Newmarket

CORPORATE ASSET MANAGEMENT PLAN

CORE ASSETS

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ACKNOWLEDGEMENTS

Land Acknowledgement
We acknowledge that the Town of Newmarket is located on the traditional territories of the Wendat, Haudeno-saunee, and the Anishinaabe peoples and the treaty land of the Williams Treaties First Nations and other Indigenous peoples whose presence here continues to this day. We thank them for sharing this land with us. We also acknowledge the Chippewas of Georgina Island First Nation as our close neighbours and friends, and we work to ensure a cooperative and respectful relationship. The Town of Newmarket is committed to the hard work of building a more inclusive, respectful, and equitable community and we welcome the relationships we will build on our journey to a better tomorrow.

Staff Acknowledgements
The development of this Asset Management Plan was based on the contributions of many Town staff. This acknowledgement is to thank all who contributed to the Plan and to recognize the various departments for their support and collaboration along the way. The plan is also made possible through the guidance and support provided by Council, CAO, Asset Management Steering Committee and WSP.

Support Departments
Office of Development and Infrastructure Services Commission
Engineering Services
Pubic Work Services
Financial Services
Corporate Communications
Information Technology
Customer Service
Planning
Innovation and Strategic Initiatives
Recreation and Culture
Procurement

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Regional Councilor and Deputy Mayor Tom Vegh
Ward 1: Grace Simon
Ward 2: Victor Woodhouse
Ward 3: Jane Twinney
Ward 4: Trevor Morrison
Ward 5: Bob Kwapis
Ward 6: Kelly Broome
Ward 7: Christina Bisanz

Consultant
WSP Canada Inc.

Corporate Asset Management Office

INTRODUCTION

The Town of Newmarket is committed to good governance through fiscal responsibility and financial sustainability in striving to meet the program and service needs of the community and its customers, including residents, local businesses and visitors. The Town of Newmarket will adopt and apply recognized Asset Management (AM) practices to plan, design, construct, acquire, operate, maintain, renew, replace and dispose of the Town's assets in a way that preserves sound stewardship of public resources while balancing levels of service and risk in support of delivering services to its residents and customers.

What is Asset Management?

Asset Management is an integrated business approach involving planning, finance, engineering, maintenance and operations geared towards effectively managing existing and new infrastructure to maximize benefits, reduce risk and provide safe and reliable levels of service to community users at the best value. This is accomplished in a socially, culturally, environmentally and economically conscious manner. AM relies on four key organizational components integrating together to achieve the desired service outcomes: well-planned strategies, good physical assets, highly trained professionals with respect to practices and procedures, and integrated business processes. These components, supported by appropriate technologies, provide a robust foundation for efficient service delivery.

The Vision

The Asset Management Plan aligns with the Town of Newmarket's vision and mission of Well Beyond the Ordinary and Making Newmarket Even Better. Through the implementation of AM practices, staff will develop and continuously improve how we manage our infrastructure assets throughout their lifecycle to ensure they support our goal of a healthy, happy, thriving, dynamic and extraordinary community in which to live, work and play, now and in the future.

We seek to:

- Reach out and build understanding among residents, business, staff and elected officials about the role infrastructure plays in providing services that make our quality of life even better.
- Recognize and respond to current and emerging trends in regulations, society and environment.
- Maintain a balance between an acceptable level of service and a cost that is sustainable for residents and businesses now and into the future.
- Ensure that funding levels and revenue sources are sufficient to meet current and future infrastructure demands.

We will commit to putting best practices in asset management into effect, including an asset management strategy that links disciplines and departments, integrates data and software resources and coordinates decision-making so that we will be able to invest capital resources wisely and make informed choices about how we maintain our assets and deliver our services.

History of Asset Management at the Town - Timeline

Policy & Procedure

The Town's Corporate Asset Management Policy guides the overall direction of asset management by establishing the key principles, overall mission and goals and is aligned with the Organizational Strategic Plan.

The Corporate Asset Management Procedures supports the Corporate Asset Management Policy by outlining the roles and responsibilities of all stakeholders involved in Asset Management practices supporting the delivery of municipal services to its residents and customers.

The Corporate Asset Management Policy and Procedures are founded on the following eight (8) principles:

Customer Focused

- The Town will aim to have clearly defined Levels of Service and applying AM practices to maintain the confidence of customers in how Town assets are managed. The Town will provide opportunities for municipal residents and other interested parties to provide input into the municipality's asset management planning.

Forward Looking

- The Town will make decisions and provisions that enable our assets to meet future challenges, including changing demographics and populations, customer expectations, legislative requirements, technological and environmental factors.

Holistic

- The Town will take a comprehensive approach that looks at the "big picture" and considers the combined impact of managing all aspects of the asset lifecycle.

Innovative

- The Town will continually improve its AM approach, by driving innovation in the development of tools, practices, and solutions.

Risk-Based

- The Town will manage the asset risk associated with attaining the agreed levels of service by focusing resources, expenditures, and priorities based upon risk assessments and the corresponding cost/benefit recognizing that public safety is the priority.

Service Focused

- The Town will consider all the assets in a service context and taking into account their interrelationships as opposed to optimizing individual assets in isolation.

Systematic

- The Town will adopt a formal, consistent, repeatable approach to the management of its assets that will ensure services are provided in the most effective manner.

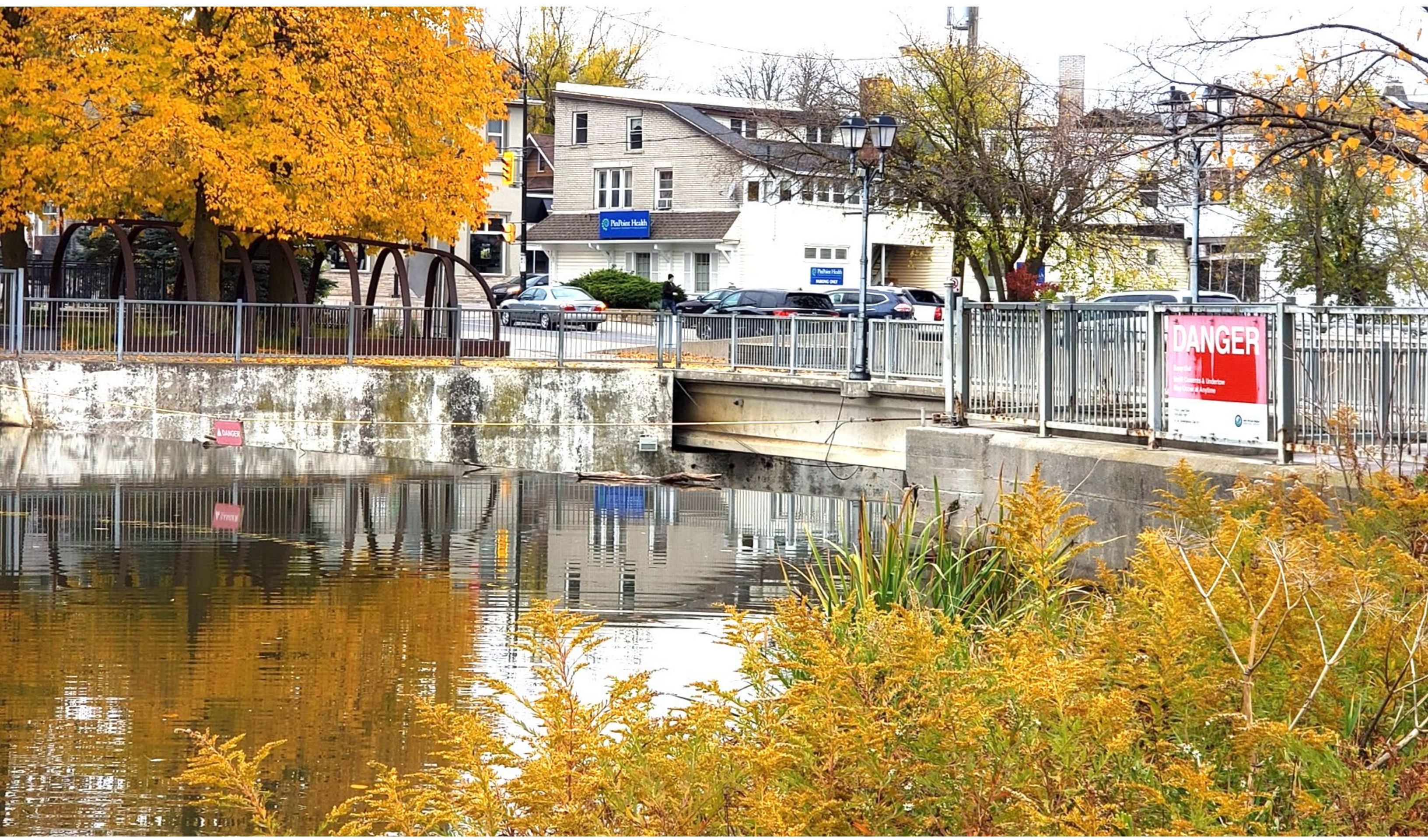
Value-Based / Affordable

- The Town will choose practices, interventions and operations that aim at reducing the lifecycle cost of asset ownership, while satisfying agreed levels of service. Decisions are based on balancing service levels, risks, and costs.

The Town will choose practices, interventions and operations that aim at reducing the lifecycle cost of asset ownership, while satisfying agreed levels of service. Decisions are based on balancing service levels, risks, and costs.

The use of these principles in applying asset management will better position the Town to:

- Deliver services at approved Levels of Service
- Improve decision-making accountability and transparency
- Better demonstrate the long-term consideration of short-term decisions
- Reduce the lifecycle costs while maintaining acceptable Levels of Service
- Link infrastructure investment decisions to service outcomes

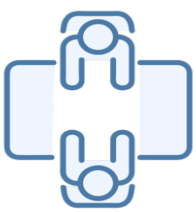


Roles and Responsibilities

Ontario Regulation 588/17 mandates that the Strategic Asset Management Policy identify the persons responsible for the municipality’s asset management planning, including the executive lead. Additionally, an explanation of the municipal council’s involvement in the municipality’s asset management planning and the municipality’s commitment to provide opportunities for municipal residents and other interested parties to provide input into the asset management planning is also required.

Council as representatives of stakeholders and the community are responsible for approving strategies, plans and policy as proposed by the Corporate Asset Management Office by a resolution. Through the annual budget process, Council will be responsible for approving funding for both capital and operation budgets associated with asset management.

The **Corporate Asset Management Steering Committee** is responsible for providing corporate support for asset management to ensure organization-wide accountability for achieving and reviewing corporate asset management goals and objectives. This includes coordinating financial, strategic planning and information technology activity and implementing processes that align with other corporate plans, frameworks, policies and regulations.



The **Corporate Asset Management Office** (CAMO) is responsible for liaising with departments and external stakeholders on matters related to asset management and ensuring project work is consistent with asset management objectives. Through this, CAMO can ensure continuous improvement of the municipality’s AM capabilities. CAMO will lead the development of asset inventories, condition assessments, risk assessments and related asset management initiatives in line with industry best practices and take part in coordinating the development of asset management tools and practices application across the organization including asset management systems development and functionality.

Asset System Working Groups and Service Providers will be responsible for supporting and complying with data collection requirements related to their areas of expertise and providing input on needs of department, status of assets, and current levels of service. Participation in the development of the Asset Management Work Plans pertaining to their areas of expertise is mandatory for success. They will be responsible for regular review of all documentation, data, and asset measurement tools to ensure continued relevance and applicability of existing policies and practices as pertains to their area.

Asset management heavily impacts the community, our residents, customers and stakeholders. **Residents, customers and stakeholders** should participate in public information sessions and provide feedback related to levels of service, service experience, and service expectations.

In 2019 the Town's AM policy was updated to include roles and responsibilities for Council, CAO, AM Steering Committee and the CAMO and is included for reference above.

Why a Plan?

AM plans are part Newmarket's long term strategic, planning, and financial management. AM Plans guide Newmarket's processes to reflect sound and accountable governance of its municipal infrastructure. The plans provide an understanding of current and future asset needs, condition and costs, service levels, risks and future growth planning and funding. The AM Plans are a living document to be reviewed and updated as the environment changes. This includes considering and incorporating standards, adding new data, updates that demonstrate continuous improvement, changing demographics and trends, provincial policy, and corporate documents and studies. At a minimum, the plans will be reviewed annually and updated every 5 years as mandated by O.Reg 588/17.

The outcomes of AM Plans are as follows.

Committment and Consistency

- Committing the Town to support the implementation of asset management methods that are consistent with the organization in order to implement the goals and objectives of our Strategic Plan informed by community and Council priorities.

Transparency and Accountability

- Provide transparency and accountability and to demonstrate to stakeholders the legitimacy of decision-making processes which combine strategic plans, budgets, service levels and risks.

Stakeholder Communication

- Communicate the endorsed management principles and approach to stakeholders

Strategic Framework

- Provide a framework for implementing asset management to enable a consistent and strategic approach while developing an asset management culture at all levels of the organization

Service Sustainability & Affordability

- Embed asset management principles for a sustainable approach to service delivery that delivers optimal value for our stakeholders while maintaining affordability.

EXECUTIVE SUMMARY

Newmarket's asset management planning process advances the Town's Strategic Priorities for financial sustainability, and demonstrates a commitment to Town values of being Well Beyond the Ordinary. The Town is implementing its vision for supporting a thriving community through the management of infrastructure using asset management practices and continuous improvement.

Asset management plans guide Newmarket's processes to reflect sound and accountable governance of its municipal infrastructure. They provide strategic plans for leaders, practical tools for service areas, and a platform for public discourse about infrastructure, services, and affordability.

The 2021 Core Asset Management Plans include Town-owned roads, bridges, water, wastewater, and stormwater assets. Each plan includes four chapters that build a holistic understanding of the Town's assets and their future:

- **Know Your Assets:** Establishes the baseline of what the Town owns, its condition, and replacement cost to inform subsequent analysis, reporting, and decisions.
- **Manage Service Delivery:** Brings visibility to levels of service, risk, and activities that support services through a framework for managing asset-related services holistically.
- **Future Ready:** Showcases ongoing and future trends that will impact the Town's assets and services. This includes growth in the core asset base, and the impacts of climate change on core assets.
- **Financial Strategy:** Uses capital financial modeling to show the cost of maintaining core assets at their current level of service, the outcomes of current levels of funding, and options for future financial decisions.

The key findings for core assets have been summarized within the Executive Summary.

KNOW YOUR ASSETS

What was once a small but thriving Town, today Newmarket is the owner of hundreds of thousands of assets. These assets were historically constructed, purchased, or acquired by the Town in order to provide services to the community. If all Town core assets were replaced today, it would cost more than $2 billion. Understanding future replacement budgets for Town assets start with the **State of the Infrastructure**, before adding risk and Level of Service (LoS) considerations.

Quantifying the asset inventory is the beginning of the Town's asset management journey. Each section of the **State of the Infrastructure** tells a story.

What Do We Own?

Assets exist to provide services, and Town owns a lot of them! The quantities show what assets the Town has become stewards of to date, which in turn determine the number of assets that need to be inspected, operated, maintained, and one day replaced with capital reinvestment.

252 Kilometers of Roads

67 Bridges and Culverts

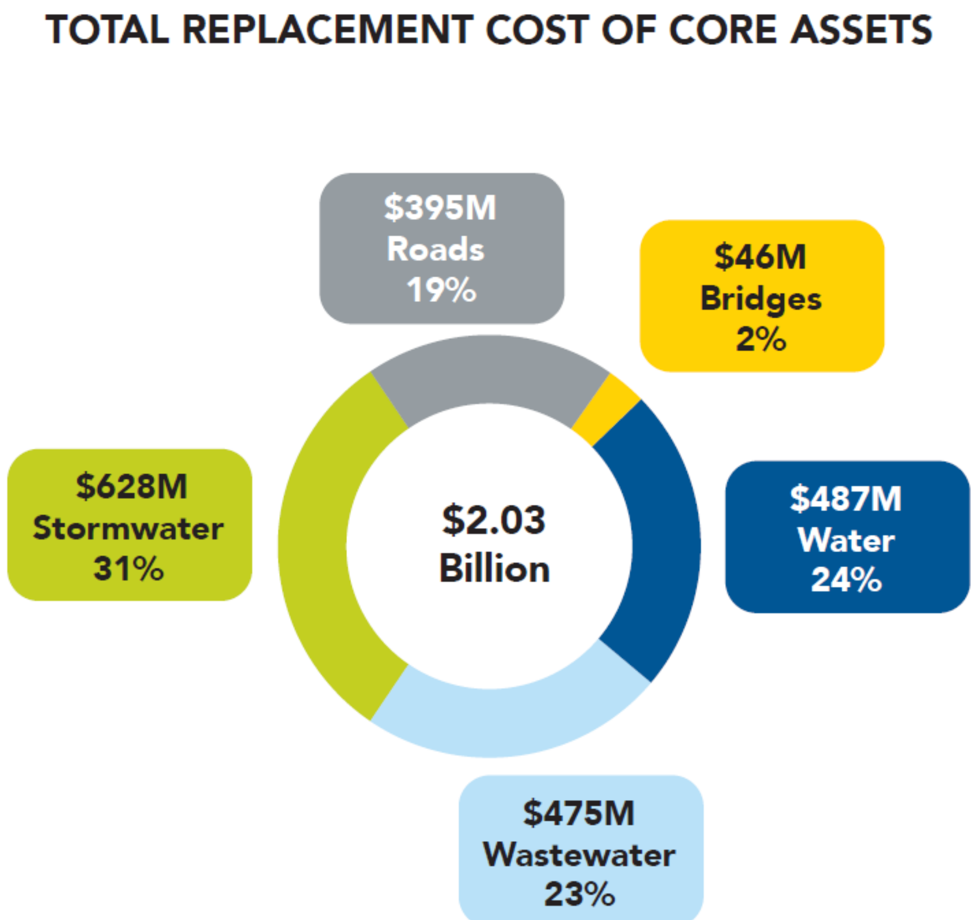
308 Kilometers of Watermain

273 Kilometers of Wastewater Sewers

297 Kilometers of Storm Sewers

What Is It Worth?

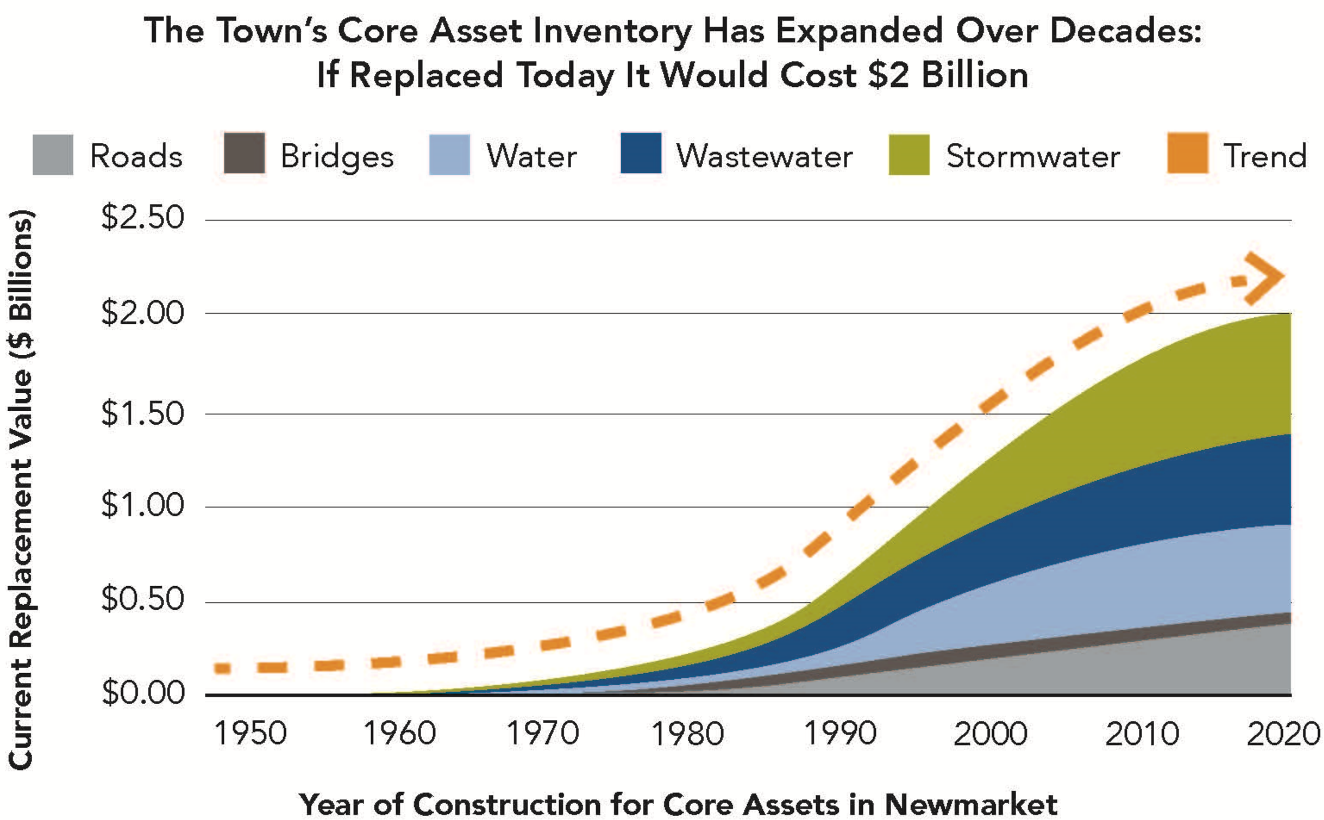
Replacement value is the current market cost to replace existing assets ensuring similar service levels for these assets into the future. Replacement unit cost represent the 2021 total contracted cost of replacing each asset the Town owns and does not consider staff time, maintenance, growth, climate change, service enhancements, or other cost factors.



** Stormwater has a higher replacement cost than water and wastewater. Results from Town data were verified against several GTA municipalities exhibiting the same trend using like-for-like comparisons. The reasons for the higher cost include owning stormwater ponds, extra assets like catchbasins and oil grit separators, and storm pipes generally being larger than water and wastewater.*

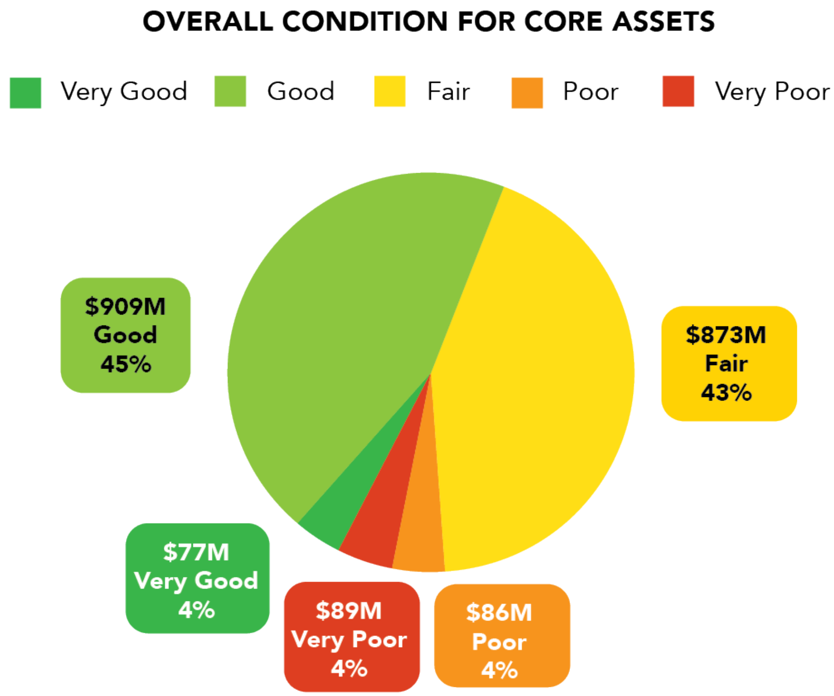
How Old Is It?

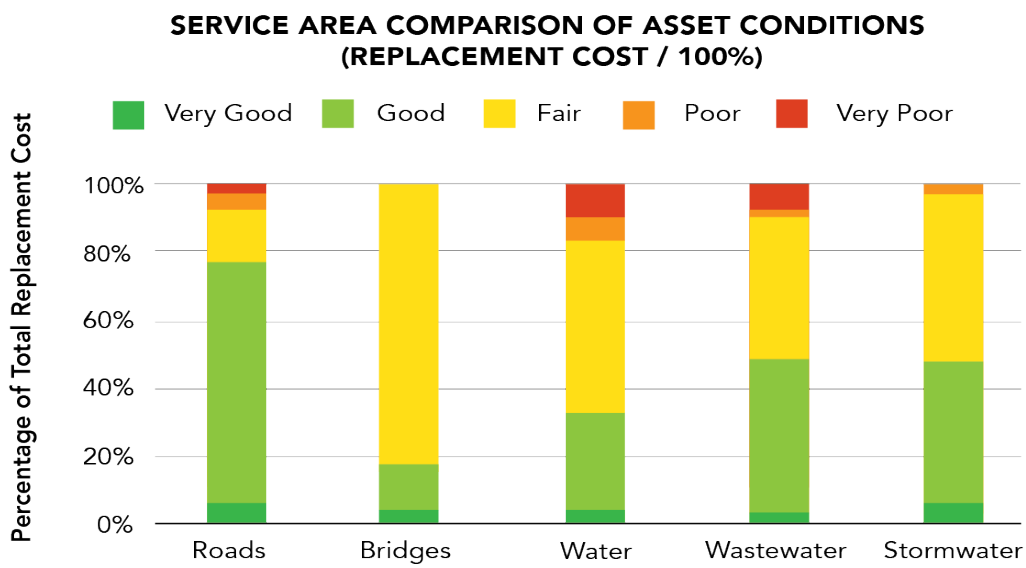
Brand new assets and aging assets vary in their ability to provide services, their maintenance need, and their replacement urgency. Understanding the age of assets allows the Town to plan for the future. Most Town assets were constructed in the 1980s, 1990s, and 2000s, meaning many assets are approaching the midpoint of their life resulting in higher repair requirements.



What Condition Are Assets In?

All assets have a finite life. As assets provide services, operate, and age, they will usually deteriorate and the need for reinvestment will arise (signified by a reduced condition rating). Condition benchmarks the age and investment need of assets, and can support other decisions such as LoS.





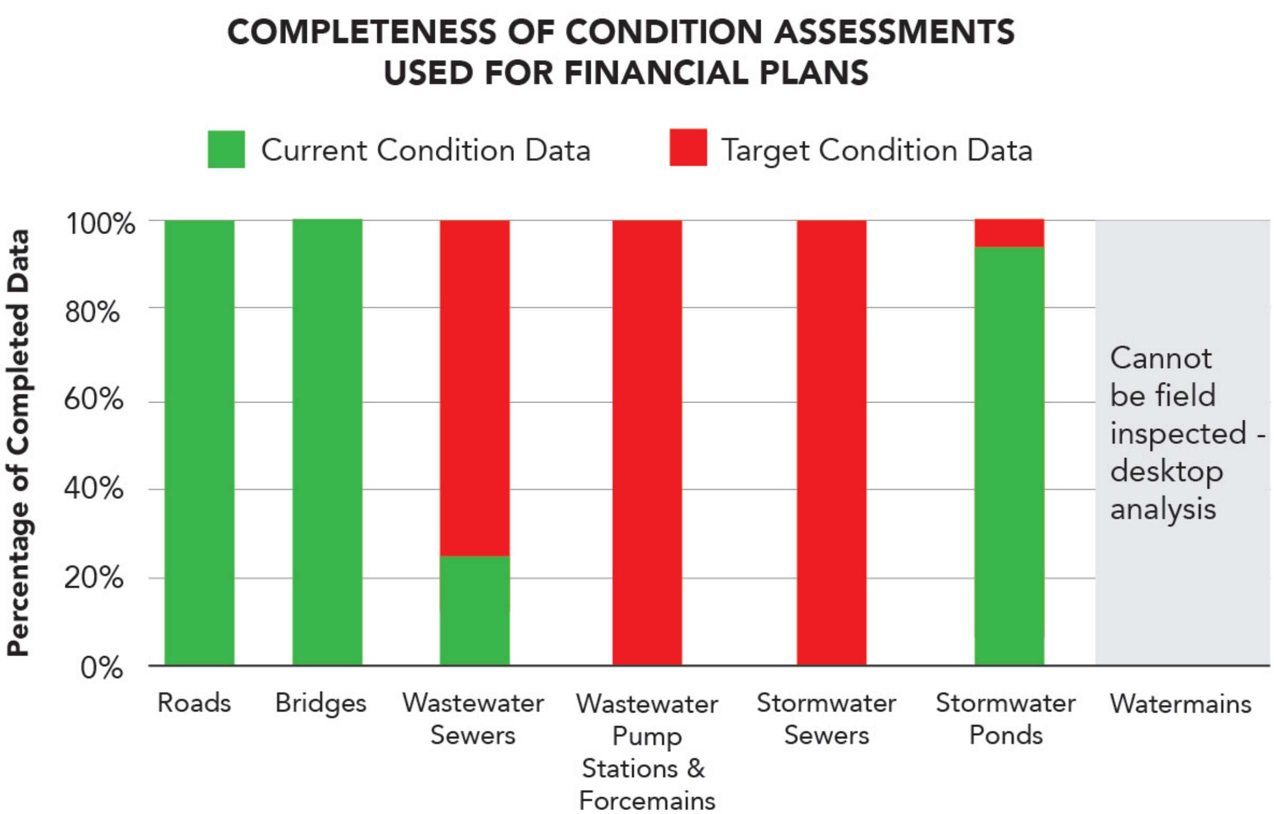
Condition Assessments

The foundation of good asset management practice is based on having comprehensive and reliable information on the current condition of the infrastructure. Without this information, financial and capital plans carry a significant amount of uncertainty.

Condition data is derived from field observations by qualified engineers who can provide information about the remaining useful life of the assets. When this information is unavailable, age is used as a proxy with a lower level of confidence.

The Town has made good progress in establishing baseline conditions for roads and bridges. Rate supported assets like wastewater sewers and stormwater sewers do not have condition data – these assets could be performing worse or better than currently estimated. The figure below summarizes progress made to date.

To manage risk, optimize allocation of limited funds, and provide assurance to financial projections, condition assessments and data collection need to become a regular business process for the Town.



MANAGE SERVICE DELIVERY

Assets exist to deliver value. Asset management is not just about the asset itself, but the creation of value that the asset can provide to the community. The expenses the Town incurs over the lifecycle of the asset are done with the goal of ensuring residents and business continue to receive exceptional service from the Town. However, providing services like transportation or clean drinking water through assets is not a cost-free or risk-free enterprise. Being good stewards of Town assets presents risks, costs, and opportunities that need to be managed.

Value realization is a balancing act – it often requires managing conflicting, interconnected drivers of risk, cost, and performance. The Town manages service delivery through a three-part framework:

- Levels of service: Outcomes customers experience and the underlying Town performance required to deliver the outcome.
- Cost: Expended Town resource on lifecycle activities that deliver services to affect the outcomes experienced by customers.
- Risk management: The mechanism by which the Town will balance cost and levels of service, and control risks associated with not achieving a level of service.

Decisions about what services to provide, what to spend, or what risks the Town will tolerate leads to changes in how the other factors are balanced. There is no single correct way on how to manage this balance – the desired approach will depend on the goals of the organization. This balancing act is depicted in the graphic below.

Levels of Service in the 2021 Asset Management Plan

For the 2021 Asset Management Plan, the Town has started by reporting on the O. Reg 588/17 requirements and select additional measures that will allow the Town to begin measuring performance and making decisions.

The focus of the 2021 Asset Management Plan's LoS is the condition of the assets as presented in **Know Your Assets** and forecasted in the Financial Strategy. The benefit of this approach is that condition is a good proxy for many service criteria. The condition of the assets can be linked to capital expenditure to rehabilitate and replace them, which is one of the Town's largest expenses. Condition is easily quantifiable and modelled, making it the logical first step for the Town's LoS analysis.

The link between condition of the asset and the service it provides is shown in the table below. Further examples are provided for each asset class in their Asset Management Plan (AMP) including pictures.

Condition Category	Condition Description*
Very Good	The asset is fit for the future. It is well maintained, in good condition, new or recently rehabilitated.
Good	The asset is adequate. It is acceptable and generally approaching the mid-stage of its expected service life.
Fair	The asset requires attention. The asset shows signs of deterioration and some elements exhibit deficiencies.
Poor	There is an increasing potential for its condition to affect the service it provides. The asset is approaching the end of its service life, the condition is below the standard and a large portion of the system exhibits significant deterioration.
Very Poor	The asset is unfit for sustained service. It is near or beyond its expected service life and shows widespread signs of advanced deterioration. Some assets may be unusable.
*Definitions are sourced from the Canadian Infrastructure Report Card and Statistics Canada, 2019.	

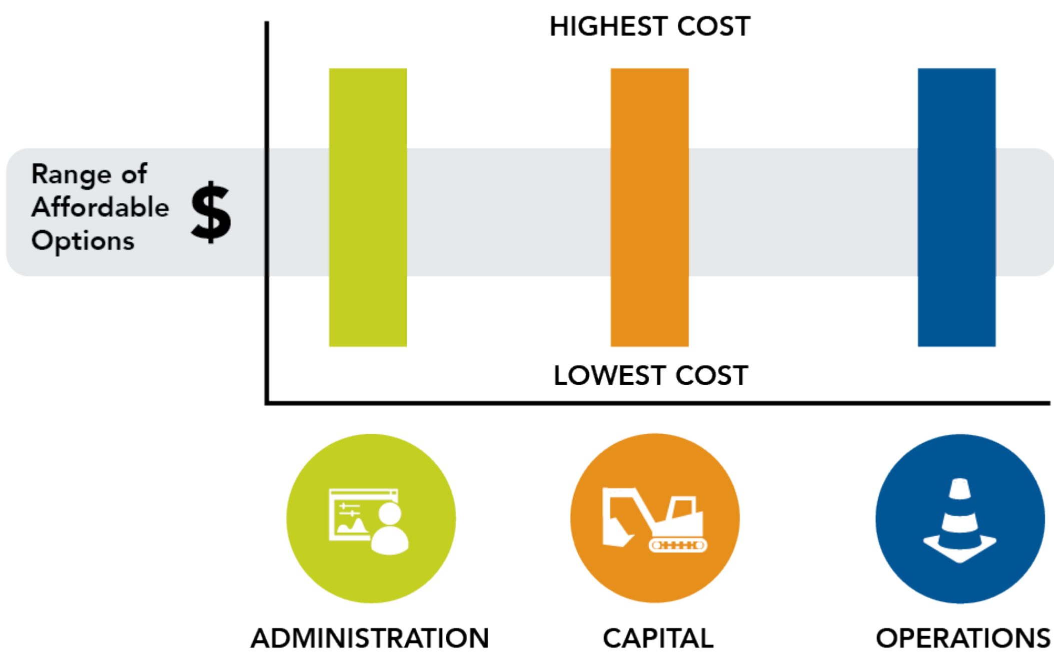
Levels of Service Decisions Affect Affordability

When targeting a LoS (improved services, decreased, or status quo), the Town will also be able to adjust the resources and funds allocated to that LoS. Conversely, decisions about removing or adding a budget mean that the Town is also deciding on a change in service levels. Therefore, LoS decisions are ultimately about desired outcomes and their affordability.

How the Town will use Levels of Service

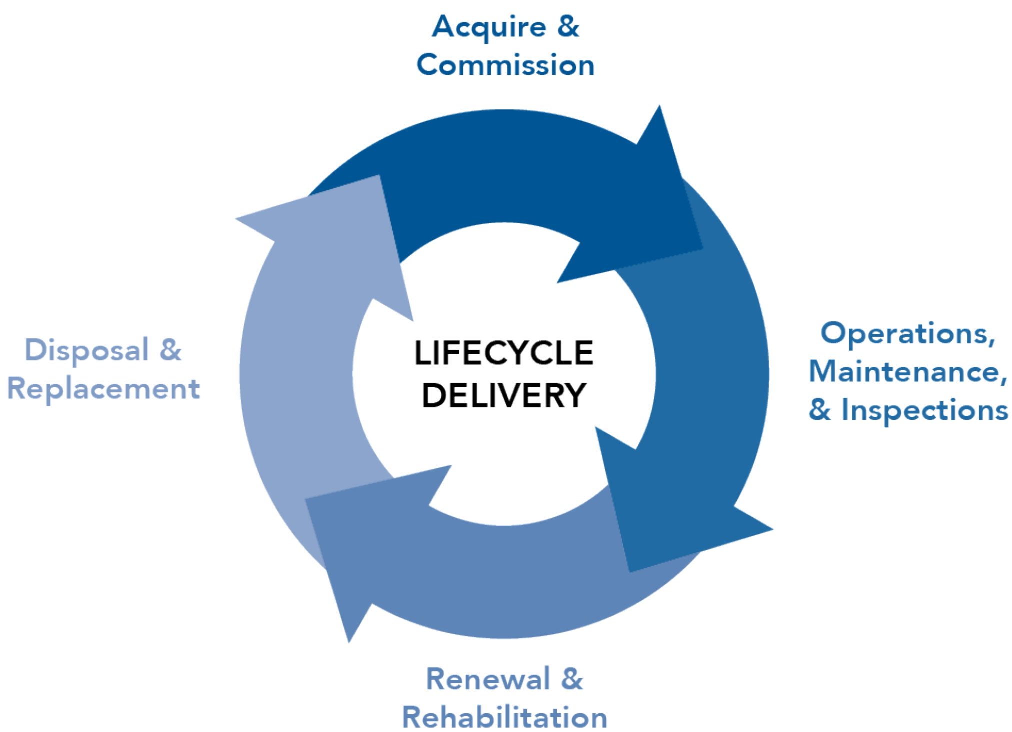
In 2025, the Town and Council will be required by Ontario Regulation 588/17 to define the LoS it wishes to achieve and the funding strategy it will employ for delivering that LoS over time. The Town and Council could simply choose to maintain the status quo of services or funding, or begin to set targets based on the direction set by leaders and customer expectations.

When targets are set, the Town will report on its planned pathway to achieve sustainable funding for that LoS. This process has been started in the Financing Strategy. The figure below shows the relationship between setting service levels and funding strategy:



Lifecycle Activities

Assets go through a series of distinct lifecycle phases from when they are created and eventually disposed of – in each of these, lifecycle activities are conducted and decisions are made about how value is delivered by an asset. This process involves many Town stakeholders who need to be aligned in what constitutes value and how it is achieved. The purpose of lifecycle strategies is to maintain the asset in an appropriate state that will deliver the required level of service for least overall cost, while keeping risk within agreed boundaries. A simplified Town asset lifecycle constitutes the following steps:



Risk

Risk is the potential of gaining or losing something of value. Values (such as services, environmental and community well-being, or financial wealth, etc.) can be gained or lost when acting or not acting in a certain situation with risks or opportunities. Managing risk means taking a deliberate and structured approach to identifying, quantifying, and responding to risk. The ability to manage risk has the potential to exist at all levels of Town decision making:

Corporate or Strategic Risks - Guide the Senior Leadership Team in policy development. Focus on strategic risks such as events that could limit the Town's ability to achieve Council priorities. Supports senior leadership in decisions on budget allocations between service areas, to minimize risk accepted by the Town.

Service Level Risks – Help directors and asset managers to manage their services by tracking risks to service delivery. These risks are closely linked to Levels of Service and the associated performance measures. Service level risks quantify the likelihood and consequences of not achieving service commitments

Asset Level Risks – Help technical and operational staff make tactical decisions about lifecycle activities for specific assets at specific locations. Each asset provides a given service for a set of customers. The risks of an asset not providing its required service is influenced by its operating context and condition.

Well Equipped and Managed

Strategic risk example:
Provide services that meet existing & future needs.

Service level risk example:
Service availability is impacted by high-demands

Asset level risk example:
2018 watermain break at Water St. railroad crossing.

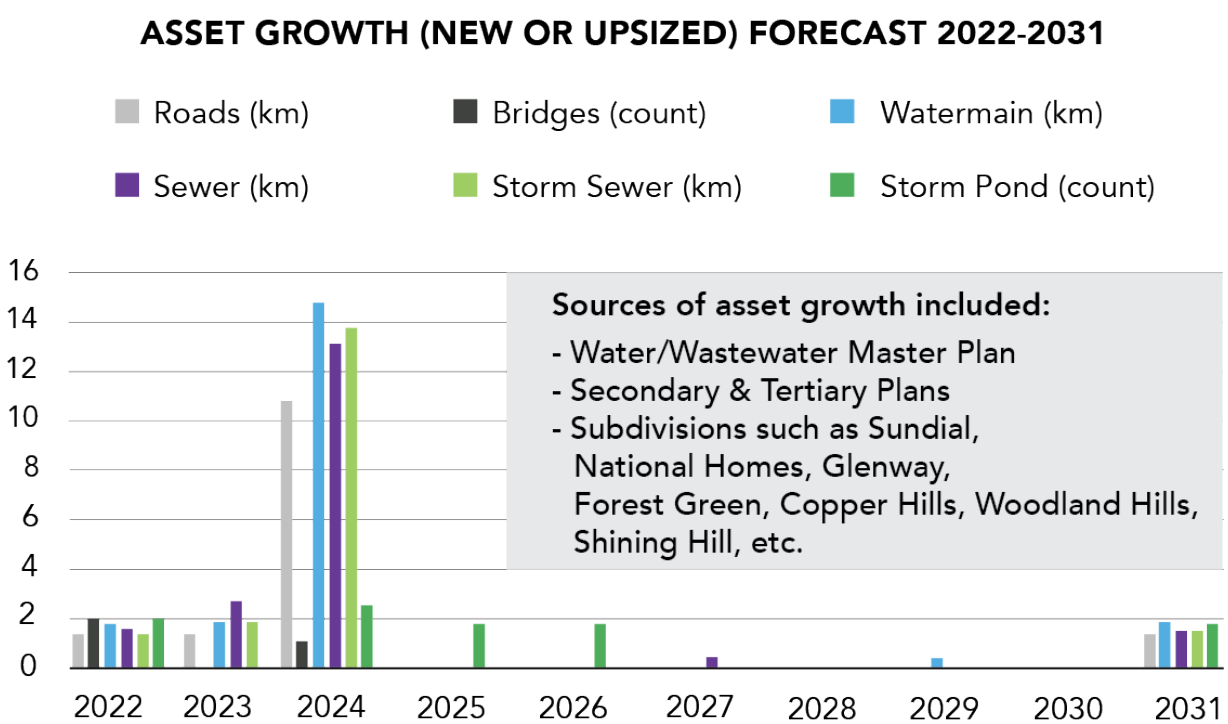
FUTURE READY

Trends in technology, society, climate and resources can shorten the life of assets and increase total cost of asset ownership. Considering these trends in asset management plans ensures the Town has a path to adequate funding, human resources with the needed skills, and industry networks to prepare for future changes. It can prepare our citizens for higher or lower levels of service; lower or higher rate increases or higher or lower risks of asset failure depending on actions of management.

Growth

Newmarket is poised for growth. The Town's Census population is expected (pre-COVID-19 projection) to increase by about 8,830 people over the next ten years, reaching about 95,210 by 2028. Population will increase by 11,290 over the next 10 years, reaching 97,670 in 2031. When more or different assets to accommodate this growth are introduced to the town's portfolio ("growth"), additional human resources, training and funding are required to operate, maintain, repair, and eventually rehabilitate or replace those assets.

Based on current plans and projections, the figure below shows the expected growth in asset quantities:



By building or assuming new assets, the Town is committing to the full lifecycle of an asset's service delivery. Once an asset is constructed, it must be operated, maintained, and eventually replaced. For example, streets must be plowed, water infrastructure like hydrants must be serviced, sewers need to be inspected, and drainage features require cleaning. The responsibility for maintenance occurs when the Town assumes constructed assets from contractors or developers. By assuming assets, the Town is acquiring both a new source of service delivery and a set of liabilities that require funding and maintenance.

The level of effort and required resources to maintain growth assets has been quantified based on the total number of assets and a per-unit cost of maintenance.

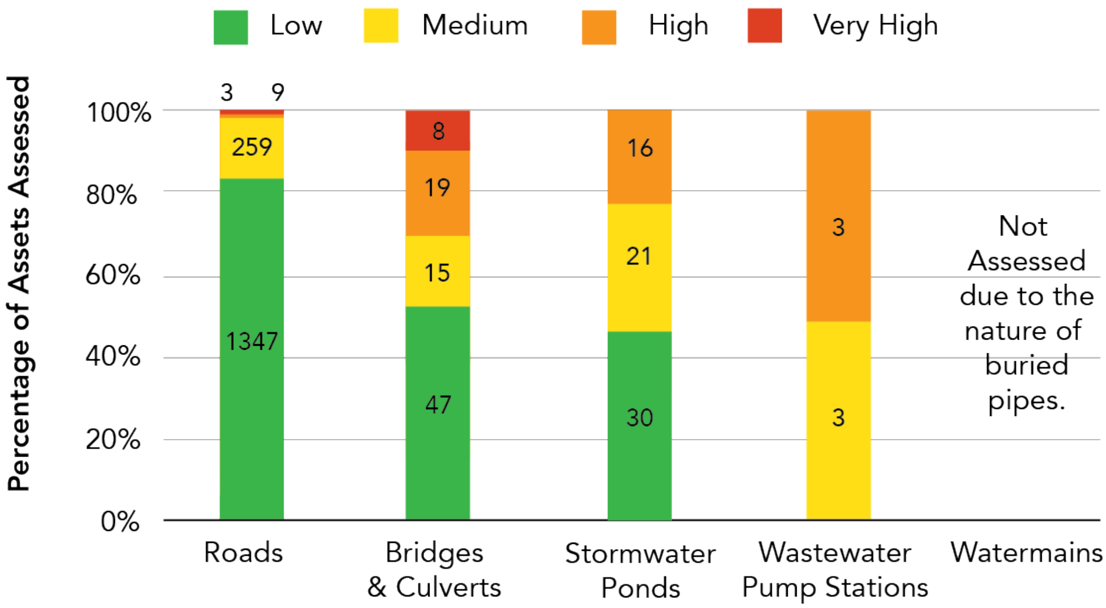
Growth of Core Assets	Operating Impact by 2024
Roads	$248,000
Bridges	$19,000
Tax Supported Subtotal	$267,000
Water	$265,000
Wastewater	$197,000
Stormwater	$100,000
Rate Supported Subtotal	$562,000
Total Operating Impact of Assumed Assets by 2024	**$829,000**

Climate Change

On January 13, 2020, the Town of Newmarket declared a climate emergency. This declaration underscores an understanding that climate change can impact all facets of life, including businesses, infrastructure, natural systems, and people's health and well-being.

The Town engaged the Ontario Climate Consortium (OCC) in June 2019 to conduct a corporate-wide resilience assessment of Town-owned infrastructure. Understanding risks and vulnerabilities is a key first step to inform ongoing and future adaptation and resilience-building efforts. Flood risk has been selected as the focus of this assessment to leverage existing flooding-related data and develop a prototype of an approach that can be replicated in the future for other climate-related risks. Results are summarized as follows:

FLOOD RESILIENCE HAZARD-VULNERABILITY RATING FOR CORE ASSETS INCLUDED IN A CLIMATE CHANGE RESILIENCE ASSESSMENT



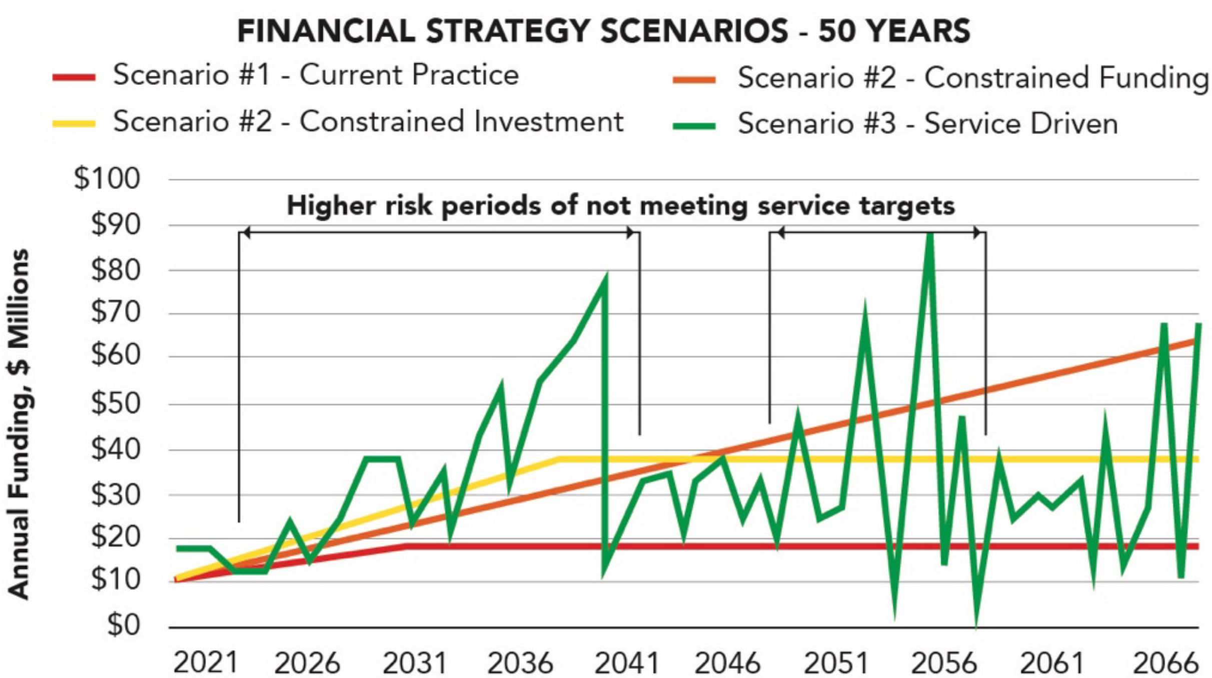
FINANCIAL STRATEGY

The Town of Newmarket has developed a Financial Strategy to evaluate the relationship between current investment levels, service outcomes and risk of service failures. The financing strategy reinforces a long-term perspective of levels of service. It considers required revenues associated with these service levels expectations versus affordability to the community.

A full Financial Strategy is provided. The Strategy includes a 50-year financial analysis, forecasted outcomes, and options for managing increasing an infrastructure gap. 10-year plans and further details are provided in each AMP.

The findings of the analysis can be summarized as follows:

- Current service levels enjoyed by the Town are **unsustainable** given current levels of investment.
- Asset condition is forecast to **deteriorate in the near term** without a consistent increase in infrastructure investment and contributions to reserves.
- An **annual increase** in the Town's capital funding is required to achieve desired service outcomes.
- This annual funding increase could be **between +$1.05M** (Constrained Investment scenario) **to +$1.964M** (Service Driven Investment), before inflation, to fund increased investment and build the Town's reserves.
- Investment in core assets is recommended to be **+$1.55M annually, before inflation**. This level of investment still may result in **some risk of service failures** as seen in the graph below.



KEY RECOMMENDATIONS TO ADVANCE ASSET MANAGEMENT MATURITY

Asset management is a continuous improvement process. Through iterations of development and implementation, new asset management capabilities can develop and others can improvement.

The development of the core Asset Management Plans is part of a broader implementation of asset management capabilities by the Corporate Asset Management Office (CAMO). These improvements are directed by the Asset Management Policy and the Asset Management Strategy.

Throughout the development of the AMP, 104 recommendations were identified for individual service areas (e.g. roads, water) and support functions (e.g. Finance, IT). Recommendations will be implemented by service areas in accordance with work plans directed by leadership. The CAMO will provide support to those leading the implementations where applicable and monitor progress. Recommendations break down as follows:

34	29	18	23
Administrative Recommendations	Strategic Recommendations	Systems Recommendations	Tactical Recommendations

At the corporate level, broader actions to improve asset management of core assets were identified by the Asset Management Plans.

Implementation of these recommendations will be subject to the direction of the Asset Management Steering Committee. Corporate recommendations for asset management of core assets are:

Know Your Assets Recommendations

- Establish data management practices for core assets such as data owners, formats, collection and reporting frequencies, and links between data and decision-making.

- Develop a condition assessment framework that supports asset-owning departments in developing condition scales and data collection programs and practices for their assets.

- Define the need for and develop options for implementing an asset registry tool that can support reporting of the State of the Infrastructure, as well as other functions like Financial Information Return. Options could include software or in-house extract-and-load tools.

Manage Service Delivery Recommendations

- Develop a governance model for AM at all levels of the organization, and clarify roles and responsibilities across the asset portfolios.

- Adopt the levels of service measures (KPIs) developed for core assets, and create processes to support their data collection, reporting, and use in decision making in preparation for 2025 O.Reg. 588/17 requirements.

- Develop Levels of Service targets for measures (KPIs) in the core asset management plans.

- Implement corporate risk management practices as suggested by the core asset management plans, (i.e. Corporate Risk Management Policy & Framework.)

Future Ready Recommendations

- Build greater connections between the planning and asset management processes.

- Advance climate change adaption and resilience policies to guide staff and inform on decision making.

Financial Strategy Recommendations

- Develop funding strategies for proposed Levels of Service targets to meet *O. Reg 588/17* 2025 requirements.

- Look for continuous improvement opportunities to extend the life of assets and prevent early replacement through condition assessments and rehabilitation technologies.

- Develop a strategy to increase capital core asset delivery capacity to deliver on AM Plans.

- Create risk management plans for the upcoming periods where renewal needs will exceed capital reinvestment capacity (e.g. 2024 – 2039).

- Create a reserve management strategy to inform how funds or new revenues are allocated to different reserves with different financial positions and different funding sources.

- Facilitate the defining and quantifying of human resource requirements for core asset lifecycle activities.

CONCLUSIONS

Infrastructure systems like roads, bridges, drinking water, sanitation, and stormwater drainage are critical services in the Town of Newmarket. Assets are the backbone of these services and the community. As the owners of more than $2 Billion in core assets, the Town will need strong stewardship to secure these investments for future generations.

Current challenges include:

- Deteriorating assets providing service levels that are likely unsustainable;
- New assets that will add operating costs, and the impacts climate change;
- An immediate 10-year infrastructure gap of $81 Million; and
- Decisions about how to adjust risk tolerance.

With these challenges come opportunity:

1. Asset management is providing visibility to risks and improvement opportunities, allowing the Town to take the proactive measures needed to manage these issues.
2. Asset management will provide alignment across the organization about a common set of business objectives, paving the way for continuous improvement opportunities.
3. New capabilities will be adopted, efficiencies will be developed, and new technologies or processes will be deployed.

These are the opportunities that lie within the immediate risks and challenges the Town faces.

The core asset management plans are a significant milestone but only one aspect of a broad spectrum of asset management practices. Asset management is not a document or a software. It is a way of doing business every day, and a lifelong journey to improve the Town. Through this journey, the Town can truly become *Well Beyond the Ordinary.*

This concludes the Executive Summary.

FINANCIAL STRATEGY

The Town has made an important investment in infrastructure, and attention must now be paid to securing this investment. The sustainability of Town infrastructure depends on effective management and ensuring the optimal use of limited funds. Sustainability will require adjusting revenue and services. The Town of Newmarket has developed a Financial Strategy to evaluate the relationship between current investment levels, service outcomes and risk of service failures. The financing strategy strengthens the budget process by reinforcing a long-term perspective of either increasing or decreasing service level and the required revenues associated with these service levels expectations versus affordability to the community. When developing the financial forecast, the Town was looking to answer four key questions:

1. What is the total spending requirement to maintain all of the Town-owned core assets, based on need?
2. What would it cost to maintain assets at the current level of service experienced today?
3. What level of service is achievable within the Town's current funding?
4. How will spending requirements change over time, and what do these trends mean for the Town's finances?

In order to answer these questions, the Town prepared an analysis of three scenarios using software supplied by the Town's consultant. Three scenarios were modelled over a 50-year time horizon. The executive summary focuses on the 50-year period. To assist Management with planning in the near term, the Asset Management Plans for Core Assets focus on a 10-year horizon.

Before presenting investment scenarios, it is important to understand the history of the Town's financial contributions as well as to establish the current funding and practices that were used to inform the financial analysis performed as part of this plan.

Historical Baseline

The baseline information pertinent to the Financial Strategy is shown in Table 1 – Table 5:

Table 1 - 2020 Closing Balance of Asset Replacement Funds

Asset Replacement Fund	Roads & Bridges	Water	Wastewater	Stormwater
Closing Balance (Dec. 31 2020)	$2,625,904	$24,725,173	$27,233,445	**- $543,331**

Table 2 - 2015 to 2020 Reserve Contributions

Historical Reserve Contribution	Roads & Bridges	Water	Wastewater	Stormwater	Total
2015	$3,846,107	$2,500,537	$3,110,528	$0	**$9,457,172**
2016	$3,846,107	$2,713,083	$3,386,377	$0*	**$9,945,567**
2017	$3,321,107	$2,713,083	$3,674,219	$872,715	**$10,581,124**
2018	$3,321,107	$3,127,156	$3,940,703	$340,512	**$10,729,478**
2019	$883,787**	$2,609,357	$3,756,246	$435,096	**$7,684,486**
2020	$1,526,176	$2,543,390	$4,074,673	$436,923	**$8,581,162**
Average	$2,790,732	$2,701,101	$3,657,124	$521,312	**$9,496,498**

*Prior to 2017, the stormwater reserve was combined with roads and bridges.
**The drop-in reserve contributions for roads and bridges in 2019 is because of the moving of annual programs into the operating budget. ARF contributions from operating budget were adjusted to compensate.

Table 3 - 2015 to 2020 Reserve Contributions as a Percentage of 2021 Replacement Value

Historical Reserve Contribution	Roads & Bridges	Water	Wastewater	Stormwater
2015	0.87%	0.52%	0.65%	-
2016	0.87%	0.57%	0.71%	-
2017	0.75%	0.57%	0.77%	0.14%
2018	0.75%	0.66%	0.83%	0.05%
2019	0.20%	0.55%	0.79%	0.07%
2020	0.35%	0.53%	0.86%	0.07%
Average	0.63%	0.57%	0.77%	0.08%

Table 4 - 2015 to 2020 Capital Spending Reinvested in Existing Core Assets

Historical Capital Reinvestment	Roads	Bridges	Water	Wastewater	Stormwater	Total
2015	$3,941,511	$163,809	$879,906	$228,726	$641,481	**$5,855,433**
2016	$1,869,269	$0	$1,412,752	$1,213,110	$497,124	**$4,992,255**
2017	$2,417,159	$243,749	$0	$284,297	$826,600	**$3,771,805**
2018	$3,926,502	$344,305	$1,712,189	$672,321	$67,739	**$6,723,056**
2019	$4,224,021	$1,102,012	$4,224,256	$714,649	$583,897	**$10,848,835**
2020	$2,074,807	$366,620	$337,524	$0	$212,031	**$2,990,982**
Average	$3,075,545	$370,083	$1,427,771	$518,851	$471,479	**$5,863,728**

Table 5 - Reinvestment Ratio (Capital Spending as a Percentage of 2021 Replacement Cost)

Historical Capital Reinvestment	Roads	Bridges	Water	Wastewater	Stormwater
2015	1.00%	0.36%	0.18%	0.05%	0.10%
2016	0.47%	0.00%	0.30%	0.26%	0.08%
2017	0.61%	0.53%	0.00%	0.06%	0.13%
2018	0.99%	0.75%	0.36%	0.14%	0.01%
2019	1.07%	2.41%	0.89%	0.15%	0.09%
2020	0.52%	0.80%	0.07%	0.00%	0.03%
Average	0.78%	0.81%	0.30%	0.11%	0.07%

Current Financial Plans and Practices

Rate supported financial plans (Water, Wastewater, Stormwater) provide a multi-year outlook of what utility rates will be set and within this what asset replacement reserve contributions will be. While rate increases are forecasted, these do not actually take place until approved by Council each year.

Tax supported assets do not have a formal financial plan, but are reviewed closely annually through the budget process. Tax supported assets have a general practice of using a 1% increase in taxes to raise contributions to the Asset Replacement Fund, although this is not a set policy and is subject to budget deliberations. Several asset types are supported by taxes including roads, parks, and facilities. Allocations to core tax-supported assets were estimated for the 2021 AMP.

Town practices are summarized in Table 6. This outlook does not guarantee any raises will take place, but serve as the basis for the Town's estimated future position.

Table 6 - Currently (Prior to AMP Scenarios) Planned Increases in Asset Replacement Fund Contributions

<table>
<tr><th>Financial Plans and Practices</th><th>Source</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>Future Year (Assumed) Outside Financial Plan</th></tr>
<tr><td>Roads & Bridges</td><td>Current Town Practice</td><td colspan="7">1% Tax Levy Yielding $667,000 (2021 dollars) in tax-supported asset replacement fund, distributed proportional to current allocation practice (not necessarily proportional to current/future need). This is subject to update.</td></tr>
<tr><td>Water</td><td rowspan="2">Water / Wastewater Financial Plans, prior to the 2021 update.</td><td>10%</td><td>10%</td><td>10%</td><td>10%</td><td>10%</td><td>4%</td><td>4%</td></tr>
<tr><td>Wastewater</td><td>7.5%</td><td>7.5%</td><td>7.5%</td><td>7.5%</td><td>7.5%</td><td>4%</td><td>4%</td></tr>
<tr><td>Stormwater</td><td>Prior to the 2021 Stormwater 10 Year Financial Plan</td><td>10%</td><td>10%</td><td>10%</td><td>10%</td><td>10%</td><td>4%</td><td>4%</td></tr>
</table>

Existing 10 Year Future Capital Funding Based on Current Plans – Before the application of AM Lens

Using the financial background and current financial position, the Town's current funding was forecasted to support long term financial planning. Extrapolating current practice was the basis for Scenario #1 (introduced in the next section). These values are only used for an assessment of the balance between funding and future renewal costs, and will be subject to internal processes and the annual budget process each year as approved by Council.

Table 7 - Existing 10 Year Future Capital Funding - Before AM Lens

Year	Roads and Bridges	Federal Gas Tax Allocation*	Water	Wastewater	Stormwater	Total
2021	$1,145,947	$2,032,789	$2,543,390	$4,074,673	$436,923	**$10,233,722**
2022	$1,350,391	$2,114,914	$2,797,729	$4,380,273	$480,615	**$11,123,923**
2023	$1,560,969	$2,157,212	$3,077,502	$4,708,794	$528,677	**$12,033,154**
2024	$1,777,864	$2,200,356	$3,385,252	$5,061,953	$581,545	**$13,006,970**
2025	$2,001,266	$2,244,363	$3,723,777	$5,441,600	$639,699	**$14,050,706**
2026	$2,231,370	$2,289,251	$4,096,155	$5,849,720	$703,669	**$15,170,164**
2027	$2,468,377	$2,335,036	$4,260,001	$6,083,709	$731,816	**$15,878,938**
2028	$2,712,494	$2,381,736	$4,430,401	$6,327,057	$761,088	**$16,612,777**
2029	$2,963,935	$2,429,371	$4,607,617	$6,580,139	$791,532	**$17,372,594**
2030	$3,222,919	$2,477,958	$4,791,922	$6,843,345	$823,193	**$18,159,337**

*Federal gas tax allocations were added to roads and bridges for modelling in the AMP, but this practice is subject to the annual budget process.

NOTE: The financial position of the Town captured within the AMP reflects information from December 2020. Ongoing improvements not captured in this plan include Six Year Water Wastewater Financial Plans, the Ten Year Stormwater Financial Plan, and the Reserve and Reserve Fund Review.

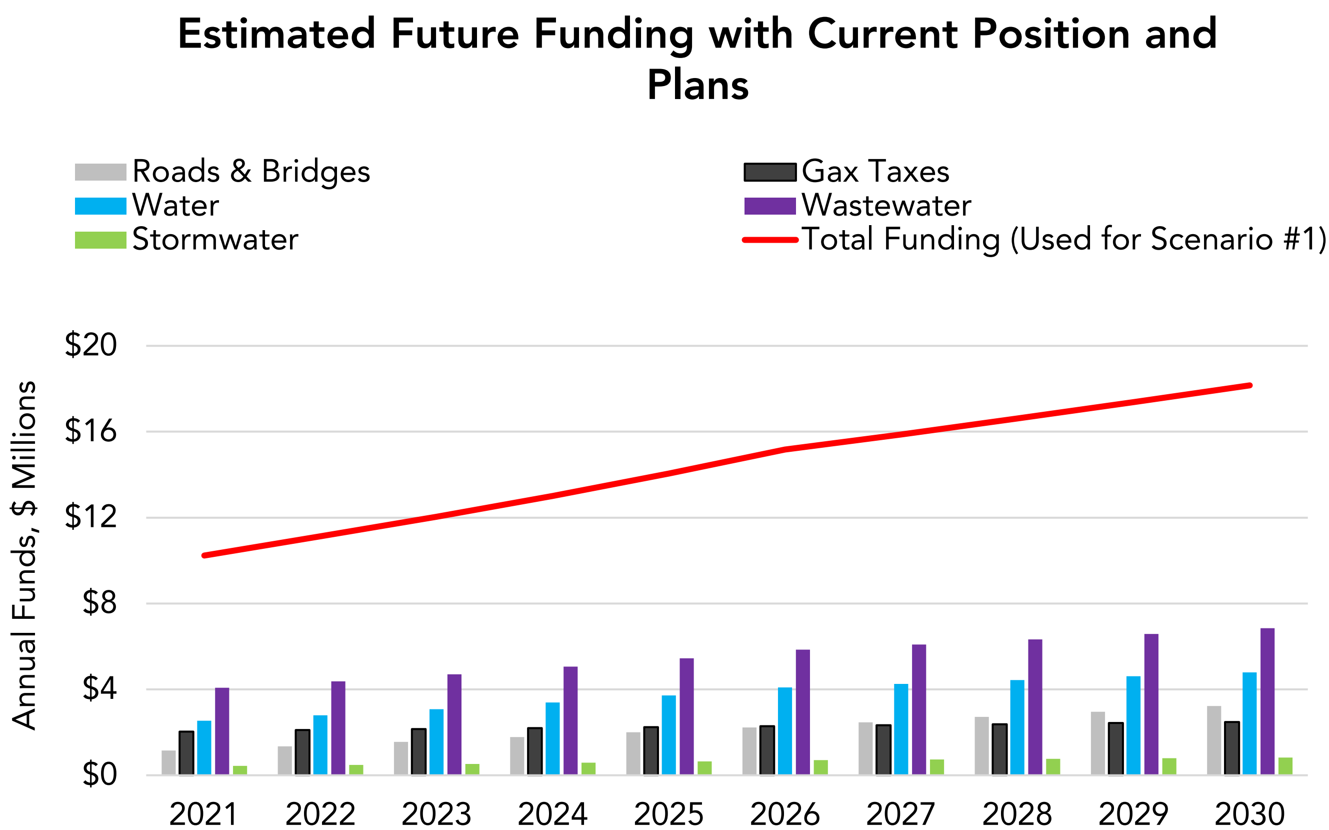


Figure 1 - Estimated Future Funding with Current Position and Plans (2021 - 2030)

Financial Analysis and Scenarios

Financial analysis was completed by modeling the replacement cost of the assets, the long-term outlook of age and condition, and lifecycle interventions that can repair or replace assets. These inputs are developed and explained over the course of the preceding sections of the executive summary and corresponding AMPs. With this information, three investment scenarios were evaluated as part of the development of the financial strategy for core assets. These can be characterized as follows:

1. **Current Investment** – which assumed that the estimated current 10-year funding was approved and then held constant thereafter.

2. **Constrained Investment** - that also seeks to achieve the target service levels, but is constrained to a defined investment envelope that escalates annually by $1.55M and then remains constant once it reaches $38.45M by 2040 across all the core asset portfolio. This investment envelope is equivalent (in cumulative investment) over the 50-year analysis period as compared to Scenario #3. Funding increases were limited to an additional $1.05M annually, every year starting in 2022. In years where the funding is still lower than the investment after the annual increase in funds, the investment in core assets would be debt supported to a cap of $75M.

3. **Level of Service (LOS) Driven Investment** – estimated an investment strategy that represents the least lifecycle cost to deliver the target level of service over the long term. This scenario does not place constraints on financial or delivery capacity.

The Town is committed to managing its infrastructure portfolio using a service level framework as part of its asset management planning process. Preliminary service level targets were established as part of the analysis to develop the financial strategy. The findings of the analysis can be summarized as follows:

- Current service levels enjoyed by the Town are **unsustainable** given current levels of investment.
- Asset condition is forecasted to **deteriorate in the near term** without a consistent increase in infrastructure investment and contributions to reserves.
- An **annual increase** in the Town's capital funding is required to achieve desired service outcomes.
- This annual funding increase could be **between +$1.05M** (Constrained Investment scenario) **to +$1.964M** (Service Driven Investment), before inflation, to fund increased investment and build the Town's reserves.

- Investment in core assets is recommended to be **+$1.55M annually, before inflation**. This level of investment still may result in **some risk of service failures**

Three scenarios were modelled over a 50-year time horizon. From these findings, the AM plans recommend the adoption of a constrained funding scenario (+$1.05M/year) or a service driven scenario (+$1.96M/year) for future implementation and financial planning, as described below.

Table 8 (next page) provides a summary of the results and outcomes associated with each scenario analyzed:

Table 8 - Outcomes based on Funding Scenarios

Scenarios	Scenario #1 - Current Investment	Scenario #2 - Constrained Investment	Scenario #3 - Service Driven Investment
Service Outcomes	- Levels of service not achieved - High risk of service failure	- Levels of service partially achieved - Periods of increased service failure risk	- Levels of service achieved
2022 to 2031 Funding Increases	+$0.83M annually, not including inflation.	+$1.05M annually every year before inflation	+$1.964 annually every year before inflation
2032 to 2071 Funding Increases	Zero.	+$1.05M annually every year before inflation	+$1.964 annually every year before inflation
Capacity Requirements	Capital program increases $0.83M annually from $10M to $18M by 2031	Capital program increases $1.55M annually from $10M to $38.5M by 2040	Variable, Avg: $33.2M Low: $11.4M, High: $86.6M
Debt Levels	No additional impact	Duration: 22 Years, positive after 2058 Annual Average: $39M Peak: $61.9M	Duration: 8 Years Annual Average: $30.9M Peak: $74.9M
Debt Impacts	Minimal	No greater than $75M	No greater than $75M
Reserves	Static, currently at ~$49M	Debt supported for 22 years, $261M by 2070	Debt supported for 8 years, $1.27B by 2070
Generational Equity	Does not achieve generational equity.	Does not achieve generational equity	Progress made towards generational equity.
2022 to 2031 Increase per Household	$25.65 per household per year before inflation	$32.40 per household per year before inflation	$60.54 per household per year before inflation
2032 to 2071 Increase per Household	Zero.	$32.40 per household per year before inflation	$60.54 per household per year before inflation
Peak % Assets in Poor or Worse (Year)	Roads: 49% (2039) Bridges: 44% (2027) Water: 58% (2065) Wastewater: 15% (2033) Stormwater: 97% (2058)	Roads: 22% (2038) Bridges: 27% (2026) Water: 43% (2053) Wastewater: 23% (2033) Stormwater: 42% (2036)	Roads: 10% (Mult) Bridges: 19% (2024) Water: 49% (2051) Wastewater: 21% (2067) Stormwater: 37% (2033)

50 YEAR ANALYSIS

The 50-year analysis produces forecasts of available funding for core assets, capital delivery, and levels of service outcomes measured as condition of core assets. Results are shown on the next page in Figure 18. Taking a big picture view of the scenario (before drilling into the immediate focus of the next 10 years in the next section), there become several points worth noting.

- In the near term, the proposed constrained funding (Scenario #2) and the current funding (Scenario #1) are similar with their investments in core infrastructure, and do not represent a large escalation over existing planned capital funding.
- Prior to 2048, the level of investment for the constrained scenario (Scenario #2) exceeds funding. Over this period, the Town must fund the difference with reserves or debt.
- The constrained level of investment (Scenario #2) is equivalent in cumulative spend as the service driven scenario (#3) over the 50-year period.
- The service driven scenario (#3) can be considered the unrestricted investment required to achieve the service targets set by the Town for the asset portfolio.
- All three scenarios were given the constraint that Town debt levels could not exceed $75M to fund investment, estimated in absence of a formal policy and based on current financial position.

Each service area has a different financial position, and the impact of each of these scenarios was analyzed for each asset class. This is discussed in each AMP.

FINANCIAL STRATEGY SCENARIOS - 50 YEARS

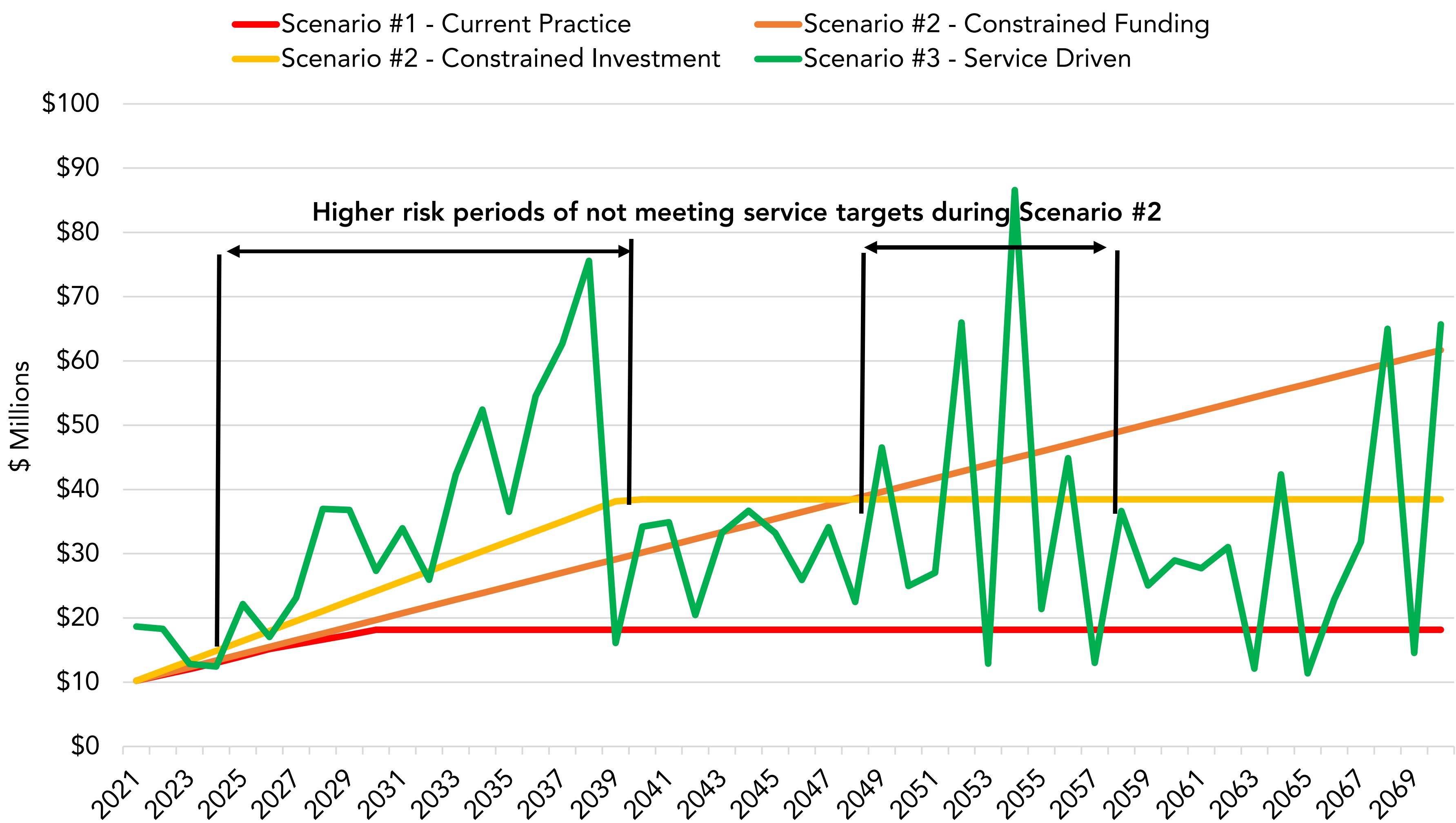


Figure 2 - 50 year Forecast for Financial Strategy Scenarios

CAPITAL DELIVERY OF SCENARIO 2

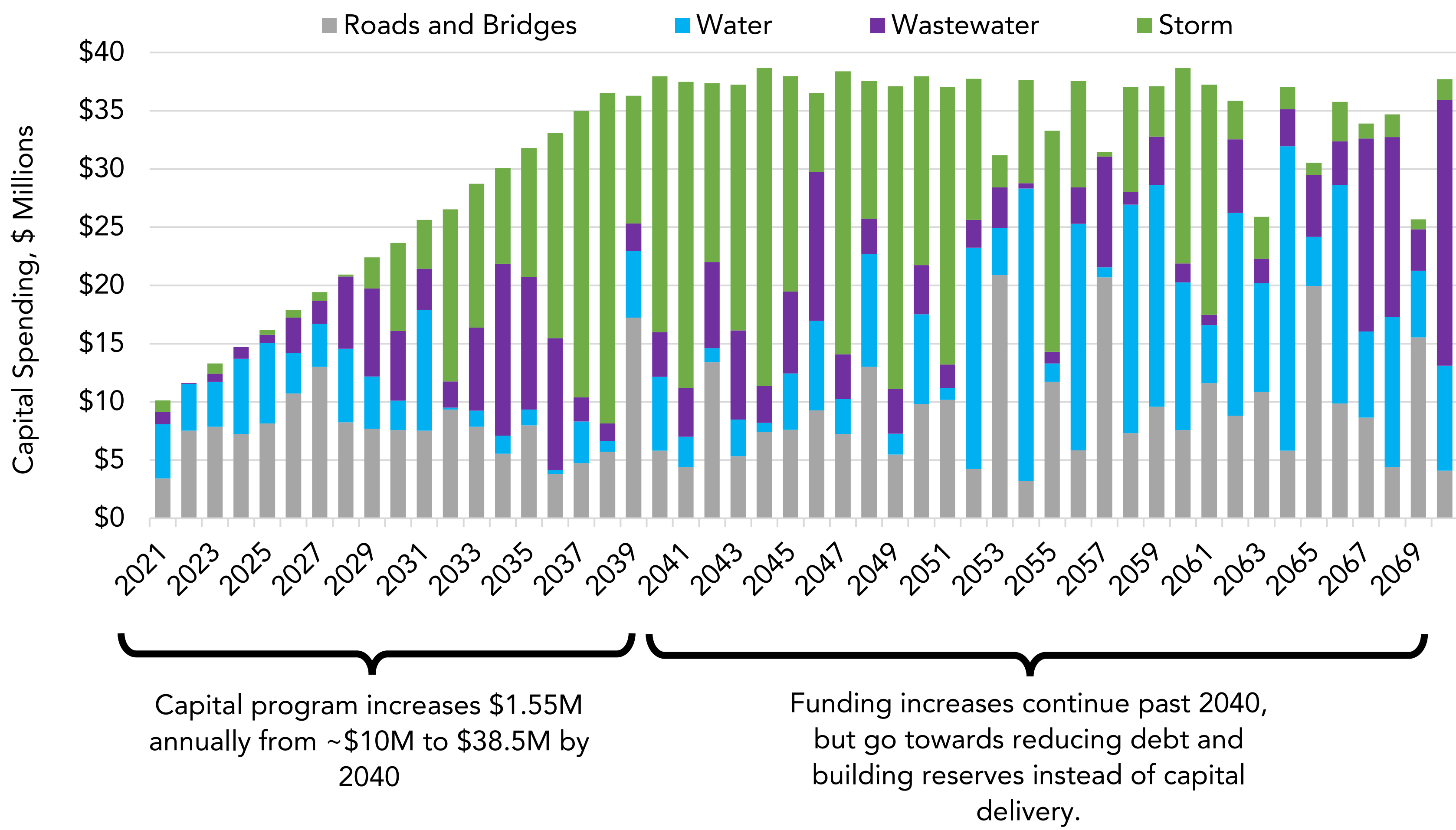


Figure 3 - Capital Delivery of Core Asset Reinvestment under Scenario #2

50 Year Forecasted Outcomes

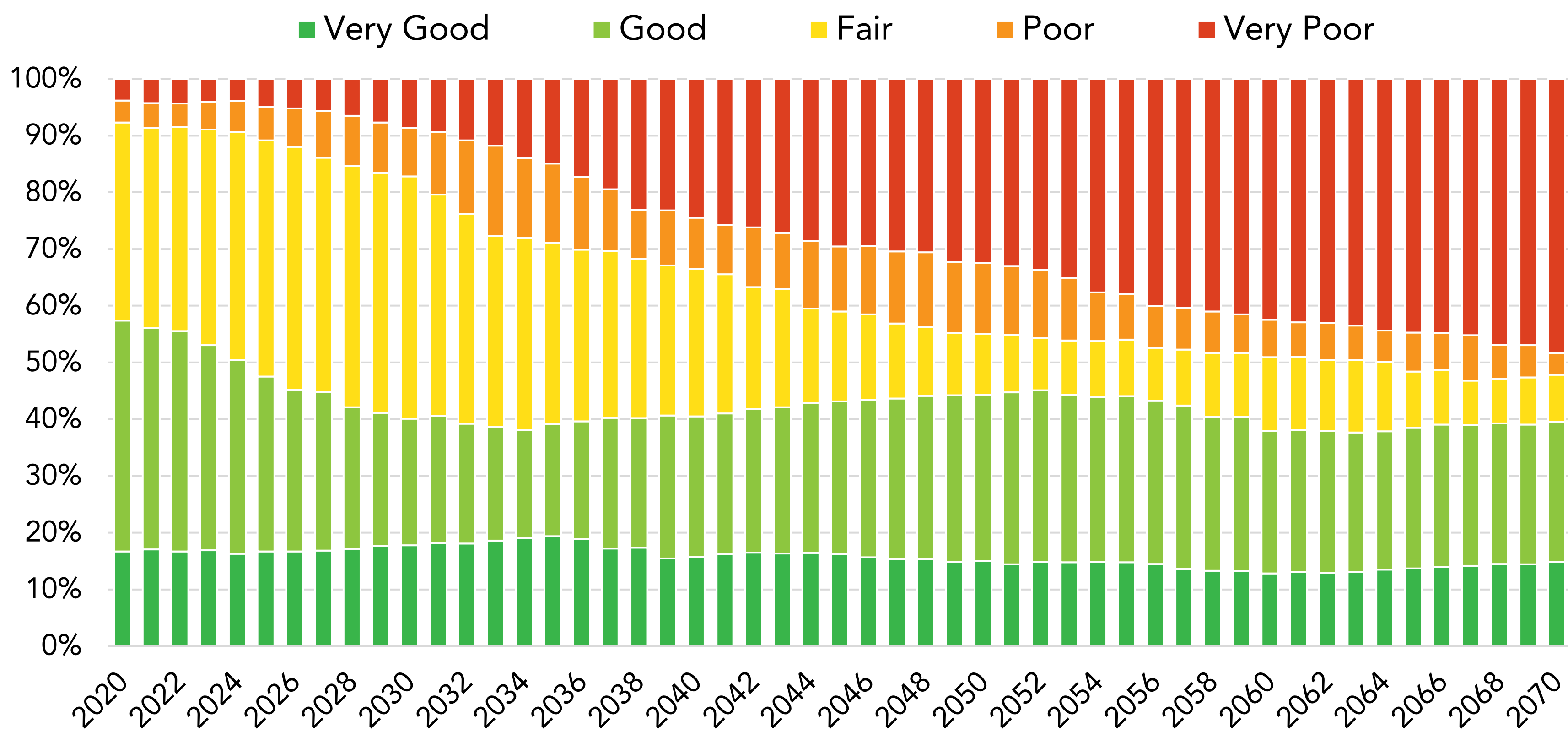
The proposed investment scenarios were established to strike a balance between the long-term investment requirements to achieve service level targets, the pace of increasing the Town's capacity for program delivery, as well as the ability to fund the required program through increased taxes, rates and infrastructure reserves. Under current investment levels, the risk of failing to meet service level targets will increase within the next 5-10 years when service levels are forecasted to not be achieved.

From 2024-2039 as well as in the early 2050s, service level risk will be higher than average – even if Scenario #2 is achieved. In practical terms, this may translate to road assets in poorer condition than targeted, bridge load restrictions, higher frequencies of water breaks, flooding and wastewater overflows during these periods.

At present, less than 10% of the major/linear core assets are in "Poor" or "Very Poor" condition. If current practice continues (Scenario #1), more than half of assets are in "Poor" or "Very Poor" condition. In Scenario #2, approximately 20% of assets in "Poor" or "Very Poor" condition. Scenario #3 reduces the use of debt, and results in fewer assets in "Poor" or "Very Poor" condition in peak years (e.g. 22% of roads in Scenario #2 vs 10% of roads in Scenario #3).

50-Year condition profiles for core assets are presented on the next three pages. Asset-level forecasts are shown in individual AMPs.

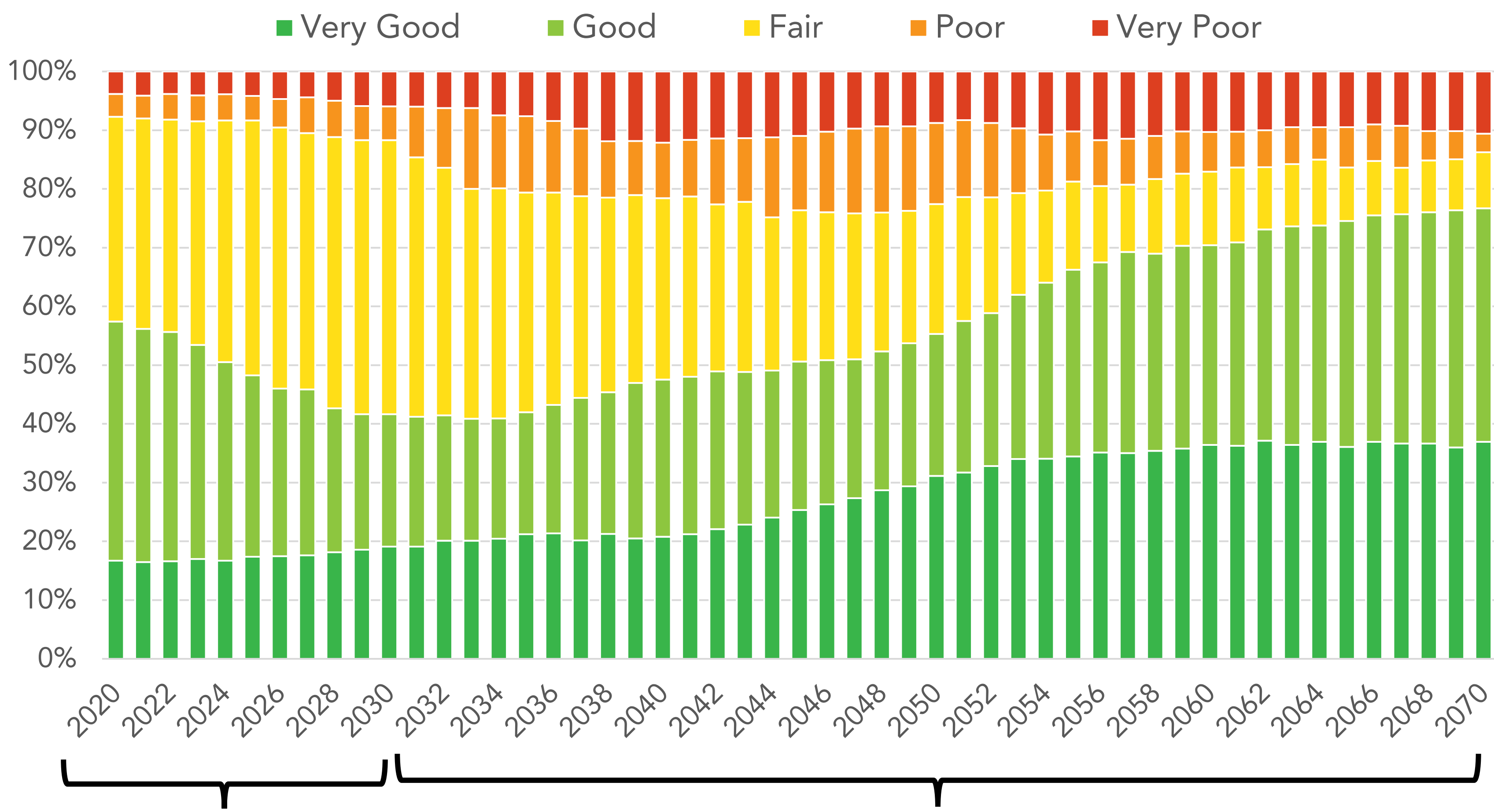
FORECASTED CONDITION OF CORE ASSETS - CURRENT FUNDING SCENARIO 1



10-year decisions concern immediate financial capacity and delivery capacity

Approach to the next 50 years requires decisions about policy, strategy, and desired outcomes for services, cost, and risk.

