Town of Aurora
Environmental Advisory Committee
Meeting Agenda

Date: Monday, June 17, 2024
Time: 7 p.m.
Location: Holland Room, Aurora Town Hall

Meetings are available to the public in person and via live stream on the Town's YouTube channel. To participate, please visit aurora.ca/participation.

Pages

1. Call to Order

2. Land Acknowledgement

3. Approval of the Agenda

4. Declarations of Pecuniary Interest and General Nature Thereof

5. Receipt of the Minutes

   5.1 Environmental Advisory Committee Meeting Minutes of May 13, 2024 — 1

   1. That the Environmental Advisory Committee Meeting Minutes of May 13, 2024, be received for information.

6. Delegations

7. Matters for Consideration

   7.1 Memorandum from Energy and Climate Change Analyst; Re: Natural Capital Asset Management Plan Draft Presentation — 5

   1. That the memorandum regarding Presentation of the Draft Natural Capital Asset Management Plan be received; and

   2. That the Environmental Advisory Committee comments regarding Presentation of the Draft Natural Capital Asset Management Plan be received and referred to staff for consideration and further action as appropriate.

8. Informational Items

9. New Business

10. Adjournment

Town of Aurora
Environmental Advisory Committee
Meeting Minutes

Date:	**Monday, May 13, 2024**
Time:	**7:00 p.m.**
Location:	**Holland Room, Aurora Town Hall**
Committee Members:	Councillor Wendy Gaertner (Vice Chair) Nicole Arsenault Shun Chen Pippette Eibel Denis Heng Kristen Martens Ken Turriff
Members Absent:	Councillor Rachel Gilliland (Chair) Alain Godin
Other Attendees:	Natalie Kehle, Analyst, Energy and Climate Change Emily Freitas, Council/Committee Coordinator

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1. Call to Order

The Chair called the meeting to order at 7:06 p.m.

2. Land Acknowledgement

The Committee acknowledged that the meeting took place on Anishinaabe lands, the traditional and treaty territory of the Chippewas of Georgina Island, recognizing the many other Nations whose presence here continues to this day, the special relationship the Chippewas have with the lands and waters of this territory, and that Aurora has shared responsibility for the stewardship of these lands and waters. It was noted that Aurora is part of the treaty lands of the

Mississaugas and Chippewas, recognized through Treaty #13 and the Williams Treaties of 1923.

3. Approval of the Agenda

Moved by Pippette Eibel
Seconded by Kristen Martens

That the agenda as circulated by Legislative Services be approved with the addition of Jason Cheng as delegation 6.2.

Carried

4. Declarations of Pecuniary Interest and General Nature Thereof

There were no declarations of pecuniary interest under the *Municipal Conflict of Interest Act, R.S.O. 1990, c. M.50*.

5. Receipt of the Minutes

5.1 Environmental Advisory Committee Meeting Minutes of April 15, 2024

Moved by Shun Chen
Seconded by Nicole Arsenault

1. That the Environmental Advisory Committee Meeting Minutes of April 15, 2024, be received for information.

Carried

6. Delegations

6.1 Jason Cheng, Climate Action; Re: Invitation to Climate Action Townhall Hosted by Climate Action Newmarket Aurora

Jason Cheng announced that Climate Action Newmarket Aurora will be hosting the Climate Action Townhall will be taking place at the Newmarket Legion on Wednesday May 29, 2024, at 7 p.m. Attendees will be able to participate in a roundtable discussion on topics such as conscious consumerism, smart energy choices, and activism.

Moved by Kristen Martens
Seconded by Shun Chen

That the comments of the delegation be received for information.

Carried

7. Matters for Consideration

7.1 Memorandum from Energy and Climate Change Analyst; Re: 2024 Energy Conservation and Demand Management Plan Draft Report

Staff discussed the Energy Conservation and Demand Management Plan Draft Report and introduced Patrick Darby, Energy & Carbon Team Manager, and Kayden Toffolo, Energy Engineering Intern, of WalterFedy, who highlighted the accomplishments, data acquisitions, sustainable building standards, and long-term goals to achieve net zero.

Staff highlighted their findings, including: the difficulty to collect waste management data, how most emissions come from waste, using information from fleet to pilot new projects, and how some recreational buildings having greater emissions such as the Stronach Aurora Recreation Complex having a 30% GHG impact, possibilities for external funding for climate action projects, and feasibility studies accompanied by the asset renewal strategy.

The Committee discussed the role of data to calculate how much waste has been diverted such as dog waste, how the recommendations will be used to stay on track of long-term goals, the use of space heaters, alternative energy options, and if the report will be shared back to the buildings that participated in the report. Staff noted that facilities play a crucial role in the implementation process.

Moved by Ken Turriff
Seconded by Pippette Eibel

1. That the memorandum regarding the 2024 Energy Conservation and Demand Management Plan Draft Report be received; and
2. That the Environmental Advisory Committee comments regarding the 2024 Energy Conservation and Demand Management Plan Draft

Report be received and referred to staff for consideration and further action as appropriate.

Carried

8. Informational Items

None.

9. New Business

None.

10. Adjournment

Moved by Nicole Arsenault
Seconded by Kristen Martens

That the meeting be adjourned at 8:02 p.m.

Carried

100 John West Way
Aurora, Ontario
L4G 6J1
(905) 727-3123
aurora.ca

Town of Aurora

Memorandum

Planning and Development Services

Re: **Natural Capital Asset Management Plan Draft Presentation**

To: Environmental Advisory Committee

From: **Natalie Kehle, Energy and Climate Change Analyst**

Date: June 17, 2024

Recommendation

1. **That the memorandum regarding Presentation of the Draft Natural Capital Asset Management Plan be received; and**

2. **That the Environmental Advisory Committee comments regarding Presentation of the Draft Natural Capital Asset Management Plan be received and referred to staff for consideration and further action as appropriate.**

Background

The Town of Aurora secured the engineering consulting services of SLBC Inc. to assist in the development of the Town's first Natural Capital Asset Management Plan (NCAMP). The draft NCAMP is found in Attachment 1. The presentation of the draft plan is found in Attachment 2.

The inclusion of natural capital assets into municipal asset management planning is important to the protection and conservation of the properties in which they are found. Natural assets include forests, streams, wetlands, green infrastructure, and green spaces. These assets play a key role in climate change mitigation, adaptation, and resiliency, such as storing carbon, mitigating storm flows, absorbing flood waters, and providing protection from storm surges. However, historically natural assets have not typically been categorized or valued as municipal assets.

With the introduction of Ontario Regulation 588/17, Asset Management Planning for Municipal Infrastructure, Ontario became the first province in Canada to regulate asset management planning at the municipal level. In accordance with the regulation, municipalities are required to inventory, value, and integrate green infrastructure, including natural infrastructure and by extension natural assets, into their asset management planning when these assets are directly owned by the municipality.

This NCAMP identifies the current practices and strategies that are in place to manage natural assets and makes recommendations where they can be further refined and improved. The NCAMP includes the following Town-owned assets:

- Natural Area Assets: forest and open spaces, waterbodies, watercourses and wetlands.
- Natural Enhanced Assets: urban trees, urban parks, community gardens and pet cemetery.

Other Town assets such as stormwater and the trail system are excluded from this plan but included under the Town's corporate Asset Management Plan (AMP). The NCAMP aligns with the Town's corporate AMP and Policy, while in compliance with Ontario Regulation 588/17.

The NCAMP was developed in consultation with Town stakeholders. Its components include:

- State of Infrastructure
- Levels of Service Assessment
- Asset Management Strategy
- Financial Analysis and Strategy
- Continuous Improvement and Next Steps

The deadline for submitting the NCAMP, as required under the O. Reg. 588/17, is July 1st, 2024, in conjunction with the Town's corporate AMP. The final draft NCAMP is scheduled to be presented to Council on July 2nd, 2024, at the Committee of the Whole meeting.

Attachments

Attachment 1 – Draft Natural Capital Asset Management Plan (NCAMP)

Attachment 2 – Natural Capital Asset Management Plan Presentation

Natural Capital Asset Management Plan

Draft
Rev. 2

May 2, 2024

Prepared by SLBC Inc.
and Green Analytics

EXECUTIVE SUMMARY

Introduction

This Natural Capital Asset Management Plan (NCAMP) communicates the requirements for the sustainable delivery of services through management of natural assets, compliance with regulatory requirements, and required funding to provide the appropriate Levels of Service (LOS) over the planning period of 10 years.

Inventory

The Town's natural assets have an estimated replacement value of **$228.2 million**. Table ES-1 provides a breakdown of the inventory and replacement value by asset type. Replacement values for natural area assets were estimated based on average restoration costs per hectare, and do not include the cost of land.

Table ES-1 Replacement Value of Natural Assets

Asset Category	Asset Class	Quantity	Replacement Value [a]	
			2024$M	% of Total
Natural Area Assets	Forest and open space	317.9 hectares [b]	57.3 [b]	25.1%
	Waterbody	4.0 hectares	N/A [c]	N/A [b]
	Watercourse	36.9 km [d]	62.8 [d]	27.5
	Wetland	72.5 hectares	18.1	7.9%
Natural Enhanced Assets	Community Gardens	2 locations with 52 plots each	0.45	0.2%
	Pet Cemetery	6.4 hectares	0.3	0.1%
	Urban Parks	114.2 hectares [e]	22.8 [e]	10.0%
	Urban Trees	26,380 street and park trees	66.4	29.1%
TOTAL			**228.2**	**100%**

[a] See Appendix B for a summary of unit cost assumptions. Replacement Values do not include land values.

[b] Includes Sheppard's Bush Conservation Area and Ducks Unlimited property, which the Town maintains in exchange for public access.

[c] For waterbodies, restoration costs were not readily available.

[d] Includes watercourse segments that traverse Town-owned property.

[e] Includes manicured grassy areas in Town-owned parks. Excludes naturalized areas and building footprints.

The replacement value of the community gardens is based on recent construction unit costs. The pet cemetery is a heritage asset that is considered irreplaceable; however, the replacement value reflects the cost of recent cost of restoration and fencing. The replacement value of urban park areas is based on the cost of sod (including installation). Land costs are not included in the value of the pet cemetery or the urban park areas.

The replacement value of trees is based on the trunk diameter replacement method, which recognizes that large trees are replaced with multiple smaller trees. See Appendix B for unit cost assumptions.

State of Infrastructure

Natural area assets are typically expected to exist in perpetuity, and will not degrade over time unless impacted by external threats, such as invasive species, drought, fire or chemical contamination. As such, asset age and remaining life are not relevant to open spaces, urban forests, waterbodies, watercourse and wetlands. Based on staff input, the Town's natural areas are considered generally to be in Good or Very Good condition. It is recommended that the Town establish a condition assessment program for natural area assets to confirm their condition and restoration needs.

Urban parks (manicured grassy areas) and the pet cemetery are also expected to exist in perpetuity if appropriately maintained. Based on staff input, the pet cemetery is in Good condition, while urban parks are generally in Fair condition due to the presence of weeds and signs of heavy use.

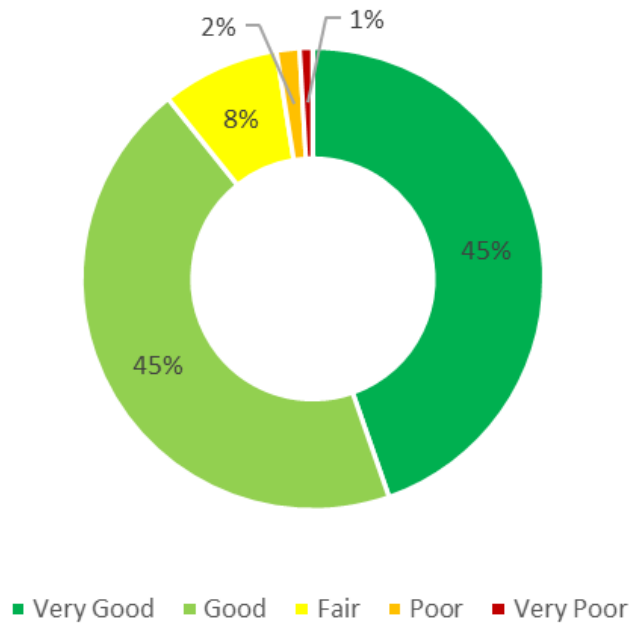
The community garden near Alliance Park is 25 years old and is in Good condition. It has an expected service life of 40 years. The community garden along Hartwell Way is being built this year and is in Very Good condition. It has an expected service of life 25 years.

Urban trees are expected live 35 to 100 years or more depending on their species and location. For example, trees planted in boulevards generally live approximately 35 years.

The average age of the Town's urban tree inventory is estimated to be approximately 28 years. The condition distribution of urban tree assets is summarized in Figure ES-1.

Based on data collected for the 2024 Urban Forest Study, approximately 90% of urban trees are estimated to be in Good or Very Good condition.

Figure ES-1 Condition of Urban Trees



Levels of Service

The NCAMP presents Community and Technical Levels of Service (LOS) related to capacity, function and reliability of natural assets. Formal targets have not been established for most of the

technical LOS. Instead, the technical LOS will be monitored to track year-to-year changes, and to observe their relationship with community satisfaction and operational costs.

Moreover, although targets have been set for tree canopy and tree diversity, those targets are not directly applicable to the Town's asset performance, because the targets apply to all trees within the municipal boundaries, whereas the Town's asset performance relates specifically to Town-owned trees.

For example, the Town's tree canopy target is 40%; however, the AM Plan defines LOS performance based only on Town-owned trees, since the Town only directly manages Town-owned assets. However, Town-owned trees provide an estimated 6.3% of canopy coverage, which makes the Town a major contributor to the community's ability to meet the 40% target.

Similarly, the Town's tree diversity goal is that no species represents more than 5% of the tree population. This target applies to all trees within the municipal boundaries; however, for the AM Plan it has been applied to the inventory of Town-owned trees. Several Town-owned tree species exceed the the diversity target as a proportion of the Town-owned inventory, and the Town is working to achieve the diversity target as part of it's long-term tree planting and tree replacement program.

The Town's population is expected to grow 11.8% from 66,370 in 2024 to 74,210 by 2034. Due to land constraints and high land costs, the Town does not plan to expand its natural area assets, urban parks, community gardens and trails to keep up with population growth. As such, the capacity LOS for these assets will decrease, meaning that more people will share use of these assets. This may be viewed negatively by some users, but the higher levels of use also represent higher efficiency due to increased benefits being derived from each asset. The Town may seek alternative ways to increase natural area asset capacity for residents, for example, through agreements with external parties or re-purposing existing Town properties.

Asset Management Strategy

Risk Management

Risk treatments recommended by the Town's Climate Change Adaptation Plan and reinforced by recommendations from the Urban Forest Study include:

1. Regularly review of the tree and plant selection list.
2. Before extreme weather events, assess the costs and benefits of increasing the current tree inspection and maintenance process.
3. After extreme weather events, continue applying procedures in the Park Maintenance Plan to inspect parks.
4. To manage non-climate threats, establish a program to monitor and assess degradation of natural assets due to invasive species, pests, diseases, contamination, overuse, misuse, unauthorized edge encroachment or other disturbances.
5. To manage wildlife threats, explore options for managing beavers and formalize an approach to reducing their negative impacts on the tree canopy and drainage.

In addition, asset failure risk was assessed for individual urban trees, and it was found that 0.1% of urban trees were considered Very High risk, representing a total of approximately 60 trees and a replacement value of $95,000. Replacement of these trees should be prioritised.

Lifecycle Management

Recommended lifecycle activities for each lifecycle stage include the following:

- Plan and Design
  - Continue updating the Stream Management Master Plan and Urban Forest Study every 10 years
  - Incorporate the Pet Cemetery into Official Plan and Parks and Recreation Master Plan when these are updated.
- Construct and Secure
  - Due to land constraints and the high cost of land it is not feasible for the Town to maintain the current LOS of natural area assets and natural enhanced assets per 1,000 people.
  - Given these constraints, construct and secure strategies should focus on working toward meeting the Town's 40% canopy cover target.
- Monitor and Maintain
  - Establish a program to assess and monitor degradation of natural assets, as described in Section 4.3.1, Recommendation 4 – Manage Non-Climate Threats. This should include assessing the condition of any newly acquired lands if any are secured.
  - Continue executing operations and maintenance activities recommended by the Stream Management Master Plan, including conducting regular field walks.
  - Continue maintaining trees in accordance with the Park Maintenance Standard and implement recommendations from the 2024 Urban Forest Study.
  - Continue maintaining urban parkland in accordance with the Park Maintenance Standard.
  - Continue formalizing maintenance standards for community gardens and pet cemetery, then implement.
- Rehabilitation and Restoration
  - Implement restoration needs identified through the assessment of natural assets.
  - Complete the improvements identified in the 2019 Stream Management Master Plan.
  - Continue replacing trees based on annual inspections, the Urban Forest Study and reports by residents and staff. Prioritize the trees identified as Very High risk. As trees are replaced, consider the recommendations in the regularly-updated Tree and Plant Selection list.

Financial Strategy

Scenario Evaluation

The following three scenarios for investing in the management of natural assets were assessed:

- Scenario A: Status Quo
- Scenario B: Status Quo with Moderate Rehabilitation, Monitoring and Maintenance

- Scenario C: Status Quo with High Rehabilitation, Monitoring and Maintenance

As indicated by their names, the strategies differ primarily in their level of monitoring and maintenance of natural assets. Scenario A: Status Quo includes monitoring and maintenance of natural enhanced assets, but very little for natural area assets. Scenario B initiates rehabilitation, monitoring and maintenance for natural assets. Scenario C is similar to Scenario B, but includes funds for more aggressive rehabilitation, monitoring and maintenance.

None of the Scenarios include the addition of natural area or enhanced assets. That means the existing natural area and enhanced assets will need to support the growing population.

Table ES-2 summarizes the costs of each scenario. The table shows that 10-year costs range from $17.12 million for Scenario A (Status Quo) to $25.48 million for Scenario C (High).

As the Status Quo scenario, Scenario A represents the anticipated annual funding available, and is used to calculate the funding gap, or additional funding needed, for Scenarios B and C. The table shows that an average of $0.36 million/year would be needed for Scenarios B and $0.84 million/year would be needed for Scenarios C.

Table ES-2 Cost Comparison 2025-2034

	Scenario A Status Quo	Scenario B Moderate	Scenario C High
Total Cost 2025-2034 (2024 $, millions)	$17.12	$20.68	$25.48
Average Annual Cost (2024 $, millions/year)	$1.71	$2.07	$2.55
Anticipated Annual Average Funding (2024 $, millions/year)	$1.71	$1.71	$1.71
Average Annual Gap (2024 $, millions/year)	--	$0.36	$0.84

Table ES-3 compares the benefits or outcomes of each scenario. As shown in the table, Scenario A only replaces 43% of the known dead and dying trees, and does not plant any new trees to contribute to achieving the canopy target. Moreover, natural area condition assessments, invasive species control and targeted seeding and planting will not be conducted. This Scenario will leave the Town and its natural assets unprepared for hazards such as extreme weather, invasive species, encroachment and misuse.

Scenario B replaces 100% of the known dead and dying trees, and plants 200 new trees to contribute to achieving the canopy target. Moreover, natural area condition assessments will be completed on all properties in the first 6 years before transitioning to a 10-year cycle. Moderate programs of invasive species control and targeted seeding and planting will also be conducted.

Table ES-3 Benefit Comparison

BENEFITS 2025-3034	Scenario A Status Quo	Scenario B Moderate	Scenario C High
Construct and Secure			
Net New Trees Planted	0	200 trees	2000 trees
Rehab and Restore			
Dead and Dying Trees Replaced	284 trees (43% of those identified in 2024)	666 trees (100% of those identified in 2024)	760 trees (100% of those identified in 2024 + others that may die over time)
Invasive Species Control (hectares treated)	0	22.2 ha	66.5 ha
Targeted Seeding and Planting (hectares treated)	0	3.8 ha	7.3 ha
Stream Rehabilitation projects completed	5 projects	5 projects	5 projects
Monitor and Maintain			
Condition Assessment (hectares assessed)	0	620.4 ha (all assets in first 6 years, followed by 10-year cycle)	664.7 ha (all assets in first 5 years, followed by 10-year cycle)
Tree Maintenance Increases with Net New Trees	n/a	Yes	Yes
Urban Park Maintenance	Same as current	Same as current	Same as current
Plan and Design			
Stream Management Master Plan Updated in 2029	Yes	Yes	Yes
Urban Forest Study Updated in 2034	Yes	Yes	Yes
Tree Inventory Updated in 2025	Yes	Yes	Yes

Scenario C is similar to Scenario B, but aims to replace 100% of the known dead and dying trees, and allows for replacement of an additional 94 trees which may fall into Very Poor condition over

the next 10 years. Two thousand (2000) new trees will be planted to contribute to the tree canopy target. Natural area condition assessments will be completed on all properties in the first 5 years (1 year faster than Scenario B) before transitioning to a 10-year cycle, and invasive species control and targeted seeding and planting will also be conducted at a higher rate. This will better position the Town for the identified risks to its natural assets.

Recommended Scenario

The costs and benefits are estimates of the potential needs that should be verified through field-based assessments of the natural assets. For this reason, Scenario B is recommended, because it includes a moderate program of assessment, maintenance and restoration activities. The data collected through the assessments will enable the Town to determine whether these programs should be reduced or expanded in the future.

To fund Scenario B, the Town may

- seek additional revenues through taxation or grants
- re-allocate funds from other programs (this may result in reduced levels of service in other prorams).

Moreover, although the Town recognizes that land constraints make future purchases of natural area assets unlikely, it is recommended that the Town continue to seek alternative ways to increase natural area asset capacity for its residents, for example, through maintenance agreements with external parties similar to the Town's existing agreements for use of the Duck's Unlimited property and Sheppard's Bush Conservation Area. There may also be opportunities for the Town to re-purpose some of its existing properties.

Plan Monitoring and Improvement

Per O.Reg. 588/17, the Town will conduct an annual review of its progress in implementing this AM Plan and will update the AM Plan after at most 5 years.

The Town is committed to continually improving how assets are managed and how services are delivered. Development of AM Plans is an iterative process that includes improving data, processes, systems, staff skills, and organizational culture over time. Key recommendations include:

- Data
    - Establish condition scoring criteria for natural assets and assess condition.
    - Establish land classifications that will be applied consistently to assets in all Town documents, including the AM Plan and the Parks and Recreation Master Plan.
- Technology
    - Continue the initiative to implement a work order management system, which will be used to track maintenance and repair activities and costs at an asset level. This information can be used to improve future needs forecasting and budgeting.
- Processes
    - Establish processes to keep tree data current as trees are replaced or maintained.

- Monitor LOS performance relative customer satisfaction and cost to inform future target setting.
- Use Town-wide tree targets to guide development of Town-owned tree targets
- Consider building on the initial risk assessment for natural assets to further inform and prioritize risk mitigation actions for natural assets.

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List of Abbreviations

Abbreviation	Definition
AM	Asset Management
CAO	Chief Administrative Officer
CCAP	Climate Change Adaptation Plan
CRV	Current Replacement Value
dbh	Diameter at breast height
EAC	Environmental Advisory Committee
ELC	Ecological Land Classification
EVNCA	Economic Valuation of Natural Capital Assets Report
GDS	Green Development Standards
LOS	Levels of Service
NCAMP	Natural Capital Asset Management Plan
OP	Official Plan
OPA	Official Plan Amendment
O.Reg.	Ontario Regulation
SOI	State of Infrastructure
TCA	Tangible Capital Asset
TRCA	Toronto Region Conservation Authority

1 INTRODUCTION

1.1 Background

The Town of Aurora is a municipality located within the boundaries of York Region. The Town has a population of over 60,000 residents and covers over 49 square kilometers of land, comprised of built and natural assets.

