water.

4.0 Drinking Water Assets

The City is committed to maintaining a safe and sustainable supply of drinking water, providing for public health protection, fire protection and support for the local economy. Drinking water assets have a total replacement value of $887,672,031.

4.1 Asset Overview

The City's Drinking Water Network is comprised of the Bare Point Water Treatment Plant (WTP) and the distribution network. After treatment, clean safe drinking water leaves the WTP and enters the distribution network. The network has 37,877 service connections, and 726 km of watermains. Additionally, the network has seven (7) pumping stations, four (4) reservoirs, one (1) standpipe, 9,456 valves and 2,595 hydrants. Table 4.1 outlines the inventory, replacement cost, average age, and condition for the Drinking Water assets.

Asset Class	Replacement Value	Asset Totals	Average Age	Average Condition
All Drinking Water Assets	887,672,000	See below	55 years	Fair
Drinking Water Assets*				
Watermains, hydrants and valves	$729,241,000	726 km watermains 9,559 valves 2,595 hydrants 37,877 service connections	55 years	Fair
Water Treatment & Distribution Facilities	$158,431,000	1 Water Treatment Plant 7 Pumping stations 4 Reservoirs 1 Standpipe 3 Water Fill Stations	37 years	Good

Table 4.1: Drinking Water Asset Overview

* A financial plan is in place for the Drinking Water System to achieve financial sustainability, full-cost recovery and affordability for consumers, while maintaining existing service levels. The City of Thunder Bay Water Authority Drinking Water System Financial Plan was prepared in accordance with the Ministry of the Environment, Conservation, and Parks (MECP) Financial Plans Regulation (O. Reg. 453/07).

4.1.1 DRINKING WATER ASSETS CONDITIONS

Watermains Condition Ratings
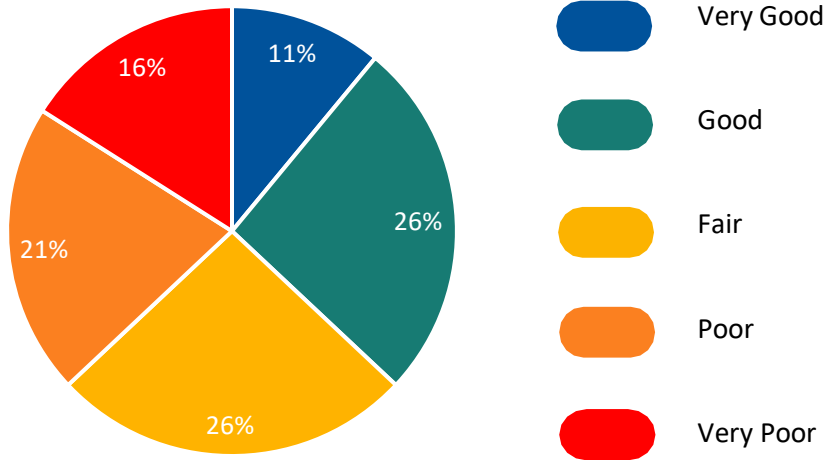
Figure 4.1: Condition Profile of watermain assets broken down as percentage of total replacement cost.

A rating system has been developed for watermains within the City to quantify the risk of failure of a pipe based on several key factors, each weighted and based on their contribution to potential failure risks. Watermain ratings are based on the surrounding soil type, previous break history, pipe material type, and watermain age. Removal of lead service connections also plays a role in prioritizing the rehabilitation or replacement of watermains.

Water Treatment and Distribution Facilities Condition Ratings
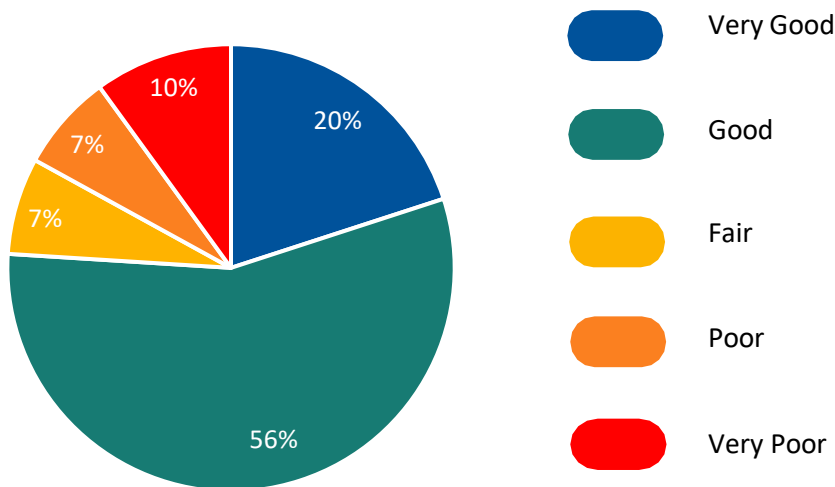
Figure 4.2: Condition Profile of drinking water treatment and distribution facilities broken down as percentage of total replacement cost.

4.1.3 ASSET AGE

Figure 4.3 shows the average age and estimated useful life of the drinking water assets. The average age of the main structural assets within the Drinking Water Network are as follows:

- Standpipe: 72 Years
- Water Treatment Plant: 15 Years. The WTP was built in 1903, with expansions in 1978 and 2007.
- Water Fill Stations: 15 Years
- Reservoirs: 41 Years
- Pumping Stations: 44 Years
- Watermains: 54 Years

Average Age and Estimated Useful Life for Drinking Water Assets
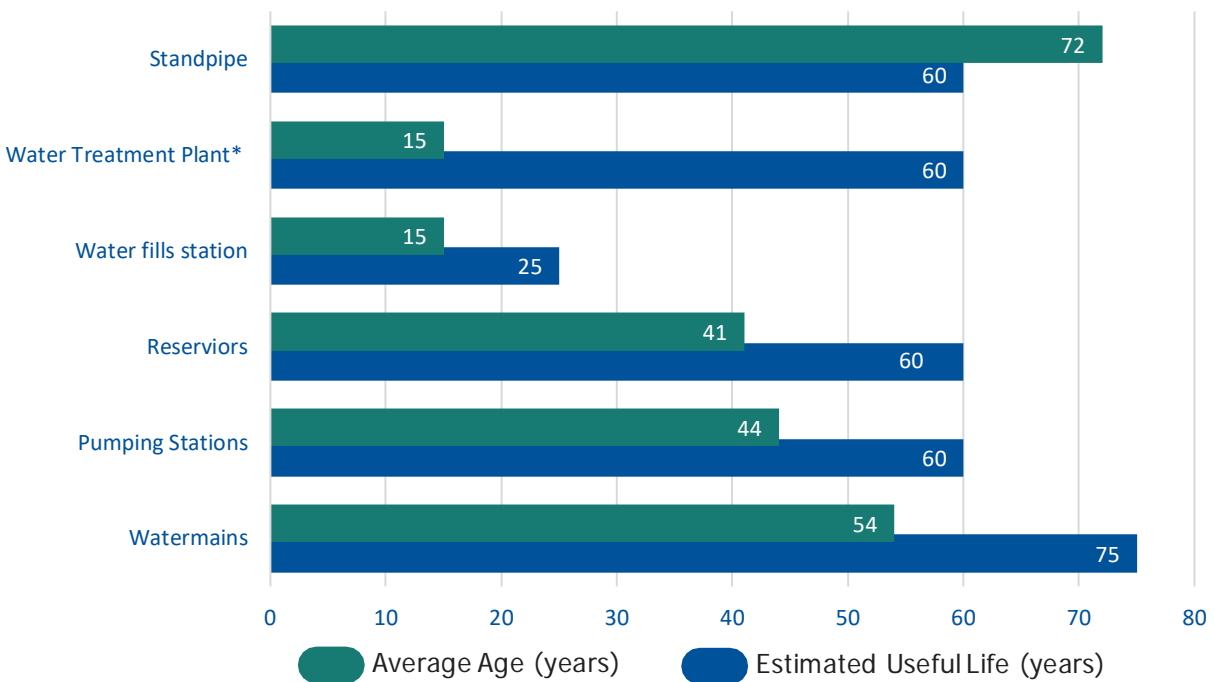
Figure 4.3: Average Age and EUL of Drinking Water Assets
 *The Water Treatment Plant age is based on the last expansion in 2007

4.2 Lifecycle of the Asset

The City's drinking water network requires the proper lifecycle activities to deliver clean and safe drinking water. If the proper lifecycle activities do not occur there is a potential risk of asset failure which may result in environmental, economic and social impacts.

At the WTP software is used to plan and schedule preventative maintenance for equipment at the plant, pumping stations and reservoirs based on manufacturer recommendations, industry best practice, past performance, and regulatory requirements. The software forecasts the maintenance, rehabilitation and replacement based on maintenance schedules. In addition, the software is used to query equipment failure.

Maintenance
- Maintenance and inspections of watermains are completed on a case-by-case basis, typically on trunk watermains where an issue may be suspected. Inspection of pressure pipes carrying potable water is limited due to the high costs and service shutdowns required for these inspections. Maintenance such as exercising of water valves and emergency repairs support the lowest lifecycle cost by extending the length between capital projects. Flow and pressure testing is conducted to identify need for repairs.

Rehabilitation
- The City of Thunder Bay uses methods such as cathodic protection, to prevent corrosion of the pipes in poor soil conditions and extends the overall life of the asset. For older watermains, activities such as cleaning and cement mortar lining are used to remove and prevent further tuberculation of the asset.

Replacement/Reconstruction
- Water delivery assets are replaced when the asset is nearing end of useful life based on the rating of the asset as described below or replacement is required for water quality or fire flow improvements.

Disposal
- Watermains are either removed during the renewal construction or are disconnected and abandoned in place. The decision between removal and abandonment is based on construction effort, costs, and future plans. Mains that have been abandoned are capped and filled to protect the surrounding and other infrastructure.

4.3 Levels of Service

To maintain safe and functioning Drinking Water Network, the City continually adheres to all regulations and water standards set by the Province.

The *Regulation* provides metrics to measure the current community LOS and technical metrics. The *Regulation* also requires the Municipality to report on the energy consumption for such assets including energy usage and operating efficiency. Additionally, public survey responses were collected to aid in measuring levels of service. Survey responses can be found in Appendix G.

4.3.1 COMMUNITY LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal drinking water network.	To deliver clean safe drinking water to service users the City of Thunder Bay's water distribution system services contains: - seven (7) pumping stations - four (4) reservoirs - one (1) standpipe - 726 km of watermains - 37,877 service connections, - 9,456 valves, and - 2,595 hydrants A map of the City of Thunder Bay Water Supply has been provided on page 79.
Scope	Description, which may include maps, of the user groups or areas of the municipality that have fire flow.	A map of the City of Thunder Bay's fire flow coverage is depicted by the hydrant supply services, provided on pages 80. The City's standard hydrant spacing does not exceed 90m in non-residential areas (i.e. industrial) and 150m in residential areas.
Scope	Percentage of survey respondents that are connected to Thunder Bay's municipal water network	91% of the 2023 Water Levels of Service Survey respondents are connected to the municipal water network.
Quality	Percentage of Citizen's that are either very or somewhat satisfied with the various services related to drinking water quality based on 2022 Citizen Satisfaction Survey.	Drinking Water Quality: 83% satisfied (City of Thunder Bay 2022 Citizen Satisfaction Survey Report)
Reliability	Description of boil water advisories and service interruptions	Thunder Bay residents receive excellent quality drinking water. Samples are taken and evaluated according to the Ministry of the Environment, Conservation

		and Parks regulations. Water quality is monitored at the WTP every minute of every day by Operators and online instrumentation. In addition, an independent certified laboratory tests approximately 2,000 samples annually for potential contaminants. The total number of water samples taken in 2022 was over 29,000. The testing program is fully compliant with Ontario's Drinking Water Regulations. A Boil Water advisory (BWA) or Drinking Water Advisory is used if contamination is found. There are three levels of BWA's with increasing severity: - Precautionary BWA - BWA (order), and a - Do Not Drink Order Service disruptions are typically caused by watermain breaks which are tracked in terms of duration and number of customers affected.
Reliability	Percentage of survey respondents that feel drinking water is readily available with minimal to no service interruptions.	96% of the 2023 Water Levels of Service Survey respondents feel drinking water is readily available.
Safety	Percentage of survey respondents that feel the water from their tap is somewhat or very safe.	80% of the 2023 Water Levels of Service Survey respondents feel drinking water is somewhat or very safe.
Function	Percentage of survey respondents that had an unplanned service interruption in the last year.	10% of the 2023 Water Levels of Service Survey respondents had an unplanned service interruption. Of those respondents 50% felt the City responded and resolved the issue in a timely manner.
Function	Percentage of survey respondents that had a planned service interruption in the last year.	9% of the 2023 Water Levels of Service Survey respondents had a planned service interruption. Of those respondents, 70% said the City provided advanced notice of the interruption.

Table 4.2: Community Levels of Service for Drinking Water Assets; Survey responses from the 2023 Water Levels of Service Survey can be found in Appendix G.

4.3.2 TECHNICAL METRICS LEVEL OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Percentage of properties connected to the municipal drinking water network.	The City of Thunder Bay has 85.4% of properties connected to the municipal water network.
Scope	Percentage of properties where fire flow is available.	The City of Thunder Bay has fire flow available to 96.6% of residential properties and 97.24% of commercial properties in the urban service limits.
Function	Number of work orders created due to concerns of colour, taste, or odour.	The City of Thunder Bay responded to 41 reports of bad colour, 5 reports of bad odour and 13 reports of bad taste.
Function	Number of lead water samples collected from the active distribution system.	There were 173 representative lead water samples collected from the active distribution system in 2022.
Function	Number of lead water samples collected and tested for residents and businesses with known or suspected lead services.	There were 513 lead water samples collected and tested in 2022 for residents and businesses.
Quality	The number of connect-days per year where a boil water advisory (precautionary, BWA, Do Not Drink) notice is in place compared to the number of properties connected to the municipal water system.	The number of connect-days per year where a BWA (precautionary, BWA, Do Not Drink) was in place compared to the number of properties connected to the system is 0.000014 days.
Quality	The number of connection-days per year impacted due to watermain breaks compared to the total number of properties connected to the municipal water system.	The number of connect-days per year impacted due to watermain breaks compared to the total number of properties connected to the system is 0.000023 days.
Performance	Capital re-investment rate vs. target re-investment rate	1.58% vs. 1.58%

Table 4.3: Technical Levels of Service for Drinking Water Assets

4.3.3 ENERGY CONSUMPTION

The City of Thunder Bay tracks and monitors energy within the WTP, reservoir and pumping facilities. Utility consumption data and costs are monitored and tracked digitally for all commodities including electricity, natural gas and water. This allows for the creation of a variety of reports including, but not limited to, benchmarking, identifying energy savings opportunities and reporting greenhouse gas emissions. Data can also be viewed over time to compare a variety of parameters including consumption and costs with built in weather normalization.

Category	Electricity (KWH)		Natural Gas (m3)	
	2021	**2022**	**2021**	**2022**
Pumping Stations	1,456,499	1,516,427	14,893	15,816
Reservoirs	275,785	272,920	18,269	21,591
WTP	6,850,209	6,887,825		
Standpipes	92,555	118,770		
Taphouses	30,190	34,657		

Table 4.4: Energy Consumption for Bare Point WTP, Reservoirs and Pumping Stations.

MUNICIPAL WATER SUPPLY AREA
Engineering & Operations Division
Engineering Department

Thunder Bay

LEGEND

— WATERMAINS

■ NO MUNICIPAL WATER SUPPLY
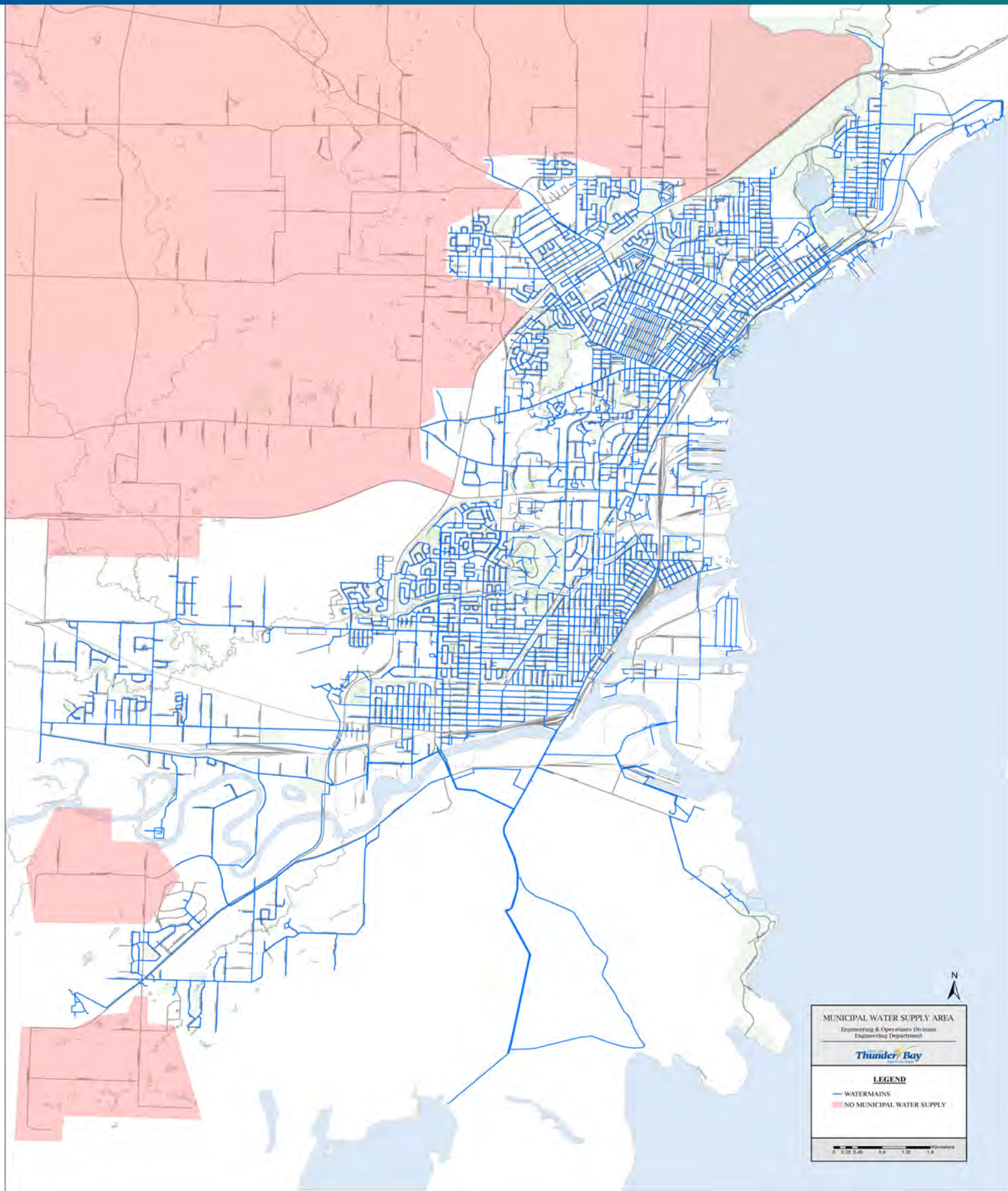
Map 4.1: City of Thunder Bay Drinking Water Supply Map
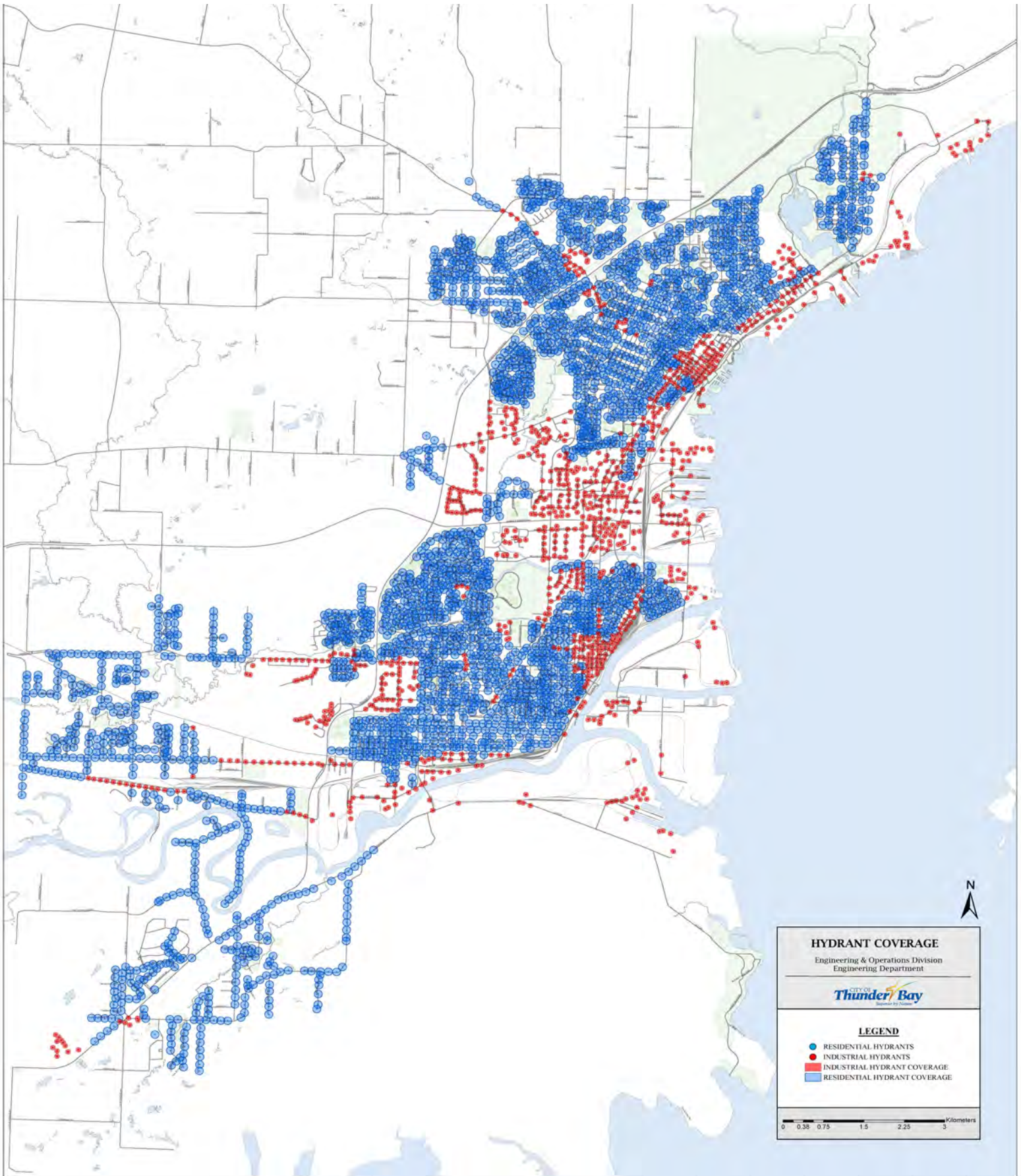
Map 4.2: City of Thunder Bay Hydrant Coverage Map

4.4 Investing in the Assets

To achieve a sustainable level of funding for drinking water services for both the short and long term, the Drinking Water System has a Council approved 20 year Financial Plan prepared in accordance with the Ministry of Environment Financial Plans *O.Reg 453/07*. The plan, which is updated every five (5) years to achieve full cost recovery over the long term and maintains current service levels while limiting overall water costs to consumers.

To maintain the proper level of repair, renewal, and replacement of the Drinking Water Network, the annual sustainable funding amount is $14,051,000. The five (5) year historical budgeted funding allocated to the drinking water assets was in line with the sustainable funding amount, meaning that there is no funding deficit for the drinking water assets.

A 50 year projection of the annual asset replacement profile is shown below.

Drinking Water Assets 50 Year Replacement Forecast

Legend:
- Required Funding
- 5 year budget average and annual requirement
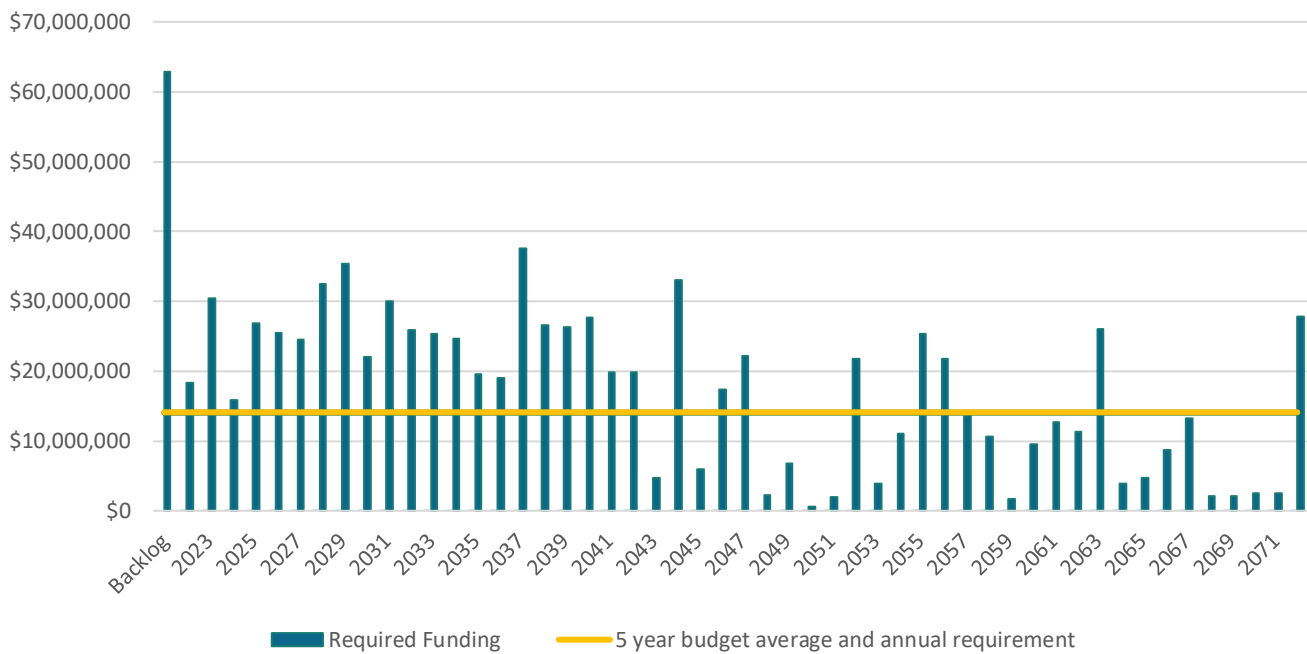
Figure 4.4: Drinking Water Assets 50 Year Replacement Forecast

Drinking Water Assets are

100% FUNDED

4.5 Climate Change Considerations

The Drinking Water Network is directly impacted by climate change. Weather events such as cold temperatures can cause watermains to break and services to freeze. The repair, renewal and replacement of water assets consider the following climate risks, adaptation and mitigation opportunities.

Climate Risks Identified with Drinking Water Assets

- Potential increased service disruptions in drinking water network with more frequent and severe weather events.
- Increased damage to in-ground infrastructure due to deep frost, frost-heaving and freeze-thaw cycles from greater temperature variability.
- Potential increased maintenance and replacement costs as infrastructure and facilities' durability and lifespan decreases with more frequent and severe weather events.

Future Climate Adaptation Measures

- Conduct a 'threat mapping' exercise to identify critical drinking water infrastructure and facilities that would be impacted by extreme weather events, and prioritize and implement projects to protect them.

Future Climate Mitigation Measures

- Explore further opportunities to increase water pumping efficiency (Objective #16, Thunder Bay Net-Zero Strategy.)
- Consider other processes for backwash treatment to reduce flows to the Water Pollution Control Plan

STORMWATER

Assets that relate to the collection, transmission, treatment, retention, infiltration, control, or discharge of stormwater.

5.0 Stormwater Assets

The City of Thunder Bay's stormwater assets manage the runoff of rain and melted snow that flows overland into catchbasins, ditches, streams, rivers and lakes. Stormwater is soaked up like a sponge in natural landscapes, which then nourishes plants and slowly replenishes streams, lakes, wetlands and aquifers. In more urban areas, impervious or hard surfaces such as asphalt, concrete and rooftops prevent stormwater from naturally soaking into the ground. Instead, the water runs quickly into catchbasins and sewer systems and then to lakes and rivers. These hard surface areas create more stormwater runoff of poorer quality carrying more pollutants such as oil, grit and debris into surrounding lakes and rivers. The runoff may contain chemicals, sediment and litter. In addition, the proper operation of the stormwater assets directly impacts the transportation assets. Road performance is directly impacted by drainage. Providing positive drainage in road right-of-ways and limiting ponding water increases the life of our road assets. Stormwater assets have a total replacement value of $372,260,000.

5.1. Asset Overview

The City of Thunder Bay's stormwater assets include 345 km of storm sewers, 486 km of ditches, three (3) stormwater retention ponds, more than 11,000 catch basins, 6,062 manholes, two (2) dams, 28 green infrastructure facilities, 39 oil-grit separators, and 373 outlets to receiving waters. Table 5.1 outlines the inventory, replacement cost, average age and condition for each of the stormwater asset types.

Asset Class	Replacement Value	Asset Totals	Average Age	Average Condition
All Stormwater Assets	$372,260,000	See below	39 years	**Fair**
Stormwater Assets				
Storm Sewers	$349,308,000	345 km	39 years	**Fair**
Pumping Stations	$6,611,000	4 pumping stations	24 years	**Good**
Low Impact Developments	$1,589,000	28	4 years	**Very Good**
Oil Grit Separators	$1,854,000	39	7 years	**Very Good**
Dams	$12,898,000	2	26 years	**Very Good**

Table 5.1: Stormwater Asset Overview

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5.1.1 ASSET CONDITION

Stormwater Assets Condition Profile
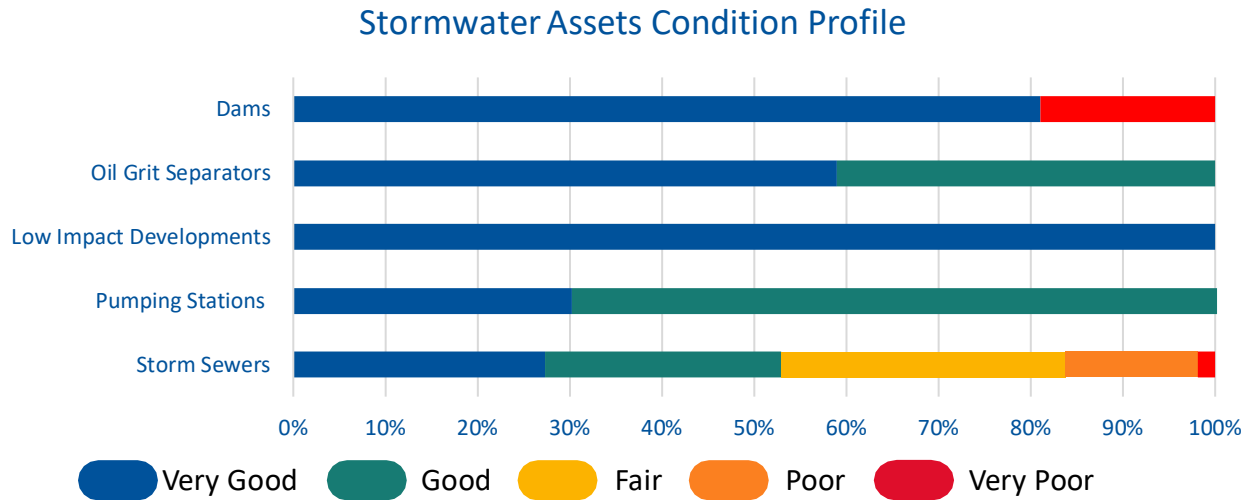
Figure 5.1: Condition Profile of stormwater assets broken down as percentage of total replacement cost.

Several components of the system such as the storm sewer system, catch basins and manholes are inspected if a problem is reported or suspected. The City's Roads Maintenance Objectives identifies that each year a percentage of the City's inventory of culverts and ditches and associated works are inspected for obstructions and appropriate action is undertaken for the drainage system to function properly.

The stormwater pumping stations are inspected a minimum of once a month and an annual work order system is in place to remind and record inspection and maintenance requirements for the components of the pumping station.

The stormwater management and treatment facilities and storm sewer outfalls are generally inspected on an annual basis, although seasonal inspections are often completed as the function of the facilities can change from season to season.

5.1.2 ASSET AGE

The average age of the stormwater assets are :

- Dams: 26 Years
- Oil Grit Separators: 7 Years
- Low Impact Developments: 4 Years
- Pumping Stations: 24 Years
- Storm Sewers: 39 Years

Average Age and Estimated Useful Life for Stormwater Assets
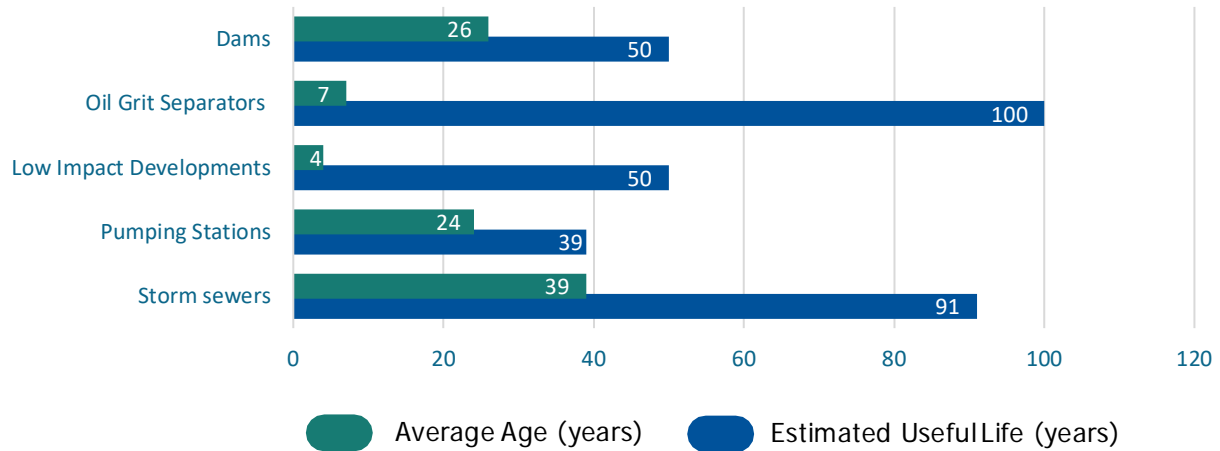
Figure 5.2: Average Age and EUL of Stormwater Assets

5.2 Lifecycle of the Asset

If the appropriate lifecycle activities are not completed and a backlog of maintenance occurs there is a potential for the failure of stormwater assets. The consequence of a failure for storm sewers are tied directly to the size of the sewer. The failure of a storm sewer may cause a significant backup throughout the system; larger storm main failures will have greater impacts. The failure of a storm sewer will have significant environmental, economic, safety and public health impacts.

Maintenance

- Maintenance of the stormwater assets happens on an as needed basis with emergency repairs, maintenance of ditches, flushing outlet structures, cleaning of oil and grit separators. Actions like this support the lowest lifecycle cost by extending the length between capital projects.

Rehabilitation

- The City of Thunder Bay is able to inspect stormwater sewers with camera technology. Relining of stormwater sewers is an option to extend the lifecycle of the asset.

Replacement/Reconstruction

- Stormwater sewers are replaced based on condition determined during camera inspections or operation issues.

Disposal

- Stormwater sewers are either removed during the renewal construction or are disconnected and abandoned in place. The decision between removal and abandonment is based on construction effort, costs, and future plans. Sewers that have been abandoned are capped and filled to protect the surrounding and other infrastructure.

5.3 Levels of Service

Stormwater assets help to reduce flooding risks and protects roads, structures, properties and waterways. The regulation provides metrics to measure the current community (qualitative) LOS and technical (quantitative) metrics. Additionally, public survey responses were collected to aid in measuring levels of service. Survey responses can be found in Appendix G.

5.3.1 COMMUNITY LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	A map has been provided on pages 89 and 90 depicting the areas of the City of Thunder Bay that are protected from flooding by means of storm sewers and/or low impact developments, or stormwater retention ponds.
Scope	Percentage of survey respondents that have experienced flooding impacts on their property.	45% of the 2023 Stormwater Levels of Service Survey respondents reported having experienced flooding impacts on their property.
Function	Percentage of survey respondents that have NOT had to delay or cancel travel due to rads being flooded in the last 5 years.	66% of the 2023 Stormwater Levels of Service Survey respondents have never had to delay or cancel travel due to roads being flooded.
Function	Percentage of survey respondents that feel thunder bay is taking enough steps to reduce the risk of flooding in the City.	The 2023 Stormwater Levels of Service Survey respondents responded with the following when asked about the City taking enough steps to reduce the risk of flooding: - 25% said Yes - 33% said No - 42% said Unsure
Quality	Percentage of Citizen's that are either very or somewhat satisfied with the various services related to storm water assets based on 2022 Citizen Satisfaction Survey.	Storm water drainage: 67% satisfied (City of Thunder Bay 2022 Citizen Satisfaction Survey Report)

Table 5.2: Community Levels of Service for Stormwater Assets. Survey responses from the 2023 Stormwater Levels of Service Survey can be found in Appendix G.

5.3.2 Technical Metrics Level of Service

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Percentage of properties in the municipality resilient to a 100-Year Storm.	95.23% percent of properties are resilient to riverine flooding from a 100-year storm. A map illustrating the flood resilience for riverine flooding based on a 100-Year Storm and the Regional Storm can be found on page 90. Additional modelling is required to determine resiliency to urban flooding.
Scope	Percentage of the municipal stormwater management system resilient to a 5-year storm.	100% of the stormwater management system is resilient to a 5-year storm.
Function	Number of calls to dispatch regarding ditch concerns.	The City of Thunder Bay responded to 53 reports from the public regarding ditches.

Table 5.3: Technical Levels of Service for Stormwater Assets.

What is the 100-Year Storm?

The term "100-year storm" is used to simplify the definition of a rainfall event that statistically has a one (1) percent chance of occurring or being exceeded in any given year, at any given place. A 100-year storm does not mean that it will only occur once every 100 years.

What is the Regional Storm?

The Regional Storm for Northern Ontario is a storm that occurred in Timmins, Ontario in 1961 in which 193 millimetres of rain fell in 12 hours. In most cases the Regional Storm exceeds the 100-year storm.