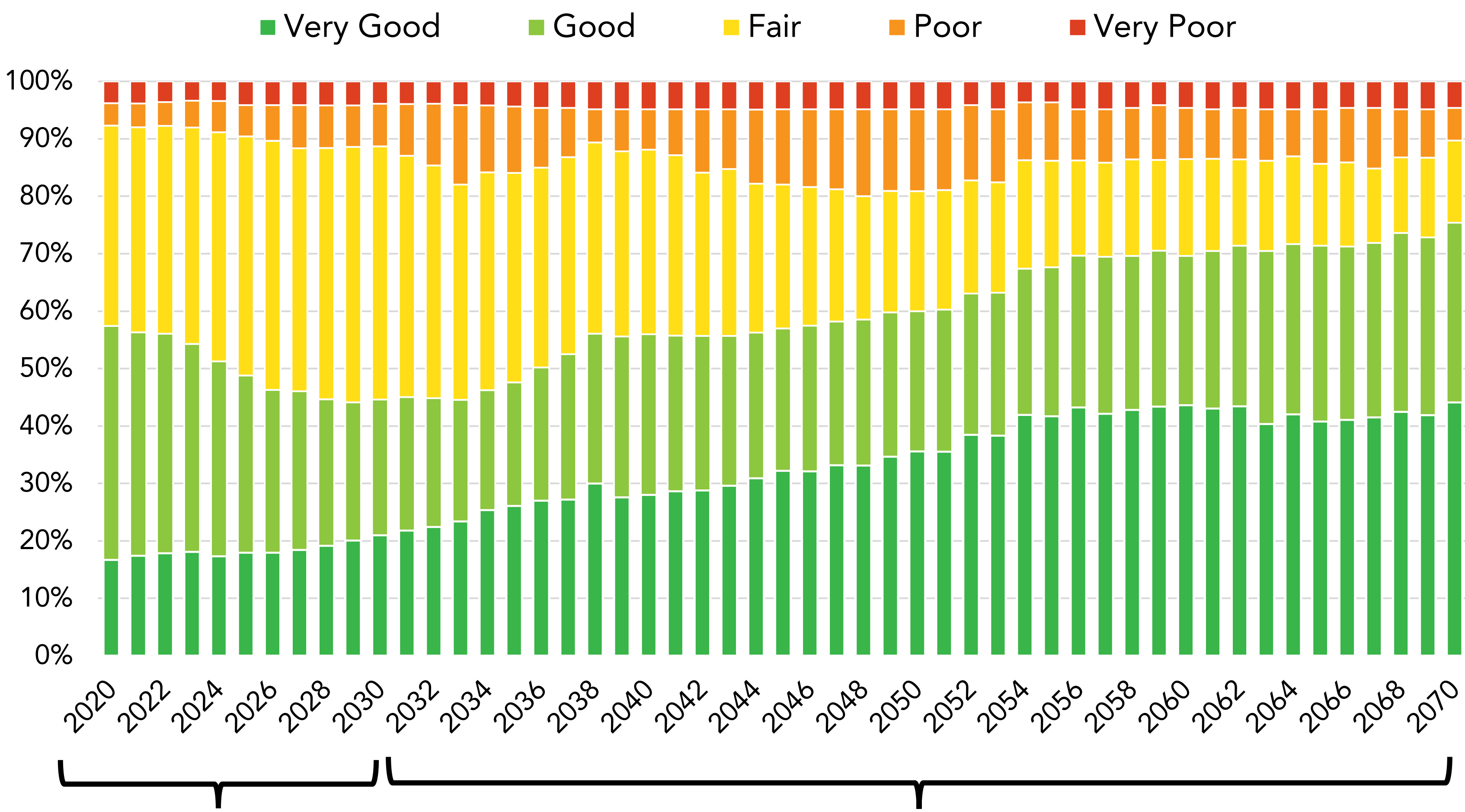
FORECASTED CONDITION OF CORE ASSETS - CONSTRAINED INVESTMENT SCENARIO 2



10-year decisions concern immediate financial capacity and delivery capacity

Approach to the next 50 years requires decisions about policy, strategy, and desired outcomes for services, cost, and risk.

FORECASTED CONDITION OF CORE ASSETS - SERVICE DRIVEN INVESTMENT SCENARIO 3



10-year decisions concern immediate financial capacity and delivery capacity

Approach to the next 50 years requires decisions about policy, strategy, and desired outcomes for services, cost, and risk.

Key Issues in the 50 Year Results

Balancing Risk and Services

When compared over 50 years, it is clear that using the needs of assets (depicted in Scenario #3) will carry risks during "waves" of renewal needs that occur while the Town is still building capacity. The constrained investment scenario (Scenario #2) represents a lower level of investment as compared to the service driven scenario (Scenario #3). By spending below the investment level forecast to achieve service levels, the Town correspondingly increases the risk of missing service targets. There are two periods (from 2024-2039 as well as in the early 2050s) where this is most noticeable.

Role of Debt in the Asset Management Plans

For the purposes of this analysis, negative reserves are assumed to be covered by debt. No analysis of debt servicing has been incorporated into the analysis. In devising the scenarios, debt was used to sustain investments in infrastructure while reserve contributions incrementally "catch up" to required spending. This was forecasted until reserve contributions exceed required capital reinvestment spending, at which point the Town starts to pay off this debt and build reserves.

$75 Million
Maximum allowable debt under the 50-year scenarios.

The allowable maximum of debt across reserves in all three scenarios was $75 Million. Under Scenario #2, the peak amount of debt is $61.9M. Under Scenario #2, the Town's collective reserves are in debt for 22 years, starting in 2036 and ending in 2058. Individual reserves (e.g. roads, stormwater) experience shortfalls immediately, well before 2036.

This forecast is depicted in Figure 20, which shows on a general basis what position reserves will be in during Scenario #2 – Constrained Investment. This does not necessarily depict current practice, which will be subject to the upcoming Reserve and Reserve Fund Review. Each asset class reserve has a different financial position, and there will be different ways of managing this. Under the constrained funding scenario (Scenario #2), the Town is not in debt by the end of the scenario. The Town currently has low levels of debt. Debt is one of the four pillars in the Town's overall Fiscal Strategy.

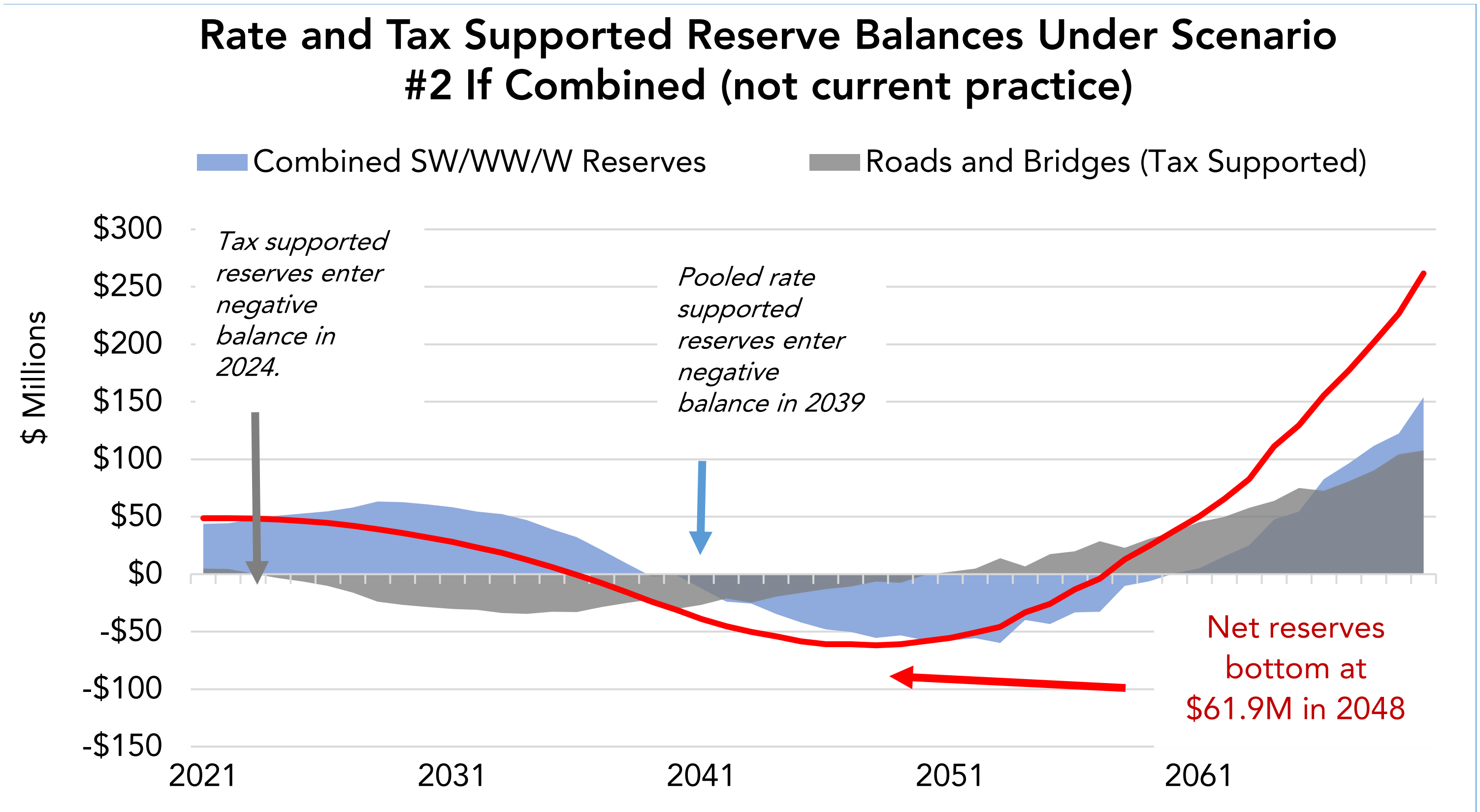


Figure 4 - Rate and Tax Supported Reserve Balances Under Scenario #2 If Combined (not current practice)

10 YEAR ANALYSIS

Financial analysis demonstrates that over the next ten years, available funds fall short relative to the constrained investment scenario (#2) or the level of service driven scenario (#3):

$144M	**$170M** (-$27M)	**$224M** (-$81M)
10 Year Projection of Available Funds for Core Assets (Scenario #1)	10 Year Investment Required Under the Constrained Scenario (Scenario #2)	10 Year Investment Required to Achieve Service Levels (Scenario #3)

It is clear that there is an immediate infrastructure gap that prevents the Town from funding core assets to sustain our current level of service. The proposed scenarios close the infrastructure gap with varying levels of effectiveness. For this reason, the scenario analysis reflects that the Town has ranging funding alternatives to consider:

- Funding at or above the constrained scenario's (Scenario #2) annual increase (+$1.05M) supports the constrained level of investment (+$1.55M annually over 2021) while ensuring debt levels are above target.

- A higher level of funding (Scenario #3, up to +$1.96M annually) would improve the Town's long-term financial position, allow for a higher level of investment (improving service levels closer to target), reduce service failure risk, and increase contributions to reserves.

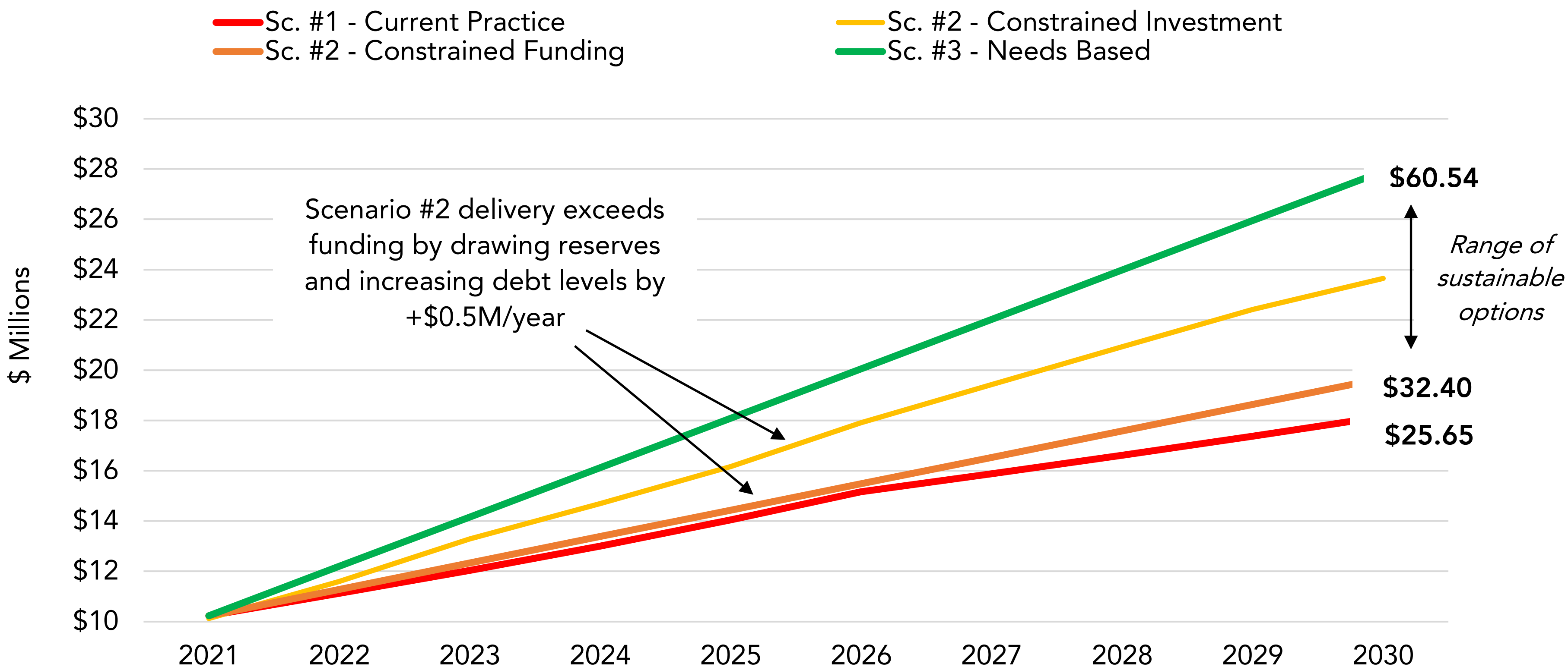
- A higher rate of investment escalation would obviously reduce service risk but requires a matching increase in funding to ensure debt does not exceed limits.

This is depicted in Figure 5 and Table 9 (next page).

Table 9 - 10 Year Investment Scenario Comparison

Year	Scenario #2 - Proposed Investment						Scenario #1 - Current Practice
	Roads	Bridges	Water	Wastewater	Stormwater	Total Proposed Spending	Annual Shortfall of Current Funding
2021	$3.2M	$0.2M	$4.7M	$1.1M	$1.0M	$10.2M	$0.0M
2022	$5.2M	$2.4M	$4.0M	$0.1M	$0.0M	$11.7M	- $0.6M
2023	$6.0M	$1.9M	$3.9M	$0.7M	$0.9M	$13.4M	- $1.4M
2024	$6.3M	$0.9M	$6.5M	$1.0M	$0.0M	$14.7M	- $1.7M
2025	$6.6M	$1.5M	$6.9M	$0.7M	$0.4M	$16.1M	- $2.0M
2026	$6.7M	$4.0M	$3.5M	$3.1M	$0.7M	$18.0M	- $2.8M
2027	$6.7M	$6.3M	$3.7M	$2.0M	$0.8M	$19.5M	- $3.6M
2028	$7.0M	$1.3M	$6.3M	$6.2M	$0.2M	$21.0M	- $4.4M
2029	$7.1M	$0.6M	$4.5M	$7.6M	$2.7M	$22.5M	- $5.1M
2030	$7.4M	$0.2M	$2.5M	$6.0M	$7.6M	$23.7M	- $5.5M
Total	**$62.1M**	**$19.3M**	**$46.4M**	**$28.3M**	**$14.1M**	**$170.2M**	**- $27M**

BREAKDOWN OF FUNDING ENVELOPE WITHIN THE THREE SCENARIOS



Scenario	#1 – Current Practice	#2 – Constrained		#3 – Needs Based
Legend	Funding & Investment	Funding	Investment	Funding & Investment
Outcome	LoS is not achieved, high risk of service failure.	LoS partially achieved, periods of service risk failure. Moderate debt ($61.9M).		LoS achieved. Low debt ($30.9M).
Cost per Household Per Year	+$25.65	+$32.40		+$60.54

Figure 5 - Breakdown of Funding Envelope within the Three Scenarios

Key Issues in the 10 Year Results for Scenario #2

Beyond the holistic view of the 50-year results, there are several practical issues that arise in the first 10 years as discussed below.

Allocating Funds Among Reserves

During the AMPs, individual assessments of each core asset service area have led to an overall assessment of the Town's financial position for core assets and prospective service levels. Each asset service area has a significantly different financial position. Policy decisions about how to manage reserves will be completed at a future date. Table 10 summarizes the 10-year shortfalls for each reserve when comparing current practice (Scenario #1) and constrained investment (Scenario #2):

Table 10 - 10 Year Funding Shortfall Between Scenario #1 and Scenario #2

Service Area	10 Year Funding Shortfall Between Scenario #1 and Scenario #2
Roads	- $18.08M
Bridges	- $9.63M
Water	- $15.89M
Wastewater	+ $27.02M
Stormwater	- $7.65M

To manage the different financial positions and funding sources of each service area there will need to be further analysis and policy decisions. These include when funds can be shared between service areas, if funds can be borrowed between reserves, how funding increases should be distributed, etc. Therefore, recommendations have been made to assess policy options for reserves.

Capital Delivery

The Financial Strategy for core assets does not assess the Town's resources, capability, or capacity to deliver capital reinvestment at current or future levels. The projected conditions and levels of service assume that 100% of required funding is delivered in each year. In the Town's overall Fiscal Strategy, it was reported that from 2010 to 2019 less than half of the Town-wide capital budget was delivered in each year prior to process improvements like the elimination of capital carryovers.

Using numbers that developed the core assets AMP, Figure 6 shows that approximately 40% of available funding (e.g. asset replacement fund and gas taxes) were not delivered as capital reinvestment. The Financial Strategy scenarios only assess funding, not delivery. If funding were continued to be delivered at 60% of what was available, the service level forecasts would be significantly downgraded from what is presented.

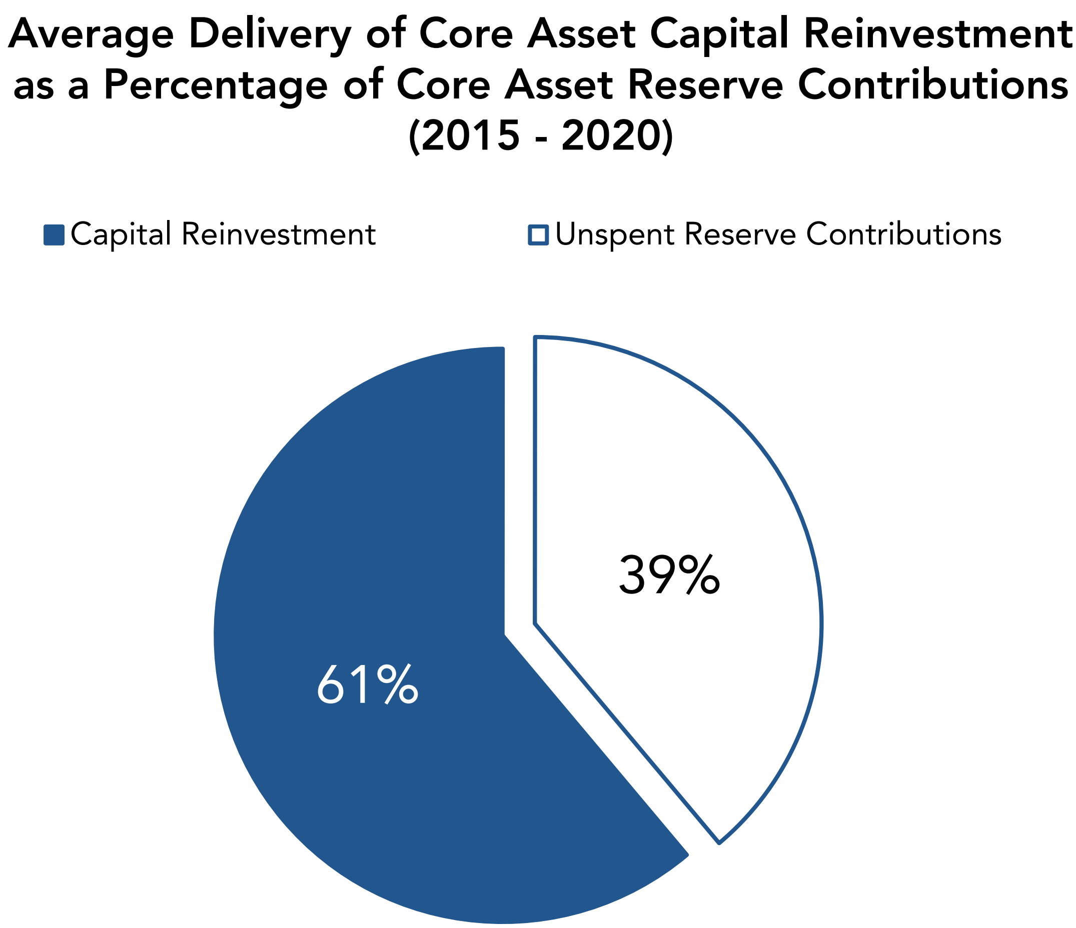


Figure 6 - Average Delivery of Core Asset Capital Reinvestment as a Percentage of Core Asset Reserve Contributions (2015 - 2020)

INTER-GENERATIONAL EQUITY

Inter-generational equity is not achieved under any of the three scenarios presented for core assets. Scenario #3 presents the closest approach to achieving generational equity, but is not designed for intergenerational equity. Scenarios and policies could be developed that achieve intergenerational equity if desired.

Good fiscal planning means that the generation of people who benefit from an asset is also the one paying for it. This concept was first introduced in the Town's overall Fiscal Strategy. There is a growing realization in municipal circles that meeting future asset management needs is going to be very expensive. Because infrastructure is less expensive in the early part of its life and more expensive later when lifecycle rehabilitation and replacement expenses occur, it is easy for today's generation of tax- and rate-payers to pay significantly less than the true cost of their use of infrastructure.

The implication for municipal finance is that robust saving for future asset management needs is a matter of inter-generational fairness. In contrast, the three core asset scenarios presented incrementally increase funding and also use debt in early years – the result of this approach is that current rate payers will not pay a proportional cost to the services they enjoy. This discount will be subsidized by future generations, who will pay the full cost of the service they experience plus the added burden of paying debt/servicing costs and building reserves from where they were received in negative balances of past generations. This is depicted in Figure 7 (next page).

Intergenerational equity is not only subject to decisions about funding, but also about levels of service. As opposed to increasing funding now to achieve intergenerational equity into the future, service levels could be decreased now and risk tolerance increased so that all generations experience similar (albeit lower) levels of service.

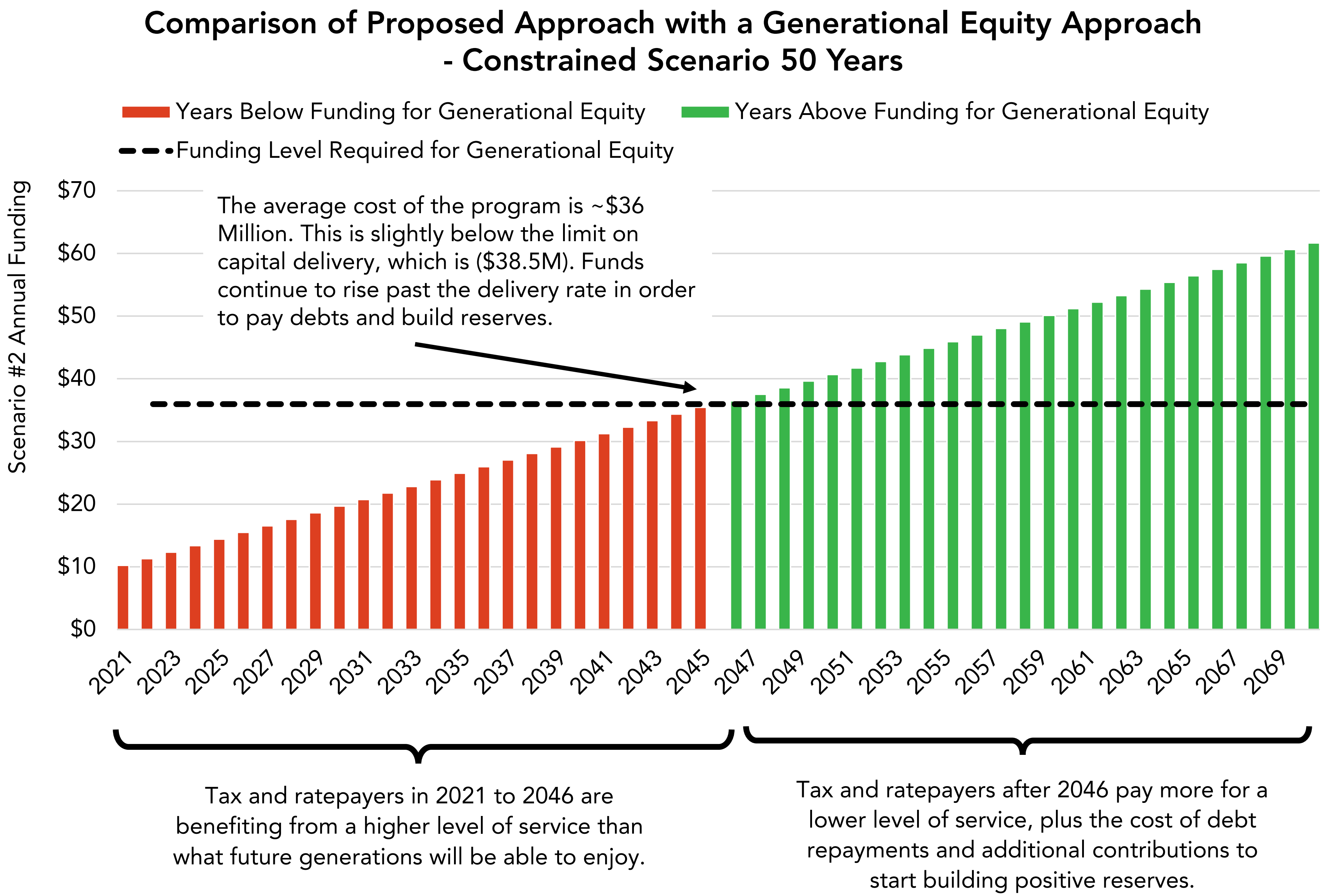


Figure 7 - Comparison of Proposed Approach with a Generational Equity Approach - Constrained Scenario 50 Years

FINANCIAL STRATEGY CONCLUSIONS

By analyzing the financial requirements of core assets over a 50-year period, it was found that current service levels enjoyed by the Town are unsustainable given current levels of investment. An annual increase in the Town's capital funding is required to achieve desired service outcomes. This annual funding increase could be between $1.05M to $1.964M per year.

During the analysis, several key issues emerged shown in Table 11. Recommendations to support these issues are provided in the Executive Summary.

Table 11 - Key Issues for the Next 10 - 50 Years

Key Issues for the Next 10 Years	Key Issues for the Next 50 Years
• **Infrastructure Gap** Depending on the service level chosen, there is a 10-year infrastructure gap between $27 Million (if risk is accepted and services are lowered) and $81 Million (if current service levels are desired to continue). • **Capital Delivery** Current capital delivery capacity is below levels needed to sustain current service levels. • **Allocation of Reserves** There is significant variation in the health of different reserves for core assets. To optimize limited funds, policy regarding allocation of reserves and the targeting of future increases across or between asset classes is needed.	• **Levels of Service** The long-term direction that is set for the service levels that assets should provide will significantly change the financial requirements. • **Risk** Upcoming waves of renewal needs mean that there are two periods (from 2024-2039 as well as in the early 2050s) where there is a heightened risk of not achieving service levels. • **Debt** An incremental approach to increasing funds means that the Town will need to deliver capital above its available funding to secure service levels. To do so, scenarios propose using debt up to a maximum of $75 Million. The Town will be in debt for anywhere from 8 to 22 years, depending on the strategy taken.

Generational equity is not achieved under any scenario. While a key issue over the next 50 years, decisions in the next 10 years will determine whether future generations pay the burden of services enjoyed by the Town today.

Service outcomes are always an equilibrium between investment, service level targets and risk of service delivery. If the forecasted outcomes are considered unacceptable, increased investment or changes in service level targets are ways to impact service risk.

CONCEPTS AND FRAMEWORKS

The Core Asset Management Plans are structured to provide consistency to stakeholders who engage with the document.

First, an introductory section is provided to establish what asset management is, what the Town wishes to achieve through asset management and Asset Management (AM) plans. Second, an executive summary of the core assets is provided to aggregate the findings of each service area into a big-picture overview of the Town's position for core assets.

A Financial Strategy expands on the executive summary through a deeper exploration of the Town's options for financing its level of service. This section provides all background information and corporate frameworks being used in the AM Plans.

STRUCTURE OF THE ASSET MANAGEMENT PLANS

A series of asset management plans are presented for each core asset service area. Each plan contains all the information specific to the service area. First-time readers will refer back to the Concepts and Frameworks (this section) to understand the meaning of the findings in the plans. This is summarized in Figure 8:

Figure 8 - Guide to Navigating the Asset Management Plans and Corporate Summaries

KNOW YOUR ASSETS

In the **Know Your Assets** section, the intent is to provide insight into the importance of asset information and knowledge. The Town own assets and is therefore responsible for operations and maintenance but also owning and managing the data for these assets. Know Your Assets is the foundation of our asset management plan as it gives us the base of what we know and own before leading into how we manage service delivery with our assets. The Know Your Assets section includes the following information:

1. **Asset Data** – What data supports the AM plans and how complete is it?
2. **State of the Infrastructure** – What is the condition of our assets, based on data?
3. **Condition Assessment Plan** – How will we collect more data to improve our AM Plans?

One goal of asset management is to ensure our assets are performing efficiently and safely, while minimizing risk and maximizing value. In order to do that, we collect asset data through the various maintenance activities performed, and knowledge and experience of our staff, users, vendors, and contractors. When done successfully, this ensures there is no loss of information through stages of handover or change and age of the workforce.

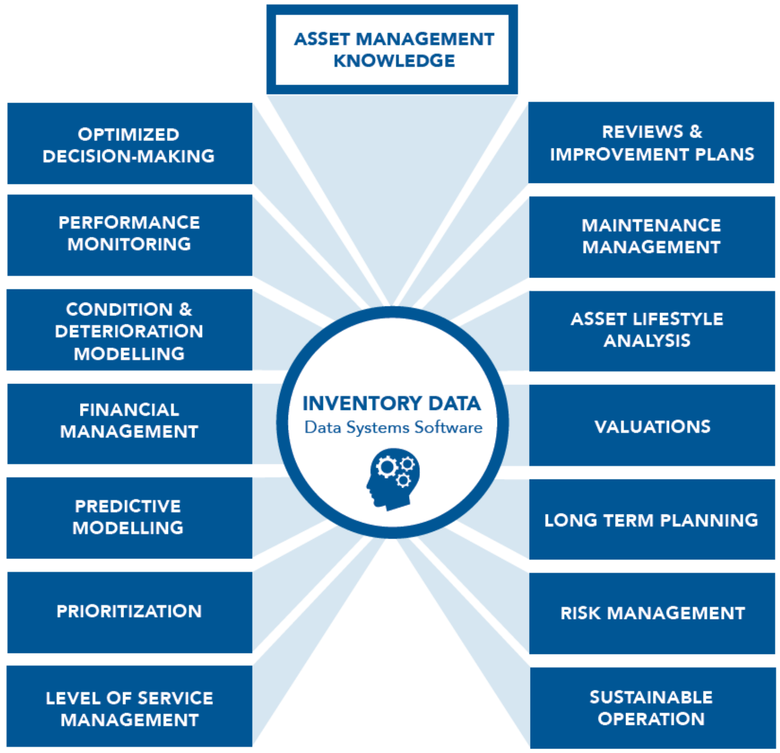


Figure 9 - Asset Management Knowledge

Know Your Assets is not just about data – it is about information and knowledge. Through processing and analysis, the data becomes information that can illustrate a picture of the Town's assets and conditions at a moment in time. When combined with historical experience, a learning environment and communication, information can become *knowledge* that should be stewarded by the organization.

Data, information and knowledge support the various processes used to ensure we are delivering the maximum value of our assets. This includes lifecycle management, risk management, sustainable operations, long term planning, financial management, improvement plans and more. The importance of knowing your assets is depicted in Figure 9.

Asset Data

Asset information is at the core of enabling all asset management processes. Without information, evidence-based decision making cannot be undertaken. Asset data that is complete and of good quality leads to reporting which depicts an accurate representation of the State of the Infrastructure, gives reliable accounts of asset value and supports the identification of priorities for infrastructure investment and determining a long-term view of infrastructure needs.

The Town's asset management systems and capabilities require asset data. Asset data includes the asset registry, and several other supporting flows of information.

Asset Registry

The Asset Registry is a centralized Geographic Information System (GIS) database that includes all of the Town's asset inventory. The asset registry contains important information about each asset such as the Asset ID, install date, and quantity. As the Town's GIS asset registry improves, the functionality will expand beyond the storage of asset data to include reporting, visualization, and distribution functions (for example, the reporting of Tangible Capital Assets). When Asset Management software is used, information about assets will be stored in the GIS registry but digitally distributed through the software.

It is the responsibility of staff who commission, maintain, and replace assets to ensure the Town's asset data is up to date.

Data to Support Asset Decisions and Processes

Beyond the asset registry, the Town's processes require a significant amount of supporting information that needs to be defined, created, maintained, and used to make decisions. Much of this information is required to support subsequent sections of the asset management plan. This includes:

- **Condition Data -** The condition of assets, based on field observations by operators, engineering specialists, or contracted services. For example, the collection of CCTV data, road needs study data, or bridge inspection data.
- **Levels of Service Data -** Measurements of how the Town's assets are performing or providing services. For example, recording and reporting traffic counts of vehicles on Town roads. This information would be collected by staff and used by leaders to support decisions about services.
- **Risk Data -** Registers of strategic, service level, and asset-level risks, as measured by the likelihood and consequence of a failure being realized by the Town. Data would be used by staff to monitor and treat risks, which would be reported to senior leaders for use in treatment plans.
- **Maintenance Data -** Actions to maintain, rehabilitate, and replace assets as determined by asset management plans would be recorded to support lifecycle management and asset tracking.

- **Financial Data -** Records of budgets and expenses would be tracked within the asset management system to monitor, report, and forecast the cost of asset management activities and services.

To realize the benefits of asset management, the Town needs to formalize the processes of managing this data. Processes would be developed for how data is used to support decisions, and governance for who maintains data would be defined.

State of Asset Data

Each asset management plan contains an assessment of the asset data for that service area. The methodology for doing so is explained in this section.

Asset management is a continuous improvement process. As the Town's capabilities advance, resources grow, and data improves, so too will the confidence in data and the ability to forecast or predict the cost. The current state of asset data demonstrates the quality and availability of information needed to support the AM plans. When forecasts or metrics are presented, the current state of the asset data should be considered.

A gap analysis of the minimum requirement for a robust asset registry is a common tool for assessing the state of asset data. It is common for municipalities to have gaps; however, it is an overall goal to improve the reliability and accuracy of all information through future iterations of the AMP. When gaps are present, they require assumptions be made.

At a minimum, an asset registry requires a few core attributes to support a basic AM Plan. These are seen below on Table 12:

Table 12 - Asset Registry Core Attributes

Attributes	Description
Unique identifier	A unique identifier for each asset that can be used to integrate information about an asset if multiple data sources are used.
Asset type	A description of what the asset is, e.g. culvert, distribution mains, valve. For more complex assets, they may be broken down into sub-types or components.
Size	The size of the assets, e.g. length, volume, area, width, diameter. This is an important determinant of replacement cost calculation.
Material	Where appropriate, the material e.g. concrete, PVC.

Attributes	Description
Condition	The condition state of the asset based on field observations or equivalent method. When condition data is not present, an age-based proxy is used.
Installation date	The date when the asset was installed or constructed. This is an important determinant of condition and financial planning.
Location	Where the asset is physically located, e.g. coordinates.

For results of the state of asset data, please refer to service area asset management plans.

Context for State of the Infrastructure

Each asset management plan uses its asset data to report on the Town's State of the Infrastructure. The methodology for establishing the State of the Infrastructure is provided in this section.

Quantifying the asset inventory is the beginning of the Town's asset management journey. Each section of the State of the Infrastructure tells a story.

What Do We Own?

Completing an asset inventory provides the quantities used for all asset management activities. For this reason, the asset inventory carries over into every subsequent section of an AMP.

The Town's asset inventory is organized into groupings that correspond to the services they provide and break down into distinct classifications of assets. Once classified, the Town's assets are quantified using the appropriate unit of measurement. Each asset management plan contains a breakdown of the Town's asset inventory.

What Is It Worth?

Asset replacement cost is presented in each asset management plan. It is also used in the Financial Strategy.

The total replacement cost of all core and non-core assets is over $2 Billion, as first reported in 2020 through the Infrastructure Report Cards. The total valuation demonstrates that the Town has made an important investment in infrastructure, and has a significant obligation to ensure the maximum return on this investment.

Assets can be assigned individual replacement unit costs, which when aggregated provided the calculated replacement value of the asset inventory. The total replacement value of an asset inventory is used to measure valuation, identify future replacement budgets, and benchmark the reinvestment in existing assets.

Replacement unit cost represent the 2021 total contracted cost of replacing each asset the Town owns and does not consider staff time, maintenance, growth, climate change, service enhancements, or other cost factors.

How Old Is It?

The age of an asset describes the amount of time that has elapsed since it was initially constructed. This date marks the beginning of the asset lifecycle, during which assets will deliver services and accrue inspection, operations, maintenance, rehabilitation, replacement, and disposal costs. Assets at the Town are of varying ages, and therefore different stages within their lifecycle. Age is an important descriptor of reinvestment need.

The Town, like many other Greater Toronto Area (GTA) municipalities, experienced its largest growth during the 1980's and 1990's. During this period, most investments made by GTA municipalities went into development-related assets since the bulk of the existing asset base was relatively new and in good condition and therefore did not need replacing. More recently however, municipalities like Newmarket have started to see the need for more infrastructure replacements for water, wastewater and buildings in the older areas of their communities. Additionally, many of the roads that were built during the peak growth period are now over 30 years old and are getting closer to the end of its lifecycle.

The rise in replacement needs after growth and development occurs is sometimes referred to as an "infrastructure echo". This concept and the trend Newmarket will face in future years is provided in Financial Strategy section.

The cumulative effects of historical growth (future growth is documented in Future Ready section, including the financial impact) in asset valuation from historical time to present day is shown in Figure 10 which depicts new assets being developed, purchased, or assumed. Here, the data demonstrates that the Town has expanded significantly with time and now has a significant 2021 replacement value of assets it is responsible for.

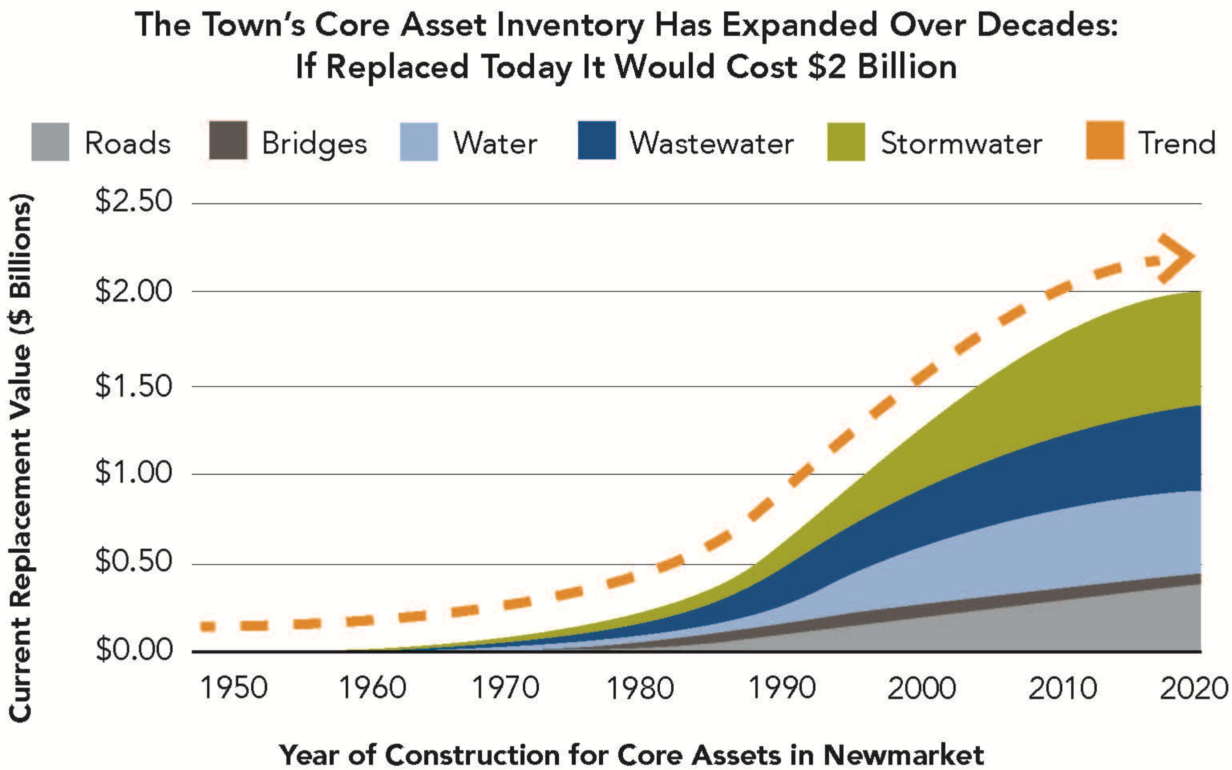


Figure 10 - Accumulating Total Replacement Cost of Core Assets by Year of Construction

What is the Expected Service Life?

All assets have a finite life. Different types of infrastructure have different life expectancies. From the time an asset is constructed, it will require a replacement in the future at the end of the expected service life. There are generally accepted industry standards and best practices that predict how long assets should last that were used in the individual asset management plans.

Each asset category shows an overall life expectancy and an average age of the assets within the category. Life expectancy is weighted by the individual assets' replacement cost – individual assets vary in life expectancies and cost different amounts. This demonstrates on a general basis how much useful life of the asset portfolio has been consumed. See Figure 11:

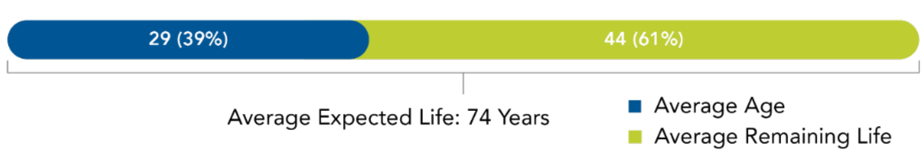


Figure 11 - Overall Estimated Service Life and Average Age

What Condition Is It?

During the asset lifecycle, assets will experience different condition states based on their state of good repair, risk, and ability to deliver services. A decrease in condition is caused by deterioration due to aging, operating conditions, or demand. Condition ratings are important measures of how assets are performing, what deterioration has occurred, what risks they may have, and what the financial health of the assets are. It can be used to inform capital planning decisions, and indicates the quality and availability of services the Town wishes to provide with its assets. The concept of condition grades was first introduced through the 2020 Infrastructure Report Cards.

Using the method of most Infrastructure Report Cards, assets are assigned condition ratings on a 5-point scale.

A condition rating system identifies which stage assets are at in their lifecycle. More detail on the condition ratings are as follows (Table 13):

Table 13 - Condition Rating Descriptions

Condition Category	Condition Description*
Very Good	The asset is fit for the future. It is well maintained, in good condition, new or recently rehabilitated.
Good	The asset is adequate. It is acceptable and generally approaching the mid-stage of its expected service life.
Fair	The asset requires attention. The asset shows signs of deterioration and some elements exhibit deficiencies.
Poor	There is an increasing potential for its condition to affect the service it provides. The asset is approaching the end of its service life, the condition is below the standard and a large portion of the system exhibits significant deterioration.
Very Poor	The asset is unfit for sustained service. It is near or beyond its expected service life and shows widespread signs of advanced deterioration. Some assets may be unusable.
Unknown	Not enough data exists.
**Definitions are sourced from the Canadian Infrastructure Report Card and Statistics Canada, 2019.*	

Each asset management plan uses a tailored approach to defining the range of assets that fall within a condition rating on the 5-point scale, as shown in the plans.

Using this context, the State of the Infrastructure is provided for each service area in its respective asset management plan. A corporate summary of the state of the infrastructure for all core assets combined is provided in the Executive Summary.

Condition Assessments

Each asset management plan contains a condition assessment plan. This section explains the basis for those condition assessment plans.

The foundation of good asset management practice is based on having comprehensive and reliable information on the current condition of the infrastructure. Municipalities need to have a clear understanding regarding performance and condition of their assets, as all management decisions regarding future expenditures and field activities should be based on this knowledge. Without this information, financial and capital plans carry a significant amount of uncertainty. The Executive Summary shows which financial plans are supported by condition data.

Some benefits of holistic condition assessment programs within the overall asset management process are listed below:

- Increased accuracy and confidence in financial forecasts with fewer assumptions
- Understanding of overall network condition leads to better management practices
- Allows for the establishment of rehabilitation programs
- Prevents future failures and provides liability protection
- Potential reduction in operation / maintenance costs
- Allows for the establishment of risk assessment programs
- Establishes proactive repair schedules
- Avoids unnecessary expenditures
- Extends asset service life therefore improving level of service
- Improves financial transparency and accountability
- Enables accurate asset reporting which, in turn, enables better decision making

Stages of Condition Assessment

Condition assessment can involve different forms of analysis in a staged approach. While the approach will vary for each asset class, stages can generally be considered as:

1. Preliminary age-based analysis (e.g. 2020 Infrastructure Report Cards).
2. Field condition assessments for the first time to establish a baseline.
3. Follow up monitoring and inspections based on risk.
4. Mathematical models using statistics or desktop analysis to extrapolate field observations once data is comprehensive and/or statistically significant.

The Town's condition assessment plans are presented in alignment with these four general stages. They show progress towards the completion of each milestone.

Project Planning and Delivery Processes

To deliver condition assessments that provide the most value to the Town, processes and plans need to be in place to complete the work and use the outcomes to drive decision making. This includes:

- Creating an operational plan for what assets will be inspected, and when.
- Project management plans for how condition assessment plans will be delivered.
- Data management plans to create, store, and distribute the collected data.
- Town subject matter experts who can interpret the condition assessment information with an engineering lens.
- Asset management frameworks to ensure all service areas are aligned in their methods for data collection, analysis, and reporting

Each asset management plan's condition assessment plan also contains a brief high-level assessment of the Town's position for planning and delivery of condition assessment processes.

MANAGE SERVICE DELIVERY

Manage Service Delivery is the second chapter of the individual asset management plans. This section explains the framework of service delivery, and the way (1) levels of service, (2) lifecycle activities, and (3) risk will be reported in the individual asset management plans.

Assets exist to deliver value. What defines value is subjective, but is usually expressed as services received by stakeholders and customers, and the benefits that the asset owner (the Town) receives during the asset's lifecycle (e.g. revenue or service delivery opportunities). Asset management is not just about the asset itself, but the creation of value that the asset can provide to the organization.

The expenses the Town incurs over the lifecycle of the asset are taken with the goal of ensuring residents and business continue to receive exceptional service from the Town. However, providing services like transportation or clean drinking water through assets is not a cost-free or risk-free enterprise. Every day, owning assets presents risks, costs, and opportunities that need to be managed by people and processes that can make decisions.

Value realization is a balancing act – it often requires managing conflicting, interconnected drivers of risk, cost, and performance. Decisions about what services to provide, what to spend, or what risks the Town will tolerate leads to changes in how the other factors are balanced. There is no single correct way on how to manage this balance – the desired approach will depend on the goals of the organization. This balancing act is depicted in Figure 12:

Figure 12 - The Triple Constraint of Service Levels, Cost, and Risk

Balancing risk, cost and performance can be done with varying levels of resolution – the Town has begun to setup these frameworks in the 2021 AMP and has managed these trade-offs within its Financial Strategy. In a mature AM system, these trade-offs are being made on a day-to-day basis at different levels of the organization ranging from senior leadership to operations supervisors. These capabilities will be advanced by the Town's asset management strategy.

To manage service delivery, the services the Town provides must first be defined. Information and processes are needed to measure costs and risks, and actions that can be taken to influence these outcomes must be defined. Actions are the lifecycle activities the Town can undertake for an asset such as inspections, operations, or maintenance.

Broken down, these sections may seem like individual pieces but they work together in a balance that takes into consideration all three parts. For results of each section, please refer to the individual asset management plans.

Levels of Service

What Are Levels of Service?

Levels of Service (LoS) describe the outcomes customers experience through the services Town assets provide. Every day people use Town assets to travel safely, get clean drinking water, and many other services. Typically, customers are more focused on the services they receive than the details of any asset (e.g. ***customer levels of service***), but behind the scenes the Town is making investments, delivering operations and maintenance, and weighing tradeoffs between cost and risk that ensure the customer receives this service (e.g. ***technical levels of service***). For this reason, LoS are simultaneously a communication tool for the public and an internal process for decision-making. This relationship is shown in Figure 13:

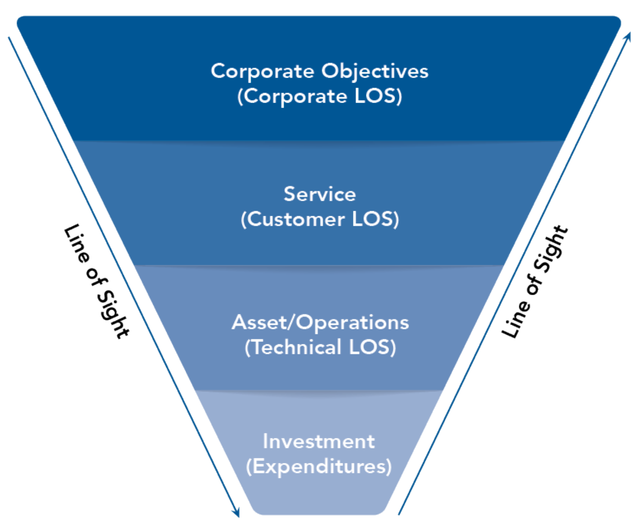


Figure 13 - Levels of Service Line of Sight from Corporate Objectives to Investment

Because LoS are both an interface with the public and a mechanism for internal service delivery, alignment is needed among stakeholders about what the Town is aiming to achieve and how this will be done.

Achieving alignment is a continual process, as expectations and available resources will change over time. These changes can be navigated with dialogue and continuous improvement. LoS should be reviewed on a frequency basis to ensure they reflect any changes in the assets or the requirements of the assets.

The process the Town is using to develop its LoS (beginning with its first study in 2017) is depicted as follows (Figure 14):

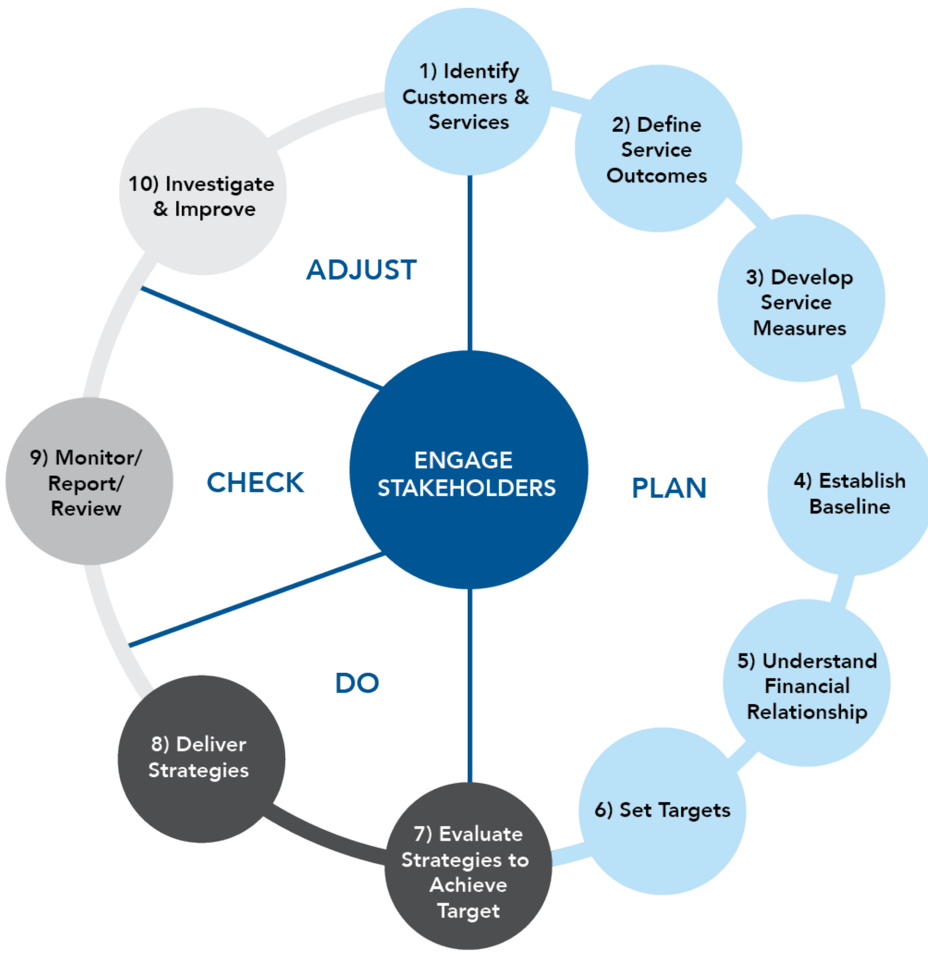


Figure 14 - Level of Service Process Outline and Deming's Management Alignment

While LoS are still being defined and measured, the Town already has a set of corporate objectives that can support alignment. These are:

1. Living Well
2. Well-Balanced
3. Well-Equipped
4. Well-Planned
5. Well-Respected

Further to the five "Wells" (corporate objectives), the approach to developing of LoS in AM plans is guided by the Town's Asset Management Policy as adopted by Council in 2019. Of the eight guiding principles (described in the Introduction), those pertinent to LoS include customer focus, taking a holistic approach, and providing value to customers. The envisioned end state of LoS within the policy is for the Town to deliver Council-approved LoS.

Measuring Levels of Service

LoS are measured by the service outcomes, the performance of assets, and by activities that support the service. As shown in Figure 14 above (previous page), measuring a LoS forms a baseline upon which decisions can be made about targets and subsequent levels of funding and risk (depicted further in section below). The Town is currently measuring three types of levels of service:

- **Customer Levels of Service** – This is the level of service the Town commits to providing the customers. These are often measured by how they are perceived by the customers and will require non-technical measures.
- **Technical Level of Service** – This is the established level of service the asset is expected to provide throughout its lifecycle and is specific and quantifiable for the asset.
- **Regulatory Requirements (O. Reg 588/17)** – The minimum levels of service measurements that the Town is required by the Province to measure and report on. The regulation does not require achieving a level of service, only the public reporting of the measurements.

When measuring a LoS, there are different service criteria that may be important to stakeholders. Ways in which services are experienced include:

- Quality
- Safety
- Reliability
- Accessibility
- Sustainability
- Compliance

Over time, the Town can strive to understand what aspects of a service are important to customers and align these with LoS decisions. Further performance measures will also need to be added as the Town develops a balanced LoS scorecard.

Levels of Service Decisions Affect Affordability

When targeting a LoS (improved services, decreased, or status quo), the Town will also be able to adjust the resources and funds allocated to that LoS. Conversely, decisions about removing or adding a budget mean that the Town is also deciding on a change in service levels. Therefore, LoS decisions are ultimately about desired outcomes and their affordability (Figure 15):

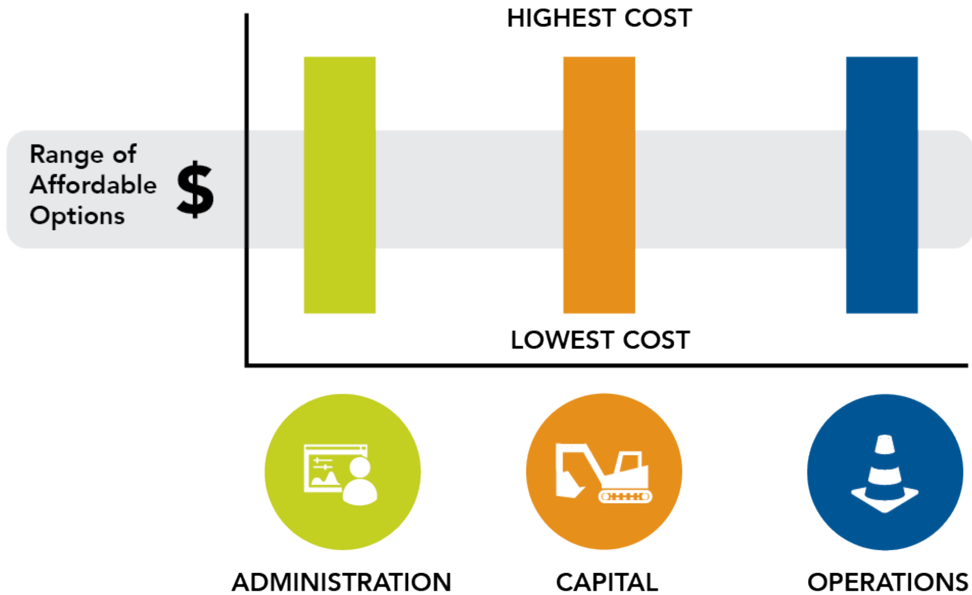


Figure 15 - Levels of Service Can Range in their Provision and Cost

How will the Town use Levels of Service

In 2025, the Town and Council will be required by Ontario Regulation 588/17 to define the LoS it wishes to achieve and the funding strategy it will employ for delivering that LoS over time. The Town and Council could simply choose to maintain the status quo of services or funding, or begin to set targets based on the direction set by leaders and customer expectations. When targets are set, the Town will report on its planned pathway to achieve sustainable funding for that LoS. This process has been started in the Financial Strategy section. The province does not require you achieve your target LoS in 2025, instead only to have a pathway for where the Town wishes to go in future years beyond 2025.

Once levels of services are defined and the mechanisms for adjusting them are established (e.g. maintenance activities), the Town can begin to build strategies for achieving its desired outcome. This could include engaging the public (as outlined in the Corporate Asset Management Procedure) to learn about what desired services and costs are. A depiction of the mechanisms for determining LoS and affordability is provided in Figure 16:

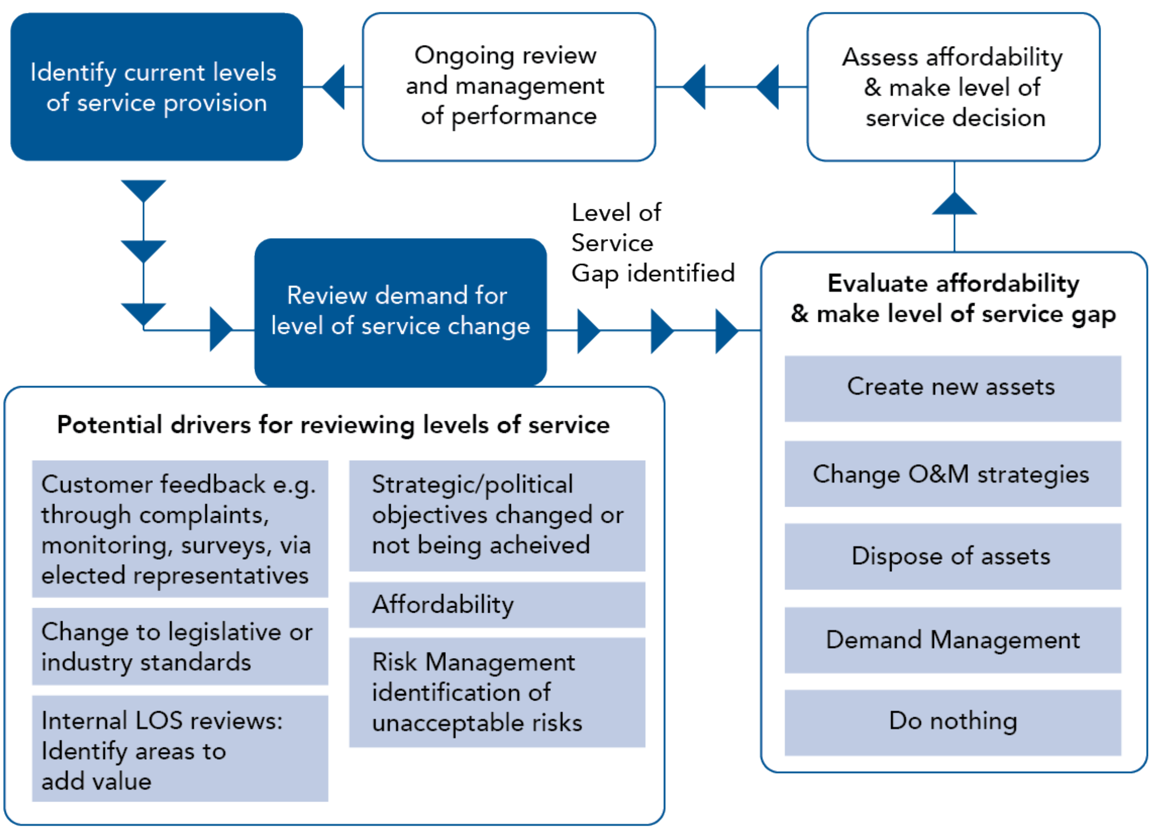


Figure 16 - How will the Town use Levels of Service?

Levels of Service in the 2021 AMP

For the 2021 Asset Management Plans, the Town has started by reporting on the O. Reg 588/17 requirements and select additional measures that will allow the Town to begin measuring performance and making decisions. The measures reported will develop over time with AM capabilities, with the long-term goal of capturing all aspects of a service and the total asset lifecycle cost holistically.

Asset Condition and Levels of Service

The focus of the 2021 Asset Management Plan's LoS is the condition of the assets as presented in Know Your Assets section and forecasted in the Financial Strategy section. The benefit of this approach is that condition is a good proxy for many service criteria. For example, roads with potholes have lower ride quality, watermains that burst have lower availability, and ponds full of sediment have lower capacity.

The condition of the assets can be linked to capital expenditure to rehabilitate and replace them, which is one of the Town's largest expenses. Condition is easily quantifiable and modelled, making it the logical first step for the Town's LoS analysis.

An example of the link between the condition of the asset and the service it provides is depicted in Figure 17. Further examples are provided for each asset class in the individual asset management plans.

Figure 17 - Example of Levels of Service for Different Asset Conditions

Levels of Service Performance and Results

This section of the Asset Management Plan summarizes the preliminary current Levels of Service and performance measures relevant to the Town. Measures were developed by staff and presented to Council via a Levels of Service Workshop in Spring 2021. As shown within the Town's Level of Service Framework section, the goals, measures, and their alignment will change naturally over time with iteration.

Current Measurements and Corporate Alignment

The levels of service measures are organized to create alignment between Town strategic objectives, a corporate goal for the service area, and the subsequent service criteria and technical/customer measures. Metrics and corporate alignment are presented in each individual asset management plan.

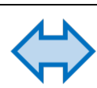
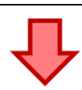
How to Read the Results

The levels of service measures in each asset management plan have been compiled into tables, beginning with the corporate goal of the assets/service followed by customer and technical measures. For each measure, two years of data are presented as required by O.Reg. 588/17 – 2019 and 2020. In future AMP updates, more years of data will be added.

For some measures, a preliminary observation about what direction the data is trending in has been made. Trend observations were not always possible with only two years of data, and not all LoS metrics would even have a trend attributable to Town performance or service outcomes. Table 14 shows how to read trend information in the LoS results.

Levels of service measures do not have endorsed targets. Trend observations are made on the basis of general best practice related to the sustainability of assets, services, and finances. Trend observations do not indicate how close or far away the Town's LoS is from any hypothetical LoS target.

Table 14 - Levels of Service Legend

Legend	
Symbol	Meaning
	Trending up in the desired direction.
	Trending down in the desired direction.
	A trend is not apparent.
	Trending down in an undesired direction.
	Trending up in an undesired direction.

Please refer to the individual asset management plans for their levels of service measures and 2019/2020 results.

Regulatory Requirements

Legislative requirements describe the minimum activities or outcomes the Town must deliver through its service delivery as directed by laws, regulations, and directives from regulators like the Province. There are a number of constraints and requirements that steer how the Town delivers services. Compliance with regulations must always be ensured in order to avoid fines, legal action, or loss of funding opportunities. These requirements can be understood as the minimum Level of Service the Town must provide with its core assets. This is depicted as follows (Figure 18):

Defining minimum LoS using regulatory requirements is a form of risk management (an overview of the links between risk and levels of service is provided in Risk section). It demonstrates the Town's commitment to the desired outcomes of the legislation – failure to realize these outcomes often includes other risks beyond the immediate financial and legal impacts, such as undesirable social and environmental impacts. There are many other "minimum" levels of service without a legislative requirement that the Town would not accept performing below, usually based on risk to the Town or its residents and customers, social norms, culture, or the Town's vision (e.g. "Well Equipped and Well Managed"). These minimums are usually more difficult to define than legislative requirements. As the Town's understanding of risk and levels of service evolves, other minimum LoS criteria may be defined beyond legislative requirements.

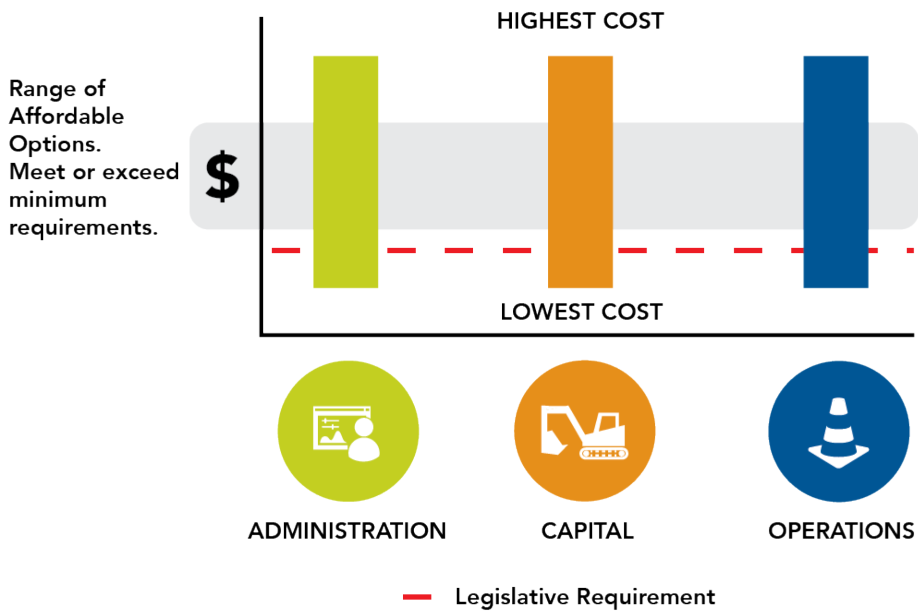


Figure 18 - Legislative Requirements Can Be Used to Define Minimum Service Requirements

Lifecycle Activities at the Town

This section explains why lifecycle activities are presented in asset management plans. Each asset management plan contains a detailed breakdown of the lifecycle activities for each asset class in the service area.

Lifecycle strategies are the planned actions and intended methods of maintenance management for an asset throughout its life. The purpose of lifecycle strategies is to maintain the asset in an appropriate state that will deliver the required level of service for least overall cost, while keeping risk within agreed boundaries.

Assets go through a series of distinct lifecycle phases from when they are created and eventually disposed of – in each of these, lifecycle activities are conducted and decisions are made about how value is delivered by an asset. This process involves many Town stakeholders who need to be aligned in what constitutes value and how it is achieved. A simplified Town asset lifecycle constitutes the following steps as depicted in Figure 19:

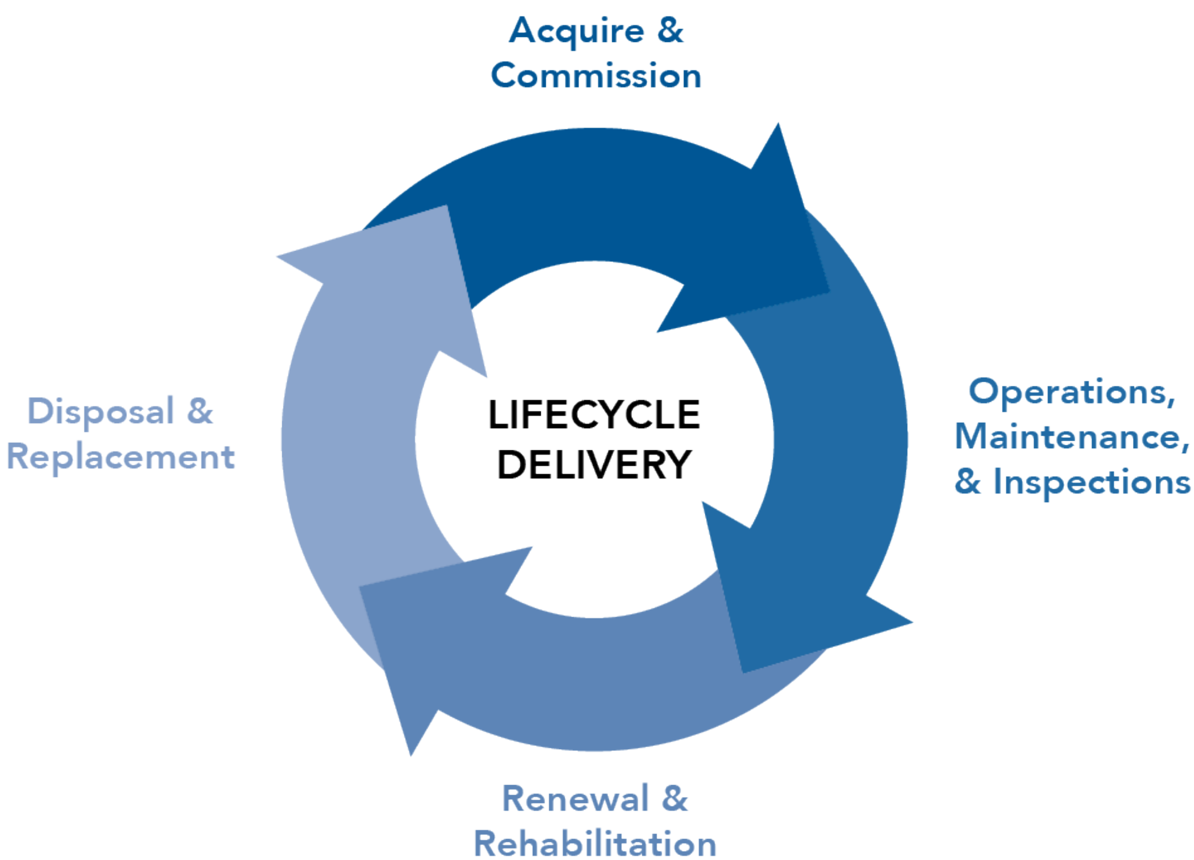


Figure 19 - Phases of Town Asset Lifecycle Delivery

The Asset Lifecycle

- **Acquire and Commission:** The need for an asset solution is defined by visioning and planning, which is translated to designs and procurement plans. Assets are constructed by the Town or a third party, and delivered in a ready state to deliver services. The decisions made in this phase will significantly influence the level of service and total lifecycle cost.
- **Operations, Maintenance, and Inspections:** Routine activities needed for correct operation of the asset, regularly scheduled work to maintain assets while they are still in working order, reactive work to reinstate broken or non-functional assets, and inspections to support services or decisions.
- **Renewal and Rehabilitation:** Rehabilitation comprises the renewal of finite life components and activities required to restore other components and elements to their functional condition and performance, it does not include the replacement of major components.
- **Disposal and Replacement:** Assets are disposed of when risks exceed value extracted from service delivery, or in response to changes in performance and capacity requirements. This is most commonly due to aging and usage in the municipal context, but could also be due to obsolescence, environmental considerations, etc. Disposing an asset restarts the cycle of planning for and delivering the vision of a new asset, if there is still demand for the service at the end of the asset's lifecycle (e.g. road corridor reconstruction).

Risk

Risk is the potential of gaining or losing something of value. Values (such as services, environmental and community well-being, or financial wealth, etc.) can be gained or lost when acting or not acting in a certain situation with risks or opportunities. Managing risk means taking a deliberate and structured approach to identifying, quantifying, and responding to risk. The ability to manage risk has the potential to exist at all levels of Town decision making:

- **Corporate or Strategic Risks** - Guide the Senior Leadership Team in policy development. Focus on strategic risks such as events that could limit the Town's ability to achieve Council priorities. Supports senior leadership in decisions on budget allocations between service areas, to minimize risk accepted by the Town.
- **Service Level Risks** – Help directors and asset managers to manage their services by tracking risks to service delivery. These risks are closely linked to levels of service and the associated performance measures. Service level risks quantify the likelihood and consequences of not achieving service commitments.
- **Asset Level Risks** – Help technical and operational staff make tactical decisions about lifecycle activities for specific assets at specific locations. Each asset provides a given service for a set of customers. The risks of an asset not providing its required service is influenced by its operating context and condition.

Service Level Risk

The Town considers risks across the asset lifecycle (first established in the 2014 AMP). The risks associated with lifecycle activities that the Town will consider are provided in the Lifecycle Activities Appendix. The assessment of risk will coincide with both levels of service and lifecycle activities.

As the Town's capabilities develop, more risks and opportunities related to service levels will be identified. An example of this process is depicted as follows:

Figure 20 - Illustration of how risk is linked to a level of service framework

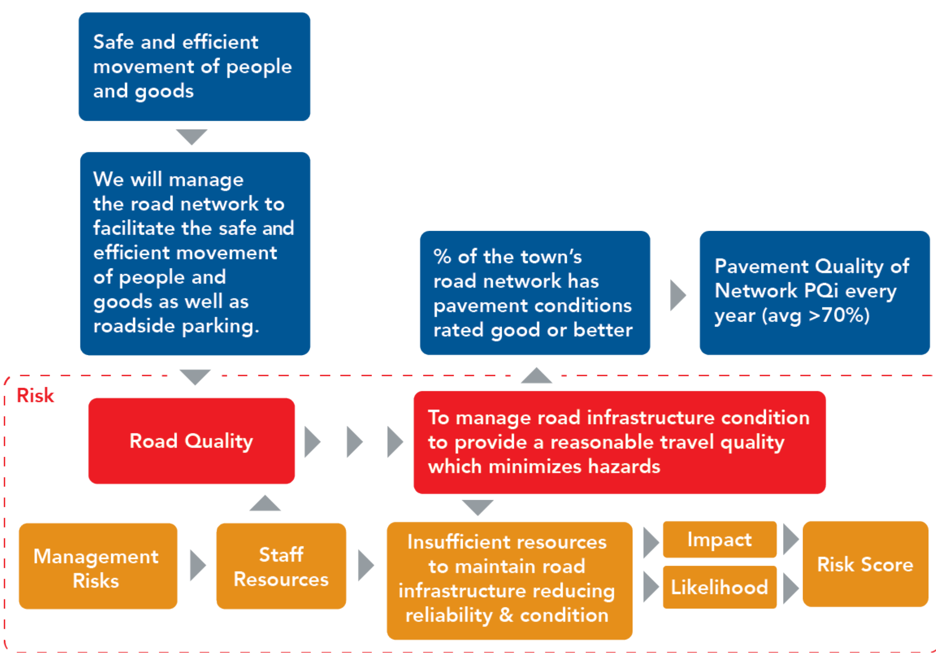


Figure 21 - Illustration of a simple approach to demonstrate how a risk process quantifies service risk.

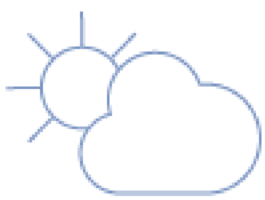
FUTURE READY

The **Future Ready** section of the asset management plans focuses on ongoing and upcoming trends that will impact current services and assets in the future. The **Future Ready** section includes the following information:

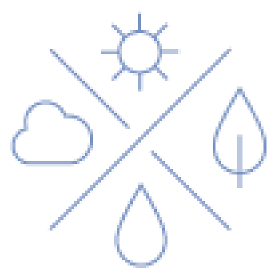
1. **Growth** – What increases in asset-related services are expected?
2. **Climate Change** – How will climate change impact core assets?
3. **Future Ready Changes** – How will the way we deliver services change with changes in society, technology, etc.?

Trends in technology, society, climate and resources can shorten the life of assets and increase total cost of asset ownership. Considering these trends in the individual asset management plans ensures the Town has adequate budget, human resources and skills, and industry networks to prepare for future changes – or to prepare residents for lower levels of service or rates increases.

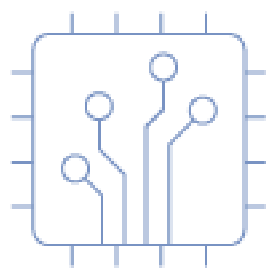
Changing society



Changing climate



Changing resources



Changing technology

This chapter of the plans will describe the anticipated effect of trends on future growth of the asset portfolio and the nature of those assets over the next ten years. As the Town gains more assets or new types of assets, there are implications for their management. This chapter of the plans also identifies which trends have already been incorporated into Town plans, and which have not. Of those not yet incorporated, it proposes management approaches. These management approaches may include more frequent maintenance or replacement, or addition of assets to have higher capacity, more up to date technology, or new materials.

Historical Growth Trends

During the ten-year period from 2009 to 2018, the Town of Newmarket experienced strong population and employment growth. Population grew from 77,650 to 86,380, an increase of approximately 9,860 people. This growth was fueled by a strong GTA economy and continued migration into the metropolitan region. Moving forward, Newmarket is expected to continue to experience growth, however it will likely shift from lower density to higher density-built forms as the Town's remaining greenfield land supply is developed.

Growth Forecast

Each asset management plan shows the expected growth in assets that are accommodating growth. Quantities are broken down by year and type.

Newmarket is poised for growth. The Town's Census population is expected (pre-COVID-19 projection) to increase by about 8,830 people over the next ten years, reaching about 95,210 by 2028. Population will increase by 11,290 over the next 10 years, reaching 97,670 in 2031.

When more or different assets to accommodate this growth are introduced to the town's portfolio ("growth"), additional human resources, training and funding are required to operate, maintain, repair, and eventually rehabilitate or replace those assets. In addition to examining future trends, it can be helpful to examine historic trends and identify reasons for increases in costs and asset base. As the asset base expands, asset managers can ensure they are accounting for the same types of cost increases.

Operating Impact of Forecasted Growth

Following the projected growth in the asset base in the individual asset management plans, the operating impact of this growth is also provided. The level of effort and required resources to maintain growth assets has been quantified based on the total number of assets and the per-unit cost of maintenance.

By building or assuming new assets, the Town is committing to the full lifecycle of an asset's service delivery. Once an asset is constructed, it must be operated, maintained, and eventually replaced. For example, streets must be plowed, water infrastructure like hydrants must be serviced, sewers need to be inspected, and drainage features require cleaning. The responsibility for maintenance occurs when the Town receives constructed assets from contractors or developers. By assuming assets, the Town is acquiring both a new source of service delivery and a set of liabilities that require funding and maintenance.

RESILIENCE

Resilience means we accept that change is inevitable.

When challenges arise, we have the courage and ability to anticipate and adapt by viewing change as an opportunity; by purposefully seeking new ways to achieve our goals; and by being open and willing to break the status quo.

We reinvent ourselves to grow and improve; to learn from both failures and successes; and to work collaboratively with others realize those possibilities.

Climate Change

The Town's asset management plans consider the impacts of climate change.

On January 13, 2020, the Town of Newmarket declared a climate emergency. This declaration reinforces and deepens the Town's commitment to protect the environment, economy and community from the impacts of climate change. This declaration also underscores an understanding that climate change can impact all facets of life, including businesses, infrastructure, natural systems, and people's health and well-being. Some of these impacts are already being felt.

The last five years (2015-2019) have been identified as the five hottest years on record (National Centers for Environmental Information, 2019). Severe weather events continue to affect local communities, resulting in significant damages and associated economic and social costs. Based on Insurance Bureau of Canada data, nine of the last ten years (2010-2019) have reported insurance payouts that have exceeded $1 billion per year for catastrophic losses (i.e., losses that amount to $25 million or more) (Green Analytics, 2020).

2019 Climate Change Resilience Assessment

Understanding risks and vulnerabilities is a key first step to inform ongoing and future adaptation and resilience-building efforts. Flood risk has been selected as the focus of this assessment to leverage existing flooding-related data and develop a prototype of an approach that can be replicated in the future for other climate-related risks (e.g., extreme heat, extreme winds, and freeze-thaw etc.). A broad understanding of flood risk has been adopted, recognizing that flood risk is a result of a confluence of multiple factors, including hazard, exposure, vulnerability and capacity.

As part of the Town's efforts to prepare for the impacts of climate change, the Town engaged the Ontario Climate Consortium (OCC) in June 2019 to conduct a corporate-wide resilience assessment of Town-owned infrastructure with support from Lake Simcoe Region Conservation Authority (LSRCA) and Ascentia. Flood hazards of interest in this assessment include riverine flooding, overland flooding and groundwater flooding. These may be associated with weather-related events (e.g., rain, or snowmelt), natural systems (e.g., creeks, rivers, and groundwater), and/or municipal infrastructure failure (e.g., storm and/or sanitary sewers).

National Centers for Environmental Information (NCEI). 2019. Assessing the Global Climate in 2019. National Oceanic and Atmospheric Administration (NOAA).

Green Analytics Corp. 2020. Investing in Canada's Future; The Cost of Climate Adaptation at the Local Level. Insurance Bureau of Canada and Federation of Canadian Municipalities.

An indicator-based tool was developed in 2019 to determine the current flood risk level for each asset based on the following three components of flood risk:

1. **Hazard** was assessed based on analysis of geospatial factors contributing to the potential occurrence of riverine flooding, overland flooding, and groundwater flooding. Historical flood records were analyzed using LSRCA's flood photo database but these records were not scored due to insufficient information regarding the extent and impact of past flooding.

2. **Vulnerability** considered the current physical, operational, social, economic, and environmental characteristics of each asset (where information was available) that can directly or indirectly increase the asset's propensity of being adversely affected by flooding.

3. **Capacity** accounted for factors contributing to the current ability of the asset and of staff to anticipate, cope, respond to, and recover from flooding. Unfortunately, Capacity could only be assessed for 4 of the 8 infrastructure categories and could not be assessed for Pumping Stations, Culverts, Roads, and Stormwater Ponds in the absence of Personnel Capacity Survey responses and other capacity-related data.

The factors used to assess current flood risk in the individual asset management plans are summarized in Table 15:

Table 15 - Flood Risk Indicators Assessed

Asset Classes Assessed	Flood Risk Indicators Assessed		
	Hazard	Vulnerability	Capacity
Roads	Proximity to floodplain. Proximity to waterbodies and watercourses. Stormwater runoff potential (topography, impervious cover, soil type). Seepage potential (water table height).	Road class. Traffic volume.	*Not assessed for roads.*
Bridges & Culverts		Criticality. Operating capacity. Condition. Replacement value. Cost of flooding.	Personnel capacity.
Wastewater Pump Stations		Criticality. Presence of basement/floors below ground.	*Not assessed for wastewater.*
Stormwater Ponds		Pond size. Ecological value.	*Not assessed for storm.*

Future Ready Trends

Asset management plans include an assessment of the future trends in technology and society that will impact how the assets are managed or deliver services.

Asset management (including the Town's policy) recognizes that our environment, society, resources, and technology are changing – managing service delivery is not just an exercise in maintaining the status quo, but respond and adapting to these changes. The data about climate change is changing quickly, and reassessments and adjustments will be needed. Recognizing this, the Town has completed workshops to help identify trends that will impact asset management and the Town in the future.

How to Read the Future Ready Results

Several trends were identified in each Future Ready trend category. The high-level implications of these trends on the management of assets is also provided. The "growth" column indicates that the trend will put pressure on the need to increase the capacity of assets. If the growth column is not selected, then the trend will affect the asset's expected life and/or operations and maintenance practices. Whether the growth column is selected or not, the trend may result in the need for more frequent maintenance, and/or revised operations and maintenance practices.

The last column in each plan's table of results also indicates whether the trend's impacts have been incorporated into Newmarket's existing plans, through Town planning or operations documents. In cases where trends are not incorporated, this means that there are no documented plans for how the Town will manage assets differently due to changing technology, climate change, or resource considerations.

The proposed roadmap for building risk management capabilities at the Town shown in the Risk section is one opportunity to address the gaps in future readiness.

Recommendations to Support the Future Ready Approach

Strategic recommendations to support implementation of Future Ready are provided in the Executive Summary. Recommendations specific to the climate resilience or growth of each asset class are provided in the individual plans. There are tactical and administrative recommendations applicable to all asset categories that are as follows:

- Pilot the use of total lifecycle sustainability analysis of proposed developments or construction projects based on (1) the total lifecycle cost of the assets and Town services and (2) the tax revenue gained from proposed developments after development charges and assumption of the development.
- Develop approximate quantities of assets in each future development at the soonest opportunity in the development process to begin budgeting and asset management planning before construction and handover take place.
- Begin gathering asset quantity information about non-core assets like parks and facilities for historical growth (2016-2021) and future growth (2021-2031) to enable the non-core asset management plans.
- Update data schemas and process for core and non-core assets to track the assumption status (assumed/un-assumed), the install date, and the assumption date.
- Establish update cycles for master plans for core assets (e.g. every 5 years).
- Increase the Town's ability to monitor growth in demand for core assets through engineering tools and processes, in conjunction with current measurements of population, employment, etc.
- Investigate the use of in-house tools or consulting services for modeling future demand for core asset services.
- Investigate any potential for growth and development in the years without very little projected assumption of assets (e.g. 2025-2030).
- Update the budget process to consider assessment growth allocations based on the number of assets assumed by Public Works each year, using the approach developed for the 2022 budget.
- Work to apply a climate change lens to the capital planning process for core assets.

FINANCIAL STRATEGY

The Financial Strategy section takes all the data and analysis gathered in previous sections of the AMP to help paint the picture of Newmarket's financial outlook for its assets with scenarios that can support financial decision-making.

The Financial Strategy for core assets has been presented with two levels of detail:

1. A corporate level of view of the financial position for core assets is presented in the Financial Strategy. This includes an analysis of risks, key issues, and policy options. This section aggregates the information in the individual asset management plans.

2. A service area view of each asset management plan provides the specific financial position of the assets, along with proposed spending levels, capital plan intervention types, maps and graphs depicting service levels, etc.

Concepts in the Financial Strategy

There are several key concepts underpinning the Financial Strategy, some of which were introduced in previous sections. In summary, these are:

1. **Replacement Cost:** Through the growth of the Town, a ~$2 Billion investment (2021 dollars) in core infrastructure has been made over the course of several decades. The significance of this investment warrants a Financial Strategy.

2. **Long Term Outlook of Age and Condition:** All assets have a finite life. Core assets like roads and sewers can last several decades, but will ultimately require a replacement in the future from when they were constructed. To fully understand the ramifications of ~$2 Billion of aging infrastructure, a long time horizon for a Financial Strategy is needed.

3. **Condition Altering Actions:** The Town can undertake lifecycle activities that extend or "reset" the life of the asset, for a capital cost. A mix of interventions ranging from minor rehabilitation to full replacement can be taken depending on the circumstance. Interventions are programmed by Town staff when assets reach certain milestones in their lifecycle based on risk and service levels.

4. **Echoes of the Past:** The Town saw periods of significant infrastructure expansion in the 1980s and 1990s. With core assets that live 40 to 80 years, most assets are approach the midpoint in their life and rehabilitation needs are increasing. Therefore, the future investment needs are in part a product of past growth and decisions known as an "expenditure echo" (Figure 22):

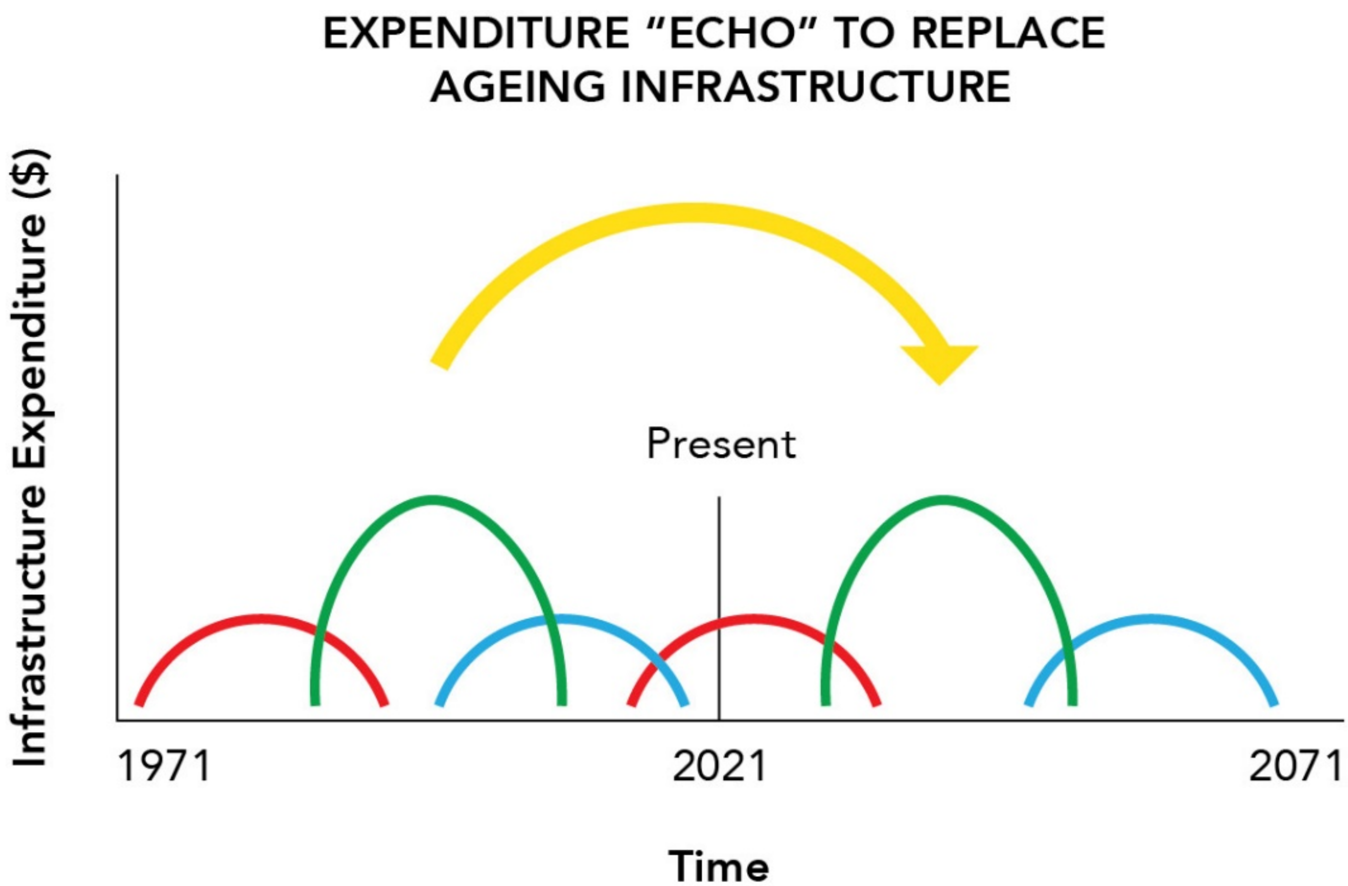


Figure 22 - Expenditure "Echo" To Replace Aging Infrastructure

Scope of the Financial Strategy

The scope of the Financial Strategy for core assets is a subset of the overall assessment of Town financial health completed in 2020. The AMP considers core assets only, and the specific costs associated with delivering core asset infrastructure services. More specifically, the 2021 Financial Strategy only focuses on the capital rehabilitation and replacement of existing infrastructure. The Future Ready section provides additional consideration to accounting for growth in the core asset inventory and the operating impact.