This Natural Capital Asset Management Plan (NCAMP) communicates the requirements for the sustainable delivery of services through management of natural assets, compliance with regulatory requirements, and funding to provide the appropriate Levels of Service (LOS) over the planning period of 10 years.

1.2 Alignment with Regulatory Requirements

Municipalities in Ontario have been using asset management processes to manage their built assets for decades. However, it has only been over the past five to ten years that municipalities have begun incorporating natural capital (e.g., wetlands, forests, meadows, watercourses, trees, parkland) into this framework. This shift has been triggered in part by:

(a) A growing need to repair aging municipal “grey” or built infrastructure with limited municipal tax dollars, which has pushed governments and others to start to explore alternative and complementary solutions.

(b) Climate change which, among other things, is putting municipal infrastructure at greater risk of failure.

(c) A growing recognition of the essential services provided by natural assets to communities at the local scale along with numerous co-benefits.

In Ontario, this shift is also being driven by Ontario Regulation (O.Reg.) 588/17 Asset Management Planning for Municipal Infrastructure under the *Infrastructure for Jobs and Prosperity Act* (2015), which came into effect January 1, 2018. O.Reg. 588/17 made Ontario the first province in Canada to regulate asset management planning at the municipal level and to require consideration of both human-made and natural assets as part of this process. Ontario remains the only Province with this type of legislation. O. Reg. 588/17 requires all municipalities in Ontario to have a comprehensive asset management plan that identifes current LOS in place for all municipal infrastructure assets by July 1st of 2024, and a plan that includes proposed LOS by July 1st of 2025.

The definition of what constitutes a municipal infrastructure asset for the purpose of O. Reg 588/17 includes “green infrastructure”, which is defined in the regulation as an:

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

In accordance with the requirements of O.Reg. 588/17, this NCAMP is posted on the Town’s website, along with related background documents.

1.3 Relationship with Other Documents

Asset management planning is a medium to long-term planning activity that relies on input from strategic planning activities and informs shorter-term decision making. The NCAMP provides a framework to validate the Town's budgeting processes and assist in prioritizing work activities, including capital projects, based on risk. It also discusses LOS that support goals in the Town's strategic plan, and lifecycle management strategies intended to reduce the overall cost of asset ownership.

The NCAMP is intended to be read with other Town policies and planning documents, including the following:

- Climate Change Adaption Plan (CCAP), 2022
- Green Development Standards (GDS), 2022
- Economic Valuation of Natural Capital Assets Report (EVNCA), 2013
- Town of Aurora Strategic Plan: 2011-2031
- Town of Aurora Official Plan 2023 Consolidation (OP)
- Town of Aurora Secondary Plans
- 2023 Parks & Recreation Master Plan
- 2023 Parks Maintenance Standard
- 2024 Urban Forest Study

The 2022 CCAP recommends climate action items, including one to update the Town's 2013 EVNCA and one to incorporate natural capital assets into the Town's AM Plan. This NCAMP partially updates the EVNCA by presenting the value of Town-owned natural assets, and it incorporates natural capital assets into the Town's AM Plan.

1.4 Key Partners

Key partners in the preparation and implementation of this AM Plan are shown in Table 1-1.

Table 1-1 Key Partners in the AM Plan

Key Stakeholder	Role in Asset Management Plan
Town of Aurora Council	Council is dedicated to serving the residents and businesses of the Town of Aurora in a responsive and effective manner, through leadership and legislative action, for the present and future well-being of the community.
Environmental Advisory Committee (EAC)	. The EAC acts as a link between citizens and the Town to facilitate the resolution of environmental concerns and to assist in implementing projects that will enhance the community environment.

Key Stakeholder	Role in Asset Management Plan
Chief Administrative Officer (CAO) and Senior Leadership Team	The CAO provides leadership that supports the policies and programs that drives the organization forward, focusing on ensuring the Town has efficient and effective systems in place to support the responsible growth of Aurora. The CAO provides corporate oversight to the program to ensure that the goal and directions of the asset management program are maintained, and the program remains consistent with the overall strategic plan.
Finance	Finance provides historic Tangible Capital Asset (TCA) amounts, and historic and current capital and operating budgets. Further, Finance provides coordination on input data and development of the AM Plan from each of the service and program areas.
Various Town Departments	Various town deparments provide input data, forecasts and text for the AM Plan related to their service and program area or area of functional expertise.

1.5 Goals and Objectives of Natural Asset Management

The Town is seeking to create a detailed and comprehensive NCAMP that will serve as an extension to the Town's current AM Plan.

The goal in managing natural and enhanced assets is to meet the defined LOS (as amended from time to time) in the most cost effective manner for the present and future community.

The key elements of natural and enhanced AM are:

- Providing a defined level of service and monitoring performance
- Managing the impact of growth through demand management and asset investment
- Taking a lifecycle approach to developing cost-effective management strategies for the long-term that meet the defined level of service
- Identifying, assessing, and appropriately controlling risks
- Linking to a long-term financial plan which identifies required, affordable expenditure and how it will be financed.

1.6 Corporate Asset Management System

AM Plans aim to provide a line of sight between corporate strategic priorities, and tactical planning, including annual budgeting and business planning. Tactical plans are then used to guide work delivery, including capital delivery, operations and maintenance. The line of sight is illustrated in **Error! Not a valid bookmark self-reference.**.

Figure 1-1 Strategic Plan line-of-sight to Work Plan

1.7 Organization of Document

The contents of this AM Plan follow the recommended elements of a detailed AM Plan:

- **Introduction**: Outlines scope, background information, relationship to other Municipal documents and plans, and applicable legislation.
- **State of Infrastructure**: Summarizes the inventory, valuation, condition and remaining life of the assets in the inventory by service and asset type.
- **Levels of Service**: Defines LOS performance indicators and targets, presents current performance and discusses the future performance outlook.
- **Asset Management Strategy**: Identifies risks to natural assets, recommends mitigation actions, and summarizes the asset management strategies, including restoration, renewal, maintenance and condition assessment, that will enable the assets to provide the required levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost.
- **Financing Strategy**: Presents three scenarios for investing in the management of natural assets. Each option carries a different cost and delivers a different lifecycle benefits. A preferred scenario is recommended.
- **NCAMP Improvement and Monitoring**: Summarizes the next steps including improving future iterations of the NCAMP and monitoring the NCAMP implementation progress.

2 STATE OF INFRASTRUCTURE

The State of Infrastructure (SOI) section of the NCAMP describes the Town's inventory of natural assets, and provides a snapshot in time of the valuation, age and condition of these assets.

2.1 Asset Hierarchy and Inventory

This NCAMP focuses on Town-owned natural assets, because the Town can only directly maintain and manage natural assets on lands under its ownership, or through a shared management agreement (e.g., with another public agency such as a Conservation Authority). However, it is also understood that the system of natural assets that exists throughout Aurora's juristiction is essential to the provision of services that benefit the community. These serivce provisions include things such as air pollution control, urban temperature regulation, water quantity and quality management, and phsyical and mental health benefits from time spent in natural areas. These benefits are discussed further in Section 2.2.

For the NCAMP, natural assets have been divided into the following categories in alignment with CSA W218:23:

- Natural Area Assets: The stock of natural areas and ecosystem elements that are relied upon and managed by a municipality
- Natural Enhanced Assets: Designed elements that have been established to mimic natural functions and processes in the service of human interests

For the NCAMP, these asset categories have been further divided into asset classes as shown in Table 2-2. The approach and assumptions used to establish the NCAMP inventory is summarized in Appendix A.

Locations of natural area and natural enhanced assets are shown in Figure 2-1. The map includes Sheppard's Bush Conservation Area and Ducks Unlimited property, which the Town maintains in exchange for public access. The map does not include the property at 672-684 Henderson Dr. because Town ownership was not formalized at the time the NCAMP was written.

The NCAMP does not include stormwater ponds, which are considered built assets, and are included in the Corporate AM Plan. Grassy areas around stormwater ponds are considered part of the stormwater pond asset, and are thus also excluded from this NCAMP.

In addition, although trails provide access to natural area assets, trails are considered built infrastructure and are covered in the Corporate AM Plan.

Table 2-1 Assets covered by this AM Plan

Asset Category	Asset Class	Description	Examples of Town Assets
Natural Area Assets	Forest and open space	Forested, naturalized or un-mowed open spaces as defined by the Ecological Land Classification (ELC)[1] geospaotial data available for Aurora. The asset class captures coniferous forest, deciduous forest, mixed forest, cutural plantation, cultural woodland, cultural thickets, and cultural meadows ELC communities.	Holland Valley Trail North property is an example of a forested asset. The natural protions of the Aurora Community Arboremtum are largely classificed as cultural meadow.
	Wetland	Wetland areas as defined by ELC. Includes Deciduous Swamp, Mixed Swamp, Thicket Swamp, Meadow Marsh, and Shallow Marsh.	A large portion of Atkinson Park is wetland.
	Waterbody	Waterbody areas as defined by the ELC. Includes Open Water, Mixed Shallow Aquatic, and Submerged Shallow Aquatic.	Open water portions of the wetland in Atkinson Park.
	Watercourse	Watercourse segments that traverse Town owned properties.	Segments of the East Holland River and Tannery Creek
Natural Enhanced Assets	Community Gardens	Sets of raised garden plots where residents and groups grow plants. Each community garden contains 52 plots.	One located near Alliance Park. One located along Hartwell Way.
	Pet Cemetery	Cultural heritage site where over 800 named pets have been documented.	Happy Woodland Pet Cemetery
	Urban Park	Manicured grassy areas within Town-owned parks	Thomas Coates Park
	Urban Trees	Town-owned street trees and park trees. Excludes trees in forests and open spaces.	

[1] This is based on the ecological land classification (ELC) system mapping for southern Ontario (in accordance with the standards established by Lee et al., 1998) This classification system is an established and widely accepted standard in southern Ontario that is useful for informing inventory structure as well as condition assessment and management of natural assets.

Figure 2-1 NCAMP Inventory

2.2 Asset Valuation

The current replacement value of an asset represents the expected cost to replace an asset to the same functional standard with a 'like for like' version based on current market conditions and construction standards. Establishing a current replacement cost for natural areas is somewhat more challenging than for built assets since natural areas (e.g. forest and wetlands) are not typically built or constructed. Therefore, estimating a replacement cost for most natural assets is achieved by estimating the anticipated cost to restore a natural asset. This was achieved by using average restoration costs per hectare of natural areas provided by Toronto Region Conservation Authority (TRCA).

For individual tree assets or other enhanced assets (e.g. community gardens), more typical construction costs or costs of replacement are used. For natural and enhanced assets, the total replacement value is estimated to be **$228.2 million**. Table 2-2 and Figure 2-2 provide a breakdown of the inventory and replacement value by asset type.

Table 2-2 Replacement Value of Natural Capital Assets

Asset Category	Asset Class	Quantity	Replacement Value [a]	
			2024$M	% of Total
Natural Area Assets	Forest and open space	321.1 hectares [b]	57.3 [b]	25.1%
	Waterbody	4.0 hectares	N/A [c]	N/A [b]
	Watercourse	36.9 km [d]	62.8 [d]	27.5
	Wetland	72.5 hectares	18.1	7.9%
Natural Enhanced Assets	Community Gardens	2 locations with 52 plots each	0.45	0.2%
	Pet Cemetery	6.4 hectares	0.3	0.1%
	Urban Parks	114.2 hectares [e]	22.8 [e]	10.0%
	Urban Trees	26,380 street and park trees	66.4	29.1%
TOTAL			**228.2**	**100%**

[a] See Appendix B for a summary of unit cost assumptions. Replacement Values do not include land values.

[b] Includes Sheppard's Bush Conservation Area and Ducks Unlimited property, which the Town maintains in exchange for public access. Does not include the property at 672-684 Henderson Dr. which the Town is under contract to purchase in June 2024.

[c] For waterbodies, restoration costs were not readily available.

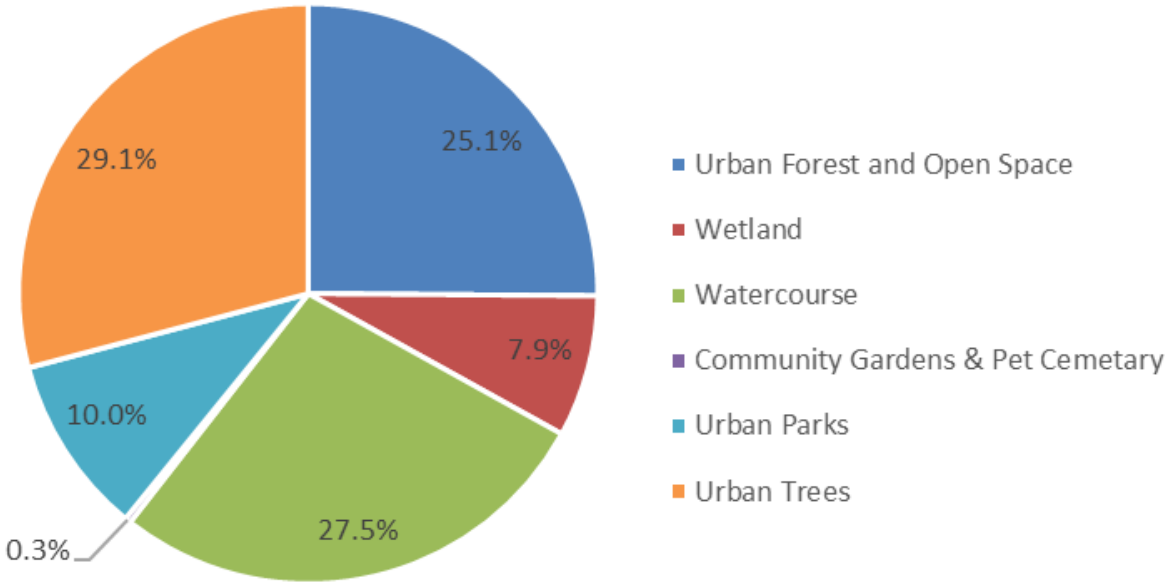
[d] Includes watercourse segments that traverse Town-owned property.

[e] Includes manicured grassy areas in Town-owned parks. Excludes naturalized areas and building footprints.

For natural area assets it is important to recognize that while restoration costs can act as replacement cost for AM purposes, it can take many years or decades for a natural system to grow, establish, and develop the ecosystem functionality to provide a 'like for like' replacement. While the restoration costs can approximate the expenditure need to replace some natural assets,

it does not fully account for the lost or reduced level of service (LOS) provision that would exist if replacement were to occur.

Figure 2-2 Portion of Replacement Costs by Asset Type



For the purpose of an asset management plan, asset valuation is typically done using the replacement cost of the asset as is outlined in Table 2-2. The replacement value is an estimate of the captial costs associated with restoring natural assets. It is important to distingish this from natural captial values which measure the value of ecosystem service provided by natural assets. Ecosystem services values are the benefits that humans derive from nature and are typrically reported as an average annual service value. For instance, Aurora (2013)[2] and Green Analytics (2017)[3] explore a range ecosystem services value provided by Aurora's natural assets. These values recogonize and demonstrate the importance of natural assets from the perspective of benefits provided to local communties. Ecosystem service benefits can be wide ranging including reduction of urban heat island effects, flood and erosion risk reduction, the provision of recreational opporutnities, and physical and mental health benefits from time spent in nature. Aurora (2013) estimated the value of ecosystem service benefits at $7.4 million per year.

2.3 Asset Age and Remaining Life

For built assets, understanding the estimated life of an asset and the proportion of life that remains provides an insight into potential risk of asset failure and potential renewal needs. For natural

[2] Aurora (2013). The Economic Value of Natural Capital Assets Associated with Ecosystem Protection.

[3] Green Analytics (2017). Valuing Natural Capital in the Lake Simcoe Watershed. Report prepared for Lake Simcoe Region Conservation Authority.

assets, age and remaining life do not apply in the same way and will not provide the same insight. Natural assets typically exist in perpetuity, and if unimpacted by external pressures, will not degrade over time.

For street and park tree assets where management is based on individual units, age is sometimes measured and reported like built assets. However, currently there is no standard lifespan to use for street trees in AM plans. Existing AM plans provide some precedent for tree lifespan, though ranges from 35 to 110 years have been used. The service life of a street or park tree will vary depending on tree species, where it is planted (e.g., in street, planter, boulevard etc.) and the conditions of the surrounding environment. For instance, trees in the boulevards tend to have a shorter lifespan that is anticipated to be in the 35 year range. The Town's existing urban tree inventory includes an age class that estimates tree age in 10-year periods. Using the mid-point of those age classes, the weighted average age of the Town's urban trees is 28 years.

Average service life and age of natural capital assets is shown in Table 2-3.

Table 2-3 Average Service Life and Age of Natural Capital

Asset Category	Asset Class	Average Service Life (Years)	Average Age (Years)
Natural Area Assets	Forest and Open Space	N/A [a]	N/A [a]
	Waterbody		
	Watercourse		
	Wetland		
Natural Enhanced Assets	Community Garden	Garden located near Alliance Park: 40 years Garden located along Hartwell Way: 25 years	Garden located near Alliance Park: 25 years Garden located along Hartwell Way: 0 years
	Pet Cemetery	N/A [a]	N/A [a]
	Urban Parks	N/A [a]	N/A [a]
	Urban Trees	35 to 100 depending on species and location	28

[a] Assets are expected to exist in perpetuity

2.4 Asset Condition

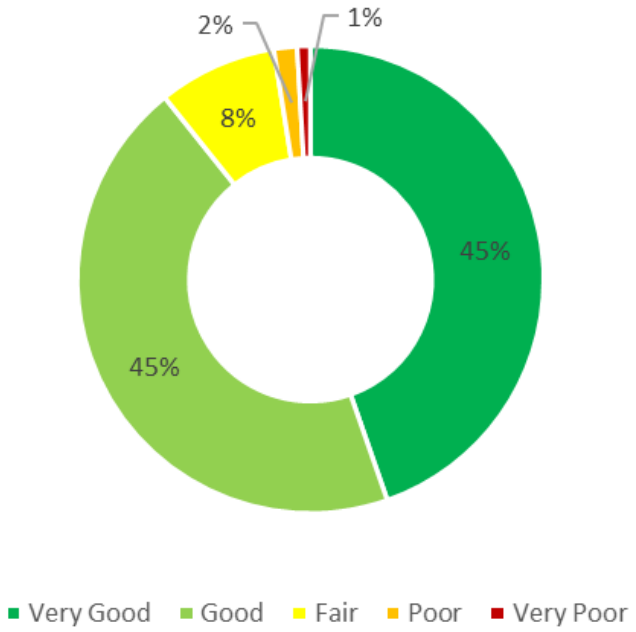
Maintaining urban trees in a healthy condition is a primary goal for the Town. Maintenance includes a wide range of activities including pruning to maintain structural integrity, promote

healthy growth and eliminate dead or hazardous branches. The Town maintains an inventory of urban trees and documents their health rating on the following six-point scale: dead, death imminent, declining, potential trouble, satisfactory, and good. For the purpose of this AM Plan the tree health scale has been adjusted to aligned with the corporate condition rating scale as summarized in Table 2-4. The condition distribution of urban tree assets is summarized in Figure 2-3. Approximately 90% of urban trees are estimated to be in 'good' or 'very good' condition.

Table 2-4 Tree Condition Rating

Condition Rating	Condition Score	Description	Tree Health Rating
Very Good	1	Fit for the future	Good
Good	2	Adequate for now	Satisfactory
Fair	3	Requires attention	Potential Trouble
Poor	4	Increasing potential of affecting service	Declining
Very Poor	5	Unfit for sustained service	Dead; death imminent

Figure 2-3 Condition of Urban Trees



For other natural assets in Aurora condition is currently not formally assessed. However, based on detailed discussions with the Town's Operations staff that maintain these assets, asset condition for the purposes of this plan can be assumed to be visually assessed and have been found to be in in good or very good condition and enhanced assets are assumed to be in fair or

good condition as summarized in Table 2-5. The urban parks largely capture the manicured turf, which were noted by Town staff as having a variety of conditions, but overall should be considered in fair condition due to presence of weeds and signs of heavy use.

Table 2-5 Asset Condition

Asset Category	Asset Class	Condition Rating	Condition Score
Natural Area Assets	Forest and Open Space	Good or very good	1 or 2
	Waterbody	Good or very good	1 or 2
	Watercourse	Good or very good	1 or 2
	Wetland	Good or very good	1 or 2
Natural Enhanced Assets	Community Garden	Good	2
	Pet Cemetery	Good	2
	Urban Parks	Fair	3
	Urban Trees	As per Figure 2-1	As per Figure 2-1

Not having detailed condition information for natural area assets is common across many municipalities, as asset management maturity is still relatively low for this asset category and there is currently no commonly accepted standard to establishing condition approach for natural area assets.[4] However, as will be discussed in the Asset Management Strategy section of this AM Plan (Section 4), regular condition monitoring can help the Town better maintain its natural assets and respond to natural asset threats.

[4] Some initial standards have been developed as outlined in Canadian Standards Association. 2023. CSA/W218-23 Specifications for Natural Asset Inventories. 31 p. However, it only provides some general guidance on condition focused more on a desktop-based approach.

2.5 Confidence in Data

The information presented in this AM Plan is based on data available at the time of preparation. It is expected that with each update of this plan, the data confidence will improve from the development and implementation of the initiatives listed in the Recommendations and Continuous Improvement section (Section 6).

The confidence in data used to support the SOI can be summarized as follows:

- Data associated with the asset inventory and valuation is rated as high confidence.
    - Data is based on sound records, procedures, investigations, and analysis, with proper documentation. There are minor shortcomings, for example some data is old, some documentation is missing and/or reliance is placed on unconfirmed reports or some extrapolation.
- Data associated with condition assessment is rated as low confidence.
    - Data is based on unconfirmed verbal reports and/or cursory inspection and analysis. There are data gaps related to condition and the Town would benefit from continuing to fill baseline data moving forward in preparation of the next AM Plan update.

3 LEVELS OF SERVICE

In the State of Infrastructure Section, the value, age, and condition of the City's non-core infrastructure assets were discussed. The Levels of Service (LOS) chapter builds on the State of Infrastructure by defining the performance the City's assets are intended to deliver over their service lives. For example, the Town's tree inventory may be expected to support a certain canopy target.

LOS are statements that describe the outputs and objectives the City intends to deliver to its residents, businesses, and other stakeholders. Developing, monitoring, and reporting on LOS are all integral parts of an overall performance management program which is aimed at improving service delivery and demonstrating accountability to the Town's stakeholders.

As per O.Reg 588/17, the AM Plan is required to provide current LOS for all asset, including natural assets, determined in accordance with qualitative descriptions and technical metrics established by the municipality.

In general, LOS are guided by a corporate commitments to the community, legislative requirements, and internal guidelines, policies, and procedures. In many cases, LOS are also implied based on past service delivery, community expectations, and infrastructure system design. Effective asset management requires that LOS be formalized and supported through a framework of performance measures, targets, and timeframes to achieve targets, and that the costs to deliver the documented LOS be understood.

