MFOA | MUNICIPAL FINANCE OFFICERS' ASSOCIATION OF ONTARIO

ASSET MANAGEMENT FRAMEWORK

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1 Introduction

1.1 Asset Management Framework

The Asset Management Framework has been prepared to assist Ontario municipalities assess and improve their maturity level in all aspects of asset management planning. While most Ontario municipalities already have an Asset Management (AM) plan, many may be unsure on how to best use it or if it meets the needs of the municipality. This document provides guidance to municipalities on how to move through the AM continuum, and how to progress towards meeting the municipality's objectives through effective and efficient management of all its assets.

Structure of Framework

This Framework is organized as follows:

Chapter 1: Introduction;
Chapter 2: Asset Management Policies and Strategies;
Chapter 3: State of Local Infrastructure;
Chapter 4: Levels of Service Analysis;
Chapter 5: Lifecycle Management Strategy;
Chapter 6: Financing Strategy;
Chapter 7: Asset Management Integration;
Chapter 8: Continuous Updates and Improvements;
Chapter 9: Asset Management Tools;
Chapter 10: Internal Governance and Ownership;
Chapter 11: Council Approval and Support; and
Chapter 12: Public Engagement and Consultation.

Overview of Chapters:

Chapter 2: Asset Management Policies and Strategies
Explains how asset management should be viewed as a process, supported by policies and strategies for meeting AM objectives effectively.

Chapter 3: State of Local Infrastructure
Provides a discussion on capital asset information collection, storage, and use. The discussion relates to a municipality's asset inventory, including asset attributes, accounting valuations, current valuations, condition assessments, service potential, risk

assessments, and data integrity. This information provides the foundation for other sections of an AM plan.

Chapter 4: Levels of Service Analysis
Examines the identification of services, community expectations, strategic (or community) based levels of service, technical levels of service, and the comparison of current service levels to expected levels of service. In addition, budget impacts of the levels of service analysis and the importance of measuring trends and performance are explained.

Chapter 5: Lifecycle Management Strategy
Provides a foundation for developing a municipality's long-term operating and capital forecast for asset related costs. This includes the requirements for non-infrastructure solutions, maintenance and operation, rehabilitation, replacement/disposal, and expansion of the municipality's asset base while moving towards the expected levels of service. The goal of a lifecycle management strategy is to have the municipality in (or moving towards) a sustainable asset management position.

Chapter 6: Financing Strategy
Identifies concepts and strategies for long-term funding plans for the lifecycle management strategies. This includes consideration of rate impacts, available funding sources, infrastructure funding deficits/shortfalls, performance and sustainability measures, and reporting options.

Chapter 7: Asset Management Integration
Describes how AM can be integrated into the budget process, strategic planning, PSAB 3150 compliance, and other relevant organizational processes.

Chapter 8: Continuous Updates and Improvements
Discusses processes and tools available for incorporating improvements and updates to the AM process.

Chapter 9: Asset Management Tools
Provides guidance related to the selection and utilization of beneficial AM software and related tools.

Chapter 10: Internal Governance and Ownership
Outlines the importance of supporting AM through the municipality's organizational

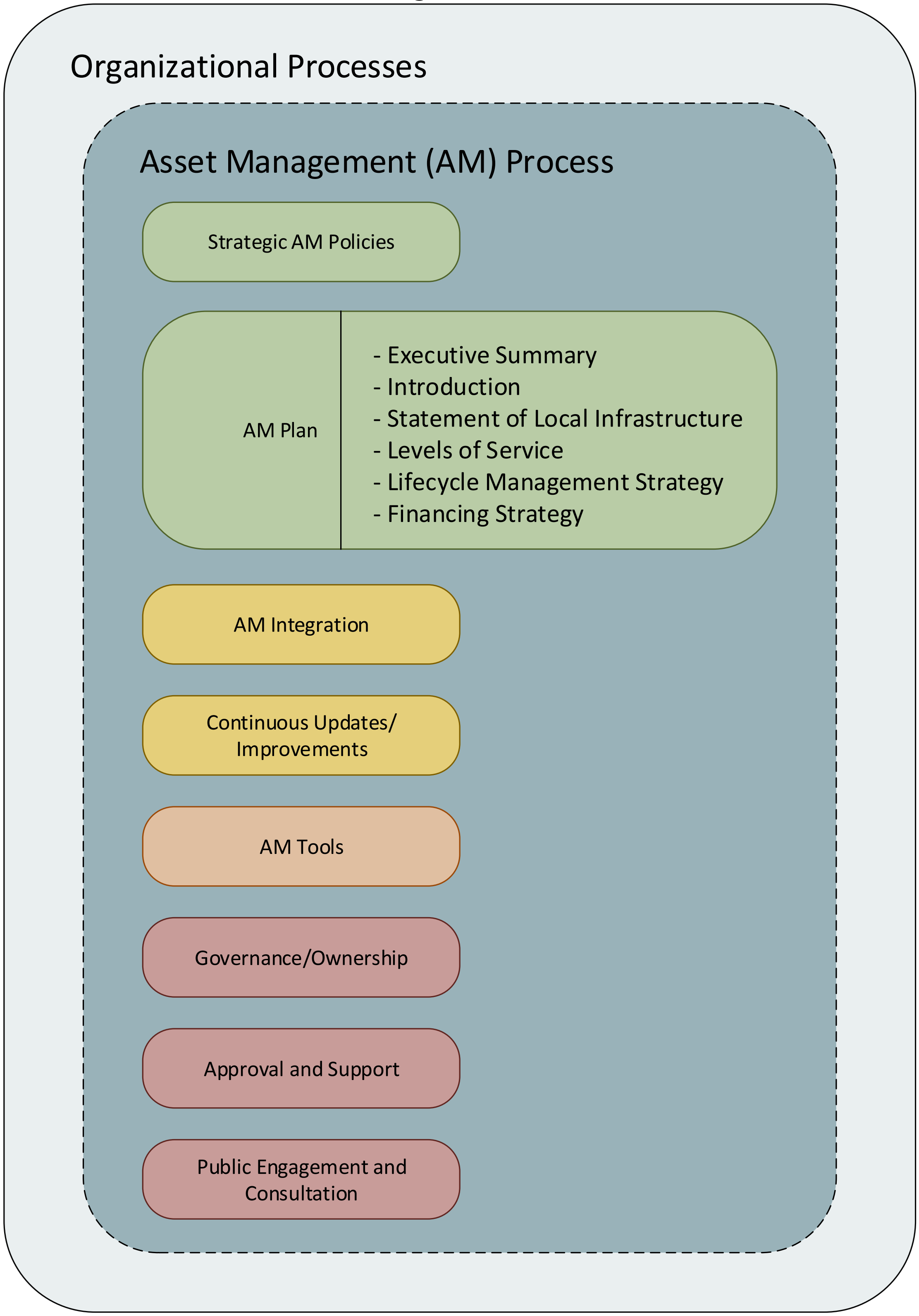
structure, leadership through senior management, and allocating sufficient AM resourcing levels.

Chapter 11: Council Approval and Support
Discusses the significance of achieving and maintaining council approval and support throughout the AM process.

Chapter 12: Public Engagement and Consultation
Highlights the advantages of involving the public in the AM process.

Figure 1-1 (below) shows the flow of these chapters in the context of the framework:

Figure 1-1
Asset Management Framework

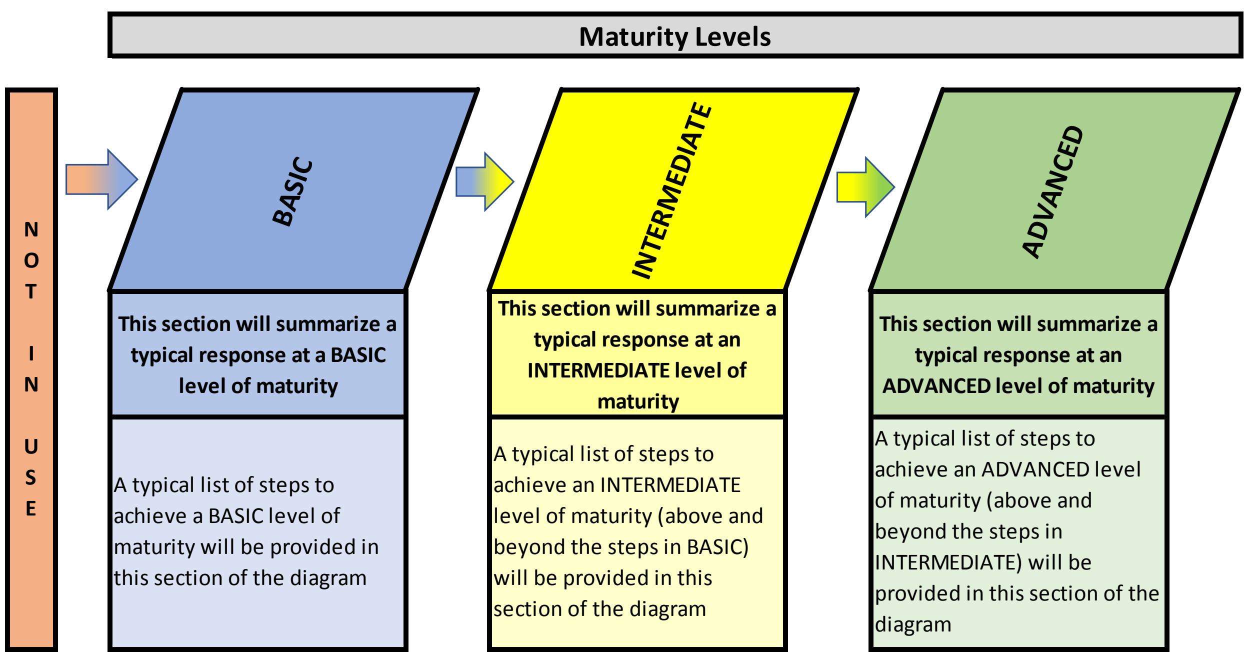


It is important to note that Figure 1-1 (above), and the chapters within this document, consist of much more than the steps to create an AM plan. Chapters 3 through 6 (State of Local Infrastructure, Levels of Service Analysis, Lifecycle Management Strategy, and Financing Strategy) form the basis for an AM plan. This document treats asset management as a process, with one portion of that process being the creation of an AM plan.

In addition, an effective asset management process involves processes, people, and technology to provide expected levels of services to the community. It is the culmination of all of these variables that makes asset management effective.

Level of Maturity Diagrams

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic level* requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

List of Acronyms and Abbreviations

AM	Asset Management

ARL	Annual Repayment Limit
BCI	Bridge Condition Index
CCTV	Closed-Circuit Television
CMMS	Computerized Maintenance Management System
CoF	Consequence of Failure
CPI	Consumer Price Index
DCA	Development Charges Act
FIR	Financial Information Return
GIS	Geographic Information System
IIMM	International Infrastructure Management Manual
IJPA	Infrastructure for Jobs and Prosperity Act
IT	Information Technology
LMS	Lifecycle Management Strategy
LOS	Level(s) of Service
NRCPI	Non-Residential Consumer Price Index
PoF	Probability of Failure
PSAB	Public Sector Accounting Board
RFP	Request for Proposal
RRF	Reserve/Reserve Fund
SAMP	Strategic Asset Management Policy
SOLI	State of Local Infrastructure
TCA	Tangible Capital Asset

1.2 Utilizing the Benefits of Asset Management

To what extent is the municipality utilizing the benefits of asset management planning within the organization?

Background

The importance of having an effective AM plan has been increasingly recognized internationally. This recognition was underscored by the 2014 release of the related International Standard ISO 55000, which "provides an overview of asset management, its principles and terminology, and the expected benefits from adopting asset management".

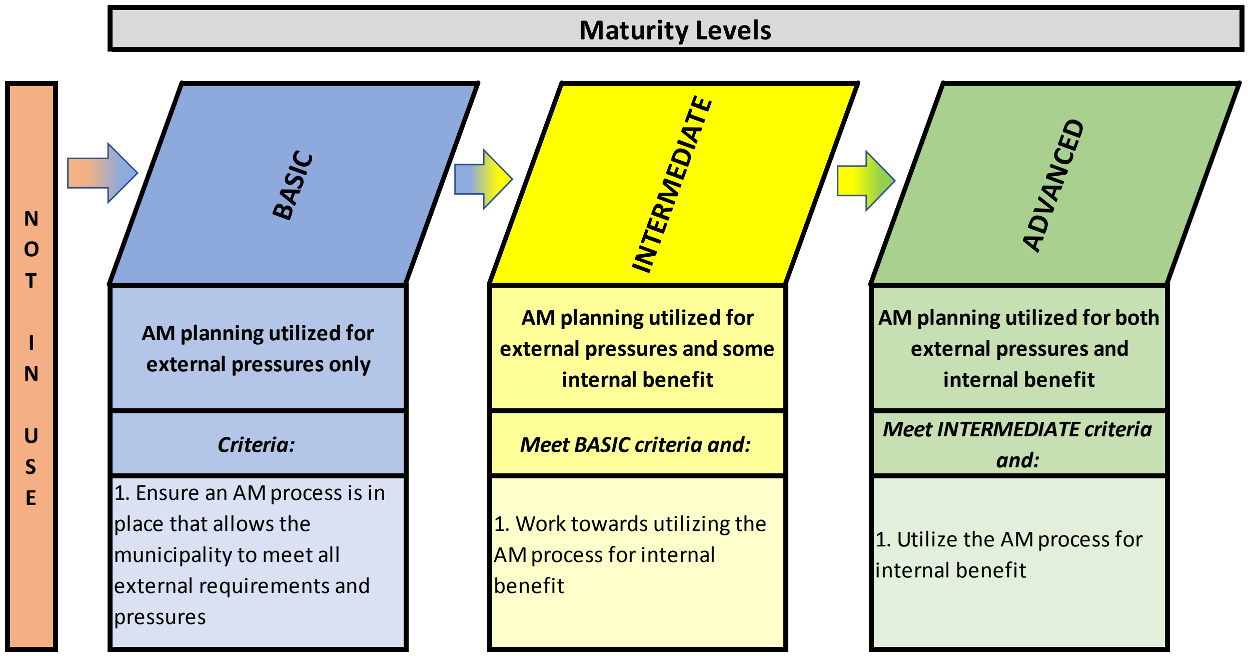
Indeed, our communities, economies, and in many ways, our quality of life are all supported by various elements of infrastructure. It follows that governments have a great responsibility to properly manage their assets. This stewardship function falls heavily at the municipal level of government, where local citizens and taxpayers rely on the availability of critical services delivered by their municipality.

Consequently, municipalities need to be aware that there are many compelling reasons for engaging in a mature asset management process. These include the following internal benefits:

- Enhance financial performance;
- Assess and manage risk;
- Support sustainability of services:
- Meet service needs & promote customer satisfaction; and
- Support economic activity & promote satisfying lifestyle.

Levels of Maturity – Utilizing Benefits of Asset Management

To what extent is the municipality utilizing the benefits of asset management planning within the organization?



At the **basic level of maturity**, municipalities use asset management planning in response to external pressures, such as unexpected changes to service delivery, asset condition or risk; and/or financial conditions. Municipalities at the basic level need to ensure they have an asset management process in place that enables the ability and flexibility necessary to respond when external pressures demand it. However, at the basic level of maturity, these circumstances are often dealt with as part of the budget process at a high level.

At the **intermediate level of maturity**, asset management planning needs to be used to not only respond to external pressures, but also to derive some internal benefit. Municipalities are considered to be at the intermediate level of maturity if they recognize that asset management has integral connections to several other processes (e.g. budget, optimal maintenance schedules, planning, service delivery, etc.) and begin the process of integrating these processes.

At the **advanced level of maturity**, asset management is used for responding to external pressures and deriving internal benefits. Municipalities at this level should have identified all links between asset management and other processes, and should have integrated them to achieve internal efficiencies, track financial performance, focus on service delivery, and promote asset management sustainability.

Asset Management Overview

There are a number of internal benefits to be gained by implementing asset management practices in addition to legislative and funding requirements. These potential benefits are discussed throughout this document. Figure 1-2 (below) highlights many of the elements of the asset management plan (discussed in detail in Chapters 3 through 6), how they interrelate, as well as other processes that could be integrated with asset management, such as:

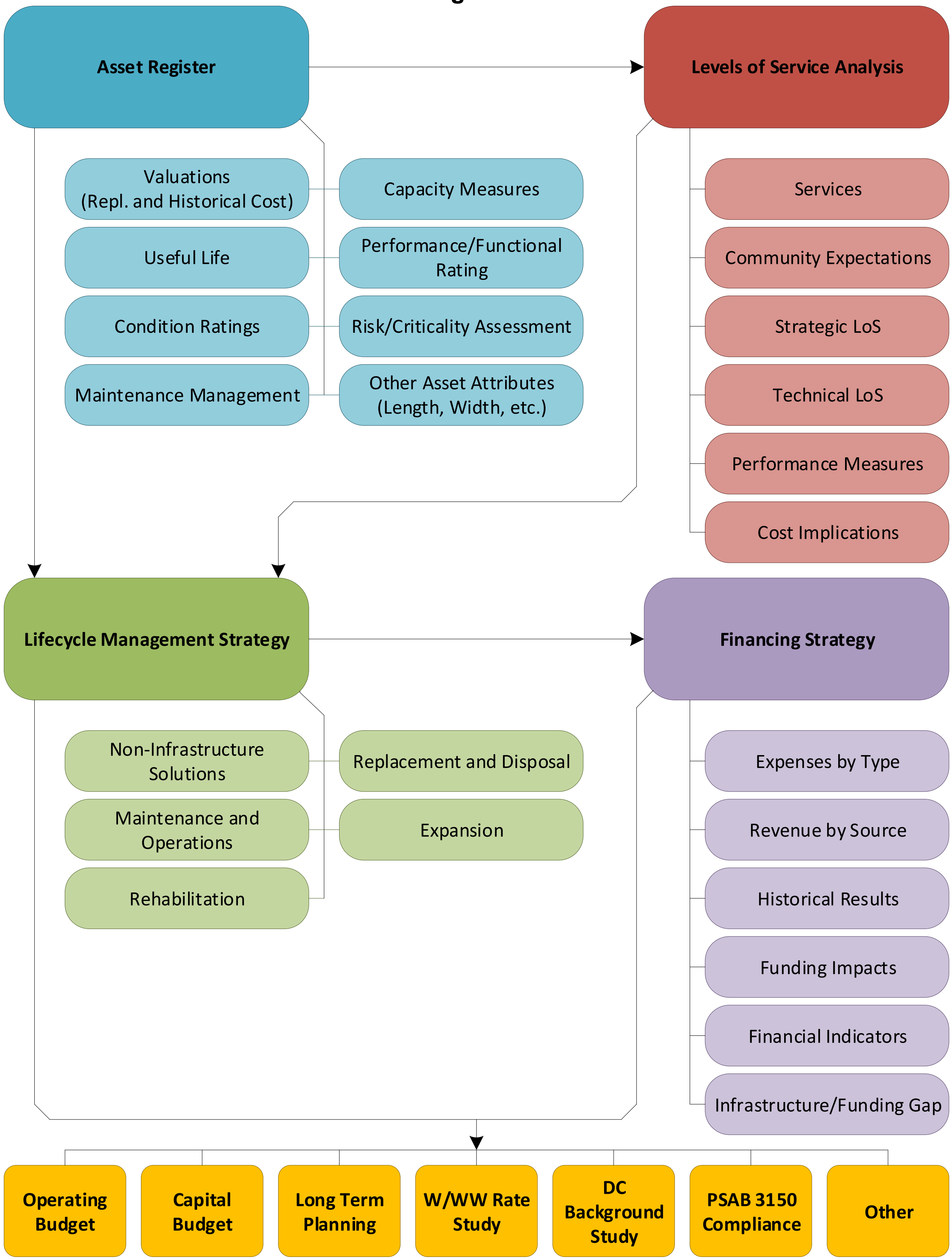
- Operating Budget;
- Capital Budget;
- Long-term Capital Plans;
- User Fee Rate Studies (i.e. water, wastewater, stormwater);
- Development Charge Background Study; and
- PSAB 3150 Compliance Process.

Municipalities will begin to see added benefits as the processes above are integrated with their asset management planning processes.

As the relationship between a municipality's AM process and the processes identified above is enhanced, the municipality will start seeing added internal benefits to the asset management process. A time will come when the internal benefits of AM planning will exceed the benefits from only responding to external pressures and requirements.

Keep in mind that a supporting comprehensive AM process ensures the development of a consistent and accurate AM plan. Figure 1-2 (below) shows the process and relationships among the component activities.

Figure 1-2
Asset Management Process



1.3 Complying with Asset Management Requirements in Ontario

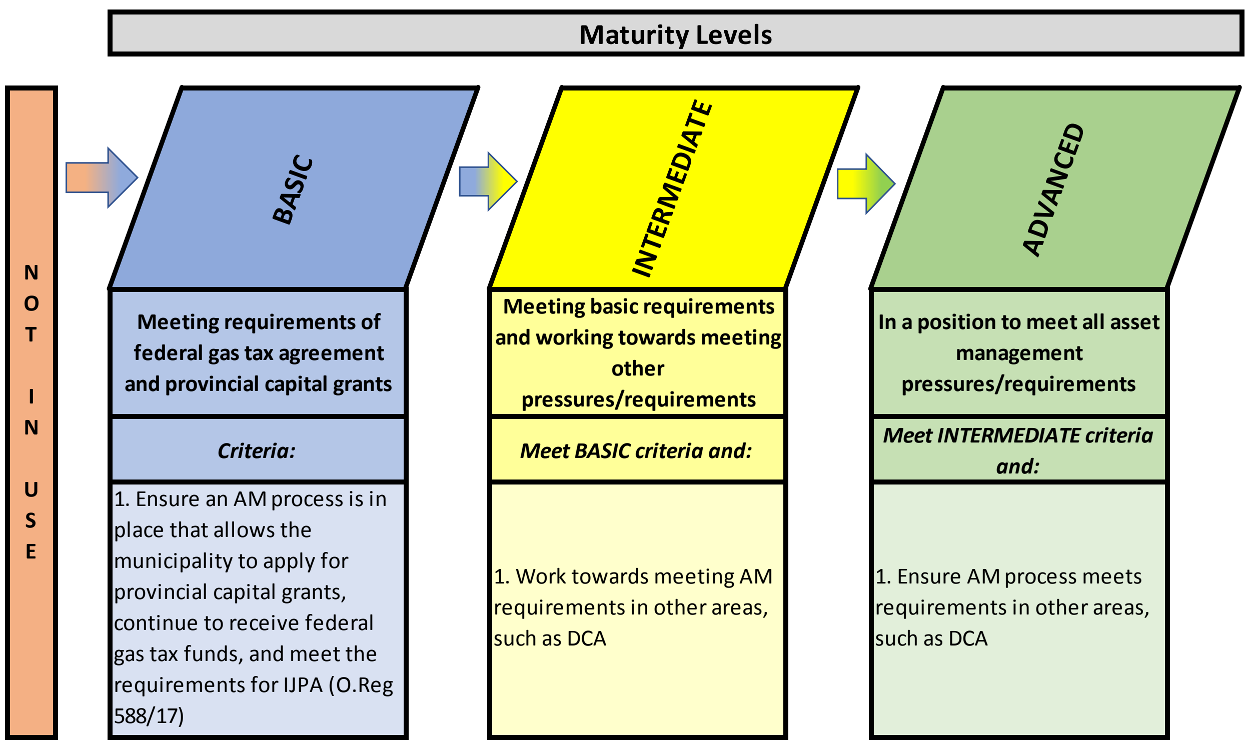
To what extent is the municipality complying with asset management pressures/requirements in Ontario?

Background

The importance of implementing and maintaining a mature asset management process has been reinforced by the requirements of provincial legislation and federal/provincial grant application processes. Municipalities should be aware of these requirements to ensure they are in compliance with them.

Levels of Maturity – Complying with Asset Management Requirements

To what extent is the municipality complying with asset management pressures/requirements in Ontario?



At the **basic level of maturity**, municipalities engage in asset management activities to comply with the AM requirements under the Ontario Federal Gas Tax Agreement, ongoing provincial capital grant applications, and the *Infrastructure for Jobs and Prosperity Act* (IJPA) through O.Reg 588/17).

At the **intermediate level of maturity**, municipalities need to comply with the requirements outlined in the Federal Gas Tax Agreement for Ontario, the requirements for applying for provincial capital grants, and the requirements of the IJPA through O.Reg 588/17. In addition, the municipality should be actively progressing towards meeting other asset management requirements, such as the DCA requirements.

At the **advanced level of maturity**, the municipality should comply with the requirements outlined in the Federal Gas Tax Agreement for Ontario, the requirements for applying for provincial capital grants, the IJPA requirements through O.Reg 588/17, DCA requirements, as well as other applicable areas.

Asset Management Requirements

The following sections provide some detail on how asset management planning fits in with federal and provincial requirements:

Ontario: "Building Together"

In 2011, the Ontario government released "Building Together", a long-term infrastructure plan which "sets out a strategic framework that will guide future investments in ways that support economic growth, are fiscally responsible, and respond to changing needs. A key element of this framework is ensuring good stewardship through proper asset management". This document highlights the importance of addressing municipal infrastructure needs through a co-operative approach by all levels of government, and underpinned by AM strategy. In conjunction with this document, provincial capital grant opportunities have been made available where having an AM plan is a prerequisite before receiving funding.

As outlined in Ontario's *Building Together: Guide for Municipal Asset Management Plans*, the elements of a detailed asset management plan must include the following:

- **Executive Summary:**
    - Typically, the final section to be prepared, and provides a succinct overview of the plan.
- **Introduction:**
    - Explains how the goals of the municipality are dependent on infrastructure. This could include discussing how infrastructure assets

support economic activity and improve quality of life. The municipality's goals may already be set out in documents, including the strategic plan and/or the Official Plan, or may need to be developed in consultation with residents.
    - Clarifies the relationship of the asset management plan to municipal planning and financial documents (e.g. how the plan impacts the budget, Official Plan and Infrastructure Master Plan).
    - Describes to the public the purpose of the asset management plan (i.e. to set out how the municipality's infrastructure will be managed to ensure that it is capable of providing the levels of service needed to support the municipality's goals).
    - States which infrastructure assets are included in the plan. Best practice is to develop a plan that covers all infrastructure assets for which the municipality is responsible. At a minimum, plans should cover roads, bridges, water and wastewater systems, and social housing.
    - Identifies how many years the asset management plan covers and when it will be updated. At a minimum, plans must cover 10 years and be updated regularly. Best practice is for plans to cover the entire lifecycle of assets.
    - Describes how the asset management plan was developed — who was involved, what resources were used, any limitations, etc.
    - Identifies how the plan will be evaluated and improved through clearly defined actions. Best practice is for actions to be short-term (less than three years) and include a timetable for implementation.
- **State of Local Infrastructure:**
    - See Chapter 3.
- **Expected Levels of Service:**
    - See Chapter 4.
- **Asset Management Strategy:**
    - See Chapter 5 – section renamed **Lifecycle Management Strategy**.
- **Financing Strategy**
    - See Chapter 6.

Federal Gas Tax Agreement in Ontario

Asset management is included as part of the requirements to receive federal gas tax funding in Ontario. In the administrative agreement for the federal gas tax fund, asset management is defined as:

> *…a strategic document that states how a group of assets are to be managed over a period of time. The plan describes the characteristics and condition of infrastructure assets, the levels of service expected from them, planned actions to ensure the assets are providing the expected level of service, and financing strategies to implement the planned actions. The plan may use any appropriate format, as long as it includes the information and analysis required to be in a plan as described in Ontario's Building Together: Guide for Municipal Asset Management Plans.*

Provisions of the federal gas tax administrative agreement related to asset management plans include:

- The costs to develop asset management plans are considered eligible expenditures for gas tax funding;
- In order to continue to be eligible for gas tax funding, municipalities must have developed an asset management plan by December 31, 2016; and
- Municipalities must provide a report to the Association of Municipalities of Ontario that an asset management plan is being used as a guide to infrastructure planning and investment decisions, including how federal gas tax funds are to be used.

Infrastructure for Jobs and Prosperity Act, 2015 (IJPA)

The *Infrastructure for Jobs and Prosperity Act*, *2015* (IJPA) was passed by the Province of Ontario June 4, 2015. As noted in section 1 of the IJPA, the Act has been enacted to "establish mechanisms to encourage principled, evidence-based and strategic long-term infrastructure planning that supports job creation and training opportunities, economic growth and protection of the environment, and incorporate design excellence into infrastructure planning". The IJPA applies to the broader public sector of which municipalities as noted in subsection 6 (2)(a), are part. (Note: local boards are also included as noted in subsection 6 (2)(b), however for the discussion purposes within this chapter, only municipalities will be specifically referenced). For the purposes of the IJPA, the definition of municipalities is identified as being from the Municipal Act, 2001 in subsection 1 (1).

The IJPA outlines the need for an Infrastructure Asset Management Plan in subsection 6 (1):

> *Every broader public-sector entity prescribed for the purposes of this section shall prepare the infrastructure asset management plans that are required by the regulations and that satisfy the prescribed requirements.*

Further, IJPA stipulates that the municipality shall provide the infrastructure AM plan to the province, as required by the Minister, and if required by regulations, shall also make the infrastructure AM plan available to the public.

The IJPA also presents a number of principles for municipalities to consider when making decisions related to infrastructure. Please refer to Chapter 2 for more details.

Requirements for the development of an asset management process are also outlined in a regulation of the IJPA (O.Reg 588/17):

1. A Strategic Asset Management Policy by *July 1, 2019* (discussed in detail in Chapter 2);
2. Municipalities would be required to prepare an asset management plan in three phases:
    a. Phase I would address core infrastructure assets (i.e. roads, bridges, culverts, wastewater, water, and stormwater) and would be required to be completed by *July 1, 2021*.
    b. Phase II would expand on Phase I by including all infrastructure assets in the plan by *July 1, 2023*.
    c. Phase III would require further details to be provided for all infrastructure assets by *July 1, 2024*.
3. Phase I (i.e. core infrastructure) and Phase II (i.e. all infrastructure) of the asset management implementation would include the following:
    a. Current levels of service.
    b. Current asset performance, using performance measures.
    c. An asset inventory, including replacement cost, age, and condition.
    d. Estimated lifecycle costs by asset category to maintain current levels of service for 10 years.
    e. For municipalities with populations under 25,000: Assumptions regarding future changes in population or economic activity, and how they relate to estimated lifecycle costs to maintain current levels of service.
    f. For municipalities with populations over 25,000: Population and employment forecasts (from Growth Plans, official plans, etc.), and the

lifecycle costs required to maintain current levels of service in order to accommodate projected increases in demand caused by growth.

4. Phase III of the asset management implementation would include the following:
    a. Proposed levels of service for the next 10 years, using provided metrics for core infrastructure and municipally created metrics for other infrastructure.
    b. An explanation of why the proposed levels of service are appropriate, including risks, affordability and whether they are achievable.
    c. The proposed performance of each category for each year over 10 years.
    d. A lifecycle management strategy.
    e. A financial strategy.
    f. Document and address available funding as well as funding shortfalls.
    g. For municipalities with populations under 25,000: A discussion of how assumptions regarding future changes in population and economic activity informed the preparation of the lifecycle management strategy and financial strategy.
    h. Municipalities with populations over 25,000: Estimated lifecycle costs to achieve proposed levels of service in order to accommodate projected increases in demand caused by population and employment growth, the funding projected to be available (by source)as a result of increased population and economic activity, and an overview of risks associated.
    i. An explanation of any other key assumptions.
5. Updates, approvals and public availability:
    a. Review and update the asset management plan at least every 5 years.
    b. The asset management plan (or update) must be endorsed by the executive lead of the municipality, and approved by Council resolution.
    c. Municipalities would be required to provide Council with an annual update on asset management planning progress, by July 1st of each year.
    d. Municipalities would be required to post their strategic asset management policy and asset management plan on the municipality's website, if one exists, and make copies of these documents available to the public, if requested.

Please note that the specific requirements of the regulation are discussed in the introduction/overview sections of each chapter throughout this framework document.

Development Charges Act (DCA)

The recent changes to the DCA in December 2016 (new clause 10(2) (c.2)) requires that a Development Charge Background Study must include an asset management plan related to new infrastructure.

Subsection 10 (3) of the DCA provides:

(3) The asset management plan shall,

(a) deal with all assets whose capital costs are proposed to be funded under the development charge by-law;

(b) demonstrate that all the assets mentioned in clause (a) are financially sustainable over their full lifecycle;

(c) contain any other information that is prescribed; and

(d) be prepared in the prescribed manner.

There are no prescribed requirements at this time for all services, except transit. Therefore, the municipality defines the approach to include within the background study.

For transit, the amended regulations provide for a prescriptive evaluation. In regard to the DCA requirements for asset management for the Transit Service, Ontario Regulation 82/98 (as amended) provides the following:

> *8(3) If a council of a municipality proposes to impose a development charge in respect of transit services, the asset management plan referred to in subsection 10 (2) (c.2) of the Act shall include the following in respect of those services:*

1. *A section that sets out the state of local infrastructure and that sets out,*
   - i. *the types of assets and their quantity or extent,*
   - ii. *the financial accounting valuation and replacement cost valuation for all assets,*
   - iii. *the asset age distribution and asset age as a proportion of expected useful life for all assets, and*
   - iv. *the asset condition based on standard engineering practices for all assets.*
2. *A section that sets out the proposed level of service and that,*
   - i. *defines the proposed level of service through timeframes and performance measures,*

ii. *discusses any external trends or issues that may affect the proposed level of service or the municipality's ability to meet it, and*
iii. *shows current performance relative to the targets set out.*

3. *An asset management strategy that,*
   i. *sets out planned actions that will enable the assets to provide the proposed level of service in a sustainable way, while managing risk, at the lowest life cycle cost,*
   ii. *is based on an assessment of potential options to achieve the proposed level of service, which assessment compares,*
      A. *life cycle costs,*
      B. *all other relevant direct and indirect costs and benefits, and*
      C. *the risks associated with the potential options,*
   iii. *contains a summary of, in relation to achieving the proposed level of service,*
      A. *non-infrastructure solutions,*
      B. *maintenance activities,*
      C. *renewal and rehabilitation activities,*
      D. *replacement activities,*
      E. *disposal activities, and*
      F. *expansion activities,*
   iv. *discusses the procurement measures that are intended to achieve the proposed level of service, and*
   v. *includes an overview of the risks associated with the strategy and any actions that will be taken in response to those risks.*
4. *A financial strategy that,*
   i. *shows the yearly expenditure forecasts that are proposed to achieve the proposed level of service, categorized by,*
      A. *non-infrastructure solutions,*
      B. *maintenance activities,*
      C. *renewal and rehabilitation activities,*
      D. *replacement activities,*
      E. *disposal activities, and*
      F. *expansion activities,*
   ii. *provides actual expenditures in respect of the categories set out in sub-subparagraphs i A to F from the previous two years, if available, for comparison purposes,*
   iii. *gives a breakdown of yearly revenues by source,*

iv. *discusses key assumptions and alternative scenarios where appropriate, and*

v. *identifies any funding shortfall relative to financial requirements that cannot be eliminated by revising service levels, asset management or financing strategies, and discusses the impact of the shortfall and how the impact will be managed.*

1.4 Resources and References

Government of Canada, Infrastructure Canada, 2014, Administrative Agreement on the Federal Gas Tax Fund (Canada-Ontario-The Association of Municipalities of Ontario-The City of Toronto), http://www.infrastructure.gc.ca/prog/agreements-ententes/gtf-fte/2014-on-eng.html

International Organization for Standardization (ISO), 2014, ISO 55000:2014, Asset management – Overview, principles and terminology, http://www.iso.org/iso/catalogue_detail?csnumber=55088

Province of Ontario, 1996, Development Charges Act, https://www.ontario.ca/laws/statute/97d27

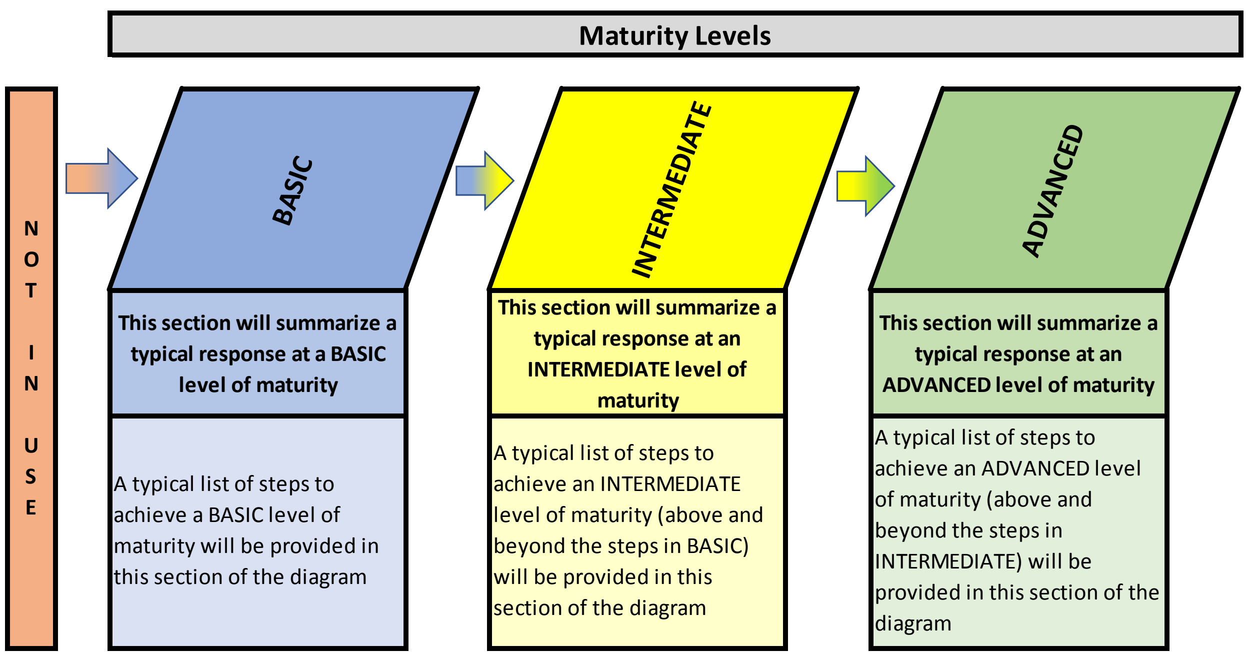
Province of Ontario, Ministry of Infrastructure, https://www.ontario.ca/page/ministry-infrastructure

Province of Ontario, Ministry of Infrastructure, 2012, Building Together: Guide for Municipal Asset Management Plans, https://www.ontario.ca/page/building-together-guide-municipal-asset-management-plans

2 Asset Management Policies and Strategies

2.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



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Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic level* requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

2.2 Overview

Asset management planning is a process[1], which should be informed by policies that assist in outlining overall approach, requirements, and roles/responsibilities, and should link to other organizational processes. A process should also detail the strategies,

[1] Note that the ISO 55000 series refers to this as an asset management *system*.

methods, and activities to undertake in order to achieve the planning objectives. One output of the AM process is the creation of an AM plan. See Figure 2-1 (below).

Figure 2-1
AM Process Output – AM Plan

<u>*Infrastructure for Jobs and Prosperity Act* (IJPA) and O. Reg 588/17 requirements:</u>

A Strategic Asset Management Policy (SAMP) must be developed and adopted by *July 1, 2019*, reviewed and updated at least every 5 years, and include the following:

1. Identify which municipal goals, plans or policies the AM plan would support (e.g. official plan, strategic plan, master plans, etc.);
2. A process for how the AM plan is to be considered in the development of the annual budget and any applicable long-term financial plans;
3. The municipality’s approach to continuous improvement and adoption of best practices regarding AM planning;

4. The principles that would guide AM planning in the municipality, including principles identified in section 3 of the IJPA;
5. A commitment to consider:
    a. the actions required to address the risks/vulnerabilities caused by climate change to the municipality's infrastructure assets, including to operations, levels of service, and lifecycle management, including the anticipated costs that could arise from these impacts, and the adaptation opportunities that may be undertaken to manage these potential risks;
    b. Mitigation approaches to climate change, such as greenhouse gas emissions reduction goals and targets;
    c. Disaster planning and any required contingency funding;
6. A process to ensure AM planning would be aligned with water and wastewater financial plans, including any financial plans prepared under the Safe Drinking Water Act, 2002.
7. A process to ensure AM planning would be aligned with Ontario's land-use planning framework, including any relevant policy statements issued under section 3(1) of the Planning Act; Provincial plans as defined in the Planning Act; and, municipal official plans;
8. A discussion of capitalization thresholds used to determine which assets are to be included in the AM plan and how this compares to the municipality's Tangible Capital Asset policy;
9. A commitment to coordinate planning between interrelated infrastructure assets with separate ownership structures by pursuing collaborative opportunities with upper-tier municipalities, neighbouring municipalities, and jointly-owned municipal bodies;
10. Identification of who would be responsible for AM planning, including an executive lead;
11. An explanation of Council's involvement in AM planning; and
12. A commitment to provide opportunities for municipal residents and other interested parties to provide input into AM planning.

Item (4) above references principles outlined under section 3 of the IJPA. These principles indicate that infrastructure planning and investment should:

- Take a long-term view, considering the needs of citizens and being mindful of demographic and economic trends;
- Take into account any applicable budgets and fiscal plans of the municipality;
- Be based on clearly identified infrastructure priorities;

- Ensure the continued provision of core public services such as health care and education;
- Promote economic competitiveness, productivity, job creation, and training opportunities;
- Ensure that the health and safety of workers who are involved in the construction and maintenance of infrastructure assets is protected;
- Foster innovation through the use of innovative technologies, techniques, and practices developed in Ontario;
- Be evidence based and transparent;
- Be undertaken with consideration of any provincial or municipal plans or strategies established in Ontario, even when they are not binding, but may still be relevant (e.g. Section 3 of the *Planning Act*, water sustainability plans under *Water Opportunities Act, 2010*, Lake Simcoe Protection Plan established under the *Lake Simcoe Protection Act, 2008*, transportation plans established under the *Metrolinx Act, 2006*);
- Promote accessibility for persons with disabilities;
- Minimize environmental impact—as well as respect and help maintain ecological and biological diversity—with infrastructure designed to be resilient to the effects of climate change;
- Endeavour to make use of acceptable recycled aggregates; and
- Promote community, social, and economic benefits, such as local job creation and training, improvement of public spaces, etc.

2.3 Asset Management Policies and Strategies

AM policies and strategies provide structure and guidance as to how a municipality will execute, maintain, and continuously improve AM planning, in order to provide services to stakeholders.

Is the asset management planning process supported by asset management policies and strategies?

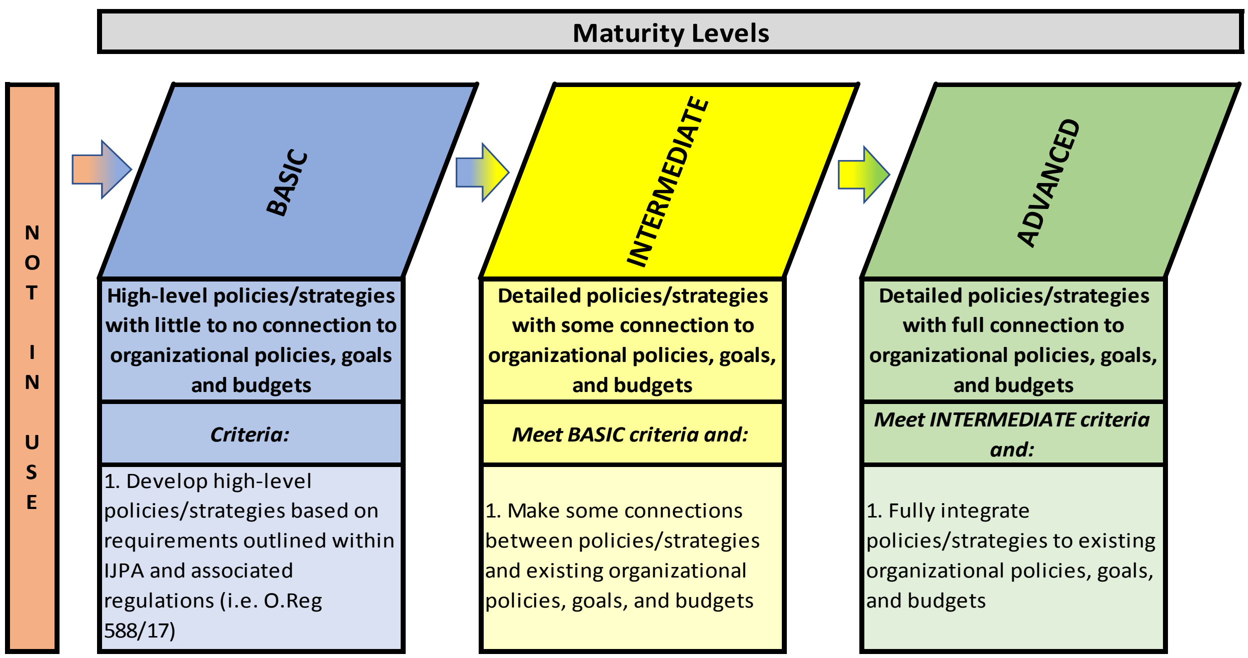
Background

Asset Management policies and strategies provide direction to municipal staff throughout the entire asset management process. They provide a framework for the asset management process and provide the connection to other organizational processes outside of asset management.

The regulation to the *Infrastructure for Jobs and Prosperity Act, 2015* (IJPA) requires that municipalities develop a strategic asset management policy (SAMP) with a number of principles and prescribed elements. The SAMP, which combines asset management policies and strategies into one requirement, support the asset management planning process through its connection to long-term organizational policies, goals and objectives.

Levels of Maturity – AM Planning and SAMP

Is the asset management planning process supported by asset management policies and strategies?



At the **basic level of maturity**, municipalities often have high-level AM policies/strategies (which adhere to the requirements of O.Reg 588/17). It is likely that there is little connection between the AM policies/ strategies and other organizational policies, goals, and budgets. The AM policies/strategies have likely been developed at a high level based upon the requirements outlined within the IJPA.

At the **intermediate level of maturity**, the municipality should prepare detailed AM policies/strategies based on the requirements of the IJPA and its associated regulations. Some connections should be made between the AM policies/strategies and the organizational policies, goals, and budgets.

At the **advanced level of maturity**, the municipality should prepare detailed AM policies/strategies based on the requirements of the IJPA and its associated regulations. The AM policies/strategies should be fully integrated with organizational policies, goals, and budgets.

Asset Management Policies

From a broad perspective, asset management policies set forth how a municipality uses asset management planning to fulfill its objectives and goals that have been established in other organizational policies and strategies. These AM policies will broadly explain how the asset management process will align with and carry out a municipality's mission statement as outlined in strategic planning documents.

Creating and maintaining asset management policies are vital steps in developing a robust and sustainable asset management process. These steps set forth the municipality's commitment to AM, offer high-level guidance, and ensure accountability throughout the process. Ultimately, these policies are the broad foundation on which the rest of the asset management planning process will build upon.

Examples of policy topics:

- Explain how all legislated rules and laws will be followed, or how the asset management process will assist in current reporting practices.
- Detail the municipal-wide principles and vision to which the AM process must adhere, and how it will integrate into existing municipal planning and operational processes.
- Describe how the annual budgeting process will be advised by the outputs of the asset management process.
- Outline existing departments/divisions responsible for AM, or the creation of a specific asset management group (e.g. committee), that will be tasked with creating, maintaining, updating, and managing the entire asset management process.
- Detail and define all asset classes/categories that will be managed and how they will be kept up to date (e.g. valuations, conditions, etc.). This can also be outlined in a process manual that supplements the AM policies (more on this below).

- Set forth expected services, community expectations, and service levels that will be maintained over time.
- Introduce key metrics that are easily understood, functional, and reviewable in order to set standard functionality and performance levels for each asset class/category.
- Determine how inspections and reviews will be carried out to ensure service standards are being maintained at agreed upon levels. This can also be outlined in a process manual that supplements the AM policies (more on this below).

Asset Management Strategies

Asset management strategies build upon the structure set in the AM policies and lay a path, or action plan, to accomplish the municipality's organizational goals at a more detailed level. The AM strategies answer how the municipality intends to provide expected service levels to the public through sustainable assets. In so doing, the AM strategies should aim to minimize the costs and risks associated with the AM process. It should be noted that the ISO 55000 series as well as some organizations refer to asset management strategies as a "strategic asset management plan". These terms are interchangeable and this document will always reference the former.

Comprehensive AM strategies are important because they provide a clear link between the asset management policy and asset management plan. If policies largely answer "why" to undertake asset management planning and asset management plans answer the "what" and "when", the strategy answers "how" this will all be undertaken. The strategies will provide guidance on how staff will go about executing the duties necessary in maintaining the municipality's asset management process.

Examples of strategy topics:

- Detail, through a schedule, the frequency of review and updates to all facets of the asset management process.
- Identify the current state of all asset classes/categories within the AM process and include all relevant info (e.g. replacement costs, service levels, risk, probability of failure) to be maintained, as well as the municipality's policies.
- Specify how the outputs and strategies of the asset management process will tie into existing municipal documents and plans.
- Clarify how all departments/divisions will incorporate asset management into their decision-making process.

- Specify the AM plans and processes that will be implemented, and how.
- Specify the metrics that will be utilized to measure the progress of the asset management process (e.g. service level metrics or additional metrics).
- Create timelines or roadmaps that detail progress and provide accountability to the municipality.
- Specify the roles and responsibilities of staff that will carry out the administration of the asset management process, as well as the roles of Council and the public.
- Identify all the data that will be collected and maintained on all assets, and set schedules for these updates (e.g. reviews every 1, 3, 5, etc. years).
- Specify any technical tools (e.g. IT systems, asset databases) that will be utilized in the asset management system and their level of integration.

Process Manual

Given the number of possible updates to the asset register, the number of sources of information, and the breadth of staff and potential consultants in an organization involved in the various aspects of asset management planning, a formal process manual can be beneficial to ensure a consistent application of methodologies across the asset register. The manual can be used to identify how the asset register is to be updated, when updates take place, and by whom. The major assumptions to be made can also be identified and documented as part of the process manual.

In order to facilitate consistency, issues such as staff/consultant hiring, training, and performance review (see Chapter 10 for more discussion on these issues) should be touched upon in the manual. Having a manual in place and included with other AM strategies should assist in providing a level of consistency to the AM updates being performed.

Strategic Asset Management Policy

The *Infrastructure for Jobs and Prosperity Act, 2015* (IJPA) requires asset management planning for public sector entities. The Province of Ontario has created a regulation under the IJPA (O.Reg 588/17) requiring municipalities to create a Strategic Asset Management Policy (SAMP). Please refer to the Overview section of this chapter (see above) for the detailed requirements of this SAMP as outlined in O.Reg 588/17.

2.4 Use of the Asset Management Policies and Strategies

Commitment to following AM policies and strategies ensures structure, consistency, and accountability in the AM process.

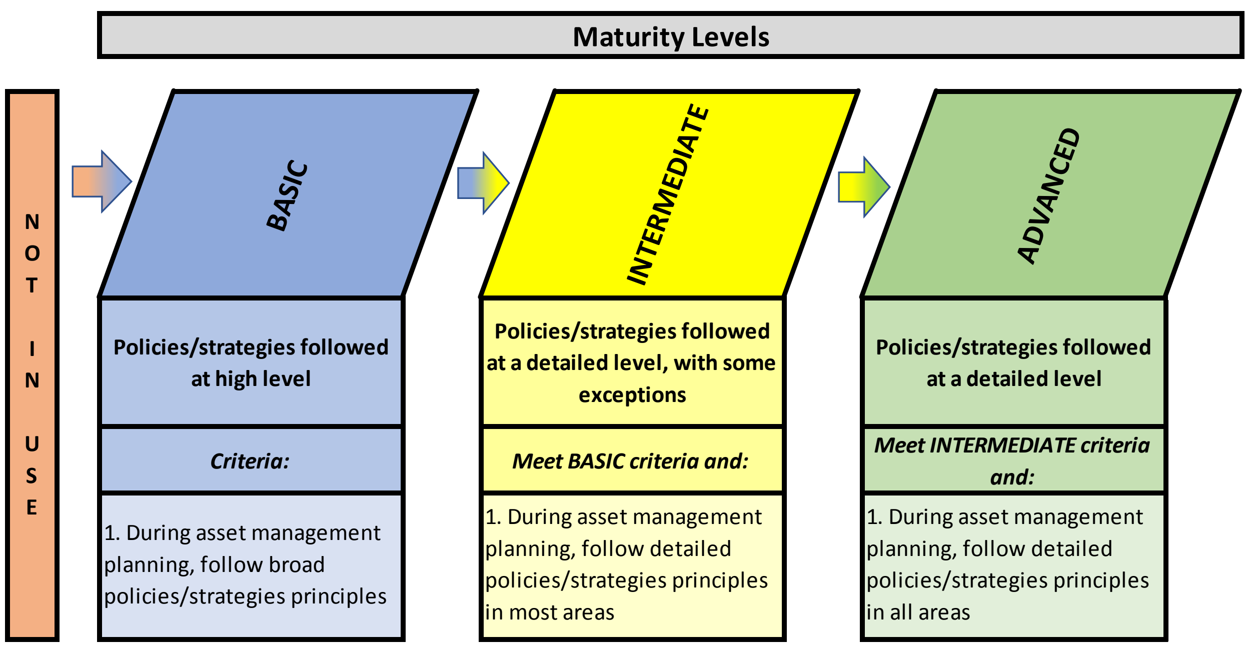
To what extent do the AM policies/strategies guide the asset management planning process?

Background

AM policies and strategies can be great guides for the asset management process, once in place and approved by Council. The extent of their use in guiding a municipality in AM planning going forward is the optimal method of determining their overall effectiveness and AM maturity level.

Levels of Maturity – Use of AM Policies/Strategies

To what extent do the AM policies/strategies guide the asset management planning process?



At the **basic level of maturity**, municipalities will follow their AM policies/strategies at a high level only. Broad AM policies/strategies principles would be followed during asset management planning.

At the **intermediate level of maturity**, municipalities will follow the AM policies/strategies at a detailed level, with some exceptions and/or gaps identified in policy/strategy areas.

At the **advanced level of maturity**, the municipalities will follow the AM policies/strategies at a detailed level in all areas, with no gaps in policy/strategy areas.

Use of AM Policies/Strategies

This section provides an overview of municipalities' ability to follow the AM policies and strategies in place (see examples discussed above). These policies and strategies are present to put structure, consistency, and accountability in the AM process. Following them shows commitment to asset management over the long-term.

A municipality will typically put in place initial policies and strategies based on early interpretations of AM planning needs within a municipality. It is only through ongoing trial and error that these policies and strategies are improved and updated to the point where they effectively guide the municipality in AM planning. Improvements and updates can take the form of:

- Relating existing policies and strategies to the specific needs of the municipality;
- Filling gaps in policy/strategy areas that were not addressed in previous updates; and
- Refining the ongoing action plan (e.g. strategies) to take into consideration recent decisions by Council, new information and available tools and techniques.

2.5 Asset Management Performance and Effectiveness

Incorporating performance measures and other metrics into AM policies and strategies allows municipalities to evaluate whether their AM process is producing the desired outcomes.

To what extent do the policies/strategies provide an approach to evaluate the performance and effectiveness of the AM planning process?

Background

It is important to determine whether the AM planning process is resulting in the desired outcomes. There are different approaches available to accomplish this, from high-level discussions (e.g. reach sustainability within ‘x’ years), to detailed performance metrics or ratios. The more rigorous and regular the evaluation process is, the higher the level of maturity for this issue.

Levels of Maturity – Evaluating the AM Process

To what extent do the policies/strategies provide an approach to evaluate the performance and effectiveness of the AM planning process?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Policies/strategies identify high-level discussions as method to evaluate AM planning process performance/effectiveness	**Policies/strategies identify both discussions and some documented metrics to evaluate AM planning process performance/effectiveness**	**Policies/strategies identify detailed discussions and metrics to evaluate AM planning process performance/effectiveness**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Develop broad discussion points on how the AM process can be evaluated in terms of performance and effectiveness	1. Develop discussion points on how the AM process can be evaluated in terms of performance and effectiveness	1. Develop detailed discussion points on how the AM process can be evaluated in terms of performance and effectiveness
	2. Include these broad discussion points within the policies/strategies, and use them to evaluate the performance/effectiveness on an ad hoc basis	2. Develop and document high-level AM planning performance metrics	2. Develop and document detailed AM planning performance metrics
		3. Include the discussion points and metrics within the policies/strategies and use them to evaluate the performance/effectiveness on an ad hoc basis	3. Include the discussion points and metrics within the policies/strategies and use them to evaluate the performance/effectiveness on a frequent/scheduled basis

At the **basic level of maturity**, municipalities use high-level discussions to evaluate the AM planning process performance and effectiveness. Broad discussion points to be used as criteria for evaluation will be developed and documented within the AM policies/strategies. These discussion points will tend to be used on an ad hoc basis as opposed to a scheduled or periodic basis.

At the **intermediate level of maturity**, municipalities should use both discussions and metrics to evaluate the AM planning process performance and effectiveness. High-level AM planning performance metrics to be used as criteria for evaluation will be developed and documented within the AM policies/strategies, along with agreed upon discussion points. These discussion points and metrics will tend to be used on an ad hoc basis.

At the **advanced level of maturity**, municipalities should use both detailed discussions and metrics to evaluate the AM planning process performance and effectiveness. Detailed AM planning performance metrics to be used as criteria for evaluation will be developed and documented within the AM policies/strategies. These discussion points and metrics should be used on a frequent and scheduled basis.

Performance Discussions

Performance discussions relate to the ability to describe the outcomes of a successful asset management process. This discussion should feed directly from the municipality's AM policies and strategies. Performance areas to consider include:

- Asset condition ratings, functionality, and/or performance;
- Moving towards expected service levels;
- Implementing (or moving towards) a sustainable asset management planning position;
- Meeting legislative requirements;
- Customer satisfaction; and
- Mitigating risk to acceptable levels.

This discussion can take place within a municipality's AM plan, within a periodic update report to Council, or even in an internal report to staff (e.g. senior management). The overall objective is to describe whether the AM planning process in place is creating the desired outcome or outcomes.

Performance Metrics

Performance metrics represent a more formal approach to measuring a municipality's success in achieving its desired objectives or outcomes. Performance metrics are designed to evaluate actual performance outcomes against desired service delivery-based outcomes. In addition, measuring performance over time will provide trending information related to progress in moving towards important goals. This lends itself to greater accountability as objective measures can be used to evaluate AM performance of not only the corporation as a whole, but municipal departments or divisions. Examples are as follows:

- Specific level of service performance measures (see Chapter 4);
- Infrastructure gap (see Chapter 6);
- Funding gap or sustainability ratio (see Chapter 6);
- Incidents of non-compliance with AM policies/strategies;
- Incidents of non-compliance with legislation; and
- Comparison of risk per service area in relation to acceptable levels.

2.6 Resources and References

Asset Management BC, Asset Management for Sustainable Service Delivery: A BC Framework, https://www.assetmanagementbc.ca/framework/

Institute of Public Works Engineering Australasia, 2015, International Infrastructure Management Manual, https://www.ipwea.org/publications/bookshop/ipweabookshop/iimm

International Organization for Standardization (ISO), 2014, ISO 55000:2014, Asset management – Overview, principles and terminology, http://www.iso.org/iso/catalogue_detail?csnumber=55088

Municipal Finance Officers' Association of Ontario, 2014, A Guide to Developing a Municipal Asset Management Policy, http://www.mfoa.on.ca/mfoa/main/VLFile.aspx?a=242&s=955758

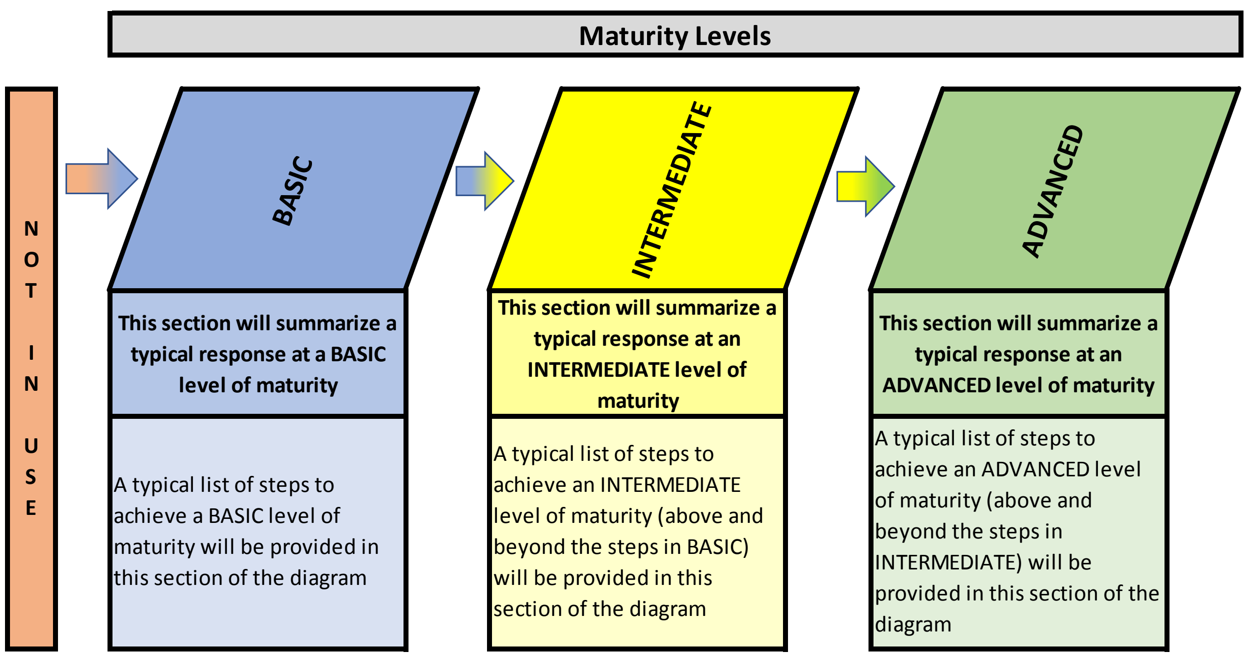
Province of Ontario, 2015, Infrastructure for Jobs and Prosperity Act, https://www.ontario.ca/laws/statute/15i15

Province of Ontario, Ministry of Infrastructure, 2017, Infrastructure for Jobs and Prosperity Act – Draft Regulation, https://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTMyNTkw&statusId=MjAxMzgx

3 State of Local Infrastructure

3.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of maturity diagrams within this framework will assist municipalities to identify their current levels of maturity for each AM area. Furthermore, for municipalities that have a desire to move to a higher level of maturity over time, the diagrams will provide potential approaches to doing so. To more easily depict the maturity levels ascribed to specific questions posed within the framework, the following diagram will be utilized for each question:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices

to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

3.2 Overview

The capital assets of a municipality exist for the purpose of delivering services, either directly or indirectly, to the public. In order to track and determine how well capital assets are performing in this regard, an asset inventory containing appropriate information on each asset should be collected and maintained. From this data, the “state of a municipality’s local infrastructure” can be determined and evaluated to provide the foundation for decisions and recommendations within the asset management planning process.

This chapter focuses on the process of undertaking a state of local infrastructure analysis. A municipality can prepare for this analysis by creating and updating an asset register, which is also an important tool for maintaining asset inventory information. Discussion will focus on the following:

1. Use and importance;
2. Asset attributes;
3. Level of asset detail;
4. Asset valuations;
5. Condition assessments;
6. Risk and criticality;
7. Age/condition profile; and
8. Updating the asset register.

Infrastructure for Jobs and Prosperity Act (IJPA) and O. Reg 588/17 Requirements

O.Reg 588/17 outlines the following requirements with respect to asset inventories:

A municipality's AM plan must include the following (for each asset category):

a) A summary of the assets in the category;
b) The replacement cost of the assets in the category;
c) the average age of the assets in the category, determined by assessing the average age of the components of the assets;
d) The information available on the condition of the assets in the category; and
e) A description of the municipality's approach to assessing the condition of the assets in the category, based on recognized and generally accepted good engineering practices where appropriate.

The information above must be available for core infrastructure by July 1, 2021 and for all other assets by July 1, 2023.

As per O.Reg 588/17, a municipality's AM plan must be reviewed and updated at least every 5 years. Therefore, the information above must also be reviewed and updated at least every 5 years.

3.3 The Asset Register

3.3.1 Use and Importance

A comprehensive asset register provides a centralized source of asset information that enables efficient analysis and dissemination of information for many corporate needs, including asset management.

Is there one comprehensive asset register?

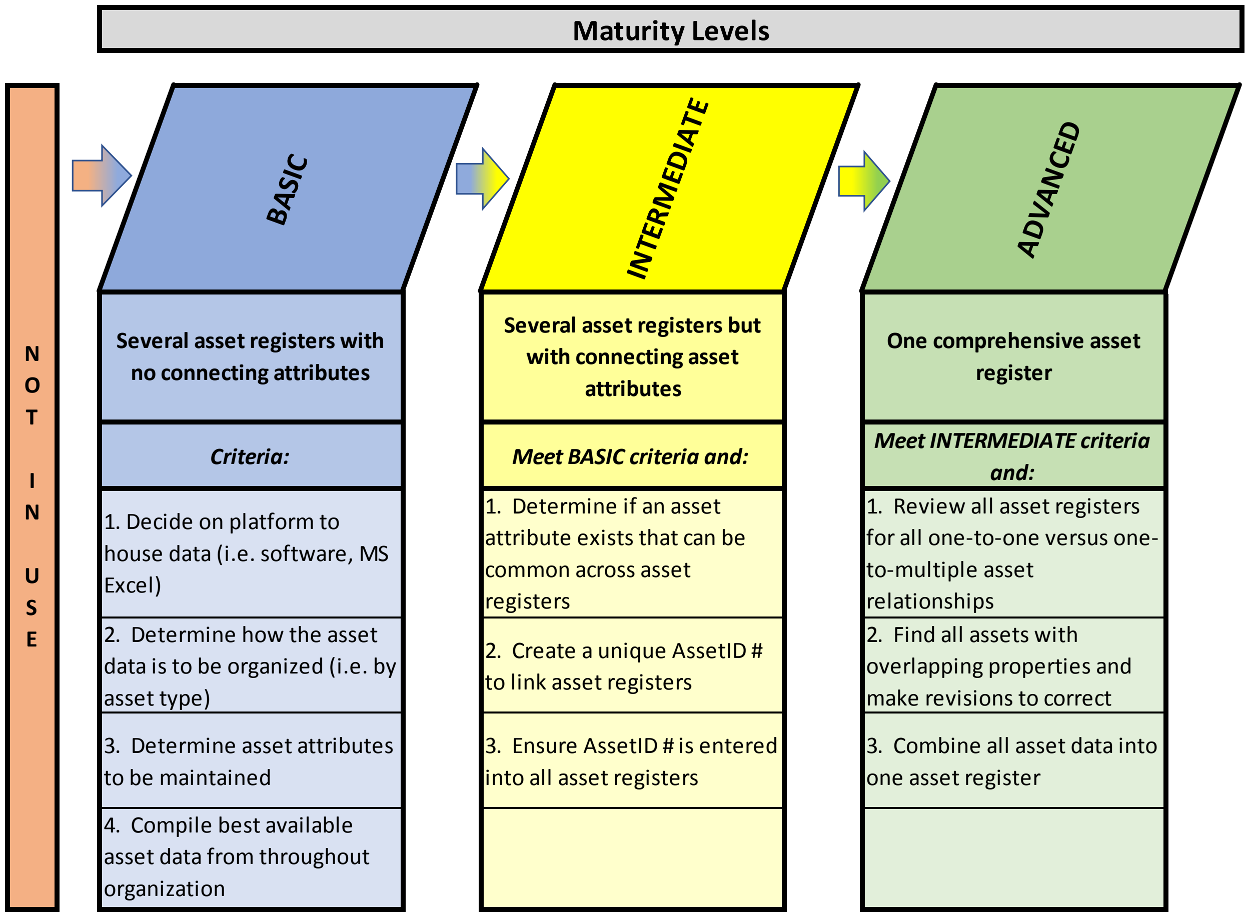
Background

Asset information is used across multiple departments, services and activities within an organization. This includes PSAB 3150 compliance, FIR reporting, asset management, maintenance management, GIS, condition/inspection reports and "capital needs" studies or reports. In each of these areas, the common need is to have accurate, available, and up-to-date asset data upon which decisions can be made. With so many uses of asset data across an organization, a common struggle among municipalities is the ability to have all departments using the same asset data. This is commonly referred to as having "one version of truth" from an asset perspective.