Operating costs have been reviewed, but will not be analyzed in depth until future improvements in maintenance management systems allow for a complete service level and sustainability analysis. In summary (Table 16):

Table 16 - AMP Financial Strategy Scope

In the Scope of the AMP Financial Strategy	Not in the Scope of the AMP Financial Strategy
Tax supported roads and bridges, and rate supported water, wastewater, and stormwater assets.	Tax supported non-core assets like parks, facilities, trails, and fleet.
Capital spending on condition-altering replacement and rehabilitation activities.	Annual operations and maintenance expenses needed to deliver core services.
Assessments and scenarios regarding the financial position of core assets.	Overall assessment of the financial health of the Town (completed by the 2020 Fiscal Strategy).
Projections of future cost using 2021 dollars.	Impacts of inflation, investment interest, or debt interest.
Impacts of growth in assets on future O&M requirements.	Cost recovery of growth accommodations captured by Development Charges.
Consideration of Town-controlled revenue sources.	Opportunities for external funding like government grants. This analysis does not include allocations of the Ontario Community Infrastructure Fund (OCIF).
Levels of service options within the current composition of assets, assuming "like for like" replacements.	Quantified impacts of levels of service changes, climate change impacts, new technology or assets, and other trends identified in the Future Ready section.
The amount of capital spending that may need to be delivered in future years.	Assessment of the Town's resource capacity (e.g. staff, processes, technology, etc.) needed to deliver the projected level of capital spending.

Current Financial Background

Before presenting investment scenarios, it is important to first establish the current budgets and practices used for financial analysis. Much of discussion and analysis of the current position will revolve around the Town's Asset Replacement Fund, a reserve for each Town service area from its respective operating budget. This reserve is then used to fund capital expenditures for renewing and replacing those assets.

Ongoing Changes

The Town continues to improve the understanding of its financial position through the projects set out by the council priorities for long-term financial sustainability. AMPs will integrate with these living documents, and update processes will allow these information sources to be reconciled. The financial position of the Town captured within the AMP reflects information from December 2020. Ongoing improvements not captured in this plan include the Reserve and Reserve Fund Review.

Historical Baseline

The baseline information pertinent to the Financial Strategy is shown in the Executive Summary section. This includes reserve balances, reinvestment rates, reserve contribution rates, etc. Excerpts from the historical baseline are also provided in the individual asset management plans.

Current Financial Plans and Practices

The Town has a series of best practices and formalized financial plans that support its financial decision-making, driven by an annual budget process that is continuously improving. There are current plans in place for rate-supported assets and an estimated extrapolation of current practice for tax supported assets that were used to inform future asset financial planning. Details like assumptions for funding increases are provided in the Financial Strategy or the individual asset management plans as applicable.

Financial Forecast

When developing the financial forecast, the Town wished to answer four key questions:

1. What is the total spending requirement to maintain all of the Town-owned core assets, based on need?
2. What would it cost to maintain assets at the current level of service experienced today?
3. What level of service is achievable within the Town’s current funding?
4. How will spending requirements change over time, and what does these trends mean for the Town’s finances?

To answer these questions, three scenarios were prepared in the capital-planning model that were used to produce the financial forecast. Further details about the financial impacts and the implications of these scenarios is provided in the Financial Strategy section.

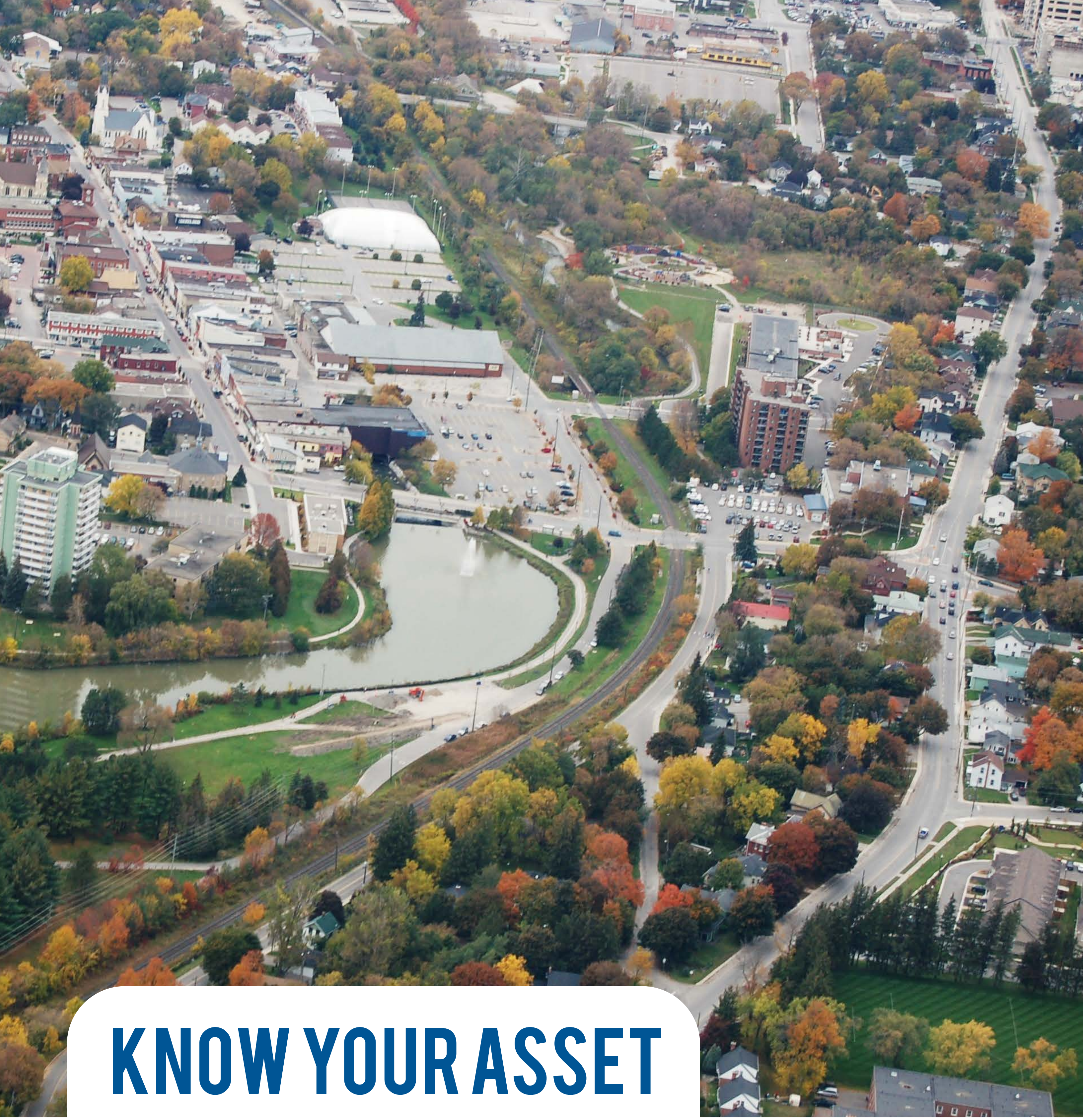
Recommendations to Support the Financial Strategy

Strategic recommendations to support implementation of the Financial Strategy are provided in the Executive Summary. There are tactical and administrative recommendations applicable to all asset categories that are as follows:

- Develop a method for reconciling replacement costs, construction price inflation, and reinvestment rates for consistent asset management record keeping, calculations, and reporting.
- Formalize existing practices for tracking reinvestment rates and reserve contributions.

ROADS ASSET MANAGEMENT PLAN

Newmarket



KNOW YOUR ASSET

The Town is responsible for $2 Billion+ of assets. Assets exist to provide services to the community. Their ability to deliver services depends on Town stewardship and informed decision making. As assets age they have to be replaced. Key takeaways in this section will include:

- What do we own?
- What condition is it?
- What would it cost to replace?

DATA GAP ANALYSIS

Asset data is the first part of Know Your Assets and forms the foundation for the State of the Infrastructure. For a review of this approach, see the Concepts and Frameworks.

Using the requirements of a standard asset registry, a gap analysis of the Road asset registry is provided in Figure 23 below. There is a slight gap in asset type, material, size and age data.

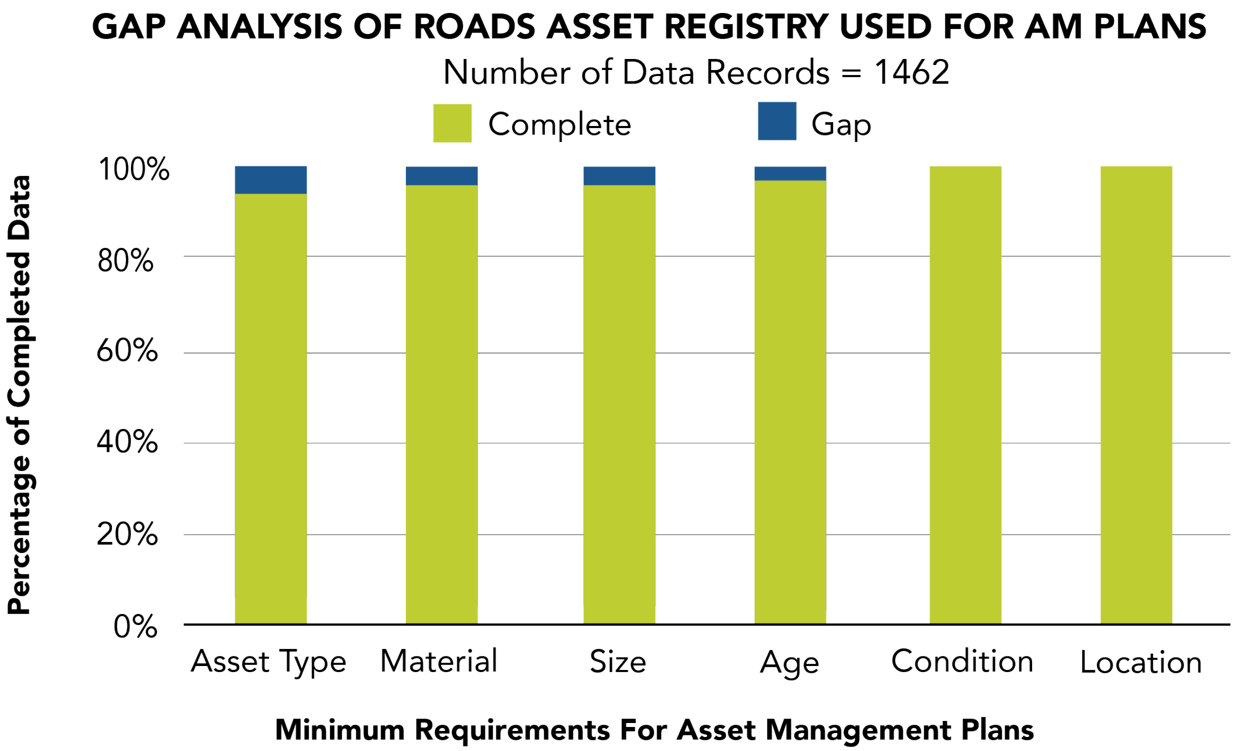


Figure 23 - Gap Analysis of Roads Asset Registry Used for AM Plans

When viewing subsequent sections of the asset management plan that use asset data, consideration should be given to the data gaps described here.

CONTEXT FOR STATE OF THE INFRASTRUCTURE

The State of the Infrastructure will combine inventory quantities, replacement costs, and condition ratings to provide a detailed breakdown of the Town's assets.

What Do We Own? The inventory has been organized in a hierarchy to reflect the asset types providing the service, and to support reporting and planning. The Town's inventory for the roads service area is organized as follows (Figure 24). Non-core assets related to roads will be studied in subsequent asset management plans in future years.

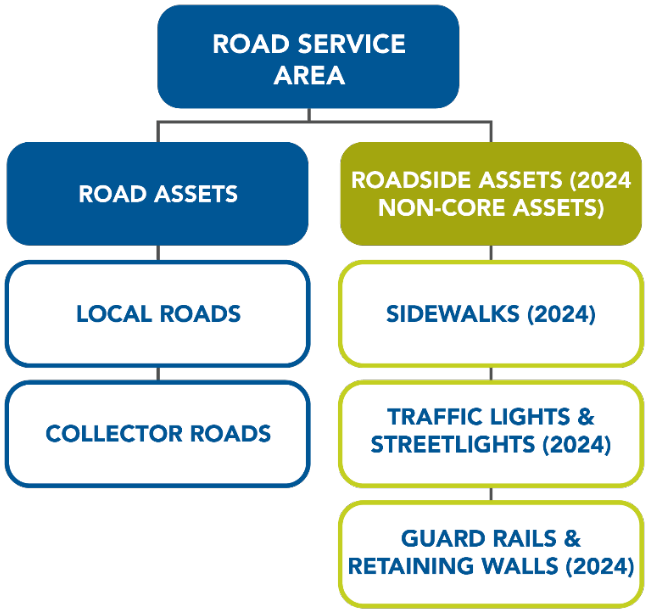


Figure 24 - Road Service Area Classification

This inventory will be used for replacement valuations, service delivery, operations and maintenance, growth updates, capital planning, and financial reporting.

What Does It Cost? The total replacement cost for roads is ~$395 Million (2021 dollars). This is equivalent to 16% of all Town-owned assets, and 19% of the core asset subset reported through the 2021 AMP.

What Condition Is It? Assets are assigned condition ratings on a 5-point scale as seen in Table 17. Ratings are assigned based on Pavement Condition Index, as measured by specialized equipment mounted to a vehicle that scans the Town's roads.

Table 17 - Pavement Condition Index

Condition Ratings – Pavement Condition Index				
Very Good	Good	Fair	Poor	Very Poor
100 – 90	90 – 65	65 – 50	50 – 30	30 – 0

Roads Network Infrastructure Report Card

Newmarket

INFRASTRUCTURE PURPOSE

The Town's local and collector roads transport people and goods quickly and safely to where they need to go. Roads are maintained to ensure safe and smooth transportation.

REPLACEMENT COST:
$395 Million

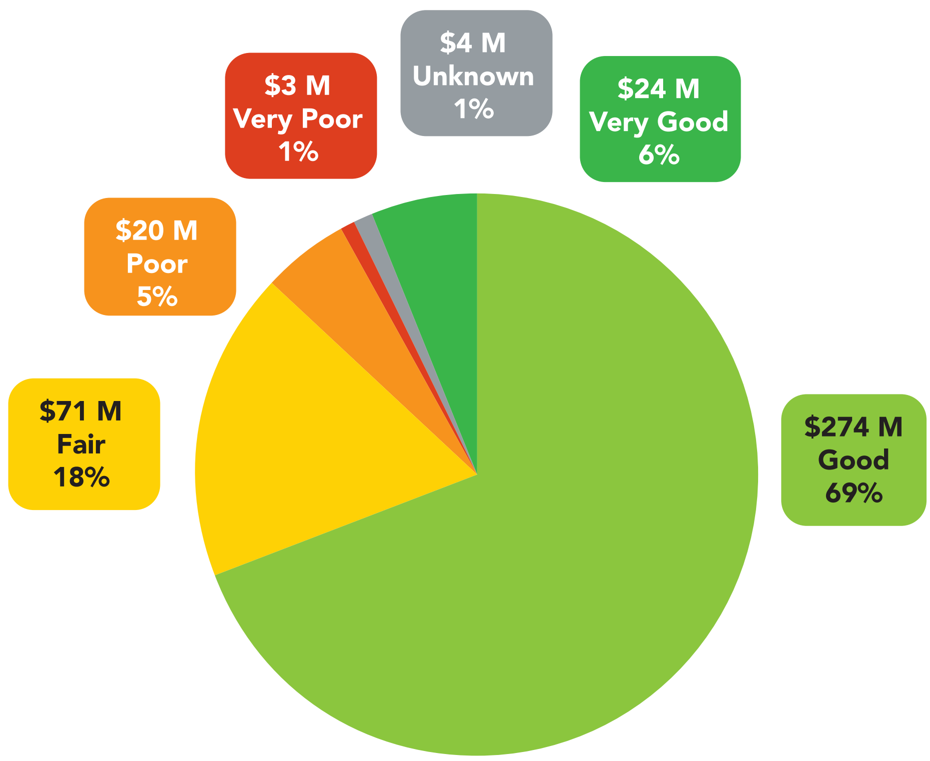
AVERAGE NETWORK CONDITION
GOOD

INVENTORY
Local Roads:
185 centerline km
Collector Roads:
66 centerline km
Rural: 1 centreline km

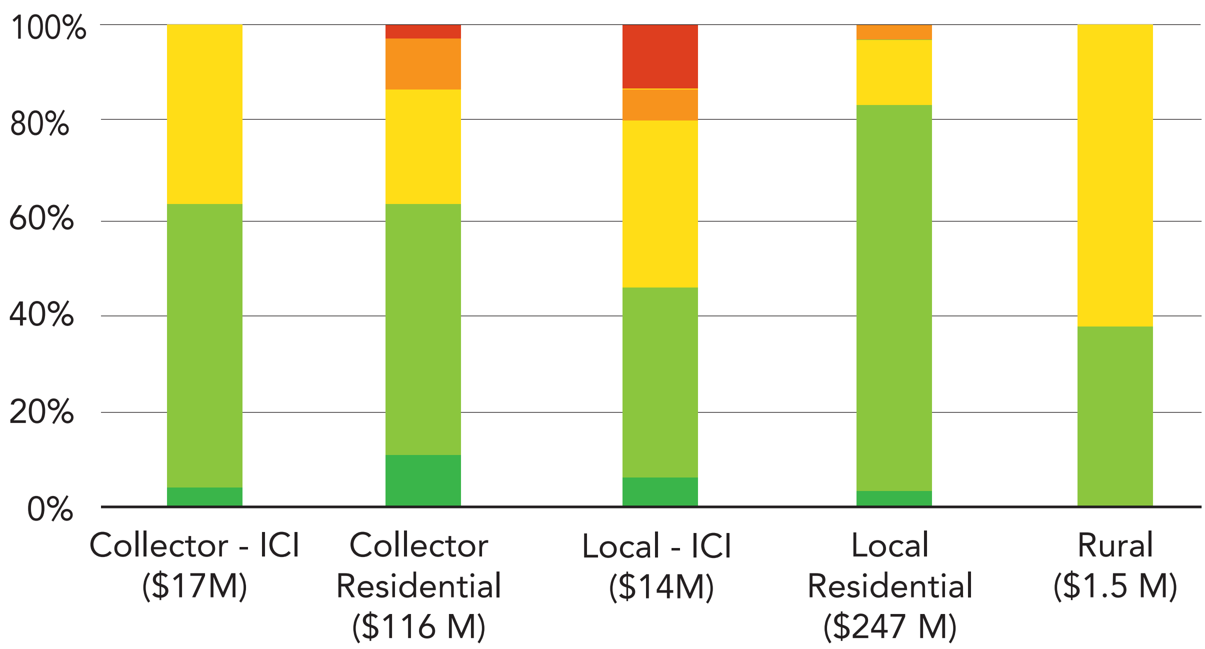
WHAT CONDITION ARE OUR ASSETS IN?

Very Good | Good | Fair | Poor | Very Poor | Unknown

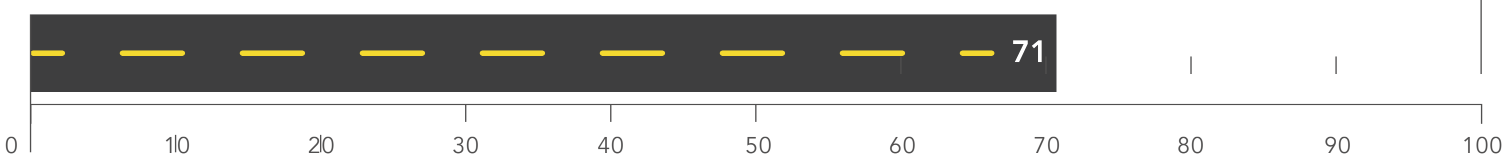
Current Condition & Replacement Cost ($ Millions)



Road Condition Breakdown by Service Type

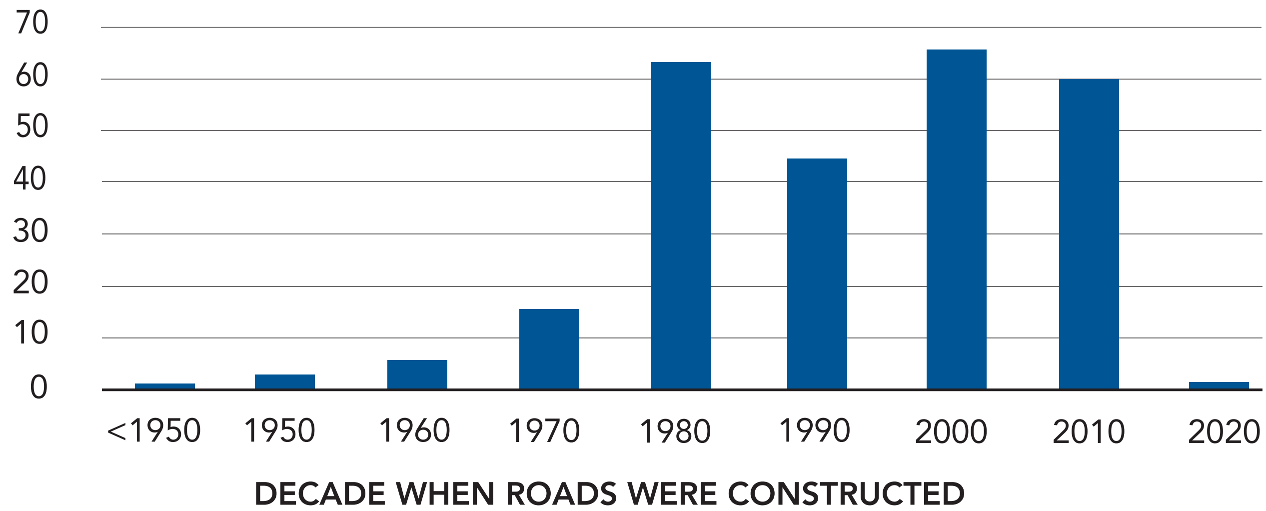


Average Road Pavement Condition (out of 100)

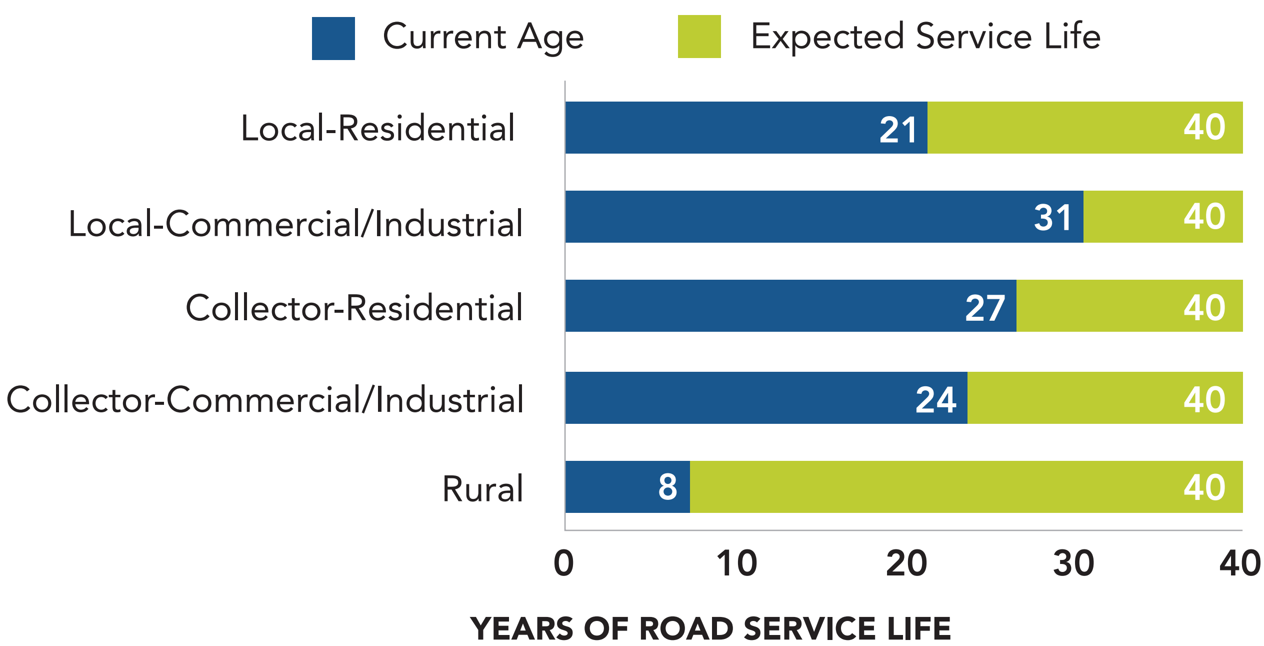


HOW OLD ARE OUR ASSETS?

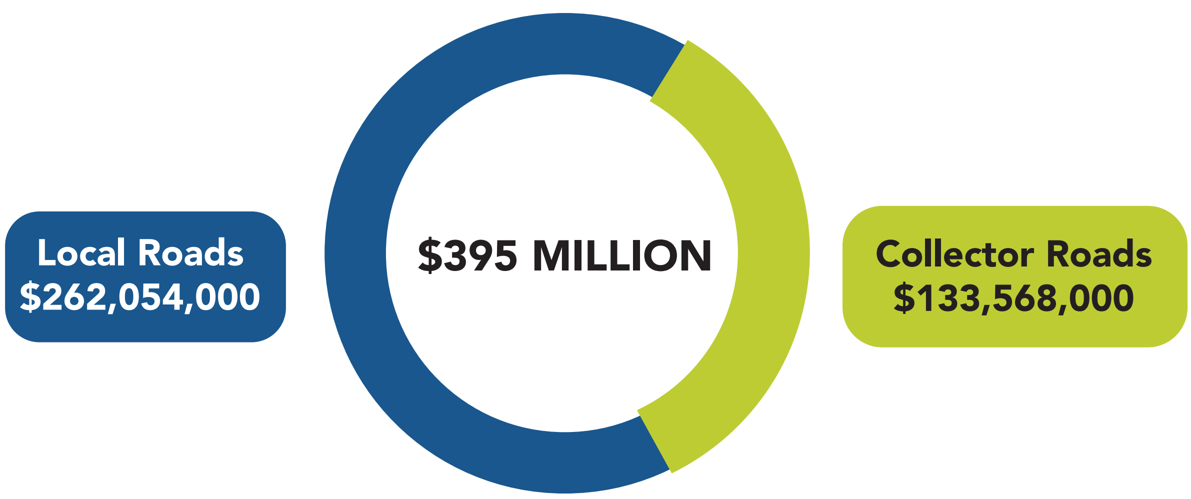
DECADE OF ROAD CONSTRUCTION (TOTAL KILOMETERS)



AVERAGE AGE AND EXPECTED SERVICE LIFE OF ROADS



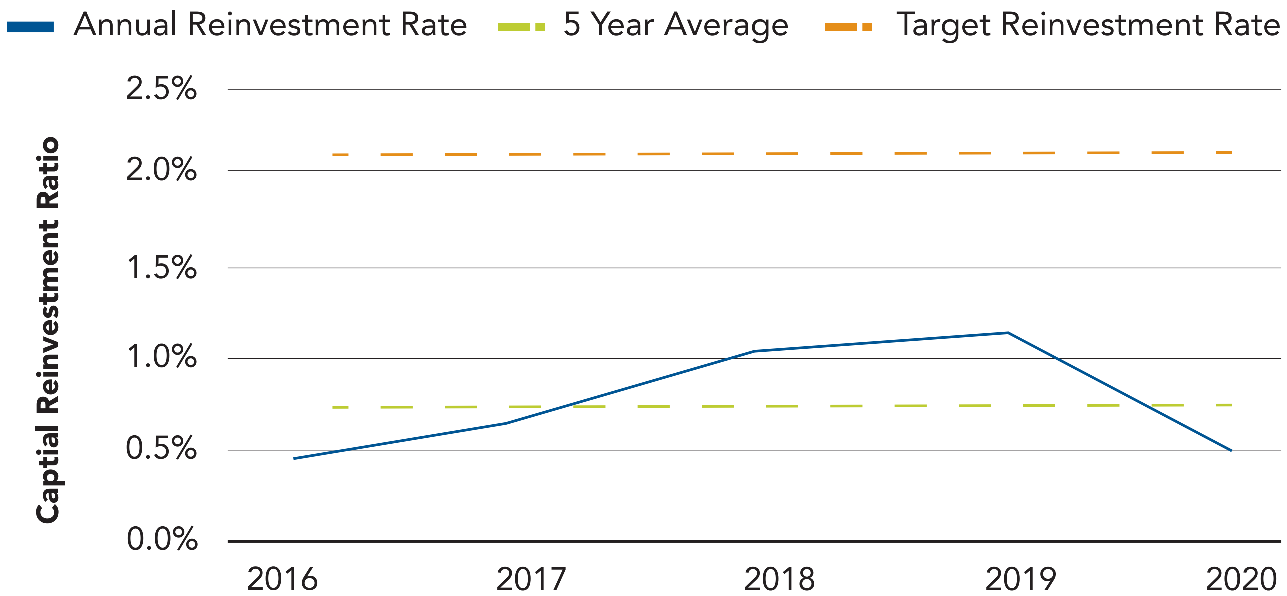
WHAT WOULD OUR ASSETS COST TO RECONSTRUCT IN 2021?



CURRENT CAPITAL SPENDING

CAPITAL REINVESTMENT (5 YEAR AVERAGE)	$3.28M
REINVESTMENT RATIO * (5 YEAR AVERAGE)	0.84%

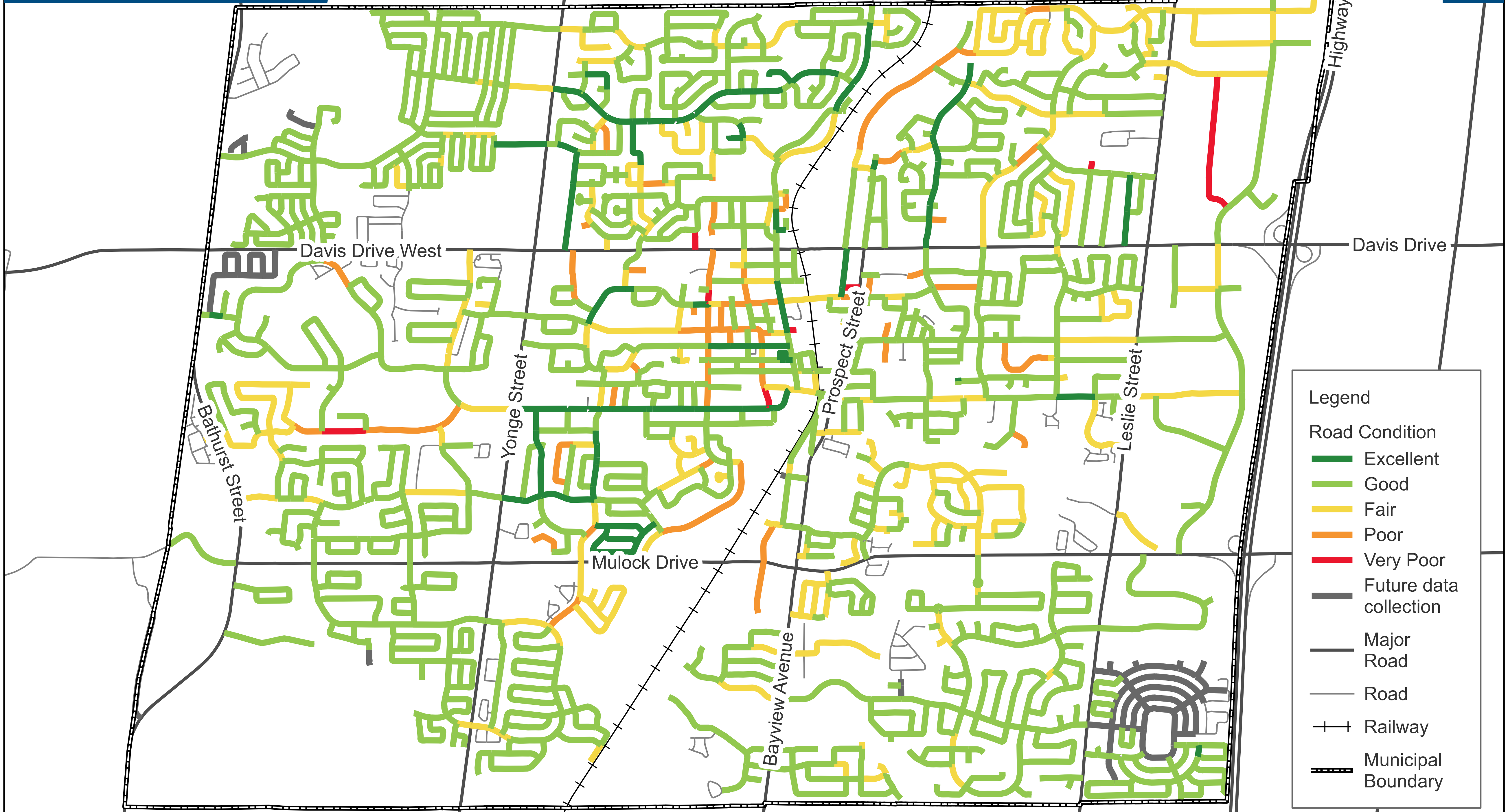
HISTORICAL ACTUAL REINVESTMENT RATIO IN ROADS
Percentage of Total Replacement Cost (%)



* **Reinvestment Ratio:** A financial measure indicating the Towns reinvestment into existing assets via the capital program. The Canada Infrastructure Report Card recommends a minimum annual reinvestment ratio of 1%

Town of Newmarket – 2021

Condition of Roads



Sources: Roads, Railway, Municipal Boundary - Data, Analytics and Visualization Services Branch, Corporate Services © The Regional Municipality of York, 2021; All other data - © Town of Newmarket, 2021. DISCLAIMER: The information depicted on this map has been compiled from various sources. While every effort has been made to accurately depict the information, data/mapping errors may exist. This map has been produced for illustrative purposes only. It is not a substitute for a legal survey. Printed: October, 2021.

Document Path:G:\Projects_PRO\CorporateServices\Finance\AssetManagment\Infra_Report_Card\Infra_Report_Card.aprx\Road_Condition_Report Map 8x14

CONDITION ASSESSMENT PLAN

Condition Assessment Plan for Roads

Concluding Know Your Assets, the Town will use condition assessments to increase knowledge of the assets, monitor performance, and refine financial projections. The Town's approach to condition assessments is described in the Concepts and Frameworks.

Strategy for Roads

The Town has an established history (10+ years) of conducting Road Needs Studies. With a new partnership with York Region established by Engineering in 2018, the methods of assessment and the data collected have become more advanced. This data is used by the Town in capital planning software. The Town will continue to leverage the York Region partnership to get affordable road needs studies.

Baseline conditions for the entire road network (100%) are already established, meaning the Town's first milestones are achieved (Figure 25). With subsequent inspections, year over year comparisons (currently completed once every two years) will allow the Town to identify trends that would inform capital financial planning.

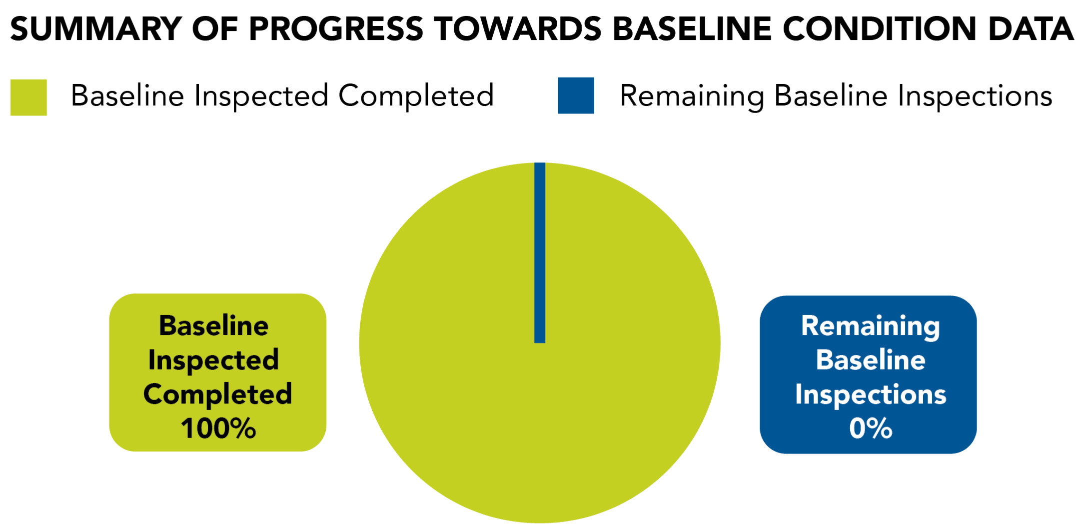


Figure 25 - Summary of Progress Towards Baseline Condition Data

Summary of Next Steps and Target for Roads

A summary of current achievements and future targets in the Town's Condition Assessment Plan is outlined below in Table 18. Opportunities to complete the next milestone in the condition assessment plan are captured as recommendations to conclude the Know your Assets section.

Table 18 - Summary of Current Achievements and Future Targets for Roads Condition Assessment Plan

<table>
<tr><th>Assessment Methods</th><th>Age-Based Assessment</th><th>Field Condition Assessment Baseline</th><th>Follow Up Condition Monitoring</th><th>Mathematical Modelling</th></tr>
<tr><td>Status</td><td>Complete</td><td>Complete</td><td>In Progress</td><td>TBD</td></tr>
<tr><td>Methodology</td><td>Age, Service Life</td><td colspan="2">Road Need Studies</td><td>TBD</td></tr>
<tr><td>Responsible Party</td><td>Asset Management</td><td colspan="2">Engineering (Capital)</td><td>Asset Management</td></tr>
<tr><td>Budget for Activities</td><td>n/a</td><td>Complete</td><td>Yes</td><td>n/a</td></tr>
<tr><td>Project Planning and Delivery Processes</td><td>n/a</td><td>*Complete*</td><td>*No*</td><td>n/a</td></tr>
<tr><td>Current Progress</td><td rowspan="3">Complete</td><td rowspan="3">100% Baseline Completed 2018/2019</td><td rowspan="2">**In Progress:** Re-Inspecting Every Two Years. Adjust frequency after multiple years of observation. Second set of inspection was completed in summer/fall 2021. pavement data.</td><td rowspan="2">Options will be considered starting in 2023 when there are at least 3 years of data (2018, 2021, and 2023)</td></tr>
<tr><td>Goal</td></tr>
<tr><td>Time to Achieve Goal</td><td>2022</td><td>*2023 +*</td></tr>
</table>

RECOMMENDATIONS

- Centralize assembled roads datasets for inventory, pavement condition, age, maintenance history, and traffic in GIS with a relational data model and distribute to service area and support function users.
- Address gaps in road data attributes such as missing road class, size measurements, roadside environment, etc.
- Review historical design standards to classify roads based on characteristics pertinent to useful life of the assets, such as drainage/sub-drains.
- Update record keeping methods to always use the Road Asset ID. Processes include: Traffic counts/studies, road cut permits, tangible capital assets, records of crack sealing and resurfacing, planning of new roads, minimum maintenance standards.
- Develop a common system of road classifications to be used corporately based on design standards, regulatory requirements, and other considerations.
- Create a data management plan for storing, reporting, and analyzing multiple years of pavement condition data.

MANAGE SERVICE DELIVERY

Asset management is not software, or a document. It is a way of doing business every day. Asset management requires processes to balance the services provided, the risks associated, and their cost. To make tradeoffs, visibility is needed into what is being done and why. Key takeaways will include:

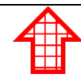
- What services do we provide?
- What activities support services, and who does what?
- What are the risks of our services?

LEVELS OF SERVICE ALIGNMENT

Manage Service Delivery is about the services asset deliver, the associated risks or opportunities, and activities/resources that are expended doing so. This is explained in the Concepts and Frameworks section. To begin the use of this framework, the Town has developed a set of measures for levels of service.

The levels of service measures are organized to create alignment between Town strategic objectives, a corporate goal for the service (e.g. roads), and the subsequent service criteria and technical/customer measures. Metrics have been listed and aligned before presenting the results in the following section. The result of this process is shown as follows (Figure 26).

Figure 26 - Roads Levels of Service Alignment

Legend			
Symbol	**Meaning**	**Symbol**	**Meaning**
	Trending up in the desired direction.		Trending down in an undesired direction.
	Trending down in the desired direction.		Trending up in an undesired direction.

Corporate Goal

Safe, well-maintained and managed transportation network for vehicles, cycling and pedestrians.

Customer Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Average pavement condition index of *local* roads (# / 100)	**71 / 100 PCI**	**70 / 100 PCI**	
Average pavement condition index of *collector* roads (# / 100)	**65 / 100 PCI**	**65 / 100 PCI**	*Trend not applicable*
Number of winter events plowed and salted (events per year)	**76 events**	**50 events**	*Trend not applicable*
Average daily traffic on *local* roads (number of vehicles)	**675 vehicles per day**	**675 vehicles per day**	*Trend not applicable*
Average daily traffic on *collector* roads (number of vehicles)	**3,724 vehicles per day**	**3,724 vehicles per day**	*Trend not applicable*
Number of customer complaints (includes quality, snow removal, and service issues - excludes bike lanes, traffic, etc.)	**1483 complaints**	**1481 complaints**	*Trend not applicable*

Technical Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Capital Renewal Reinvestment Ratio (5 year rolling average)	**0.83%** of replacement cost	**0.73%** of replacement cost	↓
Kilometers of road patrols completed per year	**8,614 km** inspected	**10,626 km** inspected	↑
Number of winter events cleared by snow plowing (events per year).	**19** events	**18** events	*Trend not applicable*
Number of winter events cleared by salt application only (events per year).	**57** events	**32** events	*Trend not applicable*
Kilometers of roads repaired by crack sealing per year.	**13.1 km** of road repairs	**0 km** of road repairs	↓
Kilometers of roads rehabilitated by resurfacing per year.	**3.9 km** of road repairs	**1.7 km** of road repairs	↓
Average utilized capacity on *local* roads (% / 1500 AADT)	**45%** of traffic capacity	**45%** of traffic capacity	*Trend not applicable*
Average utilized capacity on *collector* roads (% / 6500 AADT)	**57%** of traffic capacity	**57%** of traffic capacity	*Trend not applicable*
Percentage of *local* roads above planned capacity (% > 1500 AADT)	**9%** of local roads	**9%** of local roads	*Trend not applicable*
Percentage of *collector* roads above planned capacity (% > 6500 AADT)	**11%** of collector roads	**11%** of collector roads	*Trend not applicable*

Regulatory Levels of Service

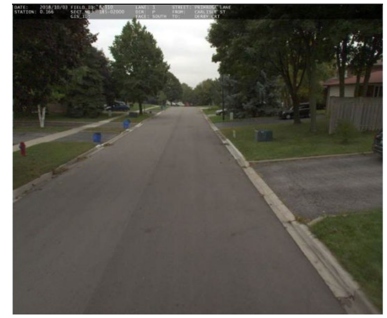
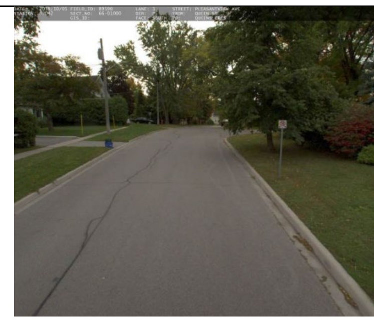
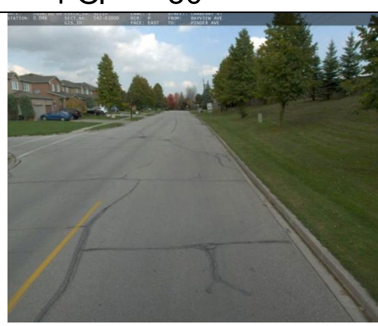
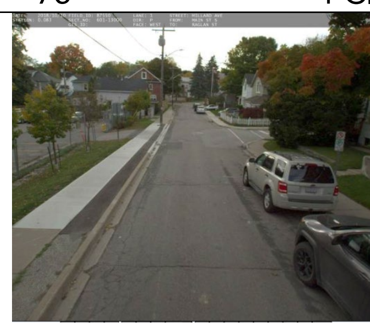
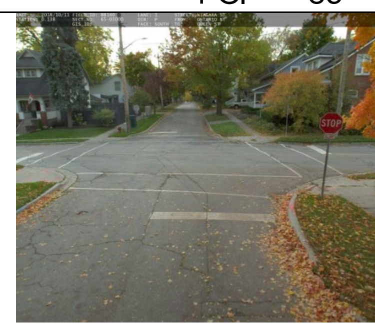
Measure	2019 Performance	2020 Performance	Improvement Trend*
Number of lane-kilometers of *collector* roads as a proportion of square kilometers of land area of the municipality.	**3.6 lane kilometers**	**3.6 lane kilometers**	*Trend not applicable*
Number of lane-kilometers of *local* roads as a proportion of square kilometers of land area of the municipality.	**9.5 lane kilometers**	**9.5 lane kilometers**	*Trend not applicable*
For paved roads in the municipality, the average pavement condition index value.	**69 / 100 PCI**	**68 / 100 PCI**	

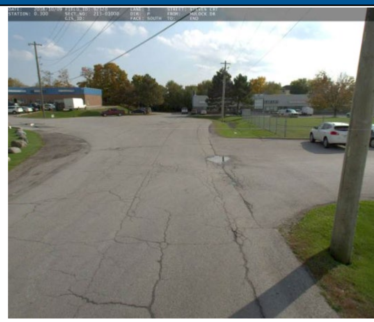
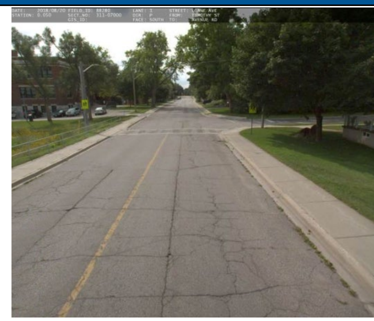
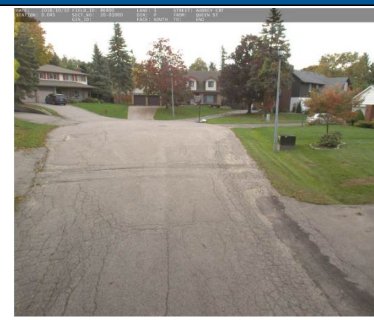
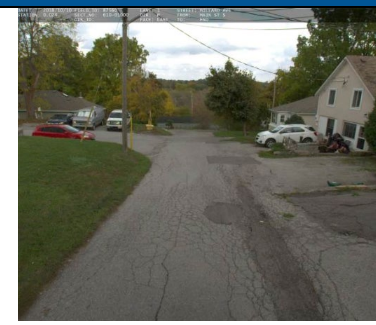
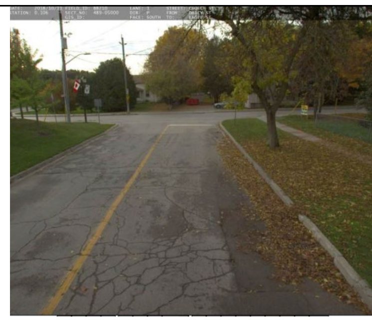
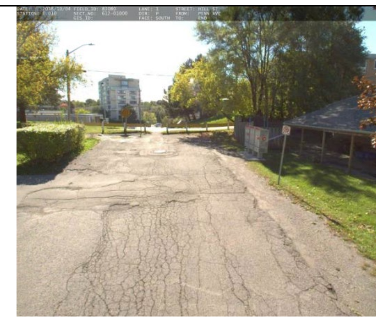
*Levels of service measures do not have endorsed targets. Trend observations are made on the basis of general recommendations related to the sustainability of assets, services, and finances.

ILLUSTRATION OF CURRENT LEVELS OF SERVICE

As shown in the State of the Infrastructure Report Card, the Town's assets exist in a variety of condition states. This was linked to the LoS Framework section, which showed how condition is a primary driver of service levels. Financial decisions about what asset conditions will be financed (shown in the Financial Strategy section) ultimately impacts LoS. To illustrate this impact, a collection of images has been collected depicting the differences in condition and LoS. See Table 19.

Table 19 - Condition and Level of Service

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets
Very Good ***PCI 100 - 90***	 PCI = ~90  PCI = ~90
Good ***PCI 90 - 65***	 PCI = ~80  PCI = ~75  PCI = ~70  PCI = ~65
Fair ***PCI 65 - 50***	 PCI = ~60  PCI = ~55  PCI = ~50

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets
Poor ***PCI 50 - 30***	 PCI = ~45  PCI = ~40  PCI = ~35  PCI = ~30
Very Poor ***PCI 30 - 0***	 PCI = ~25  PCI = ~20

LEGISLATIVE REQUIREMENTS

Legislative requirements are one way to define minimum levels of service requirements, as described in the Concepts and Frameworks section.

New Upcoming Legislative Requirements

At the time of AMP publication there are no upcoming regulatory requirements known for Roads that would impact the Town's levels of service or budgets.

Current Legislative Requirements

The Town currently operates within several regulatory requirements. As the regulatory environment changes, the minimum Level of Service the Town provides may also change. Current regulatory requirements are as follows (Table 20):

Table 20 - Current Regulatory Requirements

Legislation	Overview	Impact to Asset Management
Ontario Regulation 239/02 – Minimum Maintenance Standards	The minimum maintenance standards were developed to provide municipalities with a defence against liability from actions arising with regard to levels of care on roads and bridges. The Ontario Regulation 239/02, which came into force on November 1, 2002, contains the minimum maintenance standards. These standards set a minimum level of care for how roads are operated and maintained. PWS uses this Regulation to set LOS guidelines. Through patrolling, staff can identify issues that require repair, helping extend lifecycles, keeping the Town within the regulatory requirements and providing input on the type of future maintenance options which assist when it comes to budget preparation. This continual monitoring of assets is imperative for public safety and instills a "best practices" motto for PWS.	Minimum operations and maintenance frequencies or standards for: • Road patrolling • Snow removal • Timely debris removal • Annual retro-reflectivity assessment of signs and corrective action • Bike lane winter and summer maintenance • Paint markings • Potholes repairs • Pavement cracks • Road illumination and visibility • Signs • Traffic control signal systems • Bridge deck spalls/road surface discontinuities

Lifecycle Activities - Results

This section outlines the current business practices employed by the Town to manage assets and services throughout their lifecycle. At this early stage of implementing and improving asset management practices, the Town has not undertaken any studies to review current practices for lifecycle management or researched alternative options for service delivery. Where appropriate these have been identified as improvement tasks. The Town also wishes to quantify each activity to help determine tradeoffs and opportunities for levels of service adjustments, which will be completed as AM capabilities advance.

The Town's lifecycle activities and improvement opportunities for Roads are summarized in Table 21.

Table 21 - Lifecycle Activities and Improvement Opportunities for Roads

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construction of New Roads	Development Engineering	Recommendations captured in "Future Ready" chapter.
Operations, Maintenance, and Inspections	Regulatory Road Patrols	Public Works	
	Line Painting		Develop a road paint inventory.
	Pot Hole Maintenance & Asphalt Repairs		
	Debris Removal & Clean Up		
	Street Sweeping		
	Winter Patrols		
	Snow Plowing		Implement the RevItUp recommendations related to allocation of resources for winter control. A review of 2017-2019 actual work order charges by AM found that approximately 25% of staff time for winter control is attributable to non-roads staff.
	Road Salting		
	Snow Removal & Disposal		
	Winter Damage Inspections & Repairs		
	Road Cuts	Public Works	Review & update the process of road cut fees. Improve data management to track road cuts by road Asset ID.
	Condition Assessments	Engineering	
	Crack Sealing	Public Works	Apply capital-planning lens to planning and coordination of crack sealing with other road interventions.

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
	Traffic Data Collection	Engineering (Transportation)	Develop method for migrating traffic data from traffic software to the roads GIS data.
Renewal and Rehabilitation	Micro-resurfacing	*To Be Determined*	Budget for and conduct a micro-surfacing pilot program. Monitor and report on suitability for use in Newmarket.
	Overlay / Mill & Overlay	Engineering	Develop corridor management strategies to plan road interventions around underground assets.
	Two Lift Mill & Overlay		
	Full Depth Reclamation		
Replacement	Full Reconstruction		

RISK

Risk is a key asset management tool, and works on a spectrum of asset-level, service-level, and corporate-level spectrum of considerations. This is described in the Concepts and Frameworks section.

The Town currently does not have a formalized, holistic approach to risk management. However, some existing activities and components of service delivery include risk elements and there are multiple examples of using risk-based approaches to support decision-making. There is also a desire to continue with improved risk practices as part of asset management planning and work towards regulatory requirements for service level risk analysis. To meet this need, **a 3 Step Development Plan is recommended**.

The 3 Steps reflect the types of risks – corporate, service level, and asset level, and follows the international standard for risk management (ISO 31000) (Table 22):

Table 22 - 3 Step Development Plan for Risk Management Practices

Recommendation Phase	Improvement Measures
Step 1 – Near Term **Goal of this Phase:** Ensure existing risk components are consistent and broadly applied.	1.1 Review and update budget decision package form and process with risk and service-based considerations. COMPLETE 1.2 Establish a criticality rating methodology that is applicable across all asset classes and apply it to all core assets. COMPLETE 1.3 Assign roles and responsibilities, including accountability, for risk management in the Town – Establish Council and leadership's accountability for ensuring risk is considered and incorporated into all levels of decision-making processes within the Town over time.
Step 2 – Mid Term **Goal of this Phase:** Formalize a Risk Management Framework that is directly integrated within all relevant Town	2.1 Development of a risk management policy that is endorsed by Council, and a corresponding strategy for implementing the policy across the Town. 2.2 Develop a risk management framework to assess asset criticality, asset risk, service risks, and risks to achieving corporate (strategic) goals.

Recommendation Phase	Improvement Measures
processes. It is important that the framework is supported by senior leadership to ensure it adds value and effectively impacts decision-making.	2.3 Establish reporting processes to keep the Town's management teams and Council aware of critical risks, and their associated mitigation actions. 2.4 Develop service level risk registers for each area (roads, water, etc.) that can support a corporate risk register that may be monitored by senior leadership and used to support the management of service delivery.
Step 3 – Long Term **Goal of this Phase:** Leverage risk to be a core capability for the Town.	3.1 Establish a regular review process for identified risks as well as the Town's risk framework. 3.2 Employ risk as an optimization objective for funding allocation and other strategic decision-making. Once risk is strongly embedded within the Town's processes, the Town may wish to employ software and other useful tools to evaluate risk and funding allocations to minimize residual risk accepted by the Town.

Asset Level Risk

As progress towards completing Step 1 of the 3 Step Development Plan for risk management, asset level risk has been assessed for the Town's Roads using a risk framework. The results of this process are shown as follows:

Risk Inputs	Likelihood of Failure (LoF)	Consequence of Failure (CoF)
Road Risk Factors Assessed	- Pavement Condition (2019) o Surface distress o Ride comfort	- Road class - Traffic count - Number of lanes - One-way streets - Land use - Proximity to stakeholders like schools and hospitals - Bus routes - Bike lanes

Roads Risk (Consequence X Likelihood of Failure) Profile

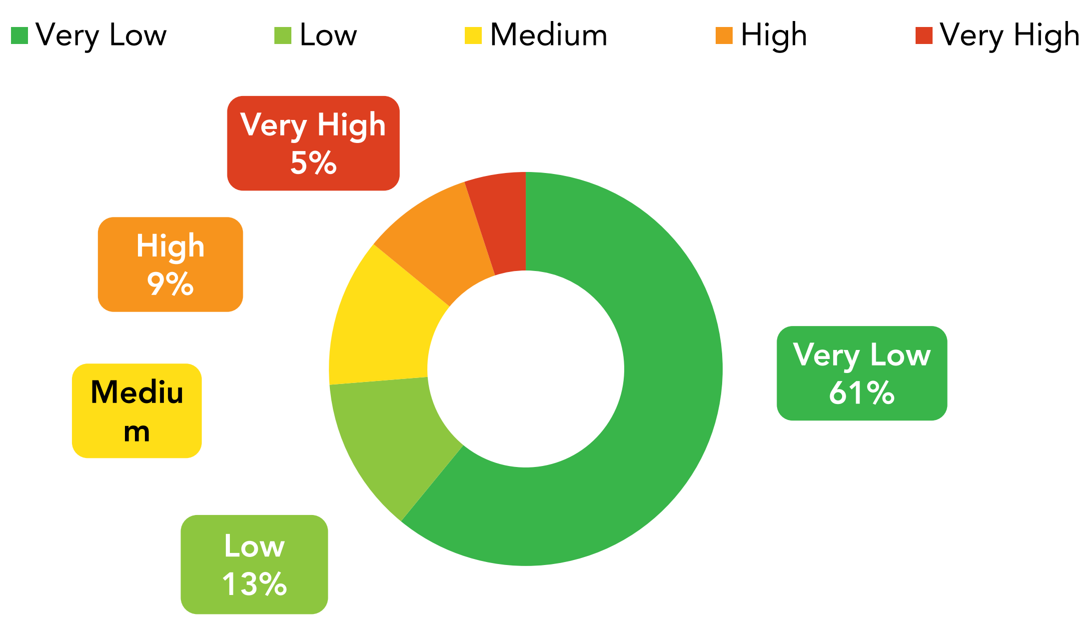


Figure 27 - Roads Asset Risk Profile

FUTURE READY

What was once a small but thriving Town, today Newmarket is a desirable and affordable community. While the future is bright, trends like increasing service expectations, urbanization, and climate change are challenging the status quo. The future will change how the Town manages assets. Key takeaways will include:

- Impacts of growth on assets and budgets.
- Vulnerabilities and adaption and mitigation approaches to climate change.
- Aligning master plans with the management of existing assets

GROWTH FORECAST

Identified Growth Impacts on Road Assets

1. **Urban expansion**: 14.3 km of new roads will be added to Newmarket over the next four years due to the assumption of Sundial, National Homes, Glenway, and Forest Green subdivisions into the Town's portfolio. There is an additional large area in the South West (Shining Hill) that is expected to be developed just outside of the timeframe of the AMP, but the timing could be brought forward.

2. **Urban intensification:** No roads are planned to be added or widened over the AMP timeframe – however, there is planned intensification on Main Street and the urban secondary plan area, generally located along the Davis Drive corridor between Upper Canada Mall and Huron Heights Drive and along the Yonge Street corridor between the Town's northerly boundary and Savage Road. Although the quantity and nature of assets required for these fully built-out plans has been estimated, full built-out is not expected within the AMP timeframe. However, a staged approach may be required for asset upgrades. Such an approach has not yet been detailed. Once it has, these changes should be incorporated into the AMP.

3. **Changing standards**: No changes to the road network have been identified as a result of changing design standards or regulations, such as bridge load carrying capacity regulations. However, potential changes due to technology and resource philosophies have been identified in Table 24. Standards could also change in response to climate change – for example, intense storm frequency could prompt changes in road designs with higher curbs or improved road slope to provide enough major storm capacity.

4. **Climate change:** No specific changes to the road asset portfolio to mitigate against the effects of climate change have been identified yet; however, a high-level flood resilience assessment of Town-owned infrastructure has been undertaken for roads. The next phase of study would be to assess the risks based on existing mitigation measures, and then identify assets for upgrade or development based on flood vulnerability. If such a study is completed and identifies asset improvements, the AMP should incorporate those new assets. The Town's maintenance regime will also need to be analyzed – for example, an increased number of freeze/thaw cycles could damage infrastructure requiring more crack sealing, resurfacing, etc.

The following (Table 23) summarizes these asset increases by length of road added to the portfolio each year. The roads planned over the AMP timeframe are entirely due to urban expansion, as noted previously. However, for asset management purposes it is important to note that there is a substantial gap in identified growth assets due to step changes in urban intensification, as well as gaps in identifying growth assets required for changing technology, climate, and resources – and associated changes in standards.

Table 23 - Road Length Increase to 2032 and Beyond

ROADS		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	2032+
New Assets	Local Roads (km)	1.4	1.2	10.9							0.8	**14.3 km**	5.9
	Collector Roads (km)	0.4	0.4									**0.8 km**	8.5
Capacity Increase (Widening)	Local Roads (km)											**0 km**	1.8 + 0.5

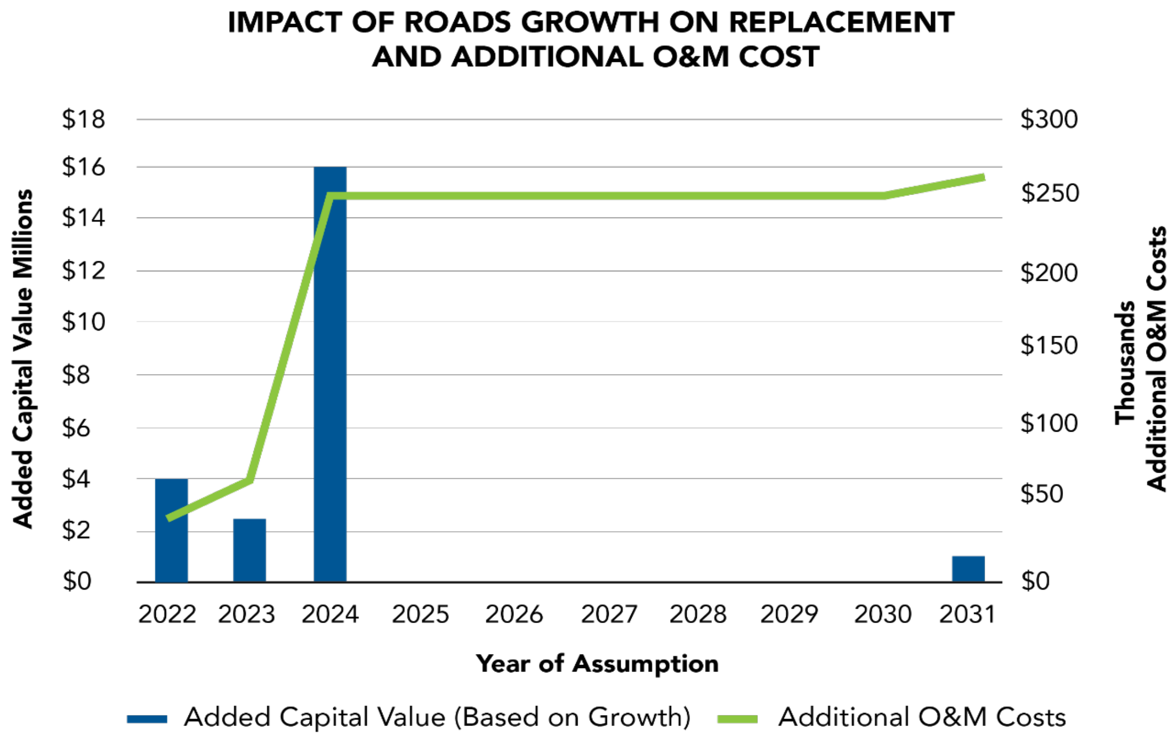


Figure 28 - Impact of Roads Growth on Replacement and Additional O&M Cost

Historical Context of Growth

Since 2016, the length of roads assumed by the Town had varied between 0 and 7km per year (see Figure 29). In contrast, in 2024, the quantum of assumed assets may be 11km, or 50% higher than in any year in recent history. Some of these 11km may be assumed earlier, which would ease the burden on the operations team working the new assets into their plans.

An additional 14km of roads are expected to be assumed beyond 2032 – however, due to the long timeframe, there may be some earlier works during the period of this AMP. The timing of the assumption of these new assets should be reviewed in the next three years.

Figure 28 shows that the asset base is expected to continue growing, which means the Town will need to continue to increase investments in O&M costs.

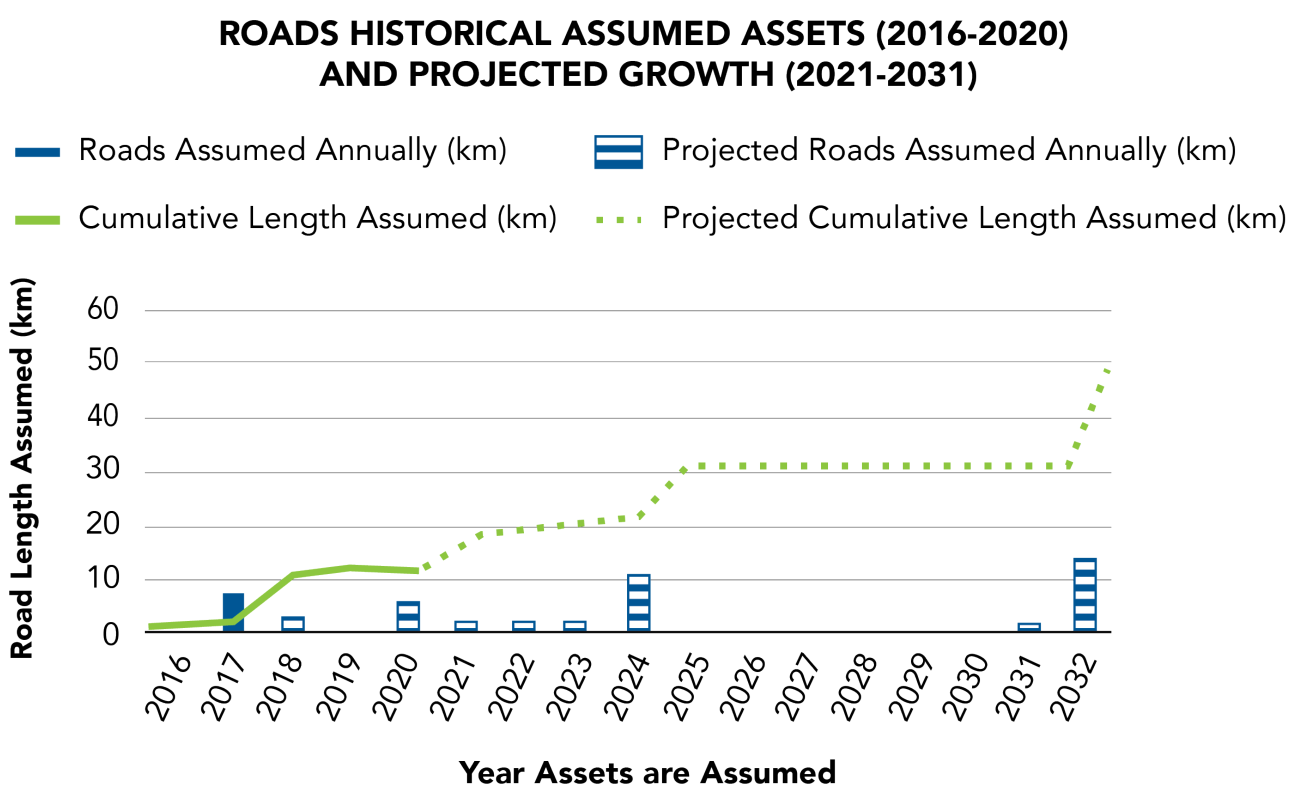


Figure 29 - Roads Historical Assumed Assets and Projected Growth to 2032

Results of the Flood Risk Assessment

Three roads assets received a very high Hazard-Vulnerability Rating. Meanwhile, 9 assets received a high Hazard-Vulnerability Rating, and 259 assets received a medium Hazard-Vulnerability Rating, and 1347 received a low Rating (see Figure 30). This means that a majority (or 83%) of road segments received a low Hazard-Vulnerability Rating. Results of the climate change flood resilience assessment for roads are as follows:

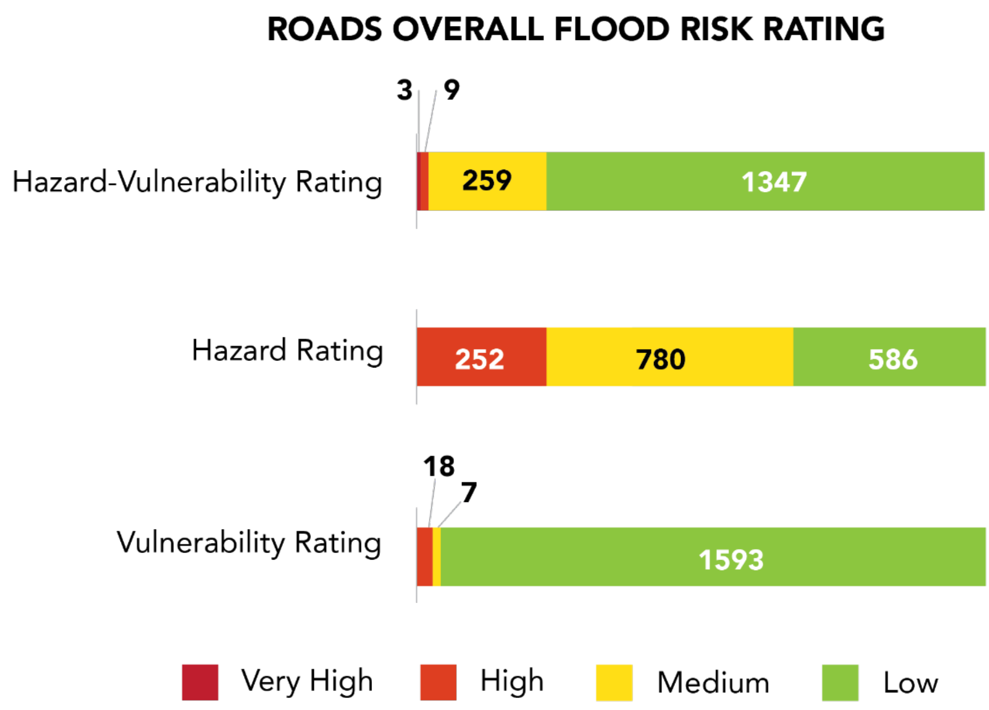


Figure 30 - Roads Overall Flood Risk Rating

Table 24 - Implications of Future Trends on Roads

Trend category	Trend	Implications for the management of our assets (to maintain service levels)	Growth	In existing plans?
Society	Increased health & sustainability focus	Upgrade roadways to accommodate more forms of micro-mobility Reduce road width as bike lanes and wider sidewalks are introduced.	√	
	Urban intensification	Upgrade capacity of existing assets to accommodate more users in existing areas	√	√
	Urban expansion	Install additional assets to accommodate new users in new areas	√	√
	Increasing environmental concern	Reduce salt and sediment applied to roadway.		
Technology	More electric vehicles	Install EV charging stations- This is a non-core asset and has not been assessed further	√	
	Introduction of connected and automated vehicles	Sensors, other assets to accommodate new connectivity technology Introduction of connected and autonomous vehicles may require upgrades to existing infrastructure and/or more frequent operation and maintenance activities like line painting and snow clearing.	√	
Resources	Zero carbon legislation / standards / policies	Use materials with lower whole-of-life embedded carbon. Material cost and durability will be affected. May require different maintenance regime and new skills.		

Trend category	Trend	Implications for the management of our assets (to maintain service levels)	Growth	In existing plans?
	Reduced waste production	Use lower-waste materials. May require different maintenance regime and new skills. For example, the new re-use of excess soil regulations in Ontario.		
	New materials	New materials may become available that change the asset lifecycle and how it is managed.		
Climate	Hotter weather	Use more heat-resistant materials. May require different maintenance regime and new skills. Or, warmer winters that increase the frequency of melt events.	√	
	Higher rainfall intensity (handle higher rainfall events)	Upgrade assets for greater protection. May require different maintenance regime and new skills.	√	

RECOMMENDATIONS

- Establish an approximate timeline for the Urban Centers secondary plan.

FINANCIAL STRATEGY

The Town has made an important investment in infrastructure, and attention must now be paid to securing this investment. The sustainability of Town infrastructure depends on effective management and ensuring the optimal use of limited funds. Sustainability will require adjusting revenue and services. In this section:

- Current financial position and level of service trends.
- Scenarios for managing levels of service, risk, and funding gaps.

ESTIMATED FUTURE BUDGET

The approach to financial planning for core assets is summarized in Concepts and Frameworks section and the corporate overview for the results of this process are provided in the Financial Strategy section. This section only provides details pertinent to the service area under consideration.

Estimated Future Budgets Based on Current Position and Plans

Using the financial background and current financial position, the Town's current budget was forecasted to support long term financial planning. These values were used for an assessment of the balance between budget and future renewal costs, and will be subject to internal processes and the annual budget process each year as approved by Council.

Table 25 - Estimated Future Budgets based on Current Position and Plans

Year	Roads and Bridges	Federal Gas Tax Allocation*	**Total**
2021	$1,145,947	$2,032,789	**$3,178,736**
2022	$1,350,391	$2,114,914	**$3,465,305**
2023	$1,560,969	$2,157,212	**$3,718,181**
2024	$1,777,864	$2,200,356	**$3,978,220**
2025	$2,001,266	$2,244,363	**$4,245,629**
2026	$2,231,370	$2,289,251	**$4,520,621**
2027	$2,468,377	$2,335,036	**$4,803,413**
2028	$2,712,494	$2,381,736	**$5,094,230**
2029	$2,963,935	$2,429,371	**$5,393,306**
2030	$3,222,919	$2,477,958	**$5,700,877**

**Federal gas taxes were allocated to roads and bridges for modelling in the AMP, but this practice is subject to the Reserve and Reserve Fund Review and the annual budget process. Roads and bridges are combined due to use of a shared reserve (recommendations to develop policies for separating or allocating between these assets have been made).*

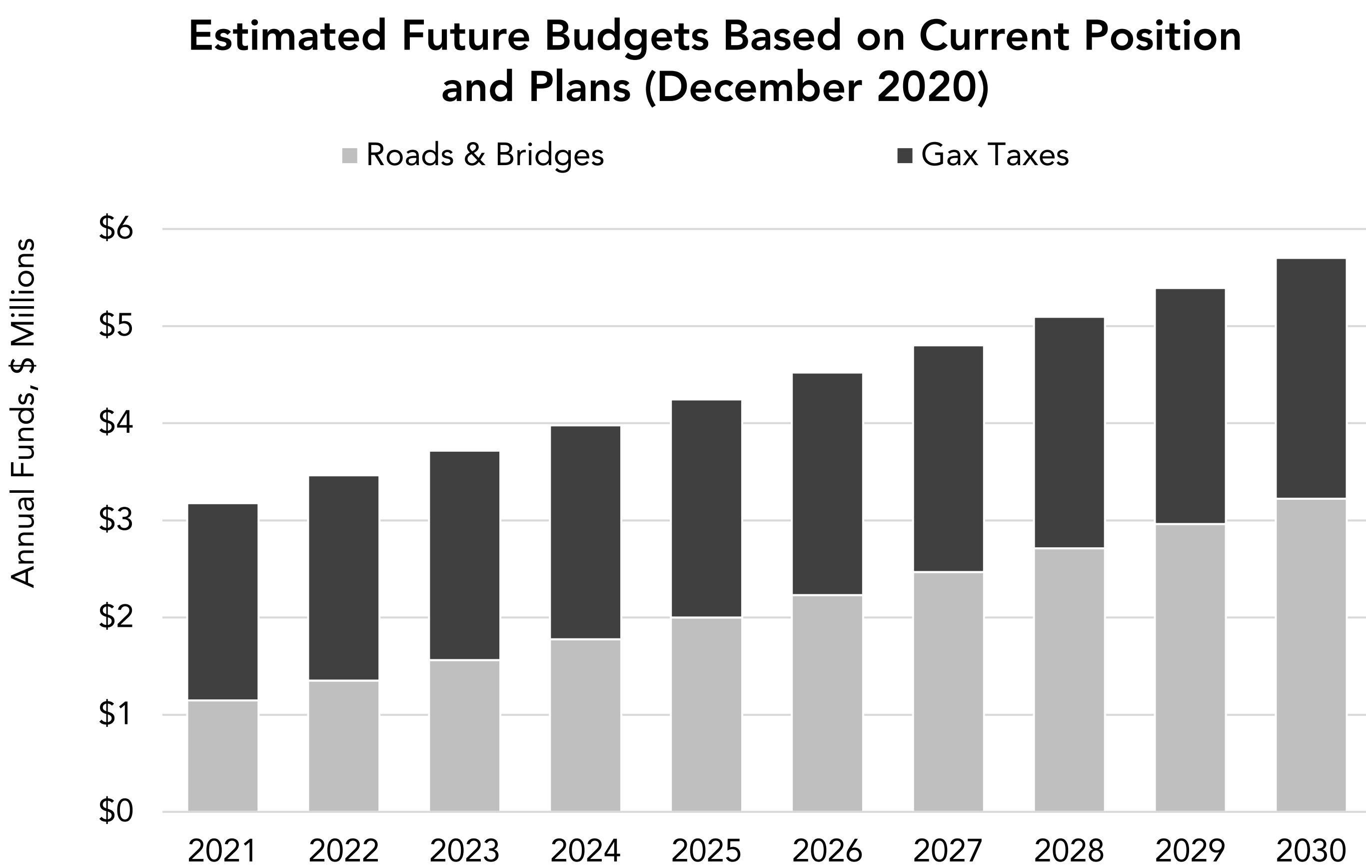


Figure 31 - Estimated Future Budgets Based on Current Position and Plans (December 2020)

Roads Scenario Methodology

To model the investment need, consolidation of inventory, replacement cost, condition, levels of service, risk, and lifecycle activities as shown throughout the AMP was completed. The three scenarios detailed in the corporate Financial Strategy were executed, along with the following minimum constraints:

Table 26 - Modelling Minimum Constraints

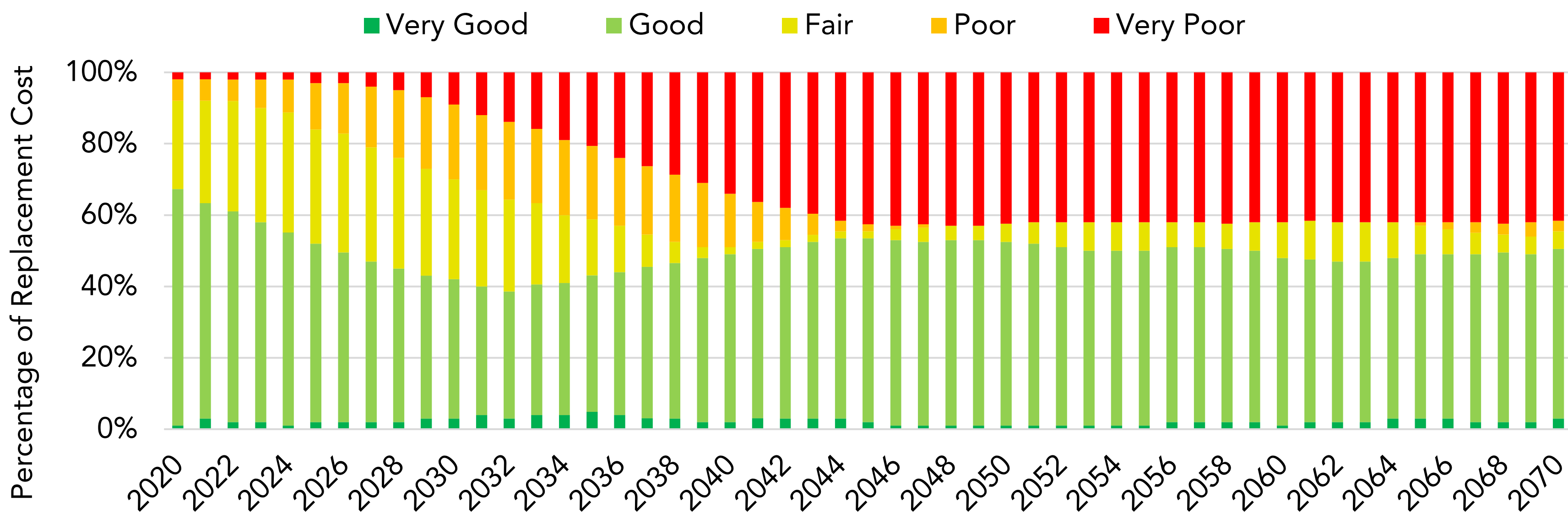
Asset	Service Level Targets
Local Roads	No more than 5% of the network can be in Very Poor Condition No more than 10% of the network can be in Poor Condition, or worse.
Collector Roads	No more than 5% of collector roads can be in Poor Condition, or worse. Collectors are not permitted to deteriorate into a Very Poor Condition

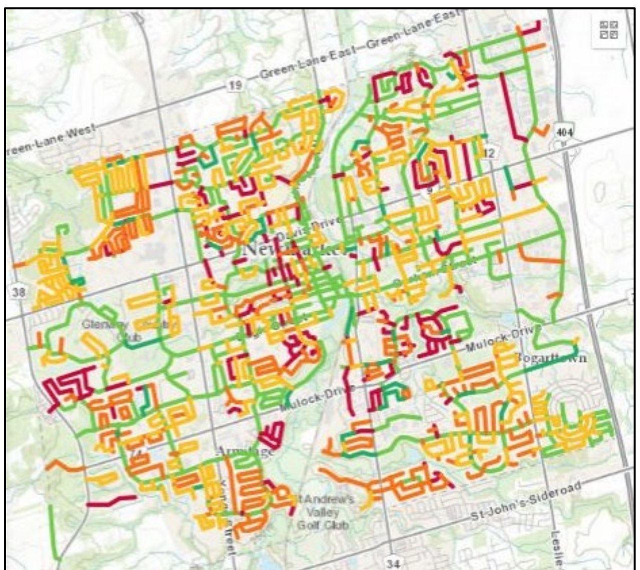
These constraints are minimums before scenario parameters are applied, in order to capture the current Town approach to maintaining a minimum state of good repair.

Roads Scenario Results

The following figures illustrate how the condition of roads are forecasted to change over time under all three investment scenarios.

ROADS - CURRENT BUDGET SCENARIO

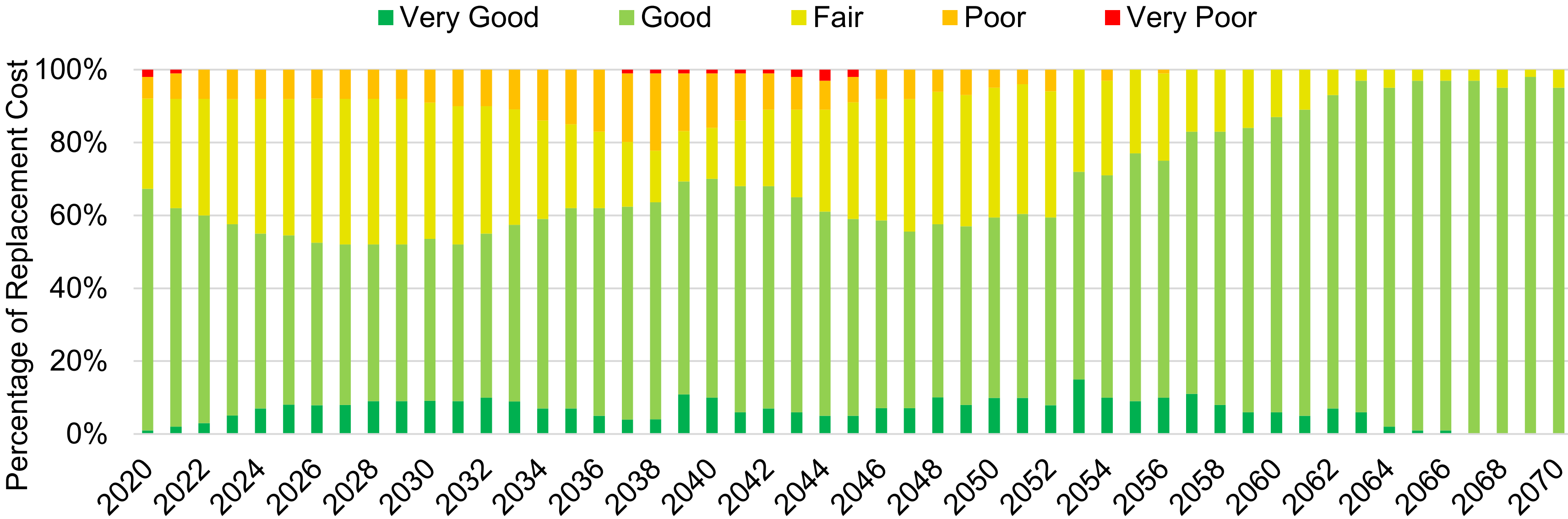


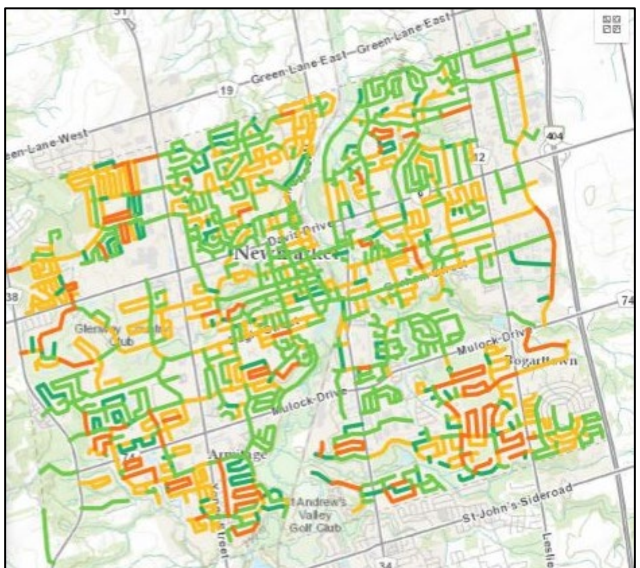


10 Year Forecast under Current Budget Scenario

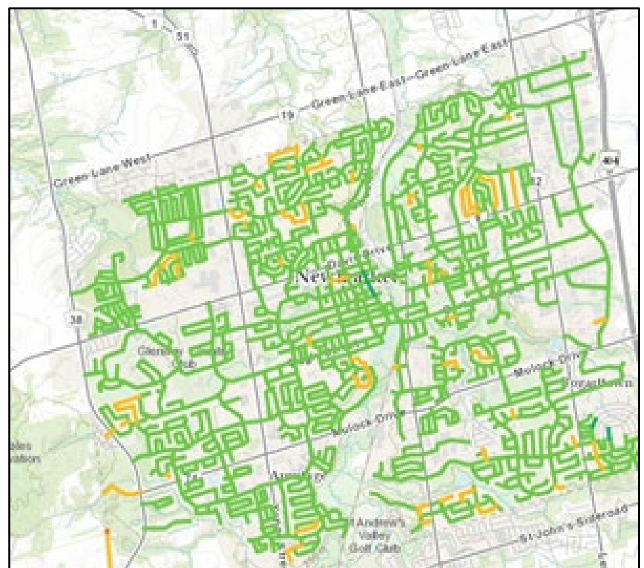
50 Year Forecast under Current Budget Scenario

ROADS - CONSTRAINED BUDGET SCENARIO



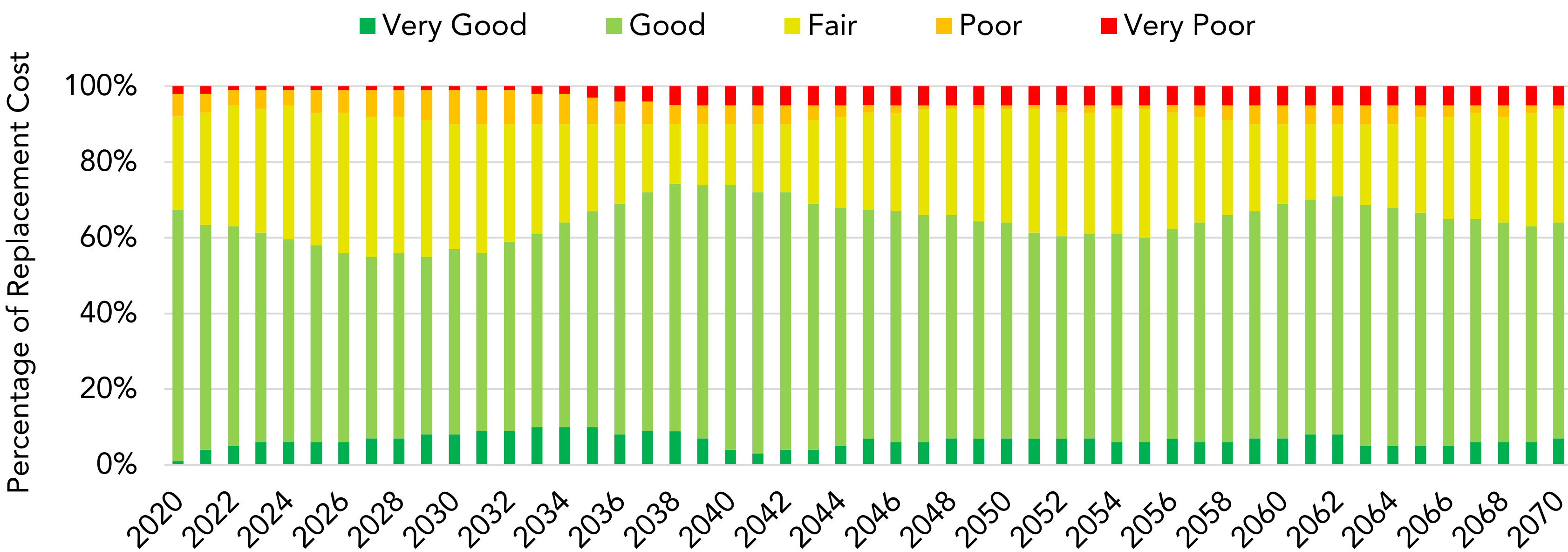


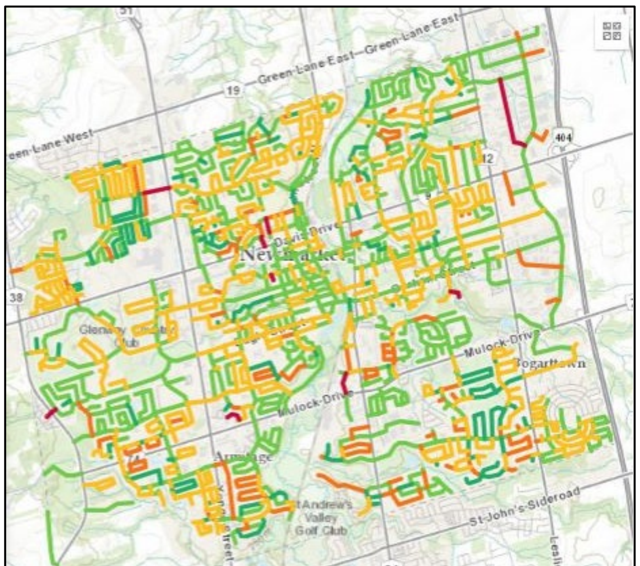
10 Year Forecast under Constrained Budget Scenario



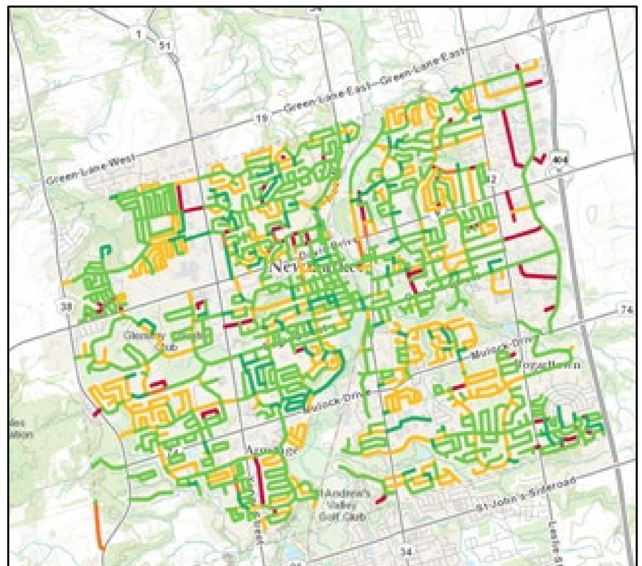
50 Year Forecast under Constrained Budget Scenario

ROADS – SERVICE LEVEL DRIVEN SCENARIO





10 Year Forecast under Service Level Driven Budget Scenario



50 Year Forecast under Service Level Driven Budget Scenario

Several observations are important to note about the forecast:

- If investment continues at current levels, service levels will not be achieved, and the network will be in much poorer condition than it is currently.
- Under the service driven budget scenario, service level targets are achieved in every year of the analysis period.
- Under the constrained investment scenario, overall condition over the long term improves substantially, and there are no segments in poor or very poor condition after 2055.
- Despite straying from service level targets for a period of time, the mixture of interventions under the constrained scenario allows for an overall better network condition over the long term as compared to the Service Driven based investment scenario.