3.1 Levels of Service Framework

Figure 3-1 shows the LOS framework and line of sight from high-level Corporate initiatives to detailed asset-specific Technical LOS. Corporate commitments, along with legislated LOS guide Community LOS that describe the services that the assets need to deliver to the City's residents and businesses. Community LOS can typically be categorized to one of the following service attributes:

- **Capacity:** Measures that reflect whether the service and supporting assets are of sufficient capacity to meet user demand.
- **Function:** Measures that reflect the suitability of the services, operations and assets for the user or other stakeholder.
- **Reliability & Quality:** Measures that reflect whether services and supporting assets are reliable, available when needed, and responsive to the community.
- **Affordability:** Measures that reflect whether services and supporting assets are adequately funded in both the short and long term.

Technical LOS measures support the Community LOS. They relate to the allocation of resources to service activities to best achieve the desired community outcomes and demonstrate effective performance.

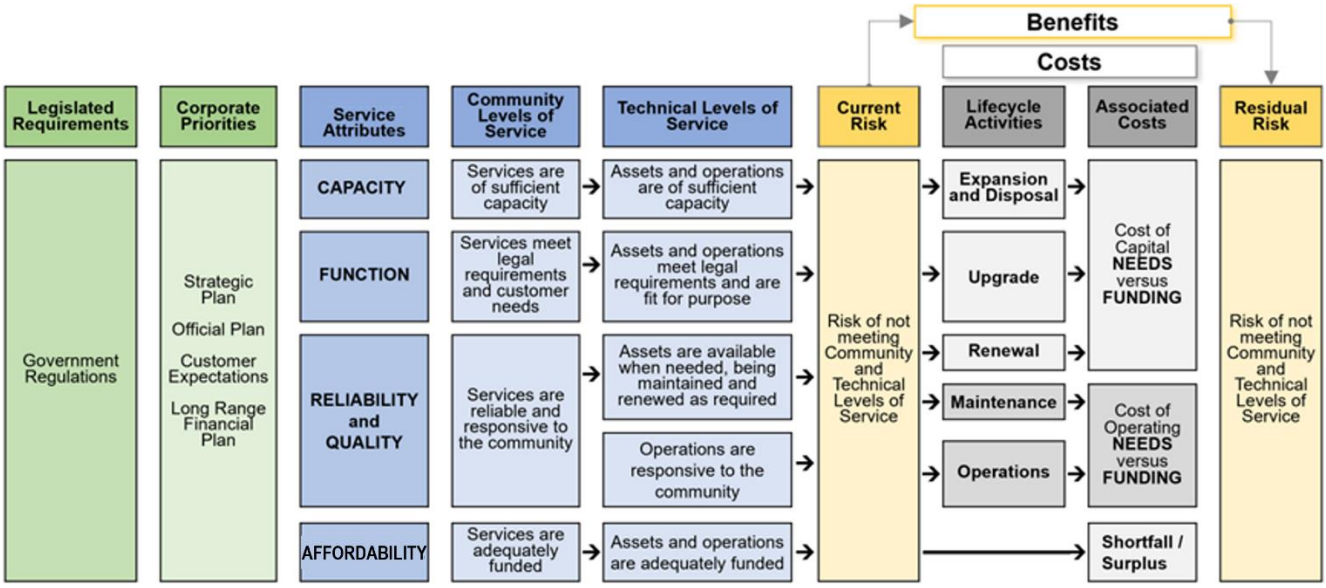
Community LOS are translated into Technical LOS, where:

- **Capacity LOS** drive assessment of expansion needs
- **Function LOS** drive assessment of upgrade needs

- **Reliability & Quality LOS** drive assessment of renewal, maintenance and operations (and programming) needs
- **Affordability LOS** drive assessment of financial sustainability needs.

Through the asset mangement process the risks of failing to achieve the defined Community and Technical LOS are assessed, and lifecycle activities are prioritized to address those risks. Lifecycle activities may include expansion, upgrade, renewal, maintenance or operational activities, depending on the category of LOS to be addressed. In some cases, lifecycle activities address several Community and Technical LOS. For example, a project on a runway may simultaniously increase capacity, make upgrades to meet regulatory requirements, and renew existing pavement. The nature of the lifecycle activity determines whether it should be funded as capital or operating, as well as eligible funding sources. As shown in the figure below, even after the lifecycle intervention, some residual risk may remain.

Figure 3-1 Levels of Service Framework



The following sections describe the Legislative Requirements, Corporate Priorities, and Community and Technical LOS that guide the Town's management of natural assets.

3.2 Legislative Requirements

Legislative requirements that impact the delivery of the Town's natural asset services are outlined in Table 3-1.

Table 3-1 Legislative Requirements

Legislation	Requirement
Municipal Act, 2001	The main statute governing the creation, administration and government of municipalities in Ontario, other than the City of Toronto.
Ontario Regulation 588/17 The Infrastructure for Jobs and Prosperity Act, 2015	Sets out the principles for the provincial government to regulate asset management planning for municipalities.
Public Sector Accounting Board Standard 3150	Standards on how to account for and report on tangible capital assets in government financial statements. Natural assets are not currently included in finanical reporting however, there is active discussion on how to include the value of natural assets in financial statements.
Environmental Protection Act	The primary pollution control legislation in Ontario. Prohibits discharge of any contaminants to the environment that can cause or are likely to cause adverse effects. Amounts of approved contaminants must not exceed limits prescribed by the regulations. Requires that spills of pollutants are reported and cleaned up promptly. Has the authority to establish liability on the party at fault.
Ontario Water Resources Act	Focuses on both groundwater and surface water throughout the province. Regulates sewage disposal and "sewage works" and prohibits the discharge of polluting materials that may impair water quality.

3.3 Corporate Levels of Service

The Corporate LOS establish service levels that describe the main vision or objective of service delivery for the Town. The Corporate Strategic Plan identifies three pillars of success that reflect the needs of the community and in turn guide the management of the Town's assets. As shown below, Natural Environment is one of three pillars of the Corporate Strategic Plan.

Table 3-2 Corporate Strategic Plan Pillars of Success

Pillar of Success	Service Level Objective
Community	Support an exceptional quality of life for all
Economy	Enable a diverse, createive and resilient economy
Natural Environment	Support environmental stewardship and sustainability

3.4 Community and Technical Levels of Service

Community LOS translate the Town's Corporate priorities into statements that describe how the community should experience natural asset services. Technical LOS then translate those statements into quantitative performance metrics, which allow the Town to compare its natural asset services with prior years or against service targets.

It is worth noting that a single natural asset can provide multiple services to a community, sometimes referred to as co-benefits (e.g., cooling, passive recreation venue, reduced stress, air quality improvements). In 2013, Aurora published an assessment of ecosystem services provided by the Town's natural assets, highlighting the range of services provided such as carbon storage and sequestration, pollution regulation, water regulation and treatment, pollination, recreation, and health benefits. The provision and value of these services demonstrate the importance of including natural assets in asset management planning.

While the "service-benefit stacking" noted above helps make natural assets a compelling solution for community service delivery, it adds to the complexity of incorporating natural assets into an asset management plan in a consistent and useful way. Furthermore, the science of ecosystem service measurement is still evolving and the more accessible options for quantifying such measures are driven largely by the area of the natural asset. For informing an asset management plan, areas managed for ecological or natural purposes, or percent of canopy cover, can be considered effective proxy measures for the provision of a suite of ecosystem services. For instance, percent canopy cover can be considered a proxy measure for local temperature reduction, carbon sequestration, and air quality regulation.

Table 3-3 summarizes Community and Technical LOS along with current and desired performance. The second last column of the table shows that formal targets have not been established for most of the technical LOS. Instead, the technical LOS will be monitored to track year-to-year changes, and to observe their relationship with community satisfaction and operational costs.

On the other hand, the table shows that formal targets have been established for tree canopy and tree diversity; however those targets are not directly applicable to the Town's asset performance (fifth column of Table 3-3), because the targets apply to all trees within the municipal boundaries, whereas the Town's asset performance relates specifically to Town-owned trees.

For example, the Town's tree canopy target is 40%; however, the AM Plan defines LOS performance based only on Town-owned trees, since the Town only directly manages Town-owned assets. However, Town-owned trees provide an estimated 6.3% of canopy coverage, which makes the Town a major contributor to the community's ability to meet the 40% target.

Similarly, the Town's tree diversity goal is that no species represents more than 5% of the tree population. This target applies to all trees within the municipal boundaries; however, for the AM Plan it has been applied to the inventory of Town-owned trees. (This assumes that the Town-owned inventory isn't deliberately being weighted to counter-balance lack of diversity of non-owned trees.) As shown in the table, several Town-owned tree species exceed the the diversity target as a proportion of the Town-owned inventory. The Town is working to achieve the diversity target as part of it's long-term tree planting and tree replacement program.

Table 3-3 Current Level of Service Performance

Service Attribute	Community LOS	Technical LOS	Relevant Asset Type	Current Performance Metric	Data Source	Target Performance	Target Performance Achieved?
Capacity & Use	Natural assets are suitable to all kinds of users and are easy to access.[a]	% residential homes within 500m of natural area assets or enhanced asset areas	Natural area and natural enhanced assets	99.35% of residential properties	GIS anlaysis	No established target. Town to monitor performance.	n/a
		Area of natural area assets and natural enhanced assets per 1000 people	Natural area and natural enhanced assets	Natural area assets per 1000 people: 5.94 ha [b,c] Natural enhanced asset per 1000 people: 1.82 ha [b,c]	Inventory analysis	No established target. Town to monitor performance.	n/a
		Area of canopy cover owned by the Town	Urban trees and forest and open space	Approximately 313 ha of canopy cover is Town owned. This provides a canopy cover of 6.3%.	Inventory analysis	Town does not have a target for Town-owned canopy cover, but has established a target of 40% canopy overall (current performance is 34%).	n/a
		# of public maintained street and park trees per 1000 people	Urban trees	# of urban trees: 26,380 # of public maintained street trees/person: 397.5 [c]	Inventory analysis	No established target. Town to monitor performance.	n/a
		# of Community Garden locations per 1000 people	Community gardens	# of locations: 2 # of plots per 1000 people: 0.030 [c]	Inventory analysis	No established target. Town to monitor performance.	n/a
		# of km of trails through natural area assets and natural enhanced assets per 1000 people	Natural area and natural enhanced assets	40.87 km of trails through town-owned and town-maintaind land Trails per 1000 people: 0.616 km [c]	GIS analysis	No established target. Town to monitor performance.	n/a
Function	Enrich Aurora's ecology by protecting and preserving biodiversity. [d]	Species diversity of maintained trees	Urban trees	Species composition for highest 5 species in Town's tree inventory: • Norway maple (14.96%) • Littleleaf linden (11.83%) • Ash (9.51%) • Honey locust (8.54%) • Silver maple (5.49%)	Analysis of tree inventory data	2024 Urban Forest Study Recommendation 8: Long-term goal that **no species represents more than 5%** of the tree population, no genus represents more than 10% of the tree population, and no family represents more than 20% of the intensively managed tree population both municipal-wide and at the neighbourhood level.	No (target is long-term)
		% Town-owned natural assets affected by invasive species	Natural area assets	55% of Open Space − Natural Cover plots show invasive plant species (from Urban Forest Study) [e]	2024 Urban Forest Study	No established target. Town to monitor performance.	n/a
Quality & Reliabillity	Natural and enhanced assets are in good condition, meeting the needs of users.[a]	Tree pruning activities completed per year	Urban trees	3150 (in-house) 183 (contracted)	Town operations estimate	No established target. Town to monitor performance.	n/a
		# of trees planted per year	Urban trees	750 tree per year	Town operations estimate	No established target. Town to monitor performance.	n/a

a) Adapted based on Level of Service Statement for Aurora's Parks & Recreation facilities.

b) The Parks and Recreation Master Plan, reports 2.7 hectares per 1000 residents of parkland, but defines parkland as lands within Town-owned park properties. Those properties do not consistently include or exclude naturalized areas.

c) Population in 2024 estimated at 66,370 based on 2022 York Region Official Plan.

d) From the Town of Aurora Corporate Environmental Action Plan 2018.

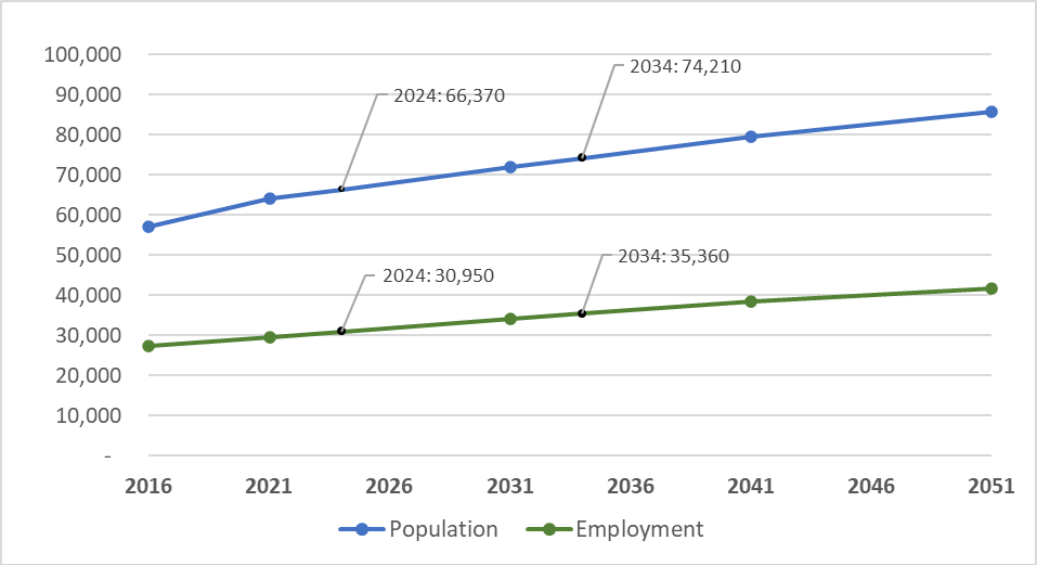
e) Existing data is not specific to town-owned natural assets. However, data compiled for the Urban Forest Study based on a series of representative sample plots across Aurora found that 55% of "Open Space – Natura Cover" plots had presence of invasive plant species.

3.5 Levels of Service Outlook

LOS performance may be affected by future trends, such as population growth or changes in the environment and climate. This section focuses on the impact of population growth on LOS, because many of the LOS are defined relative to population. Environmental, climate and other hazards are discussed in Section 4.1.2 on risk assessment.

Figure 3-2 shows that, based on the 2022 York Region Official Plan forecasts, the Town's population is expected to grow 11.8% from 66,370 in 2024 to 74,210 by 2034, and employment will grow from 30,950 to 35,360. O.Reg. 588/17 requires AM Plans to report forecasted population and employment growth; however, natural asset planning is primarily driven by growth in population (residents).

Figure 3-2 Forecast Population and Employment Growth



Source: 2022 York Region Official Plan

Table 3-4 describes the expected outlook for each technical LOS in consideration of the Town's anticipated population growth and its current plans for natural assets.

Table 3-4 Level of Service Outlook

Service Attribute	Community LOS	Technical LOS	Future Outlook
Capacity & Use	Natural assets are suitable to all kinds of users and	% residential homes within 500m of natural area assets or enhanced asset areas	According to the Official Plan, most new units will be added in the Aurora Promenade and Major Transit Station Areas. These corridors generally have natural asset parcels within 500m, so this metric will **likely increase (improve)** with growth.

Service Attribute	Community LOS	Technical LOS	Future Outlook
	are easy to access.[a]	Area of natural area assets and natural enhanced assets per 1000 people	Due to land constraints and high land costs, the Town does not plan on acquiring additional natural area assets or urban parks. As such, natural area assets and natural enhanced assets per 1000 people will **likely decrease**.
		Area of canopy cover owned by the Town	The Town-owned tree canopy is **expected to increase (improve)** as new trees are planted, and as trees mature in good in health. Tree planting and maintenance and planting levels will be discussed in the Asest Management Strategy (Section 4) and Financing Strategy (Section 5).
		# of public maintained street and park trees per 1000 people	The ratio of Town-owned trees to people will **likely decrease**, unless the Town plants additional trees in proportion to population growth. Tree planting levels will be discussed in the Asest Management Strategy (Section 4) and Financing Strategy (Section 5).
		# of Community Garden locations per 1000 people	As population grows, this ratio will **decrease.** The Town does not currently plan to build additional community gardens.
		# of km of trails through natural area assets and natural enhanced assets per 1000 people	As population grows, this ratio will **likely decrease.** The Town may build additional trails on private land under maintenance agreements; however, it will not likely be sufficient to maintain the current ratio of trails to people.
Function	Enrich Aurora's ecology by protecting and preserving biodiversity. **d**	Species diversity of maintained trees	The species diversity will **slowly improve** through the Town's tree replacement and planting program.
		% Town-owned natural assets affected by invasive species	The % of natural assets affected by invasive species will **may increase (worsen)** if actions are not taken to manage them.
Quality & Reliabillity	Natural and enhanced assets are in good condition, meeting the needs of users.[a]	Tree pruning activities completed per year	Given the same resources (budget), tree pruning activities are expected to remain **steady**. However, if the tree inventory grows, this would represent a reduction (worsening) in maintenance attention for each tree.
		# of trees planted per year	Given the same resources (budget), tree planting activities are expected to remain **steady**. Depending on targets for tree canopy and trees per population, a steady annual rate of tree planting may or may not be sufficient.

As indicated in the table, due to land constraints and high land costs, the Town does not plan to expand its natural area assets, urban parks, community gardens and trails to keep up with population growth. As such, the capacity LOS for these assets will decrease, meaning that more people will share use of these assets. This may be viewed negatively by some users, but the higher levels of use also represent higher efficiency due to increased benefits being derived from each asset.

Despite the land constraints, the Town may seek alternative ways to increase natural area asset capacity for residents, for example, through maintenance agreements with external parties similar to the Town's existing agreements for use of the Duck's Unlimited property and Sheppard's Bush Conservation Area. There may also be opportunities for the Town to re-purpose some of its existing properties.

The Town-owned tree canopy is expected to increase (improve) as new trees are planted, and as trees mature in good in health; however, this depends on the resources allocated to both tree maintenance and tree planting. To maintain the current ratio of Town-owned trees to people, the Town will need to plant 3,123 net new trees by 2034. Through planting of new and replacement trees, the Town will slowly work toward its diversity target of no more than 5% of any one species. Tree maintenance and planting are discussed in Section 4.

The % of natural assets affected by invasive species will may increase (worsen) if actions are not taken to manage them. Mitigation and management of invasive species are discussed in Section 4.

4 ASSET MANAGEMENT STRATEGY

The Asset Management Strategy section of the AM Plan identifies risks to natural assets, recommends mitigation actions, and summarizes the asset management strategies, including restoration, renewal, maintenance and condition assessment, that will enable the assets to provide the required Levels of Service (LOS) in a sustainable way, while managing risk.

4.1 Risk Assessment

This section addresses risks to the Town's natural assets. First, the risk context is discussed, then a risk assessment highlights anticiated hazards and threats to the Town's natural assets. Next, an asset failure risk assessment is presented for urban trees. Risk mitigation actions to address known risk are discussed.

4.1.1 Risk Context

The standard risk assessment approach used for built assets can also be applied to natural assets. However, the application of risk is slightly different given the unique features of natural assets and natural area assets in particular. Natural assets are resilient, meaning they can withstand a certain amount of stress and in many cases, they repair themselves when damaged. Therefore, degradation or damage to one component of a natural asset may not have a significant impact on the overall LOS (e.g., the loss of one tree may have a minor impact on overall forest or canopy cover and the associated services). This resiliency is one of the many reasons natural assets are seen as effective solutions to deal with certain infrastructure and climate change related challenges. However, cumulative effects and exposure to multiple stressors can lead to tipping points that can cause cascading or widespread failure of natural assets. Therefore, a risk assessment for natural assets needs to consider the range of hazards to which natural assets are exposed, and the potential impacts those hazards could trigger.

Ideally, the condition of natural assets is carefully assessed and monitored at regular intervals. In such a situation, a natural asset's condition can help inform the probability of asset failure, much in the same way it is used for built assets. Provided the condition assessments are robust, a lower condition rating would imply a lower level of natural resilience, and that a certain level of degradation has occurred such that additional stressors would be more likely to trigger failure.

Currently, condition assessments and regular monitoring of the condition of natural assets within Aurora is limited. However, the Town's objective is to develop and implement regular monitoring and condition assessment protocols. Once available, this information can be combined with the current understanding of threats and hazards to natural assets to inform the probability and consequences of asset failure.

4.1.2 Natural Asset Risk Assessment – Hazards and Threats

As a starting point, this AM plan outlines the work completed to date toward understanding the range of threats and hazards to natural assets. The Town has already made progress on risk management related to natural assets through its 2022 Climate Change Adaptation Plan (CCAP). As part of the CCAP, specific climate hazards were identified. Each hazard was assigned a probability of occurrence rating and a severity of consequence rating, which were combined into four risk ratings summarized in Table 4-1.

Table 4-1 Risk Rating Overview

Risk Rating	Description*
Low Risk	No immediate vulnerability associated with natural infrastructure.
Low-medium Risk	Potential vulnerability exists, viability of the natural infrastructure is not an immediate concern, but action may be required in the foreseeable future.
High-medium Risk	Potential vulnerability exists, viability of the natural infrastructure is not an immediate concern, but action is needed soon to avoid anticipated consequences.
High Risk	A known vulnerability is present, mitigative actions are required to ensure viability of natural infrastructure.

* Descriptions of risk ratings were adapted from what was used in Aurora's Climate Change Action Plan and modified to also apply to non-climate related threats or hazards.

Climate change risks pose a significant challenge to managing Town assets and maintaining service levels. Climate change impacts increase the probability of natural asset failure and can also increase the consequence of failure in terms of financial impacts, service delivery, and damages to the natural environment. Therefore, in general, climate change is anticipated to increase the Town's risk exposure. Several specific climate related hazards are identified in the Town's CCAP. These hazards are further detailed into potential risks to natural assets as summarized in Table 4-2.

For natural assets, other non-climate or human activity-related threats and hazards exist that should also be considered. Building on the work done through the CCAP in addition to input gathered from Town staff and the results of the 2024 Urban Forest Study, other hazards identified include invasive species, pests and diseases, wildlife impacts, unauthorized edge encroachment or disturbances, contamination (e.g. road salting and other spills), and overuse and misuse of natural areas. The potential impacts and risk ratings associated with these hazards are detailed in Table 4-2 for natural area assets and natural enhanced assets.

Aurora's Urban Forest Study provides some additional insight into the invasive species and climate change vulnerability of forest and tree assets. For instance, the urban forest study reports that 55% of the Town's forest plots had at least one invasive species present. Presence and symptoms of spongy moth and emerald ash borer were observed in 15% and 8% of plots surveyed, respectively. Furthermore, 60% of the total tree population in Aurora (Town-owned and other) are tree species considered highly or extremely vulnerable to climate change.

Risk mitigation strategies are identified in Section 4.1.4.