NORTHWARD STORM COVERAGE

Engineering & Operations Division
Engineering Department

CITY OF
Thunder Bay
Superior by Nature

LEGEND

— STORM MAINS
▮ STORMWATER MANAGEMENT FACILITIES

Kilometers
0   0.1   0.2   0.4   0.6   0.8

N
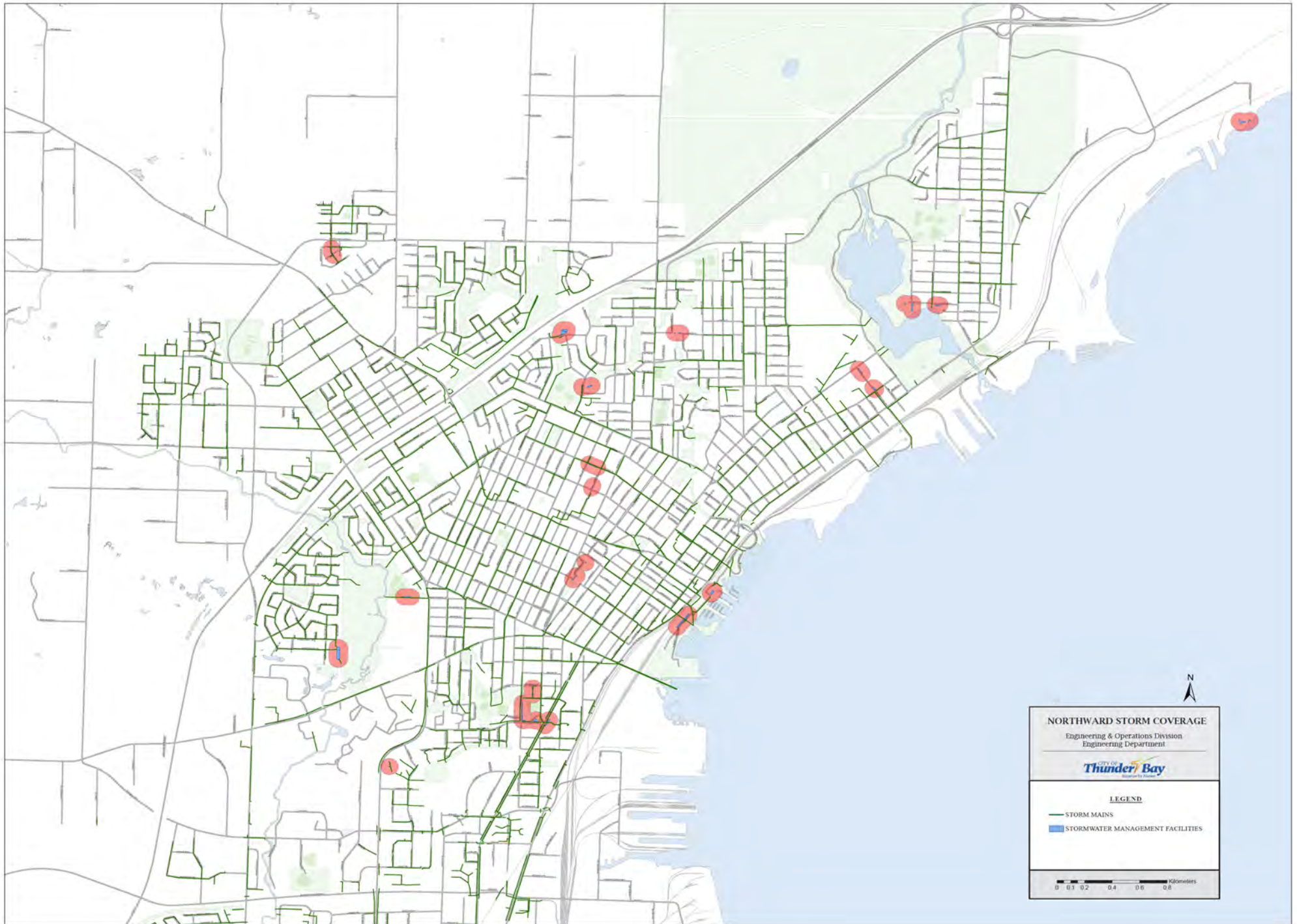
Map 5.1 Thunder Bay Northward Storm Map
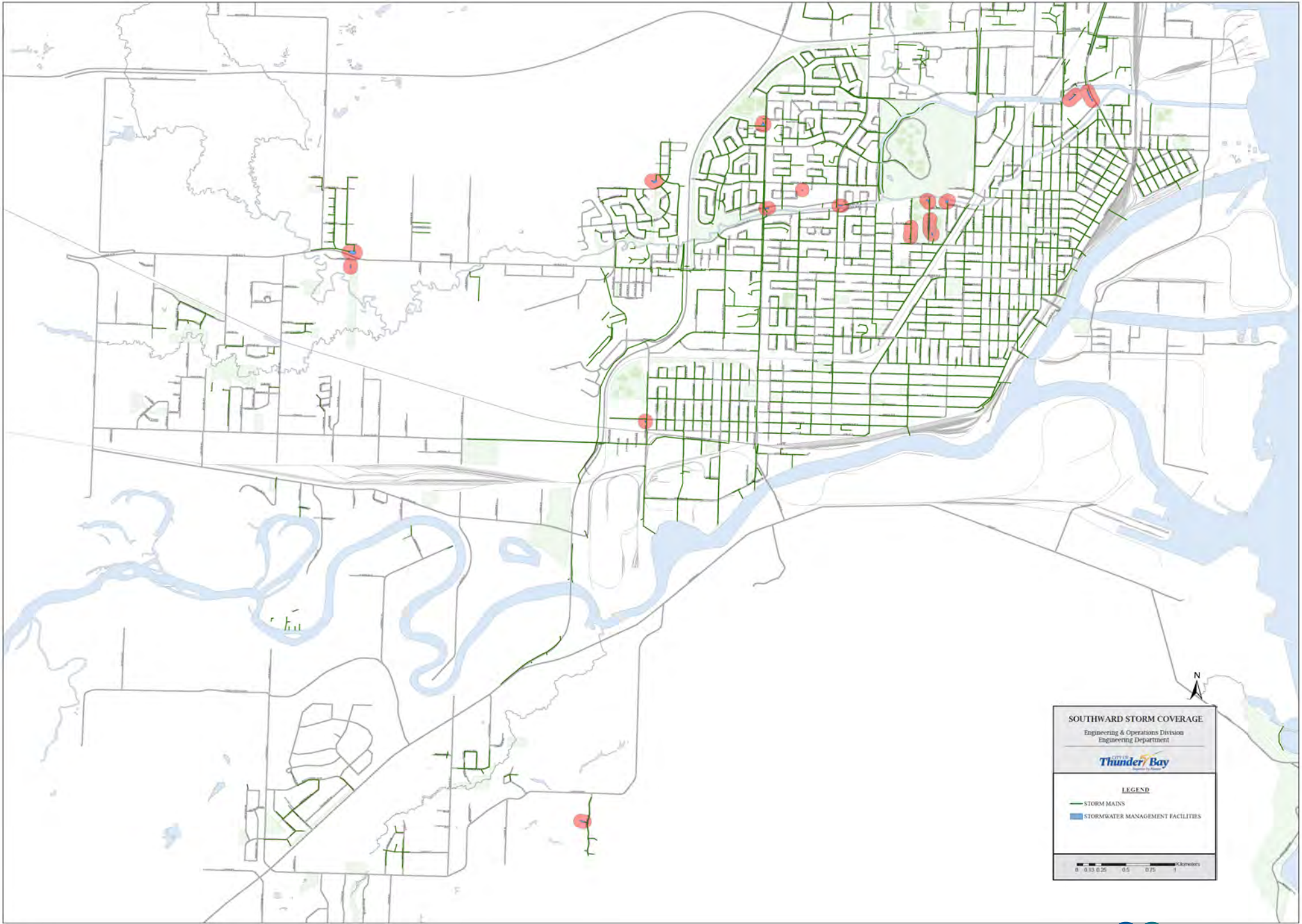
Map 5.2: Thunder Bay Southward Storm map
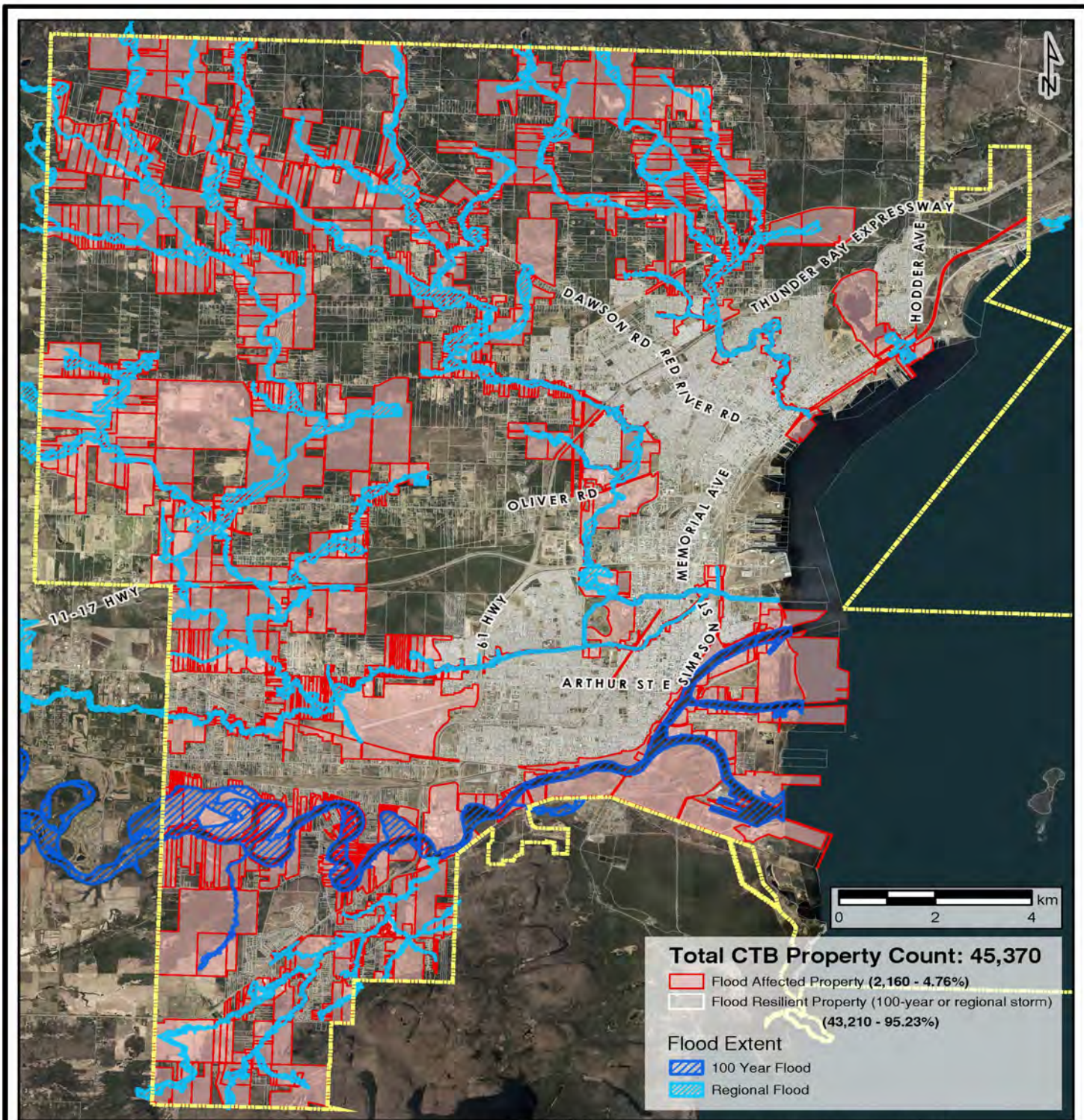
SOUTHWARD STORM COVERAGE

Engineering & Operations Division
Engineering Department

Thunder Bay

LEGEND

STORM MAINS
STORMWATER MANAGEMENT FACILITIES

Map 5.3: Thunder Bay Flood Resilience Map

5.4 Investing in the Assets

To maintain the proper level of repair, renewal and replacement of the stormwater assets the annual sustainable funding amount is $4,350,000. The 5 year historical budgeted funding allocated to the stormwater assets was $3,156,000. This means that there is an infrastructure deficit, or shortfall, of $1,194,000.

The shortfall has and will continue to create a backlog of work and will require significant funding to overcome. A 50 year projection of the annual asset replacement profile is shown below.
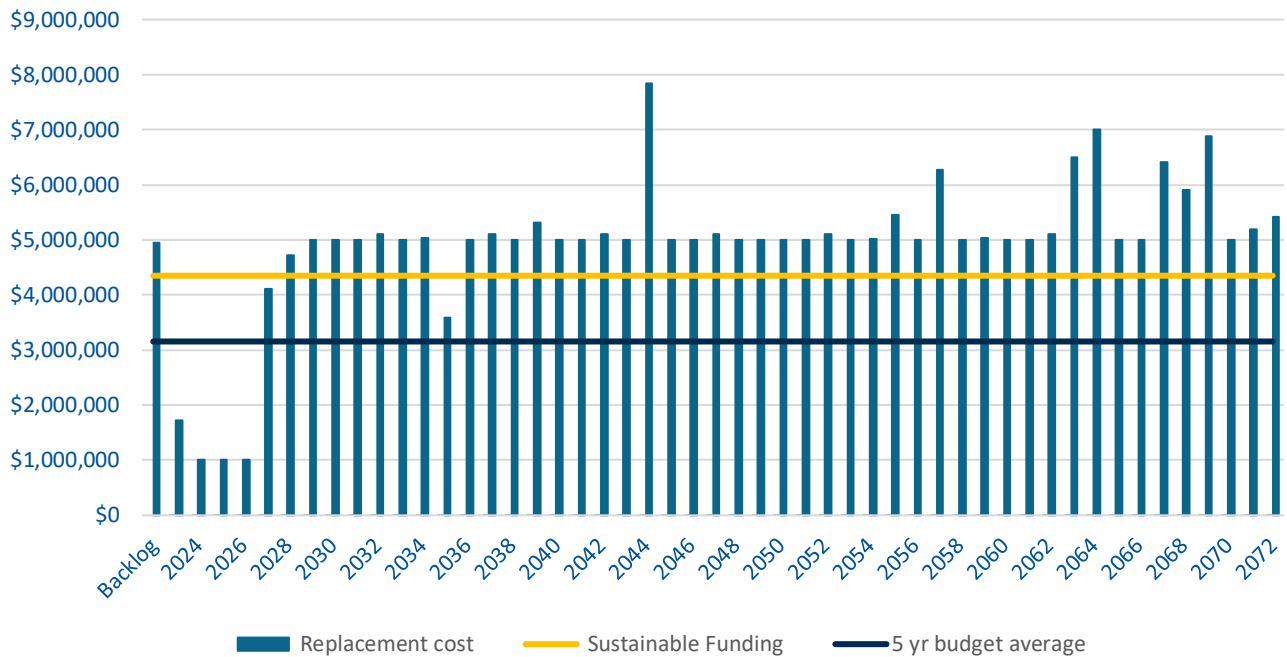
Figure 5.3: Stormwater Assets 50 Year Asset Replacement Forecast

Stormwater Assets Infrastructure Deficit:

$1,194,000

5.5 Climate Change Considerations

Stormwater assets are directly impacted by climate change such as flooding due to significant rainfall. The repair, renewal and replacement of stormwater assets consider the following climate risks, adaptation and mitigation opportunities.

Climate Risks Identified with Stormwater Assets:

- Potential increased infrastructure and building damage as more frequent and severe weather events increase overland flooding from stormwater ponding in low-lying areas.
- Increased springtime flooding and decrease in spring time groundwater recharge due to greater frost depth from extreme cold.

Future Climate Adaptation Opportunities:

- Designing and implementing measures to minimize future storm impacts with green infrastructure and low impact development (LID) facilities that reduce and treat stormwater.
- Increasing the capacity of the minor drainage system in areas that experience flooding problems and bottlenecks in trunk systems by up-sizing the storm sewers.

Future Climate Mitigation Opportunities:

- Explore opportunities for enhanced carbon sequestration through green infrastructure on city-owned and private land (aligns with Objective #2, Thunder Bay Net-Zero Strategy).

Low impact development (LID) is a term used to describe a land planning and engineering design approach to managing stormwater runoff. LID emphasizes conservation and use of on-site natural features to protect water quality. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrology through infiltrating, filtering, storing, evaporating and detaining runoff close to its source. Some examples of LID techniques are bio-retention, permeable pavement, rain barrels, grassed swales, green roofs, reducing impermeable surfaces and tree box filters.

WASTEWATER

Assets that relate to the collection, transmission, treatment, and disposal of wastewater including any wastewater assets.

6.0 Wastewater Assets

The City of Thunder Bay's wastewater network is comprised of the Atlantic Avenue Water Pollution Control Plant (WPCP) and the sanitary sewer network. The WPCP provides service to over 108,000 people and has a rated capacity to treat 84.5 million litres per day. Wastewater assets have a total replacement value of $708,395,000.

6.1 Asset Overview

The wastewater network includes the WPCP, four (4) lift stations, 34,969 service connections, and 526 kilometers of sanitary sewers. Table 6.1 outlines the inventory, replacement cost, average age and condition for the wastewater assets.

Asset Class	Replacement Value	Asset Totals	Average Age	Average Condition
All Wastewater Assets	$708,395,000	See below	63 years	**Fair**
Wastewater Assets				
Sanitary Sewers, Service connections and Manholes	$522,935,000	526 km of sanitary sewers, 6,062 manholes, 34,969 service connections	63 years	**Poor**
Water Pollution Control Plant and Process Assets	$183,348,000	1 (Atlantic Ave WPCP)	18 years	**Good**
Lift Stations	$2,241,000	4 lift stations	40 years	**Good**

Table 6.1: Wastewater Asset Overview

6.1.1 ASSET CONDITION

Figure 6.1: Wastewater Assets Condition Profile broken down as a percentage of replacement cost.

95

Inspection of the City's sanitary sewers is completed with camera technology. Approximately 40 km of the City's sewers are inspected yearly. Based on the defects observed in the sewer, it is given a one (1) to five (5) rating.

6.1.2 ASSET AGE

The average age of the assets within the Wastewater network:

- WPCP Buildings: 14 Years; Built in 1964 with expansions in 1975, 1991, 2004, 2009, and major investments in 2014 and 2016.
- WPCP Processes (Mechanical, Electrical, Equipment, HVAC, Site Works, etc): 20 Years
- Lift Stations: 40 Years
- Sanitary Sewers: 63 Years

Average Age and Estimated Useful Life Wastewater Assets

Asset	Average Age (years)	Estimated Useful Life (years)
Lift Stations	40	60
Sanitary Sewers	63	93
WPCP Process Assets	20	26
WPCP Building*	14	60
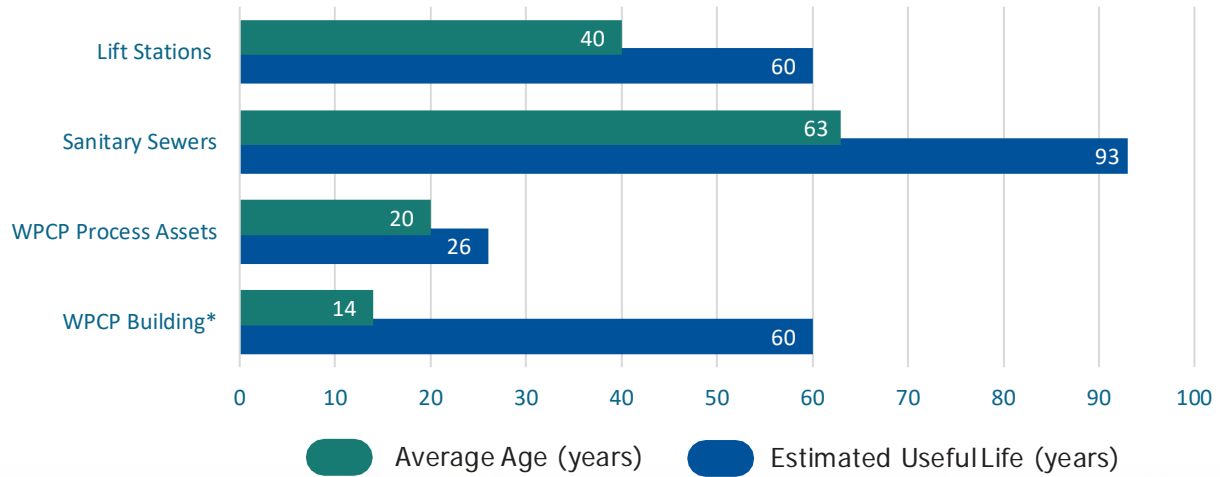
Figure 6.2: Average Age and EUL of Wastewater Assets.
*The Water Pollution Control Plant age is based on the last building expansion in 2009;

6.2 Lifecycle of the Asset

Wastewater assets require the proper lifecycle activities to collect and treat sewage and safeguard the environment. If the proper lifecycle activities do not occur, there is a potential risk of asset failure, which may result in consequences such as environmental, economic, public health, and safety impacts.

The WPCP provides wastewater treatment for the entire sanitary sewer services within the City of Thunder Bay. Operation of the WPCP is regulated by the Ministry of Environment, Conservation and Parks (MECP) under the Environmental Protection Act, as well as additional reporting requirements for Environment and Climate Change Canada (ECCC) under the Wastewater Systems Effluent Regulation. A detailed description of the WPCP, lift stations and related operating criteria can be found in the annual wastewater report available on the City's website.

Maintenance

- Maintenance of wastewater assets happens on an as needed basis with emergency repairs and preventative maintenance. Maintenance actions support the lowest lifecycle cost by extending the length between capital projects.

Rehabilitation (minor)

- The City is able to inspect sanitary lines with camera technology. Rehabilitation, such as grouting, seals cracks and prevents ingress of tree roots and groundwater infiltration to maintain capacity and extend the overall life of the asset. For older sanitary sewers, activities such as relining can be used to extend the useful life of a pipe.

Replacement/Reconstruction

- Sanitary lines are replaced based on camera rating and operational issues.

Disposal

- Sanitary sewers are either removed during the renewal construction or are disconnected and abandoned in place. The decision between removal and abandonment is based on construction effort, costs, and future plans. Sewers that have been abandoned are capped and filled to protect the surrounding and other infrastructure.

6.3 Levels of Service

The wastewater network collects and treats the wastewater from homes, businesses, and industry. Wastewater travels through our sanitary sewer system to the WPCP for treatment.

The *Regulation* provides metrics to measure the current community (qualitative) LOS and technical (quantitative) metrics. Additionally, the *Regulation* requires the Municipality to report on the energy consumption for such assets that would measure energy usage and operating efficiency. Survey responses from the 2023 Water Levels of Service Survey can be found in Appendix G.

6.3.1 COMMUNITY LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system.	A map has been provided on page 103 depicting the user groups and areas that are connected to the wastewater service system.
Scope	Percentage of survey respondents that are connected to Thunder Bay's municipal wastewater sewer service.	90% of the 2023 Wastewater Levels of Service Survey respondents are connected to the municipal wastewater sewer service.
Accessibility	Percentage of survey respondents that have a front clean out to enable inspection and maintenance of sewer connections.	52% of the 2023 Wastewater Levels of Service Survey respondents have a front clean out. 28% of respondents were unsure if they have a front clean out.
Reliability	Percentage of survey respondents that rated the City's sanitary sewer collection system and services Good or Very Good.	58% of the 2023 Wastewater Levels of Service Survey respondents rated the sanitary sewer collection system and services Good or Very Good.
Reliability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.	900 m of combined sewer system and 13 catch basins remain to separate. Most of this will be completed in 2024 with only two catch basins left to separate. At the end of 2024 there will be two sanitary sewer emergency overflows directed to watercourses that remain. They include the Montreal Street pumping station to the Kaminisitquia River and the overflow on the McVicar trunk sewer to McVicar Creek.

		The City has made significant progress in the last 25 years to eliminate combined sanitary and storm sewers in favour of a separated storm system to reduce basement-flooding risk and unnecessary treatment at the WPCP and protect the environment. Previously, there were many combined sewer overflows (CSO) that discharged into local rivers. These had regulating manholes that allowed high flows during storm events in the combined sewer to overflow to the river. Many of these former combined sewer overflows were converted to duckbill valves at the river outfalls in the 1990s to prevent river water from backing up into the combined sewers as the original flap gate style valves in the regulating manholes were subject to being held open by sticks and debris from the river. Currently there is one left in the system that is scheduled for removal as part of a storm separation project under the Pollution Prevention and Control Plan.
Reliability	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.	The City of Thunder Bay had a total of four (4) combined sewer overflow (CSO) points in 2022. For the four (4) CSO points, there was a total of zero (0) overflow events with a total volume of 0 m^3 in discharged 2022.
Reliability	Description of how stormwater can get into sanitary sewers in the municipal wastewater system causing sewage to overflow into streets or backup into homes.	Rivers can back up into combined sewers where outlet flapper gates or duckbill valves get stuck open due to debris. Stormwater can enter the sanitary network where overflow pipes exist between sanitary and storm sewers or from roof leader and foundation drain connections to the sanitary system. Stormwater can also enter the sanitary system at manholes through holes in manhole lids, improper sealing or damage of the manhole.
Reliability	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described.	Historically CSOs were converted to duckbill valves at river outfalls to prevent river backup into combined sewers. The City has two (2) remaining regulating type maintenance holes with flap gates combined with high pipe inverts that flow to the Kaministiqua still existing; one of them is scheduled for removal in 2024. Most overflow pipes between sanitary and storm sewers have been abandoned, plugged and/or removed.

		Repairs to and sealing of manholes are completed as issues are identified. New technologies addressing stormwater inflow issues are assessed as they become available.
Reliability	Description of the effluent that is discharged from sewage treatment plants in the municipal water system.	A chart has been provided on page 101 with the WPCP Annual Average Effluent Quality from 2007-2023 outlining the effluent discharged to surface waters after treatment.

Table 6.2: Community Levels of Service for Wastewater Assets; Survey responses from the 2023 Water Levels of Service Survey can be found in Appendix G.

6.3.2 TECHNICAL METRICS LEVEL OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Percentage of properties in the municipality connected to the municipal wastewater system.	There are 34,969 or 80.9% of properties connected to the wastewater system.
Function	The number of complaints received by the WPCP in 2022.	There were zero (0) complaints received in 2022 related to the WPCP.
Reliability	The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.	There were 0 events or 0% of the total number of properties connected to the system where combined sewer flow exceeded the system capacity in 2022.
Reliability	The number of connect-days per year impacted due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	There was 30 connect-days or 0.09% of the total number of properties connected to the system impacted due to wastewater backups.
Reliability	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	There were two (2) effluent violations or 0.008% of properties connected to the system due to wastewater discharge.
Performance	Capital re-investment rate vs. target re-investment rate	1.91% vs. 1.91%

Table 6.3: Technical Levels of Service for Wastewater Assets

6.3.3 WPCP Annual Average Effluent Quality

Year	Total Treated Volume ML	Average Treated Volume MLD	% of Rated Capacity	Days Flow > Rated Capacity (84.5 MLD)	Precipitation mm	BOD Carb 5 mg/L	TSS mg/L	Total Phos mg/L	E Coli #/100 mL	pH SU	Temp °C
2013	29,948	78.1	92	101	595	6.8	8.4	0.4	97	7.5	14.1
2014	29,664	77	91	97	634	8.2	8	0.4	50	7.2	13.8
2015	29,396	76.6	91	96	667	6.2	7.6	0.4	66	7.2	14.3
2016	31,144	81	96	99	639	5.6	8.5	0.4	80	7.4	14.9
2017	28,886	82	97	131	666	7	6.9	0.3	51	6.9	14
2018	25,681	70.3	83	38	633	5.6	7.1	0.3	73	6.4	13.9
2019	26,317	72.1	85	88	673	6.9	8.3	0.3	52	7.5	13.3
2020	23,409	63.9	76	18	487	6.4	6.9	0.3	60	7.4	14.1
2021	21,230	57.2	68	19	554	10.5	10.2	0.4	52	7.4	14.1
2022	28,026	76.7	91	80	798	7.4	8.5	0.3	138	7.4	13.8
2023	21,805	59.7	71	43	389	11.3	11.2	0.4	42	7.3	14.6
Average	26,864	72	86	74	612	7	8	0	69	7	14
Limit	-	-	-	-	-	25	25	1	200	6.0 to 9.6	No limit
Max	31,144	82	97	131	798	11	11	0	138	8	15
Min	21,230	57	68	18	389	6	7	0	42	6	13

Table 6.4: Annual Effluent Quality

6.3.4 ENERGY CONSUMPTION

The City of Thunder Bay tracks and monitors energy usage within the wastewater facilities. Utility consumption data and costs are monitored and tracked digitally for all commodities including electricity, natural gas and water. This allows for the creation of a variety of reports including, but not limited to benchmarking, identifying energy savings opportunities and reporting greenhouse gas emissions. Data can also be viewed over time to compare a variety of parameters including consumption and costs with built in weather normalization.

Category	Electricity (KWH)		Natural Gas (m^3)	
Year	2021	2022	2021	2022
WPCP	11,169,219	13,259,892	1,108,565	1,168,959
Lift Stations	30,270.74	32,590.35		

Table 6.5: WPCP and Lift Stations Energy Consumption

Biogas contains approximately 60% methane (the combustible component of natural gas). The cogeneration system at the WPCP converts the biogas from the treatment process to electricity and captures the heat generated from the engine. The biogas can also be used in the plant boilers to generate heat.

In 2022, there was 1,640 MWh of electricity generated on site at the Water Pollution Control Plant. Over 80% of gas generated in digesters was used to generate electricity or heat on-site buildings.

SANITARY SERVICE AREA
Engineering & Operations Division
Engineering Department

Thunder Bay
Superior by Nature

LEGEND
—— SANITARY SEWER MAINS
▢ NO MUNICIPAL SANITARY
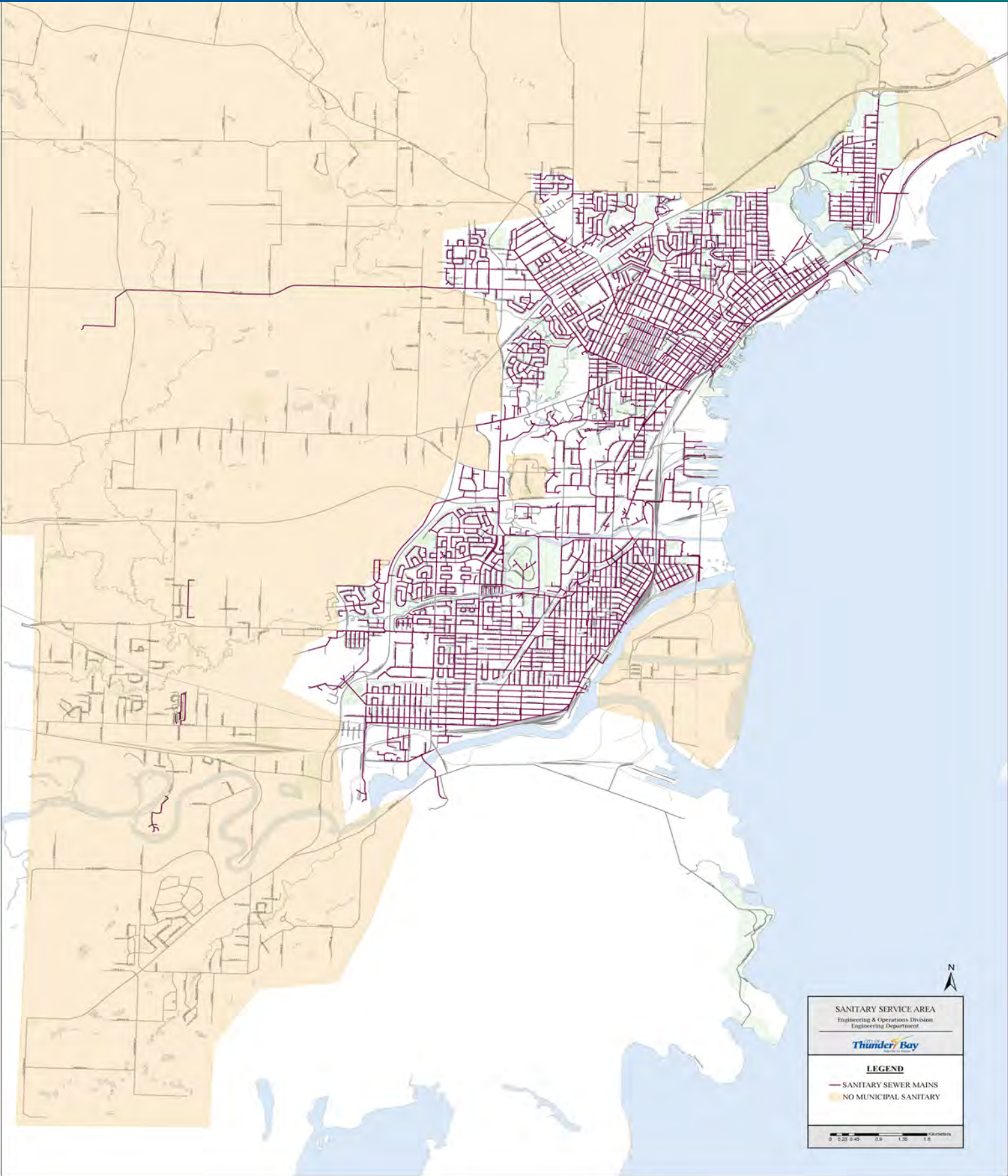
Map 6.1: Sanitary Service Area

6.4 Investing in the Assets

To achieve the sustainable level of funding to provide wastewater collection and treatment services to the City for both the short and long term, the wastewater system has a Council approved 20 Year Financial Plan with the goal of achieving financial sustainability, full-cost recovery and affordability for consumers while maintaining the City's existing service levels for sewage collection and treatment.

To maintain the proper level of repair, renewal and replacement of the Wastewater network the annual sustainable funding amount is $13,509,000. The five (5) year historical budgeted funding allocated to the wastewater assets was in line with the sustainable funding amount, meaning there is no funding deficit for the wastewater assets.

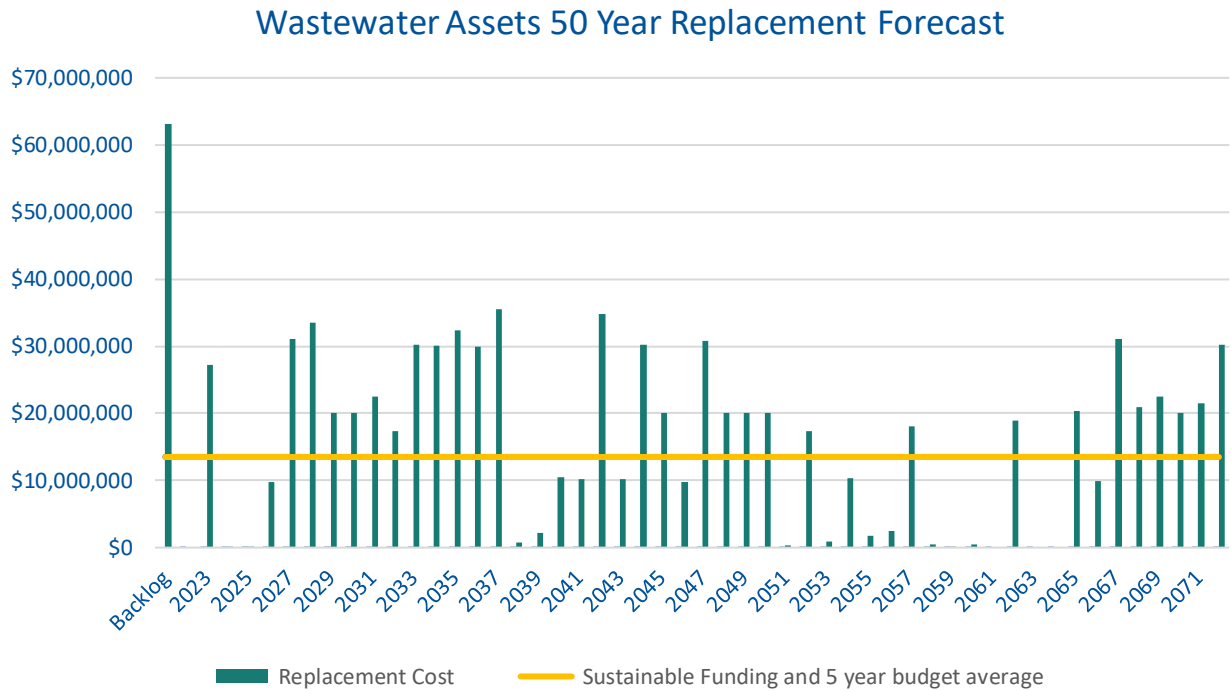A 50 year projection of the annual asset replacement profile is shown below.

Figure 6.3 : Wastewater Service 50 Year Asset Replacement Forecast

Wastewater Infrastructure is

100% FUNDED

6.5 Climate Change Considerations

The wastewater network is directly impacted by climate change. Weather events such as heavy rain and flooding can cause pressurized flows and joints to fail, sewers to deform or collapse, sewer backups and sewer overflows.

The repair, renewal and replacement of wastewater assets consider the following climate risks, adaptation and mitigation opportunities.

Climate Risks Identified with Wastewater Services:

- Potential increased service disruptions in services with more frequent and severe weather events.
- Potential increased maintenance and replacement costs as infrastructure durability and lifespan decreases with more frequent and severe weather events.
- Potential increased wastewater treatment and management as more frequent and severe weather events increase contamination from storm water runoff and wastewater overflow.

Current Climate Adaptation Measures:

- Capacity of the wastewater system to respond to extreme weather is monitored.
- Wastewater and stormwater sewer separation is ongoing, reducing environmental risks and weather impacts on WPCP.

Future Climate Mitigation Opportunities:

- The WPCP requires substantial amounts of energy to operate. Increasing process efficiency will result in reduced energy consumption and GHG emissions (aligns with Objective #2, Thunder Bay Net-Zero Strategy).
- In addition to improving process efficiency, fuel switching will be explored to reduce the use of fossil fuels in operations.

FACILITIES

Buildings and structures that provide key services to the community, some of which include recreation, administrative, emergency services, operations, and more.

7.0 Facilities

The City of Thunder Bay owns and operates a vast array of diverse buildings and structures as part of its built environment that provide key services to the community, some of which include recreation, administrative, emergency services and operations. These assets support service delivery by providing safe and efficient facilities for use by staff, Council, Boards and Agencies and members of the public. The Capital Facility Construction Section of Engineering and Operations manages and maintains these assets to meet safety and regulatory requirements as well as the City's functional requirements, in a reliable and sustainable manner. Facilities assets have a total replacement value of $727,618,000.

7.1 Asset Overview

Facility asset inventory includes 193 facilities located throughout the service delivery area of the City of Thunder Bay. It also includes several facilities owned by the City or outside board, and managed by a board and/or agencies that operate and provide services out of these locations. It does not include Water, Wastewater or Stormwater facilities as those are reported under the respective sections. A Facility asset includes the building and system to support it; for example, the building structure, roof, HVAC, mechanical/ electrical systems and life safety systems in the building.

Table **7.1** outlines the inventory, replacement cost, average age, and condition for each asset in the category. Replacement costs are based on like-for-like replacement. Improvement values to meet Net-Zero targets or functionality are not included.

Asset Class	Facilities Included	Replacement Value	Asset Totals	Average Age	Average Condition
All Facilities Assets		$727,618,000	193 Facilities	46 years	**Fair**
City of Thunder Bay					
Administrative	City Hall, Archives, Pool 6, Victoriaville Civic Centre, McKellar Mall, Whalen Building	$95,796,000	6 Facilities 293,201 sq. ft.	66 years	**Fair**
Emergency Services	EMS and Fire	$53,837,000	15 Facilities 133,757 sq. ft.	37 years	**Good**
Operations	Egan Yard, Mountdale Yard, Solid Waste & Recycling, Animal Services, Parks North, Traffic Control & Street Lighting	$47,992,000	29 Facilities 175,061 sq. ft.	34 years	**Poor**
Parks	Prince Arthur's Landing, Chippewa Park, Trowbridge, Centennial, Golf Clubhouses, All Other Parks Buildings	$54,669,000	91 Facilities 168,929 sq. ft.	43 years	**Poor**

Recreation and Tourism	Pools, Arenas & Stadia, Community Centres, Older Adult Centres, Tourism	$199,123,000	33 Facilities 504,284 sq. ft.	46 years	**Poor**
Social Services	Daycares, Homes for the Aged, Transit	$74,945,000	5 Facilities 221,698 sq. ft	42 years	**Very Good**
Outside Boards and Agencies					
Facilities Management Agreements	CN Station, Magnus Theatre, Tournament Centre, Shelter House, Museum, Sports Hall of Fame, Thunder Bay Community Auditorium	$103,958,000	8 Facilities 212,780 sq. ft.	79 years	**Good**
Thunder Bay Police Services	Balmoral Police Station	$28,165,000	1 Facility 65,500 sq.ft	39 years	**Poor**
Thunder Bay Public Library	Libraries	$30,633,000	3 Facilities 38,165 sq.ft	66 years	**Fair**
Parking Authority	Parkades	$38,500,000	2 Facilities 431,445 sq.ft	38 years	**Poor**

Table 7.1: Facilities Asset Overview

7.1.1 ASSET CONDITION

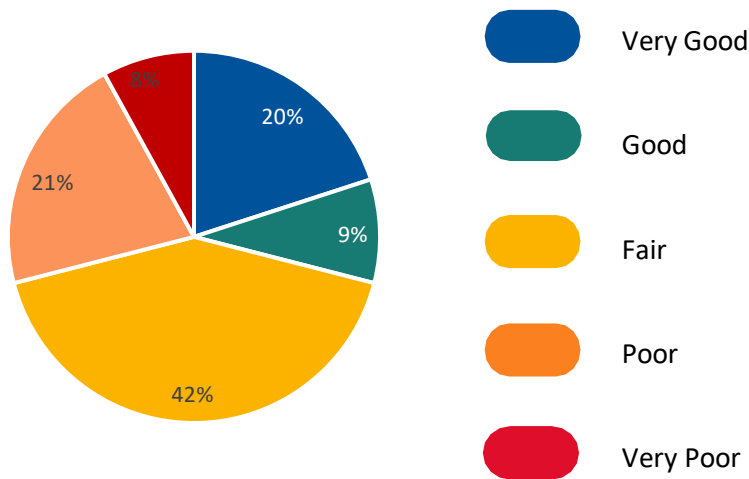## Facilities Condition Rating

Figure 7.1: Condition Profile of Facilities broken down as percentage of total replacement cost.

Condition assessments are carried out by qualified assessors who provide objective, verified information for optimizing long-term facilities investments. Standard, comprehensive and specialized (i.e. structural, energy) assessments are completed typically on a five (5) to six (6) year basis.

To monitor facility performance over time, the City of Thunder Bay uses a facility condition index (FCI) based on an industry standard asset management tool which measures an asset's condition at a specific point in time. Individual facility ratings are updated when capital work or a condition assessment is completed. The lower the value of FCI, the better condition that a facility is in.

$$\textbf{Facility Condition Index (FCI)} = \frac{\textbf{Sum of Renewal Needs in a Given Period of Time (\$)}}{\textbf{Current Replacement Value (CRV) (\$)}}$$

The 5-Scale condition rating system is as follows:

Asset Condition Rating	Facility Condition Index (FCI)
Very Good	<3%
Good	3 - 5%
Fair	5 - 10%
Poor	10 - 30%
Very Poor	>30%

7.1.2 ASSET AGE
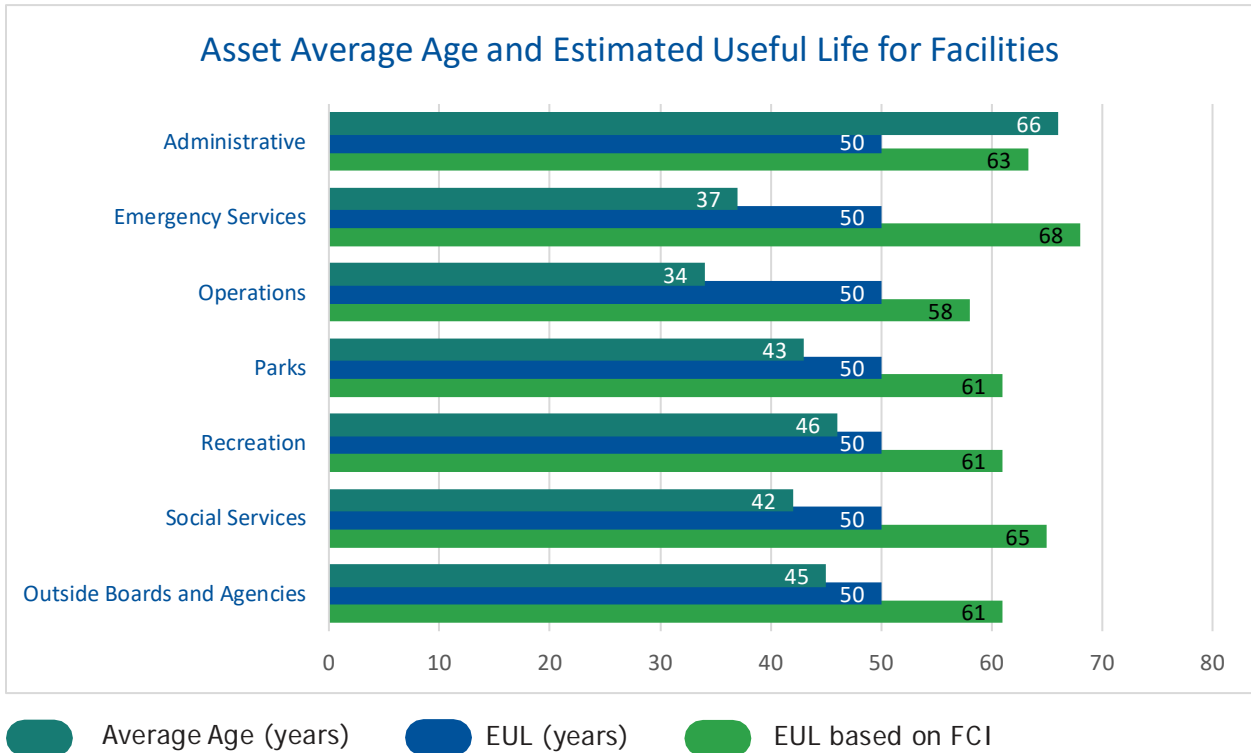
The average age of facilities is 46 years.

Figure 7.2: Average Age and Estimated Useful Life of Facilities.