It is for these reasons that the constrained investment scenario was selected for future planning for this asset class. The significance of the constrained investment scenario for the Town's core assets is explained in the Executive Summary and the Financial Strategy section.

Long Term Trend and 10 Year Budget

The following figure summarizes the investment forecast for roads under the constrained scenario.

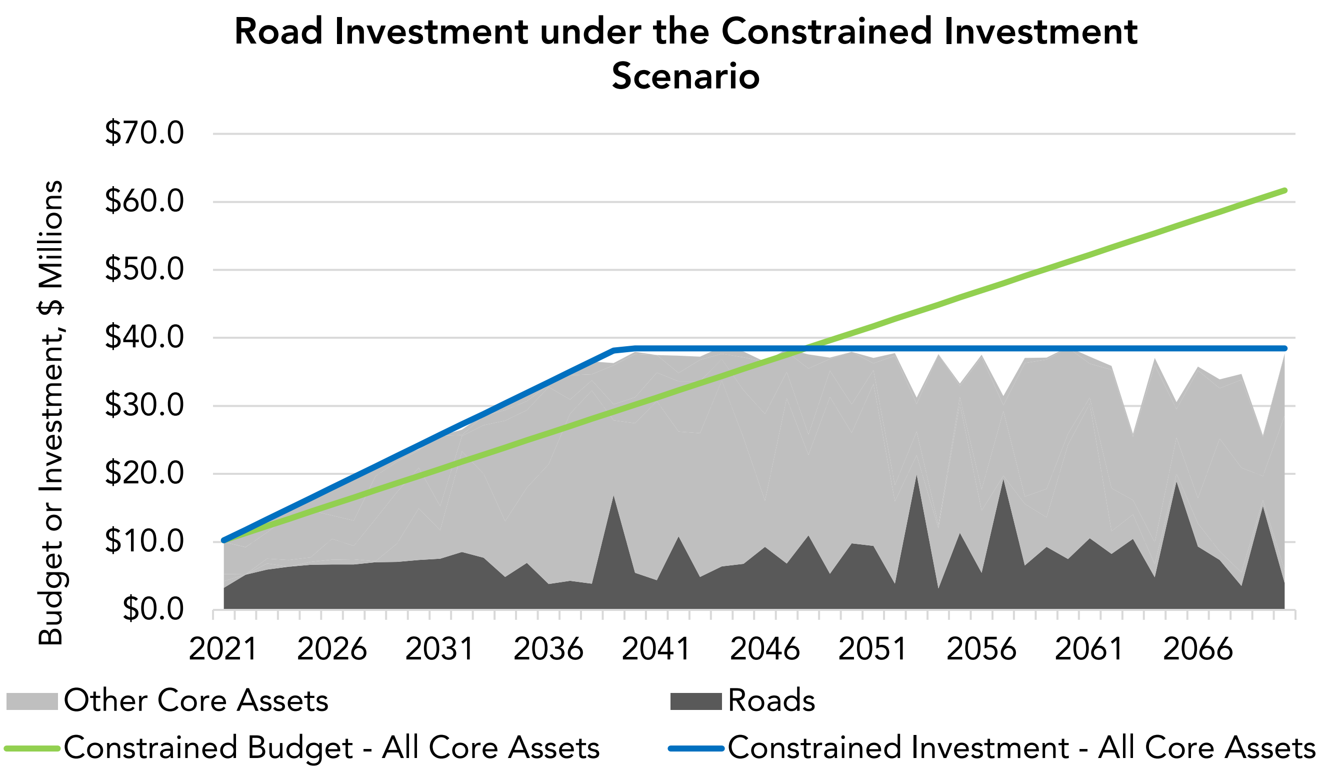


Figure 32 - Road Investment under the Constrained Investment Scenario

The annual average investment over the next 50 years is $7.9M for road pavements (in 2021 dollars). This is substantially higher than current levels of investment. Table 27 summarizes the proposed investment in road pavements over the next 10 years based on the constrained scenario as well as the Town of Newmarket's current 10-year reserve contributions for this asset class. Table 28 summarizes the intervention types that make up the investment in this asset class.

Table 27 - Proposed investment and a comparison to the Town's existing budget for Roads

Year	Constrained Scenario Proposed Investment	Town's Current Reserve Contribution (plus Gas Tax)	Difference
2021	$3.24M	$3.18M	***+$0.06M***
2022	$5.16M	$3.46M	***+$1.70M***
2023	$5.95M	$3.72M	***+$2.23M***
2024	$6.34M	$3.97M	***+$2.37M***
2025	$6.63M	$4.24M	***+$2.39M***
2026	$6.70M	$4.51M	***+$2.19M***
2027	$6.69M	$4.80M	***+$1.89M***
2028	$6.99M	$5.09M	***+$1.90M***
2029	$7.08M	$5.39M	***+$1.69M***
2030	$7.36M	$5.70M	***+$1.66M***
Total	**$62.14M**	**$44.06M**	**+$18.08M**

Table 28 - Proposed interventions that make up the recommended investment for Roads

Road Treatments	Resurfacing	Full Depth Reclamation	Reconstruction	Total
2021	$44,000	$970,000	$2,230,000	**$3,244,000**
2022	$0	$1,580,000	$3,584,000	**$5,164,000**
2023	$0	$4,277,000	$1,669,000	**$5,946,000**
2024	$16,000	$5,155,000	$1,170,000	**$6,341,000**
2025	$33,000	$6,594,000	$0	**$6,627,000**
2026	$38,000	$6,663,000	$0	**$6,701,000**
2027	$12,000	$6,681,000	$0	**$6,693,000**
2028	$8,000	$6,982,000	$0	**$6,990,000**
2029	$5,000	$7,070,000	$0	**$7,075,000**
2030	$0	$7,356,000	$0	**$7,356,000**

FORECASTED OUTCOMES

The constrained scenario was established to strike a balance between the long-term investment requirements to achieve service level targets, the pace of increasing the Town's capacity for program delivery, as well as the ability to fund the required program through increased taxes, rates and infrastructure reserves. Under current investment levels, the risk of failing to meet service level targets will increase within the next 5-10 years (See Figure 33 below), when service levels are forecasted to not be achieved. Several points are worth noting about the recommended constrained investment scenario:

- The constrained budget scenario is forecasted to have periods when a portion of the road network is in poor condition that exceeds service levels (Peaking around 2038).

- The elevated levels of poor condition forecasted in this scenario can be considered a period of higher risk of not achieving target service levels between 2030 to 2045.

- This does not translate to road failure or unavailability. It does however mean that condition targets above, may not be consistently achieved during this period. Practically, this means roads in a poorer condition than targeted by Town, and reduced quality in terms of roughness, rutting and surface distresses visible in the pavement structure.

Service outcomes are always an equilibrium between investment, service level targets and risk of service delivery. If the forecasted outcomes are considered unacceptable, increased investment, or changes in service level targets are ways to impact service risk.

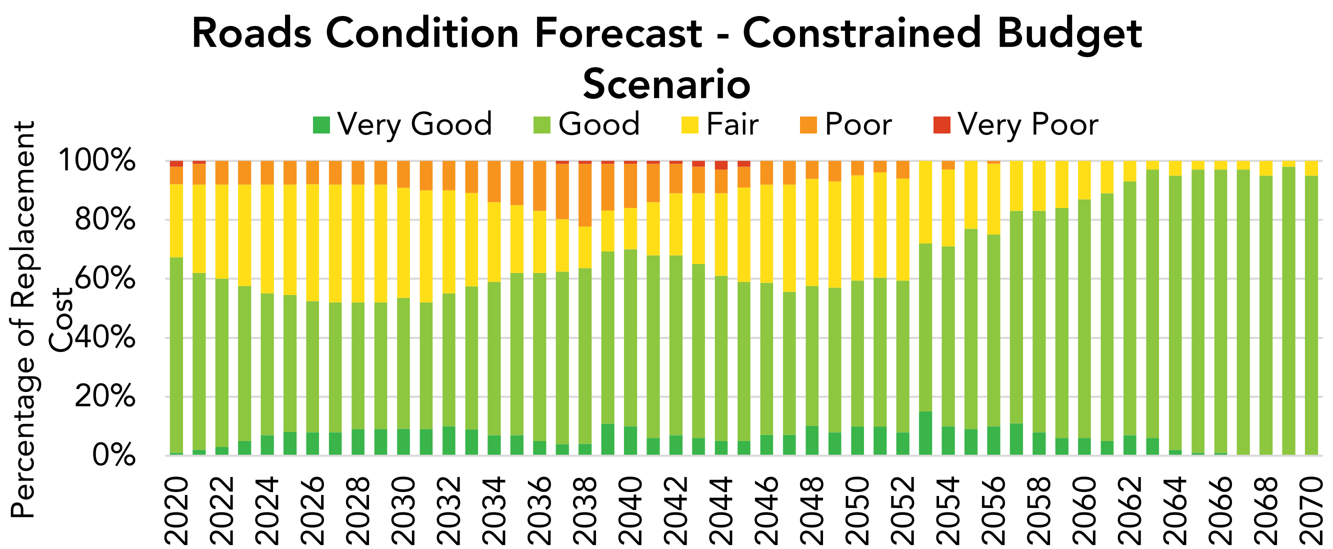
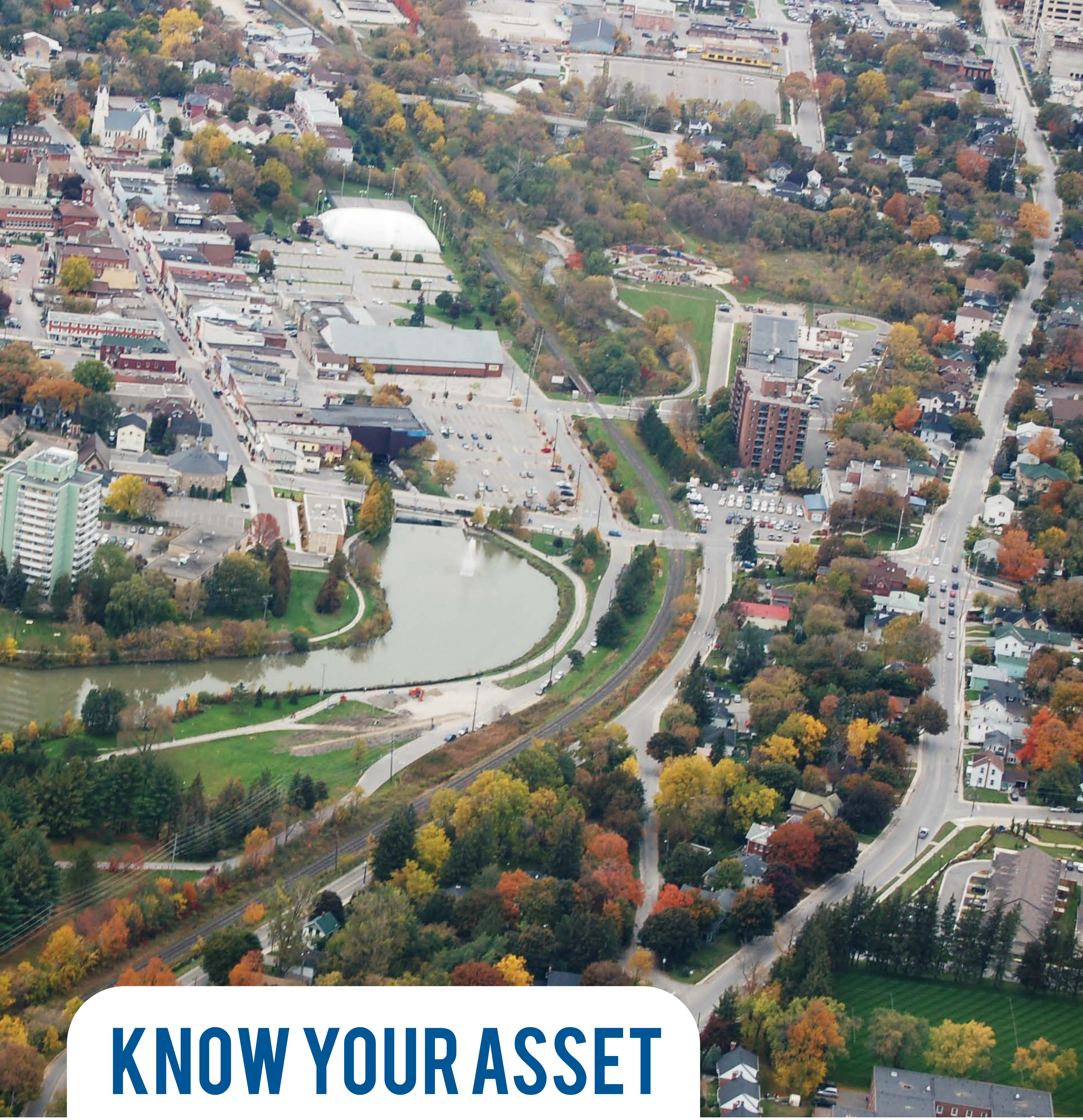


Figure 33 - Higher risk of not meeting service level targets - Roads with Constrained Budget Scenario

BRIDGES ASSET MANAGEMENT PLAN



KNOW YOUR ASSET

The Town is responsible for $2 Billion+ of assets. Assets exist to provide services to the community. Their ability to deliver services depends on Town stewardship and informed decision making. As assets age they have to be replaced. Key takeaways in this section will include:

- What do we own?
- What condition is it?
- What would it cost to replace?

DATA GAP ANALYSIS

Asset data is the first part of Know Your Assets and forms the foundation for the State of the Infrastructure. For a review of this approach, see the Concepts and Frameworks section. Using the requirements of a standard asset registry, a gap analysis of the Bridges asset registry is provided as follows (Figure 34). There is a slight gap in asset type, material, size and age data.

When viewing subsequent sections of the asset management plan that use asset data, consideration should be given to the data gaps described here.

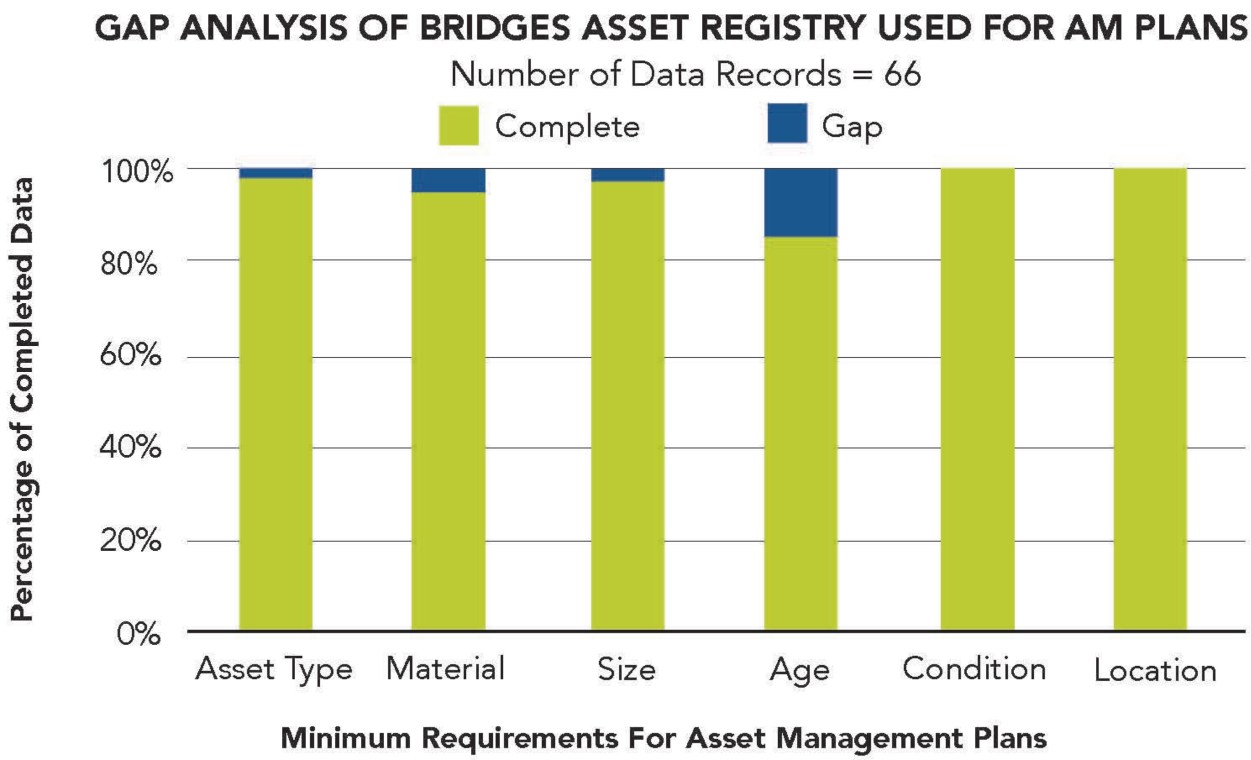


Figure 34 - Gap Analysis of Bridges Asset Registry Used for AM Plans

CONTEXT FOR THE STATE OF THE INFRASTRUCTURE

The State of the Infrastructure will combine inventory quantities, replacement costs, and condition ratings to provide a detailed breakdown of the Town's assets.

What Do We Own? The inventory has been organized in a hierarchy to reflect the asset types providing the service, and to support reporting and planning. The Town's bridge inventory follows the provincial definition of a span greater than 3 meters. "Non-structural" bridge and culvert assets fewer than 3 meters in span are not included in the bridge inventory (non-structural culverts belong to stormwater and non-structural pedestrian crossings belong to parks or sidewalks).

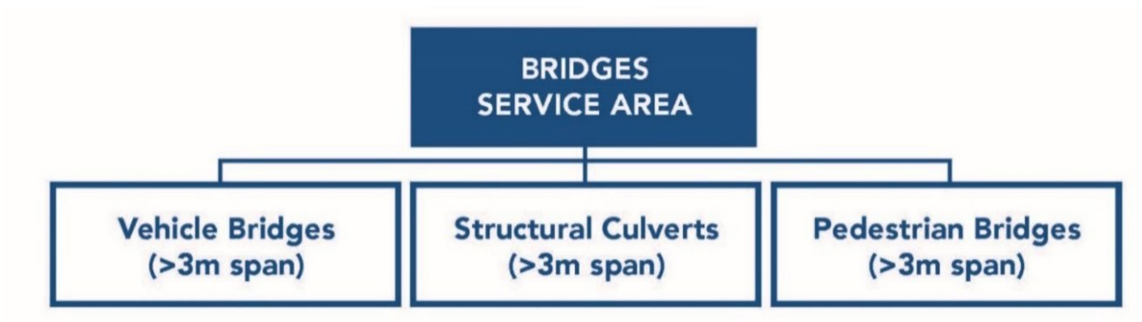


Figure 35 - Bridges Service Area Classification

This inventory will be used for replacement valuations, service delivery, operations and maintenance, growth updates, capital planning, and financial reporting.

What Does It Cost? The total replacement cost for bridges is ~$46 Million (2021 dollars). This is equivalent to 1.8% of all Town-owned assets, and 2% of the core asset subset reported through the 2021 AMP.

What Condition Is It? Using the method of most Infrastructure Report Cards, assets are assigned condition ratings on a 5-point scale. Ratings are assigned based on Bridge Condition Index, as measured by engineering specialists under a provincially legislated protocol.

Table 29 - Bridge Condition Index

Condition Ratings				
Very Good	Good	Fair	Poor	Very Poor
100 – 85	85 – 70	70 – 50	50 – 30	30 – 0
Bridge Condition Index (BCI), British Columbia Method*				

**The Town maintains all regulatory requirements and practices related to Ontario Structural Inspection Manual inspections and reporting, however a consultant review of Town conditions found that British Columbia's method of calculating BCI was a better indicator of state of good repair for the Town's assets.*

Bridge Infrastructure Report Card

Newmarket

INFRASTRUCTURE PURPOSE

The Town's bridges provide a safe passage to vehicles, cyclists, and pedestrians. Some also serve as local landmarks in Town. Each structure is inspected every two years as mandated by the Province of Ontario.

REPLACEMENT COST: $46 Million

AVERAGE NETWORK CONDITION FAIR

INVENTORY
Vehicle Bridges: 13
Foot Bridges: 36
Structural Culvert: 18

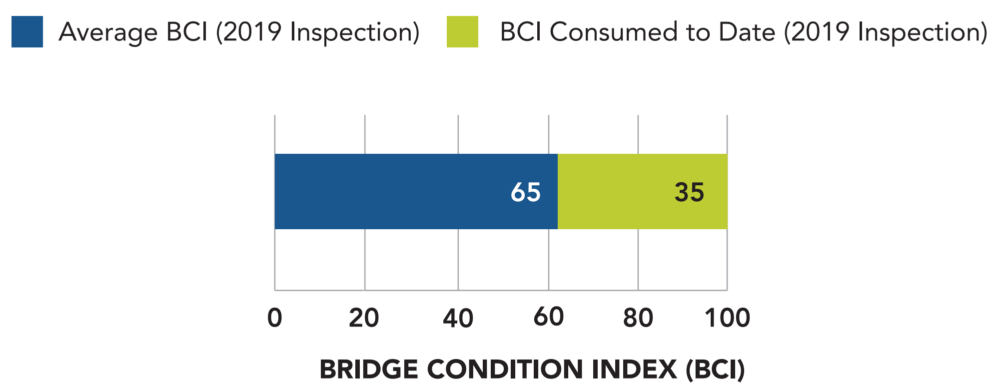
DETAILS:

Life Expectancy

To date, our bridges have consumed on average 63% of its expected lifespan, based on age. In spite of this, our bridges received an overall Fair rating based on biannual contracted engineering inspections that assess bridge's condition (BCI).

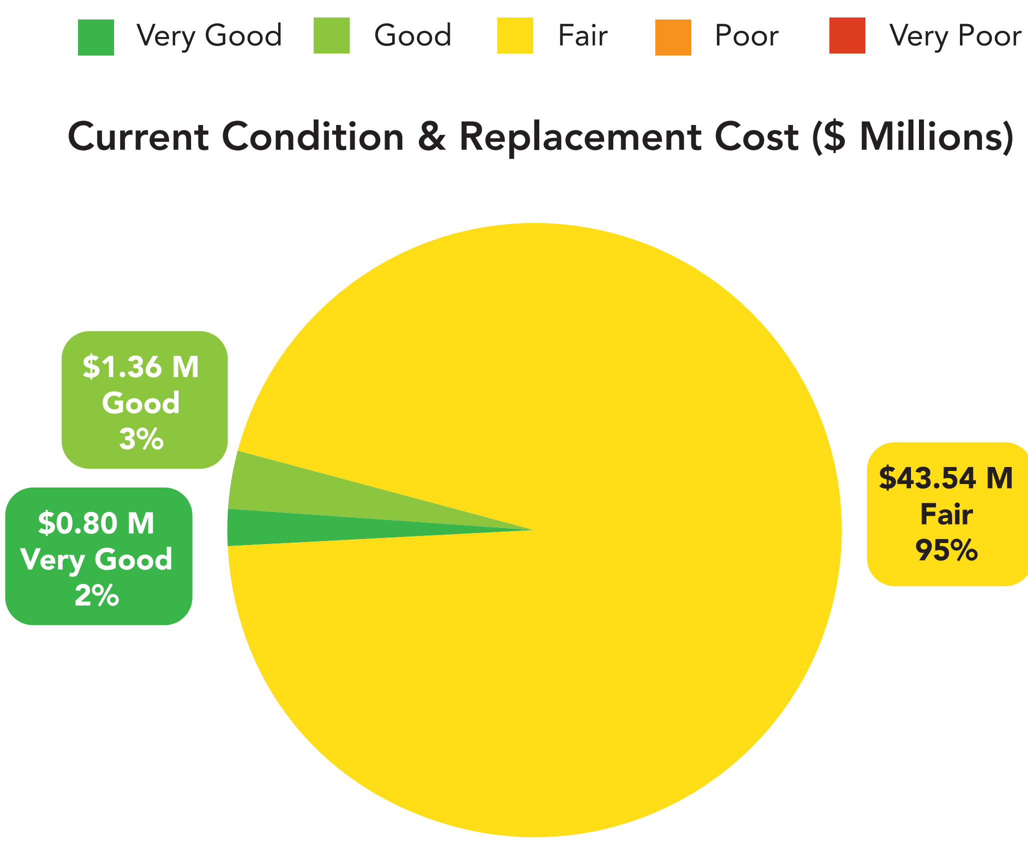
Average Rating: Fair.

AVERAGE BRIDGE CONDITION INDEX OF TOWN BRIDGES & CULVERTS

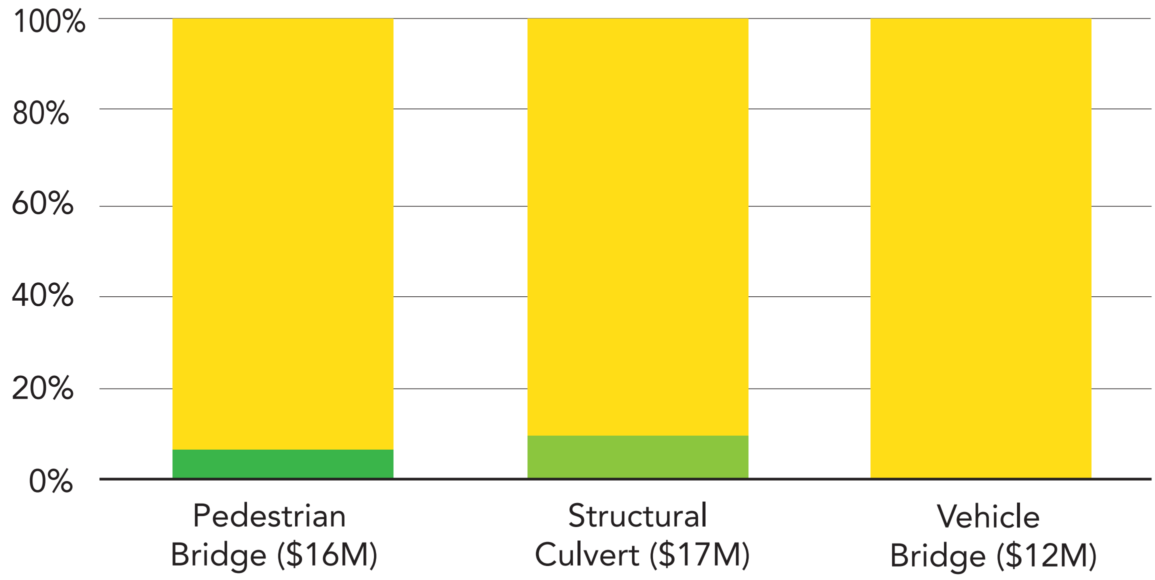


WHAT CONDITION ARE OUR ASSETS IN?

Current Condition & Replacement Cost ($ Millions)

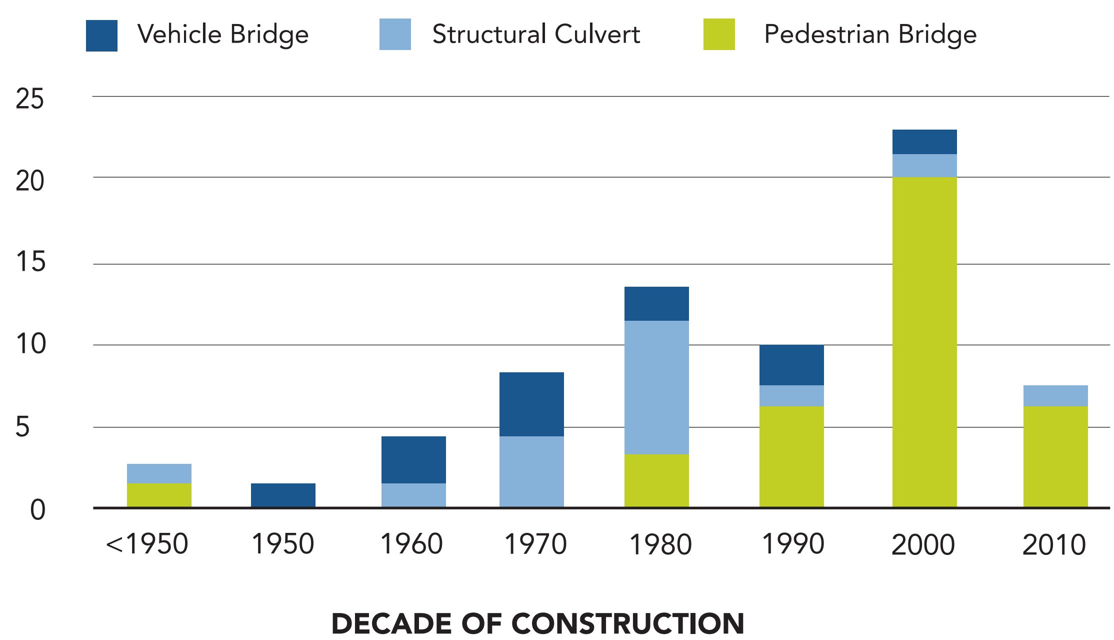


Bridge Condition Breakdown by Service Type

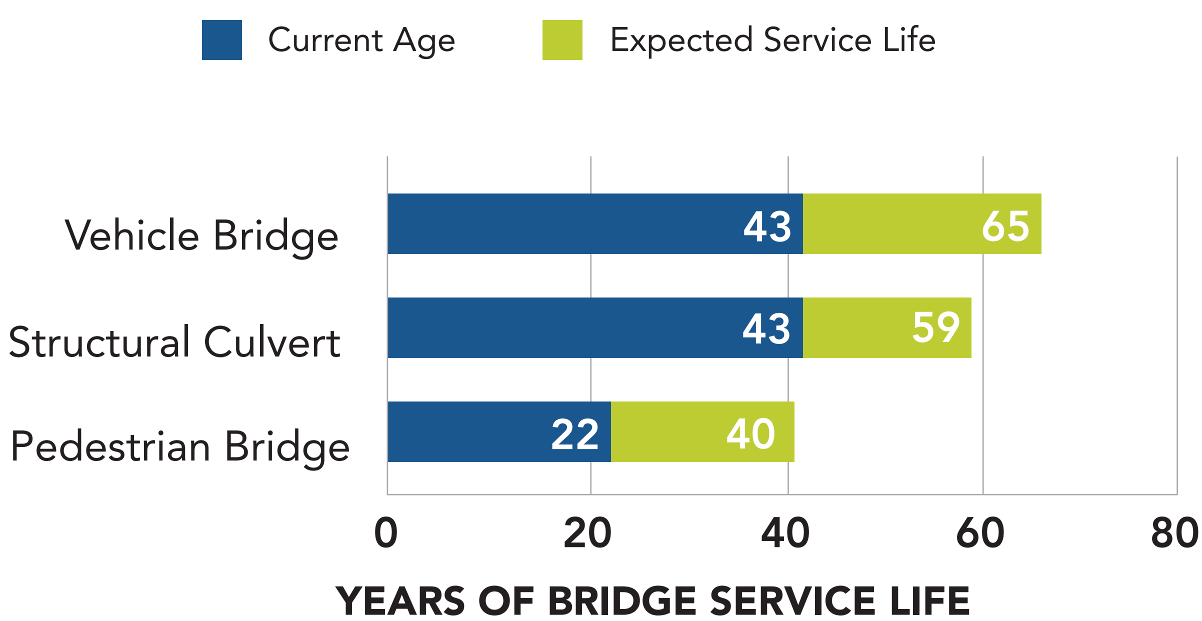


HOW OLD ARE OUR ASSETS?

BRIDGE INVENTORY BY DECADE CONSTRUCTED

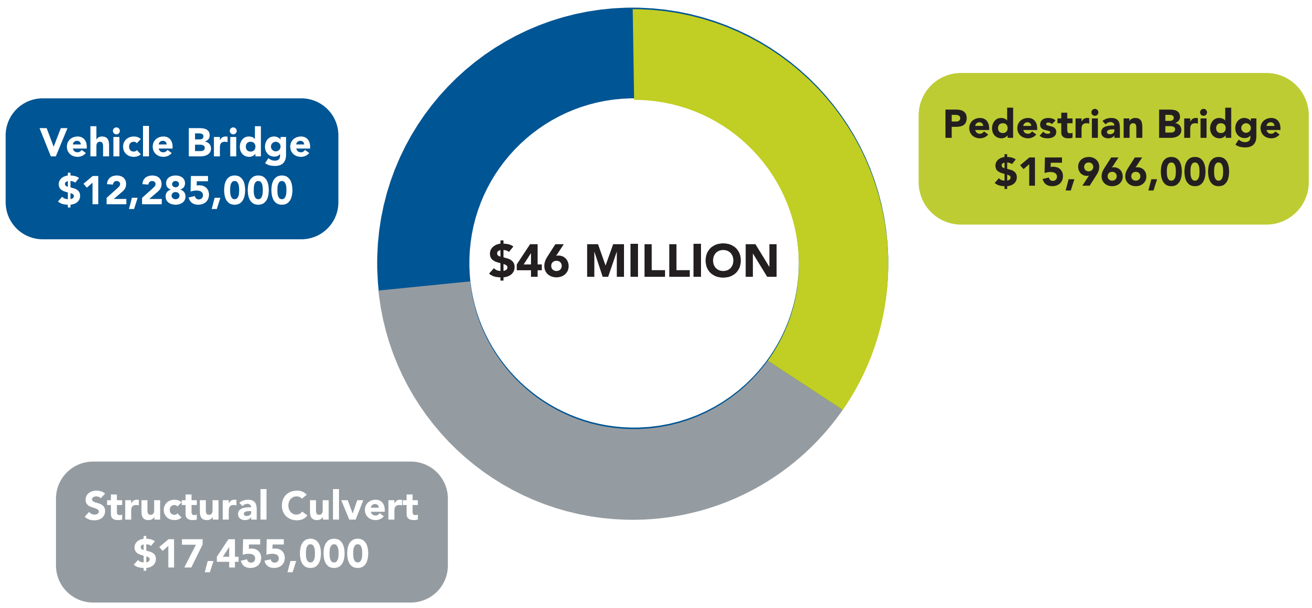


AVERAGE AGE AND EXPECTED SERVICE LIFE OF BRIDGES



WHAT WOULD OUR ASSETS COST TO RECONSTRUCT IN 2021?

TOTAL ASSET REPLACEMENT COST OF BRIDGES

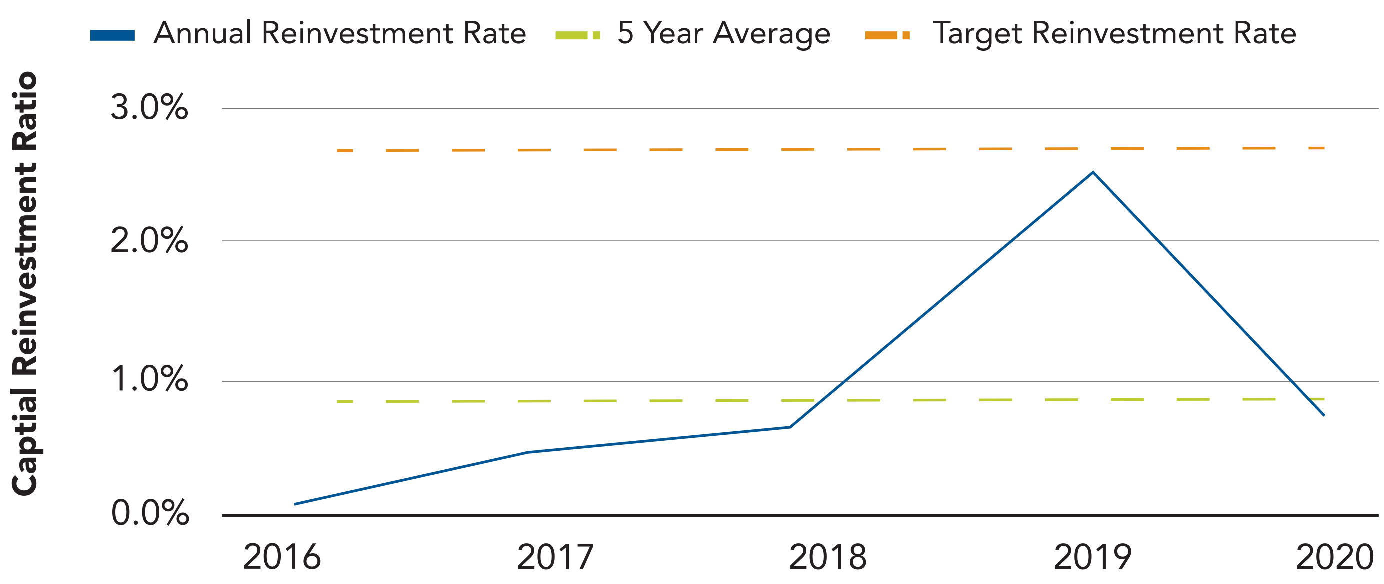


CURRENT CAPITAL SPENDING

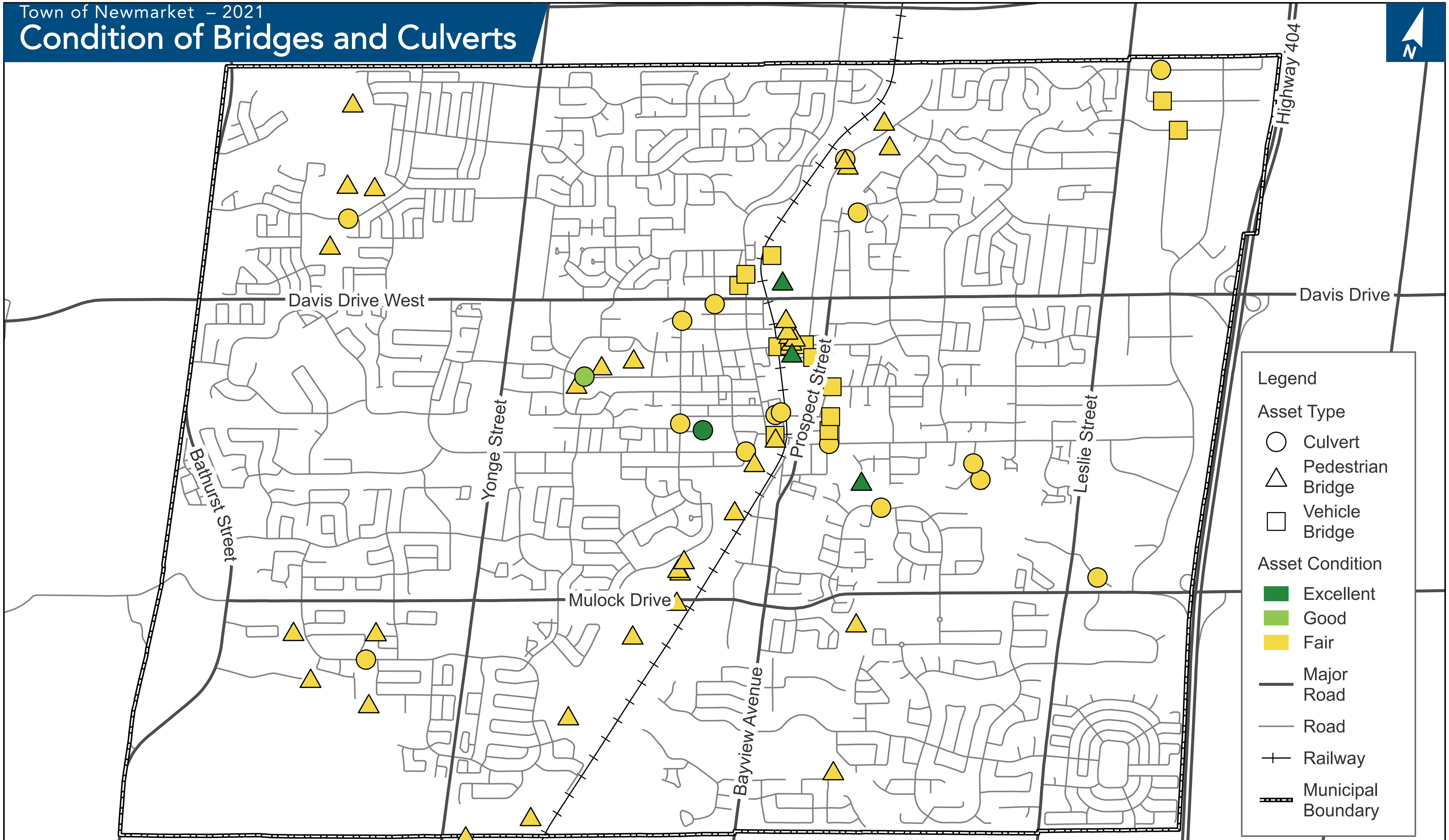
CAPITAL REINVESTMENT (5 YEAR AVERAGE)	$0.57M
REINVESTMENT RATIO * (5 YEAR AVERAGE)	0.12%

HISTORICAL ACTUAL REINVESTMENT RATIO IN BRIDGES

Percentage of Total Replacement Cost (%)



* **Reinvestment Ratio:** A financial measure indicating the Towns reinvestment into existing assets via the capital program. The Canada Infrastructure Report Card recommends a minimum annual reinvestment ratio of 1%



Sources: Roads, Railway, Municipal Boundary - Data, Analytics and Visualization Services Branch, Corporate Services © The Regional Municipality of York, 2021; All other data - © Town of Newmarket, 2021. DISCLAIMER: The information depicted on this map has been compiled from various sources. While every effort has been made to accurately depict the information, data/mapping errors may exist. This map has been produced for illustrative purposes only. It is not a substitute for a legal survey. Printed: October, 2021.

Document Path:G:\Projects_PRO\CorporateServices\Finance\AssetManagment\Infra_Report_Card\Infra_Report_Card.aprx\BridgesCulverts_Condition_Report Map 8x14

Conditions Assessment Plan for Bridges

Concluding Know Your Assets, the Town will use condition assessments to increase knowledge of the assets, monitor performance, and refine financial projections. The Town's approach to condition assessments is described in the Concepts and Frameworks section.

Strategy for Bridges

As identified in the legislative requirements section, the Town completes the provincially mandated biennial inspections using the Ontario Structural Inspection Manual (OSIM) protocol with assistance from contracted engineering services.

OSIM will continue to be the focus of the Town's condition assessment strategy, while striving to improve the processes and data that come out of these inspections. Recent progress included the development of a GIS-based bridges database and ongoing work on an Operations, Maintenance, and Minor Capital Plan for bridges. The Town's first detailed investigation (beyond OSIM) of a major bridge was also completed. Going forward to optimize the bridge lifecycle as the assets age, the Town will need to develop processes and capacity for data management and special field investigations with engineers who can provide expert judgement to the program.

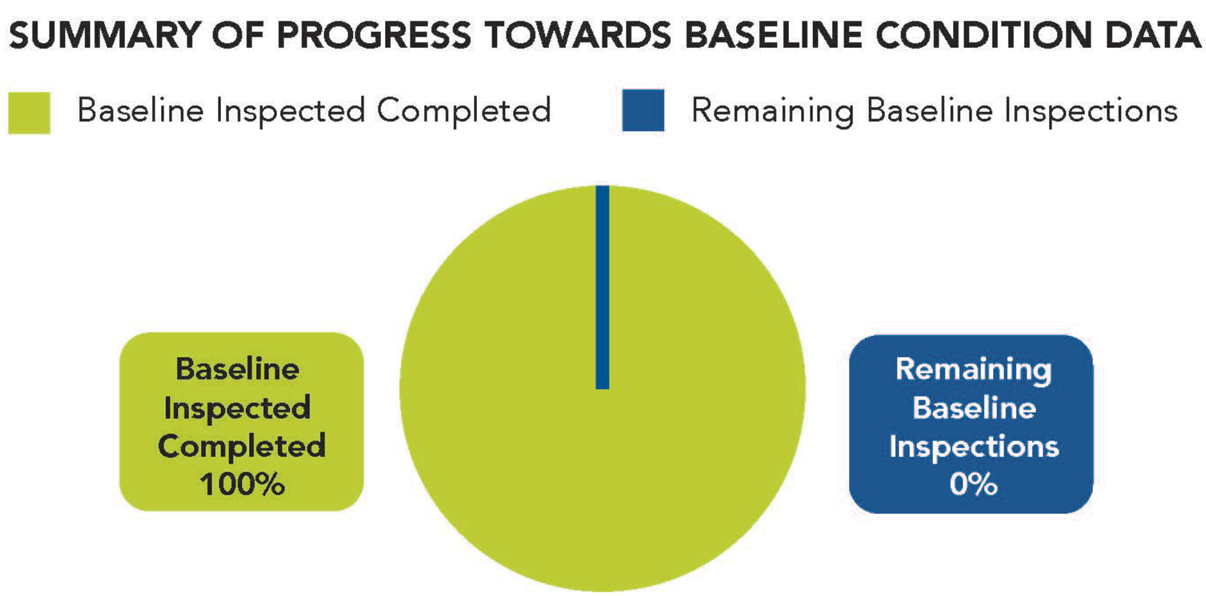


Figure 36 - Summary of Progress Towards Baseline Condition Data

Progress and Next Steps for Bridges

The Town has made good progress with its condition assessment programs to date. A summary of current achievements and future targets in the Town's Condition Assessment Plan is as follows (Table 30). Opportunities to complete the next milestone in the condition assessment plan are captured as recommendations to conclude the Know your Assets section.

Table 30 - Progress and Next Steps for Bridges

<table>
<tr><th>Assessment Methods</th><th>Age-Based Assessment</th><th>Field Condition Assessment Baseline</th><th>Follow Up Condition Monitoring</th><th>Mathematical Modelling</th></tr>
<tr><td>Progress</td><td>Complete</td><td>Complete</td><td>Improvement Opportunity</td><td>n/a</td></tr>
<tr><td>Methodology</td><td>Age, Service Life</td><td colspan="2">Current: OSIM Inspections
Future: OSIM, and Detailed Investigations</td><td>n/a</td></tr>
<tr><td>Responsible Party</td><td>Asset Management</td><td colspan="2">Engineering (Capital)</td><td>Asset Management</td></tr>
<tr><td>Budget for Activities</td><td>n/a</td><td>Complete</td><td>OSIM – Yes
Investigations - No</td><td>n/a</td></tr>
<tr><td>Project Planning and Delivery Processes</td><td>n/a</td><td>Complete</td><td>No</td><td>n/a</td></tr>
<tr><td>Current Progress</td><td rowspan="3">Complete</td><td rowspan="3">100% Baseline Completed: 2018/2019</td><td rowspan="3">Inspections: Every two years as provincially mandated.

Investigations: Build on the success of the Town's first bridge investigation</td><td rowspan="3">n/a – Due to the frequency of OSIM inspections and the relatively small size of the Town's inventory, the need for modelling is not apparent yet.</td></tr>
<tr><td>Goal</td></tr>
<tr><td>Time to Achieve Goal</td></tr>
</table>

RECOMMENDATIONS

- Develop a GIS distribution method for the newly assembled OSIM database for use and analysis by Engineering.
- Develop a data schematic template for OSIM inspections using the newly developed OSIM database.
- Develop a data update plan using opportunistic data collection during OSIM to get missing data like bridge measurements.
- Develop a formal inventory of the ancillary structures associated with bridges that are not strictly defined as OSIM assets. Examples include the drainage structures at Fairy Lake or the retaining walls lining waterways at George Richardson Park.
- Work with GIS department to expand data for bridges that capture project constraints using front-end studies to improve risk management and financial planning. Examples include overlap with private utilities.
- Develop processes for reviewing and analyzing multiple years of OSIM data within the newly assembled OSIM database (e.g. 2019 vs 2021 vs 2023 results).
- Complete an operating budget request for additional bridge investigations.
- Develop a multi-year plan for managing older bridges through monitoring and condition assessment.

MANAGE SERVICE DELIVERY

Asset management is not software, or a document. It is a way of doing business every day. Asset management requires processes to balance the services provided, the risks associated, and their cost. To make tradeoffs, visibility is needed into what is being done and why. Key takeaways will include:

- What services do we provide?
- What activities support services, and who does what?
- What are the risks of our services?

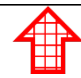
LEVELS OF SERVICE ALIGNMENT

Manage Service Delivery is about the services asset deliver, the associated risks or opportunities, and activities/resources that are expended doing so. This is explained in the Concepts and Frameworks section. To begin the use of this framework, the Town has developed a set of measures for levels of service.

The levels of service measures are organized to create alignment between Town strategic objectives, a corporate goal for the service (e.g. bridges), and the subsequent service criteria and technical/customer measures. Metrics have been listed and aligned before presenting the results. The result of this process is shown as follows (Figure 37):

Figure 37 - Bridges Levels of Service Alignment

PERFORMANCE AND RESULTS

Legend			
Symbol	**Meaning**	**Symbol**	**Meaning**
	Trending up in the desired direction.		Trending down in an undesired direction.
	Trending down in the desired direction.		Trending up in an undesired direction.

Corporate Goal

Safe reliable crossings that provide access for all mobilities.

Customer Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of bridges in “Fair” or better condition (/ 100%).	100% of bridges	100% of bridges	*Trend not applicable*
Average pavement condition of drivable bridges (PCI / 100).	63 / 100 PCI	63 / 100 PCI	
Percentage of drivable bridges with cycling or pedestrian infrastructure.	81% of drivable bridges	81% of drivable bridges	*Trend not applicable*
Average daily traffic on drivable bridges (number of vehicles).	3,353 vehicles per day	3,353 vehicles per day	*Trend not applicable*
Number of customer complaints (bridge appearance, graffiti, etc.)	6 complaints	9 complaints	*Trend not applicable*

Technical Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Average bridge condition index value (/ 100, British Columbia method***).	64 / 100 BCI	64 / 100 BCI	
Capital renewal reinvestment ratio (5-year rolling average).	0.81% of replacement cost	0.90% of replacement cost	
Percentage of bridges requiring minor and/or major repairs within 5 years (per OSIM).	15% of bridges	21% of bridges	
Percentage of bridges inspected within last 2 years.	100%	100%	
Average condition of primary structural loading components (/ 100%).	Fair - (62%)	Fair - (62%)	*Trend not applicable*
Average condition of secondary structural loading components (/ 100%).	Fair - (63%)	Fair - (63%)	*Trend not applicable*
Average condition of non-structural auxiliary components (/ 100%).	Fair - (63%)	Fair - (63%)	*Trend not applicable*
Average utilized traffic capacity of drivable bridges.	79% of traffic capacity.	79% of traffic capacity.	*Trend not applicable*
Percent of drivable bridges with traffic above road class design.	28% of drivable bridges.	28% of drivable bridges.	*Trend not applicable*

*Levels of service measures do not have endorsed targets. Trend observations are made on the basis of general recommendations related to the sustainability of assets, services, and finances

**Bridges do not have a dedicated asset replacement fund, instead being shared with roads and sidewalks. It is recommended that these funds be separated to allow for an independent funding source based on the needs of the assets.

***The Town maintains all regulatory requirements and practices related to Ontario Structural Inspection Manual inspections and reporting, however a consultant review of Town conditions found that British Columbia's method of calculating BCI was a better indicator of state of good repair for the Town's assets.

Regulatory Levels of Service

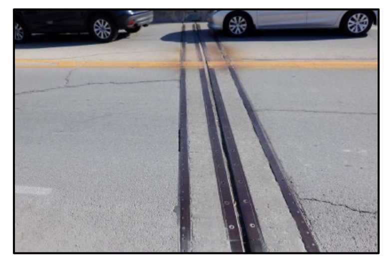
Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of bridges in the municipality with loading or dimensional restrictions.	**1%**	**1%**	*Trend not applicable*
For bridges in the municipality, the average bridge condition index value (OSIM method***), / 100.	**72 / 100 BCI**	**72 / 100 BCI**	*Trend not applicable*
For structural culverts in the municipality, the average bridge condition index value (OSIM method***), / 100.	**73 / 100 BCI**	**73 / 100 BCI**	*Trend not applicable*

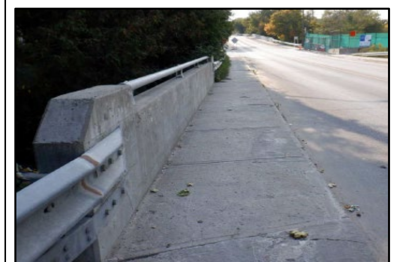
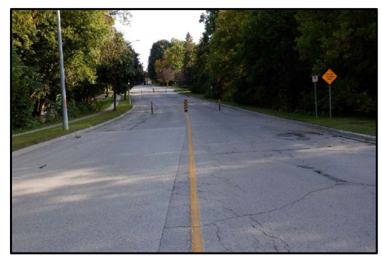
***See annotated description of Town methods in description of technical levels of service.

Illustration of Current Levels of Service

As shown in the State of the Infrastructure, the Town's assets exist in a variety of condition states. This was linked to the LoS Framework section, which showed how condition is a primary driver of service levels. Financial decisions about what asset conditions will be financed (shown in the Financial Strategy section) ultimately impacts LoS. To illustrate this impact, a collection of images has been collected depicting the differences in condition and LoS. See Table 31.

Table 31 - Condition and Level of Service

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets			
Very Good	 Precast concrete box culvert installed in 2017.	 Footbridge west of Fairy Lake.	 Excellent driving surface on a Town vehicle bridge.	 Soffit, bottom surface of a vehicle bridge.
Good	 Abutment wall with minor hairline cracks.	 Pedestrian bridge with light scaling, rust stains, honey combing, and corrosion.	 Good driving surface on a Town vehicle bridge.	 Expansion joints with light scaling and abrasion.

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets			
Fair	 Pier with minor cracks.	 Spall, delamination, and concrete patches on wing wall.	 Fair driving surface on a Town vehicle bridge.	 Sidewalk with minor cracks, abrasions, and pop outs.
Poor	 Wing wall with wide cracks, spall, and delamination	 Footbridge stringers and bracings with perforations and corrosion.	 Poor driving surface on a Town vehicle bridge.	 Pier with pattern cracks

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets			
Very Poor	 Inward rotation and separation of wingwall from culvert	 Delamination with exposed, corroded rebar	 Very poor driving surface on a Town vehicle bridge.	 Severe delamination with exposed, corroded rebar

UPCOMING LEGISLATIVE REQUIREMENTS

Legislative requirements are one way to define minimum levels of service requirements, as described in the Concepts and Frameworks section.

New Upcoming Legislative Requirements

At the time of AMP publication there are no upcoming regulatory requirements known for Bridges that would impact the Town's levels of service or budgets.

Current Legislative Requirements

The Town currently operates within several regulatory requirements. As the regulatory environment changes, the minimum Level of Service the Town provides may also change. Current regulatory requirements are as follows (Table 32):

Table 32 - Current Legislative Requirements

Legislation	Overview	Impact to Asset Management
Ontario Regulation 104/97: Standards for Bridges and amendments: • O. Reg. 160/02 • O. Reg. 278/06 • O. Reg. 472/10	O.Reg. 104/97 was created to addressing the growing problem of aging bridges. Large portions of Ontario's bridges were built in the post-World War 2 boom, before today's rigorous safety standards – as a result, they are slowly deteriorating. The regulation mandates biennial inspections with a detailed protocol (OSIM) to ensure safety risks and maintenance needs are detected and addressed proactively.	• Requirements for assessment of bridges every two years for integrity, safety and condition by a professional engineer using the OSIM protocol. • Requirements to maintain every bridge in a "state of good repair" (not defined by the regulation) as a minimum level of service. • Requirements to design, evaluate, construct or rehabilitate bridges in conformance with the Canadian Highway Bridge Design Code (below).
Canadian Highway Bridge Design Code	Maintained by the Canadian Standards Authority, the Code guides engineers with design requirements focused on safety and reliability. The Code includes detailed frameworks for loading, durability, seismic design, foundations, buried structures, materials, rehabilitation, and analysis methods.	• Adherence to the Code when building new bridges, and analyzing and rehabilitating existing bridges as required by Ontario Regulation 104/97.

Lifecycle Activities - Results

This section outlines the current business practices employed by the Town to manage assets throughout their lifecycle. At this early stage of implementing and improving asset management practices, the Town has not undertaken any studies to review current practices for lifecycle management or researched alternative options for service delivery. Where appropriate these have been identified as improvement tasks. The Town also wishes to quantify each activity to help determine tradeoffs and opportunities for levels of service adjustments, which will be completed as AM capabilities advance.

The Town's lifecycle activities and improvement opportunities for Bridges are summarized in Table 33

Bridges Asset Lifecycle Strategy

Table 33 - Lifecycle Activities and Improvement Opportunities for Bridges

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Commission new bridges	Development Engineering	Recommendations captured in "Future Ready"
Operations, Maintenance, and Inspections	Biennial OSIM inspections	Engineering	Recommendations captured in "Know Your Assets"
	Special inspections, structural monitoring, testing.	Engineering	Recommendations captured in "Condition Assessment Plan"
	Spring non-structural safety inspections (e.g. debris, potholes)	Public Works	Formalize and create a checklist for non-structural spring safety inspections.
	Joint and gutter cleaning	To be determined*	**TBD:** Bridges are long-lived assets, and the early-life strategy for the Town's portfolio has focused on regulatory compliance and OSIM recommendations. To extend the life of the assets, the Town will be recommending a Maintenance and Minor Capital Rehabilitation Strategy be budgeted and implemented for managing the bridges. To achieve this, the Town will be quantifying resources needs for budget consideration, as well as an implementation plan (e.g.
	Bridge washing		
	Maintain bearing shelf and shelf debris removal.		
	Zinc application (steel culverts only)		
	Channel cleaning and vegetation management		
	Reinstate rip-rap of channels, piers, and slope protection.		
	Temporary closures.		
Renewal and Rehabilitation	Reset and/or replace bearings & joints		
	Waterproof entire bridge		

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
	Minor / major concrete repairs and patch repairs		outsourcing, in-house staffing development, etc.) based on a Memorandum of Understanding (MOU) between departments who will share contributions to the plan. The objective of these projects are to extend the life of the assets.
	Crack injection		
	Partial substructure or deck replacement, strengthening	Engineering	
	Upgrades, strengthening, and improvements	n/a	
	Culvert repairs: inverts, headwalls, structural lining, concrete repairs, barrel repairs	Engineering	
	Footbridge repairs: Painting, sand blasting, pile replacement, timber replacements, patch painting		Coordinate / limit winter salt application on pedestrian bridges with staff maintaining trails to limit the impacts of corrosion and deterioration.
Replacement	Replace bridge, culvert, footbridge		Separate the replacement fund for bridges from roads & sidewalks.

RISK

Risk is a key asset management tool, and works on a spectrum of asset-level, service-level, and corporate-level spectrum of considerations. This is described in the Concepts and Frameworks section.

The Town currently does not have a formalized, holistic approach to risk management. However, some existing activities and components of service delivery include risk elements and there are multiple examples of using risk-based approaches to support decision-making. There is also a desire to continue with improved risk practices as part of asset management planning and work towards regulatory requirements for service level risk analysis. To meet this need, **a 3 Step Development Plan is recommended**.

The 3 Steps reflect the types of risks – corporate, service level, and asset level, and follows the international standard for risk management (ISO 31000) (Table 34):

Table 34 - 3 Step Development Plan for Risk Management Practices

Recommendation Phase	Improvement Measures
Step 1 – Near Term **Goal of this Phase:** Ensure existing risk components are consistent and broadly applied.	1.1 Review and update budget decision package form and process with risk and service-based considerations. COMPLETE 1.2 Establish a criticality rating methodology that is applicable across all asset classes and apply it to all core assets. COMPLETE 1.3 Assign roles and responsibilities, including accountability, for risk management in the Town – Establish Council and leadership's accountability for ensuring risk is considered and incorporated into all levels of decision-making processes within the Town over time.
Step 2 – Mid Term **Goal of this Phase:** Formalize a Risk Management Framework that is directly integrated within all relevant Town	2.1 Development of a risk management policy that is endorsed by Council, and a corresponding strategy for implementing the policy across the Town. 2.2 Develop a risk management framework to assess asset criticality, asset risk, service risks, and risks to achieving corporate (strategic) goals.

Recommendation Phase	Improvement Measures
processes. It is important that the framework is supported by senior leadership to ensure it adds value and effectively impacts decision-making.	2.3 Establish reporting processes to keep the Town's management teams and Council aware of critical risks, and their associated mitigation actions. 2.4 Develop service level risk registers for each area (roads, water, etc.) that can support a corporate risk register that may be monitored by senior leadership and used to support the management of service delivery.
Step 3 – Long Term **Goal of this Phase:** Leverage risk to be a core capability for the Town.	3.1 Establish a regular review process for identified risks as well as the Town's risk framework. 3.2 Employ risk as an optimization objective for funding allocation and other strategic decision-making. Once risk is strongly embedded within the Town's processes, the Town may wish to employ software and other useful tools to evaluate risk and funding allocations to minimize residual risk accepted by the Town.

Asset Level Risk

As progress towards completing Step 1 of the 3 Step Development Plan for risk management, asset level risk has been assessed for the Town's Bridges using a risk framework.

The results of this process are shown as follows:

Table 35 - Bridges Risk Profile

Risk Inputs	Likelihood of Failure (LoF)	Consequence of Failure (CoF)
Bridge Risk Factors Assessed	- Bridge Condition Index (2019)	- Bridge deck size (area, square meters) - Road class - Traffic count - Crossing type (railroads and watercourses)

Vehicle Bridge and Culvert Risk (Consequence x Likelihood of Failure) Profile

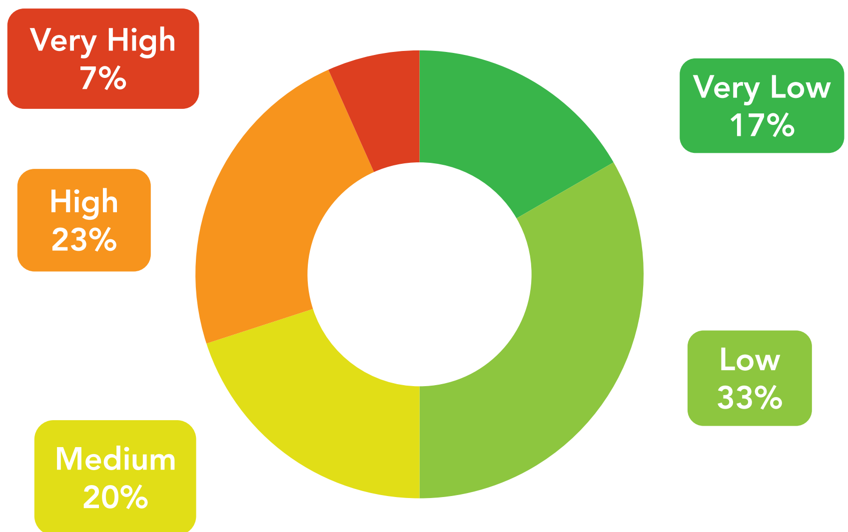


Figure 38 - Vehicle Bridge and Culvert Asset Risk Profile

Pedestrian Bridge Risk (Consequence x Likelihood of Failure) Profile

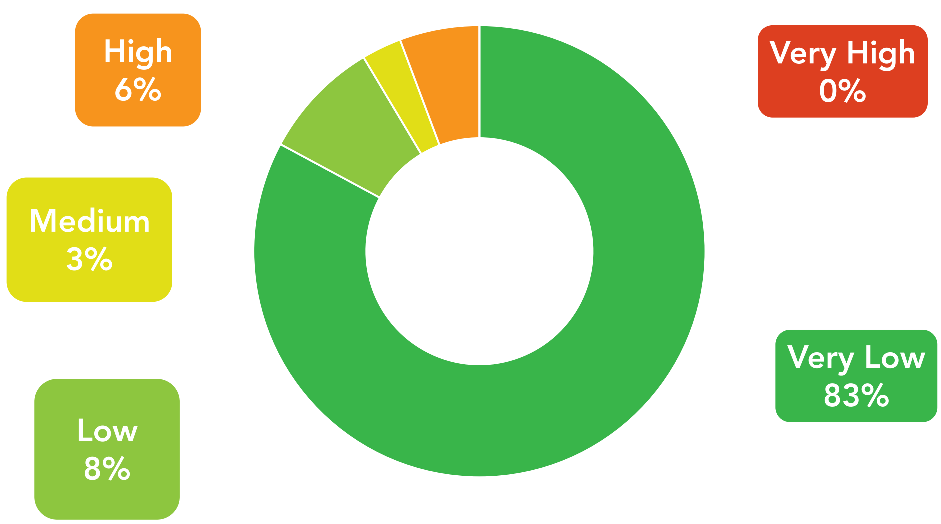


Figure 39 - Pedestrian Bridge Asset Risk Profile

- Facilitate the allocation of governance, roles and responsibilities, budget, and processes recommended by the Bridges Operations Maintenance and Minor Capital Plan currently being developed by the AM Office, staff, and the Town's consultant.

FUTURE READY

What was once a small but thriving Town, today Newmarket is a desirable and affordable community. While the future is bright, trends like increasing service expectations, urbanization, and climate change are challenging the status quo. The future will change how the Town manages assets. Key takeaways will include:

- Impacts of growth on assets and budgets.
- Vulnerabilities and adaption and mitigation approaches to climate change.
- Aligning master plans with the management of existing assets

GROWTH FORECAST

Identified Growth Impacts on Bridge Assets

1. Urban expansion: One additional vehicle bridge and two additional pedestrian bridges will be added to Newmarket over the next four years due to the assumption of Sundial, National Homes, Glenway, and Forest Green subdivisions into the Town's portfolio. There is an additional large area in the South West (Shining Hill) that is expected to be developed just outside of the timeframe of the AMP, but the timing could be brought forward.

2. Urban intensification: No bridges are planned to be added or widened over the AMP timeframe – however, there is planned intensification on Main Street and the urban secondary plan area, generally located along the Davis Drive corridor between Upper Canada Mall and Huron Heights Drive and along the Yonge Street corridor between the Town's northerly boundary and Savage Road. Although the quantity and nature of assets required for these fully built-out plans has been estimated, full built-out is not expected within the AMP timeframe. However, a staged approach may be required for asset upgrades. Such an approach has not yet been detailed. Once it has, these changes should be incorporated into the AMP.

3. Changing standards: No changes to the bridge assets have been identified as a result of changing design standards or regulations, such as bridge load carrying capacity regulations. However, potential changes due to technology and resource philosophies have been identified in Table 37.

4. Climate change: No specific changes to the bridge asset portfolio to mitigate against the effects of climate change have been identified yet; however, a high-level flood resilience assessment of Town-owned infrastructure has been undertaken for bridges, culverts and roads. The next phase of the study will assess the risks based on existing mitigation measures, then identify assets for upgrade or development based on flood vulnerability. Once the study is complete and identifies asset improvements, the AMP should incorporate those new assets.

Table 36 summarizes these asset increases by number of bridges added to the portfolio each year. The bridges planned over the AMP timeframe are entirely due to urban expansion, as shown in Table 36. However, for asset management purposes it is important to note that there is a substantial gap in identified growth assets due to step changes in urban intensification, as well as gaps in identifying growth assets required for changing technology, climate, and resources – and associated changes in standards.

Table 36 - Bridges Growth to 2032 and Beyond

Bridges		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	2032+
New Assets	Vehicle Bridges (count)	1										1	3
	Pedestrian Bridges (count)	1		1								2	

The level of effort and required resources to maintain growth assets has been quantified based on the total number of assets and the per-unit cost of maintenance. See Figure 40.

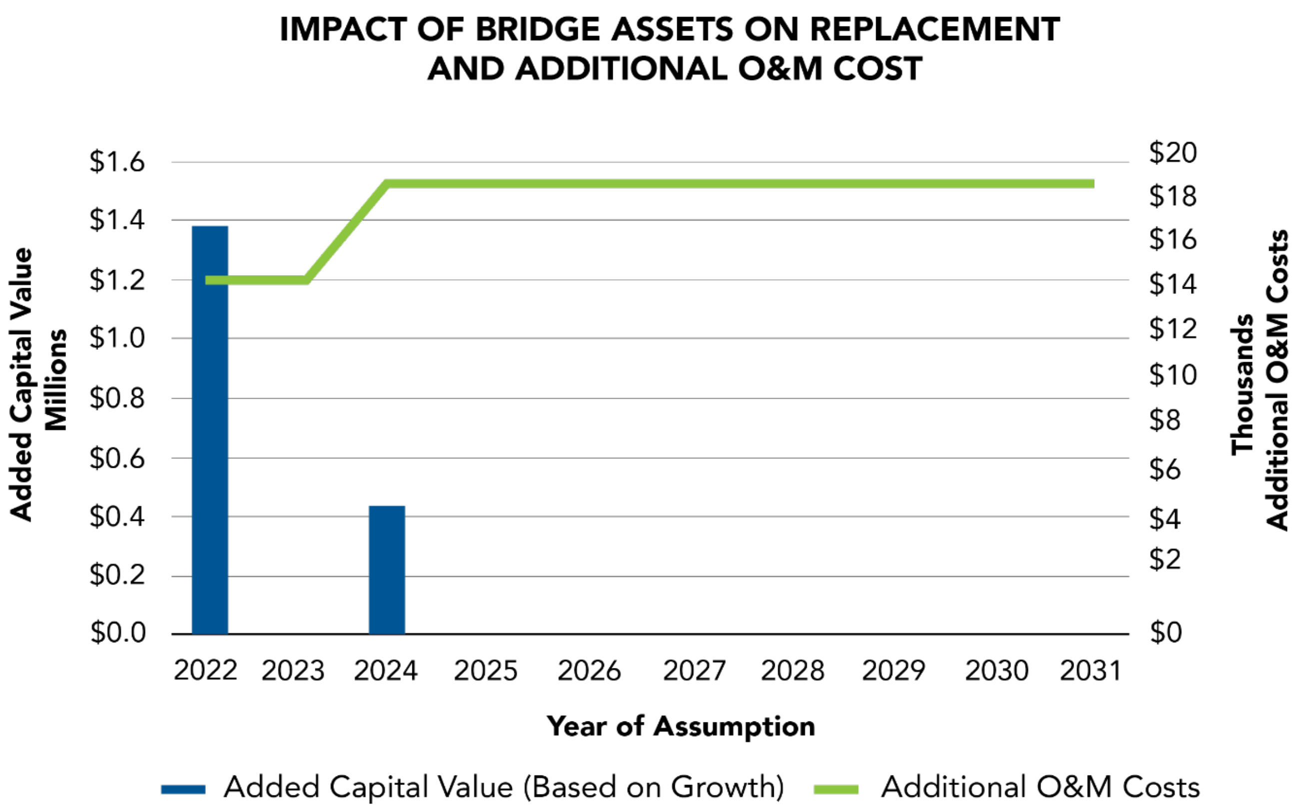


Figure 40 - Impact of Bridges Growth on Replacement and Additional O&M Cost

Historical Context of Growth

One (1) bridge has been added to the Town's portfolio since 2016 (see Figure 41). In contrast, between 2021 and 2024, the number of assumed assets may increase by three (3), a significant increase in comparison to the previous four-year period 2016 - 2020. Some of these bridges may be assumed earlier or later than anticipated, which would ease the burden on the operations team working the new assets into their plans.

An additional three (3) bridges are expected to be assumed beyond 2032 – however, due to the long timeframe, there may be some earlier works during the period of this AMP. The timing of the assumption of these new assets should be reviewed in the next three years.

Figure 40 show that the asset base is expected to continue growing, which means the Town will need to continue to increase investments in O&M costs.

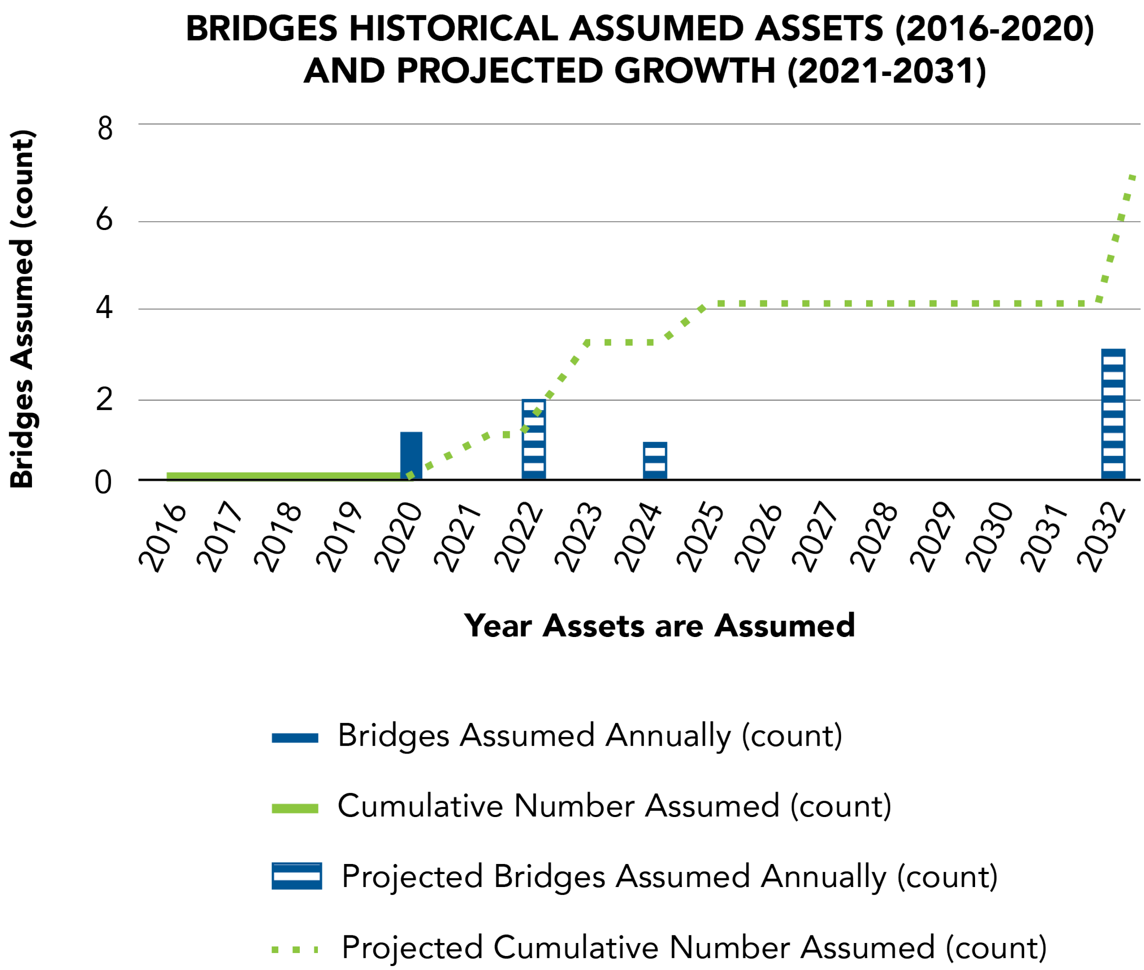
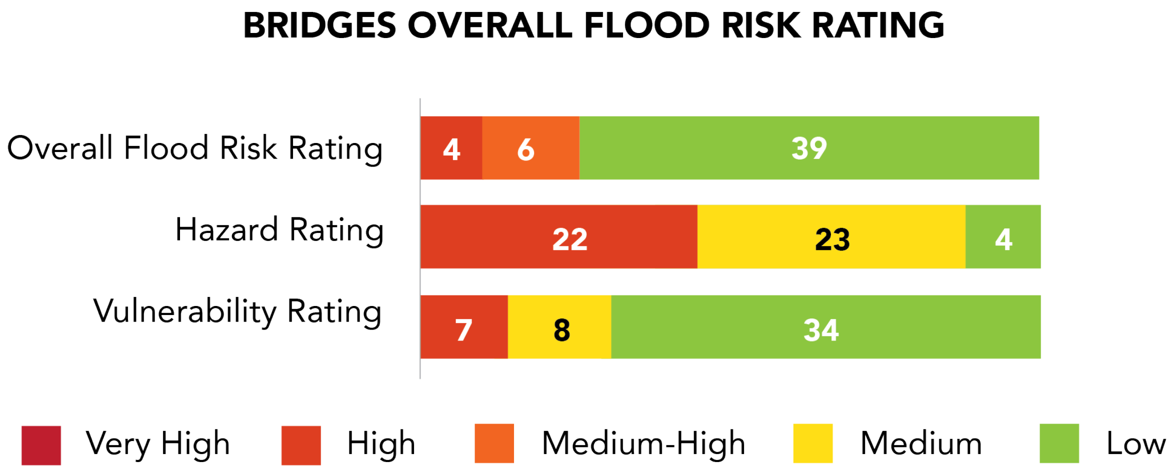


Figure 41 - Bridges Historical Assumed Assets and Projected Growth to 2032

Results of the Flood Risk Assessment

Four (4) assets received a high Overall Flood Risk Rating, 6 assets received a medium-high Overall Flood Risk Rating, and 39 assets received a low Overall Flood Risk Rating (see Figure 42). This means that a majority (or 80%) of bridges received a low Hazard-Vulnerability Rating. Results of the climate change flood resilience assessment for Bridges are as follows:



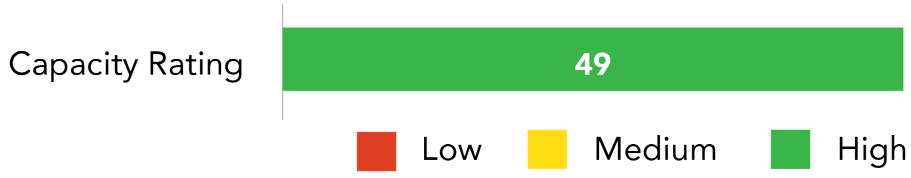


Figure 42 - Bridges Overall Flood Risk Rating

A total of four culvert assets received a very high Hazard-Vulnerability Rating. Meanwhile, 19 assets received a high Hazard-Vulnerability Rating, 9 assets received a medium Hazard-Vulnerability Rating, and 8 assets received a low Rating (see Figure 43). This means that only a minority (or 20%) of culverts received a low Hazard-Vulnerability Rating. Results of the climate change flood resilience assessment for Culverts are as follows:

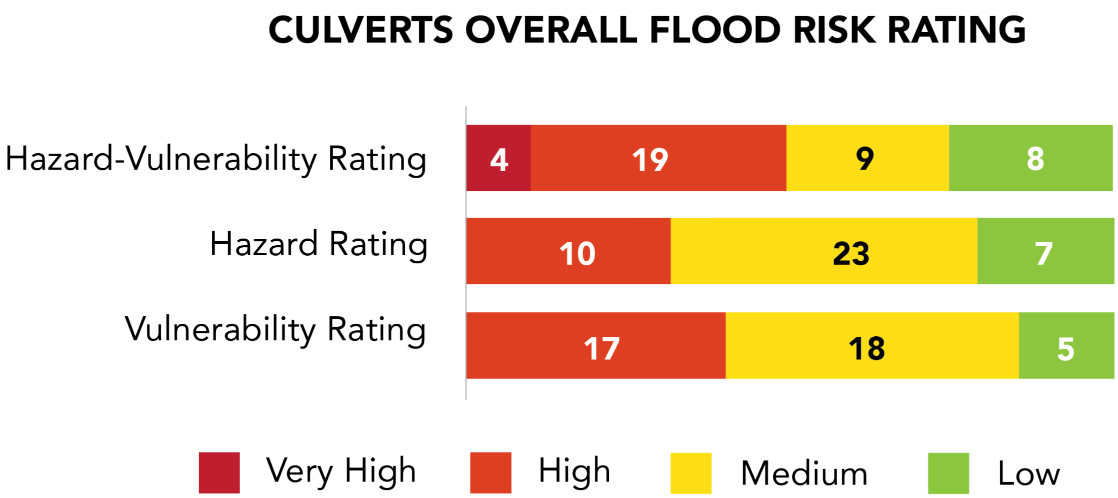


Figure 43 - Culverts Overall Flood Risk Rating

FUTURE TREND AND ASSET IMPACTS

Table 37 - Implications of future trends on Newmarket's bridge asset portfolio

Trend category	Trend	Implications for the management of our assets (to maintain our level of service)	Growth	In existing plans?
Society	Increased health & sustainability focus	Upgrade bridges to accommodate more forms of micro-mobility Increase bridge deck width as bike lanes and wider sidewalks are introduced, or build more pedestrian and cycle-friendly bridges	√	
	Urban intensification	Upgrade capacity of existing assets to accommodate more users in existing areas	√	√
	Urban expansion	Install additional assets to accommodate new users in new areas	√	√
	Increasing environmental concern	Reduce salt and sediment applied to roadway on bridges		
Technology	More electric vehicles	Install EV charging stations- This is a non-core asset and has not been assessed further	√	
	Introduction of connected and automated vehicles	Introduction of connected and autonomous vehicles may require upgrades to existing infrastructure and/or more frequent operation and maintenance activities like line painting and snow clearing.	√	
Resources	Zero carbon legislation / standards / policies	Use materials with lower whole-of-life embedded carbon. Material cost and durability will be affected. May require different maintenance regime and new skills.		
	Reduced waste production	Use lower-waste materials. May require different maintenance regime and new skills. For		

Trend category	Trend	Implications for the management of our assets (to maintain our level of service)	Growth	In existing plans?
		example, the new re-use of excess soil regulations in Ontario.		
	New materials	New materials may become available that change the asset lifecycle and how it is managed.		
Climate	Hotter weather	Use more heat-resistant materials. May require different maintenance regime and new skills. Or, warmer winters that increase the frequency of melt events.	√	
	Higher rainfall intensity (handle higher rainfall events)	Upgrade assets for greater protection. May require different maintenance regime and new skills.	√	

RECOMMENDATIONS

- Develop quantities of pedestrian bridges that will be constructed during the implementation of the Active Transportation Plan as designs or concepts of the trails are advanced.
- Establish an approximate timeline for the Urban Centers secondary plan.

FINANCIAL STRATEGY

The Town has made an important investment in infrastructure, and attention must now be paid to securing this investment. The sustainability of Town infrastructure depends on effective management and ensuring the optimal use of limited funds. Sustainability will require adjusting revenue and services. In this section:

- Current financial position and level of service trends.
- Scenarios for managing levels of service, risk, and funding gaps.

ESTIMATED FUTURE BUDGETS

The approach to financial planning for core assets is summarized in Concepts and Frameworks section and the corporate overview for the results of this process are provided in the Financial Strategy section. This section only provides details pertinent to the service area under consideration.

Estimated Future Budgets Based on Current Position and Plans

Using the financial background and current financial position, the Town's current budget was forecasted to support long term financial planning. These values were used for an assessment of the balance between budget and future renewal costs, and will be subject to internal processes and the annual budget process each year as approved by Council.

Table 38 - Estimated Future Budgets based on Current Position and Plans

Year	Roads and Bridges	Federal Gas Tax Allocation*	**Total**
2021	$1,145,947	$2,032,789	**$3,178,736**
2022	$1,350,391	$2,114,914	**$3,465,305**
2023	$1,560,969	$2,157,212	**$3,718,181**
2024	$1,777,864	$2,200,356	**$3,978,220**
2025	$2,001,266	$2,244,363	**$4,245,629**
2026	$2,231,370	$2,289,251	**$4,520,621**
2027	$2,468,377	$2,335,036	**$4,803,413**
2028	$2,712,494	$2,381,736	**$5,094,230**
2029	$2,963,935	$2,429,371	**$5,393,306**
2030	$3,222,919	$2,477,958	**$5,700,877**

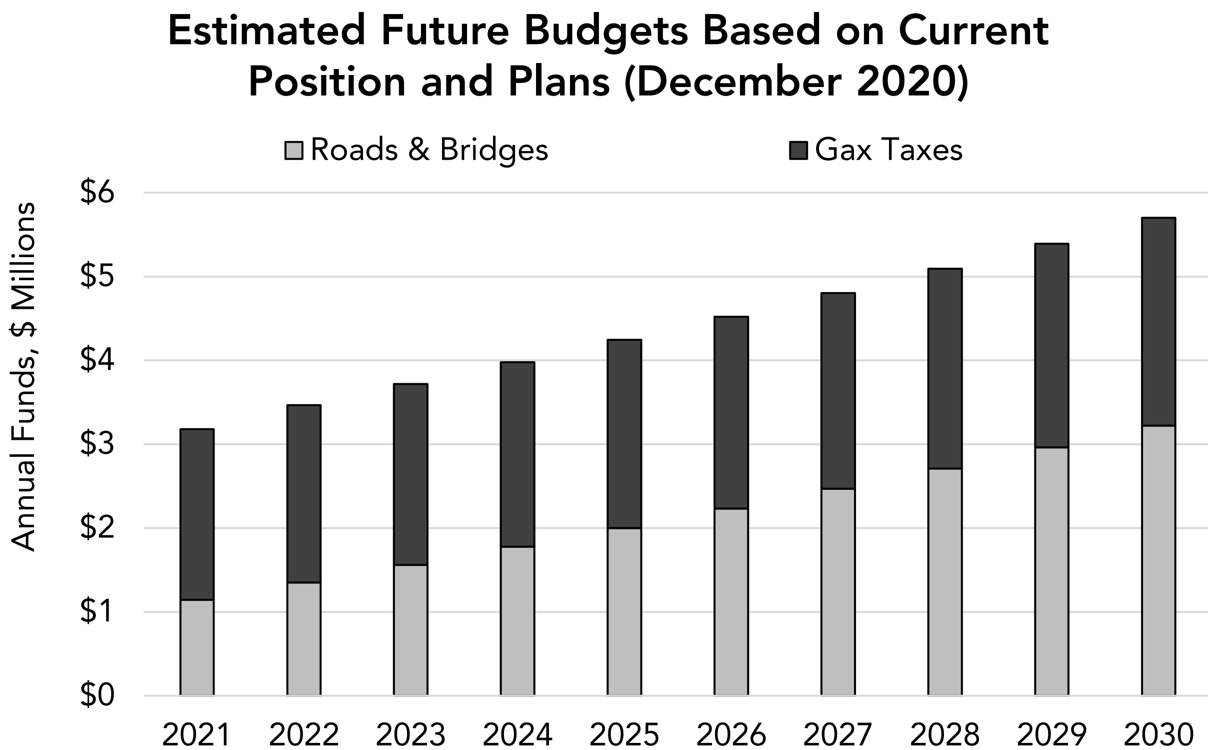


Figure 44 - Estimated Future Budgets Based on Current Position and Plans (December 2020)

******Federal gas taxes were allocated to roads and bridges for modelling in the AMP, but this practice is subject to the Reserve and Reserve Fund Review and the annual budget process. Roads and bridges are combined due to use of a shared reserve (recommendations to develop policies for separating or allocating between these assets have been made).*

Bridges Scenario Methodology

To model the investment need, consolidation of inventory, replacement cost, condition, levels of service, risk, and lifecycle activities as shown throughout the AMP was completed. The three scenarios detailed in the corporate Financial Strategy were executed, along with the following minimum constraints:

Table 39 - Modelling Minimum Constraints

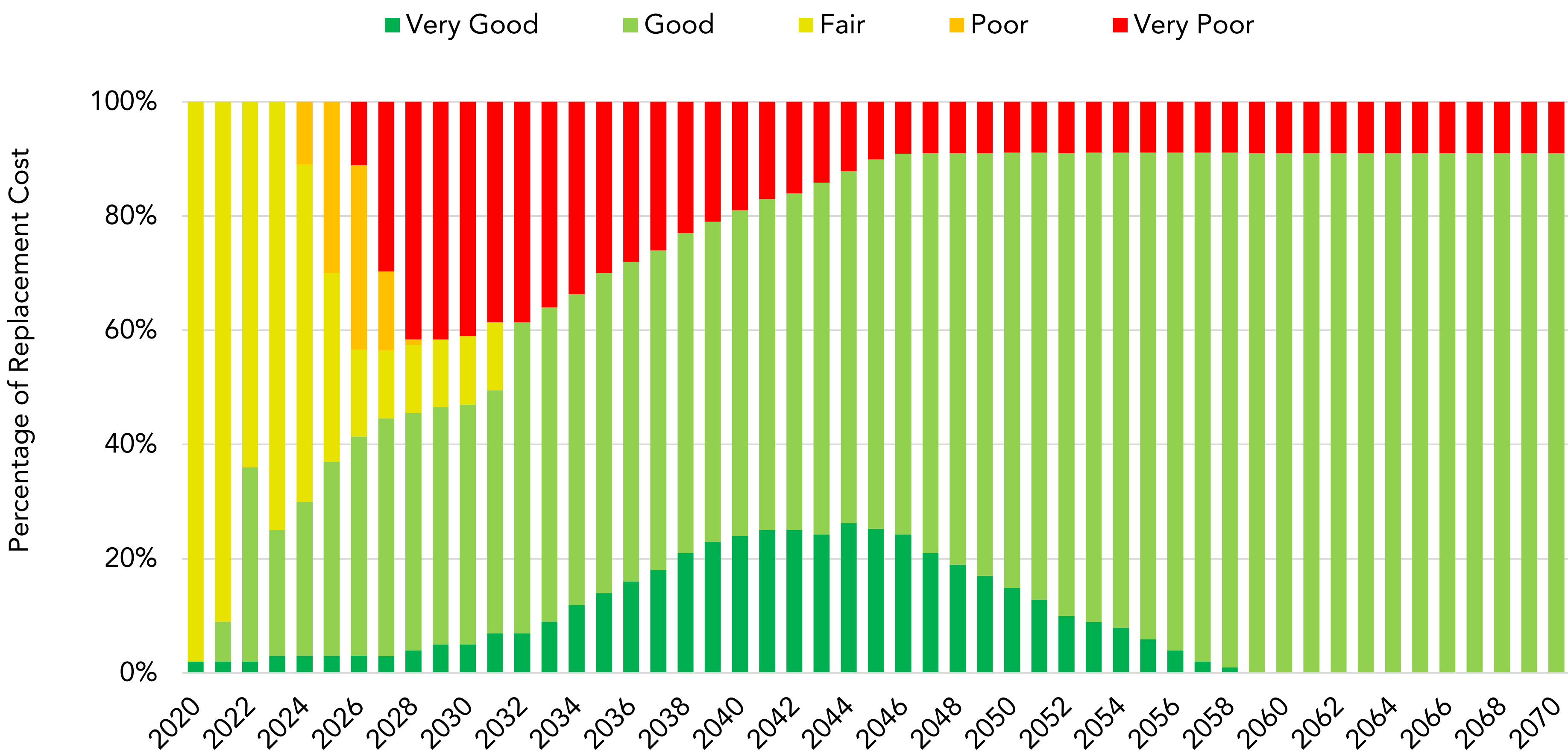
Asset	Service Level Target
Bridges (Network Overall)	No more than 25% of the network can be in Fair Condition or worse. No bridge can be in Very Poor condition.
Culverts (Network Overall)	No more than 25% of the network can be in Fair Condition or worse. No more than 5% of the network can be in Poor Condition or worse. No culverts can be permitted to be in Very Poor condition.