Table 4-2 Risk Assessment of Threats and Hazards

Asset Category	Threat or Hazard	Potenital Impacts	Risk Rating
Natural Areas Assets	Extreme heat and drought	Vegetation dieback and increased watering or replacement of vegetation required.	Low-medium
	Extreme rainfall and erosion	Washout of vegetation, erosion of soil, exposure of roots, and damage to trees and vegetation.	Low-medium

Asset Category	Threat or Hazard	Potenital Impacts	Risk Rating
	Extreme storms (wind and lightning)	Replacement and maintenance of vegetation may be required after lightning or wind damage to trees and plants. Debris can also cause physical hazards.	Low-medium[5]
	Invasive species, pests and disease	Potential for tree mortality in forest areas from spongy moth and emerald ash borer. Phragmites impact ecological function of natural wetlands. Europen buckthorn, Manitoba maple, and garlic mustard were most common invasive species found in natural cover forest plots.	High-medium
	Wildlife Impacts	Beavers are a risk to tree canopy, and their dams cause flooding. There are limited remedation options.	High-medium
	Unauthorized edge encroachment or disturbances	Impacts resulting from inappropriate and unauthorized activities adjacent to and within natural assets that negatively impact the natural asset.For example these could include dumping of yard or other waste from adjacent land use; installation of forts, sheds, or other structures; Mowing or other gardening; creation of informal trails.	Low
	Contamination (e.g. road salting and other spills)	Introduction of pollutants and /or chemicals to the asset that can seriously impair the function of or kill the asset.	Low
	Overuse and misuse	Impacts resulting from heavy volume of activity or in appropriate uses of natural assets causing negative impacts. Impacts could include widening of formal trails; excessive off-trail activities, use of motorized vehicles such as ATVs, dogs off-leash, excessive litter, etc.	Low
Natural Enhanced Assets	Extreme heat and drought	Fields maybe become unusable and/or require additional maintenance.	Low-medium
	Extreme rainfall and erosion	Washout of vegetation, erosion of soil, exposure of roots, and damage to trees and vegetation.	Low-medium
	Extreme storms (wind and lightning)	Replacement and maintenance of vegetation may be required after lightning or wind damage to trees and plants. Debris can also cause physical hazards.	Low-medium
	Unauthorized edge encroachment or disturbances	Impacts resulting from inappropriate and unauthorized activities adjacent to and within natural assets that negatively impact the natural asset.	Low
	Overuse and misuse	Impacts resulting from excessive and overuse of open space and parkland causing negative impacts.	Low-medium

[5] Through the CCAP this risk was rated at low-medium. However, based on recent experience Staff noted that this risk could be a medium-high risk.

4.1.3 Urban Tree Risk Assessment – Asset Failure

For urban trees, existing inventory data on individual trees allowed for a more detailed assessment of risk using consequence and probability of failure. Urban trees were assigned a consequence of failure rating based on their trunk diameter at breast height (as per Table 4-3). The rationale for this is that larger trees tend to provide a greater LOS and are more costly to replace. For instance, a large mature tree will provide a larger canopy cover offering greater shade, runoff control, and neighbourhood asthetics. Loss of this tree results in greater loss of benefits. Probability of failure was assigned based on asset condition rating (as per Table 4-4).

Table 4-3 Consequence of Failure (CoF) Rating Scale

CoF Rating	Trunk diameter at breast height (dbh)
1	<5 cm
2	5 to <20cm
3	20 to <40cm
4	40 to <80 cm
5	>=80cm

Table 4-4 Probability of Failure (PoF) Rating Scale

PoF Rating	Probability of Failure	Corresponding Asset Condition
1	Rare	Very Good
2	Unlikely	Good
3	Possible	Fair
4	Probable	Poor
5	Almost Certain	Very Poor

Table 4-5 shown below, presents the Risk Evaluation Matrix Framework that depicts the risk exposure, based on the likelihood of occurrence and consequence rating for urban trees in Aurora.

Table 4-5 Risk Evaluation Matrix Framework

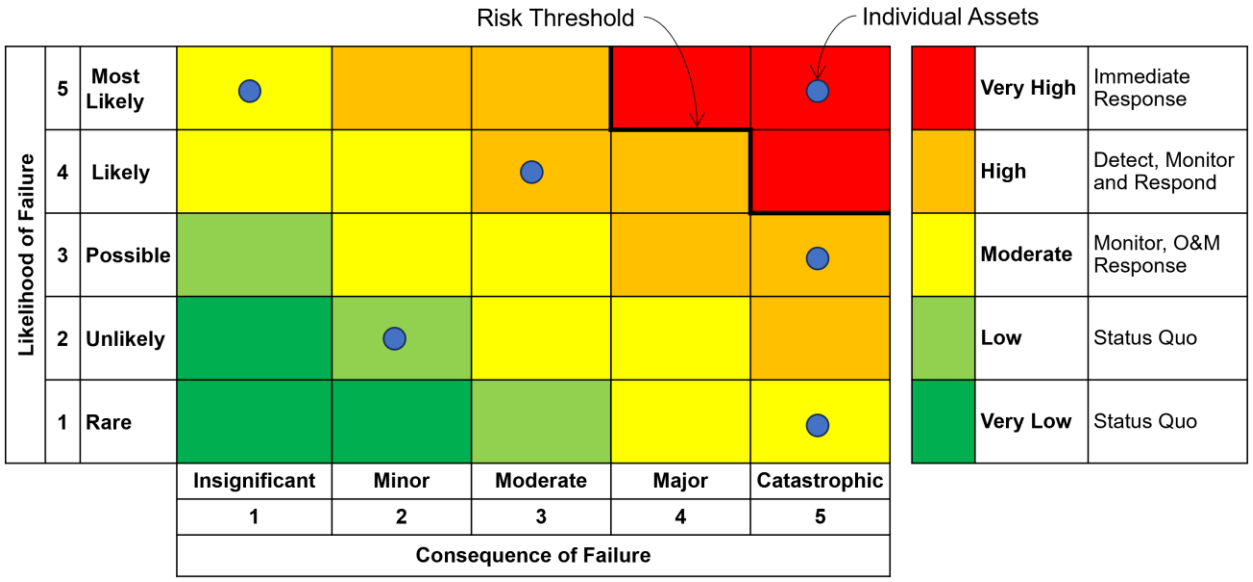


Table 4-6 shows the risk evaluation matrix for Aurora's urban trees, based on the likelihood of occurrence and consequence ratings. Overall, only 0.1% of urban trees were considered Very High risk. This represents a total of approximately 60 trees and a replacement value of $95,000.

Table 4-6 Risk Evaluation Matrix (2024 $, millions) – Urban Trees

Likelihood of Failure	1	2	3	4	5
5	$0.04	$0.15	$0.18	$0.04	$0.00
4	$0.03	$0.29	$0.49	$0.27	$0.05
3	$0.17	$0.88	$3.07	$2.39	$0.20
2	$0.67	$6.09	$16.80	$8.63	$0.64
1	$0.89	$8.07	$12.65	$3.62	$0.11
	Consequence of Failure				

Risk Exposure	CRV*($M)	CRV*(%)
Very High	$0.10	0.1%
High	$4.34	6.5%
Moderate	$33.45	50.4%
Low	$18.91	28.5%
Very Low	$9.64	14.5%
Total	**$66.43**	**100.0%**

* CRV = Current Replacement Value

4.1.4 Risk Mitigation Strategies

With an understanding of the risks facing natural assets, risk response or mitigation strategies can be established. Through the work of the CCAP and the Urban Forest Study, the Town has already identifed several risk mitigation strategies many of which are already being implemened by the Town. Climate change risk mitigation actions identified for natural assets through the CCAP include the following:

1. Plan for low-maintenance landscaping with hardy species adapted to future climate conditions.
2. Adopt or enhance maintenance procedures to proactively identify hazardous trees and undertake preventative maintenance before damage occurs during extreme events.
3. Continue applying procedures in the Park Maintenance Plan to inspect parks following extreme weather events to identify damaged landscaping and amenities to prioritize repairs and minimize service disruptions.

The 2024 Urban Forest Study also identified recommendations related to the mitigation of climate change, invasive species and pest risk relevant to the Town's urban forest and urban trees. These include:

1. Assess the Town's current recommended planting list based on the climate vulnerability of each species. Shift recommendations to native and appropriate non-native, non-invasive species that have a higher tolerance and lower vulnerability to climate change impacts.
2. Consider targeted removal of high priority invasive plant species at high priority sites following best practices.
3. Develop a monitoring and action strategy for invasive species, including pests and diseases, and continue taking proactive approaches to address new and emerging invasive species, such as hemlock woolly adelgid and oak wilt.

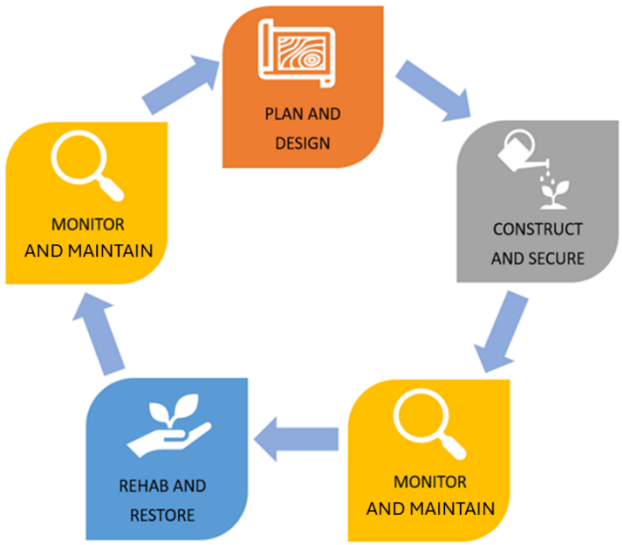
In addition to the risk mitigiation already identified through the CCAP and the Urban Forest Study, this AM plan recommends other mitigation actions for natural assets:

1. Conduct a study to assess the current condition of Town-owned natural area assets, documenting evidence of non-climate related risk (e.g. presence of invasive species, area degraded by overuse, etc.). Implement recommended upgrade, restoration, renewal and maintenance activities.
2. Remove and replace the trees identified as being at very high risk of failure (approximately 60 trees with a total value of $60,000 as shown in Table 4-6).
3. Explore options for managing beavers and formalize an approach to reducing their negative impacts on the tree canopy and drainage.
4. When the Town acquires new natural assets, conduct a condition assessment of the assets to inform financial considerations and risks to the Town.

4.2 Asset Management Strategies

The application of asset management lifecycle stages to natural assets is still evolving. For natural assets the stages are similar to built assets, however, some of the unique features of natural assets require a slightly different framing. The Natural Assets Initiative (2024)[6] recently released a guidance document to help municipalities across canada incorporate natural assets into their assessment managemtn planning process. The document articulates four key lifecycle stages for natural assets as shown in Figure 2-1 and as per the following descriptions:

Figure 4-1 Natural Asset Management Lifecycle



Source: Natural Assets Initiative (2024)

- **Plan and design** - activities to inform the subsequent stages that at a minimum involve data and information collection to understand the type, location and extent of natural assets under the management of the local government.
- **Construct and secure** – activities to provide a new asset that did not exist previously or to expand an existing asset (e.g., expanding an urban forest, planting new trees, constructing new community gardens). This includes securing land to expand the area of natural assets and where necessary, constructing new natural assets.
- **Rehabilitate and restore** – activities similar to upgrade and renewal of built assets. For natural assets, these activities tend to focus more on restoring degraded assets (e.g. replacing deteriorated sod, replanting deceased street trees, restoring streams affected by erosion), or improving asset resilience to known risks (e.g. replacing trees with different species to meet diversity targets or vaccinating trees).
- **Monitor and maintain** – activities needed to retain asset condition, including regularly scheduled inspection and assessment, regular fertilizing, overseeding, aeration and mowing of grassy areas; regular removal of litter and debris; or clean-up of tree limbs following extreme weather events.

This AM Plan focuses the asset management stratgies around the lifecycle stages identified above. Note that disposal, a common consideration in asset management for built assets is largely not applicable to natural assets. An exception to this is some enhanced assets such as

[6] NAI (2024). Nature is infrastructure: How to include natural assets in asset management plans. Natural Assets Initiative. naturalassetsinitiative.ca

urban trees managed as individual units that have an end of life, and therefore disposal and asset replacement is needed.

Though asset management, the Town assesses the costs of potential lifecycle activities to determine the lowest lifecycle cost strategy to manage each asset type and deliver required services. Failing to take care of assets can impact the total cost of ownership for that asset and can also have other impacts such as causing damage to other infrastructure or interruption to service delivery.

This section of the NCAMP works through each of the lifecycle stages outlining what the Town is currently doing for each stage and potential future action that may be needed.

4.2.1 Plan and Design

The planning and design stage is intended to establish the long-term strategy for a service and its assets, and to inform the subsequent stages of planning for monitoring and maintenance, rehabilitation and restoration, and construction or securing of assets.

Table 4-7 lists the Town's current long-term strategic planning activities for natural assets. For natural area assets, the vision for scope and quantity of Town-owned services is shaped by the Strategic Plan 2011-2031, and land use plans defined in the Official Plan 2023 and Secondary Plans. In addition, the Town's Stream Management Master Plan 2019 defines the Town's vision for watercourse management. The Urban Forest Study 2024 defines the vision for tree canopy coverage, tree species diversity, and tree health. The Parks and Recreation Master Plan 2023 defines the Town's vision for urban parkland area and community gardens. The Pet Cemetery was acquired in 2011 and is in the process of being restored.

The table also shows potential future activities that may enhance the Town's long-term planning of natural assets. For example, it is recommended that the Town establish update frequencies for the Stream Management Master Plan and Parks and Recreation Master Plan and update these plans when they are due. Similarly, the Urban Forest Study should be updated on its established frequency of every 10 years. It is also recommended that the Pet Cemetery be incorporated into the into Official Plan and Parks and Recreation Master Plan when these are updated.

Table 4-7 Long-term Strategic Planning Activities

Asset Category	Asset Class	Current Activities	Potential Future Activities
Natural Area Assets	Forest and Open Spaces	Strategic Plan 2011-2031 Official Plan 2023 Secondary Plans (various) Urban Forest Study 2024 (for urban forests)	Update when due
	Wetlands		
	Waterbodies		
	Watercourses	Strategic Plan 2011-2031 Official Plan 2023 Stream Management Master Plan 2019	Establish a frequency for updating the Stream Management Master Plan and udpate when due
Natural Enhanced Assets	Urban Trees	Urban Forest Study 2024 (updated every 10 years)	Update the Urban Forest Study when due
	Urban Parks	Strategic Plan 2011-2031 Official Plan 2023 Parks and Recreation Master Plan 2023	Establish a frequency for updating the Parks and Frequency Master Plan and udpate when due
	Community Gardens		

Asset Category	Asset Class	Current Activities	Potential Future Activities
	Pet Cemetery	Site is planned for Heritage designation. Site aquired in 2011 and is in the process of being restored. Restoration is planned to continue over the next few years including clearing internal pathways, debris removal, stone cleaning, data/name collection and formal site/plot survey .	Incorporate Pet Cemetery into Parks and Recreation Master Plan

Planning for construction and securing, monitoring and maintenance, and rehabilitation and restoration of natural assets is currently done in this AM Plan, which references other planning documents where more detailed study has been completed. Construction and securing activities are discussed in Section 4.2.2, monitoring and maintenance activities are discussed in Section 4.2.3, and rehabilitation and restoration activities are discussed in Section 4.2.4.

4.2.2 Construct and Secure

As was explained in Section 3.5, the Town's population is expected to grow 11.8% from 66,370 in 2024 to 74,210 by 2034; however, due to land constraints and high land costs, the Town does not plan to expand its natural area assets, urban parks, community gardens and trails to keep up with population growth.

The Town may consider planting additional trees to help achieve the Town-wide canopy target of 40%. Town-owned trees currently provide 6.3% canopy cover, and the Town-wide coverage is currently 34%. Additional planting of Town-owned trees will help achieve the 40% target.

Additional planting will also help the Town maintain its current LOS ratio of Town-owned trees to people. To maintain the current ratio of 397.5 trees per 1000 people, the Town will need to plant 3,123 trees by 2034; however, maintaining the current LOS is not an established target. For new plantings, the Town will select trees that will achieve its species diversity goal.

4.2.3 Monitor and Maintain

Monitoring and maintenance strategies for natural assets focus on improving assets' long-term resilience. Table 4-8 outlines the Town's current monitoring and maintenance activities by asset type. In addition, potential future activities have been identified that could help the Town improve and advance its overall management of natural assets.

Table 4-8 Monitor and Maintain Management Strategies

Asset Category	Asset Class	Current Activities	Potential Future Activites
Natural Area Assets	Forest and Open Space	Current urban forest maintenance focuses on areas along the trail system,	Inspect for invasive species and assess management need.

Asset Category	Asset Class	Current Activities	Potential Future Activites
		identifying and addressing trees that pose a hazard for to public safety. Some identification of invasive species is completed, however, this is typically spearheaded by local rate-payers groups.	Urban Forest Study recommends developing a monitoring and action strategy for invasive species, including pests and diseases, and continuing to take proactive approaches to address new and emerging invasive species, such as hemlock woolly adelgid and oak wilt.
	Wetland	None	Inspect for invasive species and assess management needs. Adopt monitoring procedures to routinely inspect owned natural assets for preventative maintenance needs. Inspect assets regularly for signs of risk exposure, degradation, and possible rehabilitation needs. Potential future activities to be determined associated with Ducks Unlimited Canada property.
	Waterbody	None	Inspect for invasive species and assess management needs.
	Watercourses	Stream Management Master Plan provides recommendations for a maintenance and monitoring plan as well as long-term monitoring including (See Appendix C for map of recommended field walks): • 5-year inspection cycle field walks • 10-year inspection cycle field walks • 10-year inspection cycle at road crossings only	Continue executing operation and maintence activities recommended by the Stream Management Master Plan.
Natural Enhanced Assets	Urban Trees	As per the Park Maintenance Standard, pruning of street trees varies by age class as follows: (1) Trees in the age class 15-25 years pruned once every 5 years; (2) Trees in the age class of 25-35 years pruned once every 7 years: (3) Trees in the age class of 35 years or more pruned once every 10 years. Corrective maintenance (clean up after storm).	Continue with tree maintenance program and implement recommendations from Urban Forest Study.
	Urban Parks	As per the Park Maintenance Standard, turf areas will be mowed to an average of 5cm, clippings will be removed from non-turf areas using a backpack blower, and litter and debris will be removed. Sports fields grass is aerated, top dressed, over seeded and fertilized.	Continue in accordance with existing maintenance standards.
	Community Gardens	Maintenance standards in development.	Formalize and implement maintenance standards.

Asset Category	Asset Class	Current Activities	Potential Future Activites
	Pet Cemetery	Maintenance standards in development.	Formalize and implement maintenance standards.

4.2.4 Rehabilitate and Restore

The goal of rehabilitation and restoration activities is to improve asset condition, improve an assets' resilience to anticipated risks, or to respond to certain extreme hazard events that require reactive rehabilitation. Specific rehabilitation or restoration needs should be identified through routine monitoring and inspection. Currently the Town has a robust inspection cycle for urban trees. However, for other natural assets, restoration activities are more reactionary. Table 4-9 provides a summary of the Town's current and possible future rehabilitate and restore activities.

Table 4-9 Rehabilitate and Restore Management Strategies

Asset Class	Current Rehabilitation Activities	Potential Future Rehabilitation Activities
Wetlands Waterbody	No regular or planned rehabiliation efforts.	To be determined and prioritized through condition assessments and site inpsections.
Forest and open space	The Town is nearing the end of its Emerald Ash Borer (EAB) management program, and there is no additional funding planned for forest restoration activities. Restoration programs are implemented as needed in response to specific threats and damage, such as invasive species, diseases or extreme weather. An Urban Forest Study is completed every 10 years to assess the health of trees and forests based on aerial photo. The most recent study was completed in 2024. The aerial photo does not enable assessment of the understory.	To be determined and prioritized through condition assessments and site inpsections
Watercourses	A Stream Management Master Plan was completed in 2019, and the Town is continuing to implement the recommended erosion control improvements. Outstanding needs include: • Wellinton Street - Reach-Scale Engineering • 45 Tyler Street - Natural Channel Design • Sandusky Park - Selective Works and Assisted Natural Recovery	Complete the improvements identified in the 2019 Stream Management Master Plan.

Asset Class	Current Rehabilitation Activities	Potential Future Rehabilitation Activities
	• Harriman Road Driveways - Selective Works or Natural Channel Design	
Urban Trees	Street and park trees are individually replaced when they are damaged, dying or dead. Town staff complete a tree inspection and inventory on one quadrant of the Town each year. As such, trees are inspected every 4 years. During the inspection, trees are maintained or identified for replacement. Trees are also identified for replacement through the Urban Forest Study, which is completed every 10 years, and assesses the health of trees based on aerial photo. The most recent study was completed in 2024.	Continue replacing trees as needed, based on annual inspections, the Urban Forest Study and reports by residents and staff. As trees are replaced, strive to achieve the species diversity target defined in the LOS (based on the Urban Forest Plan), and to shift to native and appropriate non-native, non-invasive species that have a higher tolerance and lower vulnerability to climate change impacts.
Urban Parks	As per the Park Maintenance Standard, manicured grassy areas are not restored or re-sodded unless, except for high wear areas of sports fields.	Continue in accordance with existing maintenance standards.
Community Gardens	These constructed assets are replaced and renewed as needed. The existing Community Garden is approximately 25 years old, and is in Good condition, so renewal is not currently planned.	Monitor the existing Community Garden for signs of deterioration, and renew as needed. A second Community Garden is being constructed in 2024, and is not expected to require renewal in the AM Plan's 10-year planning period.
Pet Cemetery	The Pet Cemetery was purchased in 2011 and has been undergoing restoration since 2017. The restoration is almost complete, and no additional renewal needs are anticipated.	Establish regular on-site monitoring and assessment of the Pet Cemetery, to proactively identify restoration and rehabilitation needs.

4.3 Summary of Lifecycle Management Needs

This section identified current lifecycle management activities and potential future activities to address risks to natural assets and achieve desired LOS.

4.3.1 Managing Risk

Based on the Town's CCAP and interviews with Town staff, invasive species, pests and diseases, and wildlife impacts (specifically beavers) present High-medium risks to the Town's natural assets. Low-medium risks include extreme weather, contamination, overuse, and misuse. Low risks include unauthorized edge encroachment or disturbances. No threats were ranked as High risk.

Risk treatments recommended by the CCAP and reinforced by recommendations from the Urban Forest Study include:

1. **Tree and Plant Selection**

   Regularly assess the Town's planting list to plant trees, shrubs and other plants that are native or non-invasive, low-maintenance, and resilient to invasive species, pests, diseases and projected climate conditions.

2. **Before Extreme Weather Events**

   Assess the costs and benefits of increasing the current tree inspection and maintenance process (one quadrant of the Town each year) to identify hazardous trees and undertake preventative maintenance before damage occurs during extreme weather events. Implement the optimal inspection and maintenance frequency.

3. **After Extreme Weather Events**

   Continue applying procedures in the Park Maintenance Plan to inspect parks following extreme weather events to identify damaged landscaping and amenities to prioritize repairs and minimize service disruptions.

4. **Managing Non-Climate Threats**

   Establish a program to monitor and assess degradation of natural assets due to invasive species, pests, diseases, contamination, overuse, misuse, unauthorized edge encroachment or other disturbances. Continue taking proactive approaches to address new and emerging invasive species, such as hemlock woolly adelgid and oak wilt. Consider targeted removal of high priority invasive plant species at high priority sites following best practices. Implement actions to restore degraded assets and to prevent future degradation.

5. **Managing Wildlife Threats**

   Explore options for managing beavers and formalize an approach to reducing their negative impacts on the tree canopy and drainage.

In addition, asset failure risk was assessed for individual urban trees, and it was found that 0.1% of urban trees were considered Very High risk, representing a total of approximately 60 trees and a replacement value of $95,000. It is recommended that the Town remove and replace these trees.