Some organizations may keep asset registers in spreadsheets, while other organizations may keep them in more formal databases or systems that are designed for the specific purpose of maintaining asset data in an efficient and effective manner. Regardless of the technology in place, data integrity, completeness and reliability become critical to ensure accurate asset information is available to make decisions. Asset registers will be discussed further in Chapter 9 (Asset Management Tools).

Levels of Maturity – Structure of Asset Register(s)

Is there one comprehensive asset register?



At the **basic level of maturity**, municipalities often have a number of asset registers in multiple formats with no connecting attributes. For example, different departments may each have an asset register for their own purposes, but with no objective of connecting the data between them. At this level, an asset register exists for asset management purposes.

As municipalities with no asset register(s) prepare to collect and maintain asset data, a few decisions will have to be made. First, where will the asset information be stored and maintained. There are many alternatives, such as using spreadsheets (i.e. MS Excel or Access) or obtaining specialized software. Second, how will the asset data be organized within the asset register, and which asset attributes will be collected and maintained. With these questions answered, the municipality will be in a position to gather the necessary information from various sources within the organization. Asset attributes will be discussed in more detail below.

At the **intermediate level of maturity**, municipalities establish linkages between the various asset registers, including the asset management register. This can be achieved through asset attributes such as a common asset identifier.

At the **advanced level of maturity**, municipalities operate with one comprehensive asset register, or multiple asset registers that are connected to provide “one version of truth”. While asset data may be stored in multiple registers, they are interconnected and controls are in place to ensure consistency, completeness and accuracy. To move from an intermediate to advanced level of maturity, the municipality should perform a review of all asset registers to identify all one-to-one asset relationships, where the same asset may reside in more than one asset register (i.e. PSAB register and GIS), versus one-to-multiple asset relationships (road segment could include base, surface, curbs, etc. or multiple road segments could equate to one segment in another register). Further investigation should be done to identify assets with overlapping properties across asset types. For example, consider a length of road complete with wastewater mains. The road segments may not exactly line up with those of the wastewater mains. When developing one comprehensive asset register, these overlapping properties will have to be managed in clearly defined business processes.

The Asset Register

As discussed above, there are many uses for an asset register or multiple connected asset registers. The asset register is the foundation for any organization’s asset management process. This section describes various best practices for maintaining asset register(s).

There are two primary components of an asset register:

1. **Physical asset register components**: These components include the data required to maintain the levels of service that the assets provide. At a minimum, this includes physical attributes (i.e. description, location, size, material type) and condition, but may be extended to include technical data, criticality, functionality, capacity, and maintenance history.
2. **Financial asset register components**: These components include relevant asset financial details such as valuations and costing. In part, the financial asset register forms a part of a larger corporate finance system, through PSAB 3150 valuations, but also includes asset management values such as benchmark costs and current costs (i.e. replacement cost).

Physical and financial asset registers may exist as separate registers or may exist in combination as a single asset register. In cases where the registers are separate, there should be some level of integration or connectivity (manual or automated) between them to ensure common data is kept consistent. Maintaining a common and unique identifier for each asset is suggested for any asset register where asset data is maintained in separate areas. The most common unique identifier is the Asset ID.

Maintain "One Version of Truth"

A comprehensive asset register will often be made up of a number of integrated data sources, where each is primarily designed for specific department use. In situations where the asset register is not integrated and comprehensive, multiple asset registers exist and are maintained by specific departments or staff. The concern with having multiple asset registers from an asset management perspective is the challenge of ensuring "one version of truth". For example, the Public Works department may believe they have 250 road segments with a replacement cost of $150 million. However, the Finance department may believe there are 200 road segments with a replacement cost of $250 million. In this situation, both departments are relying on different and inconsistent sources of information to meet their needs.

Perhaps the most critical best practice for any asset register is to establish parameters to ensure that there is only one version of truth for all asset management data. These parameters define the "primary data sources" for each type of data and how it will be used and managed across the organization. This may require documented business processes that are supported and enforced across existing department boundaries. The development of these processes may be especially challenging within organizations that have traditionally stored and maintained similar data in different data stores with no formal processes to define data truth.

Multiple Asset Registers for Multiple Uses

In some cases, municipalities may decide to have multiple asset registers that are disconnected. This can work where asset data is maintained for significantly different needs. Examples include:

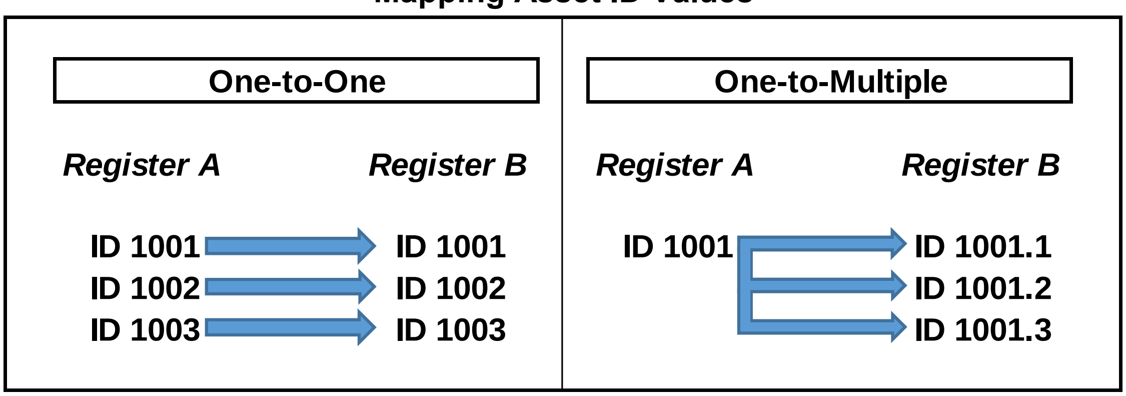
- Asset management:
- Maintenance management; and
- Financial reporting.

These asset registers may have attributes that are similar, such as descriptions, size, material type, replacement cost, etc. However, they also have independent (i.e. unique) attributes, such as historical cost and amortization. Also, these asset registers can be maintained at differing levels of detail. For example, an asset management buildings inventory may have 20 components per building, however a financial reporting (PSAB) register may record buildings as a single asset. Both approaches in this example meet the specific needs of the users and stakeholders of each register. Municipalities will need to determine if a connection between the multiple asset registers is warranted. Where similar attributes exist, a beneficial first step would be to assess if the multiple asset registers are providing similar results (such as the total length of roadways).

The most important parameters for maintaining an asset register with one version of truth across multiple data sources include using unique asset ID numbers and developing an approach for accessing and maintaining the data.

1. **Defining Asset ID Values:** Each asset within the asset register(s) should be assigned a unique asset ID value. This ID is used within asset inventories and spreadsheets to connect sources of asset data relevant to a specific asset across all data stores. For example, condition data, financial data, and maintenance data from different sources can be connected to assets through the asset ID. Keep in mind that this connection through asset IDs can be a one-to-one relationship or a "one-to-multiple" relationship. See below for examples of each.

Figure 3-1
Mapping Asset ID Values



2. **Accessing and Maintaining Data:** Processes and rules should be developed for how data will be accessed and maintained across all sources of data. This includes the ability to see asset data (i.e. "read-only" permission) and the ability to edit asset data (i.e. "write" permission). These permissions can span to:

- All assets (i.e. certain staff can see all assets);
- Some departments/assets (i.e. only Public Works can edit road assets); or
- Particular asset attributes (i.e. only Finance can edit PSAB 3150 values or only Public Works staff can update roads condition ratings and replacement costs).

Maintain an Asset Hierarchy or Structure

An optimal asset hierarchy or structure is developed in a manner such that both external and internal reporting needs are addressed. For example, from an external perspective, there is a need to report assets based on asset type for the annual audited financial statements, and by department for the FIR. However, a municipality may choose to internally track assets based on a structure that differs from external reporting needs.

An example of an internal asset categorization is as follows:

1. Roads Related;
2. Bridges and Major Culverts;
3. Water Supply;
4. Wastewater;
5. Stormwater Drainage;
6. Solid Waste;
7. Facilities (Buildings);
8. Vehicles, Machinery, and Equipment;
9. Land Improvements; and
10. Other.

Many of these asset classes can be broken down into various asset sub-classes.

Table 3-1
Sample Asset Hierarchy

<table>
<tr><th>Asset Class</th><th>Asset Type</th><th>Component</th></tr>
<tr><td rowspan="8">Transportation</td><td rowspan="2">Road</td><td>Surface</td></tr>
<tr><td>Base</td></tr>
<tr><td rowspan="2">Structures</td><td>Bridges</td></tr>
<tr><td>Culverts > 3m</td></tr>
<tr><td>Curb</td><td>N/A</td></tr>
<tr><td>Sidewalk</td><td>N/A</td></tr>
<tr><td>Streetlight</td><td>N/A</td></tr>
<tr><td>Traffic Management Device</td><td>N/A</td></tr>
<tr><td>Facility</td><td>General Building</td><td>Substructure</td></tr>
</table>

Asset Class	Asset Type	Component
		Shell
		Interior
		Services
		Equipment and Furnishings
		Special Construction
Water Supply	Main	Gravity
		Pressure
	Node	Joint
		Valve
		Hydrant
	Storage Facility Pumping Station Treatment Facility	Process Equipment
		Process Electrical
		Process Instrumentation
		Process Piping
		Build and Process Structural
		Building Architectural
		Building Services

Municipal assets possess relationships and are associated with other municipal assets. For instance, an asset can have components or segments (discussed further in sections below), it can share a location with other assets, and it can be associated with one or multiple departments, or even associated with one or multiple asset classes or types.

Table 3-2
Sample Asset Register

Asset ID	Asset	Asset Type	Location	FIR Department	Internal Department
RD 005	Tom St.	Road – Infrastructure	From Smith St. to John St.	Transportation	Public Works
W 012	Watermain	Water – Infrastructure	Tom St. RD 005	Water	Public Works
WW 012	Wastewater Main	Wastewater – Infrastructure	Tom St. RD 005	Wastewater	Public Works
BLDG 02	West Arena	Facility	123 Smith St.	Recreation and Culture	Parks and Recreation
EQ 56	Generator	Equipment	West Arena	Recreation and Culture	Parks and Recreation
ST 003	Stormwater Pond	Land Improvement	Wilson Blvd.	Stormwater	Public Works
SW 115	Truck	Vehicle	East End Landfill	Solid Waste	Public Works

BR 203	Culvert	Road – Infrastructure	Tom St.	Transportation	Public Works

Maintaining an asset hierarchy that provides some type of classification and structure to the municipal assets provides many benefits such as:

- External and internal reporting classifications;
- The ability to locate assets spatially; and
- Determine if related/associated assets impact each other.

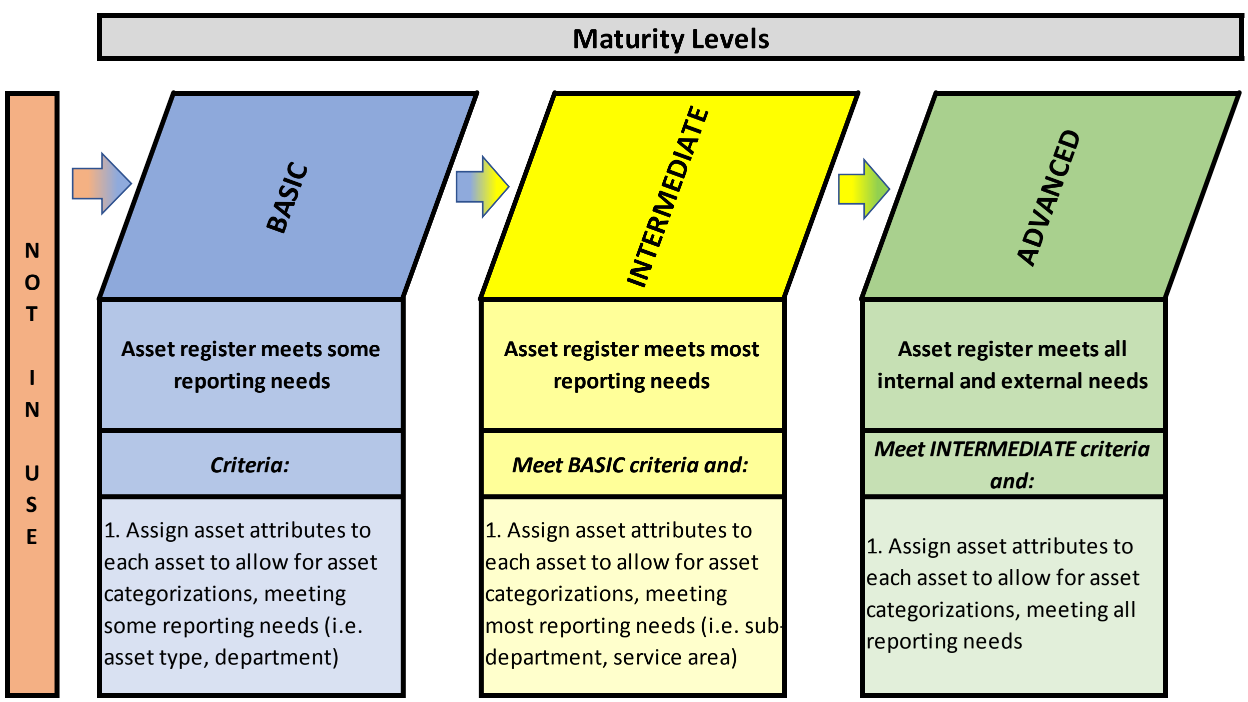
To what extent does your asset register meet internal and external reporting needs?

Background

Regardless of the platform(s) used to retain asset information, it is important to strive towards the successful use of the available information for reporting purposes. There are a number of internal and external reporting needs within a municipality, therefore consideration should be given to the ability of the asset register to provide the necessary timely information for this purpose.

Levels of Maturity – Asset Register and Reporting

To what extent does your asset register meet internal and external reporting needs?



At the **basic level of maturity**, municipalities will find that their asset register will meet some of their reporting needs. These municipalities will assign asset attributes, such as asset type and department, to each asset, which will allow for asset categorizations for use in reporting. Initial focus should be on required reporting needs such as annual financial reporting.

At the **intermediate level of maturity**, the asset register will meet most of the municipal reporting needs, both externally and internally. The municipality will make use of more specific asset attributes, such as sub-department and/or service area, for asset categorization to be used in meeting most reporting needs.

At the **advanced level of maturity**, the municipality will ensure all necessary asset attributes are assigned to assets to allow for sufficient asset categorization to meet all reporting needs, both internally and externally. At this level, reports should be generated easily with very little need for manual formatting/adjustments.

Reporting Needs

The asset register should contain sufficient and accurate detail to meet a municipality's internal and external reporting needs.

Internal reporting would relate to the ability to produce reports that facilitate the effective management of capital assets in the delivery of municipal services. External reporting would meet legislative, operational, and financial accounting reporting needs. Examples of each are as follows:

Table 3-3
Sample Internal/External Reports

Internal Reporting	External Reporting
Annual Budget	Audited Financial Statements (including segment reporting)
Asset Management Planning	Financial Information Return (FIR)
Long-Term Forecasting and Financial Planning	Grant Applications
Maintenance Management	Water and Wastewater Financial Plans
Asset Condition/Inspection Reports	Asset Condition/Inspection Reports

Municipalities should determine what asset information is required, and in what classification or format for each reporting need. Reviewing all reporting needs before making refinements to an asset register can assist in identifying appropriate asset categorizations, as well as asset attribute data to collect.

Many of the reporting needs identified relate to either external accounting or internal (management) accounting reporting. The following chart from the "Guide to Accounting for and Reporting Tangible Capital Assets", highlights the contrast in the requirements for financial accounting and internal management accounting.

Table 3-4
Financial/Management Accounting Requirements

Financial Accounting	Management Accounting
Oriented to those external to the organization	Oriented to those internal to the organization
Reports governed by prescribed principles	Reports and content are flexible
Based on the needs of external users	Based on the needs of management
There is need for uniformity in reporting due to various user needs	Management can specify the type and content of information needed
Addresses all financial aspects of the local government as a whole for decision making	Typically addresses certain aspects of the local government for decision making
Focuses on financial position, annual results and cash-generating ability	Focuses on issues such as determining prices to be charged, choices in product lines offered and product profitability
Transaction and event based	Includes transactions and events, future plans and any other required data
Unified by the basic equation Assets – Liabilities = Net Assets	Based on three principles: full, differential, and responsibility costing
Mandatory	Optional

Source: Guide to Accounting for and Reporting Tangible Capital Assets, April 2007

3.3.2 Asset Attributes

Collecting and tracking appropriate asset attributes enables municipalities to understand the state, extent, and relative importance of the organization's assets.

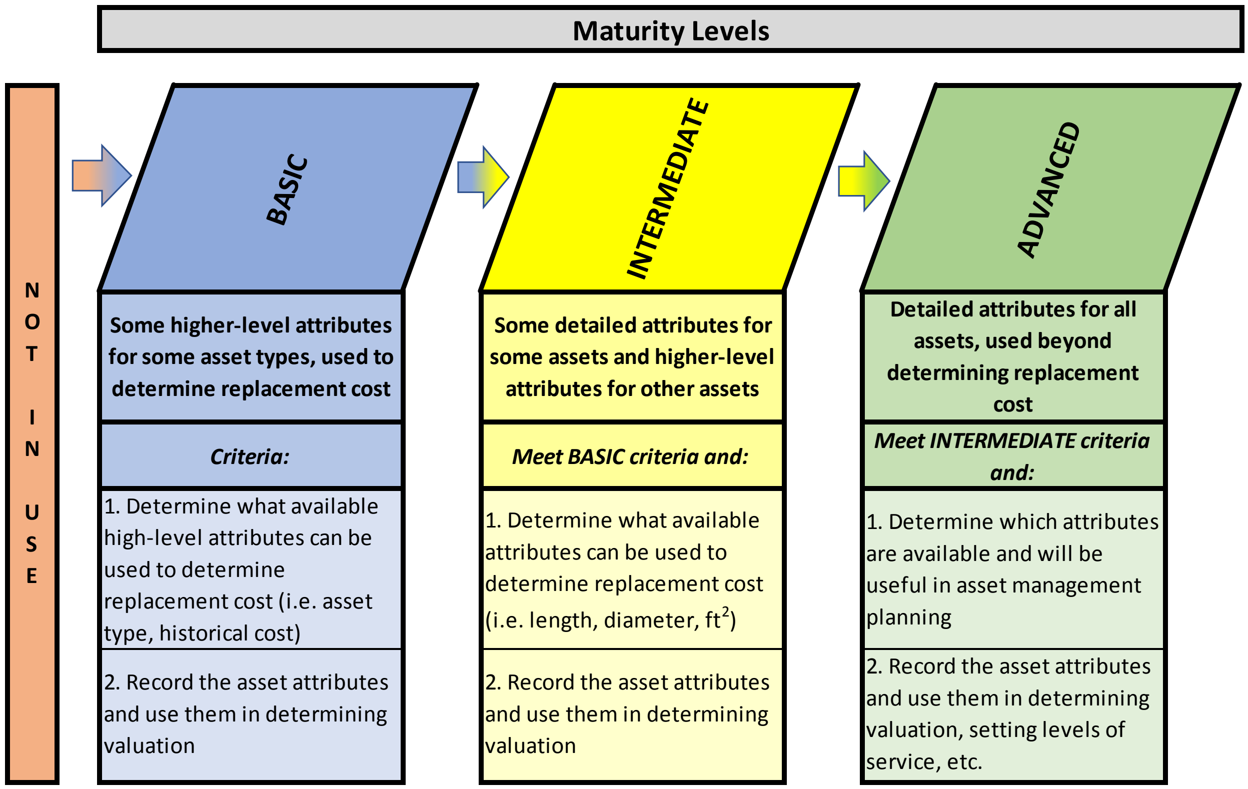
To what extent does the municipality include detailed asset attributes in the asset register?

Background

Asset attributes are characteristics that enable each asset to be clearly identified, quantified, described, evaluated, and accounted for. Asset attribute information requirements will vary between asset classes and between different asset types. Some attribute data will be held at the asset level while other data will be required at a more detailed component level. In addition, required attribute data will also vary by municipality. The level of detail required will, as a general rule, be dependent on the sophistication of the organization's asset management processes and more so, the level of detail deemed important to the municipality. For an organization using basic asset management functions only higher-level attributes may be accounted for. Similarly, the level at which attribute data is collected should be related to the end use of the data. If assets are managed at a "whole asset" level it may not be necessary to collect and maintain detailed attribute data at a component level. Also, asset attribute data will depend on the type of information used for each asset type to determine valuation and expected levels of service.

Levels of Maturity – Asset Attributes

To what extent does the municipality include detailed asset attributes in the asset register?



At the **basic level of maturity**, municipalities include within their asset data some higher-level attributes for some asset types. Municipalities need to determine for which attributes are available, easily recorded, and can be used to determine current valuation for each asset. It would be expected that, as a minimum, attributes such as asset type, location, useful life, age and historical cost would be included. Once the asset attributes have been recorded, they can be used in determining current valuation of the assets.

At the **intermediate level of maturity**, detailed attributes for some assets may be used, along with some higher-level attributes for other assets. This includes attributes at a more granular level, such as asset length, width, diameter and material type (if applicable) for more complex assets. This level of detail enables the municipality to calculate benchmark costs, such as cost per length, cost per diameter and/or cost by square foot/metre. This information allows for a more detailed costing to be completed, and also a more detailed levels of service analysis.

At the **advanced level of maturity**, detailed attributes would be documented and maintained for all assets. At this level, municipalities may include additional attributes that allow valuations to be done at a more detailed level. Attributes, such as functionality and capacity, are also used to set current levels of service and risk at a detailed level.

Types of Asset Attributes

The following table illustrates examples of attribute types that can be considered as part of maintaining an asset register.

Table 3-5
Sample Asset Register Attribute Types

Parameters	Description of use
Asset Identifiers, Location, and Descriptors	To identify, describe and locate the asset. Will also define asset in terms of position in an asset hierarchy.
Detailed Technical Data	To individualize and quantify each asset from similar assets.
Valuation Data	Data that allows the organization to assess costs of the assets (both historical and current) and record/track amortization.
Maintenance Data	Data that identifies the work to be completed and work completed against an asset.
Condition Data	Data used to assess asset risk and determine actual remaining useful lives of assets.
Predictive Data	Data used to allow future behaviour of assets to be predicted. These would include deterioration curves and treatment effect details.
Performance Data	Data recording demand and capacity performance. Unplanned maintenance activity is recorded against asset including cause and costs. Planned maintenance procedures adopted for critical assets.
Risk Data	Data used to analyze risk of an asset's failure and determine the risk to organizations if the asset were to fail.
Lifecycle data	Data used to plan future costs associated with operations, maintenance, creation, renewal, disposal of assets. The cost of any strategy should also be determined.
Optimized Lifecycle Data	Data used to optimize analysis of works taking into account the following factors: risk, maintenance, operations, life extension, age and condition of asset, asset decay, treatment options and cost.

Source: Adapted from IIMM 2011 2.4.1 table 2.4.1.

The following attribute types will be discussed in more detail below:

1. Identification, Description, and Location;
2. Classification;
3. Physical – Components, Materials, and Dimensions;
4. Financial;

5. Condition;
6. Risk / Criticality;
7. Functionality and Capacity;
8. Maintenance; and
9. Predictive.

Identification, Description, and Location attributes

These attributes identify an individual asset, provide information as to its location and describe it in basic terms. Typically, these attributes may include:

Identifiers: details that enable the asset to be recognized.

- Asset ID or Asset Number: an identifier unique to the asset;
- Asset Name: where a name simplifies identification and location e.g. Smith Pavilion; and
- Parent Asset: often provides context to identifying the asset e.g. Smith Pavilion may be a child of XYZ Sports Ground.

Location: details that enable the asset to be located and/or related to other assets or features, can include:

- A street address;
- Start and end distances for linear assets;
- A floor level, or room within a building;
- A generic locality or local name;
- Precincts, neighbourhoods, wards, etc.;
- Map references; and
- Spatial coordinates (GIS data).

Classification Attributes

Classification attributes allow assets to be grouped for reporting and other management requirements, enable placement in asset hierarchies, and differentiate assets with differing service level requirements. Examples include:

- Asset Class;
- Asset Type;
- Hierarchy;

- Significance; and
- Ownership.

Physical Attributes

Physical attributes relate to the physical make-up of an asset that enable it or its components to be differentiated from other similar assets, quantified and described in detail. Examples include:

- Detailed descriptors;
- Structural details;
- Manufacturer (make, model and vin number);
- Insurance details;
- Materials; and
- Dimensions.

Financial Attributes

Financial attributes relate to financial aspects of assets. This may include:

- Asset valuation for asset management:
  - Unit rate for replacement (i.e. benchmark cost);
  - Current replacement cost;
  - Asset consumption (deterioration curve/profile);
  - Estimated service life (deterioration curve/profile);
  - Maintenance costs;
  - Capital costs for rehabilitation or enhancement/expansion activities; and
  - Operating costs.
- Asset valuation specific to PSAB 3150:
  - Historical cost;
  - Accumulated amortization;
  - Net book value;
  - Useful life (amortization period);
  - Age;
  - Amortization rate;
  - Amortization method (e.g. straight line based on age, consumption-based); and
  - Remaining useful life.

Condition Attributes

Condition attributes relate to the physical condition of the asset. As municipalities may have various condition ratings scales across asset types, best practices would suggest that this be considered “raw data” and used to generate condition ratings that are consistent across all assets. For example, if a municipality decides that a consistent condition rating out of 10 is to be used for all assets, but a consultant provides the municipality bridge condition indexes (BCI) out of 100, then the BCI data would be treated as raw data to be used to generate an asset management condition rating out of 10 (i.e. BCI divided by 10). Having a consistent rating across all assets allows municipalities to compare assets across departments or service areas for asset management purposes.

Some assets will only require a single condition attribute while other more complex assets may require multiple condition attributes. More complex asset (i.e. road and bridge) condition ratings prepared by consultants typically include multiple ratings while less complex assets usually receive one overall condition rating. The municipality must determine which ratings are to be used for asset management purposes. Further discussion on condition ratings is provided in later sections.

Risk or Criticality Attributes

Risk or criticality attributes relate to risks associated with assets. Typically, the attributes are related to the overall risk of the asset failing (i.e. exposure, probability of failure and consequence of failure). Risk attributes may also include items such as number of customers affected (in case of asset failure), existence of alternatives (detours for roads or reverse feeds for water supply), potential service delays, costing implications and social implications. Risk mitigation factors can also be accounted for within the calculations. Further discussions on risk and criticality are outlined in later sections.

Functionality and Capacity Attributes

Functionality and capacity attributes relate to the “fitness for purpose” of assets. These attributes define how well an asset is capable of performing compared to expected performance. This information can become very useful in determining levels of service (See Chapter 4) as well as asset risk (to be discussed below).

Functionality attributes typically relate to how well an asset is suited to the service provided while capacity attributes tend to relate to the scale of the service or the ability to cope with current or future use. For example:

- An area may lack functionality if no public toilet is provided;
- A building used to provide services to senior citizens that is not fitted with grab rails or wheelchair access would be lacking in functionality;
- Ongoing occurrences of roads congestion or subway congestion could suggest a lack of capacity; and
- Stormwater mains filled with roots or other debris may impact capacity.

Both functionality and capacity attributes are often derived from other attributes. For example, the functional adequacy of a road or sidewalk, may be related to its width dimension, its surface material, or both in comparison to the desired size and material of a road or sidewalk as defined by the municipality.

Functionality and capacity attributes support asset management planning as they relate to the ability of the asset to provide the defined desired levels of service. Long-term planning should include actions required to correct functionality and capacity issues, if expected levels of service indicate that corrections are needed. The degree and level of the functional or capacity issue will often be used to prioritize asset rehabilitation, replacement, upgrade/expansion, or the creation of new assets.

The table below provides some examples of functionality and capacity attributes:

Table 3-6
Sample Capacity/Functionality Attributes

Asset Type	Capacity	Functionality
Roads Related	Road Width Road Standard (i.e. urban vs. rural) Available Sidewalks Available Streetlights	Comfort/Amenity Accessibility Usability Environment
Bridges and Major Culverts	Load Limit Bridge Width	Comfort/Amenity Accessibility Usability Environment
Water, Wastewater, and Stormwater	Pressure/Flow Rate Interconnection/Distribution Future Demand Size (diameter) and Depth	Risk of Damage Public Rating Factor Properties Service Ratio Pressure/Flow Rate

Asset Type	Capacity	Functionality
	Gravity Factor	
Buildings and Facilities	Bathroom Availability Parking Spots Room Layout Available Storage Sports/Fitness Availability	Comfort/Amenity Accessibility Usability Environment
Vehicles, Machinery, and Equipment	Available Power Available Storage – People Available Storage – Cargo	Comfort/Amenity Accessibility Usability
Land Improvements	Usable Area Number of Benches/Picnic Tables Limited Parking Spots	Comfort/Amenity (Public Toilets) Accessibility Usability Environment
Solid Waste	Available Landfill Volume Recycling Volume Roadside Collection Volume	Environment Diversion Percent Number of Complaints

The following is an example of a functionality assessment matrix that can be used to assess functionality across municipal buildings. This type of analysis can be used in assessing levels of service.

Table 3-7
Sample Functionality Assessment Matrix

Functionality		Bldg. 1	Bldg. 2	Bldg. 3	Bldg. 4	Bldg. 5
Indicator	Aspects Considered					
Accessibility	Location Hrs of Operation Design, Disabled Access	✓	✓	✓	✓	✓
Accommodation	Fit for Purpose	X	✓	✓	X	✓
Room Layout	Fit for Purpose	✓	✓	✓	✓	✓
Circulation Spaces	Suitability and Adequacy	✓	✓	✓	✓	✓
Temporary Storage	Location Quantity and Suitability	X	✓	✓	✓	✓
Permanent Storage	Location Quantity and Suitability	✓	✓	✓	✓	✓
Acoustics	Adequacy – Internal and External	X	✓	✓	✓	✓
Fixed Joinery Items	General Condition Quality and Quantity	✓	✓	✓	✓	✓

Functionality		Bldg. 1	Bldg. 2	Bldg. 3	Bldg. 4	Bldg. 5
Indicator	**Aspects Considered**					
Fittings and Furniture	General Condition Quality and Quantity	X	✓	✓	✓	✓
Fixed Appliances	General Condition Quality and Quantity	✓	✓	✓	✓	✓
Window Coverings	General Condition Quality and Quantity	X	✓	✓	✓	✓
Signage	Location Quality and Appropriateness	✓	X	✓	✓	✓
Technology	Access to IT Automation, etc.	X	X	✓	✓	✓
Car Parking	Availability Suitability	✓	X	✓	✓	✓

<u>Maintenance Attributes</u>

Maintenance attributes relate to the maintenance of assets throughout their lifecycle. This can include responsibility (owner, manager, etc.), inspection and/or testing schedules, work identified (defects), programmed work, work status (pending, outstanding or completed). In the event that the municipality has a maintenance management system, this data would be integrated into that system (see Chapter 9). Maintenance attributes can be useful in determining an asset's condition, especially with assets that are difficult to assess (i.e. water mains, wastewater force mains, and difficult to access stormwater mains). It can also be useful in establishing future maintenance needs within the asset management process.

<u>Predictive Attributes</u>

Predictive attributes allow future behaviour of assets to be predicted. These would include deterioration curves and treatment effect details. These enable the future state of an asset to be predicted. Attributes used for valuation such as useful life, remaining useful life, and age are often also included here.

In summary, the table below provides examples of individual asset attributes for various attribute types:

Table 3-8
Sample Individual Asset Attributes

Attribute Type	Attribute Examples		
Identification, description, and location	Asset ID Street Address	Asset Name GIS ID	Parent Address
Classification	Asset Class Significance	Asset Type Heritage	Hierarchy Ownership
Physical	Detailed Descriptors Materials	Structural Details	Manufacturer
Financial	Historical Cost Age Consumption Pattern Renewal/Betterment	Replacement Cost Useful Life (UL) Maintenance Costs	Net Book Value Remaining UL Amortization Rate
Condition	Date of Assessment	Method of Assessment	Rating
Risk	Risk Type Consequence of Failure	Exposure Date of Assessment	Probability of Failure
Functionality and capacity	Expected LOS	Measured LOS	
Maintenance	Responsible Person Programmed Work	Inspection Schedule Work Status (pending, outstanding, or complete)	Work Identified
Predictive	Deterioration Curves	Treatment Effect Details	

The table below outlines some basic attributes that may be seen for different asset categories or types:

Table 3-9
Sample Basic Attributes

Asset Type	Attribute Examples		
Roads	Road Name Length Road Type	“From” Street Width	“To” Street Material Type
Bridges	Bridge Name Length	Location (street) Width	Structure Type
Stormwater	Road Name Length	“From” Street/Node Diameter	“To” Street/Node Pipe Material
Water System	Road Name Length	“From” Street/Node Diameter	“To” Street/Node Pipe Material
Wastewater	Road Name Length	“From” Street/Node Diameter	“To” Street/Node Pipe Material
Facilities	Address Number of Floors	Material Type Dimensions	Square Footage

Asset Type	Attribute Examples		
Solid Waste	Address	Odour Factor	Diversion %
Equipment and Vehicles	Vehicle Number	Department	Insurance Information
Land Improvements	Address	Material Type	Quantity

3.3.3 Asset Level of Detail

The level of asset componentization and segmentation should reflect how the organization manages its assets. Having the right level of detail allows for more informed AM decisions.

How are your assets broken down into components?

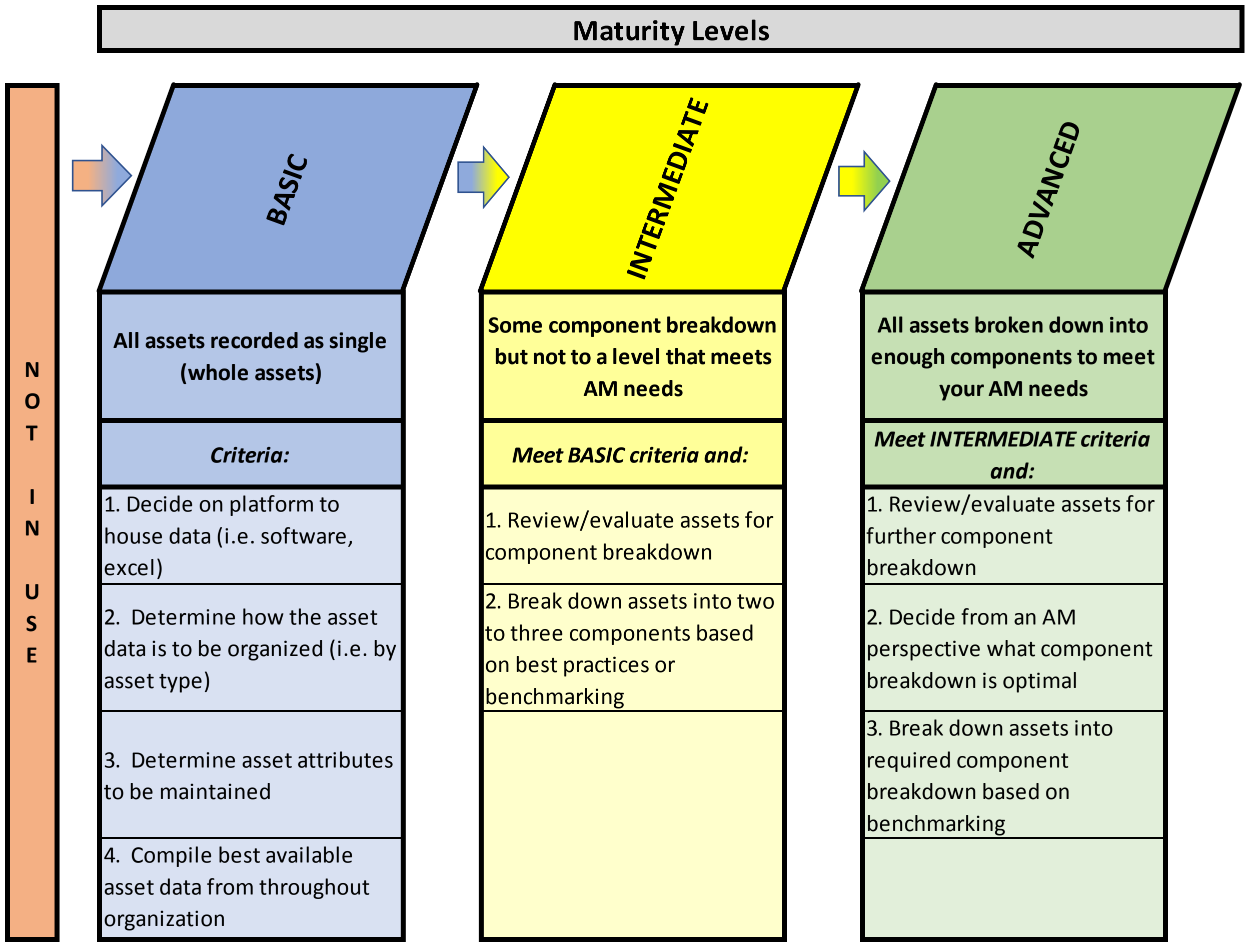
Background

Identifying the level of asset detail to be recorded is a key to successful asset management. Insufficient or inaccurate data does not provide reliable inputs for decision making and reporting, while excessive data often creates confusion and leads to the data becoming unused and poorly maintained.

A good starting point for determining an appropriate level of detail is to identify how data is to be used and what level of detail is required for that use from a component perspective. (e.g. if an asset is to be managed and costed at a whole asset level there is probably little value in capturing condition data at a component level.)

Levels of Maturity – Asset Components

How are your assets broken down into components?



At the **basic level of maturity**, municipalities record all assets as single assets (whole assets). The steps to attain this level are: first, determine where the asset information will be housed; second, determine how the asset data will be organized within the asset register, and which asset attributes will be maintained; and third, gather the necessary information to populate the asset register from various sources within the organization.

At the **intermediate level of maturity**, some component breakdown is undertaken, but not to a level that meets all asset management needs. In order to move to the intermediate level, municipalities will need to review and evaluate their assets to determine which types or categories should be broken down into components (focusing on more complex assets such as buildings and roads). At this level, it would be expected that these assets may be broken down into some components, based on best practices or benchmarking. Once components are created, they are treated as individual assets that relate to the overall whole asset.

At the **advanced level of maturity**, all assets are broken down into enough components to meet the municipality's asset management needs. Again, a review and evaluation would be completed to identify assets for further breakdown. This evaluation would be undertaken from an asset management perspective to determine the optimal level of component breakdown for all assets.

Use of Asset Components

The decision to break down an asset and maintain it at a component level will be based on the benefits this approach versus the cost to collect and maintain the data by the municipality. Complex assets (such as treatment plants, roads, and facilities) are often maintained at the component level to facilitate more accurate service delivery cost information. This occurs because major components have their own expected useful life that can be significantly different than the whole asset's useful life. Similarly, the individual major components may also have significantly different useful lives from each other. This difference in components' useful lives may then require replacement at different intervals during the life of the overall complex asset. By separately maintaining component data, important attributes such as replacement cost, risk/criticality, condition, and functionality/capacity can be tracked and made readily available for each component. Thus, a more accurate service delivery cost is developed with the use of components for certain assets.

The following tables provide examples of various assets being broken down into key components as well as examples of asset categorizations and classes.

Table 3-10
Sample Asset Classes/Categories/Components – Roads

<table>
<tr><th>Parent Asset</th><th>Classification</th><th>Road Type</th><th>Class*</th><th>Ward</th><th>Asset</th><th>Component Asset</th></tr>
<tr><td rowspan="6">Roads</td><td rowspan="3">Urban</td><td rowspan="2">Local</td><td>Class 1</td><td>Ward 1</td><td>Road 1</td><td>Surface</td></tr>
<tr><td>Class 2</td><td>Ward 2</td><td>Road 2</td><td>Base</td></tr>
<tr><td rowspan="2">Collector</td><td>Class 3</td><td>Ward 3</td><td>Road 3</td><td>Curb</td></tr>
<tr><td rowspan="3">Rural</td><td>Class 4</td><td>Ward 4</td><td>Road 4</td><td>Sidewalk</td></tr>
<tr><td rowspan="2">Arterial</td><td>Class 5</td><td>Ward 5</td><td>Road 5</td><td>Guard Rails</td></tr>
<tr><td>Class 6</td><td>Ward 6</td><td>Road 6</td><td>Streetlights</td></tr>
</table>

* Minimum Maintenance Standards

Table 3-11
Sample Asset Classes/Categories/Components – Bridges

<table>
<tr><th>Parent Asset</th><th>Classification</th><th>Road Type</th><th>Class*</th><th>Ward</th><th>Asset</th><th>Component Asset</th></tr>
<tr><td rowspan="6">Bridges</td><td rowspan="3">Urban</td><td rowspan="2">Local</td><td>Class 1</td><td>Ward 1</td><td>Bridge 1</td><td rowspan="2">Surface</td></tr>
<tr><td>Class 2</td><td>Ward 2</td><td>Bridge 2</td></tr>
<tr><td rowspan="2">Collector</td><td>Class 3</td><td>Ward 3</td><td>Bridge 3</td><td>Deck</td></tr>
<tr><td rowspan="3">Rural</td><td>Class 4</td><td>Ward 4</td><td>Bridge 4</td><td>Structure</td></tr>
<tr><td rowspan="2">Arterial</td><td>Class 5</td><td>Ward 5</td><td>Bridge 5</td><td rowspan="2">Rails</td></tr>
<tr><td>Class 6</td><td>Ward 6</td><td>Bridge 6</td></tr>
</table>

* Minimum Maintenance Standards

Table 3-12
Sample Asset Classes/Categories/Components – Buildings

<table>
<tr><th>Parent Asset</th><th>Department</th><th>Service</th><th>Ward</th><th>Asset</th><th>Uniformat Level 1</th><th>Uniformat Level 2</th></tr>
<tr><td rowspan="17">Buildings</td><td rowspan="9">Dept. 1</td><td rowspan="5">Service A</td><td rowspan="2">Ward 1</td><td rowspan="3">Building 1</td><td rowspan="2">Substructure</td><td>Foundations</td></tr>
<tr><td>Basement Constr’n</td></tr>
<tr><td rowspan="2">Ward 2</td><td rowspan="3">Shell</td><td>Superstructure</td></tr>
<tr><td rowspan="3">Building 2</td><td>Exterior Enclosure</td></tr>
<tr><td rowspan="2">Ward 3</td><td>Roofing</td></tr>
<tr><td rowspan="4">Service B</td><td rowspan="3">Interiors</td><td>Interior Constr’n</td></tr>
<tr><td rowspan="2">Ward 4</td><td rowspan="3">Building 3</td><td>Stairs</td></tr>
<tr><td>Interior Finishes</td></tr>
<tr><td rowspan="2">Ward 5</td><td rowspan="5">Services</td><td>Conveying</td></tr>
<tr><td rowspan="8">Dept. 2</td><td rowspan="3">Service C</td><td rowspan="3">Building 4</td><td>Plumbing</td></tr>
<tr><td rowspan="2">Ward 6</td><td>HVAC</td></tr>
<tr><td>Fire Protection</td></tr>
<tr><td rowspan="5">Service D</td><td rowspan="2">Ward 7</td><td rowspan="3">Building 5</td><td>Electrical</td></tr>
<tr><td rowspan="2">Equipment and Furnishings</td><td>Equipment</td></tr>
<tr><td rowspan="2">Ward 8</td><td>Furnishings</td></tr>
<tr><td rowspan="2">Building 6</td><td rowspan="2">Special Constr’n / Demo.</td><td>Special Constr’n</td></tr>
<tr><td>Ward 9</td><td>Selective Building Demolition</td></tr>
</table>

Table 3-13
Sample Asset Classes/Categories/Components – Water/Wastewater Facilities

Parent Asset	Classification	Ward	Asset	Component Asset
	Water	Ward 1	Building 1	Process Equipment

Parent Asset	Classification	Ward	Asset	Component Asset
Water and Wastewater Buildings				Process Electrical
		Ward 2	Building 2	Process Instrumentation
		Ward 3		Process Piping
	Wastewater	Ward 4	Building 3	Building and Process Structural
		Ward 5	Building 4	Building Architectural
		Ward 6		Building Services

Table 3-14
Sample Asset Classes/Categories/Components – Environmental Linear Assets

Parent Asset	Classification	Ward	Main ID	Component Asset
Water, Wastewater, and Stormwater Linear Assets	Water	Ward 1	Main 1	Main
		Ward 2	Main 2	
	Wastewater	Ward 3	Main 3	Service Connection
		Ward 4	Main 4	
	Stormwater	Ward 5	Main 5	Manholes
		Ward 6	Main 6	

Table 3-15
Sample Asset Classes/Categories/Components – Solid Waste

Parent Asset	Ward	Address	Component Asset
Solid Waste	Ward 1	Address 1	Collection Vehicles
	Ward 2	Address 2	
	Ward 3	Address 3	Scales
	Ward 4	Address 4	
	Ward 5	Address 5	Sorting Equipment
	Ward 6	Address 6	

Table 3-16
Sample Asset Classes/Categories/Components – Vehicles/Machinery/Equipment

Parent Asset	Classification	Ward	Address	Component Asset
Vehicles, Machinery, and Equipment	Roads	Ward 1	Address 1	Main Vehicle/Mach., Equipment
		Ward 2	Address 2	
	Fire	Ward 3	Address 3	Motor
		Ward 4	Address 4	
	Parks	Ward 5	Address 5	Detachable Components
		Ward 6	Address 6	

Table 3-17
Sample Asset Classes/Categories/Components – Land Improvements

Parent Asset	Classification	Ward	Address	Component Asset
	Roads	Ward 1	Address 1	

<table>
<tr><th>Parent Asset</th><th>Classification</th><th>Ward</th><th>Address</th><th>Component Asset</th></tr>
<tr><td rowspan="5">Land Improvements</td><td></td><td>Ward 2</td><td>Address 2</td><td>Parking Lots: Surface, Base</td></tr>
<tr><td rowspan="2">Fire</td><td>Ward 3</td><td>Address 3</td><td rowspan="2">Playground Structure: By Piece of Equipment</td></tr>
<tr><td>Ward 4</td><td>Address 4</td></tr>
<tr><td rowspan="2">Parks</td><td>Ward 5</td><td>Address 5</td><td rowspan="2">Fencing: Use of Fence “Segments”</td></tr>
<tr><td>Ward 6</td><td>Address 6</td></tr>
</table>

It is important to note, however, that there may be other opportunities to break down a whole asset into its components. Each municipality must assess its asset-related needs, and make appropriate determinations based on how the assets are actually operated and maintained. In general, it would be advantageous to organize an asset’s data into components when:

- The components of a single whole asset have significantly different useful lives from each other;
- The assets are operated and maintained more at a component level;
- Asset condition differs from one component to another; and
- The cost or risk of failure of the components is significant enough to warrant separate tracking.

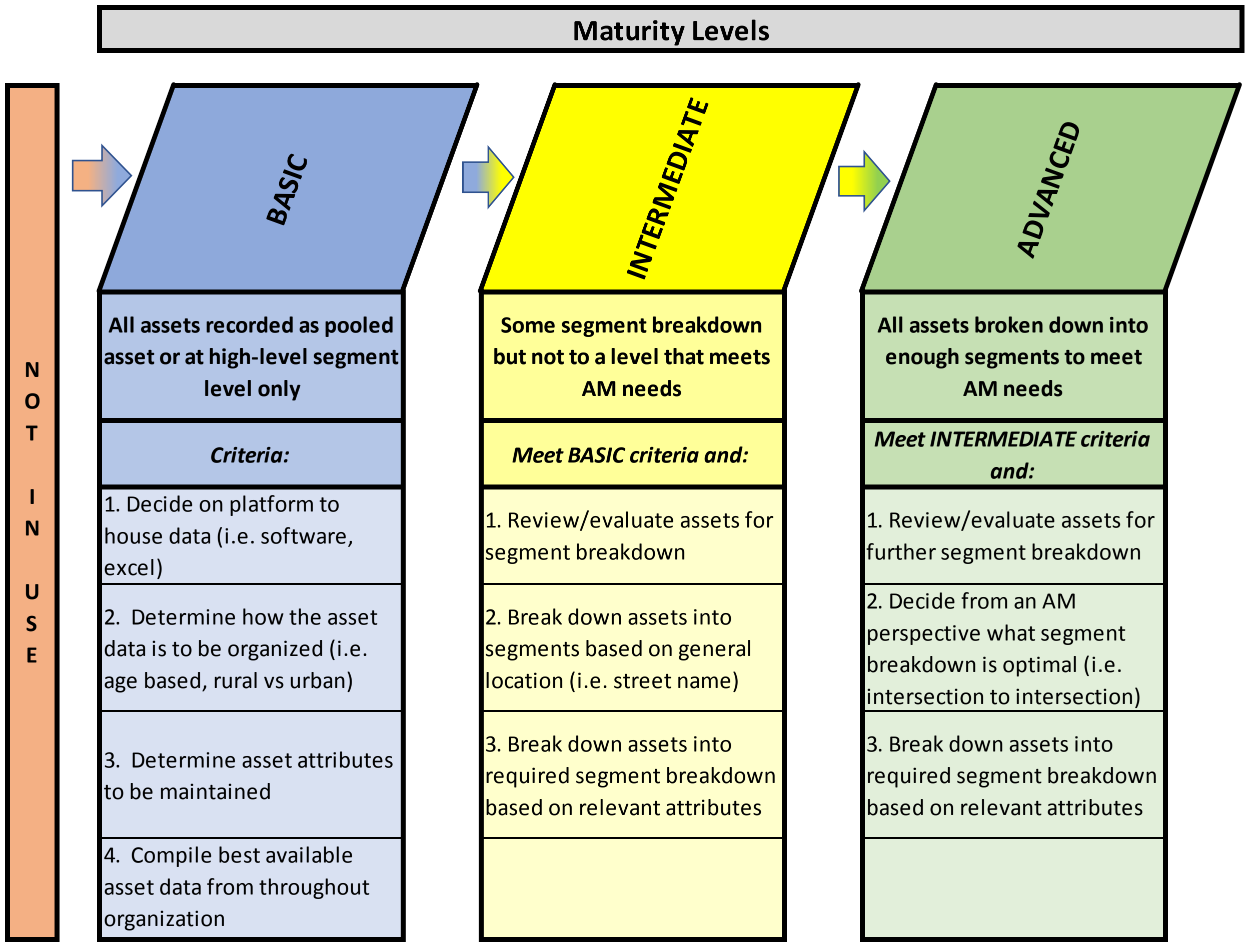
How are your assets broken down into segments (i.e. Roads, Water, Storm, Wastewater)?

Background

The optimal level of linear asset segmentation is another factor to consider when determining the appropriate level of asset detail (i.e. for roads, water mains, wastewater mains and storm mains). Determining the level of segmentation is a process that is somewhat similar to determining the level of asset component breakdown. Both require a cost/benefit analysis to determine what makes sense for each specific municipality.

Levels of Maturity – Asset Segmentation

How are your assets broken down into segments (i.e. Roads, Water, Storm, Wastewater)?



At the **basic level of maturity**, municipalities record all assets as single assets (whole assets) or through some type of pooling approach. An example would include pooling roads by year of construction. The steps to attain this level are:

1. Determine where the asset information will be housed;
2. Determine how the asset data will be organized within the asset register; and
3. Ascertain which asset attributes will be maintained.

From this point, the municipality will be in a position to gather the necessary information from various sources within the organization.

At the **intermediate level of maturity**, some segmentation is undertaken but not to a level that meets asset management needs. Asset pooling would be minimal for linear assets. To successfully advance to the intermediate level, municipalities will first need to review and evaluate their assets to determine which should be broken down into segments. At this level, it is expected that assets may be broken down into segments based on general location (i.e. by street name) and by age (year of construction).

At the **advanced level of maturity**, all assets are broken down into enough segments to meet asset management needs. A review and evaluation should be completed to identify assets for further segmentation. This evaluation is undertaken from an asset management perspective to determine the optimal level of segmentation (i.e. intersection to intersection, or GIS node to node). At the advanced level of maturity, municipalities may make use of shorter and clearly identifiable segments.

Use of Asset Segmentation

The collection of data for linear or network-related assets such as roads, water, wastewater, and stormwater systems will typically include length, unit of measure and location (start and end points). This information provides the opportunity to identify and track network assets based on logically determined "segments". The determination of the basis for segmentation will hinge upon how the municipality's data is arranged. Common examples of asset segmentation include:

- By intersection;
- By length (i.e. every 500 meters);
- By GIS node; and/or
- By age/condition (Since different segments of linear assets are constructed, or replaced at different times, it is usually advantageous to track these segments separately).

By using a segmentation approach, a municipality will have a more accurate and detailed breakdown of network or linear related assets. The advantages of using segments includes the ability to document betterments and replacements more accurately (i.e. limit the instances where segments are partial replaced or improved). However, there are disadvantages related to the need to maintain more assets within the asset register.

Once again, the municipality must consider its asset management needs when deciding whether to apply segmentation to a linear asset category. As discussed earlier, the municipality should attempt to break down its assets based on how they are operated and maintained.

3.3.4 Asset Costs

Realistic asset cost estimates enable more accurate costing of asset needs. To ensure the asset costings remain realistic municipalities should establish a process for continuous or periodic updates.

How is replacement cost determined?

Background

Asset costs are not only a requirement in asset record keeping, but also of great benefit to municipalities in asset management planning and other areas. Costs take many forms, including:

- **Historical cost:** The original cost to purchase or construct the asset, which is typically only used for accounting purposes; and
- **Current cost:** The cost of the asset in today's dollars, which can represent:
  - **Reproduction cost:** The current cost of the asset in place today; and
  - **Replacement cost:** The current cost of the asset with which you intend to replace an existing asset.

Accurate costs assist asset managers with external reporting needs, as well as making long-term asset management and financial management decisions. They provide an understanding of the asset investment level and allow staff to allocate costs and plan for maintenance, rehabilitation, and replacements.

Levels of Maturity – Replacement Cost

How is replacement cost determined?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Reproduction cost primarily based on inflated historical cost and/or high-level estimates from credible sources	**Some use of replacement cost and some reproduction cost, based on credible sources (i.e. minimal reliance on inflated historical cost)**	**Replacement cost utilized throughout, based on credible sources**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Ensure historical cost and year of purchase or construction is recorded	1. Use credible replacement cost data, where available, through development of a list of benchmark costs or whole costs	1. Consider replacement cost sources such as internal benchmark data (i.e. past invoices) and external benchmark data (i.e. local municipalities or Ontario)
	2. Use appropriate cost index to inflate historical cost to an estimated reproduction cost.	2. For assets missing a replacement cost, use appropriate cost index to inflate historical cost to estimate reproduction cost	2. Develop a master list of benchmark costs and whole value replacement costs that can be linked or imported into the asset register based on asset attributes
	3. Review reproduction costs for accuracy, substituting other costs, as available (i.e. insurance costs)	3. Review costs for accuracy, substituting other costs, as available (i.e. insurance costs)	3. Review costs for accuracy, adjusting the master list of replacement costs, as necessary

At the **basic level of maturity**, municipalities determine current cost by using reproduction cost estimates, based on inflating historical cost to current year cost using relevant inflation indices. To perform these calculations municipalities will first require, as a minimum, the historical cost of their assets and the year of acquisition/construction. Second, municipalities will require an appropriate cost index to be applied to inflate historical cost to current year costs. Statistics Canada maintains many historical cost indices that are relevant including CPI (for purchased assets such as equipment, machinery, vehicles, etc.) and NRCPI (for construction related assets such as roads, water, wastewater, facilities, etc.). It is recommended that the resulting reproduction costs are reviewed for accuracy with consideration given to substituting other available costs (i.e. engineering estimates, insurance), if deemed more appropriate.

At the **intermediate level of maturity**, municipalities make more use of replacement cost estimates for future cost purposes, and supplement replacement costs with reproduction cost (from credible sources) where necessary. Inflated historical cost use is minimized wherever possible. The use of credible sources for replacement cost, through the development of benchmark costs or whole asset cost estimates is undertaken. For assets with no available replacement cost information, reproduction cost estimates are used. It is recommended that resulting replacement/reproduction costs be reviewed for accuracy with consideration to substituting other available costs (i.e. engineering estimates, insurance), if deemed more appropriate.

At the **advanced level of maturity**, municipalities use replacement cost exclusively, based on credible and supportable sources. This requires the municipality to have in place a process to find and document replacement cost sources (i.e. internal sources, such as past tenders and invoices; and external sources, such as benchmark costs from comparable municipalities or the province). This master list of benchmark costs and whole value replacement costs should be linked to or imported into the asset register based on asset attributes (i.e. road length or road square metres). It is recommended that the resulting replacement costs be reviewed to ensure an appropriate level of accuracy.

Definition of Asset Cost

PSAB 3150 states that the historical cost of an asset should include “all costs directly attributable to the acquisition, construction or development of the tangible capital asset. This includes installing the asset at the location and in the condition necessary for its intended use. Examples of directly attributable costs include:

- Asset purchase or construction;
- Site preparation costs;
- Initial delivery and handling costs;
- Installation and assembly costs;
- Costs of testing that the asset is functioning properly prior to, or during, installation;
- Professional fees (e.g. design, legal, etc.); and
- Other (e.g. service continuity costs).

The term “directly attributable” is the key to determining whether a cost can be allocated to a tangible capital asset” from a historical cost perspective. While this term is related to determining the historical cost of an asset, the same guideline can be applied in determining the asset's current cost for asset management purposes. If a municipality only includes an asset's purchase or construction cost in the determination of current cost the cost will be underestimated, as it is ignoring the other costs that are directly attributable to making the asset "service ready". Therefore, when determining current cost, a municipality should be mindful of all costs involved in getting the asset ready to be used and put into service.

Current Estimates of Future Costs

There are a number of methods available to determine the current cost of a capital asset. Current valuation for different capital assets may require varied approaches depending on availability of costing information, and complexity of the calculation itself. The use of benchmarking costs can be very useful in this regard. Benchmarking costs can be internally calculated, or retrieved from external sources such as neighbouring municipalities, industry publications/experts, online searches, and buyers' guides. The following are various methods of determining current cost:

- **Inflated historical cost:** The historical cost of an asset, as used for PSAB 3150 purposes, inflated to current year dollars using some type of construction or consumer price index (i.e. from Stats Can or MFOA);
- **Insured cost:** The current cost of an asset as identified by insurance appraisal;
- **Reproduction cost:** The cost of reproducing an asset in substantially identical form, often referred to as like-for-like, since it does not attempt to take into account impacts on costs such as changes in technology or construction methods; and
- **Replacement cost:** The cost of the asset intended to replace an existing asset. It attempts to take into account changes in technology, as well as the municipality's expected levels of service.

The methods of determining current cost described above vary in terms of complexity and level of accuracy. In determining a reproduction or replacement cost, source costs or benchmark costs can be derived from external sources (i.e. other municipalities or provincial averages) or from internal sources (i.e. recent tender pricing). The following list of approaches is presented in order of accuracy for determining current valuation:

1. **Replacement Cost – Internal Benchmark Cost:** This method is most accurate since it relates to the cost of the asset being purchased or constructed, and it takes into account any specific local cost factors for the municipality. A good

source of information for internal benchmark costs would be from recent tender results or capital project progress payments.

2. **Replacement Cost – External Benchmark Cost:** This method provides the cost of the asset being purchased or constructed but will not necessarily consider specific cost factors existing for the municipality.

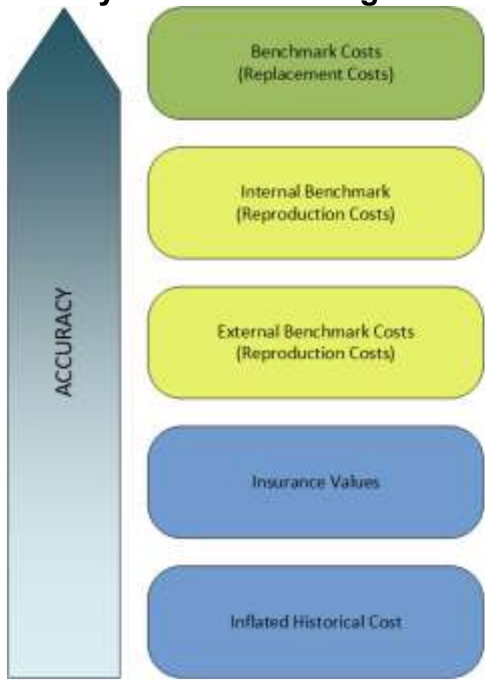
3. **Reproduction Cost – Internal Benchmark Cost:** This method will provide a cost to reproduce the existing asset in its current form, taking into account any specific local cost factors for the municipality.

4. **Reproduction Cost – External Benchmark Cost:** This method will provide a cost to reproduce the existing asset in its current form, but will not necessarily consider specific cost factors existing for the municipality.

5. **Insurance Cost:** Replacement costs for insurance purposes are estimates based on factors and inputs that may be quite different than those required for asset management costing purposes. Again, caution should be exercised before considering this method of current valuation.

6. **Inflated Historical Cost:** This method can be easier to perform, but caution is advised when considering the result. Current valuation, undertaken in this manner, is predicated on many assumptions used when determining historical cost, and also relies on inflationary cost indexes as being accurate. For example, assets purchased in the past may have completely different attributes than currently available comparable assets or may have been constructed using methods/materials that have undergone significant change over the years. In addition, there are numerous available rates of inflation that could be applied in the calculation, and the alternative applications will impact on the final result.

Figure 3-2
Accuracy of Asset Costing Methods



Some examples of benchmark costs are shown in the table below:

Table 3-18
Sample Benchmark Costing Methods

Benchmark Costs		
Service Area	**Asset Type**	**Examples**
Roads	Roads	$/Linear Metre
		$/m^2
Bridges	Bridges	$/Bridge Type per Span
Stormwater	Stormwater Main	$/m by Diameter
Solid Waste	Landfill	$/Item by Type
Water	Water Main	$/m by Diameter
Wastewater	Wastewater Main	$/m by Diameter
Buildings	Buildings	$/ft^2
Equipment and Vehicles	Equipment and Vehicles	$/Item by Type
Land Improvements	Fencing	$/m
	Land Improvements	$/Item by Type

Do you have documentation in place to determine when and how current values (i.e. replacement costs) are updated?

Background

As noted in the previous section, there are a number of alternative methods to determine replacement costs. Once replacement costs have been initially determined, a process should be put into place to update replacement costs on a regular basis. New or better information can come to light that can significantly affect currently recorded replacement costs. In addition, inflation can play a role in valuation adjustments. Since replacement costs can come from various sources, documentation of the frequency and recommended sources of replacement costs should be created and put in place.

Levels of Maturity – Replacement Cost Documentation

Do you have documentation in place to determine when and how current values (i.e. replacement costs) are updated?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	No documentation in place but informal processes followed on an ad hoc basis	**Documentation in place that is somewhat followed on an ad hoc basis**	**Complete policy in place that is followed**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. At a staff level, determine when replacement costs values are to be updated (i.e. by asset categories)	1. Review best practices in regards to how and when to update replacement cost values	1. Formalize documentation into municipal policy
	2. For each asset category determine how replacement cost values are to be updated (i.e. inflation, benchmark, study)	2. At a staff level, document how and when replacement costs are to be updated by asset category	2. Put policy into practice
		3. Documentation utilized as a general guide	3. Periodically review policy to ensure it continues to meet the needs of the municipality

At the **basic level of maturity**, municipalities may have no documentation in place to outline the cost process. Instead, costing is undertaken in an informal way, typically on an ad hoc basis. At a staff level, it would be determined when current costs would be updated (i.e. by asset category), and by what methodology.

At the **intermediate level of maturity**, municipalities have a costing process documented and in place, however it may only be followed on an ad hoc basis. It is recommended that when putting a process in place, municipalities review best practices and applicable legislation related to the timing and methodologies of asset valuation. This provides an opportunity for staff to prepare the valuation process with best practices and legislative requirements in mind. However, at the intermediate level of maturity, the documentation, once completed, may not be fully used as intended.

At the **advanced level of maturity**, a complete costing policy will be put in place and be followed consistently by staff. This requires municipalities to formalize the costing process into a policy with appropriate approval processes. The policy is put into practice with periodic reviews to ensure it is still meeting the needs of the municipality.

Updating Current Estimates of Future Costs

Updating estimates of future costs can be completed using different methodologies and at different time intervals. For example, a municipality may perform a formal update of benchmarking costs for an asset type once every five years. In the intervening years, using appropriate construction or consumer related inflationary adjustments can be considered (see table below). A municipality may also decide to undertake formal updates on current costs on a more frequent basis for high risk/critical assets, or for assets with legislated requirements to perform assessments on a more frequent basis (i.e. bridges).

Table 3-19
Sample Timeline for Updating Benchmark Costs

Year					
0	1	2	3	4	5
Benchmarking Costs Updated	Inflationary Factor Applied	Inflationary Factor Applied	Inflationary Factor Applied	Inflationary Factor Applied	Benchmarking Costs Updated

3.3.5 Condition Assessments

Asset condition ratings that accurately reflect the health of the asset portfolio are an integral element of an asset register. Developing formal policies on the methods and frequency of updating asset conditions ensures consistent and reliable information.

What sources of information are used to assess asset condition?

Background

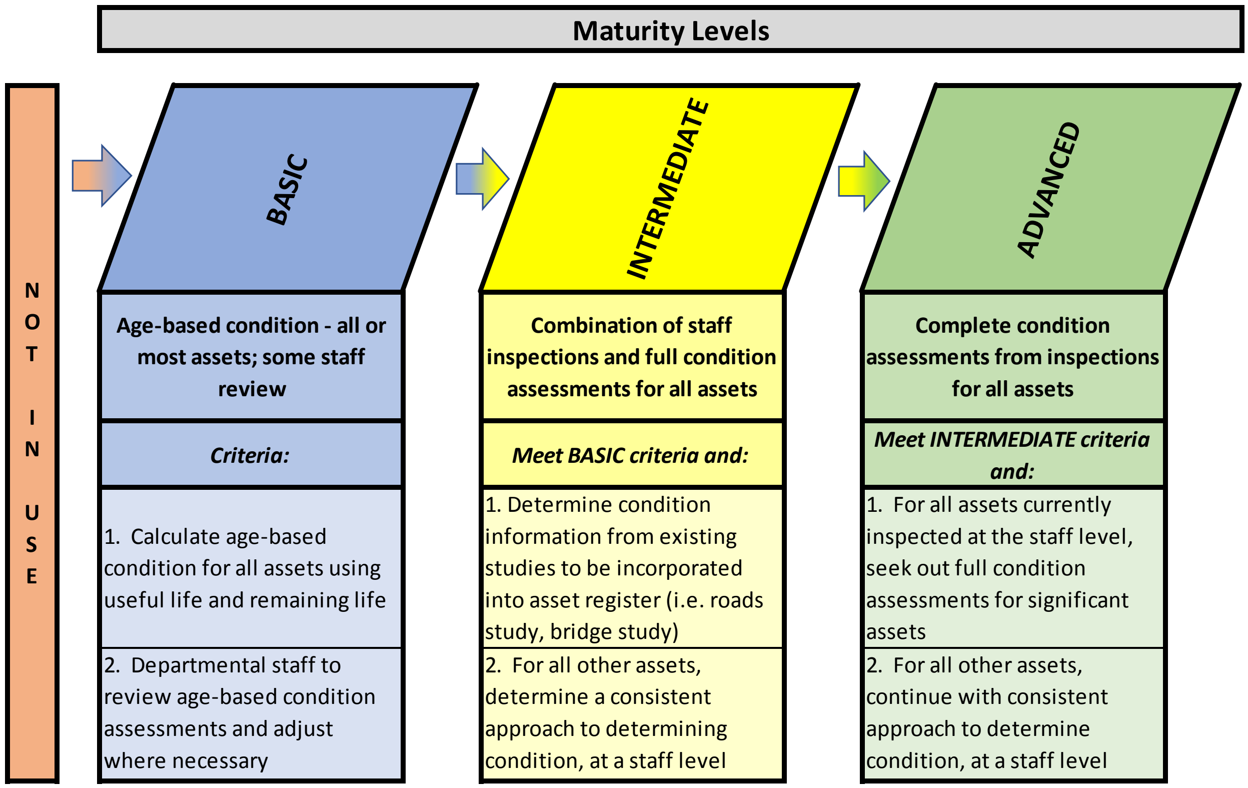
The physical state or health of an asset is defined by its condition rating. Condition measures provide information about where an asset is in its overall life cycle. Condition ratings are also considered a more accurate attribute to be used in making asset decisions, in comparison to an age-based approach.