These constraints are minimums before scenario parameters are applied, in order to capture current Town approach to maintaining a state of good repair.

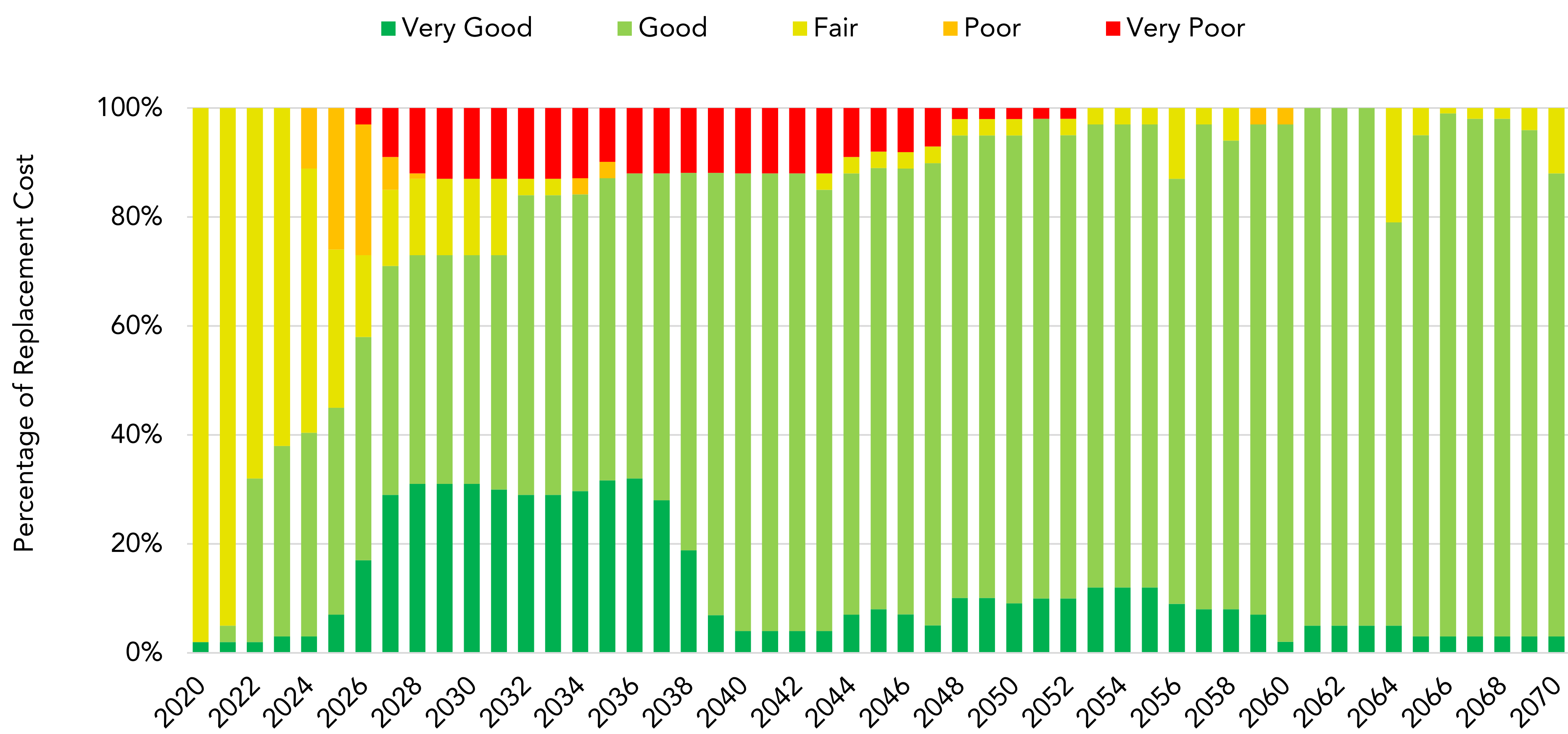
Bridges Scenario Results

The following figures illustrate how condition of bridges are forecasted to change over time under all three investment scenarios.

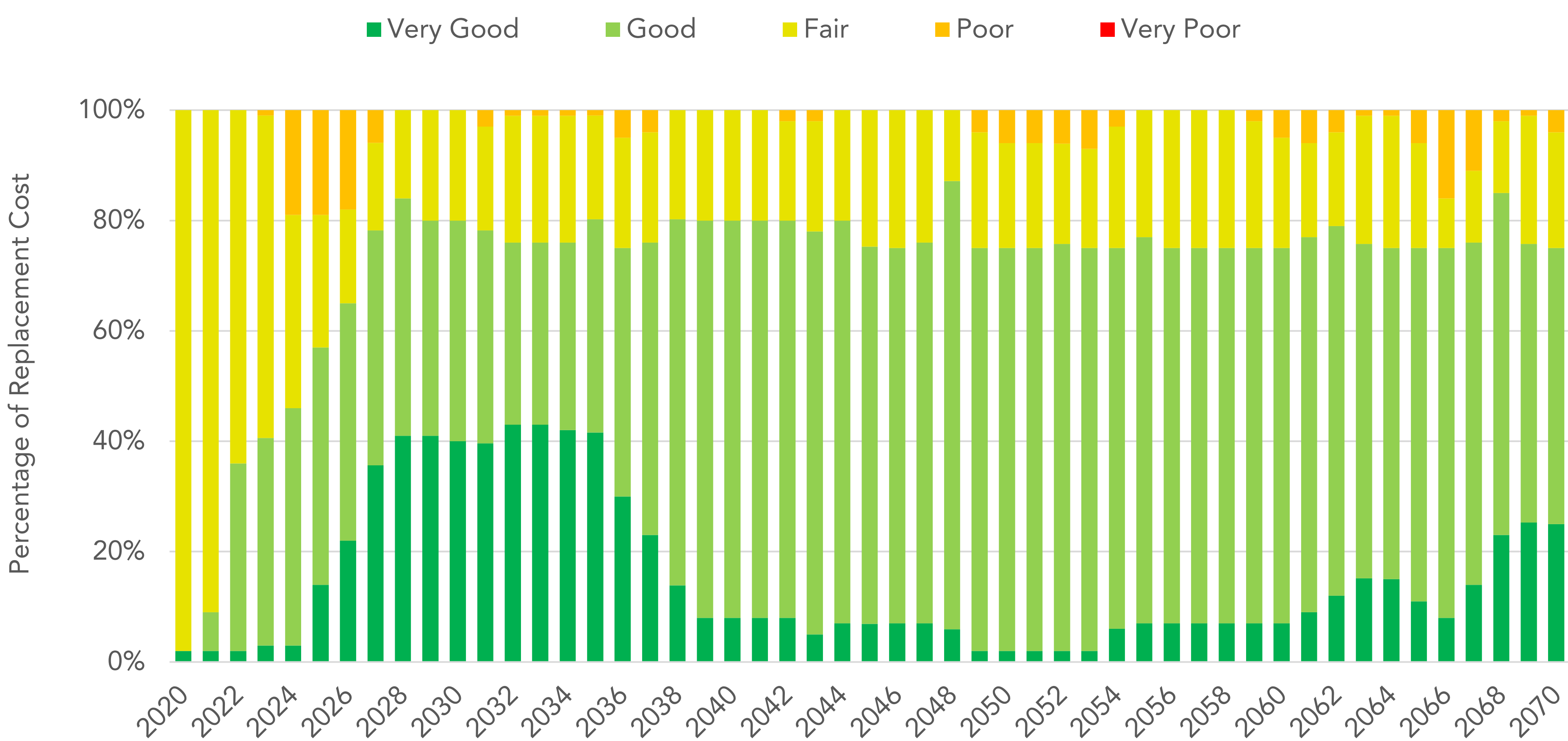
BRIDGES - CURRENT BUDGET SCENARIO



BRIDGES - CONSTRAINED BUDGET SCENARIO



BRIDGES - SERVICE LEVEL DRIVEN SCENARIO



Several observations are important to note about the forecast:

- If investment continues at current levels, service levels will not be achieved, and both bridges and culverts will be in poorer condition than they are currently, with deterioration accelerating particularly in the next 25 years.
- Under the service driven budget scenario, service level targets are achieved in every year of the analysis period.
- Under the constrained investment scenario, overall condition over the long term improves substantially, and there are very few bridges in poor or very poor condition after 2048.
- Despite straying from service level targets for a period of time, the mixture of interventions under the constrained scenario allows for a network condition over the long term that is comparably similar to the Service Driven based investment scenario.

It is for these reasons that the constrained investment scenario was selected for future planning for this asset class. The significance of the constrained investment scenario for the Town's core assets is explained in the Executive Summary and the Financial Strategy section.

Long Term Trend and 10 Year Budget

The following (Figure 45) summarizes the investment forecast for bridges under the constrained scenario.

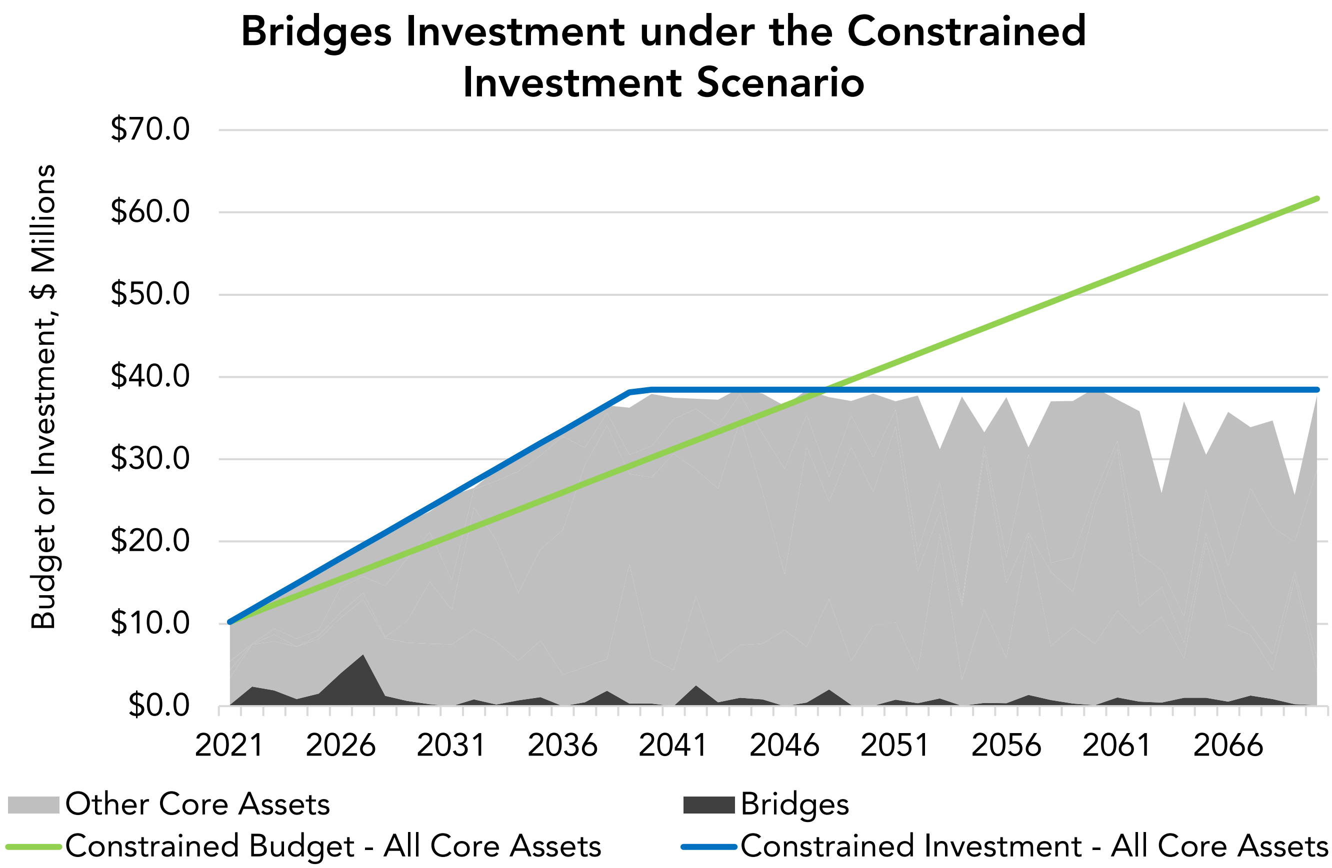


Figure 45 - Bridges Investment under the Constrained Investment Scenario

The annual average investment over the next 50 years is $0.9M for all bridges (in 2021 dollars). This is higher than current levels of investment. Table 40 summarizes the proposed investment in bridges over the next 10 years based on the constrained scenario, and compares this to the Town of Newmarket's current 10-year reserve contributions for this asset class. Table 41 summarizes the intervention types that make up the investment in this asset class.

Table 40 - Proposed investment and a comparison to the Town's existing budget for Bridges

Year	Constrained Scenario Proposed Investment	Town's Current Reserve Contribution (plus Gas Tax)*	Difference
2021	$0.17M	$0.6M	-$0.43M
2022	$2.36M	$2.36M	-
2023	$1.91M	$1.08M	+$0.83M
2024	$0.88M	$0.95M	-$0.07M
2025	$1.52M	$0.60M	+$0.92M
2026	$4.01M	$1.64M	+$2.37M
2027	$6.31M	$0.60M	+$5.71M
2028	$1.25M	$0.60M	+$0.65M
2029	$0.63M	$0.60M	+$0.03M
2030	$0.22M	$0.60M	-$0.38M
Total	**$19.26M**	**$9.63M**	**+$9.63M**

*Current practices varies in budget year to year as amounts are based on OSIM recommendations. AMP outcomes are expected to include new methods of reserve allocations for bridges.

Table 41 - Proposed interventions that make up the recommended investment for Bridges

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bridge Proposed Interventions										
Deck or Structural Rehab	$0	$1,200,000	$0	$0	$0	$372,000	$0	$0	$0	$0
Full Bridge Replacement	$0	$0	$411,000	$0	$952,000	$2,352,000	$3,552,000	$957,000	$0	$0
Minor Rehab	$172,000	$714,000	$825,000	$326,000	$78,000	$0	$160,000	$0	$0	$0
Seal Replacement	$0	$0	$0	$0	$0	$43,000	$138,000	$206,000	$59,000	$0
Culvert Proposed Interventions										
Minor Rehab (Zinc Application)	$0	$0	$0	$132,000	$0	$0	$0	$0	$132,000	$0
Major Concrete Repair	$0	$0	$0	$0	$0	$0	$1,536,000	$0	$0	$0
Major Rehab (Headwall Repairs)	$0	$0	$0	$0	$0	$0	$0	$0	$334,000	$0
Rip Rap Repair	$0	$0	$0	$0	$0	$0	$19,000	$87,000	$105,000	$222,000
Minor Concrete Repairs	$0	$0	$670,000	$418,000	$490,000	$0	$0	$0	$0	$0
Replacement	$0	$447,000	$0	$0	$0	$1,244,000	$901,000	$0	$0	$0
Total	**$172,000**	**$2,361,000**	**$1,906,000**	**$876,000**	**$1,520,000**	**$4,011,000**	**$6,307,000**	**$1,250,000**	**$630,000**	**$222,000**

FORECASTED OUTCOMES

The constrained scenario was established to strike a balance between the long-term investment requirements to achieve service level targets, the pace of increasing the Town's capacity for program delivery, as well as the ability to fund the required program through increased taxes, rates and infrastructure reserves. Under current investment levels, the risk of failing to meet service level targets will increase within the next 5-10 years (See Figure 46 below), when service levels are forecasted to not be achieved. Several points are worth noting about the recommended constrained investment scenario:

- The constrained budget scenario is forecasted to have periods when a 10-15% of the bridges portfolio is in very poor condition that exceeds service levels (particularly between 2028-2047, see Figure 46 below);
- The elevated levels of very poor condition forecasted in this scenario can be considered a period of higher risk of not achieving target service levels between 2024 to 2047.
- This does not translate to bridge failure or unavailability. It does however mean that condition targets as specified in the methodology may not be consistently achieved during this period. Practically, this means bridges may have load restrictions, lane closures or temporary bridge closures if reactive maintenance or repair are required if problems occur.

Service outcomes are always an equilibrium between investment, service level targets and risk of service delivery. If the forecasted outcomes are considered unacceptable, increased investment, or changes in service level targets are ways to impact service risk.

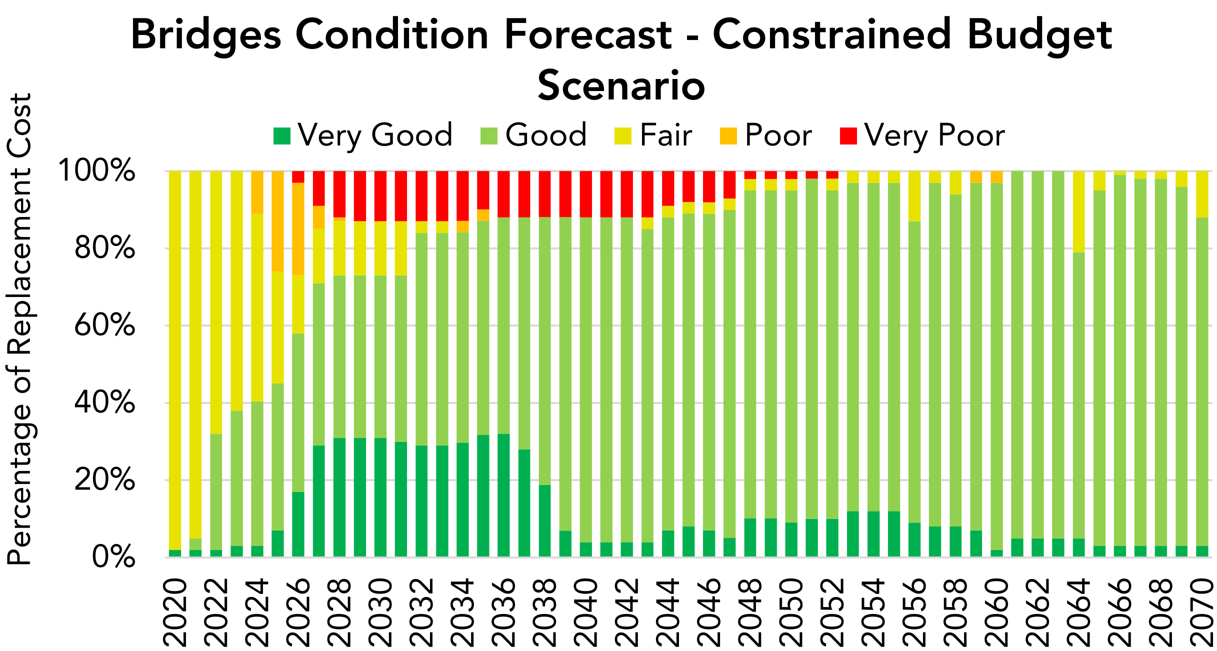
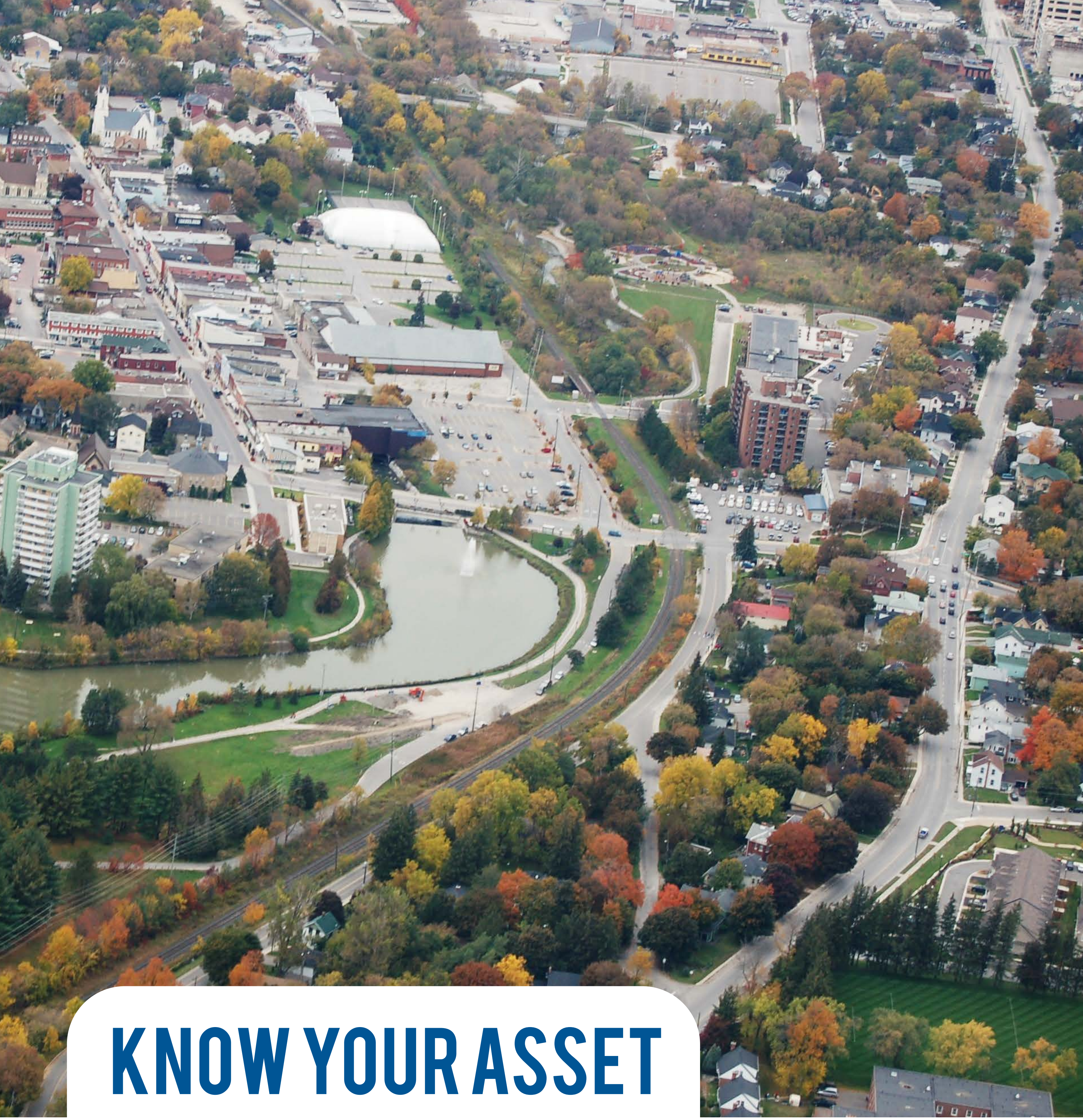


Figure 46 - Higher risk of not meeting service level targets – Bridges with Constrained Budget Scenario

DRINKING WATER ASSET MANAGEMENT PLAN

Newmarket



KNOW YOUR ASSET

The Town is responsible for $2 Billion+ of assets. Assets exist to provide services to the community. Their ability to deliver services depends on Town stewardship and informed decision making. As assets age they have to be replaced. Key takeaways in this section will include:

- What do we own?
- What condition is it?
- What would it cost to replace?

DATA GAP ANALYSIS

Asset data is the first part of Know Your Assets and forms the foundation for the State of the Infrastructure. For a review of this approach, see the Concepts and Frameworks section.

Using the requirements of a standard asset registry, a gap analysis of the Water asset registry is provided as follows (Figure 47):

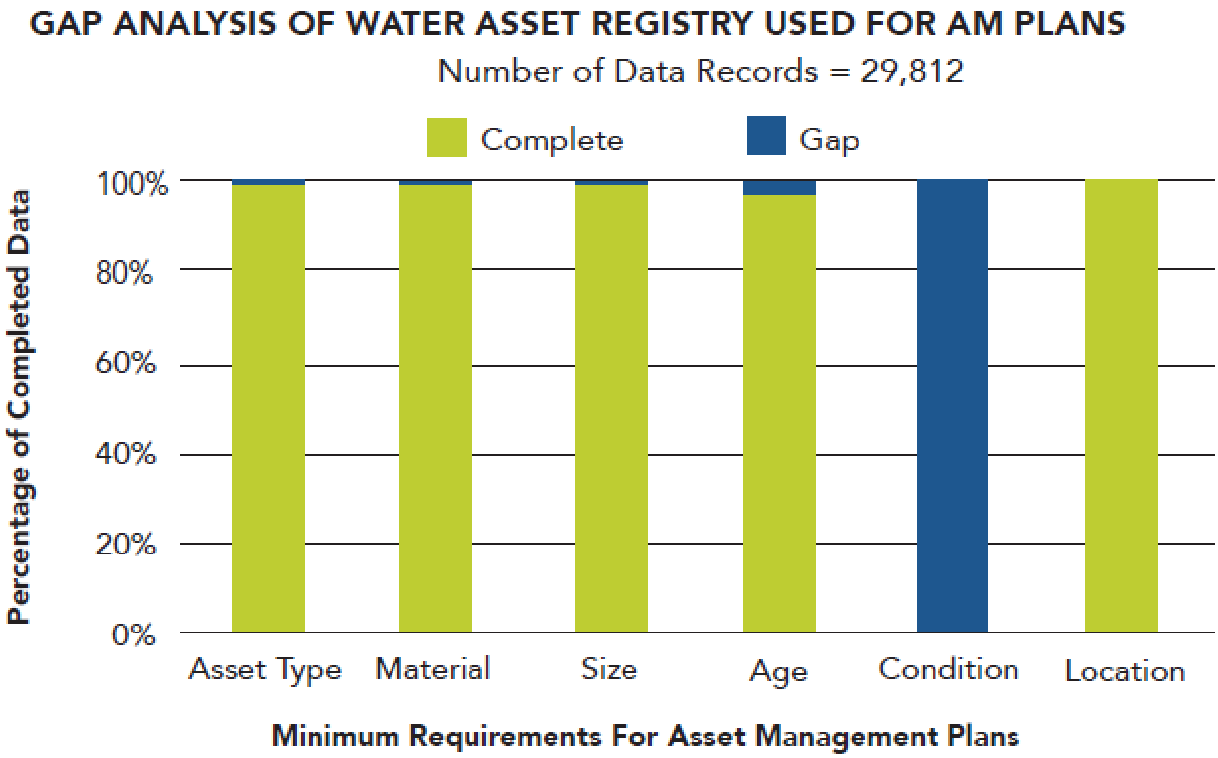


Figure 47 - Gap Analysis of Water Asset Registry Used For AM Plans

When viewing subsequent sections of the asset management plan that use asset data, consideration should be given to the data gaps described here.

CONTEXT FOR STATE OF INFRASTRUCTURE

The State of the Infrastructure will combine inventory quantities, replacement costs, and condition ratings to provide a detailed breakdown of the Town's assets.

What Do We Own? The inventory has been organized in a hierarchy to reflect the asset types providing the service, and to support reporting and planning. The Town's inventory for the water service area is organized as follows (Figure 48).

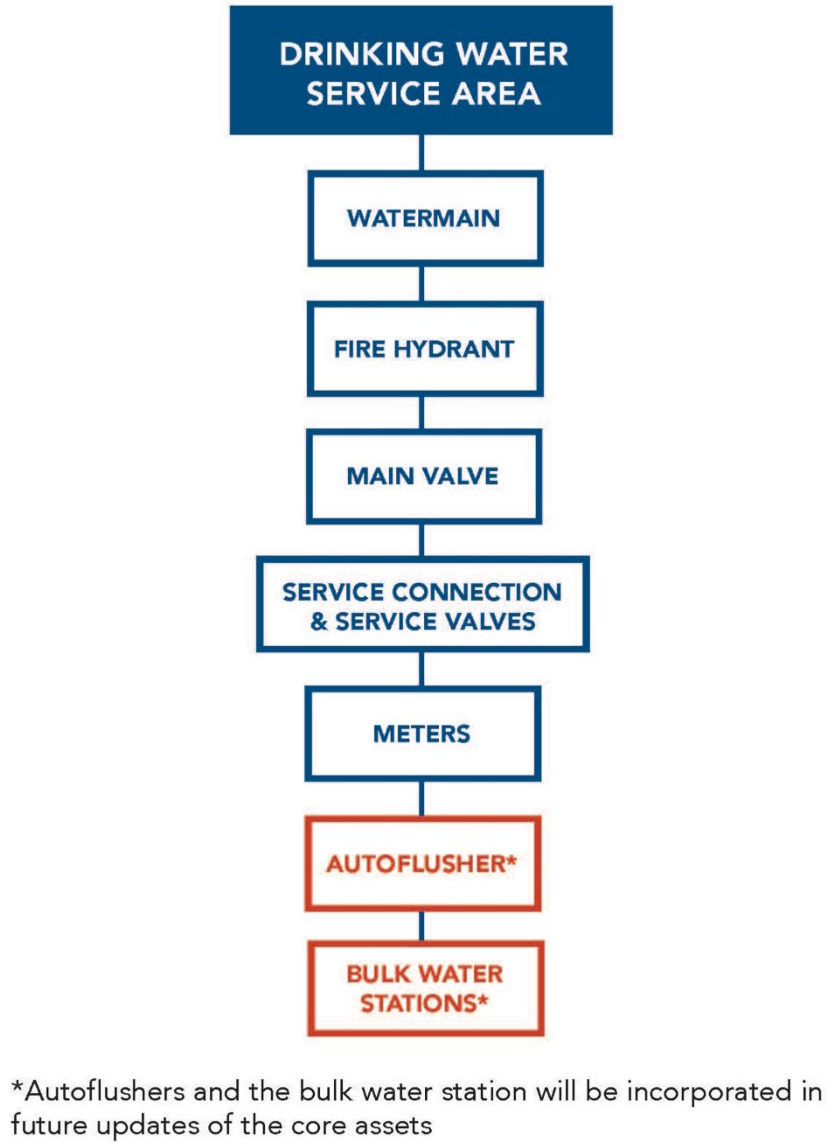


Figure 48 - Drinking Water Service Area Classification

This inventory will be used for replacement valuations, service delivery, operations and maintenance, growth updates, capital planning, and financial reporting.

What Does It Cost? The total replacement cost for water is ~$487 Million (2021 dollars). This is equivalent to 20% of all Town-owned assets, and 24% of the core asset subset reported through the 2021 AMP.

What Condition Is It? Using the method of most Infrastructure Report Cards, assets are assigned condition ratings on a 5-point scale. Ratings are assigned based on age, and supporting information like material type and frequency of main breaks. Age is an industry-accepted benchmark for the high-level analysis of infrastructure portfolios, using the principles outlined in the Concepts and Frameworks section.

Table 42 - Age Based Condition Rating

Condition Ratings Based on Current Age of the Assets				
Very Good	Good	Fair	Poor	Very Poor
100% – 90%	90% – 70%	70% – 35%	35% – 20%	20% – 0%
Percentage of Remaining Useful Life				

Water Distribution Infrastructure Report Card

Newmarket

INFRASTRUCTURE PURPOSE

The Town provides drinking water distribution to service residents, business and customers with water purchased from York Region. The distribution system is maintained by the Town for high water quality and reliable supply.

REPLACEMENT COST:
$487 Million

AVERAGE NETWORK CONDITION
FAIR

INVENTORY
See breakdown below

DETAILS:

Life Expectancy

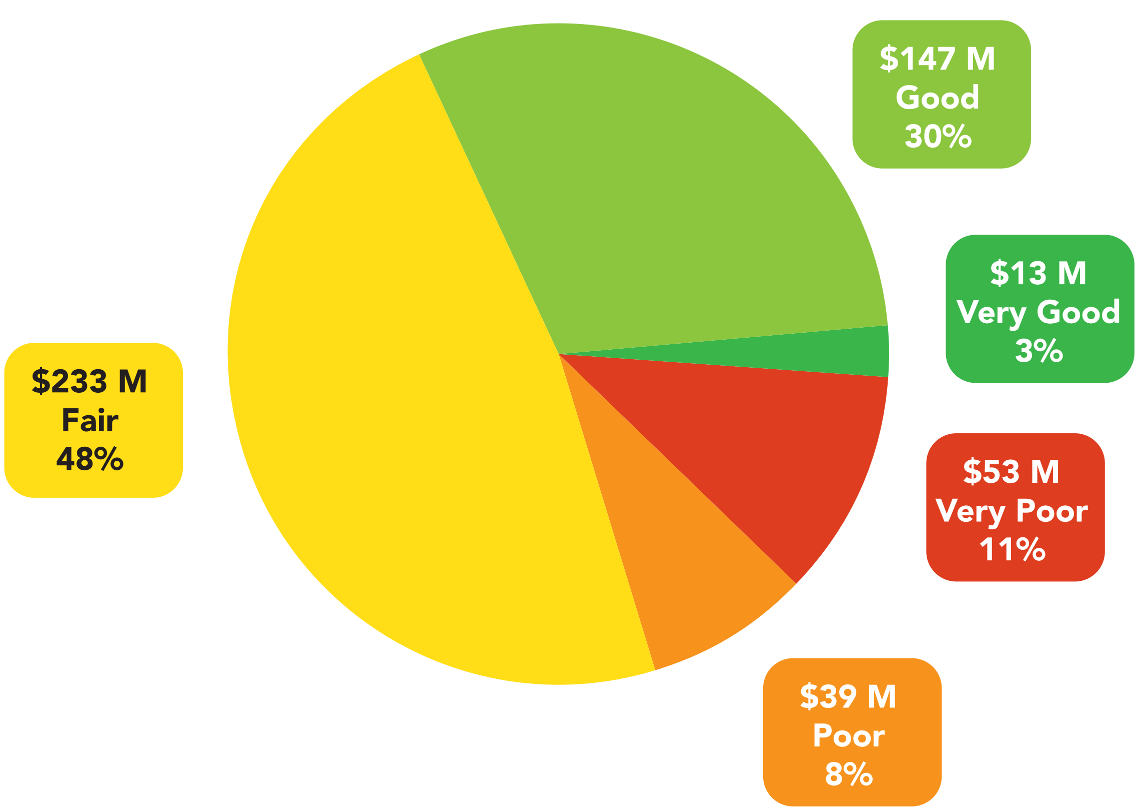
To date, our water distribution system has used on average, 39% of its intended life span with 61% of its life span remaining.

Average Rating: Fair.

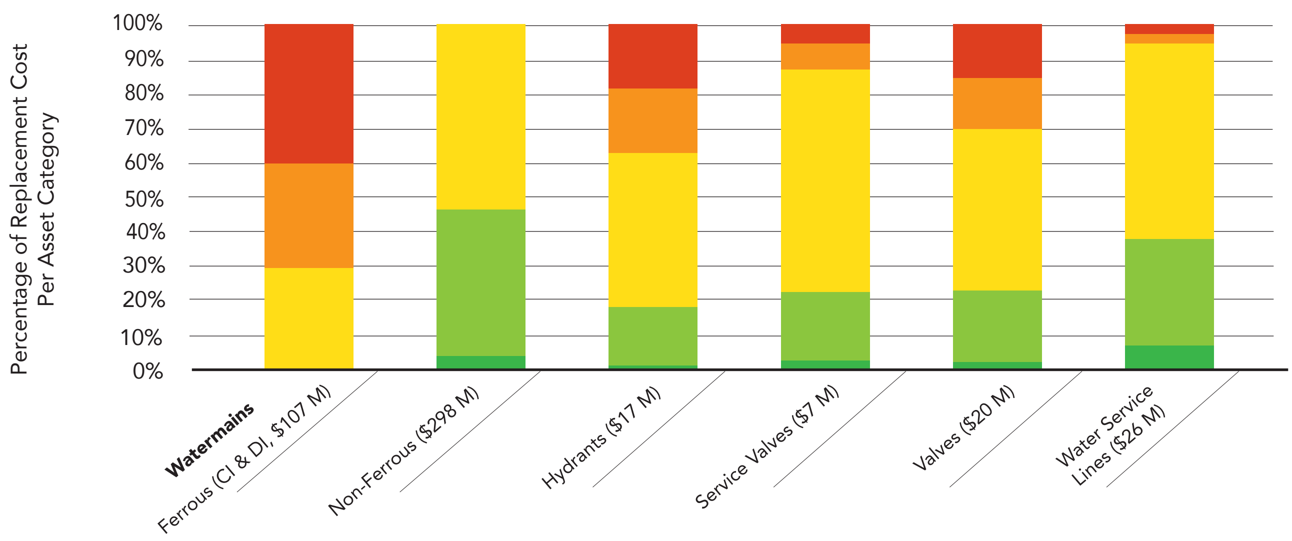
WHAT CONDITION ARE OUR ASSETS IN?

Very Good | Good | Fair | Poor | Very Poor

Current Condition & Replacement Cost ($ Millions)



Water Condition Breakdown by Asset Class (Normalized 100%)



Poor condition assets are mostly attributed to iron watermains, which are older and known to break easily. New PVC pipes do not have this vulnerability.

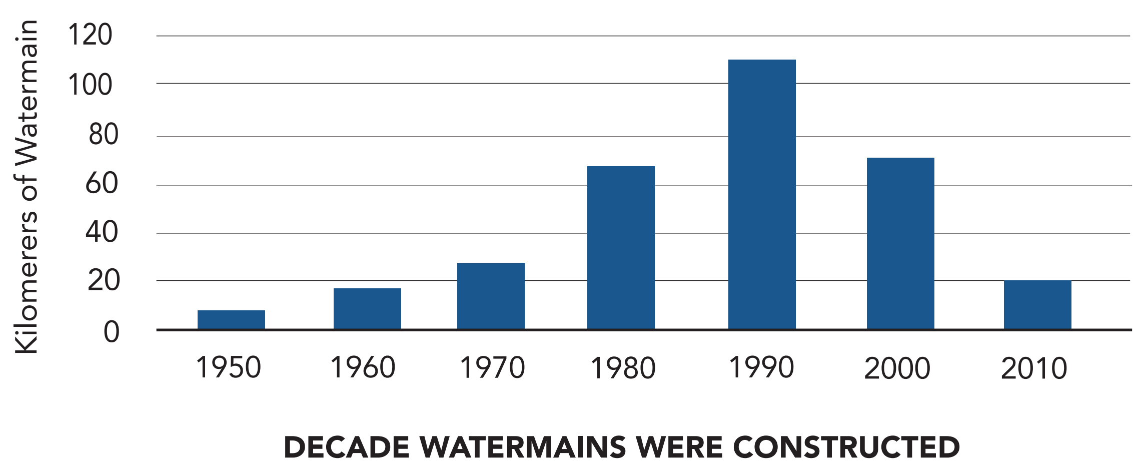
WHAT ASSETS DO WE OWN?

Asset Class	Quantity
Water Mains	308 kilometers
Fire Hydrants	2287 assets
Main Valves	4547 assets
Service Connections (Town-owned)	148 kilometers*
Service Valves	14,824*
Meters	26,172
Bulk Water Stations	1**
Auto-Flushers	10**
*As shown in data assumptions, the provided asset inventories for services are only partially complete and will increase as data improves. These values are extrapolated as required for financial planning.	
**Inventory is approximate and assets will be fully incorporated in future AMP updates.	

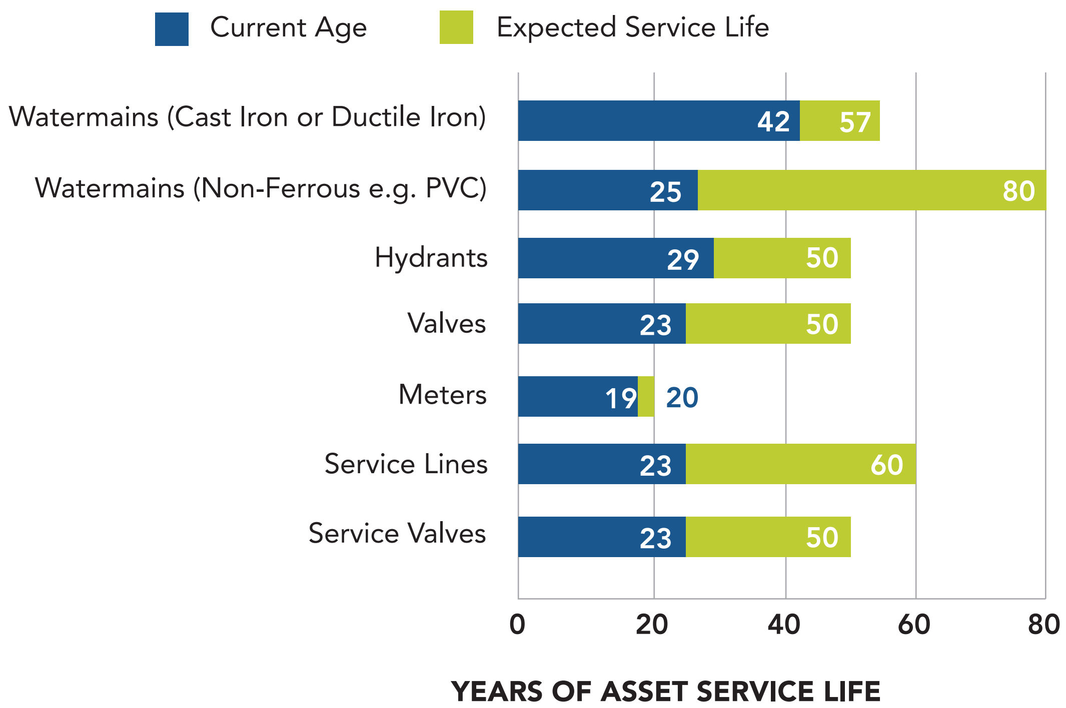
HOW OLD ARE OUR ASSETS?

DECADE OF WATERMAIN CONSTRUCTION

(Total Kilometers)

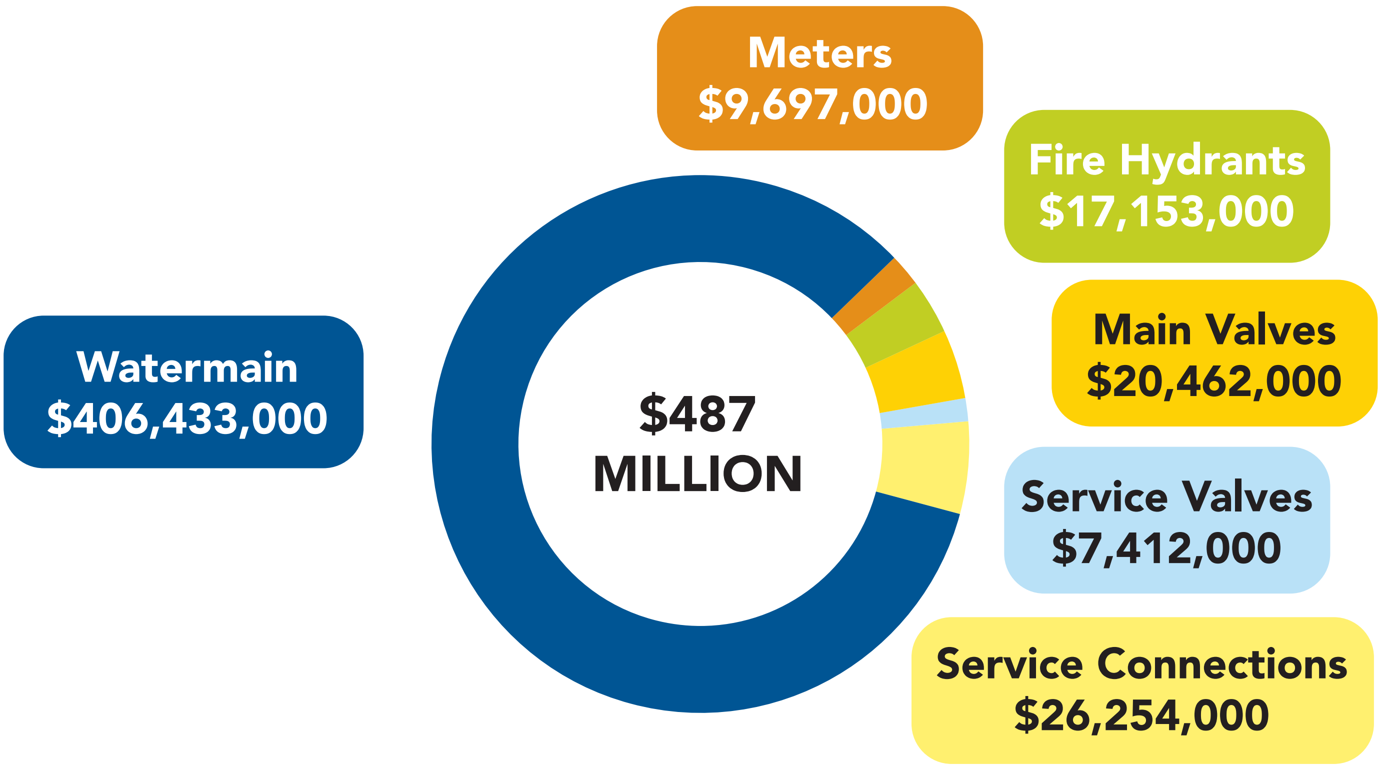


AVERAGE AGE AND EXPECTED SERVICE LIFE OF WATER INFRASTRUCTURE



WHAT WOULD OUR ASSETS COST TO RECONSTRUCT IN 2021?

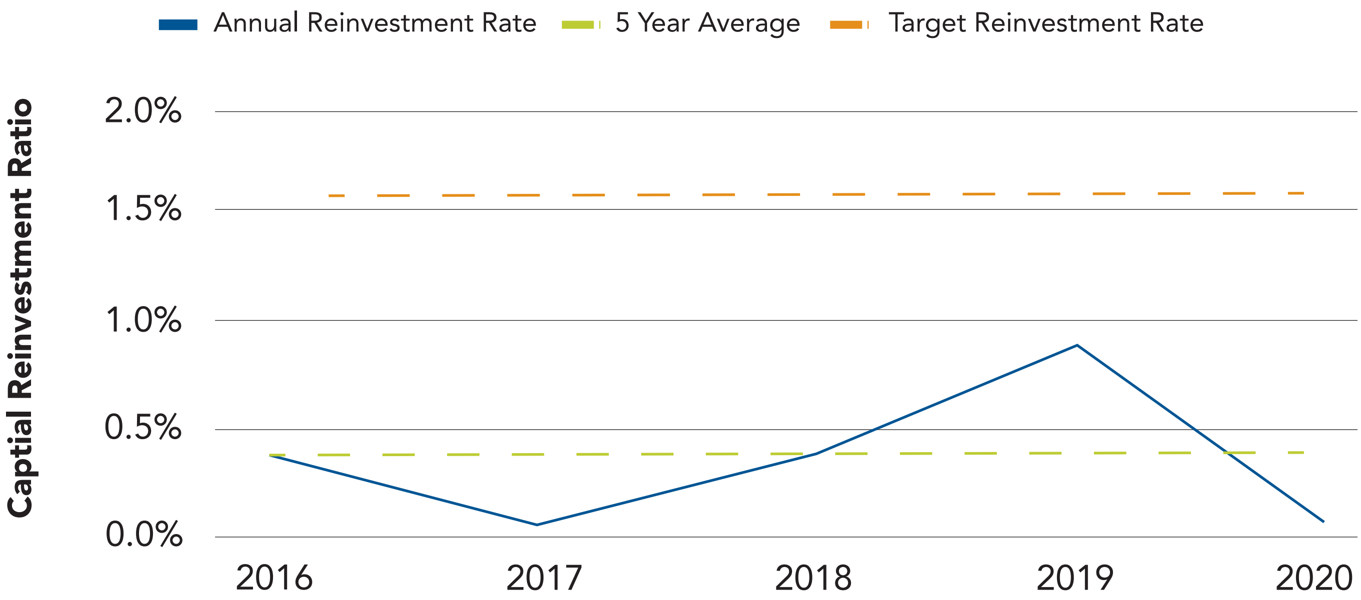
TOTAL ASSET REPLACEMENT COST OF DRINKING WATER



CURRENT CAPITAL SPENDING

CAPITAL REINVESTMENT (5 YEAR AVERAGE)	$1.53M
REINVESTMENT RATIO * (5 YEAR AVERAGE)	0.32%

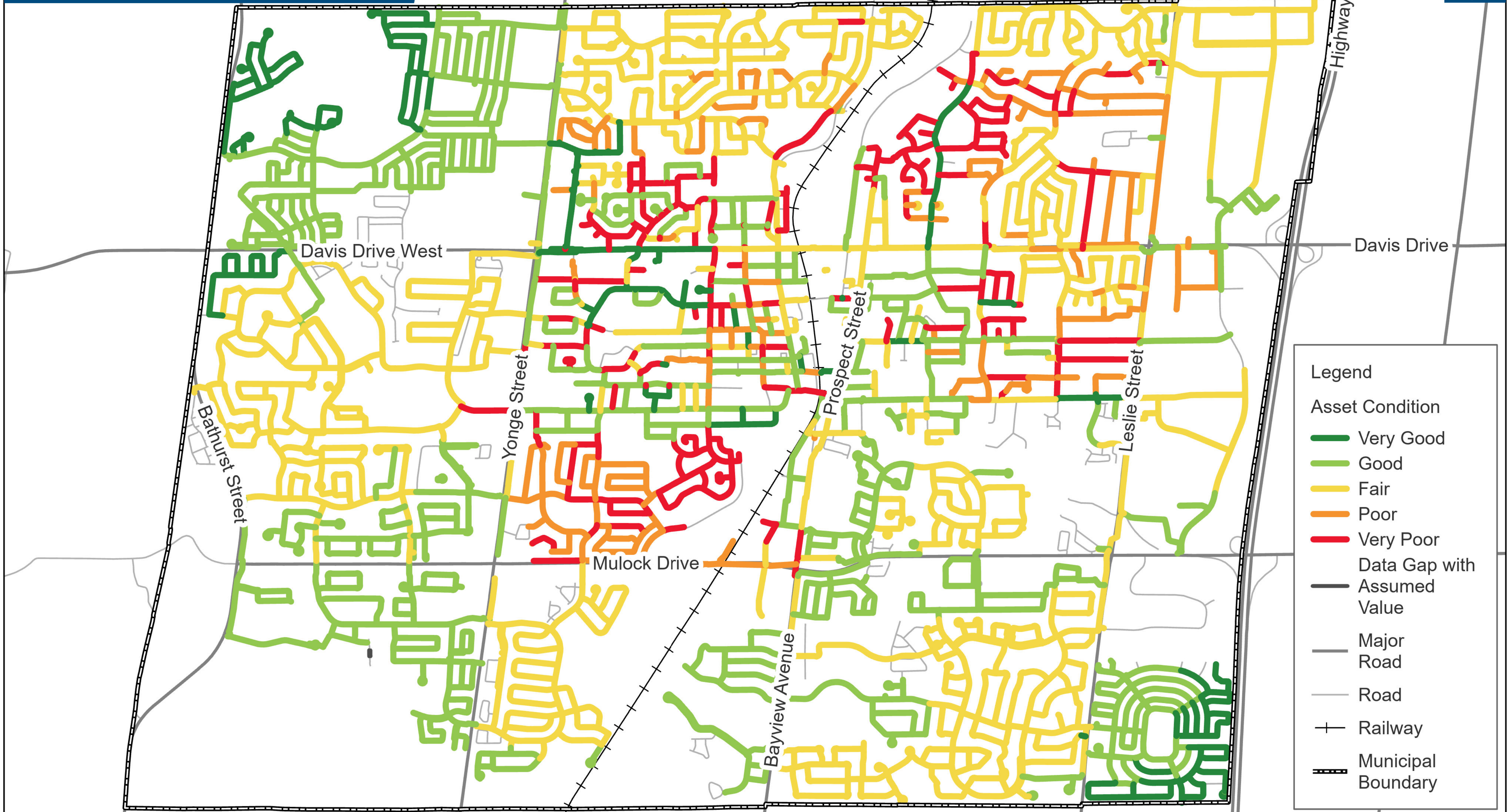
HISTORICAL ACTUAL REINVESTMENT RATIO IN WATER
Percentage of Total Replacement Cost (%)



* **Reinvestment Ratio:** A financial measure indicating the Towns reinvestment into existing assets via the capital program. The Canada Infrastructure Report Card recommends a minimum annual reinvestment ratio of 1%

Town of Newmarket – 2021

Condition of Watermains



Document Path:G:\Projects_PRO\CorporateServices\Finance\AssetManagment\Infra_Report_Card\Infra_Report_Card.aprx\Water_Condition_Report Map 8x14

PROGRESS AND NEXT STEPS

Concluding Know Your Assets, the Town will use condition assessments to increase knowledge of the assets, monitor performance, and refine financial projections. The Town's approach to condition assessments is described in the Concepts and Frameworks section.

Strategy for Water

Watermains have a different approach to condition assessment and renewal decision making than other assets. Watermains are pressurized buried pipes, meaning they are inaccessible and condition defects are not visible (unlike sewers). The method for assessing pipe condition varies drastically with pipe material. Performance and break history are good indicators of condition, and main break history demonstrates that the Town has a poor condition cast iron inventory that should be removed over time to reduce reactive maintenance. Figure 49 – Figure 51 summarizes the Town's main break history as a proxy for asset conditions:

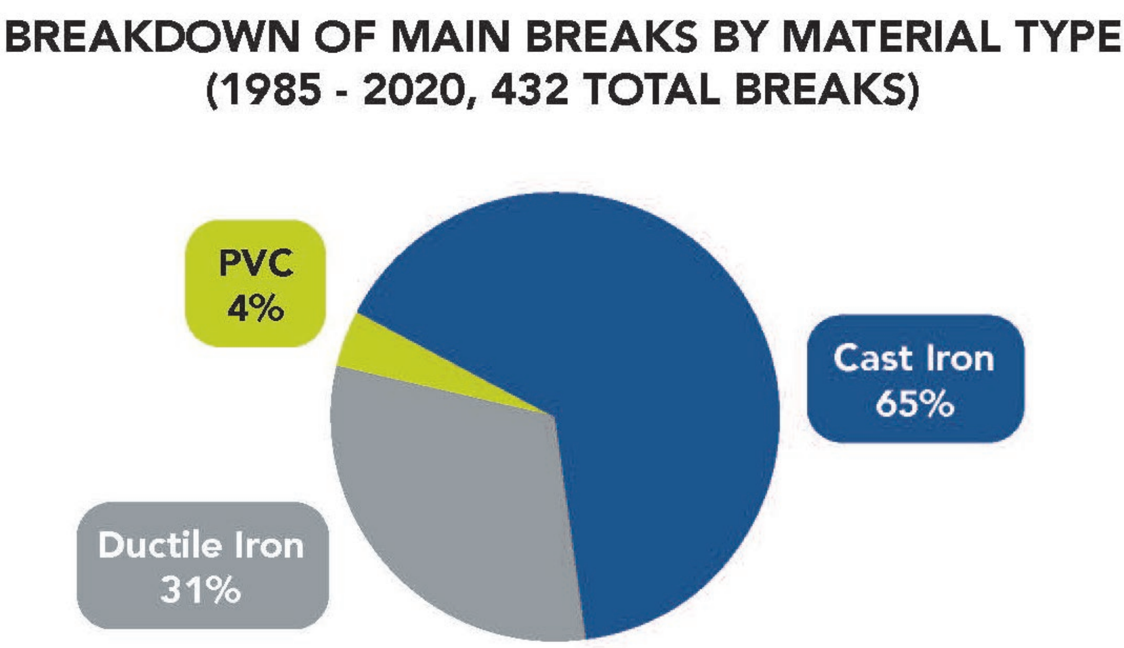


Figure 49 - Breakdown of Main Breaks by Material Type

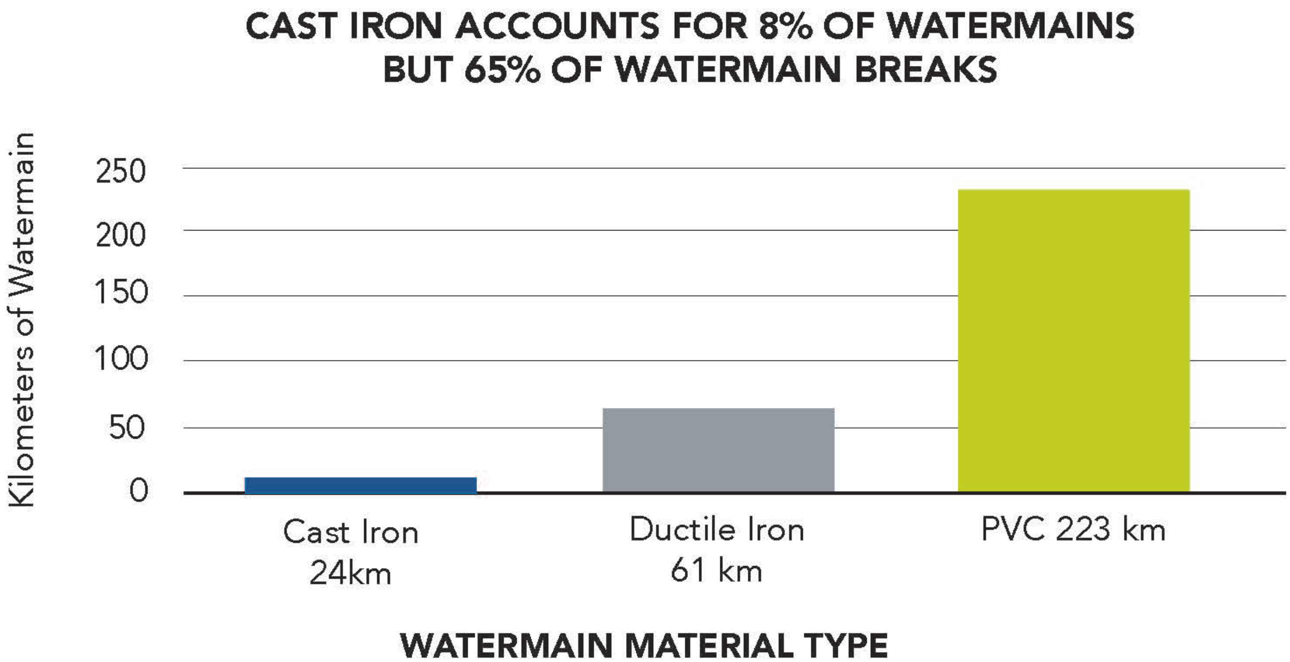


Figure 50 - Cast Iron Accounts for 8% of Watermains but 65% of Watermain Breaks

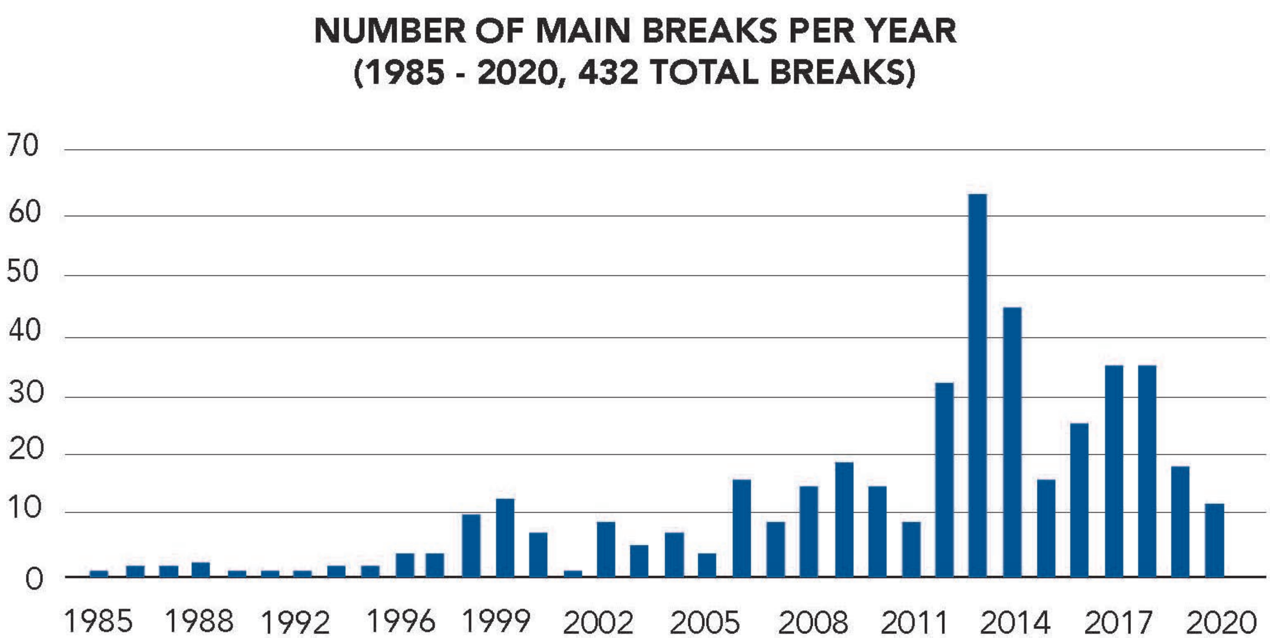


Figure 51 - Number of Main Breaks Per Year (1985 - 2020, 432 total breaks)

Watermain conditions are a significant driver of the Town's capital plan, which often focuses construction projects on locations with poor condition watermains. The rate at which these watermains are replaced will have impacts on capital budgets, customer levels of service, and expenditure on reactive maintenance. Over time, levels of service may see positive impacts from removing these watermains, while those that are not yet removed may see increasing break rates. Therefore, it is recommended that a desktop study of the cast iron and ductile iron watermains be conducted. The goal of analysis will be presenting options for replacing these watermains under different time horizons with different budgets, service outcomes, and trade-offs / opportunities costs of reactive maintenance costs.

Condition assessment is an important part of an asset management strategy. However, water has several interconnected issues associated with service delivery, namely non-revenue water and water quality issues. These outcomes should also be part of any studies or planning for the network.

Progress in watermain condition assessment to date includes:

- 2018 - Consultant led risk assessment of watermains completed.
- 2020 – Watermain breaks database updated by Public Works, GIS, and Asset Management
- 2021 – Capital planning software for watermains piloted as part of the Asset Management Plan.

Goal: Conduct a desktop analysis of watermain conditions by material type cohort, with the goal of presenting options for replacing the watermains under different time horizons with corresponding budgets and service outcomes.

RECOMENDATIONS

- Complete asset inventory GIS layers for auto flushers and bulk water stations.
- Review and update the sample stations layer in GIS for use as an asset inventory.
- Develop a condition assessment scale for use by contractors during annual regulatory hydrant maintenance.
- Conduct a desktop analysis of watermain conditions by material type cohort, with the goal of presenting options for replacing the watermains under different time horizons with corresponding budgets and service outcomes.

MANAGE SERVICE DELIVERY

Asset management is not software, or a document. It is a way of doing business every day. Asset management requires processes to balance the services provided, the risks associated, and their cost. To make tradeoffs, visibility is needed into what is being done and why. Key takeaways will include:

- What services do we provide?
- What activities support services, and who does what?
- What are the risks of our services?

LEVELS OF SERVICE ALIGNMENT

Manage Service Delivery is about the services asset deliver, the associated risks or opportunities, and activities/resources that are expended doing so. This is explained in the Concepts and Frameworks section. To begin the use of this framework, the Town has developed a set of measures for levels of service.

The levels of service measures are organized to create alignment between Town strategic objectives, a corporate goal for the service (e.g. water), and the subsequent service criteria and technical/customer measures. Metrics have been listed and aligned before presenting the results in the next section. The result of this process is shown as follows (Figure 52):

Figure 52 - Water Levels of Service Alignment

PERFORMANCE AND RESULTS

Legend			
Symbol	Meaning	Symbol	Meaning
	Trending up in the desired direction.		Trending down in an undesired direction.
	Trending down in the desired direction.		Trending up in an undesired direction.

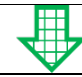
Corporate Goal

Provide accessible, safe, reliable drinking water for a reasonable price.

Customer Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Average operating pressure of water service	**71 psi**	**74 psi**	*Trend not applicable*
Number of services below operating pressure guidelines (<40 psi)	**51 services**	**89 services**	*Trend not applicable*
Percentage of assets in <u>Fair</u> or better condition	**82%**	**82%**	
Number of complaints related to the quantity and availability of water (excludes billing, service requests, etc).	**678 complaints**	**435 complaints**	
Annual MECP Inspection Rating	**91.39%**	**97.57%**	

Technical Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
The number of AWQIs encountered as a percentage of the total number of samples collected	**2.6%** of samples	**1.7%** of samples	
Capital renewal reinvestment ratio (5 year rolling average)	**0.35%** of replacement cost	**0.32%** of replacement cost	
Number of watermain breaks	**18** breaks	**12** breaks	

*Levels of service measures do not have endorsed targets. Trend observations are made on the basis of general recommendations related to the sustainability of assets, services, and finances

Regulatory Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of properties connected to the municipal water system	**97%** of properties	**97%** of properties	*Trend not applicable*
Percentage of properties where fire flow is available.	**99%** of properties	**99%** of properties	*Trend not applicable*
The number of connection days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	**0 days**	**0 days**	*Trend not applicable*
The total number of available connection days per year due to water main breaks compared to the total number of properties connected to the municipal water system.	**99.9992%** available connection days.	**99.9998%** available connection days.	

ILLUSTRATION OF CURRENT LEVELS OF SERVICE

As shown in the State of the Infrastructure section, the Town's assets exist in a variety of condition states. This was linked to the LoS Framework section, which showed how condition is a primary driver of service levels. Financial decisions about what asset conditions will be financed (shown in Financial Strategy) ultimately impacts LoS. To illustrate this impact, a collection of images have been collected depicting the differences in condition and LoS.

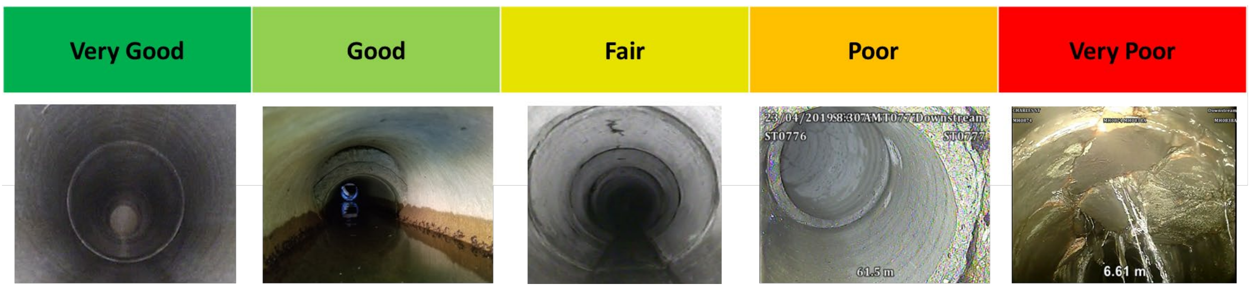


Figure 53 - Example of Levels of Service for Different Asset Conditions

Watermain deterioration is difficult to capture visually due to accessibility of pressurized buried pipe. To supplement, wastewater sewer pictures have been provided from the Wastewater Asset Management Plan.

LEGISLATIVE REQUIREMENTS

Legislative requirements are one way to define minimum levels of service requirements, as describe by the Concepts and Frameworks section.

Upcoming Legislative Requirements

At the time of AMP publication there are no upcoming regulatory requirements known for Water that would impact the Town's levels of service or budgets.

Current Legislative Requirements

The Town currently operates within several regulatory requirements. As the regulatory environment changes, the minimum Level of Service the Town provides may also change. Current regulatory requirements are as follows (Table 43):

Table 43 - Current Legislative Requirements

Legislation	Overview	Impact to Asset Management
O. Reg 170/03 – Drinking Water Systems	Applies to drinking water distribution systems like the Town's via the Safe Drinking Water Act of 2002. O.Reg 170/03 defines and categorizes drinking water systems in Ontario with set requirements for public reporting, sampling (biological and chemical), parameters for exceedance, and processes for reporting and corrective action.	• Sampling of drinking water at sample stations by water operators. • Manual and automated flushing to achieve parameters for water quality. • Potential installation of more sampling stations and autoflushers with population growth.
O. Reg. 128/04 - Certification of Drinking Water System Operators and Water Quality Analysts	Establishes a classification system for drinking water operators and water quality analysts, and the subsequent licensing and training requirements and processes for each class.	• Requirements to maintain staff licensing, provide training. • Operate in accordance with training. • Administrative and record keeping requirements.
O. Reg. 169/03 - Ontario Drinking Water Quality Standards	In alignment with O. Reg. 170/03, the Ontario Drinking Water Quality Standards outline maximum concentrations of 149 chemical and	• Requirements for testing and sampling of drinking water. • Requirements for field equipment. • Requirements for monthly and annual maintenance of equipment.

Legislation	Overview	Impact to Asset Management
	microbiological parameters for drinking water.	• Budgets for laboratory testing of samples. • Support costs to enable collection, transportation, and reporting of samples tested.
National Fire Protection Association Codes and Standards, and 0. Reg. 388/97	The Design Guidelines for Drinking-Water Systems says to refer to O. Reg. 388/97 for non-design requirements respecting fire hydrants. O. Reg. 388/97 states that municipal and private hydrants shall be maintained in operating condition and that hydrants shall be inspected annually and after each use. The requirements for fire flow can be found under Chapter 4 of NFPA 291.	• Requirements to inspect and exercise hydrants annually to ensure adequate operating conditions and flow. • Requirements to take corrective action when hydrants are not in adequate operating condition. • Must ensure hydrants are accessible and free of obstructions, including snow and ice. • Hydrants must be uniformly marked and color coded.
Drinking Water Quality Management System	According to the Safe Drinking Water Act, Owners and Operating Authorities of municipal drinking water systems are required to implement a Quality Management System (QMS) that meets the requirements of the Drinking Water Quality Management Standard (DWQMS). The QMS establishes objectives and documents procedures to achieve the objectives.	• Internal and External Audits once every calendar year. • Conduct risk assessment processes. • Maintain operational plans for renewal of infrastructure. • Requirements to develop and monitor continuous improvement processes. • Requirements for document and record control. • Reporting requirements to top management and the Owner. • Requirements for equipment verification and calibration. • Emergency response testing requirements.

Lifecycle Activities - Results

This section outlines the current business practices employed by the Town to manage assets throughout their lifecycle. At this early stage of implementing and improving asset management practices, the Town has not undertaken any studies to review current practices for lifecycle management or researched alternative options for service delivery. Where appropriate these have been identified as improvement tasks. The Town also wishes to quantify each activity to help determine tradeoffs and opportunities for levels of service adjustments, which will be completed as AM capabilities advance.

The Town's lifecycle activities and improvement opportunities for Water are summarized in Table 44 - 47.

Table 44 - Fire Hydrant Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construction of new hydrants	Development Engineering	
Operations, Maintenance, and Inspections	Inspections and servicing	Public Works (Water)	Update contractor methodology to include a 5-point scale condition assessment. Establish a data management plan for annual hydrant inspections.
	Hydrant painting		
	Winter inspections & maintenance		
	Fire flow operations		
Renewal and Rehabilitation	Repairs and operational replacements	Public Works (Water)	
Replacement	Replace hydrants and associated infrastructure	Engineering	

Table 45 - Meters, Bulk Meter, and Water Station Asset Lifecycle

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construction of new meters	Development Engineering	**Building Application**: • Recommendation: Include meter fees to provide visibility to cost of meter and monthly fixed charges by meter size. **Subdivision Agreement**: • Recommendation: Include meter fees to provide visibility to cost of meter and monthly fixed charges by meter size. **Meter Purchase & Installation**: • Observation: Builders currently purchase meters directly from the Town. This increases administrative burden and requires the Town to store inventory (and is accountable) for inventory purchased until picked up by the vendor. • Recommendation: builders purchase meters directly from approved vendor. **Meter Sealing & Occupancy:** • Observation: Currently builder provides ~5 days notice to Town staff prior to Occupancy to seal meters. Occupancy cannot be delayed due to unsealed meter, and access becomes an issue after occupancy – sometimes resulting in high customer bills or credits. Recommendation: Review meter seal & occupancy process for gaps and opportunities for improvement.
Operations, Maintenance, and Inspections	Meter reads, inspections, investigations, and maintenance.	Public Works (Water)	**Meter Maintenance / Investigations** • Recommendation(s) ○ Review resourcing and budget requirements required for legacy and smart meter maintenance activities.

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
			○ Implement annual or semi-annual process to identify and repair meters that are receiving estimated billing due to meter maintenance that were not addressed during standard meter maintenance appointments. (i.e. Wire run and/or repair due to cut/broken wire, customer refusal during initial appointments, missed appointments) • Customer Appointments ○ Observation: Customers not charged for missed appointments Recommendation: Implement process to charge customers for missed appointments.
	Bulk meter inspections		
	Water station flushing		
	Water station calibration		
Renewal and Rehabilitation	Operational meter repairs and replacements		See '*Operations, Maintenance, and Inspections'* → '*Meter reads, inspections, investigations, and maintenance'*
	Bulk meter and water station repairs/replace		
Replacement	Replace meters		**Recommendation:** Develop replacement strategy required for new meter and smartpoint inventory. Options**: i)** active replacement program starting at year X and replacing X meters/smartpoint per year ii) mass replace as meters/smartpoint reach expected end of life due to battery life.
	Upgrade meters to smart advanced meters (AMI)	Public Works (Water) & Strategic Initiatives	**Meter Communication**

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
			• Observation: Responsibility of monitoring & escalation of meter communication issues is currently outsourced through a contract set to expire. • Recommendation: i) Review contract cost & accountabilities to determine if Town is getting value for cost to determine if contract should be extended or brought in-house. ii) align on AMI resourcing requirements and strategy for AMI meter communication & value add services. **Meter Maintenance:** • Observation: Meter communication investigations are currently being performed by a consultant pending training of Town staff and implementation of internal processes. • Recommendation: Review resourcing & budget requirements review required for AMI meter maintenance activities. **Value-Add Services:** • I.e. Leak, Continuous flow, reverse flow identification and customer notification. • Strategy and resourcing plan required for implementation of value-add services. (I.e. Condition identification & customer notification)

Table 46 - Watermain Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible	Observations and Recommendations
Acquire and Commission	Construction of new water mains	Development Engineering	Recommendations captured in "Future Ready" chapter.
Operations, Maintenance, and Inspections	Watermain flushing: (unidirectional, dead end, automated)	Public Works (Water)	
	Watermain swabbing		
	Watermain breaks		
	Water quality monitoring		
	Demand monitoring and modelling	Development Engineering *(master plans)* and Public Works (Water) *(operational demand management)*	Recommendations captured in "Future Ready" chapter.
	Watermain cathodic protection	Public Works (Water) *With support from Engineering*	Create governance model and project management plan. Define roles & responsibilities. See recommendations about rehabilitation targets in "Condition Assessment Plan". Develop criteria for intervening with watermain lining rather than removal/replacement as part of a corridor management strategy (with AM support).
Renewal and Rehabilitation	Watermain lining		

Lifecycle Phase	Lifecycle Activity	Responsible	Observations and Recommendations
Replacement	Replace watermains and associated infrastructure	Engineering	See recommendations about rehabilitation targets in "Condition Assessment Plan".

Table 47 - Valves Assets Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible	Observations and Recommendations
Acquire and Commission	Construction of new valves and service valves	Development Engineering	
Operations, Maintenance, and Inspections	Valve inspection and turning	Public Works (Water)	Formalize inspection programs and record condition observations. Develop multi-year plan and resource plan for sustainable valve operations.
	Valve operations, shut-offs		
Renewal and Rehabilitation	Valve repairs and operational replacements		
Replacement	Replace valves and associated infrastructure	Engineering	

RISK

Risk is a key asset management tool, and works on a spectrum of asset-level, service-level, and corporate-level spectrum of considerations. This is described in the Concepts and Frameworks section.

The Town currently does not have a formalized, holistic approach to risk management. However, some existing activities and components of service delivery include risk elements and there are multiple examples of using risk-based approaches to support decision-making. There is also a desire to continue with improved risk practices as part of asset management planning and work towards regulatory requirements for service level risk analysis. To meet this need, **a 3 Step Development Plan is recommended**.

The 3 Steps reflect the types of risks – corporate, service level, and asset level, and follows the international standard for risk management (ISO 31000) (Table 48):

Table 48 - 3 Step Development Plan for Risk Management Practices

Recommendation Phase	Improvement Measures
Step 1 – Near Term **Goal of this Phase:** Ensure existing risk components are consistent and broadly applied.	1.1 Review and update budget decision package form and process with risk and service-based considerations. COMPLETE 1.2 Establish a criticality rating methodology that is applicable across all asset classes and apply it to all core assets. COMPLETE 1.3 Assign roles and responsibilities, including accountability, for risk management in the Town – Establish Council and leadership's accountability for ensuring risk is considered and incorporated into all levels of decision-making processes within the Town over time.
Step 2 – Mid Term **Goal of this Phase:** Formalize a Risk Management Framework that is directly integrated	2.1 Development of a risk management policy that is endorsed by Council, and a corresponding strategy for implementing the policy across the Town. 2.2 Develop a risk management framework to assess asset criticality, asset risk, service risks, and risks to achieving corporate (strategic) goals.

Recommendation Phase	Improvement Measures
within all relevant Town processes. It is important that the framework is supported by senior leadership to ensure it adds value and effectively impacts decision-making.	2.3 Establish reporting processes to keep the Town's management teams and Council aware of critical risks, and their associated mitigation actions. 2.4 Develop service level risk registers for each area (roads, water, etc.) that can support a corporate risk register that may be monitored by senior leadership and used to support the management of service delivery.
Step 3 – Long Term **Goal of this Phase:** Leverage risk to be a core capability for the Town.	3.1 Establish a regular review process for identified risks as well as the Town's risk framework. 3.2 Employ risk as an optimization objective for funding allocation and other strategic decision-making. Once risk is strongly embedded within the Town's processes, the Town may wish to employ software and other useful tools to evaluate risk and funding allocations to minimize residual risk accepted by the Town.

Asset Level Risk
As progress towards completing Step 1 of the 3 Step Development Plan for risk management, asset level risk has been assessed for the Town's watermains using a risk framework. The results of this process are shown as follows (Table 49):

Table 49 - Watermain Risk Profile

Risk Inputs	Likelihood of Failure (LoF)	Consequence of Failure (CoF)
Water Risk Factors Assessed	- Age - Material - Failure History	- Road class - Watermain diameter - Proximity to critical customers - Proximity to watercourses and environmentally sensitive areas - Land use

Watermain Risk Profile (Consequence X Likelihood of Failure) Profile

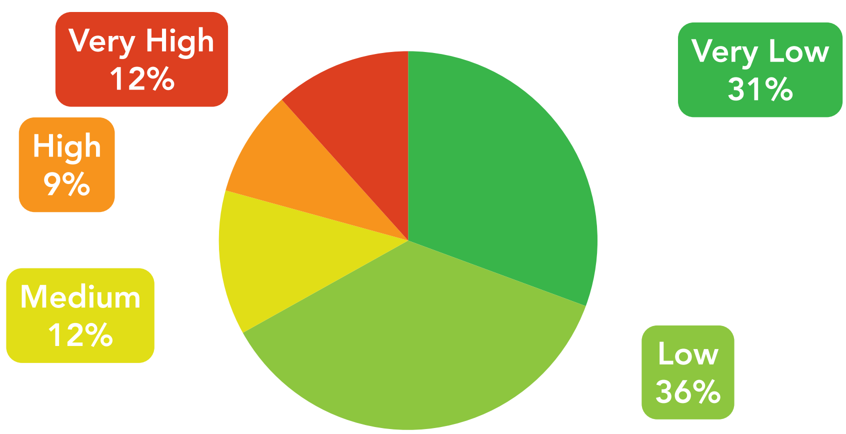


Figure 54 - Water Asset Risk Profile

FUTURE READY

What was once a small but thriving Town, today Newmarket is a desirable and affordable community. While the future is bright, trends like increasing service expectations, urbanization, and climate change are challenging the status quo. The future will change how the Town manages assets. Key takeaways will include:

- Impacts of growth on assets and budgets.
- Vulnerabilities and adaption and mitigation approaches to climate change.
- Aligning master plans with the management of existing assets

GROWTH FORECAST

Identified Growth Impacts on Water Assets

1. Urban expansion: 16.8 km of new watermain will be added to Newmarket over the next four years due to the assumption of Sundial, National Homes, Glenway, and Forest Green subdivisions into the Town's portfolio. There is an additional large area in the South West (Shining Hill) that is expected to be developed just outside of the timeframe of the AMP, but the timing could be brought forward.

2. Urban intensification: 1.3 km of watermain is planned to be upgraded to increase capacity over the AMP timeframe. There is planned intensification on Main Street and the urban secondary plan area, generally located along the Davis Drive corridor between Upper Canada Mall and Huron Heights Drive and along the Yonge Street corridor between the Town's northerly boundary and Savage Road. Although the quantity and nature of assets required for these fully built-out plans has been estimated, full build-out is not expected within the AMP timeframe. However, a staged approach may be required for asset upgrades. If so, these changes should be incorporated into the AMP.

3. Changing standards: No changes to the water distribution network have been identified as a result of changing design standards or regulations. However, potential changes due to technology and resource philosophies have been identified in Table 51.

4. Climate change: No specific changes to the water asset portfolio to mitigate against the effects of climate change have been identified yet; however, a high-level flood resilience assessment of Town-owned infrastructure has been undertaken. The next phase of the study will assess the risks based on existing mitigation measures, then identify assets for upgrade or development based on flood vulnerability. Once the study is complete and identifies asset improvements, the AMP should incorporate those new assets.

Table 50 summarizes these asset increases by length of watermain added or upgraded each year. As shown in the table, the water mains planned over the AMP timeframe are almost all entirely due to urban expansion (new assets) or urban intensification (capacity increase). However, for asset management purposes it is important to note that there is a substantial gap in identified growth assets due to step changes in urban intensification, as well as gaps in identifying growth assets required for changing technology, climate, and resources – and associated changes in standards.

Table 50 - Water Asset Growth Increase to 2032 and Beyond

WATER		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	2032+
New Assets	Watermains (km)	1.7	1.8	13.3							1.1	17.9	
	Fire Hydrants (count)	14	18	35							8	75	
	Valves (count)	24	26	92							14	156	
	Valve Chambers (count)	2	4	2							1	9	
Capacity Increase	Water Upgrades (km)			1.2					0.1			1.3	

The level of effort and required resources to maintain growth assets has been quantified based on the total number of assets and the per-unit cost of maintenance. See Figure 55.

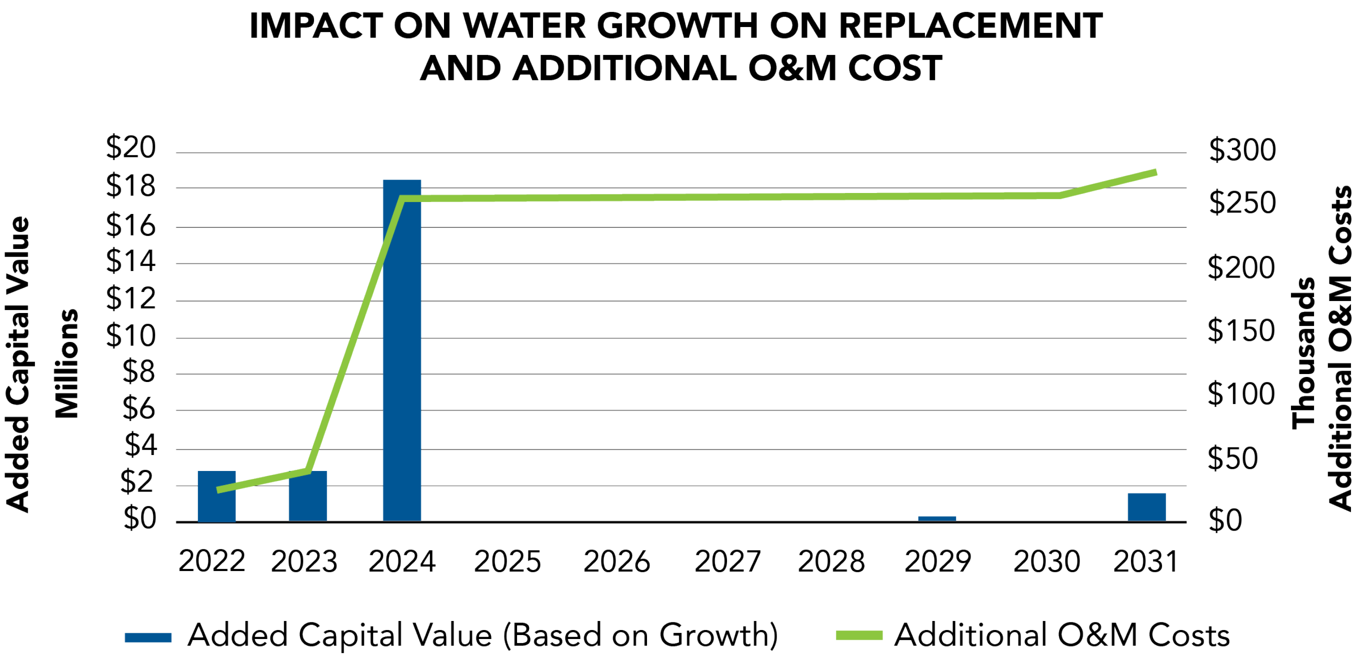


Figure 55 - Impact of Water Growth on Replacement and Additional O&M Cost

Historical Context of Growth

Since 2016, the length of watermains assumed by the Town had varied between 4 and 10km per year (see Figure 56). In contrast, in 2024, the quantum of assumed assets may be 13km, or about 33% higher than in 2020 when the greatest number of assets have been assumed in recent years. Some of these 13km may be assumed earlier, which would ease the burden on the operations team working the new assets into their plans. The quantum of watermains to be assumed beyond 2032 is unknown. However, the timing of the assumption of any new assets should be reviewed in the next three years to provide greater clarity for necessary resourcing.

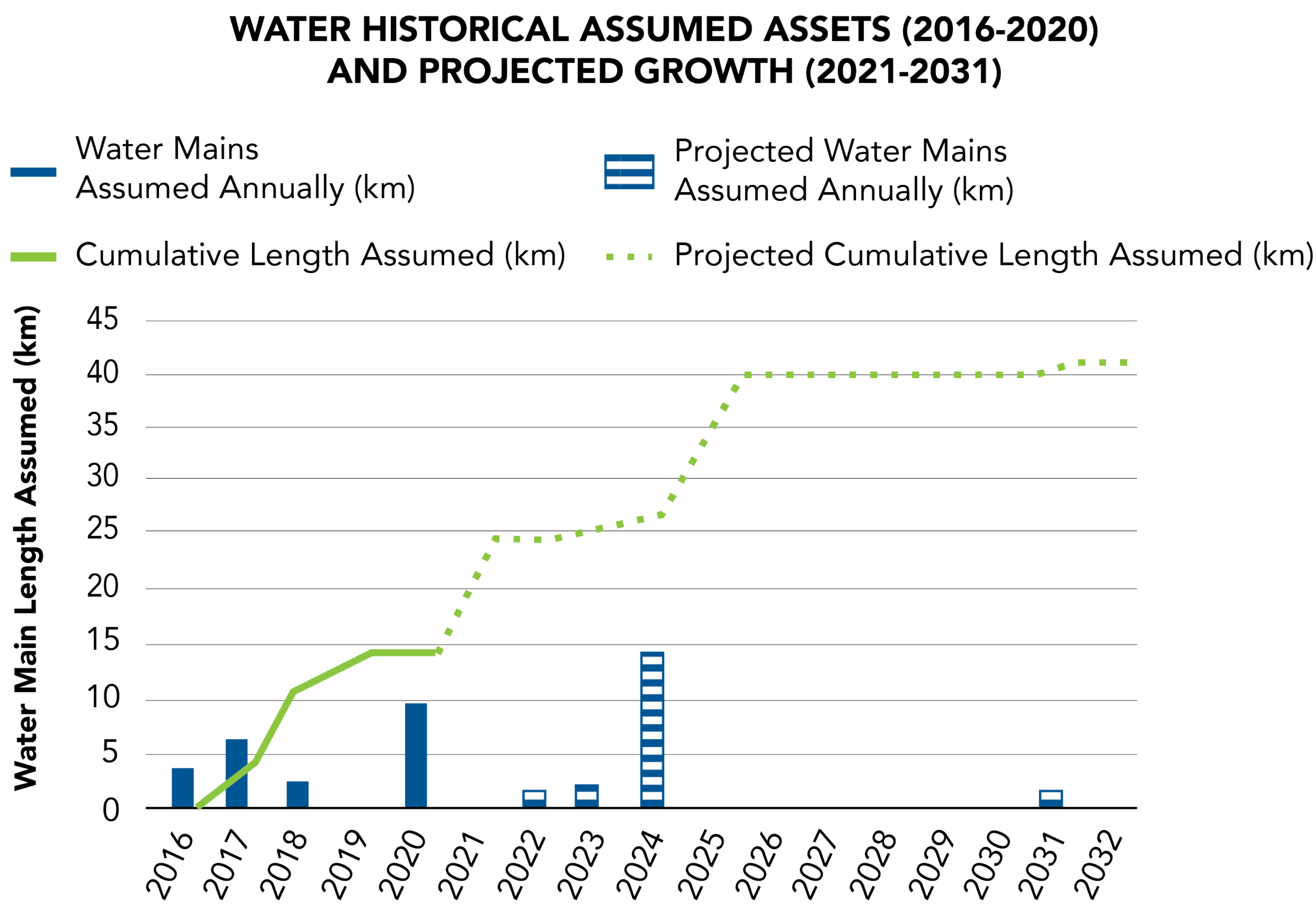


Figure 56 - Water Historical Assumed Assets and Projected Growth to 2032

CLIMATE CHANGE ASSESSMENT

The scope of the 2019 Climate Change Resilience Assessment did not address Town-owned drinking water infrastructure, as these assets are buried underground and the impacts of flooding are difficult to model. There are also other types of climate change impacts that would be of particular impact to the Town, such as freezing and thawing of the ground where pipes are buried. These types of impacts will be studied as the Town's capabilities to mitigate and adapt to climate change improve. For results of the 2019 Climate Change Resilience Assessment, please see the Asset Management Plans for Roads, Bridges, Wastewater, and Stormwater.