4.3.2 Managing the Asset Lifecycle

In addition to the Town's current practices for managing natural assets across the stages of the lifecycle, potential future activities for the Town to consider for each lifecycle stage include the following:

- Plan and Design
    - Continue updating the Stream Management Master Plan and Urban Forest Study every 10 years
    - Incorporate the Pet Cemetery into Official Plan and Parks and Recreation Master Plan when these are updated.

- Construct and Secure
    - Due to land constraints and the high cost of land it is not feasible for the Town to maintain the current LOS of natural area assets and natural enhanced assets per 1,000 people.
    - Given these constraints, construct and secure strategies should focus on working toward meeting the Town's 40% canopy cover target.
- Monitor and Maintain
    - Establish a program to assess and monitor degradation of natural assets, as described in Section 4.3.1, Recommendation 4 – Manage Non-Climate Threats. This should include assessing the condition of any newly acquired lands if any are secured.
    - Continue executing operations and maintenance activities recommended by the Stream Management Master Plan, including conducting regular field walks.
    - Continue maintaining trees in accordance with the Park Maintenance Standard and implement recommendations from the 2024 Urban Forest Study.
    - Continue maintaining urban parkland in accordance with the Park Maintenance Standard.
    - Continue formalizing maintenance standards for community gardens and pet cemetery, then implement.
- Rehabilitation and Restoration
    - Implement restoration needs identified through the assessment of natural assets.
    - Complete the improvements identified in the 2019 Stream Management Master Plan.
    - Continue replacing trees based on annual inspections, the Urban Forest Study and reports by residents and staff. Prioritize the trees identified as Very High risk in Table 4-6. As trees are replaced, consider the recommendations in the Tree and Plant Selection list updated in alignment with Section 4.3.1, Recommendation 1 – Tree and Plant Selection. Strive to achieve the species diversity target defined in the LOS (based on the Urban Forest Plan), and to shift to native and appropriate non-native, non-invasive species that have a higher tolerance and lower vulnerability to climate change impacts.

The next section discusses the estimated costs of the recommended risk mitigations and potential future lifecycle activities.

5 FINANCIAL STRATEGY

This section presents three options for investing in the management of natural assets. Each option carries a different cost, and delivers a different lifecycle benefits. The scenarios are:

- **Scenario A: Status Quo**
  Manage assets according to current practices and planned restoration activities. Replace dead and dying trees based on capacity of existing budget.
- **Scenario B: Status Quo with Moderate Rehabilitation, Monitoring and Maintenance**
  Continue status quo actvities and initiate programs to manage invasive species, conduct targeted planting and seeding, and assess condition of natural area assets. Replace all dead and dying trees (as identified in 2024) over the 10-year period.
- **Scenario C: Status Quo with High Rehabilitation, Monitoring and Maintenance**
  Continue status quo actvities and initiate programs to more aggressively manage invasive species, conduct targeted planting and seeding, and assess condition of natural area assets. Replace all dead and dying trees (as identified in 2024) over the 10-year period and allow for replacement of additional trees that may fail during that period.

As indicated by their names, the strategies differ primarily in their level of monitoring and maintenance of natural assets. Scenario A: Status Quo includes monitoring and maintenance of natural enhanced assets, but very little for natural area assets. Scenario B initiates rehabilitation, monitoring and maintenance for natural assets. Scenario C is similar to Scenario B, but includes funds for more aggressive rehabilitation, monitoring and maintenance.

Due to land constraints and the high cost of land, none of the Scenarios include the addition of natural area or enhanced assets. That means the existing natural area and enhanced assets will need to support the growing population.

The details of each Scenario are described below, followed by a summary comparison.

5.1 Scenario A: Status Quo

Table 5-1 summarizes the lifecycle activities included in the Status Quo scenario. As previously explained, no natural area assets or natural enhanced assets (community gardens, parklands or pet cemeteries) are planned to be added.

The following assumptions were used to estimate the finanical forecasts for the status quo scenario:

- Rehabilitation and Restoration
  - It is assumed that the existing (2024) operational budget will be used to replace dead and dying trees. Specifically, this scenario assumes that tree replacement activities will be limited to the existing (2024) operational budget of $64,000/year. With that amount, and a cost of $2,050 per tree replacement ($600 to plant a new tree, $1,250 to remove the above ground portion of the tree and $200 to remove

the stump)[7], the scenario allows for the replacement of only 28.4 trees/year or 284 trees over the 10-year period. This accounts for 43% of the 666 trees identified in 2024 as being in Very Poor condition, and leaves no additional funding for net new trees.

  - Recommendations of the 2019 Stream Management Master Plan will be implemented, including $8.44 million of stream rehabilitation projects, which are already included in the Town's 10 year capital plan.

- Monitor and Maintain
  - The stream monitoring walks are estimated to cost $45,000, and are recommended in 2028 to provide data to the Stream Management Master Plan update. This is based on the length of stream to be inspected and an average cost of $1,000/km.[8]
  - Includes the continued maintaince efforts for urban parks, community gardens, and the pet cemetery. This cost is based on current budget expenses and an estimate staff time related to these assets to generate a average maintenace cost of $431,187/year.
  - Tree maintenace costs are esitmated using a similar process including current expenses and staff time to generate an average maintenace cost of $353,160/tree (or $13.4/tree per year). The per tree estimate is used scale the tree costs based estimated changes in the number of trees over the 10 year period.
- Plan and Design
  - 10-year update of the Stream Management Master Plan (required in year 2029), which is expected to cost about $150,000.
  - Updated tree inventory is based on what is currently reported in the 10-year Capaital Budget amounting to $36,200 in 2024.
  - An update to the Urban Forest Study is also included for 2033 and is estimated based on the Town's portion of the cost to complete the recent 2023 as repoted in the 10 year capital budget.

[7] Unit costs for tree planting and removal of tree and stump are general assumptions, which were verified by Town staff as reasonable estimates based on typical costs paid by the Town.

[8] The assumed unit cost of $1000 per km is based on costs reported by CVC (2020) in *Life Cycle Costing of Restoration and Environmental Management Actions: Costing Natural Assets in Peel Region.* The average cost captures anticipated time for travel to and from the site, to walk the trail and complete inspection, as well as pre-planning and follow-up data entry.

Table 5-1 Scenario A: Status Quo Lifecycle Activities

Lifecycle Stage	**Activities for Natural Area Assets** (Forests and Open Spaces, Water Bodies, Wetlands, Watercourses)	**Activities for Natural Enhanced Assets** (Community Gardens, Urban Parks, Urban Trees and Pet Cemetery)
Construct and Secure	None	None
Rehabilitation and Restore	In accordance with 2019 Stream Managemet Master Plan, **complete recommended stream rehabilitation** projects: • Tyler St. • Sandusky Park • Harriman Rd. • Wellington St. Phases 1 and 2 In accordance with current practices: • **No invasive species contro**l • **No targeted seeding and planting** in natural area assets	In accordance with current practices, complete $64,000/year of tree replacements each year. This allows for **replacement of 28.4 trees/year** for a total of 284 trees over 10 years (43% of the 666 trees identified in 2024 as being in Very Poor condition). No rehabilitation or restoration needs were identified for Community Gardens, Urban Parks or Pet Cemetery over the next 10 years.
Monitor and Maintain	Conduct **stream monitoring walks**, as recommended by 2019 Stream Managemet Master Plan. **No condition assessment of natural area assets** (in accordance with current practices).	Continue **status quo maintenance practices** for urban trees, urban parks, community gardens and the pet cemetery. Status quo activities are defined in the Parks Maintenance Standards.
Plan and Design	**Update Stream Management Master Plan** on 10-year cycle (next update due 2029).	In accordance with current plans: • **Update tree inventory in 2025** • **Update Urban Forest Study** in 2034 (10-year cycle).

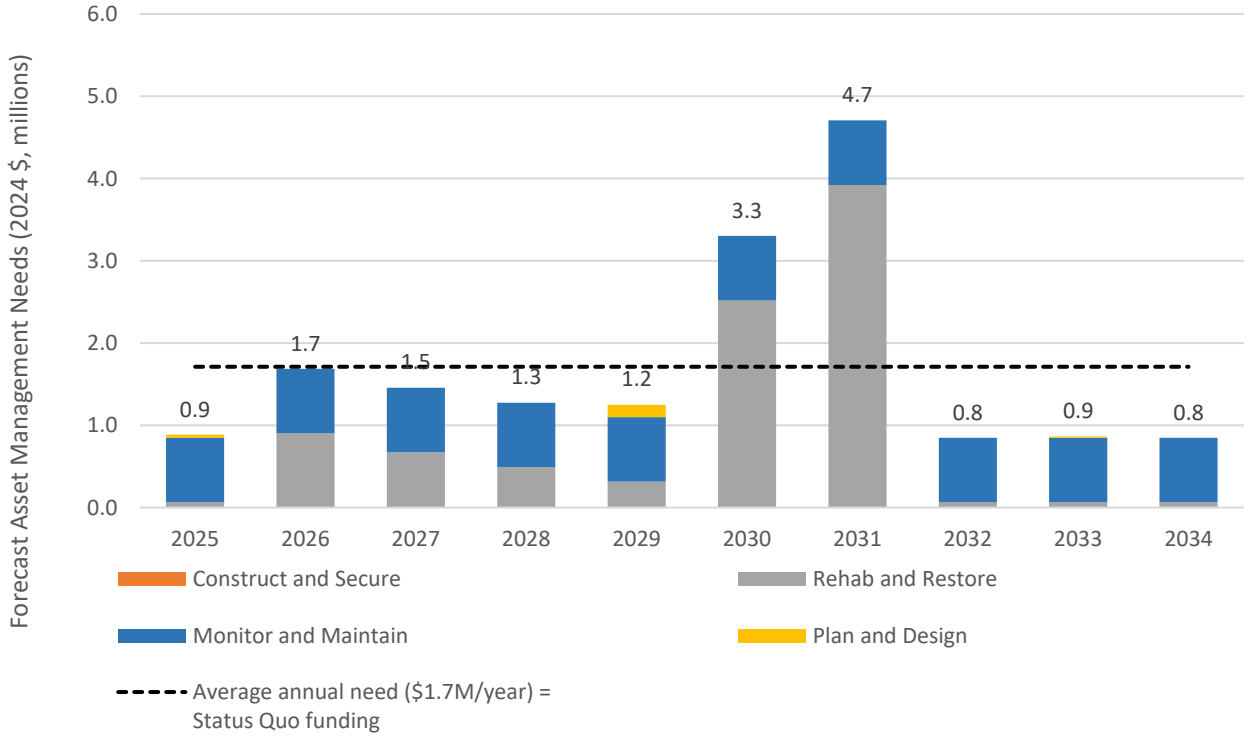
Table 5-2 and Figure 5-1 outline the status quo scenario financial needs forecast over a ten-year period from 2025 to 2034. There are no planned expenditures throughout the period for construction and securement activities. The cost of rehab and restore activities vary over the 10-year based on the planned timing of stream rehabilitaion works. For monitor and maintain activities, the expenditure is consistent each year at $784,347. Plan and design activities also vary depending on the assumed timing of the study and plan updates. Collectively, the total forecasted expenditure across all categories over the 10-year period is $17.1 million, with an average annual expenditure of $1.7 (indicated by the black dash line in Figured 5-1). See Appendix D for detailed financial tables.

This scenario is derived from Status Quo actvities and planned budget allocations, and thus represents the anticipated available funding.

Table 5-2 Scenario A: Finanical Needs Forecast 2025-2034

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	10-year TOTAL	10-year ANN AVG
Construct and Secure	-	-	-	-	-	-	-	-	-	-	-	-
Rehab and Restore	64,000	902,000	672,000	490,000	315,000	2,518,000	3,922,000	64,000	64,000	64,000	9,075,000	907,500
Monitor and Maintain	784,347	784,347	784,347	784,347	784,347	784,347	784,347	784,347	784,347	784,347	7,843,471	784,347
Plan and Design	36,200	-	-	-	150,000	-	-	-	15,000	-	201,200	20,120
OVERALL TOTAL	884,547	1,686,347	1,456,347	1,274,347	1,249,347	3,302,347	4,706,347	848,347	863,347	848,347	**17,119,671**	**1,711,967**

Figure 5-1 Scenario A: Financial Needs Forecast 2025-2034



5.2 Scenario B: Moderate Rehab, Monitoring and Maintenance

Table 5-3 lists the lifecycle activities included in the moderate scenario. The lifecycle activites are the same as described in Scenario A, except for the following changes:

- Construct and Secure
    - 200 new trees planted over 10 years, or on average 20 trees/year at cost of $600/tree.
- Rehabilitation and Restore
    - Using the same unit cost assumtions, this scenario costs the replacement of all 666 tree in Very Poor condition over the next 10 years.
    - Invasive species controls are applied to 22.2 ha over the next 10 years. Based on costs reported by CVC (2020)[9], the unit cost for these procedures were estimated to be $6/m^2. When applied to the assumed area of treatment results in a cost of $1.33 million over 10-years.
    - Trageted seeding or planting activities are applied to 3.8 ha over the next 10 years. Based on costs reported by CVC (2020), the unit cost for these procedures were estimated to be $21/m^2. When applied to the assumed area of treatment results in a cost of $0.8 million over 10-years.

Table 5-3 Scenario B: Moderate Lifecycle Activities

Lifecycle Stage	Activities for Natural Area Assets (Forests and Open Spaces, Water Bodies, Wetlands, Watercourses)	Activities for Natural Enhanced Assets (Community Gardens, Urban Parks, Urban Trees and Pet Cemetery)
Construct and Secure	None	Adds 200 new trees over 10 years (20/year)
Rehabilitation and Restore	In accordance with 2019 Stream Managemet Master Plan, **complete recommended stream rehabilitation** projects: • Tyler St. • Sandusky Park • Harriman Rd. • Wellington St. Phases 1 and 2 Begin targeted rehabilitation and restoration where need is greatest. Over 10 years:	**Replaces 666 / 666 trees in Very Poor** condition (as identified in 2024) over the next 10 years. No rehabilitation or restoration needs were identified for Community Gardens, Urban Parks or Pet Cemetery over the next 10 years.

[9] CVC (2020). *Life Cycle Costing of Restoration and Environmental Management Actions: Costing Natural Assets in Peel Region.*

	• Complete invasive species control on 22.2 ha • Complete targeted seeding and planting over 3.8 ha.	
Monitor and Maintain	Conduct **stream monitoring walks**, as recommended by 2019 Stream Managemet Master Plan. Completes condition assessment on all natural areas in first 6 years, then continues on a cycle of assessing each property every 10 years (1/10th of portfolio per year).	Continue **status quo maintenance practices** for urban trees, urban parks, community gardens and the pet cemetery. Status quo activities are defined in the Parks Maintenance Standards. Increases tree maintenance activities in proprtion with addition of trees.
Plan and Design	**Update Stream Management Master Plan** on 10-year cycle (next update due 2029).	In accordance with current plans: • **Update tree inventory in 2025** • **Update Urban Forest Study** in 2034 (10-year cycle).

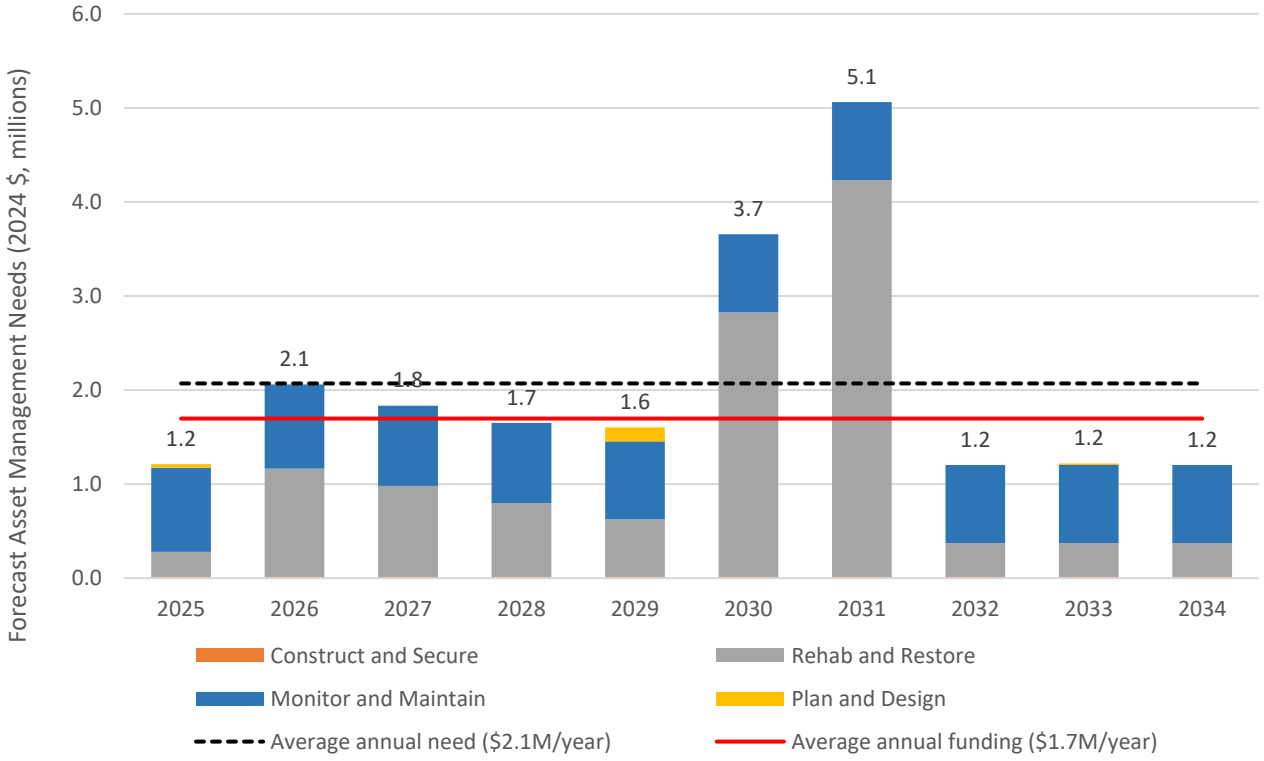
Table 5-4 and Figure 5-2 show the forecasted financial needs over a ten-year period for Scenario B. Construction and securement activities related to planting new trees are estimated to cost $120,000 over the next 10-years. As with Scenario A, rehab and restore activities vary over the 10-year based on the planned timing of stream rehabilitaion works. Monitor and maintain activies are higher than in Scenario A to allow for additional tree replacement, invasive species controls, and targeted planting and seeding. The plan and deisgn expenditures remain the same as Scenario A.

The overall forecasted need across all caategories for the 10-year period totals $20.68 million. The forcasted financial need surpasses the Status Quo Scenario by $3.56 million, with an average annual funding gap of $0.36 million (indicated by the difference between the red line and the black dash line in Figure 5-2). See Appendix D for detailed financial tables.

Table 5-4 Scenario B: Financial Needs Forecast 2025-2034

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	10-year TOTAL	10-year ANN AVG
Construct and Secure	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	120,000	12,000
Rehab and Restore	266,810	1,150,838	966,867	784,867	609,867	2,812,867	4,216,867	358,867	358,867	358,867	11,885,583	1,188,558
Monitor and Maintain	893,939	894,206	850,638	850,905	829,255	829,522	829,790	830,058	830,326	830,593	8,469,232	846,923
Plan and Design	36,200	-	-	-	150,000	-	-	-	15,000	-	201,200	20,120
OVERALL TOTAL	1,208,949	2,057,045	1,829,504	1,647,772	1,601,122	3,654,389	5,058,657	1,200,925	1,216,193	1,201,460	**20,676,016**	**2,067,602**
Difference from Status Quo	324,402	370,698	373,157	373,425	351,775	352,042	352,310	352,578	352,846	353,113	3,556,345	355,635

Figure 5-2 Scenario B: Financial Needs Forecast 2025-2034



5.3 Scenario C: High Rehab, Monitoring and Maintenance

Table 5-5 lists the lifecycle activities included in the Scenario C. The lifecycle activites are the same as described in Scenario B, with exception of the the following:

- Rehabilitate and Restore
    - Using the same unit cost assumtions, this scenario replaces all 666 tree in Very Poor condition over the next 10 years plus an additional 9-10 trees per year for a total of 760 trees over 10-years).
    - Invasive species controls are applied to 66.5 ha over the next 10 years, using the same cost assumptions outlined for Sceanrio B.
    - Trageted seeding or planting activities are applied to 7.3 ha over the next 10 years, using the same cost assumptions outlined for Sceanrio B.

Table 5-5 Scenario C: High Lifecycle Activities

Lifecycle Stage	**Activities for Natural Area Assets** (Forests and Open Spaces, Water Bodies, Wetlands, Watercourses)	**Activities for Natural Enhanced Assets** (Community Gardens, Urban Parks, Urban Trees and Pet Cemetery)
Construct and Secure	None	Adds 2,000 new trees over 10 years (200/year)
Rehabilitation and Restore	In accordance with 2019 Stream Managemet Master Plan, **complete recommended stream rehabilitation** projects: • Tyler St. • Sandusky Park • Harriman Rd. • Wellington St. Phases 1 and 2 Begin targeted rehabilitation and restoration where need is greatest. Over 10 years: • Complete invasive species control on 66.5 ha • Complete targeted seeding and planting over 7.3 ha.	**Replaces 760 trees** over the next 10 years, which includes the current 666 in Very Poor condition and allows for an additional 10/year. No rehabilitation or restoration needs were identified for Community Gardens, Urban Parks or Pet Cemetery over the next 10 years.
Monitor and Maintain	Conduct **stream monitoring walks,** as recommended by 2019 Stream Managemet Master Plan. Complete condition assessment on all natural areas in first 5 years, then continue on a cycle of assessing each	Continue **status quo maintenance practices** for urban trees, urban parks, community gardens and the pet cemetery. Status quo activities are defined in the Parks Maintenance Standards.

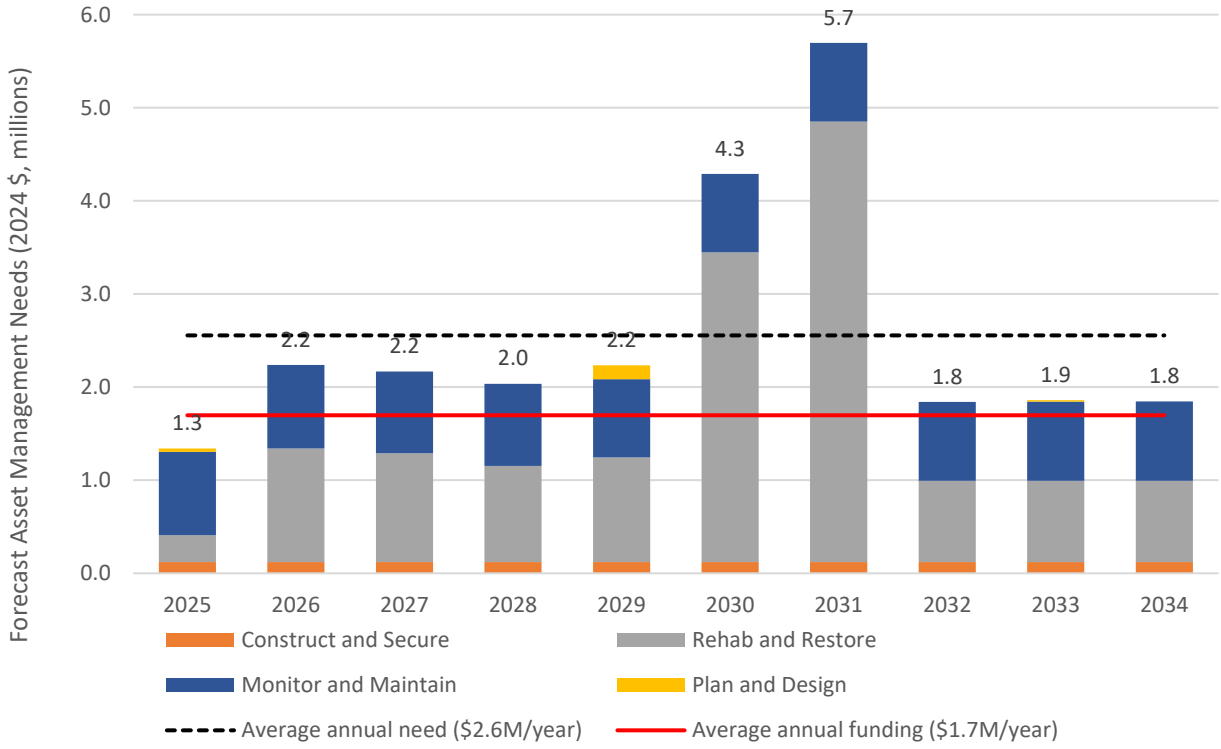
	property every 10 years (1/10th of portfolio per year).	Increase tree maintenance activities in proprtion with addition of trees.
Plan and Design	**Update Stream Management Master Plan** on 10-year cycle (next update due 2029).	In accordance with current plans: • **Update tree inventory in 2025** • **Update Urban Forest Study** in 2034 (10-year cycle).