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7.2 Lifecycle of the Asset

The City's facilities require the proper lifecycle activities to deliver safe and functional buildings. If the proper lifecycle activities do not occur, there is a potential risk of failure which may result in environmental, economic, and social impacts. The consequences of the failure of facilities are tied directly to the function of the facility. The failure of a facility or part of a facility may cause service disruptions, closures and risk to the health and safety of facility occupants.

Maintenance

- Regularly scheduled inspections and maintenance and more significant repair and activities associated with unexpected events. Maintenance addresses major emergency facility-related equipment failures and replacement not included in the operating budgets or the current capital renewal budgets. Non-infrastructure solutions are considered in all stages of the planning process to identify opportunities to optimize asset lifecycles and reduce asset related service delivery costs.

Rehabilitation (major or minor)

- Rehabilitation of facilities includes the planned replacement of major building components including roof systems, HVAC systems, building envelope systems, electrical systems, plumbing systems, and interior finishes. Replacement of components or systems are based on physical condition, timeframe within its lifecycle, the priority index assigned to individual components or systems, and alignment with the Corporate Energy Management Plan. New systems, components, or finishes are energy efficient and environmentally sustainable in nature and consideration is made so that facilities can meet Net-Zero requirements.

Replacement / Reconstruction

- Facilities are replaced when directed if the asset is nearing the end of its useful life of 50 years, based on the condition rating, or functional obsolescence.

Disposal

- Appropriate and proper disposal of facilities occurs once the asset has reached the end of its useful life, is in poor condition and/or is underperforming, or is otherwise no longer needed by the municipality due to realignment, or replacement/construction of another facility. When the operational costs of maintaining the facility exceed the benefits of rehabilitation, typically the City investigates disposing of or replacing the asset.

The individual components of a facility are inspected if a problem is reported or suspected and appropriate action is taken as necessary. Facilities generally undergo a comprehensive condition assessment on a five (5) to seven (7) year basis. The following graph outlines the costs projected to maintain the components so that the facilities are maintained at a FAIR condition rating over the next 50 years.

50 Year Facility Component Renewal Forecast

Figure 7.3: Facility Components 50 Year Renewal Forecast
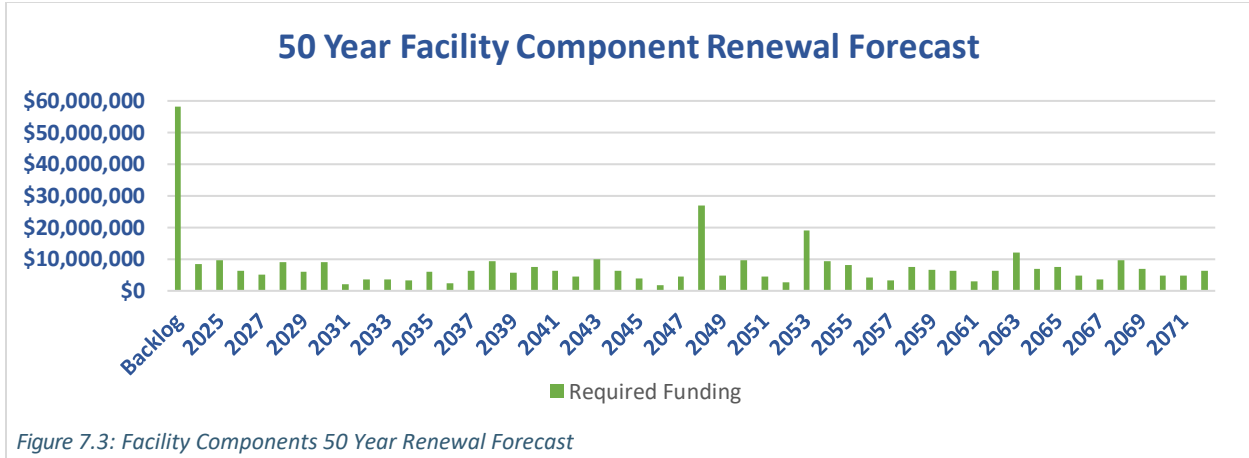
7.3 Levels of Service

To maintain safe and functional facilities the City of Thunder Bay continually adheres to all municipal, provincial and federal regulations and standards. Accessibility audits are completed to identify required improvements to meet AODA.

Over the next twenty years at the current level of funding, many of the aging facilities will degrade and likely not be able to maintain the expected LOS. Compounding the issue is the fact that there is currently a significant backlog of work and high amounts of capital and maintenance requirements for many of the facilities.

For facility LOS the City needs to ensure that quality services are delivered affordably, and are both accessible and reliable, while also emphasizing sustainability and public safety. In addition, the City needs to ensure that there are appropriate resources to respond to unexpected events. The City strives to balance between providing diverse services at the appropriate levels while keeping costs and associated risks as low as possible.

7.3.1 COMMUNITY LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description of the types and/or locations of facilities in the City of Thunder Bay's service delivery area.	The City of Thunder Bay has an inventory of 179 facilities that comply with the TCA policy, these include: Six (6) Administrative, 15 Emergency Services, 29 Operations, 91 Parks, 33 Recreation, and five (5) Social Services. Outside Boards and Agencies inventory includes 14 facilities: Eight (8) Facilities Management Agreements, One (1) Thunder Bay Police Services, Three (3) Thunder Bay Public Library, Two (2) Parking Authority.

	Description of usage of Facilities.	**Administrative facilities** such as City Hall, Archives, Pool 6, Victoriaville Civic Centre, McKellar Mall, and Whalen Building contain administration offices and public facing counters. Regular open hours for these facilities is Monday to Friday: 8:30 a.m. - 4:30 p.m. Hours that the facilities are open to the public vary by facility and can be found online at thunderbay.ca.
		Emergency Services: Facilities are operational 24/7 to respond to emergency services.
		Operations: Facilities are open for staff as required.
		Parks: Facilities open to the public such as washrooms, changerooms, kitchen and laundry facilities, and concessions are open seasonally. Chippewa Park has seven seasonal cabins available for rent. Other Parks facilities such as garages, workshops, offices and electrical buildings are for staff to operate and maintain and used on an as need basis.
		Recreation: Arenas and Stadia –The City operates six (6)arenas with ice season rentals available at various facilities from late September to early April. One Arena ice surface remains open for ice rentals throughout the summer months. Arena building rentals are also available during the off-season. The City operates the Fort William Stadium and Port Arthur Stadium. Rates for rental can be found online at thunderbay.ca.
		Community Centres – Thunder Bay has nine (9) Community Centres offering neighbourhood and community-based programs and events. Most of the centres are operated by external boards. A brief overview of the programming, events and services offered by each Centre can be found in the Community Centre section of the current edition of The Key.
		Community Pools – Thunder Bay has three indoor pools and two outdoor pools. Pools offer public swimming, lessons, certifications, and are available for rental. The Canada Games Complex offers a variety of social, recreational, competitive, instructional and therapeutic activities. See thunderbay.ca for details on each pool.
		Older Adult Centres, such as the 55+ Centre and West Arthur Community Centre offer recreational programs, activities, and services for those 55 and older in our community. Hours of operations and programming can be found online at thunderbay.ca.

		Youth Centre – The Kinsmen Youth Centre offers year-round drop-in and registered recreational programs, activities, and services for youth between the ages of 10-18. **Social Services:** Pioneer Ridge: A long-term care home providing each resident with quality services and programs. Information on this facility can be found online at thunderbay.ca. Child Care: Algoma Child Care and Grace Remus Child Care (inside Pioneer Ridge) are childcare facilities that provide a safe, stimulating and nurturing environment. Hours of operation: Monday to Friday, 7 a.m. to 5:30 p.m. Transit Facilities: One transit terminal and one administrative building and garage. Water Street terminal is open to the public 6 a.m. to midnight every day. The administrative building is open to the public Monday to Friday 8:30 a.m. to 4:30 p.m. The garage is open for staff during operating hours. **Outside Boards and Agencies:** Facilities Rental Agreements: Facilities such as CN Station, Magnus Theatre, Tournament Centre, Shelter House, Museum, Sports Hall of Fame, Jumbo Gardens and the Thunder Bay Community Auditorium have facility rental agreements with The City of Thunder Bay and are managed according to the individual agreements. Thunder Bay Police Service Station: Facility is open 24/7 to respond to emergencies. Thunder Bay Public Library: Provides the space, collections, services and programs that residents need to learn, grow, create and be successful. Hours that the facilities are open to the public vary by facility and can be found online at https://www.tbpl.ca/. Parkades: Provide parking services by offering long-term and short-term or hourly rental rates in parkades. Parkades are open for public parking 24/7.
Quality	Description that illustrates the different levels of facility condition.	For facilities, a Facility Condition Index (FCI) is used to measure defects in the facility. The FCI rating falls between zero percent (0%) and one hundred percent (100%) and is used to determine if a

		facility has an overall condition of very good, good, fair, poor or very poor. Individual facility ratings are updated when capital work or a condition assessment is completed. The lower the value of FCI, the better condition that a facility is in.
Quality	Percentage of Citizens that are either very or somewhat satisfied with the various services related to City Facilities based on 2022 Citizen Satisfaction Survey.	Public Library: 94% satisfied Canada Games Complex: 90% satisfied Fort William Gardens: 89% satisfied Recreation Facilities: 89% satisfied Indoor and Outdoor Pools and Beaches: 88% satisfied

Table 7.2: Community Levels of Service for Facilities.

7.3.2 TECHNICAL METRICS LEVEL OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Quality	The overall facility condition index value.	Facility condition index in 2022 is 7.89 or FAIR.
Reliability	Number of facilities with unscheduled downtime (4 or more hours) to provide reliable facilities without unexpected downtime.	Number of facilities with unscheduled downtime (4 or more hours) in 2023: One (1)
Energy Efficiency	For facilities, the overall energy usage.	Electricity usage for all facilities in 2022 was 21,053,850 kwh. Natural gas usage for all facilities in 2022 was 3,672,715m3
Safety and Regulatory	Percentage of safety inspections that pass minimum legislated safety standards.	100% of Facilities passed safety inspections in 2023.
Sustainability	Percentage of facilities in fair or better condition. Percentage of facilities in poor or very poor condition.	55.44% of municipal facilities are in fair or better condition in 2023. 44.56% of municipal facilities are in poor or very poor condition in 2023.
Performance	Capital re-investment rate vs. target re-investment rate	1.09% vs. 2.00%
Accessibility	Percentage of Facilities compliant with AODA	15% of all facilities meet current AODA standards. All facilities built prior to AODA legislation are being updated as component renewals occur

Table 7.3: Technical Levels of Service for Facilities.

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7.4 Investing in the Assets

To maintain the proper level of repair, renewal and replacement of facilities, the annual sustainable funding amount is $13,995,000. The 5-year historical budgeted funding allocated to the facilities assets was $7,639,000. This means that there is an infrastructure deficit, or shortfall, of $6,356,000.

There is a significant backlog of work on building components such as roofing, HVAC, etc as seen in section 7.2. When this work is completed it extends the life of the facilities. The following figure shows the 50 year projection of the replacement of the entire facility once the facility reaches a very poor condition. The projection is based on the current condition ratings and life expectancy of the facility.
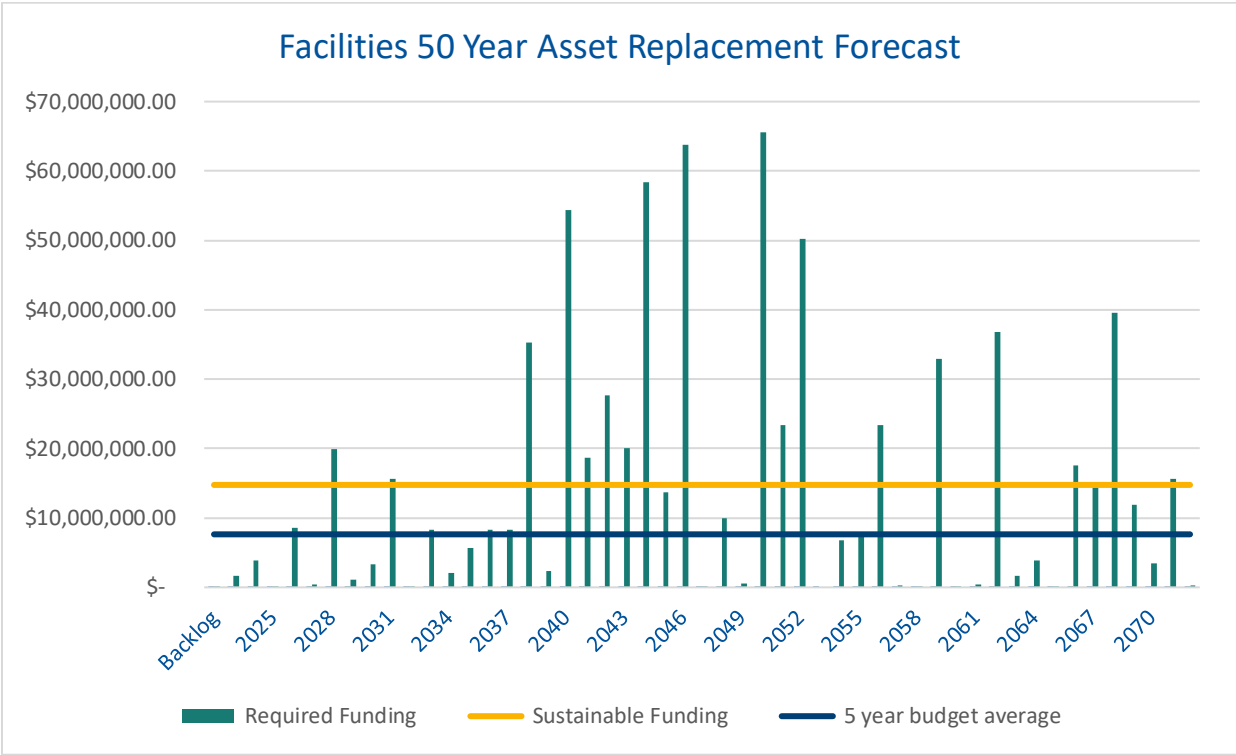
Figure 7.4: Facilities 50 Year Asset Replacement Forecast

Facilities Infrastructure Deficit:

$6,356,000

7.5 Climate Change Considerations

Facilities are directly impacted by climate change weather events such as rainstorms and flooding, high winds, extreme heat, extreme cold, significant snowfall and frequent freeze and thaw cycles. A Facility can also contribute to climate change with its carbon footprint. The repair, renewal and replacement of facility assets consider the following climate risks, adaptation and mitigation opportunities:

Climate Risks Identified for Facilities:

- Potential facility infrastructure damage and increased maintenance and replacement costs as more frequent and severe weather events occur.
- Potential service disruptions and facility closures due to more frequent and severe weather events.

Future Climate Adaptation Measures:

- Identify facilities that may be impacted by extreme weather events, and increase the frequency of inspections and maintenance.
- Design and implement measures to minimize climate change impacts such as changes to building envelope materials, building specifications, site considerations, new technology, and other protection methods for both new construction and retrofitting existing facilities to minimize service disruption and increase resiliency.
- Design and implement considerations for adapting facilities as community emergency and disaster service sites.
- Standardize low-intensity design stormwater management practices on new and existing facility sites.

Future Climate Mitigation Opportunities:

- Explore further opportunities for greenhouse gas reductions and improving energy performance (Objectives #4-6, and Objective #9, Thunder Bay Net-Zero Strategy).
- Investigate areas of priority to incorporate best practices, low carbon materials, and green infrastructure into facility planning and design.
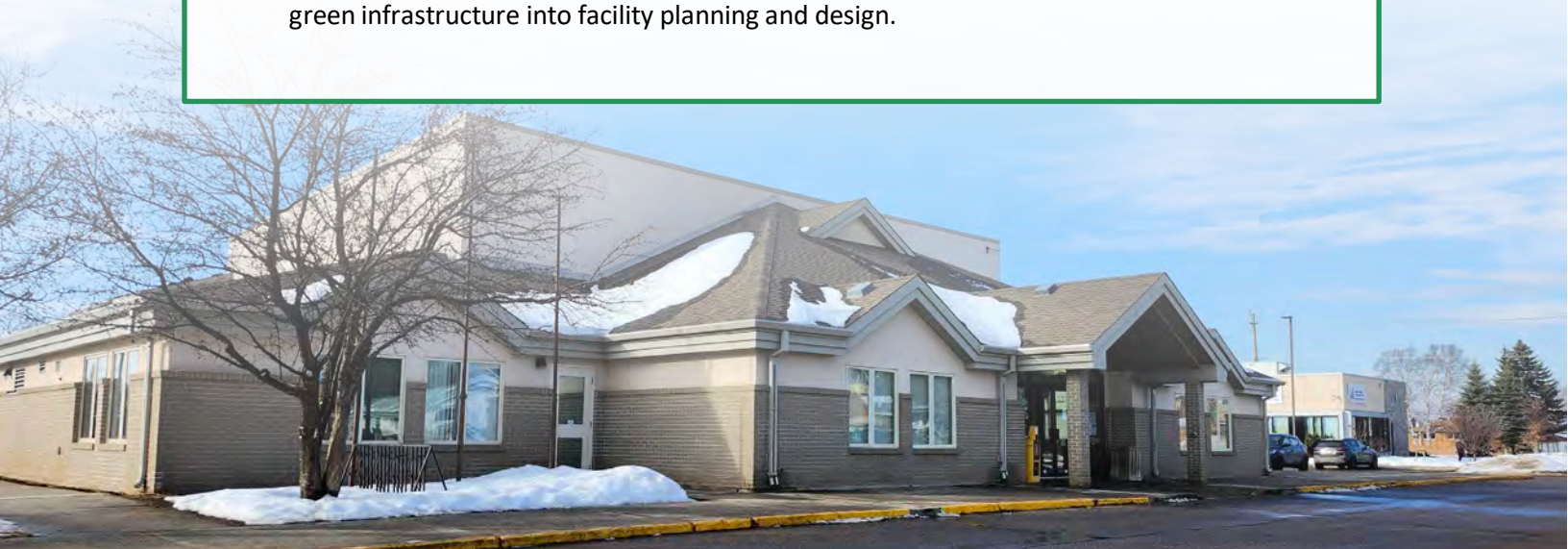
FLEET AND MACHINERY

Vehicles and machinery assets that allow staff to efficiently deliver municipal services.

8.0 Fleet and Machinery

The City of Thunder Bay owns and operates a vast array of vehicles and machinery which allows staff to efficiently deliver municipal services. Fleet and Machinery assets have a total replacement value of $126,336,000.

8.1 Asset Overview

The types of fleet and machinery that The City owns and maintains range from small passenger vehicles, to Transit buses, to heavy equipment for construction operations and snow removal. There are also specialized vehicles such as fire trucks, ambulances and police vehicles for emergency services. Specialized machinery such as riding lawn mowers, trailers, forklifts and ice resurfacers are also included in the City's Fleet.

Table 8.1 outlines the inventory, replacement cost, average age and condition for each of the fleet and machinery assets. Note that the only assets that are recorded in this list are those that comply with the Tangible Capital Asset Policy of individual assets over $10,000 and pooled assets over $50,000 in value.

Asset Class	Asset Sub-Class	Replacement Value	Asset Totals	Average Age	Average Condition
All Fleet and Machinery Assets		$126,336,000	751	11 years	Fair
Fleet Vehicles					
Light Vehicles	Half Ton	$2,739,000	53	8 years	Good
	Midsize	$321,000	7	4 years	Very Good
	Three Quarter Ton	$2,768,000	48	8 years	Fair
	Vans	$1,559,000	29	8 years	Good
Medium Vehicles	Bus - Specialized	$5,725,000	27	4 years	Very Good
	Medium Truck	$4,353,000	25	11 years	Good
	One Ton	$1,423,000	13	9 years	Good
Heavy Vehicles	Packer	$7,084,000	16	10 years	Poor
	Heavy Truck	$10,278,000	35	11 years	Good
	Bus - Conventional	$33,851,000	48	10 years	Good
Emergency Vehicles	Police Vehicles	$4,838,000	94	6 years	Fair
	Fire Vehicles	$13,871,000	41	12 years	Very Good
	EMS Vehicles	$9,114,000	75	6 years	Fair

Asset Class	Asset Sub-Class	Replacement Value	Asset Totals	Average Age	Average Condition
Machinery					
Light Machinery	Lawn Care, Trailers, Misc	$6,516,000	55	6 years	Good
	Off-road: Forklifts, sidewalk tractors, skid steers, tractors, ATV's	$4,031,000	52	6 years	Fair
Medium Machinery	Compressors, hoists and lifts, snowblowers	$2,716,000	19	5 years	Good
	Off-road, asphalt patcher, backhoe loader, ice resurfacer, sweepers, vacuum	$5,090,000	29	11 years	Good
Heavy Machinery	Off-road: Articulating dump, graders, compactors, excavators, loaders	$10,059,000	26	10 years	Poor

Table 8.1: Fleet and Machinery Asset Overview

8.1.1 ASSET CONDITION

Fleet and Machinery Condition Rating
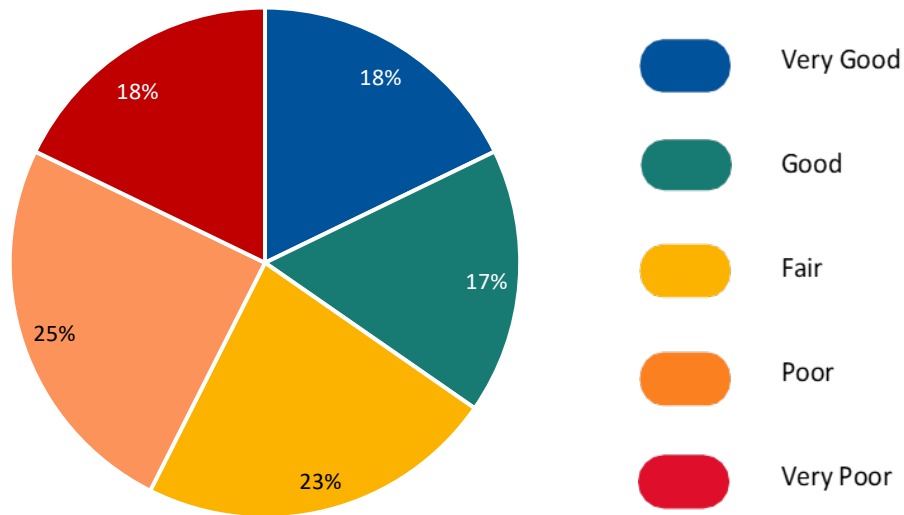
Figure 8.1 Fleet and Machinery Condition Profile broken down as a percentage of total replacement cost.

All fleet and machinery assets are inspected according to a prescribed maintenance schedule or if a problem is reported or suspected. Appropriate action is taken and documented if issues are identified. A condition assessment rating system for vehicles and equipment has been developed to prioritize fleet replacements and optimize lifecycle costs. Fleet Services assets are regulated by the Ministry of Transportation, Ministry of Environment, and Technical Safety Standards Authority.

8.1.2 ASSET AGE

The average age of fleet and machinery assets is 11 years. Each of the fleet and machinery assets carry useful lives that vary by department and use.

Figure 8.2 outlines the average age and the average estimated useful life of the different types of fleet and machinery.

Fleet and Machinery Average Age and Estimated Useful Life

Category	Average Age (years)	Estimated Useful Life (years)
Heavy Machinery	10	11
Medium Machinery	10	15
Light Machinery	15	20
EMS Vehicles	7	10
Fire Vehicles	12	20
Police Vehicles	6	3
Heavy Vehicles	11	13
Medium Vehicles	8	11
Light Vehicles	7	11

Figure 8.2: Average Age and EUL of Fleet and Machinery

8.2 Lifecycle of Fleet and Machinery Assets

The City's fleet and machinery assets require the proper lifecycle activities to deliver municipal services to the public. If the proper lifecycle activities are not completed and a backlog of maintenance and replacement occurs, there is a potential risk of vehicle and equipment failure which may result in environmental, economic and social impacts. The maintenance, rehabilitation and replacement of fleet asset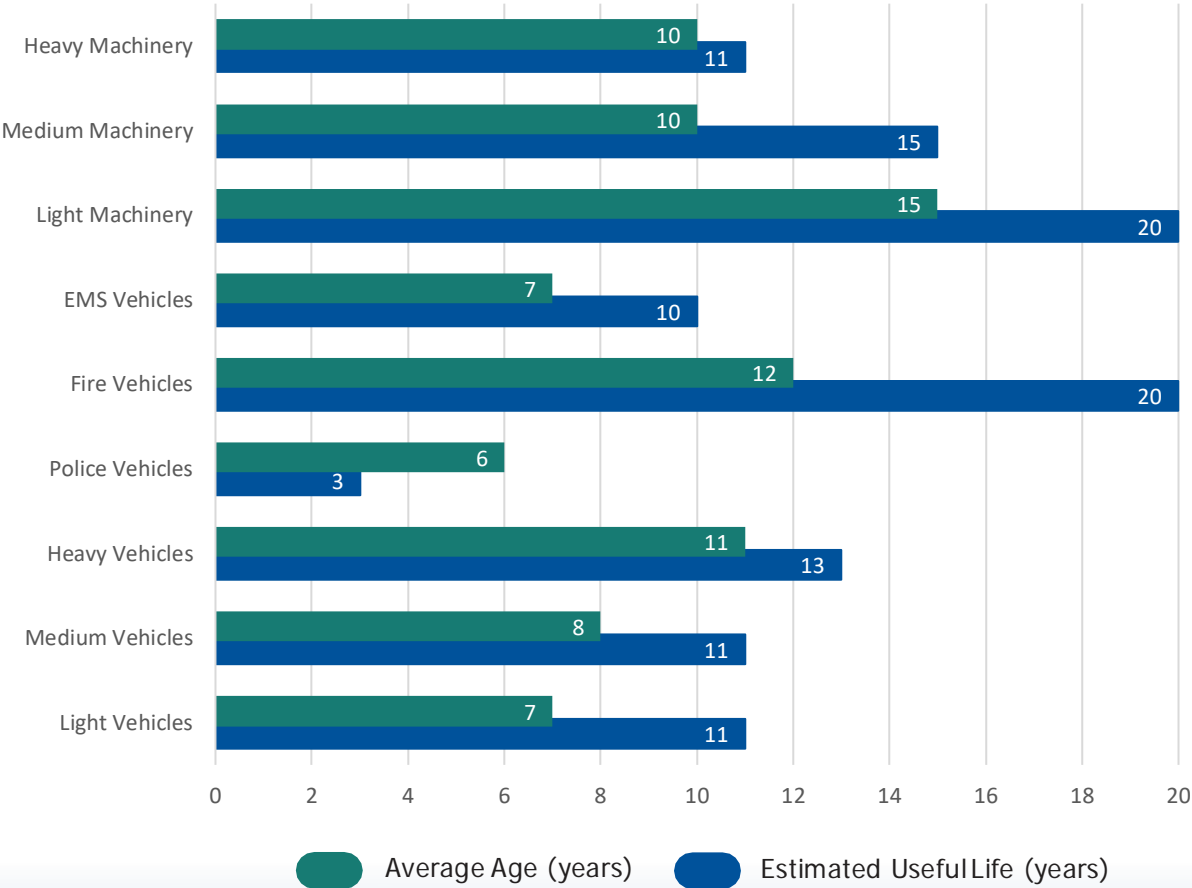s are based on inspections, manufacturer recommendations, industry best practice, past performance and regulatory requirements in order to optimize fleet asset lifecycles.

The City's Fleet has five main lifecycle activities:

Maintenance

- Fleet and machinery are inspected and maintained per regulatory requirements and best practices. Preventative maintenance of fleet assets is carried out on a regular basis, with very minor outsourcing due to specialty repairs. Reactive maintenance occurs for circumstances that cannot be easily mitigated such as vehicle accidents requiring immediate repair, or faster than anticipated vehicle or equipment breakdowns. The objective is to minimize unplanned non-standardized work to support the lowest lifecycle cost by extending the length of time to rehabilitate or replace.

Rehabilitation

- Renewals and rehabilitations are driven by regular preventative maintenance programs. Major overhauls or reconditioning of fleet assets are very costly and generally do not add enough extended life in order to add value.

Replacement

- Strategic assessment of fleet and equipment for optimal asset lifecycles occurs to determine the timing of replacement that minimizes maintenance and repair work and maximizes salvage value. When determining the most appropriate option for the fleet assets, a thorough review of service life remaining, condition, mileage, performance, lifecycle management, regulatory compliance, operational need, criticality, and annual repair costs are taken into consideration, with some assets being transferred or rotated to different departments or a lighter function. The City of Thunder Bay uses procurement practices to acquire high quality assets with longer lifecycles, extended warranties, and service agreements. Consideration is given to alternative fuel options in order to reduce greenhouse gases.

Disposal

- Fleet and machinery are disposed through auction to maximize salvage value, or environmental salvage activities.

8.3 Levels of Service

To maintain safe and functioning fleet and machinery the City has established Fleet Maintenance Standards, revised in 2022. These Standards provide trigger points when maintenance needs to be done either by frequency or based on a physical condition.

8.3.1 COMMUNITY LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description of types of fleet and machinery	The City of Thunder Bay has an inventory of 751 vehicles and machinery that comply with the TCA policy, categorized as follows: **Light Vehicles:** 53 half ton trucks, 7 midsize trucks, 48 three quarter ton trucks, 29 vans; **Medium Vehicles:** 27 specialized buses, 25 medium trucks, 13 one ton trucks; **Heavy Vehicles:** 16 packers, 35 heavy trucks, 48 conventional buses; **Emergency Vehicles:** 94 police vehicles both marked and unmarked as well as utility and transport; 41 fire vehicles including rescue trucks and boat, fire pumpers, ladders, command vehicles, atvs; 75 EMS vehicles including ambulances, tractors, and emergency response vehicles; **Light Machinery:** 166 assets of various smaller machinery including lawn care, trailers, forklifts, sidewalk tractors, skid steers, tractors, atvs, and miscellaneous equipment; **Medium Machinery:** 48 assets of various medium sized machinery including compressors, hoists and lifts, snowblowers, asphalt patcher, backhoe loader, ice resurfacers, sweepers and vacuums; **Heavy Machinery:** 26 assets of various larger heavy machinery including articulating dump, graders, compactor, excavators and loaders.
Quality	Percentage of Citizen's that are either very or somewhat satisfied with the various services related to City Fleet based on 2022 Citizen Satisfaction Survey.	Fire: 94% satisfied. EMS: 94% satisfied. Parks and Greenspaces: 91% satisfied. Garbage Collection: 89% satisfied. Golf courses: 84% satisfied. Public Transit: 81% satisfied. Maintenance of sidewalks and grassed areas: 81% satisfied. Bike lanes: 78% satisfied. Police services: 73% satisfied. Snow removal on roads and sidewalks: 69% satisfied. Maintenance of streets: 64% satisfied.

		(City of Thunder Bay 2022 Citizen Satisfaction Survey Report)
	Percentage of survey respondents that feel that priority road routes are plowed in a reasonable amount of time.	65.5% of the 2023 Roads, Street Lighting, and Traffic Signals Levels of Service Survey respondents feel that the priority routes are either always or most of the time plowed in a reasonable amount of time.
	Percentage of survey respondents that feel that sidewalks are plowed in a reasonable amount of time.	51.1% of the 2023 Active Transportation Levels of Service Survey respondents feel that the sidewalks are either always or most of the time plowed in a reasonable amount of time.
Safety	Description of the process for maintaining the safety of fleet.	All fleet assets are inspected per regulatory requirements and repairs are completed as needed based on inspections and servicing requirements. All staff that utilize City fleet are required to complete pre-use inspections, document their findings in the asset logs, and must carry and maintain operator licenses.

Table 8.2: Community Levels of Service for Fleet and Machinery

8.3.2 TECHNICAL METRICS LEVEL OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Quality	The average condition of fleet and machinery assets	FAIR
Reliability	Average downtime due to breakdowns (time in the shop for unplanned maintenance/repairs) per vehicle/machinery type (in hours)	There was an average of eight hours of unplanned downtime per vehicle/machinery type in 2023.
Reliability	Percent of vehicles with more than 8 hours of annual downtime due to breakdowns	62% of vehicles had more than 8 hours of downtime due to breakdowns.
Reliability	Annual average cost of reactive maintenance/repairs per asset	$7,365 per asset in 2023
Safety and Regulatory	Percentage of legislated commercial motor vehicle inspections completed on time	100% in 2023
Cost Efficiency	Cost per hour, depending on asset class	$129.15 in 2023
Sustainability	Greenhouse gas emission reduction (in Tonnes CO2e)	60.5 in 2022
Performance	Capital re-investment rate vs. target re-investment rate	6.55% vs. 8.94%

Table 8.3: Technical Levels of Service for Fleet and Machinery.

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8.4 Investing in the Assets

To maintain the proper level of repair, renewal, and replacement of fleet and machinery assets the annual sustainable funding amount is $11,182,000. The five (5) year historical budgeted funding allocated to fleet and machinery assets was $8,193,000. This means that there is an infrastructure deficit, or shortfall, of $2,989,000.

The shortfall has and will continue to create a backlog of work and will require significant funding to overcome. A 50-year projection of the annual asset replacement profile is shown below. The projection is based on the current condition ratings and life expectancy of fleet and machinery assets.
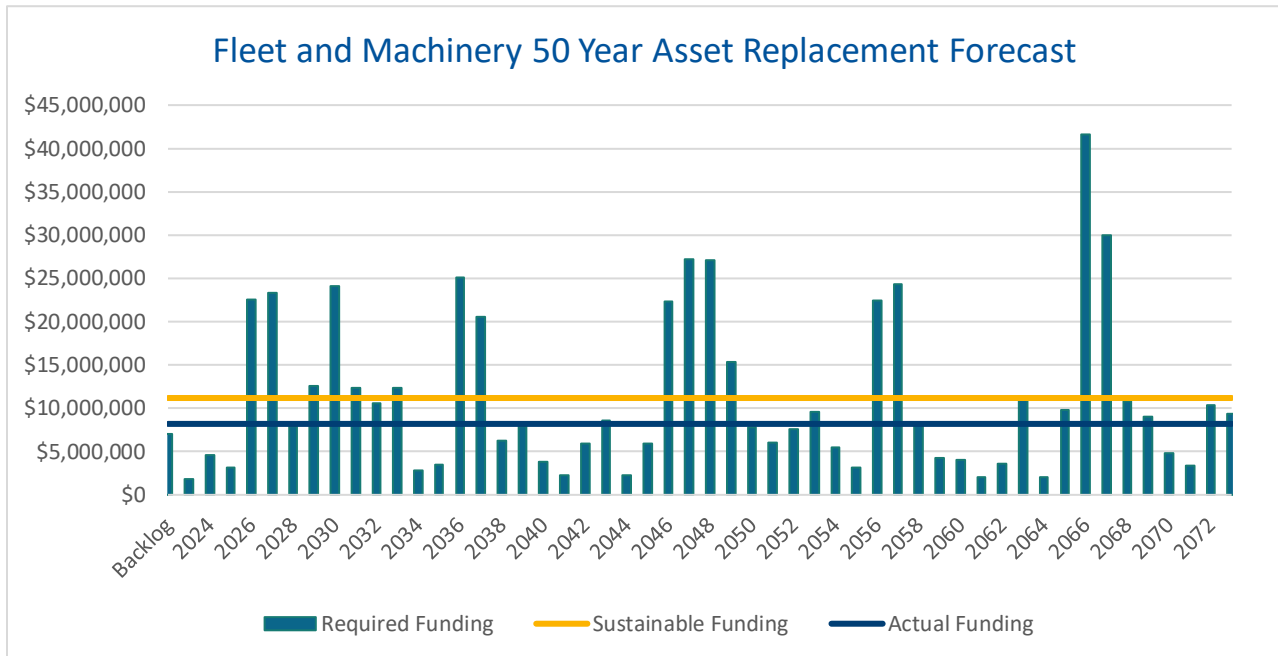

Figure 8.3: Fleet and Machinery 50 Year Asset Replacement Forecast

Fleet and Machinery Infrastructure Deficit:

$2,989,000

8.5 Climate Change Considerations

Fleet and machinery assets are directly impacted by climate change. Weather events such as extreme temperatures and significant rainfall or snowfall can cause fleet and equipment to break down. Fleet and machinery can also contribute to climate change with their carbon footprint and the type of fossil fuel used for its operation. The repair, renewal and replacement of fleet and machinery assets consider the following climate risks, adaptation and mitigation opportunities.

Climate Risks Identified with Fleet:

- Potential service disruptions due to fleet and machinery not being sized appropriately for handling weather events.
- Potential shortage of fuel sources due to more frequent and severe weather events affecting the global supply chain.

Future Climate Adaptation Measures:

- Consider Climate Change impacts in the procurement and operation plan for fleet.

Future Climate Mitigation Opportunities:

- Implement policy changes such as reduced idling, and driver training that includes fuel-efficient driving techniques.
- Monitor fuel consumption, emissions, and driving behaviour to help increase the efficiency of the fleet.
- Public Transit is convenient, accessible, and low carbon, with a target of converting the municipal transit fleet to 100% electric by 2035 (Objective #12, Thunder Bay Net Zero Strategy).
- Vehicles are powered with low-carbon energy, with a target of converting all muncipal fleet to 100% electric by 2040 (Objective #14, Thunder Bay Net-Zero Strategy).

EQUIPMENT

Assets that are utilized to maintain public infrastructure and support the delivery of services.

9.0 Equipment

The City of Thunder Bay owns and operates a vast array of equipment which allows staff to efficiently deliver municipal services. Equipment assets have a total replacement value of $62,818,000.

9.1 Asset Overview

In order to maintain a high quality of public infrastructure and support the delivery of services the City owns several types of equipment. This includes, but is not limited to:

- Parks amenities, benches and waste receptacles;
- Administrative computers, hardware and software;
- Equipment required to provide long term care;
- Equipment to maintain and repair infrastructure;
- Equipment for public use within recreation centers;
- Equipment to deliver emergency services; and
- Transit equipment and structures

Table 9.1 outlines the inventory, replacement cost, average age and condition for each asset in the category. Note that the only assets recorded in this list are those that comply with the Tangible Capital Asset Policy of individual assets over $10,000 and pooled assets over $50,000 in value.

Asset Class	Examples	Replacement Value	Asset Totals	Average Age	Average Condition
All Equipment Assets		$62,818,000	4800	14 years	**Fair**
Equipment					
IT Services	Hardware, Software, Servers, etc.	$12,287,000	927*	5 Years	**Fair****
Emergency Services	EMS, Fire and Police equipment	$17,840,000	342	9 Years	**Poor**
Recreation Services	Arena boards and glass, Sound systems, water slide, gym equipment, etc	$2,327,000	49	19 Years	**Poor**
Parks Services	Parks amenities, waste receptacles, benches, etc	$12,440,000	2875*	24 Years	**Good**
Long Term Care Services	Kitchen equipment,	$2,920,000	253*	15 Years	**Poor**

	lifts, medical equipment, etc.				**Poor**
Transit	Fair boxes, shelters, radio system, hoists, etc.	$6,590,000	155	8 Years	**Poor**
Other Equipment	Equipment required for General Government, Parking, Landfill, Planning etc.	$8,398,000	199	18 Years	**Poor**

Table 9.1: Equipment Asset Overview;
* Total asset counts may be much lower than expected as many assets in this asset class such as laptops, desktops, beds, and lifts are pooled assets.
**At the time of this report all city computers were in the process of replacement.

9.1.1 ASSET CONDITION

Condition Profile of Equipment

- 8% — Very Good
- 27% — Good
- 19% — Fair
- 10% — Poor
- 36% — Very Poor
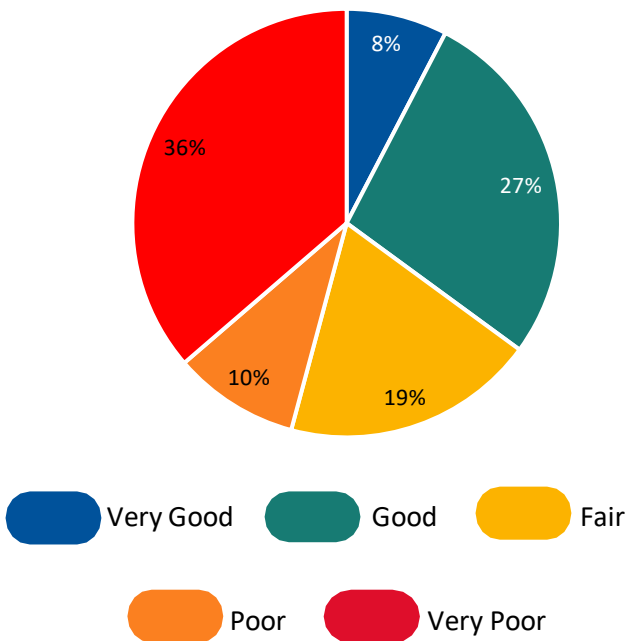
Figure 9.1: Condition Profile of Equipment broken down as a percentage of total replacement cost.