FUTURE TREND AND ASSSET IMPACTS

Table 51 - Implications of Future Trends on Water

Trend category	Trend	Implications for the management of our assets (to maintain service levels)	Growth	In existing plans?
Society	Urban intensification	Upgrade capacity of existing assets to accommodate more users in existing areas	√	√
	Urban expansion	Install additional assets to accommodate new users in new areas	√	√
	Aging Population	Asset is not fully utilised. Cost per litre rises. Additionally, less water consumption could impact wastewater system.		
	Changing societal norms	Changing consumption related to behaviours.		
Technology	New technology	Water meter technology changes from analog to wireless reading. Capital or operational costs may also increase.	√	√

Trend category	Trend	Implications for the management of our assets (to maintain service levels)	Growth	In existing plans?
Resources	Zero carbon legislation / standards / policies	Maintain more frequently or more rigorously. Upon replacement, use materials and construction, operations and maintenance practices that have lower carbon implications. May require different maintenance regime and new skills.		
	Legislation / regulations for stricter water quality standards	New water quality or monitoring practices may be required.		
	Reduced waste production	Maintain more frequently or more rigorously. Upon replacement, use lower-waste materials. May require different maintenance regime and new skills. For example, the new re-use of excess soil regulations in Ontario.		
	New materials	New materials may become available that change the asset lifecycle and how it is managed.		
Climate	Hotter weather	Water lawns more often, more people get pools. More reservoir capacity required. Or, warmer winters that increase the frequency of melt events.	√	
	Higher rainfall intensity(handle higher rainfall events)	Upgrade assets for greater protection. May require different maintenance regime and new skills.	√	

FINANCIAL STRATEGY

The Town has made an important investment in infrastructure, and attention must now be paid to securing this investment. The sustainability of Town infrastructure depends on effective management and ensuring the optimal use of limited funds. Sustainability will require adjusting revenue and services. In this section:

- Current financial position and level of service trends.
- Scenarios for managing levels of service, risk, and funding gaps.

ESTIMATED FUTURE BUDGETS BASED ON CURRENT POSITIONS AND PLANS

The approach to financial planning for core assets is summarized in Concepts and Frameworks section and the corporate overview for the results of this process are provided in the Financial Strategy section. This section only provides details pertinent to the service area under consideration.

Estimated Future Budgets Based on Current Positions and Plans

Using the financial background and current financial position, the Town's current budget was forecasted to support long term financial planning. These values were used for an assessment of the balance between budget and future renewal costs, and will be subject to internal processes and the annual budget process each year as approved by Council.

Table 52 - Estimated Future Budgets Based on Current Positions and Plans

Year	Water
2021	$2,543,390
2022	$2,797,729
2023	$3,077,502
2024	$3,385,252
2025	$3,723,777
2026	$4,096,155
2027	$4,260,001
2028	$4,430,401
2029	$4,607,617
2030	$4,791,922

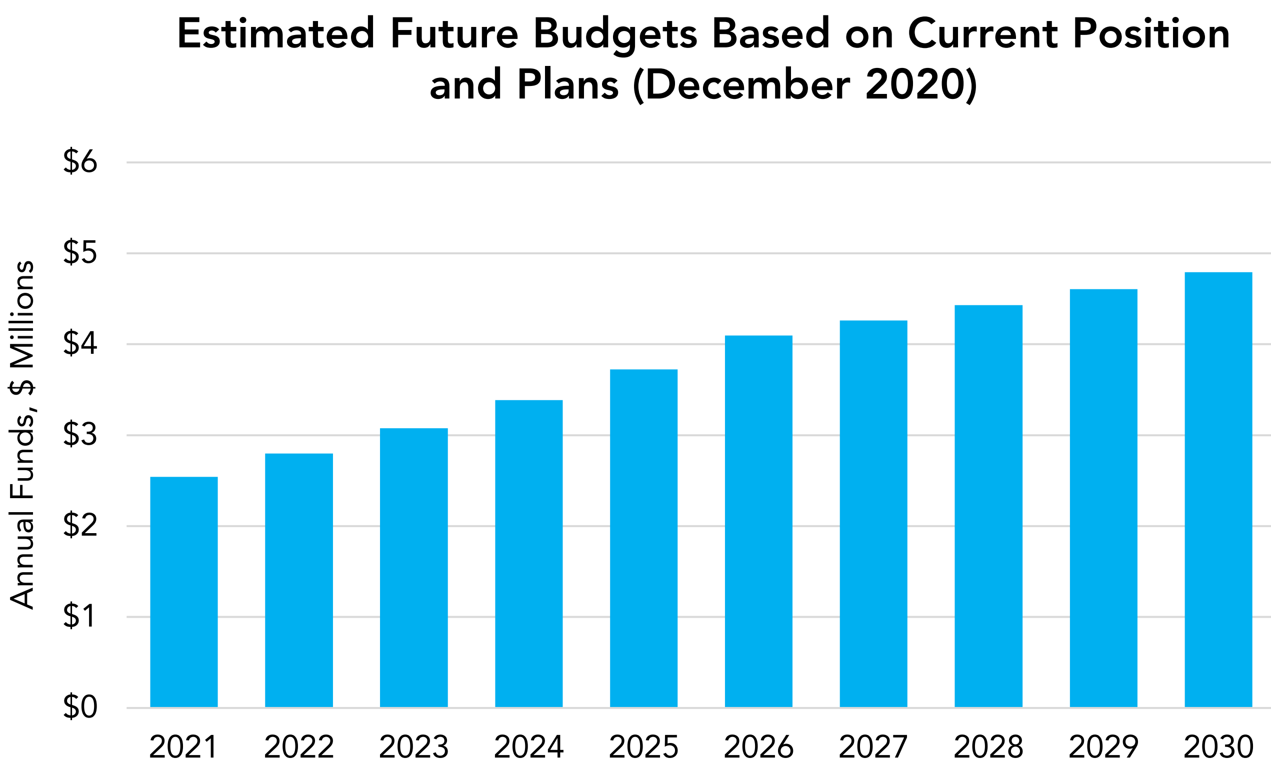


Figure 57 - Estimated Future Budgets Based on Current Position and Plans (December 2020)

SCENARIO FORECAST

Water Scenario Methodology

To model the investment need, consolidation of inventory, replacement cost, condition, levels of service, risk, and lifecycle activities as shown throughout the AMP was completed. The three scenarios detailed in the corporate Financial Strategy were executed, along with the following minimum constraints:

Table 53 - Modelling Minimum Constraints

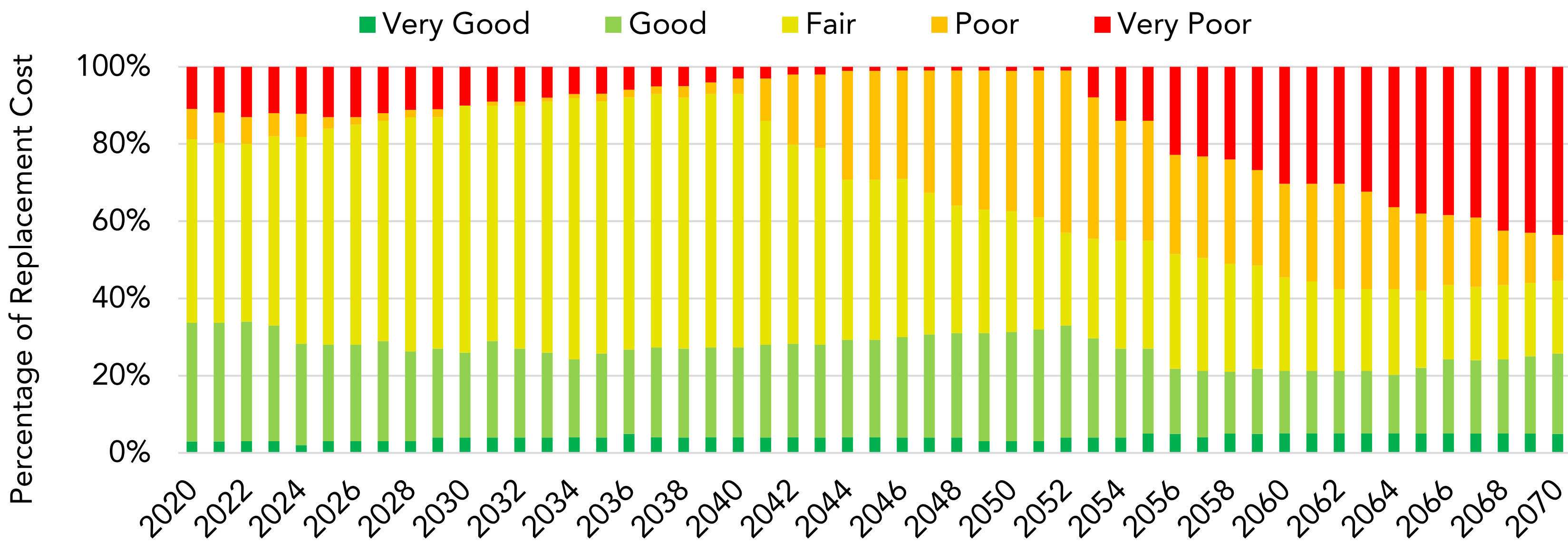
Asset	Service Level Target
Watermains	No Large or Very Large pipes can be permitted to deteriorate to a Very Poor Condition. No more than 5% of the network can be in Very Poor Condition
Service Connections	No more than 5% of the network can be in Very Poor Condition
Hydrants	
Valves	

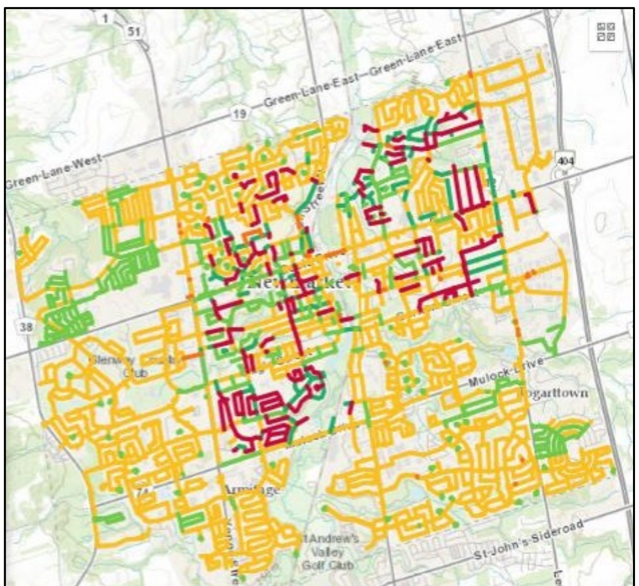
These constraints are minimums before scenario parameters are applied, in order to capture current Town approach to maintaining a minimum state of good repair.

Water Scenario Results

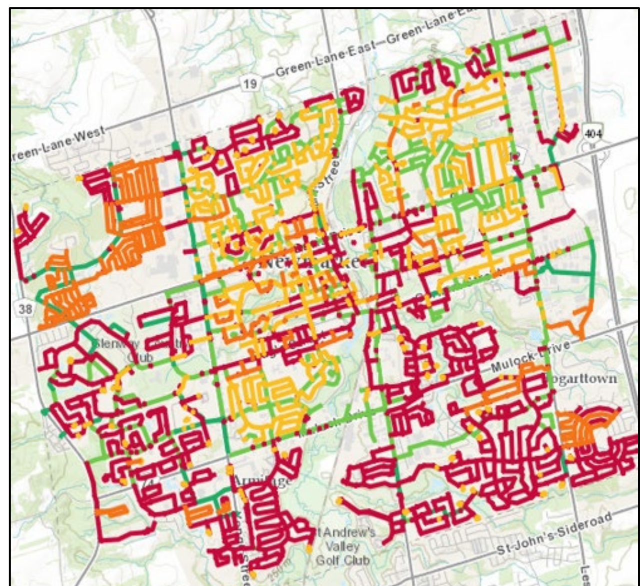
The following figures illustrate how condition of watermains are forecast to change over time under all three investment scenarios.

WATER - CURRENT BUDGET SCENARIO



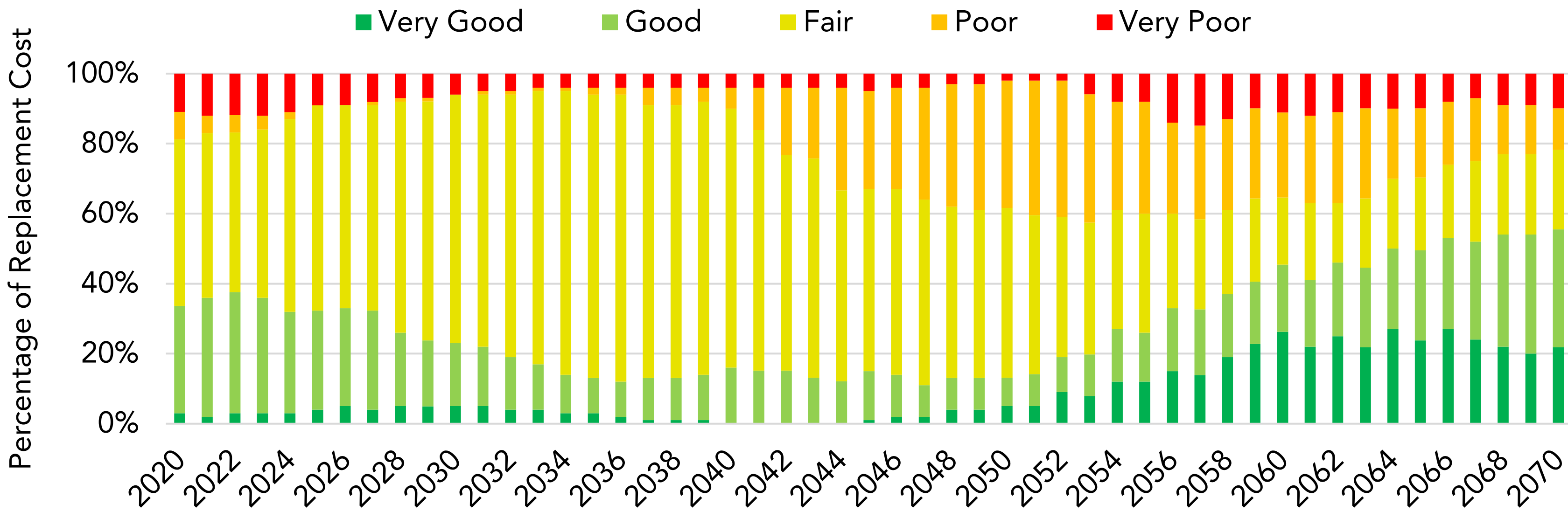


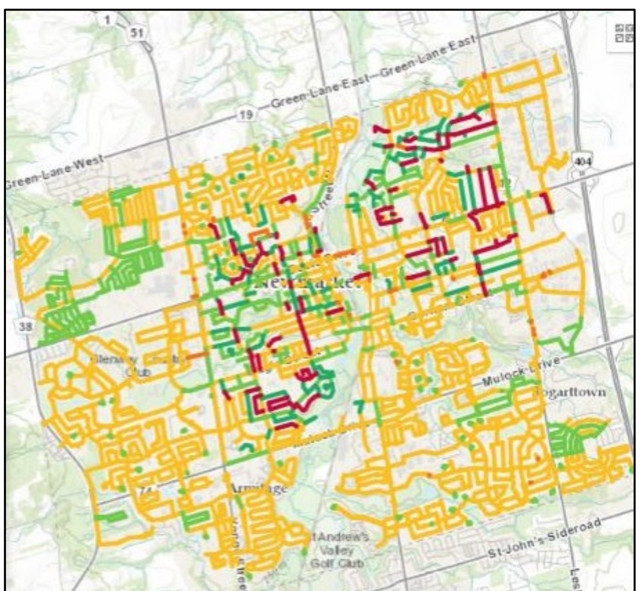
10 Year Forecast under Current Budget Scenario



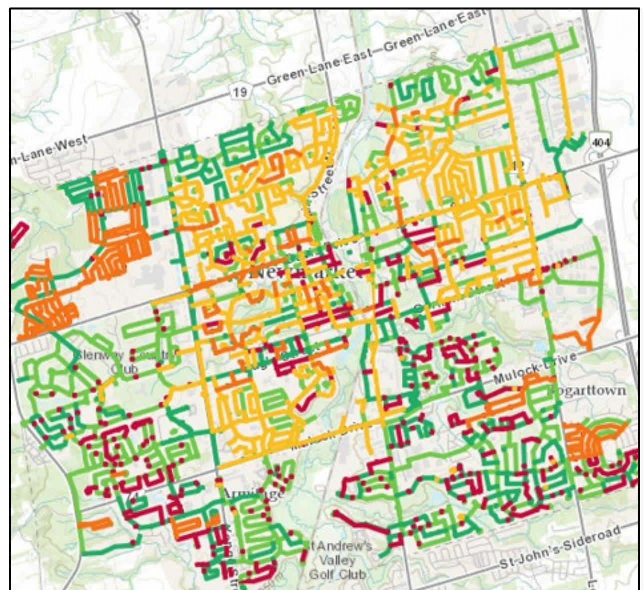
50 Year Forecast under Current Budget Scenario

WATER - CONSTRAINED BUDGET SCENARIO



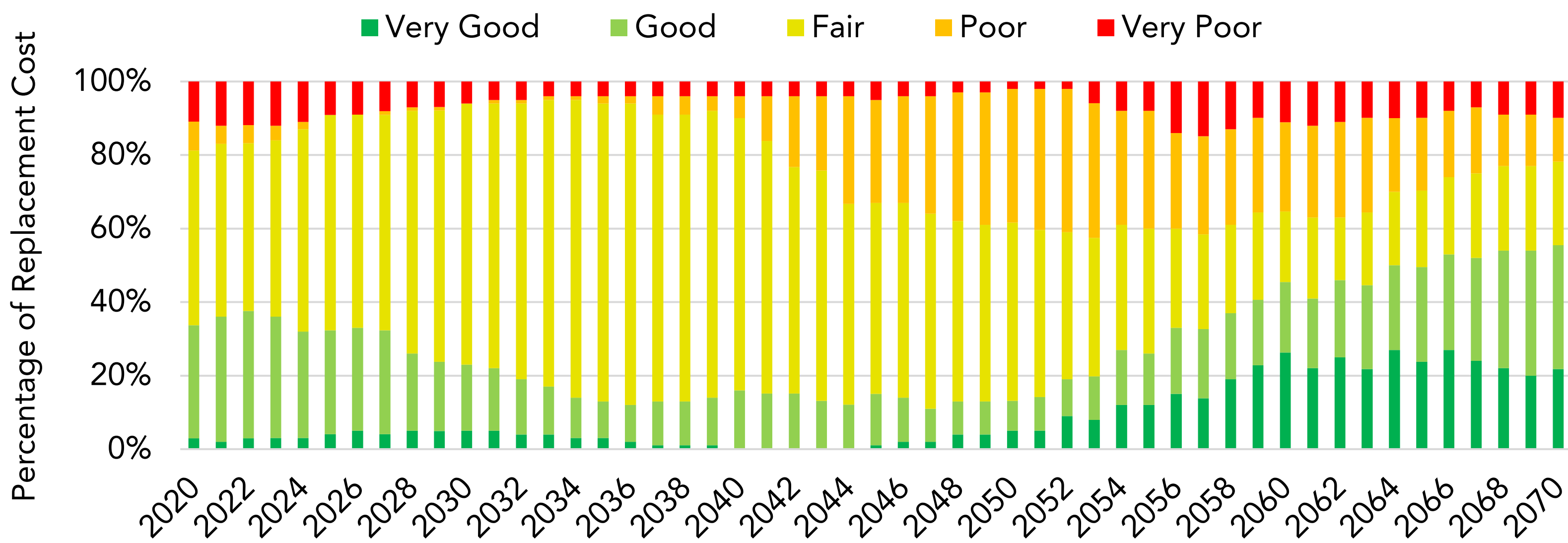


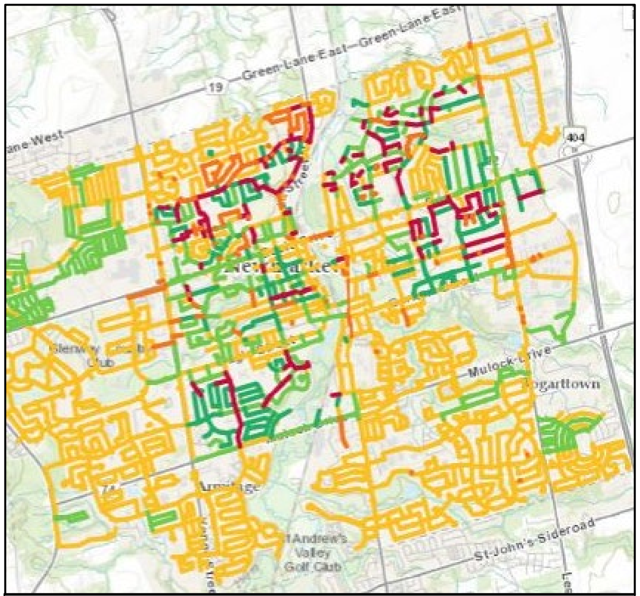
10 Year Forecast under Constrained Budget Scenario



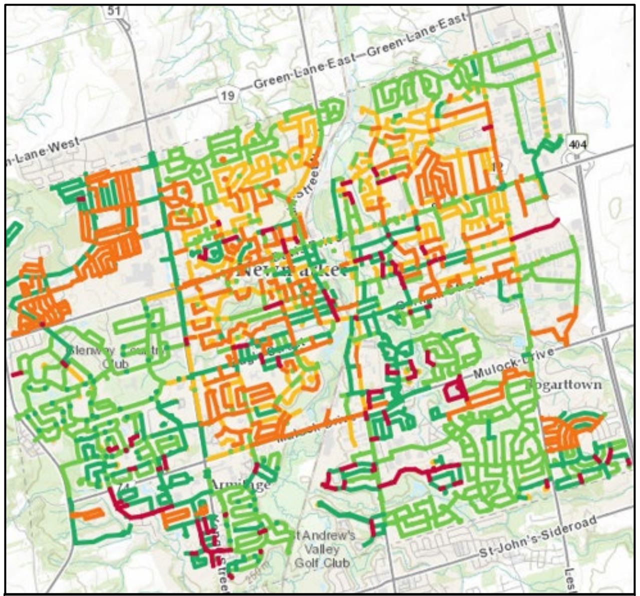
50 Year Forecast under Constrained Budget Scenario

WATER – SERVICE LEVEL DRIVEN BUDGET SCENARIO





10 Year Forecast under Service Level Driven Budget Scenario



50 Year Forecast under Service Level Driven Budget Scenario

Several observations are important to note about the forecast:

- If investment continues at current levels, service levels will not be achieved, and the network will be in much poorer condition than it is currently.
- Under the constrained budget scenario, service level targets are achieved in every year of the analysis period.
- Under the constrained budget scenario, overall condition over the long term improves substantially, and delivers a very similar condition outcome to the service driven budget over the long term.
- Despite straying from service level targets for a period of time, the mixture of interventions under the constrained scenario allows for an overall network that is a generally aligned with service targets for the next 35 years.

It is for these reasons that the constrained investment scenario was selected for future planning for this asset class. The significance of the constrained investment scenario for the Town's core assets is explained in the Executive Summary and the Financial Strategy section.

Long Term Trend and 10 Year Budget

The following Figure 58 summarizes the investment forecast for water under the constrained scenario.

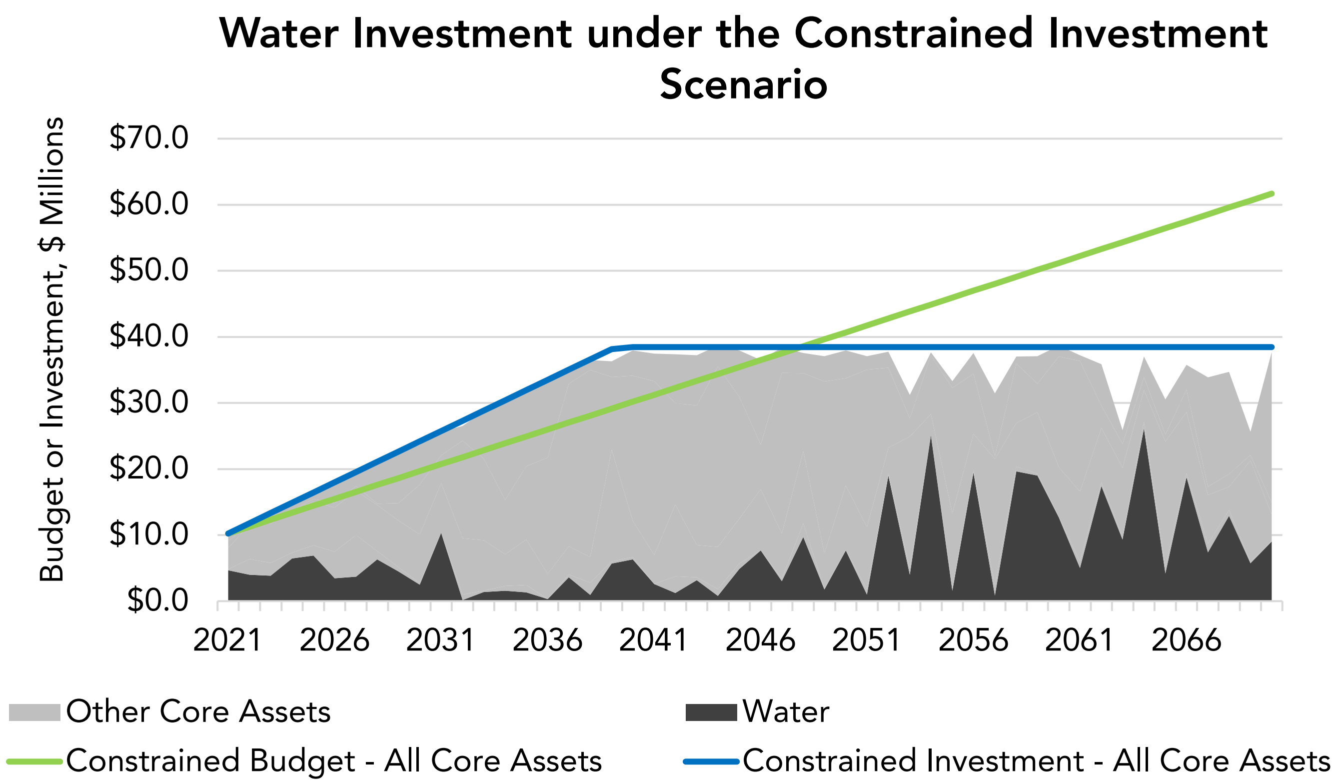


Figure 58 - Water Investment under the Constrained Investment Scenario

The annual average investment over the next 50 years is $7.2M for the water portfolio (in 2021 dollars). This is substantially higher than current levels of investment. Table 54 summarizes the proposed investment in water assets over the next 10 years based on the constrained scenario as well as the Town of Newmarket's current 10-year capital budget for this asset class. Table 55 summarizes the intervention types that make up the constrained investment in this asset class.

Table 54 - Proposed investment and a comparison to the Town's existing budget for Water

Year	Constrained Scenario Proposed Investment	Town's Current Reserve Contribution*	Difference
2021	$4.67M	$2.54M	+$2.12M
2022	$4.01M	$2.80M	+$1.21M
2023	$3.86M	$3.08M	+$0.78M
2024	$6.47M	$3.39M	+$3.09M
2025	$6.91M	$3.72M	+$3.19M
2026	$3.46M	$4.10M	-$0.63M
2027	$3.69M	$4.26M	-$0.57M
2028	$6.31M	$4.43M	+$1.88M
2029	$4.47M	$4.61M	-$0.14M
2030	$2.52M	$4.79M	-$2.28M
Total	**$46.37**	**$37.72**	**+$15.89**

*Prior to the 2021 Six Year Water Financial Plan updates as detailed within the Current Financial Plans section.

Table 55 - Proposed interventions that make up the recommended investment for Water

Road Treatments	Replace hydrants, valves, services.	Watermain replacements	Cathodic protections	Total
2021	$1,304,000	$300,000	$3,064,000	**$4,668,000**
2022	$462,000	$2,905,000	$640,000	**$4,007,000**
2023	$1,046,000	$2,622,000	$194,000	**$3,862,000**
2024	$1,824,000	$3,478,000	$1,170,000	**$6,472,000**
2025	$622,000	$5,569,000	$724,000	**$6,915,000**
2026	$971,000	$2,214,000	$275,000	**$3,460,000**
2027	$1,782,000	$1,559,000	$347,000	**$3,688,000**
2028	$1,757,000	$4,474,000	$78,000	**$6,309,000**
2029	$2,327,000	$1,920,000	$224,000	**$4,471,000**
2030	$464,000	$2,034,000	$19,000	**$2,517,000**

Forecasted Outcomes

The constrained scenario was established to strike a balance between the long-term investment requirements to achieve service level targets, the pace of increasing the Town's capacity for program delivery, as well as the ability to fund the required program through increased taxes, rates and infrastructure reserves. Under current investment levels, the risk of failing to meet service level targets will increase substantially over the next 50 years (See Figure 59), when service levels are forecast to not be achieved. Several points are worth noting about the recommended constrained investment scenario:

- The constrained budget scenario is forecasted to have periods when a portion of the water network is in very poor condition that exceeds service levels (beginning in 2044).
- The elevated levels of very poor condition forecasted in this constrained scenario can be considered a period of higher risk of not achieving target service levels between 2053 to 2070.
- This translates to a higher risk of water service failures or unavailability. Practically, this means a greater frequency of watermain breaks, unplanned outages and potentially boil orders.

Service outcomes are always an equilibrium between investment, service level targets and risk of service delivery. If the forecasted outcomes are considered unacceptable, increased investment, or changes in service level targets are ways to impact service risk.

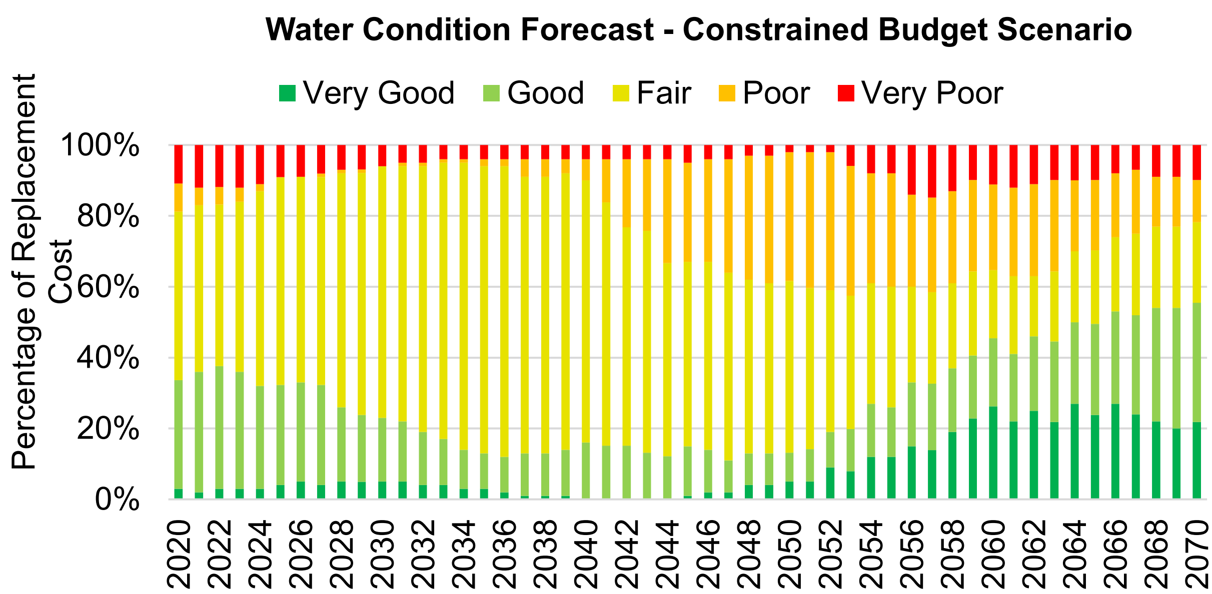
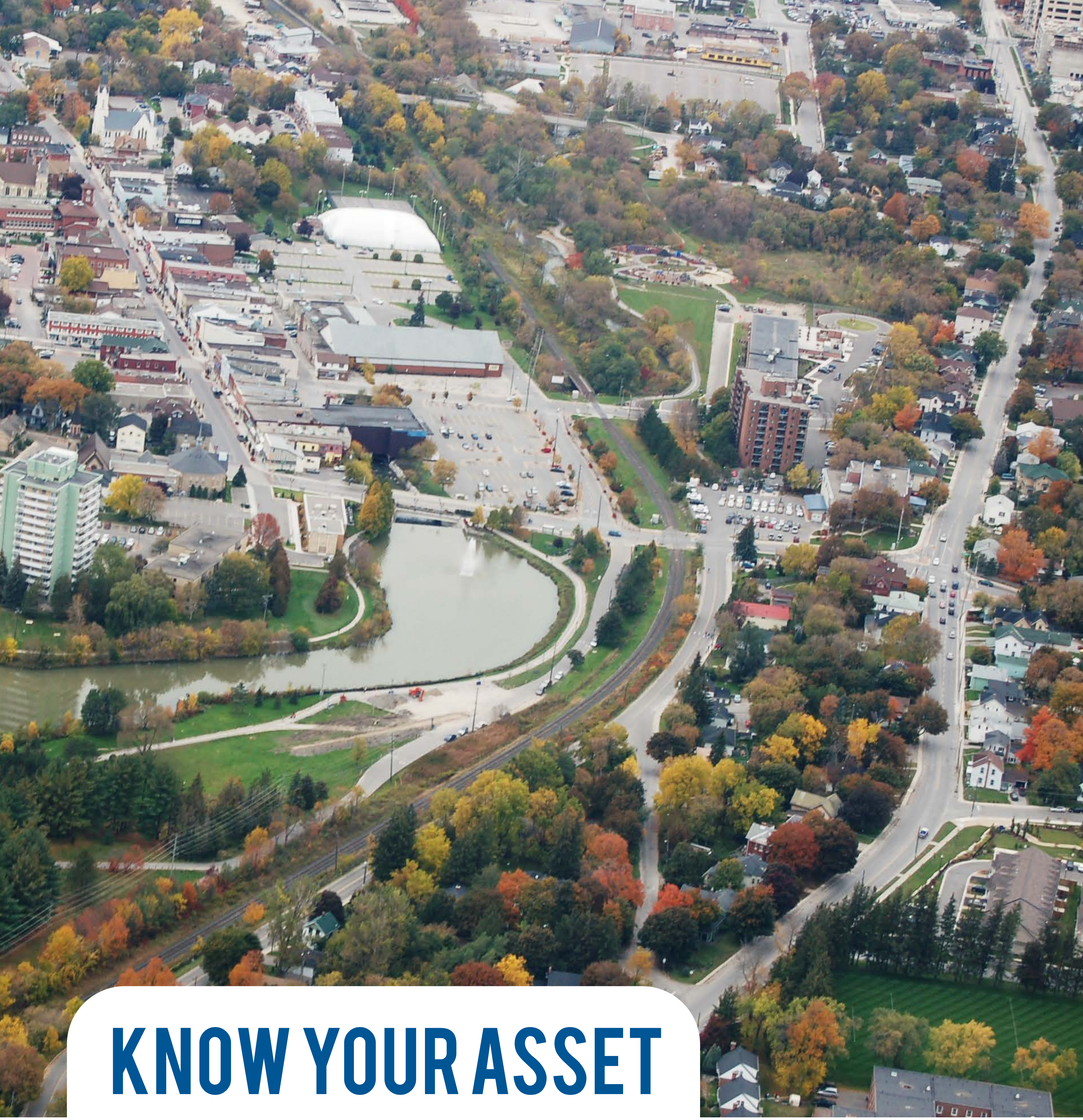


Figure 59 - Higher risk of not meeting service level targets – Watermains with Constrained Budget Scenario

WASTEWATER ASSET MANAGEMENT PLAN



KNOW YOUR ASSET

The Town is responsible for $2 Billion+ of assets. Assets exist to provide services to the community. Their ability to deliver services depends on Town stewardship and informed decision making. As assets age they have to be replaced. Key takeaways in this section will include:

- What do we own?
- What condition is it?
- What would it cost to replace?

DATA GAP ANALYSIS

Asset data is the first part of Know Your Assets and forms the foundation for the State of the Infrastructure. For a review of this approach, see the Concepts and Frameworks section.

Using the requirements of a standard asset registry, a gap analysis of the Wastewater asset registry is provided as follows (Figure 60):

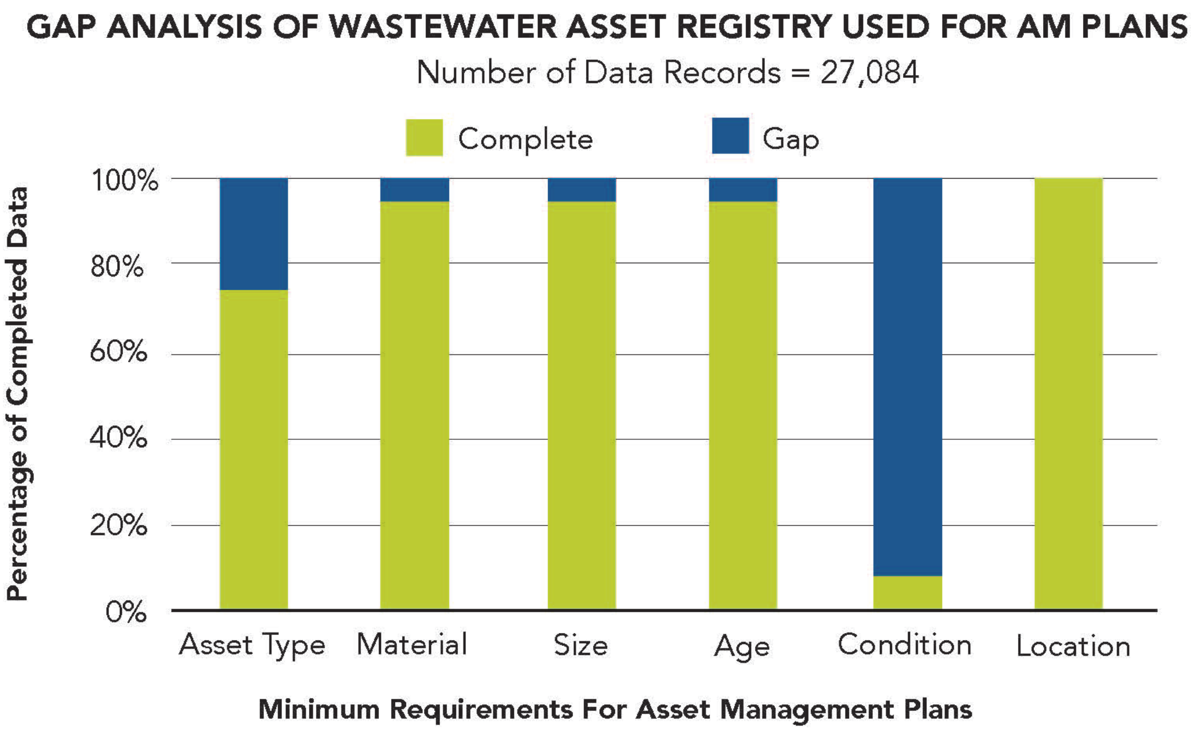


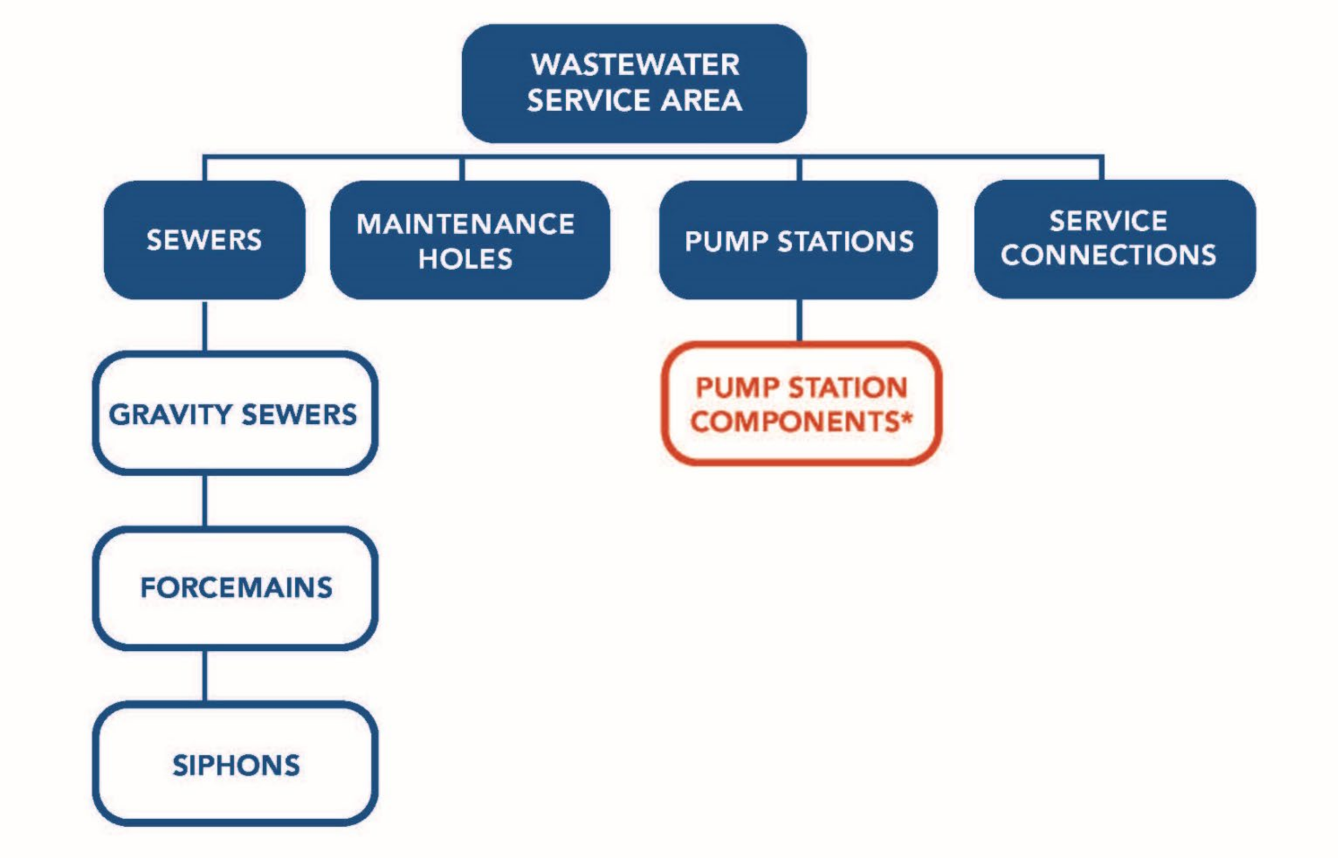
Figure 60 - Gap Analysis of Wastewater Asset Registry Used for AM Plans

When viewing subsequent sections of the asset management plan that use asset data, consideration should be given to the data gaps described here.

CONTEXT FOR THE STATE OF INFRASTRUCTURE

The State of the Infrastructure will combine inventory quantities, replacement costs, and condition ratings to provide a detailed breakdown of the Town's assets.

What Do We Own? The inventory has been organized in a hierarchy to reflect the asset types providing the service, and to support reporting and planning. The Town's inventory for the wastewater service area is organized as follows (Figure 61).



Pump station components will be incorporated in future updates of the core assets AMP.

Figure 61 - Wastewater Service Area Classification

This inventory will be used for replacement valuations, service delivery, operations and maintenance, growth updates, capital planning, and financial reporting.

What Does It Cost? The total replacement cost for wastewater is ~$475 Million (2021 dollars). This is equivalent to 19% of all Town-owned assets, and 23% of the core asset subset reported through the 2021 AMP.

What Condition Is It? Using the method of most Infrastructure Report Cards, assets are assigned condition ratings on a 5-point scale. Ratings are assigned based on age, or condition assessment data where available. Age is an industry-accepted benchmark for the high-level analysis of infrastructure portfolios, using the principles outlined in the Concepts and Frameworks section.

Table 56 - Age Based Condition Rating

Condition Ratings Based on Current Age of the Assets				
Very Good	Good	Fair	Poor	Very Poor
100% – 90%	90% – 70%	70% – 35%	35% – 20%	20% – 0%
Percentage of Remaining Useful Life				

Using this context, the State of the Infrastructure is provided below.

Wastewater Collection Infrastructure Report Card

Newmarket

INFRASTRUCTURE PURPOSE

The Town collects wastewater from residents, sending it to York Region trunk sewers and facilities. The Town maintains the wastewater system to ensure it has the capacity to support the community's wastewater needs.

REPLACEMENT COST: $475 Million

AVERAGE NETWORK CONDITION FAIR

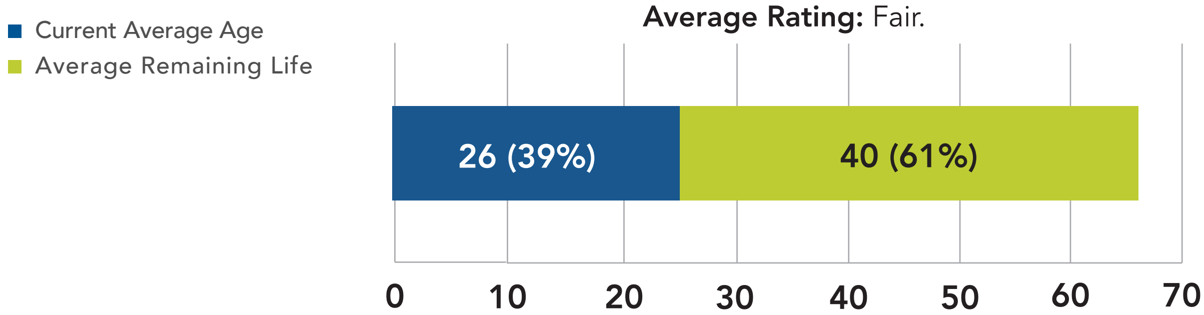
INVENTORY See table below

DETAILS:

Life Expectancy

To date, our wastewater collection system has consumed on average, 39% of its intended life span with 61% of its life span remaining.

Average Rating: Fair.

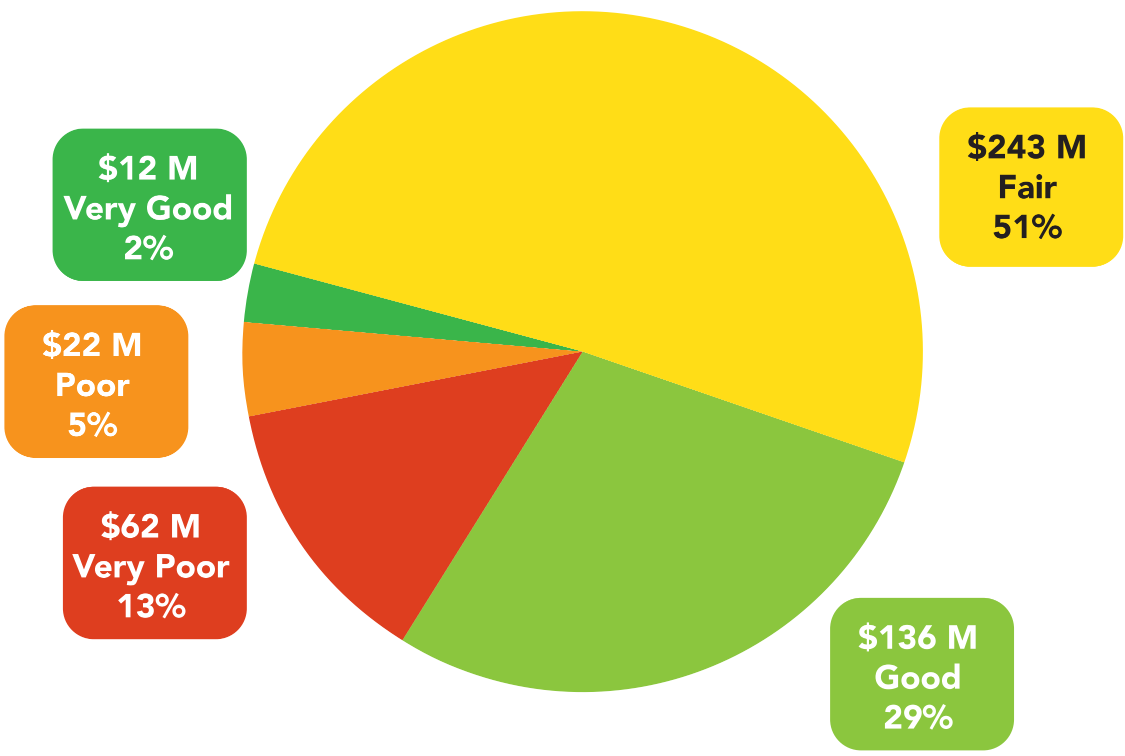


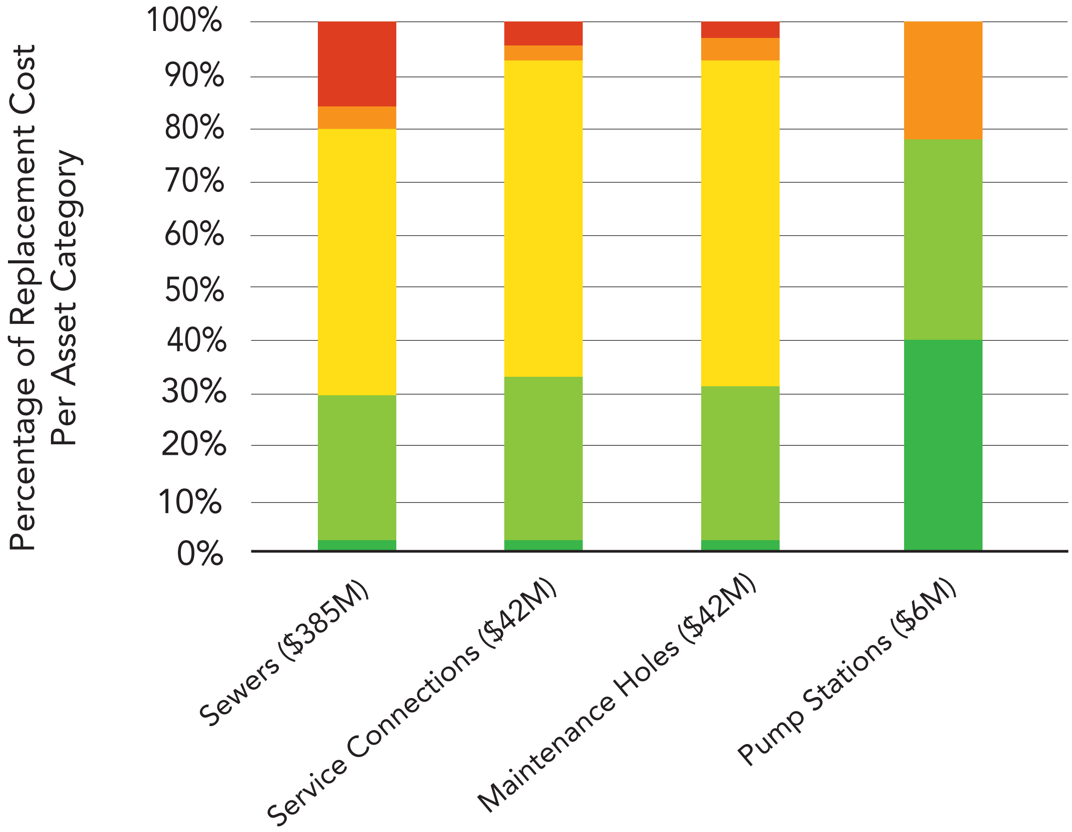
Average Expected Service Life = 66 Years

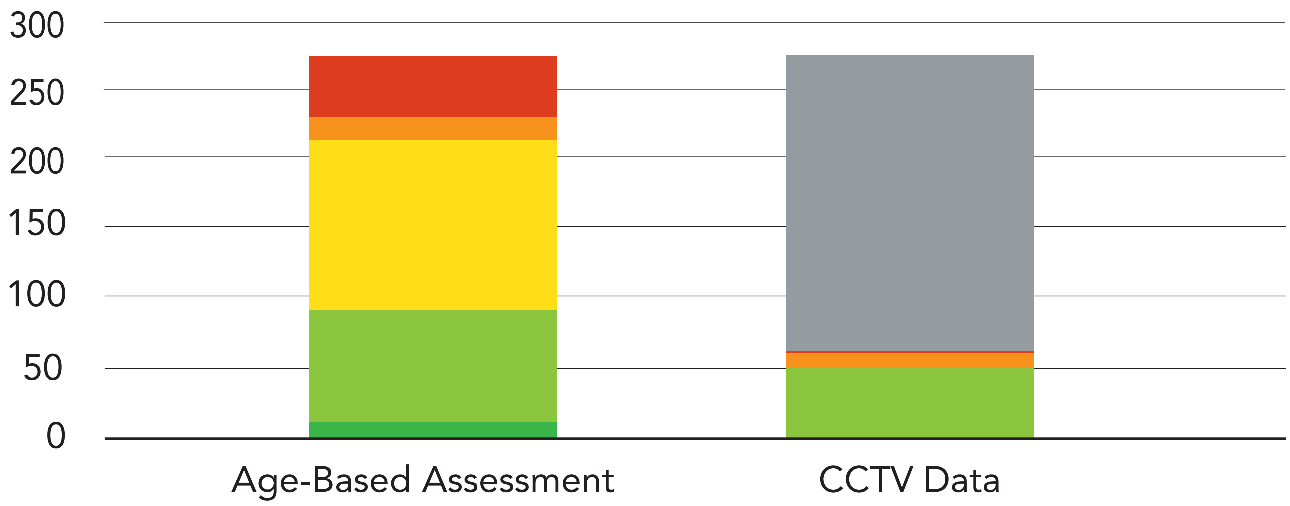
WHAT CONDITION ARE OUR ASSETS IN?

Very Good Good Fair Poor Very Poor Unknown

Current Condition & Replacement Cost ($ Millions)







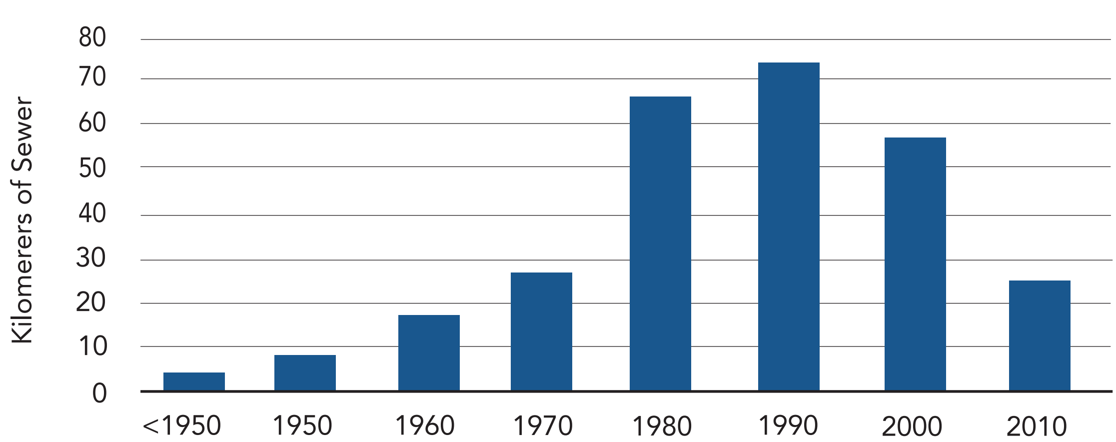
KILOMETERS OF SEWER

WHAT ASSETS DO WE OWN?

Asset Class	Quantity
Sewer	273 kilometers
Maintenance Holes	4,302 assets
Pump Stations	6 pump stations
Service Connections (Town-owned)	168 kilometers*

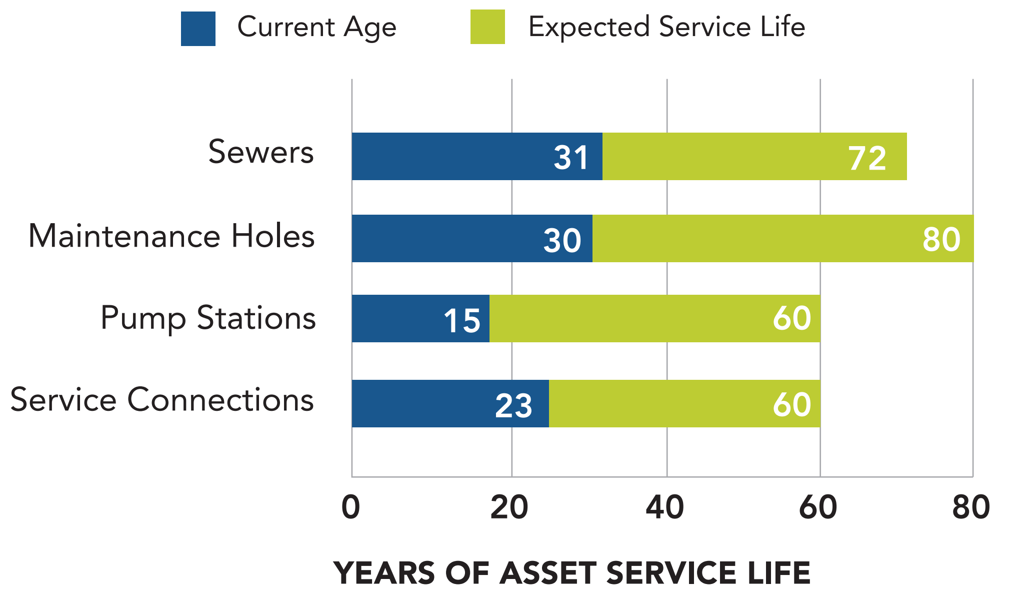
*As shown in data assumptions, the provided asset inventories for services are only partially complete and will increase as data improves. These values are extrapolated as required for financial planning.

HOW OLD ARE OUR ASSETS?

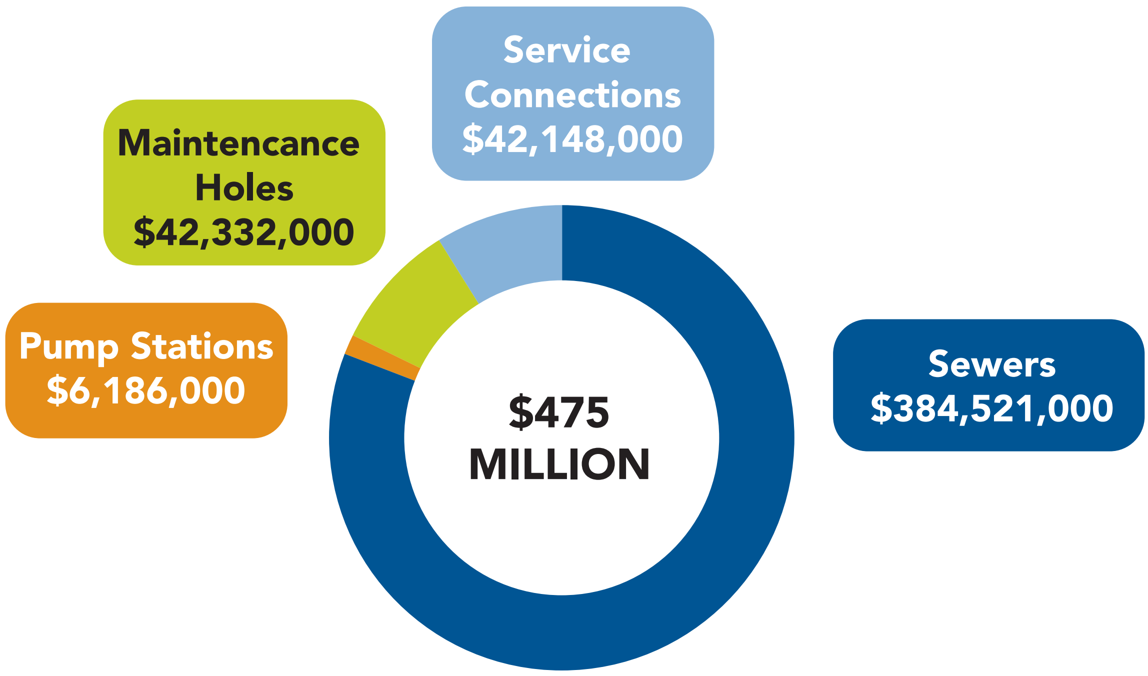


DECADE SEWERS WERE CONSTRUCTED

AVERAGE AGE AND EXPECTED SERVICE LIFE OF WASTEWATER



WHAT WOULD OUR ASSETS COST TO RECONSTRUCT IN 2021?

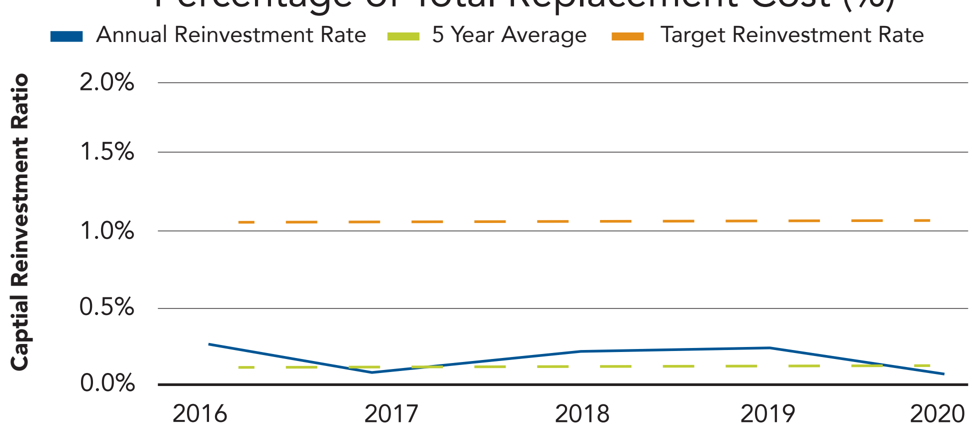


CURRENT CAPITAL SPENDING

CAPITAL REINVESTMENT (5 YEAR AVERAGE)	$0.57M
REINVESTMENT RATIO * (5 YEAR AVERAGE)	0.12%

HISTORICAL ACTUAL REINVESTMENT RATIO IN WASTEWATER

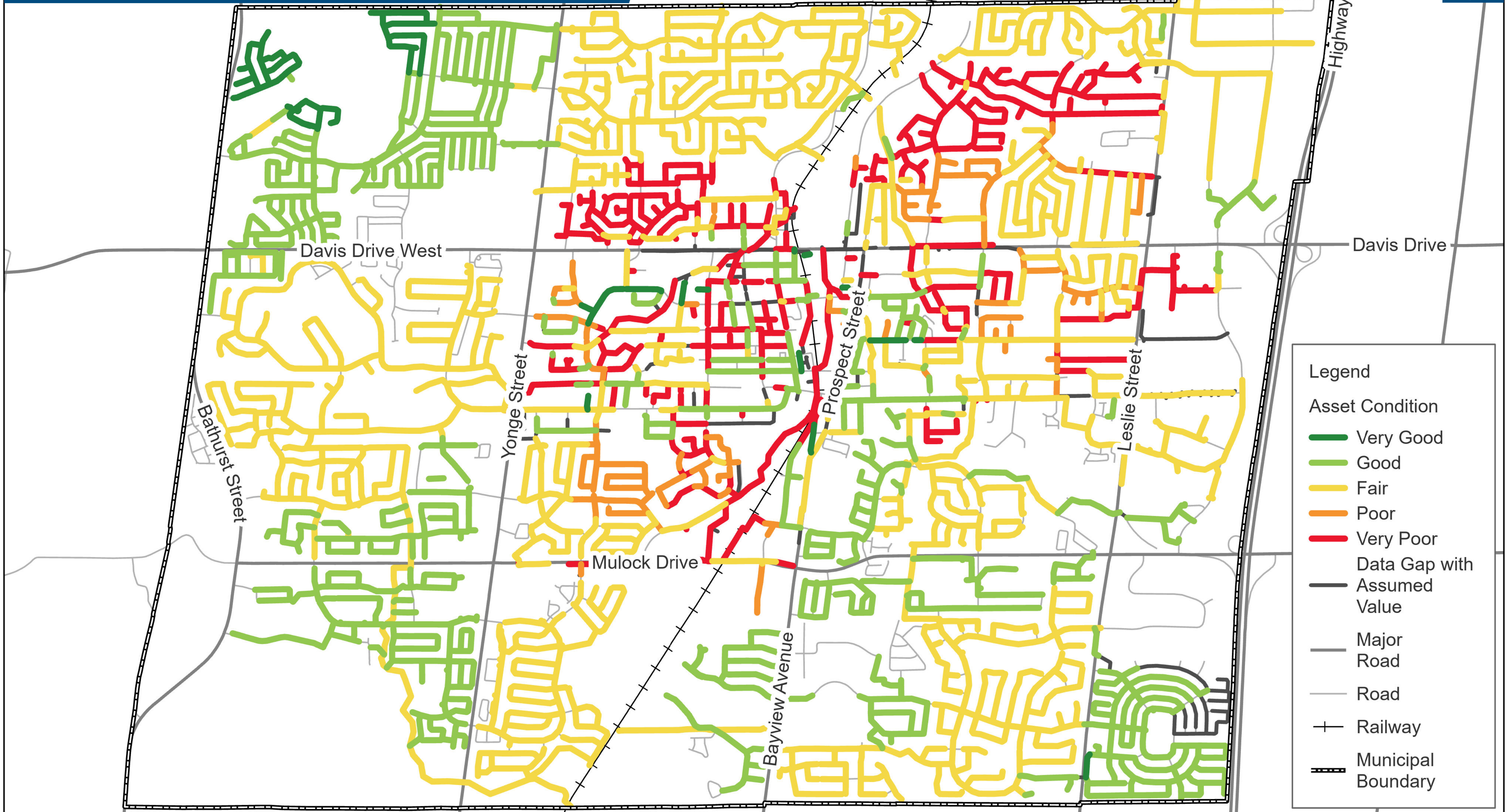
Percentage of Total Replacement Cost (%)



* **Reinvestment Ratio:** A financial measure indicating the Towns reinvestment into existing assets via the capital program. The Canada Infrastructure Report Card recommends a minimum annual reinvestment ratio of 1%

Town of Newmarket – 2021

Condition of Wastewater Infrastructure



Sources: Roads, Railway, Municipal Boundary - Data, Analytics and Visualization Services Branch, Corporate Services © The Regional Municipality of York, 2021; All other data - © Town of Newmarket, 2021. DISCLAIMER: The information depicted on this map has been compiled from various sources. While every effort has been made to accurately depict the information, data/mapping errors may exist. This map has been produced for illustrative purposes only. It is not a substitute for a legal survey. Printed: October, 2021.

Document Path:G:\Projects_PRO\CorporateServices\Finance\AssetManagment\Infra_Report_Card\Infra_Report_Card.aprx\Wastewater_Condition_Report Map 8x14

CONDITION ASSESSMENT PLAN

Concluding Know Your Assets, the Town will use condition assessments to increase knowledge of the assets, monitor performance, and refine financial projections. The Town's approach to condition assessments is described in the Concepts and Frameworks section.

Condition Assessment Plan for Wastewater Sewers

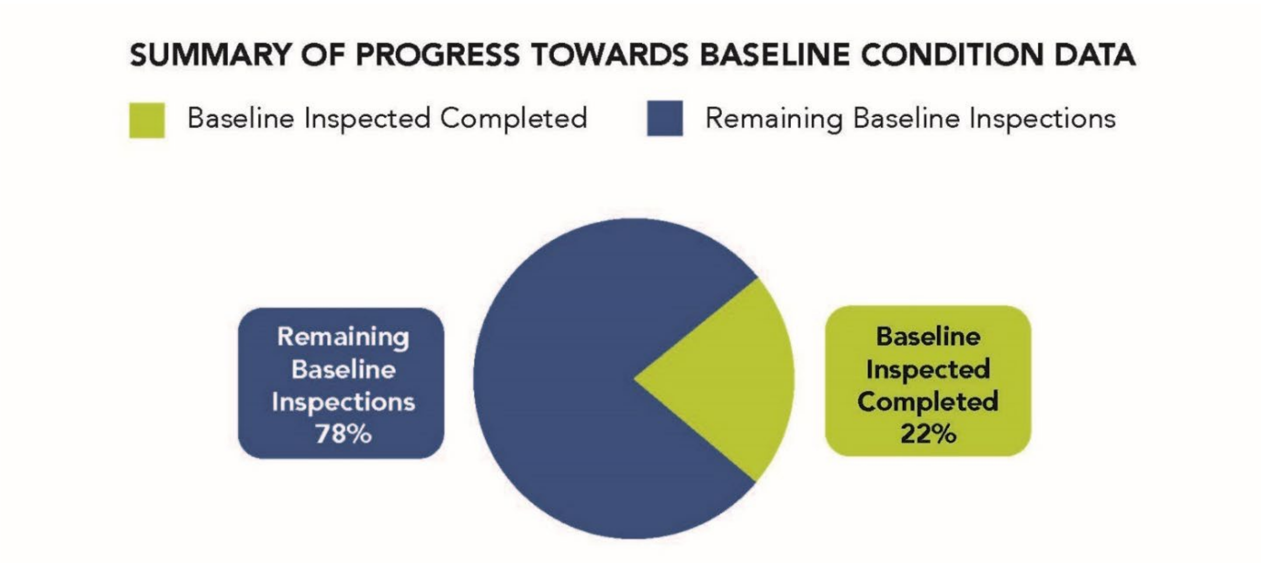
The condition assessment strategy for sewers focused on CCTV field inspections, a relatively inexpensive way to get comprehensive condition information about assets that are otherwise buried "out-of-sight". To complete inspections, the Town uses a York Region Purchasing Coop where Newmarket is the lead agency for the Northern Six municipalities. The Town is targeting baseline inspection of the entire network to improve confidence in long term financial plans (standard practice among municipalities with large sewer networks).

The Town completes CCTV operationally and in support of capital projects, but needs to develop governance, processes, and data management capabilities to extract the full benefit of CCTV inspections and scale up current practice. This will require staff resources, process improvements, and technology supports. Recent milestones of progress include the conversion of free inspections funded by developers for inflow & infiltration into a limited CCTV database.

The Town has made good progress with its condition assessment programs to date. A summary of current achievements and future targets in the Town's Condition Assessment Plan is as follows (Table 57) on the next two pages. Opportunities to complete the next milestone in the condition assessment plan are captured as recommendations to conclude the Know your Assets section.

Summary of Next Steps and targets for Wastewater sewers

A summary of current achievements and future targets in the Town's Condition Assessment Plan is outlined below in Table 57. Opportunities to complete the next milestone in the condition assessment plan are captured as recommendations to conclude the Know your Assets section.



*The Town has inspected more than 22% of sewers but this was done on an operational basis – if issues were present they were detected, but conditions were not historically recorded for future use.

Figure 62 - Summary of Progress Towards Baseline Condition Data

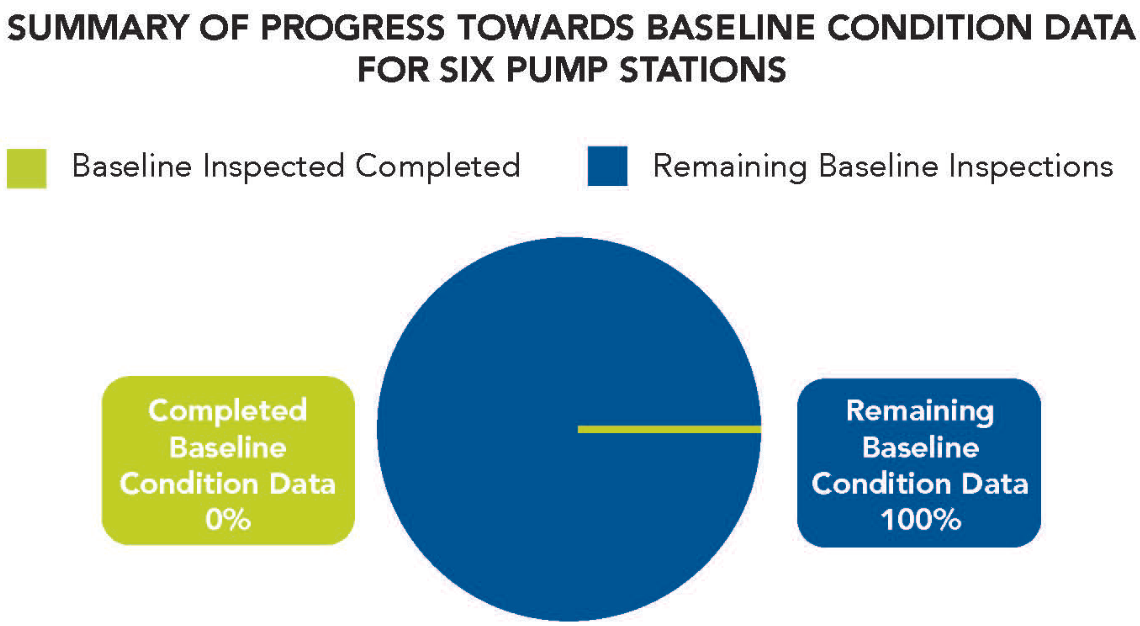
Table 57 - Summary of Current Achievements and Future Targets for Wastewater Sewers

Assessment Methods	Age-Based Assessment	Field Condition Assessment Baseline	Follow Up Condition Monitoring	Mathematical Modelling
Status	Complete	**Improvement Opportunity**		**n/a**
Methodology	Age, Service Life	CCTV Camera Inspections (Contracted Services)		*TBD*
Responsible Party	Asset Management	Public Works (Water / Wastewater)		*Asset Management*
Budget for Activities	**n/a**	Yes	Yes	**n/a**
Project Planning and Project Delivery Process	**n/a**	**No**	**No**	**n/a**
Current Progress	Complete	22% of all sewers inspected	A risk-based approach (industry standard) will be used to optimize follow-up inspection frequency based on CoF and LoF of each sewer, ranging from every year to every 10+ years.	*Options considered will depend on the findings of baseline inspections.*
Goal		100% of all sewers inspected (78% still outstanding)		
Time to Achieve Goal		**2026:** Baseline inspection of the network could be achieved by 2026 based on current budget and the remaining length of sewer. However, current practice indicates that staff resourcing, process, and data management are greater barriers to achieving the goal than budget.		*TBD*

Condition Assessment Plan for Wastewater Pump Stations and Forcemains

The Town owns six pump stations connected to forcemain sewers that pump pressurized sewage water across areas of low drainage (e.g. uphill or long flat areas). These pump stations are regularly attended to by wastewater operators, who can monitor the instrumentation readings and provide maintenance. However, the Town does not have data about the assets within the pump station (e.g. wet well) or their condition. Pump stations also need to consider the building envelope (e.g. foundation, walls, roof).

Pump stations are complex assets with high impact failure modes. With the assets approaching the midpoint of their service life, the need for condition data and a proactive approach is increasing. The Town wishes to establish an asset hierarchy for pump stations, collect an asset inventory, and collect condition data on wastewater-related assets (e.g. pump, instrumentation, forcemains) and facility-related assets (e.g. structural, mechanical, electrical).



**Condition observations are regularly reported operationally by wastewater operators who attend pump stations. However, this practice needs to be converted to a database, and additional details are needed.*

Figure 63 - Summary of Progress Towards Baseline Condition Data

Summary of next steps and targets for pump stations and forcemains

A summary of current achievements and future targets in the Town's Condition Assessment Plan is outlined below in Table 58. Opportunities to complete the next milestone in the condition assessment plan are captured as recommendations to conclude the Know your Assets section.

Table 58 - Summary of Next Steps and Targets for Pump Stations and Forcemains

Assessment Methods	Age-Based Assessment	Field Condition Assessment Baseline	Follow Up Condition Monitoring	Mathematical Modelling
Status	**Incomplete**	**Incomplete**	**Incomplete**	**n/a**
Methodology	Age, Service Life	Pump Station Condition Assessment and Facility Condition Assessment		*TBD*
Responsible Party	Asset Management	Pump and Forcemains: PWS (Water / Wastewater) Building Envelope: PWS (Facilities)		*Asset Management*
Budget for Activities	**n/a**	**Pump Station: No** **Building Envelope: Yes**	**No**	**n/a**
Project Planning and Project Delivery Process	**n/a**	**No**	**No**	**n/a**
Current Progress	Preliminary age of entire facility analyzed.	Building condition assessment on track for Q2 2022	Options considered will depend on the findings of Goal baseline inspections.	
Goal	Asset hierarchy to support field data collection of assets and components	Field condition assessment of pump station and forcemain assets.		
Time to Achieve Goal	2022	Pump and Forcemain: 2023 Building Envelope: 2022	To be determined.	

RECOMMENDATIONS

- Incorporate addressing data gaps into any CCTV data collection plans.
- Incorporate data generated by the 2017 Wastewater Master Plan into GIS.
- Complete a pump station asset inventory and condition assessment. Update GIS pump station inventory.
- Review forcemains and siphons and establish need for condition assessments or maintenance programs (e.g. draw-down tests, pigging, sonar, etc.).
- Establish roles and responsibilities for CCTV and a plan for achieving a system-wide inspection program.
- Expand condition assessments of sewers to include maintenance holes using the MACP protocol.
- Complete a building condition assessment of pump station building elements (e.g. structure, electrical, etc.).
- Establish a process and data management plan for flow monitoring including the use of data collected by York Region.

MANAGE SERVICE DELIVERY

Asset management is not software, or a document. It is a way of doing business every day. Asset management requires processes to balance the services provided, the risks associated, and their cost. To make tradeoffs, visibility is needed into what is being done and why. Key takeaways will include:

- What services do we provide?
- What activities support services, and who does what?
- What are the risks of our services?

LEVELS OF SERVICE ALIGNMENT

Manage Service Delivery is about the services asset deliver, the associated risks or opportunities, and activities/resources that are expended doing so. This is explained in the Concepts and Frameworks section. To begin the use of this framework, the Town has developed a set of measures for levels of service.

The levels of service measures are organized to create alignment between Town strategic objectives, a corporate goal for the service (e.g. wastewater), and the subsequent service criteria and technical/customer measures. Metrics have been listed and aligned before presenting the results in the next section. The result of this process is shown as follows (Figure 64):

Figure 64 - Wastewater Levels of Service Alignment

LEVELS OF SERVICE PERFORMANCE AND RESULTS

Legend			
Symbol	**Meaning**	**Symbol**	**Meaning**
	Trending up in the desired direction.		Trending down in an undesired direction.
	Trending down in the desired direction.		Trending up in an undesired direction.

Corporate Goal

Provide accessible, available and reliable wastewater collection services that meet regulations at a reasonable cost.

Customer Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of assets in "Fair" or better condition.	**82% of assets**	**82% of assets**	
Percentage of properties connected to the wastewater system.	**97% of properties**	**97% of properties**	Trend not applicable
Number of wastewater related customer complaints (includes back ups, service leaks, overflows – excludes billing, service requests, etc.)	**33 complaints**	**65 complaints**	Trend not applicable

Technical Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of sewers CCTV inspected per year.	**6.34% of sewers**	**2.99% of sewers**	
Percentage of sewers flushed per year.	**1.52% of sewers**	**1.52% of sewers**	Trend not applicable
Percentage of sewer laterals flushed per year.	**0.44% of laterals**	**0.47% of laterals**	Trend not applicable
Capital reinvestment to replacement cost ratio.	**0.15% of replacement cost**	**0.00% of replacement cost**	
Number of sewer and lateral failures per year.	**7 sewer breaks**	**7 sewer breaks**	Trend not applicable

*Levels of service measures do not have endorsed targets. Trend observations are made on the basis of general recommendations related to the sustainability of assets, services, and finances.

Regulatory Levels of Service

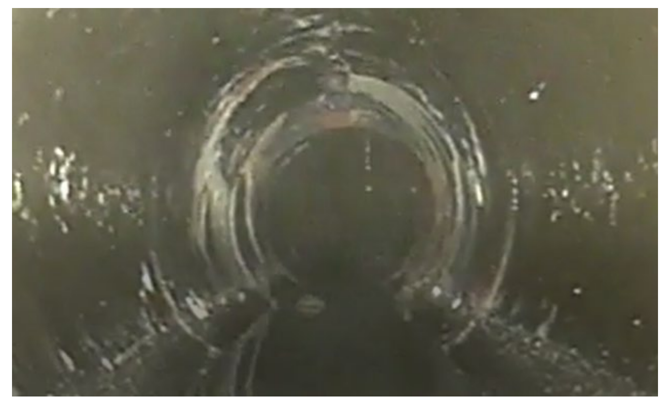
Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of properties connected to the municipal wastewater system	**97% of properties**	**97% of properties**	Trend not applicable
The number of events per year where flow in municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system	**0 events per year.**	**0 events per year.**	Trend not applicable
The number of connection days per year due to backups compared to the total number of properties connected to the municipal wastewater system.	**0.00034% of available connection days**	**0.00017% of available connection days**	Trend not applicable
The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	**1**	**0**	

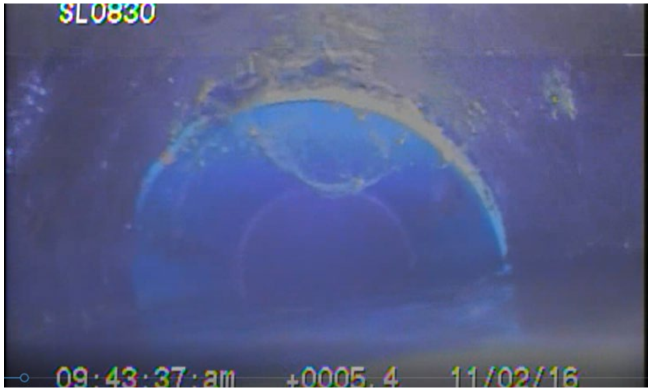
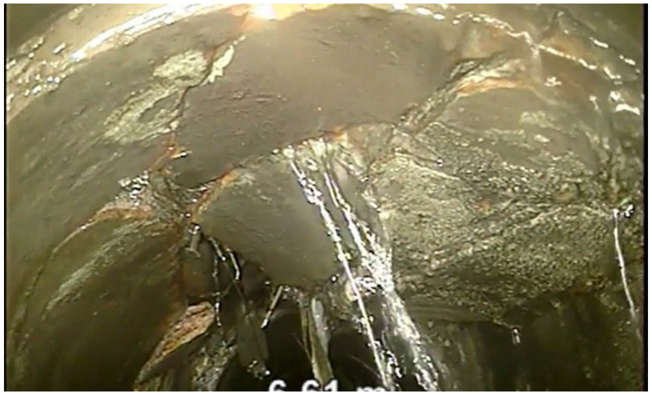
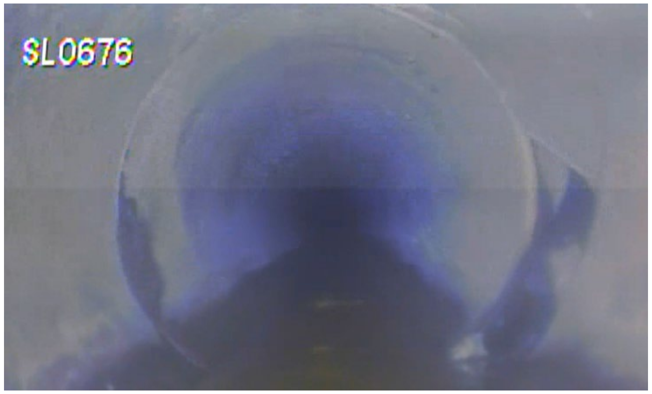
ILLUSTRATION OF CURRENT LEVELS OF SERVICE

As shown in the State of the Infrastructure, the Town's assets exist in a variety of condition states. This was linked to the LoS Framework, which showed how condition is a primary driver of service levels. Financial decisions about what asset conditions will be financed ultimately impacts LoS. To illustrate this impact, a collection of images has been collected depicting the differences in condition and LoS. See Table 59.

Table 59 - Condition and Level of Service

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets
Very Good	 Newly constructed sewer.

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets	
Good	 Sewer with early signs of wear and tear.	 Sewer with very minor spiral cracks.
Fair	 Sewer with visible signs of corrosion and wear and tear.	 Sewer with longitudinal fracture.

Condition & Level of Service	Images Illustrating Different Condition Levels of Town Assets	
Poor	 Sewer with spiral fractures	 Sewer with defective repair patch.
Very Poor	 Deformed rigid pipe	 Broken pipe with visible soil at 4 o'clock and 7 o'clock

LEGISLATIVE REQUIREMENTS

Legislative requirements are one way to define minimum levels of service requirements, as described in the Concepts and Frameworks section.

Upcoming Legislative Requirements

The regulatory framework is changing for wastewater by the Ontario Ministry of Environment in a new system called the Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA). After preliminary consultations with Ontario municipalities and pilot programs in Barrie, Region of Halton, Region of Peel, and City of Sudbury, the Town was formally notified in August 2021. The Town is required to submit an application by March 2022. Once approved, the CLI-ECA will impact the Town's Level of Service.

An ECA is required under Section 53 of the Ontario Water Resources Act (OWRA) to "use, operate, establish, alter, extend or replace new or existing sewage works". A municipality may be using or operating existing infrastructure, such as works constructed prior to approval requirements, which does not have an ECA in contravention of s.53(1) of the OWRA. A CLI-ECA is intended to address these gaps, while also providing streamlined processes for future system modification with less administrative effort.

Application Requirements

The application for a CLI-ECA is a significant level of effort for the Town, and will include providing the following to the Province by March 2022:

- List all existing ECAs.
- Status of Asset Management Plan.
- Map of system.
- Description of system.
- Description of all pumping stations.
- Pollution prevention and control plan.

Levels of Service Impacts

Once the CLI-ECA is approved and in effect, the new framework will contain requirements that will change the Town's current Level of Service. The total extent of the requirements are unknown and will be negotiated with the Ministry after the Ministry responds to the Town's application.

Current Legislative Requirements

The Town currently operates within several regulatory requirements. As the regulatory environment changes, the minimum Level of Service the Town provides may also change. Current regulatory requirements are as follows (Table 60):

Table 60 - Current Legislative Requirements

Legislation	Overview	Impact to Asset Management
O. Reg. 129/04 – Licensing of Sewage Work Operators	As with O.Reg. 128/04 for drinking water operators, O.Reg. 129/04 establishes a classification system for sewage operators. It provides licensing and training requirements and processes for each class of operator. Town operators are dually licensed for both water and wastewater operations.	• Requirements to maintain staff licensing, provide training. • Operate in accordance with training. • Administrative and record keeping requirements.
Environmental Protection Act	The Environmental Protection Act (EPA) provide a broad legislative authority for environmental protection across Ontario which includes a variety of guidelines applicable to wastewater.	• Corrective action and administrative processes for environmental releases and spill response (e.g. sewer failures).
Ontario Water Resources Act	See above discussion of upcoming regulatory requirements that will change how Environmental Compliance Approvals are used.	

Lifecycle Activities - Results

This section outlines the current business practices employed by the Town to manage assets throughout their lifecycle. At this early stage of implementing and improving asset management practices, the Town has not undertaken any studies to review current practices for lifecycle management or researched alternative options for service delivery. Where appropriate these have been identified as improvement tasks. The Town also wishes to quantify each activity to help determine tradeoffs and opportunities for levels of service adjustments, which will be completed as AM capabilities advance.

The Town’s lifecycle activities and improvement opportunities for Wastewater are summarized in Table 61- Table 63.

Table 61 - Wastewater Sewer Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new wastewater sewers.	Development Engineering	Recommendations captured by "Know Your Assets" chapter.
Operations, Maintenance, and Inspections	Sewer Line Rapid Assessment Tool (SL-RAT) inspection program to prioritize flushing and inspection program.	Public Works (Water)	Secure funding for SL-RAT in 2022 budget process. Adopt SL-RAT as a new in-house technology. Develop a multi-year plan for identifying flushing needs with SL-RAT.
	CCTV sewer inspections for structural integrity and operational condition	Public Works (Water) With support from Engineering	Recommendations captured by "Know Your Assets" chapter. Develop an inventory of vulnerable sewer service connections constructed of "black" Orangeburg pipe via the CCTV program and use this information to develop replacement policies.
	Flushing	Public Works (Water)	
	Inflow & Infiltration Reduction	Development Engineering, Private developers, York Region.	Develop a data management plan for I&I linked to GIS and modelled off future processes developed for CCTV.
	Flow monitoring and modelling	Development Engineering	Recommendations captured in "Future Ready" chapter in Concepts and Frameworks section.

Renewal and Rehabilitation	Reactive spot repairs	Public Works (Water)	Create governance model. Define roles & responsibilities. Use CCTV data once collected to inform a multi-year repair strategy and budget.
	Sewer structural lining	Unassigned	
	Patching and point repairs		
	Open trench rehabilitation		
Replacement	End of life replacement	Engineering	
	Upsize sewers for added capacity		

Table 62 - Wastewater Pump Station Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new pump stations.	Development Engineering	
Operations, Maintenance, and Inspections	Routine operator inspections	Public Works (Water) with technical support from Engineering	
	Monthly standby power testing and maintenance		
	Wet well cleaning		
Renewal and Rehabilitation	Instrumentation replacement and corrosion prevention		Recommendations captured by "Know Your Assets" chapter.
	Pump rehabilitation		
	Pump replacement		
Replacement	Major facility renewal (electrical, mechanical, Instrumentation and process equipment)		
	End-of-life structural rehabilitation	Public Works (Facilities)	

Table 63 - Wastewater Maintenance Hold Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new wastewater manholes.	Development Engineering	
Operations, Maintenance, and Inspections	Ad-hoc operational inspections	Public Works (Water)	
	Formal inspection program		Recommendations captured by "Know Your Assets" chapter.
	Rebuild adjustment units		
	Repair benching and parging around pipes as required		
	Debris removal		
Renewal and Rehabilitation	Replacement of manhole cover/lid		
Replacement	End of life replacement	Engineering (Capital)	

Risk is a key asset management tool, and works on a spectrum of asset-level, service-level, and corporate-level spectrum of considerations. This is described in the Concepts and Frameworks section.

The Town currently does not have a formalized, holistic approach to risk management. However, some existing activities and components of service delivery include risk elements and there are multiple examples of using risk-based approaches to support decision-making. There is also a desire to continue with improved risk practices as part of asset management planning and work towards regulatory requirements for service level risk analysis. To meet this need, **a 3 Step Development Plan is recommended**.