Asset condition is measured in order to:

- Identify and plan for treatments that maximize asset life, avoid unplanned failures, and maintain service levels;
- Be able to assess the remaining useful life of an asset;
- Enable long-term financial planning based on asset deterioration and renewal needs; and
- To comply with statutory and regulatory requirements (where applicable).

Levels of Maturity – Condition Assessment

What sources of information are used to assess asset condition?



At the **basic level of maturity**, municipalities rely on age-based condition ratings for all or most assets, although some adjustments are expected based on staff review. This process includes the calculation of each asset's remaining useful life and how the result compares to that asset's total useful life. This relationship would drive the determination of each particular asset's condition rating. For example, an asset at the end of its life would have a condition rating of 'poor', or 0/5 or 0/10, whereas an asset at the beginning of its life would have a condition rating of 'very good' or 5/5 or 10/10. Staff could review the resulting condition assessments and adjust, where necessary, based on asset knowledge.

At the **intermediate level of maturity**, municipalities engage in a combination of staff inspections and full condition assessments for all assets. Condition information would be sourced from existing studies (i.e. roads studies, bridge studies, etc.) and incorporated into the asset register. For other assets, staff would follow a consistent approach to determining condition based on visual or full inspections.

At the **advanced level of maturity,** complete condition assessments by inspection of all assets are undertaken. This entails the use of full condition assessments for all significant assets with staff following a consistent approach to determine condition for the remaining assets.

Condition Assessment Approaches and Examples

There are different approaches to assessing the condition of assets. Also, there are different factors to consider when choosing a condition assessment method for each asset type.

Generally, condition assessment methods fall under the following headings:

1. **Age-Based:** Using the asset's age in relation to useful life, make an estimation of where the asset is in its life cycle. This method provides a similar result to an age-based asset analysis.
   Example***:*** *An asset has a useful life of 60 years, and is 50 years old. The age based condition rating is: (60 – 50) / 60 = 17% of maximum condition (i.e. 1.7/10)*

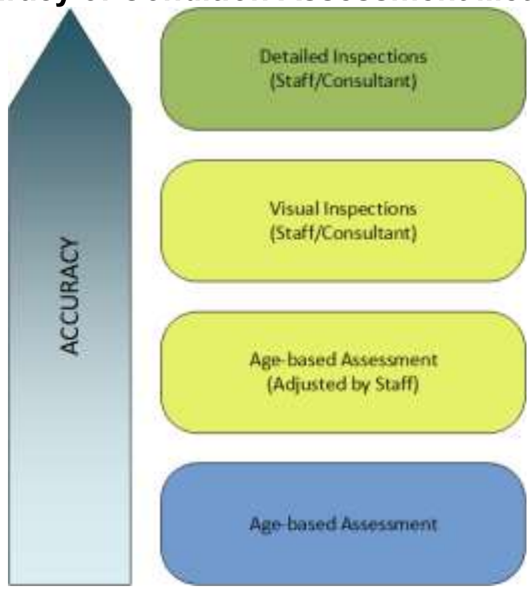
2. **Age-Based with Adjustments by Staf**f: Similar to age-based assessments, however, the municipality's staff would review the results and make amendments where deemed appropriate.
   Example***:*** *An asset has a useful life of 60 years, and is 50 years old. The age-based condition rating is: (60 – 50) / 60 = 17% of max condition (i.e. 1.7/10). Public Works staff have decided to adjust the condition score from 1.7 to 5.0 due to their knowledge of the asset and how it has been maintained. This may result in delaying scheduled replacement by several years.*

3. **Visual Inspection:** This can be undertaken by municipal staff or consultant. A visual inspection of each asset is used to determine an overall condition rating.

4. **Detailed Inspection:** Again, this can be undertaken by municipal staff or consultant, and standard engineering practices should be applied. The inspection moves beyond visual, and includes other factors such as functionality and testing.

The following diagram outlines how the level of condition assessment accuracy increases based on the type of assessment performed.

Figure 3-3
Accuracy of Condition Assessment Methods



The method of condition assessment is often determined by asset type. For example, if the asset is easily accessible and identifiable, a visual inspection may often be an appropriate method of condition assessment. This may apply to assets such as road surface related assets, bridges, buildings, furniture and equipment. A visual assessment may also be completed using digital imaging. Road condition data is increasingly being assessed using digital imaging, with the condition assessed off-site using the images. Similar techniques are also used to inspect hard to access areas of large buildings and structures.

For assets that are difficult to inspect (e.g. buried assets such as water and wastewater mains), physical inspection may not be possible. In such cases, condition is often derived from the asset age, maintenance records, or CCTV inspections (if possible). A sample may be inspected and the results extrapolated to the remainder of the network. For assets such as road bases, frequently consultants will perform tests and drill bore holes into the base to determine condition. Past maintenance data, including repair/breakdown/deficiency data of assets being assessed can be taken into account, as well.

For some assets such as pumps and other machinery, constant monitoring of factors such as pressure, temperature, and vibration will provide continuous condition data. The following table provides some examples of asset condition assessment factors:

Table 3-20
Sample Asset Condition Assessment Factors

<table>
<tr><th colspan="2">Rating</th><th>Condition Description</th></tr>
<tr><td colspan="2">Roads</td><td>Cracking – Linear, Transverse, Pattern
Rutting
Roughness (Ride)
Surface Texture – Flushing and Stripping
Asphalt Ravelling
Bitumen Oxidisation
Deformation
Skid Resistance
Deflection (Strength)
Joint Spalling (Concrete)
Joint Stepping (Concrete)</td></tr>
<tr><td colspan="2">Sidewalks</td><td>Trips (Steps)
Cracking</td></tr>
<tr><td colspan="2">Curbs</td><td>Cracking
Displacement (Vertical)
Displacement (Horizontal)
Rotation</td></tr>
<tr><td rowspan="4">Bridges and Major Culverts</td><td>Deck</td><td>Cracking
Expansion Joint Displacement
Deformation</td></tr>
<tr><td>Superstructure and Substructure</td><td>Cracking
Spalling
Corrosion
Deformation</td></tr>
<tr><td>Abutments/End Walls</td><td>Cracking
Spalling
Erosion (Undercutting)
Corrosion</td></tr>
<tr><td>Railings/Handrails and Barriers</td><td>Cracking
Spalling
Deformation
Accident Damage</td></tr>
</table>

Condition ratings can follow any scale and can be either quantitative or qualitative. Regardless of the condition rating scale used, it is recommended that municipalities remain consistent with that scale over all asset categories. Table 3-21 (below) provides some examples:

Table 3-21
Sample Condition Rating Scales

Quantitative Condition Scale	Qualitative Condition Scale
0 to 3 Scale 0 to 5 Scale 0 to 10 Scale 0 to 100 Scale	Poor, Average, Good (Equivalent to a 0 to 3 Scale). Very Poor, Poor, Average, Good, Very Good (Equivalent to a 0 to 5 Scale).

Actual condition data can take many forms, although as a general rule it is expressed in terms of:

- **Severity:** Measures how good/bad the asset condition is; and
- **Extent:** Measures how much of a particular distress or defect there is.

Some examples of condition measures commonly used for assets are shown below.

A basic condition rating scale:

Table 3-22
Sample Qualitative Condition Rating Scale

Rating	Condition Description
Poor	The asset exhibits obvious signs of deterioration and should either be monitored more closely or some form of intervention undertaken to improve the condition. The risk of failure is higher.
Fair	The asset is showing some signs of deterioration and may therefore require more attention but is still a moderate to low risk of failure.
Good	The asset shows little, if any, sign of deteriorations and should only require basic maintenance and upkeep. Very low risk of failure.

This scale is suitable for simple assets with low criticality. It is relatively easy to define and assess condition.

A slightly more detailed numeric scale based on severity of visible attributes:

Table 3-23
Sample Qualitative Condition Rating Scale – Severity

Rating	Condition Description
0	Asset Unserviceable
1	Renewal Required
2	Maintenance Required
3	Minor Defects Only
4	Very Good Condition
5	Brand New

Similar to above, this scale is suitable for simple assets with low criticality. It is relatively easy to define and assess condition.

A numeric scale based on “extent”:

Table 3-24
Sample Quantitative Condition Rating Scale – Extent

Rating	Condition Description
0	Cracking affecting > 40% of the Asset
1	Defect affecting between 20% and 40% of the Asset
2	Defect affecting between 10% and 20% of the Asset
3	Defect affecting between 5% and 10% of the Asset
4	Defect affecting < 5% of the Asset (length, area)
5	No Defect

This scale is suitable for simple or complex/linear assets, provides a reasonably simple method of assessment, and provides reasonable indication of treatment needs.

A numeric scale can also be associated with a severity scale such as the one below for cracking:

Table 3-25
Sample Quantitative Condition Rating Scale – Severity

Severity	Severity Description
Severe (X)	Cracks > 5mm
Moderate (M)	Cracks > 2mm < 5mm
Slight (S)	Cracks < 2mm

This approach results in a matrix as shown in the following table:

Table 3-26
Sample Severity/Extent Matrix

Severity	Extent 0	Extent 1	Extent 2	Extent 3	Extent 4	Extent 5
Severe (X)		X1	X2	X3	X4	X5
Moderate (M)		M1	M2	M3	M4	M5
Slight (S)	0	S1	S2	S3	S4	S5

Another combination of severity and extent is often used for all assets, in this case the percentage of the asset in each condition state for the numerical scale is reported:

Table 3-27
Sample Condition Rating Scale

%Condition 1	%Condition 2	%Condition 3	%Condition 4	%Condition 5	Total Condition
10%	15%	20%	35%	20%	100%

This table provides a good indication of the extent of remedial work required as well as combining to provide overall condition. This can also be used in the municipality's levels of service analysis (see Chapter 4).

Regardless of the type of condition information collected or which method of capture is used, it is essential to have an understanding of the accuracy of the data and its reliability/consistency. Different personnel (staff or consultants) may assess the condition of assets differently, even after training and using a standard method. For example, if three different consulting companies assessed the condition of a road, you could potentially receive 3 different rating approaches that cannot be compared to each other. Processes and approaches to determine condition ratings should be put in place to ensure a somewhat consistent approach that should be much less open to interpretation.

Prior to commencing the condition assessments, it is important to develop a strategy which outlines not only the approach, but also the timing and frequency to be used with completing condition assessments. Consideration should be given to:

- Assessment approach:
  - Identify how much useful life has been consumed;
  - Identify a condition (or multiple condition ratings) where some intervention is required to ensure the asset meets service standards (i.e. renewal, rehabilitation or maintenance); and
  - Indicate if the asset is in danger of service or physical failure.
- Use of condition information;
- Condition assessment collection options; and
- Costs and limitations of each method.

Do you have documentation in place to determine when and how condition assessments are updated?

Background

Condition assessments should be updated on a regular basis. In order to facilitate the planning of condition assessment updates, it is advisable to document the frequency and recommended methods for doing so.

Levels of Maturity – Condition Assessment Documentation

Do you have documentation in place to determine when and how condition assessments are updated?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	No documentation in place but informal processes followed on an ad hoc basis	**Documentation in place that is somewhat followed on an ad hoc basis**	**Complete policy in place that is followed**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. At a staff level, determine when condition assessments are to be updated (i.e. by asset categories)	1. Review best practices in regards to how and when to update condition assessments	1. Formalize documentation into municipal policy
	2. For each asset category determine how condition assessments are to be updated (i.e. staff adjustments, new studies)	2. At a staff level, document how and when condition assessments are to be updated by asset category	2. Put policy into practice
		3. Documentation utilized as a general guide	3. Periodically review policy to ensure it continues to meet the needs of the municipality, and that condition rating process is repeatable and consistent

At the **basic level of maturity**, municipalities may not have any documentation in place related to condition assessment processes. Rather, the condition assessment might be undertaken in an informal way, on an ad hoc basis, as needed. At a staff level, it might be determined when condition assessments would be updated (i.e. by asset category), as well as the methodology to be used.

At the **intermediate level of maturity**, municipalities have a documented process in place, but it may only be followed on an ad hoc basis. It is recommended that municipalities review best practices related to the timing and methodologies of condition assessments when putting documentation into place. Legislative requirements should also be consulted. Staff should prepare the documentation with best practices and legislative requirements in mind. However, at the intermediate level of maturity, the documentation, once completed, may not be fully used as intended.

At the **advanced level of maturity**, a complete condition assessment policy is put in place, and is followed by staff. This requires municipalities to formalize condition assessment documentation into a policy with appropriate approval processes. The policy in place should undergo periodic reviews to ensure it is still meeting the needs of the municipality.

Updating Condition Assessment Data

Condition assessments should be kept up to date within the asset register. The municipality will need to determine the desired level of detail to be tracked and frequency at which these assessments should take place. One approach is to hire a qualified consultant to undertake a formal condition assessment periodically (i.e. every 5 years) with staff performing assessments (i.e. visual inspections or adjustments) in the intervening years (see table below). This approach allows for more minor adjustments to condition assessments, with condition "resets" occurring on a frequent basis.

Table 3-28
Sample Timeline for Updating Condition Assessment

Year					
0	1	2	3	4	5
Assessment by Qualified Consultant	Assessment Reviewed by Staff	Assessment Reviewed by Staff	Assessment Reviewed by Staff	Assessment Reviewed by Staff	Assessment by Qualified Consultant

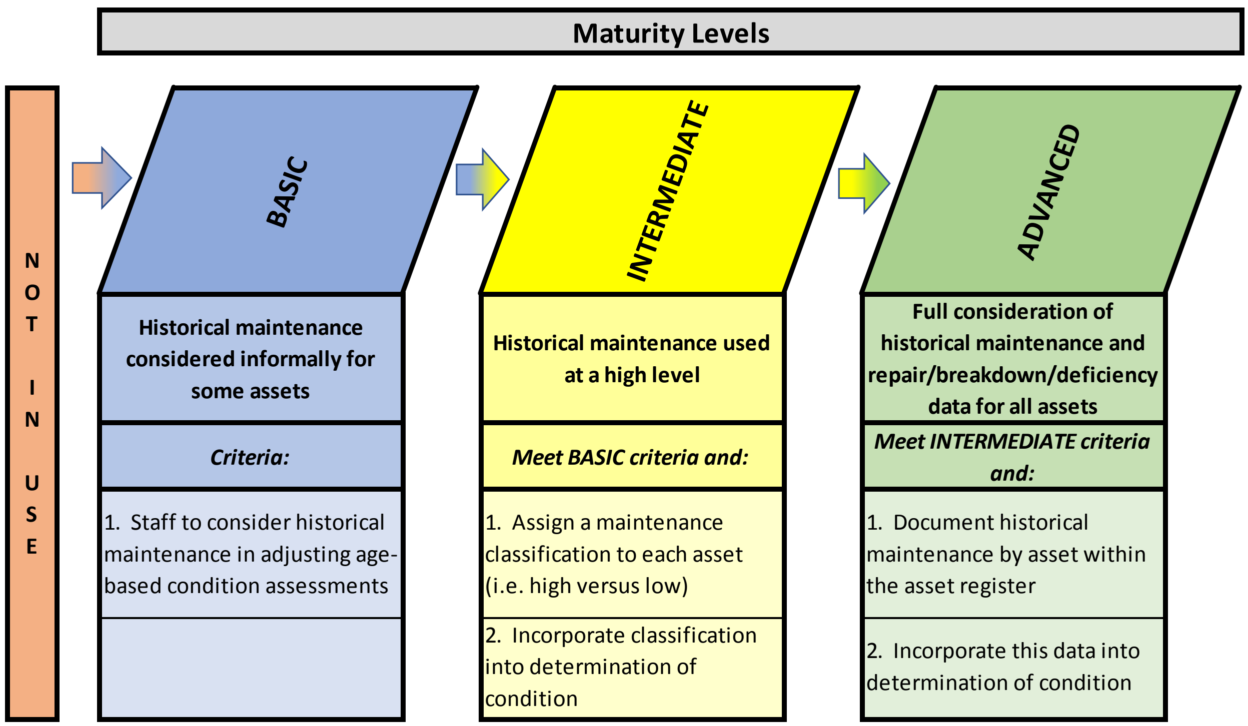
To what extent are the condition assessments impacted by historical maintenance (i.e. repair/breakdown/deficiency) data?

Background

Historical maintenance data is important to factor in when assessing asset condition. Historical maintenance includes any repairs, breakdowns or deficiencies. This data is especially useful for assets where assessing condition is a challenge, such as watermains.

Levels of Maturity – Condition Assessment and Historical Maintenance

To what extent are the condition assessments impacted by historical maintenance (i.e. repair/breakdown/deficiency) data?



At the **basic level of maturity**, municipalities informally consider historical maintenance for some assets. This would likely occur informally as staff reviewed age-based condition assessments (based on knowledge and professional judgement).

At the **intermediate level of maturity**, a more formal process may be in place but at a high level. For example, a maintenance classification may be assigned to each asset, such as ‘high’ versus ‘low’. This classification would be considered in the determination of each asset’s condition assessment.

At the **advanced level of maturity**, municipalities give full consideration of historical maintenance, repairs, breakdowns, and deficiencies in determining asset conditions. This will require the documentation of these events for each asset within the asset register. The impact of this data would then be part of the condition assessment process, through standard engineering practices.

Is there a process in place that ensures repeatability and consistency of condition ratings?

Background

The ability to make accurate decisions based on asset condition ratings is very much based on the accuracy of the condition ratings themselves. This can be difficult, with staff turnover within the municipality and within the consulting firms that may assist in conducting the condition assessments. In addition, a municipality may hire different consulting firms from one year to the next, based on a tender/proposal award process.

With different people conducting condition assessments over time for a municipality, the ability to complete a “trending analysis” on asset condition is difficult unless these condition ratings are conducted using a consistent and repeatable approach. Without this documented approach, an asset with a condition rating of “7” based on one consultant’s calculations may not be consistent with a “7” for another consultant’s calculations.

Levels of Maturity

Is there a process in place that ensures repeatability and consistency of condition ratings?

	Maturity Levels		
NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Condition ratings provided by consultants, with no direction provided by staff.	**Condition ratings provided by consultants, with some direction provided by staff.**	**Written and approved guidelines in place regarding condition assessments.**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Hire external consultants, as needed, to perform condition rating assessments based on their methodology and expertise.	1. Municipal staff provide some guidance to external consultants with respect to condition rating methodology.	1. Repeatable and consistent guidelines are in place for condition assessments (all assets).
	2. Municipal staff perform condition ratings for minor assets, however no formal guideline exists.	2. Informal guidelines exist for municipal staff to follow regarding minor assets.	

At the **basic level of maturity**, municipalities hire external consultants or have internal staff perform condition ratings, however how the condition ratings are determined is based on the professional expertise of the consultant/staff with no direction provided. Condition ratings are reviewed on a periodic basis with no formal process in place.

At the **intermediate level of maturity**, municipalities provide some direction to external consultants and/or internal staff members that are assisting with determining condition ratings. This can take the form of high-level direction or process regarding condition content or the methods used to determine condition ratings. This direction can be verbal or written and may not be followed on a regular basis.

At the **advanced level of maturity**, municipalities have written guidelines/procedures for calculating condition ratings for all assets. These guidelines ensure the repeatability and consistency of condition ratings, regardless of who is conducting them. The condition rating guidelines make up and approved component of the asset management planning process. Condition ratings are completed and verified to the guideline on a regular basis.

Consistency of Condition Ratings

For some assets, condition ratings can be legislated, such as the OSIM bridge inspections required every 2 years in Ontario. For other asset types, condition ratings may be more high level (i.e. vehicles). Regardless of the amount of effort or the level of detail required to conduct condition assessments, a consistent and repeatable methodology is needed. Documenting this methodology in a formal process ensures that consistency is maintained, even when staff turnover brings new employees into the condition assessment process.

Components of a consistent and repeatable condition assessment process:

- The assets being assessed as part of the methodology;
- The condition rating format (i.e. out of 5, 10 or 100);
- The calculation required to conduct the condition assessment (if applicable);
- Definition of variables and inputs within the calculation; and
- Definitions and examples of condition ratings, such as:
    - *“A 7 out of 10 is defined as…”*
    - *“The following picture illustrates an asset with a condition rating of 7/10”.*

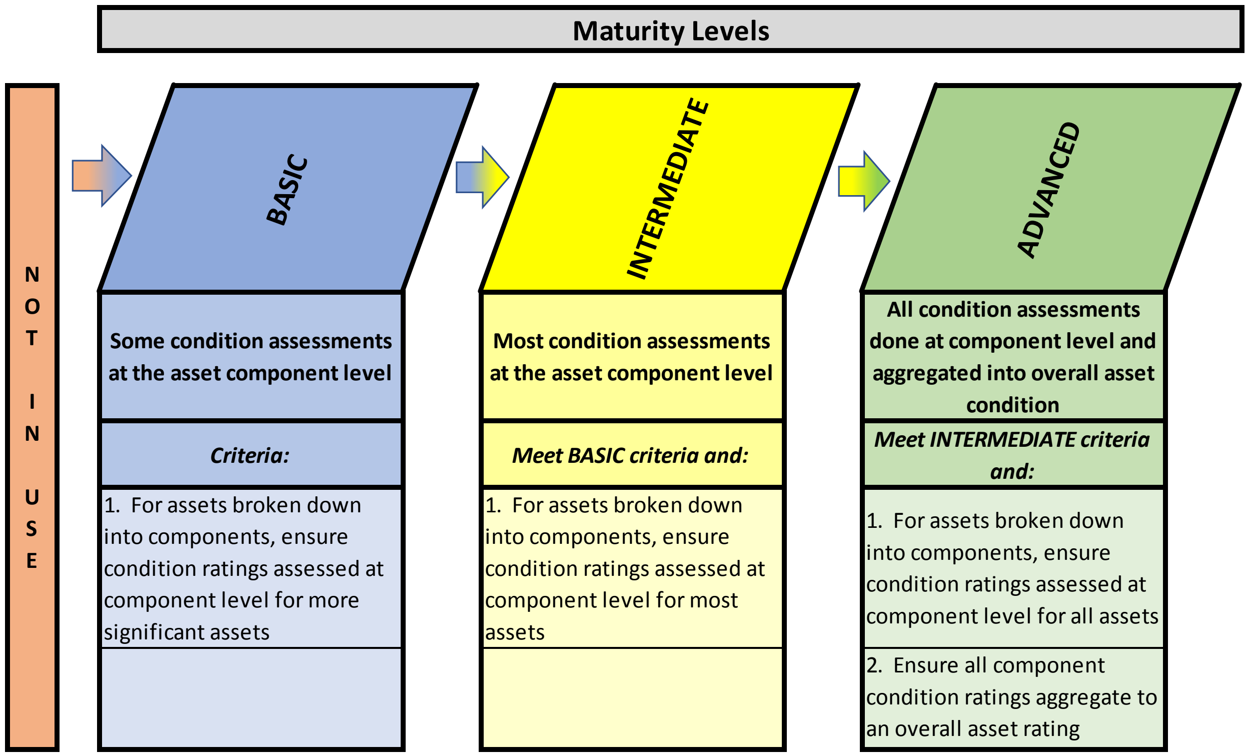
Are the condition assessments performed at the asset component level (for assets with components)?

Background

Since many assets will be broken down into components, consideration should be given to assessing condition at the component level versus at the whole asset level.

Levels of Maturity – Condition Assessment and Asset Components

Are the condition assessments performed at the asset component level (for assets with components)?



At the **basic level of maturity**, condition ratings are completed at the component level for significant assets, such as roads, bridges and facilities.

At the **intermediate level of maturity**, condition ratings are completed at the component level for most assets.

At the **advanced level of maturity**, condition ratings are completed at the component level for all assets where components are used. The component condition ratings would then be aggregated into an overall asset condition rating for the complex asset as a whole.

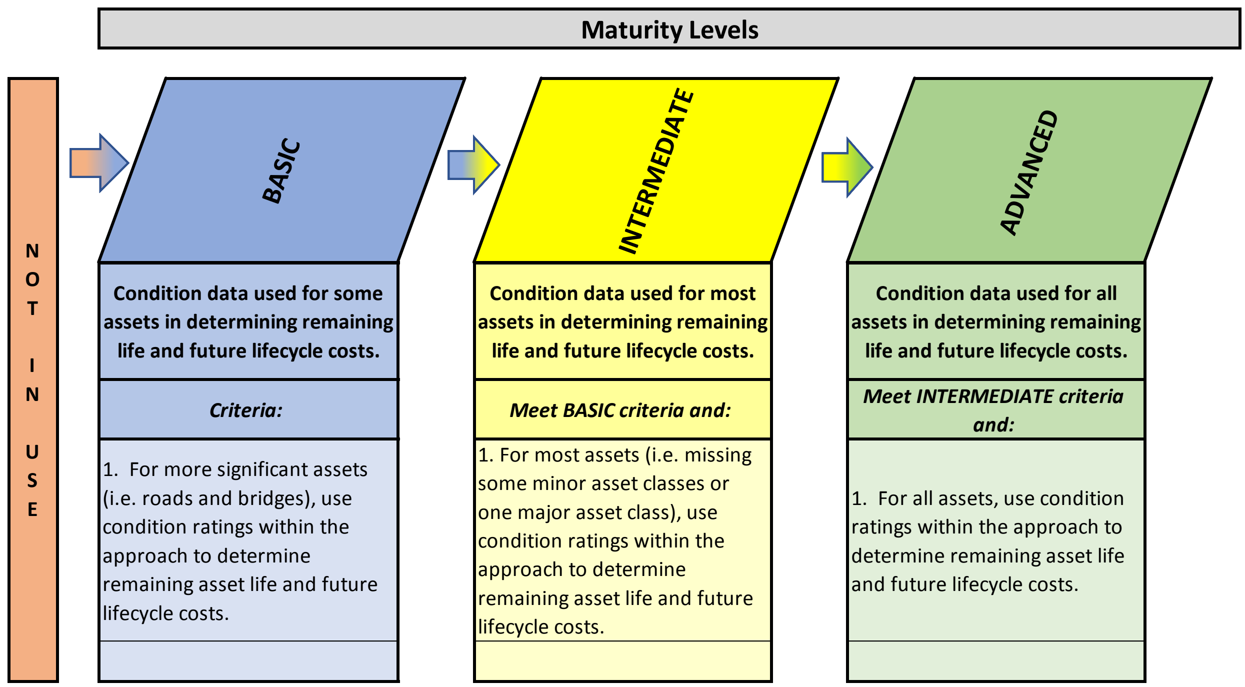
Is condition data used to determine remaining life and future lifecycle costs?

Background

As discussed in this chapter, condition rating data provides a more accurate approach to determining the remaining useful life of an asset, in comparison to using asset age and the asset's estimated useful life. An asset can be half way through its anticipated useful life from an age perspective, however it has been maintained very well and has a "good" condition rating. Using condition ratings in the determinization of remaining useful life leads to a more accurate determination of future lifecycle costs required.

Levels of Maturity

Is condition data used to determine remaining life and future lifecycle costs?



At the **basic level of maturity**, condition ratings are used for some assets (i.e. occasionally used) in determining remaining useful life and future lifecycle costs.

At the **intermediate level of maturity**, condition ratings are used for most assets (i.e. more moderately or frequently used) in determining remaining useful life and future lifecycle costs.

At the **advanced level of maturity**, condition ratings are used for all assets in determining remaining useful life and future lifecycle costs.

Using Condition Ratings to Make Decisions

Using condition ratings in the asset management process to determine asset remaining useful life and future lifecycle cost requirements can take many forms, depending on the complexity of the overall process, including:

- Using condition ratings in an asset database, for municipal staff to make decisions based on professional judgement;

- Using condition ratings in asset management spreadsheets, using formulas to make decisions; and
- Inputting condition ratings into asset management software to generate asset management related decisions and outcomes.

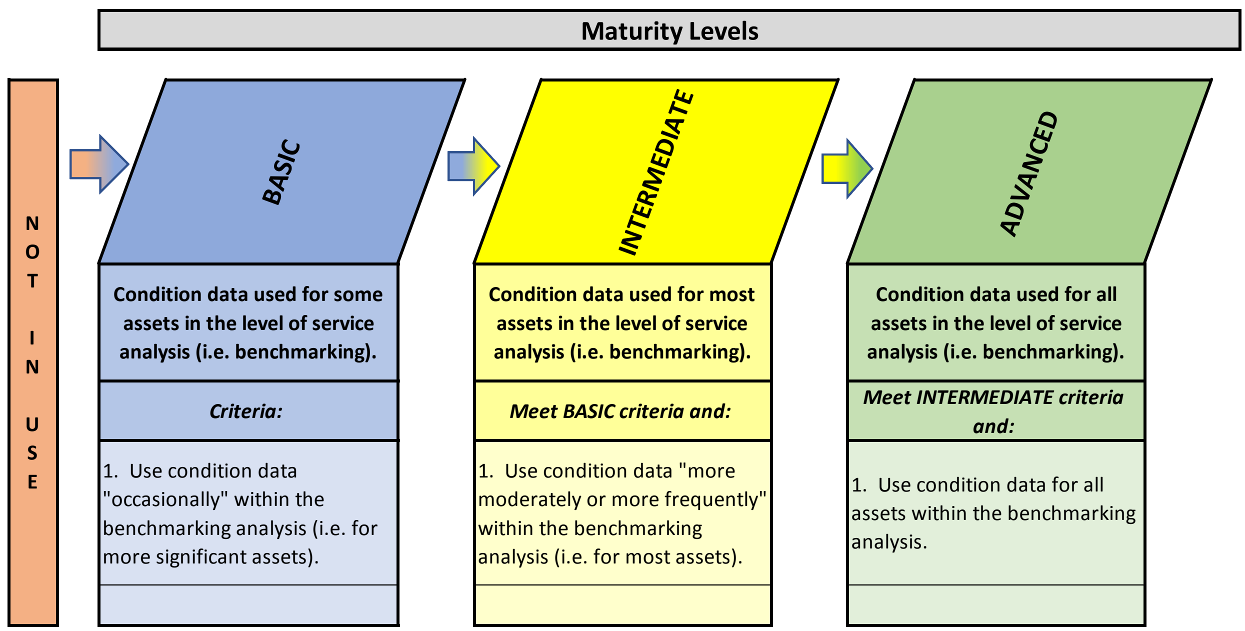
Is condition data used in the level of service analysis (i.e. benchmarking) from year to year?

Background

As discussed in chapter 4, an important tool in the levels of service analysis is the ability to do a trending analysis on metrics or performance measures. Condition is a metric that is commonly used in this area. Understanding if an asset's condition rating is tracking towards or away from condition objectives provides useful information with respect to spending levels and the impact on service.

Levels of Maturity

Is condition data used in the level of service analysis (i.e. benchmarking) from year to year?



At the **basic level of maturity**, condition ratings are used for some assets (i.e. occasionally used) in determining service levels (i.e. benchmarking).

At the **intermediate level of maturity**, condition ratings are used for most assets (i.e. more moderately or frequently used) in determining service levels (i.e. benchmarking).

At the **advanced level of maturity**, condition ratings are used for all assets in determining service levels (i.e. benchmarking).

Condition Data and Levels of Service

Please refer to the discussion on performance measures and trending within Chapter 4.

3.3.6 Risk and Criticality

Risk and criticality measures can allow municipalities to prioritize asset needs. Tying the risk/criticality of an asset to the frequency of its condition updates ensures that a municipality's most vital assets are consistently monitored.

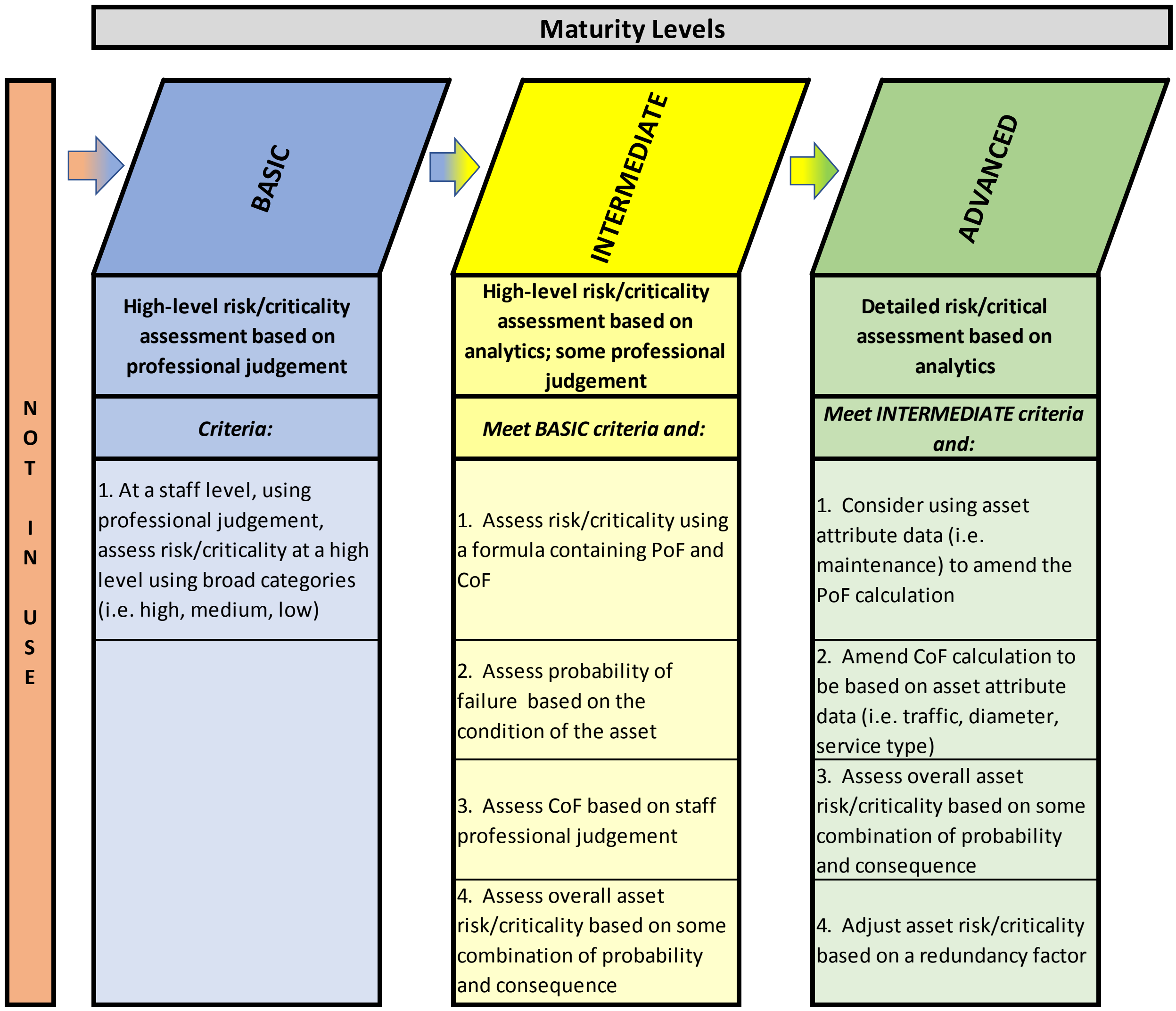
What method of risk/criticality assessment is used?

Background

Risk management and optimized informed decision making are inherently linked. Identifying and acknowledging risks and managing them appropriately helps to mitigate the implications and consequence associated with such risks. This enables municipalities to make informed decisions around how to manage assets and their associated risk.

Levels of Maturity – Assessment of Risk/Criticality

What method of risk/criticality assessment is used?



At the **basic level of maturity**, staff assess risk/criticality using their professional judgement. It would be typical at this level of maturity to see the use of broad categories for risk/criticality such as ‘high’, ‘medium’, and ‘low’ or using a numerical scale such as “0 to 3” or “0 to 5”.

At the **intermediate level of maturity**, it is expected to see the introduction of some risk/criticality assessments based on analytics, to supplement professional judgement. This would entail assessing risk using a formula based upon probability of failure (PoF) and consequence of failure (CoF). The assessment of PoF would be dependent upon, at a minimum, the condition of the asset, whereas CoF would be assessed based on staff’s professional judgement or some use of analytics. Overall risk/criticality can then be assessed based upon some combination of probability and consequence.

At the **advanced level of maturity**, a detailed risk/criticality assessment would be completed based upon analytics. This would include the use of asset attribute information to determine PoF and CoF. Overall risk/criticality can then be assessed based upon some combination of blending probability and consequence. Finally, consideration can be given to redundancy or other risk mitigation factors that may impact on the consequence assessment.

Risk and Criticality Analytics

The risk or criticality calculation determines the overall risk of asset failure. Ideally, this calculation would be performed on all municipal assets consistently. If this is achieved, the risk/criticality analytic can become a documented approach to determining capital priorities. If applied consistently across all assets, a municipality can compare priorities across asset types (i.e. what is more important, a road or a park?).

A common risk/criticality formula is provided below:

Figure 3-4
Example of Risk/Criticality Formula

Asset Risk / Criticality = **Probability of Failure** X **Consequence of Failure** X **Risk Mitigation or Redundancy**

Probability of Failure (PoF): What is the chance that the asset will fail?

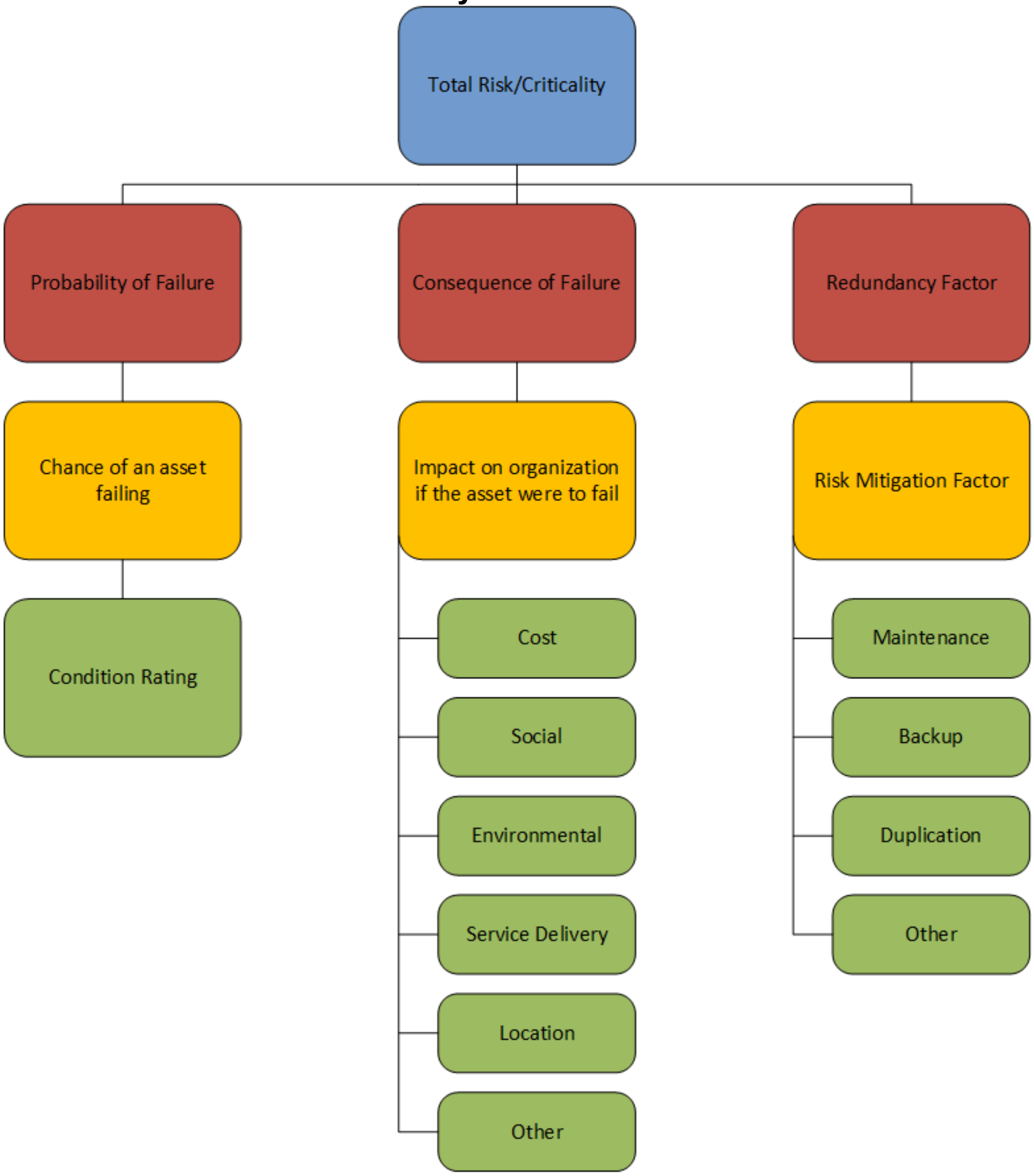
Consequence of Failure (CoF): What is the impact to the municipality if the asset does fail?

Risk Mitigation or Redundancy: Does the municipality have any risk mitigation procedures in place that reduce the overall risk or criticality rating for the asset? Examples:

- Maintenance or rehabilitation programs; and
- Backup or duplicate assets that can provide similar services (i.e. does the municipality have a fire truck that can act as a backup for another fire truck?).

The following diagram summarizes the risk/criticality calculation process:

Figure 3-5
Risk/Criticality Calculation Process



Probability of failure has commonly been linked to the condition assessment for each of the assets. For example, an asset with a condition rating of “Very Poor” would have an “Almost Certain” probability of failure, while an asset with a condition rating of “Very Good” would have a “Rare” probability of failure. Please refer to the following table for an example, both in quantitative and qualitative terms:

Table 3-29
Probability of Failure Matrix

Asset	Condition (/5)	Condition Qualitative	Probability of Failure Score (/5)	Probability of Failure Score (Qualitative)
Asset 1	5	Very Good	1	Rare
Asset 2	4	Good	2	Unlikely
Asset 3	3	Average	3	Possible
Asset 4	2	Poor	4	Likely
Asset 5	1	Very Poor	5	Almost Certain

This matrix can be scaled appropriately depending on the condition rating scale used by the municipality.

The following example of probability of failure (i.e. likelihood of failure) has been obtained from the IIMM[1]:

Table 3-30
Sample Probability of Failure – IIMM

Likelihood	Descriptor	Probability of Occurrence
Rare	May occur only in exceptional circumstances	More than 20 years
Unlikely	Could occur at some time	Within 10-20 years
Possible	Might occur at some time	Within 3-5 years
Likely	Will probably occur in most circumstances	Within 2 years
Almost certain	Expected to occur in most circumstances	Within 1 year

Function, in addition to condition, can also be considered In more advanced determinations of probability of failure, asset capacity and functionality can also play a role in the calculation. Including these variables (as discussed earlier in this chapter), it is recognized that an asset can “fail” due to the assets inability to function correctly or address the needed capacity. An asset in perfect condition can technically fail if appropriate functionality and capacity is not being addressed.

Consequence of failure can be a more subjective calculation. To determine the overall consequence of an asset failing to a municipality, the following areas should be considered:

[1] IPWEA, 2015, International Infrastructure Management Manual

- **Cost Impacts:** The cost of failure to the municipality (i.e. capital replacement, rehabilitation, fines and penalties, damages, etc.);
- **Social impacts:** The potential injury to residents or municipal staff;
- **Environmental impacts:** The impact of the asset failure on the environment;
- **Service delivery impacts:** The impact of the asset failure on the municipality's ability to provide services at desired levels, or potential service delivery interruptions; and
- **Location impacts:** The varying impact of asset failure based on the asset's location within the municipality. For example, are assets servicing hospitals or schools a higher consequence? Does the municipality have a bridge that is the only access point to a region of the municipality for residents, fire, police, school buses and snow plows?

From an impact perspective, these areas can be incorporated into a consequence of failure calculation at a high level, using the following:

Table 3-31
Consequence of Failure Matrix

Consequence of Failure	Cost Consequences	Other Consequences		
		Social	Environmental	Service Delivery
Insignificant	Negligible or Insignificant Cost	No Injury	No Impact	No Interruptions
Minor	Small/Minor Cost – within Budget Allocations	Minor Injury	Short-Term/Minor Impact – Fixable	Minor Interruptions
Moderate	Considerable Cost – Requires Revisions to Budget	Moderate Injury	Medium-Term Impact – Fixable	Moderate Interruptions
Major	Substantial Cost – Multi-Year Budget Impacts	Major Injury	Long-Term Impact – Fixable	Major Interruptions
Significant	Significant Cost – Difficult to Recover	Significant Injury	Long-Term Impact – Permanent	Significant Interruptions

Alternatively, consequence of failure can be estimated by using asset attribute information found in the municipality's asset registers for each asset class. For example, the type of road (local, collector, arterial) can play a role in establishing the consequence of failure for road assets, which assumes that there are differing consequences or criticalities for each type of road (i.e. an arterial road is more critical than a local road). For water and wastewater mains, the pipe diameter can play a role, assuming that different pipe diameters yield differing consequences/criticalities (i.e. larger diameter mains are more critical than smaller diameter mains). In these two examples, road type and pipe diameter are being used to quantify the number of residents that would be impacted by an asset failure. It is assumed an arterial road services more residents than a local road, and a larger diameter water pipe services more residents than a smaller diameter pipe.

The following table provides some examples of asset attributes that can be used to determine consequence of failure, or asset criticality:

Table 3-32
Sample Asset Attributes in Determining Consequence of Failure

Asset Type	Attribute	Example of High CoF	Example of Low CoF
Roads and Bridges	Road Type	Arterial	Local
		HCB	Gravel
	Traffic	High Traffic	Low Traffic
	Speed Limit	High Speed Limit	Low Speed Limit
	Access	Road/Bridge with only Local Access	Many Roads/Bridges with Access
	Replacement Cost	High Value	Low Value
Water, Wastewater, and Stormwater Mains	Main Diameter	High Diameter	Low Diameter
	Trunk vs. Local Main	Trunk Mains	Local Mains
	Water Crossing	Main Crosses Water	Main Doesn't Cross Water
	Replacement Cost	High Value	Low Value
Facilities, Vehicles, Equipment, and Land Improvements	Type of Service	Fire, Water, Wastewater	Parks, Recreation, Culture
	Service Delay	Long Delay	Short or No Delay
	Back-Up Asset Available?	No	Yes
	Replacement Cost	High Value	Low Value

The following example of consequence of failure has been obtained from the IIMM[2]:

[2] IPWEA, 2015, International Infrastructure Management Manual

Table 3-33
Consequence of Failure – IIMM

Consequences	Description
Insignificant	No injuries, low financial loss (less than $10,000)
Minor	First aid treatment, on-site release immediately contained, medium financial loss ($10,000 - $50,000)
Moderate	Medical treatment required, on-site release contained with outside assistance, high financial loss ($50,000 - $200,000)
Major	Extensive injuries, loss of production capacity, off-site release with no detrimental effects, major financial loss ($200,000 - $1,000,000)
Catastrophic	Deaths, toxic release off-site with detrimental effect, huge financial loss (more than $1M)

It is recommended that both probability of failure and consequence of failure be assigned either a quantitative or qualitative rating (similar to condition ratings). As shown in examples above, probability of failure can range from “Rare” to “Almost Certain” from a qualitative perspective, or quantitatively through a scale such as 0-5 or 0-10. Consequence of failure can range from “Insignificant” to “Significant” from a qualitative perspective, or quantitatively through a scale such as 0-5 or 0-10. The benefit of using a qualitative or numerical scale is the ability to mathematically incorporate both PoF and CoF into an overall risk or criticality rating.

With both probability of failure and consequence of failure documented, total asset risk or criticality can be determined using a matrix similar to the one shown below. Total risk/criticality in this example has been classified under the following categories:

- **Extreme Risk (E):** Risk well beyond acceptable levels (red);
- **High Risk (H):** Risk beyond acceptable levels (orange);
- **Medium Risk (M):** Risk at acceptable levels, monitoring required to ensure risk does not become high (yellow); and
- **Low Risk (L):** Risk at or below acceptable levels (green).

Table 3-34
Total Risk of Asset Failure Matrix

Probability of Failure	Consequence of Failure				
	Insignificant	Minor	Moderate	Major	Significant
Rare	L	L	M	M	H
Unlikely	L	M	M	M	H
Possible	L	M	M	H	E
Likely	M	M	H	H	E
Almost Certain	M	H	H	E	E

When PoF and CoF are numerical (quantitative scale), the municipality must determine the correct way to “blend” them together to determine overall risk/criticality. Some options are as follows:

1. Multiply PoF and CoF together (i.e. using PoF and CoF scales out of 10 each, total risk would be a maximum of 10 x 10 = 100).

2. Add PoF and CoF together (i.e. using PoF and CoF scales out of 10 each, total risk would be a maximum of 10 + 10 = 20).

3. Use some type of weighted average of PoF and CoF (i.e. using PoF and CoF scales out of 10 each, and an assumption that PoF is more important to the calculation, total risk would be a maximum of 10 PoF (80%) + 10 CoF (20%) = Risk 10(100%)). Please see the figure below for an additional example illustration of how to calculate risk under Option 3.

Figure 3-6
Example of Risk Rating Calculation – Weighted Average

$$\underbrace{80\%}_{\text{PoF Weight}} \times \underbrace{8}_{\text{PoF Rating}} + \underbrace{20\%}_{\text{CoF Weight}} \times \underbrace{2}_{\text{CoF Rating}} = \underbrace{6.8}_{\text{Risk Rating}}$$

Options 1 and 2 assume that both PoF and CoF are equally as important in the calculation. Option 3 allows the option of weighting PoF and CoF so that one has a larger impact on the calculation (i.e. in the example above, it is assumed that PoF has 80% of the total impact on the overall formula).

Risk levels can be reduced or mitigated through planned maintenance, rehabilitation and/or replacement. An objective of asset management planning is to reduce risk levels where they are deemed to be too high, as well as ensure assets are maintained in a way that maintains risk at acceptable levels over the forecast period.

Table 3-35 (below), illustrates an example of calculating risk/criticality for roads. In this example, probability of failure is based on asset condition (as discussed above), and consequence of failure is based on road type (in example 1) and traffic count (in example 2). The weighted approach to blending PoF and CoF together is also used (80%/20% respectively). It is important to note that municipalities should adjust and tweak the risk/criticality calculation so that it results in an accurate list of capital priorities (i.e. the highest risk assets). This can be done through trial and error. For example, a municipality can try one particular formula for assessing risk/criticality and review it with each department for accuracy. If priority projects are not coming to the top of the list, then determine why your formulas are not providing accurate results and adjust accordingly. Please note that more than one variable can be used in determining PoF or CoF. For example, if a municipality felt that both road type and traffic count should play a role in the calculation of CoF for roads, then both factors can be combined into an overall CoF calculation.

Table 3-35
Example of Risk/Criticality Calculation – Roads

Risk Calculation Example				Example 1 – CoF based on Road Type			Example 2 – CoF based on Traffic Count		
			Weight	80%	20%	100%	80%	20%	100%
Road	Type	Daily Traffic	Cond. (/10)	PoF (/10)	CoF (/10) – Based on Type	Risk / Criticality	PoF (/10)	Cof (/10) – Based on Traffic	Risk / Criticality
Road 1	Local	100	8	2	4	2.4	2	4	2.4
Road 2	Collector	500	6	4	6	4.4	4	4	4.0
Road 3	Arterial	1,000	6	4	8	4.8	4	6	4.4
Road 4	Local	50	7	3	4	3.2	3	4	3.2
Road 5	Collector	400	4	6	6	6.0	6	4	5.6
Road 6	Arterial	1,500	2	8	8	8.0	8	8	8.0
Road 7	Local	200	7	3	4	3.2	3	4	3.2
Road 8	Collector	800	6	4	6	4.4	4	6	4.4
Road 9	Arterial	1,100	9	1	8	2.4	1	8	2.4
Road 10	Local	50	10	0	4	0.8	0	4	0.8

highest priority

As discussed above, risk mitigation or redundancy adjustments can be made to account for:

- Processes the municipality has that automatically offset the risk calculation; and
- Whether redundancy/backup assets exist.

These adjustments become a direct reduction to consequence of failure.

Using Risk to Determine Treatments

According to IIMM, critical assets are defined as: “assets for which the financial, business or service level consequences of failure are sufficiently severe to justify proactive inspection and rehabilitation. Critical assets have a lower threshold for action than non-critical assets”.

The level of risk or criticality is used to determine asset treatments. Treatments can range from immediate corrective action (such as stopping work or preventing use of the asset) for ‘Very High’ risks, to managing by routine procedures for ‘Low’ risks.

An asset with a ‘High’ risk rating will require ‘prioritized action’. This may include actions such as reducing the probability of the event occurring by physical methods (i.e. limiting usage to within the asset’s capacity, increasing monitoring and maintenance practices, etc.), reducing consequence of failure (i.e. limiting speed of use, preparing response plans, etc.) and/or sharing the risk with others (insuring the organization against the risk). A treatment or action table example is as follows:

Table 3-36
Sample Treatment/Action Table

Level of Risk		Action Required
VH	Very High Risk	Immediate corrective action
H	High Risk	Prioritized action required
M	Medium Risk	Planned action required
L	Low Risk	Manage by routine procedures

Keeping condition assessments and risk assessments current can also be undertaken with different approaches. Since risk is tied to condition (i.e. probability of failure is often tied to condition), these two concepts should be considered together. With condition assessments kept current, it makes the risk assessment more accurate.

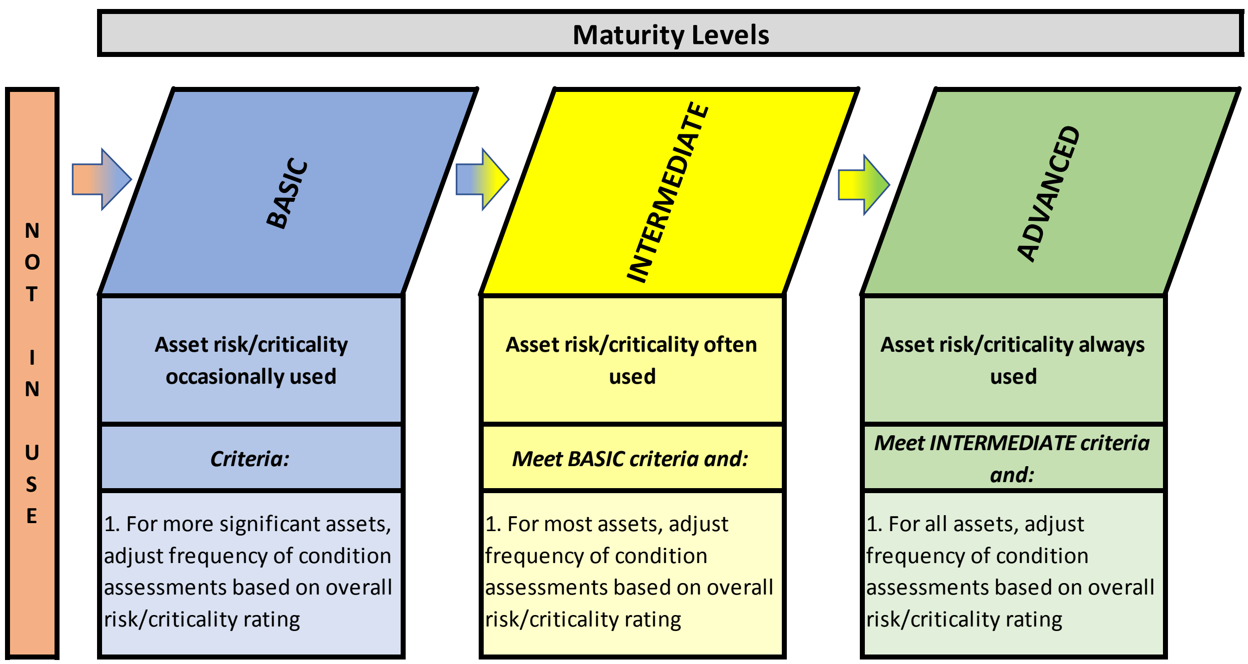
To what extent is asset risk/criticality used to determine how frequently asset conditions are assessed?

Background

An important factor in determining the frequency of performing asset condition assessments is the level of risk/criticality.

Levels of Maturity – Updating Condition Assessment Based on Risk/Criticality

To what extent is asset risk/criticality used to determine how frequently asset conditions are assessed?



At the **basic level of maturity**, overall asset risk/criticality is used occasionally to determine the frequency of condition assessments. It is suggested that at this level, the emphasis should be placed on more significant (complex) assets.

At the **intermediate level of maturity**, overall asset risk/criticality is often used in determining the frequency of condition assessments. At this level, most assets would be included in these assessments.

At the **advanced level of maturity**, overall asset risk/criticality is always used for all assets when determining the frequency of condition assessments.

Updating Condition Based on Risk/Criticality

This section focuses on a municipality's responsiveness to the results of its risk/criticality assessments in determining how often to conduct condition assessments. For example, assets may generally be assessed for condition once every five years (subject to legislative requirements). However, if a specific asset or asset type has a higher risk/criticality, the condition assessment(s) may be undertaken earlier to compensate. With this practice, it is realized that more critical assets may require more frequent condition/risk assessments in order to ensure risk is kept at acceptable levels. For example, in general a municipality may assess condition on facilities every 5 years; however, it is common to assess condition on more critical facilities every 3 years or even annually for highly critical facilities. See Table 3-37 (below) for an example:

Table 3-37
Sample Condition Assessment Timeline based on Risk Assessment

Risk Assessment	Complex Assets: Frequency of Condition Assessments
Extreme	Detailed Condition Assessment Every Year
High	Staff Inspections Every Year Detailed Condition Assessment Every 3 Years
Medium	Staff Inspections Every Year Detailed Condition Assessment Every 5 Years
Low	Staff Inspections Every Year Detailed Condition Assessment Every 7 Years

3.3.7 Age/Condition Profiles

Condition profiles provide a high-level report card on the health of a municipality's assets. A comparison to the associated age profile outlines the differences between condition assessment and asset age for each asset category

Has an age/condition profile been developed for all assets?

Background

Age and condition are important elements in assessing the state of local infrastructure.. This information allows municipalities to perform analysis of the future service potential for its assets. In general, an age profile represents the age of the assets and the proportion of asset age to expected useful life. Asset condition profiles focus on the proportion of assets that may be assessed at different levels of condition (i.e. good, fair, poor).

Levels of Maturity – Age/Condition Profiles

Has an age/condition profile been developed for all assets?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Age profile for some assets	**Age profile for most assets**	**Age/condition profile for all assets**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. For more significant assets, complete an analysis of asset age and useful life	1. For most assets, complete an analysis of asset age and useful life	1. For all assets, complete an analysis of asset age and useful life
	2. Consider how to summarize this analysis by asset category (i.e. weighted average)	2. Consider how to summarize this analysis by asset category (i.e. weighted average)	2. Compare asset age profile to asset condition
		3. Determine how and when the age profile will be updated and tracked	3. Consider how to summarize this analysis by asset category (i.e. weighted average)
			4. Determine how and when the age profile will be updated and tracked

At the **basic level of maturity**, municipalities have developed an age profile for more significant assets. Consideration should be given to summarizing this analysis by asset category to provide insight into the age profiles at that level of detail. It is common to summarize this analysis by using a weighted average, based on the cost (current valuation) of the individual assets within an asset category, when determining an overall age profile for the asset category.

At the **intermediate level of maturity**, the age profile would be determined for most assets, with the results summarized by asset category.

At the **advanced level of maturity**, the age profile would be determined for all assets, but would also include a comparison to the condition profile for these assets. As a result, a similar but more robust analysis can be prepared, showing the difference between the age-based and condition-based assessment summaries.

Age Profile and Service Potential

Service Capacity is defined as:

The total future service capacity of an asset. It is normally determined by reference to the operating capacity and economic life of an asset. (IIMM 2011)

An asset's service capacity refers to the output that the asset is able to sustain in delivering a service. Therefore, service potential is a function of both the level of output and the remaining service life of the asset.

There are a number of ways asset service potential can be assessed and monitored. Typically, they involve some assessment of the degree to which the useful life of an asset, or group of assets, has been consumed. The simplest method to assess service potential is to compare age to useful life. Assuming both are relatively accurately recorded, the result will indicate how long an asset is likely to continue to provide service, strictly from an age perspective. Similarly, this method can be used to assess a network, either by quantifying the assets in similar ranges of life consumed, or by deriving the average (or weighted average) ratio between age and useful life. It is important to note that the 'Building Together – Guide for Municipal Asset Management Plans includes the requirement to include within an AM plan one or more tables summarizing:

Asset age distribution and asset age as a proportion of expected useful life.

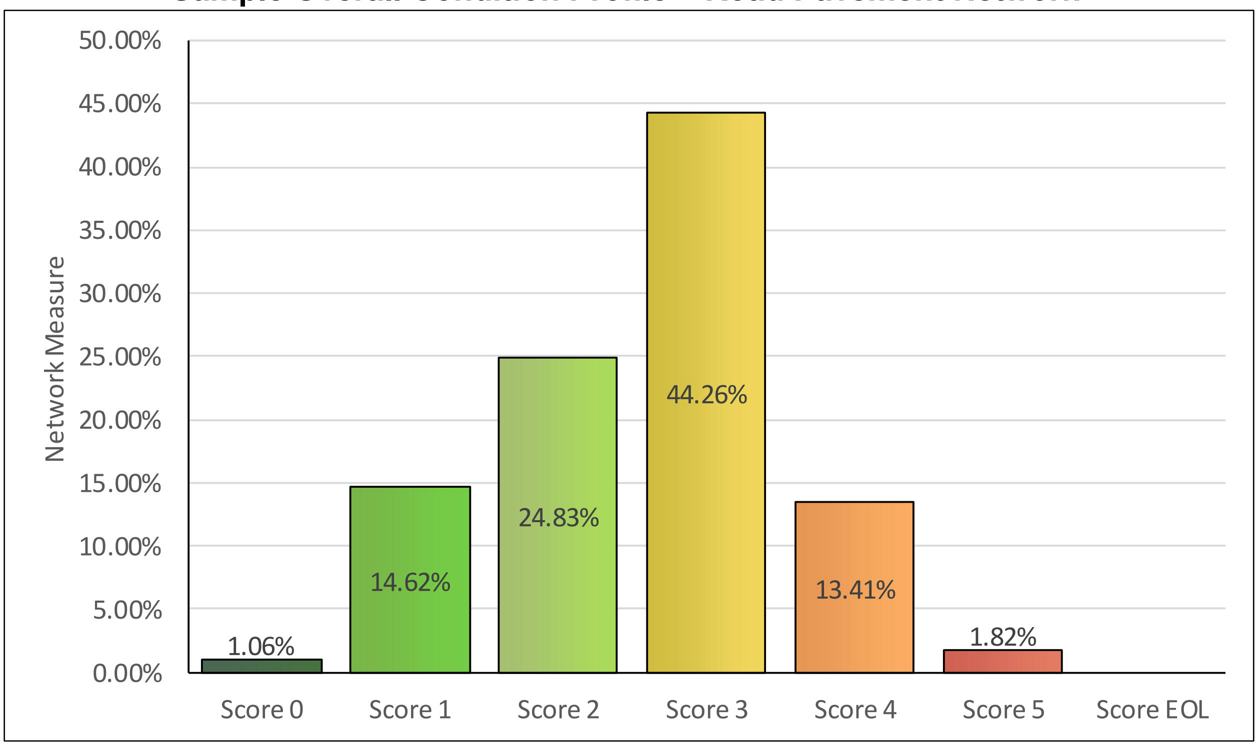
It is important to be aware that there are significant limitations with age-based assessments. Assets will often either have an actual service life significantly shorter or longer than the theoretical useful life assigned. This may occur for a number of reasons, including: greater than expected use, variations in construction, a change in the required levels of service, very good or very poor maintenance history, and/or an initial lack of understanding of the true service life.

The assessment of condition and development of condition profiles for the assets will often provide a more realistic indication of an asset's remaining life, and therefore the remaining service potential. It is clear that as condition deteriorates, the remaining life of an asset will reduce. If condition deteriorates slowly, then it is probable that the asset will exceed its expected useful life. This provides some indication that there may also be a corresponding increase to overall expected service-potential levels. Conversely, if condition deteriorates quickly, it is probable that the asset will not meet its expected useful life and anticipated service-potential levels. Verifying this deterioration can only occur if the condition is monitored over the life of the asset.

On a network or asset group basis, the overall condition profile can be analyzed to provide an indication of the remaining service potential of the entire asset stock.

The figure below shows an overall condition profile for the pavement component of a road network. In this example, condition 5 (shown in red) is the intervention level for asset replacement and condition 0 (shown in dark green) is a new asset.

Figure 3-7
Sample Overall Condition Profile – Road Pavement Network



Based on the information represented in the above figure, we can calculate the percentage service potential remaining for this asset group. The table below takes the condition profile above and applies remaining service-potential percentages (as determined by the municipality) for each rating level, to calculate the percentage service potential remaining for the pavement component of the road network:

Table 3-38
Sample Service Potential Calculation – Road Pavement Network

Rating	Network %	Service Potential %	Remaining Service Potential
0	0.13	100	0.13
1	14.62	80	11.70
2	24.83	60	14.90
3	45.26	40	18.10
4	13.41	20	2.68
5	1.75	0	0
Percentage Service Potential Remaining			47.51%

In summary, it is useful to conduct an analysis of a municipality's age profile and service potential. While an age-based approach will illustrate how old the assets are, a condition or service-potential approach will provide more accurate information with respect to the state of a municipality's assets. An example of combining an age-based and condition-based profile is provided below. Based on the colour coding identified, there can be a significant difference in remaining life when comparing an age-based assessment to a condition-based assessment.

Table 3-39
Sample Comparison of Age-based and Condition-based Assessments

Asset	Age-Based Analysis			Condition-Based Analysis		
	Useful Life	Age	Remaining Life	Condition (/10)	Condition-Based Remaining Life	Remaining Life
Asset 1	50	50	0%	3	15	30%
Asset 2	50	45	10%	1	5	10%
Asset 3	50	40	20%	3	15	30%
Asset 4	50	35	30%	4	20	40%
Asset 5	50	30	40%	6	30	60%
Asset 6	50	25	50%	4	20	40%
Asset 7	50	20	60%	7	35	70%
Asset 8	50	15	70%	6	30	60%
Asset 9	50	10	80%	8	40	80%
Asset 10	50	5	90%	9	45	90%

Good
Average
Poor

3.3.8 Updating the Asset Register

The asset register is the backbone of the AM planning process; therefore, ensuring that it accurately captures the asset portfolio is paramount. Municipalities should put in place policies that ensure changes to the asset portfolio are captured.