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9.1.2 ASSET AGE

The average age of equipment is 14 years. Each of the equipment assets carry useful lives that vary by department and use.

Figure 9.2 outlines the average age and the average estimated useful life of the different types of equipment.

Average Age and Estimated Useful Life for Equipment Sub-Assets

Figure 9.2: Average Age and EUL of Equipment

Average Age (years)   Estimated Useful Life (years)

9.2 Lifecycle of the Equipment

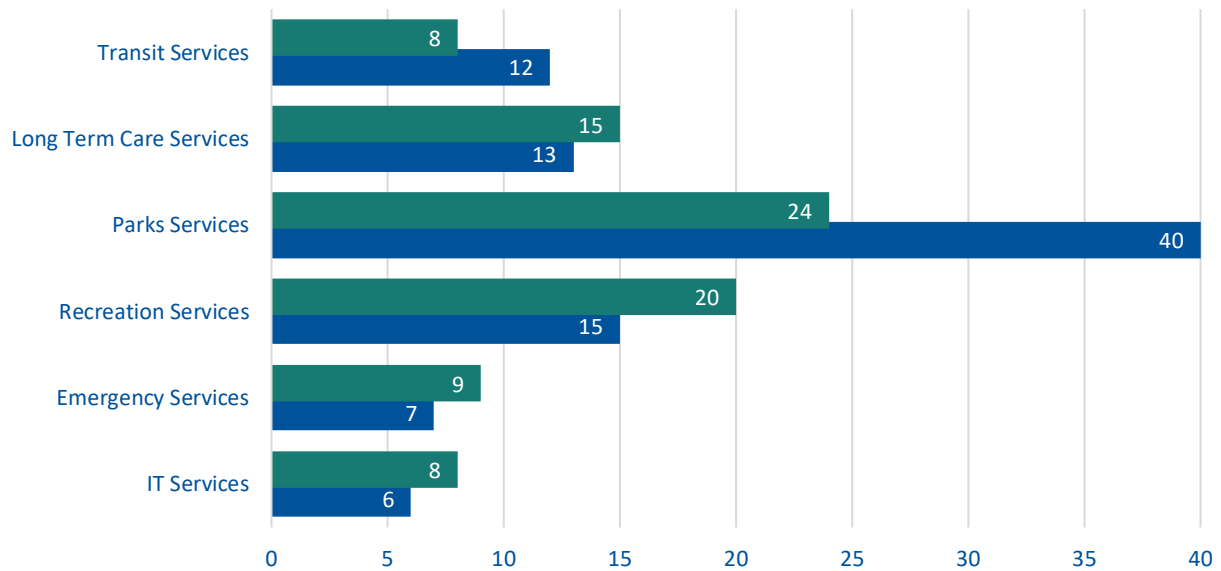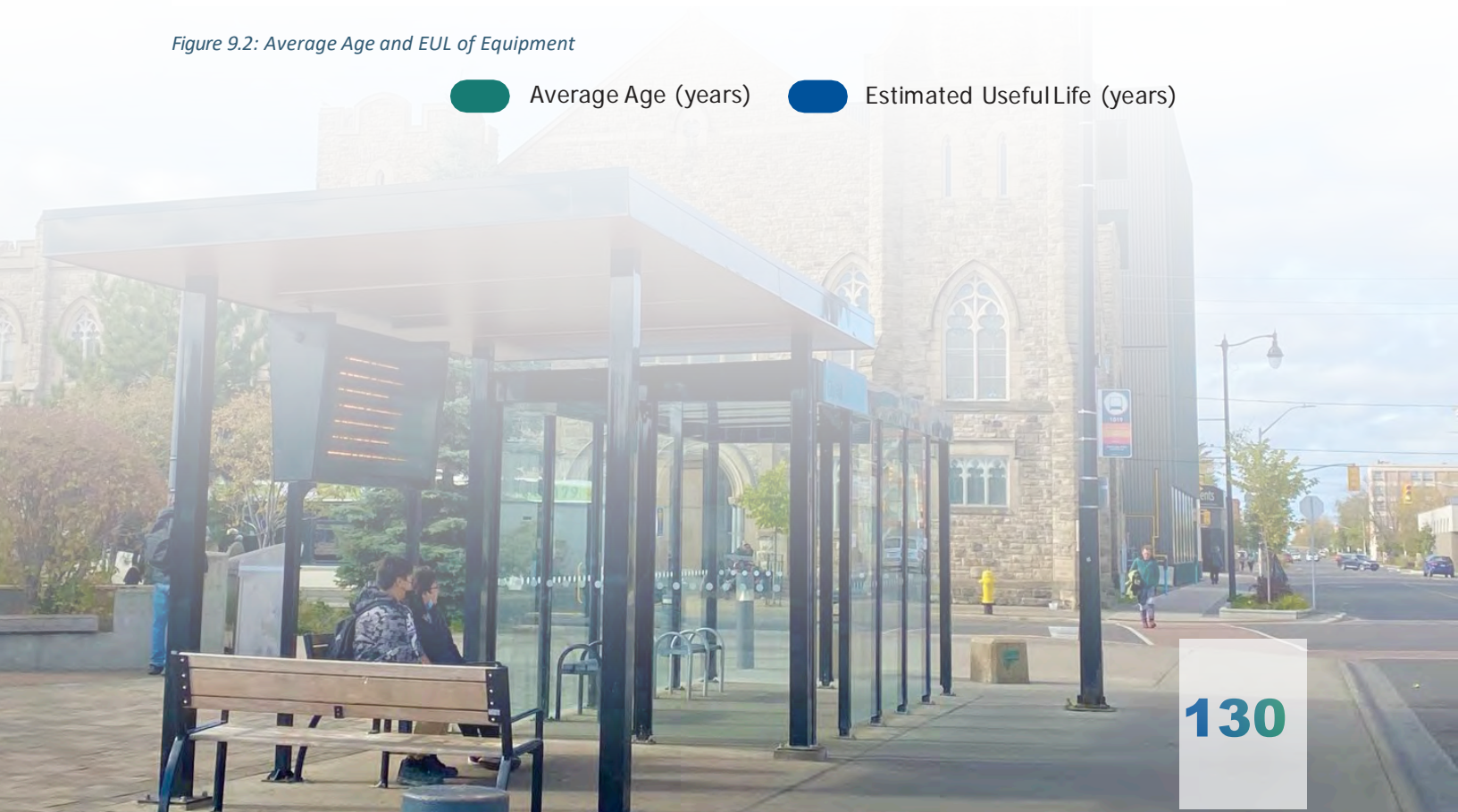The City's equipment assets require the proper lifecycle activities to deliver municipal services to the public. If the proper lifecycle activities are not completed and a backlog of maintenance and replacement occurs there is a potential risk of equipment failure which may result in environmental, economic and social impacts.

Generally, equipment has four main lifecycle activities:

Maintenance

- Equipment that is in good or very good condition are inspected and maintained per best practices. Reactive maintenance occurs for circumstances that cannot be easily mitigated such as faster than anticipated deterioration or equipment breakdowns. Emergency services equipment and other critical assets are inspected and maintained more rigoursly.

Rehabilitation

- Small upgrades or repair is driven by manufacturer recommendations and municipal staff expertise. Reactive rehabilitation or maintenance occurs for circumstances that cannot be easily mitigated such as faster than anticipated deterioration or equipment breakdowns.

Replacement

- Upgrades or complete replacement occurs as per manufacturer or developer recommendations or when equipment falls into poor or very poor condition. Staff prioritize replacement of assets based on their criticality, available redundancies and budget constraints.

Disposal

- Equipment is disposed through best management practice, procurement policies, or environmental salvage activities.

9.3 Levels of Service

The following tables identify the City's current level of service for equipment. The metrics include technical and community level of service metrics that are determined by municipal staff.

9.3.1 COMMUNITY LEVELS OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Reliability	Description of redundancies available to ensure equipment is available, as necessary, for operations.	Redundancies are present in the majority of equipment asset classes to ensure continuous operations. For computers and IT devices, staff members can work from any City device of which there are spares. For critical operations there are back-ups or spares available.
Affordability	Description of the timelines for equipment inspections or IT software and hardware upgrades	Lifecycle activities vary widely depending on the type of equipment and are guided by the criticality of the asset and budget constraints. IT software and hardware upgrades are completed based on manufacturer or developer recommendations and subscriptions.
Sustainability	Description of the current condition of equipment and the plans that are in place to maintain or improve the condition.	The majority of equipment assets are maintained reactively and are repaired or replaced at end-of-life or as needed.

Table 9.2: Community Levels of Service for Equipment

9.3.2 TECHNICAL METRICS LEVEL OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Quality	Percentage of equipment assets where their age is greater than their useful life.	10%
Sustainability	Percentage of equipment that is in good/very good condition	35%
Sustainability	Percentage of equipment that is in poor/very poor condition	46%
Performance	Capital re-investment rate vs. target re-investment rate	6.23% vs. 9.79%

Table 9.3: Technical Levels of Service for Equipment

9.4 Investing in the Assets

To maintain the proper level of repair, renewal, and replacement of equipment, the annual sustainable funding amount is $6,148,000. The five (5) year historical budgeted funding allocated to the equipment assets was $3,913,000. This means that there is an infrastructure deficit, or shortfall, of $2,235,000.

The shortfall has and will continue to create a backlog of work and will require significant funding to overcome. A 50-year projection of the annual asset replacement profile is shown below.

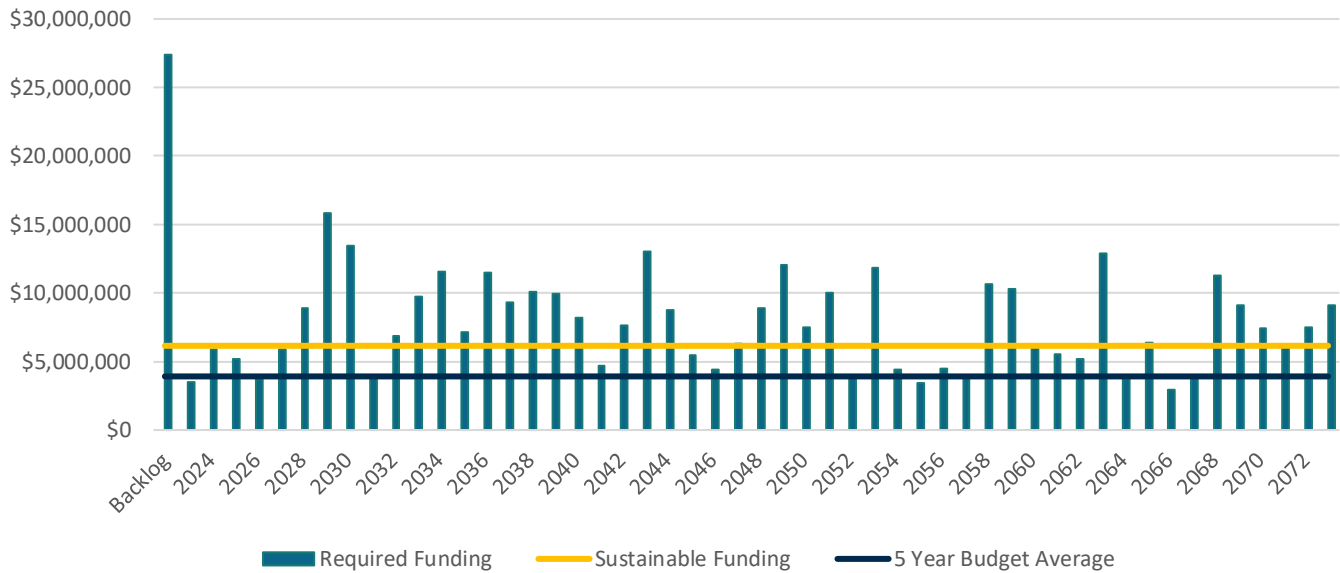### Equipment 50 Year Asset Replacement Forecast

Figure 9.3: Equipment 50 Year Asset Replacement Forecast

Equipment Infrastructure Deficit:

$2,235,000

9.5 Climate Change Considerations

City equipment can be exposed to the events and impacts of climate change. Weather events such as extreme temperatures and significant rainfall or snowfall can cause equipment to break down. Equipment can also contribute to climate change with its carbon footprint and the type of fossil fuel used for its operation. The repair, renewal and replacement of fleet and equipment assets consider the following climate risks, adaptation and mitigation opportunities.

Climate Risks Identified with Equipment:

- Potential for equipment to breakdown or not function during extreme weather events.
- Potential shortage of fuel sources due to more frequent and severe weather events affecting the global supply chain.

Future Climate Adaptation Measures:

- Monitor outdoor equipment and determine if there is equipment that is suceptible to increased deterioration or being inaccessible during extreme weather events based on location.

Future Climate Mitigation Opportunities:

- Implement the procurement and operation plan for low carbon equipment.
- Monitor emissions to and investigate areas of priority to incorporate best practices and green technology into equipment.
- Identify appropriateness of equipment that is optimized with the most efficient and right amount of assets to meet operational needs.

LAND IMPROVEMENTS

Assets that serve to improve the utility and/or the enjoyment of outdoor spaces.

10.0 Land Improvement Assets

Land Improvement assets represent a variety of asset types that serve to improve the utility and/or the enjoyment of outdoor spaces. Land Improvement assets are managed by several different departments. Land Improvement assets have a total replacement value of $256,071,000.

The City of Thunder Bay recognizes the importance citizens place on a healthy environment and have a number of plans to protect and enhance nature such as the: Urban Forest Management Plan, Urban Design Guidelines, Net-Zero Strategy, Climate Adaptation Plan and Stormwater Management Plan.

10.1 Asset Overview

This asset class includes parking lots, trails and walkways, play parks, sports fields, public art, fencing, docks, other siteworks such as fueling areas in public works yards and the leachate system at the landfill, as well as natural infrastructure such as trees and forests.

Table 10.1 outlines the inventory, replacement cost, average age, and condition for each of the Land Improvement assets. Note that the only assets that are recorded in this list are those that comply with the Tangible Capital Asset Policy of individual assets over $10,000 and pooled assets over $50,000 in value.

Asset Class	Asset Sub-Class	Replacement Value	Asset Totals	Average Age	Average Condition
All Land Improvements		256,071,000	See below	28 years	**Fair**
Parks					
Play Parks	Playgrounds, Bike/Skate Parks, Dog Parks, Adult Fitness, Splashpads	$21,589,000	136	19 years	**Good**
Trails	Paved trail system	$26,544,000	73 km	14 years	**Good**
Sports	Baseball fields, soccer fields, cricket fields, tennis courts, pickleball courts, basketball courts	$14,027,000	102	31 years	**Good**
Structures	Fencing, dugouts, pergolas, canopies	$17,714,000	100 shade structures, 30,077m of fencing	30 years	**Fair**
Utilities	Lighting, Underground Distribution Lines, Electrical panels, Transformers	$8,874,000	284	20 years	**Fair**

Art and Culture	Monuments, Plaques, Displays	$1,904,000	126	31 years	**Good**
Landfill					
Landfill	Cells, leachate system, gas collection system, paving and fencing	$18,270,000	8	13 years	**Good**
General Land Improvements					
Parking lots and entrance roads.	Surfaces and curbs	$60,212,000	261	31 years	**Fair**
All other land improvements	Transit terminal land improvements, fencing, fueling facilities	$2,478,000	77	23 years	**Fair**
Public Art					
Public Art Pieces	Art Pieces	3,615,000	40	13 years	**Good**
Natural Assets					
Individual Trees	Boulevard and Maintained Parks Trees	$80,844,000*	40,422	N/A	**Fair**
Parks Forested Areas	Dense Forested Areas	N/A	1305 hectares	N/A	**Fair**

Table 10.1: Land Improvement Asset Overview;
*Replacement includes the removal of the old tree, planting a new young tree, and watering for three years.

The urban forest is recognized both as an asset and a vital component of our green infrastructure, natural heritage system and our quality of life. Unlike our other assets, trees are living and increase in value with age for most of their lifecycle. Our urban forest is at risk from insects, disease, weather damage and development pressures. In the past, there has been a reactive approach to managing these issues. The development of proactive and timely asset management practices is critical to sustain a healthy urban forest. The current total replacement value of boulevard and maintained parks trees is $80,844,000. The calculation for tree replacement includes the removal of the old tree, planting a new young tree, and watering for three (3) years. However, trees appreciate over the life of the tree and it is not possible to replace mature trees with an equivalent tree. The current value of our existing boulevard and maintained Parks trees is

Natural Infrastructure within the City of Thunder Bay has a

Current value of

$392 million

A Replacement Cost of

over $80 million

and generates a flow of
ANNUAL service value of

$13 million

therefore much higher than the replacement cost at $392,000,000. As forested areas regenerate naturally, a replacement cost is not generated for the purposes of this Plan. To determine the service value of natural assets values were placed on the assets according to the services and benefits they provide such as recreation opportunities, water treatment, stormwater absorption, improved air quality, providing habitat for wildlife and more.[1] The values associated with natural assets will be updated and refined through the renewal of the Urban Forest Management Plan.

Public art beautifies cities, gives meaning to place and builds community identity. It contributes to a visually dynamic environment, creating public spaces that celebrate, engage and stimulate. Residents of Thunder Bay take immense pride in the magnificent natural setting of their northern community and rich cultural heritage. Numerous works within our public art collection are reflective of these elements.

Developing an asset management plan for the maintenance and renewal of public art entails recognizing both its differences and similarities compared to managing other assets. Unlike replaceable items such as equipment in an arena or a new truck in a fleet, public art pieces are unique and irreplaceable.

10.1.1 ASSET CONDITION
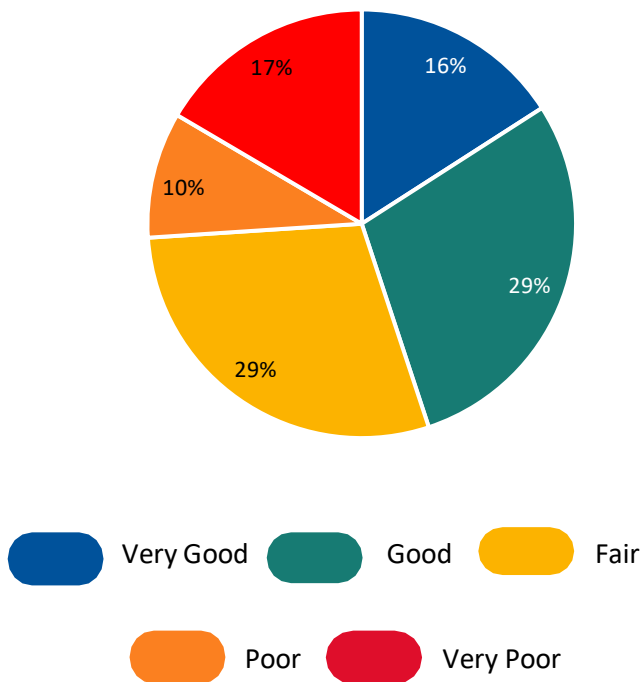
Condition Profile of Land Improvements

Legend:
- Very Good — 16%
- Good — 29%
- Fair — 29%
- Poor — 10%
- Very Poor — 17%

Figure 10.1: Condition Profile of Land Improvements broken down as a percentage of total replacement cost.

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[1] Values placed on trees were derived from The economic value of Canada's National Capital Green Network | PLOS ONE for forests and the 2023 i-tree report for Thunder Bay's Boulevard Trees.

10.1.2 ASSET AGE

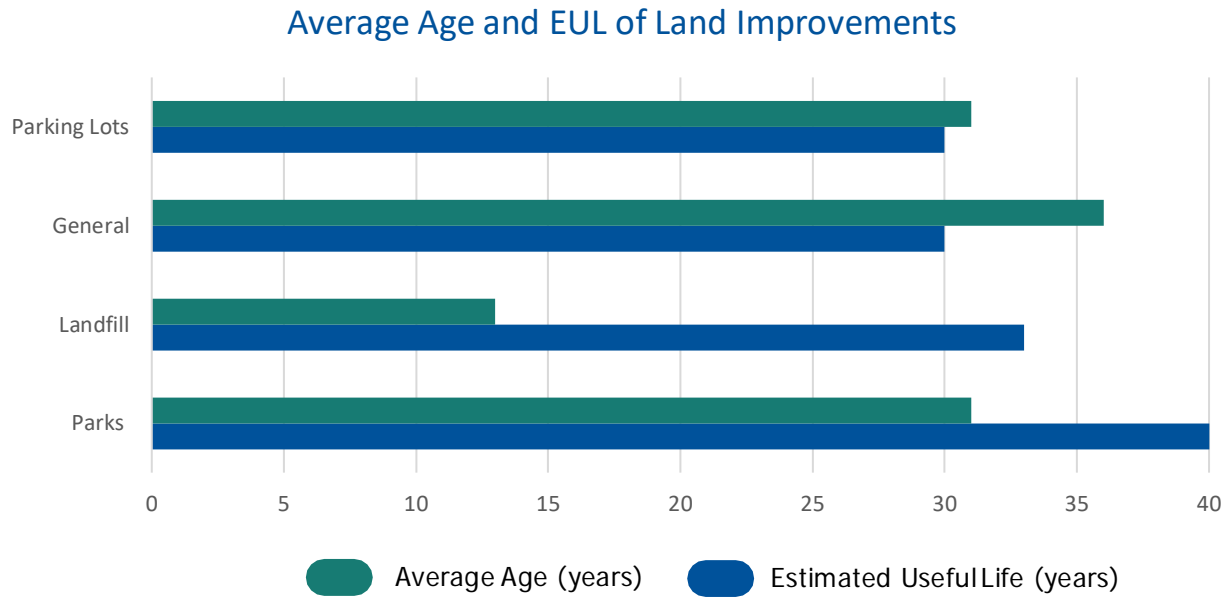### Average Age and EUL of Land Improvements

Figure 10.2 : Average Age and EUL of Land Improvement assets.

Figure 10.2 shows the average age and estimated useful life (EUL) of land improvements. The overall average of land improvement assets is 28 years. Data is not currently available to estimate the age of trees in the Urban Forest. Public art does not have an EUL; however, maintenance and conservation planning are vital to ensure the integrity and longevity of the pieces.

10.2 Lifecycle of the Asset

If the appropriate lifecycle activities are not completed and a backlog of maintenance occurs there are significant consequences to land improvement assets.

Maintenance

- Planned activities such as inspections, monitoring, patching and minor repair. Work orders are issued for identified deficiencies.
- Residents can submit complaints to Infrastructure, Development & Operations Dispatch regarding the state of land improvement assets. Complaints are reviewed, triaged, and responded to accordingly.
- City boulevard and parks trees are maintained through activities including trimming, removals, plantings, injections or treatment, and watering new trees based on available resources. The trees are monitored and problems are addressed when triggered by staff or public observations.

Rehabilitation

- There are certain activities that can be performed to extend the life of land improvement assets. Repairs are driven by health and safety concerns, customer complaints / expectations and budget constraints.
- Activities to extend the life of mature trees include deep root fertilization, bolting and cabling, soil remediation and root barriers

Replacement/Reconstruction

- Land Improvement assets are replaced at end-of-life;
- Public Art pieces are intended to be maintained in perpetuity.
- Trees that are dead or dying are considered for replacement. This includes the removal of dead tree and stump. The site is prepared for a new tree to be planted. There may be use of underground technologies to provide protected rooting zone in conjunction with utilities, sidewalks, and in some cases roads.

Disposal

- Disposal of Land Improvement assets occur in line with best practices when service changes are required or when changes in usage make them unnecessary.
- When tree removal is considered necesary, disposal activities include: tree, brush, and wood removal, stump removal, site restoration.

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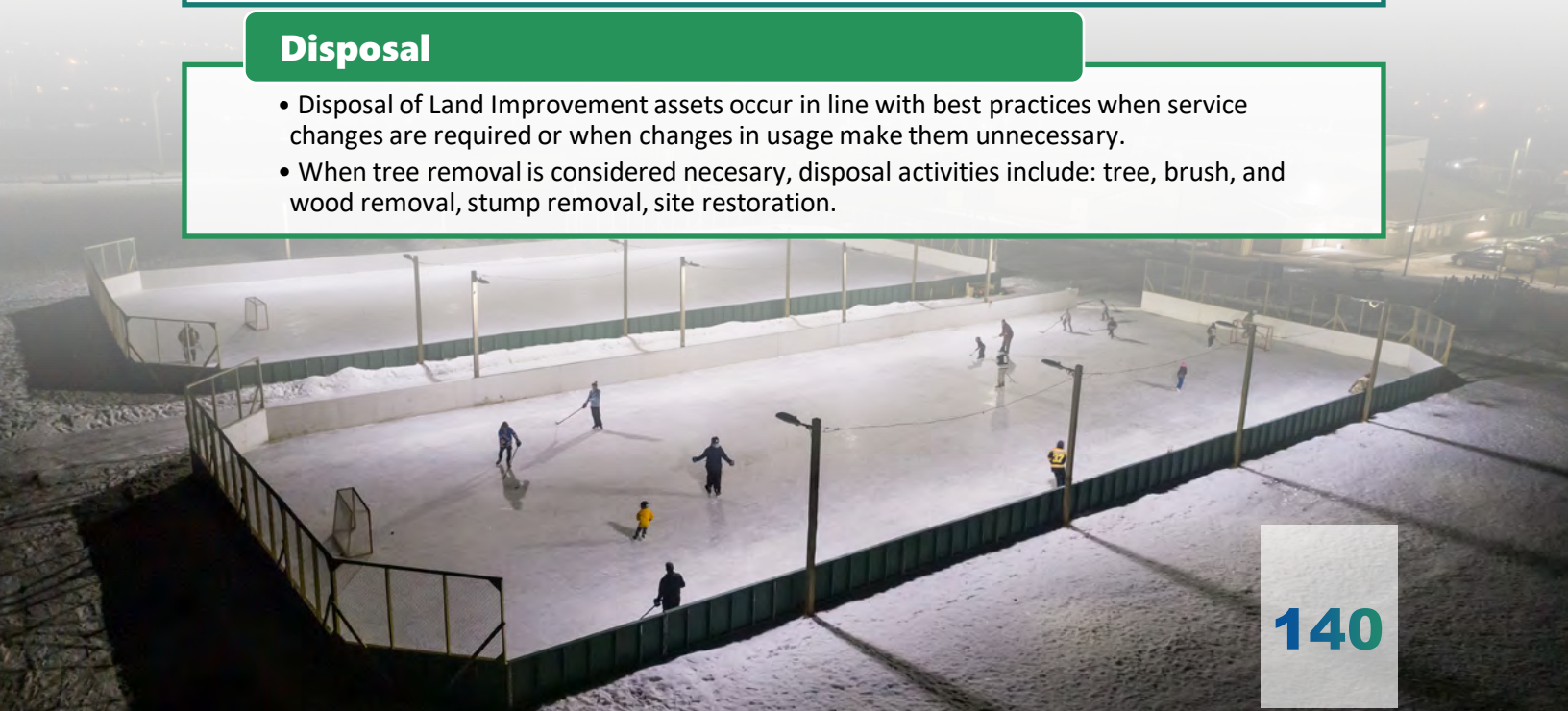
10.3 Levels of Service

10.3.1 COMMUNITY LEVELS OF SERVICE

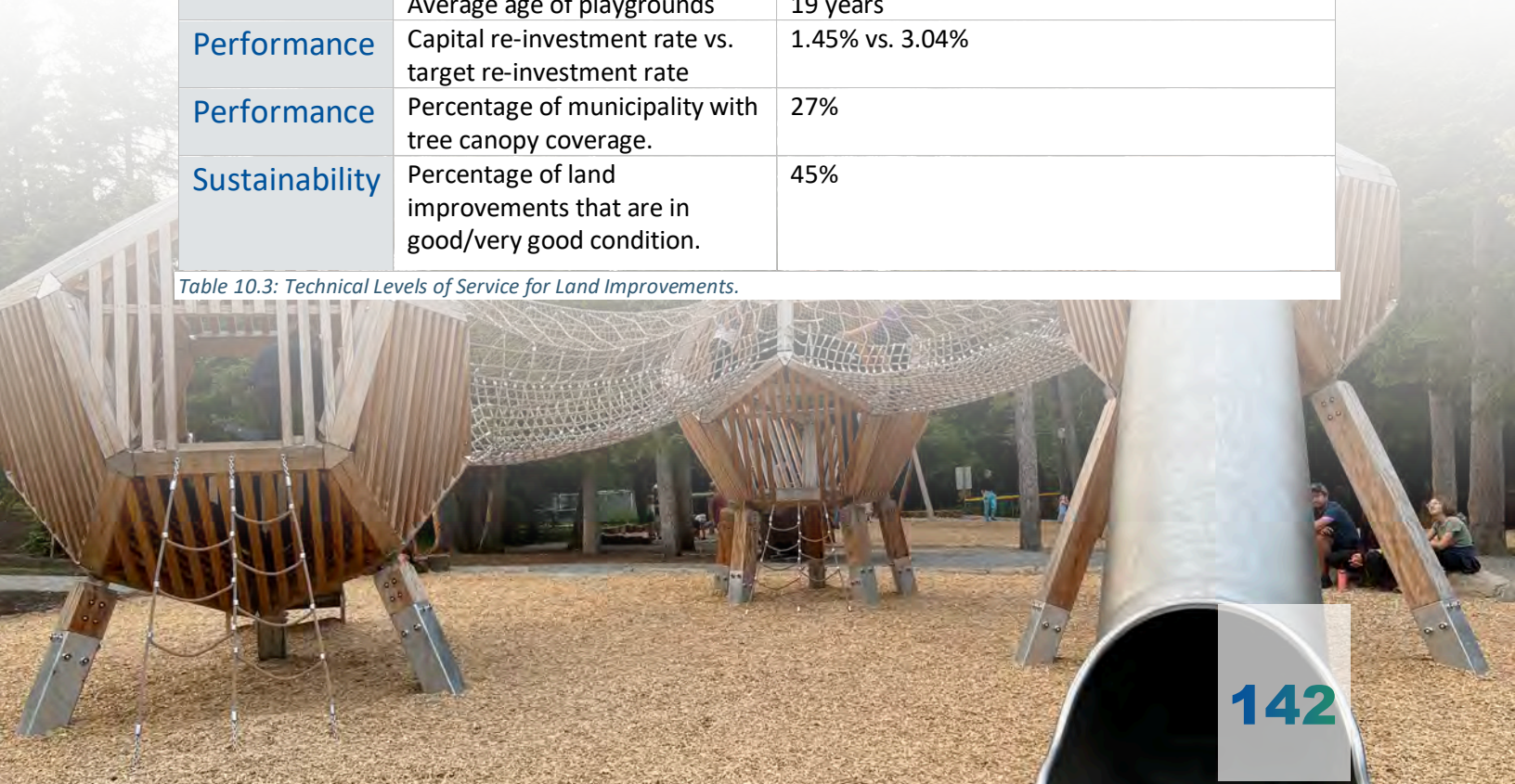| Service Attribute	Performance Measure	2022/2023 Performance
Scope	Description, which may include maps, of the areas of the municipality that are parkland	A map has been provided on page 143 depicting the areas of the City of Thunder Bay that are parklands.
	Description, which may include maps, of the areas of the municipal parkland that are forested.	A map has been provided on page 144 depicting the areas of the City of Thunder Bay of forested parkland.
	Description, which may include maps, of the multi-use trails within the City.	There are 73 km of paved multi-use trails. A map has been provided on page 145 depicting the multi-use trails in the City of Thunder Bay.
	Description, which may include maps, of the areas of the municipal parkland that are sports fields.	A map has been provided on page 146 depicting the areas of the City of Thunder Bay Parks that are sports fields.
Quality	Percentage of citizens that are either very or somewhat satisfied with the various services related to Land Improvement Assets based on 2022 Citizen Satisfaction Survey.	Parks and Greenspaces: 91% satisfied. Hiking and walking trails: 91% (City of Thunder Bay 2022 Citizen Satisfaction Survey Report)
	Percentage of survey respondents that feel that the multi-use trail network should be maintained at a GOOD (current) rating.	75.5% of the 2023 Active Transportation Levels of Service Survey respondent feel that multi-use-trails should be maintained at a GOOD rating.
	Percentage of survey respondents that feel that the City spends an adequate amount on multi-use trails.	30.8% of the 2023 Active Transportation Levels of Service Survey respondents feel that the City spends an adequate amount on multi-use trails. 50.3% of respondents would like more spent on multi-use trails.

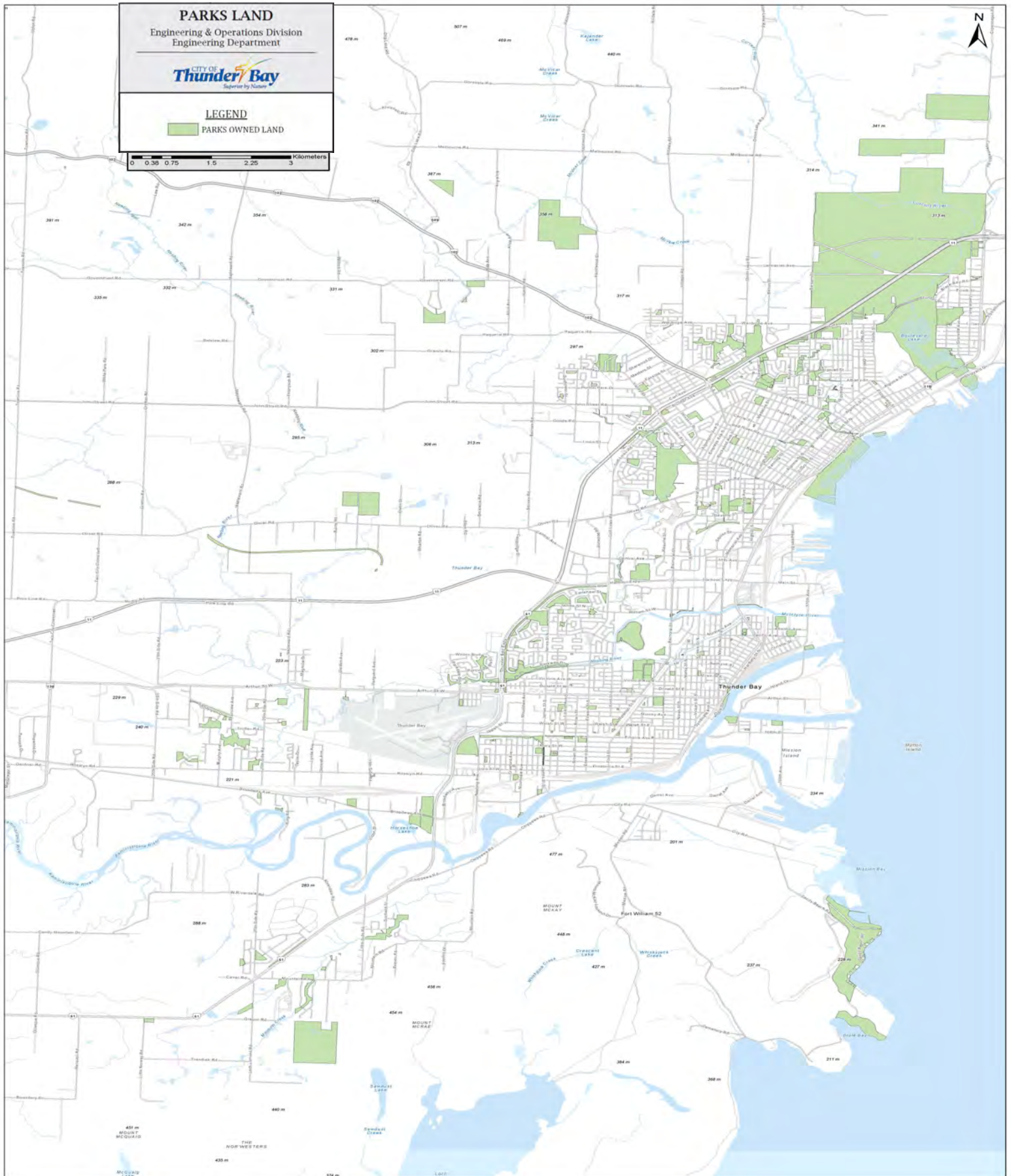| Safety	Description of the interventions taken to ensure the regular safe use of land improvement assets.	Land improvement assets are inspected at various intervals based on the asset type. Residents can also file service requests if they identify issues relevant to any of the City's assets.
	Percentage of survey respondents that feel safe while using multiuse trails.	73.2% of the 2023 Active Transportation Levels of Service Survey respondent feel somewhat or very safe while using multi-use trails. 66.6% of those that use a mobility device feel safe using the device on a multi-use trail.
	Survey respondents' top reasons for feeling unsafe using multiuse trails.	1. Poor connectivity (eg. Limited road crossings, trails don't connect, etc.) 2. Other (eg. Poor lighting, more separation between vehicular and active transportation infrastructure needed, personal safety concerns) 3. Surface condition (eg. Significant cracking, tripping hazards, potholes)

Table 10.2: Community Levels of Service for Land Improvements. Survey responses from the 2023 Active Transportation Levels of Service Survey can be found in Appendix G.
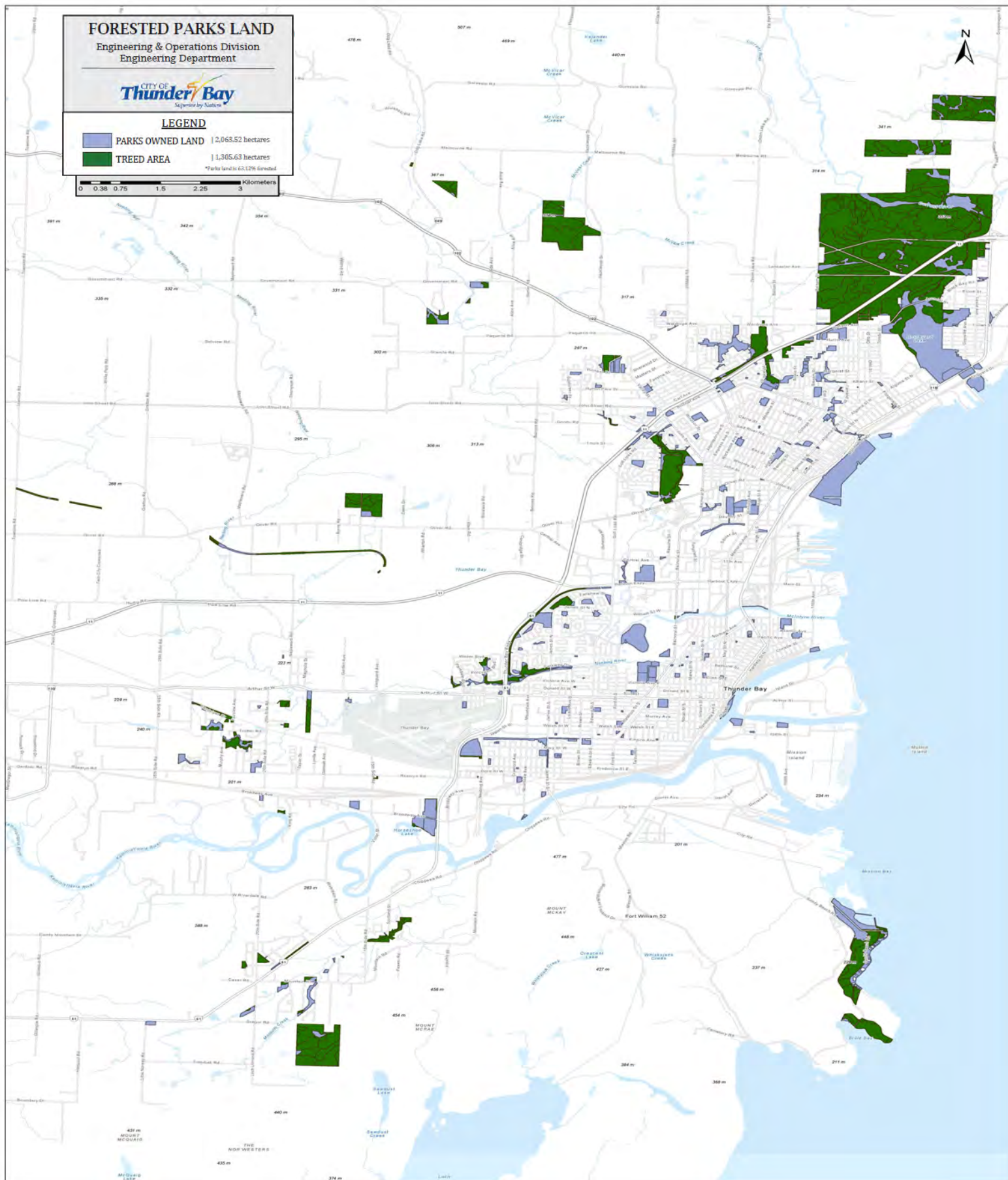
10.3.2 TECHNICAL LEVEL OF SERVICE

Service Attribute	Performance Measure	2022/2023 Performance
Accessibility and Reliability	Number of playground structures that are AODA compliant vs. total number of playground structures.	24 vs. 119
	Average age of playgrounds	19 years
Performance	Capital re-investment rate vs. target re-investment rate	1.45% vs. 3.04%
Performance	Percentage of municipality with tree canopy coverage.	27%
Sustainability	Percentage of land improvements that are in good/very good condition.	45%