The 3 Steps reflect the types of risks – corporate, service level, and asset level, and follows the international standard for risk management (ISO 31000) (Table 64):

Table 64 - 3 Step Development Plan for Risk Management Practices

Recommendation Phase	Improvement Measures
Step 1 – Near Term **Goal of this Phase:** Ensure existing risk components are consistent and broadly applied.	1.1 Review and update budget decision package form and process with risk and service-based considerations. COMPLETE 1.2 Establish a criticality rating methodology that is applicable across all asset classes and apply it to all core assets. COMPLETE 1.3 Assign roles and responsibilities, including accountability, for risk management in the Town – Establish Council and leadership's accountability for ensuring risk is considered and incorporated into all levels of decision-making processes within the Town over time.
Step 2 – Mid Term **Goal of this Phase:** Formalize a Risk Management Framework that is directly integrated within all relevant Town	2.1 Development of a risk management policy that is endorsed by Council, and a corresponding strategy for implementing the policy across the Town. 2.2 Develop a risk management framework to assess asset criticality, asset risk, service risks, and risks to achieving corporate (strategic) goals.

Recommendation Phase	Improvement Measures
processes. It is important that the framework is supported by senior leadership to ensure it adds value and effectively impacts decision-making.	2.3 Establish reporting processes to keep the Town's management teams and Council aware of critical risks, and their associated mitigation actions. 2.4 Develop service level risk registers for each area (roads, water, etc.) that can support a corporate risk register that may be monitored by senior leadership and used to support the management of service delivery.
Step 3 – Long Term **Goal of this Phase:** Leverage risk to be a core capability for the Town.	3.1 Establish a regular review process for identified risks as well as the Town's risk framework. 3.2 Employ risk as an optimization objective for funding allocation and other strategic decision-making. Once risk is strongly embedded within the Town's processes, the Town may wish to employ software and other useful tools to evaluate risk and funding allocations to minimize residual risk accepted by the Town.

Asset Level Risk

As progress towards completing Step 1 of the 3 Step Development Plan for risk management, asset level risk has been assessed for the Town's wastewater sewers using a risk framework. The results of this process are shown as follows (Table 65):

Table 65 - Wastewater Risk Profile

Risk Inputs	Likelihood of Failure (LoF)	Consequence of Failure (CoF)
Water Risk Factors Assessed	- Age & Material or CCTV Condition Grade	- Road class - Sewer diameter - Proximity to critical customers - Proximity to watercourses and environmentally sensitive areas - Land use
Wastewater Risk Profile *(Consequence x Likelihood of Failure)* Profile		
An asset risk assessment of wastewater sewers has been completed and is used to inform tactical decisions by staff. This assessments needs to be aligned in the same framework as other the core assets before it can be presented in the proper manner. This alignment update is ongoing and the AMP will be updated with this information when it is complete.		

RECOMMENDATIONS

- Create and formalize a method of tracking sewer backups that aligns with Ontario Regulation 588/17 requirements.

FUTURE READY

What was once a small but thriving Town, today Newmarket is a desirable and affordable community. While the future is bright, trends like increasing service expectations, urbanization, and climate change are challenging the status quo. The future will change how the Town manages assets. Key takeaways will include:

- Impacts of growth on assets and budgets.
- Vulnerabilities and adaption and mitigation approaches to climate change.
- Aligning master plans with the management of existing assets

Identified Growth Impacts on Wastewater Assets

1. **Urban expansion**: 16.3 km of new wastewater main and 173 maintenance holes will be added to Newmarket over the next four years due to the assumption of Sundial, National Homes, Glenway, and Forest Green subdivisions into the Town's portfolio. There is an additional large area in the South West (Shining Hill) that is expected to be developed just outside of the timeframe of the AMP, but the timing could be brought forward.

2. **Urban intensification:** 1.2 km of wastewater main is planned to be upgraded to increase capacity over the AMP timeframe. There is planned intensification on Main Street and the urban secondary plan area, generally located along the Davis Drive corridor between Upper Canada Mall and Huron Heights Drive and along the Yonge Street corridor between the Town's northerly boundary and Savage Road. Although the quantity and nature of assets required for these fully built-out plans has been estimated, full build-out is not expected within the AMP timeframe. However, a staged approach may be required for asset upgrades. If so, these changes should be incorporated into the AMP.

3. **Changing standards**: No changes to the wastewater network have been identified as a result of changing design standards or regulations. However, potential changes due to technology and resource philosophies have been identified in Table 67.

4. **Climate change:** No specific changes to the wastewater asset portfolio to mitigate against the effects of climate change have been identified yet; however, a high-level flood resilience assessment of Town-owned infrastructure has been undertaken for wastewater pump stations. The next phase of the study will assess the risks based on existing mitigation measures, then identify assets for upgrade or development based on flood vulnerability. Once the study is complete and identifies asset improvements, this AMP should incorporate those new assets.

Table 66 summarizes these asset increases by length of wastewater sewer and associated assets added each year. As shown in Figure 65, the wastewater assets planned over the AMP timeframe are almost all entirely due to urban expansion (new assets). However, for asset management purposes it is important to note that there is a substantial gap in identified growth assets due to step changes in urban intensification, as well as gaps in identifying growth assets required for changing technology, climate, and resources – and associated changes in standards.

Table 66 - Wastewater Asset Increase to 2032 and Beyond

WASTEWATER		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	2032+
New Assets	Wastewater Sewers (km)	1.5	1.7	13.1							0.8	17.1	
	Manholes (count)	41	46	86							19	192	
	Pump Stations (count)											0	
Capacity Increase	Wastewater Sewers (km)	0.1	0.8				0.3					1.2	6.4

The level of effort and required resources to maintain growth assets has been quantified based on the total number of assets and the per-unit cost of maintenance. See Figure 65.

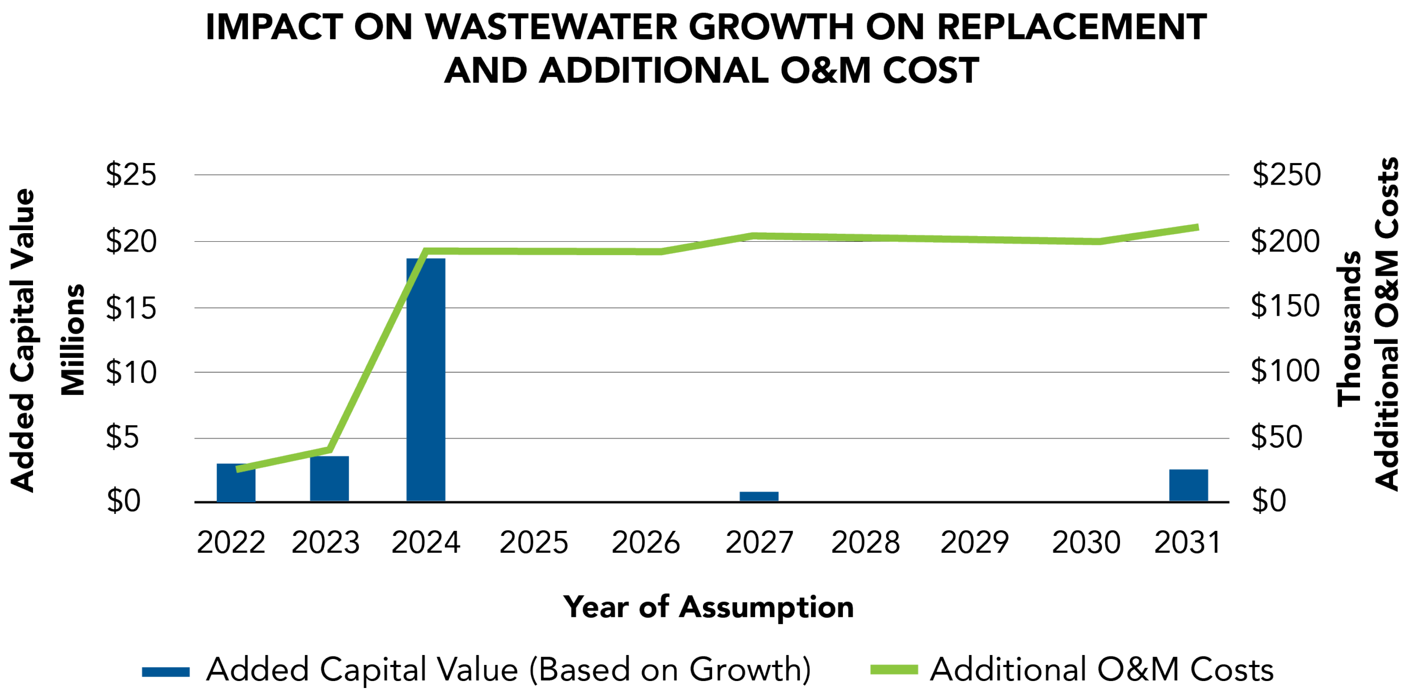


Figure 65 - Impact of Wastewater Growth on Replacement and Additional O&M Cost

Historical Context of Growth

Since 2016, the length of wastewater mains assumed by the Town had varied between 3 and 10km per year (see Figure 66). In contrast, in 2024, the quantum of assumed assets may be 13km, or about 30% higher than in 2020 when the greatest number of assets have been assumed in recent years. Some of these 14km may be assumed earlier, which would ease the burden on the operations team working the new assets into their plans.

The quantum of wastewater mains to be assumed beyond 2032 is unknown. However, the timing of the assumption of any new assets should be reviewed in the next three years to provide greater clarity for necessary resourcing.

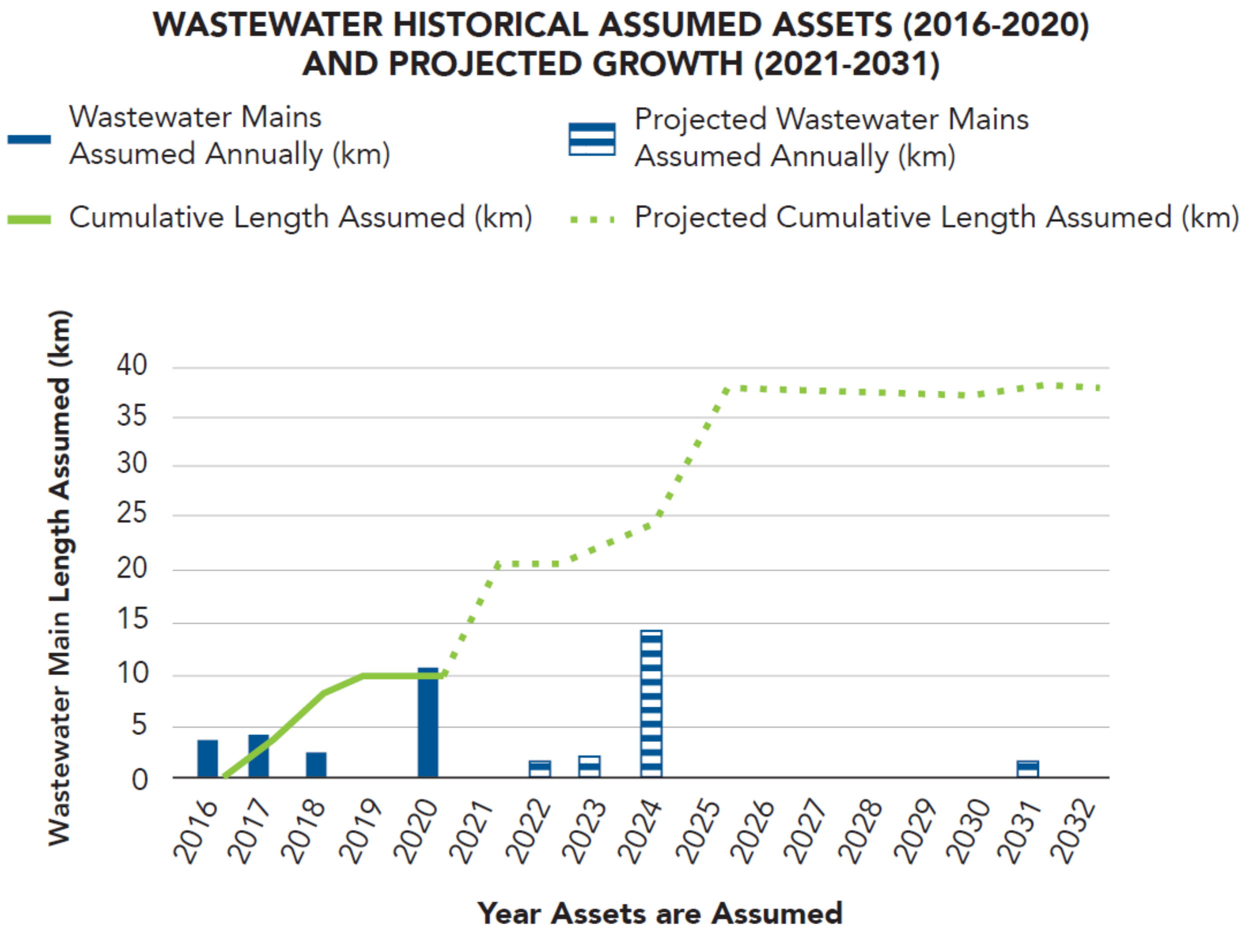


Figure 66 - Wastewater Historical Assumed Assets and Projected Growth to 2032

Results of the Flood Risk Assessment

The Town's wastewater pump stations were assessed based on a hazard-vulnerability rating for climate change related flood hazards. No asset received a very high Hazard-Vulnerability Rating or low Hazard-Vulnerability Rating. Meanwhile, 3 assets received a high Hazard-Vulnerability Rating, and 3 assets received a medium Hazard-Vulnerability Rating (see Figure 67). Results of the climate change flood resilience assessment for wastewater pump stations are as follows:

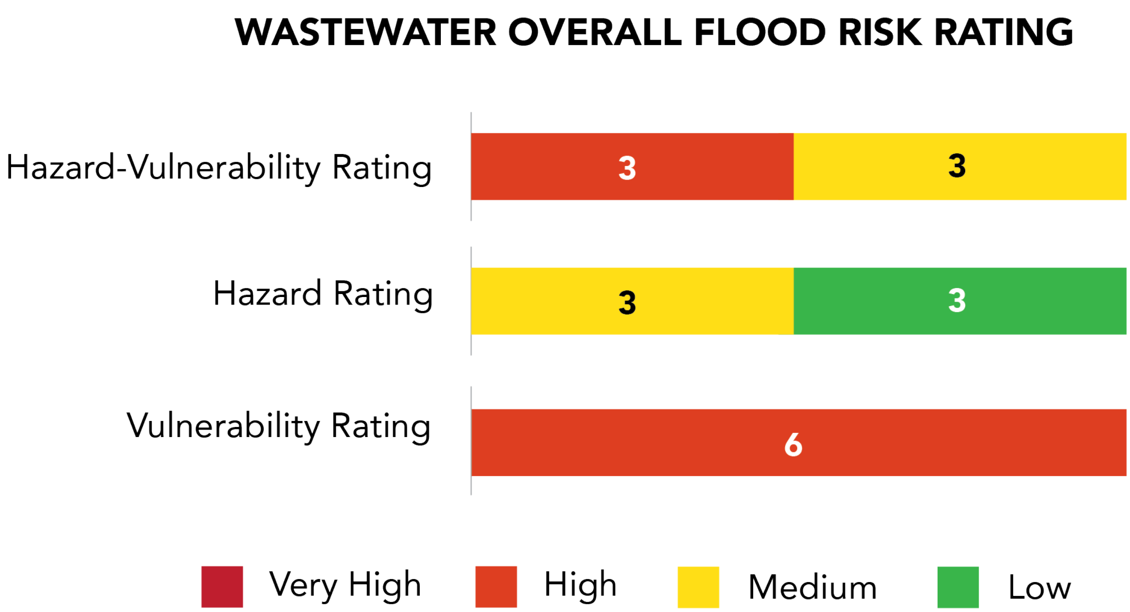


Figure 67 - Wastewater Pump Station Overall Flood Risk Rating

Table 67 - Implications of Future Trends for Wastewater

Trend category	Trend	Implications for the management of our assets (to maintain our service levels)	Growth	In existing plans?
Society	Legislation / regulation changes	Assets may need to be upgraded or replaced to meet new environmental standards.	√	
	Urban intensification	Growth of the Town in currently developed areas of the municipality to higher-density residential / commercial buildings may require increase to pipe capacity.	√	√
	Urban expansion	Growth of the Town to previously undeveloped areas of the municipality requires new wastewater infrastructure. The new infrastructure is provided by developers, but additional maintenance and operations resources are required.	√	√
Technology	New monitoring and control technology	Wastewater collection and monitoring technology advances. Capital or operational expenditures may also increase.	√	
Resources	Zero carbon legislation / standards / policies	Existing assets require a planned replacement with lower-carbon alternatives. These alternatives may require new skills, equipment, and require more or less frequent maintenance.		
	Reduced waste production	Maintain more frequently or more rigorously. Upon replacement, use lower-waste materials. May require different maintenance regime and new skills. For example, the new re-use of excess soil regulations in Ontario.		
	New materials	Use lower-waste materials. May require different maintenance regime and new skills.		

Trend category	Trend	Implications for the management of our assets (to maintain our service levels)	Growth	In existing plans?
Climate	Hotter weather	Prolonged high temperatures affecting wastewater infrastructure by causing increased rate of deterioration. Lower flows may also require more frequent and intense maintenance. Or, warmer winters that increase the frequency of melt events.	√	
	Higher rainfall intensity (handle higher rainfall events)	Increase in severe or prolonged wet weather events can overwhelm wastewater infrastructure, causing flooding, sewer backups. Since the asset capacity is inadequate, the asset will be replaced earlier, therefore having a shorter asset life.	√	

FINANCIAL STRATEGY

The Town has made an important investment in infrastructure, and attention must now be paid to securing this investment. The sustainability of Town infrastructure depends on effective management and ensuring the optimal use of limited funds. Sustainability will require adjusting revenue and services. In this section:

- Current financial position and level of service trends.
- Scenarios for managing levels of service, risk, and funding gaps.

ESTIMATED FUTURE BUDGETS

The approach to financial planning for core assets is summarized in Concepts and Frameworks section and the corporate overview for the results of this process are provided in the Financial Strategy section. This section only provides details pertinent to the service area under consideration.

Estimated Future Budgets Based on Current Position and Plans

Using the financial background and current financial position, the Town's current budget was forecasted to support long term financial planning. These values were used for an assessment of the balance between budget and future renewal costs, and will be subject to internal processes and the annual budget process each year as approved by Council.

Table 68 - Estimated Future Budgets based on Current Position and Plans

Year	Wastewater
2021	$4,074,673
2022	$4,380,273
2023	$4,708,794
2024	$5,061,953
2025	$5,441,600
2026	$5,849,720
2027	$6,083,709
2028	$6,327,057
2029	$6,580,139
2030	$6,843,345

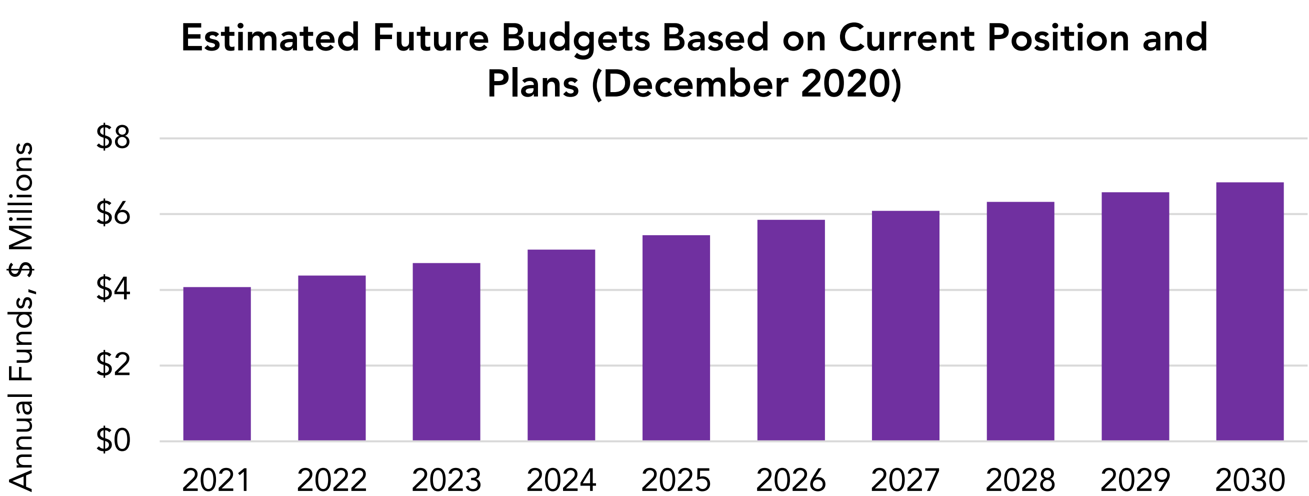


Figure 68 Estimated Future Budgets Based on Current Position and Plans (December 2020)

SCENARIO FORECAST

Wastewater Scenario Methodology

To model the investment need, consolidation of inventory, replacement cost, condition, levels of service, risk, and lifecycle activities as shown throughout the AMP was completed. The three scenarios detailed in the corporate Financial Strategy were executed, along with the following minimum constraints:

Table 69 - Modelling Minimum Constraints

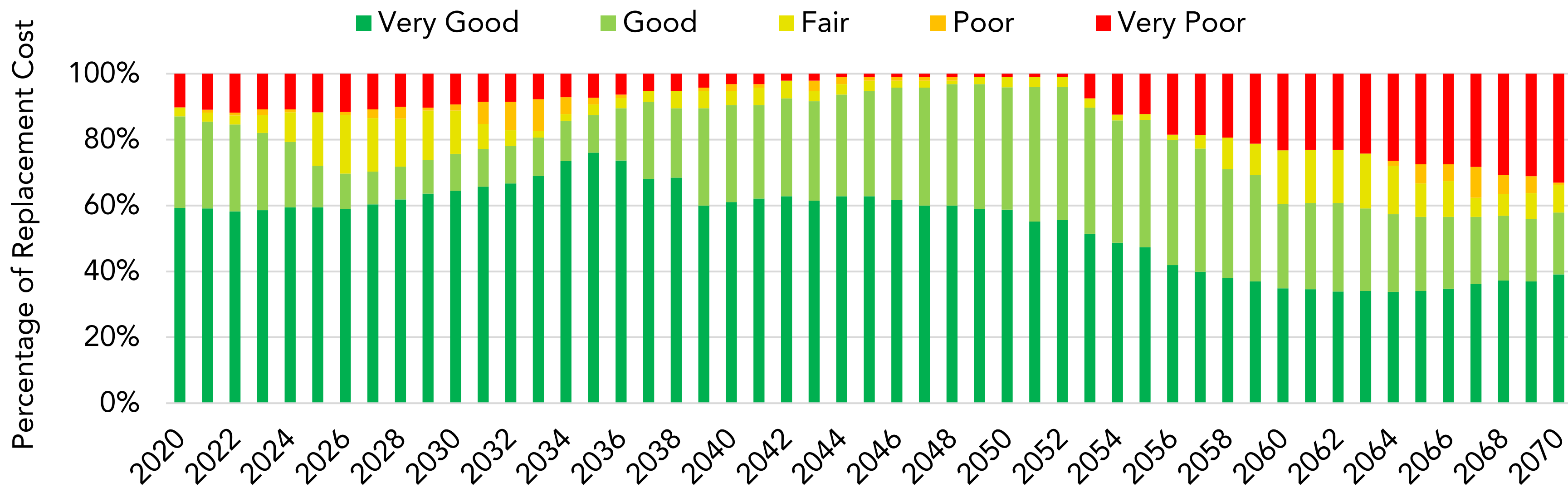
Asset	Service Level Target
Sewers	No Large pipes can be permitted to deteriorate to a Very Poor Condition No more than 5% of the network can be in Very Poor Condition
Pump Stations	No more than 5% of pump stations the network can be in Very Poor Condition No more than 35% of pump stations the network can be in Fair Condition or worse
Maintenance Holes	No more than 5% of the network can be in Very Poor Condition
Service Connections	

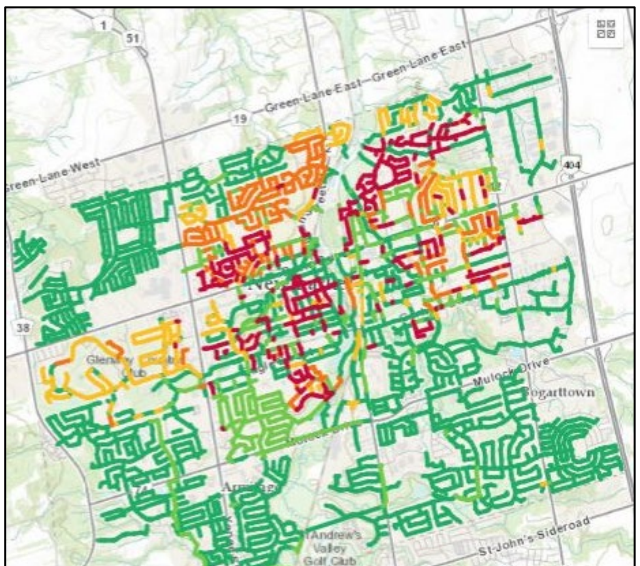
These constraints are minimums before scenario parameters are applied, in order to capture current Town approach to maintaining a minimum state of good repair.

Wastewater Scenario Results

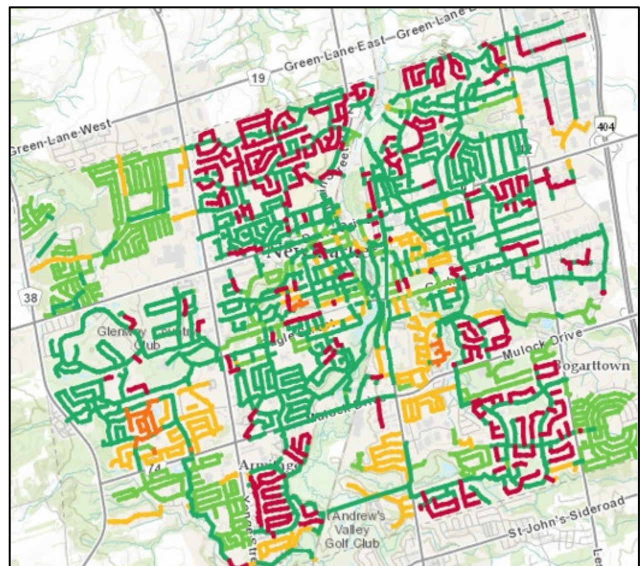
The following figures illustrate how condition of wastewater are forecast to change over time under all three investment scenario):

WASTEWATER - CURRENT BUDGET SCENARIO



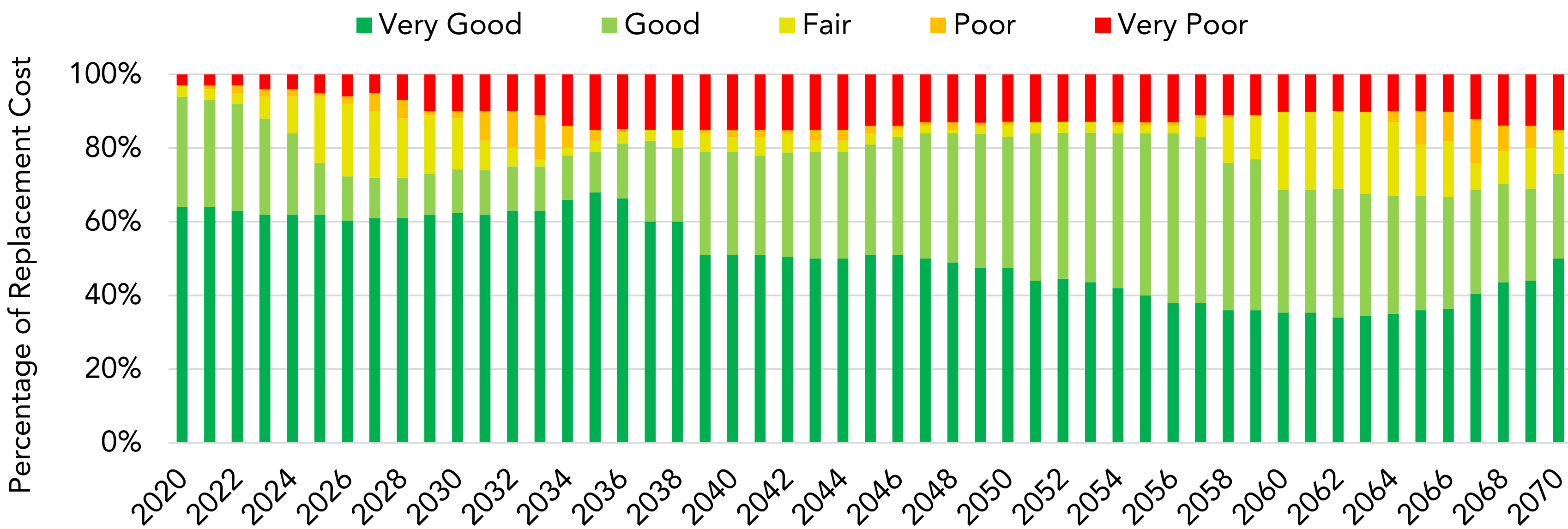


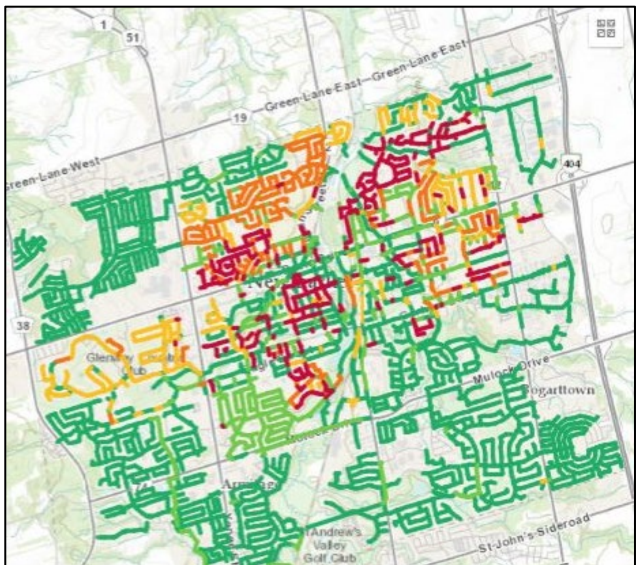
10 Year Forecast under Current Budget Scenario



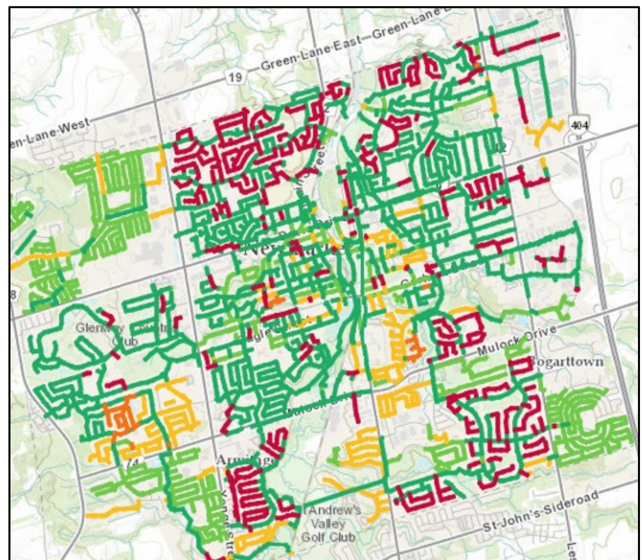
50 Year Forecast under Current Budget Scenario

WASTEWATER - CONSTRAINED BUDGET SCENARIO



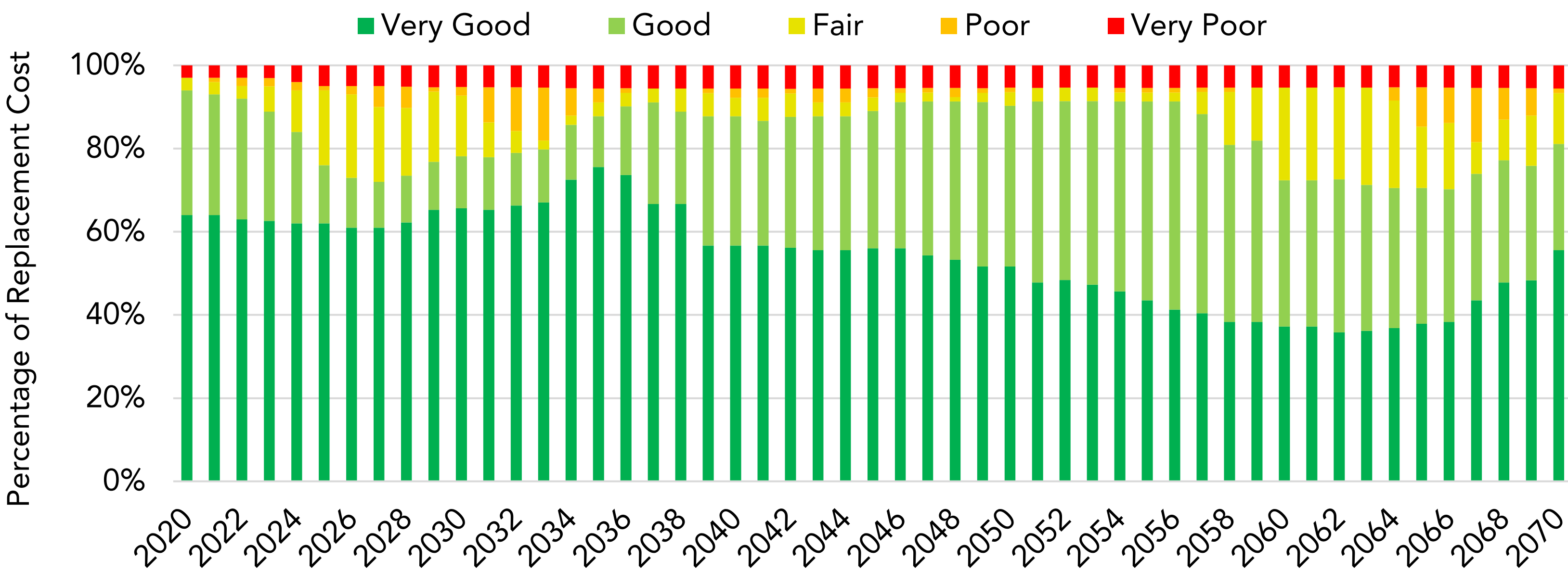


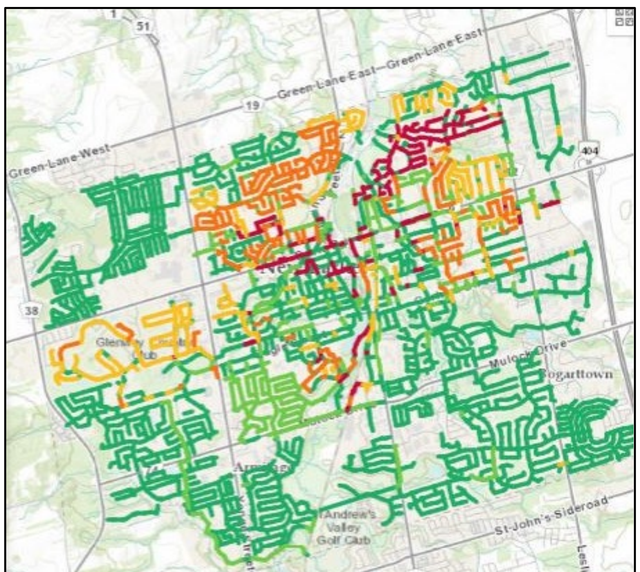
10 Year Forecast under Constrained Budget Scenario



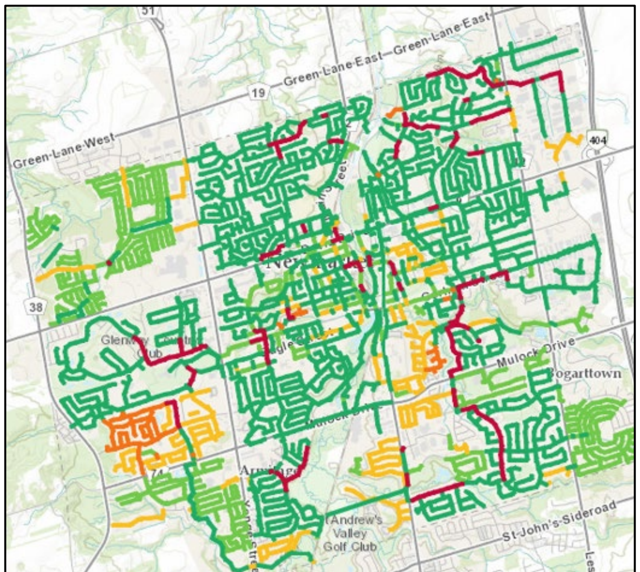
50 Year Forecast under Constrained Budget Scenario

WASTEWATER – SERVICE LEVEL BUDGET SCENARIO





10 Year Forecast under Service Level Driven Budget Scenario



50 Year Forecast under Service Level Driven Budget Scenario

Several observations are important to note about the forecast:

- Current investment levels for this asset class are close to the sustainable levels required for the portfolio.
- Under the service driven budget scenario, service level targets are achieved in every year of the analysis period, and investment over the next 50 years is in line with current budgets.
- Under the constrained investment scenario, overall condition over the long term is below service target for much of the analysis period.
- Despite straying from service level targets, the mixture of interventions under the constrained scenario allows for an overall network that maintains high criticality assets in fair condition or better, and restricts poor/very poor assets to local assets.

It is for these reasons that the constrained investment scenario was selected for future planning for this asset class. The significance of the constrained investment scenario for the Town's core assets is explained in the Executive Summary and the Financial Strategy section.

Long Term Trend and 10 Year Budget

The following figure summarizes the investment forecast for wastewater under the constrained scenario.

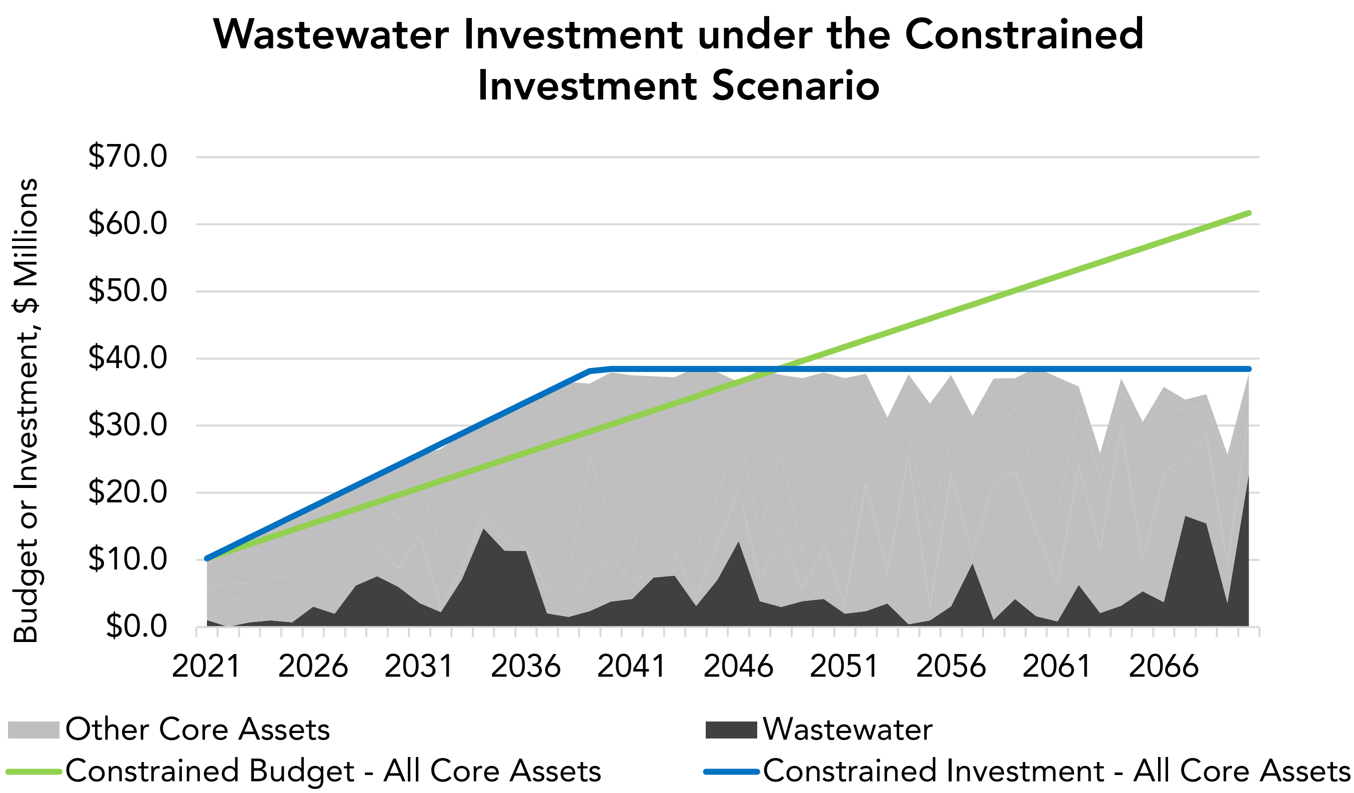


Figure 69 - Wastewater Investment under the Constrained Investment Scenario

The annual average investment over the next 50 years is $5.1M for the wastewater portfolio (in 2021 dollars). This is in line with current levels of reserve contributions, but not current levels of capital spending. Table 70 summarizes the proposed investment in wastewater assets over the next 10 years based on the constrained scenario as well as the Town of Newmarket's current 10-year capital budget for this asset class. Table 71 summarizes the intervention types that make up the constrained investment in this asset class.

Table 70 - Proposed investment and a comparison to the Town's existing budget for Wastewater

Year	Constrained Scenario Proposed Investment	Town's Current Reserve Contribution*	Difference
2021	$1.06 M	$4.07 M	-$3.02 M
2022	$0.06 M	$4.38 M	-$4.32 M
2023	$0.70 M	$4.71 M	-$4.01 M
2024	$1.00 M	$5.06 M	-$4.06 M
2025	$0.70 M	$5.44 M	-$4.75 M
2026	$3.05 M	$5.85 M	-$2.80 M
2027	$1.99 M	$6.08 M	-$4.09 M
2028	$6.21 M	$6.33 M	-$0.12 M
2029	$7.55 M	$6.58 M	$0.97 M
2030	$6.00 M	$6.84 M	-$0.84 M
Total	**$28.32 M**	**$55.34 M**	**-$27.02 M**

*Prior to the 2021 Six Year Wastewater Financial Plan updates as detailed within the Current Financial Plans section.

Table 71 - Proposed interventions that make up the recommended investment for Wastewater

Road Treatments	Repair and Replace Sewers	Maintenance Holes, Pump Stations, Service Connections	Total
2021	$1,056,000	$0	**$1,056,000**
2022	$0	$62,000	**$62 ,000**
2023	$566,000	$131,000	**$697,000**
2024	$0	$1,003,000	**$1,003,000**
2025	$0	$696,000	**$696,000**
2026	$2,063,000	$988,000	**$3,052,000**
2027	$1,918,000	$75,000	**$1,993,000**
2028	$4,358,000	$1,848,000	**$6,206,000**
2029	$5,286,000	$2,269,000	**$7,554,000**
2030	$6,003,000	$0	**$6,003,000**

The proposed investment scenario was established to strike a balance between the long-term investment requirements to achieve service level targets, the pace of increasing the Town's capacity for program delivery, as well as the ability to fund the required program through increased taxes, rates and infrastructure reserves. Several points are worth noting about the recommended constrained investment scenario:

- The constrained budget scenario is forecasted to have periods when a portion of the wastewater network is in very poor condition that exceeds service levels (Peaking in 2044, see Figure 70 below);
- The elevated levels of very poor condition forecasted in this scenario can be considered a period of higher risk of not achieving target service levels between 2028 to 2070.
- This translates to a higher risk of wastewater service failures or unavailability. Practically, this means a greater frequency of sewer overflows, backups, groundwater ingress and other problems.

Service outcomes are always an equilibrium between investment, service level targets and risk of service delivery. If the forecasted outcomes are considered unacceptable, increased investment, or changes in service level targets are ways to impact service risk.

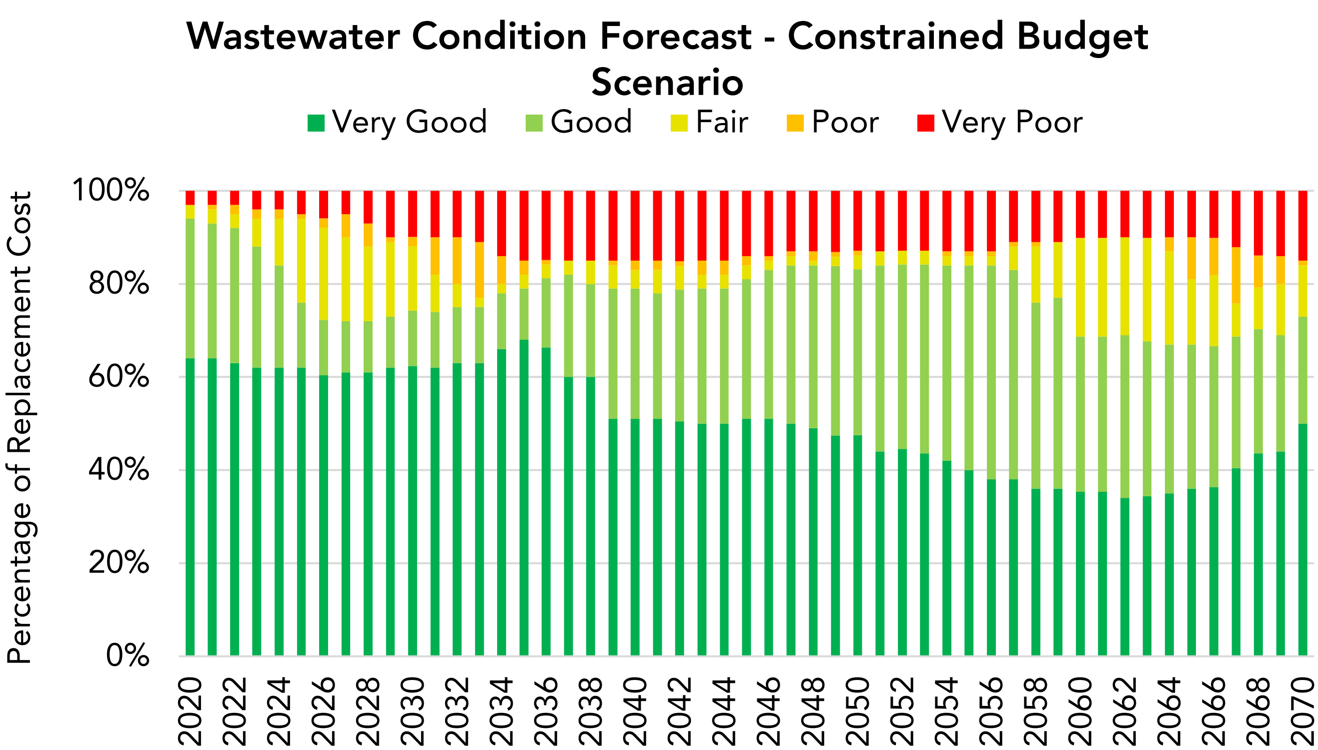
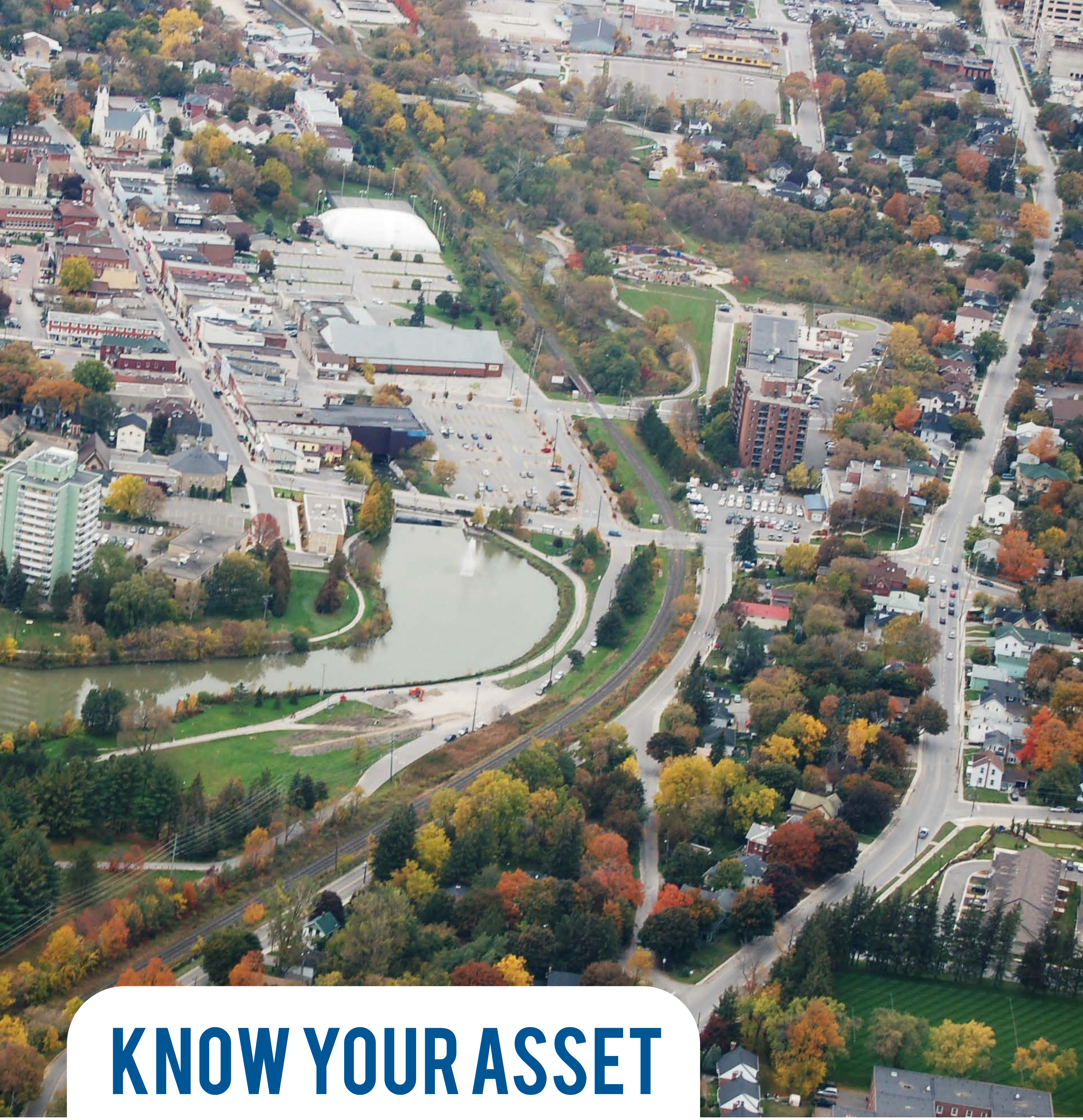


Figure 70 - Higher risk of not meeting service level targets – Wastewater with Constrained Budget Scenario

STORMWATER ASSET MANAGEMENT PLAN

Newmarket



KNOW YOUR ASSET

The Town is responsible for $2 Billion+ of assets. Assets exist to provide services to the community. Their ability to deliver services depends on Town stewardship and informed decision making. As assets age they have to be replaced. Key takeaways in this section will include:

- What do we own?
- What condition is it?
- What would it cost to replace?

DATA GAP ANALYSIS

Asset data is the first part of Know Your Assets and forms the foundation for the State of the Infrastructure. For a review of this approach, see the Concepts and Frameworks section.

Using the requirements of a standard asset registry, a gap analysis of the Stormwater asset registry is provided as follows (Figure 71):

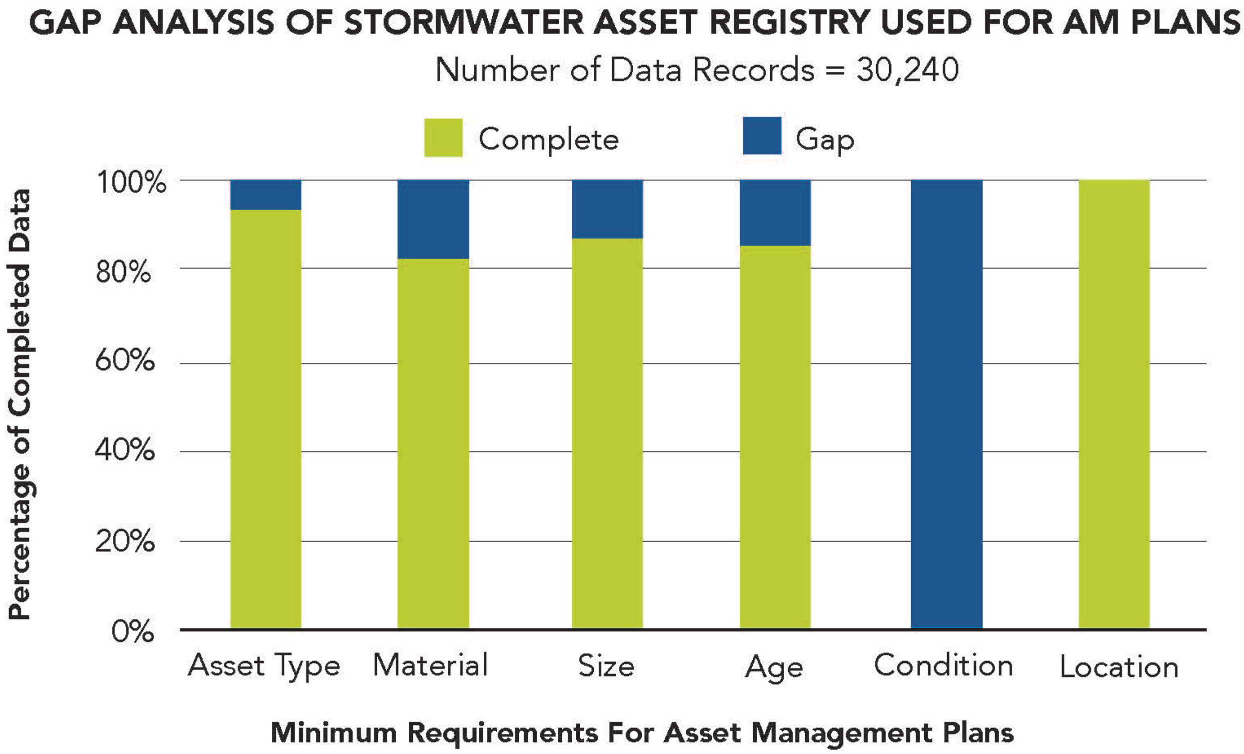


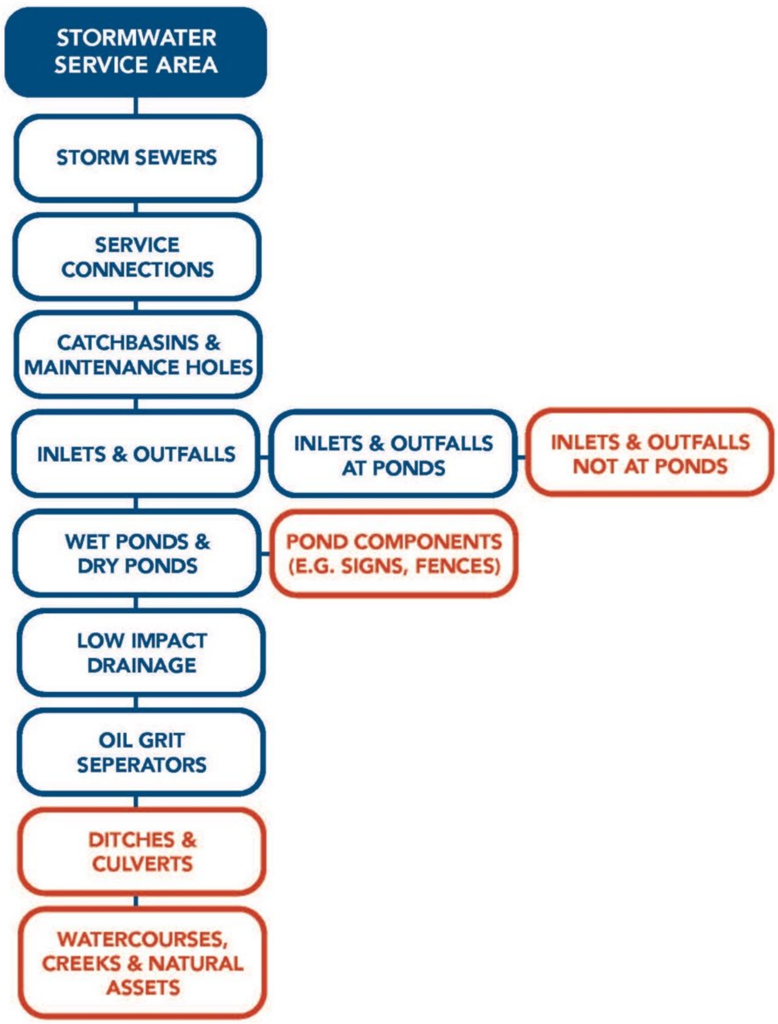
Figure 71 - Gap Analysis of Stormwater Asset Registry Used for AM Plans

When viewing subsequent sections of the asset management plan that use asset data, consideration should be given to the data gaps described here.

CONTEXT FOR THE STATE OF THE INFRASTRUCTURE

The State of the Infrastructure will combine inventory quantities, replacement costs, and condition ratings to provide a detailed breakdown of the Town's assets.

What Do We Own? The inventory has been organized in a hierarchy to reflect the asset types providing the service, and to support reporting and planning. The Town's asset inventory is organized into groupings that correspond to the services they provide and break down into distinct classifications of assets. Once classified, the Town's assets are quantified using the appropriate unit of measurement. The Town's inventory for the stormwater service area is organized as follows (Figure 72).



****Ditches, culverts, watercourses, creeks, and inlets/outfalls (not at ponds) will be incorporated in future updates of the core assets AMP.***

Figure 72 - Stormwater Service Area Classification

This inventory will be used for replacement valuations, service delivery, operations and maintenance, growth updates, capital planning, and financial reporting.

What Does It Cost? The total replacement cost for stormwater is ~$628 Million (2021 dollars). This is equivalent to 26% of all Town-owned assets, and 31% of the core asset subset reported through the 2021 AMP.

What Condition Is It? Using the method of most Infrastructure Report Cards, assets are assigned condition ratings on a 5-point scale. Ratings are assigned based on age, or condition assessment data where available. Age is an industry-accepted benchmark for the high-level analysis of infrastructure portfolios, using the principles outlined in the Concepts and Frameworks section.

Table 72 - Age Based Condition Rating

Condition Ratings Based on Current Age of the Assets				
Very Good	Good	Fair	Poor	Very Poor
100% – 90%	90% – 70%	70% – 35%	35% – 20%	20% – 0%
Percentage of Remaining Useful Life				

Using this context, the State of the Infrastructure is provided below.

Stormwater System Infrastructure Report Card

Newmarket

INFRASTRUCTURE PURPOSE

The Town provides stormwater collection, treatment, and infiltration using a combination of sewer, drainage features, and facilities. Stormwater is treated for both quality and quantity to ensure adequate drainage, safe passage, and environmental stewardship.

REPLACEMENT COST: $628 Million

AVERAGE NETWORK CONDITION FAIR

INVENTORY See table below

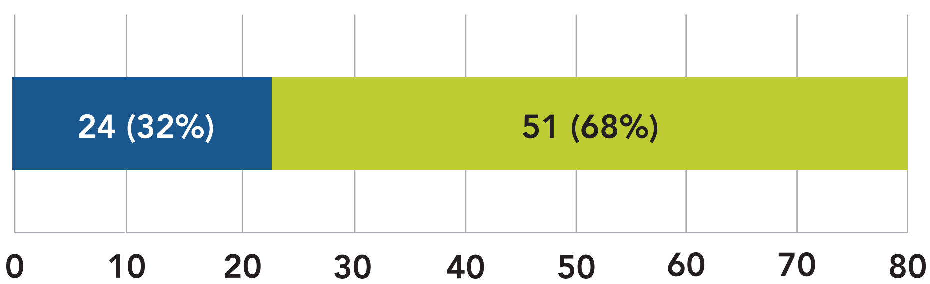
DETAILS:

Life Expectancy

To date, our stormwater system has used on average, 32% of its intended life span with 68% of its life span remaining.

Average Rating: Fair.

Current Average Age
Average Remaining Life

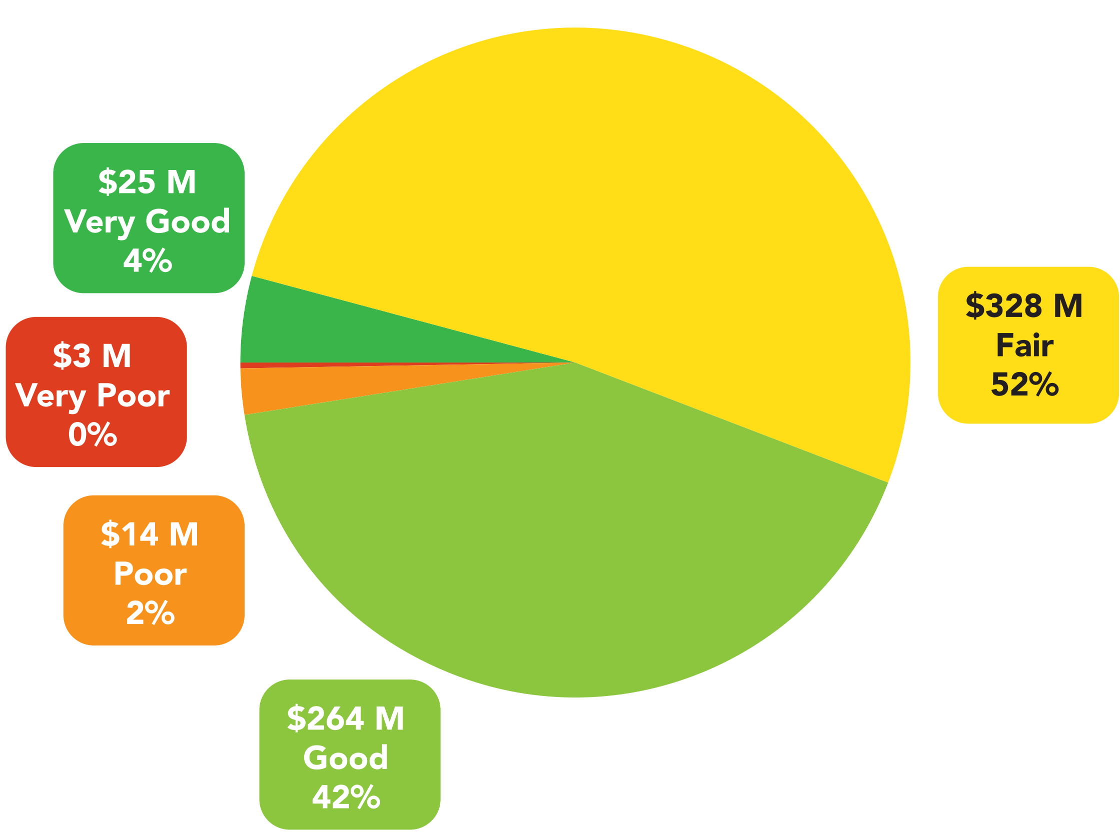


Average Expected Life: 75 Years

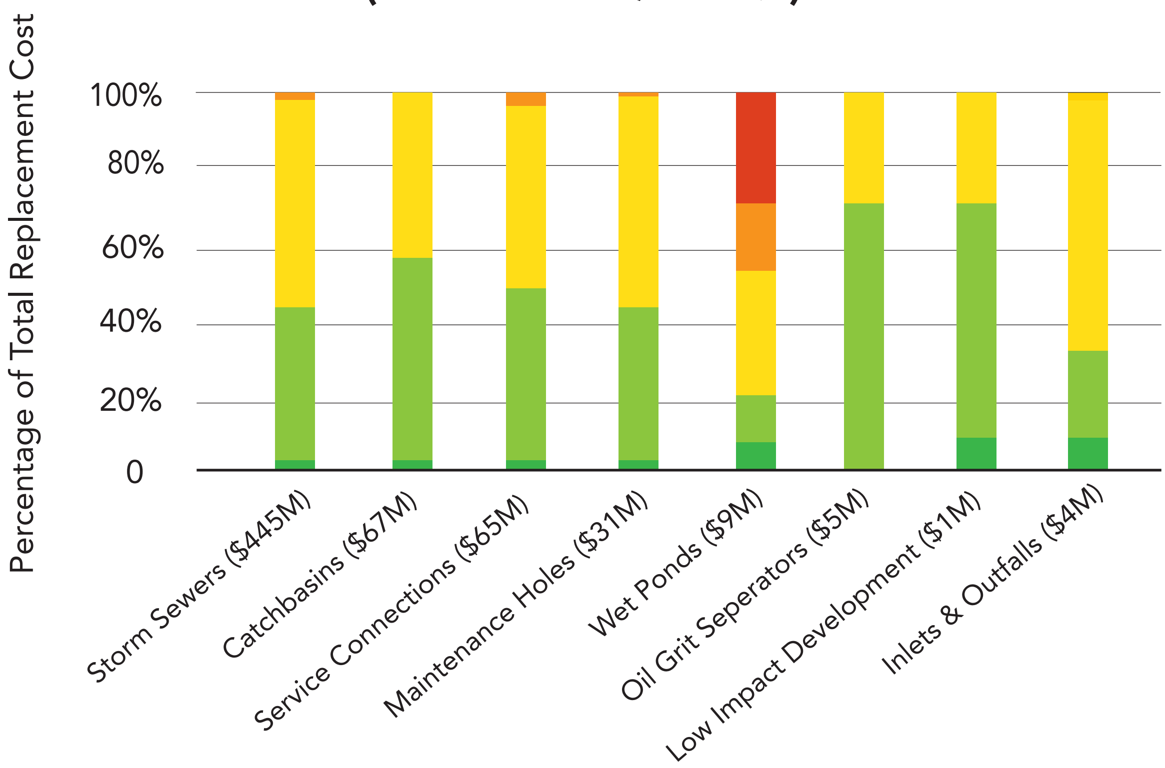
WHAT CONDITION ARE OUR ASSETS IN?

Very Good | Good | Fair | Poor | Very Poor | Unknown

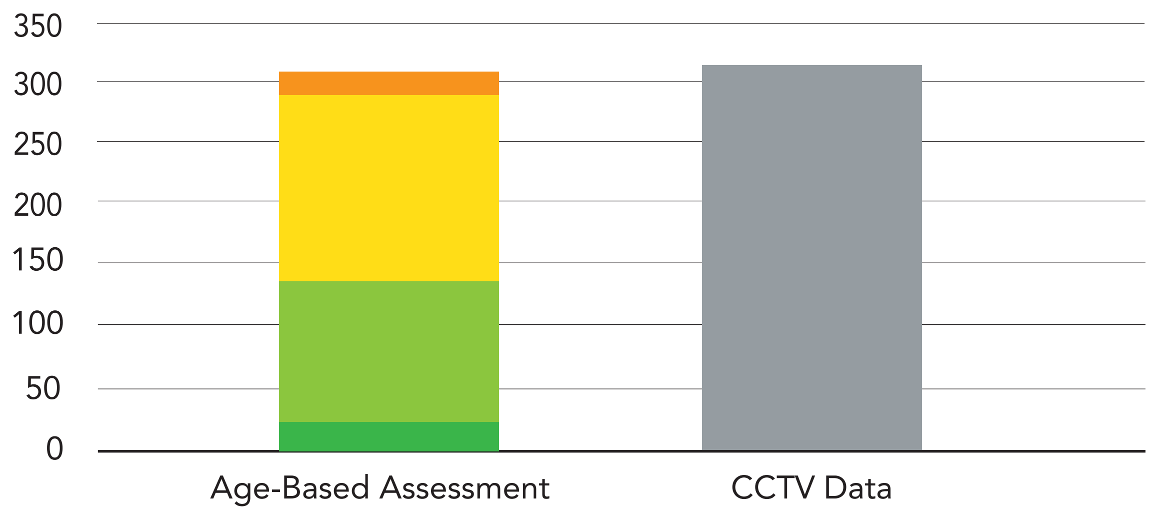
Current Condition & Replacement Cost ($ Millions)



Stormwater Condition Breakdown by Asset Class (Normalized / 100%)



Sewer Condition: Comparison of Age-Based Analysis with Available CCTV Inspection Data



WHAT ASSETS DO WE OWN?

Asset Class	Quantity
Sewers	297 kilometers
Maintenance Holes	3,467 assets
Catchbasins	7,608 catchbasins
Wet Ponds*	42 ponds
Dry Ponds*,**	18 ponds
Inlets & Outfalls at Ponds	371 assets
Oil Grit Separators	36 assets
Low Impact Drainage	21 locations
Service Connections (Town-owned)***	71 kilometers

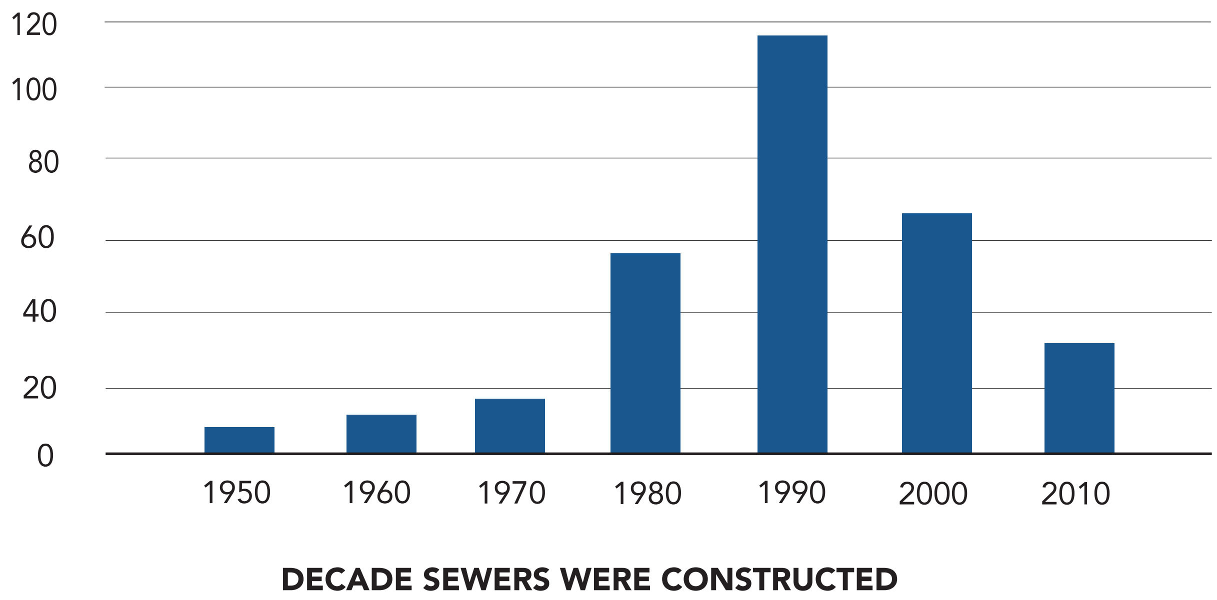
*The Town is undergoing a significant GIS update for ponds, and the current database contains some assets that are being redefined as other facility types, natural water bodies, etc. The Town owns and maintains 34 wet ponds and 21 dry ponds – GIS data will soon reflect this. Subsequent sections of the AMP are based on this understanding.

**Dry ponds are included in the asset management plan but were not assessed for their condition because at current practice they are naturalized and only require vegetation maintenance. As the Town's understanding of dry ponds changes the AMP will be updated reflect this – some dry pond costs may currently be unaccounted for such as measures to adhere to the Lake Simcoe Protection Plan.

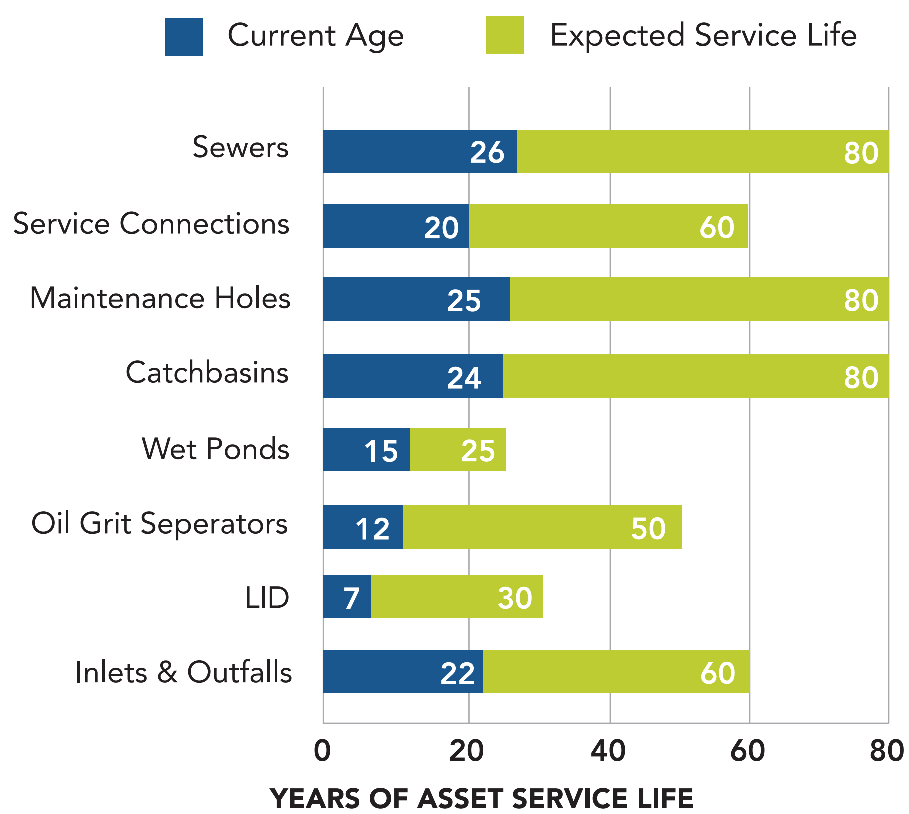
**The service connection asset inventory is only partially complete and will increase n quantity as data improves. These values are extrapolated as required for financial planning.

HOW OLD ARE OUR ASSETS?

DECADE OF STORMWATER SEWER CONSTRUCTION

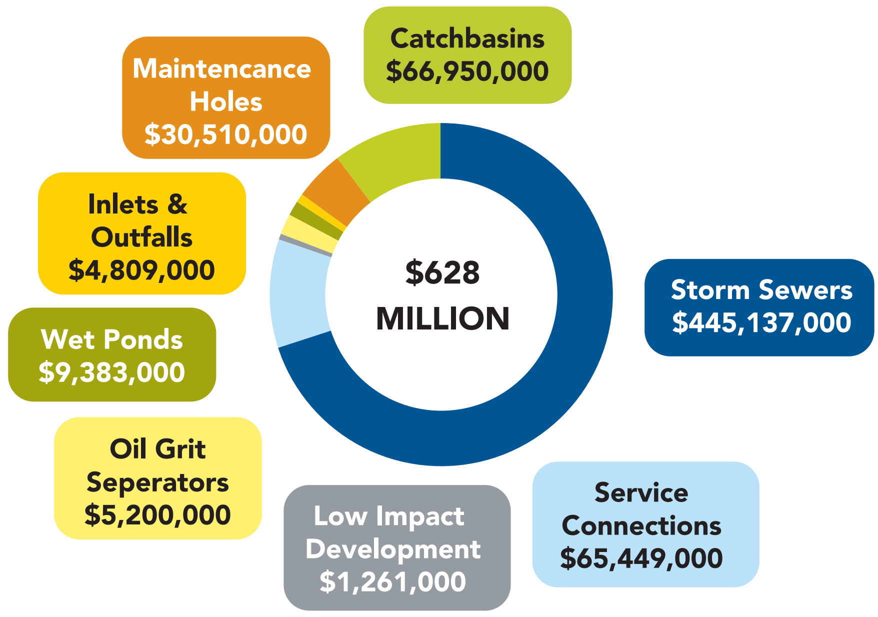


AVERAGE AGE AND EXPECTED SERVICE LIFE OF STORMWATER INFRASTRUCTURE



WHAT WOULD OUR ASSETS COST TO RECONSTRUCT IN 2021?

TOTAL ASSET REPLACEMENT COST OF STORMWATER



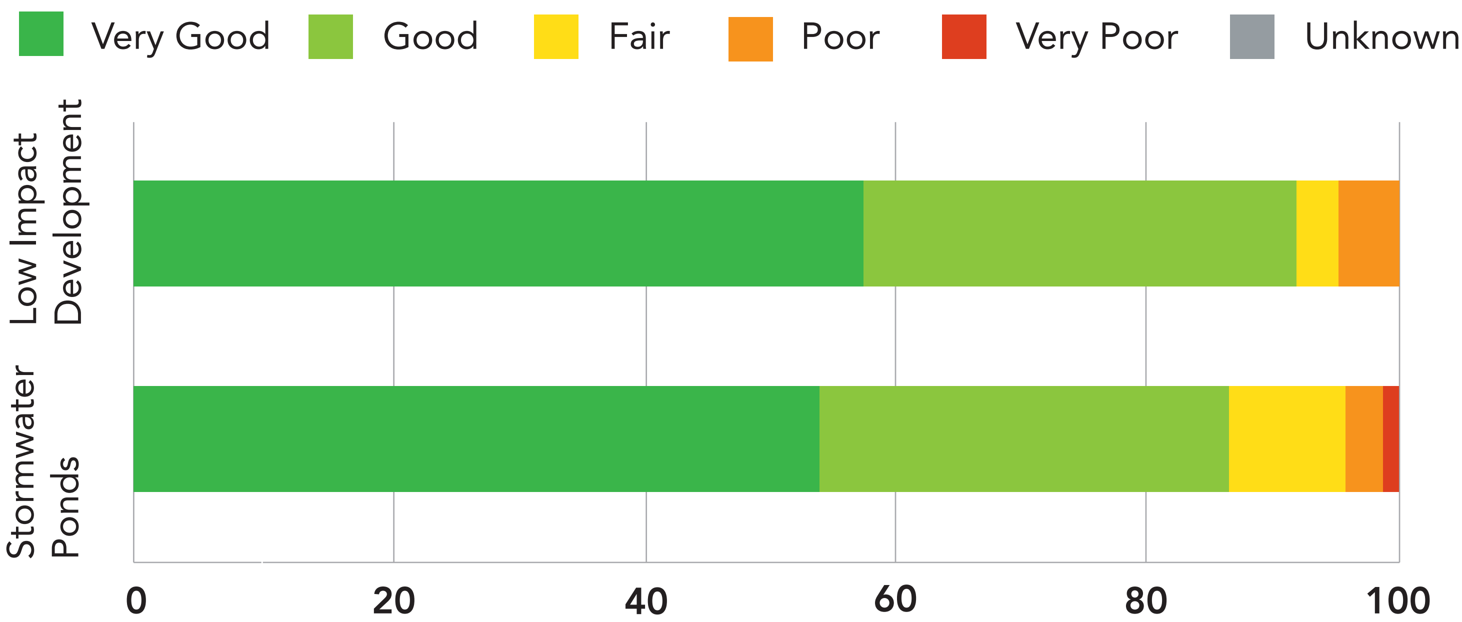
POND INSPECTION PROGRAM

In 2021, inspections of pond assets yielded the following results:

- 19 out of the 55 ponds inspected had one or more assets with a value of 4 or 5.
- 2 of 15 LIDs inspected had one or more assets with a value of 4 or 5.

Results of storm pond and LID inspections break down as follows. After inspections are complete, the Town begins planning maintenance projects for corrective action.

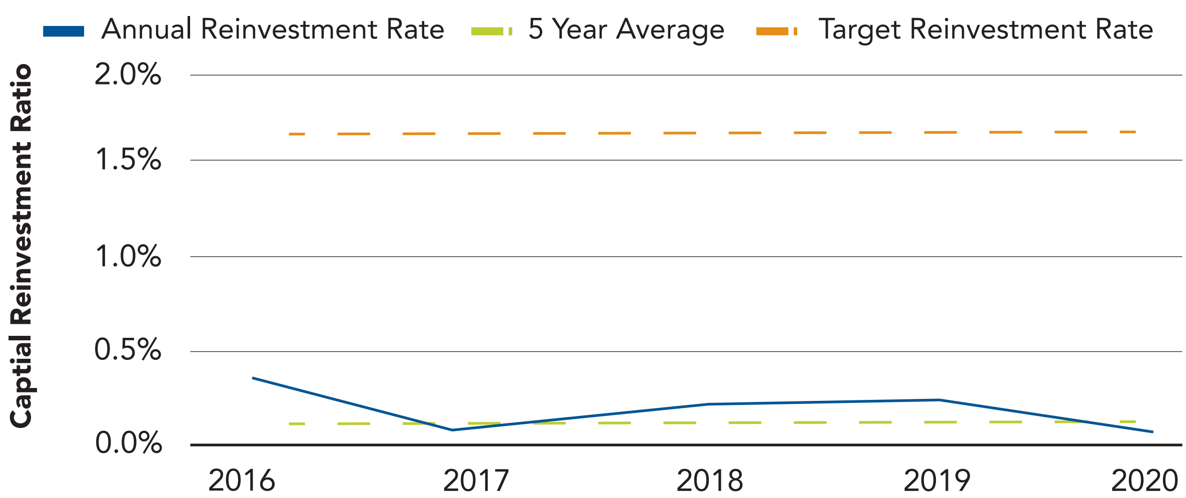
2021 POND INSPECTION PROGRAM
CONDITION OF ASSETS WITHIN PONDS



CURRENT CAPITAL SPENDING

CAPITAL REINVESTMENT (5 YEAR AVERAGE)	$0.44M
REINVESTMENT RATIO * (5 YEAR AVERAGE)	0.07%

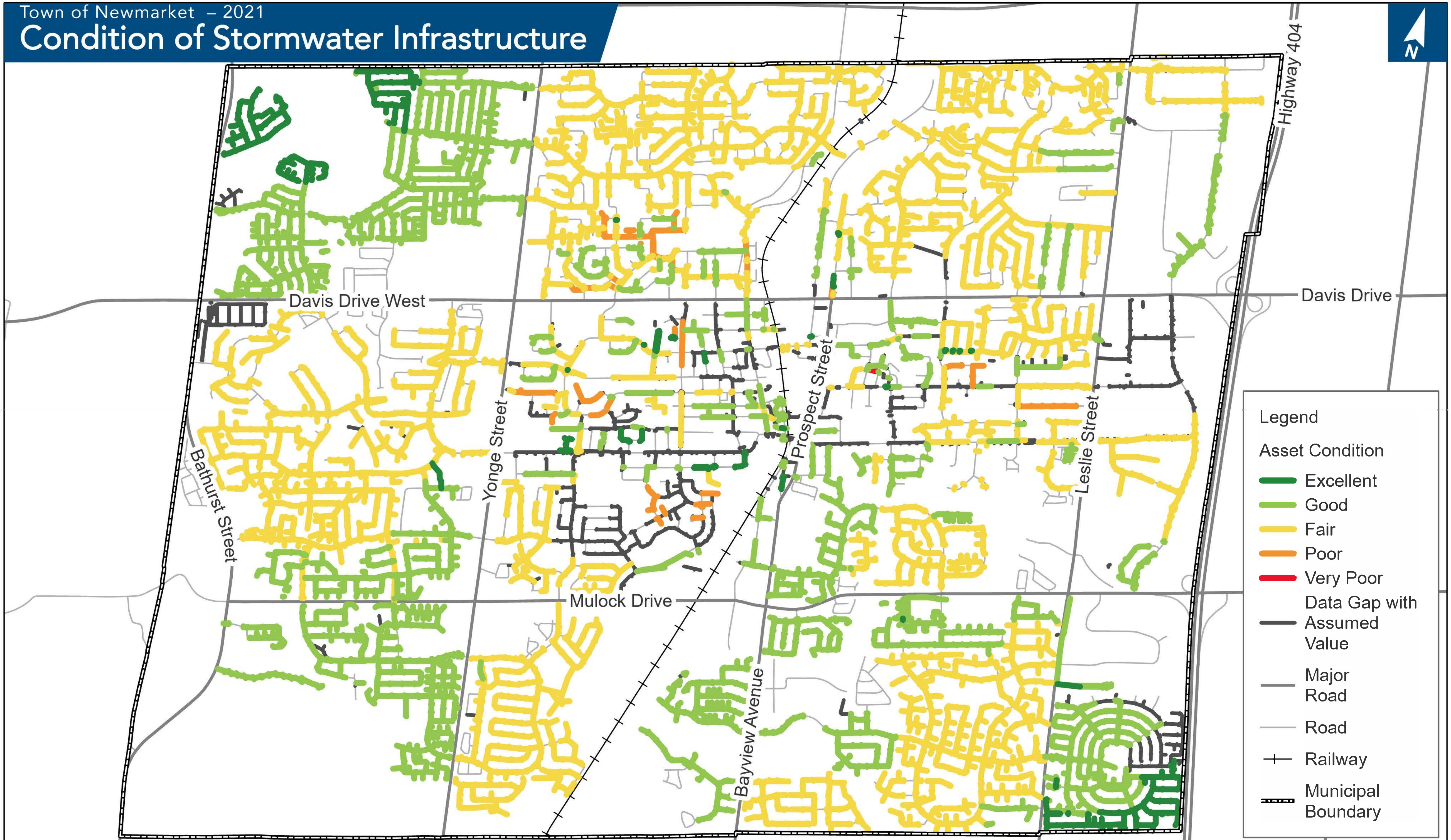
HISTORICAL ACTUAL REINVESTMENT RATIO IN STORMWATER
Percentage of Total Replacement Cost (%)



* **Reinvestment Ratio:** A financial measure indicating the Towns reinvestment into existing assets via the capital program. The Canada Infrastructure Report Card recommends a minimum annual reinvestment ratio of 1%

Town of Newmarket – 2021

Condition of Stormwater Infrastructure



Sources: Roads, Railway, Municipal Boundary - Data, Analytics and Visualization Services Branch, Corporate Services © The Regional Municipality of York, 2021; All other data - © Town of Newmarket, 2021. DISCLAIMER: The information depicted on this map has been compiled from various sources. While every effort has been made to accurately depict the information, data/mapping errors may exist. This map has been produced for illustrative purposes only. It is not a substitute for a legal survey Printed: October, 2021.

Document Path:G:\Projects_PRO\CorporateServices\Finance\AssetManagment\Infra_Report_Card\Infra_Report_Card.aprx\Stormwater_Condition_Report Map 8x14

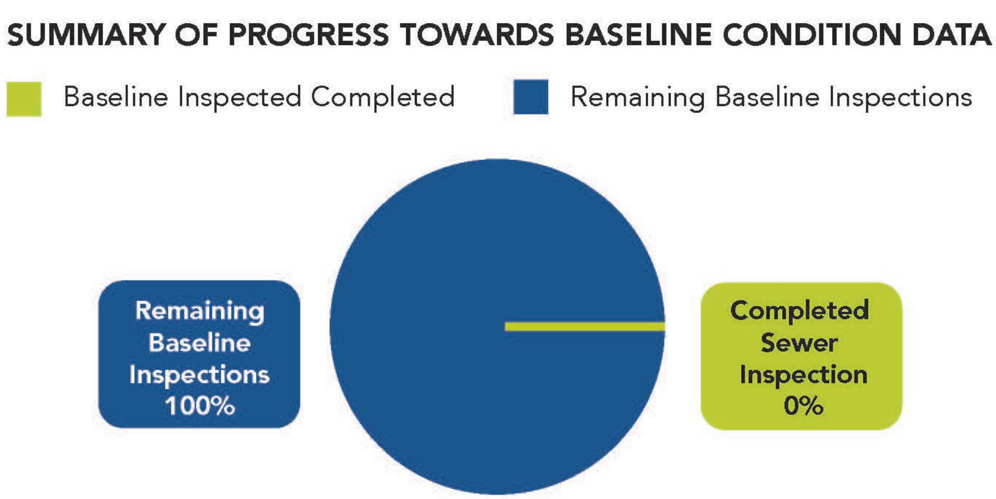
CONDITION ASSESSMENT PLAN

Concluding Know Your Assets, the Town will use condition assessments to increase knowledge of the assets, monitor performance, and refine financial projections. The Town's approach to condition assessments is described in the Concepts and Frameworks section.

Condition Assessment Plan for Stormwater Sewers

The condition assessment strategy for stormwater sewers focused on CCTV field inspections, a relatively inexpensive way to get comprehensive condition information about assets that are otherwise buried "out-of-sight". The stormwater sewers have never been systematically inspected, instead investigated for occasional operational issues or capital planning locations. Storm sewers generally have fewer issues than sanitary sewers, but require a baseline of condition data. Because stormwater is financially constrained yet has an extensive ~297 km pipe network valued at ~$440 Million with limited data, the Town wishes to embark on its first stormwater sewer condition assessment in order to secure the financial planning for these assets with improved confidence. 2021 operating budget was secured for this activity – for the program to be successful, governance now needs to be defined and processes need to be developed.

The Town has made good progress with its condition assessment programs to date. A summary of current achievements and future targets in the Town's Condition Assessment Plan is on Table 73 (next page):



*The Town has inspected more than 0% of sewers but this was done on an operational basis – if issues were present they were detected, but conditions were not historically recorded for future use.

Figure 73 - Summary of Progress Towards Baseline Condition Data

Summary of next steps and targets for Stormwater Sewers

A summary of current achievements and future targets in the Town's Condition Assessment Plan is outlined below in Table 73. Opportunities to complete the next milestone in the condition assessment plan are captured as recommendations to conclude the Know your Assets section.