Table 5-6 and Figure 5-3 display the 10-year financial needs forecast under Scenario C. The total projected financial need for all categories is estimated to be $25.48 million over the 10-year period, with an annual average need of $2.55 million. Compared to Scenario A, Scenario C requires an additional $8.36 million over the 10-year period, which breaks down to an average annual funding gap of $0.84 million, indicated by the difference between the black dash line and the red line in Figure 5-3. See Appendix D for detailed financial tables.

Table 5-6 Scenario C: Cost Forecast 2025-2034

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	10-year TOTAL	10-year ANN AVG
Construct and Secure	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	1,200,000	120,000
Rehab and Restore	287,310	1,217,367	1,164,905	1,028,934	1,116,954	3,319,954	4,723,954	865,954	865,954	865,954	15,457,238	1,545,724
Monitor and Maintain	893,939	896,616	877,375	880,053	838,894	841,571	844,249	846,926	849,604	852,281	8,621,507	862,151
Plan and Design	36,200	-	-	-	150,000	-	-	-	15,000	-	201,200	20,120
OVERALL TOTAL	1,337,449	2,233,983	2,162,281	2,028,987	2,225,847	4,281,525	5,688,202	1,832,880	1,850,557	1,838,235	**25,479,944**	**2,547,994**
Difference from Status Quo	452,902	547,636	705,934	754,639	976,500	979,178	981,855	984,533	987,210	989,888	8,360,274	836,027

Figure 5-3 Scenario C: Cost Forecast 2025-2034



5.4 Summary and Recommendation

The three scenarios for natural asset management are compared in Tables 5-7 and 5-8. Table 5-7 summarizes the costs of each scenario. The table shows that 10-year costs range from $17.12 million for Scenario A (Status Quo) to $25.48 million for Scenario C (High).

As the Status Quo scenario, Scenario A represents the anticipated annual funding available, and is used to calculate the funding gap, or additional funding needed, for Scenarios B and C. The table shows that an average of $0.36 million/year would be needed for Scenarios B and $0.84 million/year would be needed for Scenarios C.

Table 5-7 Cost Comparison 2025-2034

	Scenario A Status Quo	Scenario B Moderate	Scenario C High
Total Cost 2025-2034 (2024 $, millions)	$17.12	$20.68	$25.48
Average Annual Cost (2024 $, millions/year)	$1.71	$2.07	$2.55
Anticipated Annual Average Funding (2024 $, millions/year)	$1.71	$1.71	$1.71
Average Annual Gap (2024 $, millions/year)	--	$0.36	$0.84

Table 5-8 compares the benefits or outcomes of each scenario. As shown in the table, Scenario A only replaces 43% of the known dead and dying trees, and does not plant any new trees to contribute to achieving the canopy target. Moreover, natural area condition assessments, invasive species control and targeted seeding and planting will not be conducted. This Scenario will leave the Town and its natural assets unprepared for hazards such as extreme weather, invasive species, encroachment and misuse.

Scenario B replaces 100% of the known dead and dying trees, and plants 200 new trees to contribute to achieving the canopy target. Moreover, natural area condition assessments will be completed on all properties in the first 6 years before transitioning to a 10-year cycle. Moderate programs of invasive species control and targeted seeding and planting will also be conducted.

Scenario C is similar to Scenario B, but aims to replace 100% of the known dead and dying trees, and allows for replacement of an additional 94 trees which may fall into Very Poor condition over the next 10 years. Two thousand (2000) new trees will be planted to contribute to the tree canopy target (but is still insufficient to maintain the current LOS ratio of trees to population). Natural area condition assessments will be completed on all properties in the first 5 years (1 year faster than Scenario B) before transitioning to a 10-year cycle, and invasive species control and targeted seeding and planting will also be conducted at a higher rate. This will better position the Town for the identified risks to its natural assets.

Table 5-8 Benefit Comparison

BENEFITS 2025-3034	Scenario A Status Quo	Scenario B Moderate	Scenario C High
Construct and Secure			
Net New Trees Planted	0	200 trees	2000 trees
Rehab and Restore			
Dead and Dying Trees Replaced	284 trees (43% of those identified in 2024)	666 trees (100% of those identified in 2024)	760 trees (100% of those identified in 2024 + others that may die over time)
Invasive Species Control (hectares treated)	0	22.2 ha	66.5 ha
Targeted Seeding and Planting (hectares treated)	0	3.8 ha	7.3 ha
Stream Rehabilitation projects completed	5 projects	5 projects	5 projects
Monitor and Maintain			
Condition Assessment (hectares assessed)	0	620.4 ha (all assets in first 6 years, followed by 10-year cycle)	664.7 ha (all assets in first 5 years, followed by 10-year cycle)
Tree Maintenance Increases with Net New Trees	n/a	Yes	Yes
Urban Park Maintenance	Same as current	Same as current	Same as current
Plan and Design			
Stream Management Master Plan Updated in 2029	Yes	Yes	Yes
Urban Forest Study Updated in 2034	Yes	Yes	Yes
Tree Inventory Updated in 2025	Yes	Yes	Yes

The costs and benefits are estimates of the potential needs that should be verified through field-based assessments of the natural assets. For this reason, Scenario B is recommended, because it includes a moderate program of assessment, maintenance and restoration activities. The data collected through the assessments will enable the Town to determine whether these programs should be reduced or expanded in the future.

To fund Scenario B, the Town may

- seek additional revenues through taxation or grants
- re-allocate funds from other programs (this may result in reduced levels of service in other prorams).

Moreover, although the Town recognizes that land constraints make future purchases of natural area assets unlikely, it is recommended that the Town continue to seek alternative ways to increase natural area asset capacity for its residents, for example, through maintenance agreements with external parties similar to the Town's existing agreements for use of the Duck's Unlimited property and Sheppard's Bush Conservation Area. There may also be opportunities for the Town to re-purpose some of its existing properties.

6 NCAMP IMPROVEMENT AND MONITORING

6.1 AM Plan Improvement Recommendations

The Town is committed to continually improving how assets are managed and how services are delivered. Development of AM Plans is an iterative process that includes improving data, processes, systems, staff skills, and organizational culture over time. Table 4-9 identifies recommendations for the Town that will help the AM Plan evolve and improve through each iteration.

Table 6-1 Asset Management Improvement Recommendations

Gap	Improvement Recommendation
State of Infrastructure	
Establish a condition assessment program for natural assets	For this AM Plan, condition scores for many asset classes were established based on staff knowledge and expertise. Future efforts should work toward establishing a condition assessment program, as recommended in Section 4 under Maintenance and Monitoring activities. The protocol should also include an assessment of condition for any acquired lands the Town may secure. Prior to beginning condition assessments it is recommended that the Town establish condition scoring criteria for different natural asset types, so that the appropriate data can be collected. For instance, the Town may refer to and adapt Credit Valley Conservation's "Rapid Condition Assessment Protocol."
Inventory improvements	An initial natural asset inventory has been developed based on the best available data which incorporates local Ecological Land Classification (ELC) mapping, the Town's parks and open space GIS layer, as well as available spatial data associated with community gardens, the pet cemetery, and watercourses. The inventory also includes lands maintained but not owned by the Town. Future refinements to consider include addressing: • While the inventory provides the best available depiction of the Town-owned natural assets, there are limitations with ELC data; for example, the ELC's defined land cover is not always an accurate reflection of what is on the land. • Land types should be defined consistently across the NCAMP and the Parks and Recreation Master Plan. For example, the Parks and Recreation Master Plan defines parklands to include all lands within the boundaries of a Town-owned park; however, for the purposes of the NCAMP, some of the areas are considered forests or open spaces (meadows). • Based on the GIS date, urban park assets (manicured grassy areas) in the NCAMP include park facilities that are not part of this AM plan, such as playgrounds, play courts, skate parks and splash pads. Future refinements should designate them appropriately. • New properties have been recently purchased that have not been included and should be added for the next AMP

Regular urban tree inventory updates	Continue to update and improve the accuracy of the street tree inventory. Design and implement processes to keep the tree inventory current by updating the asset data as trees are replaced or maintained. These updates should be incorporated into work order management processes, and tree inventory data should be required from developers and tree planting contractors.
Levels of Service	
Refinement of Levels of Service	LOS have been established for this AM Plan that demonstrate some of the important services delivered by natural assets. As the Town's AM maturity evolves for this asset portfolio, LOS should be updated and refined to improve the connections between LOS measures, management actions, and financial impacts.
Monitoring and Target Setting	LOS performance should be monitored relative customer satisfaction and cost to inform future target setting.
Use Town-wide tree targets to guide development of Town-owned tree targets	Although targets have been set for tree canopy and tree diversity, those targets are not directly applicable to the Town's asset performance, because the targets apply to all trees within the municipal boundaries, whereas the Town's asset performance relates specifically to Town-owned trees. The Town-wide tree targets should be used to guide development of Town-owned tree targets, which in turn will guide the Town's asset investment needs. For example, given that the Town-wide canopy target is 40%, how much of that should comprise Town-owned trees? Also, can the diversity target be applied to the Town-owned inventory, or should the Town aim for a different species mix to offset an imbalance in non-owned tree species?
Asset Management and Financial Analysis	
Risk Management	Consider building on the initial risk assessment for natural assets to further inform and prioritize risk mitigation actions for natural assets. However, it is recognized that the industry is still in the early stages of understanding how to best apply risk management assessment to natural assets and the Town's approach will evolve over time as the industry matures. The Natural Assets Initiative (2024)[10] recently released a guidance document that provides some potential options
Determine or refine growth needs assessment	Currently, LOS as defined by area of assets per capita provide a good metric for understanding the general LOS being provided. This LOS can also inform growth needs. However, there is a limit to how much land can be acquired and dedicated to natural assets as the population continues to grow. This AMP assumes no growth due to land and financial constraints, but some land acquisition may be possible that could reduce the decline of the population based LOS.
Conduct a rehabilitation and restoration needs assessment	To better understand the financial needs for natural assets, consider a site-specific assessment of rehabilitation and restoration needs, which would establish and prioritize necessary management inventions.

[10] NAI (2024). Nature is infrastructure: How to include natural assets in asset management plans. Natural Assets Initiative. naturalassetsinitiative.ca

Maintenance Costs	Current maintenance funding has been well defined for urban parks and urban trees. Working toward a better understanding of maintenance needs for natural area assets could shift some of the funding needs for managing natural assets from capital budgets to operation budgets as maturity with natural areas assets increases over time. Continue the initiative to implement a work order management system, which will be used to track maintenance and repair activities and costs at an asset level. This information can be used to improve future needs forecasting and budgeting.

6.2 AM Plan Monitoring and Review

The AM Plan will be updated every five years to ensure it reports an updated snapshot of the Town's asset portfolio and its associated value, age, and condition. It will ensure that the City has an updated 10-year outlook including service levels, costs of the associated lifecycle strategies and an assessment of any funding shortfalls.

Per O.Reg. 588/17, the Town will conduct an annual review of its progress in implementing this AM Plan and will discuss strategies to address any factors impeding its implementation.

6.3 Performance Measures

The effectiveness of this AM Plan can be measured in the following ways:

- The degree to which the forecast costs identified in this NCAMP are incorporated into the long-term financial plan,
- The degree to which the 1- to 5-year detailed works programs, budgets, business plans align with the recommendations of the NCAMP, and
- The degree to which the existing and projected service levels and service consequences, risks and residual risks are incorporated into the Strategic Planning documents and associated plans.

APPENDIX A: ESTABLISHING NCAMP INVENTORY

To establish the NCAMP inventory, the spatial boundaries of town-owned land and 2 properties (Ducks unlimited Canada lands and the Ontario Heritage Trust's Sheppard's Bush property) of town-maintained land were combined. A natural asset hierarchy was then established to organize the inventory into asset types within the parent categories of "Natural Area Assets" and "Natural Enhanced Assets". The data utilized to compose the inventory is outlined in Table A-1.

Table A-1 Data Utilized

Data Name	Source
Municipal Boundary	Data_NCAMP.gdb / Municipal Boundary
Building Footprints	Data_NCAMP.gdb / Building Footprints
LSRCA Ecological Land Classification	Data_NCAMP.gdb / LSRCA
Parks and Open Space Lots (New)	Aurora
Community Gardens	Aurora - Additionally provided shapefile for Community Gardens
Pet Cemetery	Aurora - Additionally provided shapefile for Pet Cemetery
Additional Town Owned Land	Aurora - Additionally provided shapefile for polygons missing from original Town Owned Land data
Town Maintained Land	Aurora - Additionally provided shapefile for further delineation of Town Maintained Land
Streams & Reaches v2	Aurora

To develop the Natural Area Assets portion of the inventory hierarchy, ELC classes were used to delineate natural polygon areas on the town-owned and -maintained lands.An outline of the conversion of ELC classes to Asset Type groups is outlined in Table A-2.

Table A-22 Conversion of ELC Category to Asset Class groupings

Asset Class	Ecological Land Calssification Category
Forest and Open Space	Coniferous Forest
	Cultural Plantation
	Cultural Thicket
	Cultural Woodland
	Deciduous Forest
	Mixed Forest
	Cultural Meadow
Waterbody	Open Water
	Submerged Shallow Aquatic
	Mixed Shallow Aquatic
Wetland	Deciduous Swamp
	Meadow Marsh
	Mixed Swamp
	Shallow Marsh

For watercourse assets, data (Streams & Reaches v2) was provided for the project and was used to identify the stream segments and attributes associated with Town-owned and managed properties.

The identification of Natural Enhanced Assets was performed using multiple datasets. For Urban Trees, data was provided that identified individual street and park trees. This data was unmodified and adopted to meet the hierarchy structure of the inventory. Urban Parks were identified using the “Parks and Open Spaces Lots” dataset. Parks and Open Space boundaries in the city provided data did not have complete ELC coverage within the area. For example, an ELC forest polygon may have only covered a portion of a park area, leaving the rest of the park as a gap in the inventory. In areas classified as Urban Park in the “Parks and Open Space Lot” dataset, gaps were classified as “Urban Park”. In areas classified as Urban Forest and Open Space in the “Parks and Open Space Lot” dataset, gaps were classified as “Forest and Open Space”.

Community Gardens and a Pet Cemetary were added into the inventory by merging the layers into the inventory and prioritizing their boundaries as a uniquely classified enhanced asset over any existing classifiction

Once the inventory was organized, the data was clipped to be restricted to the boundaries of the merged Town Owned Land and Town Maintained Land. Any assets that fell within Town Maintained land were assigned an attribute within the data to allow easier filtering of Town Maintained assets.

Finally, the data was inspected and compared to available satilite imagery to identify any glaring errors assoicated with the allocation of the ELC classes, with emphasis on ensuring manicured turf areas were not allocated a natural land cover. A total of 3 properties were adjusted based on this review.

APPENDIX B: UNIT COST ASSUMPTIONS

Asset Category	Asset Class	Asset Subtype	Unit Cost
Natural Area Assets[a]	Forest and unmanicured open space	Cultural Meadow	$198,144 per ha
		Coniferous Forest	$173,847 per ha
		Deciduous Forest	
		Mixed Forest	
		Cultural plantation	
		Cultural woodland	
		Cultural Thicket	$188,546 per ha
	Wetland	Deciduous Swamp	$268,404 per ha
		Mixed Swamp	
		Thicket Swamp	$245,945 per ha
		Meadow Marsh	$224,816 per ha
		Shallow Marsh	
	Waterbody		NA[b]
	Watercourse		$1,700,200 per km[c]
Natural Enhanced Assets	Community Garden		$150,000 for the existing garden $300,000 for the newly built garden[d]
	Pet Cemetery		$300,000[e]
	Manicured open space		$200,000 per ha[f]
	Urban Trees		$600 per tree + $16.50 per cm dbh (removal)[g]

a) Natural asset unit costs per ha are based on 2023 typical restoration costs provided by TRCA. In general, the NCAMP replacement values do not include land costs.

b) For waterbodies restoration costs were not readily available.

c) While there has been some stream restoration works done within Aurora, those have focused more on shoreline and stream bank stablization and may not sufficiently capture the 'replacement cost' value of the whole stream feature. Future work could explore the potential cost of broader stream restoration focused on recreating natural stream features.CVC (2019) provides an approximate estimate of stream corridor rehabilitation. It should be noted that costs for stream rehabilitation projects can vary widely depending on local context, site access, extent of flow management required, etc. The CVC (2019) rehabliation costs are based on stream corridor segments assumed to be 500m long and 20m wide. For comparison, Aurora's Stream Management Master Plan estimates a reach-scale restoration project for Tannery Creek could cost $7M for 1,250m (or about $5.6 M per km).

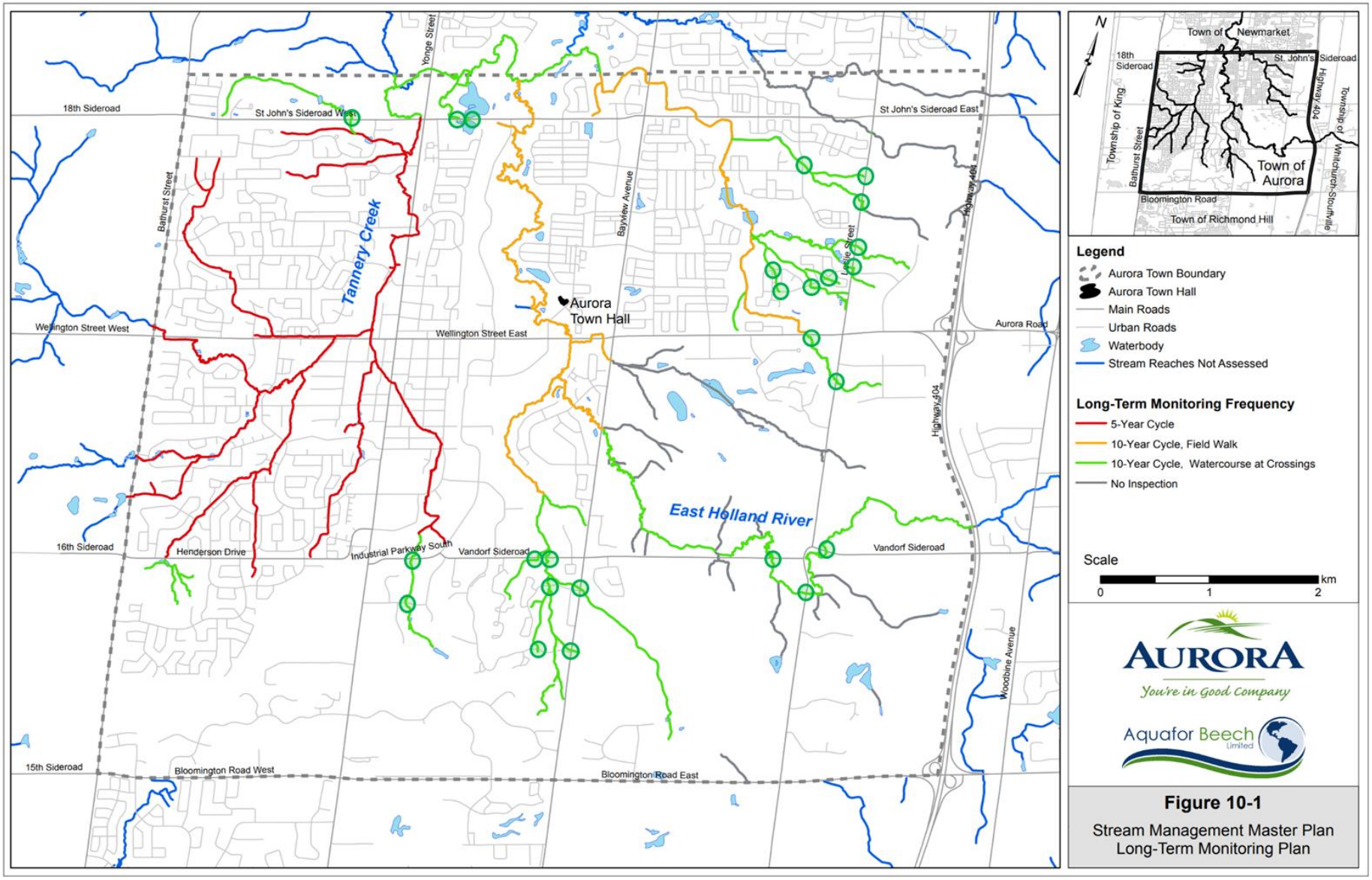
d) Community garden costs are based on an estimated construction cost for the newest community garden. There are two community gardens both with 52 garden plots. Therefore, $300,000 per garden was applied.

e) The pet cemetery is considered a cultural heritage area and considered irreplaceable. However, for the purpose of the AM plan, recent upgrade costs estimated to be roughly $300,000 is applied. In general, the NCAMP replacement values do not include land costs.

f) Urban park areas largely capture mainicured grassy areas. Therefore, the average cost of $200,000/ha, used as a replacement cost is based on $20/sqm cost of installed sod.

g) Replacement costs for individually managed urban trees was established using the diameter replacement method. A cost of $600 per tree is applied to the estimated number of trees needed to replace existing trees, which is determined by dividing the diamater at breast height (dbh) of each tree by the assumed dbh of the replacement tree (5cm). This approach is used to help establish a “like for like” replacement. For instance, a replacement tree with a 5cm dbh will not be able to provide the same service level as a tree with 100cm dbh. It should be recongized that the Town does not actually replace trees based on this ratio. The ratio is used for the purpose of this AM plan to establish the “like for like” replacement cost. In addition to the tree replacement, a removal cost is also applied based on an assumed average costs for tree removal and stumping ($1,650 per tree). However, in an effort to avoid applying a removal and stumping cost for mature trees to the young trees currently in the inventory, the $1,650 was assumed to apply to 100cm dbh tree to generate a removal and stumpage cost that could be scaled by each trees dbh. The resulting assumption is a removal and stumpage cost of $16.50 per 1cm dbh.