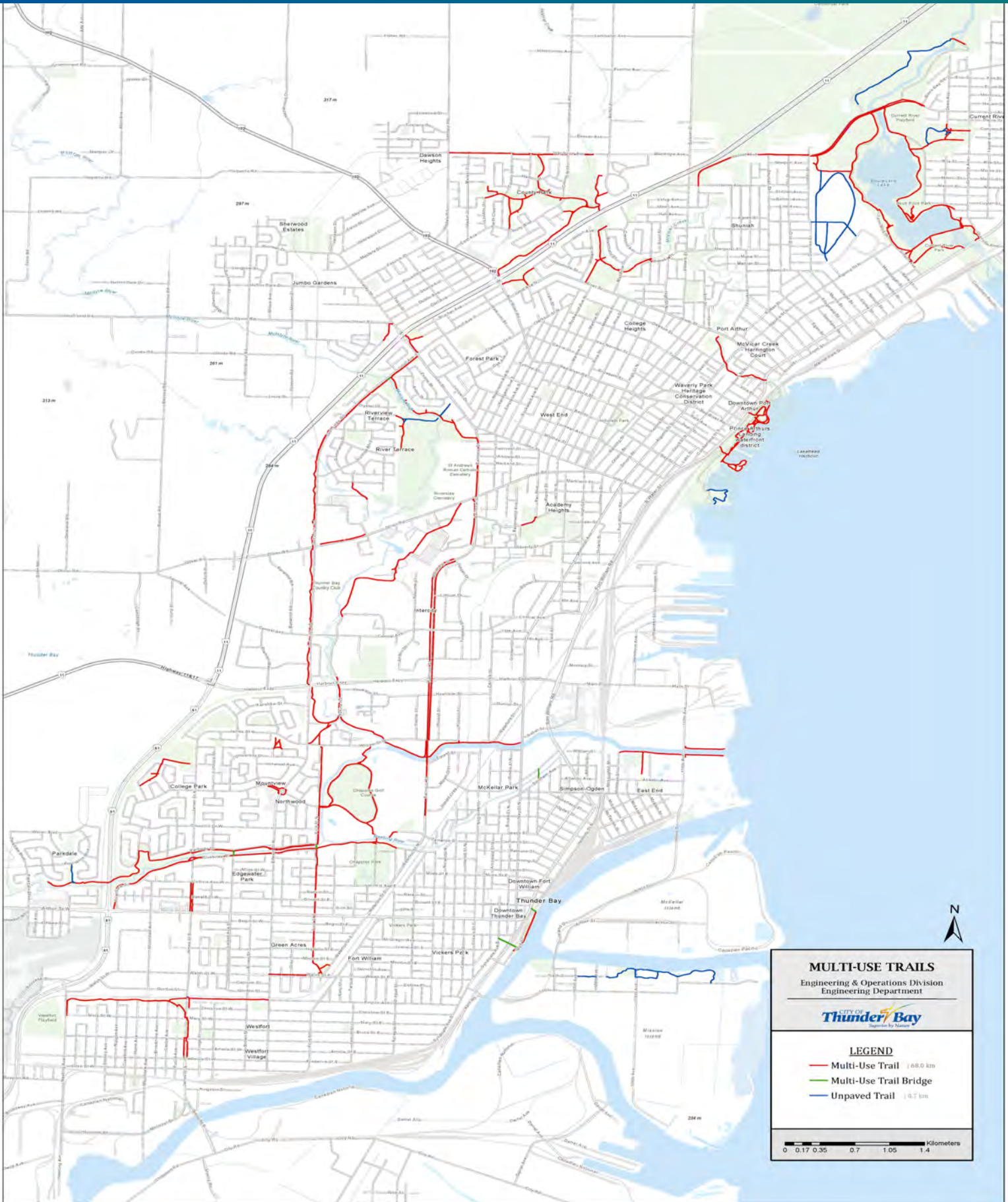*Table 10.3: Technical Levels of Service for Land Improvements.*

Map 10.1: City of Thunder Bay Parklands

FORESTED PARKS LAND
Engineering & Operations Division
Engineering Department

CITY OF Thunder Bay
Superior by Nature

LEGEND
PARKS OWNED LAND | 2,063.52 hectares
TREED AREA | 1,305.63 hectares
*Parks land is 63.12% forested

Map 10.2: City of Thunder Bay Forested Parklands

MULTI-USE TRAILS

Engineering & Operations Division
Engineering Department

CITY OF
Thunder Bay
Superior by Nature

LEGEND

— Multi-Use Trail | 68.0 km
— Multi-Use Trail Bridge
— Unpaved Trail | 8.7 km

Kilometers
0   0.17 0.35   0.7   1.05   1.4

Map 10.3: City of Thunder Bay Multi-use Trails

PARKS FIELDS

Engineering & Operations Division
Engineering Department

CITY OF
Thunder Bay
Superior by Nature

LEGEND

SPORTSFIELDS | 40.17 hectares

DOG PARKS | 7.72 hectares

Kilometers
0 0.25 0.5 1 1.5 2
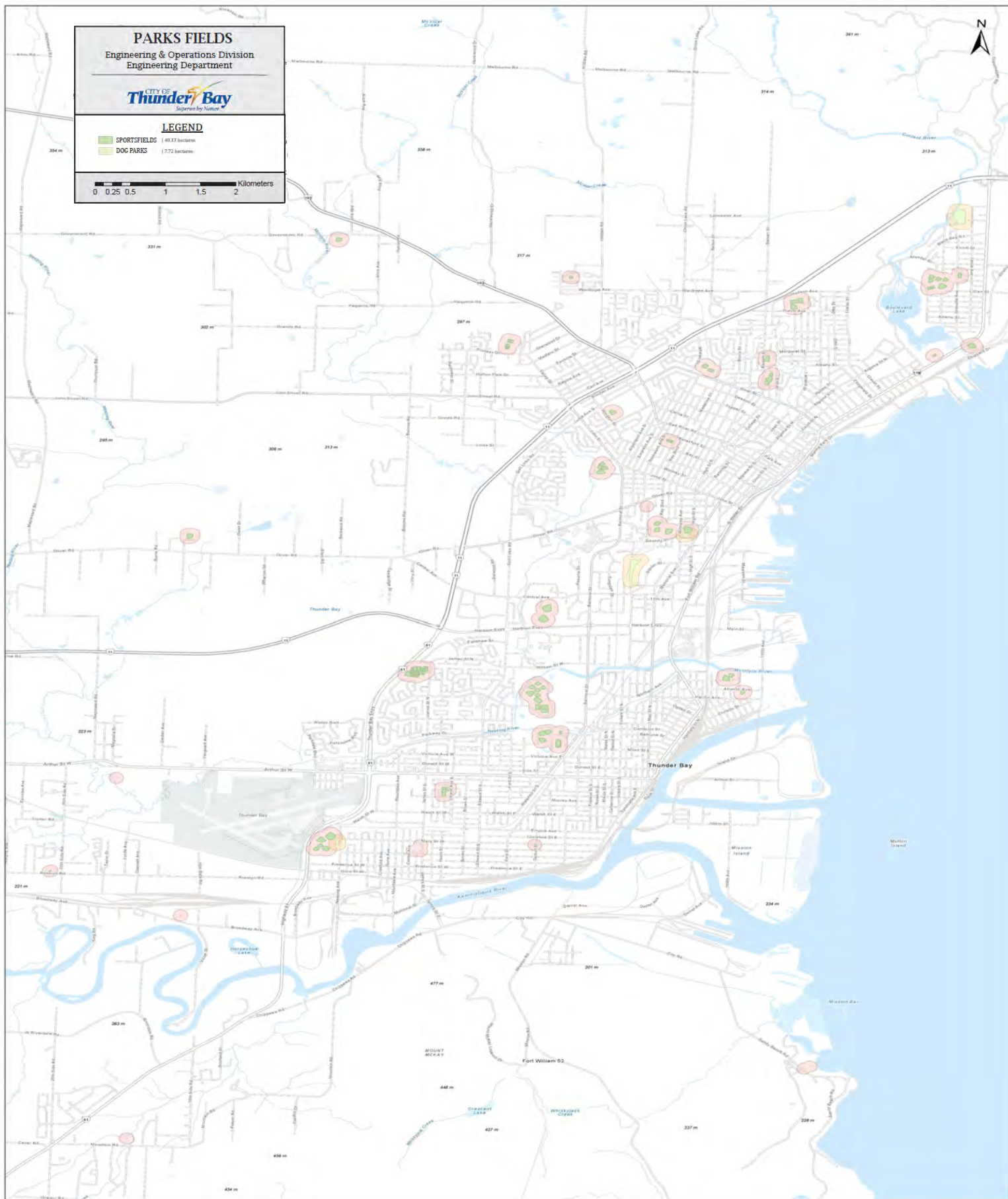
Map 10.4: City of Thunder Bay Sports Fields

146

10.4 Investing in the Assets

To maintain the proper level of repair, renewal and replacement of land improvement assets the annual sustainable funding amount is $7,796,000. The five (5) year historical budgeted funding allocated to the land improvement assets was $3,711,000. This means that there is an infrastructure deficit, or shortfall, of $4,085,000.

The shortfall has and will continue to create a backlog of work and will require significant funding to overcome. A 50-year projection of the annual asset replacement profile is shown below.
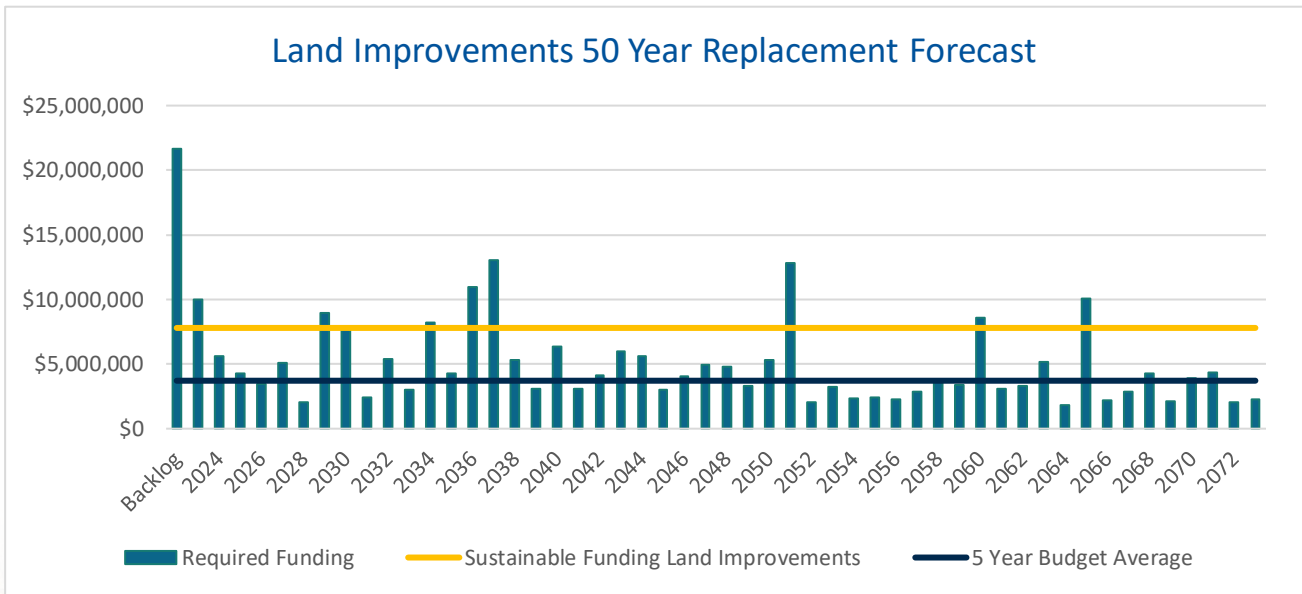

Figure 10.3 : Land Improvements 50 Year Asset Replacement Forecast

Land Improvement Infrastructure Deficit:

$4,085,000

10.5 Climate Change Considerations

Land Improvements assets are directly impacted by climate change such as flooding due to significant rainfall. The repair, renewal and replacement of land improvement assets consider the following climate risks, adaptation and mitigation opportunities.

Climate Risks Identified with Land Improvement Assets:

- Potential increased infrastructure damage as more frequent and severe weather events increase overland flooding from stormwater ponding in low-lying areas.
- Increased springtime flooding and decrease in spring time groundwater recharge due to greater frost depth from extreme cold.
- Potential increased maintenance and replacement costs as pavement and other exposed land improvement assests durability and lifespan decreases with more severe weather events and freeze and thaw cycles.

Future Climate Adaptation Opportunities:

- Consider Climate Change impacts in the design, location, construction and maintenance of the land improvement assets while considering affordability and co-benefits.
- Incorporate new technology and best practices in the design, construction and mai ntenance of new infrastructure to minimize service disruption and increase resiliency.
- Increase urban canopy coverage to aid in stormwater management, air quality, carbon sequestration, providing habitat for wildlife, and more.

Future Climate Mitigation Opportunities:

- Investing in complete, connected cycling and pedestrian networks in the short to medium term (aligns with Objective #13, Thunder Bay Net-Zero Strategy).
- Assess embodied carbon of materials used in infrastructure projects and explore oppo rtunities to use materials and construction methods with lower embodied carbon.
- Increase the landfill capture rate of methane to 80% by 2040 (Objective #15, Thunder Bay Net-Zero Strategy.

11.0 Next Steps

This Phase Two Asset Management Plan has been developed to achieve compliance with *Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure* under the *Infrastructure for Jobs and Prosperities Act, 2015.*   Next steps include:

Phase Three – by July 1,2025

Establish proposed levels of service (LOS) for all assets including information such as:

- Why are the proposed LOS appropriate for the City based on options and risk associated with the long-term sustainability of the City?
- How do the proposed LOS differ from the current LOS?
- Are the proposed LOS achievable?
- Can the City afford the proposed LOS?

Determine performance of each asset category based on measures developed by the City such as those that would measure energy usage and operating efficiency.

Develop a lifecycle management and financial strategy for all assets including information such as:

- Prepare a full lifecycle of the asset.
- Determine the options and risks of lifecycle activities to achieve the proposed LOS and which options can achieve the LOS at the lowest cost.
- Estimated annual costs, estimated funding projections and information on how to maximize projected funding to be available to achieve the proposed LOS.
- Estimated capital expenditures and significant operating costs to achieve proposed LOS to accommodate increases in demand due to population and employment growth, including costs related to new construction or to upgrading existing municipal infrastructure assets.
- Source of funding projected to be available due to an increase in population and economic activity.
- Overview of risks associated with the implementation of the Asset Management Plan and actions that could mitigate those risks.

Endorsement of the Plan through resolution of City Council.

Annual review by City Council including the City's progress on implementation of the Plan, factors impeding the implementation and a strategy to address those factors.

APPENDICES
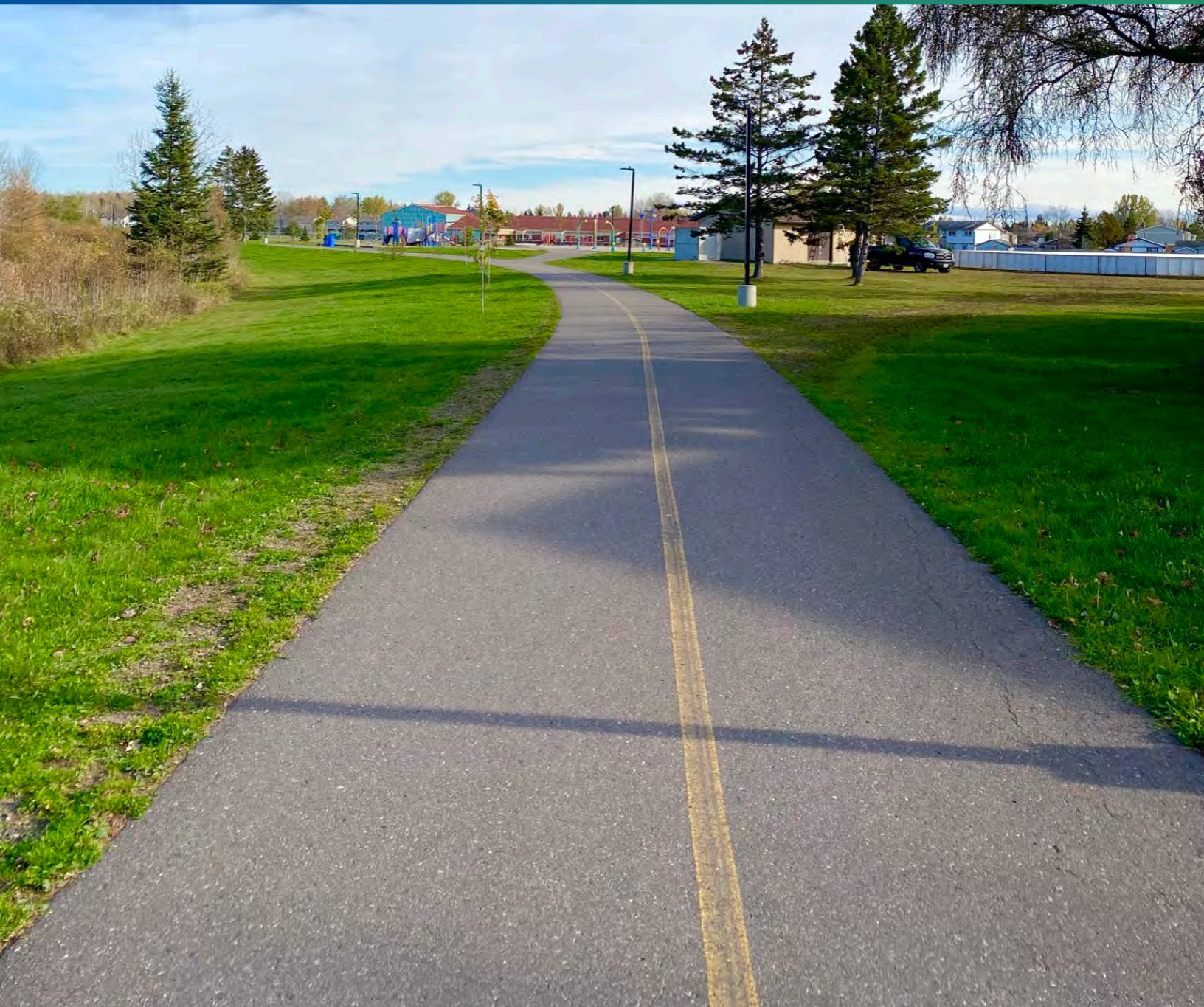
APPENDIX A. Location of Data

The data and information used for this Plan is stored using various software programs and databases. A central repository of information is within CityWide Asset Manager Module (CityWide AM). This software holds financial records for all assets deemed to be tangible capital assets (TCA) and is used as the source data for the Plan.

Other software and databases currently used by the City include Infor (Hansen), Esri GIS and databases used by individual sections. Physical road assessment information is input into a Pavement Management System to model robust deterioration curves and used to predict the current road condition. For assets that do not have an objective condition rating, internal subject matter experts assess the assets within that asset class to determine a subjective condition rating.

A copy of the City of Thunder Bay's Asset Management Policy and the Future-Ready Roadmap: Sustainable Services through Asset Management are available on the City's website.

APPENDIX B. Exclusions and Assumptions

The development of this Phase Two Plan was guided by the requirements of the regulation and considers the following exclusions and assumptions. The Plan:

- Does not account for any future legislative changes;
- Does not assume material growth to service areas from new development activities;
- Does not consider deferred maintenance, using assets beyond their useful life, and/or unplanned debt to maintain, rehabilitate or replace assets;
- Does not consider lifecycle activities that are missed or delayed, such as maintenance, rehabilitation or disposal;
- Does not include inflation;
- Expresses information in 2022 dollars;
- Includes a growth rate of nil to financial forecasts[1]; and
- Includes state of infrastructure at a single point-in-time.

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[1] The current growth rate is fluctuating between the positive and negative rate of <1%.

APPENDIX C. Glossary

Arterial Road: Arterial roads are classified as rural, minor, or major and are planned, designed and constructed to carry moderate to large volumes of through-traffic (vehicles, transit, pedestrians, and cyclists) travelling at moderate speeds throughout the City.

Asset Management: The process that allows a municipality to implement a long-term approach for managing and investing in assets. It includes the planning, design, construction, operation, and maintenance of assets and infrastructure used to provide City services.

Asset Management Plan: Provides a comprehensive reference for the construction, maintenance, rehabilitation, disposal, and replacement of the City's assets based on sound asset management practices and principles.

Asset Category: A category of municipal assets that is an aggregate of assets or composed of any other aggregate of municipal infrastructure assets that provide the same type of service.

Asset Condition: The condition of an asset based on overall health and physical condition, and is used to help estimate how long before repair, renewal, or replacement is required.

Collector Roads Collector roads are planned, designed, and constructed to carry moderate volumes of medium-distance traffic (vehicles, transit, pedestrians, and cyclists) travelling at moderate speeds between local and arterial roads. The function is to accommodate traffic movements and provide direct access to properties.

Community Levels of Service: See Levels of Service.

Connect-days: The number of properties connected to a municipal system that are affected by a service issue, multiplied by the number of days on which those properties are affected by the service issue.

Core Asset: Any municipal infrastructure asset that is a:

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) Road asset; or a
e) Bridge or Structural culvert.

Estimated Useful Life (EUL): The estimated useful life is based upon the previous asset longevity and design life of an asset.

Future-Ready Roadmap: This is the name given to the City of Thunder Bay's Asset Management Plan and Program.

Green Infrastructure Asset: An infrastructure asset consisting of natural or human-made elements that provide ecological and hydrological functions and processes and includes natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces and green roofs.

Infrastructure Deficit: Amount of capital that remains unfunded when comparing the required funding and planned capital budget.

Lane-kilometre: A kilometre-long segment of roadway that is a single lane in width.

Levels of Service (LOS): Levels of Service are indicators that are comprised of many factors that define and establish quality thresholds at which municipal services are provided. Community LOS are qualitative, non technical descriptions. Technical metrics LOS are quantitative. Performance measures may be legislated, City service objectives, or industry standards.

Lifecycle Activity: Activities undertaken with respect to a municipal infrastructure asset over its service life, including constructing, maintaining, renewing, operating and decommissioning, and all engineering and design work associated with those activities.

Local Road: Local roads are planned, designed, and constructed to provide property access and carry low volumes of traffic (vehicles, transit, pedestrians, and cyclists) travelling at relatively slow speeds between points of origin and collector roads.

Low Impact Development (LID): Low Impact Development, term used in Canada and United States to describe a land planning and engineering design approach to managing Stormwater runoff. A LID emphasizes conservation and use of on-site natural features to protect water quality. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrology through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source. Some examples of LID techniques include permeable pavement, rain barrels, grassed swales, green roofs, and tree box filters.

Municipal Infrastructure Asset: An infrastructure asset, including a green infrastructure asset, directly owned by a municipality or included on the consolidated financial statements of a municipality, but does not include an infrastructure asset that is managed by a joint municipal water board.

Ontario Structure Inspection Manual: The Ontario Structure Inspection Manual (OSIM), published by the Ministry of Transportation and dated October 2000 (revised November 2003 and April 2008) and available on a the Government of Ontario website.

Operating Costs: The aggregate of costs, including energy costs, of operating a municipal infrastructure asset over its service life.

Service Life: The total period during which a municipal infrastructure asset is in use or is available to be used.

Significant Operating Costs: Where the operating costs with respect to all municipal infrastructure assets within an asset category are exceed a threshold amount set by the municipality, the total amount of those operating costs.

Stormwater: Runoff, such as rain and melted snow, that flows overland into catchbasins, ditches, streams, rivers and lakes. Stormwater assets relate to the collection, transmission, treatment, retention, infiltration, control, or discharge of stormwater.

Structural Culvert: Has the meaning set out for "culvert (structural)" in the Ontario Structure Inspection Manual.

Sustainable Funding: The amount of annual funds required to be available to manage the expected costs of maintaining the assets at their current levels of service. It provides a stable level of funds allowing for accurate and consistent planning. It includes an average maintenance/replacement cost with an additional amount used for savings.

Technical Metric Levels of Service: See Levels of Service.

Transportation Services: Assets that relate to the road system that are paved or gravel, bridge assets categorized as any vehicle, pedestrian, or multi-use bridge, and structural culvert assets which are any cross culverts larger than 3 m in diameter.

Total Annual Funding: Includes the capital portion of tax revenue (including Enhanced Infrastructure Renewal Plan) at 70%, Provincial Gas Tax, Canada Community Building Fund, Ontario Community Infrastructure Fund, planned debt and cyclical reserve contributions. Tax funding is allocated proportionally based on the percentage deficit- the larger the infrastructure deficit, the larger the allocation of tax funding.

Wastewater: Water that has been used in a home, business, or as part of an industrial process. Wastewater, or raw sewage, from across the City, is collected in large trunk sewers and flows, mainly by gravity, to the Main Pump Station at the Atlantic Avenue Water Pollution Control Plant. Wastewater assets relate to the collection, transmission, treatment, or disposal of wastewater, including any wastewater assets that, from time-to-time, manage stormwater.

APPENDIX D. Asset Management Policy

CITY OF
Thunder Bay
Superior by Nature

CORPORATE   *Policy No. 11-02-08*
POLICY   *Effective Date: 03/20/2019*

SECTION:	ASSET MANAGEMENT
DEPARTMENT/DIVISION	INFRASTRUCTURE & OPERATIONS
SUBJECT:	***Strategic Asset Management Policy***

POLICY STATEMENT

The City of Thunder Bay is committed to developing and implementing a corporate wide **Asset Management Program** in compliance with Ontario Regulation 588/17(O. Reg. 588/17), Asset Management Planning for Municipal Infrastructure, under the *Infrastructure for Jobs and Prosperity Act, 2015*. The program will promote informed infrastructure investment decisions based on sound asset management practices and will include social, environmental and economic considerations.

PURPOSE

The purpose of this policy is to provide leadership in and commitment to the development and implementation of the City's asset management program. It is intended to guide the consistent use of **Asset Management (AM)** across the organization, to facilitate logical and evidence-based decision-making for the management of **Municipal Infrastructure Assets** and to support the delivery of sustainable community services now and in the future. This policy demonstrates an organization-wide commitment to the good stewardship of municipal infrastructure assets and to improved accountability and transparency to the community through the adoption of best practices in asset management.

BACKGROUND

The City is responsible for providing a range of services to the community including reliable transportation servicess for the movement of people and goods, safe drinking water, environmentally safe collection and treatment of wastewater and stormwater, safe and functional public facilities, and recreation programs and opportunities, among many others. To deliver these services it owns and manages a diverse portfolio of municipal infrastructure assets that includes roads, sidewalks, bridges, culverts, watermains, treatment plants and pump stations, sanitary and storm sewer servicess, facilities and parks, as well as an extensive inventory of equipment and fleet. As the social, economic and environmental well-being of the community depends on the reliable performance of these municipal infrastructure assets it is critical to implement a systematic, sustainable approach to their management. An asset management approach allows organizations to make informed decisions regarding the planning, building, operating, maintaining, renewing, replacing and disposing of municipal infrastructure assets through a wide range of **Lifecycle Activities**.

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ALIGNMENT WITH THE MUNICIPALITY'S STRATEGIC DIRECTIONS

The Asset Management Program will be informed by several of the City's planning documents including the City of Thunder Bay Official Plan; the Corporate Strategic Plan; the EarthCare Sustainability Plan; and the Climate Ready City: City of Thunder Bay Climate Adaptation Strategy, among others. These documents complement each other and provide direction on achieving long-term social, environmental, and economic sustainability that support the development of the City's assets in accordance with citizen input.

PRINCIPLES

To guide Thunder Bay's asset management program, the following statements have been developed in compliance with O. Reg. 588/17:

1. Implement continuous improvement protocols and adopt best practices regarding asset management planning, including:
   i. Complete and accurate asset data
   ii. Condition assessment protocols
   iii. Risk and criticality models
   iv. Lifecycle management
   v. Financial strategy development
   vi. **Level Of Service** framework

2. Continue to develop and maintain an asset inventory of all municipal infrastructure assets.

3. Develop an **Asset Management Plan** that incorporates all municipal infrastructure assets that meet the **Capitalization Thresholds** outlined in the organization's Tangible Capital Asset Policy, as summarized in Schedule A of this Strategic Asset Management Policy. With the exception of work-in-progress, all single and pooled municipal infrastructure assets that fall within one of these asset classes and meet the capitalization threshold will be incorporated in future asset management plans.

   Future asset management plans may include any assets to which work is completed through approved capital projects, regardless of whether these assets meet existing capitalization thresholds.

   After 2024, the plan will be updated at least every five years in accordance with O. Reg. 588/17 requirements to promote, document and communicate continuous improvement of the Asset Management Program.

4. Integrate the asset management program with long-term financial planning and budgeting strategies. This includes the development of financial plans that determine the level of funding required to achieve short-term operating and maintenance needs, in addition to long-term funding needs to replace and/or renew municipal infrastructure of existing and new infrastructure, including considerations for climate mitigation and adaptation.

5. Continue to develop performance metrics to transparently communicate the current state of the asset management program to Council and the community.

6. Consider the social, economic, and environmental risks and vulnerabilities of municipal infrastructure assets including risks relating to climate change and the actions that may be required including, but not limited to, anticipated costs that could arise from these impacts, adaptation

opportunities, mitigation approaches, disaster planning and contingency funding. Impacts may include matters relating to construction, operations, levels of service and lifecycle management.

7. Align, annually through the capital budget process, asset management planning with financial plans prepared under the Safe Drinking Water Act, 2002, such as the City of Thunder Bay's Drinking Water System Financial Plan, as well as any financial plans related to the Municipality's other assets, as approved by Council.

8. Align all asset management planning with the Province of Ontario's land-use planning framework, including any relevant policy statements issued under section 3(1) of the *Planning Act*; any provincial plans as defined in the *Planning Act,* and the City of Thunder Bay's official plan.

9. Continue to coordinate asset management planning where infrastructure assets connect or are interrelated with neighbouring communities wherever viable and beneficial.

10. Provide opportunities for municipal residents and other interested parties to offer input into asset management planning.

11. Review and, if necessary, update this Strategic Asset Management Policy at least every five years.

12. The City shall consider where applicable the principles in as outlined in Section 3 of the *Infrastructure for Jobs and Prosperity Act, 2015*, when making decisions regarding asset management.

ROLES AND RESPONSIBILITIES

1. **Council**
    i.   Approve AM policy and policy updates
    ii.   Approve the AM plan and plan updates
    iii. Approve the human and financial resources required to support the elements of sustainable service delivery
    iv.   Consider the impact of policy decisions and expansion to infrastructure on the City's ability to maintain existing assets
    v.   Consider the sustainability of growth and the Levels Of Service delivered to the community when making decisions

2. **Executive Lead (General Manager - Infrastructure and Operations)**
    i.   Seek Council endorsement of the AM plan, policy, and any updates
    ii.   Report to Council and the Executive Management Team on AM program and required planning resources

REFERENCES

1. As of the effective date of this policy the following regulatory documents apply:
    a. *Infrastructure for Jobs and Prosperity Act, 2015*.
        i. Section 3: Infrastructure Planning Principles
    b. Ontario Regulation 588/17, Asset Management Planning for Municipal Infrastructure
2. Corporate Report No. R 16/2019

DEFINITIONS

Unless otherwise noted, the definitions provided in this document align with those outlined in Ontario Regulation 588/17 (O. Reg. 588/17), Asset Management Planning for Municipal Infrastructure, under the *Infrastructure for Jobs and Prosperity Act, 2015*.

1. **Asset Management (AM)** – the coordinated activity of an organization to realize value from assets. It considers all asset types, and includes all activities involved in the asset's life cycle from planning and acquisition/creation; to operational and maintenance activities, rehabilitation, and renewal; to replacement or disposal and any remaining liabilities. Asset management is holistic and normally involves balancing costs, risks, opportunities and performance benefits to achieve the total lowest lifecycle cost for each asset (ISO 55000).

2. **Asset Management Program –** The people, processes, tools, and other resources involved in the delivery of asset management.

3. **Asset Management Plan** – documented information that specifies the activities, resources, and timescales required for an individual asset, or a grouping of assets, to achieve the organization's asset management objectives (ISO 55000). Under O. Reg. 588/17, by 2024 AM plans for all infrastructure assets will be required to include the current levels of service being provided; the current performance of each asset category; a summary of assets in each asset category, their replacement cost, average age, condition information, and condition assessment protocols; lifecycle activities required to maintain current levels of service; discussion of population and economic forecasts; and documentation of processes to make inventory and condition related background information available to the public.

4. **Capitalization Threshold** – the monetary value of a municipal infrastructure asset at or above which a municipality will capitalize the value of the asset and below which the municipality will expense the cost.

5. **Level Of Service** – parameters, or combination of parameters, which reflect social, political, environmental and economic outcomes that the organization delivers. Parameters can include, but are not necessarily limited to, safety, customer satisfaction, quality, quantity, capacity, reliability, responsiveness, environmental acceptability, cost, and availability (ISO 55000).

6. **Lifecycle Activities** – activities undertaken with respect to a municipal infrastructure asset over its service life, including constructing, maintaining, renewing, operating and decommissioning, and all engineering and design work associated with those activities.

7. **Municipal Infrastructure Asset** – an infrastructure asset, including a green infrastructure asset, directly owned by a municipality or included on the consolidated financial statements of a municipality, but does not include an infrastructure asset that is managed by a joint municipal water board.

City of Thunder Bay Strategic Asset Management Policy

Schedule A – Tangible Capital Asset Policy

As per Appendix A of the Tangible Capital Asset Policy, the City has established asset categories and capitalization thresholds in accordance with Public Sector Accounting Board reporting guidelines. This includes single asset capitalization thresholds as outlined below:

Asset Type	Single Asset Capitalization Threshold
Land	$0
Land – Depreciable	$0
Land Improvements	$10,000
Buildings (minimum 100 ft^2)	$10,000
Machinery & Equipment	$10,000
Vehicles	$10,000
Linear	$10,000
Work-In-Progress	Capitalize upon substantial completion of work, and/or when asset is placed into service

The City has also identified two exceptions to the rule that municipal infrastructure assets must meet the capitalization threshold in order for those assets to be capitalized in financial statements. These exceptions deal with large bulk purchases and cyclical capital projects, which will be captured as a pooled asset as follows:

Exception	Exception Criteria	Pooled Asset Capitalization Threshold
Large Bulk Purchase	Asset falls into the General Capital – Machinery and Equipment class.	Individual cost >= $10,000 Bulk purchase >= $50,000
Cyclical Capital Project	Asset falls into the General Capital – Machinery and Equipment class; project is identified as a capital project; project is a repetitive annual or cyclical project.	Individual cost >= $10,000 Project cost >= $10,000

APPENDIX E. Municipal Plans

The Future-Ready Roadmap supports moving key strategic priorities forward and integrates information from other Corporate strategic documents. A brief description of these plans and strategies and how each relates to asset management is provided below.

2023-2027 Maamawe, Growing Together Strategic Plan

- The goal of the Maamawe, Growing Together Strategic Plan is to provide Council's vision, priorities, and strategy for Thunder Bay. The Plan includes four strategic directions: Maamawe - All Together, Safety and well-being, Growth, and Sustainability.
- The Future-Ready Roadmap will support the Strategic Plan by aiming to fulfill the goals of: Plan and deliver cost-effective services, take decisive action to respond to the climate emergency, and make it easier to access City services.

Active Transportation Plan

- The goal of the Active Transportation Plan is to improve the safety for people participating in active transportation; increase the number of people walking, biking, or travelling by active transportation; develop infrastructure that supports active transportation; develop policies that support active transportation; and develop community partnerships to help implement a dynamic and sustainable active transportation plan.
- The Future-Ready Roadmap will support the Active Transportation Plan by planning for the appropriate financing and sustainable funding required to fund, maintain, and upgrade current and future active transportation infrastructure.

Climate Ready City:
City of Thunder Bay Climate Adaptation Strategy

- The goal of the Climate Adaptation Strategy is to reduce the risks inherent to climate change, while taking advantage of opportunities presented. It supports the City to prepare for, respond to, and recover from the potential impacts of climate change. Infrastructure asset management was identified as a focus area within the strategy, with an emphasis on increasing the resilience of infrastructure and the natural environment.
- The Future-Ready Roadmap will support the Climate Adaptation Strategy through integrating climate adaptation into municipal asset management. This will inform decision-making and strategic long-term investments to reduce the infrastructure risks associated with climate change and capitalize on opportunities.

Climate-Forward City: Thunder Bay Net-Zero Strategy

- The Net-Zero Strategy is a community-wide energy use and GHG emissions inventory and action plan for Thunder Bay to reach net-zero emissions by 2050. It provides a vision for the community and highlights the scale of changes needed to respond to the climate emergency declared by City Council in January 2020.
- The Future-Ready Roadmap will support the Net-Zero Strategy by integrating GHG emissions considerations and prioritizing energy efficiency in the procurement, maintenance, and renewal of assets.

Digital Strategy

- The goal of the City of Thunder Bay Digital Strategy is to use technology to make our community work better in the digital age. It sets out the framework for delivering customer-centred, digitally-powered City services and identifies a number of digital initiatives to be actioned.
- Digital Strategy supports the Future-Ready Roadmap by aiding in digitizing processes and managing data well to drive our practices and decision-making.

Drinking Water System Financial Plan

- The goal of the Drinking Water System Financial Plan is to provide safe drinking water in the short and long term, achieve financial viability, limit overall water costs to consumers, fund the long term capital plan, achieve full cost recovery over the long term, and maintain the current service levels. The Plan focuses on achieving a balance between maintaining the water system in a safe and effective manner, while limiting expenditures and water rate increases.
- The Future-Ready Roadmap will support the Drinking Water System Financial Plan by planning the required maintenance and rehabilitation of assets to reduce lifecycle costs to help keep water network costs in line with the Financial Plan.

EarthCare Sustainability Plan

- The goal of the EarthCare Sustainability Plan is to lead the community in securing the environmental health of our region, and thereby improve the social, cultural, and economic wellbeing of future generations.
- The Future-Ready Roadmap will support the EarthCare Sustainability Plan by working with the public to achieve environmental goals, to educate on asset management best practices and new ideas, and to mutually benefit from the outcomes.

Indigenous Relations & Inclusion Strategy

- The goal of the Indigenous Relations & Inclusion Strategy is to support the City's enhancement of its relationship with Indigenous partners and communities, while advancing Indigenous Peoples' inclusion in the City's opportunities and growth, and is guided by the City of Thunder Bay Anishinaabe Elders Council, commitments made under the Anti-Racism & Inclusion Accord and other strategic documents, and the local Indigenous community.
- The Future-Ready Roadmap will support the Indigenous Relations & Inclusion Strategy by incorporating and honouring Indigenous history and culture in City spaces through exhibits and activities, collaborating on new place-making initiatives and opportunities for welcoming spaces in the city, conducting research in collaboration with academic and Indigenous partners to identify Indigenous heritage recognition opportunities in City spaces, and by maintaining and enhancing existing place-making spaces.

Fit Together: Recreation and Facilities Master Plan

- The goal of the Fit Together: Recreation and Facilities Master Plan is to outline a series of short, medium to longer term priorities for investement in facilities, services and programs owned and/or delivered/operated by The City of Thunder Bay over a 15-year timeframe.
- The Future-Ready Roadmap will support the Recreation and Facilities Master Plan by planning the required maintenance and rehabilitation of assets to enhance where feasible and fiscally sustainable the useful life of existing facilities.

Official Plan

- The goal of the Official Plan is to represent the land use related goals and objectives of Council, identified through The City's Strategic Plan and other documents related to environmental protection and sustainability, climate adaptation, active transportation, culture, urban design, healthy communities, economic prosperity and food systems.
- The Future-Ready Roadmap will support the Official Plan by planning for the assets that will be adopted or required by the City to continue to provide services as land use develops.

Pollution Prevention and Control Plan

- The goal of the Pollution Prevention and Control Plan is to outline an implementation plan based on a study done to investigate the direct municipal discharges to water courses in the Thunder Bay urban service area.
- The Future-Ready Roadmap will support the Pollution Prevention and Control Plan by planning for the appropriate financing and sustainable funding required to fund the final projects identified in the Plan.

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Stormwater Management Plan

- The goal of the Stormwater Management Plan is to map out how to achieve a sustainable environment over 20 years, focussing on the stormwater system, and how changes in the environment, land use, and climate affect it. The Plan examines opportunities to assess and improve current infrastructure.
- The Future-Ready Roadmap will support the Stormwater Management Plan by planning for the appropriate financing and sustainable funding required to fund future upgrades and maintenance to the stormwater services.

Transportation Master Plan

- The goal of the Transportation Master Plan is to provide a long-term vision for the transportation services and related maintenance required up until 2040 and beyond.
- The Future-Ready Roadmap will support the Transportation Master Plan by planning for the appropriate financing and sustainable funding required to achieve the strategic vision for the transportation infrastructure.

Urban Design Guidelines

- The goal of the Urban Design Guidelines is to provide performance standards for a number of site design elements including building orientation and facades, parking and circulation, lighting, stormwater management, and landscaping.
- The Future-Ready Roadmap will support the Urban Design Guidelines by planning the required capital for maintenance and rehabilitiation the assets included in the guidelines.

Urban Forest Management Plan

- The goal of the Wastewater System Financial Plan is to outline the projected operating and capital plan for the next 20 years to achieve financial sustainability, full-cost recovery and affordability for consumers, while maintaining the City's existing service levels for sewage collection and treatment.
- The Future-Ready Roadmap will support the Wastewater System Financial Plan by planning the required maintenance and rehabilitation of assets to reduce lifecycle costs to help keep water network costs in line with the Financial Plan.