Table 73 - Summary of Current Achievements and Future Targets for Stormwater Condition Assessment Plan

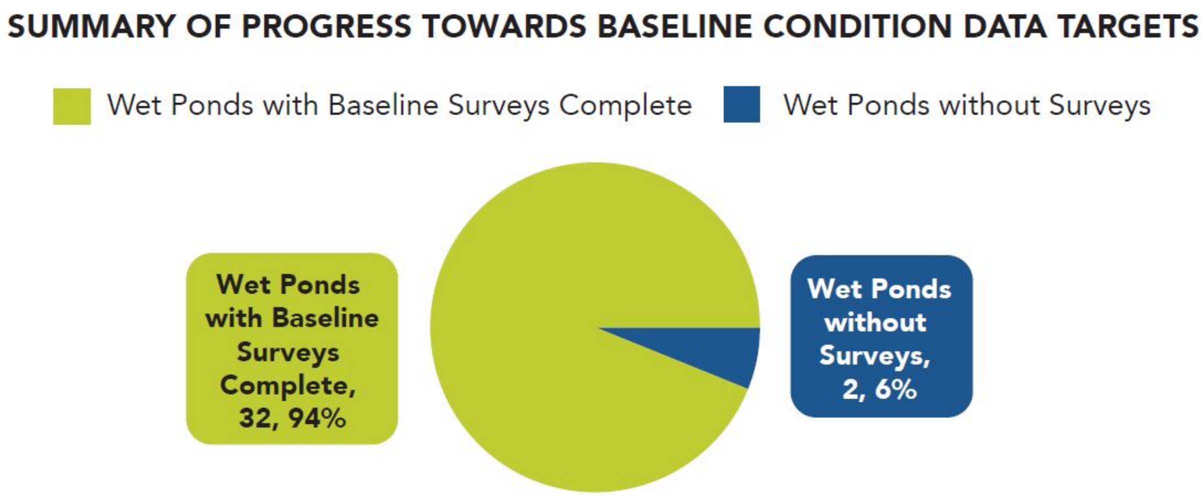
Assessment Methods	Age-Based Assessment	Field Condition Assessment Baseline	Follow Up Condition Monitoring	Mathematical Modelling
Status	Complete	Improvement Opportunity		n/a
Methodology	Age, Service Life	CCTV Camera Inspections (Contracted Services)		*TBD*
Responsible Party	Asset Management	Unassigned		*Asset Management*
Budget for Activities	n/a	Yes	Yes	n/a
Project Planning and Project Delivery Process	n/a	No	No	n/a
Current Progress	Complete	0% of all sewers inspected	A risk-based approach (industry standard) will be used to optimize follow-up inspection frequency based on CoF and LoF of each sewer, ranging from every year to every 10+ years.	*Options considered will depend on the findings of baseline inspections.*
Goal		100% of all sewers inspected (100% still outstanding)		

Time to Achieve Goal		**2029:** Baseline inspection of the network could be achieved by 2029 based on current budget and the remaining length of sewer. However, current practice indicates that staff resourcing, process, and data management are also barriers to achieving the goal besides budget.	*TBD*

Condition Assessment Plan for Stormwater Ponds

The focus of pond condition assessment is on measuring the accumulation of large volumes of sediment within the storage basin of wet ponds. When a pond becomes full it must be excavated, a costly capital expense that resets the life of the pond. Assessing sediment volumes is limited to wet ponds (excludes dry ponds). To plan for sediment removals, the Town uses contracted services for bathymetric surveys that provide measurements of sediment levels indicating when a capital intervention is required. A baseline understanding of most ponds has been established, meaning the focus will now shift to follow up monitoring and forecasting.

Aside from the storage basin, ponds contain many smaller assets like outfalls, headwalls structures, retaining walls, etc. These features are already inspected through a summer program. As an improvement measure, the data management and reporting for these inspections are recommended as being formalized.



**Completed baseline is on track after inspections completed in 2016, 2019, and 2021. Ponds without surveys were recently rehabilitated (dredged) and therefore don't require a survey yet*

Figure 74 - Summary of Progress Towards Baseline Condition Data

Summary of next steps and targets for Stormwater ponds

A summary of current achievements and future targets in the Town's Condition Assessment Plan is outlined below in Table 74. Opportunities to complete the next milestone in the condition assessment plan are captured as recommendations to conclude the Know your Assets section.

Table 74 - Summary of Next Steps and Targets for Stormwater Ponds

Assessment Methods	Age-Based Assessment	Field Condition Assessment Baseline	Follow Up Condition Monitoring	Mathematical Modelling
Status	Complete	On Track (Complete)	**Next Steps & Improvement Opportunity**	**Next Steps & Improvement Opportunity**
Methodology	Age, Service Life	Bathymetric Surveys & Summer Inspections		The Town is already engaged in engineering calculations and modelling for ponds.
Responsible Party	Asset Management	Engineering (Climate Change)		
Budget for Activities	**n/a**	**Yes**	**Yes**	**n/a**
Project Planning and Project Delivery Process	**n/a**	**Complete**	**Yes**	**n/a**
Current Progress	Complete	94% of wet ponds surveyed.	**Recommendation:** Create multi-year plan for surveys and other investigations. Formalize data management of assets inside ponds. Current progress includes the development of an SOP and GIS data collection form.	Explore forecasting and evaluation methods (e.g. sedimentation rates) that link to dredging plans and environmental retrofits.
Goal		100% of wet ponds surveyed.		
Time to Achieve Goal		2022/2023 or date of next inspection contract.	2022	2024

RECOMMENDATIONS

- Incorporate addressing data gaps into any CCTV data collection plans.
- Continue the significant ongoing data update as part of the stormwater CLI-ECA application. Expected benefits include new datasets for ditches, improved data for inlets, outfalls and ponds, and new data about stormwater catchments.
- Develop an inventory of the assets inside ponds including fences, signs, retaining walls, baffles, valves, weirs, etc.
- Clean up the non-structural culverts information shared by OSIM culverts and stormwater sewers and create a new GIS layer for this asset.
- Complete an asset inventory of the assets located at creeks that are regularly inspected by PWS.
- Create a data collection plan for headwall structures located at inlets and outfalls.
- Assign responsibility for stormwater CCTV.
- Implement recommended data collection and condition assessment processes for wastewater (see wastewater AMP) for stormwater.
- Continue progress of building data management processes for pond inspections including sediment basin volumes and condition of assets within ponds.
- Create multi-year plan for bathymetric surveys and other investigations.
- Formalize data management of assets inside ponds. Current progress includes the development of an SOP and GIS data collection form.

MANAGE SERVICE DELIVERY

Asset management is not software, or a document. It is a way of doing business every day. Asset management requires processes to balance the services provided, the risks associated, and their cost. To make tradeoffs, visibility is needed into what is being done and why. Key takeaways will include:

- What services do we provide?
- What activities support services, and who does what?
- What are the risks of our services?

LEVELS OF SERVICE ALIGNMENT

Manage Service Delivery is about the services asset deliver, the associated risks or opportunities, and activities/resources that are expended doing so. This is explained in the Concepts and Frameworks section. To begin the use of this framework, the Town has developed a set of measures for levels of service.

The levels of service measures are organized to create alignment between Town strategic objectives, a corporate goal for the service (e.g. stormwater), and the subsequent service criteria and technical/customer measures. Metrics have been listed and aligned before presenting the results in the next section. The result of this process is shown as follows (Figure 75)*:

*To achieve full alignment of levels of service indicators, more measures are being recommended related to system performance during storms and flooding events should they occur.

Figure 75 - Stormwater Levels of Service Alignment

PERFORMANCE AND RESULTS

Legend			
Symbol	**Meaning**	**Symbol**	**Meaning**
	Trending up in the desired direction.		Trending down in an undesired direction.
	Trending down in the desired direction.		Trending up in an undesired direction.

Corporate Goal

Protection of property from flooding at an appropriate cost.

Customer Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of assets in Fair or better condition	**97%** of assets	**97%** of assets	
Number of stormwater related complaints per year (includes sewer, catchbasin, and pond operations and performance – excludes billing, service requests, etc.)	**78 complaints**	**62 complaints**	Trend not applicable
Percentage of properties resilient to 5-year and 100-year storms.	See regulatory LoS below (measures requested by O.Reg. 588/17)	See regulatory LoS below (measures requested by O.Reg. 588/17)	See regulatory LoS below (measures requested by O.Reg. 588/17)

Technical Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Capital renewal reinvestment ratio (5 year rolling average)	**0.08% of replacement cost**	**0.07% of replacement cost**	
Number of times streets were swept per year	**Twice (2)**	**Once (1)**	
Percentage of storm sewers inspected per year	**1%**	**0%**	
Percentage of catchbasins cleaned per year	**33%**	**31%**	Trend not applicable
Percentage of catchbasins repaired per year	**0.4%**	**0.1%**	
Total number of wet ponds past due for rehabilitation	**9 of 34 wet ponds (27%)**	**9 of 34 wet ponds (27%)**	

Regulatory Levels of Service

Measure	2019 Performance	2020 Performance	Improvement Trend*
Percentage of properties in municipality resilient to a 100-year storm.	**98.8%**	**98.8%**	Trend not applicable
Percentage of the municipal stormwater management system resilient to a 5-year storm.	**100%**	**100%**	Trend not applicable

*Levels of service measures do not have endorsed targets. Trend observations are made on the basis of general recommendations related to the sustainability of assets, services, and finances

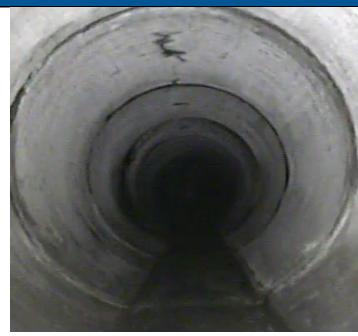
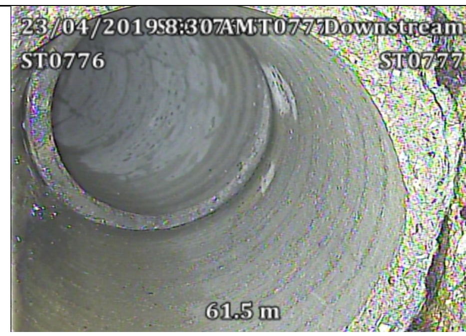
ILLUSTRATION OF CURRENT LEVELS OF SERVICE

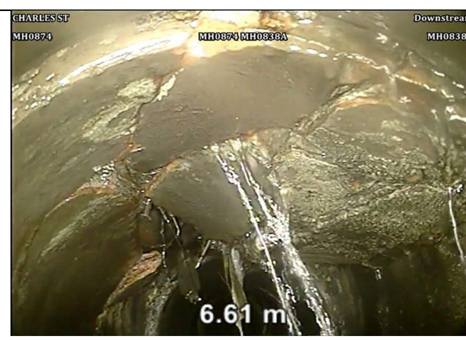
As shown in the State of the Infrastructure, the Town's assets exist in a variety of condition states. This was linked to the LoS Framework, which showed how condition is a primary driver of service levels. Financial decisions about what asset conditions will be financed ultimately impacts LoS. To illustrate this impact, a collection of images has been collected depicting the differences in condition and LoS. See Table 75.

Images illustrating different condition levels of Town Assets

Table 75 - Condition and Level of Service

Condition & Level of Service	Sewers
Very Good	 Newly constructed storm sewer in very good condition.
Good	 In-use 300 mm storm pipe in good condition.

<table>
<tr><th>Condition & Level of Service</th><th>Sewers</th></tr>
<tr><td>Fair</td><td>
Storm sewer with longitudinal crack at 12 o'clock.</td></tr>
<tr><td>Poor</td><td>

Storm sewers with offset joints.</td></tr>
<tr><td>Very Poor</td><td>

Deformed rigid pipe (wastewater example).</td></tr>
</table>

LEGISLATIVE REQUIREMENTS

Legislative requirements are one way to define minimum levels of service requirements, as describe by the Concepts and Frameworks section.

Upcoming Legislative Requirements

The regulatory framework is changing for stormwater by the Ontario Ministry of Environment in a new system called the Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA). After preliminary consultations with Ontario municipalities and pilot programs in Barrie, Region of Halton, Region of Peel, and City of Sudbury, the Town was formally notified in August 2021. The Town is required to submit an application by March 2022. Once approved, the CLI-ECA will impact the Town's Level of Service.

An ECA is required under Section 53 of the Ontario Water Resources Act (OWRA) to "use, operate, establish, alter, extend or replace new or existing sewage works". A municipality may be using or operating existing infrastructure, such as works constructed prior to approval requirements, which does not have an ECA in contravention of s.53(1) of the OWRA. A CLI-ECA is intended to address these gaps, while also providing streamlined processes for future system modification with less administrative effort.

Application Requirements

The application for a CLI-ECA is a significant level of effort for the Town, and will include providing the following to the Province by March 2022:

- List all existing ECAs.
- Status of Asset Management Plan.
- Map of system including and outfalls and outfall catchment areas.
- Description of system.
- Detailed breakdowns of the linear asset inventory.
- Description of all ponds, oil grit separators, low impact developments, and their treatment levels.
- Status of stormwater master plan and watershed plans.

Levels of Service Impacts

Once the CLI-ECA is approved and in effect, the new framework could contain requirements that may change the Town's current Level of Service. The total extent of the requirements are unknown and will be negotiated with the Ministry after the Ministry responds to the Town's application.

Current Legislative Requirements

The Town currently operates within several regulatory requirements. As the regulatory environment changes, the minimum Level of Service the Town provides may also change. Current regulatory requirements are as follows (Table 76):

Table 76 - Current Legislative Requirements

<table>
<tr><th>Legislation</th><th>Overview</th><th>Impact to Asset Management</th></tr>
<tr><td>Environmental Protection Act</td><td rowspan="2">*Changing in 2022 under the new CLI-ECA system described above*</td><td rowspan="2">• Administrative activities related to managing ECAs.
• Minimum requirements for inspections and record keeping.
• Requirements for vegetation, sediment, and debris removal.
• Corrective actions required for safety risks.
• Potential for effluent quality monitoring.
• Coordination with developers constructing ponds.</td></tr>
<tr><td>Section 53 of the Water Resources Act</td></tr>
<tr><td>Lake Simcoe Protection Act and Plan</td><td>The Act and Plan aim to restore the health of aquatic life within the Lake Simcoe watershed, improve water quality (included phosphorous loading), rehabilitate shoreline and natural heritage, and address impacts of climate change. Chapters 4 and 5 of the plan provide guidelines relevant to the Town's stormwater ponds. Stormwater runoff from urban areas within the watershed is identified as a major cause of phosphorous loading in the lake's tributaries.</td><td>• Prepare and implement a comprehensive stormwater management master plan.
• Incorporate into their official plans policies related to reducing stormwater runoff volume and pollutant loadings from major development and existing settlement areas.
• An application for major development shall be accompanied by a stormwater management plan consistent with master planning, subwatershed evaluations, an integrated "treatment train" approach, and evaluation of anticipated changes in water balance and phosphorous loading.
• New major developments are required to meet the "Enhanced" level of protection specified by the MOECC's Stormwater Management Planning and Design Manual.
• Every owner and operator of a new stormwater management works will be required to inspect and maintain the works.
• If the design capacity of an outlet is greater than 10,000 L per day, the owner is required to monitor the quality of the effluent from the works on a periodic basis.</td></tr>
</table>

Lifecycle Activities - Results

This section outlines the current business practices employed by the Town to manage assets throughout their lifecycle. At this early stage of implementing and improving asset management practices, the Town has not undertaken any studies to review current practices for lifecycle management or researched alternative options for service delivery. Where appropriate these have been identified as improvement tasks. The Town also wishes to quantify each activity to help determine tradeoffs and opportunities for levels of service adjustments, which will be completed as AM capabilities advance.

The Town's lifecycle activities and improvement opportunities for Stormwater are summarized in Table 77 - Table 84.

Table 77 - Stormwater Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new stormwater sewers.	Development Engineering	Recommendations captured by "Know Your Assets" chapter.
Operations, Maintenance, and Inspections	Super Pipe Inspection, Cleaning, and Sluice Gate Operations	Water (PWS) Technical support from Engineering	Initial inspections complete. Formalize a maintenance plan with a multi year outlook.
	Pre/post check big storms for back-ups, debris, etc.	Roads (PWS)	
	Street sweeping to prevent debris buildup		
	CCTV storm sewer inspections	Unassigned	Recommendations captured by "Know Your Assets" chapter.
	Debris removal & flushing	Water (PWS)	
	Spill response	Public Works (All)	Define roles & responsibilities. Formalize existing practices.
Renewal and Rehabilitation	Sewer structural lining	Unassigned	Create governance model. Define roles & responsibilities. Use CCTV data once collected to inform a multi year repair strategy and budget.
	Patching and point repairs		
	Open trench rehabilitation		
Replacement	End of life replacement	Engineering	

Table 78 - Stormwater Maintenance Hole Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new stormwater manholes.	Development Engineering	
Operations, Maintenance, and Inspections	Ad-hoc operational inspections	Water (PWS)	
	Formal inspection program		Recommendations captured by “Know Your Assets” chapter.
	Rebuild adjustment units		
	Repair benching and parging around pipes as required		
Renewal and Rehabilitation	Replacement of manhole cover/lid		
Replacement	End of life replacement	Engineering (Capital)	

Table 79 - Stormwater Catchbasin Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new stormwater catchbasins.	Development Engineering	
Operations, Maintenance, and Inspections	Inspections	Roads (PWS)	
	Vacuuming		Backlog successfully eliminated and successful transition to salt rocks. Develop multi-year plan for catchbasin vacuuming based on new operating conditions, adjust budget.
	Leaf clearing and debris removal		
	Thawing		
	Reactive maintenance and storm response		
Renewal and Rehabilitation	Repairs and adjustments		
	Sealing connections		
	Replace grates		
Replacement	End of life replacement	Engineering	

Table 80 - Stormwater Inlets and Outfalls Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new inlets and outfalls.	Development Engineering	
Operations, Maintenance, and Inspections	Remove debris accumulated at inlets and outfalls	Roads (PWS) – Assets at Creeks and Ponds Only Unassigned: Other inlets and outfalls.	Pilot the use of “socks” designed to catch debris before it enters the water.
	Pre/post storm checks		Expand the scope of inlets/outfalls from the current scope of ponds, creeks and known trouble spots, to all assets. Create governance model. Define roles & responsibilities. Develop multi-year plan and budget.
	Inlet/outfall Inspections		
	Vegetation management		
	Replace hinges		
	Creek debris and tree removal		
	Remove ice floods	Parks (PWS)	
Renewal and Rehabilitation	Grate repairs	Assets in Ponds – Engineering	
	Reinstate erosion protection	Assets at Creeks – Roads (with Eng. support)	
Replacement	End of life replacement	Engineering	

Table 81 - Stormwater Ponds Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new ponds	Development Engineering	
Operations, Maintenance, and Inspections	Full annual inspections	Engineering	
	Detailed inspections (contracted)		
	Bathymetric surveys		
	Environmental monitoring and data loggers		Use 2022 Stormwater Master Plan to inform cost options of environmental monitoring & protection. Use the CLI-ECA identified monitoring program to provide the plan.
	Clean & inspect pond inlets & outlets	Roads (PWS)	
	Pond reactive maintenance (obstructions, washouts, etc.)	Roads (PWS) Engineering if contracted support.	
	Pond easement maintenance (rough cuts and garbage)	Parks (PWS)	
	Boulevard mowing		
	Minor pond maintenance (Forestry)		
	Minor pond maintenance (without trees) – fence, slopes, etc.		
	Install and replace signs		Work with Corporate Services to review approach to signage to promote safety.
	Spring garbage clean up		

	Flood watch at ponds & Waterways		
	Install decorative fountains		
	Manage beaver activity, fire ants, and invasive plants.		
	Minor inlet/outlet and grate repairs.	Roads (PWS)	
Renewal and Rehabilitation	Repair hard assets (grates, dissipaters, agitators, stone work, etc.)	Engineering (Climate)	
	Level of service upgrades and pond retrofits		Monitor legislative requirements and financial impact. Use 2022 Stormwater Master Plan to inform AMP updates.
	Basin dredging to remove sediment.		Change the current practice of annual funding requests "per pond" to a program based budget based on AM plans.
Replacement	Replace hard assets or pond liner.		

Table 82 - Stormwater Low Impact Development Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Commission new LIDs	Development Engineering	Develop levels of service options and costs for implementation of LID and incorporate into the budget process.
	Install LIDs during capital projects.	Engineering	
Operations, Maintenance, and Inspections	Annual inspection	Engineering (Climate)	
	Vegetation management	Parks (PWS)	
	Sediment management	Roads (PWS)	
Renewal and Rehabilitation	-	-	
Replacement	Replace assets	Engineering	

Table 83 - Stormwater Oil Grit Separator Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new OGS	Development Engineering	
Operations, Maintenance, and Inspections	Visual inspections	Water (PWS)	Formalize inspection program and manage data. Continue progress made with InfoMax.
	Sediment removal and disposal	Water (PWS)	
Renewal and Rehabilitation	-	-	
Replacement	Replace oil grit separators	Engineering	

Table 84 - Stormwater Ditches and Culverts Asset Lifecycle Strategy

Lifecycle Phase	Lifecycle Activity	Responsible Party	Observations & Recommendations
Acquire and Commission	Construct new ditches and culverts	Development Engineering	
Operations, Maintenance, and Inspections	Visual inspections	Roads (PWS)	Recommendations captured in "Know Your Assets" chapter.
	Remove vegetation		
	Clear spillway		
	Reactive maintenance and washouts		
	Reactive culvert repairs		
	Manage invasive species		
Renewal and Rehabilitation	Mechanical ditch regrading		
Replacement	Culvert replacements		

Risk

Risk is a key asset management tool, and works on a spectrum of asset-level, service-level, and corporate-level spectrum of considerations. This is described in the Concepts and Frameworks section.

The Town currently does not have a formalized, holistic approach to risk management. However, some existing activities and components of service delivery include risk elements and there are multiple examples of using risk-based approaches to support decision-making. There is also a desire to continue with improved risk practices as part of asset management planning and work towards regulatory requirements for service level risk analysis. To meet this need, **a 3 Step Development Plan is recommended**.

The 3 Steps reflect the types of risks – corporate, service level, and asset level, and follows the international standard for risk management (ISO 31000) (Table 85):

Table 85 - 3 Step Development Plan for Risk Management Practices

Recommendation Phase	Improvement Measures
Step 1 – Near Term **Goal of this Phase:** Ensure existing risk components are consistent and broadly applied.	1.1 Review and update budget decision package form and process with risk and service-based considerations. COMPLETE 1.2 Establish a criticality rating methodology that is applicable across all asset classes and apply it to all core assets. COMPLETE 1.3 Assign roles and responsibilities, including accountability, for risk management in the Town – Establish Council and leadership's accountability for ensuring risk is considered and incorporated into all levels of decision-making processes within the Town over time.
Step 2 – Mid Term **Goal of this Phase:** Formalize a Risk Management Framework that is directly integrated within all relevant Town	2.1 Development of a risk management policy that is endorsed by Council, and a corresponding strategy for implementing the policy across the Town. 2.2 Develop a risk management framework to assess asset criticality, asset risk, service risks, and risks to achieving corporate (strategic) goals.

Recommendation Phase	Improvement Measures
processes. It is important that the framework is supported by senior leadership to ensure it adds value and effectively impacts decision-making.	2.3 Establish reporting processes to keep the Town's management teams and Council aware of critical risks, and their associated mitigation actions. 2.4 Develop service level risk registers for each area (roads, water, etc.) that can support a corporate risk register that may be monitored by senior leadership and used to support the management of service delivery.
Step 3 – Long Term **Goal of this Phase:** Leverage risk to be a core capability for the Town.	3.1 Establish a regular review process for identified risks as well as the Town's risk framework. 3.2 Employ risk as an optimization objective for funding allocation and other strategic decision-making. Once risk is strongly embedded within the Town's processes, the Town may wish to employ software and other useful tools to evaluate risk and funding allocations to minimize residual risk accepted by the Town.

Asset Level Risk
As progress towards completing Step 1 of the 3 Step Development Plan for risk management, asset level risk has been assessed for the Town's stormwater sewers using a risk framework. The results of this process are shown as follows (Table 86):

Table 86 - Stormwater Asset Level Risk Profile

Risk Inputs	Likelihood of Failure (LoF)	Consequence of Failure (CoF)
Stormwater Risk Factors Assessed	- Age	-Pipe Material -Pipe Diameter -Pipe Structure Type -Pipe Placement -Road Class -Stakeholder Impact -Land Use

Stormwater Sewer Risk Profile (Consequence X Likelihood of Failure) Profile

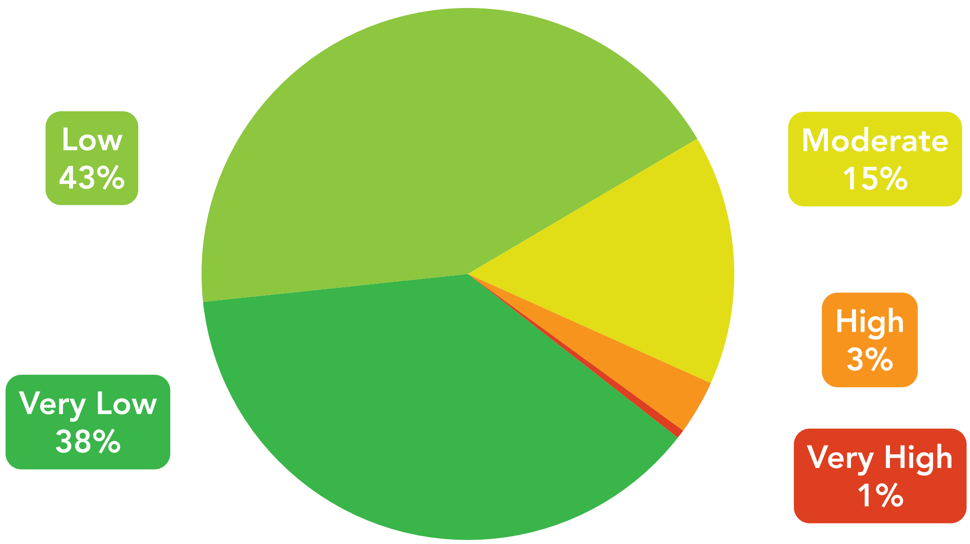


Figure 76 - Stormwater Sewer Risk Profile

RECOMMENDATIONS

- Formalize roles and responsibilities for flood response.
- Develop a method for tracking flood events

FUTURE READY

What was once a small but thriving Town, today Newmarket is a desirable and affordable community. While the future is bright, trends like increasing service expectations, urbanization, and climate change are challenging the status quo. The future will change how the Town manages assets. Key takeaways will include:

- Impacts of growth on assets and budgets.
- Vulnerabilities and adaption and mitigation approaches to climate change.
- Aligning master plans with the management of existing assets

GROWTH IMPACTS

Identified Growth Impacts on Stormwater Assets

1. Urban expansion: 16.9 km of new stormwater main, 261 catchbasins, 158 maintenance holes, 2 oil-grit separators, and 5 ponds will be added to Newmarket over the next four years due to the assumption of Sundial, National Homes, Glenway, and Forest Green subdivisions into the Town's portfolio. There is an additional large area in the South West (Shining Hill) that is expected to be developed just outside of the timeframe of the AMP, but the timing could be brought forward.

2. Urban intensification: No stormwater mains are to be upgraded to increase capacity over the AMP timeframe – however, there is planned intensification on Main Street and the urban secondary plan area, generally located along the Davis Drive corridor between Upper Canada Mall and Huron Heights Drive and along the Yonge Street corridor between the Town's northerly boundary and Savage Road. Although the quantity and nature of assets required for these fully built-out plans has been estimated, full build-out is not expected within the AMP timeframe. However, a staged approach may be required for asset upgrades. If so, these changes should be incorporated into the AMP.

3. Changing standards: No changes to the stormwater network have been identified as a result of changing design standards or regulations. However, potential changes due to technology and resource philosophies have been identified in Table 88.

4. Climate change: No specific changes to the stormwater asset portfolio to mitigate against the effects of climate change have been identified yet; however, a high-level flood resilience assessment of Town-owned infrastructure has been undertaken for stormwater ponds. The next phase of the study will assess the risks based on existing mitigation measures, then identify assets for upgrade or development based on flood vulnerability. Once the study is complete and identifies asset improvements, this AMP should incorporate those new assets.

Table 87 summarizes these asset increases by length of stormwater main and associated assets added each year. As shown in Table 87 the stormwater assets planned over the AMP timeframe are almost all entirely due to urban expansion (new assets). However, for asset management purposes it is important to note that there is a substantial gap in identified growth assets due to step changes in urban intensification, as well as gaps in identifying growth assets required for changing technology, climate, and resources – and associated changes in standards.

Table 87 - Stormwater Asset Increase to 2032 and Beyond

STORMWATER		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	2032+
New Assets	Stormwater Sewers (km)	1.4	1.7	13.8							0.8	17.7	
	Ditches (km)			0.02								0.02	
	Catchbasins (count)	68	75	118							30	291	
	Manholes (count)	46	47	65							18	176	
	Oil-Grit Separators (OGS, count)	1		1								2	
	Low-Impact Developments (LID, count)				4	1						5	
	Ponds (count)	2		3	1	1					1	8	1
	Berms											0	1

The level of effort and required resources to maintain growth assets has been quantified based on the total number of assets and the per-unit cost of maintenance. See Figure 77.

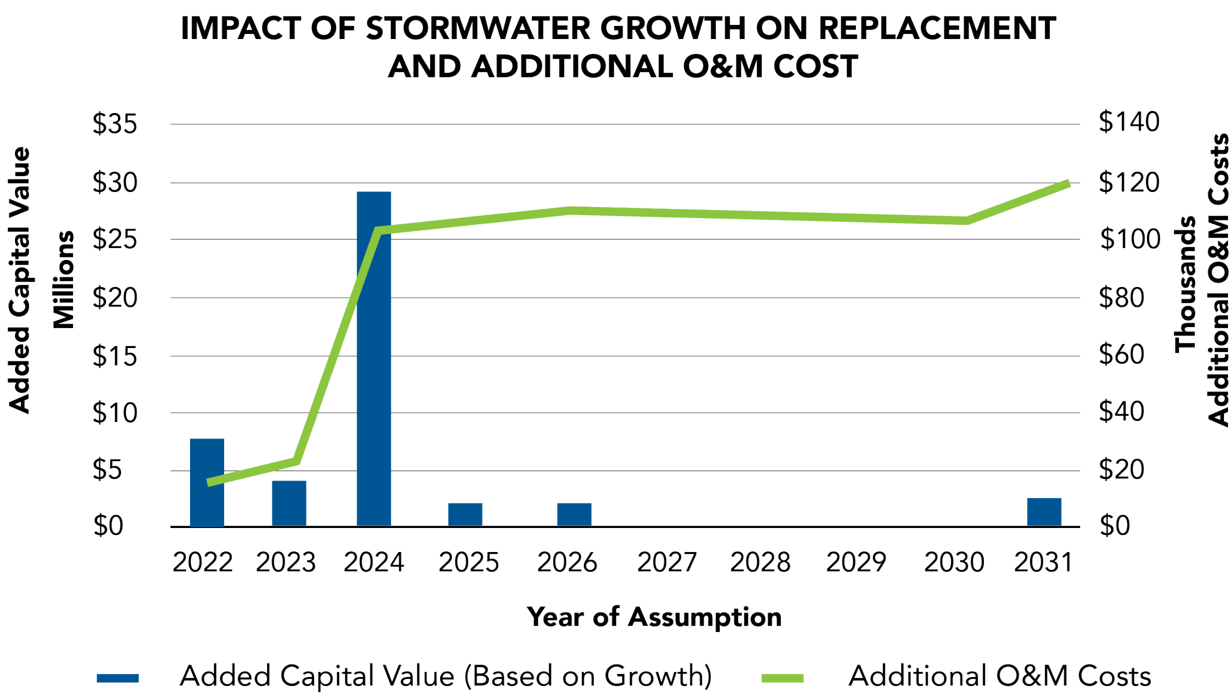


Figure 77 - Impact of Stormwater Growth on Replacement and Additional O&M Cost

Historical Context of Growth

Since 2016, the length of stormwater mains assumed by the Town had varied between 3 and 11km per year (see Figure 78). In contrast, in 2024, the quantum of assumed assets may be 14km, or about 30% higher than in 2020 when the greatest number of assets have been assumed in recent years. Some of these 14km may be assumed earlier, which would ease the burden on the operations team working the new assets into their plans.

The quantum of stormwater mains to be assumed beyond 2032 is unknown. However, the timing of the assumption of any new assets should be reviewed in the next three years to provide greater clarity for necessary resourcing.

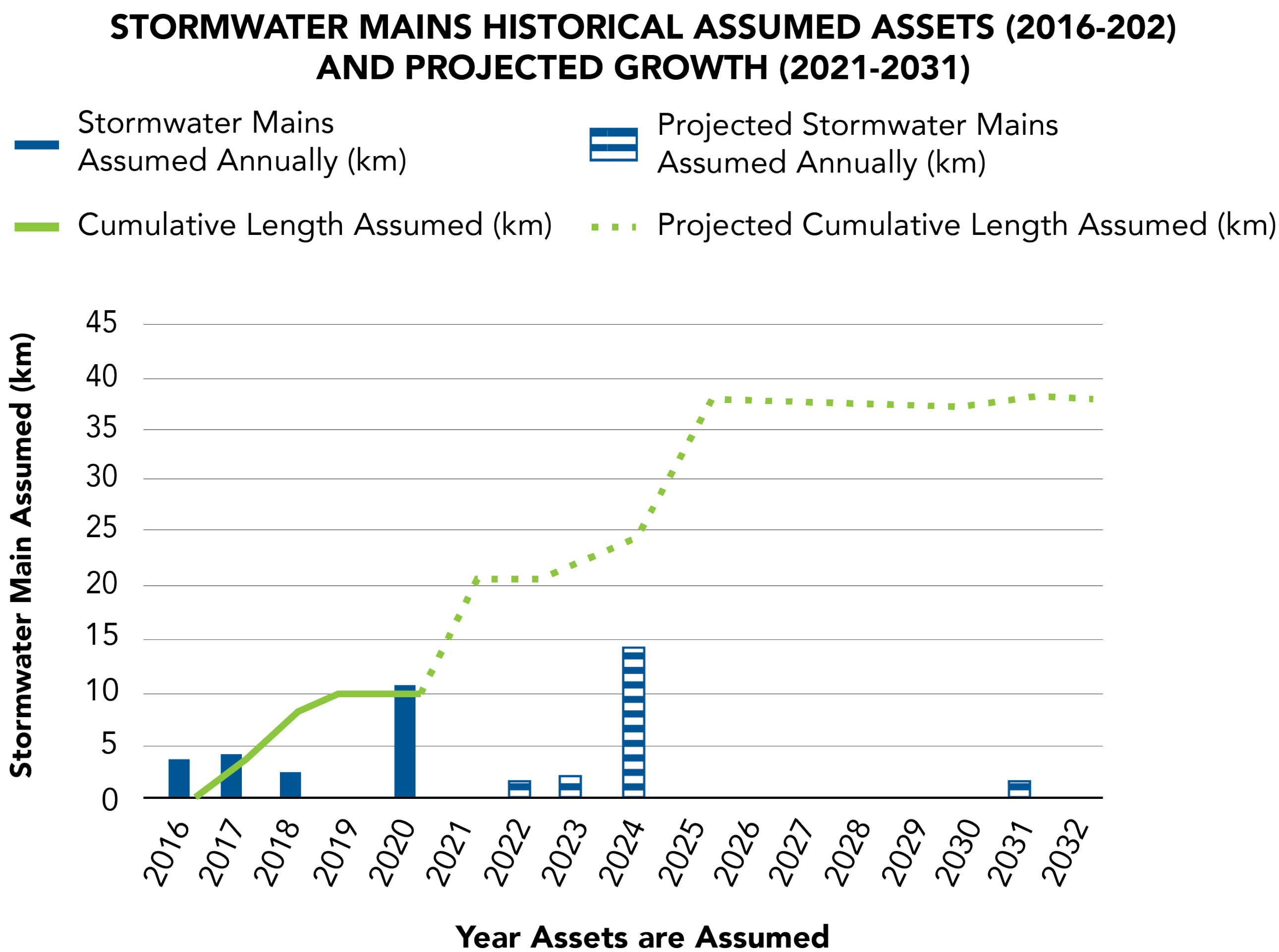


Figure 78 - Stormwater Historical Assumed Assets and Projected Growth to 2032

Results of the Flood Risk Assessment

Stormwater ponds were assessed based on Hazard and Vulnerability as no Capacity-related information was available at the time of this study. No asset received a very high Hazard-Vulnerability Rating. Meanwhile, 16 assets received a high Hazard-Vulnerability Rating, 21 assets received a medium Hazard-Vulnerability Rating, and 30 assets received a low Rating (see Figure 79). This means that almost half (or 45%) of stormwater received a low Hazard-Vulnerability Rating. Results of the climate change flood resilience assessment for stormwater are as follows:

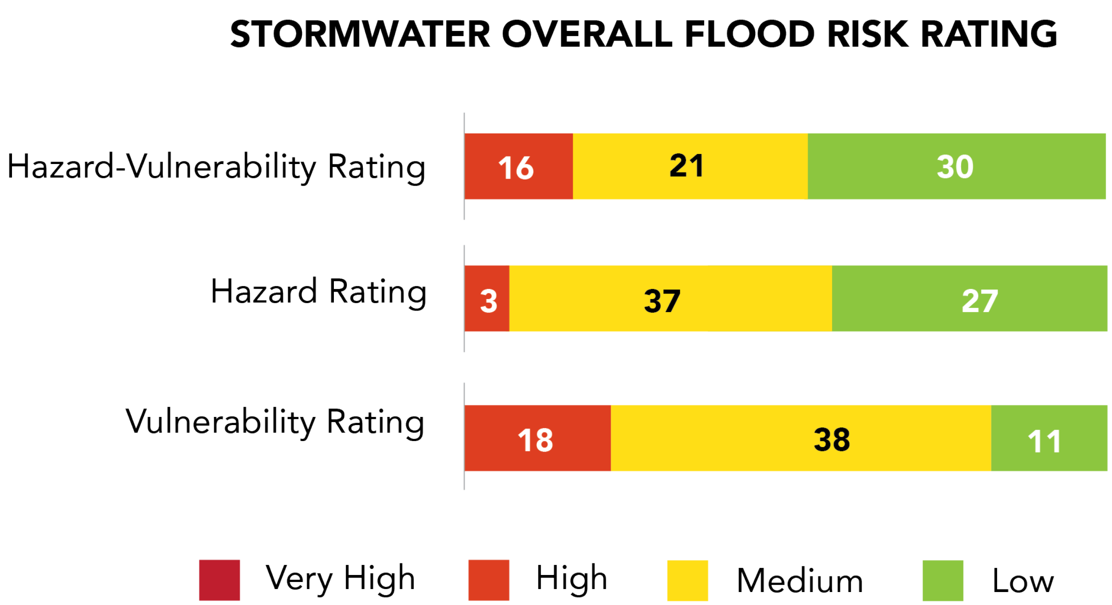


Figure 79 - Stormwater Overall Flood Risk Rating

FUTURE TREND AND ASSET IMPACTS

Table 88 - Implications of Future Trends on Stormwater

Trend category	Trend	Implications for the management of our assets to maintain our levels of service	Growth	In existing plans?
Society	Urban intensification	Upgrade capacity of existing assets to accommodate more users in existing areas	√	√
	Urban expansion	Install additional assets to accommodate new users in new areas	√	√
Technology	Increasing ability to meet stricter environmental standards	Need to upgrade assets to better monitor and control flows, water quality and aspects of asset performance.	√	
Resources	Zero carbon legislation / standards / policies	Maintain more frequently or more rigorously. Upon replacement, use materials and construction, operations and maintenance practices that have lower carbon implications. May require different maintenance regime and new skills.		
	Reduced waste production	Maintain more frequently or more rigorously. Upon replacement, use lower-waste materials. May require different maintenance regime and new skills. For example, the new re-use of excess soil regulations in Ontario.		
	New materials	New materials may become available that change the asset lifecycle and how it is managed.		
Climate	Hotter weather	Prolonged high temperatures affecting stormwater management infrastructure by causing increased rate of deterioration Or, warmer winters that increase the frequency of melt events.	√	
	Higher rainfall intensity (handle higher rainfall events)	Upgrade assets for greater protection. May require different maintenance regime and new skills.	√	

RECOMMENDATIONS

- Add climate change considerations to the stormwater masterplan by developing a Town-wide stormwater hydraulic model or conducting studies of vulnerable areas.

FINANCIAL STRATEGY

The Town has made an important investment in infrastructure, and attention must now be paid to securing this investment. The sustainability of Town infrastructure depends on effective management and ensuring the optimal use of limited funds. Sustainability will require adjusting revenue and services. In this section:

- Current financial position and level of service trends.
- Scenarios for managing levels of service, risk, and funding gaps.

The approach to financial planning for core assets is summarized in Concepts and Frameworks section and the corporate overview for the results of this process are provided in the Financial Strategy section. This section only provides details pertinent to the service area under consideration.

Estimated Future Budgets Based on Current Position and Plans

Using the financial background and current financial position, the Town's current budget was forecasted to support long term financial planning. These values were used for an assessment of the balance between budget and future renewal costs, and will be subject to internal processes and the annual budget process each year as approved by Council.

Table 89 - Estimated Future Budgets based on Current Position and Plans

Year	Stormwater
2021	$436,923
2022	$480,615
2023	$528,677
2024	$581,545
2025	$639,699
2026	$703,669
2027	$731,816
2028	$761,088
2029	$791,532
2030	$823,193

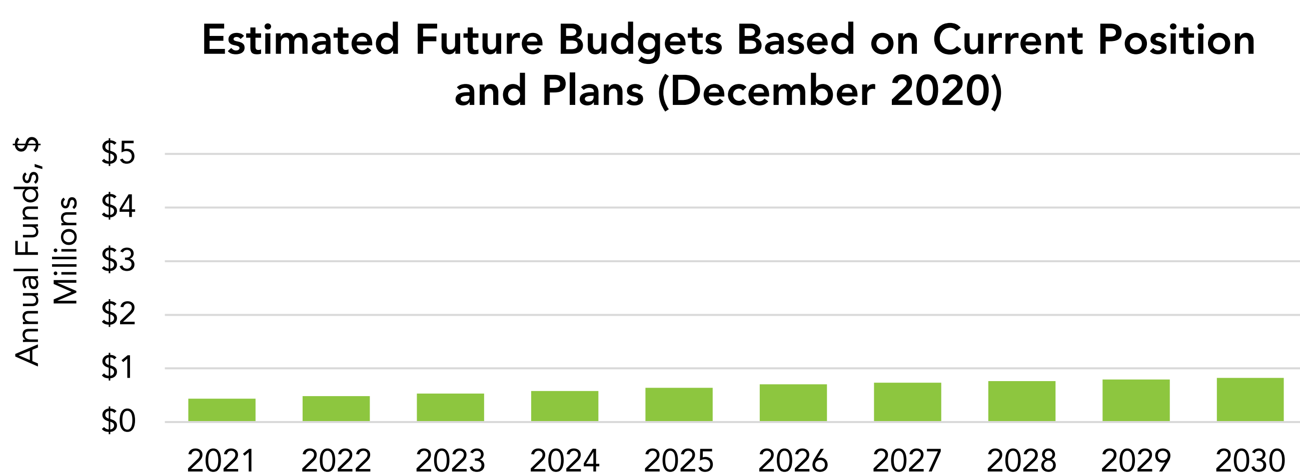


Figure 80 - Estimated Future Budgets Based on Current Position and Plans (December 2020)

SCENARIO FORECAST

Stormwater Scenario Methodology

To model the investment need, consolidation of inventory, replacement cost, condition, levels of service, risk, and lifecycle activities as shown throughout the AMP was completed. The three scenarios detailed in the corporate Financial Strategy were executed, along with the following minimum constraints:

Table 90 - Modelling Minimum Constraints

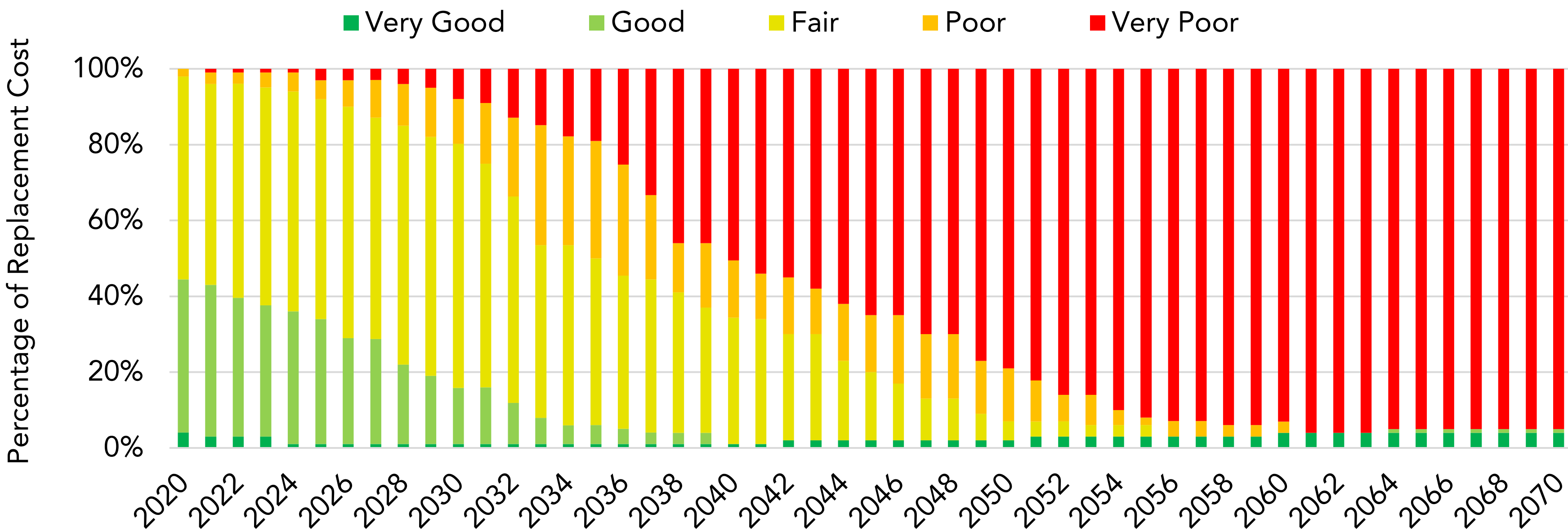
Asset	Service Level Target
Storm Sewers	No Large or Very Large pipes can be permitted to deteriorate to a Very Poor Condition No more than 5% of the network can be in Very Poor Condition
Ponds	No ponds can be in Very Poor condition.
Catchbasins, Maintenance Holes, Culverts, Inlets/Outlets, OGS, LID, Service Connections	No more than 5% of the network can be in Very Poor Condition

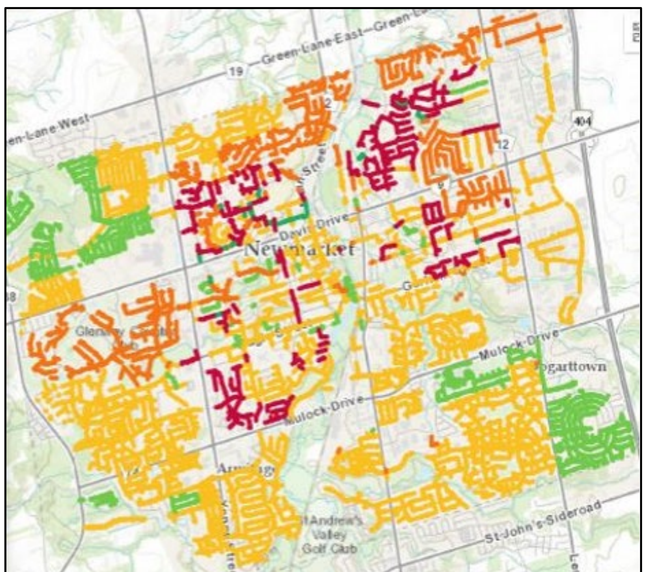
These constraints are minimums before scenario parameters are applied, in order to capture current Town approach to maintaining a minimum state of good repair.

Stormwater Scenario Results

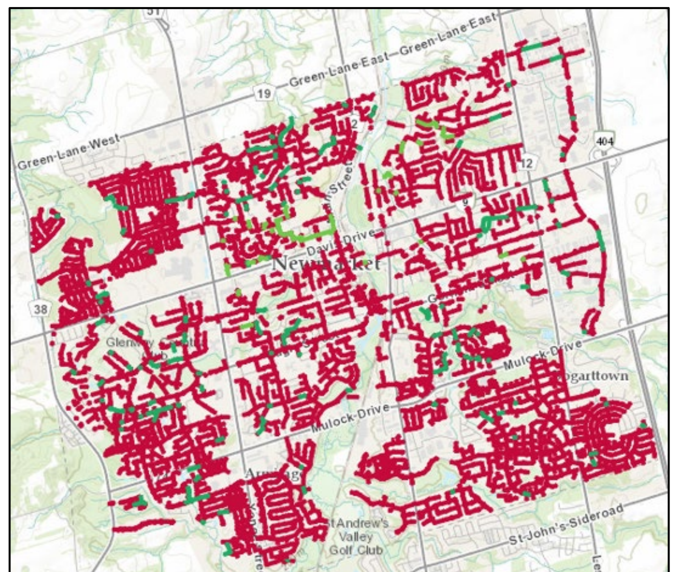
The following figures illustrate how condition of stormwater assets are forecast to change over time under all three investment scenarios.

STORMWATER - CURRENT BUDGET SCENARIO



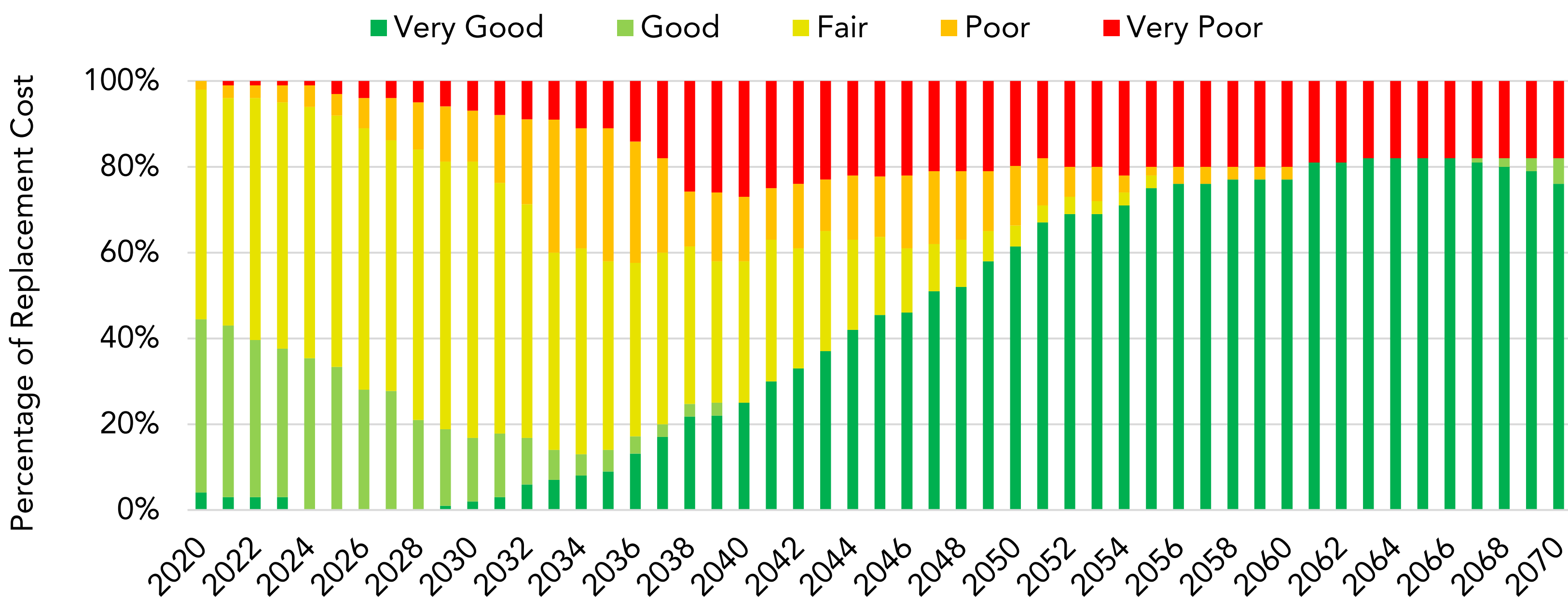


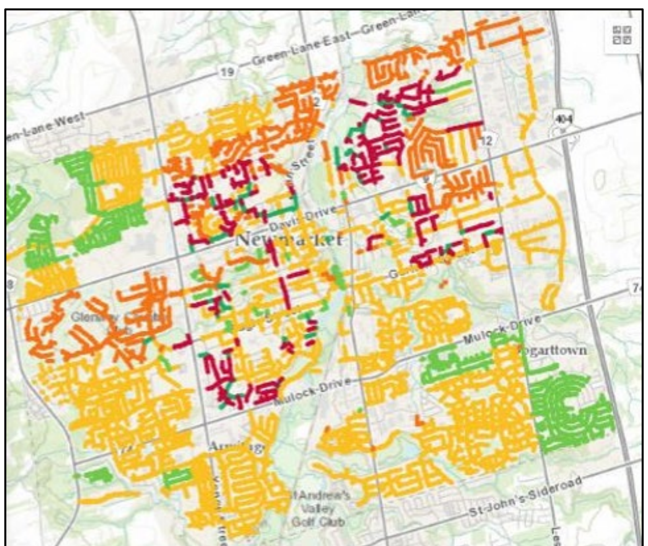
10 Year Forecast under Current Budget Scenario



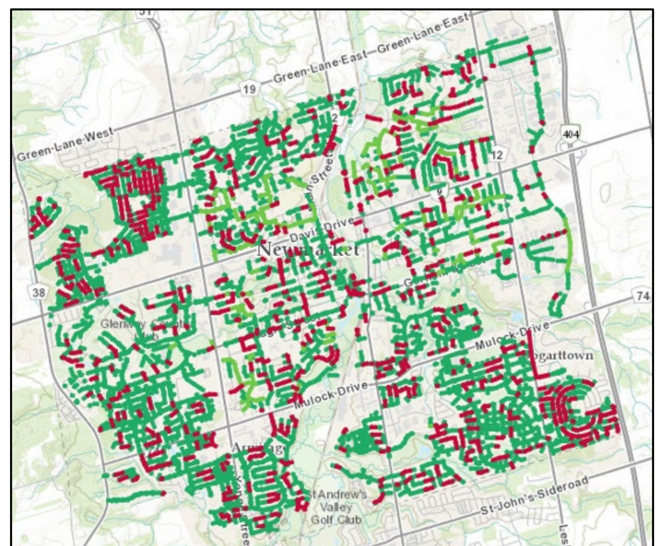
50 Year Forecast under Current Budget Scenario

STORMWATER - CONSTRAINED BUDGET SCENARIO



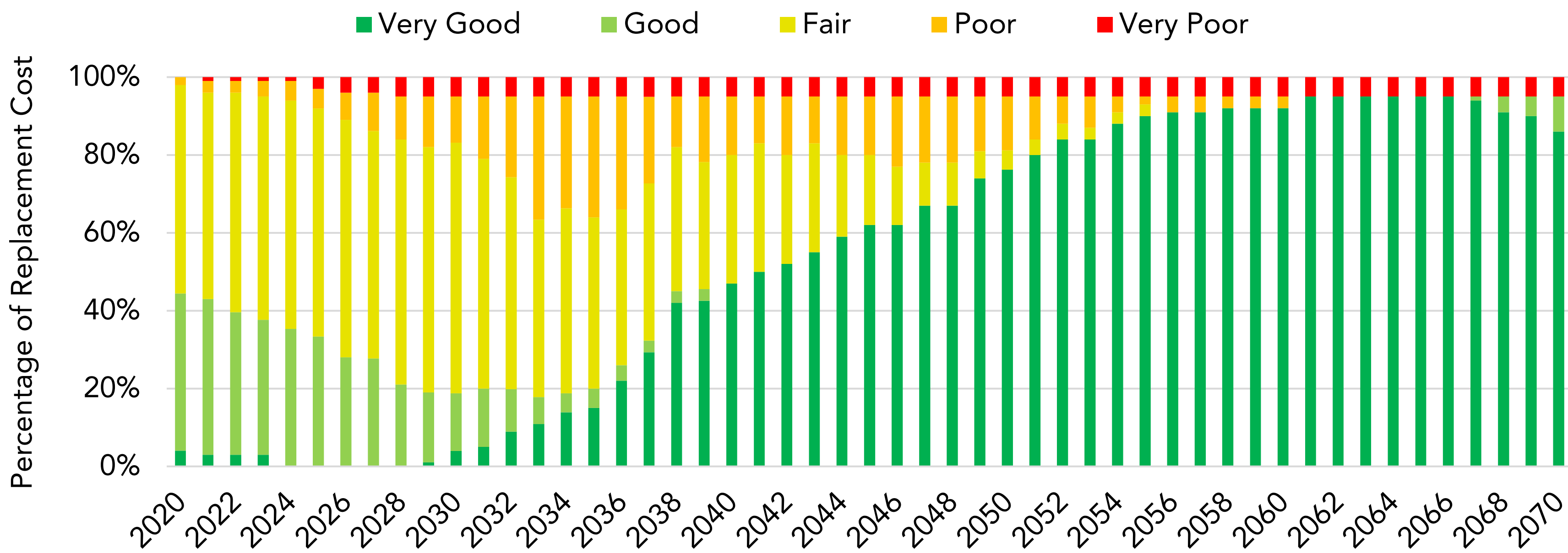


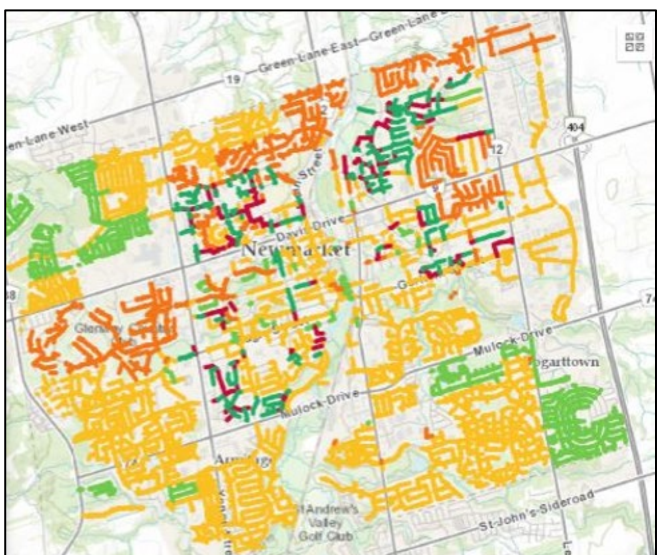
10 Year Forecast under Constrained Budget Scenario



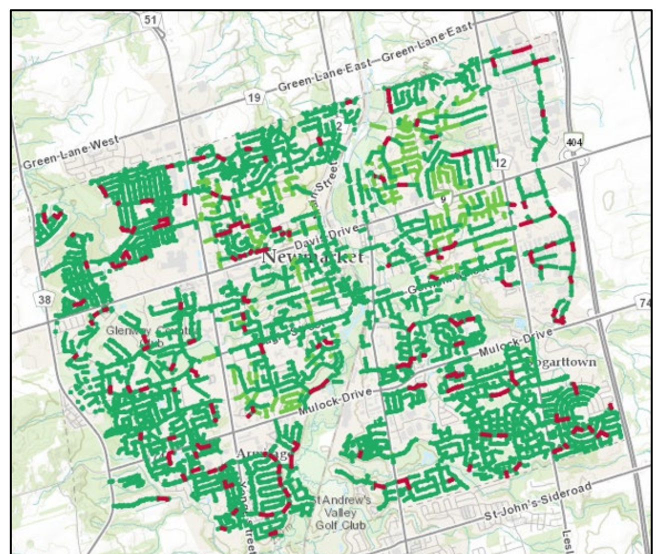
50 Year Forecast under Constrained Budget Scenario

STORMWATER – SERVICE LEVEL DRIVEN BUDGET SCENARIO





10 Year Forecast under Service Level Driven Budget Scenario



50 Year Forecast under Service Level Driven Budget Scenario

Several observations are important to note about the forecast:

- If investment continues at current levels, service levels will not be achieved, and the network will be in much poorer condition than it is currently.
- Under the service driven budget scenario, service level targets are achieved in every year of the analysis period.
- Under the constrained investment scenario, overall condition over the long term improves substantially, and delivers a similar condition outcome to the service driven budget over the long term, though a higher level of assets in very poor condition.
- Despite straying from service level targets for a period of time, the mixture of interventions under the constrained scenario allows for an overall network that is a predominantly very good condition particularly after 2055.

It is for these reasons that the constrained investment scenario was selected for future planning for this asset class. The significance of the constrained investment scenario for the Town's core assets is explained in the Executive Summary and the Financial Strategy section.

Long Term Trend and 10 Year Budget

The following Figure 81 summarizes the investment forecast for stormwater under the constrained scenario.

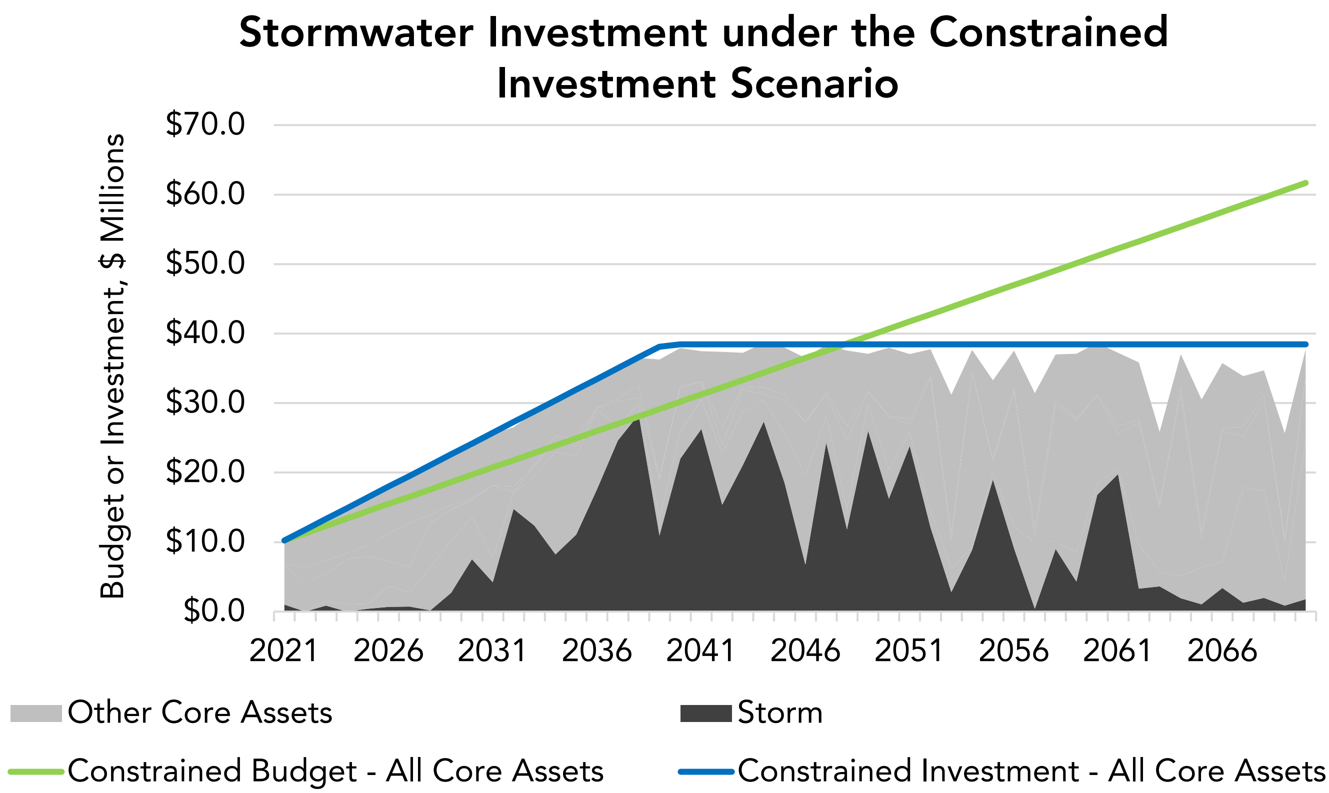


Figure 81 - Stormwater Investment under the Constrained Investment Scenario

The annual average investment over the next 50 years is $7.2M for the stormwater portfolio (in 2021 dollars). This is substantially higher than current levels of investment. Table 91 summarizes the proposed investment in stormwater assets over the next 10 years based on the constrained scenario as well as the Town of Newmarket's current 10-year capital budget for this asset class. Table 92 summarizes the intervention types that make up the constrained investment in this asset class.

Table 91 - Proposed investment and a comparison to the Town's existing budget for Stormwater

Year	Constrained Scenario Proposed Investment	Town's Current Reserve Contribution*	Difference
2021	$0.99 M	$0.44 M	$0.55 M
2022	$0.00 M	$0.48 M	-$0.48 M
2023	$0.87 M	$0.53 M	$0.35 M
2024	$0.00 M	$0.58 M	-$0.58 M
2025	$0.41 M	$0.64 M	-$0.23 M
2026	$0.68 M	$0.70 M	-$0.02 M
2027	$0.75 M	$0.73 M	$0.02 M
2028	$0.18 M	$0.76 M	-$0.59 M
2029	$2.69 M	$0.79 M	$1.90 M
2030	$7.55 M	$0.82 M	$6.73 M
Total	**$14.12 M**	**$6.47 M**	**$7.65 M**

*Prior to the forthcoming 10 Year Stormwater Financial Plan updates as detailed within the Current Financial Plans section.

Table 92 - Proposed interventions that make up the recommended investment for Stormwater

Road Treatments	Storm Sewer Rehabilitation and Replacement	Pond Rehabilitation - Dredging	Replace Maintenance Holes	Replace catchbasins, inlets/outlets, LID, OGS, etc.	Total
2021	$0	$987,000	$0	*Expenditures forecasted outside the 10-year horizon.*	**$987,000**
2022	$0	$0	$0		**$0,000**
2023	$0	$874,000	$0		**$874,000**
2024	$0	$0	$0		**$0,000**
2025	$0	$412,000	$0		**$412,000**
2026	$346,000	$339,000	$0,000		**$684,000**
2027	$0,000	$748,000	$0,000		**$748,000**
2028	$0	$176,000	$0		**$176,000**
2029	$2,485,000	$0	$202,000		**$2,688,000**
2030	$7,491,000	$0	$62,000		**$7,553,000**

Forecasted Outcomes

The constrained scenario was established to strike a balance between the long-term investment requirements to achieve service level targets, the pace of increasing the Town's capacity for program delivery, as well as the ability to fund the required program through increased taxes, rates and infrastructure reserves. Under current investment levels, the risk of failing to meet service level targets will increase substantially over the next 50 years, when service levels are forecast to not be achieved. Several points are worth noting about the recommended constrained investment scenario:

- The constrained budget scenario is forecasted to have periods when a portion of the stormwater network is in very poor condition that exceeds service levels (Rising by 2038 and leveling off thereafter at ~20%, see Figure 82 below)
- The elevated levels of very poor condition forecasted in this scenario can be considered a period of higher risk of not achieving target service levels between 2038 to 2070.
- This translates to a higher risk of stormwater service failures or unavailability. Practically, this means a greater frequency of flooding, washouts, and groundwater entrainment.

Service outcomes are always an equilibrium between investment, service level targets and risk of service delivery. If the forecasted outcomes are considered unacceptable, increased investment, or changes in service level targets are ways to impact service risk.

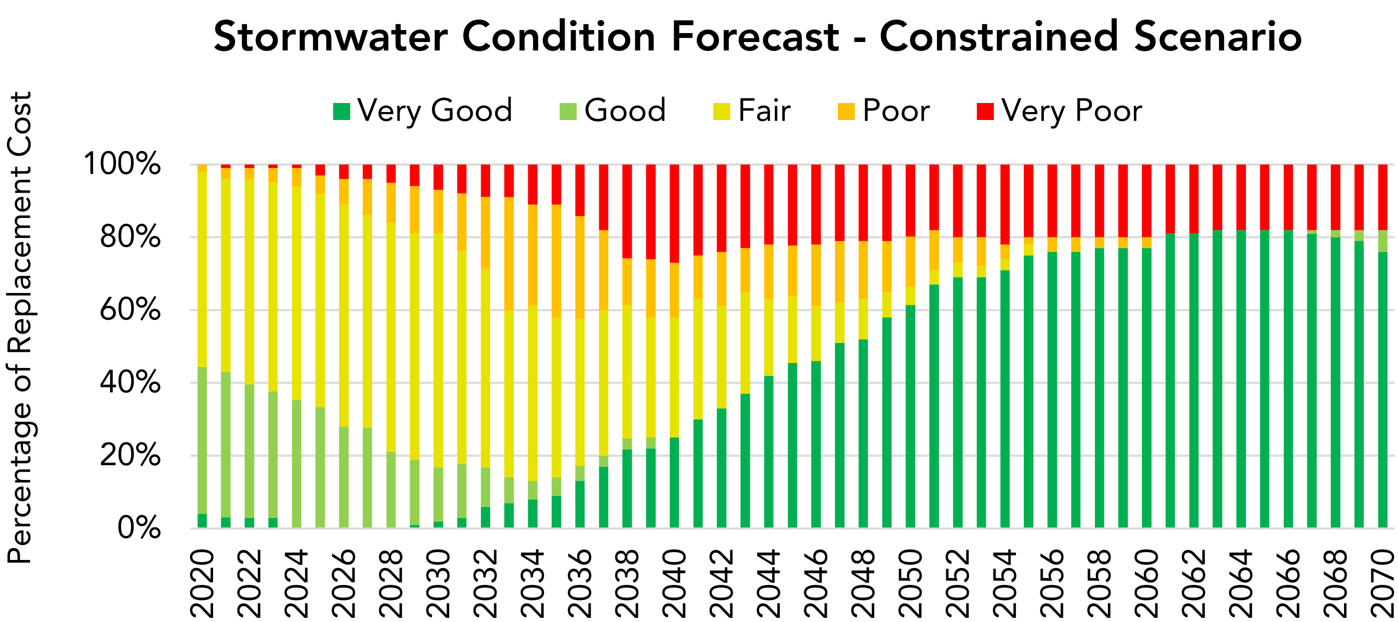


Figure 82 - Higher risk of not meeting service level targets – Stormwater with Constrained Budget Scenario

Newmarket

APPENDICES

A1. LIFECYCLE MANAGEMENT ACTIVITIES AND RISKS

Activities	Generic Asset Management Practices or Planned Actions	Generic Risks Associated with Asset Management Practices or Planned Actions
Non-Infrastructure Solutions *Actions or policies that can lower costs or extend useful lives*	• Development controls and approvals. • Financial and Planning strategies to control costs. • Developing computerized maintenance management system. • Updating and applying design standards. • Ongoing search for additional funding. • Operational improvements. • Improvements to employee capabilities, communications, training, etc. • Public involvement practices including awareness training, posters and website. • Changes to Levels of Service (LOS). • Developing Corporate Asset Management program.	• Lack of a realization of the benefit from the activity (i.e. the life is not extended or the cost of managing an asset increases rather than decreases). • Lowers the costs of existing operations and may provide additional capacity but does not extend the service life of assets. • Plans/Reports/Recommendations. • Asset management plans or proposed network solutions not followed. • Inadequate Funding. • Poor Quality asset information. • Planning Assumptions incorrect. • Regulatory requirements, standards, criteria change or do not exist. • Economic fluctuations, inflation, downturns, revenue and use reduces/increases. • Occurrence of Climate Change/Adverse Weather/Unforeseen events and emergencies, resulting in funds being diverted to assets that were not originally planned. • Growth projections not as planned. • Service Provision Changes.

Activities	Generic Asset Management Practices or Planned Actions	Generic Risks Associated with Asset Management Practices or Planned Actions
Maintenance Activities *Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events.*	• Maintenance also triggered by the public 'inspection' through phone and web interface available for public reports/complaints. • Scheduled preventative maintenance programs for the majority of assets. • Scheduled inspection programs for key assets.	• Completing planned maintenance activities while managing the need to execute reactive maintenance activities. • Incorrectly planned maintenance activities can lead to premature asset failure. • Enough resources available to complete a series of unplanned, urgent work requests that are submitted in close succession. • Overscheduling preventative maintenance can lead to excessive maintenance and additional costs with no actual benefits.
Renewal/Rehab Activities *Activities associated with disposing of an asset once it has reached the end of its useful life or is otherwise no longer needed by the municipality.*	• Adopt the latest technology that maintains the current level of service.	• Incorrect assumptions regarding improved expected useful life after rehabilitation.
Replacement/Construction Activities *Activities that are expected to occur once an asset has reached the end of its useful life and renewal/rehab is no longer an option*	• Adopt the latest technology that maintains the current level of service.	• Cost over-runs during large, complex design and construction projects.

Activities	Generic Asset Management Practices or Planned Actions	Generic Risks Associated with Asset Management Practices or Planned Actions
Disposal Activities *Activities associated with disposing of an asset once it has reached the end of its useful life or is otherwise no longer needed by the municipality.*	• Dispose of assets under the applicable regulation and environmental standards.	• Disposal incorrectly performed or cost overruns resulting from increase disposal requirements compared to initial estimates.
Service Improvement Activities *Planned activities to improve an asset's capacity, quality, and system reliability.*	• Adopt the latest technology that enhances the current level of service.	• Service improvement is either not required or incorrectly assessed
Growth Activities *Planned activities required to extend services to previously unserved areas – or expand services to meet growth demands.*	• Undertake Environmental Assessments. Assumption of subdivisions, commercial and industrial extensions, local improvements, etc.	• Incorrect growth assessments may result in overabundance of assets. • Risk of insufficient funding to maintain new asset. • Incorrect asset size will cost more money and may cause operational challenges (too large asset), or may result in the need to prematurely expand the asset (too small asset).

A2. RECOMMENDATIONS

Recommendations for All Assets

ID	Source	Recommendation
1	Executive Summary	Establish data management practices for core assets such as data owners, formats, collection and reporting frequencies, and links between data and decision making.
2	Executive Summary	Develop a condition assessment framework that supports asset-owning departments in developing condition scales and data collection programs and practices for their assets.
3	Executive Summary	Define the need for and develop options for implementing an asset registry tool that can support reporting of the State of the Infrastructure, as well as other functions like Financial Information Return. Options could include software or in-house extract-and-load tools.
4	Executive Summary	Develop a governance model for AM at all levels of the organization, and clarify roles and responsibilities across the asset portfolios.
5	Executive Summary	Adopt the levels of service measures (KPIs) developed for core assets, and create processes to support their data collection, reporting, and use in decision making in preparation for 2025 O.Reg. 588/17 requirements.
6	Executive Summary	Develop Levels of Service targets for measures (KPIs) in the core asset management plans.
7	Executive Summary	Implement corporate risk management practices as suggested by the core asset management plans, (i.e. Corporate Risk Management Policy & Framework.)
8	Executive Summary	Build greater connections between the planning and asset management processes.
9	Executive Summary	Advance climate change adaption and resilience policies to guide staff and inform on decision-making.
10	Executive Summary	Develop funding strategies for proposed Levels of Service targets to meet O. Reg 588/17 2025 requirements.
11	Executive Summary	Look for continuous improvement opportunities to extend the life of assets and prevent early replacement through condition assessments and rehabilitation technologies.

ID	Source	Recommendation
12	Executive Summary	Develop a strategy to increase capital core asset delivery capacity to deliver on AM Plans.
13	Executive Summary	Create risk management plans for the upcoming periods where renewal needs will exceed capital reinvestment capacity (e.g. 2024 – 2039).
14	Executive Summary	Create a reserve management strategy to inform how funds or new revenues are allocated to different reserves with different financial positions and different
15	Executive Summary	Facilitate the defining and quantifying of human resource requirements for core asset lifecycle activities.
16	Concepts & Frameworks	Develop a corporate asset hierarchy to enable the development of asset data and systems.
17	Concepts & Frameworks	Formalize existing practices for tracking reinvestment rates and reserve contributions.
18	Concepts & Frameworks	Development a method for reconciling replacement costs, construction price inflation, and reinvestment rates.
19	Future Ready	Pilot the use of total lifecycle sustainability analysis of proposed developments or construction projects based on (1) the total lifecycle cost of the assets and Town services and (2) the tax revenue gained from proposed developments after development charges and assumption of the development.
20	Future Ready	Develop approximate quantities of assets in each future development at the soonest opportunity in the development process to begin budgeting, asset management planning before construction and handover take place.
21	Future Ready	Begin gathering asset quantity information about non-core assets like parks and facilities for historical growth (2016-2021) and future growth (2021-2031) to enable the non-core asset management plans.
22	Future Ready	Update data schemas and process for core and non-core assets to track the assumption status (assumed/un-assumed), the install date, and the assumption date.
23	Future Ready	Increase the Town's ability to monitor growth in demand for core assets through engineering tools and processes, in conjunction with current measurements of population, employment, etc.
24	Future Ready	Establish update cycles for master plans for core assets (e.g. every 5 years).

ID	Source	Recommendation
25	Future Ready	Investigate the use of in-house tools or consulting services for modeling future demand for core asset services.
26	Future Ready	Investigate any potential for growth and development in the years without very little projected assumption of assets (e.g. 2025-2030).
27	Future Ready	Update the budget process to consider assessment growth allocations based on the number of assets assumed by Public Works each year, using the approach developed for the 2022 budget.
28	Future Ready	Work to apply a climate change lens to the capital planning process for core assets.
29	Manage Service Delivery	Risk Phase 1: Review and update budget decision package form and process with risk and service-based considerations.
30	Manage Service Delivery	Risk Phase 1: Establish a criticality rating methodology that is applicable across all asset classes and apply it to all core assets
31	Manage Service Delivery	Risk Phase 1: Assign roles and responsibilities, including accountability, for risk management in the Town – Establish Council and leadership's accountability for ensuring risk is considered and incorporated into all levels of decision-making processes within the Town over time.
32	Manage Service Delivery	Risk Phase 2: Development of a risk management policy that is endorsed by Council, and a corresponding strategy for implementing the policy across the Town.
33	Manage Service Delivery	Risk Phase 2: Develop a risk management framework to assess asset criticality, asset risk, service risks, and risks to achieving corporate (strategic) goals.
34	Manage Service Delivery	Risk Phase 2: Establish reporting processes to keep the Town's management teams and Council aware of critical risks, and their associated mitigation actions.
35	Manage Service Delivery	Risk Phase 2: Develop service level risk registers for each area (roads, water, etc.) that can support a corporate risk register that may be monitored by senior leadership and used to support the management of service delivery.
36	Manage Service Delivery	Risk Phase 3: Establish a regular review process for identified risks as well as the Town's risk framework.

ID	Source	Recommendation
37	Manage Service Delivery	Risk Phase 3: Employ risk as an optimization objective for funding allocation and other strategic decision-making. Once risk is strongly embedded within the Town's processes, the Town may wish to employ software and other useful tools to evaluate risk and funding allocations to minimize residual risk accepted by the Town.

Recommendations for Roads

ID	Source	Recommendation
38	Know Your Assets	Centralize assembled roads datasets for inventory, pavement condition, age, maintenance history, and traffic in GIS with a relational data model and distribute to service area and support function users.
39	Know Your Assets	Address gaps in road data attributes such as missing road class, size measurements, roadside environment, etc.
40	Know Your Assets	Review historical design standards to classify roads based on characteristics pertinent to useful life of the assets, such as drainage/sub-drains.
41	Know Your Assets	Update record keeping methods to always use the Road Asset ID. Processes include: Traffic counts/studies, road cut permits, tangible capital assets, records of crack sealing and resurfacing, planning of new roads, etc.
42	Know Your Assets	Develop a common system of road classifications to be used corporately based on levels of service, design standards, regulatory requirements, and other considerations.
43	Know Your Assets	Create a data management plan for storing, reporting, and analyzing multiple years of pavement condition data.
44	Future Ready	Establish an approximate timeline for the Urban Centers secondary plan.
45	Manage Service Delivery	Develop a road paint inventory.
46	Manage Service Delivery	Implement the RevItUp recommendations related to allocation of resources for winter control. A review of 2017-2019 actual work order charges by AM found that approximately 25% of staff time for winter control is attributable to non-roads staff.

ID	Source	Recommendation
47	Manage Service Delivery	Review & update the process of road cut fees. Improve data management to track road cuts by road Asset ID.
48	Manage Service Delivery	Apply capital-planning lens to planning and coordination of crack sealing with other road interventions.
49	Manage Service Delivery	Budget for and conduct a micro-surfacing pilot program. Monitor and report on suitability for use in Newmarket.
50	Manage Service Delivery	Develop corridor management strategies to plan road interventions around underground assets.
51	Manage Service Delivery	Develop method for migrating traffic data from traffic software to the roads GIS data.
52	Future Ready	Develop quantities of pedestrian bridges that will be constructed during the implementation of the Active Transportation Plan as designs or concepts of the trails are advanced.

Recommendations for Bridges

ID	Source	Recommendation
53	Know Your Assets	Develop a GIS distribution method for the newly assembled OSIM database for use and analysis by Engineering.
54	Know Your Assets	Develop a data schematic template for OSIM inspections using the newly developed OSIM database.
55	Know Your Assets	Develop a data update plan using opportunistic data collection during OSIM to get missing data like bridge measurements.
56	Know Your Assets	Develop a formal inventory of the ancillary structures associated with bridges that are not strictly defined as OSIM assets. Examples include the drainage structures at Fairy Lake or the retaining walls lining waterways at George Richardson Park.
57	Know Your Assets	Work with GIS department to expand data for bridges that capture project constraints using front-end studies to improve risk management and financial planning. Examples include overlap with private utilities.
58	Know Your Assets	Develop processes for reviewing and analyzing multiple years of OSIM data within the newly assembled OSIM database (e.g. 2019 vs 2021 vs 2023 results).
59	Know Your Assets	Complete an operating budget request for additional bridge investigations.
60	Know Your Assets	Develop a multi-year plan for managing older bridges through monitoring and condition assessment.
61	Manage Service Delivery	Formalize and create a checklist for non-structural spring safety inspections.

ID	Source	Recommendation
62	Manage Service Delivery	Coordinate / limit winter salt application on pedestrian bridges with staff maintaining trails to limit the impacts of corrosion and deterioration on bridge assets.
63	Manage Service Delivery	Separate the asset replacement funds for bridges, roads, and sidewalks.
64	Manage Service Delivery	Facilitate the allocation of governance, roles and responsibilities, budget, and processes recommended by the Bridges Operations Maintenance and Minor Capital Plan currently being developed by the AM Office, staff, and the Town’s consultant.

Recommendations for Water

ID	Source	Recommendation
65	Know Your Assets	Complete asset inventory GIS layers for autoflushers and bulk water stations.
66	Know Your Assets	Review and update the sample stations layer in GIS for use as an asset inventory.
67	Know Your Assets	Conduct a desktop analysis of watermain conditions by material type cohort, with the goal of presenting options for replacing the watermains under different time horizons with corresponding budgets and service outcomes.
68	Manage Service Delivery	Watermain Rehabilitation - Cathodic Protections and Lining. Create governance model and project management plan. Define roles & responsibilities. See recommendations about rehabilitation targets in "Condition Assessment Plan". Develop criteria for intervening with watermain lining rather than removal/replacement as part of a corridor management strategy (with AM support).
69	Manage Service Delivery	Valve Maintenance Programs: Formalize inspection programs and record condition observations. Develop multi-year plan and resource plan for sustainable valve operations.
70	Manage Service Delivery	Hydrant inspections: Update contractor methodology to include a 5-point scale condition assessment. Establish a data management plan for annual hydrant inspections.
71	Manage Service Delivery	Building Application: Water Meters, Building Application: Include meter fees in building application to provide visibility to cost of meter and monthly fixed charges by meter size.

ID	Source	Recommendation
72	Manage Service Delivery	Water Meters, Subdivision Agreement: Include meter fees to provide visibility to cost of meter and monthly fixed charges by meter size.
73	Manage Service Delivery	Water Meters, Meter Purchase & Installation: • Observation: Builders currently purchase meters directly from the Town. This increases administrative burden and requires the Town to store inventory (and is accountable) for inventory purchased until picked up by the vendor. • Recommendation: builders purchase meters directly from approved vendor.
74	Manage Service Delivery	Water Meters, Meter Sealing & Occupancy: • Observation: Currently builder provides ~5 days notice to Town staff prior to Occupancy to seal meters. Occupancy cannot be delayed due to unsealed meter, and access becomes an issue after occupancy – sometimes resulting in high customer bills or credits. • Recommendation: Review meter seal & occupancy process for gaps and opportunities for improvement.
75	Manage Service Delivery	Water Meters, Meter Maintenance / Investigations • Review resourcing & budget requirements required for legacy & AMI meter maintenance activities. • Implement annual or semi-annual process to identify and repair meters that are being receiving estimated billing due to meter maintenance that were not addressed during standard meter maintenance appointments. (i.e. Wire run and/or repair due to cut/broken wire, customer refusal during initial appointments, missed appointments)
76	Manage Service Delivery	Water meters, Customer Appointments • Observation: Customers not charged for missed appointments • Recommendation: Implement process to charge customers for missed appointments

ID	Source	Recommendation
77	Manage Service Delivery	Water Meters, Replacements: Develop replacement strategy required for new meter & smartpoint inventory. Options: i) active replacement program starting at year X and replacing X meters/smartpoint per year ii) mass replace as meters/smartpoint reach expected end of life due to battery life.
78	Manage Service Delivery	Water Meters, Value-Add Services: • I.e. Leak, Continuous flow, reverse flow identification and customer notification. • Strategy & resourcing plan required for implementation of value-add services. (I.e. Condition identification & customer notification)
79	Manage Service Delivery	Meter Communication • Observation: Responsibility Monitoring & escalation of meter communication issues is currently outsourced to Olameter through a contract expiring in Q4 2021. • Recommendation: i) Review contract cost & accountabilities to determine if Town is getting value for cost to determine if contract should be extended or brought in-house. ii) align on AMI resourcing requirements and strategy for AMI meter communication & value add services.
80	Manage Service Delivery	Meter Maintenance: • Observation: Meter communication investigations are currently being performed by Wamco pending training of Town staff and implementation of internal processes. • Recommendation: Review resourcing & budget requirements review required for AMI meter maintenance activities.

Recommendations for Wastewater

ID	Source	Recommendation
81	Know Your Assets	Incorporate addressing data gaps into any CCTV data collection plans.
82	Know Your Assets	Incorporate data generated by the 2017 Wastewater Master Plan into GIS.
83	Know Your Assets	Establish a process and data management plan for flow monitoring including the use of data collected by York Region.
84	Know Your Assets	Complete a pump station asset inventory and wastewater asset condition assessment. Update GIS pump station inventory.
85	Know Your Assets	Review forcemains and siphons and establish need for condition assessments or maintenance programs (e.g. draw-down tests, pigging, sonar, etc.).
86	Know Your Assets	Establish roles and responsibilities for CCTV and a plan for achieving a system-wide inspection program.
87	Know Your Assets	Complete a building condition assessment of pump station building elements (e.g. structure, electrical, etc.).
88	Know Your Assets	Expand condition assessments of sewers to include maintenance holes using the MACP protocol.
89	Manage Service Delivery	Secure funding for SL-RAT in 2022 budget process. Adopt SL-RAT as a new in-house technology. Develop a multi-year plan for identifying flushing needs with SL-RAT.

ID	Source	Recommendation
90	Manage Service Delivery	Develop a data management plan for I&I linked to GIS and modelled off future processes developed for CCTV.
91	Manage Service Delivery	Structural lining, preventive patching and point repairs, reactive spot repairs: Create governance model. Define roles & responsibilities. Use CCTV data once collected to inform a multi-year repair strategy and budget.
92	Manage Service Delivery	Create and formalize a method of documenting sewer backups that aligns with Ontario Regulation 588/17 requirements.
93	Manage Service Delivery	PWS (Water) and Engineering: Develop an inventory of vulnerable sewer service connections constructed of “black” Orangeburg pipe via the CCTV program and use this information to develop replacement policies.

Recommendations for Stormwater

ID	Source	Recommendation
94	Know Your Assets	Incorporate addressing data gaps into any CCTV data collection plans.
95	Know Your Assets	Continue the significant ongoing data update as part of the stormwater CLI-ECA application. Expected benefits include new datasets for ditches, improved data for inlets, outfalls and ponds, and new data about stormwater catchments.
96	Know Your Assets	Develop an inventory of the assets inside ponds including fences, signs, retaining walls, baffles, valves, weirs, etc.
97	Know Your Assets	Clean up the non-structural culverts information shared by OSIM culverts and stormwater sewers and create a new GIS layer for this asset.
98	Know Your Assets	Complete an asset inventory of the assets located at creeks that are regularly inspected by PWS.
99	Know Your Assets	Create a data collection plan for headwall structures located at inlets and outfalls.
100	Know Your Assets	Assign responsibility for stormwater CCTV.
101	Know Your Assets	Implement recommended data collection and condition assessment processes for wastewater (see wastewater AMP) for stormwater.
102	Know Your Assets	Continue progress of building data management processes for pond inspections including sediment basin volumes and condition of assets within ponds.
103	Know Your Assets	Formalize data management of assets inside ponds. Current progress includes the development of an SOP and GIS data collection form.

ID	Source	Recommendation
104	Know Your Assets	Create multi-year plan for bathymetric surveys and other investigations.
105	Future Ready	Add climate change considerations to the stormwater masterplan by developing a Town-wide stormwater hydraulic model or conducting studies of vulnerable areas.
106	Manage Service Delivery	Super Pipe Inspections, Sluice Gate Operations, and Maintenance: Initial inspections are successfully complete. Formalize a maintenance plan with a multi-year outlook.
107	Manage Service Delivery	Spill Response: Define roles & responsibilities. Formalize existing practices.
108	Manage Service Delivery	Structural lining, preventive patching and point repairs, reactive spot repairs: Create governance model. Define roles & responsibilities. Use CCTV data once collected to inform a multi-year repair strategy and budget.
109	Manage Service Delivery	Catchbasin Vacuuming: Backlog successfully eliminated and successful transition to salt rocks. Develop multi-year plan for catchbasin vacuuming based on new operating conditions, adjust budget.
110	Manage Service Delivery	Pilot the use of "socks" designed to catch debris before it enters the water.
111	Manage Service Delivery	Operations and Maintenance of Inlets and Outfalls: Create governance model. Define roles & responsibilities. Develop multi-year plan and budget. Expand the scope of inlets/outfalls from the current scope of ponds, creeks and known trouble spots, to all assets.
112	Manage Service Delivery	Environmental Monitoring and Data Loggers: Use 2022 Stormwater Master Plan to inform cost options of environmental monitoring & protection. Use the CLI-ECA identified monitoring program to provide the plan.

ID	Source	Recommendation
113	Manage Service Delivery	Work with Corporate Services to review approach to signage to promote safety.
114	Manage Service Delivery	Levels of Service Upgrades and Pond Retrofits: Monitor legislative requirements and financial impact. Use 2022 Stormwater Master Plan to inform AMP updates.
115	Manage Service Delivery	Wet Pond Dredging/Rehabilitation: Change the current practice of annual funding requests "per pond" to a program based budget based on AM plans.
116	Manage Service Delivery	Implementation of New LID Assets: Develop levels of service options and costs for implementation of LID and incorporate into the budget process
117	Manage Service Delivery	Oil Grit Separator Inspections & Maintenance: Formalize inspection and cleaning programs and manage data.
118	Manage Service Delivery	Define roles and responsibilities for flood response.
119	Manage Service Delivery	Develop a method for tracking flood events with Customer Service