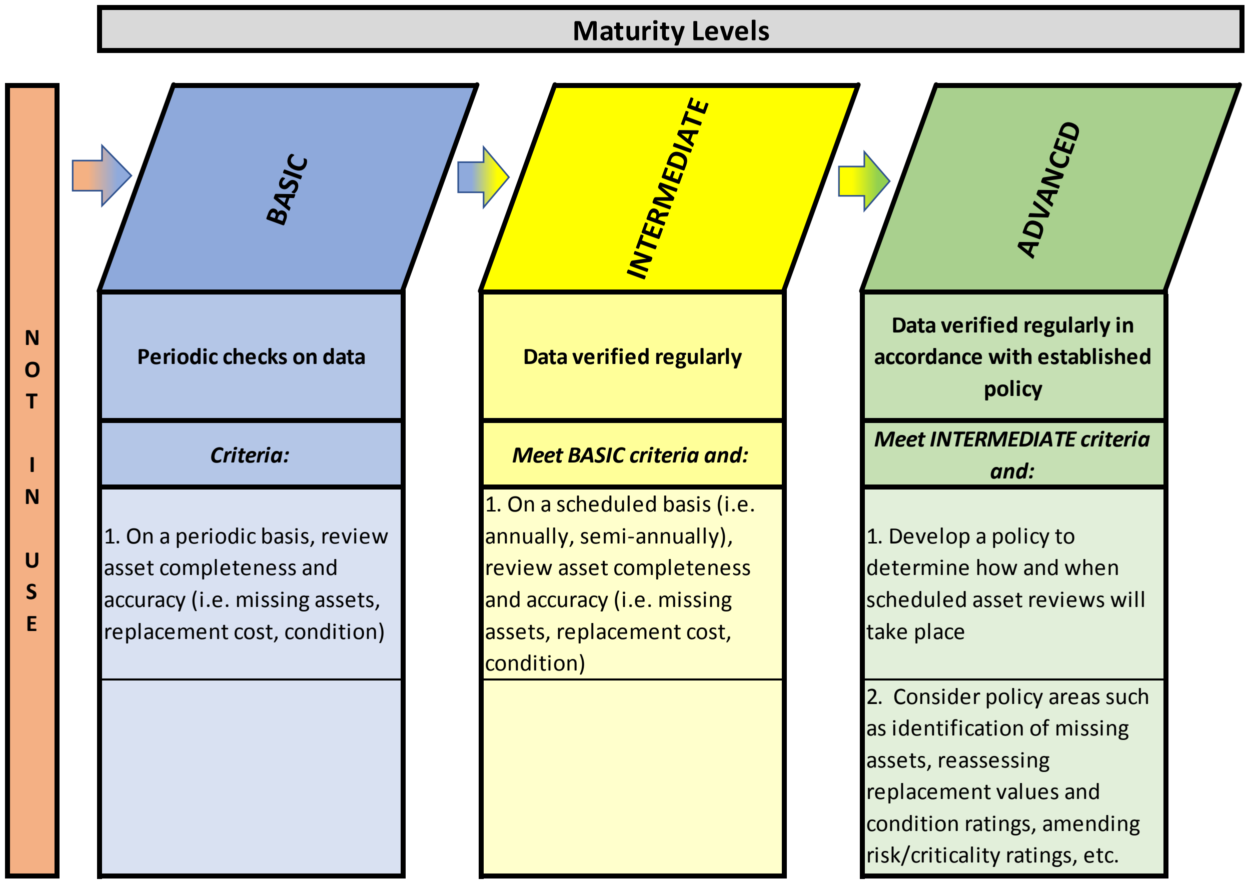
Is there a process in place to record new acquisitions/disposals in the asset register(s)?

Background

Once the asset register has been created consideration needs to be given to the process of keeping it current. Discussions regarding updating replacement cost, condition ratings, and risk assessments can be found in previous sections; however, updating the asset register for new acquisitions/disposals information is also important. This information can come from a number of sources; therefore, municipalities will have to be prepared to collect relevant details and use them to update the asset register accordingly.

Levels of Maturity – Updating Acquisitions/Disposals

Is there a process in place to record new acquisitions/disposals in the asset register(s)?



At the **basic level of maturity**, municipalities periodically update their asset data for new acquisitions/disposals. Municipalities at this level may update their PSAB 3150 asset data annually for acquisitions/disposals, betterments, etc., in order to complete financial statements and the Financial Information Return (FIR). Other asset registers, which are used for asset management purposes, would be updated periodically.

At the **intermediate level of maturity**, asset data for new acquisitions/disposals is updated on a regular basis. PSAB 3150 asset data may updated on a scheduled basis, as opposed to waiting for year end. Similarly, the asset registers would be updated on a scheduled basis.

At the **advanced level of maturity**, asset data for new acquisitions/disposals is updated regularly, in all asset registers, in accordance with established policy. This would require municipalities to review and update their asset policies to be in line with asset management needs (i.e. acquisitions, disposals, capitalization thresholds, etc.). Then, following policy requirements, all asset registers should be updated accordingly.

Asset Additions

There may be multiple sources of information related to asset additions to monitor. Most asset addition costs will flow through the accounts payable and payroll systems of a municipality’s financial system. Consideration should be given to appropriate account/job costing identification within the accounting systems in order to simplify the accurate collection of costs for assets.

There are also instances where asset additions occur, but no evident costing or attribute information is available. This could occur when assets are donated (contributed) or assumed from developers. In these cases, a municipality needs a process in place to be made aware of these contribution events in order to know when to record these contributed assets, and to have access to all required information to record the applicable assets, such as benchmark costs, engineering specifications, etc.

Another type of asset “addition” is the recording of missing assets. From time to time, municipalities may find assets that they own and manage that are not recorded in the asset register. While this technically is not an asset addition for accounting purposes, it is a needed addition to the asset register. Keep capitalization thresholds in mind when deciding whether or not to record these missing assets.

Capitalization thresholds can play a significant role in determining how to update the asset register(s). Capitalization thresholds represent the amount that is significant enough to a municipality, in each asset area, to warrant a discussion regarding capitalization. Any costs below identified capitalization thresholds are simply expenses in operations. Keep in mind that capitalization thresholds are also kept for accounting (PSAB 3150) purposes, and these thresholds can differ from identified asset management capitalization thresholds, if needed.

Asset Disposals

Asset disposal can occur in a number of ways including trade-ins, asset retirement/decommissioning, removal of existing linear assets when constructing new linear assets, and selling of buildings or other assets. Each municipality must monitor the sources of information that would identify all disposals, and ensure it triggers the related changes to the asset register.

Attribute Changes

Municipalities will need to be aware of how best to share information across departments as it relates to whether work done on assets has created changes to asset attributes, thus necessitating updates to the asset register. For example, when a road is changed from gravel to a paved surface, the attribute for material type will need to be changed. Another example includes widening a bridge or a sidewalk (thus changing the dimensions of the asset).

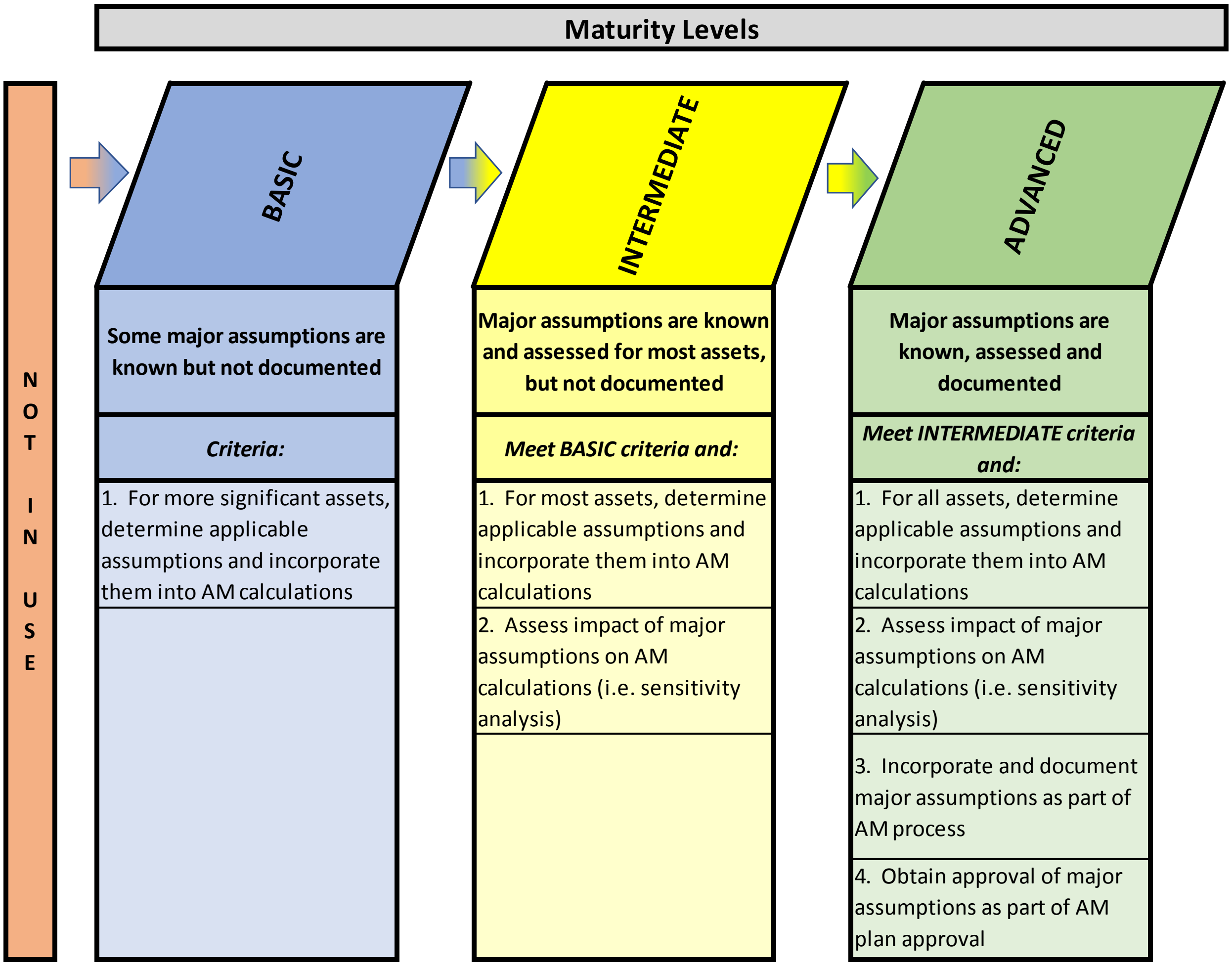
To what extent have major assumptions been assessed and documented?

Background

Within asset management data, a number of assumptions will have been made for a variety of purposes. There will be occasions when these assumptions may be questioned (i.e. from auditors or staff), or reviewed for continuing applicability by municipal staff. It is recommended that all major assumptions related to asset management data be documented to facilitate clarity and reasoning.

Levels of Maturity – Documentation

To what extent have major assumptions been assessed and documented?



At the **basic level of maturity**, municipalities make use of some major assumptions in their asset management calculations for significant assets but may not document them.

At the **intermediate level of maturity**, all major assumptions are known and assessed for asset management calculations related to most assets, but documentation may still be lacking. The impact of the major assumptions on asset management calculations may be assessed using techniques such as sensitivity analysis.

At the **advanced level of maturity**, all major assumptions are known, assessed, and documented for asset management calculations related to all assets. As with the intermediate level of maturity, the impact of the assumptions would be assessed. In moving from intermediate to advanced maturity, major assumptions should be documented (i.e. through a process manual). The major assumptions can be approved as part of the overall asset management plan approval.

Process Manual

Given the number of possible updates to the asset register, the number of sources of information, and the breadth of staff and potential consultants in an organization involved in the various aspects of asset management, a formal process manual can be beneficial to track all assumptions and ensure a consistent application of methodologies across the asset register. The manual can be used to identify how the asset register is to be updated, when updates take place and by whom. The major assumptions to be made can also be identified and documented as part of the process manual.

In order to facilitate consistency, issues such as staff/consultant hiring, training, and performance review (see Chapter 10 for more discussion on these issues) should be touched upon in the manual. Having a manual in place should assist in providing a level of consistency to the updates being performed.

3.4 Resources and References

Government of Canada, Treasury Board of Canada Secretariat Organization, https://www.canada.ca/en/treasury-board-secretariat/corporate/risk-management.html

Institute of Public Works Engineering Australasia (IPWEA), NAMS.PLUS Asset Management, https://www.ipwea.org/communities/assetmanagement/namsplus

IPWEA 2012, Long-Term Financial Planning Practice Note 6, https://www.ipwea.org/viewdocument/ipwea-long-term-fina

IPWEA, 2015, Australian Infrastructure Financial Management Manual , https://www.ipwea.org/publications/bookshop/ipweabookshop/aifmm

IPWEA, 2015, International Infrastructure Management Manual, https://www.ipwea.org/publications/bookshop/ipweabookshop/iimm

International Organization for Standardization (ISO), 2009, ISO 31000:2009, Risk management – Principles and guidelines, https://www.iso.org/iso-31000-risk-management.html

ISO, 2014, ISO 55000:2014, Asset management – Overview, principles and terminology, http://www.iso.org/iso/catalogue_detail?csnumber=55088

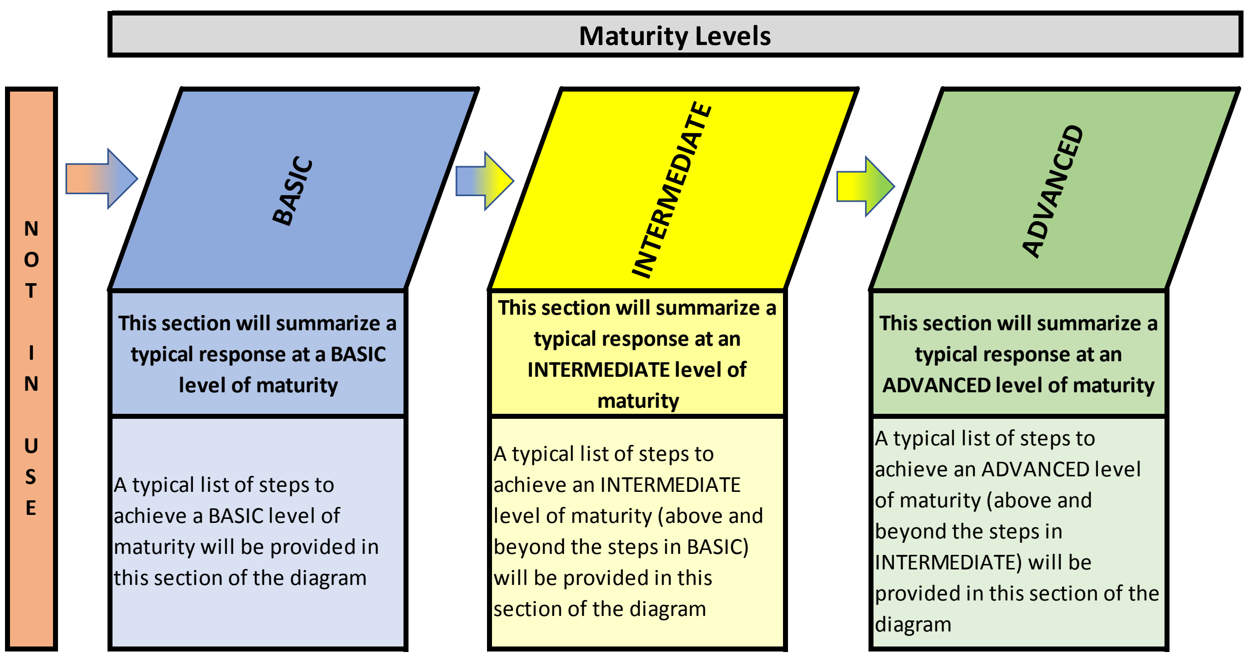
Public Sector Accounting Board, 2006, PS 3150 Tangible Capital Assets

Public Sector Accounting Group of the Canadian Institute of Chartered Accountants, 2007, Guide to Accounting for and Reporting Tangible Capital Assets, http://www.frascanada.ca/standards-for-public-sector-entities/resources/reference-materials/item14603.pdf

4 Levels of Service

4.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of maturity diagrams within this framework will assist municipalities to identify their current levels of maturity for each AM area. Furthermore, for municipalities that have a desire to move to a higher level of maturity over time, the diagrams will provide potential approaches to doing so. To more easily depict the maturity levels ascribed to specific questions posed within the framework, the following diagram will be utilized for each question:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices

to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

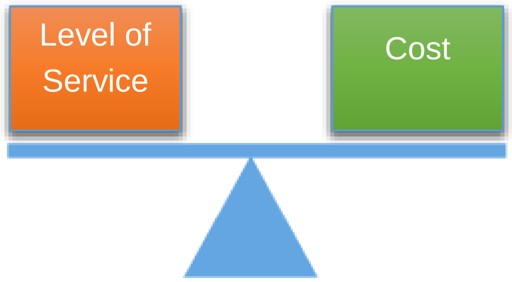
At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

4.2 Overview

Levels of Service (LOS) Analysis is a component of asset management planning that is significant and has a great deal of impact. Municipalities must not lose sight of the fact that its core purpose is to provide services to residents and other stakeholders. Assets help to provide those services and most of the resources devoted to asset management planning are spent on infrastructure. In this respect, physical assets are simply a portion of what is required to deliver the various levels of service as determined by the municipality. The municipality needs to ensure that the infrastructure performs to meet the level of service goals at an affordable and sustainable cost. An objective of an LOS analysis is to find a balance between the expected level of service and the cost of providing that level of service.

Figure 4-1
Balance between Level of Service and Cost

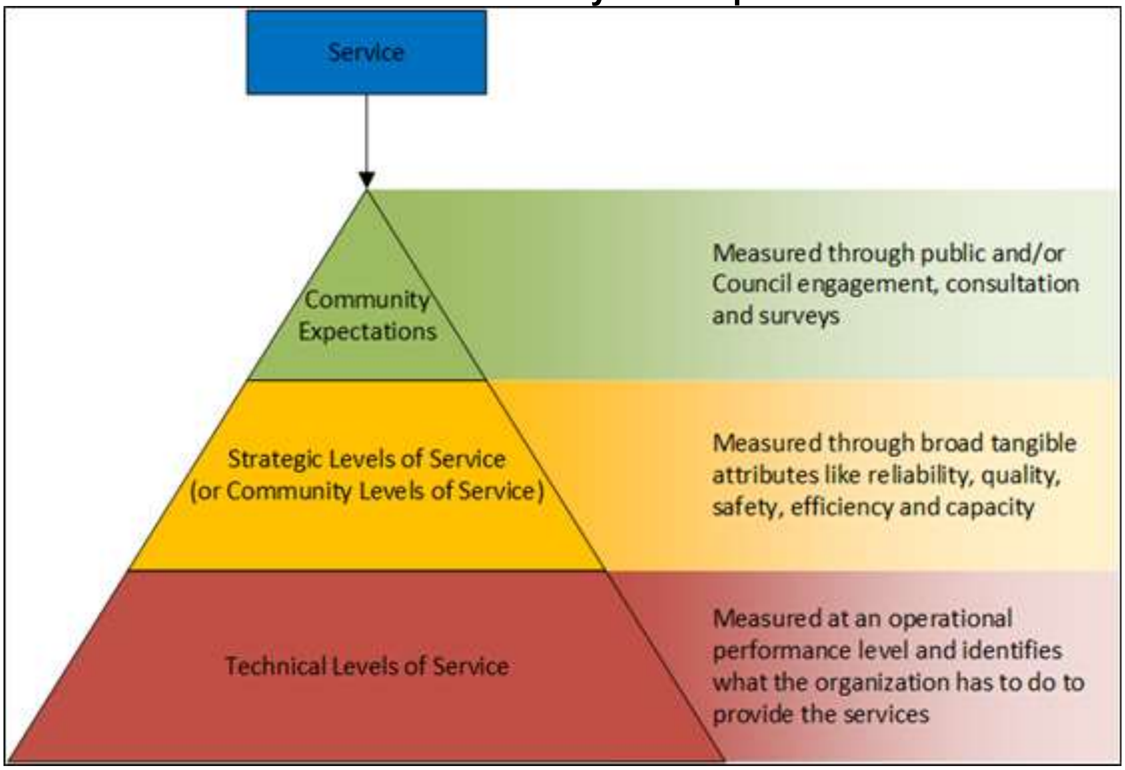


An LOS analysis includes:

- **Service identification** with the identification of assets involved in providing the services and the stakeholders impacted;
- Determination of **community expectations** with respect to services;
- Determination of **strategic levels of service**, based on community expectations (frequently referred to as customer levels of service);
- Determination of **technical levels of service** for each strategic level of service;
- **Comparison** of existing levels of service to expected strategic/technical levels of service;
- Use of **performance measures** to assist in comparing existing service levels to expected levels; and
- An assessment of the lifecycle **cost implications** of moving from existing levels of service to expected (desired) levels of service over a forecast period.

These components of the LOS analysis can be viewed from a hierarchy or pyramid perspective (see Figure 4-2 below), where the technical levels of service are needed to fulfill strategic levels of service, which are needed to satisfy community expectations, which are all based on a particular service or services being provided.

Figure 4-2
Level of Service Analysis Components



The outcome from identifying and determining levels of service can take on many forms, including:

- Qualitative descriptions of services and service levels;
- Identifications of programs, procedures, and/or activities that are required to achieve particular service levels; and
- Performance measures or key performance indicators (KPIs) that can illustrate the progression of service levels (i.e. through trending analysis) and an ultimate objective or target performance measure/KPI for which to strive.

The following sections are designed to assist municipalities understand their level of asset management maturity with respect to developing an LOS analysis within the asset management planning process. Each of the components introduced above are explained in more detail below.

Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements

O.Reg 588/17 outlines the following requirements with respect to levels of service:

Every municipality shall prepare an asset management plan in respect of its core municipal infrastructure assets by July 1, 2021, and in respect of all of its other municipal infrastructure assets by July 1, 2023.

A municipality's asset management plan must include the following:

a) For each asset category, the current levels of service being provided, determined in accordance with the following qualitative descriptions and technical metrics and based on data from at most the two calendar years prior to the year in which all information required under this section is included in the asset management plan:
   i. With respect to core municipal infrastructure assets, the qualitative descriptions set out in Column 2 and the technical metrics set out in Column 3 of Table 1, 2, 3, 4 or 5, as the case may be.
   ii. With respect to all other municipal infrastructure assets, the qualitative descriptions and technical metrics established by the municipality.

b) The current performance of each asset category, determined in accordance with the performance measures established by the municipality, such as those that would measure energy usage and operating efficiency, and based on data from at most two calendar years prior to the year in which all information required under this section is included in the asset management plan.

By July 1, 2024, every asset management plan must include the following additional information:

a) For each asset category, the levels of service that the municipality proposes to provide for each of the 10 years following, determined in accordance with the following qualitative descriptions and technical metrics:
   i. With respect to core municipal infrastructure assets, the qualitative descriptions set out in Column 2 and the technical metrics set out in Column 3 of Table 1, 2, 3, 4 or 5, as the case may be.
   ii. With respect to all other municipal infrastructure assets, the qualitative descriptions and technical metrics established by the municipality.

b) An explanation of why the proposed levels of service are appropriate for the municipality, based on an assessment of the following:

i. The options for the proposed levels of service and the risks associated with those options to the long term sustainability of the municipality.
ii. How the proposed levels of service differ from the current levels of service set out.
iii. Whether the proposed levels of service are achievable.
iv. The municipality's ability to afford the proposed levels of service.

c) The proposed performance of each asset category for each year of the 10-year period, determined in accordance with the performance measures established by the municipality, such as those that would measure energy usage and operating efficiency.

Please refer to Table 4-15 below in the Performance Measures section for details regarding the contents of "Tables 1 to 5" as per O.Reg 588/17.

4.3 Identifying Services to Provide

In order to determine appropriate LOS, a municipality must first understand what services it provides and what assets are involved in delivering those services.

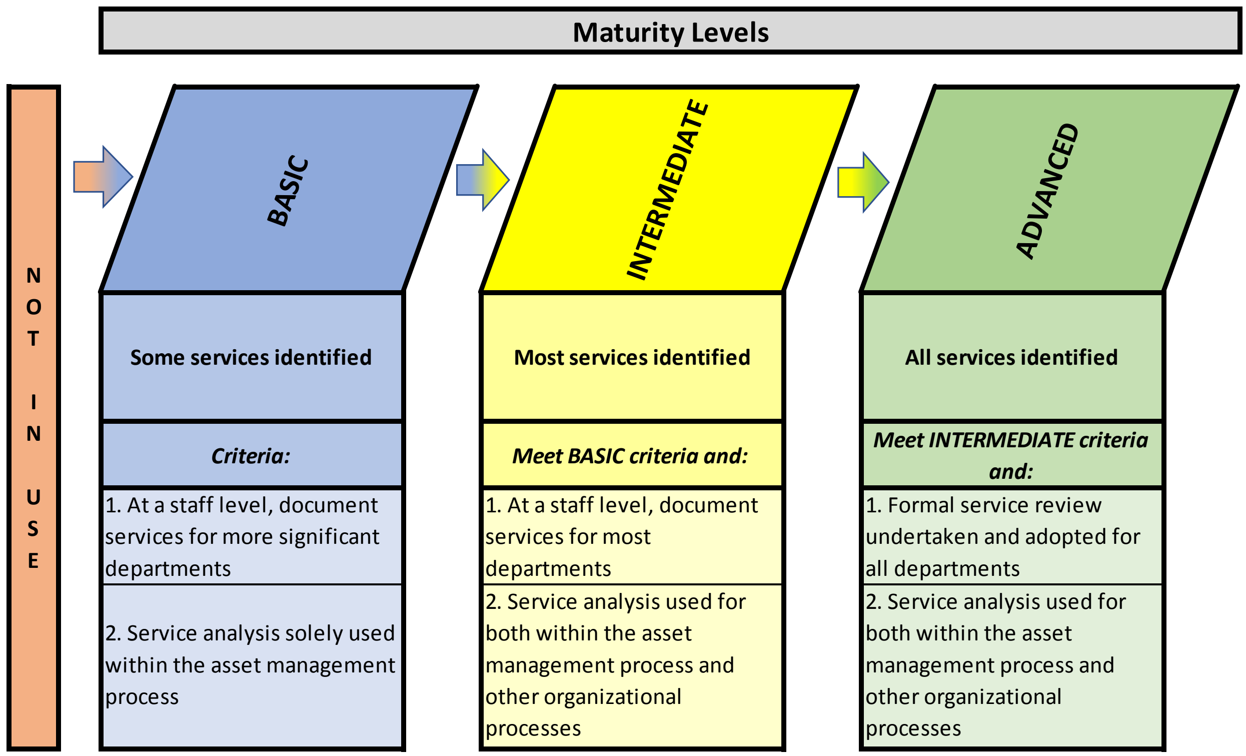
Have your services been determined?

Background

Identifying and determining services to provide is beneficial for several reasons. For asset management planning, identifying services is an important step in developing the LOS analysis. Once the municipality has identified the services it is providing and what services it wishes to provide, then the level of service to be provided can be determined. Service reviews can be undertaken by both formal and informal means and involve a number of stakeholders including staff, Council, and the public.

Levels of Maturity – Service Review

Have your services been determined?



At the **basic level of maturity**, municipalities will identify and determine the service levels of more significant services. Typically, this would occur at the staff level in an informal process and would focus on departments or services such as roads, water, and wastewater. The service analysis will likely only be used within the asset management process in completing an LOS analysis.

At the **intermediate level of maturity**, staff will identify and document most services provided by the municipality. The service analysis will be used in both the asset management process, as well as other organizational processes. At this level, the analysis is likely still informal, however, it would involve input from applicable departments within the municipality.

At the **advanced level of maturity**, all services are identified, documented and service levels determined. This is typically undertaken using a more formal service review process with the results adopted and approved by Council for all departments. This process includes the identification of assets that contribute to providing each service, detailed descriptions in relation to “how” and “why” the services are being provided, and a review of stakeholders impacted by each service area. The service analysis is used in both the asset management process, as well as other organizational processes.

Service Reviews

Given that the asset management planning process is in place to determine how assets will provide services to residents and other stakeholders, the identification of services is a critical “first step” to initiate the LOS analysis. Municipalities provide all of the legally mandated services, as well as a multitude of other services desired by the residents. The development of a “service centric” asset management process entails understanding and answering the following questions for all services:

- What are the services that we think we are to provide?
- What are the services that our customers expect?
- What are the services that we are really providing today?
- What assets are involved in providing each service?

At this stage, a municipality is not identifying how the services should be provided, or the level of that service to be provided. Identifying core services is a process of understanding and documenting the services the municipality provides today and intends to provide going forward, in addition to the assets needed to provide each service. Examples include the following:

Table 4-1
Sample Services and Related Assets

Department	Services	Applicable Assets
Transportation Services	Roads	Road base, surface, bicycle lanes, turning lanes, etc.
	Bridges and Culverts	Structure, deck, surface, etc.
	Sidewalks	Sidewalks
	Streetlights	Poles, fixtures, etc.
	Traffic Lights	Poles, lights, controllers, etc.
	Transit	Vehicles, facilities, equipment, etc.
	Parking	Lots, lights, facilities, equipment, etc.
	Winter Control	Vehicles, equipment
Environmental	Water Distribution	Water mains, wells, pumps, towers, valves, hydrants, etc.
	Water Treatment	Treatment plant (treatment systems, chlorination, pumps, chemical injection and filtration, piping, SCADA, pump houses, etc.
	Wastewater Collection	Mains, pumping systems, manholes, etc.

Department	Services	Applicable Assets
	Wastewater Treatment	Treatment plant (separators, aeration systems, pumps, chemical systems, SCADA, settlement ponds, facilities, etc.)
	Stormwater	Urban: Stormwater mains, catch basins, ponds, headwalls, etc.
		Rural: Open ditches, culverts, ponds, headwalls, etc.
	Solid Waste Collection	Vehicles, transfer stations, weigh scales, containers, etc.
	Solid Waste Disposal	Landfills, monitoring wells, compactors, bulldozers/loaders, etc.
	Solid Waste Diversion	Transfer stations, vehicles, containers, etc.
Protection Services	Fire	Vehicles, equipment, facilities, hydrants, etc.
	Police	Vehicles, equipment, facilities, etc.
	Protective Inspection and Control	
Recreation and Cultural Services	Recreation Facilities	Facilities (arenas, pools, community halls, etc.), vehicles, equipment
	Parks	Vehicles, equipment, facilities, active parks, passive parks, etc.
	Libraries	Facilities, equipment, etc.
	Museums	
Health Services	Public Health/Hospitals	Facilities, equipment, etc.
	Ambulance Services	Facilities, vehicles, equipment, dispatch equipment, etc.
	Cemeteries	Land improvements, facilities, equipment, etc.
Social Services and Social Housing	Assistance to Aged Persons	Facilities, equipment, etc.
	Child Care	Facilities, equipment, etc.
	Housing/Co-op/Rent	Facilities, equipment, etc.
Planning and Development Services	Residential/Industrial/ Commercial/Agriculture	Land, services, etc.
General Government	Administration	Equipment, vehicles, facilities, etc.

The levels of service in each area will be added to this analysis in later sections.

More comprehensive service reviews can include additional information, such as why services are being provided, as well as pros/cons associated with providing each particular service. For example, a municipality may be struggling with the idea of providing serviced industrial land to promote industrial growth. If a municipality decides not to directly provide this service, agreements can be put in place to allow local developers to provide it.

To add to the service identification process, a municipality can decide to include the identification of specific customers and other stakeholders involved in providing services. Common customer/stakeholder groups could include:

- Landowners (i.e. property taxation base);
- External users (e.g. water, wastewater, parks, recreation, library, policing, fire, solid waste, etc.);
- Internal municipal users (e.g. senior management, inter-departmental services, supervisors, technical staff, etc.);
- Elected officials;
- Regulatory agencies;
- Municipal agencies;
- Special interest groups;
- Vendors or business owners; and
- Developers.

As with the service identification outcomes, the list of customers/stakeholders can be enhanced to mention the interests and positions of each of the groups identified as well as how various levels of service may impact them.

4.4 Level of Service Analysis

Having the LOS analysis follow a well-defined process ensures that relevant stakeholders have been consulted and that there is accountability to the established LOS. It also allows for a connection between expected LOS and the cost of providing that service level.

What process was followed in developing the level of service analysis?

Background

While the later sections in this chapter focus on the specific content of an LOS analysis, this section deals with the steps involved in the process, as well as who is involved.

Levels of service relates to the overall service objectives of the organization. Therefore, it makes sense to consider the involvement of all departments that provide services within the LOS development process. Also, decisions will be made regarding the sources of information to be included in the analysis, which may include input and decisions from technical staff, management, Council, and the public.

Levels of Maturity – Level of Service Analysis

What process was followed in developing the level of service analysis?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	LOS analysis completed for significant departments informally	**LOS analysis completed for most departments and approved by council**	**LOS analysis completed for all departments, with public input and approved by council**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. At a staff level (i.e. by workshop), complete a LOS analysis at a basic level for significant departments	1. At a staff level (i.e.by workshop), complete a LOS analysis at a detailed level for most departments	1. At a staff level, initiate a LOS analysis at a detailed level for all departments
	2. Ensure LOS analysis meets the needs of external pressures	2. Ensure the LOS analysis provides benefit internal to the organization while meeting external pressures	2. Seek public input on LOS (i.e. by workshops, public meetings, surveys)
	3. Ensure the LOS analysis is indirectly endorsed by council through endorsement of AM plan	3. Ensure the LOS analysis is directly endorsed by council as part of a specific recommendation (part of AM plan, or independent of AM plan)	3. Ensure the LOS analysis provides benefit internal to the organization while meeting external pressures
			4. Ensure the LOS analysis is directly endorsed by council as part of a specific recommendation (part of AM plan, or independent of AM plan)

At the **basic level of maturity**, the LOS analysis is likely completed for significant departments only. The process is usually conducted informally by a group of staff through workshops, meetings, or similar types of activity. The analysis may be undertaken at a more cursory or basic level, and is primarily being undertaken due to the external pressures of having an LOS analysis within the organization's asset management plan (i.e. following O.Reg 588/17). Staff should ensure Council endorses the LOS analysis, even if done so indirectly as part of their endorsement of the overall asset management plan.

At the **intermediate level of maturity**, the LOS analysis will now be completed for most departments that provide services. With most departments included in the analysis, representatives from each department provide input in the process. Staff complete a detailed LOS analysis, ensuring both internal organizational objectives and external asset management pressures are addressed. Council should directly endorse the LOS analysis by specific recommendation, either as part of the asset management plan endorsement, or through independent report(s) completed as part of the overall asset management process.

At the **advanced level of maturity**, staff will undertake a detailed LOS analysis for all departments that provide services. Input from the public is sought through the use of workshops, public meetings, and/or surveys. The LOS analysis is undertaken taking into consideration the public input. Both internal organizational objectives and external pressures should be addressed through the LOS analysis. Council should directly endorse the LOS analysis by specific recommendation either as part of the asset management plan endorsement, or through independent report(s) completed as part of the overall asset management process.

What are Levels of Service?

An understanding of the levels of service provided by a municipality is required in order to effectively deliver services using municipal capital assets. Capital assets are only in place to deliver identified services to the community. Therefore, municipal staff and Council should have a strong understanding of the service levels expected by the community, while also taking into consideration what service levels are affordable. Although the community desires for service level can limitless, what the community is willing to pay for is often less so. Through the LOS analysis, community needs and expectations are considered, and also measure against the cost and the willingness to pay.

The IIMM defines LOS as "the defined service quality for a particular service against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental, acceptability and cost".

The IIMM notes that the LOS analysis can be used to:

- Inform customers of the proposed level of service to be offered;
- Develop asset management strategies to deliver the required level of service;
- Measure performance against defined (current and desired) levels of service;
- Identify the costs and benefits associated with the services offered; and
- Enable customers to assess the suitability, affordability, and equity of the services offered.

While these outcomes benefit the asset management process, they can also benefit other organizational processes, such as strategic planning, developing master plans, and the budget development and approval process.

Factors Affecting Levels of Service

A number of factors may affect the level of service delivery for a particular asset type. An organization’s policy objectives, community expectations, legislative requirements, and resource constraints are some of the factors that generally influence the level of service. The IIMM provides the following details on some of these factors:

- **Community Expectations**: This factor represents one of the major drivers in setting levels of service. Information is needed about the community’s expected level of service and willingness to pay for this service. A balance then needs to be determined between that expected level of service and its associated costs.
- **Legislative requirements**: Legislative standards and regulations affect the way assets are managed. These requirements stipulate the minimum levels of service. Therefore, relevant requirements must be taken into consideration in setting levels of service.
- **Policies and objectives**: Existing policies and objectives should be taken into account when developing levels of service, with care taken to remain aligned with an organization’s strategic planning documents.
- **Resource availability and financial constraints**: These constraints play a large role in an organization’s ability to provide sustainable levels of service. Therefore, resource constraints play a significant part in determining affordable levels of service.

Current vs. Expected Levels of Service

The concept of comparing current vs. expected LOS is very important to the overall LOS analysis process and will be discussed in more detail in a later section, however, it is being introduced in this section. Current levels of service are essentially the service levels that are being provided by a municipality at the present time. They can be defined through qualitative descriptions, lifecycle cost related programs, and/or performance measures. The current year's budget reflects the cost of providing current levels of service. However, the current year's budget may or may not include adequate funding to maintain current levels of service over time (more on this in the performance measures sections). Information on current levels of service enables an understanding of the difference between the service levels currently being provided and the service levels expected.

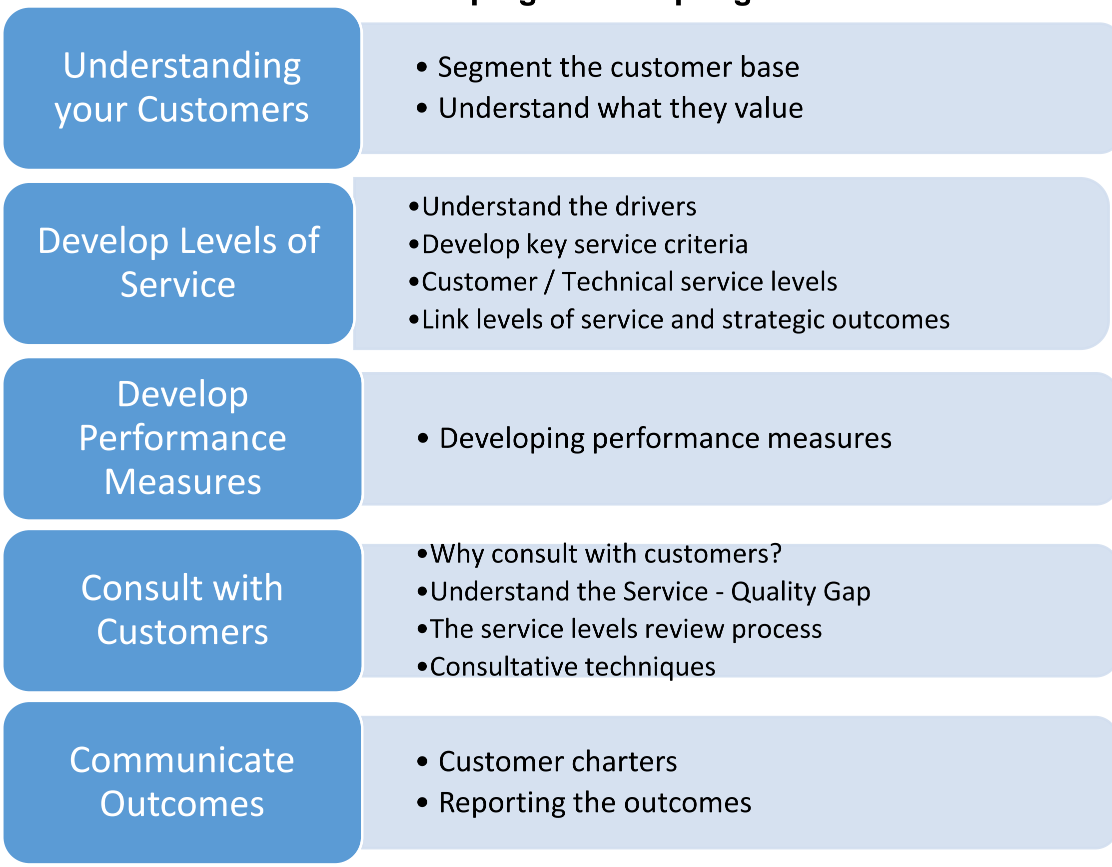
Levels of service are differentiated between:

- **Community Expectations**: Based on what the customer and community expects to receive;
- **Strategic (or Customer) Levels of Service**: Measuring community expectations against attributes such as reliability, quality, safety, efficiency, and capacity. Outlines what the customer will receive from a levels of service standpoint; and
- **Technical Levels of Service**: How the organization provides (or will provide) the levels of service, often using operational or technical measures.

The Process of Developing a Level of Service Analysis

The IIMM defines the process for developing and adopting level of service measures as follows:

Figure 4-3
IIMM Process for Developing and Adopting Levels of Service



Or, in other words, creating an LOS analysis can involve:

1. **Defining Customer Expectations**
   - Understanding your customer and their wants/needs
2. **Developing Levels of Service**
   - Customer vs. technical LOS
   - Current vs. expected LOS
   - Use of performance measures and key performance indicators (KPIs)
3. **Consultation, Communication and Approval**
   - Receiving input on the proposed LOS analysis
   - Communicating the LOS analysis to stakeholders
   - Seeking Council approval of the LOS analysis
4. **Ongoing Review, Updates and Improvements**
   - Updating the LOS analysis, as needed

Defining Customer Expectations

The process of defining customer expectations involve any or all of the following:

- Staff input;
- Use of industry/local knowledge;
- Existing reports that refer to customer expectations;
- Council input; and/or
- Seeking public input.

Involving Council and/or the public in the process of defining customer expectations provides a direct connection between the community and their expectations that may not identified through other sources. Other sources can involve assumptions and estimations of customer expectations. Therefore, direct input from the public can be more accurate, although it requires a more extensive and time-consuming process. Public input can take many forms, including:

- Public meetings;
- Specific workshops or focus groups;
- Comment submissions; and
- Surveys or questionnaires.

Developing Levels of Service

To be effective in developing levels of service, input should be gathered from and communicated to all interested parties. At this point, the services being provided and the community expectations should be documented. Using this information, the applicable departments and staff to include in the LOS discussions can be determined. This section deals only with the process of developing an LOS analysis, and further detail on the actual content of that process will be discussed below in other sections.

Consultation, Communication, and Approval

Once the LOS analysis is complete in "draft form", decisions should be made regarding the consultation, communication, and/or approval processes that need to occur to finalize the analysis. From a consultation point of view, various stakeholders will be brought into the process to review the draft LOS analysis and provide feedback. These stakeholders may include other staff members, Council, and the public. The approval of the LOS analysis may be simply the discussion and approval at a Council (or

Committee) meeting. A more extensive process may include public workshops or online videos/reports to communicate the LOS analysis to the public and Council before it is discussed and approved. A decision on when to approve the LOS analysis, either as part of an overall asset management plan, or independently of an asset management plan, will also have to be made. An independent approval process puts a lot more focus on the LOS analysis than when noted as part of an overall asset management plan approval discussion. The additional attention may be useful in getting Council and the public to understand and buy into the analysis and its conclusions.

Ongoing Review, Updates and Improvements

The establishment of an LOS analysis is not a one-time occurrence. Rather, it is a constant and evolving process with ongoing consideration to customer expectations, legislative or technological requirements/changes, corporate strategic mission and objectives, and financial opportunities/constraints. It is recommended that municipalities review their LOS on a periodic basis (see Chapter 8 on Continuous Improvements). The frequency of these reviews should be established and followed by staff as part of the Strategic Asset Management Policy (see Chapter 2).

As a municipality moves through the maturity framework to a desired level, it is expected that the amount of public input regarding LOS will likely increase. It is important to note that although seeking public input is important, this input must be considered taking into account financial considerations. Also, the degree of public input in the asset management process will depend on the municipality's capacity to establish a reasonable and meaningful process.

Establishing LOS targets is often an iterative process. The process starts with public (community) expectations of service levels and then measuring these expectations against constraints such as financial considerations, resourcing and affordability. Only after these constraints have been taken into account will it be determined whether public expectations can in fact be approved as expected (target) LOS for the municipality's asset management process.

4.5 Determining Community Expectations

Having a good understanding of community expectations help ensure that the community's true values are reflected in defining LOS in an informed manner.

To what extent have community expectations been documented in the LOS analysis?

Background

One of the first steps in the development of an LOS analysis determining what services/service levels the community expects the municipality to provide. While there are different approaches to gathering and utilizing this information, it should be based on the service identification process discussed above. As mentioned previously, community expectations and strategic (customer) levels of service (discussed later) are documented based on how the customer and community receives the service, while technical LOS relates to how staff deliver the service.

Levels of Maturity – Community Expectations

To what extent have community expectations been documented in the LOS analysis?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Community expectations developed & documented by staff	**Community expectations developed & documented by staff with strategic planning documents and Council input**	**Community expectations developed & documented through community consultation or strategic planning documents**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Staff to develop community expectations as part of an internal process, based on experience and professional judgement	1. Staff to develop community expectations as part of an internal process, based on experience and professional judgement	1. Staff to conduct community expectations consultation with council and members of the public
	2. Document community expectations by service or asset area, for use in the AM plan	2. Incorporate available strategic planning documents that reference community expectations and LOS (e.g. official plan, strategic plan, master plan)	2. Document community expectations by service or asset area, for use in the AM plan
		3. Seek council input on refining community expectations	3. Integrate documented community expectations into future updates to the AM plan and strategic planning documents
		4. Document community expectations by service or asset area, for use in the AM plan	

At the **basic level of maturity**, community expectations are usually developed by staff, as a result of an internal (informal) process and based on staff experience and professional judgment. The community expectations are documented by service/asset area, for use within the asset management plan.

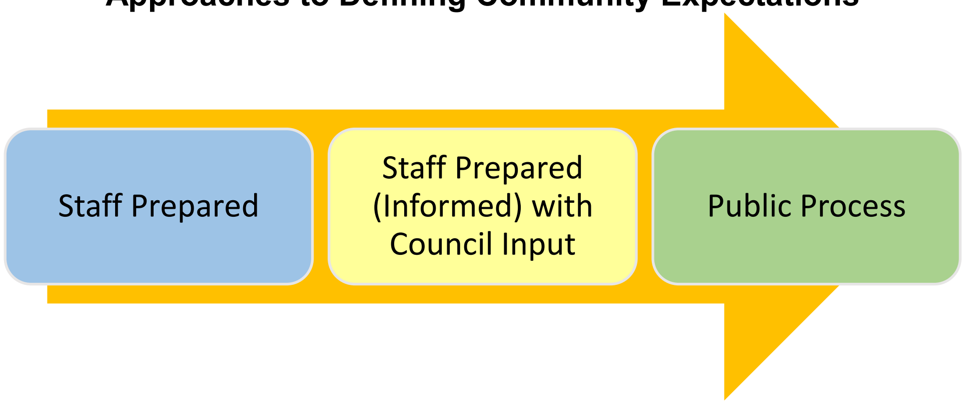
At the **intermediate level of maturity**, staff would still likely develop community expectations, but incorporate existing strategic planning documents (e.g. official plan, strategic plan, master plan, etc.). Council input will also be sought and used to refine community expectations. From this point, community expectations are documented by service/asset area, for use in the asset management plan.

At the **advanced level of maturity**, community consultations are undertaken early in the process, including Council and members of the public, to identify community expectations. The community expectations are documented by service/asset area, for use in the asset management plan. Moving forward, the community expectations are integrated into future updates to the asset management plan, as well as other strategic planning documents.

Developing Community Expectations

The process of developing community expectations can be as simple as staff completing the process or be more in depth and include Council and/or the public in the process. In addition, existing reports, processes, or meeting minutes can be used to inform the process with more detailed information already known regarding community expectations. As illustrated in Figure 4-4 (below), there is potential for increased accuracy in the process and acceptance of the results by Council and the public as the more complex public process is used.

Figure 4-4
Approaches to Defining Community Expectations



The customers who are the ultimate users of the services will have diverse needs and expectations. This underscores the need to understand the customers and connect their divers needs to the level of service being provided. It is beneficial to group the users based on their type and needs when developing community expectations. As part of this process, the community expectations of the various customer groups will need to be consolidated for use in the LOS analysis.

The actual process involved in documenting community expectations is similar, regardless of who is included in the process. It starts with the identification of services for the municipality (including applicable capital assets involved in providing that service), and then documenting what the community expectations are for each service area. The documentation should be completed in a way that reflects how the community would communicate expectations. While this sounds simplistic, this process will have a significant impact on asset management planning as a whole within the municipality. A misunderstanding of community expectations can result in the development of an asset management plan that does not meet the needs of the community.

Expanding on the table of services discussed previously, the following table provides examples of community expectations for each service area:

Table 4-2
Sample Community Expectations

Department	Services	Applicable Assets	Community Expectations
Transportation Services	Roads	Road base, surface, bicycle lanes, turning lanes, etc.	**"Smooth roads that take me where I need to go without too much congestion"**
	Bridges and Culverts	Structure, deck, surface, etc.	**"Sturdy bridges that take me where I need to go without too much congestion"**
	Sidewalks	Sidewalks	**"Sidewalks that I can walk safely on to key areas of the Community"**
	Streetlights	Poles, fixtures, etc.	**"Streetlights that work so I don't have to walk in the dark"**
	Traffic Lights	Poles, lights, controllers, etc.	**"Traffic lights are placed where needed to ensure smooth and safe traffic flow"**
	Transit	Vehicles, facilities, equipment, etc.	**"Access to public transit to allow me to get where I need to go on a reasonable schedule"**

Department	Services	Applicable Assets	Community Expectations
	Parking	Lots, lights, facilities, equipment, etc.	**"Safe and convenient parking is available, where needed"**
	Winter Control	Vehicles, equipment	**"Able to drive on roads safely in winter conditions"**
Environmental	Water Distribution	Water mains, wells, pumps, towers, valves, hydrants, etc.	**"Clean water, when I need it, that tastes good, has adequate pressure, at a reasonable cost"**
	Water Treatment	Treatment plant (treatment systems, chlorination, pumps, chemical injection and filtration, piping, SCADA, pump houses, etc.	
	Wastewater Collection	Mains, pumping systems, manholes, etc.	**"Wastewater systems that take my waste away and treats it with no harm to the environment"**
	Wastewater Treatment	Treatment plant (separators, aeration systems, pumps, chemical systems, SCADA, settlement ponds, facilities, etc.)	
	Stormwater	Urban: Stormwater mains, catch basins, ponds, headwalls, etc.	**"No flooding on our streets or properties"**
		Rural: Open ditches, culverts, ponds, headwalls, etc.	
	Solid Waste Collection	Vehicles, transfer stations, weigh scales, containers, etc.	**"My garbage and recycling to be picked up each week and processed**

Department	Services	Applicable Assets	Community Expectations
	Solid Waste Disposal	Landfills, monitoring wells, compactors, bulldozers/loaders, etc.	**with no harm to the environment"**
	Solid Waste Diversion	Transfer stations, vehicles, containers, etc.	
Protection Services	Fire	Vehicles, equipment, facilities, hydrants, etc.	**"The fire department to arrive at emergencies as fast as possible with capable firefighters"**
	Police	Vehicles, equipment, facilities, etc.	**"Police will respond to emergencies in a timely manner"**
	Protective Inspection and Control	Vehicles, equipment, facilities, etc.	**"Ability to ensure by-laws are being adhered to"**
Recreation and Cultural Services	Recreation Facilities	Facilities (arenas, pools, community halls, etc.), vehicles, equipment	**"Good recreation facilities to meet the demands of the community"** **"Access to community halls for community functions"**
	Parks	Vehicles, equipment, facilities, active parks, passive parks, etc.	**"Parks that are clean, safe, with playgrounds and open fields"**
	Libraries Museums	Facilities, equipment, etc.	**"All facilities should be accessible"**
Health Services	Public Health/Hospitals	Facilities, equipment, etc.	**"Access to health services to enhance my quality of life"**
	Ambulance Services	Facilities, vehicles, equipment, dispatch equipment, etc.	**"Properly equipped ambulance personnel will be dispatched and arrive on-site when needed"**

Department	Services	Applicable Assets	Community Expectations
	Cemeteries	Land improvements, facilities, equipment, etc.	**"Availability of a well-maintained and private site for interment needs"**
Social Services and Social Housing	Assistance to Aged Persons	Facilities, equipment, etc.	**"Accessible and well-maintained housing for senior citizens"**
	Child Care	Facilities, equipment, etc.	**"Availability of child care services, so parents can pursue their careers"**
	Housing/Co-op/Rent	Facilities, equipment, etc.	**"The community should support opportunities for independent living"**
Planning and Development Services	Residential/Industrial/ Commercial/Agriculture	Land, services, etc.	**"Land should be made ready for development, as needed"**
General Government	Administration	Equipment, vehicles, facilities, etc.	**"A Town Hall that allows me to attend Council meetings, pay taxes and get my questions answered**

It is likely that the community will expect a high level of service in each area, without having an understanding of the financial consequences of providing that level of service. An opportunity to improve the public's understanding of the relationship between service levels and cost can be added to the ongoing development and refinement of community expectations. The public will first need to understand a municipality's asset management process (as well as the implications of plan recommendations) before clearly defined expectations can be received from them. The process of providing the connection between cost and service level will hopefully assist the public understanding which can be used to revise documented community expectations. In a later section, the process of outlining the financial impacts of levels of service will be discussed.

4.6 Developing Strategic (Customer) Levels of Service

Well-defined strategic LOS relate to community expectations and thereby clearly communicate desired customer outcomes. These levels of service are described in a manner that outlines what is being received by the customer.

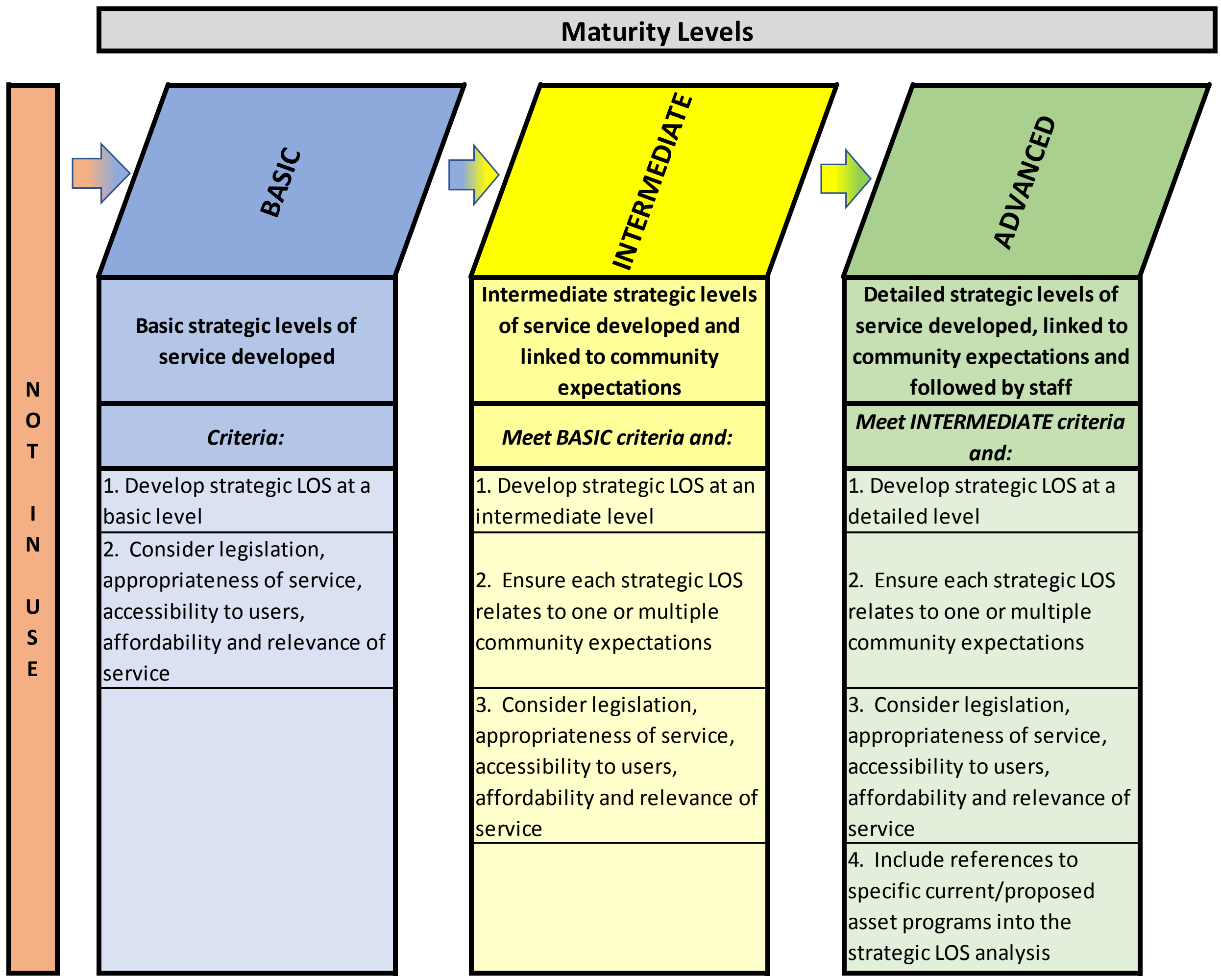
To what extent have strategic (customer) LOS categories been developed and used?

Background

Strategic (or customer) LOS relates to broad issues such as overall outcomes or services for the community. They are recorded in a manner that describes how the customers are receiving the service. This expands on the community expectations discussed earlier and attempts to describe the levels of service in terms of what is actually being provided to the customer from a strategic point of view.

Levels of Maturity – Strategic (Customer) LOS Categories

To what extent have strategic (customer) LOS categories been developed and used?



At the **basic level of maturity**, strategic (customer) LOS will be developed, but only at a high-level, with consideration given to key customer outcomes, including relevant legislation, appropriateness of service, accessibility to users, affordability and relevance of service. At this level, there is not yet direct linkage to community expectations (or the community expectations analysis is incomplete). At a minimum, the legislative requirements outlined in O.Reg 588/17 with respect to customer LOS will be met.

At the **intermediate level of maturity**, municipalities will develop strategic (customer) LOS at a more comprehensive level. Each strategic LOS would be determined with community expectations taken into account and directly linked to the analysis. As with the basic level of maturity, key customer outcomes including relevant legislation, appropriateness of service, accessibility to users, affordability and relevance of service should also be considered.

At the **advanced level of maturity**, detailed strategic LOS will be developed with both community expectations and customer outcomes taken into account. References to specific current and/or proposed asset programs that assist in providing the service will be included in the strategic LOS analysis.

<u>Developing Strategic (Customer) Levels of Service</u>

Strategic LOS (also commonly referred to as customer LOS) are documented based on how the customer and community receives the services provided by the municipality. This differs from technical LOS, which are documented based on how the municipality provides the services. To clarify, strategic (customer) LOS are from the customer's perspective while technical LOS are from the municipality's perspective.

The overview section described the ways in which strategic (customer) LOS can be documented and tracked, including:

- Qualitative descriptions of services and service levels;
- Identifications of programs, procedures and/or activities that are required to achieve particular service levels; and
- Performance measures or key performance indicators (KPIs) that can illustrate the progression of service levels (i.e. through trending analysis) and an ultimate objective or target performance measure/KPI to strive for.

This section focuses on qualitative descriptions of levels of service. Programs/procedures and performance measures will be discussed in later sections.

A number of factors may affect the strategic LOS for a particular asset type. Factors include:

- Customer expectations;
- An organization's policy and objectives;
- Legislative requirements; and
- Resource constraints.

Strategic (customer) LOS define service levels in relation to a range of attributes, for example:

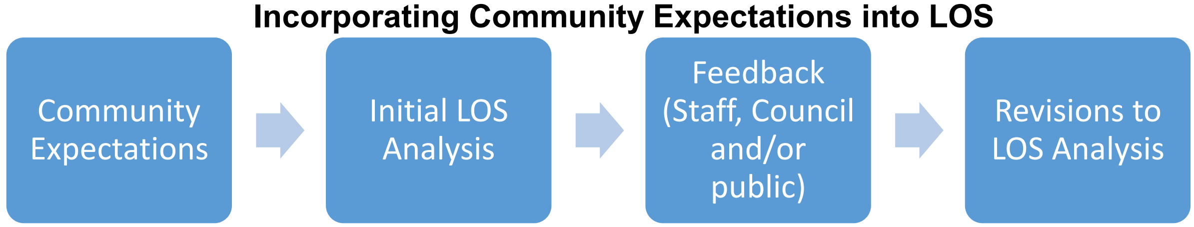
- Reliability;
- Functionality;
- Quantity;

- Quality;
- Responsiveness;
- Safety;
- Capacity;
- Environmental impacts;
- Efficiency;
- Affordability;
- Speed;
- Availability;
- Sustainability;
- Appearance;
- Comfort; and
- Efficiency.

In some cases, these attributes relate to asset performance, and in other cases they describe customer benefit. Customer benefit is very much a strategic (customer) attribute, however, asset performance can be both strategic (customer) LOS and technical LOS. If the customer directly uses the asset (e.g. roads), then the performance of that asset is more related to strategic LOS (i.e. how the customer experiences the service). If, however, the customer does not directly use the asset (e.g. a snow plow is helping provide safe roads, but the plow itself is not directly used by the customer), then the performance of that asset is more related to technical LOS (i.e. how the municipality/staff provide the service).

The act of defining strategic LOS can involve consolidating customer expectations for a particular service, and setting a level of service (using various descriptive attributes) that attempts to meet customer expectations. Customer expectations are one of the major drivers in setting levels of service (as discussed above), as it is the customer expectations that lays the foundation for service levels established from a strategic point of view. This process can assist in identifying the customer's willingness to pay for particular service levels.

Figure 4-5
Incorporating Community Expectations into LOS



Examples are as follows (attributes are underlined):

Table 4-3
Sample Strategic LOS – Expected

Services	Applicable Assets	Community Expectations	Strategic LOS Expected (Customer Perspective)
Roads	Road base, surface, bicycle lanes, turning lanes, etc.	"Smooth roads that take me where I need to go without too much congestion"	**<u>Safe</u>, <u>reliable</u> roads with <u>adequate capacity</u>**
Bridges and Culverts	Structure, deck, surface, etc.	"Sturdy bridges that take me where I need to go without too much congestion"	**<u>Safe</u>, <u>reliable</u> bridges with <u>adequate capacity</u>**
Sidewalks	Sidewalks	"Sidewalks that I can walk safely on to key areas of the Community"	**<u>Safe</u> sidewalks, <u>access</u> from subdivisions to downtown**
Streetlights	Poles, fixtures, etc.	"Streetlights that work so I don't have to walk in the dark"	**<u>Reliable</u> streetlights**
Traffic Lights	Poles, lights, controllers, etc.	"Traffic lights are placed where needed to ensure smooth and safe traffic flow"	**<u>Reliable</u> traffic lights**
Transit	Vehicles, facilities, equipment, etc.	"Access to public transit to allow me to get where I need to go on a reasonable schedule"	**<u>Reliable</u> and <u>convenient</u> transit services**
Parking	Lots, lights, facilities, equipment, etc.	"Safe and convenient parking is available, where needed"	**<u>Convenient</u> and <u>secure</u> parking locations**
Winter Control	Vehicles, equipment	"Able to drive on roads safely in winter conditions"	**<u>Safe</u> roads in winter**

Services	Applicable Assets	Community Expectations	Strategic LOS Expected (Customer Perspective)
Water Distribution	Water mains, wells, pumps, towers, valves, hydrants, etc.	"Clean water, when I need it, that tastes good, has adequate pressure, at a reasonable cost"	**Quality and efficient water supply, with adequate capacity**
Water Treatment	Treatment plant (treatment systems, chlorination, pumps, chemical injection and filtration, piping, SCADA, pump houses, etc.		
Wastewater Collection	Mains, pumping systems, manholes, etc.	"Wastewater systems that take my waste away and treats it with no harm to the environment"	**Quality wastewater collection, with adequate capacity and no environmental impacts**
Wastewater Treatment	Treatment plant (separators, aeration systems, pumps, chemical systems, SCADA, settlement ponds, facilities, etc.)		
Stormwater	Urban: Stormwater mains, catch basins, ponds, headwalls, etc.	"No flooding on our streets or properties"	**Stormwater system with adequate capacity**
	Rural: Open ditches, culverts, ponds, headwalls, etc.		

Services	Applicable Assets	Community Expectations	Strategic LOS Expected (Customer Perspective)
Solid Waste Collection	Vehicles, transfer stations, weigh scales, containers, etc.	"My garbage and recycling to be picked up each week and processed with no harm to the environment"	**Responsive and efficient solid waste collection system**
Solid Waste Disposal	Landfills, monitoring wells, compactors, bulldozers/loaders, etc.		
Solid Waste Diversion	Transfer stations, vehicles, containers, etc.		
Fire	Vehicles, equipment, facilities, hydrants, etc.	"The fire department to arrive at emergencies as fast as possible with capable firefighters"	**Responsive and quality fire services**
Police	Vehicles, equipment, facilities, etc.	"Police will respond to emergencies in a timely manner"	**Responsive and quality police services**
Protective Inspection and Control	Vehicles, equipment, facilities, etc.	"Ability to ensure by-laws are being adhered to"	**Responsive and quality inspection services**
Recreation Facilities	Facilities (arenas, pools, community halls, etc.), vehicles, equipment	"Good recreation facilities to meet the demands of the community"	**Adequate quantity and quality of recreation facilities**
		"Access to community halls for community functions"	**Reliable, safe community halls**

Services	Applicable Assets	Community Expectations	Strategic LOS Expected (Customer Perspective)
Parks	Vehicles, equipment, facilities, active parks, passive parks, etc.	"Parks that are clean, safe, with playgrounds and open fields"	**Adequate quantity and quality of parks**
Libraries	Facilities, equipment, etc.	"All facilities should be accessible"	**Safe and functional facilities**
Museums			
Public Health/Hospitals	Facilities, equipment, etc.	"Access to health services to enhance my quality of life"	**Available, quality health care**
Ambulance Services	Facilities, vehicles, equipment, dispatch equipment, etc.	"Properly equipped ambulance personnel will be dispatched and arrive on-site when needed"	**Reliable, responsive ambulance service**
Cemeteries	Land improvements, facilities, equipment, etc.	"Availability of a well-maintained and private site for interment needs"	**Available, well-maintained cemeteries**
Assistance to Aged Persons	Facilities, equipment, etc.	"Accessible and well-maintained housing for senior citizens"	**Available, functional housing for senior citizens**
Child Care	Facilities, equipment, etc.	"Availability of child care services, so parents can pursue their careers"	**Available, safe child care service locations**
Housing/Co-op/Rent	Facilities, equipment, etc.	"The community should support opportunities for independent living"	**Available, functional assisted living facilities**

Services	Applicable Assets	Community Expectations	Strategic LOS Expected (Customer Perspective)
Residential/Industrial/ Commercial/Agriculture	Land, services, etc.	"Land should be made ready for development, as needed"	**Available serviced land for development**
Administration	Equipment, vehicles, facilities, etc.	"A Town Hall that allows me to attend Council meetings, pay taxes and get my questions answered	**Safe and functional equipment and facilities**

While the examples in the table above are high level, further descriptions can be included in the identification of the strategic (or customer) LOS, such as expanding on:

- How these service attributes (e.g. reliability, functionality, etc.) will be provided to customers; and
- Breaking down community expectations by defined customer groups.

Table 4-4 (below) is an example of linking the services being provided to the assets providing the service, the defined customer groups impacted by the service and the strategic (customer) LOS established. This example labels the service being provided at a higher level, as "Transportation Services".

Table 4-4
Linking Services, Assets, Customers, and Strategic LOS

Service	Asset Type	Various Customer Groups	Strategic (Customer) LOS
Transportation Services	Road Network	• Drivers of private vehicles • Drivers of public or commercial vehicles • Motorcyclists • Local residents • Commercial • Commuters • Visitors / tourists • Emergency Services / Police • Pedestrians • Cyclists • Recreational use	• Safe, comfortable and efficient transportation system • Safe journey • Smooth ride and clear directions • Efficient, safe, and cost-effective transport of goods and services to and from customers • Cost effective transportation options • Safe access and parking

The IIMM identifies a number of important items to consider when identifying customer service levels:

- All significant activities for each service should be covered;
- The number of service criteria should be manageable and appropriate to the quality and availability of the financial and service level data;
- Service criteria should be recognizable, meaningful and assist the organization to achieve its goals; and
- Levels of service should consider: quality, quantity, safety, capacity, fitness for purpose, aesthetics, reliability, responsiveness, environmental acceptability, and cost.

As previously mentioned strategic (customer) LOS relates to how the customer receives the service, in terms of both tangible and intangible measures and criteria. Further examples of tangible measures that relate specifically to the customer include:

- Appearance of assets (e.g. facilities);
- Frequency of service disruptions;
- Accessibility to users (e.g. 24 hours a day, 7 days a week);
- Availability of a service; and
- Incidences of illness or injury.

Examples of intangible measures include:

- Appropriateness of service;
- Affordability;
- Relevance of the service being provided in terms of demand characteristics, future demographics, current back-logs and where the pressure points are;
- Speed of service; and
- Attitude and ease of dealing with the municipality.

At a strategic level, LOS will generally apply to a generic service, class or large grouping of assets and have a long-term focus. As such, they should refer to levels of services that apply to the whole of that service or asset class. Alternatively, strategic LOS can be set based on specific categories of assets within that class. For example, a municipality may set strategic LOS for water services as “to provide quality and efficient water supply, with adequate capacity”. This generic LOS statement applies to all water supply. If the municipality wanted to break down “water supply” into smaller service categories (e.g. residential vs. non-residential water supply, or large diameter mains vs. smaller diameter mains), specific levels of service could be defined at that level, if there were differing statements to make about LOS in each category.