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Wastewater System Financial Plan

- The goal of the Wastewater System Financial Plan is to outline the projected operating and capital plan for the next 20 years to achieve financial sustainability, full-cost recovery and affordability for consumers, while maintaining the City's existing service levels for sewage collection and treatment.
- The Future-Ready Roadmap will support the Wastewater System Financial Plan by planning the required maintenance and rehabilitation of assets to reduce lifecycle costs to help keep wastewater network costs in line with the Financial Plan.

APPENDIX F. Future Ready-Roadmap Team

The Future Ready-Roadmap team is overseen by an internal steering committee comprised of senior levels of Administration with representation from all Departments and led by the General Manager – Infrastructure, Development & Operations. A Project Manager role was created for overall project management and to support the strategic execution of this work.

Executive Lead and Project Management

- Kerri Marshall – General Manager, Infrastructure, Development & Operations, Executive Lead
- Amy Coomes – Project Manager, Engineering & Operations

Steering Committee

- Kayla Dixon – Director, Engineering & Operations
- Joel DePeuter – Director, Development Services
- Keri Greaves – City Treasurer, Corporate Services
- Cory Halvorsen – Manager, Parks & Open Spaces
- Leah Prentice – Director, Recreation & Culture
- Jana Roy – Capital Asset Accountant/Financial Analyst, Corporate Services
- Julie Wiejak – Policy & Research Analyst, Infrastructure, Development & Operations

Collaborative Group Members

- Newmill Allwyn – Risk and Asset Management Analyst, Parks and Open Spaces
- Kelly Andrew – Accountant, Office of the City Treasurer
- Cory Auger – Coordinator Parks Services
- Bob Bates – Plant Superintendent, WPCP
- Brent Bigford – GIS Application Specialist, Planning Services
- Lisa Bosch – Planning and Research Analyst – Capital Facilities Construction
- Cherri Braye – Director of Resources, Thunder Bay Public Library
- Barry Caland – Environmental Services Supervisor, Community Services
- Sandra Carpino – IT Compliance and Risk Specialist, Corporate Information Technology

- Brent Cline – Superintendent – Administrative Services, Superior North EMS
- Daniel Corbett – Urban Forester, Parks and Open Spaces
- Henry Connor – Technology Management Specialist, Central Support
- Vanessa DeGiacomo-Zwaresh – Energy Analyst, Engineering and Operations
- Laurie Fors – Supervisor Budgets & Capital Programs, Infrastructure, Development and Operations
- Doug Glena – Manager, Fleet Services
- Erin Marcella-Fui – Superintendent Bare Point WTP, Environment Division
- Franco Marchese – Manager of Facility Services, Community Services
- Lindsay Menard – Superintendent Water Pollution Control Plant, Environment Division
- Jesse Mikulinski – Engineering Design and Field Staff Supervisor, Engineering and Operations
- Kendra Moen – GIS Technologist, Engineering & Operations
- Rae-Ann Molly – Community Program Coordinator, Community Centres, Community Services
- Dawn Paris – Director of Finance and Facilities, Thunder Bay Police Service
- Jonathan Paske – Supervisor, Parking Authority
- Jacob Porter – Climate Adaptation Coordinator, Engineering & Operations
- Werner Schwar – Supervisor, Parks & Open Space Planning
- Kristie Sinclair – Accountant, Office of the City Treasurer
- Randy Thompson - Division Chief - Apparatus & Equipment, Thunder Bay Fire Rescue
- Mike Vogrig – Project Engineer, Engineering & Operations
- Deanna Walker – Manager, Realty Services
- Michelle Warywoda – Director, Environment Division

APPENDIX G. Levels of Service Survey Response Summaries

Roads, Street Lighting and Traffic Signals Levels of Service Survey Responses - 219 Participants

Q1   How do you interact with the roads in Thunder Bay using motorized vehicles? (Are you a driver, a passenger, etc). Rank in order from most (1) to least (3) often.

OPTION	RANK
Driver	1.17
Passenger in a private vehicle	2.00
Passenger on public transit	2.72

Q2   How safe do you currently feel while using the roads in Thunder Bay in a motorized vehicle?

Legend: ■ Very safe ■ Somewhat safe ■ Neutral ■ Somewhat unsafe ■ Very unsafe

Pie chart values: 11%, 41%, 15%, 24%, 9%
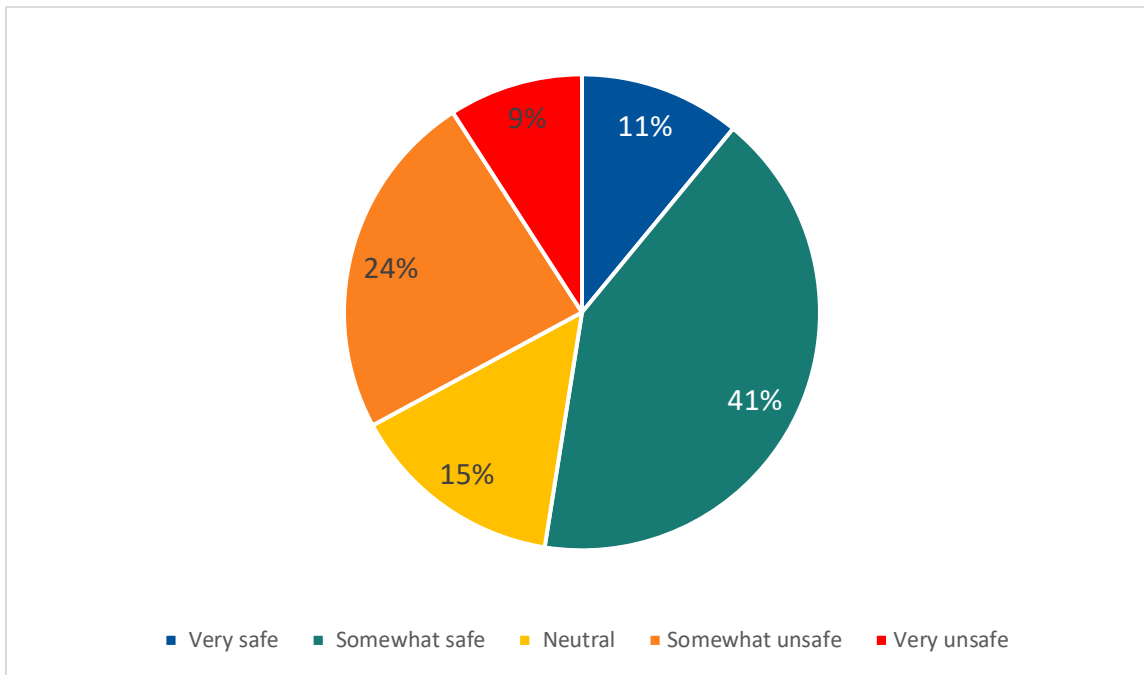
Q3   What are the top reasons you do NOT currently feel safe using a motorized vehicle on roads in Thunder Bay? Select up to 3 max.

Bar chart categories:
- Other (please specify)
- Poor connectivity (e.g. roads frequently closed, dead...
- Operational Issue (e.g. snow or ice not cleared,...
- Surface condition (e.g. significant cracking, potholes)
- Infrastructure Design (e.g. not enough safety...
- Driver Compliance (e.g. Vehicles not stopping at...
- Traffic/congestion (e.g. Too many cars, people, or...

Axis: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180

Q4   The current average condition of Thunder Bay roads is FAIR. Please indicate your satisfaction with this as the average condition for the roads.

Legend: Very satisfied | Somewhat satisfied | Neither | Dissatisfied | Very dissatisfied
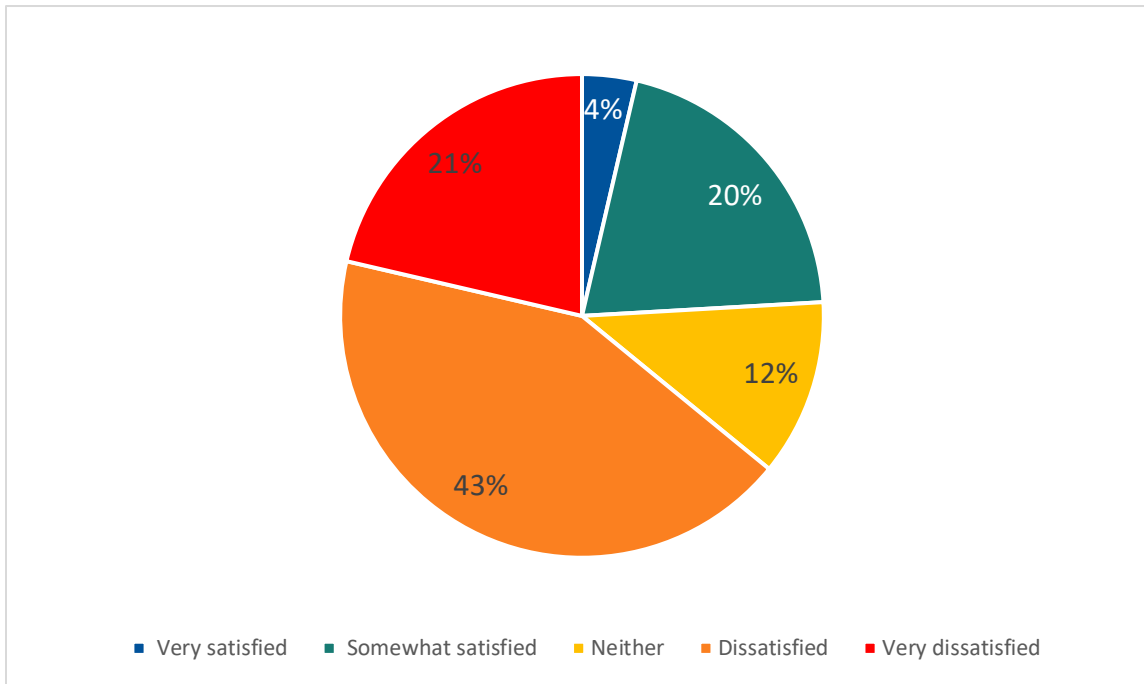
Q5   Currently, 39% of roads in Thunder Bay are in GOOD or VERY GOOD condition, 44% are in FAIR condition. In your opinion, what percentage of roads should be in GOOD or VERY GOOD condition?

Legend: Less than the current 39% | About the same as now | More than 40% | Unsure/No preference

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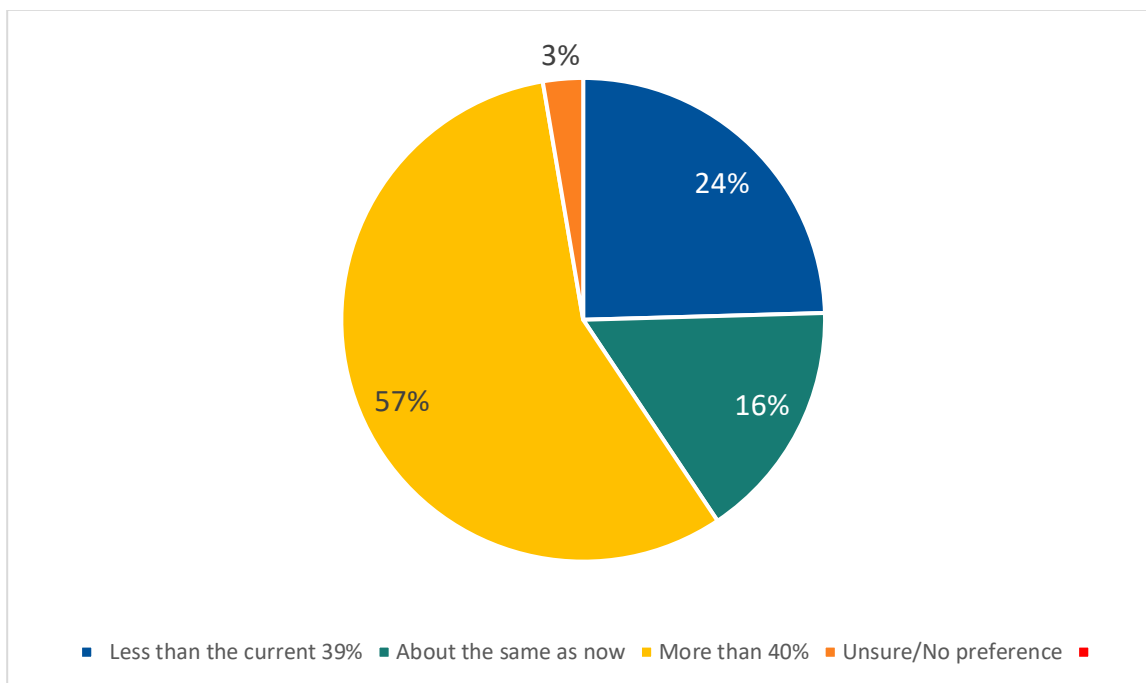
Q6   Would you be willing to pay more taxes to increase the average condition of the roads in Thunder Bay?

45%

55%

■ Yes ■ No
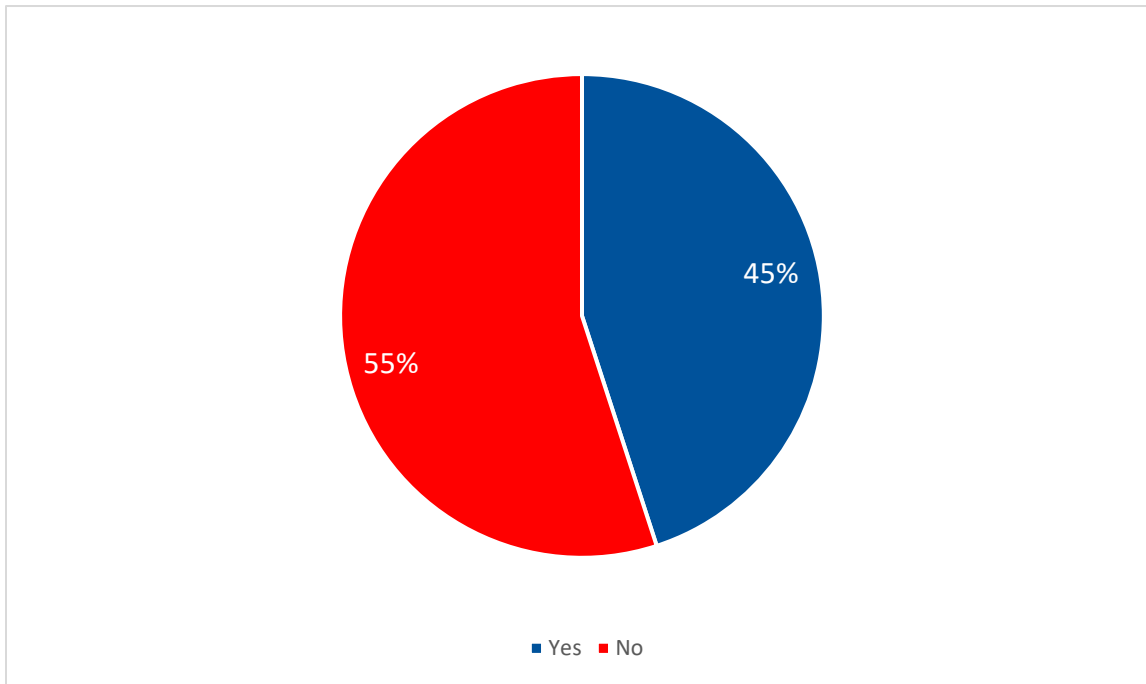
Q7   How do you feel about the amount the City spends on roads each year?

4%

8%

29%

59%

■ Too much! The Roads budget should be DECREASED

■ Just right. The roads budget is adequate.

■ Spend more! The roads budget should be INCREASED

■ Unsure/No preference
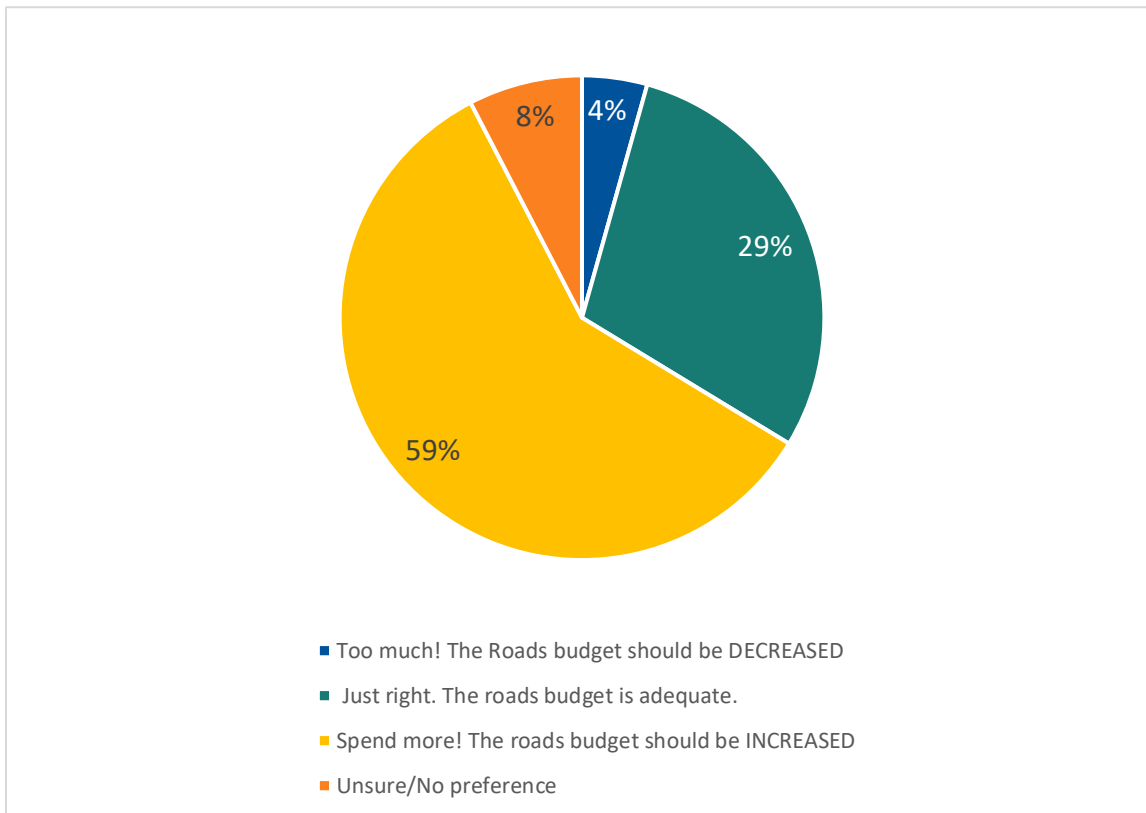
Q9   How do you feel about traffic/congestion on the roads in Thunder Bay?

- Traffic levels are acceptable - I experience little to no congestion
- Neutral - congestion happens sometimes but it is infrequent/causes little impact
- Traffic is unacceptable - congestion happens too much and too often
- Other
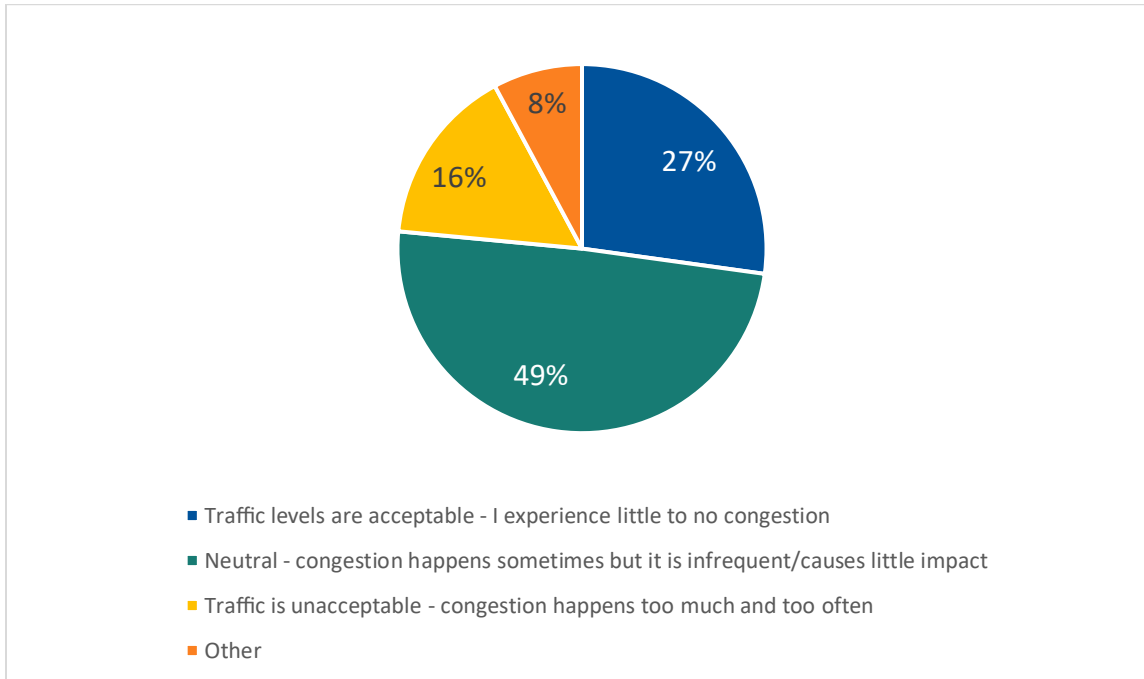
Q10   Please indicate your satisfaction with the current lighting of City streets at night?

- Satisfied
- Neither
- Dissatisfied

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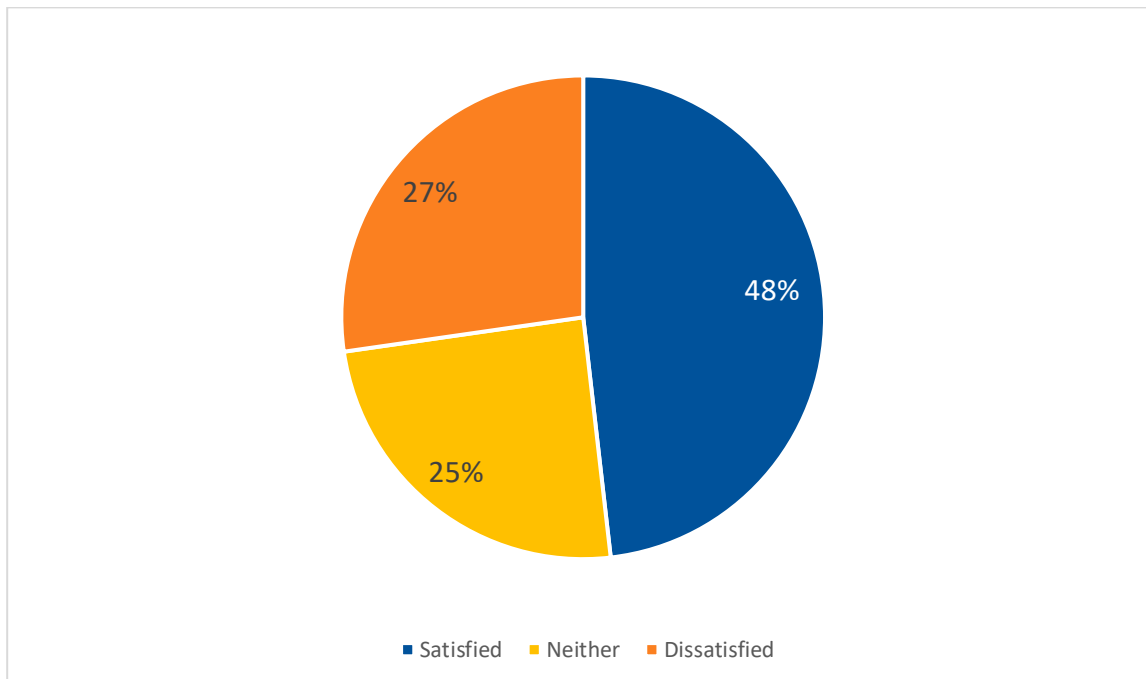
Q12 **When road closures occur for maintenance or construction work, do you think the City provides adequate communication and notifications (e.g. signage, updates through local media) to allow you to find alternate routes?**
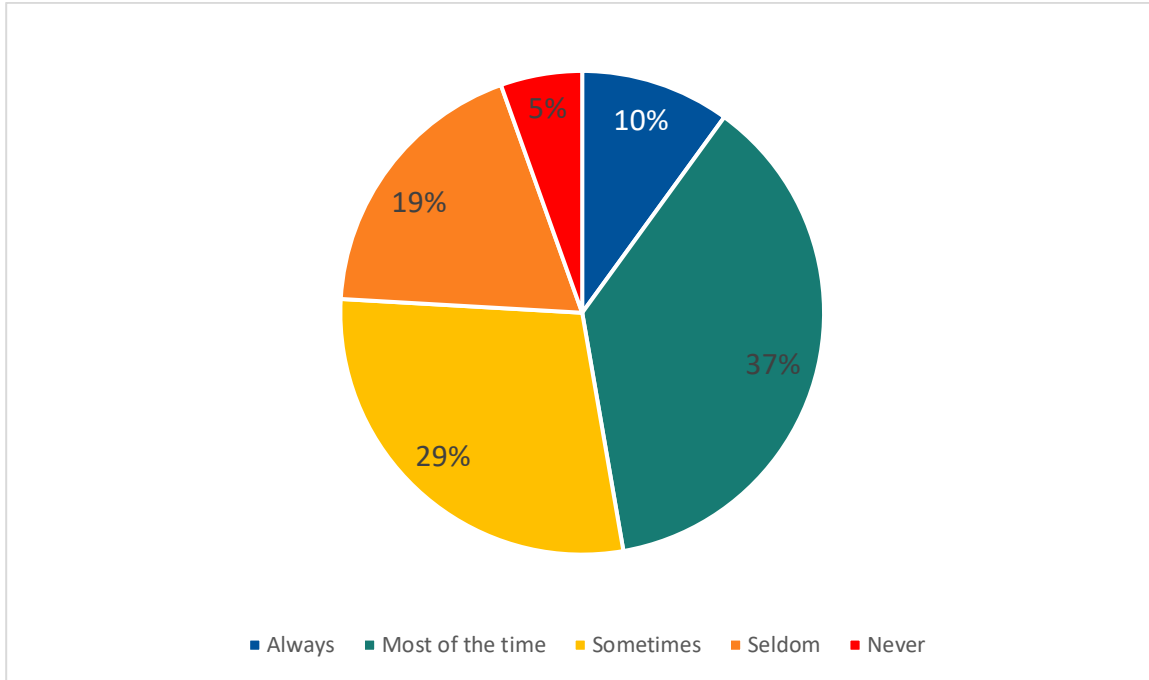
Q14 **The Roads Division relies on approximately 70 pieces of equipment which it either owns or contracts to tackle a winter storm. During a winter storm with at least 5cm of snow, do you feel priority routes are plowed in a reasonable amount of time?**

Always ■ Most of the time ■ Sometimes ■ Seldom ■ Never
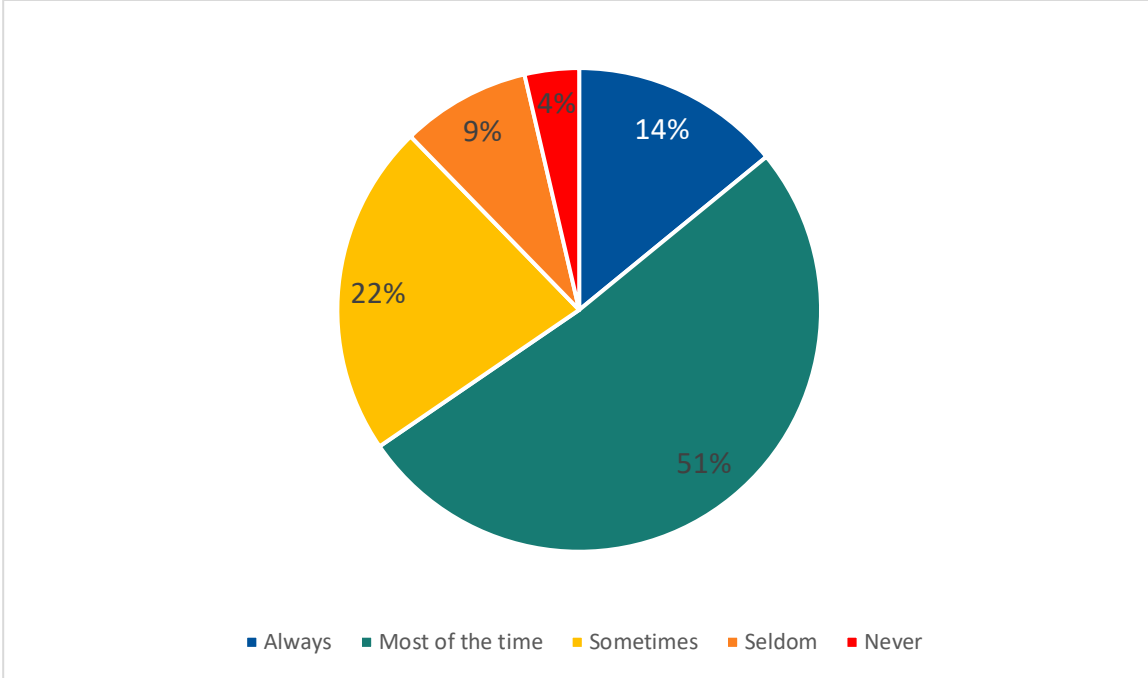
Q15   Have you ever reported a pothole to the City?

■ Yes ■ No

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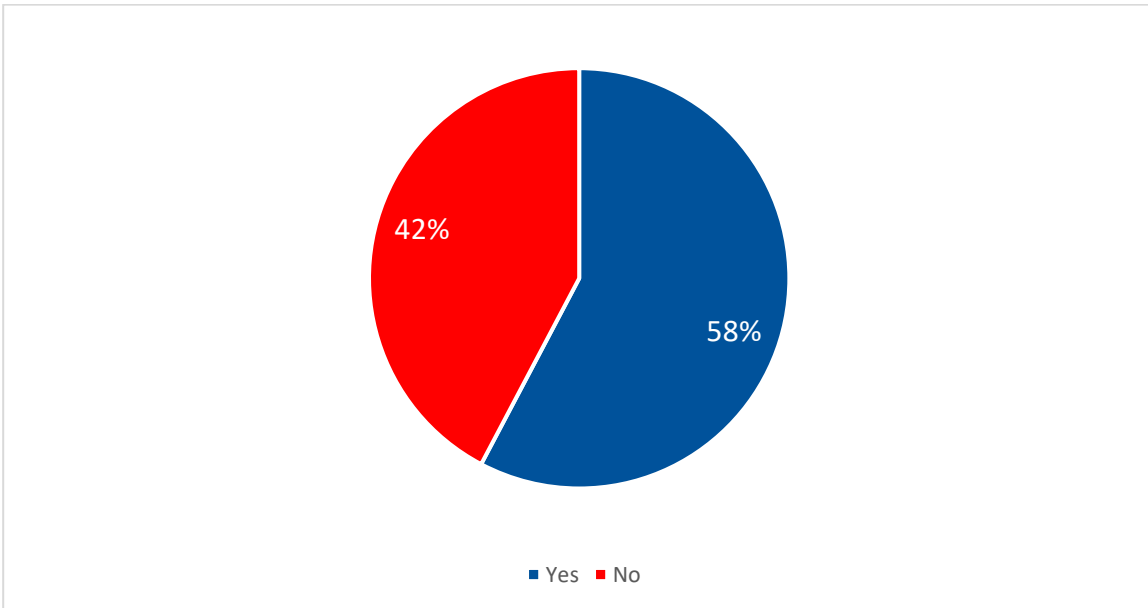
Q16   If yes, was the pothole fixed in a timely manner?
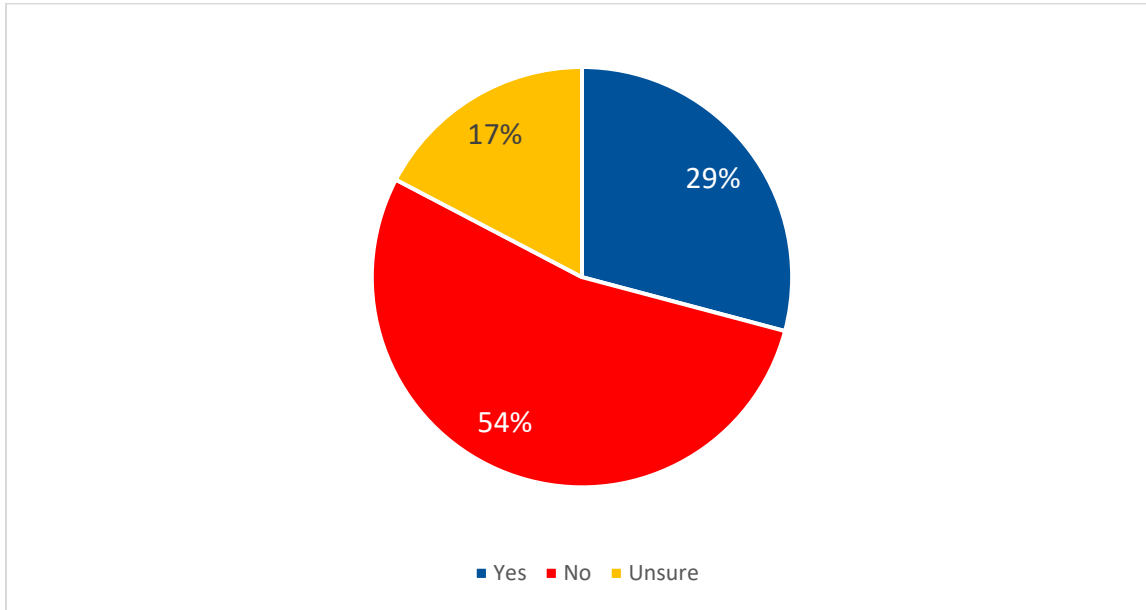
Q17   Did you know you can report potholes and other issues to the City online or by phone to help us keep our community active and welcoming?
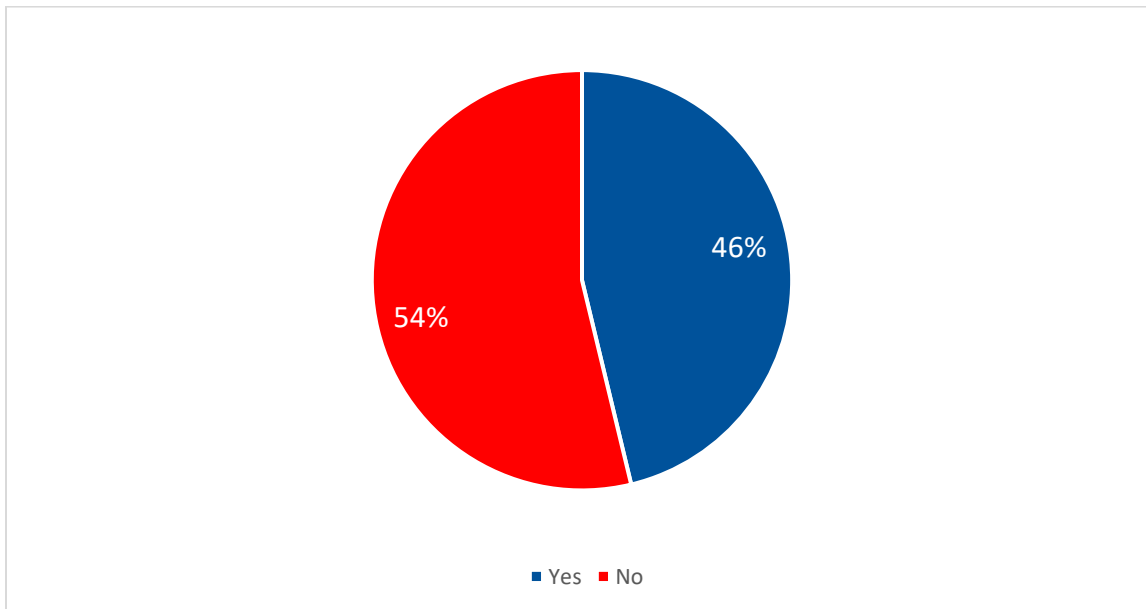
Bridges and Culvers - 84 Participants

Q1 How safe do you feel while travelling over bridges and culverts in the City?

- Very safe
- Somewhat safe
- Neutral
- Somewhat unsafe
- Very unsafe
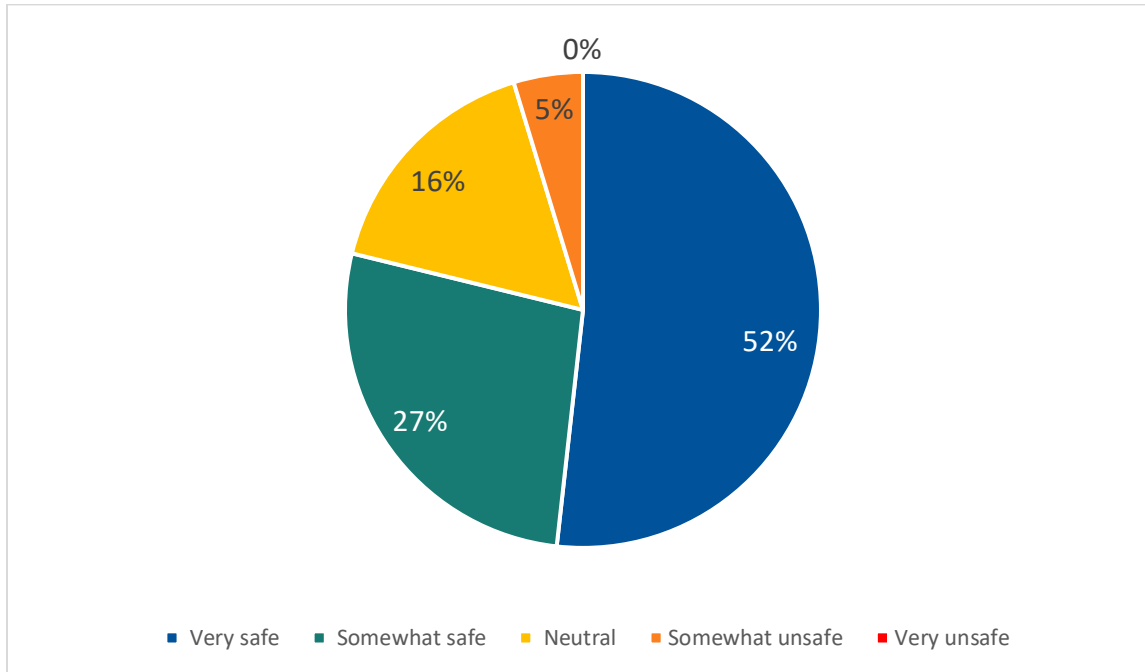
Q2 The average condition of Thunder Bay Bridges and Culverts is GOOD. If the average condition of bridges and culverts is maintained at FAIR, it would result in more reduced load postings, delays and bridge closures. Do you believe bridges and culverts should continue to be maintained to GOOD conditions?