APPENDIX C: MAP OF RECOMMENDED MONITORING FREQUENCY



Source: Stream Management Master Plan, 2019

APPENDIX D: DETAILED FINANCIAL FORECAST TABLES

This Appendix provides detailed cost projections for:

- Scenario A: Status Quo
- Scenario B: Status Quo with Moderate Rehabilitation, Monitoring and Maintenance
- Scenario C: Status Quo with High Rehabilitation, Monitoring and Maintenance

Scenario A – Status Quo

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	10-Year TOTAL	10-Year ANN AVG
Construction and Securing (Growth)											**TOTAL**	**ANN AVG**
Planting costs	-	-	-	-	-	-	-	-	-	-		
Total Construct and Secure	-	-	-	-	-	-	-	-	-	-	**-**	**-**
Rehabilitation and Restoration											**TOTAL**	**ANN AVG**
Total land (open spaces, forests, wetlands)	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***		
% area to control each year	***-***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	**-**	
Invasive Species Control	-	-	-	-	-	-	-	-	-	-	-	-
% area to seed / plant each year	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	**-**	
Targeted Seeding or Planting	-	-	-	-	-	-	-	-	-	-	-	-
Stream Rehabilitation												
Stream Rehabilitation - Tyler St.	-	718,000	-	-	-	-	-	-	-	-	718,000	71,800
Stream Rehabilitation - Sandusky Park	-	120,000	608,000	-	-	-	-	-	-	-	728,000	72,800
Stream Rehabilitation - Harriman Rd.	-	-	-	-	251,000	-	1,300,000	-	-	-	1,551,000	155,100
Stream Rehabilitation - Wellington St. Phase 1	-	-	-	426,000	-	2,454,000	-	-	-	-	2,880,000	288,000
Stream Rehabilitation - Wellington St. Phase 2	-	-	-	-	-	-	2,558,000	-	-	-	2,558,000	255,800
Total trees to replace	***31.2***	***31.2***	***31.2***	***31.2***	***31.2***	***31.2***	***31.2***	***31.2***	***31.2***	***31.2***	***312.2***	
Urban Tree Replacement (only the VP in 2024)	64,000	64,000	64,000	64,000	64,000	64,000	64,000	64,000	64,000	64,000	640,000	64,000
Total Rehab and Restore	64,000	902,000	672,000	490,000	315,000	2,518,000	3,922,000	64,000	64,000	64,000	**9,075,000**	**907,500**
Monitoring and Maintenance											**TOTAL**	**ANN AVG**
Total land (open spaces, forests, wetlands)	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***		
% to assess each year	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***	***0%***		
Natural area assets assessments	-	-	-	-	-	-	-	-	-	-	-	-
Number of trees to be maintained	***26,380***	***26,380***	***26,380***	***26,380***	***26,380***	***26,380***	***26,380***	***26,380***	***26,380***	***26,380***		
Urban Tree Maintenance, based on existing (no adjustment for additional trees)	353,160	353,160	353,160	353,160	353,160	353,160	353,160	353,160	353,160	353,160	3,531,600	353,160
Stream Monitoring												
Red - 2019 Stream Management Master Plan every 10 years*	-	-	-	23,360	-	-	-	-	-	-	23,360	2,336
Yellow - 2019 Stream Management Master Plan recommended every 10 years	-	-	-	14,900	-	-	-	-	-	-	14,900	1,490
Green - 2019 Stream Management Master Plan recommended every 10 years, crossings only	-	-	-	6,250	-	-	-	-	-	-	6,250	625
Urban park, community garden, pet cemetery	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***		
Existing maintenance cost	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	4,311,871	431,187
Total Monitor and Maintain	784,347	784,347	784,347	784,347	784,347	784,347	784,347	784,347	784,347	784,347	**7,843,471**	**784,347**
Plan and Design											**TOTAL**	**ANN AVG**
Stream Management Master Plan	-	-	-	-	150,000	-	-	-	-	-	150,000	15,000
Urban Forest Study	-	-	-	-	-	-	-	-	15,000	-	15,000	1,500
Tree inventory update	36,200	-	-	-	-	-	-	-	-	-	36,200	3,620
Total Plan and Design	36,200	-	-	-	150,000	-	-	-	15,000	-	**201,200**	**20,120**

Scenario B – Status Quo with Moderate Rehabilitation, Monitoring and Maintenance

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	10-Year TOTAL	10-Year ANN AVG
Construction and Securing (Growth)											**TOTAL**	**ANN AVG**
Planting costs	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000		
Total Construct and Secure	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	**120,000**	**12,000**
Rehabilitation and Restoration											**TOTAL**	**ANN AVG**
Total land (open spaces, forests, wetlands)	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***		
% area to control each year	***0.5%***	***0.5%***	***0.5%***	***0.5%***	***0.5%***	***0.5%***	***0.5%***	***0.5%***	***0.5%***	***0.5%***	***21.9***	
Invasive Species Control	131,510	131,510	131,510	131,510	131,510	131,510	131,510	131,510	131,510	131,510	1,315,099	131,510
% area to seed / plant each year	***0.00%***	***0.05%***	***0.10%***	***0.10%***	***0.10%***	***0.10%***	***0.10%***	***0.10%***	***0.10%***	***0.10%***	***3.7***	
Targeted Seeding or Planting	-	46,028	92,057	92,057	92,057	92,057	92,057	92,057	92,057	92,057	782,484	78,248
Stream Rehabilitation												
Stream Rehabilitation - Tyler St.	-	718,000	-	-	-	-	-	-	-	-	718,000	71,800
Stream Rehabilitation - Sandusky Park	-	120,000	608,000	-	-	-	-	-	-	-	728,000	72,800
Stream Rehabilitation - Harriman Rd.	-	-	-	-	251,000	-	1,300,000	-	-	-	1,551,000	155,100
ːam Rehabilitation - Wellington St. Phase 1	-	-	-	426,000	-	2,454,000	-	-	-	-	2,880,000	288,000
Stream Rehabilitation - Wellington St. Phase 2	-	-	-	-	-	-	2,558,000	-	-	-	2,558,000	255,800
Total trees to replace	***66.0***	***66.0***	***66.0***	***66.0***	***66.0***	***66.0***	***66.0***	***66.0***	***66.0***	***66.0***		
Urban Tree Replacement (only the VP in 2024)	135,300	135,300	135,300	135,300	135,300	135,300	135,300	135,300	135,300	135,300	1,353,000	135,300
Total Rehab and Restore	266,810	1,150,838	966,867	784,867	609,867	2,812,867	4,216,867	358,867	358,867	358,867	**11,885,587**	**1,188,558**
Monitoring and Maintenance											**TOTAL**	**ANN AVG**
Total land (open spaces, forests, wetlands)	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***		
% to assess each year	***25%***	***25%***	***15%***	***15%***	***10%***	***10%***	***10%***	***10%***	***10%***	***10%***	***613.7***	
Natural area assets assessments	109,592	109,592	65,755	65,755	43,837	43,837	43,837	43,837	43,837	43,837	613,713	504,121
nber of trees to be maintained	***26,380***	***26,400***	***26,420***	***26,440***	***26,460***	***26,480***	***26,500***	***26,520***	***26,540***	***26,560***		
Urban Tree Maintenance, based on existing cost/tree, increases with addition of trees	353,160	353,428	353,695	353,963	354,231	354,499	354,766	355,034	355,302	355,570	3,543,649	354,365
Stream Monitoring												
Red - 2019 Stream Management Master Plan recommended every 5 years	-	-	-	23,360	-	-	-	-	23,360	-	46,720	4,672
Yellow - 2019 Stream Management Master Plan recommended every 10 years	-	-	-	14,900	-	-	-	-	-	-	14,900	1,490
Green - 2019 Stream Management Master Plan recommended every 10 years, crossings only	-	-	-	6,250	-	-	-	-	-	-	6,250	625
an park, community garden, pet cemetery	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***		
ːting maintenance cost	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	4,311,871	431,187
Total Monitor and Maintain	893,939	894,206	850,638	850,905	829,255	829,522	829,790	830,058	830,326	830,593	**8,469,232**	**846,923**
Plan and Design											**TOTAL**	**ANN AVG**
Stream Management Master Plan	-	-	-	-	150,000	-	-	-	-	-	150,000	15,000
Urban Forest Study	-	-	-	-	-	-	-	-	15,000	-	15,000	1,500
Tree inventory update	36,200	-	-	-	-	-	-	-	-	-	36,200	3,620
Total Plan and Design	36,200	-	-	-	150,000	-	-	-	15,000	-	**201,200**	**20,120**

Scenario C – Status Quo with High Rehabilitation, Monitoring and Maintenance

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	10-Year TOTAL	10-Year ANN AVG
Construction and Securing (Growth)											**TOTAL**	**ANN AVG**
Planting costs	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000		
Total Construct and Secure	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	**1,200,000**	**120,000**
Rehabilitation and Restoration											**TOTAL**	**ANN AVG**
Total land (open spaces, forests, wetlands)	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***		
% area to control each year	***0.5%***	***0.5%***	***1.0%***	***1.0%***	***2.0%***	***2.0%***	***2.0%***	***2.0%***	***2.0%***	***2.0%***	***65.8***	
Invasive Species Control	109,592	109,592	87,673	87,673	43,837	43,837	43,837	43,837	43,837	43,837	3,945,298	394,530
% area to seed / plant each year	***0.0%***	***0.1%***	***0.2%***	***0.2%***	***0.2%***	***0.2%***	***0.2%***	***0.2%***	***0.2%***	***0.2%***	***7.2***	
Targeted Seeding or Planting	-	92,057	138,085	184,114	184,114	184,114	184,114	184,114	184,114	184,114	1,518,940	151,894
Stream Rehabilitation												
Stream Rehabilitation - Tyler St.	-	718,000	-	-	-	-	-	-	-	-	718,000	71,800
Stream Rehabilitation - Sandusky Park	-	120,000	608,000	-	-	-	-	-	-	-	728,000	72,800
Stream Rehabilitation - Harriman Rd.	-	-	-	-	251,000	-	1,300,000	-	-	-	1,551,000	155,100
Stream Rehabilitation - Wellington St. Phase 1	-	-	-	426,000	-	2,454,000	-	-	-	-	2,880,000	288,000
Stream Rehabilitation - Wellington St. Phase 2	-	-	-	-	-	-	2,558,000	-	-	-	2,558,000	255,800
Total trees to replace	***76.0***	***76.0***	***76.0***	***76.0***	***76.0***	***76.0***	***76.0***	***76.0***	***76.0***	***76.0***	***760***	
Urban Tree Replacement (only the VP in 2024)	155,800	155,800	155,800	155,800	155,800	155,800	155,800	155,800	155,800	155,800	1,558,000	155,800
Total Rehab and Restore	287,310	1,217,367	1,164,905	1,028,934	1,116,954	3,319,954	4,723,954	865,954	865,954	865,954	**15,457,245**	**1,545,724**
Monitoring and Maintenance											**TOTAL**	**ANN AVG**
Total land (open spaces, forests, wetlands)	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***	***438.4***		
% to assess each year	***25%***	***25%***	***20%***	***20%***	***10%***	***10%***	***10%***	***10%***	***10%***	***10%***	***657.5***	
Natural area assets assessments	109,592	109,592	87,673	87,673	43,837	43,837	43,837	43,837	43,837	43,837	657,550	65,755
Number of trees to be maintained	***26,380***	***26,580***	***26,780***	***26,980***	***27,180***	***27,380***	***27,580***	***27,780***	***27,980***	***28,180***		
Urban Tree Maintenance, based on existing (no adjustment for additional trees)	353,160	355,837	358,515	361,192	363,870	366,547	369,225	371,902	374,580	377,257	3,652,087	365,209
Stream Monitoring												
Red - 2019 Stream Management Master Plan recommended every 5 years	-	-	-	23,360	-	-	-	-	23,360	-	46,720	4,672
Yellow - 2019 Stream Management Master Plan recommended every 10 years	-	-	-	14,900	-	-	-	-	-	-	14,900	1,490
Green - 2019 Stream Management Master Plan recommended every 10 years, crossings only	-	-	-	6,250	-	-	-	-	-	-	6,250	625
Urban park, community garden, pet cemetery	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***	***122.3***		
Existing maintenance cost	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	431,187	4,311,871	431,187
Total Monitor and Maintain	893,939	896,616	877,375	880,053	838,894	841,571	844,249	846,926	849,604	852,281	**8,621,507**	**862,151**
Plan and Design											**TOTAL**	**ANN AVG**
Stream Management Master Plan	-	-	-	-	150,000	-	-	-	-	-	150,000	15,000
Urban Forest Study	-	-	-	-	-	-	-	-	15,000	-	15,000	1,500
Tree inventory update	36,200	-	-	-	-	-	-	-	-	-	36,200	3,620
Total Plan and Design	36,200	-	-	-	150,000	-	-	-	15,000	-	**201,200**	**20,120**

TOWN OF AURORA
NATURAL CAPITAL ASSET MANAGEMENT PLAN

Environmental Advisory Committee

June 17, 2024

AGENDA

- **Project Overview**
- **Findings**
  - Inventory and Condition
  - Levels of Service
  - Asset Lifecycle Management Plan
  - Financial Strategy
  - AM Improvement Recommendations
- **Questions/Discussion?**

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What is Asset Management?

The coordinated activity of an organization to realize value from assets

This includes:

- Delivering the service levels customers need and regulators require
- While minimizing total costs of asset ownership
- At an acceptable level of risk
- Within an environment of limited resources

Creating sustained value

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What is an Asset Management Plan?

The AM Plan consolidates infrastructure-related needs identified throughout the organization, in

- Master plans
- Condition assessments
- Business cases
- Strategic plans, etc.

Infrastructure needs can then be prioritized organization-wide.

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O.Reg. 588/17 for Asset Management Planning

July 2019
Strategic
AM Policy

Required to articulate specific principles and commitments that will guide decisions around when, why and how money is spent on assets.

July 2022
AM Plan
Current LOS
Core Assets

Required to document current LOS and costs to sustain current LOS provided by **the water, wastewater, stormwater, road and bridge assets**

July 2024
AM Plan
Current LOS
All Assets

Required to document **current LOS** and costs to sustain current LOS for **non-core** assets, including **natural** assets and infrastructure.

July 2025
AM Plan
Proposed LOS
All Assets

Required to document **proposed LOS** and costs to achieve proposed LOS, and the financial strategy to fund these expenditures

Progress implementing AM Plans to be reported annually.

AM Plans to be updated at least every 5 years.

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NCAMP Asset Categories

Natural Area Assets

- Forests & Open spaces
- Wetlands
- Watercourses
- Waterbodies

Natural Enhanced Assets

- Urban Trees
- Urban Parks
- Community Gardens
- Pet Cemetery

NCAMP excludes:

- Stormwater ponds and surrounding areas
- Other stormwater assets
- Trails

See Corporate AM Plan.

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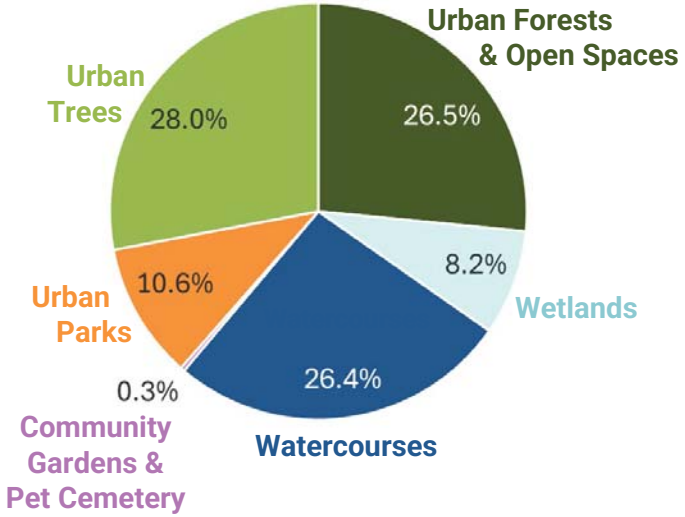
Inventory of Natural Assets

Asset Category	Asset Class	Quantity	Unit Cost	Replacement Value (2024$M)
Natural Area Assets	Forest and open space	350.6 hectares	Meadow $198k / ha Thicket $189k / ha Forest $174k / ha	$ 63.0
	Waterbody	6.3 hectares	*No readily availabe cost*	--
	Watercourse	36.9 km	$1.7M / km	$ 62.8
	Wetland	78.3 hectares	Deciduous Swamp $268k / ha Mixed Swamp $268k / ha Thicket Swamp $245k / ha Marsh $224k / ha	$ 19.4
Natural Enhanced Assets	Community Gardens	2 locations with 52 plots each	Near Alliance Park $150k Near Hartwell Way $300k	$ 0.5
	Pet Cemetery	6.4 hectares	Whole property $300k	$ 0.3
	Urban Parks	125.4 hectares	Grassy areas $200k / ha	$ 25.1
	Urban Trees	26,435 street and park trees	$600 per new tree needed to replace existing tree (dbh existing / 5cm) + $16.50 per cm dbh existing tree (removal and stumping) e.g. $2,700 to replace 20cm dbh tree = $2,400 for 4 new trees + $330 for removal and stumping	$ 66.4
TOTAL				**$ 237.5**

$ 237.5 million



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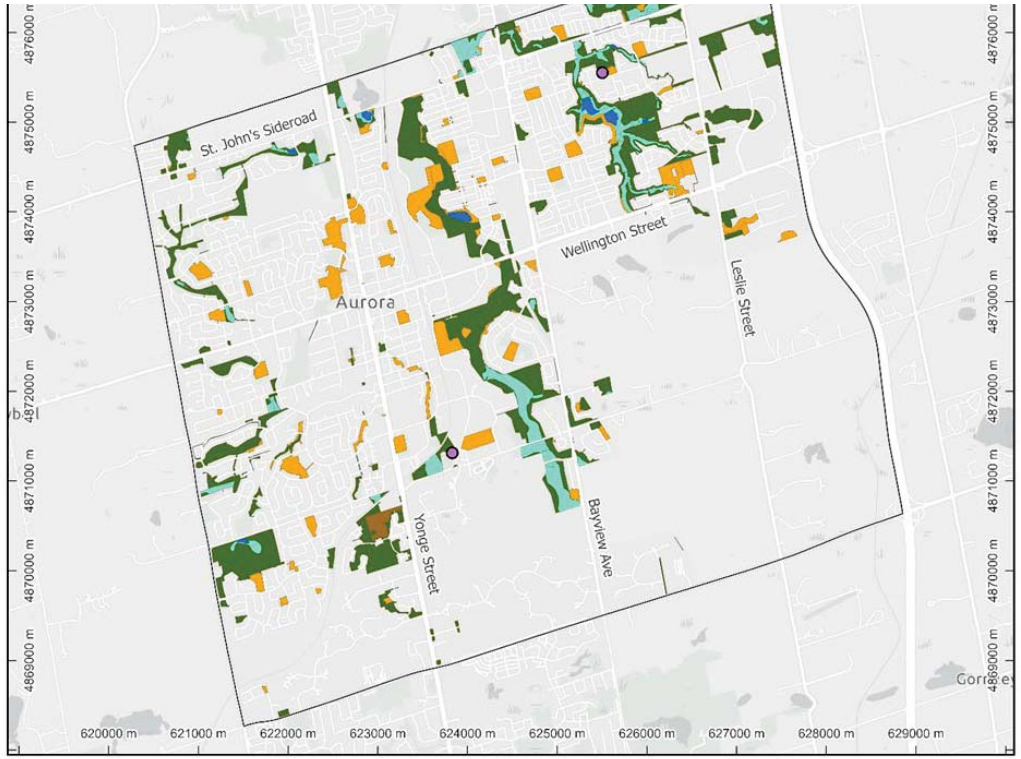


Urban Park
Waterbody
Wetland
Community Gardens
Municipal Boundary

SLIDE : 8

Spatial Reference
Name: NAD 1983 UTM Zone 17N
PCS: NAD 1983 UTM Zone 17N

N

0 0.5 1 2 Kilometers

Province of Ontario, York Region, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

green ANALYTICS

AURORA

State of Infrastructure

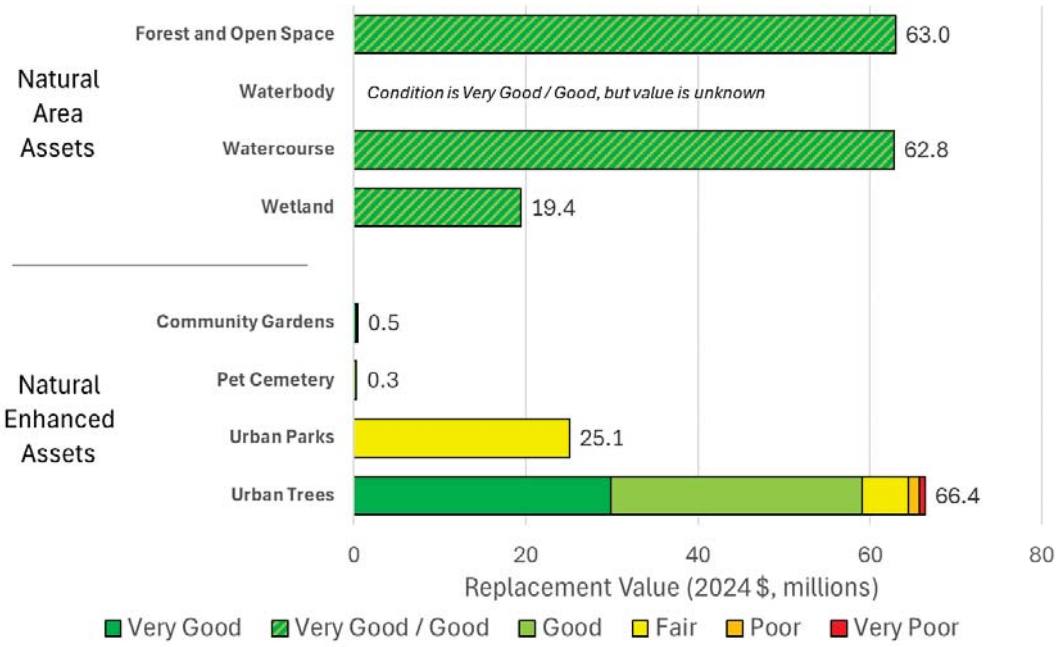
86% **Very Good or Good**

13% Fair

1% Poor

0.3% Very Poor

Condition of Natural Assets



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Levels of Service

Capacity and Access to Natural and Enhanced Areas

- % residential homes within 500m of natural or enhanced areas

- Natural area assets per 1000 people

- Enhanced area assets per 1000 people

- km of trails through natural and enhanced areas per 1000 people

- Community Garden locations per 1000 people

Current Performance	**99.35%**	**6.6 hectares**	**2.0 hectares**	**0.62 km**	**0.030**
Anticipated Trend to 2049 (due to population growth)	**increasing**	**5.2 hectares**	**1.6 hectares**	**0.48 km**	**0.024**

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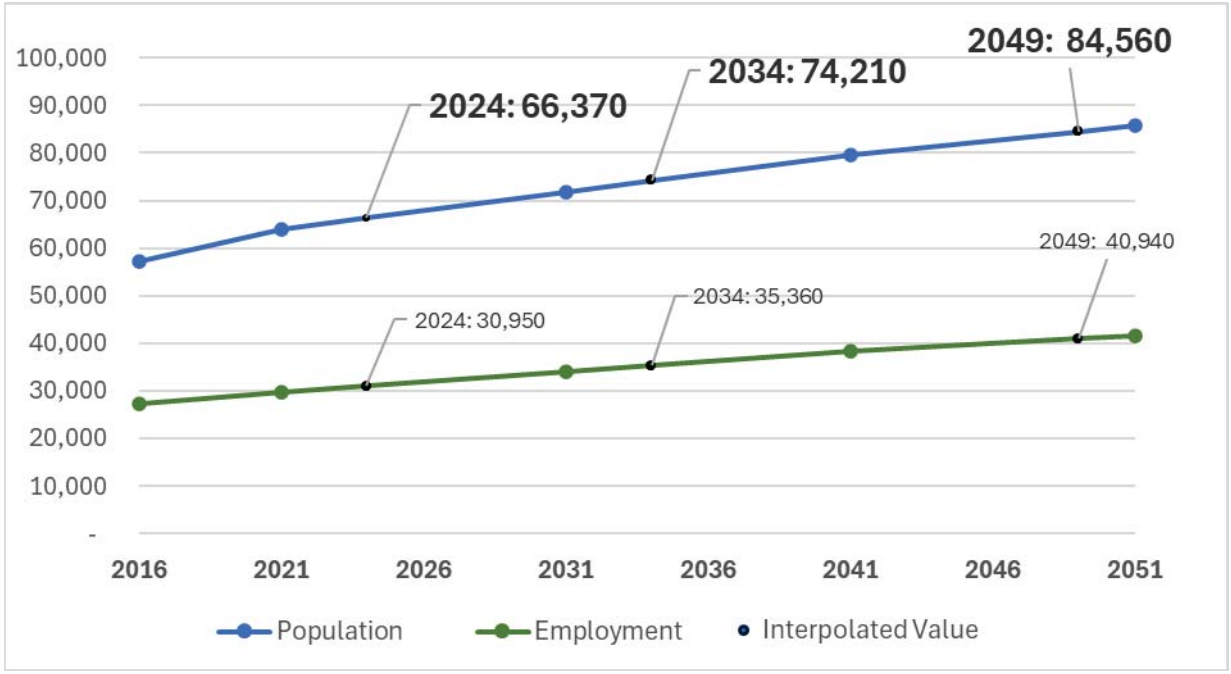
Levels of Service

Projected Population Growth



Population to grow 27.4% over next 25 years.