In order to better understand the community’s expectations and limitations related to levels of service, it can be beneficial to complete a public consultation process. This process will help identify customer expectations, can help link these expectations to strategic (customer) LOS within the LOS analysis, and assist in educating the public on the financial implications of providing particular levels of service. A balance can then be made between the expected LOS and cost.

<u>O.Reg 588/17</u>

The IJPA through O.Reg 588/17 has incorporated some mandatory customer (community) based descriptions for core infrastructure asset categories. As these descriptions are connected with mandatory performance metrics that are to be reported on in a municipality's AM plan, both have been provided in the Performance Measures section below (see Table 4-15).

4.7 Comparing Strategic Current vs. Expected Levels of Service

Analyzing differences between current and expected LOS allows municipalities to identify areas for improvement, create priorities, and quantify financial impacts.

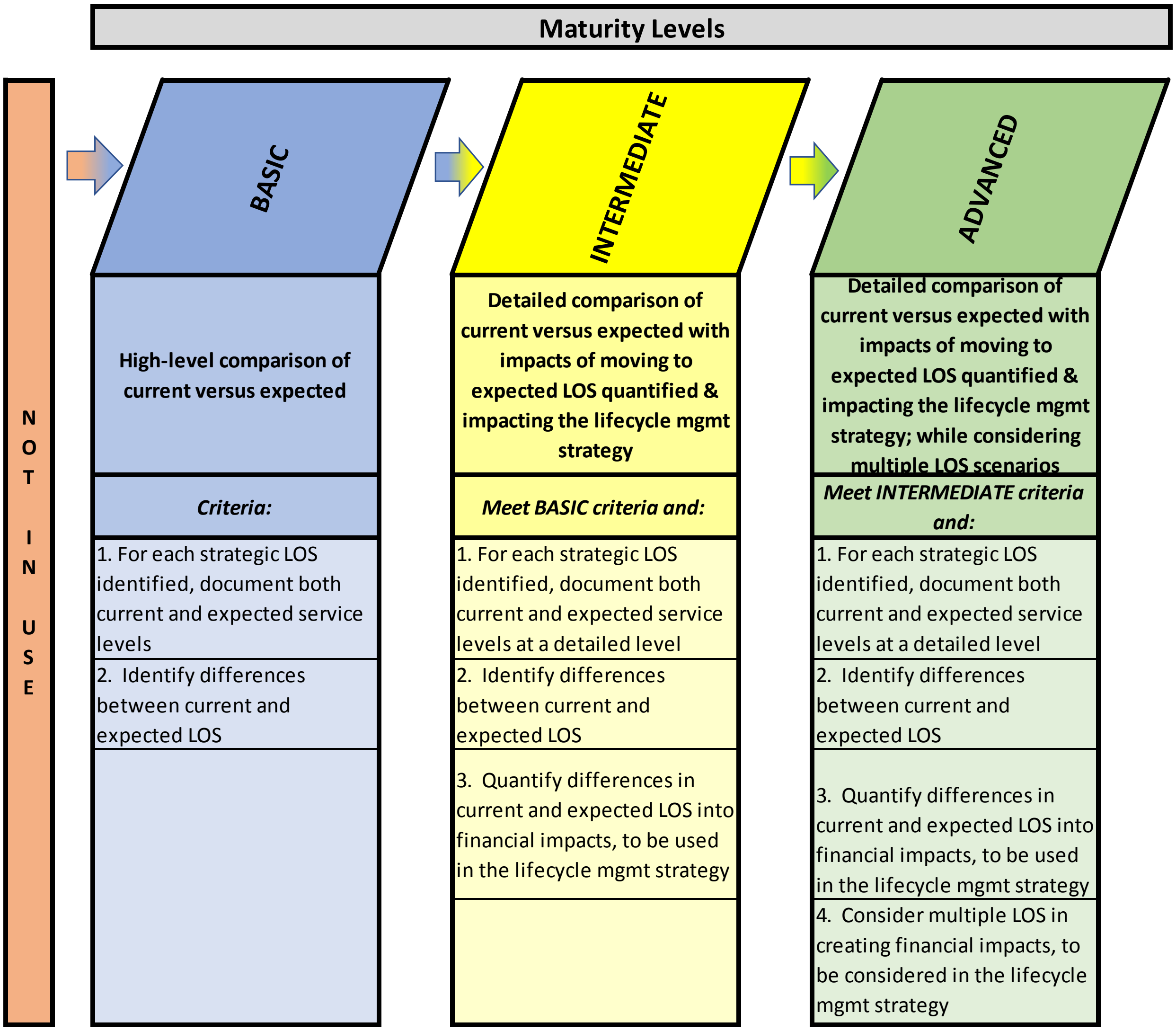
To what extent are current levels of service compared to expected levels of service at a strategic (customer) level?

Background

One of the ultimate goals of asset management planning is to move to (or towards) expected LOS. To evaluate the level of success of the asset management planning process from a level of service perspective, a comparison of current LOS to expected LOS is needed. In this manner, municipalities can identify areas of success, and assess where improvements are required, how to move to expected LOS, and at what cost.

Levels of Maturity: Current LOS vs. Expected LOS at Strategic Level

To what extent are current LOS compared to expected LOS at a strategic level?



At the **basic level of maturity**, municipalities will undertake a high-level comparison of current versus expected strategic LOS at the strategic (customer) level. The comparison is predominantly qualitative (through the use of descriptions) and the results and differences are identified and documented for use in the LOS analysis. At a minimum, the legislative requirements outlined in O.Reg 588/17 with respect to customer LOS will be met.

At the **intermediate level of maturity**, the differences between current and expected strategic LOS are also quantified into asset lifecycle impacts as well as financial impacts, and the results carried forward for implementation within the lifecycle management strategy (see Chapter 5).

At the **advanced level of maturity**, municipalities complete the additional step of considering multiple LOS when quantifying financial impacts, and consider the results within the lifecycle management strategy scenarios (see Chapter 5).

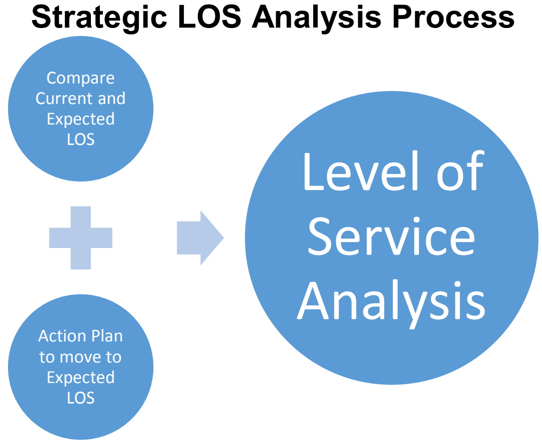
<u>Comparing Current LOS to Expected LOS (Strategic)</u>

As outlined earlier in this chapter, a strategic LOS analysis includes:

- An identification of existing LOS;
- A determination of expected (or desired) LOS; and
- An assessment of the implications of moving from existing LOS to expected (desired) LOS over a forecast period.

Therefore, if current LOS equates to what service level is currently provided, expected LOS outlines the overall objective or target LOS to be reached at some point in time. The amount of time it will take to reach expected LOS depends on the assumptions a municipality makes within the asset management planning process. Using different assumptions will lead to multiple scenarios and multiple timelines within the within the lifecycle management strategy. For example, a municipality could decide to meet expected LOS in a particular area in 10 years. When that scenario is assessed within the Lifecycle Management Strategy (see Chapter 5) and the Financing Strategy (see Chapter 6) and concluded to be too expensive too quickly, the LOS analysis can be updated to include another scenario to reach expected LOS in 15 or 20 years. Alternate scenarios can also represent different (e.g. higher or lower) levels of service.

Figure 4-6
Strategic LOS Analysis Process



This section deals specifically with the comparison of current and expected LOS from a strategic (customer) perspective and the associated financial implications. While the financial implications are considered in other sections of the asset management plan, identifying gaps in service levels, and understanding how they impact the customer, is critical in assessing these implications within the proper context. Table 4-5 (below) illustrates a high-level comparison of expected LOS (developed in earlier sections) to current LOS. This comparison can support an action plan that outlines what has to be done in order to move towards expected LOS. As noted earlier, the amount of time it takes to implement the action plan and the level of service defined as expected plays a role in assessing the overall financial implications of the LOS analysis. Therefore, both the amount of time and the level of service can be adjusted through the use of multiple LOS scenarios.

Table 4-5
Sample Current Strategic LOS and Action Plans

Services	Strategic LOS Expected (Customer Perspective)	Current LOS	Action Plans
Roads	Safe, reliable roads with adequate capacity	**Roads mostly safe and reliable, with some capacity issues**	**Increased rehabilitation and expansion program**
Bridges and Culverts	Safe, reliable bridges with adequate capacity	**Bridges mostly safe and reliable, with some capacity issues**	**Increased rehabilitation and expansion program**
Sidewalks	Safe sidewalks, access from subdivisions to downtown	**Safe sidewalks, access from most subdivisions to downtown**	**New sidewalk expansion program**
Streetlights	Reliable streetlights	**Reliable streetlights**	**LED program**
Traffic Lights	Reliable traffic lights	**Reliable traffic lights**	**N/A**
Transit	Reliable and convenient transit services	**Transit services mostly reliable and convenient**	**Increased inspection and maintenance**
Parking	Convenient and secure parking locations	**Parking locations convenient and secure**	**N/A**
Winter Control	Safe roads in winter	**Roads safe in winter**	**N/A**

Services	Strategic LOS Expected (Customer Perspective)	Current LOS	Action Plans
Water Distribution Water Treatment	Quality and efficient water supply, with adequate capacity	**Quality and efficient water supply, with adequate capacity**	**Water Rate Study**
Wastewater Collection Wastewater Treatment	Quality wastewater collection, with adequate capacity and no environmental impacts	**Quality wastewater collection, with adequate capacity and no environmental impacts**	**Wastewater Rate Study, Inflow and Infiltration Inspections**
Stormwater	Stormwater system with adequate capacity	**Stormwater system with adequate capacity**	**N/A**
Solid Waste Collection Solid Waste Disposal Solid Waste Diversion	Responsive and efficient solid waste collection system	**Responsive and efficient solid waste collection system**	**N/A**
Fire	Responsive and quality fire services	**Responsive and quality fire services**	**N/A**
Police	Responsive and quality police services	**Responsive and quality police services**	**N/A**
Protective Inspection and Control	Responsive and quality inspection services	**Responsive and quality inspection services**	**N/A**
Recreation Facilities	Adequate quantity and quality of recreation facilities	**Adequate quality of recreation facilities and parks, arenas beyond full capacity**	**Additional ice pad**
	Reliable, safe community halls	**Reliable, safe community halls**	**N/A**
Parks	Adequate quantity and quality of parks	**Adequate quantity and quality of parks**	**N/A**
Libraries Museums	Safe and functional facilities	**Safe and functional facilities, however, not accessible**	**Accessibility program**

Services	Strategic LOS Expected (Customer Perspective)	Current LOS	Action Plans
Public Health/Hospitals	Available, quality health care	**Available, quality health care**	**N/A**
Ambulance Services	Reliable, responsive ambulance service	**Reliable, responsive ambulance service**	**N/A**
Cemeteries	Available, well-maintained cemeteries	**Available, well-maintained cemeteries**	**N/A**
Assistance to Aged Persons	Available, functional housing for senior citizens	**Available, functional housing for senior citizens**	**N/A**
Child Care	Available, safe child care service locations	**Available, safe child care service locations**	**N/A**
Housing/Co-op/Rent	Available, functional assisted living facilities	**Available, functional assisted living facilities, however, upgrades required to meet new fire safety standards**	**N/A**
Residential/Industrial/ Commercial/Agriculture	Available serviced land for development	**Available serviced land for development**	**N/A**
Administration	Safe and functional equipment and facilities	**Safe and functional equipment and facilities**	**Upgrade non-compliant**

In Table 4-5 above, action plan items can be further detailed in terms of timing and costing. For example:

Table 4-6
Sample Strategic Action Plan Scenarios

Action Item	Scenario 1	Scenario 2	Scenario 3
New Sidewalk Expansion Program	Both sides of street, in 5 years: **$100,000 per year**	One side of street, in 5 years: **$50,000 per year**	One side of street, in 10 years: **$25,000 per year**

These scenarios can be used to educate Council and the public on the relationship between levels of service, and costs to provide expected LOS.

Action items can include:

- Non-infrastructure items;
- Maintenance items;
- Rehabilitation items/programs;
- Replacement items/programs; and/or
- Expansion items/programs.

Costing Levels of Service Action Plans

The following are required in order to cost levels of service action plans:

a) Well-defined levels of service scenarios and respective action plan items;
b) A clearly defined action plan, including what is needed, where it is needed and why;
c) A process of determining costs and unit rates associated with that action plan; and
d) Accurate cost information.

When including action items within the LOS analysis, municipalities should be mindful of:

- The total cost of implementing the action plan;
- The impact the action plan has on the future lifecycle costs of the applicable assets (more on this in Chapter 5); and
- The impact of the action plan items on projected LOS over the forecast period.

4.8 Developing Technical Levels of Service

Well-defined Technical LOS are linked to strategic LOS and define how the municipality will provide and meet expected strategic LOS. Integrating technical LOS into daily duties of operations staff can raise staff awareness of how their work contributes to providing a specific LOS to the community.

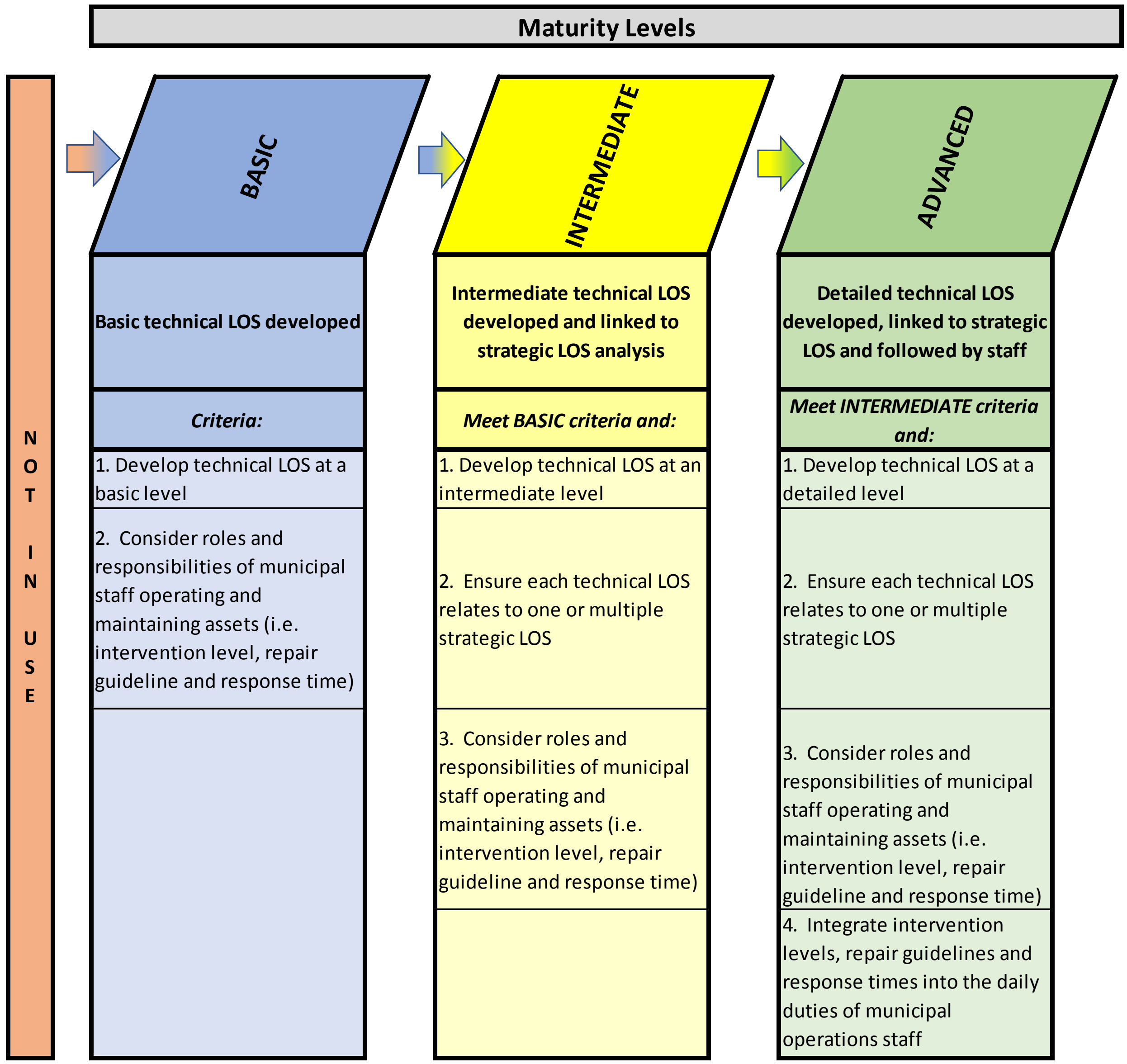
To what extent have technical LOS categories been developed and used?

Background

Technical LOS outline, from a municipal perspective, the services and service levels provided (and to be provided) to the community. This differs from strategic (customer) LOS which are more from the customer's point of view. Technical LOS should be developed and linked to the strategic (customer) LOS as well as the overall customer expectations. Technical LOS will generally be more specific than strategic LOS, relating more to the roles and responsibilities of municipal staff as well as how technical LOS differ within each broad asset category.

Levels of Maturity – Technical LOS Categories

To what extent have technical LOS categories been developed and used?



At the **basic level of maturity**, technical LOS are developed but only at a high level. Consideration is given to roles and responsibilities of municipal staff that operate and maintain assets and provide the services (i.e. intervention levels, repair guidelines and response times). At a minimum, the legislative requirements outlined in O.Reg 588/17 with respect to technical LOS will be met.

At the **intermediate level of maturity**, municipalities will develop technical LOS at a more detailed level. Each technical LOS would be considered in relation to one or more strategic (customer) LOS. Consideration would be given to roles and responsibilities of municipal staff operating and maintaining assets.

At the **advanced level of maturity**, intervention levels, repair guidelines and response times are alo integrated into the daily duties of municipal operations staff. At this level of maturity, operational staff are aware of their contribution to providing levels of service to the community.

Developing Technical Levels of Service

The discussion on strategic (customer) LOS was at a high level in the previous sections, with broad service and asset categories. For example, roads were grouped together into one category, with the following levels of service expectations:

- **Community Expectations:** “Smooth roads that take me where I need to go without too much congestion”; and
- **Strategic (Customer) LOS:** “Safe, reliable roads with adequate capacity”.

Technical LOS are documented in the same manner as strategic (customer) LOS, including:

- Qualitative descriptions of services and service levels;
- Identifications of programs, procedures and/or activities that are required to achieve particular service levels; and
- Performance measures or key performance indicators (KPIs) that can illustrate the progression of service levels (i.e. through trending analysis) and an ultimate objective or target performance measure/KPI to strive for.

This section focuses on the qualitative descriptions and programs needed from a LOS perspective. Performance measures are discussed in later sections.

While the documented structure is similar to strategic (customer) LOS, the focus for measurement has now shifted to the municipality and municipal staff. In setting technical LOS, we will think of service levels from this perspective:

- What is being done by the municipality to provide current LOS?
- What has to be done in the future in order to provide expected LOS?
- Are there performance measures that can assist in describing technical LOS?

Also, similar to strategic (customer) LOS, technical LOS define service levels in relation to a range of attributes, such as:

- Reliability;

- Functionality;
- Quantity;
- Quality;
- Responsiveness;
- Safety;
- Capacity;
- Environmental impacts;
- Efficiency;
- Affordability;
- Speed;
- Availability;
- Sustainability;
- Appearance;
- Comfort; and
- Efficiency.

As discussed in the strategic (customer) LOS section, in some cases these attributes (ab0ve) relate to asset performance, and in other cases they describe customer benefit. Customer benefit is very much a strategic (customer) attribute. However, asset performance can relate to both strategic (customer) LOS and technical LOS. If the customer directly uses the asset (e.g. roads), then the performance of that asset is more related to strategic LOS (i.e. how the customer experiences the service). If the customer does not directly use the asset (e.g. a snow plow helping to provide safe roads, but the plow is not directly used by the customer), then the performance of that asset is more related to technical LOS (i.e. how the municipality/staff provide the service).

Technical levels of service can relate to:

- Legislative compliance;
- Levels of functionality;
- Levels of financial return or asset cost;
- Reduction in the dependency for new asset solutions;
- Specific lifecycle costs (maintenance, rehabilitation, replacement, expansion);
- Levels of asset condition; and
- Risk and safety.

Specifically, technical levels of service are detailed objectives that normally relate to specific services, assets or activities. These may include such things as:

- Design standards;
- Maintenance intervention levels;
- Response times;
- Work activity standards; and/or
- Asset condition standards.

Each technical level of service is intended to ensure a particular service standard is met from a municipal or staff perspective (i.e. what an organization has to do). For example, at what point will we repair, renew or upgrade to meet the strategic (customer) LOS?

When it comes to technical LOS, it now has to be determined how municipal staff will provide this level of service. What's more, "how" may differ, depending on the road type, for example. Roads can be classified into classes or categories such as rural/semi-urban/urban or local/collector/arterial or even paved/unpaved. The technical LOS for each category may be different. For example, the attributes "safe", "reliable", and "adequate capacity" were used to describe strategic LOS. To some municipalities, these attributes can be provided by staff to all roads using the same maintenance, rehabilitation and replacement programs. However, many municipalities will consider an urban or arterial road to have a "higher" level of service than a rural or local road. In many ways, this comes back to the consequence of failure discussions outlined in Chapter 3. The consequence of failure for an arterial road that handles much more traffic at faster speeds is higher than the consequence of failure of a local road with much less traffic and reduced speeds. Differing consequences can result in differing levels of service. Going back to our road example above, providing "safe", "reliable" and "adequate capacity" roads could mean differing action plans depending on the type of road (and the risks associated with that road).

Examples for various asset categories are provided in the table below:

Table 4-7
Example of Varying Technical LOS Levels

Strategic LOS Level	Technical LOS Level
Roads and Bridges	• Local, Collector, Arterial • Rural, Semi-Urban, Urban • MMS classes 1,2,3,4,5,6 • Traffic ranges (High, Med, Low)

Strategic LOS Level	Technical LOS Level
	• By replacement cost (high value, medium value, low value)
Mains (Water, Wastewater, Storm)	• Residential, Non-Residential • By diameter (Small, Med, Large) • By replacement cost (high value, medium value, low value)
Solid Waste	• By replacement cost (high value, medium value, low value)
Facilities	• By replacement cost (high value, medium value, low value) • By the type of service being provided (high, med, low critical service)
Vehicles and Equipment	• By replacement cost (high value, medium value, low value) • By the type of service being provided (high, med, low critical service)
Land Improvements	• By replacement cost (high value, medium value, low value) • By the type of service being provided (high, med, low critical service)

One approach to identifying the correct service or asset breakdown in defining levels of service is to review maintenance, rehabilitation and replacement decisions by asset category.

- Do you perform the exact same maintenance on all roads or does it differ depending on the road type?
- Do you schedule rehabilitation and replacement needs the exact same on all roads or does it differ depending on the road type?

If you perform these lifecycle activities based on a different level or frequency, for example, on arterial roads in comparison to local roads, there is a good chance that LOS should be defined differently for each.

Table 4-8
Sample Expected Technical LOS

Services	Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)
Roads	Safe, reliable roads with adequate capacity	**Average condition rating: Local (5/10), Collector (6/10), Arterial (7/10)**

Services	Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)
		Follow Minimum Maintenance Standards
Bridges and Culverts	Safe, reliable bridges with adequate capacity	**Average condition rating: 7/10**
		Follow Minimum Maintenance Standards
Sidewalks	Safe sidewalks, access from subdivisions to downtown	**Average condition: 7/10**
		Minimize complaints
Streetlights	Reliable streetlights	**Minimize complaints**
Traffic Lights	Reliable traffic lights	**Minimize complaints**
Transit	Reliable and convenient transit services	**Inspect and perform maintenance on vehicles monthly**
		Minimize complaints
Parking	Convenient and secure parking locations	**Minimize complaints**
Winter Control	Safe roads in winter	**Follow MMS**
Water Distribution	Quality and efficient water supply, with adequate capacity	**Meet legislative requirements**
Water Treatment		**Unaccounted for water under 30%**
		Less than 5 main breaks annually, per 100 customers
Wastewater Collection	Quality wastewater collection, with adequate capacity and no environmental impacts	**Meet legislative requirements**
		Minimize incidents of bypass
Wastewater Treatment		**Less than 5 main breaks annually, per 100 customers**
Stormwater	Stormwater system with adequate capacity	**Minimize flooding incidents per 1,000 people**
Solid Waste Collection	Responsive and efficient solid waste collection system	**Minimize complaints**
Solid Waste Disposal		**Inspect and perform maintenance on vehicles monthly**
Solid Waste Diversion		
Fire	Responsive and quality fire services	**Minimize response times**
		Meet legislative requirements

Services	Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)
		Follow vehicle and equipment replacement program
Police	Responsive and quality police services	**Minimize response times**
		Meet legislative requirements
		Follow vehicle and equipment replacement program
Protective Inspection and Control	Responsive and quality inspection services	**Follow vehicle and equipment replacement program**
Recreation Facilities	Adequate quantity and quality of recreation facilities	**Utilization percentages for all facilities to be between 80% and 100%**
	Reliable, safe community halls	**Follow facility maintenance program**
		Minimize complaints
Parks	Adequate quantity and quality of parks	**Provide 1 park per 1,000 residents**
Libraries	Safe and functional facilities	**100% of facilities to pass accessibility standards**
Museums		
Public Health/Hospitals	Available, quality health care	**Meet legislative requirements**
		Follow facility maintenance program
Ambulance Services	Reliable, responsive ambulance service	**Minimize response times**
		Meet legislative requirements
		Follow vehicle and equipment replacement program
Cemeteries	Available, well-maintained cemeteries	**Minimize complaints**
Assistance to Aged Persons	Available, functional housing for senior citizens	**Meet legislative requirements**
		Follow facility maintenance program

Services	Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)
Child Care	Available, safe child care service locations	**Meet legislative requirements** **Follow facility maintenance program**
Housing/Co-op/Rent	Available, functional assisted living facilities	**Meet legislative requirements** **Follow facility maintenance program**
Residential/Industrial/ Commercial/Agriculture	Available serviced land for development	**Minimize complaints**
Administration	Safe and functional equipment and facilities	**Minimize complaints**

Expanding on the examples in the table above, technical LOS can be detailed in a manner to assist municipal staff from a day-to-day operational perspective. For example, "minimizing complaints" can be expanded to include how to deal with complaints, such as:

- Staff will respond to customer complaints within X hours;
- Staff will perform required maintenance on assets within Y days; and
- Staff will provide a response to complaints within Z hours.

It is also important to point out that many of the technical LOS illustrated in the table above refer to a service that can be measured through a key performance indicator or performance measure. For example, a technical LOS objective for water is to have "unaccounted for water under 30%". This is a performance measure that not only can be measured each year, but can also be analysed over many years to indicate in what direction this measure is trending (e.g. upwards, downwards or staying consistent). This becomes important when discussing performance measures in a later section.

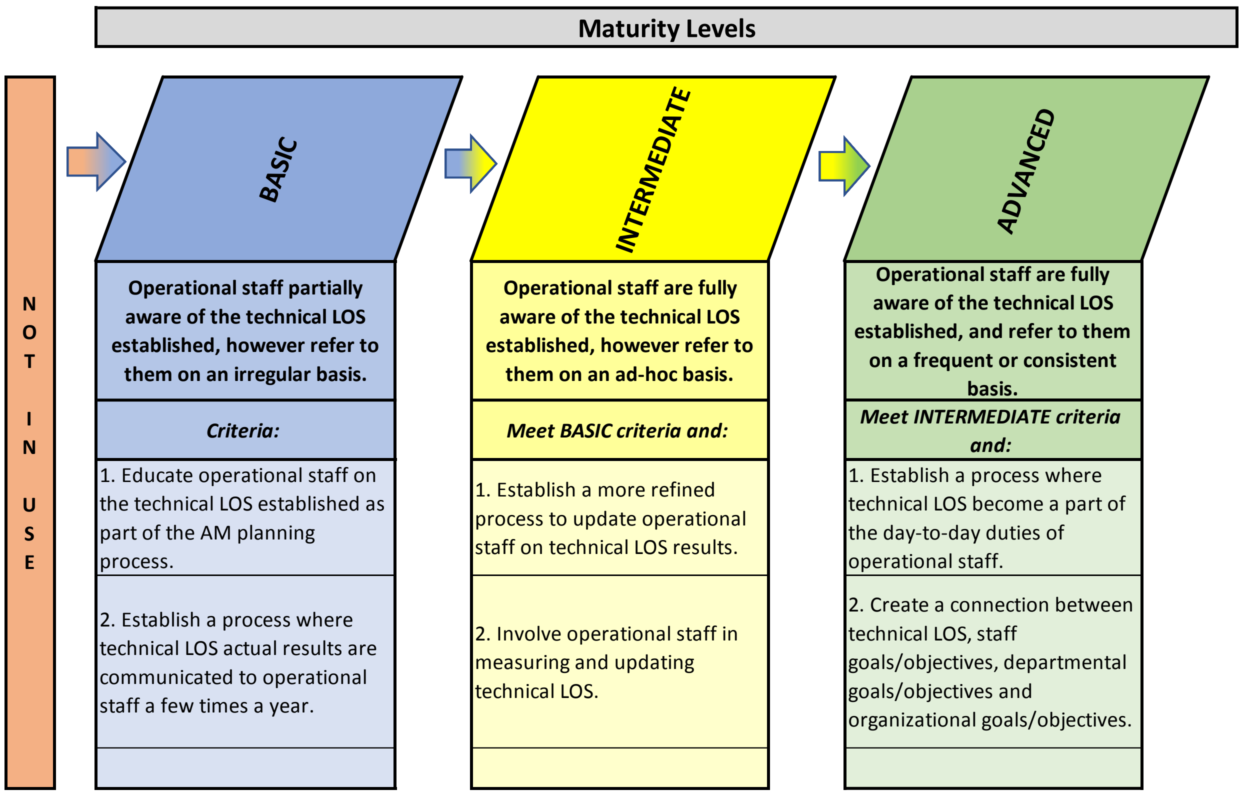
To what extent are technical levels of service followed by operational staff?

Background

Operational staff play a key role in providing various services within a municipality. The day-to-day activities of these staff contribute to the overall goals and objectives of their individual divisions and departments. They also contribute to the goals and objectives of the organization as a whole as outlined in the municipality's strategic planning document. Linking these operational activities to the technical LOS analysis provides a direct connection between the levels of service being provided (or expected to be provided) and the effort (time, resourcing, cost, etc.) from the operational staff to provide those service levels.

Levels of Maturity

To what extent are technical levels of service followed by operational staff?



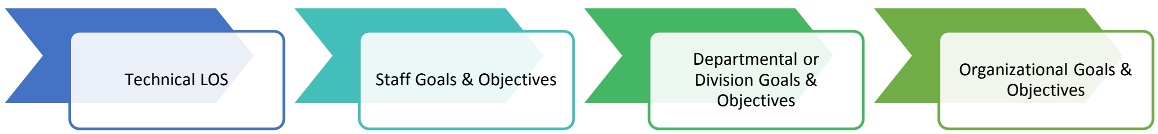
At the **basic level of maturity**, operational staff will have a high-level understanding of the technical LOS established as part of the AM planning process. This will be in the form of a high-level educational process as well as communication to relay updated results (i.e. actual technical LOS results) a few times a year.

At the **intermediate level of maturity**, operational staff will have a more detailed understanding of technical LOS established within the municipality. At this level, operational staff participate in measuring technical LOS on an annual basis.

At the **advanced level of maturity**, operational staff will have their day-to-day duties linked to the technical LOS within their department. In addition, there is a direct connection between the technical LOS and goals and objectives of the employees, the department/division and the organization as a whole.

Operational Activities and Technical Levels of Service

Technical LOS was discussed in detail in the previous section. This section relates to the integration of these technical LOS into the activities performed by operational staff. This integration allows for the ability to relate the actions of staff to the over-arching goals and objectives of the department, or even the organization as a whole. This can provide an approach to evaluating staff performance in meeting these goals/objectives. What's more, having operational staff educated and informed on technical LOS established within the AM planning process provides additional benefits, such as staff "buy-on" on the AM process.



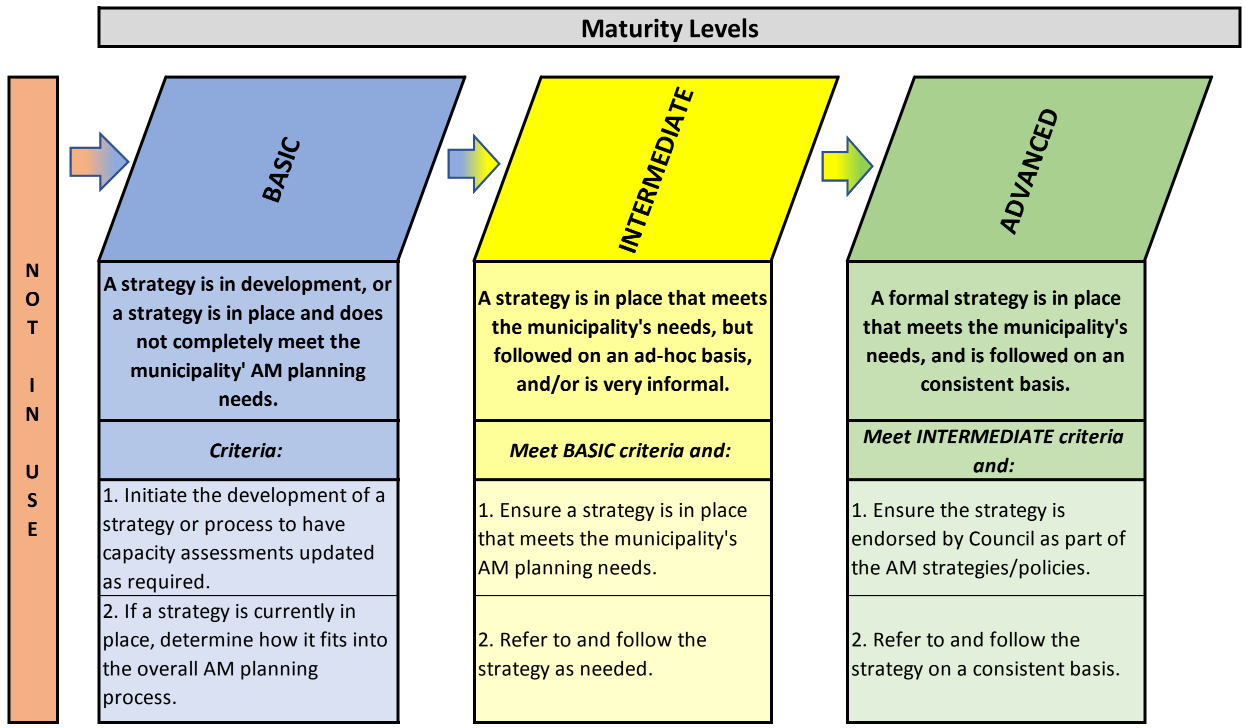
Do you have a strategy in place to determine when and how service capacity assessments are updated?

Background

Service capacity data provides critical information on municipal assets, as it relates to the maximum service each asset can provide in its current state. Having this data updated on a consistent basis assists in providing service levels at expected levels.

Levels of Maturity

Do you have a strategy in place to determine when and how service capacity assessments are updated?



At the **basic level of maturity**, municipalities initiate the development of a strategy or process to have capacity assessments updated, as required. If a strategy is currently in place, municipalities at this level will need to determine how it fits into the overall asset management planning process.

At the **intermediate level of maturity**, municipalities ensure a strategy is in place that meets its asset management planning needs and refer to it as needed.

At the **advanced level of maturity**, municipalities ensure the strategy is endorsed by Council and refer to it on a consistent basis.

<u>Updating Service Capacity Assessments</u>

As described above, an asset's service capacity refers to the "maximum output" an asset can provide on a consistent basis. Examples are as follows:

- Roads & Bridges: Traffic Volumes;
- Water, Wastewater & Storm: Flows;
- Solid Waste: Utilization or storage capacity;
- Vehicles/Equipment: Kilometers or hours;

As time passes, or as assets are used or improved, their service capacities may also change. This makes the service capacity attribute as important to update as the condition rating or replacement cost of the asset.

A strategy or process to follow to ensure service capacity data remains accurate and consistent ensures that this information can be relied upon within the asset management planning process. This process can be as simple as the need to reassess or recalculate service capacity annually, in addition to when significant events (i.e. asset addition, disposal, improvement, and write-off) occur.

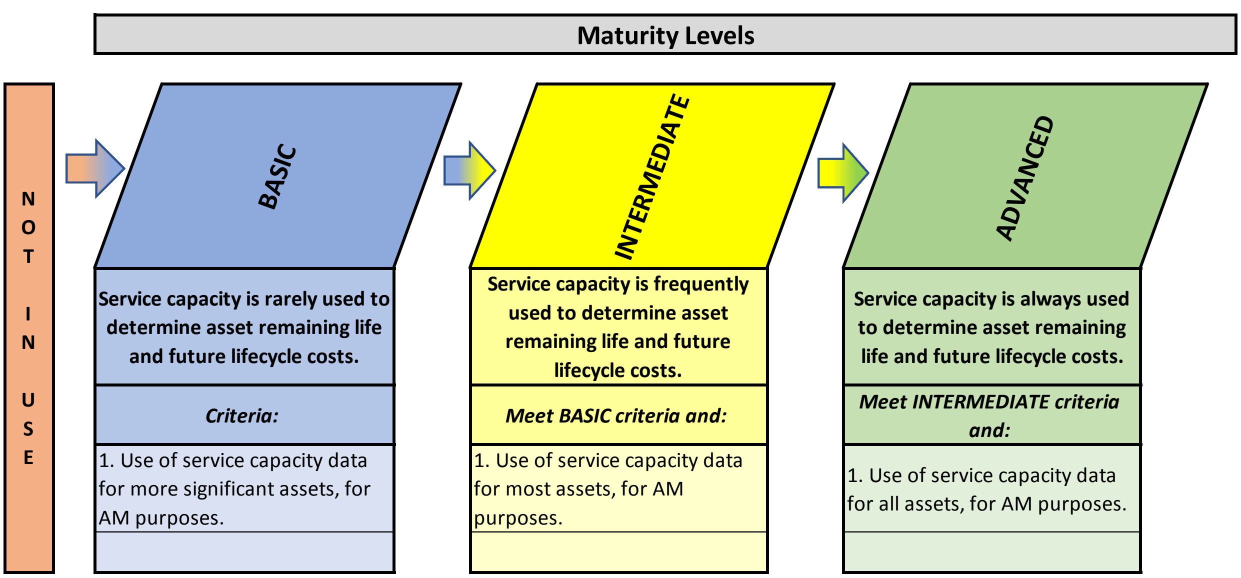
To what extent is service capacity data used to determine asset remmaining life and future lifecycle costs?

Background

Incorporating service capacity data within the technical LOS analysis provides critical information to assess asset remaining life and future lifecycle costs required. As discussed in Chapter 3, an asset can "fail" based on its condition, but also based on not providing the needed capacity to provide a service.

Levels of Maturity

To what extent is service capacity data used to determine asset remaining life and future lifecycle costs?



At the basic level of maturity, municipalities use service capacity data for more significant assets.

At the intermediate level of maturity, municipalities use service capacity data for most assets.

At the advanced level of maturity, municipalities use service capacity data for all assets.

Use of Service Capacity Data

Service capacity data can be used within the AM planning process in many ways, including:

- It is an asset attribute that can be maintained within a municipality's asset register (see Chapter 3);
- It can form part of the "risk" calculation discussed in Chapter 3;
- Can form part of the level of service analysis (i.e. technical LOS) discussed within this chapter, including the tracking and trending of this data to determine if assets can provide services at desired levels (see the performance measures section below); and
- It can be a direct criteria within the Lifecycle Management Strategy (Chapter 4) to determine timing of lifecycle costs. For example, an asset rehabilitation can be accelerated within the forecast period due to the fact that the current service capacity will not sustain desired service levels.

4.9 Comparing Technical Current vs. Expected Levels of Service

Analyzing differences between current and expected technical LOS allows municipalities to create operational plans for moving towards expected service levels.

To what extent are you comparing current LOS to expected LOS at a technical level?

Background

Comparing current LOS to expected LOS at the technical level not only provides a mechanism to outline action plans to move towards expected LOS, but also assists the municipality from an operation perspective, by outlining what has to occur at a staff level to meet expected service levels.

Levels of Maturity: Current LOS vs. Expected LOS (Technical)

To what extent are you comparing current LOS to expected LOS at a technical level?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	High-level comparison of current versus expected	**Detailed comparison of current versus expected with impacts of moving to expected LOS quantified & impacting the lifecycle mgmt strategy**	**Detailed comparison of current versus expected with impacts of moving to expected LOS quantified & impacting the lifecycle mgmt strategy; while considering multiple LOS scenarios**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. For each technical LOS identified, document both current and expected service levels	1. For each technical LOS identified, document both current and expected service levels at a detailed level	1. For each technical LOS identified, document both current and expected service levels at a detailed level
	2. Identify differences between current and expected LOS	2. Identify differences between current and expected LOS	2. Identify differences between current and expected LOS
		3. Quantify differences in current and expected LOS into financial impacts, to be used in the lifecycle mgmt strategy	3. Quantify differences in current and expected LOS into financial impacts, to be used in the lifecycle mgmt strategy
			4. Consider multiple LOS in creating financial impacts, to be considered in the lifecycle mgmt strategy

At the **basic level of maturity**, municipalities undertake a high-level comparison of current versus expected technical LOS. The results and differences should be identified and documented within the LOS analysis. At a minimum, the legislative requirements outlined in O.Reg 588/17 with respect to technical LOS should be met.

At the **intermediate level of maturity**, the differences between current and expected technical LOS are quantified into financial impacts and utilized within the lifecycle management strategy (see Chapter 5).

At the **advanced level of maturity**, municipalities take the additional step of considering multiple LOS when quantifying financial impacts and consider the results within the lifecycle management strategy (see Chapter 5).

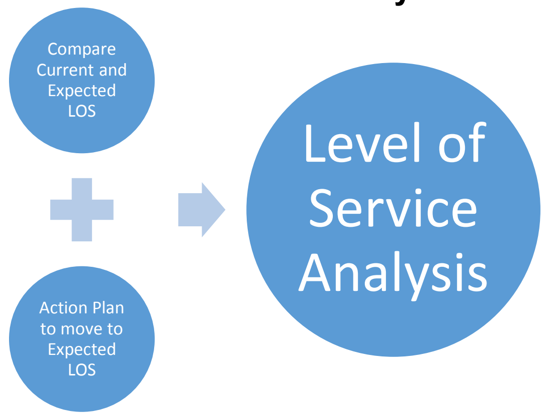
Comparing Current LOS to Expected LOS (Technical)

As outlined earlier in this chapter, a technical LOS analysis includes:

- An identification of existing LOS;
- A determination of expected (or desired) LOS; and
- An assessment the implications of moving from existing LOS to expected (desired) LOS over a forecast period.

Therefore, if current LOS equates to what service level is currently provided, expected LOS outlines the overall objective or target LOS to be reached at some point in time. The amount of time it will take to reach expected LOS depends on the assumptions a municipality makes within the asset management planning process. Using different assumptions will lead to multiple scenarios and multiple timelines within the within the lifecycle management strategy. For example, a municipality could decide to meet expected LOS in a particular area in 10 years. When that scenario is assessed within the Lifecycle Management Strategy (see Chapter 5) and the Financing Strategy (see Chapter 6) and concluded to be too expensive too quickly, the LOS analysis can be updated to include another scenario to reach expected LOS in 15 or 20 years. Alternate scenarios can also represent different (e.g. higher or lower) levels of service.

Figure 4-7
Technical LOS Analysis



This section deals specifically with the comparison of current and expected LOS from a technical perspective as well as the associated financial implications. While the financial implications are used in other sections of the asset management plan, identifying gaps in service levels is critical in assessing these implications. The table below illustrates a high-level comparison of expected LOS (developed in earlier sections) to current LOS. With this comparison in place, an action plan can be established that outlines what has to be done in order to move towards expected LOS. As mentioned earlier, the amount of time it takes to implement the action plan and the expected level of service is a factor in assessing the overall financial implications of the LOS analysis, therefore both the amount of time and the level of service can be adjusted through the use of multiple LOS scenarios.

Table 4-9
Sample Current Technical LOS and Action Plans

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Action Plans
Safe, reliable roads with adequate capacity	Average condition rating: Local (5/10), Collector (6/10), Arterial (7/10)	**Local: 4/10** **Collector: 4/10** **Arterial: 5/10**	**Increase funding to road rehabilitation and replacement programs**
	Follow Minimum Maintenance Standards	**Following MMS**	**N/A**
	Average condition rating: 7/10	**Current: 6/10**	**Increase bridge rehabilitation program**

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Action Plans
Safe, reliable bridges with adequate capacity	Follow Minimum Maintenance Standards	**Following MMS**	**N/A**
Safe sidewalks, access from subdivisions to downtown	Average condition: 7/10	**Current: 6/10**	**Increase sidewalk program**
	Minimize complaints	**Current: 5 complaints**	**N/A**
Reliable streetlights	Minimize complaints	**Current: 8 complaints**	**N/A**
Reliable traffic lights	Minimize complaints	**Current: 3 complaints**	**N/A**
Reliable and convenient transit services	Inspect and perform maintenance on vehicles monthly	**Inspection and maintenance plan followed**	**Increase maintenance funding**
	Minimize complaints	**Current: 14 complaints**	**N/A**
Convenient and secure parking locations	Minimize complaints	**Current: 3 complaints**	**N/A**
Safe roads in winter	Follow MMS	**Compliant with MMS**	**N/A**
Quality and efficient water supply, with adequate capacity	Meet legislative requirements	**Meeting legislative requirements**	**N/A**
	Unaccounted for water under 30%	**Unaccounted for water: 35%**	**Implement watermain looping program**
	Less than 5 main breaks annually, per 100 customers	**Breaks per 100 customers: 2**	**N/A**
Quality wastewater collection, with adequate capacity and no environmental impacts	Meet legislative requirements	**Meeting legislative requirements**	**N/A**
	Minimize incidents of bypass	**Incidents of bypass: 0**	**N/A**
	Less than 5 main breaks annually, per 100 customers	**Breaks per 100 customers: 20**	**Implement CCTV inspection program**

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Action Plans
Stormwater system with adequate capacity	Minimize flooding incidents per 1,000 people	**Flooding Incidents: 0**	**N/A**
Responsive and efficient solid waste collection system	Minimize complaints	**Current: 32 complaints**	**Review routes to reduce complaints**
	Inspect and perform maintenance on vehicles monthly	**Inspection and maintenance plan followed**	**N/A**
Responsive and quality fire services	Minimize response times	**Response times within requirements**	**N/A**
	Meet legislative requirements	**Meeting legislative requirements**	**N/A**
	Follow vehicle and equipment replacement program	**Maintenance and replacement plan followed but underfunded**	**Increase funding to equipment replacement**
Responsive and quality police services	Minimize response times	**Response times within requirements**	**N/A**
	Meet legislative requirements	**Meeting legislative requirements**	**N/A**
	Follow vehicle and equipment replacement program	**Maintenance and replacement plan followed but underfunded**	**Increase funding to equipment replacement**
Responsive and quality inspection services	Follow vehicle and equipment replacement program	**Maintenance and replacement plan followed**	**N/A**

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Action Plans
Adequate quantity and quality of recreation facilities	Utilization percentages for all facilities to be between 80% and 100%	Ice Pad: 99% utilized, demand for more capacity	Expand to 2 ice pads
Reliable, safe community halls	Follow facility maintenance program	Inspection and maintenance plan followed	N/A
	Minimize complaints	Current: 5 complaints	N/A
Adequate quantity and quality of parks	Provide 1 park per 1,000 residents	Currently 0.8 parks per 1,000 residents	1 new active park
Safe and functional facilities	100% of facilities to pass accessibility standards	40% of facilities pass accessibility standards	Accelerate accessibility compliance rehab program
Available, quality health care	Meet legislative requirements	Meeting legislative requirements	N/A
	Follow facility maintenance program	Inspection and maintenance plan followed but underfunded	Increase funding to facility maintenance
Reliable, responsive ambulance service	Minimize response times	Response times within requirements	N/A
	Meet legislative requirements	Meeting legislative requirements	N/A
	Follow vehicle and equipment replacement program	Inspection and maintenance plan followed	N/A
Available, well-maintained cemeteries	Minimize complaints	Current: 10 complaints	Increase frequency of grass cutting
Available, functional housing for senior citizens	Meet legislative requirements	Meeting legislative requirements	N/A

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Action Plans
	Follow facility maintenance program	**Inspection and maintenance plan followed**	**N/A**
Available, safe child care service locations	Meet legislative requirements	**Meeting legislative requirements**	**N/A**
	Follow facility maintenance program	**Inspection and maintenance plan followed**	**N/A**
Available, functional assisted living facilities	Meet legislative requirements	**New legislative requirements related to fire safety not being met in all facilities**	**Immediately replace components creating non-compliance**
	Follow facility maintenance program	**Inspection and maintenance plan followed**	**N/A**
Available serviced land for development	Minimize complaints	**Current: 1 complaint**	**N/A**
Safe and functional equipment and facilities	Minimize complaints	**Current: 2 complaints**	**N/A**

In the table above, action plan items can be detailed out further in terms of timing and costing. For example:

Table 4-10
Sample Technical Action Plan Scenarios

Action Item	Scenario 1	Scenario 2	Scenario 3
CCTV Inspection Program	All wastewater mains inspected in 2 years: **$250,000 per year**	All wastewater mains inspected in 5 years: **$100,000 per year**	All wastewater mains inspected in 10 years: **$50,000 per year**

These scenarios can be helpful in educating Council and the public on the relationship between levels of service, and costs to provide expected LOS. In the table above, the risks associated with delaying the CCTV inspection program can also be discussed.

Action items can include:

- Non-infrastructure items;
- Maintenance items;
- Rehabilitation items/programs;
- Replacement items/programs; and/or
- Expansion items/programs.

Costing Levels of Service Action Plans

The following steps are required to cost levels of service action plans:

- Well-defined levels of service scenarios and respective action plan items;
- A clearly defined action plan, including what is needed, where it is needed, and why;
- A process of determining costs and unit rates associated with that action plan; and
- Accurate cost information.

When including action items within the LOS analysis, municipalities should be mindful of:

- The total cost of implementing the action plan;
- The impact the action plan has on the future lifecycle costs of the applicable assets (more on this in Chapter 5); and
- The impact of the action plan items on projected LOS over the forecast period.

4.10 Performance Measures

Performance measures quantify the strategic and technical LOS measures, to enable a meaningful tracking of performance over time. This is important to ensure that the municipality is trending in the right direction towards established LOS targets.

To what extent is the LOS analysis incorporating performance measures?

Background

The technical LOS described in earlier sections are often quantified through the use of performance measures. Strategic (customer) LOS can also be quantified using performance measures. Performance measures allow municipalities to track levels of service over a number of years, which can provide a better understanding of how successful their lifecycle management strategies (e.g. long-term forecasts) have been in the past. With the correct tools, performance measures can also be used to project future levels of service. This information can inform better decision making for future long-term plans.

Levels of Maturity – LOS Performance Measures

To what extent is the LOS analysis incorporating performance measures?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Performance measures identified, although isolated to one year of analysis	**Performance measures identified and a trending analysis is included over multiple years**	**Performance measures identified, trending analysis is included over multiple years, and the trending is analysed to determine impact on lifecycle mgmt strategy**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. At a staff level, determine what performance measures best describe and quantify levels of service being provided	1. At a staff level, determine what performance measures best describe and quantify levels of service being provided	1. At a staff level, determine what performance measures best describe and quantify levels of service being provided
	2. For each asset category, compare performance measure results to staff-determined objectives	2. Prepare a table that documents the performance measures results over multiple years, and includes trending analysis	2. Prepare a table that documents the performance measures results over multiple years, and includes trending analysis
		3. For each asset category, compare performance measure results and trending analysis to staff-determined objectives	3. For each asset category, compare performance measure results and trending analysis to staff-determined objectives
			4. Quantify differences in current and trending/objectives into financial impacts, to be used in the lifecycle mgmt strategy

At the **basic level of maturity**, staff typically identify and calculate performance measures they deemed to be appropriate. At a minimum, performance measures outlined in O.Reg 588/17 are used. For each asset category, the results of the performance measures are compared to staff-determined objectives. The scope of analysis is usually focused on one year.

At the **intermediate level of maturity**, similar analyses are undertaken, and would also highlight trends in performance measures over multiple years. This can be accomplished through the use of a table that outlines performance measures over multiple years. For each asset category, performance measure results and trending analysis can be compared to staff-determined objectives.

At the **advanced level of maturity**, after completing the steps outlined above in the intermediate level, the differences between current performance measure results and performance measure objectives are quantified into financial impacts and should be used within the lifecycle management strategy (see Chapter 5).

Performance Measures

Previous sections of this chapter explored elements of defining levels of service from a qualitative point of view and assessing the associated financial implications. Performance measures or key performance indicators (KPIs) are another method of documenting and assessing levels of service. Performance measures provide a quantitative basis for analysis which enables trend analysis to determine if a municipality is moving towards or away from specified LOS objectives. For example, the use of condition ratings from a performance measure perspective allows municipalities to see what condition their assets are in now and also whether that condition rating is getting better or worse over time.

Performance measures are developed to assess the overall performance of assets, service delivery and/or business efficiency. These measures can assist in identifying action items (e.g. capital investment decisions, resource allocations, etc.) needed to move towards expected service level objectives. Technical LOS measures are needed for justification of operational decisions and to support capital investment decisions, while strategic (customer) measures are required to assess asset performance in terms of services provided to the customer. In both cases, performance measures used by a municipality should be meaningful, transparent, constant/consistent and easily measurable.

Performance measures can be used to support both the strategic and technical LOS developed for each service area. Having that direct link between the qualitative LOS measure and the quantitative performance measure provides strength and verification to the LOS analysis. This way it’s possible to identify where a level of service isn’t being met and any trends that arise over time. For example, the strategic (customer) LOS “road assets will be accessible 24 hours a day, 7 days a week” can be supported by a performance measure that tracks the “number of road or bridge closures due to poor asset condition”. In this example, if the number of road/bridge closures due to poor asset condition are increasing year over year, it indicates that the municipality is moving further away from its expected LOS objective. Essentially, a performance measure provides an indication of how well the level of service is being delivered. Below is a table expanding the technical LOS discussions in earlier section to include potential performance measures to track over time.

Table 4-11
Sample Performance Measures

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Performance Measure
Safe, reliable roads with adequate capacity	Average condition rating: Local (5/10), Collector (6/10), Arterial (7/10)	Local: 4/10 Collector: 4/10 Arterial: 5/10	**Average condition rating**
	Follow Minimum Maintenance Standards	Following MMS	**Number of MMS non-compliance events**
Safe, reliable bridges with adequate capacity	Average condition rating: 7/10	Current: 6/10	**Average condition rating**
	Follow Minimum Maintenance Standards	Following MMS	**Number of MMS non-compliance events**
Safe sidewalks, access from subdivisions to downtown	Average condition: 7/10	Current: 6/10	**Average condition rating**
	Minimize complaints	Current: 5 complaints	**Number of complaints**
Reliable streetlights	Minimize complaints	Current: 8 complaints	**Number of complaints**
Reliable traffic lights	Minimize complaints	Current: 3 complaints	**Number of complaints**
Reliable and convenient transit services	Inspect and perform maintenance on vehicles monthly	Inspection and maintenance plan followed	**Number of Out-of-Service days**
	Minimize complaints	Current: 14 complaints	**Number of complaints**
Convenient and secure parking locations	Minimize complaints	Current: 3 complaints	**Number of complaints**
Safe roads in winter	Follow MMS	Compliant	**MMS Statistics**

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Performance Measure
Quality and efficient water supply, with adequate capacity	Meet legislative requirements	Meeting legislative requirements	**Number of days of Boil Water Advisory**
	Unaccounted for water under 30%	Unaccounted for water: 35%	**% unaccounted for water**
	Less than 5 main breaks annually, per 100 customers	Breaks per 100 customers: 2	**Main breaks per 100 customers**
Quality wastewater collection, with adequate capacity and no environmental impacts	Meet legislative requirements	Meeting legislative requirements	**N/A**
	Minimize incidents of bypass	Incidents of bypass: 0	**Number of incidents of bypass**
	Less than 5 main breaks annually, per 100 customers	Breaks per 100 customers: 20	**Main breaks per 100 customers**
Stormwater system with adequate capacity	Minimize flooding incidents per 1,000 people	Flooding Incidents: 0	**Number of flooding incidents per 1,000 residents**
Responsive and efficient solid waste collection system	Minimize complaints	Current: 32 complaints	**Number of complaints**
	Inspect and perform maintenance on vehicles monthly	Inspection and maintenance plan followed	**Number of Out-of-Service days**
Responsive and quality fire services	Minimize response times	Response times within requirements	**Response times**
	Meet legislative requirements	Meeting legislative requirements	**N/A**
	Follow vehicle and equipment replacement program	Maintenance and replacement plan followed but underfunded	**Number of Out-of-Service days**

Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Performance Measure
Responsive and quality police services	Minimize response times	Response times within requirements	**Response times**
	Meet legislative requirements	Meeting legislative requirements	**N/A**
	Follow vehicle and equipment replacement program	Maintenance and replacement plan followed but underfunded	**Number of Out-of-Service days**
Responsive and quality inspection services	Follow vehicle and equipment replacement program	Maintenance and replacement plan followed	**Number of Out-of-Service days**
Adequate quantity and quality of recreation facilities	Utilization percentages for all facilities to be between 80% and 100%	Ice Pad: 99% utilized, demand for more capacity	**Facility capacity utilized**
Reliable, safe community halls	Follow facility maintenance program	Inspection and maintenance plan followed	**Number of days amenities unavailable**
	Minimize complaints	Current: 5 complaints	**Number of complaints**
Adequate quantity and quality of parks	Provide 1 park per 1,000 residents	Currently 0.8 parks per 1,000 residents	**Parks per 1,000 residents**
Safe and functional facilities	100% of facilities to pass accessibility standards	40% of facilities pass accessibility standards	**Percentage of facilities meeting accessibility standards**
Available, quality health care	Meet legislative requirements	Meeting legislative requirements	**N/A**
	Follow facility maintenance program	Inspection and maintenance plan followed but underfunded	**Number of deficiencies identified**
Reliable, responsive ambulance service	Minimize response times	Response times within requirements	**Response times**

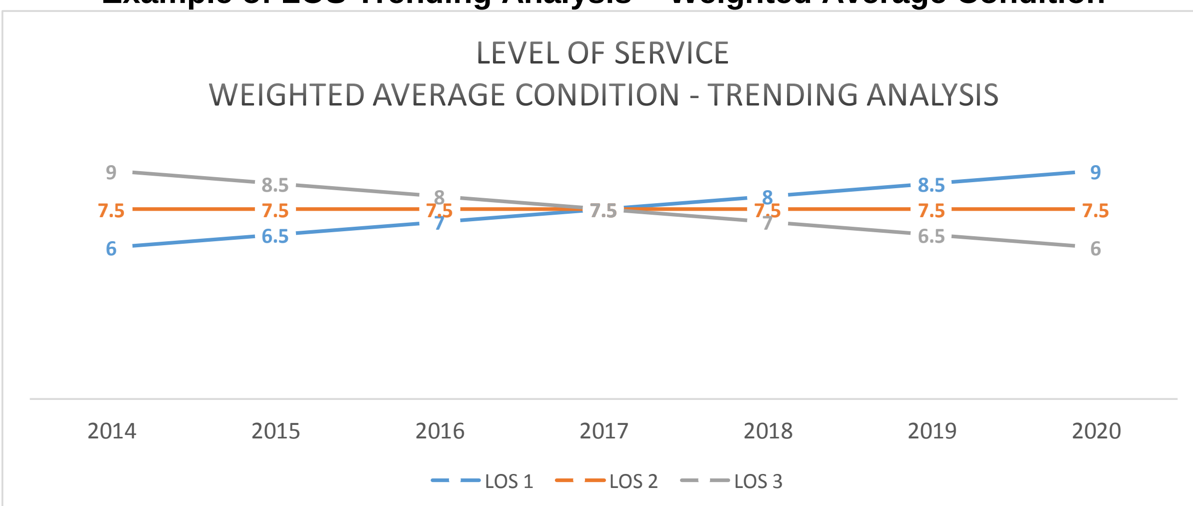
Strategic LOS Expected (Customer Perspective)	Technical LOS Expected (Staff Perspective)	Current LOS	Performance Measure
	Meet legislative requirements	Meeting legislative requirements	**N/A**
	Follow vehicle and equipment replacement program	Inspection and maintenance plan followed	**Number of Out-of-Service days**
Available, well-maintained cemeteries	Minimize complaints	Current: 1 complaint	**Number of complaints**
Available, functional housing for senior citizens	Meet legislative requirements	Meeting legislative requirements	**N/A**
	Follow facility maintenance program	Inspection and maintenance plan followed	**Number of deficiencies identified**
Available, safe child care service locations	Meet legislative requirements	Meeting legislative requirements	**N/A**
	Follow facility maintenance program	Inspection and maintenance plan followed	**Number of deficiencies identified**
Available, functional assisted living facilities	Meet legislative requirements	New legislative requirements related to fire safety not being met in all facilities	**Number of deficiencies identified**
	Follow facility maintenance program	Inspection and maintenance plan followed	**Number of deficiencies identified**
Available serviced land for development	Minimize complaints	Current: 1 complaint	**Number of complaints**
Safe and functional equipment and facilities	Minimize complaints	Current: 2 complaints	**Number of complaints**

In each of the performance measure examples above, a municipality can use an overall performance objective and trending analysis to measure its progress in moving towards expected LOS.

The Importance of Trending

If a municipality states “we have an average condition rating on our park structures of 7.5 and an objective of 9.0, they can safely say they are currently not meeting expected LOS. However, what this municipality doesn’t know is whether or not they are “trending” towards or away from the 9.0 condition objective. The graph below shows 3 different situations this municipality could be in:

Figure 4-8
Example of LOS Trending Analysis – Weighted Average Condition

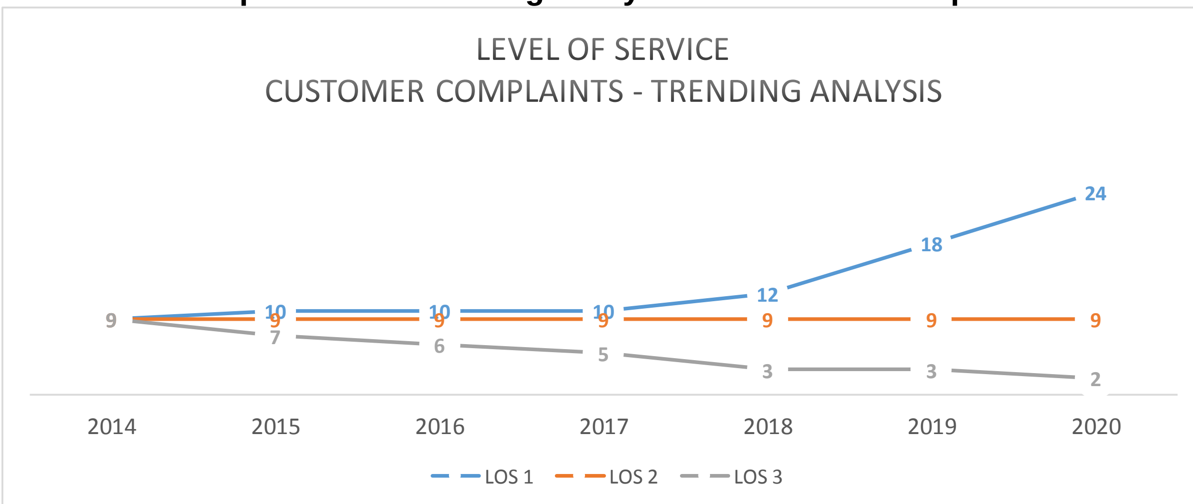


- LOS 1 (Blue): The municipality’s average condition rating is trending upwards;
- LOS 2 (Orange): The municipality’s average condition rating is remaining constant; and
- LOS 3 (Gray): The municipality’s average condition rating is trending downwards.

The municipality will not have enough information to know whether funding increases are needed for their park structures if all they know is that the current average condition rating is 7.5. Use of the trending analysis to complement this information assists in making that decision.

This trending analysis can be useful for any performance measure. The graph below illustrates the use of trending for the purpose of tracking customer complaints. This type of graph may be useful to project future potential complaints under a scenario whereby a particular maintenance or rehabilitation program is not implemented.

Figure 4-9
Example of LOS Trending Analysis – Customer Complaints



Performance measures can be categorized into groups (such as the attributes shown below).

- Quality;
- Reliability / Responsiveness;
- Customer Service;
- Sustainability;
- Safety;
- Accessibility; and
- Affordability

Customer performance measures should measure how the customer receives the service.

Technical measures provide an overall picture of organizational performance

Some important things to keep in mind when deciding on performance measures to incorporate into an asset management process. Ensure they are:

- Repeatable;
- Consistent;
- Relevant to the level of service and customer base;
- They are within your control;
- Well defined (how to calculate, what to include/exclude, etc.)
- That consideration is given to industry standards; and

- The time and cost associated with tracking and recording the measure is considered against the value attained.

The ISO 55002 also highlights the need for levels of service and performance measures to be SMART:

Figure 4-10
ISO 55002 SMART Performance Measures

Specific	• The measure is clear and unambiguous. It outlines exactly what is expected, the importance, who's responsible or involved, and how and when it's measured.
Measureable	• There is a clear procedure for measuring progress. If a goal is not measurable, it's impossible to know whether progress is being made. The procedure defines the quantity, cost or quality metrics for the measure.
Achieveable	• The measures target is realistic and attainable. It's not a 'stretch' target that is near impossible to reach, yet, not an 'easy pass' either. It should be possible to undertake as part of regular asset management processes.
Relevant	• The measure is relevant to the people responsible for achieving them, and the service being delivered.
Timely	• The measure is set with a realistic time frame in mind.

The following table provides some examples of performance measures (related to both strategic and technical LOS):

Table 4-12
Sample SMART Performance Measures

Service	Performance Measure Examples
All Assets	• Average condition assessment (by asset type or group) • Percentage of assets at or above a specified condition rating (by asset type or group) • Return on investment

Service	Performance Measure Examples
	• Operating cost per asset (or by length of asset) • Customer complaints • Response times • Availability of service (or # service disruptions) • Proportion of unplanned vs. planned maintenance each year (e.g. facilities, roads, bridges)
Roads	• Total accidents per year, per 1,000 population, relating to road conditions • Travel time or intersection delays • Percent of signs found missing or ineffective during annual inspections • Non-compliance events (or %) with Minimum Maintenance Standards
Bridges and Culverts	• Operating cost per m^2 of surface area • Percent of bridges with adequate load limits • Non-compliance events (or %) with Minimum Maintenance Standards
Facilities	• Proportion of the population living within x km of a community centre or fire hall • Percentage of facilities that meet accessibility standards • User fees as a percentage of market rates • User fees as a percentage of full cost recovery rates • Operating and maintenance costs recovered from user charges • Utilization percentages of ice pads, pools, etc. • Frequency of cleaning and maintenance activities • Number of reported accidents per year
Solid Waste	• Percent of properties that receive regular waste/recycling collection • Average volume of waste per household, per year
Stormwater	• Number of blockages or flooding incidents per year (with # residents affected) • Number of times roads closed due to flooding per year (or length of closure time)
Water	• Watermain breaks per km of pipe • Number of boil water advisories (with # residents affected) • Planned vs. unplanned shutdowns or disruptions

Service	Performance Measure Examples
	• Length of time of shutdowns or disruptions • % unaccounted for water (water billed vs. water produced) • Pressure at connection • Storage capacity • Water consumption by customer type • Percentage of facility sites with backup power • Number of incidents not in compliance with legislation
Wastewater	• Incidents of bypass • Percentage of wastewater bypassed treatment • Number of wastewater backups • Infiltration rate • Wastewater billed vs. wastewater treated • Percentage of facility sites with backup power • Number of incidents not in compliance with legislation

Prepared drawing some examples from the IIMM Manual

The following is an example of strategic (customer) levels of service performance measures for a road network.