- Yes. Bridges and culverts should continue to be maintained to Good conditions
- No. The average condition of bridges and culverts should be improved.
- No. Fair conditions would be satisfactory.
- Unsure/No opinion

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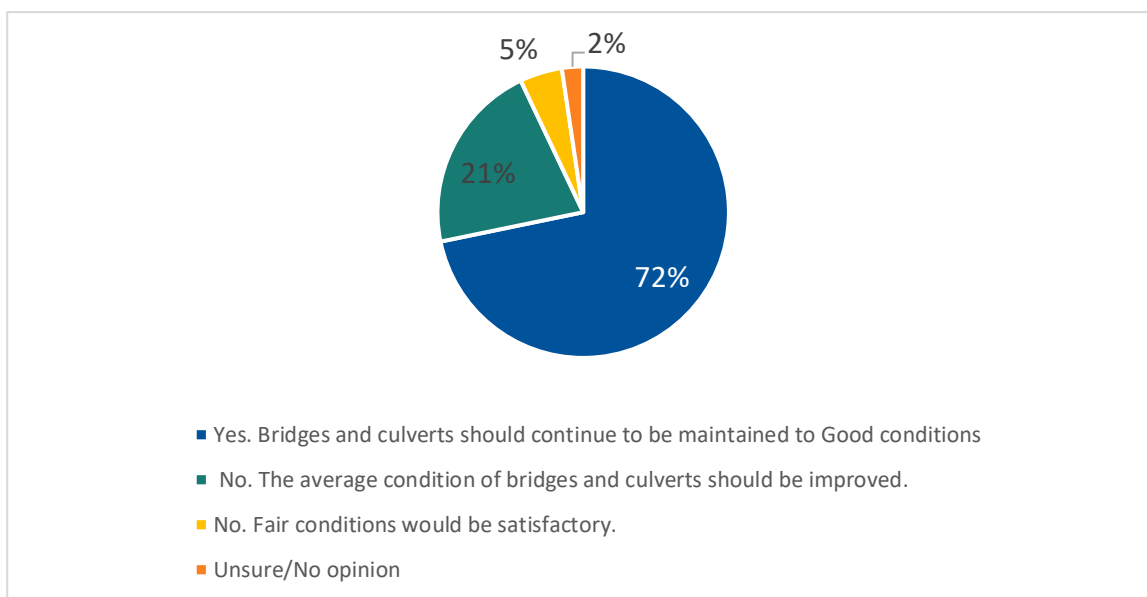
Q3 **Would you be willing to pay more taxes to see the condition of bridges and culverts increased?**

- Yes
- No
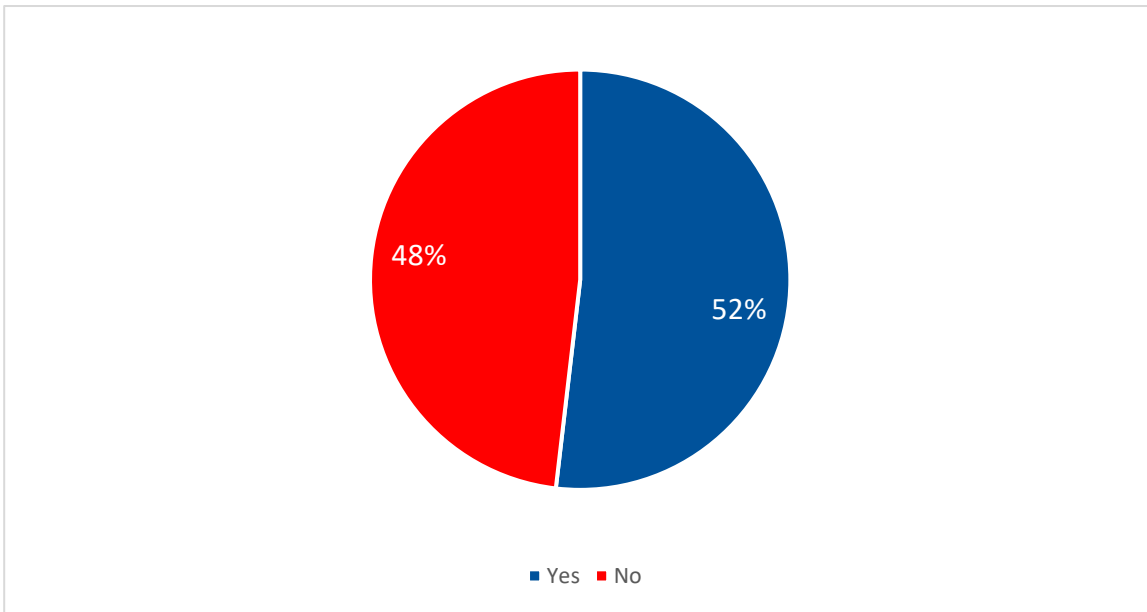
Q4 **How do you feel about the amount the city spends on bridges and culverts each year?**

- Too much! The amount spent on bridges and culverts should be DECREASED
- Just right. The amount spent on bridges and culverts is adequate
- Spend more! The amount spent on bridges and culverts should be INCREASED
- Unsure/No preference
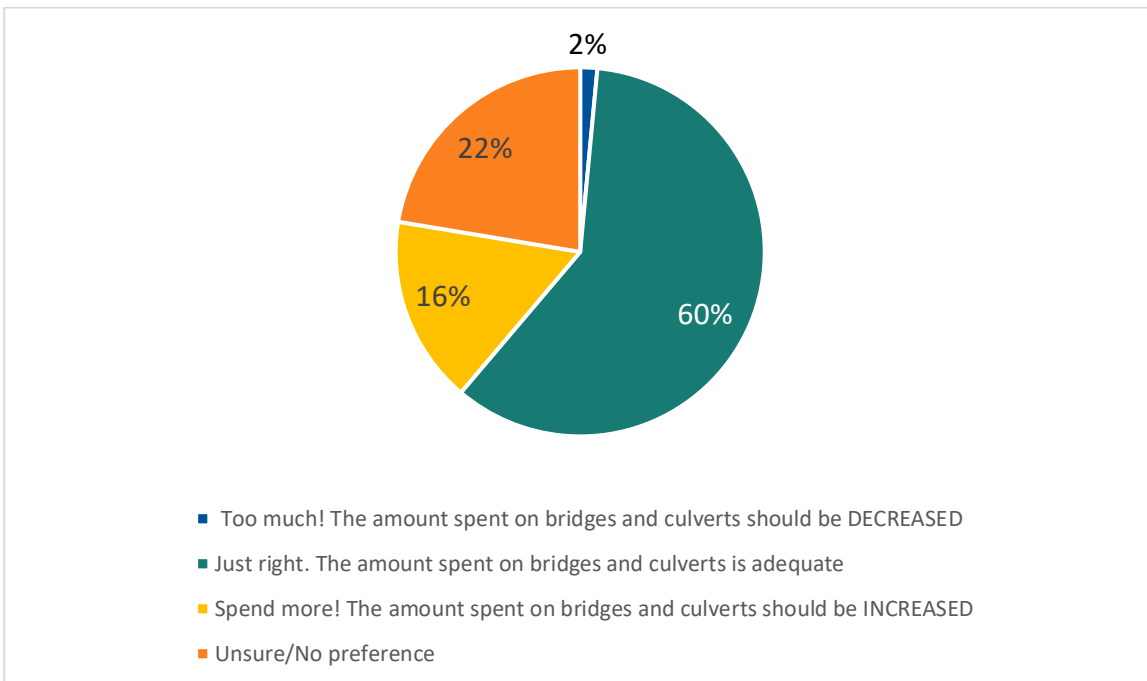
Active Transportation Levels of Service (Bike Lanes, Sidewalks, and Multi-use Trails) - 185 Participants

Q1 **How often do you cycle through urban areas? (On the roads/streets and/or using bike lanes and buffered bike lanes)**

Daily ■ A few days a week ■ A few times a month ■ Rarely ■ Never
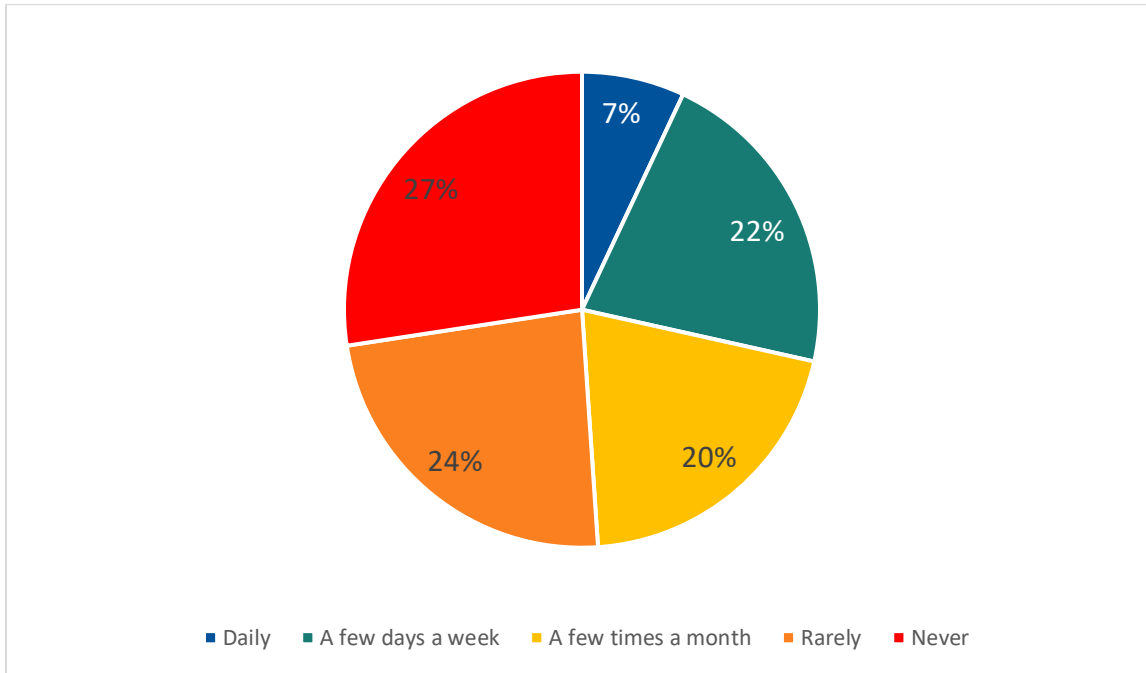
Q2 **How safe do you currently feel while cycling through urban areas? (On the roads/streets and/or using bike lanes and buffered bike lanes)**

Very safe ■ Somewhat safe ■ Neutral ■ Somewhat unsafe ■ Very unsafe

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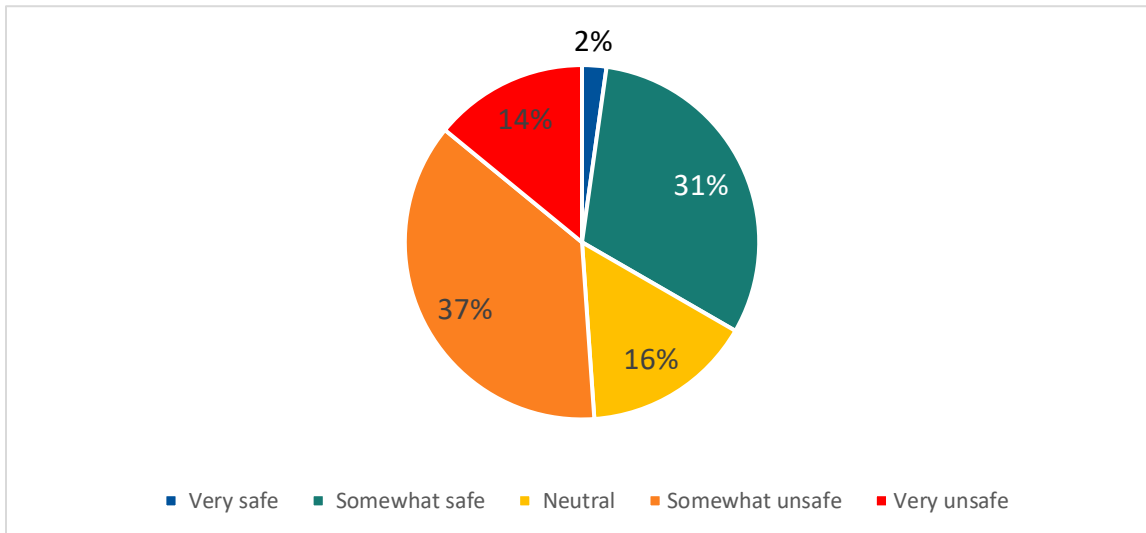
Q3   Select the top reasons why you do NOT currently feel safe cycling through urban areas. (On the roads/streets and/or using bike lanes and buffered bike lanes). Choose up to 3 max.
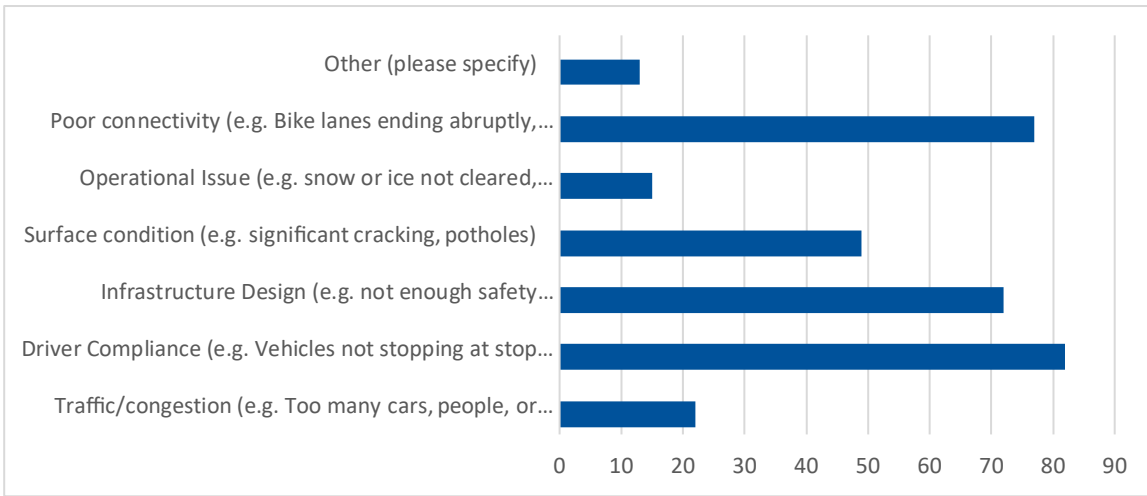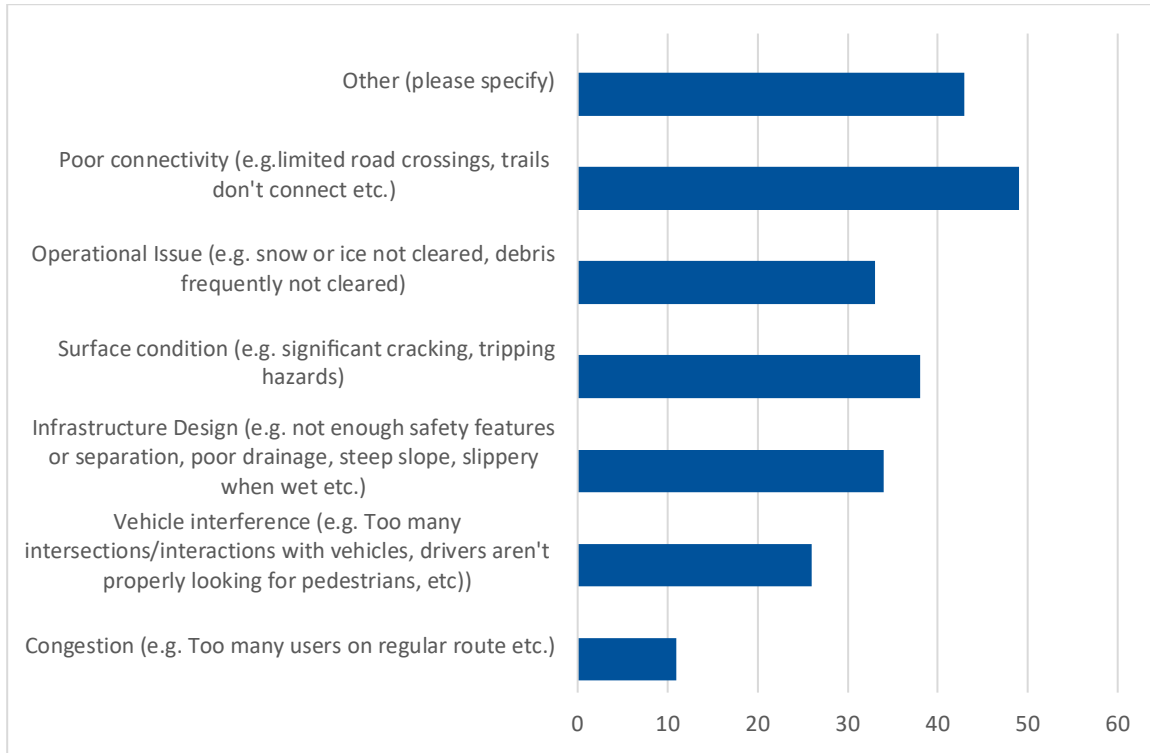

Q4   How often do you use sidewalks (for activities such as walking, jogging and other forms of exercise and/or active transportation)?
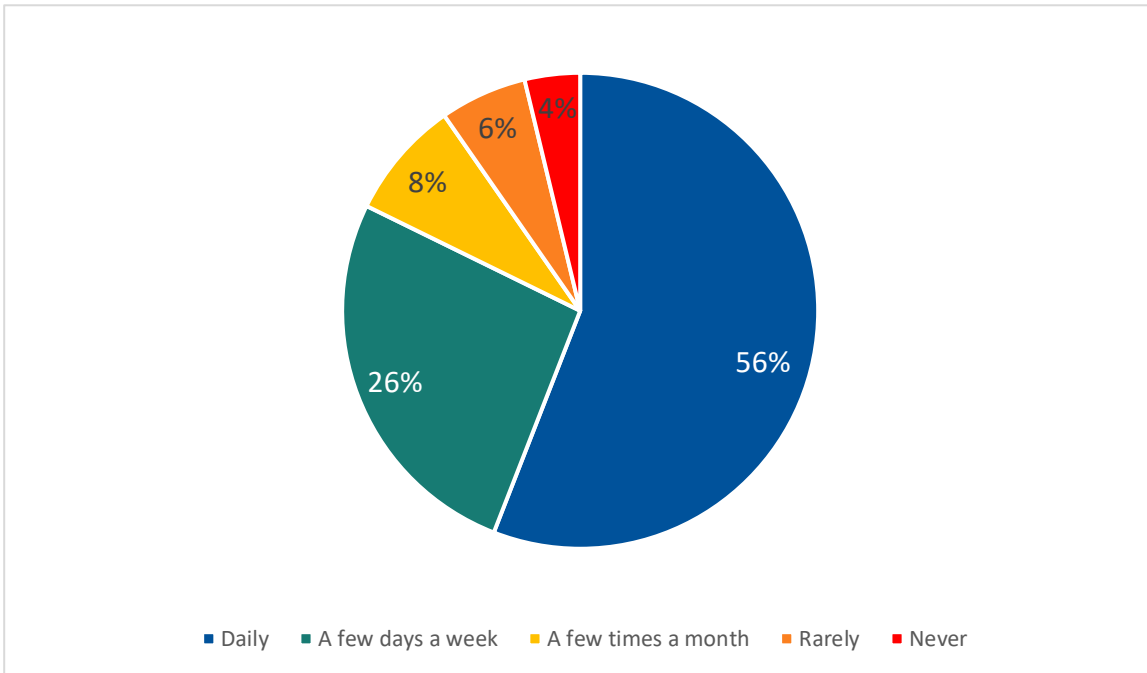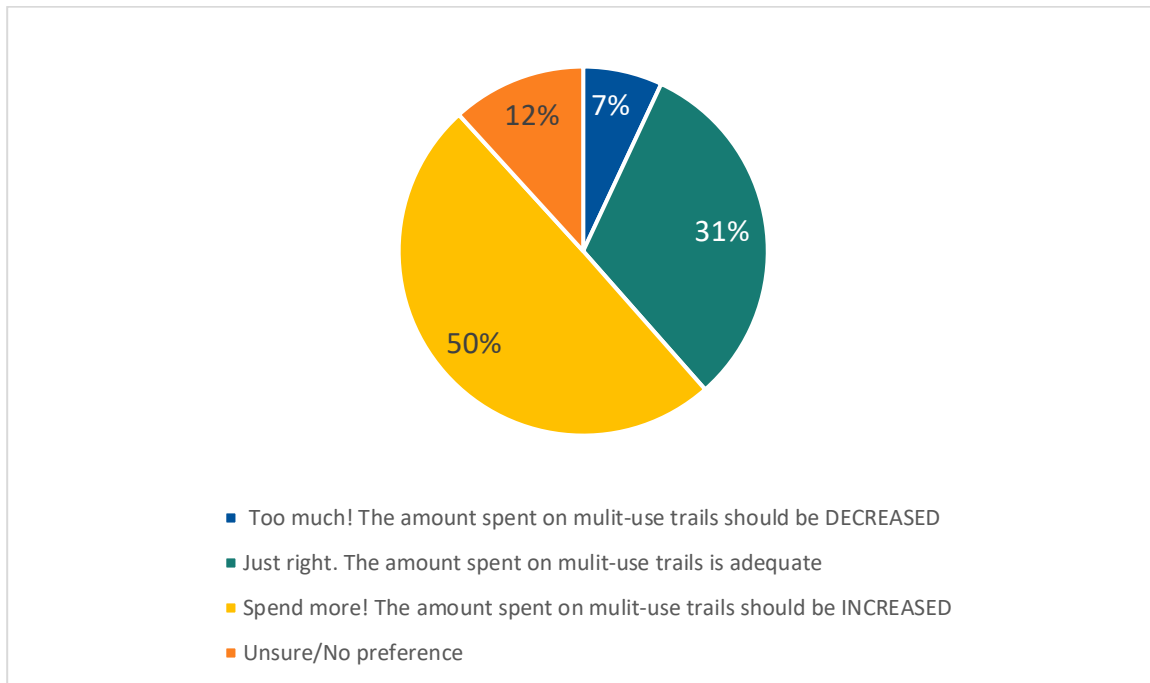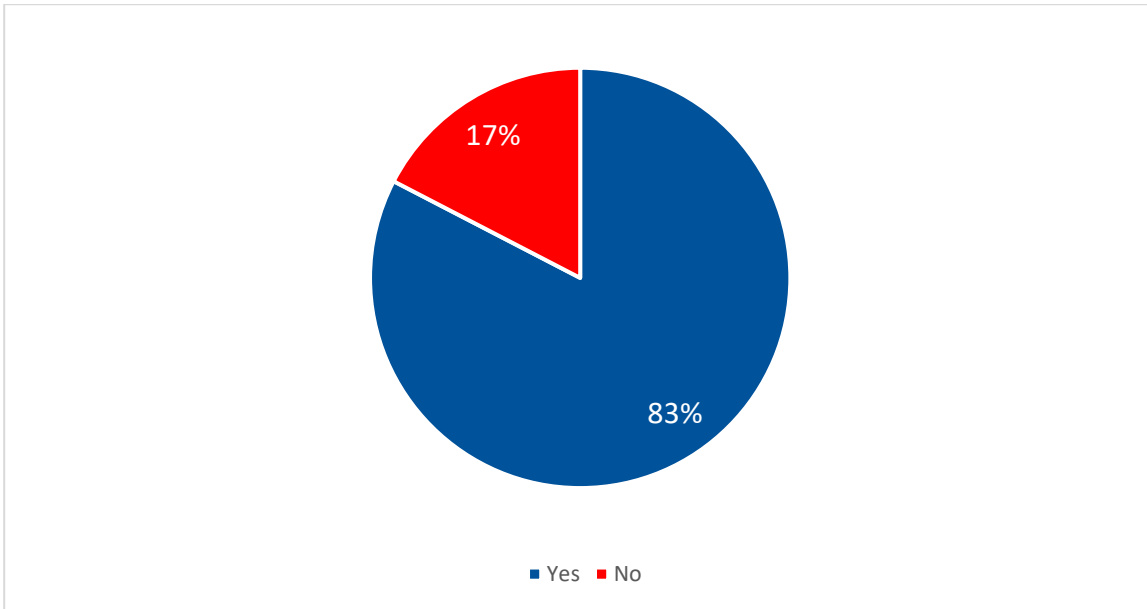
Q5   How safe do you feel while using sidewalks?

Legend: ■ Very safe ■ Somewhat safe ■ Neutral ■ Somewhat unsafe ■ Very unsafe

(Pie chart values: 27% Very safe, 44% Somewhat safe, 11% Neutral, 14% Somewhat unsafe, 4% Very unsafe)
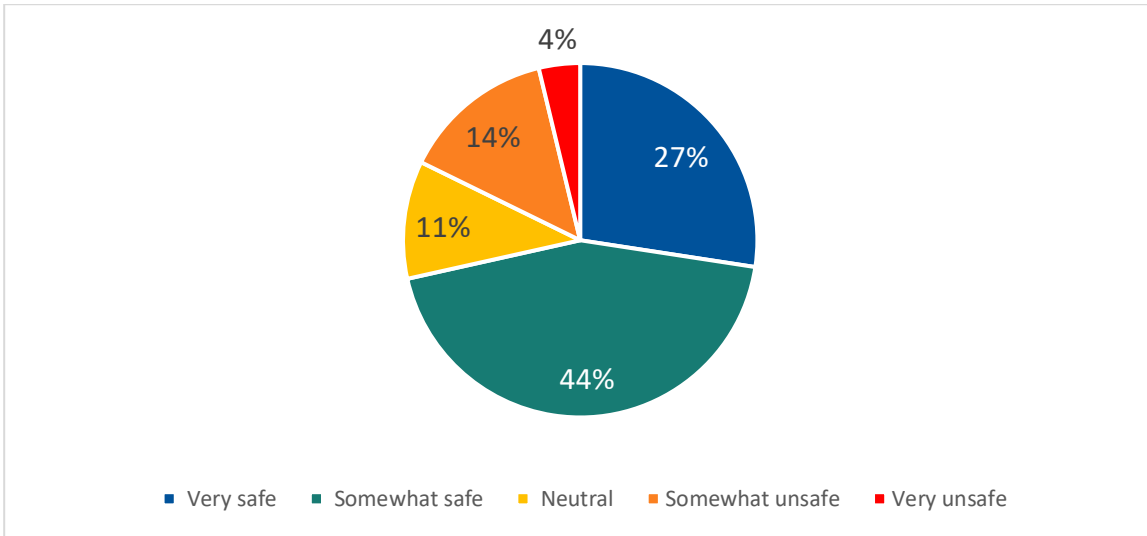
Q6   Select the top reasons you feel unsafe using sidewalks? Choose up to 3 max.

(Bar chart categories and approximate values:
Other (please specify) — ~20
Poor connectivity (e.g. Sidewalks missing, curb cuts not available for mobility devices, sidewalk frequently closed etc.) — ~57
Operational Issue (e.g. snow or ice not cleared, debris frequently not cleared) — ~66
Surface condition (e.g. significant cracking, tripping hazards) — ~65
Infrastructure Design (e.g. not enough safety features or separation, poor drainage, steep slope, slippery when wet etc.) — ~40
Vehicle interference (e.g. Too many intersections/interactions with vehicles, drivers aren't properly looking for pedestrians, etc)) — ~56
Congestion (e.g. Too many users on regular route etc.) — ~2)

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Q7   During a winter storm with at least 5cm of snow, do you think sidewalks are plowed in a reasonable amount of time?

- Always
- Most of the time
- Sometimes
- Seldom
- Never
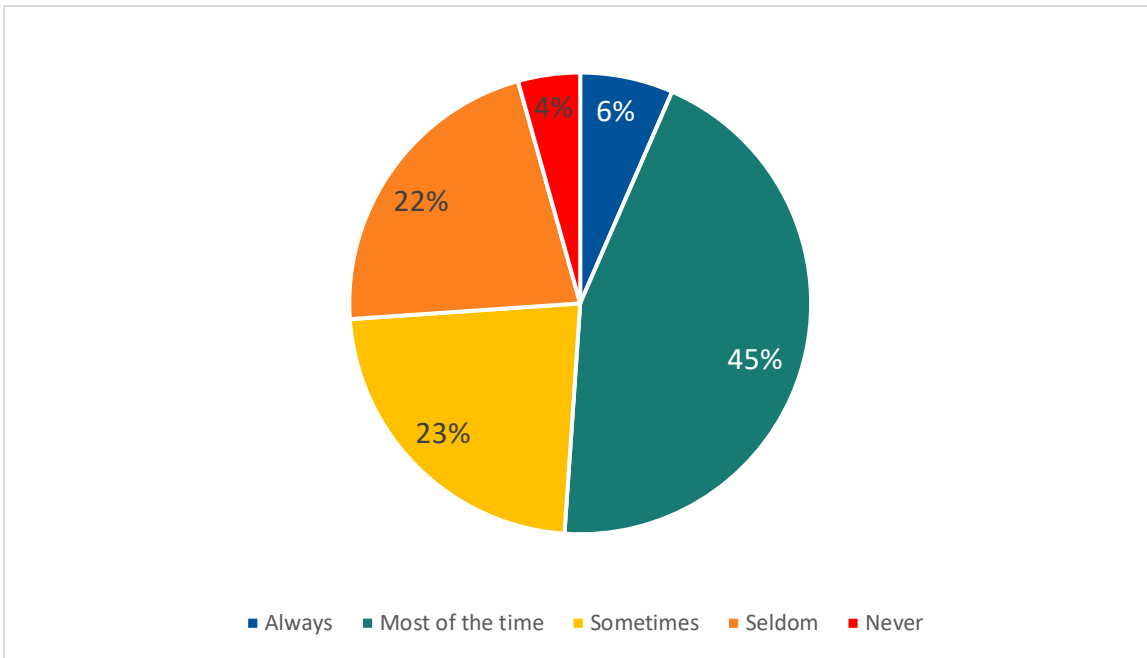
Q8   Currently, the average condition of sidewalks in Thunder Bay is GOOD. What do you feel the average condition of sidewalks should be in the future?

- Average sidewalk condition should INCREASE
- Average sidewalk condition should remain the same
- Average sidewalk condition should DECREASE
- Unsure/No opinion
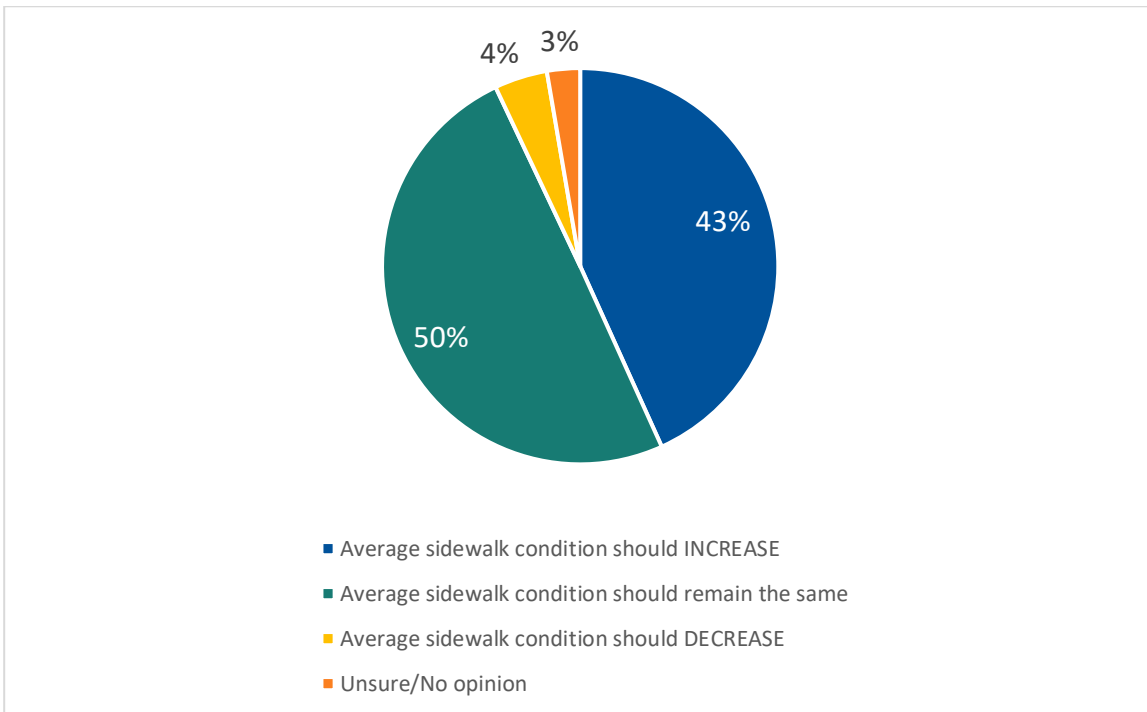
Q9   Would you be willing to pay more taxes to see the average condition of sidewalks increased?

Yes ■ No ■
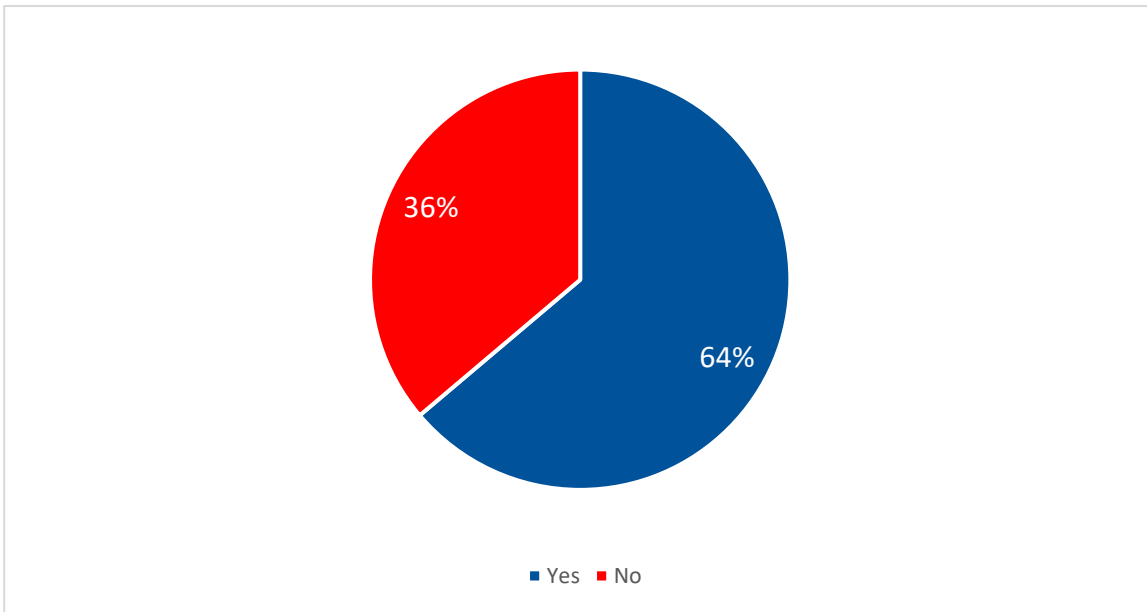
Q10   How do you feel about the amount the City spends on sidewalks?

■ Too much! The amount spent on sidewalks should be DECREASED

■ Just right. The amount spent on sidewalks is adequate

■ Spend more! The amount spent on sidewalks should be INCREASED

■ Unsure/No preference

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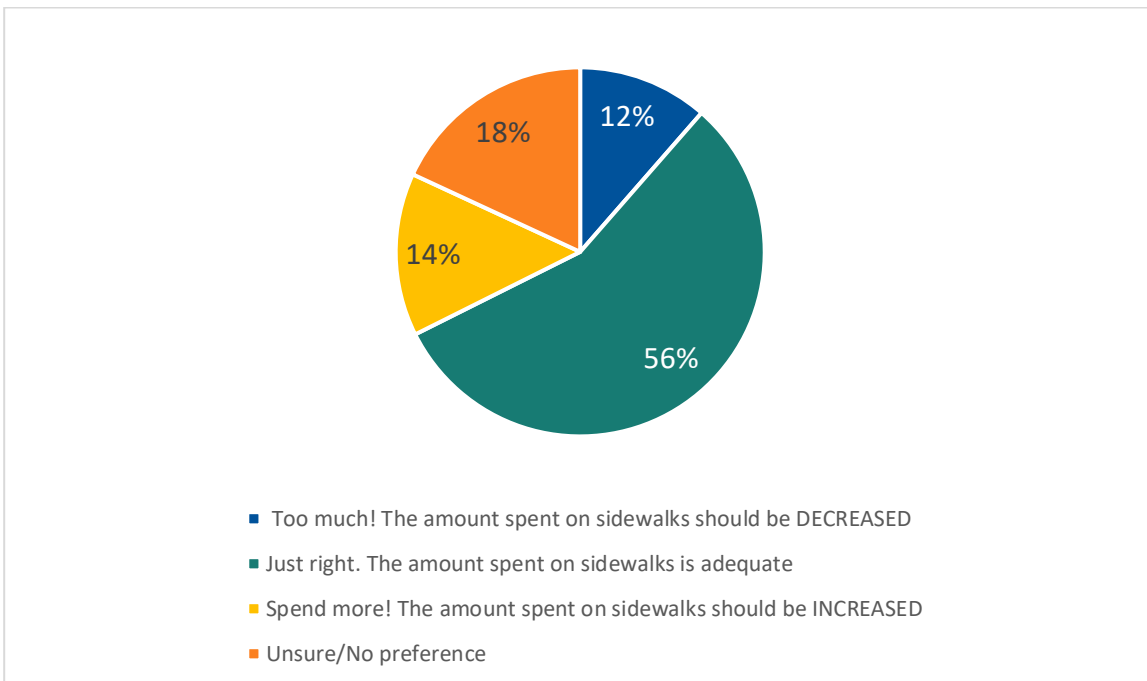
Q12   How often do you use multi-use trails for activities such as walking, jogging, cycling and other forms of exercise and/or active transportation?

Legend: ■ Daily ■ A few days a week ■ A few times a month ■ Rarely ■ Never
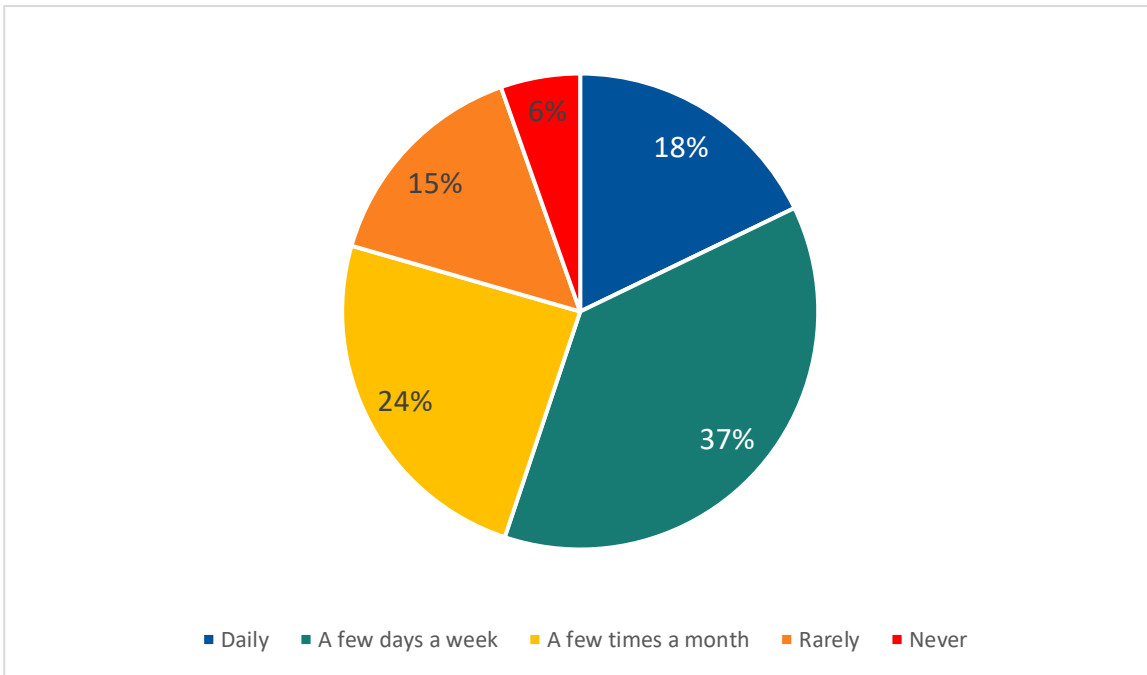
Q13   How safe do you feel while using multi-use trails?

Legend: ■ Very safe ■ Somewhat safe ■ Neutral ■ Somewhat unsafe ■ Very unsafe
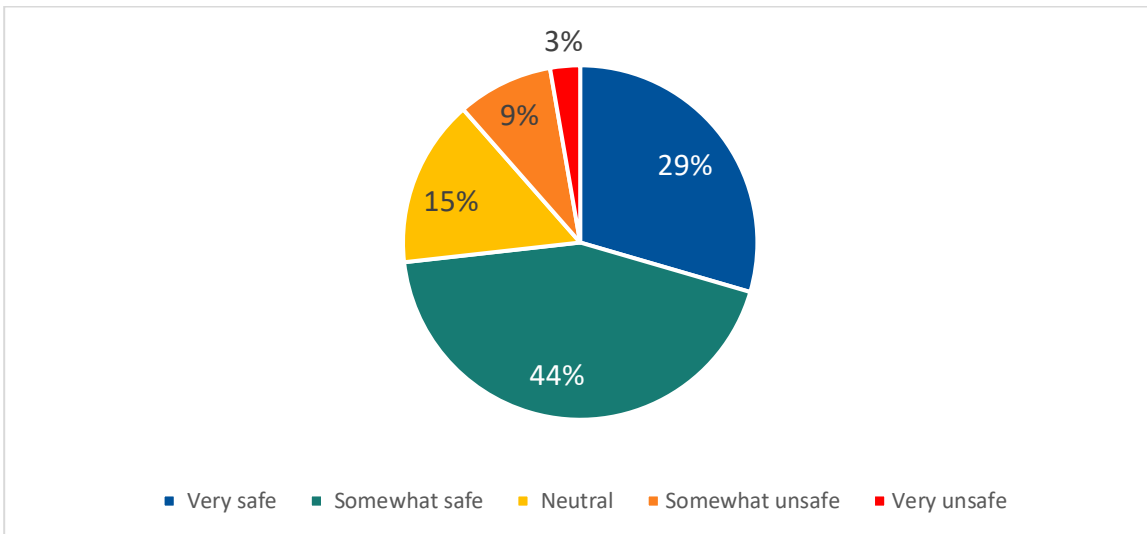
Q14   Select the top reasons you feel unsafe using multi-use trails? Choose up to 3 max.

Q15   How do you feel about the amount the City spends on multi-use trails?

- Too much! The amount spent on mulit-use trails should be DECREASED
- Just right. The amount spent on mulit-use trails is adequate
- Spend more! The amount spent on mulit-use trails should be INCREASED
- Unsure/No preference

Q16   Would you be willing to pay more taxes to increase spending on multi-use trails?

17%

83%

■ Yes ■ No

Q17   Do you use a mobility device?

6%

94%

■ Yes ■ No
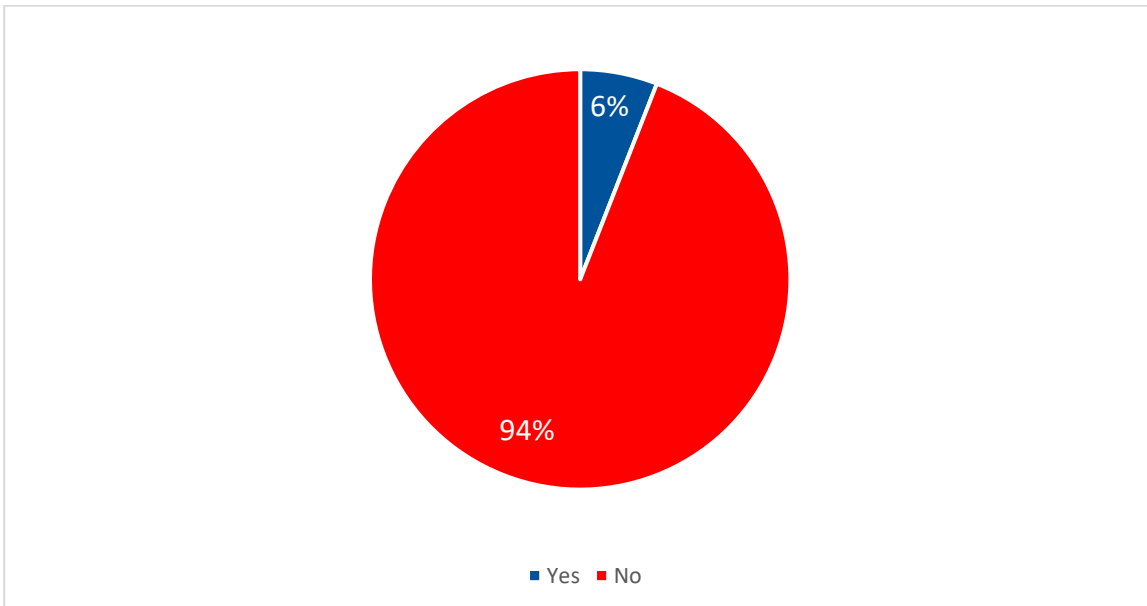
Q18   How often do you use a mobility device on sidewalks and/or multi-use trails?