Source: 2022 York Region Official Plan

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Levels of Service

Quantity of Trees

- Area of canopy cover provided by Town

- Street and park trees per 1000 people

- New trees planted per year – **street and park trees**

- New trees planted per year – **natural areas**

Current Performance	**6.3%**	**398.3 trees**	**60 trees**	**445 trees**
Anticipated Trend to 2049	← **Future performance varies by AM Scenario** →			Steady - Planted by partner organizations

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Levels of Service

Maintenance of Trees and Natural Areas

- Species composition of top 5 Town-owned tree species

- Open space and natural cover plots affected by invasive species

- Tree pruning activities completed per year

- Replacement trees planted per year

Current Performance	**15% Norway maple** **12% Littleleaf linden** **10% Ash** **9% Honey locust** **5% Silver maple**	**55%**	**3,333**	**240 trees**
Anticipated Trend to 2049	← **Future performance varies by AM Scenario** →			

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Asset Management Strategy – Risk Ratings

Type of Threat of Hazard	Threat or Hazard	Natural Area Assets (Forests, open spaces, waterbodies, wetlands, watercourses)	Enhanced Natural Assets (Urban parks, urban trees, community gardens, Pet Cemetery)
Environmental	Invasive species, pests and disease	High-medium	n/a
	Wildlife Impacts	High-medium	n/a
Climate	Extreme heat and drought	Low-medium	Low-medium
	Extreme rainfall and erosion	Low-medium	Low-medium
	Extreme storms (wind and lightning)	Low-medium	Low-medium
Human-Induced	Overuse and misuse	Low	Low-medium
	Unauthorized edge encroachment or disturbances	Low	Low
	Contamination (e.g. road salting and other spills)	Low	Low

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Asset Management Strategy – Risk Management

Risk Exposure Matrix - Urban Trees

Likelihood of Failure						
	5	$0.03	$0.10	$0.12	$0.03	$0.00
	4	$0.02	$0.19	$0.33	$0.18	$0.04
	3	$0.11	$0.59	$2.04	$1.59	$0.14
	2	$0.45	$4.05	$11.18	$5.74	$0.43
	1	$0.59	$5.37	$8.42	$2.41	$0.07
		1	2	3	4	5
		Consequence of Failure				

60 urban trees are exposing Town to Very High risk

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Asset Management Strategies

Scenario A

Status Quo

Current state activities and costs

Scenario B

Status Quo with
Moderate
Rehab, Maintenance and Monitoring

Scenario C

Status Quo with
High
Rehab, Maintenance and Monitoring

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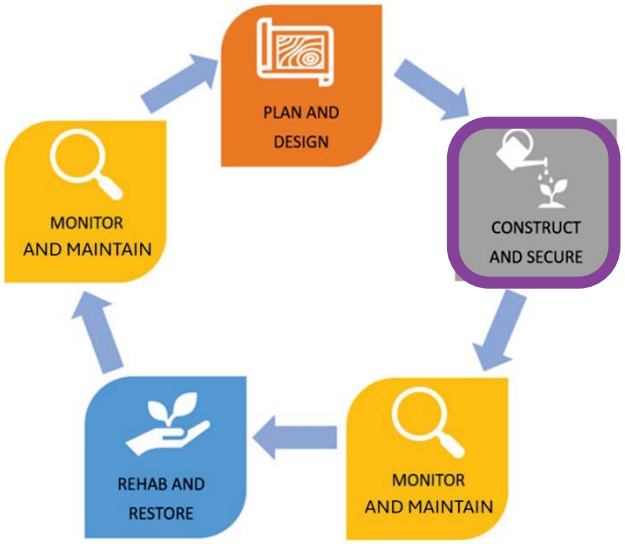
Scenario A – Status Quo Activities



Construct & Secure

- Plant 60 new urban trees/year
- Plant 445 new trees in natural areas (with partner organizations)

- Town may not be able to secure additional natural asset lands

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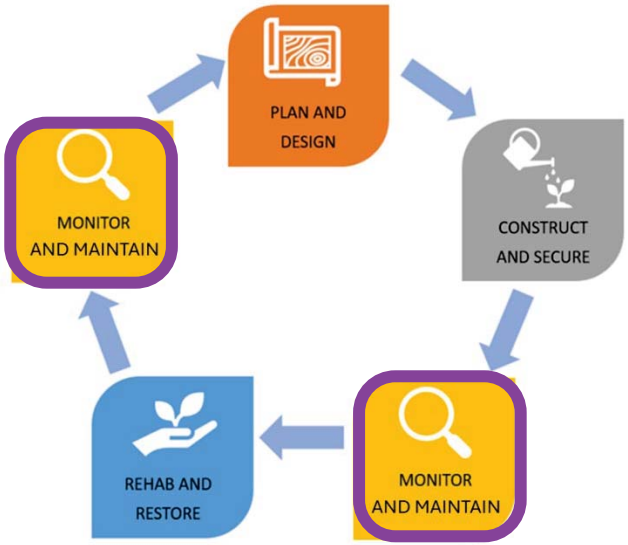
Scenario A – Status Quo Activities



Monitor and Maintain

- Continue maintaining urban trees, urban parks and trail-side vegetation according to current maintenance standards

- Does not include condition assessment for natural areas

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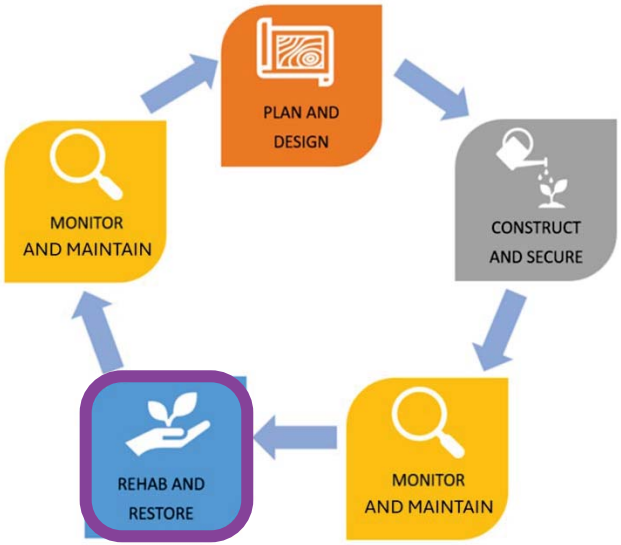
Scenario A – Status Quo Activities



Rehab and Restore

- Replace 240 urban trees / year (82% of forecast need)
- Invasive species control: 2% of natural areas over 25 years
- Targeted planting and seeding: 1% of natural areas over 25 years
- Complete the remaining stream rehabilitation projects

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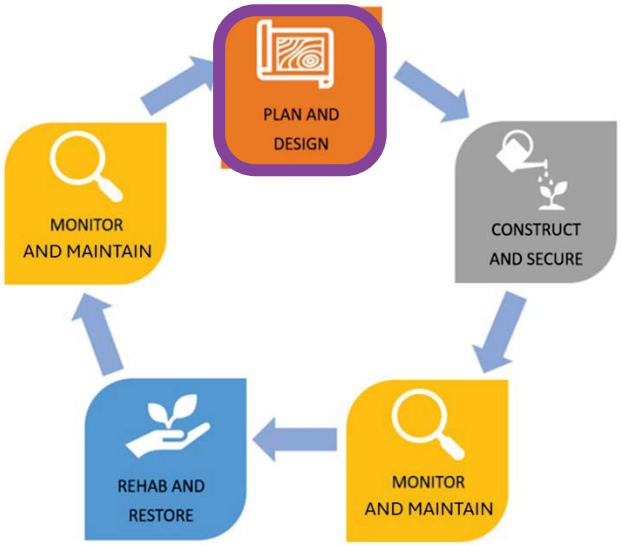
Scenario A – Status Quo Activities



Plan and Design

Continue updating (every 10 years):

- Stream Management Master Plan
- Urban Forest Study
- Tree Inventory

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Scenario Comparison –
AM Activities Completed Over 25 Years

Asset Management Activity	Scenario A	Scenario B	Scenario C
Construct & Secure			
New urban trees	1500 trees	2000 trees	4000 trees
New trees in forests and open spaces	11,125 trees (through partnerships)		
Monitor & Maintain			
5-year stream inspections	0	2	2
Natural area condition assessment	0	All areas completed in first 6 years, then 10-year cycle	All areas completed in first 5 years, then 10-year cycle
Urban tree maintenance	In accordance with current standards		
Urban park maintenance	In accordance with current standards		
Rehab & Restore			
Urban trees replaced	6,000 (82% of forecast need)	7,000 (95% of forecast need)	7,375 (100% of forecast need)
Invasive species control	2% of natural areas	13% of natural areas	45% of natural areas
Targeted seeding and planting	1% of natural areas	2.4% of natural areas	4.8% of natural areas
Stream rehab projects completed	In accordance with Stream Management Master Plan		
Plan & Design			
Stream Management Master Plan updates (including 10-year inspections)	In accordance with 10-year update frequency		
Urban Forest Study updates	In accordance with 10-year update frequency		
Tree inventory updates	In accordance with 10-year update frequency		

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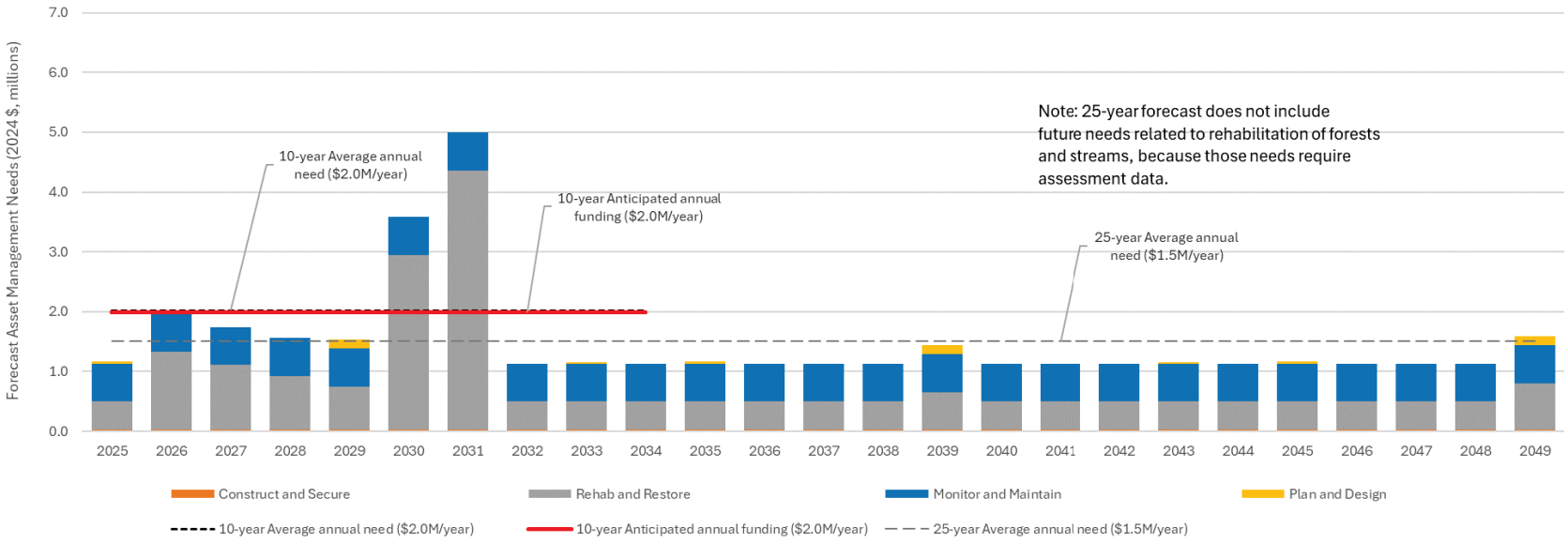
Scenario A: Status Quo – Cost

	Over 10 Years (in 2024$, millions)	Over 25 Years
Total Cost	$ 20.0	$ 37.9
Average Annual Cost	$ 2.0	$1.5
Anticipated Annual Funding	$ 2.0	$1.5
Anticipated Gap	--	--



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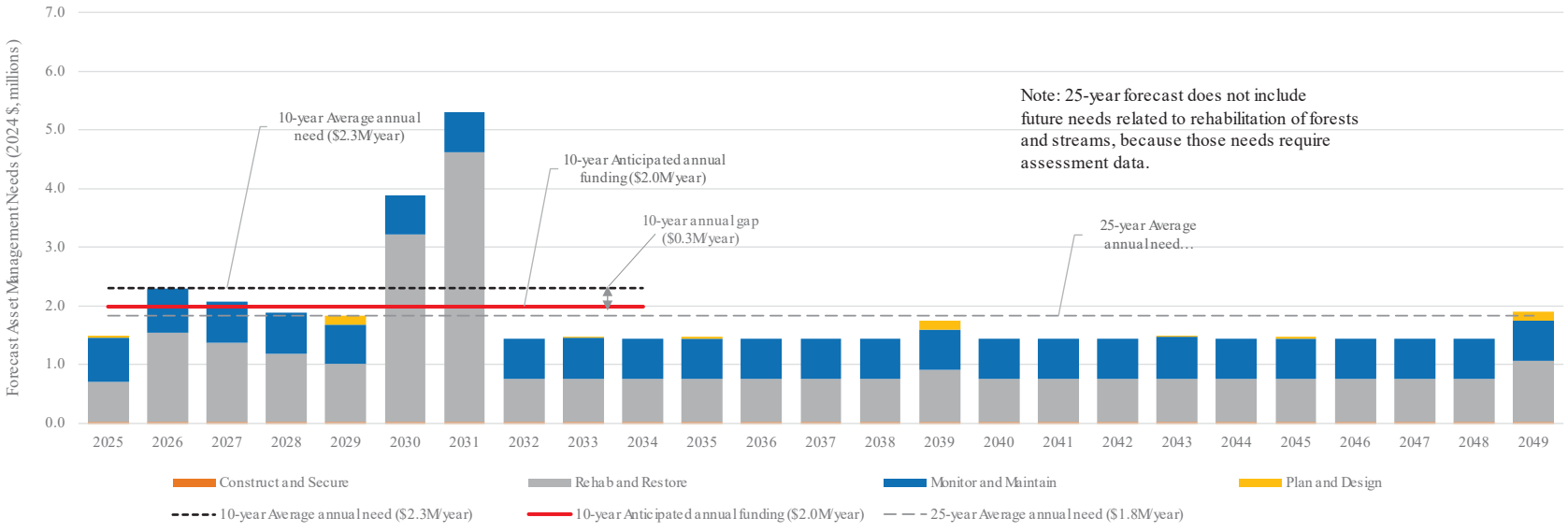
Scenario B – Cost

	Over 10 Years (in 2024$, millions)	Over 25 Years
Total Cost	$ 23.1	$ 45.7
Average Annual Cost	$ 2.3	$ 1.8
Anticipated Annual Funding	$ 2.0	$ 1.5
Anticipated Gap	**$ 0.3**	**$ 0.3**



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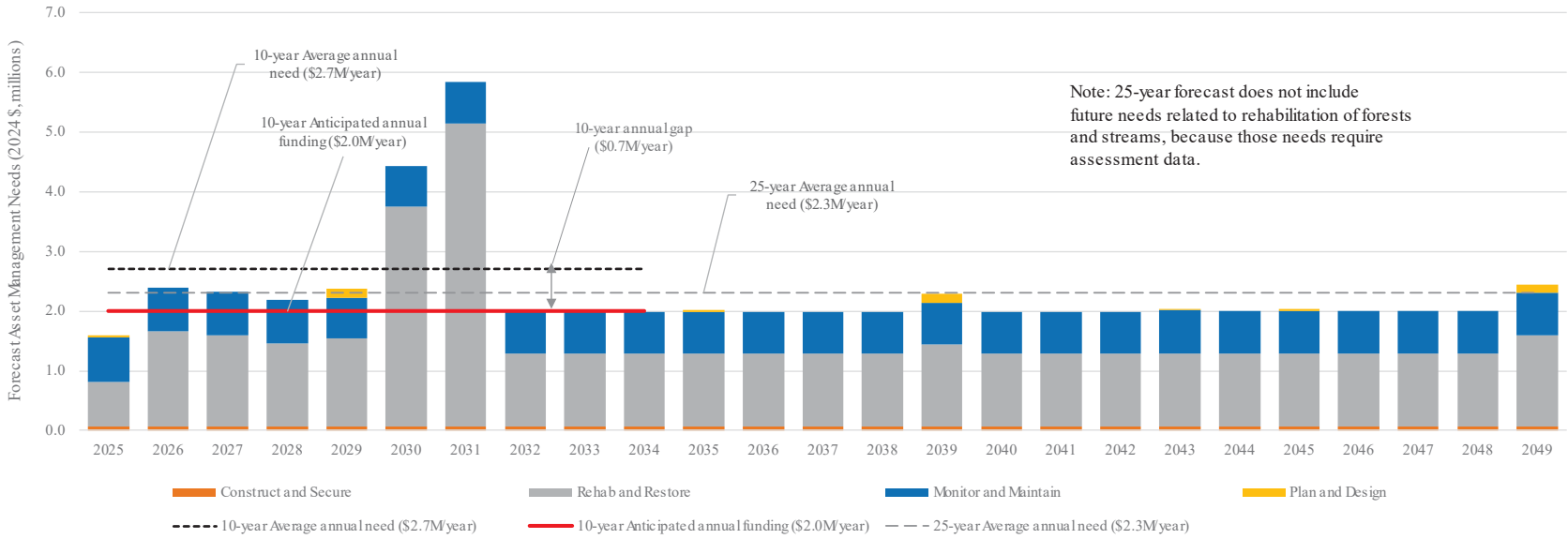
Scenario C – Cost

	Over 10 Years (in 2024$, millions)	Over 25 Years
Total Cost	$ 27.1	$ 57.9
Average Annual Cost	$ 2.7	$ 2.3
Anticipated Annual Funding	$ 2.0	$ 1.5
Anticipated Gap	**$ 0.7**	**$ 0.8**



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Scenario Comparison – Levels of Service

Quantity of Trees

- Area of canopy cover provided by Town

- Street and park trees per 1000 people

- New trees planted per year – **street and park trees**

- New trees planted per year – **natural areas**

Current Performance	**6.3%**	**398.3 trees**	**60 trees**	**445 trees**
In 2049:	**Canopy from:**			
Scenario A	**1,500 trees**	**345.3 trees**	**60 trees**	Steady - Planted by partner organizations
Scenario B	**2,000 trees**	**355.9 trees**	**80 trees**	
Scenario C	**4,000 trees**	**398.5 trees**	**160 trees**	

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Scenario Comparison – Levels of Service

Maintenance of Trees and Natural Areas

- Species composition of top 5 Town-owned tree species

- Open space and natural cover plots affected by invasive species

- Tree pruning activities completed per year

- Replacement trees planted per year

Current Performance	**Top five species each make up 5–15% of inventory**	**55%**	**3,333**	**240 trees**
In 2049: Scenario A	**Slow diversification**	**2% natural areas treated**	Per maintenance standard	**240 (82% of forecast need)**
Scenario B	**Slow-mod diversification**	**13% natural areas treated**		**280 (95% of forecast need)**
Scenario C	**Moderate diversification**	**45% natural areas treated**		**294 (100% of forecast need)**

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Scenarios B & C include assessments to monitor for threats and hazards, and actions to increase resilience to threats and hazards.

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	Unauthorized edge encroachment or disturbances	Low	Low
	Contamination (e.g. road salting and other spills)	Low	Low

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Recommended Strategy

Scenario B

	Over 10 Years (in 2024$, millions)	Over 25 Years
Total Cost	$ 23.1	$ 45.7
Average Annual Cost	$ 2.3	$ 1.8
Anticipated Annual Funding	$ 2.0	$ 1.5
Anticipated Gap	**$ 0.3**	**$ 0.3**

Allows Town to:

- Begin condition assessment program for natural assets
- Increase invasive species control and targeted planting (to increase resilience to environmental and climate hazards)
- Increase urban tree replacements (address backlog of 666 trees)
- Increase planting of new urban trees toward
  - Achieving tree canopy target
  - Maintaining ratio of trees / 1000 people

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Recommended Strategy – Funding

Scenario B

	Over 10 Years (in 2024$, millions)	Over 25 Years
Total Cost	$ 23.1	$ 45.7
Average Annual Cost	$ 2.3	$ 1.8
Anticipated Annual Funding	$ 2.0	$ 1.5
Anticipated Gap	**$ 0.3**	**$ 0.3**

To close funding gap:

- Seek additional revenues through taxation or grants
- Re-allocate funds from other programs
  (may result in reduced levels of service in other programs).

Also, continue partnerships with external organizations for

- Access to natural lands (with maintenance agreements)
- Tree planting programs
- Invasive species control (volunteers)

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AM Plan Improvements

Levels of Service

1. Monitor LOS performance and costs to enable forecasting of cost impacts of LOS adjustments.
2. Translate Town-wide tree targets into targets for Town-owned assets, e.g. tree canopy and diversity targets for Town-owned trees.
3. Consider incorporating carbon sequestration impact of natural assets in Town's GHG emissions plans, such as the Energy Conservation and Demand Management Plan and the Community Energy Plan.

AM Process, Technology and Data

4. Establish land type naming standards and implement in GIS, so that natural asset inventory will be consistent with other studies (e.g. Parks and Recreation Master Plan)
5. Continue initiative to implement maintenance management system. Use the data to better understand maintenance costs of natural assets.
6. Consider building on the initial risk assessment for natural assets to further inform and prioritize risk mitigation actions for natural assets.

Discussion

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advisory services