Table 4-13
Sample Strategic LOS Performance Measures – Road Network

Key Performance Measure	Strategic Level of Service	Performance Measure Process	Performance Target
Quality	Well-maintained and suitable transport services	Customer complaints	< 30 complaints per annum for all transport asset categories
Customer Satisfaction	Condition of local roads	Customer Survey	Score >= 6 out of 10 in Annual Customer Survey
Customer Satisfaction	Condition of sidewalks	Customer Survey	Score >= 6 out of 10 in Annual Customer Survey
Accessibility	Road assets will be accessible 24 hours a day, 7 days a week	No. of road or bridge closures due to degraded asset condition	< 10 per annum

Key Performance Measure	Strategic Level of Service	Performance Measure Process	Performance Target
Function	Road line marking is well maintained	Customer Survey	Score >= 6 out of 10 in Annual Customer Survey
Function	Bridges (pedestrian and vehicular) provide safe and equitable access to all parts of the municipality to meet community needs	No. of complaints relating to bridges	< 10 per annum
Responsiveness	Response time to customer requests	Time taken to close requests	> 80% of all requests adequately responded to within target

The following is an example of technical levels of service performance measures for a road network.

Table 4-14
Sample Technical LOS Performance Measures – Road Network

Key Performance Measure	Strategic Level of Service	Performance Measure Process	Performance Target
Condition: Sealed Roads	Condition assessment of road network every 5 years	Condition Assessment	On average Pavement Condition Index and Surface Condition Index to be in condition 6 (out of 10) or better, with 10 being the best
Condition: Sidewalks	Condition assessment of sidewalk network every 5 years	Condition Assessment	On average, footpath network to be in condition 7 (out of 10) or better, with 10 being the best
Condition: Curbs	Condition assessment of curbs every 5 years	Condition Assessment	On average, curbs to be in condition 6 (out of 10) or better, with 10 being the best

Condition: Bridges	Bridge Inspection every 2 years	Condition Assessment	On average, bridge network to be in condition 6 (out of 10) or better, with 10 being the best

Table 4-15
LOS Metrics for Core Infrastructure Required Under O.Reg 588/17

Water Assets (Table 1)

Column 1 Service attribute	Column 2 Community levels of service (qualitative descriptions)	Column 3 Technical levels of service (technical metrics)
Scope	1. Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system. 2. Description, which may include maps, of the user groups or areas of the municipality that have fire flow.	1. Percentage of properties connected to the municipal water system. 2. Percentage of properties where fire flow is available.
Reliability	Description of boil water advisories and service interruptions.	1. The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system. *2.* The number of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system.

Wastewater Assets (Table 2)

Column 1 Service attribute	Column 2 Community levels of service (qualitative descriptions)	Column 3 Technical levels of service (technical metrics)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system.	Percentage of properties connected to the municipal wastewater system.
Reliability	1. Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes. 2. Description of the frequency and	1. The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.

	volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches. 3. Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes. 4. Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in paragraph 3. 5. Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system.	2. The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system. 3. The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.

Stormwater Management Assets (Table 3)

Column 1 Service attribute	Column 2 Community levels of service (qualitative descriptions)	Column 3 Technical levels of service (technical metrics)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	1. Percentage of properties in municipality resilient to a 100-year storm. 2. Percentage of the municipal stormwater management system resilient to a 5-year storm.

Roads Assets (Table 4)

Column 1 Service attribute	Column 2 Community levels of service (qualitative descriptions)	Column 3 Technical levels of service (technical metrics)
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity.	Number of lane-kilometres of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the municipality.
Quality	Description or images that illustrate the different levels of road class pavement condition.	1. For paved roads in the municipality, the average pavement condition index value. 2. For unpaved roads in the municipality, the average surface condition (e.g. excellent, good, fair or poor).

Bridges and Culverts Assets (Table 5)

Column 1 Service attribute	Column 2 Community levels of service (qualitative descriptions)	Column 3 Technical levels of service (technical metrics)
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	Percentage of bridges in the municipality with loading or dimensional restrictions.
Quality	1. Description or images of the condition of bridges and how this would affect use of the bridges. 2. Description or images of the condition of culverts and how this would affect use of the culverts.	1. For bridges in the municipality, the average bridge condition index value. 2. For structural culverts in the municipality, the average bridge condition index value.

Documentation

With respect to performance measures, it is important to have controls in place to ensure they are calculated in an accurate and consistent manner from year to year. Given the dynamic nature of municipalities (and asset management), it is recommended that documentation be kept that includes:

1. Which performance measures are to be calculated;
2. Which performance measures are associated with which assets;
3. How often they are to be calculated;
4. How (specifically) they are to be calculated (all variables in the calculation); and
5. All assumptions made in the calculation of each performance measure.

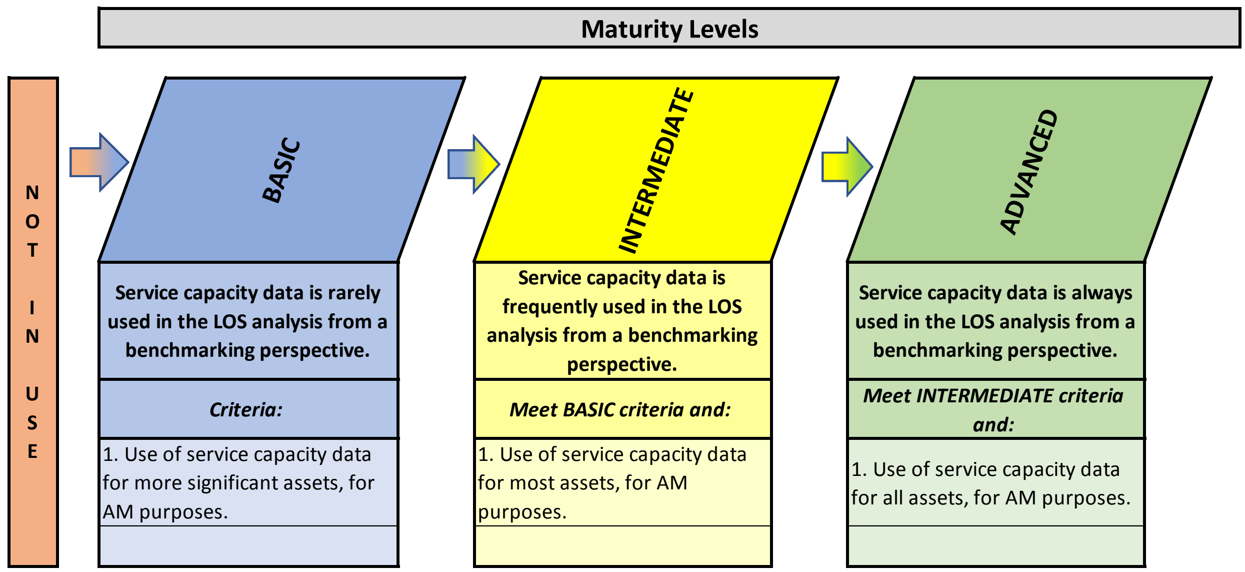
To what extent is service capacity data used in the LOS analysis with respect to benchmarking over multiple years?

Background

In the technical LOS section above, the concept of service capacity was introduced and the importance of using this data within the AM process was stressed. The ability to track this data over time allows municipalities to trend anticipated service capacities in the future, as well as assist in making more informed AM decisions.

Levels of Maturity

To what extent is service capacity data used in the LOS analysis with respect to benchmarking over multiple years?



At the **basic level of maturity**, municipalities use the service capacity data in the LOS analysis for more significant assets and typically only for asset management purposes.

At the **intermediate level of maturity**, municipalities use the service capacity data in the LOS analysis from a benchmarking perspective for many of the assets.

At the **advanced level of maturity**, municipalities use the service capacity data in the LOS analysis for all its assets.

Benchmarking Service Capacity Data

The concept of utilizing performance measures through trending was discussed in previous sections above. This is just as applicable in the use of service capacity data. Figure 4-9 graphically shows how trending data can assist in making decisions within the AM planning process. This graph could be useful in projecting out potential service capacity if a particular maintenance or rehabilitation program is not implemented. For example, if a municipality is considering an expansion to a water or wastewater plant, understanding the capacity of those plants is imperative to determining the timing and extent of the expansion.

4.11 Resources and References

Institute of Public Works Engineering Australasia (IPWEA), NAMS.PLUS Asset Management, https://www.ipwea.org/communities/assetmanagement/namsplus

IPWEA, 2014, Practice Note 8: Levels of Service & Community Engagement, http://www.ipwea.org/publications/bookshop/ipweabookshop/practicenotes/pn8

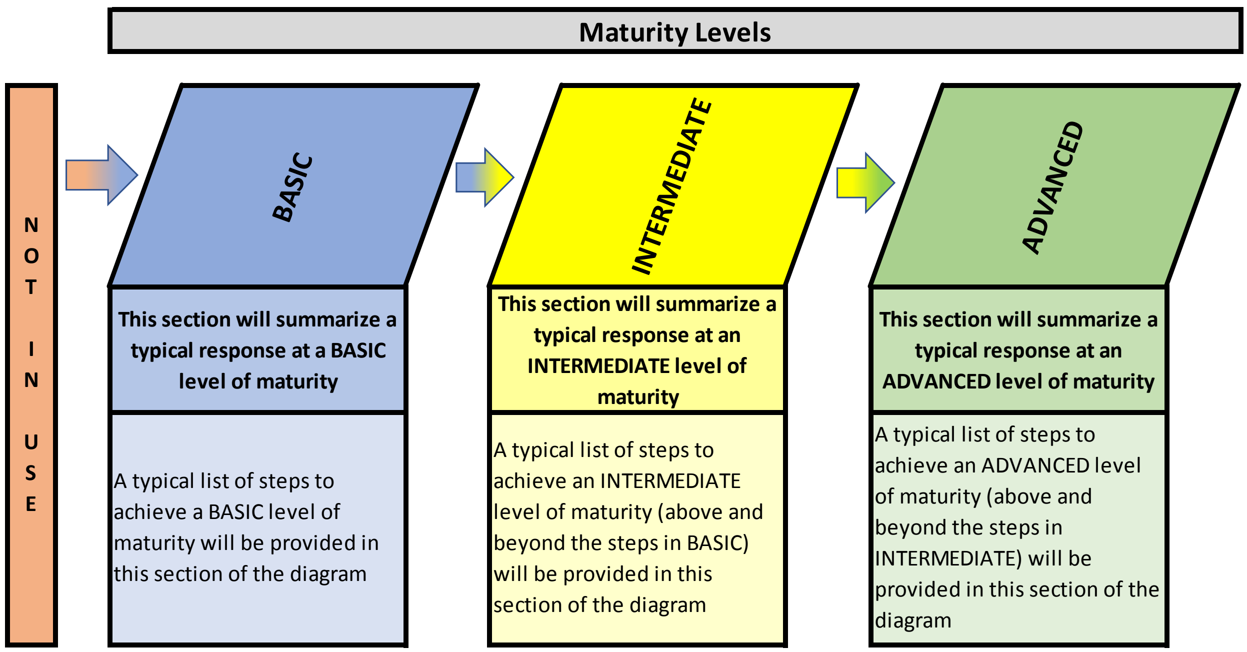
IPWEA, 2015, International Infrastructure Management Manual, https://www.ipwea.org/publications/bookshop/ipweabookshop/iimm

International Organization for Standardization (ISO), 2014, ISO 55000:2014, Asset management – Overview, principles and terminology, http://www.iso.org/iso/catalogue_detail?csnumber=55088

5 Lifecycle Management Strategy

5.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake in order to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

5.2 Overview

The Ontario “Building Together Guide for Municipal Asset Management Plans” defines an asset management strategy as:

> *The set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost.*

Moving forward, the “asset management strategy” will be referred to as the “lifecycle management strategy”, which provides a more accurate description of the requirements in this section. The actions defined and identified within the lifecycle management strategy detail how assets should be maintained, renewed/rehabilitated, replaced, disposed, or expanded upon. All strategies considered will attempt to move the municipality towards expected levels of service in an efficient and effective manner.

Lifecycle Costing

Lifecycle costing is defined by IIMM as:

> *The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.*

A "lifecycle management approach" in asset management planning not only includes estimating future lifecycle costs, but also an overview of how the asset performs over its life while providing affordable services. This is a more holistic perspective than the consideration of cost projections alone.

Within this is the true challenge of public infrastructure management which is:

> *To ensure that the assets we have now and those that will be created in the future provide suitable levels of service at a cost the community can afford.*

Lifecycle costing is comprised of the following costs over an asset's useful life:

- Acquisition or construction;
- Operating;
- Maintaining;
- Rehabilitating;
- Replacing;
- Disposing; and
- Non-infrastructure solutions.

All of the cost elements above should be considered when determining the true cost of an asset over its useful life. The resulting cost profile may look something like the following figure.

Figure 5-1
Sample Asset Cost Profile

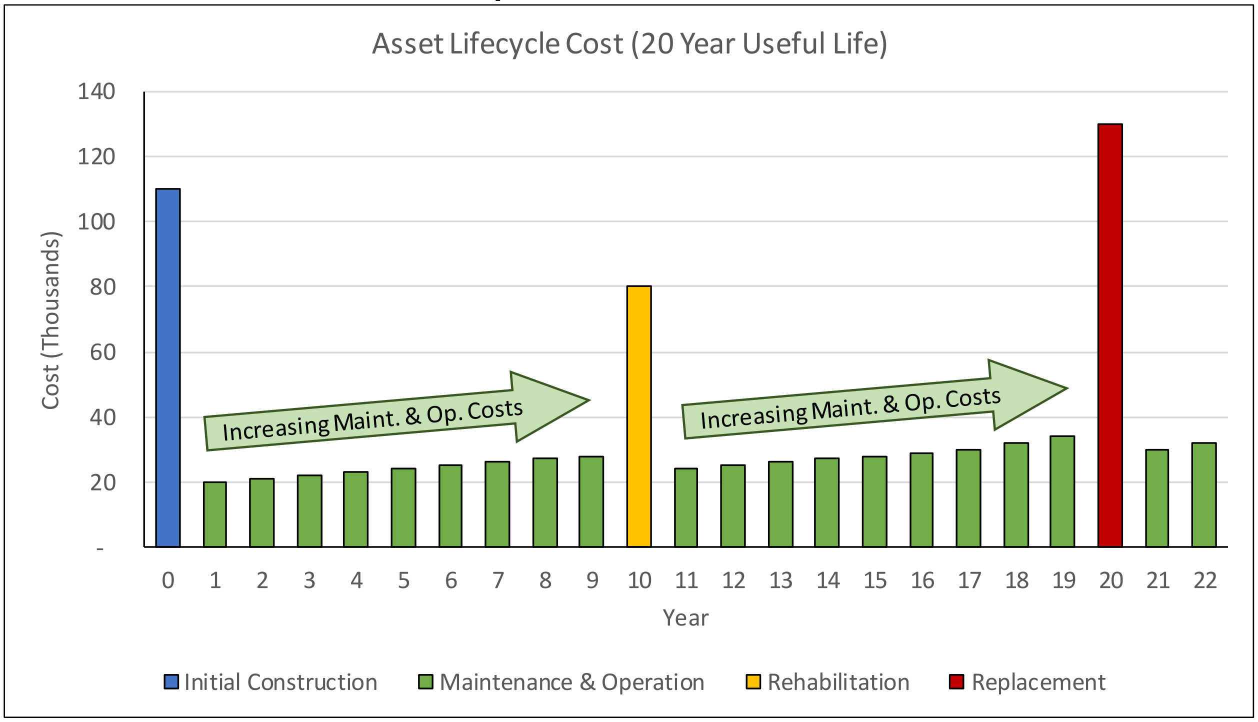


Figure 5-1 (above) illustrates:

- Initial construction of the asset occurs in year 0;
- Maintenance and operational costs are incurred annually, increasing as the asset deteriorates (from year 1 to 9);
- Rehabilitation of the asset is shown in year 10, which has the result of extending the remaining useful life of the asset and reducing annual maintenance and operational costs;
- Maintenance and operational costs are incurred annually, increasing as the asset deteriorates (from year 11 to 19);
- Complete asset replacement occurs in year 20; and
- Annual maintenance and operational costs continue forward on the new asset.

Maintenance and other interventions undertaken to sustain asset integrity and service levels occur over the life of an asset (as illustrated in Figure 5-1). Over time, these costs can outweigh the initial cost of the asset. The lifecycle management strategy helps municipalities plan for these maintenance costs over a forecast period. Because the majority of assets currently managed by a municipality are already part way through their lifecycle, the task of planning for lifecycle costs over a shortened lifecycle period can become difficult.

Using the example in Figure 5-1 (above), the existing asset could be at any point along the “time” axis, regardless of its actually age. The asset’s location on the time axis can be determined by an understanding of its behaviour as well as an interpretation of data, such as condition assessments. Age alone is not an accurate indicator of an asset’s position in its lifecycle. The timescale in the Figure 5-1 is based on an “estimated useful life” and assumes certain interventions such as maintenance and rehabilitation. This underscores why condition assessments play a key role in the lifecycle analysis. Assets will deteriorate faster or slower than expected depending on whether the asset is maintained. The condition assessment information provides a more accurate indication of lifecycle needs.

Asset managers strive to achieve the lowest lifecycle cost for all assets. The example described above provides an indication of the total lifecycle cost by summing all annual costs over the asset’s life. Comparing alternative lifecycle scenarios, such as alternative interventions and frequencies, allows municipalities to experiment with the impact of differing lifecycle forecasts on the assets themselves and the services being provided. This methodology will be expanded upon further in later sections within this chapter.

Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements

O.Reg 588/17 outlines the following requirements with respect to the Lifecycle Management Strategy:

Every municipality shall prepare an asset management plan in respect of its core municipal infrastructure assets by *July 1, 2021*, and in respect of all of its other municipal infrastructure assets by *July 1, 2023*.

A municipality’s AM plan must include the following (for each asset category):

a) The lifecycle activities that would need to be undertaken to maintain the current levels of service for each of the 10 years following the year for which the current levels of service are determined and the costs of providing those activities based on an assessment of the following:
    i. The full lifecycle of the assets.
    ii. The options for which lifecycle activities could potentially be undertaken to maintain the current levels of service.
    iii. The risks associated with the options referred to in subparagraph ii.
    iv. The lifecycle activities referred to in subparagraph ii that can be undertaken for the lowest cost to maintain the current levels of service.

b) For municipalities with a population of less than 25,000, as reported by Statistics Canada in the most recent official census, the following:
   i. A description of assumptions regarding future changes in population or economic activity.
   ii. How the assumptions referred to in subparagraph i relate to the required lifecycle activities described above.

c) For municipalities with a population of 25,000 or more, as reported by Statistics Canada in the most recent official census, the following:
   i. With respect to municipalities in the Greater Golden Horseshoe growth plan area, if the population and employment forecasts for the municipality are set out in Schedule 3 or 7 to the 2017 Growth Plan, those forecasts.
   ii. With respect to lower-tier municipalities in the Greater Golden Horseshoe growth plan area, if the population and employment forecasts for the municipality are not set out in Schedule 7 to the 2017 Growth Plan, the portion of the forecasts allocated to the lower-tier municipality in the official plan of the upper-tier municipality of which it is a part.
   iii. With respect to upper-tier municipalities or single-tier municipalities outside of the Greater Golden Horseshoe growth plan area, the population and employment forecasts for the municipality that are set out in its official plan.
   iv. With respect to lower-tier municipalities outside of the Greater Golden Horseshoe growth plan area, the population and employment forecasts for the lower-tier municipality that are set out in the official plan of the upper-tier municipality of which it is a part.
   v. If, with respect to any municipality referred to in subparagraph iii or iv, the population and employment forecasts for the municipality cannot be determined as set out in those subparagraphs, a description of assumptions regarding future changes in population or economic activity.
   vi. For each of the 10 years following the year for which the current levels of service are determined, the estimated capital expenditures and significant operating costs related to the lifecycle activities required to maintain the current levels of service in order to accommodate projected increases in demand caused by growth, including estimated capital expenditures and significant operating costs related to new construction or to upgrading of existing municipal infrastructure assets.

By *July 1, 2024*, every asset management plan must include the following additional information:

a) A lifecycle management and financial strategy that sets out the following information with respect to the assets in each asset category for the 10-year period:
   i. An identification of the lifecycle activities that would need to be undertaken to provide the proposed levels of service described in paragraph 1, based on an assessment of the following:
      A. The full lifecycle of the assets.
      B. The options for which lifecycle activities could potentially be undertaken to achieve the proposed levels of service.
      C. The risks associated with the options referred to in sub-subparagraph B.
      D. The lifecycle activities referred to in sub-subparagraph B that can be undertaken for the lowest cost to achieve the proposed levels of service.
   ii. An estimate of the annual costs for each of the 10 years of undertaking the lifecycle activities identified in subparagraph i, separated into capital expenditures and significant operating costs.
   iii. An identification of the annual funding projected to be available to undertake lifecycle activities and an explanation of the options examined by the municipality to maximize the funding projected to be available.
   iv. If, based on the funding projected to be available, the municipality identifies a funding shortfall for the lifecycle activities identified in subparagraph i,
      A. an identification of the lifecycle activities, whether set out in subparagraph i or otherwise, that the municipality will undertake, and
      B. if applicable, an explanation of how the municipality will manage the risks associated with not undertaking any of the lifecycle activities identified in subparagraph i.

b) For municipalities with a population of less than 25,000, as reported by Statistics Canada in the most recent official census, a discussion of how the assumptions regarding future changes in population and economic activity informed the preparation of the lifecycle management and financial strategy.

c) For municipalities with a population of 25,000 or more, as reported by Statistics Canada in the most recent official census,
   i. the estimated capital expenditures and significant operating costs to achieve the proposed levels of service as described in paragraph 1 in order to accommodate projected increases in demand caused by population and employment growth, as set out in the forecasts or assumptions referred to in paragraph 6 of subsection 5 (2), including estimated capital expenditures and significant operating costs related to new construction or to upgrading of existing municipal infrastructure assets,
   ii. the funding projected to be available, by source, as a result of increased population and economic activity, and
   iii. an overview of the risks associated with implementation of the asset management plan and any actions that would be proposed in response to those risks.

5.3 Non-Infrastructure Solutions – Introduction

Incorporating non-infrastructure solutions, such as demand management and integrated infrastructure planning, into the lifecycle management strategy can introduce cost efficiencies and/or extend asset useful life.

To what extent are non-infrastructure solutions incorporated into the lifecycle management strategy?

Background

Cost reduction is a consistent driver across most municipalities, and the same is true for asset management. Investment in municipal assets is subject to limited funding, so if the same outcome can be produced at a lower cost, more can be done with the funding that is available. At the same time, care must be taken to ensure that a cost reduction today does not result in a cost escalation in the future.

Non-infrastructure solutions are actions or policies that are not capital in nature, which result in the lowering of costs and/or extend the useful life of an asset.

Levels of Maturity

To what extent are non-infrastructure solutions incorporated into the lifecycle management strategy?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Some or high-level incorporation	**Full incorporation at asset type level**	**Full incorporation at detailed asset level**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Engage in broad discussions on current and/or potential non-infrastructure solutions (i.e. integrated infrastructure planning, process optimization, etc.)	1. Engage in detailed discussions on current and/or potential non-infrastructure solutions (i.e. integrated infrastructure planning, process optimization, etc.)	1. Engage in detailed discussions on current and/or potential non-infrastructure solutions (i.e. integrated infrastructure planning, process optimization, etc.)
	2. Assess the impact of the non-infrastructure solutions on the asset management process at a corporate level	2. Assess the impact of the non-infrastructure solutions on the asset management process at an asset type level	2. Assess the impact of the non-infrastructure solutions on the asset management process at a detailed asset level
	3. Incorporate the non-infrastructure analysis within the AM plan calculations	3. Incorporate the non-infrastructure analysis within the AM plan calculations	3. Incorporate the non-infrastructure analysis within the AM plan calculations

At the **basic level of maturity**, non-infrastructure solutions are incorporated into the lifecycle management strategy to some extent. Municipalities may engage in broad discussions on current and/or potential non-infrastructure solutions. The impact of these solutions on the asset management process would be assessed at a corporate level. Finally, the non-infrastructure analysis are incorporated within the asset management plan calculations.

At the **intermediate level of maturity**, non-infrastructure solutions are incorporated fully into the lifecycle management strategy at the asset level. Municipalities may engage in detailed discussions on current and/or potential non-infrastructure solutions. The impact of these solutions on the asset management process is assessed at an asset level. Finally, the non-infrastructure analysis is incorporated within the asset management plan calculations.

At the **advanced level of maturity**, non-infrastructure solutions are incorporated fully into the lifecycle management strategy at a detailed asset level. Municipalities may engage in detailed discussions on current and/or potential non-infrastructure solutions. The impact of these solutions on the asset management process is assessed at a detailed asset level. Finally, the non-infrastructure analysis is incorporated within the asset management plan calculations.

Non-Infrastructure Solutions Introduction

Non-infrastructure solutions include policies, processes, or strategies that:

- Reduce asset related costs (i.e. operating, maintaining, rehabilitation, replacement, expansion); and/or
- Improve asset performance (resulting in lower costs and/or extended life).

Achieving cost reduction can come down to effective and efficient non-infrastructure solutions for asset management:

- Effectiveness involves "doing what should be done", in terms of policies, processes, or strategies. This can come from best practices, legislation, or direction provided by policy, process, or strategy.
- Efficiency involves utilizing the policies, processes, and strategies in the best possible way.

Examples of non-infrastructure solutions include:

Table 5-1
Sample Non-Infrastructure Solutions

Solution	Example
Integrated Infrastructure Planning	Layering road, water, wastewater, and stormwater capital forecasts together. This ensures newly paved roads don't have to be dug up for main replacements.
Land Use Planning	Manage the development of land within the municipality, ensuring an efficient use of land and the efficient construction of assets.

Solution	Example
Demand Management	Manage and forecast the demand for services within the municipality (e.g. introduce HOV lanes, offer discounts for using facilities at non-peak hours, etc.). Prepare a Development Charge Background Study to manage growth.
Insurance	Minimize unforeseen and uncontrollable asset costs through the use of insurance policies.
Process Optimization	Optimization of asset management related processes, such as "levels of service impacts" and "determining a capital forecast". Optimizing these processes not only minimizes the time and resources required to complete them, but also generates more accurate and "real time" results. Undertake Water/Wastewater/Storm Rate Study.
Managed Failures	Use of asset condition, risk assessments, and levels of service to manage and plan for where assets are "allowed" to fail, allowing available funds to be used in more critical areas.
Procurement Policies	Streamline purchasing policies/by-law to increase the receipt of competitive bids for asset purchase or construction, including the ability to tender for "build/own/operate" agreements or "public private partnerships". Streamlined purchasing policies assists municipalities in getting more for the funding that is available (i.e. pave 5 km of roads per year rather than 4 km, for the same price, given the competitive bid environment).

Non-infrastructure solutions can be implemented at a high (corporate) level, at the asset type level, or at the detailed asset level. The level at which the solutions are implemented depends on the municipality's level of asset management maturity as well as the type of solution being implemented. Examples of non-infrastructure solutions are shown in Table 5-2 (below):

Table 5-2
Non-Infrastructure Solutions Implementation Levels

Maturity Level	Implementation Level	Non-Infrastructure Solution Example
Basic	Corporate (High Level)	Strategic Plan (asset management section), outlining corporate mission, goals, and action items from an asset management perspective.
Intermediate	Asset Type Level	Setting an enhanced procurement policy specifically for roads-related projects.
Advanced	Detailed Asset Level	Asset Condition/Needs Study outlining specific actions by detailed asset, asset segment, or asset component.

5.4 Non-Infrastructure Solutions – Approach

Detailed consideration of non-infrastructure solutions within the lifecycle management strategy can help municipalities accurately estimate the benefits and costs associated with these solutions.

What method is used to incorporate non-infrastructure solutions into the lifecycle management strategy?

Background

Non-infrastructure solutions may be incorporated into the lifecycle management strategy based on past historical practices or a more forward-looking approach where consideration of cost efficiencies and/or impact on asset remaining life is factored into the chosen solution(s).

Levels of Maturity

What method is used to incorporate non-infrastructure solutions into the lifecycle management strategy?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Based on historical practices and may include ad hoc adjustments	**Some consideration for cost efficiencies and/or impact on asset remaining life**	**Detailed consideration for cost efficiencies and/or impact on asset remaining life**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Review and document historical non-infrastructure solutions in place at the municipality	1. Discuss and document proposed non-infrastructure solutions	1. Discuss and document proposed non-infrastructure solutions
	2. Assess the impact of historical practices on the AM process	2. Assess the impact of proposed non-infrastructure solutions on the AM process, with some consideration for overall impact on costs and remaining life	2. Assess the impact of proposed non-infrastructure solutions on the AM process, with detailed consideration for overall impact on costs and remaining life
	3. Make high-level changes to the historical practices and associated impacts based on future plans		

At the **basic level of maturity**, municipalities will review and document historical non-infrastructure solutions that are in place. Municipalities will tend to incorporate non-infrastructure solutions into the lifecycle management strategy based on historical practices and may include subsequent ad hoc adjustments based on expected revisions to historical practices. The impact of these practices on the asset management process are assessed.

At the **intermediate level of maturity**, municipalities give some consideration to the impact of non-infrastructure solutions on cost efficiencies and/or impact on asset remaining life. Proposed non-infrastructure solutions are discussed and documented at a staff level. The impact of these solutions on the asset management process are assessed, with some consideration for the overall impact on costs and remaining life.

At the **advanced level of maturity**, municipalities give detailed consideration for cost efficiencies and/or impact on asset remaining life within a comprehensive non-infrastructure solutions analysis. Proposed non-infrastructure solutions are discussed and documented within this analysis. The impact of these solutions on the asset management process is assessed, with detailed consideration for the overall impact on asset-related costs and remaining life.

Non-Infrastructure Solutions Methodology

Section 5-3 (above) introduced non-infrastructure solutions with the following examples:

- Integrated infrastructure planning;
- Land use planning;
- Demand management;
- Effective use of insurance;
- Process optimization;
- Managed asset failures; and
- Procurement policies.

This section discusses the process and methods of incorporating non-infrastructure solutions into the asset management planning process. There are two impacts of non-infrastructure solutions for municipalities to consider:

1. Projecting the cost of implementing the non-infrastructure solution; and
2. Projecting the cost savings or extended asset life due to implementing the non-infrastructure solution.

Table 5-3 (below) provides examples of how non-infrastructure solutions can be summarized from cost and savings perspectives.

From a cost perspective, many non-infrastructure solutions will have ongoing and/or periodic costs throughout a forecast period, such as study or staff costs to implement integrated infrastructure planning or process optimization. If these costs are required every few years then the long-term forecast should reflect this need.

From a savings or asset life perspective, an estimation of the potential savings of each non-infrastructure solution is needed. This could be a one-time savings, but it’s likely to have a more long-term impact.

Table 5-3
Sample Non-Infrastructure Solutions – Cost/Savings

Non-Infrastructure Solution	Cost	Savings
Managed Asset Failures: Condition and Risk Assessments for all Assets	$50,000 every 3 years	10-year capital forecast decreases from $50 million (inflated) to $45 million (inflated) Pick-up Truck useful life extended from 7 years to 10 years
Procurement Policies: Introduce processes to increase the number of competitive bids received	$20,000 one-time study cost in 2018 $5,000 annual increase in advertising	Pave 5 km roads per year vs. 4 km per year currently 5% reduction in salt and sand contract
Process Optimization: Automate and optimize the capital forecast, using asset management software	$70,000 one-time cost for implementation and training, plus $20,000 annual software fee	Remaining service life (avg.) of assets increases from 34 years to 48 years Infrastructure gap anticipated to be eliminated in 7 fewer years than anticipated

Once this costing analysis is completed, the results can be used to inform the overall lifecycle management strategy and be combined with other lifecycle costs anticipated over the forecast period.

5.5 Maintenance Solutions – Introduction

Incorporating planned maintenance solutions into the lifecycle management strategy ensures that these activities are funded at an appropriate level, enabling assets to reach their full service potential.

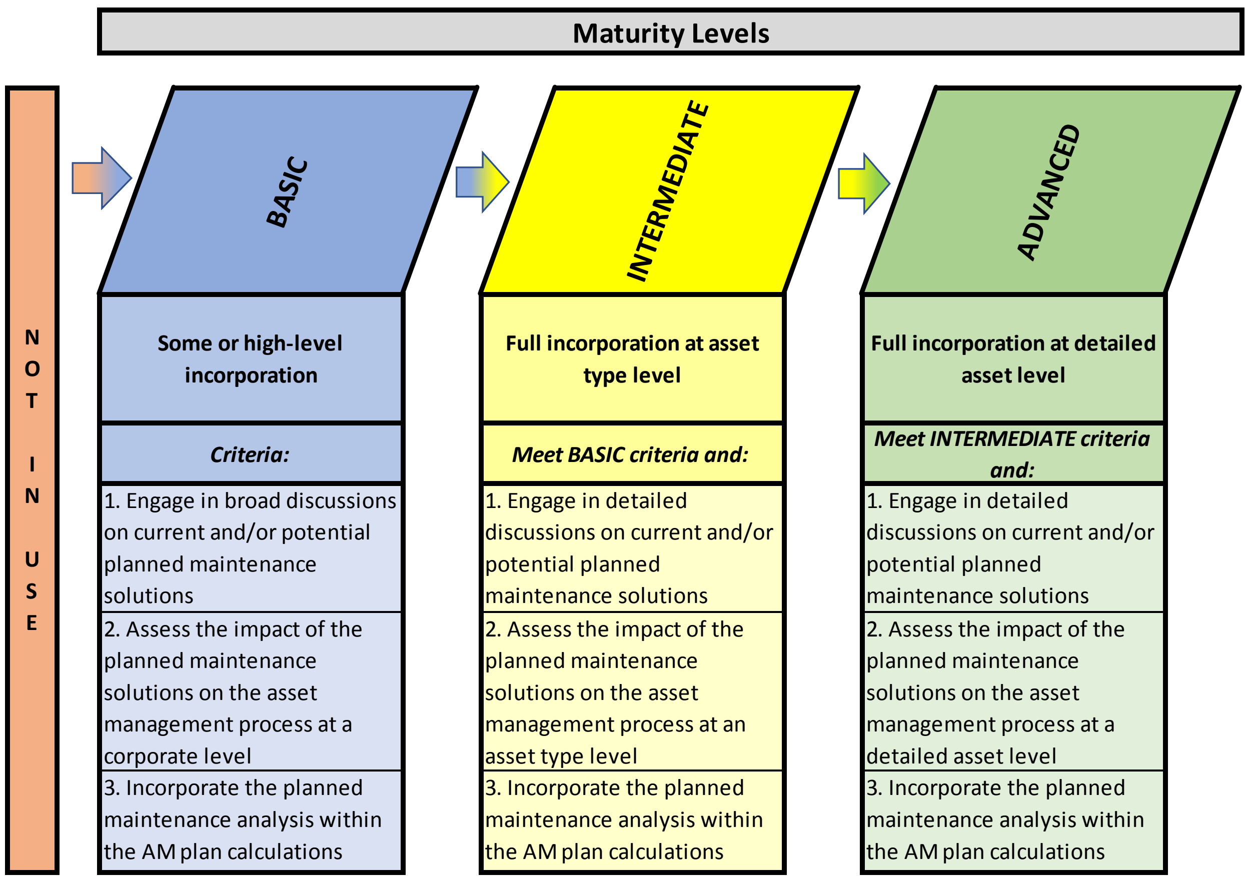
To what extent are planned maintenance solutions incorporated into the lifecycle management strategy?

Background

Municipalities will approach planned maintenance solutions in a number of ways. Some might base their plans on historical practices or broad discussions at the corporate level (i.e. more high level), while others might engage in more detailed discussions with a focus on maintenance by asset type, or possibly at a detailed asset level.

Levels of Maturity

To what extent are planned maintenance solutions incorporated into the lifecycle management strategy?



At the **basic level of maturity**, there will be some incorporation or high-level incorporation of planned maintenance solutions into the lifecycle management strategy. Municipalities engage in broad discussions on current and/or potential planned maintenance solutions. The impact of these solutions on the asset management process is assessed at a high level. Finally, the planned maintenance analysis is incorporated within the asset management plan calculations.

At the **intermediate level of maturity**, there will be full incorporation of planned maintenance solutions into the lifecycle management strategy by asset type. Municipalities engage in detailed discussions on current and/or potential planned maintenance solutions at a staff level. The impact of these solutions on the asset management process is assessed by asset type. Finally, the planned maintenance analysis is incorporated within the asset management plan calculations.

At the **advanced level of maturity**, there will be full incorporation of planned maintenance solutions into the lifecycle management strategy at a detailed asset level. Municipalities engage in detailed discussions on current and planned maintenance solutions over a long-term forecast period. The impact of these solutions on the asset management process is assessed at a detailed asset level. Finally, the planned maintenance analysis is incorporated within the asset management plan calculations.

Maintenance vs. Rehabilitation

Maintenance solutions from an asset management perspective includes regularly scheduled costs to inspect or maintain assets, or in some cases, one-time repair costs that don’t meet the definition of capital/rehabilitation. Section 3150 of the PSAB handbook provides an approach to identify repairs and maintenance versus rehabilitation or “betterments” as follows:

Non-Complex Network Assets (Facilities, Vehicles, Equipment, Land Improvements):

Service potential is enhanced (i.e. costs should be capitalized as rehabilitation) when:

- There is an increase in previously assessed output or service capacity;
- Operating costs are lowered;
- Useful life is extended; or
- The quality of output is improved (if applicable).

Complex Network Assets (Roads, Watermains, Wastewater mains, Stormwater Mains):

Service potential is enhanced (i.e. costs should be capitalized as rehabilitation) when:

- There is an increase in previously assessed output or service capacity. This may or may not increase the useful life of the applicable assets.

To reiterate, the maintenance activities for complex network assets – which are assets that form a network pattern – are those that maintain the predetermined service potential of the applicable assets. This practice is in place to ensure a maintenance activity (such as road-related pothole filling or crack sealing) is recorded as maintenance, rather than recorded as rehabilitation (i.e. capital). Even though pothole filling and crack sealing can increase the remaining life of a road, these types of activities do not increase the previously assessed service capacity.

Historical Maintenance

Municipalities might first review historical maintenance data as they begin to consider the appropriate level of planned maintenance to undertake over a forecast period. The historical data may lead to a number of question related to spending patterns, such as:

- Is this the correct level of spending?
- Should spending levels be higher or lower, and if so, on which criteria should these decisions be based?
- Where should the focus be for planned maintenance spending?
- What has been the impact of historical maintenance on our assets?

If a municipality can assess the impact of current maintenance activities on service levels (through asset condition and risk), it can be determined whether the extent of those maintenance activities is acceptable going forward over the forecast period, or if changes are required. This will be discussed further in the next section.

The collection of historical maintenance data within the asset register (see Chapter 3) can provide key data to assist in developing future maintenance strategies. Areas of concern can be uncovered, providing a basis for developing priorities. For example, assets may be identified that required high maintenance historically, or the assets are experiencing increasing maintenance costs over time, which may be supported by a declining condition rating. It is incumbent upon municipalities to identify these types of assets in order to be in the best position to direct resources and attention where most needed. For example, a decision might be made to continue to maintain the asset, which may require increasing the maintenance budget. Conversely, a decision might be made to rehabilitate or replace the asset, which could reduce future projected maintenance.

Maintenance Impact on Assets

The decision to revise historical maintenance levels should be made following an analysis of all lifecycle costs and expected levels of service. For example, if an asset is not meeting expected levels of service, the municipality will need to determine the lifecycle costs necessary to reach those expected levels. These costs might include maintenance adjustments and, potentially, other lifecycle costs (such as rehabilitation and replacement). Based on a municipality's maturity level, this can be done using a more high-level (corporate) approach, a more intermediate asset type approach, or a more detailed asset approach. Examples are provided in Table 5-4 (below).

Table 5-4
Sample Maintenance Solutions – Levels of Maturity

Maturity Level	Levels of Service Comments	Maintenance Impact
Basic	Assets as a whole are not meeting expected service levels	Increase all maintenance by 5% per year and monitor impact on service levels annually
Intermediate	One particular asset type is not meeting expected service levels	Increase maintenance programs from $500,000 to $1.2 million over 10 years to provide expected levels of service (can be increases to existing programs or new programs)
Advanced	One particular asset is not meeting expected service levels	Increase maintenance programs from $5,000 to $12,000 over 10 years to provide a specific expected service level (can be increases to existing programs or new programs)

5.6 Maintenance Solutions – Approach

A detailed analysis of the relationship between maintenance levels and asset condition and risk will ensure that the proposed maintenance solutions are aligned with expected levels of service.

What method is used to incorporate planned maintenance solutions into the lifecycle management strategy?

Background

Municipalities engage in a number of approaches to determine how much maintenance should be carried out in a given year. A simple approach may be to base maintenance spending on prior years' operating budgets, apply an inflationary increase, and adjust for any necessary ad hoc adjustments for 'out of the ordinary' or 'new' spending. Other municipalities will undertake a more detailed approach, taking into account the condition of their assets, risk levels, and desired levels of service to be provided.

Levels of Maturity

What method is used to incorporate planned maintenance solutions into the lifecycle management strategy?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Based on historical practices and ad hoc reactionary adjustments	**Some consideration for asset condition, risk, and level of service**	**Full consideration of asset condition, risk, and level of service**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Review and document historical maintenance solutions in place at the municipality	1. Discuss and document proposed maintenance solutions	1. Discuss and document proposed maintenance solutions
	2. Assess the impact of historical practices on the AM process	2. Ensure the proposed maintenance solutions have some consideration for asset condition, risk, and expected levels of service	2. Ensure the proposed maintenance solutions have full consideration for asset condition, risk, and expected levels of service
	3. Make high-level changes to the historical practices and determine associated impacts based on future plans	3. Assess the impact of proposed maintenance solutions on the AM process, with some consideration for overall impact on long-term forecast and asset remaining life	3. Assess the impact of proposed maintenance solutions on the AM process, with detailed consideration for overall impact on long-term forecast and asset remaining life

At the **basic level of maturity**, municipalities will tend to incorporate planned maintenance solutions into the lifecycle management strategy based on historical practices and may include subsequent ad hoc adjustments. These municipalities will review and document historical maintenance solutions that are in place. The impact of these practices on the asset management process is assessed. Past practices are updated with any high-level changes included in future maintenance plans. The associated impacts of these changes is determined and considered for use in the budgeting process.

At the **intermediate level of maturity**, municipalities incorporating planned maintenance into their lifecycle management strategy give some consideration to asset condition, risk, and levels of service. Proposed maintenance solutions are discussed and documented. Municipalities ensure the proposed maintenance solutions will lead to some improvement in asset condition, risk, and levels of service. The impact of these solutions on the asset management process is assessed, with some consideration for the overall impact on the long-term forecast and the assets' remaining life.

At the **advanced level of maturity**, municipalities incorporating planned maintenance into their lifecycle management strategy give full consideration to asset condition, risk, and levels of service. Proposed maintenance solutions are discussed and documented. Municipalities ensure the proposed maintenance solutions fully take into account impacts on asset condition, risk, and levels of service. The impact of these solutions on the asset management process is assessed, with detailed consideration for the overall impact on the long-term forecast and the assets' remaining life.

Planned Maintenance Strategy

This section introduces the concept of a "planned maintenance strategy", which identifies the role of planned maintenance in the asset management planning process. Maintenance decisions should be made in consideration with other lifecycle costs (i.e. rehabilitation and replacement), and be based on factors such as:

- Asset condition;
- Asset risk; and
- Expected levels of service.

Through this decision-making process the municipality will need to answer:

Does maintenance provide an improvement in asset condition, a mitigation of risk, and/or a movement towards expected levels of service in an efficient and effective manner?

And,

Does maintenance defer other lifecycle costs to the point where savings are projected?

These questions become more complicated when other lifecycle costs are brought into the equation. Finding the optimal level of maintenance, rehabilitation, and replacement lifecycle costs over a forecast period is the definition of lifecycle optimization. Weighing the lifecycle costs against the potential improvement in condition, mitigation of risk, and movement towards expected service levels becomes the ultimate goal within the lifecycle management strategy.

While *planned* maintenance should be integrated into the asset management process, *unplanned* maintenance should be discussed as well. Significant and dramatic increases in asset risk, even to the point of asset failure, can represent a need for unplanned maintenance. While one of the objectives of asset management planning is to minimize these events, they are not completely avoidable. In the case of asset failure, municipalities will need to assess whether the best strategy is to:

- Perform maintenance work;
- Rehabilitate;
- Replace the asset;
- Apply non-infrastructure solutions; or
- Do nothing (i.e. allow the asset to continue to fail).

While considering the strategies above, municipalities need to decide whether to base planned maintenance on historical trends or develop new maintenance strategies that take risk and/or asset condition into account. Either way, lifecycle costs should be quantified as part of the lifecycle management strategy as well as the impact on the assets themselves. (i.e. useful life, condition, risk, etc.).

5.7 Rehabilitation Solutions – Introduction

Asset rehabilitation often extends service life and/or improves level of service, at a fraction of the cost of asset replacement. Relative to a simple replacement analysis, incorporating asset rehabilitation solutions into the lifecycle management strategy is a more accurate way of predicting future lifecycle costs.

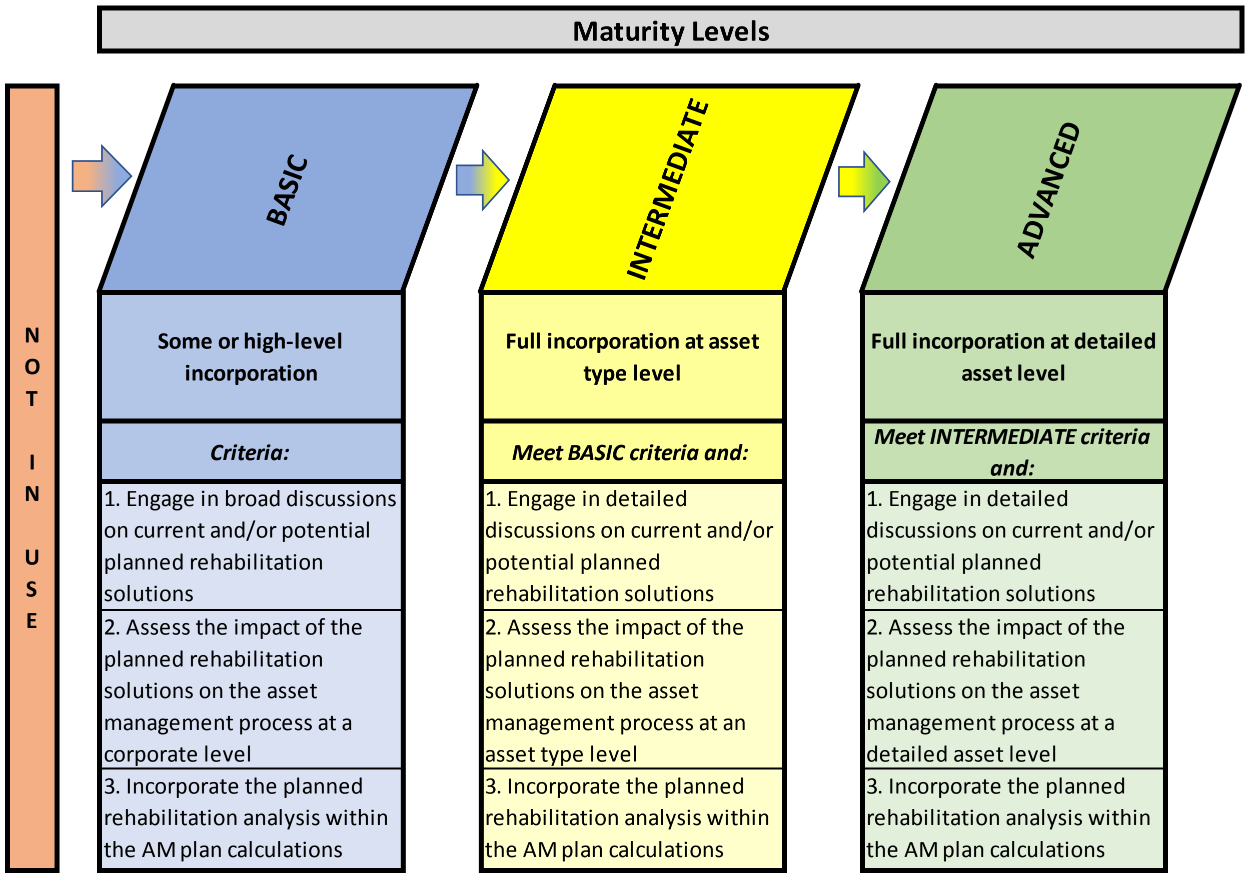
To what extent are planned rehabilitation solutions incorporated into the lifecycle management strategy?

Background

Municipalities will approach planned rehabilitation solutions in a number of ways. Some will base their plans on broad discussions at the corporate level, whereas others will engage in more detailed discussions with a focus on the asset type, or even at a detailed asset level.

Levels of Maturity

To what extent are planned rehabilitation solutions incorporated into the lifecycle management strategy?



At the **basic level of maturity**, there will be some high-level incorporation of planned rehabilitation solutions into the lifecycle management strategy. Municipalities at the basic level of maturity engage in broad discussions on current and/or potentially new planned rehabilitation solutions. The impact of these solutions on the asset management process is assessed at a corporate level. Finally, the planned rehabilitation analysis is incorporated within the asset management plan calculations.

At the **intermediate level of maturity**, there will be full incorporation of planned rehabilitation solutions into the lifecycle management strategy at the asset type level. Municipalities engage in detailed discussions on current and potential planned rehabilitation solutions to be incorporated over the forecast period. The impact of these solutions on the asset management process is assessed at the asset type level. Finally, the planned rehabilitation analysis is incorporated within the asset management plan calculations.

At the **advanced level of maturity**, there will be full incorporation of planned rehabilitation solutions into the lifecycle management strategy at a detailed asset level. Municipalities engage in detailed discussions on current and potential planned rehabilitation solutions. The impact of these solutions on the asset management process is assessed at a detailed asset level. Finally, the planned rehabilitation analysis is incorporated within the asset management plan calculations.

Rehabilitation vs. Maintenance

Rehabilitation from an asset management perspective includes significant repairs that, in many cases, extend asset life. Section 3150 of the PSAB handbook provides an approach to identify rehabilitation (or "betterments") versus repairs and maintenance, as follows:

Non-Complex Network Assets (Facilities, Vehicles, Equipment, Land Improvements):

Service potential is enhanced (i.e. costs should be capitalized as rehabilitation) when:

- There is an increase in previously assessed output or service capacity;
- Operating costs are lowered;
- Useful life is extended; or
- The quality of output is improved (if applicable).

Complex Network Assets (Roads, Watermains, Wastewater mains, Storm Mains):

Service potential is enhanced (i.e. costs should be capitalized as rehabilitation) when:

- There is an increase in previously assessed output or service capacity. This may or may not increase the useful life of the applicable assets.

To reiterate, complex network assets – which are assets that form a network pattern – rehabilitation activities increase the predetermined service potential while maintenance activities simply maintain the predetermined service potential of the applicable assets. This practice is in place to ensure rehabilitation activities such as the lining of wastewater mains are recorded as rehabilitation (i.e. capital). Conversely, maintenance activities such as road-related pothole filling or crack sealing, should be recorded as maintenance, rather than be identified as rehabilitation (i.e. capital). Although pothole filling and crack sealing could increase the remaining life of a road, these solutions do not increase the previously assessed service capacity.

Historical Rehabilitation

Municipalities might first review historical rehabilitation data as they begin to consider the appropriate level of planned rehabilitation to undertake over a forecast period. The historical data may lead to a number of question related to spending patterns, such as:

- Is this the correct level of spending?
- Should spending levels be higher or lower, and if so, on which criteria should these decisions be based?
- Where should the focus be for planned rehabilitation spending?
- What has been the impact of historical rehabilitation on our assets?

If a municipality can assess the impact of current rehabilitation practices on service levels (through asset condition and risk), it can determine whether the extent of those rehabilitation practices is acceptable going forward over the forecast period, or if changes are required. This will be discussed further in Section 5.7.

As discussed in Section 5.5, the collection of historical maintenance data within the asset register (see Chapter 3) can provide key data to assist in developing future rehabilitation strategies. Areas of concern can be uncovered, providing a basis for developing priorities. For example, assets may be identified that required high maintenance historically, or the assets are experiencing increasing maintenance costs over time, which may be supported by a declining condition rating. It is incumbent upon municipalities to identify these assets and be in the best position to direct resources and attention where most needed. For example, the decision could be made to continue to maintain the asset, which requires increasing the maintenance budget. Conversely, the decision could be made to rehabilitate or replace the asset, which could reduce future projected maintenance.

Rehabilitation Impact on Assets

The decision to revise historical rehabilitation levels should be made through an analysis of all lifecycle costs, based on expected levels of service. For example, if an asset is not meeting expected levels of service, the lifecycle costs needed to reach those levels must be determined. This could include rehabilitation and, potentially, other lifecycle costs (such as maintenance and replacement). Based on a municipality's maturity level, this can be done using a more high-level (corporate) approach, a more intermediate asset type approach, or a more detailed asset approach. Examples are provided in Table 5-5 below:

Table 5-5
Sample Rehabilitation Impacts

Maturity Level	Levels of Service Comments	Rehabilitation Impact
Basic	Assets as a whole are not meeting expected service levels	Increase all rehabilitation programs by 5% per year and monitor impact on service levels annually for impact
Intermediate	One particular asset type is not meeting expected service levels	Increase rehabilitation from $1.0 million to $2.0 million over 10 years to provide expected levels of service (can be increases to existing programs or new programs)
Advanced	One particular asset is not meeting expected service levels	Increase rehabilitation on specific asset over forecast period to provide a specific expected service level (can be increases to existing programs or new programs)

5.8 Rehabilitation Solutions – Approach

Rehabilitation solutions embraced in the lifecycle management strategy should be driven by asset condition, risk, and expected levels of service. This will enable an accurate assessment of their impact on the assets in the long-term forecast.

What method is used to incorporate planned rehabilitation solutions into the lifecycle management strategy?

Background

Municipalities engage in a number of approaches to incorporate planned rehabilitation solutions into the lifecycle management strategy. A simple approach may be to base rehabilitation solutions on historical practices, then incorporate any necessary ad hoc adjustments for unexpected situations as they arise. Other municipalities may undertake a more detailed approach, taking into account the condition of their assets, risk levels, and desired levels of service to be provided.

Levels of Maturity

What method is used to incorporate planned rehabilitation solutions into the lifecycle management strategy?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Based on historical practices and ad hoc reactionary adjustments	**Some consideration for asset condition, risk, and level of service**	**Full consideration of asset condition, risk, and level of service**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Review and document historical rehabilitation solutions in place at the municipality	1. Discuss and document proposed rehabilitation solutions	1. Discuss and document proposed rehabilitation solutions
	2. Assess the impact of historical practices on the AM process	2. Ensure the proposed rehabilitation solutions have some consideration for asset condition, risk, and expected levels of service	2. Ensure the proposed rehabilitation solutions have full consideration for asset condition, risk, and expected levels of service
	3. Make high-level changes to the historical practices and associated impacts based on future plans	3. Assess the impact of proposed rehabilitation solutions on the AM process, with some consideration for overall impact on long-term forecast and asset remaining life	3. Assess the impact of proposed rehabilitation solutions on the AM process, with detailed consideration for overall impact on long-term forecast and asset remaining life

At the **basic level of maturity**, municipalities will tend to incorporate planned rehabilitation solutions into the lifecycle management strategy based on historical practices and may include subsequent ad hoc reactionary adjustments. Municipalities will review and document historical rehabilitation solutions that are in place. The impact of these practices on the asset management process is assessed. Past practices are updated with any high-level changes included in future rehabilitation plans. The associated impacts of these changes is determined and considered for use in the budgeting process.

At the **intermediate level of maturity**, municipalities incorporating planned rehabilitation into their lifecycle management strategy would give some consideration to asset condition, risk, and levels of service. Proposed rehabilitation solutions are discussed at a staff level and documented. Municipalities ensure the proposed rehabilitation solutions lead to some improvement in asset condition, risk, and levels of service. The impact of these solutions on the asset management process is assessed, with some consideration for the overall impact on the long-term forecast and the assets' remaining life.

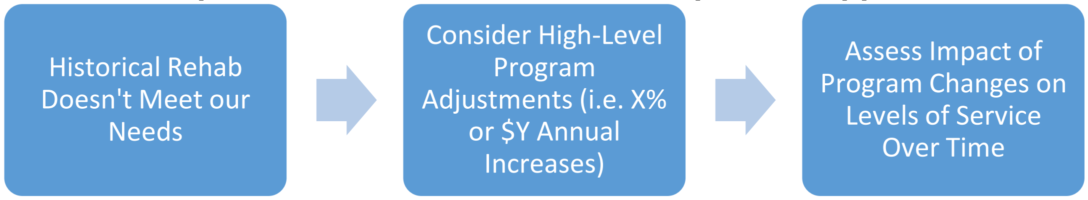
At the **advanced level of maturity**, municipalities incorporating planned rehabilitation into their lifecycle management strategy give full consideration to asset condition, risk, and levels of service. Proposed rehabilitation solutions are discussed at a staff level and documented. Municipalities ensure the proposed rehabilitation solutions take into account asset condition, risk, and levels of service. The impact of these solutions on the asset management process is assessed, with detailed consideration for the overall impact on the long-term forecast and the assets' remaining life.

Planned Rehabilitation Solutions - Approaches

Rehabilitation of certain assets can be appropriate when the asset is not maintaining or moving towards expected service levels but is not at a point in its lifecycle where replacement or maintenance is the optimal course of action. To determine appropriate planned rehabilitation solutions for the future, municipalities can follow different approaches. There are generally three broad categories for rehabilitation:

1. Top down
   Under the top down approach, historical rehabilitation programs would be used as a guide for future capital works. For example, municipalities may initiate "shave and pave" programs for some of their roads at a budgeted annual cost and would forecast continuing the program for a number of years. Similarly, a wastewater main relining program may be undertaken over a number of years. Taking these programs into account, municipalities would consider any adjustments to the programs or whether to add new programs. The municipality should assess the impact of these programs on the impacted assets' remaining useful life, replacement timelines, and the service being provided over time as the program adjustments take effect. Example:

Figure 5-2
Sample Rehabilitation Solutions – Top Down Approach

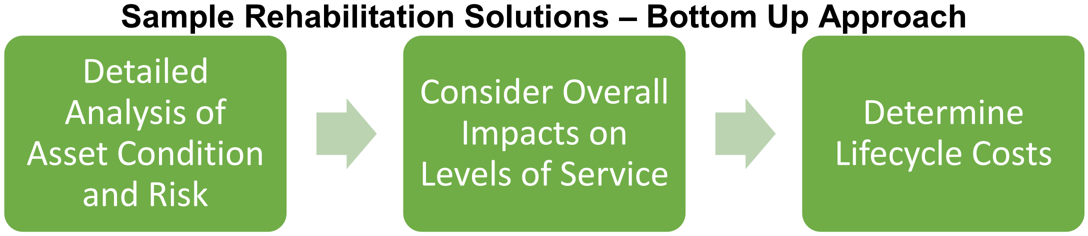


2. Predictive modelling
   The predictive modelling approach can be undertaken by municipal staff through an analysis of a set of planned actions that account for predicted effects on the assets and levels of service. This can be done at a broad level (by asset type) or at a detailed level (by detailed asset). While this can be attempted in spreadsheet format, asset management software would make this approach easier to implement. See Chapter 9 for further discussions on software as an asset management tool.

Figure 5-3
Sample Rehabilitation Solutions – Predictive Modelling Approach

3. Bottom up
   The bottom up approach is dependent on the identification of specific assets that require attention (i.e. consider specific asset risk ratings, condition ratings, and service levels). Assets identified would be scheduled for rehabilitation, with the impacts on the assets' remaining useful life and replacement timelines once again considered. Complex predictive modelling can assist with this process but is not required.

Figure 5-4
Sample Rehabilitation Solutions – Bottom Up Approach



To put these categories in context of asset management maturity:

Table 5-6
Sample Planned Rehabilitation Approaches – Level of Maturity

Maturity Level	Categories	Approach
Basic	Top Down Approach at Corporate Level	High-Level Rehabilitation Analysis (Corporate Level) Increase rehabilitation on all assets by 10%
Intermediate	Top Down or Predictive Modelling at the Asset Type Level	Rehabilitation at the Asset Type Level Increase rehabilitation on local roads by 10%
Advanced	Bottom Up or Predictive Modelling at the Detailed Asset Level	Rehabilitation at the Detailed Asset Level Increase rehabilitation on Smith St. by 10%

5.9 Replacement Solutions – Introduction

Incorporating replacement solutions into the lifecycle management strategy is important because asset replacement is often the most significant component of an asset's lifecycle cost.

To what extent are planned replacement solutions incorporated into the lifecycle management strategy?

Background

There are a number of ways that municipalities can approach planned replacement solutions. Some may base their plans on broad discussions at the corporate level, while others may engage in more detailed discussions with a focus on the asset type, or even at a detailed asset level.

Levels of Maturity

To what extent are planned replacement solutions incorporated into the lifecycle management strategy?

Maturity Levels

BASIC	INTERMEDIATE	ADVANCED
Some or high-level incorporation	**Full incorporation at asset type level**	**Full incorporation at detailed asset level**
Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
1. Engage in broad discussions on current and/or potential planned replacement solutions	1. Engage in detailed discussions on current and/or potential planned replacement solutions	1. Engage in detailed discussions on current and/or potential planned replacement solutions
2. Assess the impact of the planned replacement solutions on the asset management process at a corporate level	2. Assess the impact of the planned replacement solutions on the asset management process at an asset type level	2. Assess the impact of the planned replacement solutions on the asset management process at a detailed asset level
3. Incorporate the planned replacement analysis within the AM plan calculations	3. Incorporate the planned replacement analysis within the AM plan calculations	3. Incorporate the planned replacement analysis within the AM plan calculations

At the **basic level of maturity**, there will be some high-level incorporation of planned replacement solutions into the lifecycle management strategy. Municipalities engage in broad discussions on current and potentially new planned replacement solutions to incorporate into the forecast. The impact of these solutions on the asset management process is assessed at a corporate level. Finally, the planned replacement analysis is incorporated within the asset management plan calculations.

At the **intermediate level of maturity**, there will be full incorporation of planned replacement solutions into the lifecycle management strategy at the asset level. Municipalities engage in detailed discussions on current and potential planned replacement solutions. The impact of these solutions on the asset management process is assessed at an asset type level. Finally, the planned replacement analysis is incorporated within the asset management plan calculations.

At the **advanced level of maturity**, there will be full incorporation of planned replacement solutions into the lifecycle management strategy at a detailed asset level. Municipalities engage in detailed discussions on current and potential planned replacement solutions. The impact of these solutions on the asset management process is assessed at a detailed asset level. Finally, the planned replacement analysis is incorporated within the asset management plan calculations.

Replacement Program

Contrary to maintenance and rehabilitation identification, the recognition of an asset being replaced is relatively straightforward. With maintenance and rehabilitation, it will need to be determined whether the predetermined service potential should be changed to classify a cost as maintenance *or* rehabilitation (see Sections 5.5 and 5.6). Asset replacement simply entails replacing one asset with another. The replacement asset will either provide the same service potential or a completely different service. Please refer to the discussion in Chapter 3 regarding the difference between the reproduction cost and replacement cost of an asset.

Municipalities might first review historical replacement levels undertaken over a forecast period. The historical data may lead to a number of questions related to spending patterns, including:

- Is this the correct level of spending?
- Which criteria should drive decisions regarding spending levels?
- Where should the focus be for planned replacement spending?
- What has been the impact of historical replacement spending on our assets?

If a municipality can assess the impact of current replacement practices on service levels (through asset condition and risk), a determination can be made regarding whether that level of replacement is acceptable going forward over the forecast period, or if changes are required. This analysis can also happen at the specific asset level, assessing replacement needs on an asset-by-asset basis. This will be discussed further in the next section.

As discussed in Sections 5.6 and 5.7, the collection of historical maintenance data within the asset register (see Chapter 3) can provide key insights to assist in the development of future replacement strategies. Areas of concern can be uncovered, providing a basis for developing priorities. For example, assets may be identified that required high maintenance historically, or the assets are experiencing increasing maintenance costs over time, which may be supported by a declining condition rating. It is incumbent upon municipalities to identify such assets and be in the best position to direct resources and attention where most needed. For example, the decision could be made to continue to maintain the asset, which requires increasing the maintenance budget. Conversely, the decision could be made to rehabilitate or replace the asset, which could reduce future projected maintenance.

Replacement Impact on Assets

The decision to update historical replacement levels or patterns to suit present and future needs should be based on an analysis of all lifecycle costs and expected levels of service. For example, if a particular asset is not meeting levels of service expectations, the lifecycle costs to be incurred to move that asset towards providing expected service levels will need to be determined. This could include replacement and potentially other lifecycle costs (such as maintenance and rehabilitation). Based on the maturity level of the municipality, this can be done using a more high-level (corporate) approach, a more intermediate asset type approach, or a more detailed asset approach. Table 5-7 provides examples of replacement impacts.

Table 5-7
Sample Replacement Impacts – Level of Maturity

Maturity Level	Levels of Service Comments	Replacement Impact
Basic	Assets as a whole are not meeting expected service levels	Increase all replacement programs by 5% per year and monitor impact on service levels annually
Intermediate	One particular asset type is not meeting expected service levels	Increase replacement program from $5.0 million to $9.0 million over 10 years to provide an expected level of service
Advanced	One particular asset is not meeting expected service levels	Increase replacement on specific asset over forecast period to provide a specific expected service level

5.10 Replacement Solutions – Approach

A detailed consideration of asset replacement solutions within the lifecycle management strategy will enable the impact of these solutions to be measured and accounted for in the long-term forecast.

What method is used to incorporate planned replacement solutions into the lifecycle management strategy?

Background

Municipalities engage in a number of approaches to incorporate planned replacement solutions into the lifecycle management strategy. A simple approach may be to base replacement solutions on historical practices, with any necessary ad hoc adjustments for unexpected situations as they arise. Other municipalities may undertake a more detailed approach, taking into account the condition of their assets, risk levels, and expected levels of service to be provided.

Levels of Maturity

What method is used to incorporate planned replacement solutions into the lifecycle management strategy?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Based on historical practices and ad hoc reactionary adjustments	**Some consideration for asset condition, risk, and level of service**	**Full consideration of asset condition, risk, and level of service**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Review and document historical replacement solutions in place at the municipality	1. Discuss and document proposed replacement solutions	1. Discuss and document proposed replacement solutions
	2. Assess the impact of historical practices on the AM process	2. Ensure the proposed replacement solutions have some consideration for asset condition, risk, and expected levels of service	2. Ensure the proposed replacement solutions have full consideration for asset condition, risk, and expected levels of service
	3. Make high-level changes to the historical practices and associated impacts based on future plans	3. Assess the impact of proposed replacement solutions on the AM process, with some consideration for overall impact on long-term forecast and asset remaining life	3. Assess the impact of proposed replacement solutions on the AM process, with detailed consideration for overall impact on long-term forecast and asset remaining life

At the **basic level of maturity**, municipalities will tend to incorporate planned replacement solutions into the lifecycle management strategy based on historical practices and may include subsequent ad hoc reactionary adjustments. Municipalities will review and document historical replacement solutions that are in place. The impact of these practices on the asset management process is assessed. Past practices are updated with any high-level changes included in future replacement plans. The associated impacts of these changes is determined and considered for use in the budgeting process.

At the **intermediate level of maturity**, municipalities incorporating planned replacement into their lifecycle management strategy would give some consideration to asset condition, risk, and levels of service. Proposed replacement solutions are discussed at a staff level and documented. Municipalities ensure the proposed replacement solutions lead to some improvement in asset condition, risk, and levels of service. The impact of these solutions on the asset management process is assessed, with some consideration for the overall impact on the long-term forecast and the assets' remaining life.

At the **advanced level of maturity**, municipalities incorporating planned replacement into their lifecycle management strategy would give full consideration to asset condition, risk, and levels of service. Proposed replacement solutions are discussed at a staff level and documented. Municipalities ensure the proposed replacement solutions have full consideration for asset condition, risk, and levels of service. The impact of these solutions on the asset management process is assessed, with detailed consideration for the overall impact on the long-term forecast and the assets' remaining life.