- Daily
- A few days a week
- A few times a month
- Rarely
- Never
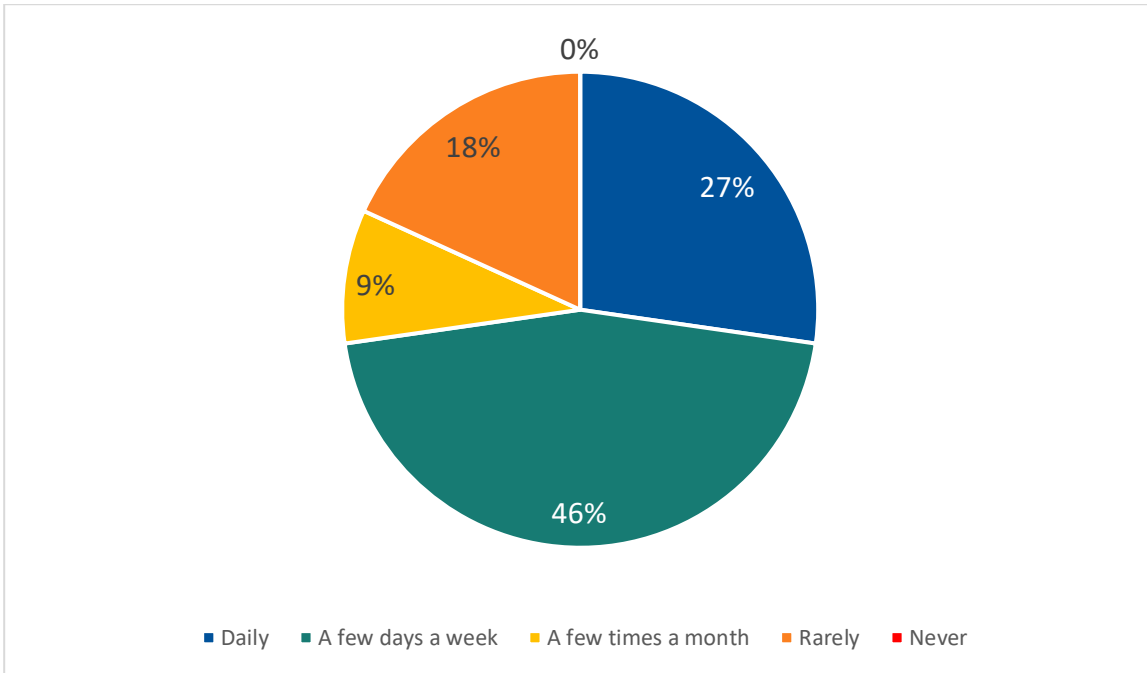
19   How safe do you feel using a mobility device on multi-use trails?

- Very safe
- Somewhat safe
- Neutral
- Somewhat unsafe
- Very unsafe

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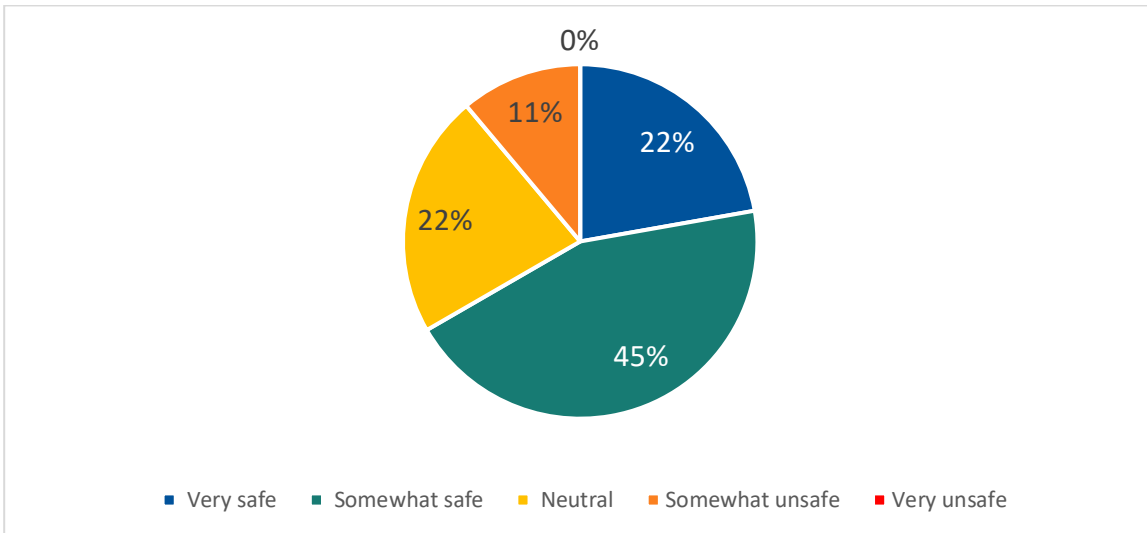
Q20   Select the top reasons you feel unsafe using a mobility device on a multi-use trail. Choose up to 3 max.
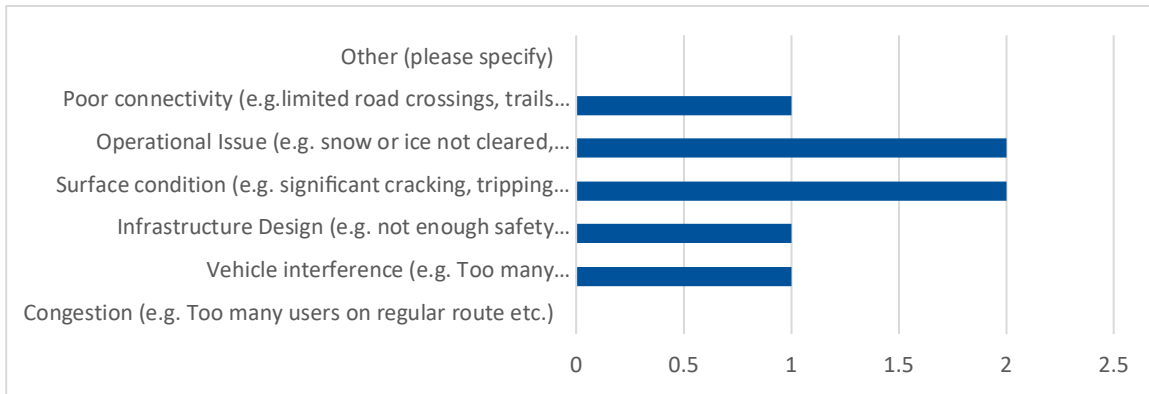
Q21   How safe do you feel using a mobility device on City sidewalks?
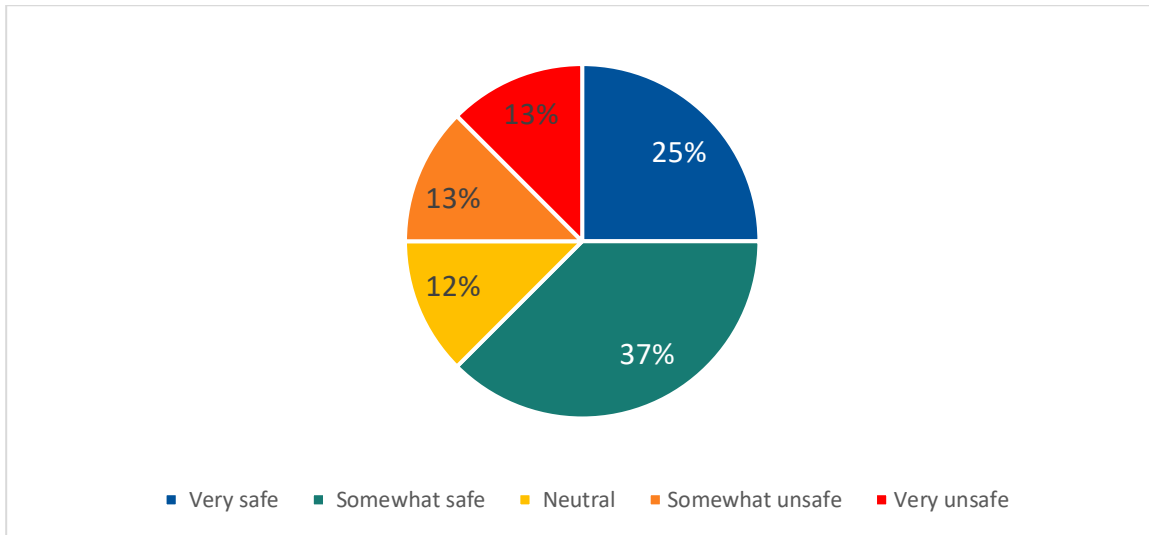
Q22   Select the top reasons you feel unsafe using a mobility device on a sidewalk. Choose up to 3 max.
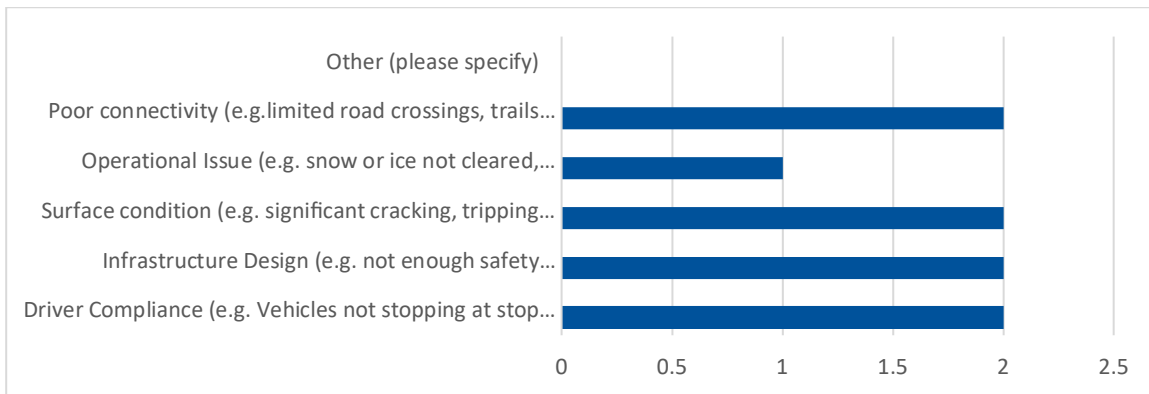
Drinking Water Levels of Service - 116 Participants

Q1   Are you connected to Thunder Bay's municipal waternetwork?
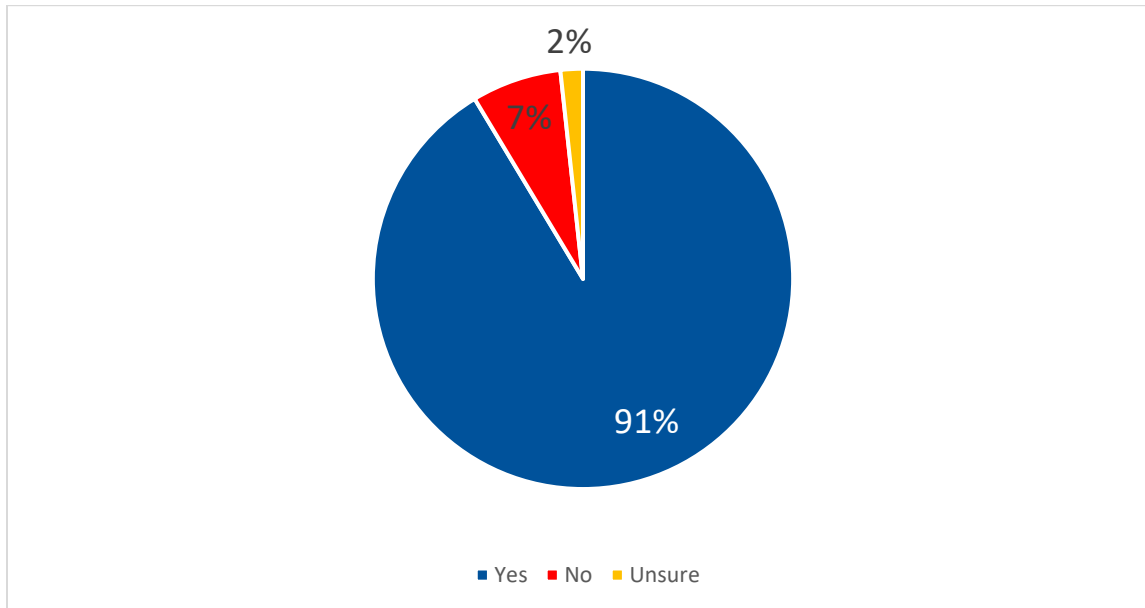
Q2   Do you feel that drinking water is readily available with minimal to no service interruptions?
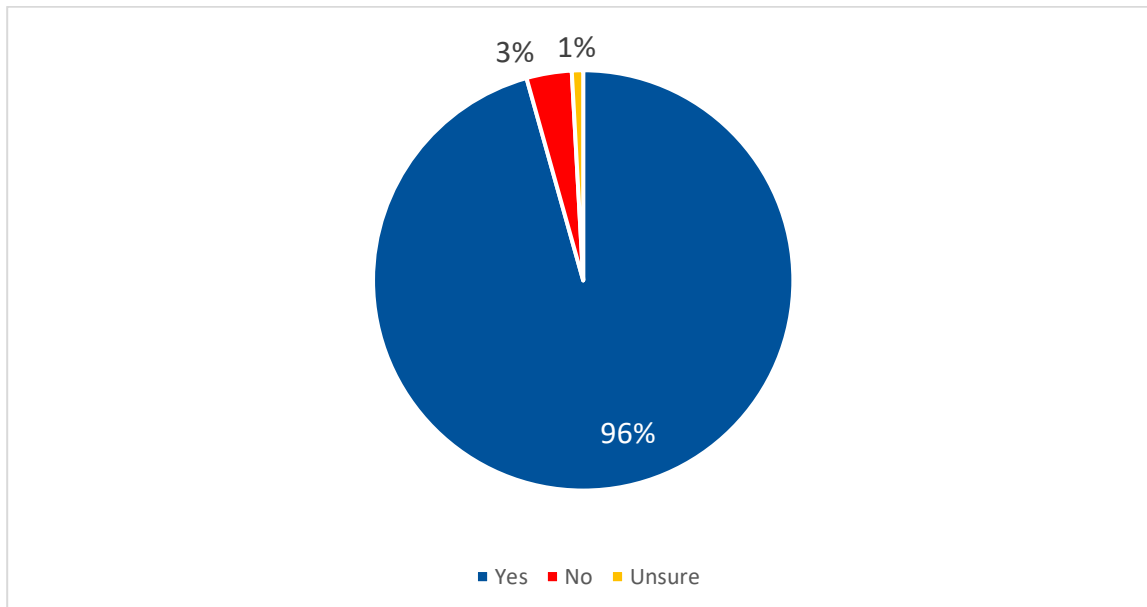
Q3   How safe do you feel the water from your tap is?

Legend: ■ Very safe   ■ Somewhat safe   ■ Neutral   ■ Somewhat unsafe   ■ Very unsafe

Values: 43%, 37%, 8%, 5%, 7%
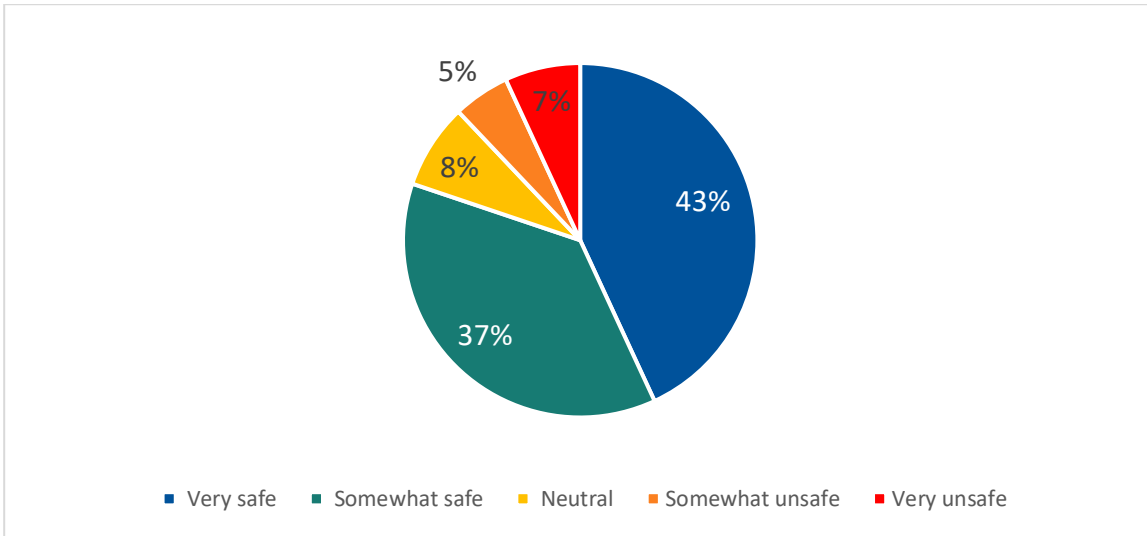
Q4   In the last 12 months, has your household or business had an unplanned water service interruption (e.g. caused by a water main break)?

Legend: ■ Yes   ■ No

Values: 10%, 90%

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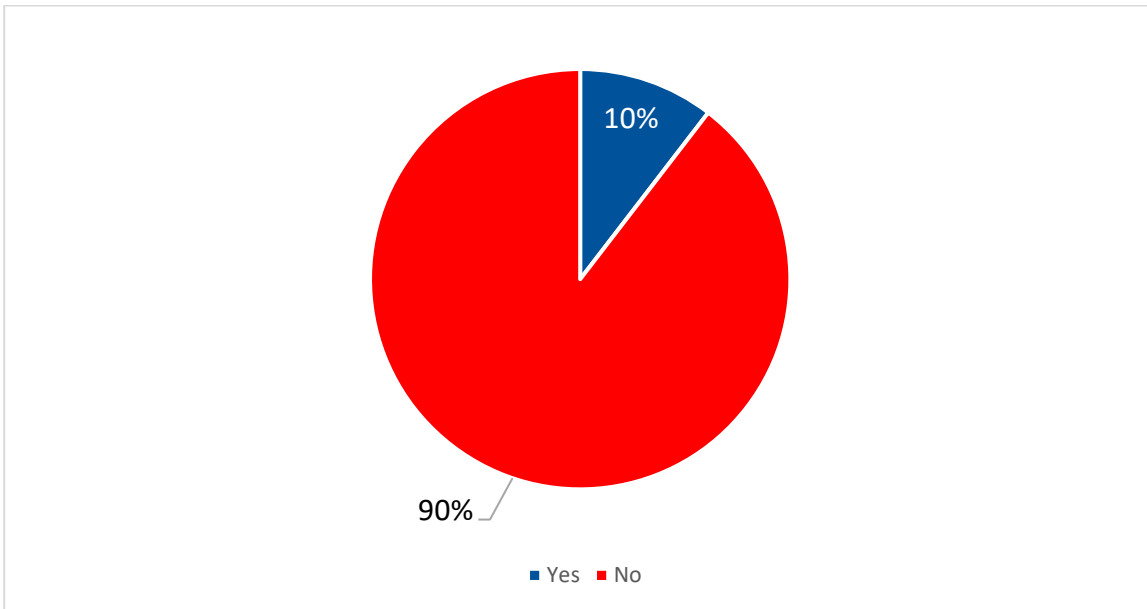
Q5   Do you feel the City responded and resolved the issue in a timely manner?
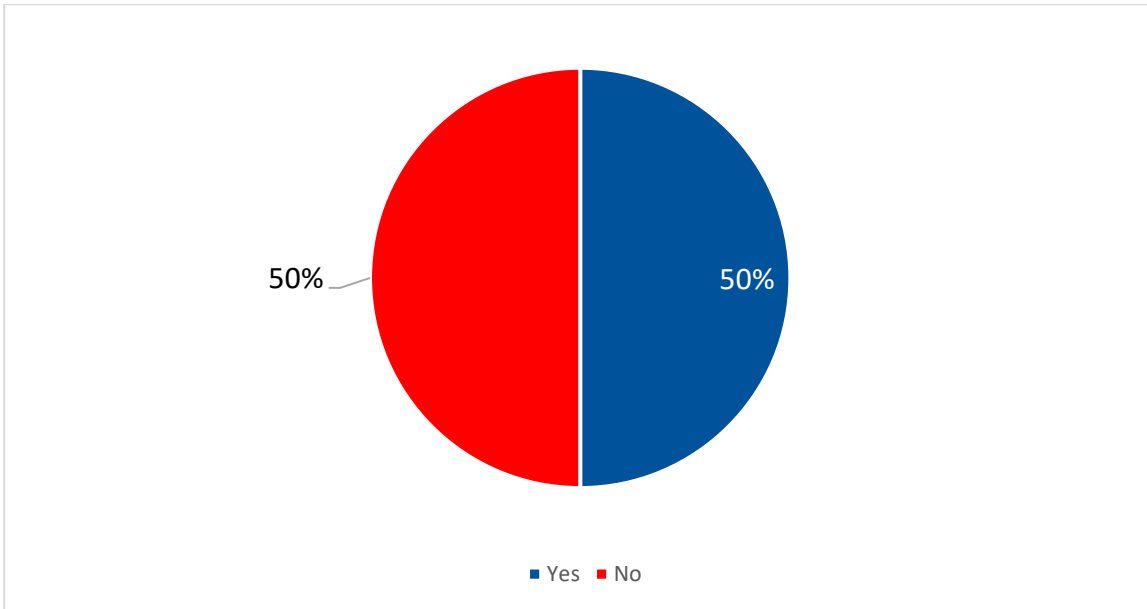
Q6   In the last 12 months, has your household or business had a planned water service interruption (e..g. planned by the City for maintenance or servicing)?
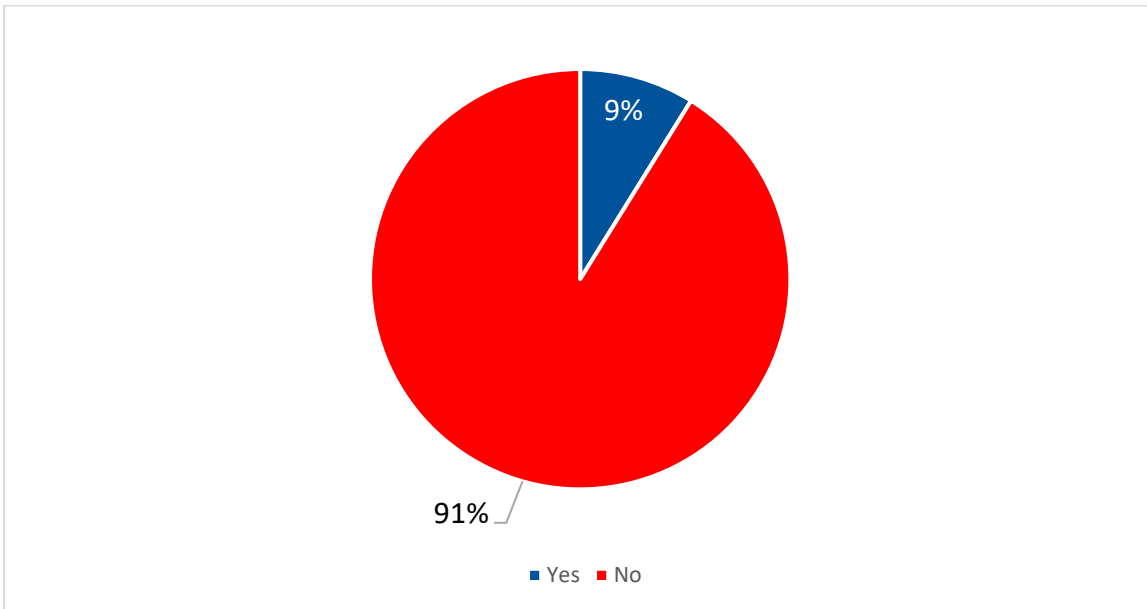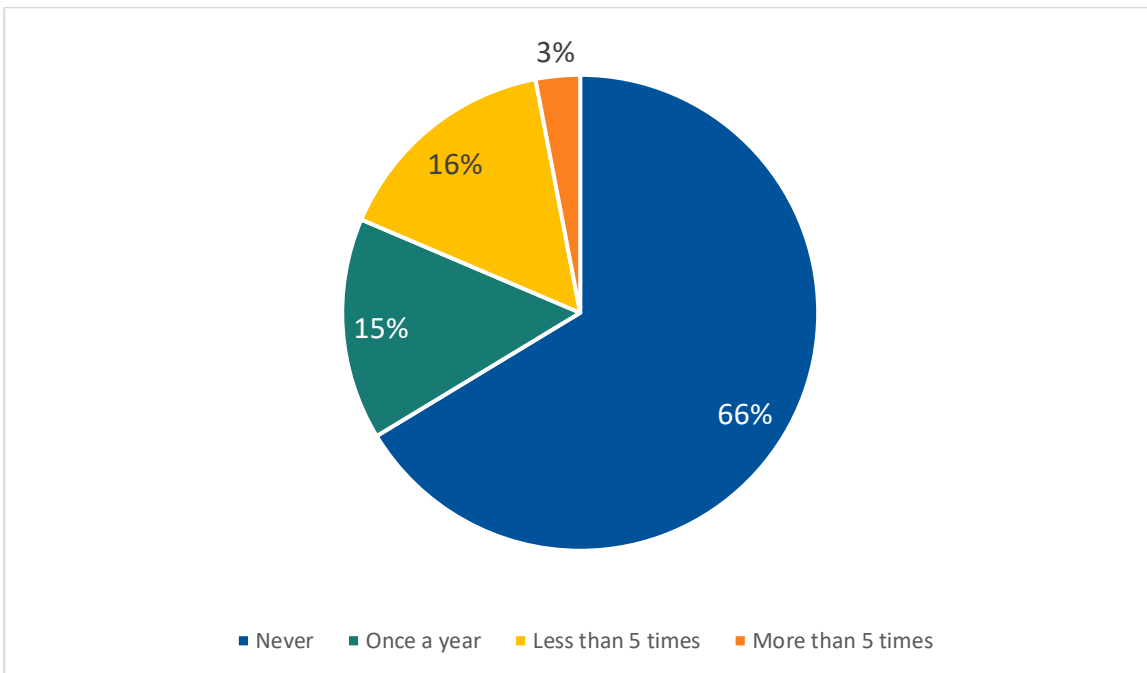
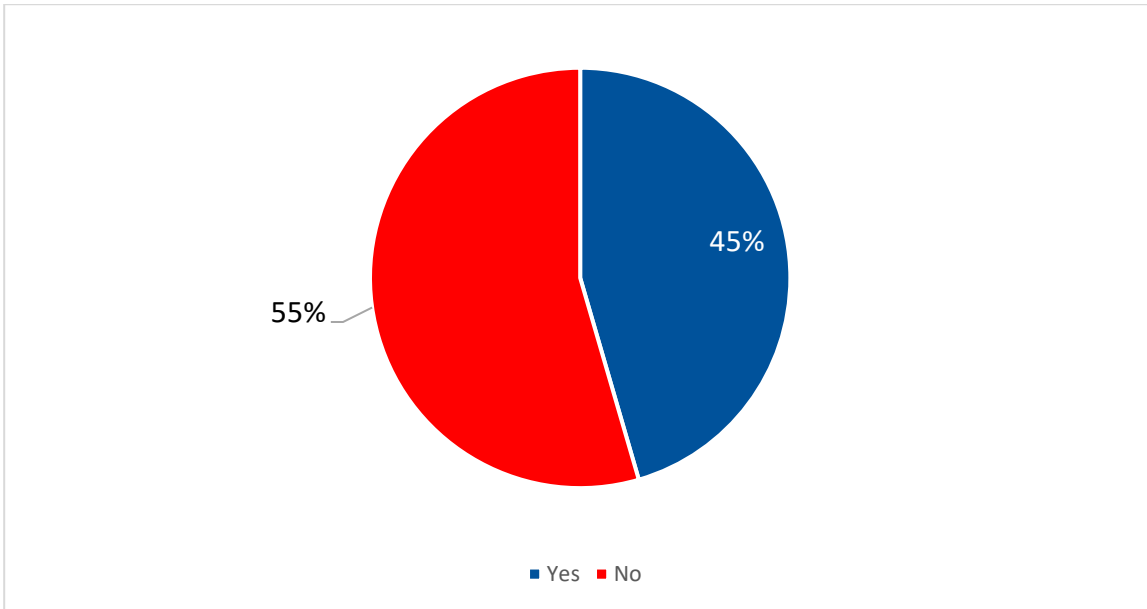**Q7** **Did the City provide you with advanced notice of the interruption?**

30%

70%

■ Yes ■ No
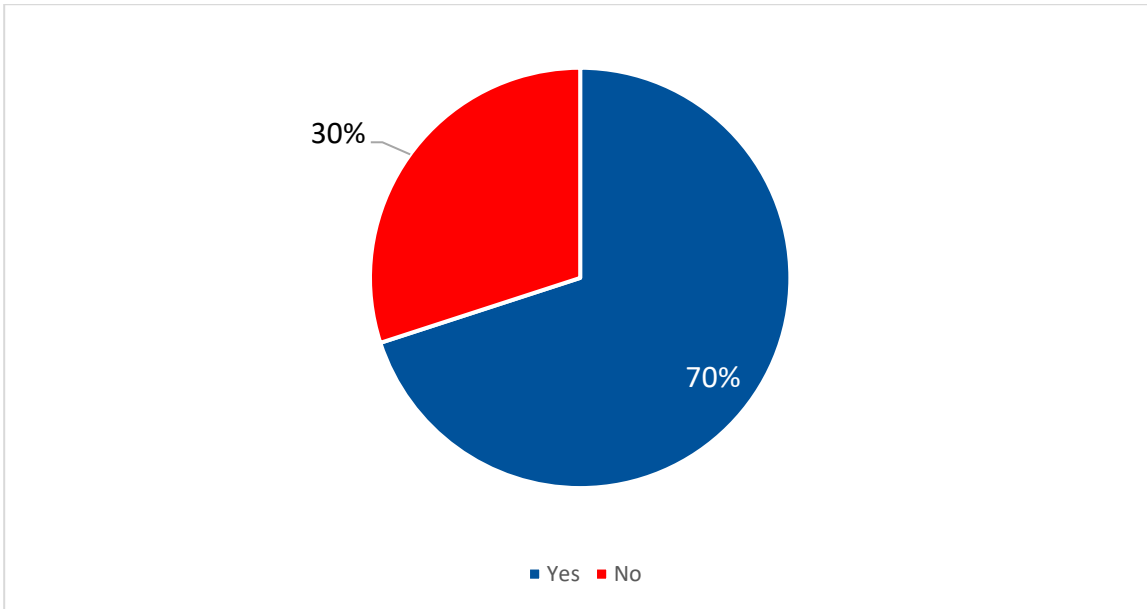
Stormwater Levels of Service - 201 Participants

Q1 **In the last 5 years how often have you had to delay or cancel travel due to roads being flooded?**

3%

16%

15%

66%

■ Never ■ Once a year ■ Less than 5 times ■ More than 5 times

Q2 Have you experienced flooding impacts on your property?

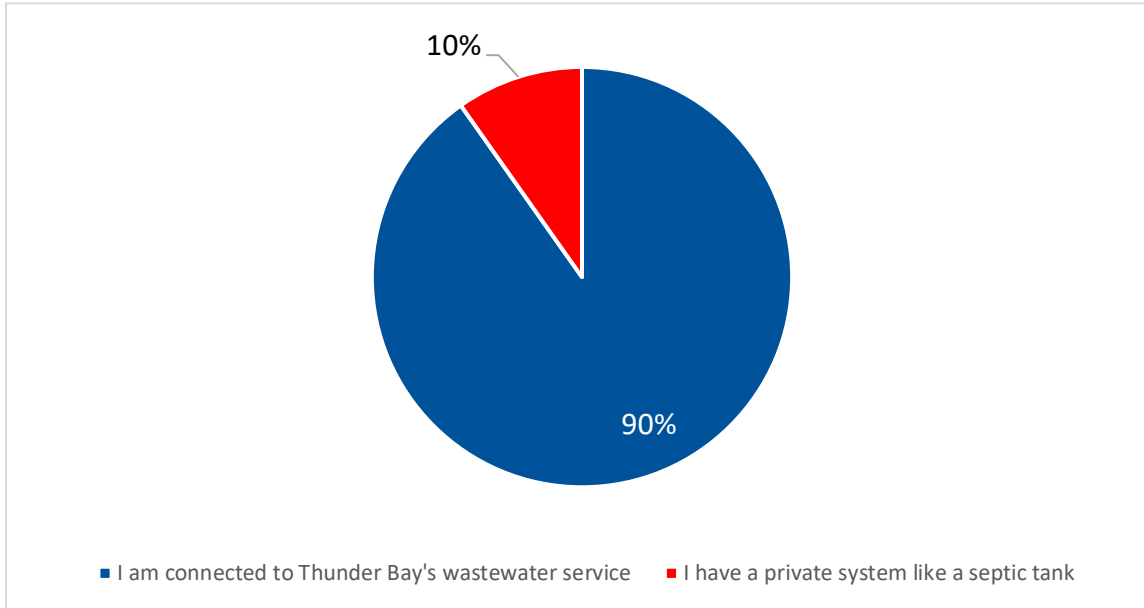

Q3 Do you feel that the City of Thunder Bay is taking enough steps each year to reduce the risk of flooding in the City?
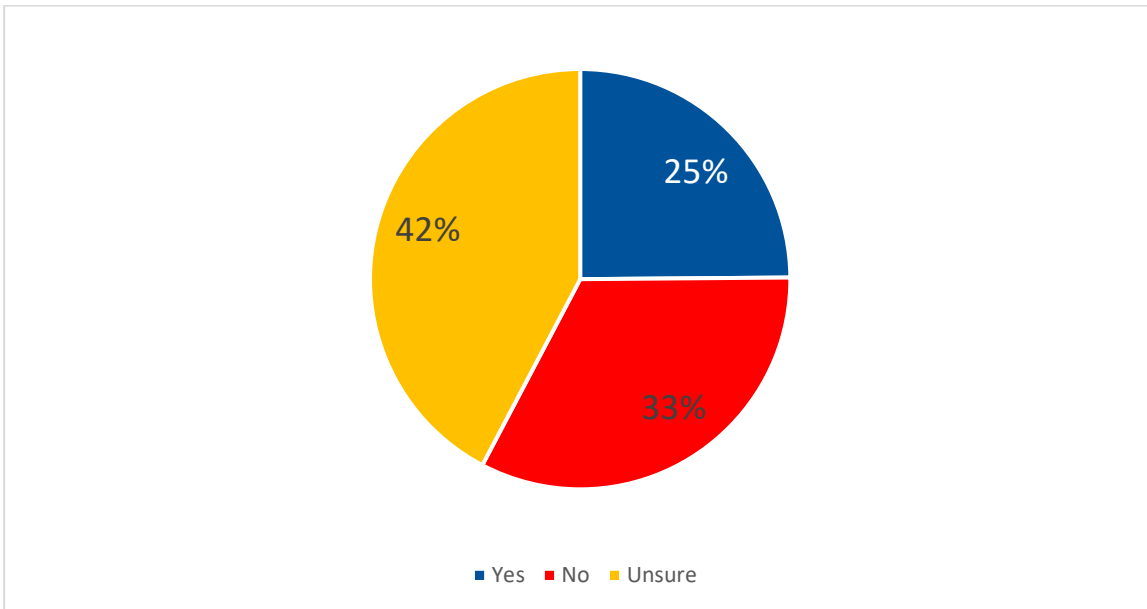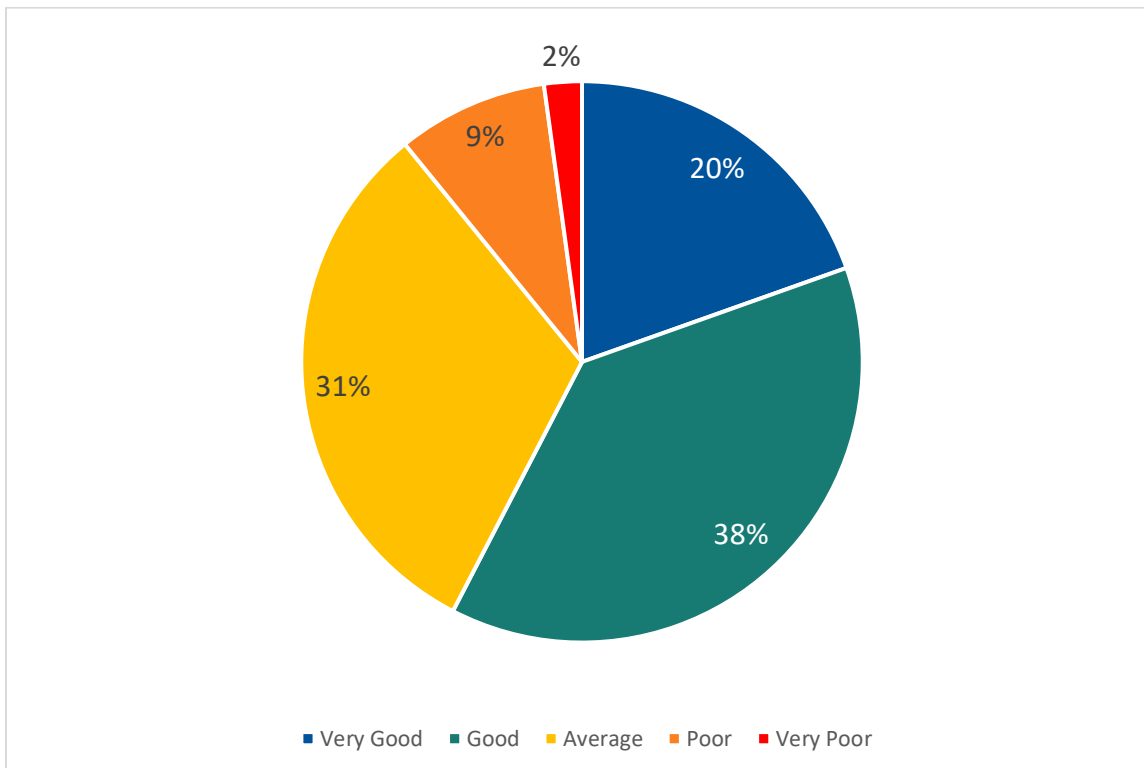
Wastewater Levels of Service - 92 Participants

Q1   What type of wastewater sewer service do you have at home?

10%

90%

- I am connected to Thunder Bay's wastewater service
- I have a private system like a septic tank

Q2   How would you rate the City's sanitary sewer collection system and services?

2%

9%

20%

31%

38%

- Very Good - Good - Average - Poor - Very Poor

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Q4   How would you rate the City's wastewater treatment processes and performance?
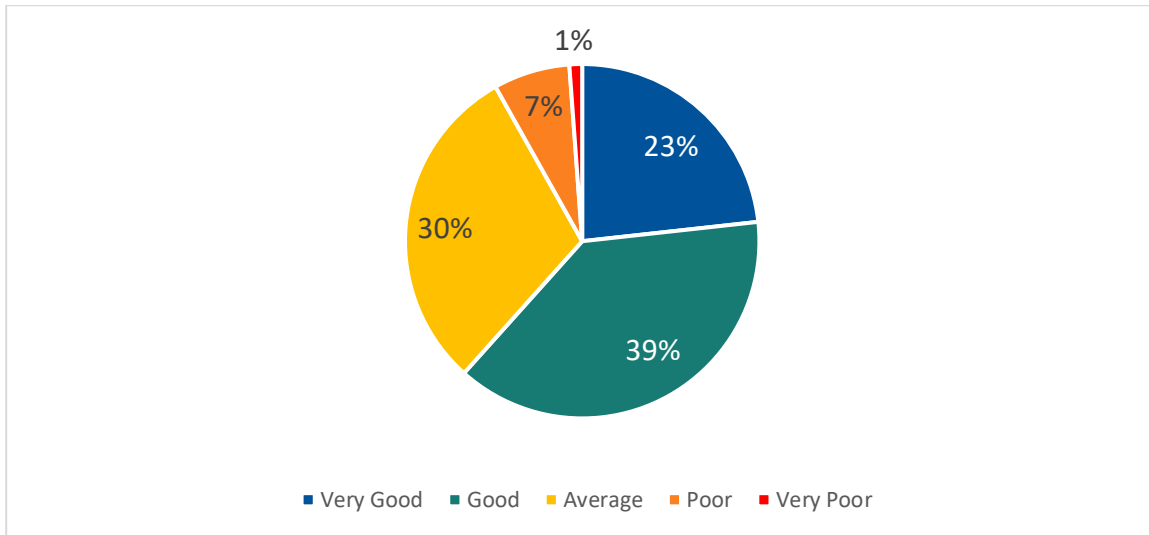
Q6   According to the Ontario Building Code, sewer and storm connections must have a front clean-out. Front clean-outs are usually located in the basement floor within one metre of the front wall of the house. Your clean-out allows access for inspection and maintenance of your sewer connection. Do you have a clean out at the front of your house?

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