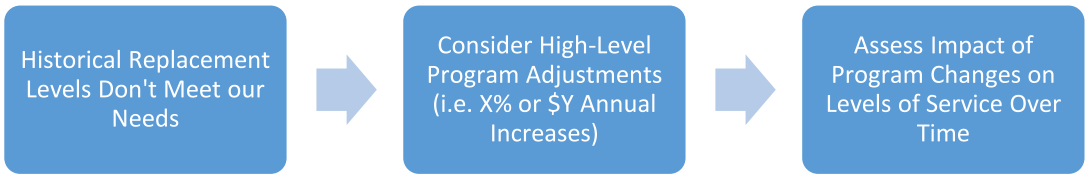
Planned Replacement Solutions - Approaches

Replacement of assets can be appropriate when the asset is not maintaining or moving towards expected service levels and has reached a point in its lifecycle where rehabilitation or maintenance are no longer optimal courses of action. In determining appropriate planned replacement solutions for the future, municipalities can follow different approaches (similar to the approaches identified for rehabilitation solutions above). There are generally three broad categories:

1. Top down
   Under the top down approach, historical replacement programs would be used as a guide for future capital works. For example, municipalities may initiate a road surface replacement program for their roads at a budgeted annual cost, and would forecast continuing the program for a number of years in the forecast. Similarly, a wastewater main replacement program may be undertaken over a

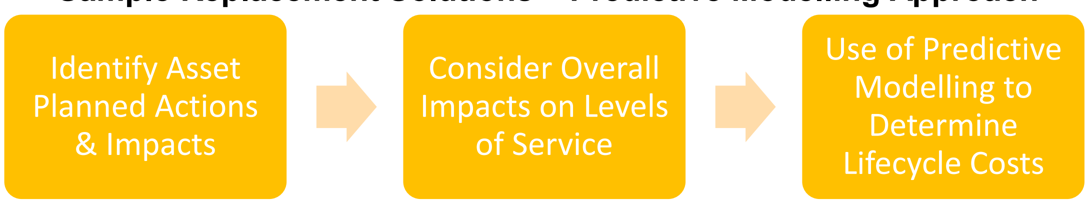
number of years. Taking these programs into account, municipalities would consider any adjustments to the programs or whether to add new programs. The municipality should assess the impact of these programs on the impacted assets' remaining useful life, replacement timelines, and the service being provided over time as the program adjustments take effect. Example:

Figure 5-5
Sample Replacement Solutions – Top Down Approach



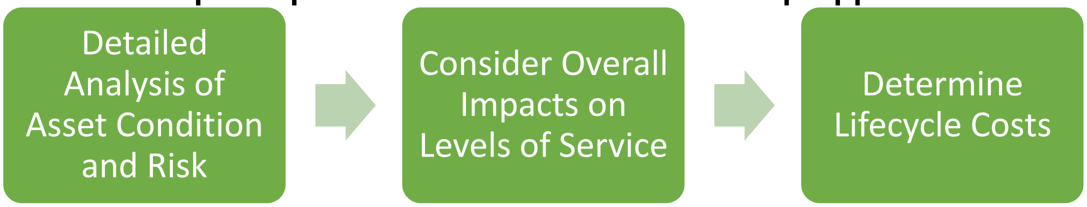
2. Predictive modelling
   The predictive modelling approach can be undertaken by municipal staff through an analysis of a set of planned actions that account for predicted effects on the assets and levels of service. This can be done at a broad level (by asset type) or at a detailed level (by detailed asset). While this can be attempted in spreadsheet format, asset management software would make this approach easier to implement. See Chapter 9 for further discussions on software as an asset management tool.

Figure 5-6
Sample Replacement Solutions – Predictive Modelling Approach



3. Bottom up
   The bottom up approach is dependent on the identification of specific assets that require attention (i.e. consider specific asset risk ratings, condition ratings, and service levels). Assets identified would be scheduled for replacement, with the impacts on the assets' remaining useful life, and replacement timelines once again considered. Complex predictive modelling can assist with this process but is not required.

Figure 5-7
Sample Replacement Solutions – Bottom Up Approach



To put these categories in context of asset management maturity:

Table 5-8
Sample Planned Replacement Solutions – Level of Maturity

Maturity Level	Categories	Approach
Basic	Top Down Approach at Corporate Level	High-Level Replacement Analysis (Corporate Level) Increase replacement on all assets by 10%
Intermediate	Top Down or Predictive Modelling at the Asset Type Level	Replacement at the Asset Type Level Increase replacement on local roads by 10%
Advanced	Bottom Up or Predictive Modelling at the Detailed Asset Level	Replacement at the Detailed Asset Level Increase replacement on Smith St. by 10%

5.11 Asset Expansion

Incorporating growth into the lifecycle management strategy ensures that the additional lifecycle costs associated with newly constructed/acquired assets and/or new services are accounted for in the long-term forecast.

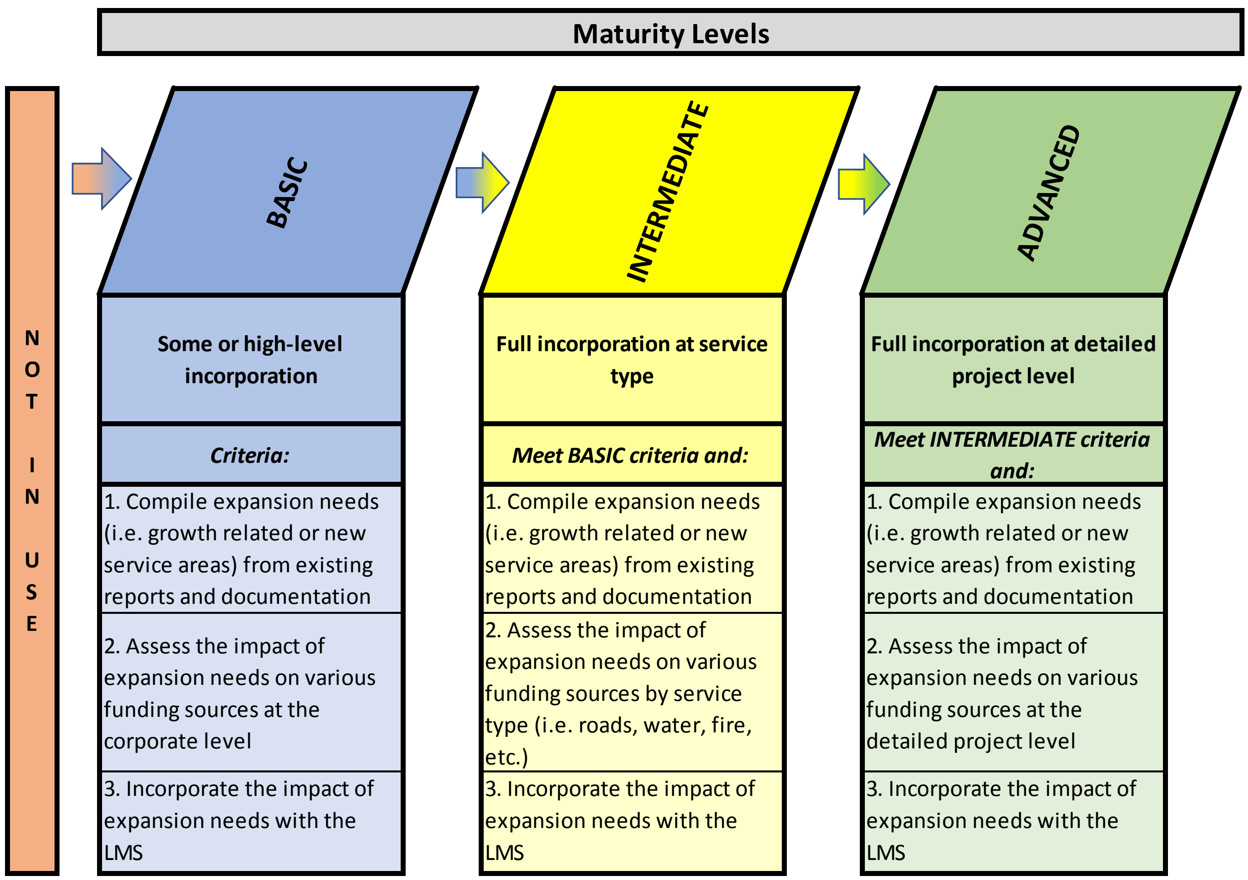
To what extent are growth and/or new service areas incorporated into the lifecycle management strategy?

Background

Municipalities can approach the incorporation of growth and/or new service areas in a number of ways. After compiling expansion needs from existing reports and documentation, some will assess the impacts on funding sources but only at the corporate level; some may take it a step further by assessing impact on funding sources by service type area; whereas others will go further still and assess impact on funding sources at the detailed project level.

Levels of Maturity

To what extent are growth and/or new service areas incorporated into the lifecycle management strategy?



At the **basic level of maturity**, there will be some incorporation or high-level incorporation of growth and/or new service areas into the lifecycle management strategy. Municipalities compile expansion needs (i.e. growth related or new service areas) from existing reports and documentation. The impact of these expansion needs on various funding sources is assessed, but generally at a high level only. The impact of the expansion needs are incorporated into lifecycle management strategy.

At the **intermediate level of maturity**, there will be full incorporation of growth and/or new service areas into the lifecycle management strategy by service type. Municipalities compile expansion needs (i.e. growth related or new service areas) from existing reports and documentation. The impact of these expansion needs on various funding sources is assessed by service type (i.e. roads, water, fire, etc.). The impact of the expansion needs is incorporated into lifecycle management strategy.

At the **advanced level of maturity**, there will be full incorporation of growth and/or new service areas into the lifecycle management strategy at the detailed project or asset level. Municipalities compile expansion needs (i.e. growth related or new service areas) from existing reports and documentation. The impact of these expansion needs on various funding sources is assessed at the detailed project level. The impact of the expansion needs is incorporated into the lifecycle management strategy.

Assets Expansion

Previous sections have detailed elements of lifecycle costing of existing assets within the context of the lifecycle management strategy. This section explores how to handle new and/or expanded assets in regards to upgrading, creating, purchasing, constructing, or receiving contributed assets (with contributed assets discussed more fully later in this chapter). As municipalities grow, become more complex, and receive demands from residents, expansion-related asset needs become a mechanism for allowing growth to occur and to provide new or expanded services.

Sources of New and Upgraded Assets

The demand for new assets, or the requirement to upgrade assets, can come from multiple sources, including:

1. **Future Growth Planning**: A process which can identify the need for new or expanded assets to meet increasing demands of providing existing services to an expanding population. For example:
    - A requirement to increase the stormwater drainage capacity in a high growth development area; or
    - The need to increase a two-lane road to a four-lane road due to traffic congestion as a result of an increase in residents and housing in the area.

2. **Gaps in the Levels of Service Provided**: When comparing current service levels to expected service levels,it may be determined that new or expanded assets are necessary. For example:
   - The proposed level of service is to maintain parks every week. Currently, parks are maintained every 2 weeks. To increase service levels, an additional mower is needed.
3. **Decision to Provide a New Service**: A municipality may decide that a new service is required within the municipality (or a previously contracted service may become a direct municipal service), resulting in the need for new or expanded assets to support this service. For example:
   - A municipality may decide to run and operate their water and wastewater systems, which was previously a contracted service. This requires additional vehicles and equipment.

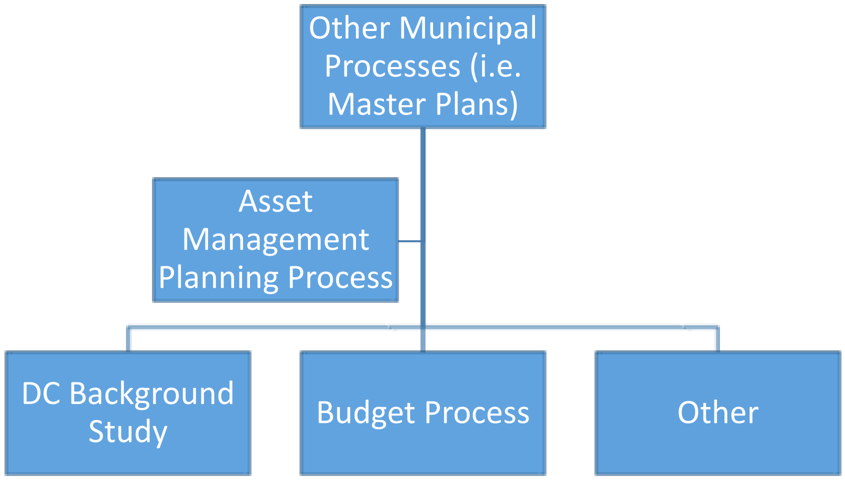
Determining Expansion Needs

Additional assets may be required as a result of the following expansion-related circumstances:

1. **Growth Planning and New Services**: Typically, these expansion needs are determined outside of the asset management planning process. Municipalities will have other various plans, policies, and strategies that deal with the concept of how that particular municipality is to grow. This can include:
   - Strategic Plans;
   - Official Plans;
   - Secondary Plans;
   - Master Plans; and
   - Other (i.e. Capital Plans).

   As illustrated in Figure 5-8 below, these plans, policies, and strategies feed growth planning and new service needs into the asset management process, as well as other processes, such as preparing a Development Charge (DC) Background Study. It is, then, these other processes, such as the DC Background Study, that can assist in determining allowable funding sources within the Financing Strategy (see Chapter 6).

Figure 5-8
Growth Planning and New Services Process



2. **Gaps in Levels of Service**: These expansion needs can come from the asset management planning process (such as the levels of service analysis – see Chapter 4), or can be supported by other municipal processes such as organizational reviews or efficiency/effectiveness reports.

5.12 Contributed Assets

Incorporating contributed assets into the lifecycle management strategy ensures that the additional lifecycle costs associated with these assets, beyond initial acquisition/construction, are accounted for in the long-term forecast.

To what extent are contributed assets incorporated into the lifecycle management strategy?

Background

Municipalities can approach the incorporation of contributed assets in a number of ways. After compiling details of anticipated contributed assets from existing reports and documentation, some municipalities will assess their impact on lifecycle management costs at the corporate level, whereas others will focus on their impact on the lifecycle management costs by asset type, or even at a detailed asset level.

Levels of Maturity

To what extent are contributed assets incorporated into the lifecycle management strategy?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Some or high-level incorporation	**Full incorporation at asset type level**	**Full incorporation at detailed asset level**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Compile details of anticipated contributed assets from existing reports and documentation	1. Compile details of anticipated contributed assets from existing reports and documentation	1. Compile details of anticipated contributed assets from existing reports and documentation
	2. Assess the impact of anticipated contributed assets on future lifecycle costs at the corporate level	2. Assess the impact of anticipated contributed assets on future lifecycle costs by asset type	2. Assess the impact of anticipated contributed assets on future lifecycle costs at the detailed asset level
	3. Incorporate the impact of expansion needs with the lifecycle management strategy	3. Incorporate the impact of expansion needs with the lifecycle management strategy	3. Incorporate the impact of expansion needs with the lifecycle management strategy

At the **basic level of maturity**, there will be some incorporation or high-level incorporation of contributed assets into the lifecycle management strategy. Municipalities at the basic level of maturity will compile details of anticipated contributed assets from existing reports and documentation. The impact on future lifecycle costs of these anticipated contributed assets is assessed, but generally at the corporate level only. The impact of the expansion needs is incorporated into the lifecycle management strategy.

At the **intermediate level of maturity**, there will be full incorporation of anticipated contributed assets into the lifecycle management strategy at the asset type level. Municipalities at the intermediate level of maturity will compile details of anticipated contributed assets from existing reports and documentation. The impact of these expansion needs on future lifecycle costs is assessed by asset type. The impact of the expansion needs is incorporated into the lifecycle management strategy.

At the **advanced level of maturity**, there will be full incorporation of anticipated contributed assets into the lifecycle management strategy at the detailed asset level. Municipalities at the advanced level of maturity will compile details of anticipated contributed assets from existing reports and documentation. The impact of these expansion needs on future lifecycle costs is assessed at the detailed asset level. The impact of the expansion needs is incorporated into the lifecycle management strategy.

Contributed Assets

Contributed assets can include:

- Assets assumed by a municipality, built by a developer (i.e. completion of a subdivision where roads, stormwater, water, wastewater, parks, etc. were included in the construction); and
- Assets donated to a municipality (i.e. a community group), or a community group agreeing to pay for a portion of an asset's purchase or rehabilitation.

The future lifecycle impact of contributed assets should be accounted for within the asset management planning process. While the municipality may not be responsible for the initial purchase or construction of the asset, other lifecycle costs such as operations, maintenance, and future rehabilitation or replacement will likely be the responsibility of the municipality.

Each municipality should identify a consistent approach to accounting for contributed assets from an asset management perspective. While, for accounting purposes, these assets don't have to be recorded until the date of assumption, asset management consideration can occur before this event, if desired. If the municipality has the ability to estimate the assets being contributed (in terms of asset types and date of contribution), these estimates can be used to start planning for future lifecycle costs within the lifecycle management strategy (long-term forecast). The municipality's approach to determine the specific point in time to account for contributed assets in the asset management process should be consistently applied, considering options such as:

- As soon as the municipality learns of the contributed assets;
- The year (or year before) the contributed asset is anticipated to be received/assumed; or

- As soon as the contributed asset is recorded for accounting purposes (typically date of assumption/receipt).

For this process to work, effective communication is needed between municipal departments to ensure future contributed assets can be identified in an appropriate manner, and at the right point in time.

5.13 Risk Assessments within the Lifecycle Management Strategy

Developing a framework for assessing risk can help municipalities to set priorities and appropriate treatment intervention points for specific assets.

How are risk assessments used within the lifecycle management strategy?

Background

The previous sections of this chapter dealt with the lifecycle cost categories that make up the lifecycle management strategy. This section will explore how risk assessments are used to identify areas for focus and priorities within the lifecycle management strategy. This will allow a municipality to effectively mitigate risk while moving towards expected levels of service from an asset management perspective.

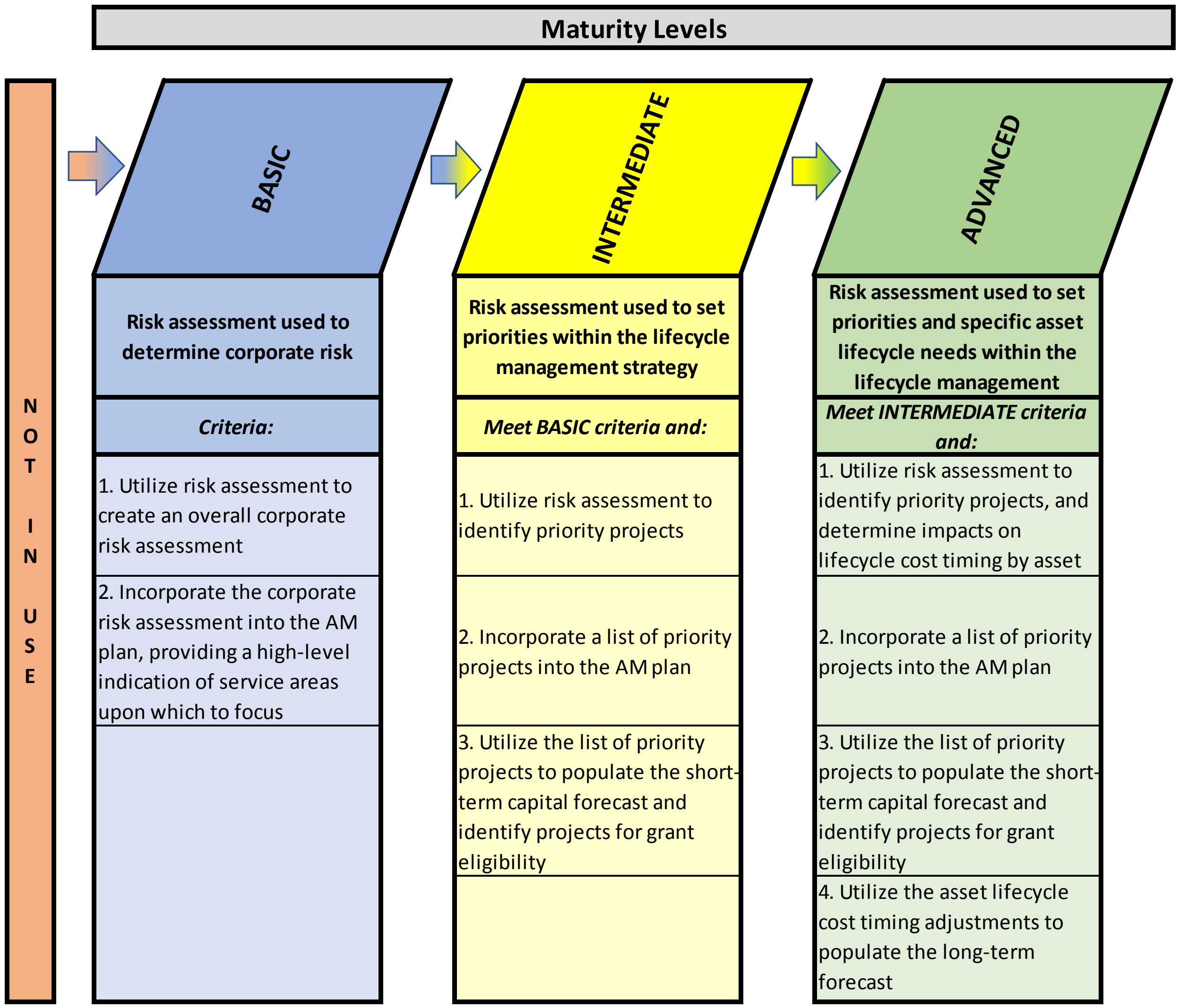
During the management and maintenance of assets there is an inherent risk associated with each activity. ISO 31000 – Risk management defines risk as:

"The effect of uncertainty on objectives"

Acknowledging risks and managing them appropriately helps to mitigate any implications associated with that risk, which enables municipal staff and Council to make informed decisions around how to manage infrastructure assets and their associated risks.

Levels of Maturity

How are risk assessments used within the lifecycle management strategy?



At the **basic level of maturity**, municipalities use risk assessment to determine corporate risk by service area. The resulting corporate risk assessment is incorporated into the asset management plan, providing a high-level indication of service areas upon which to focus in the lifecycle management strategy.

At the **intermediate level of maturity**, risk assessments are used to set priorities within the lifecycle management strategy. This is accomplished by utilizing risk assessment to identify priority projects, and then incorporating the list of priority projects into the lifecycle management strategy. The list of priority projects is utilized to populate the short-term capital forecast and to form the basis for determining grant eligibility.

At the **advanced level of maturity**, risk assessments are used to set priorities, as well as specific asset lifecycle needs within the lifecycle management strategy. Municipalities utilize risk assessments to identify priority projects, and determine the related impacts on lifecycle cost timing by specific asset. The list of priority projects is incorporated into the lifecycle management strategy. The list of priority projects is also used to populate the short-term to medium-term capital forecast and form the basis for determining grant eligibility.

Risk Management Approach

A risk management approach essentially defines what risk management means to the organization.

For the purposes of asset management, there are two types of risk:

1. **Corporate Risk**: The corporate level risk assessment looks at risks that affect the organization as a whole.
2. **Asset (Service) Risk**: The activity level risk assessment looks at risks affecting the management of a service and any associated infrastructure. This level of risk assessment also considers corporate risk and is the level most relevant to asset management.

One of the first steps in risk management is to understand the organization and define the risk context. Factors that influence risk management are identified through this process and a risk tolerance can be defined.

Three steps can be followed for this process.

1. Conduct a review that identifies internal and external factors that need to be considered when managing risks corporately.
2. Determine the organization’s risk tolerance, which can be expressed from the perspective of the organization, or for different types of services/risk.
3. Develop an overall risk management policy statement that is supported by staff and Council.

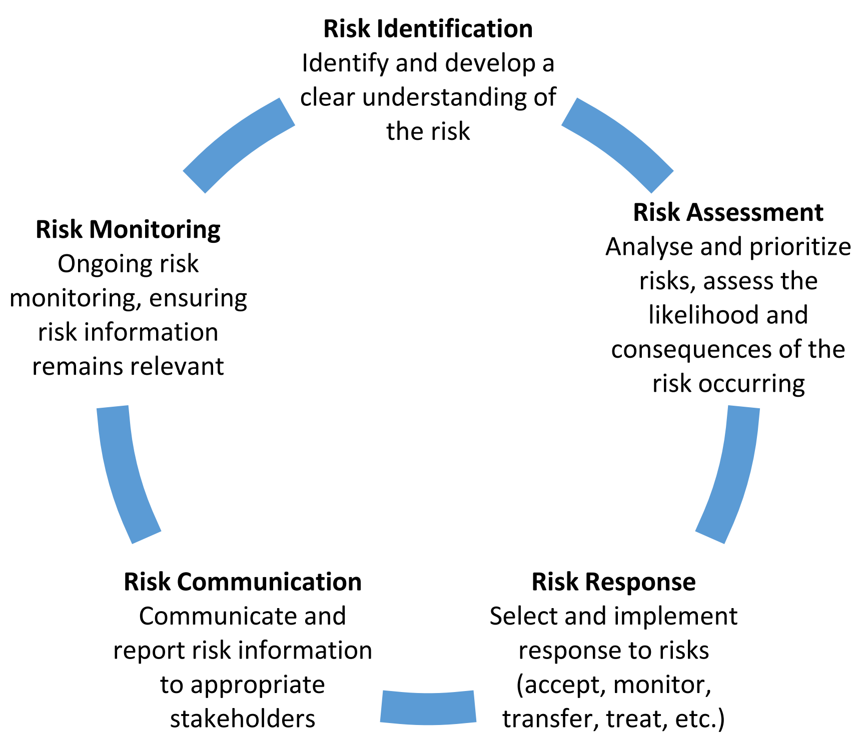
In understanding the organization from a risk perspective, a municipality should be able to describe the risk drivers affecting each service area. As discussed in Chapter 3, this includes determining the probability of assets failing as well as the consequence of assets failing, which results in services “failing”. For services that utilize assets with a high probability and/or consequence of failure, the minimization of risk can become a significant objective of asset management planning. Please refer to Chapter 3 for details on assessing asset risk.

Risk Management Process

A risk management process is usually established as a procedure and should be referred to in the asset management planning process and be integrated into decision-making to assist in mitigating risk.

A risk management process is a series of inter-related steps that guide the identification, assessment, response, communication, and monitoring of risks. The risk management process outlined in the Treasury Board of Canada Secretariat's (TBS) *Guide to Integrated Risk Management* (Section 4.6) is summarized in Figure 5-9 (below).

Figure 5-9
Risk Management Process



Uncertainty, from a risk perspective, results from a lack of information or some degree of unpredictability; while an effect is the change in expected outcomes as a result of something happening. To be effective when analyzing risks, both the possibility of risks occurring and the uncertainty of an organization meeting their objectives should have risk treatments applied to manage risk effects. Actions to minimize negative impacts should be included in an initial risk assessment to manage effects from possible risks and uncertainties.

Essentially, this recognizes that whenever one tries to meet an objective there's a chance that things won't go according to plan. There is always an element of risk and the outcomes are generally uncertain. A municipality can attempt to mitigate this and reduce uncertainty as much as possible through risk management.

Risk Assessment

Once the risk management process has been defined, the next step is to assess which risks are the most severe. An organization can then determine the level of exposure to each risk, and from there, the actions necessary from a lifecycle costing perspective to mitigate that risk. From an asset management perspective, since service levels are directly tied to assets, risk is applied to specific assets, depending on both probability and consequence of failure.

As described in Chapter 3, risk can be assessed using a risk matrix as detailed in Table 5-9 (below), whereby:

$$Probability\ of\ Failure \times Consequence\ of\ Failure = Asset\ Risk\ Score$$

There are also various deviations from this calculation (as described in Chapter 3), but all approaches focus on probability and consequence factors.

Table 5-9
Risk Assessment Matrix

Probability of Failure	Consequence of Failure				
	Insignificant	Minor	Moderate	Major	Significant
Rare	Low	Low	Medium	Medium	High
Unlikely	Low	Medium	Medium	Medium	High
Possible	Low	Medium	Medium	High	Extreme
Likely	Medium	Medium	High	High	Extreme
Almost Certain	Medium	High	High	Extreme	Extreme

Setting Priorities Using Risk

In previous sections, it was discussed that risk management and informed decision making are inherently linked. The simplest way to use risk to set priorities is through a risk matrix similar to the one shown above. The suggested steps to incorporate risk into the lifecycle management strategy include:

1. Identify the probability of asset failure;
2. Identify the consequence of that failure;
3. Combine the probability and consequence factors to obtain a risk ranking;

4. The asset or project with the highest risk should be attended to first through some type of lifecycle activity (non-infrastructure solutions, maintenance, rehabilitation, replacement, or expansion); and
5. Lifecycle activity costs identified are included in the lifecycle management strategy.

Please refer to Chapter 3 for more details on this calculation.

The *International Infrastructure Management Manual* (IIMM) provides a good illustration of this process from another perspective, shown below in Figure 5-10:

Figure 5-10
Work Prioritization Based on Risk – IIMM

(i) Probability of Failure

Failure Likely	Probability
Within 1 year	0.9
Within 2 years	0.7
Within 3 years	0.4
Within 4 - 5 years	0.2
Within 6 - 10 years	0.1
Within 11 - 20 years	0.05
Within 20 years plus	0.02

(ii) Consequence of Failure

Costs of Repair	Impact of Failure/ Customer Hours Affected			
	Less than 2,000	2,000 - 20,000	20,000 - 200,000	Over 200,000
Less than $10,000	0	2	4	6
$10,000 - $50,000	2	4	5	7
$50,000 - $500,000	5	7	8	9
Over $500,000	8	8	9	9

(iii) The probability and consequence factors are combined to rank each risk

Example	Probability	Consequence of Failure	Risk	Priority
1	0.05	9	0.45	3
2	0.9	2	1.8	2
3	0.4	7	2.8	1

Figure 3.4.9: Work Prioritisation Based on Risk

5.14 Multiple Lifecycle Management Strategy Scenarios

Developing and accessing multiple lifecycle management strategies ensures that an appropriate balance of costs and service levels can be achieved. In addition, multiple scenarios can assist municipalities in finding the most cost effective approach to providing the desired levels of service.

Has the municipality considered multiple lifecycle management strategy scenarios within its asset management plan?

Background

Municipalities can benefit from considering multiple lifecycle management strategy scenarios within their asset management plan. Comparing lifecycle cost forecasts versus asset performance (or service levels) over time for alternative strategies can assist municipalities to ensure that the most beneficial strategies are implemented.

Levels of Maturity

Has the municipality considered multiple lifecycle management strategy scenarios within its asset management plan?

Maturity Levels

NOT IN USE

BASIC	INTERMEDIATE	ADVANCED
One detailed lifecycle management strategy in place	**One detailed lifecycle management strategy in place, with a high-level sensitivity analysis of alternative strategies**	**Multiple lifecycle management strategies considered at a detailed level, with one approved by council**
Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
1. Consolidate lifecycle costing needs for each asset area into a long-term forecast	1. Consolidate lifecycle costing needs for each asset area into a long-term forecast	1. Consolidate lifecycle costing needs for each asset area into a long-term forecast
2. Ensure the long-term forecast considers expected levels of service	2. Prepare a sensitivity analysis on the forecast based on service level adjustments or different approaches to attaining expected LOS	2. Prepare alternate strategies based on service level adjustments or different approaches to attaining expected LOS
3. Attain staff support of the lifecycle management strategy across all departments	3. Attain staff support of the lifecycle management strategy across all departments	3. Attain staff support on preferred lifecycle management strategies across all departments
	4. Include the sensitivity analysis within the lifecycle management strategy	4. Include all relevant lifecycle management strategies within the lifecycle management strategy, and obtain council approval of a strategy through the AM plan

At the **basic level of maturity**, municipalities will typically have one detailed lifecycle management strategy in place. Lifecycle costing needs for each asset area are consolidated into a long-term forecast. The long-term forecast is developed with consideration for expected levels of service. Staff support for the lifecycle management strategy should be attained across all departments.

At the **intermediate level of maturity**, municipalities will have one detailed lifecycle management strategy supplemented by a high-level sensitivity analysis of alternative strategies. Lifecycle costing needs for each asset area are consolidated into a long-term forecast. A sensitivity analysis on the forecast is prepared based on service level adjustments, or alternative lifecycle costing approaches to achieving expected levels of service. Staff support for the lifecycle management strategy should be attained across all departments. The sensitivity analysis will form part of the lifecycle management strategy.

At the **advanced level of maturity**, multiple lifecycle management strategy scenarios are considered at a detailed level. Alternative strategies are prepared based on service level adjustments, or alternative lifecycle costing approaches to achieving expected levels of service. Lifecycle costing needs for each asset area are consolidated into long-term forecasts (one for each scenario). Staff support for the preferred lifecycle management strategy should be attained across all departments. All relevant strategy scenarios is included within the lifecycle management strategy, and Council approval of preferred scenarios should be obtained through the asset management plan.

Determining Lifecycle Management Strategy Scenarios

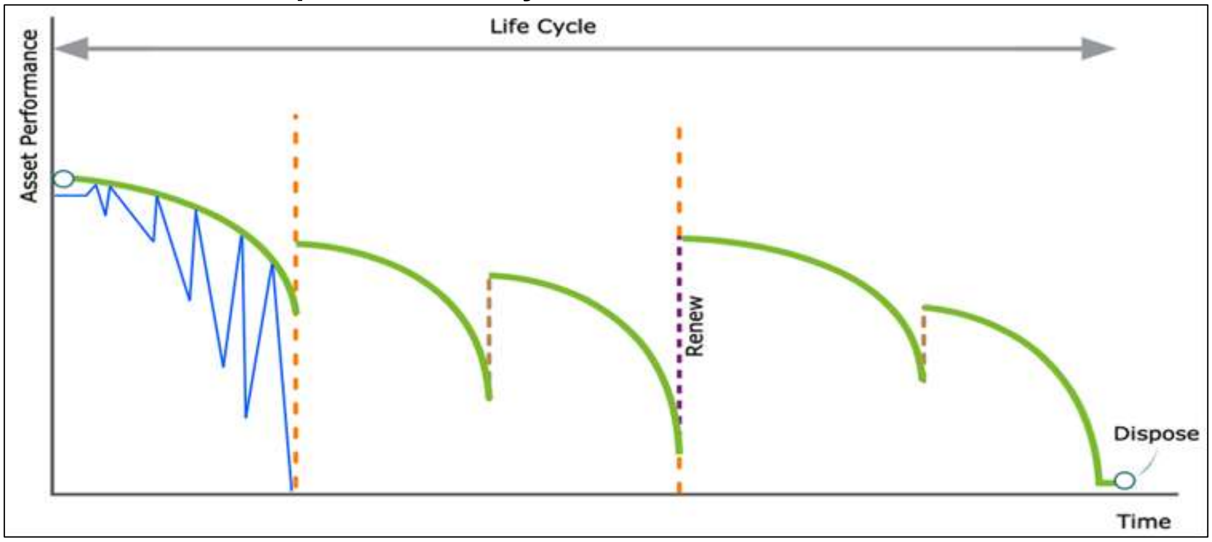
An optimal lifecycle management strategy would entail finding the most efficient/effective approach to managing assets throughout their life. The assets should be used in such a manner as to be as cost effective as possible (considering lifecycle costs), while delivering expected levels of service and mitigating risk. To facilitate this strategy, municipalities need to predict what lifecycle costs are needed, and when, including:

- Non-infrastructure solutions;
- Maintenance and operations;
- Rehabilitation;
- Replacement and disposal; and
- Expansion.

The lifecycle management strategy is the set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost

Figure 5-11 (below) represents a sample asset's lifecycle. The degradation line (green) depicts the performance/ condition levels at various stages throughout the asset' life. As expected, the performance/condition of the asset reduces as time passes. Scheduled condition assessments can provide important insights into the degradation curve.

Figure 5-11
Sample Asset Lifecycle with Planned Intervention



The blue line represents maintenance completed in the first segment of the graph (in reality this would continue over the entire life of the asset). The length of the blue lines represents the amount of maintenance required as the asset deteriorates. As the degradation curve slopes down on the *Asset Performance* axis, the total amount of maintenance increases.

The dashed lines (orange) represent asset renewal and rehabilitation. These types of activities enhance the asset's performance and service life. This is evidenced by the position of the degradation curve immediately following the dashed lines along the *Time* axis. By actively managing the lifecycle management strategy for this asset, it has had its performance and service life maximized. However, eventually, the asset is disposed of and replaced. Creating an optimal lifecycle management strategy entails this type of analysis for all assets of the municipality.

Table 5-10 (below) outlines a number of approaches available for municipalities, when considering how to manage a particular asset's lifecycle needs.

Table 5-10
Sample Lifecycle Management Scenarios

	Strategy	Considerations
Asset Based Solutions	Do nothing	Always consider 'doing nothing' as an option. This position would be the baseline against which other options are compared. In some cases, risk levels or levels of service requirements offer 'do nothing' as a legitimate alternative.
	Operational procedures	Operational management changes to limit peak demand, such as minimizing leakage (i.e. water), or modifying schedules for use of an asset, could be employed. Contingency plans can improve recovery times and reduce impacts of failure.
	Maintenance procedures	The level and timing of maintenance can improve asset performance and/or extend its useful life.
	Asset rehabilitation/renewal	Depending upon where an asset is on its lifecycle, rehabilitation may be an option to maintain service levels, or extend service life.
	Expansion	Where demand exists, investment may be required to create new assets, or to augment/enhance existing ones.
	Asset replacement/disposal	An asset which is no longer providing adequate service levels may have to be disposed of and replaced, or reconfigured to meet alternative business needs.
Non-Asset Based Solutions	Reduce demand for service	Strategies to reduce demand can be employed such as pricing incentives and provision of alternative services (i.e. promote several parks).
	Reduce levels of service	Accept lower levels of service for certain identified assets (i.e. pavement surfaces could be allowed to deteriorate to a lower condition level for certain local roads).
	Educate customers	Use communication/information to allow customers to manage their use of assets (i.e. carpooling or water conservation) and their expectations of asset performance and failure rates.

Comparing Lifecycle Scenarios: Net Present Value

With multiple lifecycle management scenarios possible within an asset management plan, a methodology is required to compare these scenarios to determine the scenario with the “lowest lifecycle cost”. One possible methodology is a *net present value* analysis.

The timing and cost of interventions and maintenance, and therefore the real lifecycle costs, are impacted by the time value of money. In simple terms, this means that to be able to have $1.00 to spend in the future, you would have to invest less than $1.00 today. As a result, to compare future expenditures over a lifecycle, the value of all expenditures need to be discounted back to a current-day value. This is called Net Present Value (NPV), also known as Net Present Worth (NPW).

The formula for NPV is:

$$\sum_{n=0}^{N} \$C_n \left[\frac{1}{(1+r)^n}\right]$$

Where:

- $0 =$ year 0 of the analysis period;
- $N =$ the number of years in the analysis period;
- $\$C_n =$ the cost in year n;
- $r =$ the discount (inflation) rate as a decimal (e.g. 0.03 for 3%); and
- $n =$ the number of years into the future from year 0.

NPV is used to compare strategies that have the same duration (i.e. 2 scenarios that cover a 20-year forecast period). Applying the concept of NPV assists in determining the scenario with the lowest lifecycle cost. From a common-sense point of view, this approach is taking the inflated lifecycle costs in each year of the forecast and deflating them to put all into current year terms. In the example below, Table 5-11, scenario 1 and scenario 2 have the same inflated lifecycle costs over the 5-year forecast ($400,000), however scenario 2 has a lower NPV.

Table 5-11
Sample Net Present Value Scenarios

year	0	1	2	3	4	5	TOTAL
Scenario 1 Inflated		50,000	65,000	80,000	95,000	110,000	400,000
Scenario 1 NPV (yr = 0)		48,544	61,269	73,211	84,406	94,887	362,317
Scenario 2 Inflated		40,000	45,000	60,000	130,000	125,000	400,000
Scenario 2 NPV (yr = 0)		38,835	42,417	54,908	115,503	107,826	359,490

Therefore, creating and selecting lifecycle management scenarios entails looking at many objectives, such as:

- The levels of service provided;

- The risk being mitigated; and
- Minimizing lifecycle costs in current year dollars (i.e. through NPV calculations).

Why Optimize?

Municipalities must make good decisions as to how, where, and when they spend the limited funds available for infrastructure (capital and operating). This means gaining the most benefit from capital expenditure and minimizing maintenance costs without compromising service or risk levels over a long period. Therefore, a primary objective of asset management planning is to achieve the best cost versus service outcome.

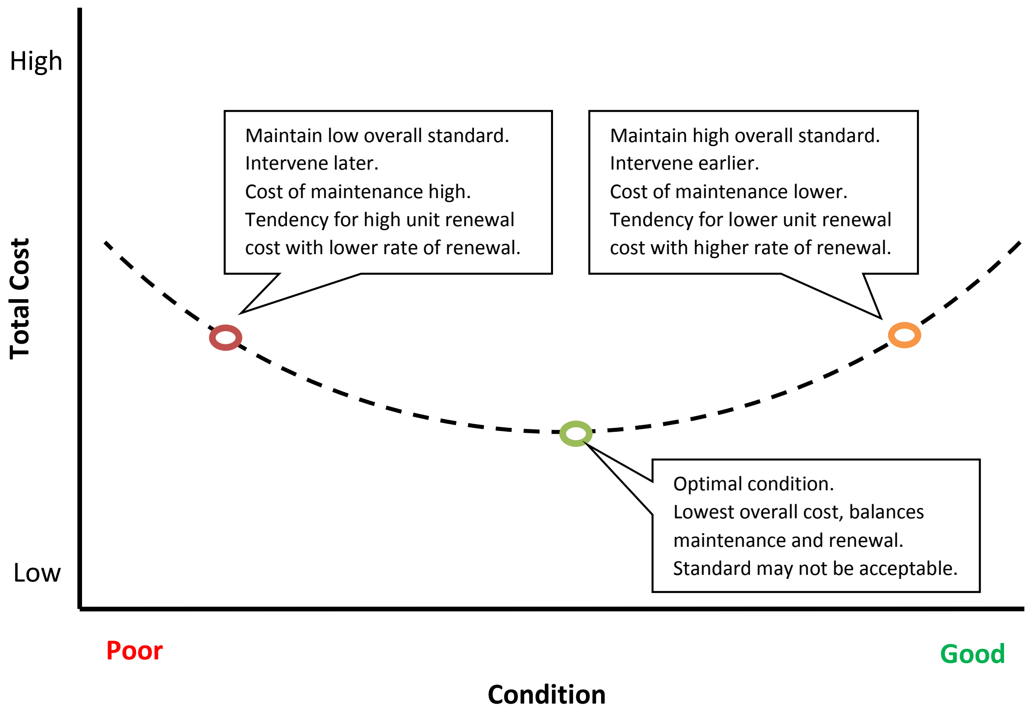
There are numerous asset management software packages that use deterministic, and/or probabilistic, techniques to model asset behaviour to predict future capital and operating budgets as well as asset condition. Many asset management software packages also include the ability to optimize aspects such as cost, risk, and other benefits. Concepts of modelling optimization are dealt with in more detail in Chapter 9.

What is Optimal?

Optimal outcomes for asset managers can mean different things. In previous sections of this chapter, lifecycle costing types were discussed. The lowest lifecycle cost could be termed as an optimal outcome from a finance point of view. If, however, the lowest lifecycle cost strategy does not deliver satisfactory levels of service, it would be a sub-optimal outcome from the customer's point of view.

This is demonstrated by Figure 5-12 below. The figure is based on the theory used by most modelling tools that costs are high to support a network in poor condition due to higher maintenance costs. Further, maintaining a network in very good condition also leads to high costs due to the need for more frequent renewal. Under this concept, the optimal cost level will be at some point between good and poor condition (the lowest point of the curve). The condition that correlates to that cost, however, may not be acceptable. So, a sub-optimal cost would be arrived at for the desired condition.

Figure 5-12
Lifecycle Management Scenarios – Optimal



Essentially, what asset managers should be striving for are levels of service that are either at the optimal point, or somewhere to the right of optimal, based on the example above.

Optimization is often constrained by available funding. For instance, it is not possible to fully optimize a condition outcome if funds are insufficient for the total maintenance and capital required. In these circumstances, the optimization will likely be the achievement the best all-round service outcome with the limited funding and involves balancing maintenance and capital costs with a number of benefits related to condition, risk, and other service aspects.

Typically, when using predictive modelling tools and optimization, a number of scenarios should be developed to evaluate differing funding levels and timing, differing service targets, and trade-offs between funding and service. After evaluation, a final scenario will be adopted as the preferred lifecycle management strategy.

5.15 Identifying Capital Priorities

Clear identification of capital priorities, spanning multiple years of the forecast period allows municipalities to outline critical projects within the asset management plan. It also provides a mechanism for determining projects eligible for grant funding, and provides linkages to key projects within the budget process.

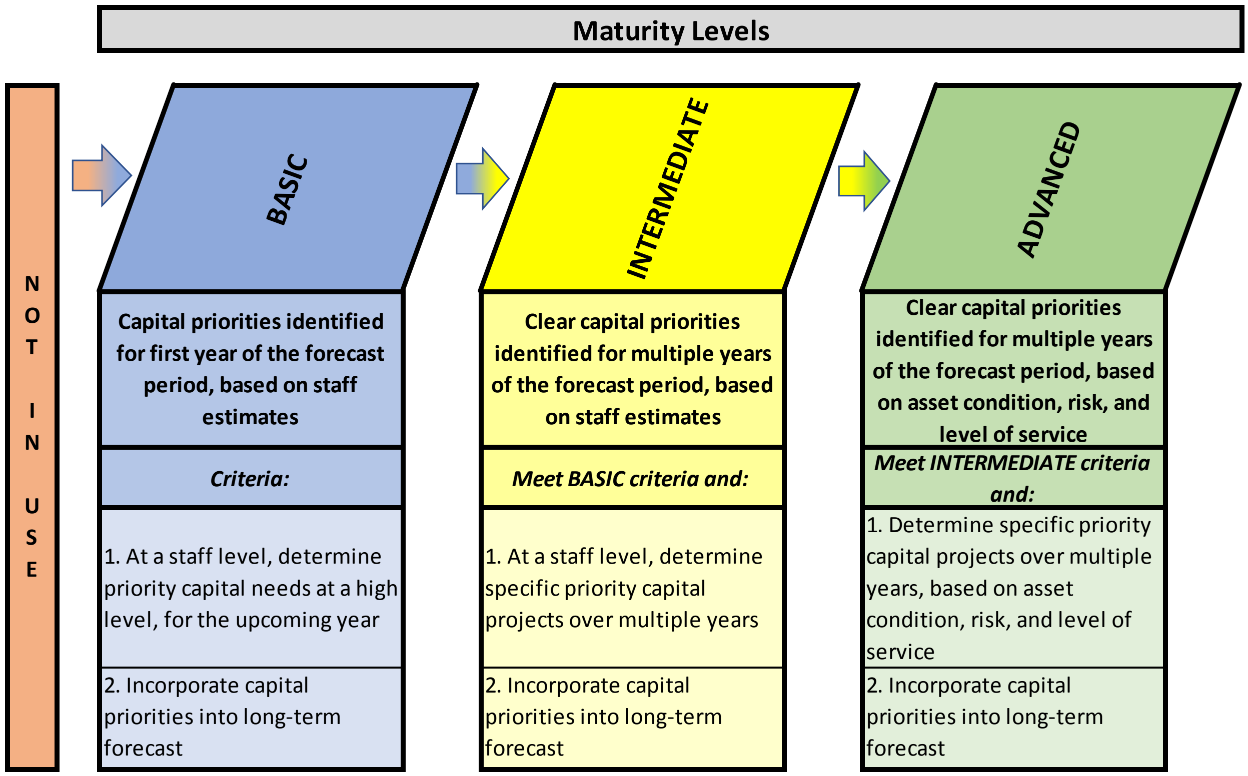
Are clear capital priorities established within the lifecycle management strategy?

Background

Capital investment is typically a combination of capital asset rehabilitations, replacements, and expansions. A methodology was introduced in the risk discussion in the section above that can assist municipalities to establish clear priorities based on a risk management approach. The clear identification of capital priorities is critical for the lifecycle management strategy, as it is a prerequisite for provincial grant funding applications and federal gas tax funding reporting.

Levels of Maturity

Are clear capital priorities established within the lifecycle management strategy?



At the **basic level of maturity**, municipalities will identify capital priorities for the first year of the forecast period only. Typically, at this level of maturity, this is done at a high level, based on staff estimates rather than a more documented and defined approach. The priorities are included in the first year of the lifecycle management strategy and identified as priorities within the asset management plan.

At the **intermediate level of maturity**, municipal staff will clearly determine specific priority capital projects over multiple years. Staff estimates are used as a foundation for the priority capital spending identification, which is documented by project or asset. This process is undertaken based on staff estimates rather than a more documented and defined approach. The priorities are included in the lifecycle management strategy and identified as priorities within the asset management plan.

At the **advanced level of maturity**, specific capital priorities are determined based on an assessment of asset needs in regards to condition, risk, and levels of service (i.e. documented and defined approach, such as risk management based). The priorities are included in the lifecycle management strategy and identified as priorities within the asset management plan.

Identifying Capital Priorities

Capital projects to be identified for current or future attention can come from a number of sources. The following list provides some areas of consideration:

- **Risk Management Assessments**: Identify assets (or service areas) with high risk of failure with the intent of mitigating risk, while providing expected levels of service;
- **Future Expansion Planning**: Identify areas where current asset capabilities will be insufficient to deliver expected levels of service, resulting in the identification of expansion-related priorities;
- **Asset Lifecycle Analysis**: Replacement/rehabilitation scenario models may identify assets as priorities (based on asset condition), in accordance with lowest lifecycle costs;
- **Asset Obsolescence**: Assets that no longer provide levels of service, or can no longer be maintained, rehabilitated or replaced given obsolescence, may be identified as priority projects;
- **Technological Advancements**: Opportunities may arise to deliver better service levels at a lower lifecycle cost;
- **Operational**: Municipal staff may identify potential priority projects to reduce asset operational costs; and
- **Land-use Plan**: Land-use planning may present new opportunities for existing assets or identify priority projects.

Depending on the availability of resources and/or the sophistication of asset management processes and tools, a municipality may prioritize decisions at the individual asset level, or at the asset type level. The latter approach will require some generalized assumptions to be made and followed for all assets of that asset type. This will potentially result in a lesser degree of accuracy than under the individual asset approach. However, making rehabilitation decisions at the asset type level can be appropriate for lower cost assets, where the cost of collecting individual cost information is not warranted, or reasonably attainable.

Examples:

Table 5-12
Asset Priority – Level of Detail

Level	Priority Project
Asset Type Level	Arterial Road Reconstruction Program

Individual Asset Level	Smith Street Reconstruction

From an asset management plan perspective, it is suggested that a subsection of the lifecycle management strategy be dedicated to discussing and identifying priorities. This subsection provides a clear and transparent priority identification for:

- Future budget consideration;
- Gas tax funding consideration; and
- Potential capital grant application process.

5.16 Resources and References

Government of Canada, 2016, Treasury Board of Canada Secretariat Organization, Guide to Integrated Risk Management, https://www.canada.ca/en/treasury-board-secretariat/corporate/risk-management/guide-integrated-risk-management.html

Institute of Public Works Engineering Australasia, 2015, International Infrastructure Management Manual, https://www.ipwea.org/publications/bookshop/ipweabookshop/iimm

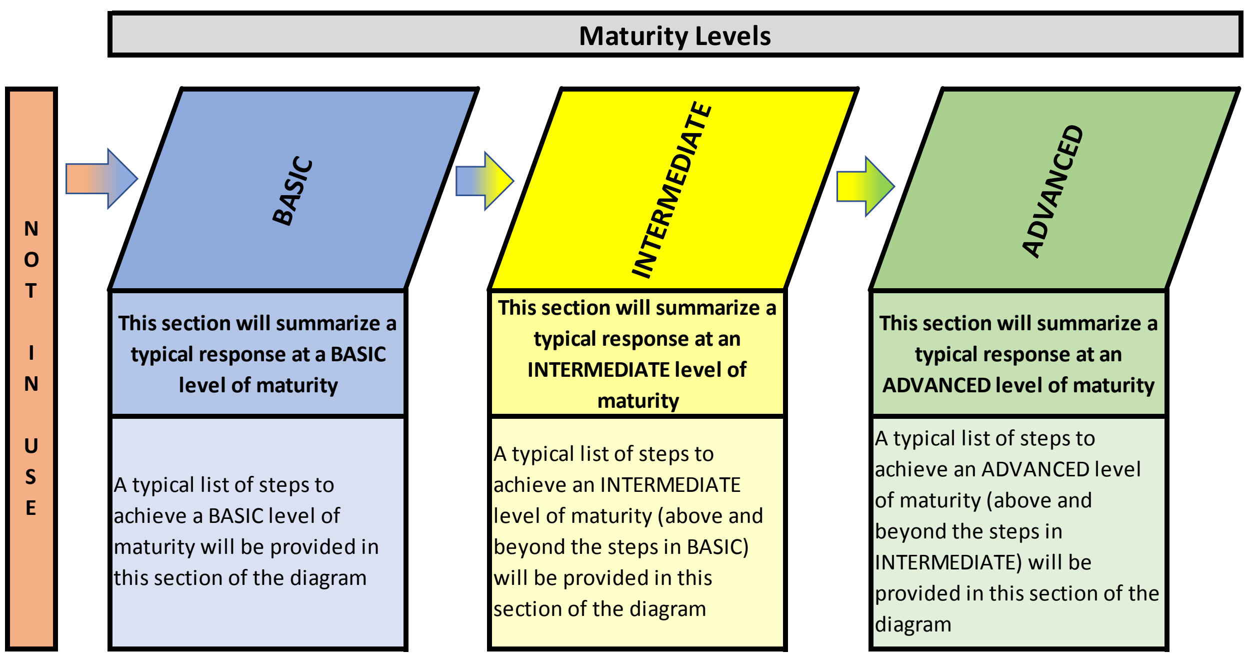
Province of Ontario, Ministry of Infrastructure, 2012, Building Together: Guide for Municipal Asset Management Plans, https://www.ontario.ca/page/building-together-guide-municipal-asset-management-plans

Public Sector Accounting Board, 2006, PS 3150 Tangible Capital Assets

6 Financing Strategy

6.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of maturity diagrams within this framework will assist municipalities to identify their current levels of maturity for each AM area. Furthermore, for municipalities that have a desire to move to a higher level of maturity over time, the diagrams will provide potential approaches to doing so. To more easily depict the maturity levels ascribed to specific questions posed within the framework, the following diagram will be utilized for each question:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices

to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

6.2 Overview

An asset management financing strategy outlines the suggested approach to funding the lifecycle management strategy (i.e. long-term forecast, see Chapter 5) that is proposed to be adopted by the municipality. The financing strategy forms an integral framework for ensuring the municipality makes optimal use of the various funding sources that it has at its disposal. It will provide a foundation for preparing other long-term financial plans including operating and capital budgets and forecasts, and financial policies, such as the use of debt and reserve/reserve funds. Further, it provides an opportunity for important analyses to be performed, including taxation and user fee rate impacts, other rate sensitivity analysis, and determination of both the infrastructure gap and funding gap.

Figure 6-1
Financing Strategy Impacts

Key Assumptions

Key assumptions related specifically to the financing strategy should be carefully considered by municipalities. When creating a plan that spans 10, 20, or more years, the slightest change in one variable can drastically change the outcome. Some key variables to consider:

- Capital inflation rate;
- Operating inflation rate;
- Debt term and rate;
- Rate of return on investments (i.e. reserve funds); and
- Growth (i.e. assessment growth for taxation and customer growth for user fees).

To provide an example of the impact and importance of determining a reasonable and defensible value for each variable (in this case, capital inflation rate), consider the following. The replacement cost today of a $1 million asset would in 20 years be valued at:

- $1.49 million using 2% annual capital inflation;
- $1.81 million using 3% annual capital inflation; or
- $2.19 million using 4% annual capital inflation.

This demonstrates the importance of determining a reasonable and defensible value for each of the variables from the list above – in this example, capital inflation rate.

Changing one variable in the calculation results in a substantial difference in cost estimates. Multiply this one example by the thousands of capital assets a municipality may own and the impact of adjusted variables will be significant.

When creating a financing strategy for a long forecast period, consider not what those variables are today, but what they could be over the forecast period (e.g. 20 years). If anticipating the variables proves to be difficult, one approach entails looking at historical results for the same time period (e.g. the last 20 years). For example, to forecast capital inflation for the next 20 years, the results of construction price indexes can be analyzed for the last 20 years. The estimates of these variables should be updated periodically to reflect the most recent historical data available.

<u>Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements</u>

O.Reg 588/17 outlines the following requirements with respect to the Financing Strategy:

Every municipality shall prepare an asset management plan in respect of its core municipal infrastructure assets by July 1, 2021, and in respect of all of its other municipal infrastructure assets by July 1, 2023.

A municipality's AM plan must include the following with respect to a financing strategy by July 1, 2024:

a) A lifecycle management and financial strategy that sets out the following information with respect to the assets in each asset category for the 10-year period:
    i. An identification of the lifecycle activities that would need to be undertaken to provide the proposed levels of service described in paragraph 1, based on an assessment of the following:
        A. The full lifecycle of the assets.
        B. The options for which lifecycle activities could potentially be undertaken to achieve the proposed levels of service.

C. The risks associated with the options referred to in sub-subparagraph B.

D. The lifecycle activities referred to in sub-subparagraph B that can be undertaken for the lowest cost to achieve the proposed levels of service.

ii. An estimate of the annual costs for each of the 10 years of undertaking the lifecycle activities identified in subparagraph i, separated into capital expenditures and significant operating costs.

iii. An identification of the annual funding projected to be available to undertake lifecycle activities and an explanation of the options examined by the municipality to maximize the funding projected to be available.

iv. If, based on the funding projected to be available, the municipality identifies a funding shortfall for the lifecycle activities identified in subparagraph i,

A. an identification of the lifecycle activities, whether set out in subparagraph i or otherwise, that the municipality will undertake, and

B. if applicable, an explanation of how the municipality will manage the risks associated with not undertaking any of the lifecycle activities identified in subparagraph i.

b) For municipalities with a population of less than 25,000, as reported by Statistics Canada in the most recent official census, a discussion of how the assumptions regarding future changes in population and economic activity informed the preparation of the lifecycle management and financial strategy.

c) For municipalities with a population of 25,000 or more, as reported by Statistics Canada in the most recent official census,

i. the estimated capital expenditures and significant operating costs to achieve the proposed levels of service as described in paragraph 1 in order to accommodate projected increases in demand caused by population and employment growth, as set out in the forecasts or assumptions referred to in paragraph 6 of subsection 5 (2), including estimated capital expenditures and significant operating costs related to new construction or to upgrading of existing municipal infrastructure assets,

ii. the funding projected to be available, by source, as a result of increased population and economic activity, and
iii. an overview of the risks associated with implementation of the asset management plan and any actions that would be proposed in response to those risks.

6.3 Consideration of All Funding Sources

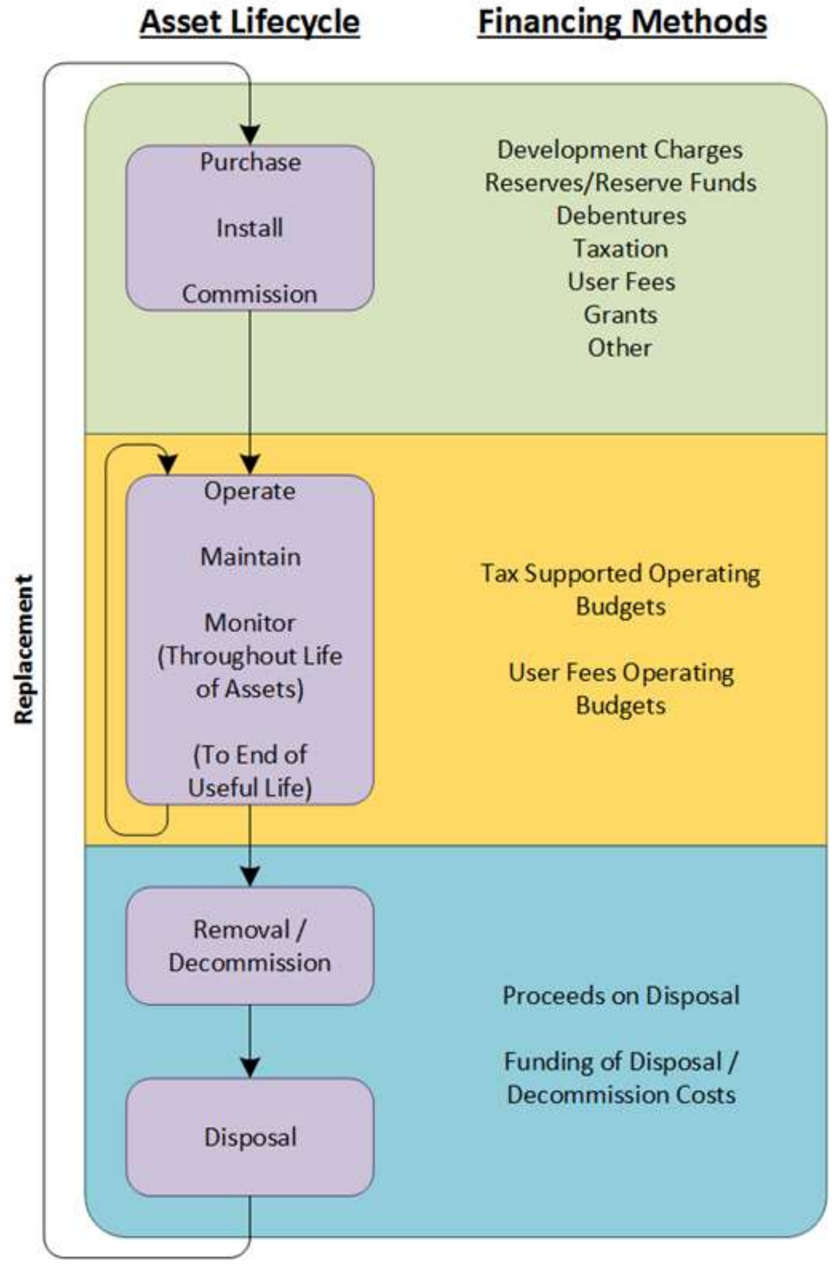
Developing a funding strategy for all available funding sources enables a municipality to more accurately quantify the impacts on each funding source as well as any funding shortfalls (i.e. “funding gap”).

Does the municipality have a financing strategy that considers all applicable funding sources?

Background

When considering various funding alternatives within the financing strategy, it is important for a municipality to consider all available revenue and financing tools, including taxation, reserves, reserve funds, debt, user fees, grants, etc. Figure 6-2 (below) illustrates how various financing methods can be used for both initial asset purchases as well as asset replacements over a lifecycle period. The initial capital purchase or construction cost is generally a larger investment of funds, requiring consideration of funding from various sources as available. Ongoing costs to operate, maintain, and monitor capital assets are generally funded through the operating budget (taxation or user fee) annually. Costs to repair are typically capital in nature, and disposal/decommissioning costs need to be taken into account when ultimately replacing the asset.

Figure 6-2
Sample Asset Lifecycle and Associated Financing Methods



Levels of Maturity – Consideration of Funding Sources

Does the municipality have a financing strategy that considers all applicable funding sources?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	High-level funding strategy for more significant funding sources	**Detailed funding strategy for more significant funding sources**	**Detailed funding strategy for all funding sources**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Determine significant funding sources that are available (i.e. taxation, user fees, etc.)	1. Determine significant funding sources that are available (i.e. taxation, user fees, etc.)	1. Determine all funding sources that are available (i.e. taxation, user fees, etc.)
	2. Identify current funding levels for each funding source, and project each funding source over the forecast period	2. Create various funding scenarios through varying use of significant funding sources to finance the lifecycle management strategy	2. Create various funding scenarios through varying use of all funding sources to finance the lifecycle management strategy
	3. Identify annual funding shortfall in comparing the lifecycle management strategy to the available funding amounts	3. Prepare continuity schedules and impact tables showing the long-term impact on each significant funding source	3. Prepare continuity schedules and impact tables showing the long-term impact on all funding sources
		4. Identify annual funding shortfall in comparing the lifecycle management strategy to the available funding amounts	4. Identify annual funding shortfall in comparing the lifecycle management strategy to the available funding amounts

At the **basic level of maturity**, municipalities typically follow a high-level funding strategy for only the more significant funding sources. The focus would first be on determining the significant funding sources related to capital requirements, such as taxation, user fees, grants, etc. The current funding levels of each funding source would be identified and projected increases shown over the forecast period. At this point, by comparing the cost of necessary capital works from the lifecycle management strategy against the available funding dollars, the municipality will have identified its annual funding shortfall or “funding gap”.

At the **intermediate level of maturity**, municipalities undertake a detailed funding strategy but only for more significant funding sources. The focus would first be on determining the significant funding sources related to capital requirements, such as taxation, user fees, grants, etc. Various funding scenarios would be created to assess long-term impacts of using varying levels of funding from different significant funding sources. This would generally be accomplished through the use of continuity schedules and impact tables created for each significant funding source. At this point, by comparing the cost of necessary capital works from the lifecycle management strategy against the available funding dollars, the municipality will have identified its annual funding shortfall or “funding gap”.

At the **advanced level of maturity**, municipalities undertake a detailed funding strategy for all funding sources. The focus would first be on determining all funding sources related to capital requirements. Various funding scenarios would be created to assess long-term impacts of using varying levels of funding from different funding sources. This would generally be accomplished through the use of continuity schedules and impact tables created for each funding source. At this point, by comparing the cost of necessary capital works from the lifecycle management strategy against the available funding dollars, the municipality will have identified its annual funding shortfall or “funding gap”.

Available Funding Sources

The funding strategies for the municipality’s capital investment should be considered in order to determine the most appropriate and sustainable options. Two common approaches are:

- Pay as you go; and
- Funding from capital reserves/reserve funds.

Pay as you go

“Pay as you go” funding methods are capital costs being funded by taxation and/or user fees at the time that the capital acquisitions are made, in addition to the issuance of debt for the remaining unfunded amounts. The debt payments (principal and interest) will then form part of future operating budget expenditures. Pay as you go is typically a more suitable strategy for shorter life and/or lower value assets. Using this approach on higher value assets could lead to the over utilization of debt financing, based on a municipality’s available debt capacity.

Funding from Capital Reserves/Reserve Funds

Another funding strategy can be established whereby an annual transfer from the applicable operating budgets to capital reserves or reserve funds is undertaken, to build a source of funds for future capital works. The creation of capital reserve funds (as opposed to reserves) provides the opportunity to earn interest, and therefore, compounds the benefits of contributions made.

Summary

A municipality will have to decide whether to base their financing strategy on the “pay as you go” methodology, “reserve/reserve fund” methodology, or a combination of the two.

In addition to debt and reserve/reserve funds, a municipality should consider other funding sources, such as taxation, user fees, grants, third party contributions, development charges, municipal act charges, donations, and any other appropriate sources. As will be illustrated in future sections to this chapter, each funding source can be analyzed using continuity schedules and other methodology to determine the optimal use within the asset management plan financing strategy.

Financing Policies

To provide the necessary guidance and support in further developing funding strategies, it is recommended that financial policies be developed, implemented, and utilized both in the asset management process and budget process. Financial policies are uniquely crafted and aimed at detailing the principles that a municipality will follow in order to reach their funding strategy goals and objectives. Most importantly, funding strategy policies will detail all requirements that must be met throughout the financing strategy development process, whether related to legislated requirements, organizational mandates, or best practices.

For examples of relevant policies, consider the following:

- Self-sustaining funds;
- Reserves & reserve funds;
- Use of debt financing; and
- Allocation of annual surplus.

Self-Sustaining Funds

Municipalities' budgets generally consist of services supported by taxation, and services supported by user fees, such as water services, wastewater services, parking services, etc. In some municipalities, these service areas may be combined with "cross-subsidization" occurring between the areas (i.e. taxation funding a portion of water costs). Best practices involve treating services supported by taxation, water user fees, and wastewater user fees as three distinct and self-sustaining budgets. Any other self-sustaining service should be treated in a similar manner.

Reserves and Reserve Funds

Municipalities use various reserves and reserve funds for both capital and operating needs. Developing reserve and reserve fund policies can assist in managing the amount of contributions to be budgeted annually and thus facilitate predictable and consistent budget impacts. Also, optimal reserve/reserve fund balances can be discussed within the policy. The use of reserve funds allows for the accrual of interest earned on reserve fund balances on an annual basis. Thus, reserve fund balances will grow with their share of interest earned.

Use of Debt Financing

Debt can be used as an effective source of capital funding when significant capital projects are required that exceed other available sources of financing. The use of debt enables the impact of capital financing to be spread over a longer period of time, resulting in future residents sharing in the cost of capital projects. The Province establishes a debt annual repayment limit (ARL) of 25% of municipal revenues.[1] Municipalities can implement an internal debt policy which further restricts debt costs annually, if deemed necessary.

Allocation of Annual Surplus[2]

At the end of each year, municipalities are in a position to determine whether actual annual revenues and expenses either exceed or fall short of annual budgeted amounts. This analysis determines the annual surplus or deficit for the year. Municipalities can

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[1] It is noted that exceptions to this rule may be made through appeal to the Ontario Municipal Board.

[2] Surplus in this context refers to modified accrual (budget) surplus. Please refer to a comparison of accounting methods at http://www.mah.gov.on.ca/Page15030.aspx

have multiple annual surplus/deficits based on the various self-sustaining funds they manage. Some municipalities will use annual surpluses as a funding source in the subsequent year. This approach can result in fluctuating impacts on the operating budget each year that can make balancing the budget difficult. Alternatively, year-end surpluses can be transferred to the appropriate reserves and reserve funds, for future use. While a portion of these funds can be directed to operating-related reserves/reserve funds (such as rate stabilization funds and working capital reserves), funds can also be used for capital-related initiatives, such as funding the asset management plan. In the event that a deficit is calculated, the deficit could be funded by the appropriate reserves or reserve funds.

6.4 Expansion Needs

Expansion needs identified in existing studies/reports and through the levels of service analysis can have significant financial implications. Therefore, the full lifecycle costs of expansion needs as well as applicable funding sources (i.e. DCs) should be incorporated into the financing strategy.

What method is used to incorporate expansion needs (i.e. growth and/or new service areas) into the financing strategy?

Background

Municipalities may need to expand their asset holdings for a number of reasons. Council may decide that they wish to add new service areas (e.g. skateboard parks, theatres, etc.), or enhance current services (e.g. upgrade gravel roads to paved roads, enhanced transit services, etc.) for existing taxpayers and citizens. Additionally, more assets may be required as a result of growth in the community.

In each case, municipalities should incorporate expansion needs and expansion-related funding sources into the financing strategy. In addition, expansion of assets translates into additional lifecycle costs of which a municipality must be aware (e.g. costs to operate, maintain, and eventually rehabilitate/replace these assets). The impacts of expansion needs are usually significant, and as such, should be managed in a prudent manner.

Levels of Maturity – Expansion Needs

What method is used to incorporate expansion needs (i.e. growth and/or new service areas) into the financing strategy?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Expansion incorporated based on high-level staff projections	**Expansion incorporated based on staff projections and existing studies/reports**	**Expansion incorporated based on staff projections, existing studies/reports and level of service analysis**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. At a staff level, determine where existing services need to be expanded, or where new services are required over the forecast period	1. At a staff level, determine where existing services need to be expanded, or where new services are required over the forecast period	1. At a staff level, determine where existing services need to be expanded, or where new services are required over the forecast period
	2. Determine the lifecycle cost and funding implications of the expansion needs for inclusion in the financing strategy	2. Take into consideration existing studies/reports (i.e. DC studies, etc.) and integrate into forecast, where appropriate	2. Take into consideration existing studies/reports (i.e. DC studies, etc.) and integrate into forecast, where appropriate
		3. Determine the lifecycle cost and funding implications of the expansion needs for inclusion in the financing strategy	3. Take into consideration level of service analysis and integrate into forecast, where appropriate
			4. Determine the lifecycle cost and funding implications of the expansion needs for inclusion in the financing strategy

At the **basic level of maturity**, municipalities incorporate expansion needs into the financing strategy based on high-level staff projections. Staff will determine, for the forecast period, where either existing services need to be expanded or where new services will be required. Staff will then project the lifecycle cost and funding implications of these expansion needs for inclusion in the financing strategy. At a minimum, the growth requirements outlined in O.Reg 588/17 will be followed.

At the **intermediate level of maturity**, expansion needs will be incorporated into the financing strategy based on both staff projections and existing studies/reports. Staff will determine, for the forecast period, where either existing services need to be expanded or where new services will be required. Further consideration will be given to existing studies and/or reports (e.g. DC studies, planning reports, etc.), and incorporated into the capital forecast, where appropriate. Staff will then project the lifecycle cost and funding implications of these expansion needs for inclusion in the financing strategy.

At the **advanced level of maturity**, expansion needs will be incorporated into the financing strategy based on staff projections, existing studies/reports, and levels of service analysis. Staff will determine, for the forecast period, where either existing services need to be expanded or where new services will be required. Further consideration will be given to existing studies and/or reports (e.g. DC studies, planning reports, etc.), and incorporated into the capital forecast, where appropriate. As an additional step, consideration will also be given to any levels of service analysis undertaken, with related impacts also added into the capital forecast. Staff will then project the lifecycle cost and funding implications of these expansion needs for inclusion in the financing strategy.

Expansion Needs

In the absence of reports or studies (e.g. master plans, DC studies, etc.) that outline expansion needs of a municipality, staff will have to determine potential impacts of expansion needs at a high-level for inclusion into the asset management process. While the initial assessment of expansion needs takes place both in the levels of service analysis (Chapter 4) and the lifecycle management strategy (Chapter 5), the financing strategy must consolidate and list these expansion needs, and also project the funding implications. For example, if a municipality wishes to construct a skateboard park (and has never provided that service in the past), it could be viewed as an asset expansion. From a financing strategy perspective, the following questions should be considered:

- How is the initial construction of the skateboard park going to be funded? Are there DC funds available for use?
- What are the ongoing operating and maintenance costs identified in the lifecycle management strategy, and how will they be funded?
- At what point is rehabilitation or replacement needed? What is the impact on budgets between now and then, given a municipality’s funding strategies?

Development Charges

In cases where growth is a driver for additional capital needs, many municipalities will implement development charge (DC) background studies (and DC by-laws) to help finance growth-related capital costs. This allows the municipality to collect DCs on growth that occurs and use those DCs to fund projects that are either fully or partially driven by growth. The DC background study typically lists not only the capital projects anticipated to be related to growth, but also a projection of the anticipated growth over a defined period.

A municipality can use the information contained within their DC background study to project the impacts of growth on the asset management plan. Similar to the generic expansion project discussion above, each growth-related project can have the following impacts:

- Initial construction funding (other than DCs)? The non-growth share of these projects can be significant and needs to be funded through other sources.
- Ongoing operating and maintenance costs, once the assets are purchased or constructed.
- Future rehabilitation or replacement costs.

These future lifecycle costs can be estimated within the asset management process and funded through the financing strategy.

6.5 Contributed Assets

Incorporating contributed assets into the financing strategy can provide greater accuracy of the plan by recognizing the future lifecycle costs that the municipality will be responsible for funding after assets are assumed.

What method is used to incorporate contributed assets into the financing strategy?

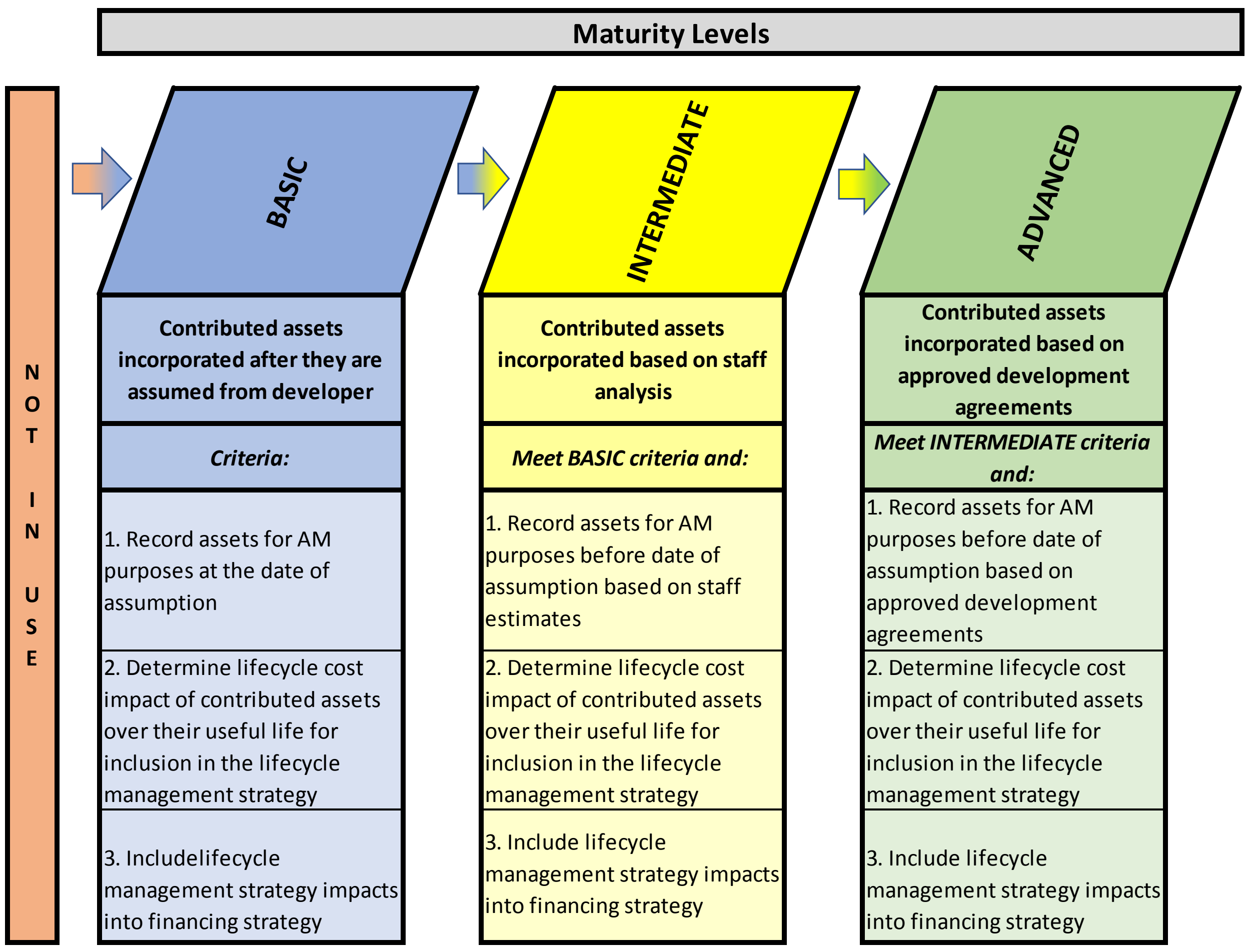
Background

Contributed assets are typically assumed by a municipality as part of a development-related agreement or a donation. They can have a substantial impact on asset management plans since they need to be operated, maintained, and eventually replaced. However, there are other assets that are contributed or donated outside of the development process (e.g. from community groups) and these situations must be taken into account within the asset management plan as well.

For contributed assets, often key asset data related to costs, dates of construction/acquisition, material, remaining useful life, condition rating, etc., must be drawn from outside sources and may require some review by municipal staff for reasonableness and accuracy. This information forms the basis for the financial impact over the asset management forecast period.

Levels of Maturity – Contributed Assets

What method is used to incorporate contributed assets into the financing strategy?



At the **basic level of maturity**, municipalities incorporate their contributed assets into the financing strategy, but only after the assets have been assumed (i.e. from the developer or community group). The contributed assets, once assumed, would be recorded for asset management purposes. The lifecycle cost impact would then be able to be determined over the assets' useful lives and included in the lifecycle management strategy. At this point, these impacts could be included in the financing strategy.

At the **intermediate level of maturity**, a more proactive approach is undertaken. Contributed assets are incorporated in the financing strategy based on staff analysis. The contributed assets would be recorded for asset management purposes before the date of assumption, based on staff estimates. Using these staff estimates, the lifecycle cost impacts of contributed assets over their useful lives can be included in the lifecycle management strategy, and from there, into the financing strategy.

At the **advanced level of maturity**, contributed assets would be incorporated into the asset management plan based on information obtained from approved development agreements. This would provide an opportunity for municipalities to record fairly detailed information about the contributed assets before the date of assumption. As with prior levels of maturity, the lifecycle cost impacts would then be included in the lifecycle management strategy, and from there, into the financing strategy.

Incorporating Contributed Assets into Financing Strategy

Information on future contributed assets can be difficult to obtain or estimate. Development agreements (and the developers themselves) can provide information on the assets that will be assumed by the municipality. However, date of assumption is usually based on the date when the terms and conditions of the development agreement are satisfied (which can be years after asset construction). This may delay the recording of contributed assets for accounting purposes, but it doesn't have to delay recording the assets for asset management purposes. The moment information is known about a contributed asset (i.e. either development-related or other contributed assets), they can be established in the asset management plan.

Contributed assets can have the following asset management impacts:

- Initial purchase or construction (either fully or partially paid for by other parties): If there is a portion to be paid for by the municipality, what funding sources will be used?
- Ongoing operating and maintenance costs: What impact on these costs once the assets are assumed? Any operating costs before assumption?
- Future rehabilitation or replacement costs. As with any capital asset, contributed assets will need to be considered within the lifecycle management strategy to understand their future lifecycle needs.

These future lifecycle costs can be estimated within the asset management process, and funded through the financing strategy.

6.6 Debt Financing

Including a detailed debt analysis in the financing strategy is important to understand projected debt servicing costs and their impact on the operating budget. This analysis should also consider projected debt needs in relation to the municipality's annual repayment limit and internal debt policy limits.

Does your financing strategy include a detailed debt analysis?

Background

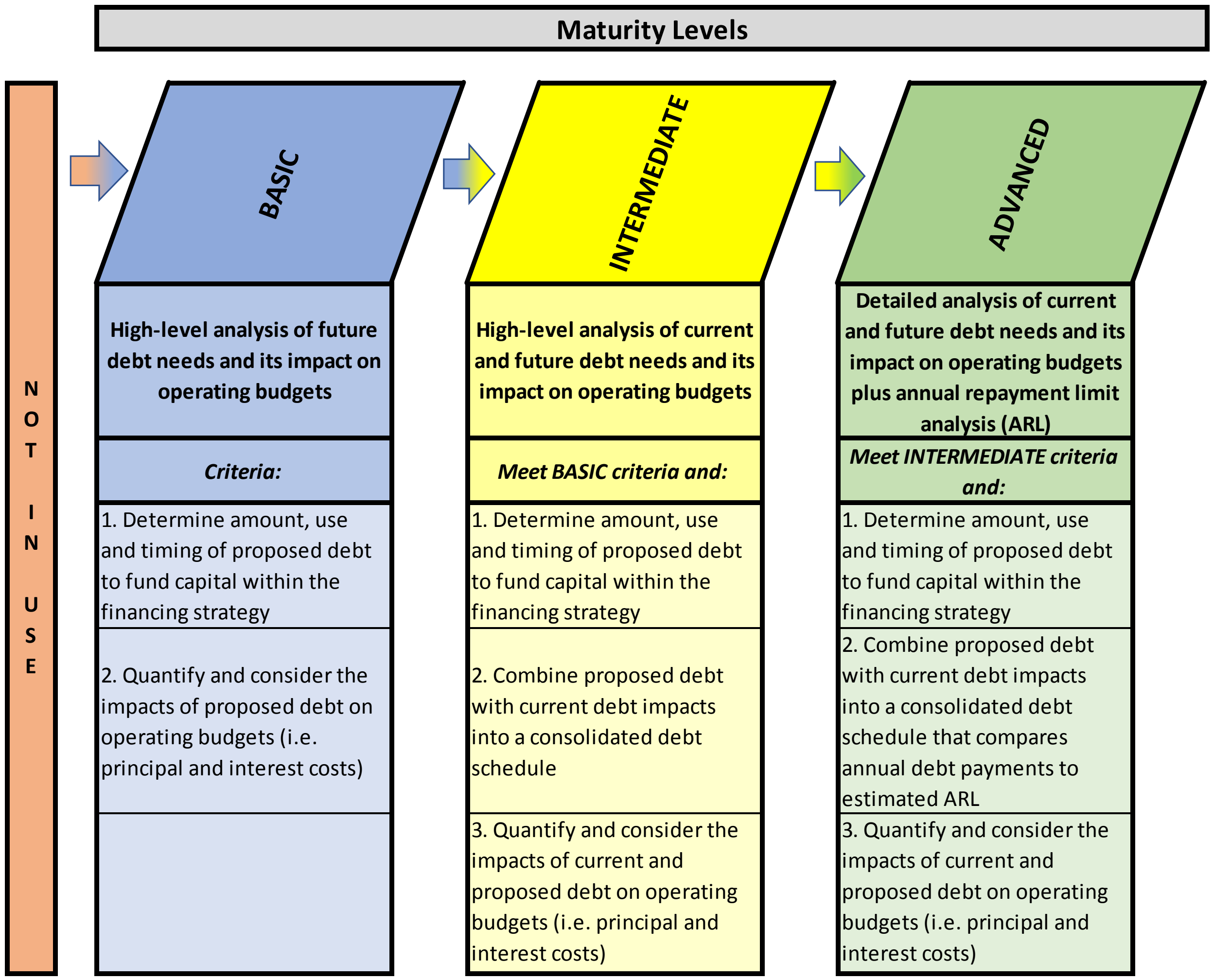
In order to forecast and assess the impact of future activities on the operating budget and debt capacity, it is recommended that a detailed debt analysis be undertaken.

In cases where significant capital needs are identified, it may be beneficial to fund large expenditures through debt financing. This has the advantage of spreading the costs of costly capital projects over time so that current and future customers can share the burden. With debt financing, municipalities must consider:

- The annual repayment limit (ARL) imposed by the province;
- Whether internal debt limits need to be derived or updated;
- If existing debt strategies need to be revised (i.e. no debt policies);
- The impact of debt on future operating costs (i.e. debt principal and interest payments); and
- Intergenerational equity, whereby the timing of the benefits gained from acquiring/constructing capital assets does not correspond to the timing of the costs of paying off the related debt. This highlights that future generations will be responsible for impacts of both past and future assets.

Levels of Maturity – Debt Financing

Does your financing strategy include a detailed debt analysis?



At the **basic level of maturity**, municipalities perform a high-level analysis of their future debt needs and consider the impacts on future operating budgets. This can be accomplished by assessing how much debt will be required to be issued for proposed capital works and the anticipated timing of debt issuance. This will provide enough information to calculate estimated annual principal and interest payments. With these annual costs calculated, the impacts on the operating budget can be quantified and considered.

At the **intermediate level of maturity**, municipalities perform a high-level analysis of both its current and future debt needs and consider the impacts on future operating budgets. As with the basic level of maturity, the first step would be assessing the amount of debt required to be issued for proposed capital works and the anticipated timing of debt issuance. This will provide enough information to calculate estimated annual principal and interest payments for proposed debt, which could then be included with current debt principal and interest payments as part of a consolidated debt schedule or analysis. With these consolidated annual costs calculated, the impacts on the operating budget can be quantified and considered.

At the **advanced level of maturity**, municipalities perform a detailed analysis of both current and future debt needs, consider the impacts on future operating budgets, and additionally, include an annual repayment limit analysis. As with the previous levels of maturity, the first step would be assessing the amount of debt required to be issued for proposed capital works and the anticipated timing of debt issuance. This will provide enough information to calculate estimated annual principal and interest payments for proposed debt. Proposed debt principal and interest payments could then be included with current debt principal and interest payments as part of a consolidated debt schedule or analysis. With these consolidated annual costs calculated, a comparison to the estimated annual repayment limits in the future can be made to ensure compliance. Finally, the impacts of the consolidated debt costs on the operating budget can be quantified and considered.

Debt Analysis - Example

The following tables demonstrate an approach to preparing a debt schedule or analysis.

1. Determine proposed debt financing required:

Table 6-1
Sample Debt Financing Required

Description	Forecast 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Capital Financing										
Provincial / Federal Grants	-	-	-	-	-	-	-	-	-	-
Debt (Non-Growth)	-	550,000	900,000	700,000	500,000	400,000	250,000	200,000	-	-
Debt (Growth)	-	-	-	-	-	-	-	500,000	300,000	-
Reserve Fund: Development Charges	-	30,000	-	500,000	200,000	-	40,000	-	400,000	-
Reserve Fund: Gas Tax	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Reserve Funds: Capital Related	4,130,000	3,754,000	3,585,000	3,973,200	4,368,900	4,672,400	5,034,300	5,304,400	5,733,700	5,971,900
Total Capital Financing	**4,350,000**	**4,554,000**	**4,705,000**	**5,393,200**	**5,288,900**	**5,292,400**	**5,544,300**	**6,224,400**	**6,653,700**	**6,191,900**

2. Estimate annual principal and interest payments for proposed debt (the following assumes debt over 20 years at 5%):

Table 6-2
Sample Non-Growth Debt Payments – Principal and Interest

New Debt (Non-Growth) Year	Principal (Inflated)	Forecast 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
2018	-		-	-	-	-	-	-	-	-	-
2019	550,000			44,133	44,133	44,133	44,133	44,133	44,133	44,133	44,133
2020	900,000				72,218	72,218	72,218	72,218	72,218	72,218	72,218
2021	700,000					56,170	56,170	56,170	56,170	56,170	56,170
2020	500,000						40,121	40,121	40,121	40,121	40,121
2023	400,000							32,097	32,097	32,097	32,097
2024	250,000								20,061	20,061	20,061
2025	200,000									16,049	16,049
2026	700,000										-
2027	-										
Total Charges	**3,500,000**	**-**	**-**	**-**	**44,133**	**116,352**	**172,522**	**212,643**	**244,740**	**264,801**	**280,849**

Table 6-3
Sample Growth Debt Payments – Principal and Interest

New Debt (Growth) Year	Principal (Inflated)	Forecast 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
2018	-		-	-	-	-	-	-	-	-	-
2019	-			-	-	-	-	-	-	-	-
2020	-				-	-	-	-	-	-	-
2021	-					-	-	-	-	-	-
2020	-						-	-	-	-	-
2023	-							-	-	-	-
2024	-								-	-	-
2025	500,000									40,121	40,121
2026	300,000										24,073
2027	-										
Total Charges	**800,000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**40,121**	**64,194**

3. Prepare and consolidate continuity schedules for proposed and existing debt. This will result in a calculation of total debt principal and interest costs over the forecast period, with outstanding debt also projected for each year. The chart below also includes a ratio of total debt outstanding as a percent of 'capital asset cost' (i.e. TCA replacement cost), which can be also calculated as a financial indicator:

Table 6-4
Sample Debt Continuity Schedules

Existing Debt:	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Opening Balance (Principal)	2,481,300	2,175,280	1,865,790	1,552,830	1,236,400	916,500	614,250	308,750	-	-
Principal Payment	306,020	309,490	312,960	316,430	319,900	302,250	305,500	308,750	-	-
Interest Payment	40,980	37,510	34,040	30,570	27,100	22,750	19,500	16,250	-	-
Total Payment (Principal & Interest)	347,000	347,000	347,000	347,000	347,000	325,000	325,000	325,000	-	-
Ending Balance (Principal)	2,175,280	1,865,790	1,552,830	1,236,400	916,500	614,250	308,750	-	-	-
New Debt:	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance (Principal)	-	-	550,000	1,433,367	2,088,683	2,520,596	2,833,983	2,980,942	3,565,188	3,722,478
New Debt Proceeds	-	550,000	900,000	700,000	500,000	400,000	250,000	700,000	300,000	-
Principal Payment	-	-	16,633	44,683	68,087	86,613	103,041	115,753	142,711	158,919
Interest Payment	-	-	27,500	71,668	104,434	126,030	141,699	149,047	178,259	186,124
Total Payment (Principal & Interest)	-	-	44,133	116,352	172,522	212,643	244,740	264,801	320,970	345,043
Ending Balance (Principal)	-	550,000	1,433,367	2,088,683	2,520,596	2,833,983	2,980,942	3,565,188	3,722,478	3,563,558
Total Debt:	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance (Principal)	**2,481,300**	**2,175,280**	**2,415,790**	**2,986,197**	**3,325,083**	**3,437,096**	**3,448,233**	**3,289,692**	**3,565,188**	**3,722,478**
New Debt Proceeds	**-**	**550,000**	**900,000**	**700,000**	**500,000**	**400,000**	**250,000**	**700,000**	**300,000**	**-**
Principal Payment	**306,020**	**309,490**	**329,593**	**361,113**	**387,987**	**388,863**	**408,541**	**424,503**	**142,711**	**158,919**
Interest Payment	**40,980**	**37,510**	**61,540**	**102,238**	**131,534**	**148,780**	**161,199**	**165,297**	**178,259**	**186,124**
Total Payment (Principal & Interest)	**347,000**	**347,000**	**391,133**	**463,352**	**519,522**	**537,643**	**569,740**	**589,801**	**320,970**	**345,043**
Ending Balance (Principal)	**2,175,280**	**2,415,790**	**2,986,197**	**3,325,083**	**3,437,096**	**3,448,233**	**3,289,692**	**3,565,188**	**3,722,478**	**3,563,558**
Debt as a % of Capital Asset Cost	1.1%	1.2%	1.4%	1.6%	1.6%	1.5%	1.4%	1.5%	1.5%	1.4%

4. The estimated annual repayment limit (ARL) can be compared to the consolidated principal and interest from the debt schedule (above). It is important for annual projected debt payments to remain less than the ARL for each year. (Note: for proper calculation of projected ARL, schedule 81 of the Financial Information Return provides details. For this example, 25% of estimated future revenue was used):

Table 6-5
Sample ARL/Debt Schedule Comparison

Debt Payment Analysis	Forecast									
	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Existing Debt - Non-Growth:										
Fire	32,500	32,500	32,500	32,500	32,500	32,500	32,500	32,500	-	-
Public Works	195,000	195,000	195,000	195,000	195,000	195,000	195,000	195,000	-	-
Parks & Recreation	97,500	97,500	97,500	97,500	97,500	97,500	97,500	97,500	-	-
Existing Debt - Growth:										
Fire	4,400	4,400	4,400	4,400	4,400	-	-	-	-	-
Public Works	17,600	17,600	17,600	17,600	17,600	-	-	-	-	-
Parks & Recreation	-	-	-	-	-	-	-	-	-	-
New Proposed Debt - Non-Growth	-	-	44,133	116,352	172,522	212,643	244,740	264,801	280,849	280,849
New Proposed Debt - Growth	-	-	-	-	-	-	-	-	40,121	64,194
Total	347,000	347,000	391,133	463,352	519,522	537,643	569,740	589,801	320,970	345,043
Estimated Annual Repayment Limit (ARL)*	2,104,000	2,234,000	2,371,000	2,519,000	2,676,000	2,786,000	2,906,000	3,033,000	3,175,000	3,320,000
Under / (Over) ARL	1,757,000	1,887,000	1,979,867	2,055,648	2,156,478	2,248,357	2,336,260	2,443,199	2,854,030	2,974,957
Percent of ARL Used	16.5%	15.5%	16.5%	18.4%	19.4%	19.3%	19.6%	19.4%	10.1%	10.4%

* Municipal Internal Debt Policy is to follow external debt restrictions imposed by the Province.

6.7 Reserve/Reserve Fund Planning

In many municipalities, funding for capital assets will flow through reserves and reserve funds. Developing reserve continuity schedules to monitor balances can be critical to ensuring a sustainable financing strategy as well as appropriate reserve balances.

Does your financing strategy include a continuity schedule for all applicable reserve/reserve funds (RRF)?

Background

To forecast and assess the impact of future activities on reserves and reserves funds, municipalities should develop continuity schedules detailing projected:

- Opening balances;
- Contributions to/from reserves and reserve funds;
- Interest earned; and
- Closing balances.

These continuity schedules can then be compared to applicable reserve/reserve fund policies to ensure the use of the funds meets all requirements (such as minimum balances, optimal balances and how the funds are to be used).

Levels of Maturity – Reserve/Reserve Fund Planning

Does your financing strategy include a continuity schedule for all applicable reserve/reserve funds (RRF)?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	High-level analysis of future activities of significant RRF	**Analysis of future activities of significant RRF, with some detailed analysis**	**Detailed analysis of future activities of all applicable RRF**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Determine amount, use and timing of proposed RRF contributions to fund capital within the financing strategy	1. Determine amount, use and timing of proposed RRF contributions to fund capital within the financing strategy	1. Determine amount, use and timing of proposed RRF contributions to fund capital within the financing strategy
		2. Prepare high-level RRF continuity schedules to track opening balances, transfers in/out, and closing balances over the forecast period	2. Prepare detailed RRF continuity schedules to track opening/closing balances, as well as transfers in/out by type, taking into account optimal RRF balance strategies
		3. Quantify and consider the impacts of proposed RRF activities on operating budgets	3. Measure RRF balances over the forecast period through use of performance measures (i.e. RRF balance as % of TCA replacement cost)
			4. Quantify and consider the impacts of proposed RRF activities on operating budgets

At the **basic level of maturity**, municipalities only perform a high-level analysis of activities of significant reserves/reserve funds. Typically, this analysis would be restricted to determining the amount, use, and timing of proposed reserve/reserve fund contributions to fund capital within the financing strategy.

At the **intermediate level of maturity**, some analysis of the impact of future activities may be performed for significant reserves/reserve funds, including some detailed analysis. In addition to determining the amount, use, and timing of proposed reserve/reserve fund contributions to fund capital within the financing strategy, high-level reserve/reserve fund continuity schedules would be prepared for the forecast period. These schedules would include opening balances, transfers in/out, and closing balances. Municipalities could then quantify and consider impacts of proposed reserve/reserve fund activities on operating budgets.

At the **advanced level of maturity**, detailed analysis would be completed of future activities of all applicable reserves/reserve funds. In addition to determining the amount, use, and timing of proposed reserve/reserve fund contributions to fund capital within the financing strategy, detailed reserve/reserve fund continuity schedules would be prepared for the forecast period. These schedules would include opening balances, transfers in/out by type (including interest earned) and closing balances. The resulting projected reserve/reserve fund balances would be measured against optimal balance and/or minimum balance strategies. Performance measures would be identified to be compared to projected reserve/reserve fund balances to ensure the municipality is providing sufficient available funds for future commitments. For example, a municipality may decide that capital lifecycle reserve funds must reach a balance of at least 1% of the capital asset replacement cost within 10 years. Municipalities could then quantify and consider impacts of proposed reserve/reserve fund activities on operating budgets.

Reserves/Reserve Funds

Reserves and reserve funds are funds that have been set aside to meet future funding requirements. They may be set aside by Council by-law or legislation. Council may set up a reserve or reserve fund for any purpose for which they have the authority to spend money.

“Reserves” are set aside by Council at their own discretion to be available to meet future needs. These future needs do not have to be specific projects/assets and one reserve can serve multiple purposes. Generally, reserves do not accumulate interest earned on annual balances unless deemed by policy.

On the other hand, “reserve funds” are set up by Council resolution or by-law for a specific purpose, which makes them harder to reallocate to other uses. Reserve funds accumulate (accrue) interest earned on balances, thereby increasing the amount of future funding available. Reserve funds are considered either obligatory (i.e. required by legislation) or discretionary (i.e. set up at the discretion of Council).

Some strategies utilized to strengthen contributions to reserves and/or reserve funds are to:

- Transfer annual modified accrual (budget) surpluses to reserves and reserve funds. This approach can be applied within each self-sustaining fund (e.g. tax supported, water, wastewater, etc.); and
- When debt obligations get repaid, continue to include the annual debt servicing amounts in the budget and transfer the funds to reserves and reserve funds.

Lifecycle Reserve Funds

Lifecycle reserve funds are used to fund the ongoing capital replacement, rehabilitation, and preventive maintenance of capital assets over their useful lives. Contributions are typically calculated based on “sinking fund” calculations (to be discussed further in a later section). This requires an analysis to determine:

- Future replacement cost of capital assets;
- Assumed inflation applicable to the capital assets to be replaced; and
- Expected interest rates to be earned on reserve funds.

This calculation quantifies the annual funding required to pay for the future replacement or rehabilitation costs, when needed.

Federal/Provincial Transfer Payments (e.g. Gas Tax)

These types of reserve funds support municipal infrastructure projects that contribute to a number of national and provincial objectives. As an example, Table 6-6 lists the federal gas tax funds national objectives. Federal funding is provided twice a year to provincial and territorial governments, or to the municipal associations which deliver this funding within a province. Projects are chosen locally and prioritized according to need. Municipalities can pool, bank, and borrow against this funding, providing significant financial flexibility. Gas tax funding received but not spent in any given year must be kept in a reserve fund that accrues interest annually.

Table 6-6
Federal Gas Tax Fund National Objectives

Increased Economic Growth and Prosperity	Cleaner Environment	Stronger Cities and Communities
Local Roads and Bridges	Community Energy Systems	Capacity Building
Public Transit	Drinking Water	Disaster Mitigation
Local and Regional Airports	Wastewater	Recreation Infrastructure
Broadband Connectivity	Solid Waste	Culture Infrastructure
Short-Sea Shipping	Brownfield Redevelopment	Tourism Infrastructure

Short-Line Rail		Sport Infrastructure

Gas tax funds can be included as a stable and sustainable funding source within the asset management financing strategy.

<u>Reserve/Reserve Fund Analysis - Example</u>

The following table provides sample reserve fund continuity schedules. The first two continuity schedules illustrate development charges reserve funds and gas tax reserve funds, respectively. The proceeds and use of these reserve funds will be restricted according to rules and regulations applying to each. For gas tax funds, the schedule is showing that the municipality will fully utilize all funds received each year.

The third sample continuity schedule illustrates a capital-related reserve fund. This reserve fund will have been established by the municipality as part of the asset management financing strategy. In this example, the municipality is working to increase the balance of this reserve fund such that it achieves its goal of 1% of capital asset replacement cost in ten years. This performance measure is displayed below the continuity schedule.

Table 6-7
Sample RRF Schedules

	Forecast									
Development Charges Reserve Funds	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	505,000	572,771	613,041	686,235	257,383	129,566	227,014	287,460	391,335	54,251
Development Charge Proceeds	84,100	86,200	88,400	90,600	92,900	95,200	97,600	100,000	102,500	105,100
Transfer to Capital	-	30,000	-	500,000	200,000	-	40,000	-	400,000	-
Transfer to Operating (Debenture Payments - Growth)	22,000	22,000	22,000	22,000	22,000	-	-	-	40,121	64,194
Interest Earned	5,671	6,070	6,794	2,548	1,283	2,248	2,846	3,875	537	952
Closing Balance	572,771	613,041	686,235	257,383	129,566	227,014	287,460	391,335	54,251	96,108

	Forecast									
Gas Tax Reserve Fund	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	-	-	-	-	-	-	-	-	-	-
Transfers From Operating	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Transfer to Capital	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Interest Earned	-	-	-	-	-	-	-	-	-	-
Closing Balance	-	-	-	-	-	-	-	-	-	-

	Forecast									
Capital Related Reserve Funds (All Tax Supported)	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	2,070,500	772,092	253,067	297,566	272,309	210,500	249,110	185,179	135,507	288,156
Transfers from Operating	2,823,948	3,232,469	3,626,552	3,945,247	4,305,007	4,708,543	4,968,536	5,253,386	5,883,496	6,218,751
Transfer to Capital	4,130,000	3,754,000	3,585,000	3,973,200	4,368,900	4,672,400	5,034,300	5,304,400	5,733,700	5,971,900
Transfer to Operating	-	-	-	-	-	-	-	-	-	-
Interest Earned	7,644	2,506	2,946	2,696	2,084	2,466	1,833	1,342	2,853	5,350
Closing Balance	772,092	253,067	297,566	272,309	210,500	249,110	185,179	135,507	288,156	540,357
Note: Closing reserve fund balances as a percentage	**0.39%**	**0.13%**	**0.14%**	**0.13%**	**0.10%**	**0.11%**	**0.08%**	**0.06%**	**0.12%**	**0.21%**

6.8 Other Funding Sources

A detailed analysis of other less significant funding sources within a financing strategy allows municipalities to project the use of these funding sources over the forecast period. This practice increases the overall accuracy of the financing strategy.

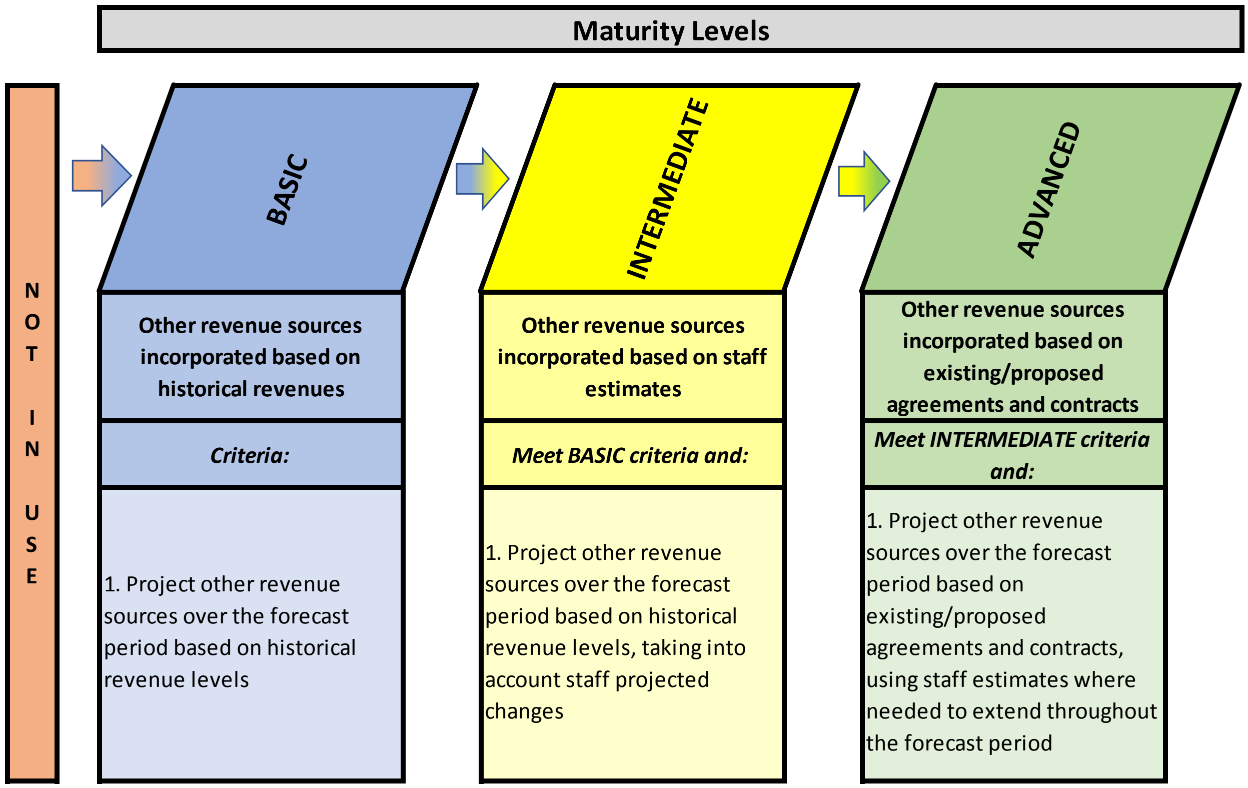
Does your financing strategy include a detailed analysis of other funding sources, such as donations, municipal act charges/landowner recoveries, grants, etc.?

Background

In addition to regularly utilized sources of funding, such as taxation, user fees, debt, and reserves/reserve funds, municipalities have limited opportunities to take advantage of other funding sources. These sources should not be overlooked when developing a financing strategy.

Levels of Maturity – Other Funding Sources

Does your financing strategy include a detailed analysis of other funding sources, such as donations, municipal act charges/landowner recoveries, grants, etc.?



At the **basic level of maturity**, municipalities incorporate a projection of other revenue sources based on historical levels into the financing strategy. A common method used to accomplish this would be the creation of a spreadsheet with historical costs input for other revenues. The forecasted amounts for other revenues would be simply based on percentage increase/decreases of the historical costs, based on staff estimates.

At the **intermediate level of maturity**, other revenue sources are incorporated into the financing strategy based on more detailed staff estimates. Typically, municipalities would start with a projection of other revenues based on historical revenue levels, but would then consider potential changes in related legislation, continuing availability of revenue source(s), and any other relevant factors. The projection of other revenues would be amended accordingly.

At the **advanced level of maturity**, other revenue sources are incorporated into the financing strategy in a more formal manner, with consideration for relevant existing/proposed agreements, contracts, or other source documents. Other revenues arising from these agreements and contracts would be calculated and included in the financing strategy. Where there are no agreements and contracts, staff would use their professional judgment to estimate the amounts and timing of other revenues.

Other Funding Sources

Grants

Current and proposed grant programs from other levels of government is one such source for which municipalities should keep attuned. It is important to understand the criteria for acceptance of capital projects for grant money. For example, many grant programs now require a formal asset management plan to be in place before any grant funds will be released. It is prudent for municipalities to ensure they have an early understanding of the criteria for acceptance when applying for grant funding. This preparation will help to ensure they are compliant with grant funding requirements as the grant programs become available, thereby avoiding any delays.

A municipality should not list grants as a funding source unless there is reasonable assurance that the grant will be approved and received. Including grants when they are not yet confirmed has the obvious effect of an overly optimistic financing strategy.

Local Improvement Charges

The legislation allowing for the imposition of local improvement charges provides an opportunity to fund capital from benefitting taxpayers under specific circumstances. There are instances when landowners in a municipality may specifically benefit from local improvements to sidewalks, roads, water systems, or wastewater systems. In these cases, a local improvement charge can be imposed by the municipality to cover all or part of the cost of construction. To help alleviate the financial burden on benefitting landowners, local improvement charges can be collected over a number of years, allowing financing terms and favourable interest rates. Municipalities contemplating a local improvement charge should consider whether the related capital works undertaken benefit only specific landowners or whether there is a more general benefit to the community. This may guide the decision as to whether a local improvement charge would be appropriate in the circumstances.

Fundraising

In some cases, citizen groups may have an interest in fundraising for community projects, such as recreation centres, libraries, park equipment, etc. Caution should be exercised in projecting anticipated funding from this source. Unless firm agreements are in place, with guaranteed amounts of funding identified, a conservative approach should be taken to quantifying donations as part of the financing strategy.

6.9 Rate Impacts (Taxation, User Fees, etc.)

A long-term analysis of taxation levy and user fee impacts is a critical component of a good financing strategy. This allows the financial feasibility of the lifecycle management strategy to be assessed in relation to the impacts on more significant funding sources.

Does the financing strategy detail out a long-term impact analysis on taxation/user fees?

Background

An important part of any financing strategy is the determination of long-term impacts of funding strategies on tax rates and user fees, such as water and wastewater rates. Under the pay-as-you-go approach, tax rates and user fees are not impacted until capital investment occurs. Typically, this results in fluctuating budgetary impacts that can create large year-over-year differences. The additional cost of debt interest will also be incurred and have to be included in the operating budget.

Another approach is to create and maintain capital reserves/reserve funds to fund future capital expenditures. This has the advantage of providing a more predictable tax/user fee impact, with an opportunity for a more gradual year-over-year change. This approach also minimizes the cost of debt interest, especially in later years when reserves/reserve funds are more established. However, this methodology requires that tax/user fee budgets be increased in years prior to the capital investment being made.

One important tool in measuring the impact on rates of the different funding methods is the long-term rate impact analysis. A rate impact analysis may apply to tax rates or user fee rates. In order to assess the impacts of the various approaches to financing strategy, an analysis can be created that measures how varying amounts of contributions to capital, debt costs, and capital reserve transfers, as well as changes in levels of service, would affect the operating budget and rates over time.

Levels of Maturity – Rate Impacts

Does the financing strategy detail out a long-term impact analysis on taxation/user fees?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	High-level analysis of taxation/user fees impact	**Detailed analysis of taxation/user fees covering a short-term time period**	**Detailed analysis of taxation/user fees covering a long-term time period**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Determine the annual amounts required from taxation/user fees to fund lifecycle management strategy	1. Determine the annual amounts required from taxation/user fees to fund lifecycle management strategy	1. Determine the annual amounts required from taxation/user fees to fund lifecycle management strategy
	2. Compare annual funding requirements to current levies (i.e. taxation, water revenues, WW revenues, etc.)	2. Prepare a levy/user fee continuity schedule taking into account growth (i.e. assessment, new customers, etc.) and operational impacts	2. Prepare a levy/user fee continuity schedule taking into account growth (i.e. assessment, new customers, etc.) and operational impacts
		3. Feed annual funding requirements into continuity schedule to determine overall impact on levy/rates covering a short-term time period	3. Feed annual funding requirements into continuity schedule to determine overall impact on levy/rates covering a long-term time period

At the **basic level of maturity**, municipalities perform a high-level analysis of taxation/user fees impacts. This analysis would entail the determination of the annual amounts required from taxation or user fees to fund the lifecycle management strategy and compare this amount to the related current tax levy or user fee revenue. The resulting percentage would be considered the rate impact.

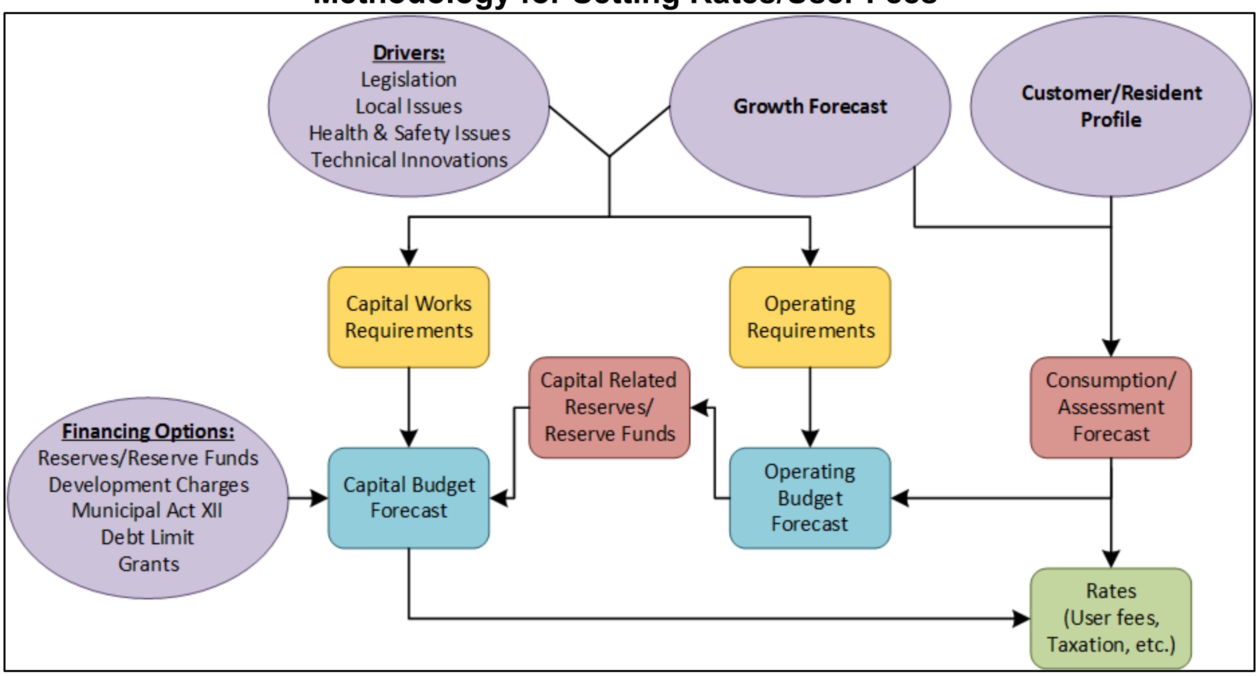
At the **intermediate level of maturity**, a detailed analysis of rate impacts is performed, but only for a short-term timeframe. This analysis first determines the annual amounts required from taxation or user fees to fund the lifecycle management strategy. A continuity schedule would be prepared for annual tax levies and/or user fee revenue, taking into account future assessment growth (taxation), changes in customer base (user fees), and operational impacts. Then, the identified funding requirements for the lifecycle management strategy would be introduced into the continuity schedule to determine the related rate impacts.

At the **advanced level of maturity**, a detailed analysis of rate impacts is performed over a long-term timeframe. This analysis would first entail the determination of the annual amounts required from taxation or user fees to fund the lifecycle management strategy. A continuity schedule would be prepared for annual tax levies and/or user fee revenue, taking into account future assessment growth (taxation), changes in customer base (user fees), and operational impacts. Then, the identified funding requirements for the lifecycle management strategy would be introduced into the continuity schedule to determine the related rate impacts.

Rate Impact Analysis - General

Figure 6-3 (below) illustrates the general methodology used in determining a tax or user fee rate forecast:

Figure 6-3
Methodology for Setting Rates/User Fees



Tax Rate Impact Analysis

The methodology employed generally consists of 5 major elements:

1. Capital Budget Forecast

The capital budget is developed to measure program/service level adjustments, lifecycle requirements, and growth-related needs. Capital expenditures will consider capital asset renewal/rehabilitation, replacement, and expansion-related costs. The capital forecast should be developed with inflationary adjustments based on relevant capital costs indices.

2. Capital Funding Plan

The capital funding plan considers the potential funding sources available to address the capital needs forecast. The sources of capital funding include taxation-based support, reserves/reserve funds, debt for program/service level improvements, and grants. The use of funding from taxation is measured against the revenue projections and affordability impacts on taxpayers. Planned funding from reserve/reserve fund sources is measured against the sustainability of these funds relative to lifecycle demands, revenue projections, and affordability impacts. Debt financing is considered for significant capital expenditures when funding is required beyond long-term lifecycle needs, or to facilitate rate transition policies. Projected impacts of debt financing should be measured against the municipality’s debt policies and annual repayment limits to ensure a practical and sustainable funding mix.

3. Operating Budget Forecast

The operating budget forecast considers adjustments to the municipality’s base budget by reflecting program/service level changes, operating fund impacts associated with infrastructure, and financing for capital needs. The operating expenditures should be forecast with inflationary adjustments and growth in service demand, based on fixed and variable cost characteristics. The operating budget forecast ties the capital funding plan and reserve/reserve fund continuity forecast to the rate-based revenue projections. This ensures sufficient funding for both the ongoing annual operation and maintenance of services supported by taxation, as well as the capital cost requirements, to ensure appropriate service delivery. Tax revenues are projected, net of anticipated operating revenues, such as user fees, rental fees, and other miscellaneous revenues.

4. Assessment Forecast

The assessment forecast is developed based on current assessment with assumed future assessment growth applied over the forecast period. Consideration should be given to known or expected future developments and the anticipated impact on assessment.

5. Tax Rate Forecast

At this stage in the analysis, the full costs of services supported by taxation are measured against total tax assessment with projected growth incorporated to determine anticipated tax rate increases.

User Fee Rate Impact Analysis

Figure 6-3 also applies to the general methodology used in determining the full cost recovery of user fees, such as water and wastewater rates.

The methodology employed generally consists of 5 major elements:

1. Customer Demands and Consumption Forecast

This first step in the analysis is important as it calculates the current base revenue by source and all assumptions for forecasting purposes. Any base charge revenues are forecast with customer growth. The customer profile forecast is modeled based on a municipality's anticipated growth forecast, by customer type. Moreover, the customer forecast is modelled for the user fee systems independently to identify differences in service demands, if any.

The consumption forecast (e.g. water) is developed by applying average annual consumption estimates to future development. The consumption estimates are based on average consumption levels by customer type, as found in customer records. The forecast may adjust the base consumption levels for anticipated conservation based on historical trends and practices witnessed in industry.

2. Capital Budget Forecast

The capital budget is developed to measure program/service level adjustments, lifecycle requirements, and growth-related needs. Capital expenditures will consider capital asset renewal/rehabilitation, replacement, and expansion-related costs. The capital forecast should be developed with inflationary adjustments based on relevant capital costs indices.

3. Capital Funding Plan

The capital funding plan considers the potential funding sources available to address the capital needs forecast. The sources of capital funding include rate-based support, reserves/reserve funds, debt for program/service level improvements, and grants. The use of rate-based funding is measured against the revenue projections and affordability impacts on ratepayers. The reserve/reserve fund sources are measured against the sustainability of these funds relative to lifecycle demands, revenue projections, and affordability impacts. Debt financing is considered for significant capital expenditures where funding is required beyond long-term lifecycle needs, or to facilitate rate transition policies. Debt financing projected impacts should be measured against the municipality's debt policies and annual repayment limits to ensure a practical and sustainable funding mix.

4. Operating Budget Forecast

The operating budget forecast considers adjustments to the municipality's user rate base budget by reflecting program/service level changes, operating fund impacts associated with infrastructure, and financing for capital needs. The operating expenditures are forecast with inflationary adjustments and growth in service demand, based on fixed and variable cost characteristics. The operating budget forecast ties the capital funding plan and reserve/reserve fund continuity forecast to the rate-based revenue projections. This ensures sufficient funding for both the ongoing annual operation and maintenance of water and wastewater services, as well as the capital cost requirements, to ensure service sustainability. Operating revenues are projected to identify the base charge and consumptive rate components net of anticipated operating revenues, such as connection fees, rental fees, and other miscellaneous revenues.

5. Rate Forecast and Structure

The rate forecast and structure component of the analysis considers various rate structures that could be utilized to recover the forecast rate-based revenue from the projected customer demands. At this stage in the analysis the full costs of service are measured against the customer growth and consumption demands to determine full cost recovery rates. The analysis may consider alternative structures for base charge and consumptive components of the rates, consistent with municipal policies/strategies, industry practice, and customer affordability.

Rate Impacts – Example

In order to project rate impacts (either taxation or user fee) due to activities related to asset management, a financial forecast will need to be created. In order to represent asset management impacts clearly in the forecast, it is advisable to separately report costs by lifecycle category. In the example tax rate forecast below, maintenance and non-infrastructure solutions are each detailed separately from existing operational costs.

Since levels of service (LOS) decisions relate to asset management strategies, they have also been separately reported in the forecast. Table 6-8 represents the LOS impacts considered for this example.

Table 6-8
Sample Rate Impact Analysis – LOS Impacts

	Levels of Service (LOS) Analysis				
	Current LOS	**Expected LOS**	**Type**	**Est. Cost to Move to Exp. LOS**	**Cost Description**
Fire	Fire equipment inspections twice per year	Fire equipment inspections monthly	Non-Infrastructure Solution	5,000	Staff time
	Current fire vehicle maintenance schedule	Accelerated fire vehicle maintenance schedule	Maintenance	30,000	Maintenance costs, staff time
Public Works	No demand management program re. use of private cars	Institute demand management program to promote alternative transportation choices other than private cars	Non-Infrastructure Solution	15,000	Promotional material, advertising in media, staff time
	Crack and Seal Program – based on visual inspection (5%/yr.). Collector / Arterial Rds. – within 2 yrs. of resurface. Other Roads – at 20 yrs.	Expand Crack and Seal and Patching Program – based on visual inspection (10%/yr.). Collector / Arterial Rds. – within 1 yr. of resurface. Other Roads – at 10 yrs.	Maintenance	55,000	Staff time, materials
Parks and Recreation	No discounts for non-peak hours at recreation facilities	Introduce discounts for non-peak hours at recreation facilities	Non-Infrastructure Solution	10,000	Loss of revenues
	Current facility maintenance program	Accelerated facility maintenance program	Maintenance	42,000	Materials, contractor costs

The forecast (Table 6-9 below) should be created such that the tax levy (or user fee revenue, if applicable) is calculated for each year of the forecast period. In the forecast, the total annual taxation levy line is highlighted. It is also recommended that any projected assessment growth (for taxation forecasts) or consumption growth (for user fee forecasts) be accounted for. The assumptions for assessment growth are included at the end of the forecast below.

Once the above information is completed, the tax rate impact (or user fee impact, if applicable) can be determined. The annual percentage increase has also been highlighted in the forecast below.

Table 6-9
Sample Rate Impact Analysis

Net Impact on Taxation	Forecast									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Expenditures (excluding Maintenance):										
Council & CAO	277,000	283,000	289,000	295,000	301,000	307,000	313,000	319,000	325,000	332,000
Clerks	530,000	541,000	552,000	563,000	574,000	585,000	597,000	609,000	621,000	633,000
Finance	574,000	585,000	597,000	609,000	621,000	633,000	646,000	659,000	672,000	685,000
Fire	718,000	732,000	747,000	762,000	777,000	793,000	809,000	825,000	842,000	859,000
Public Works	1,269,000	1,294,000	1,320,000	1,346,000	1,373,000	1,400,000	1,428,000	1,457,000	1,486,000	1,516,000
Parks & Recreation	960,000	979,000	999,000	1,019,000	1,039,000	1,060,000	1,081,000	1,103,000	1,125,000	1,148,000
Other	691,000	705,000	719,000	733,000	748,000	763,000	778,000	794,000	810,000	826,000
Revenues (Other than Taxation):										
Grants	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)
User Fees	(700,000)	(711,000)	(722,000)	(733,000)	(744,000)	(755,000)	(766,000)	(777,000)	(789,000)	(801,000)
Penalties & Interest	(130,000)	(132,000)	(134,000)	(136,000)	(138,000)	(140,000)	(142,000)	(144,000)	(146,000)	(148,000)
Other	(80,000)	(81,000)	(82,000)	(83,000)	(84,000)	(85,000)	(86,000)	(87,000)	(88,000)	(89,000)
Maintenance (Current Levels):										
Fire	85,000	87,000	89,000	91,000	93,000	95,000	97,000	99,000	101,000	103,000
Public Works	145,000	148,000	151,000	154,000	157,000	160,000	163,000	166,000	169,000	172,000
Parks & Recreation	120,000	122,000	124,000	126,000	129,000	132,000	135,000	138,000	141,000	144,000
LOS: Non-Infrastructure Solutions:										
Fire	5,000	5,100	5,200	5,300	5,400	5,500	5,600	5,700	5,800	5,900
Public Works	15,000	15,300	15,600	15,900	16,200	16,500	16,800	17,100	17,400	17,700
Parks & Recreation	10,000	10,200	10,400	10,600	10,800	11,000	11,200	11,400	11,600	11,800
LOS: Maintenance & Operations:										
Fire	30,000	30,600	31,200	31,800	32,400	33,000	33,700	34,400	35,100	35,800
Public Works	55,000	56,100	57,200	58,300	59,500	60,700	61,900	63,100	64,400	65,700
Parks & Recreation	42,000	42,800	43,700	44,600	45,500	46,400	47,300	48,200	49,200	50,200
Transfers to Reserve Funds:										
Transfer to Gas Tax Reserve	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Transfer to Capital Related Reserve Funds	2,823,948	3,232,469	3,626,552	3,945,247	4,305,007	4,708,543	4,968,536	5,253,386	5,883,496	6,218,751
Debentures Payments:										
Debt Payments (Non Growth)	325,000	325,000	369,133	441,352	497,522	537,643	569,740	589,801	280,849	280,849
Debt Payments (Growth)	22,000	22,000	22,000	22,000	22,000	-	-	-	40,121	64,194
Growth Debt Recovery - DCs	(22,000)	(22,000)	(22,000)	(22,000)	(22,000)	-	-	-	(40,121)	(64,194)
Total Taxation Levy	**7,534,948**	**8,039,569**	**8,577,986**	**9,069,098**	**9,588,329**	**10,137,286**	**10,537,776**	**10,954,087**	**11,386,845**	**11,836,700**
Taxation Levy Analysis										
Prior Year Taxation Levy	7,062,000	7,534,948	8,039,569	8,577,986	9,069,098	9,588,329	10,137,286	10,537,776	10,954,087	11,386,845
Add: Provision for Assessment Growth (see below)	105,930	113,024	120,594	128,670	136,036	143,825	152,059	158,067	164,311	170,803
Current Year Taxation Levy at 0.0% Increase	7,167,930	7,647,972	8,160,163	8,706,656	9,205,135	9,732,154	10,289,346	10,695,842	11,118,398	11,557,648
Additional Increase in Taxation Levy for the year	367,018	391,597	417,823	362,443	383,194	405,133	248,430	258,245	268,447	279,052
Total Taxation Levy	7,534,948	8,039,569	8,577,986	9,069,098	9,588,329	10,137,286	10,537,776	10,954,087	11,386,845	11,836,700
Annual Percentage Increase	**5.1%**	**5.1%**	**5.1%**	**4.2%**	**4.2%**	**4.2%**	**2.4%**	**2.4%**	**2.4%**	**2.4%**

	Forecast									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Assessment Growth Estimate (%)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%

6.10 Integrated Funding Analysis

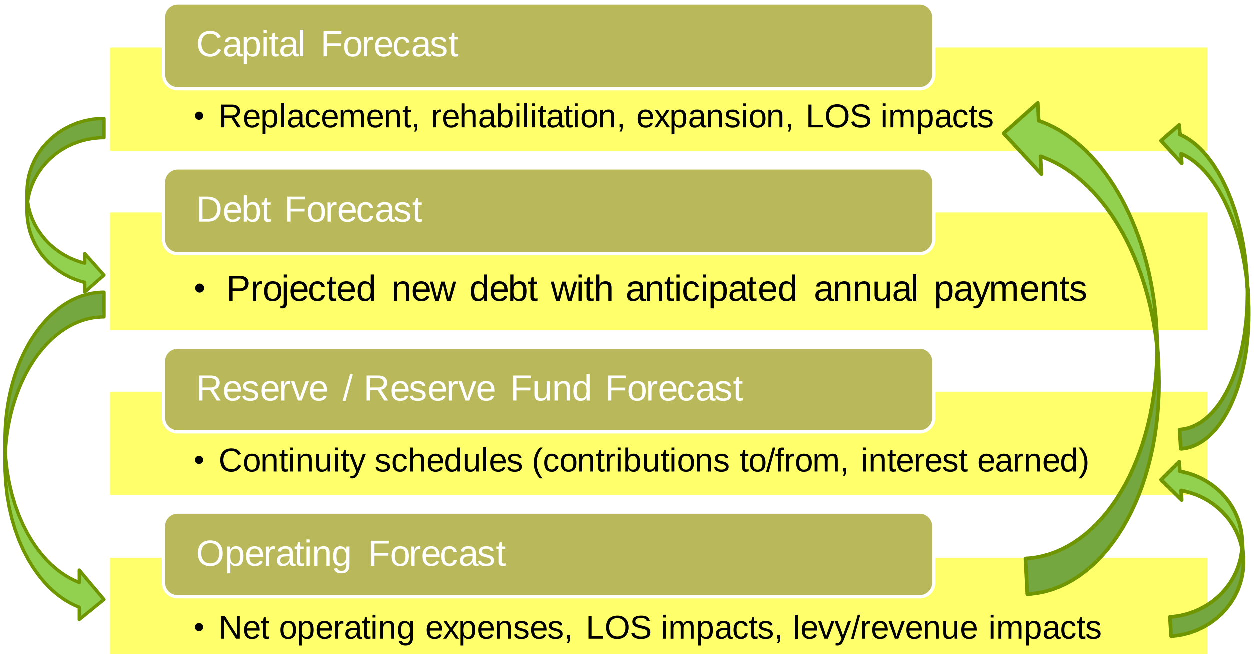
Combining all funding sources into an integrated funding analysis enables a comparison of different funding scenarios and a determination of the optimal funding strategy.

Does your financing strategy combine all individual funding source analyses into an integrated combined analysis?

Background

Any financing strategy includes interaction between the capital forecast, debt forecasts, reserve and reserve fund forecasts, and operating forecasts. Figure 6-4 (below) illustrates this interaction:

Figure 6-4
Integrated Financing Strategy Interactions

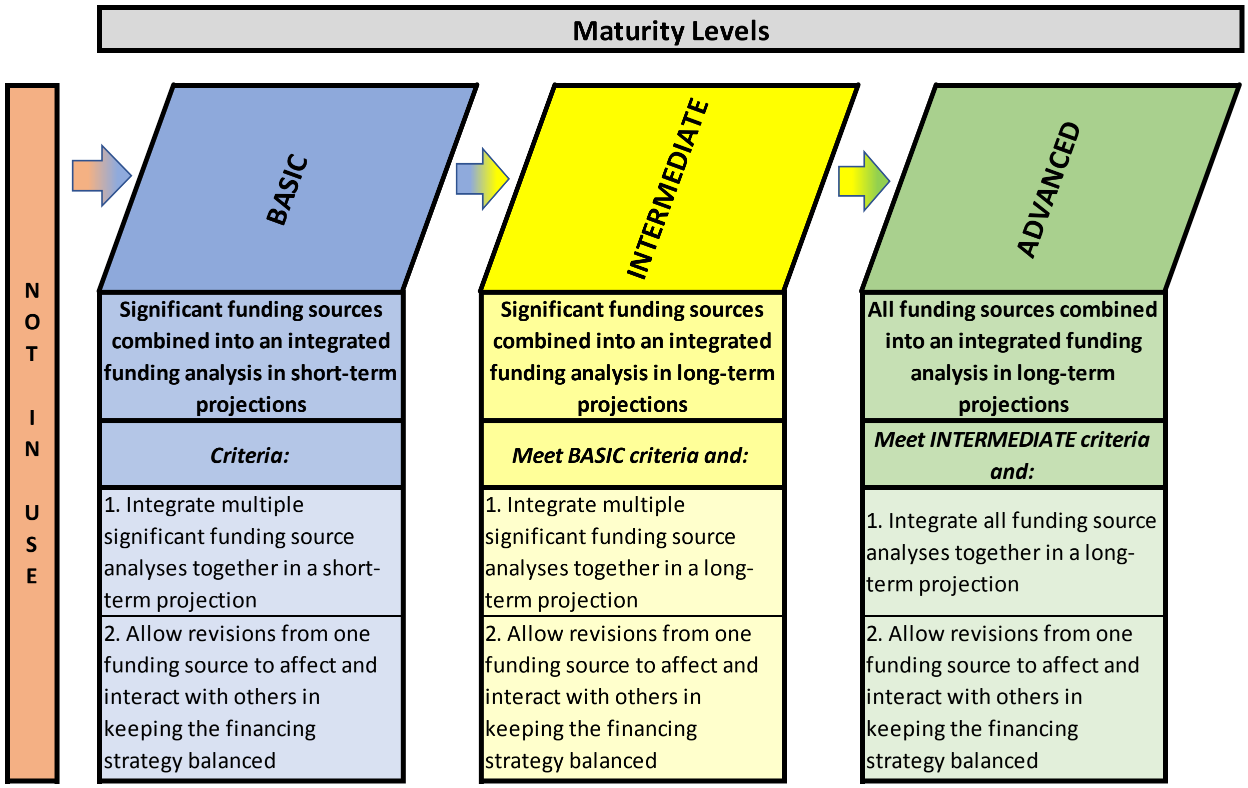


In this figure, all four sections can potentially impact each other. If the financing strategy can be modelled so that these impacts are automated, it makes balancing the financing strategy much easier.

Once the mechanisms are in place to perform an integrated funding analysis, the opportunity to assess and compare the results of different funding scenarios becomes available. It is this opportunity that puts the municipality in the best position to determine an optimal financing strategy.

Levels of Maturity – Revenue Reporting

Does your financing strategy combine all individual funding source analyses into an integrated combined analysis?



At the **basic level of maturity**, municipalities combine significant funding sources into an integrated funding analysis as part of short-term projections. Typically, this would be accomplished by integrating multiple significant funding source analyses together in a table. The table would only be used for short-term projections. Different funding scenarios could be assessed by varying the amounts of one funding source (e.g. debt financing) and ascertaining what impacts would be required on other funding sources (e.g. reserves/reserve funds, contributions from operating, etc.) to keep the financing strategy in balance.

At the **intermediate level of maturity**, municipalities combine significant funding sources into an integrated funding analysis as part of long-term projections. Typically, this would be accomplished by integrating significant funding source analyses together in a table. The table would be developed to represent long-term projections. Different funding scenarios could be assessed by varying the amounts of one funding source (e.g. debt financing) and ascertaining what impacts would be required on other funding sources (e.g. reserves/reserve funds, contributions from operating, etc.) to keep the financing strategy in balance.

At the **advanced level of maturity**, municipalities combine all funding sources into an integrated funding analysis as part of long-term projections. Typically, this would be accomplished by integrating all funding source analyses together in a table. The table would be developed to represent long-term projections. Different funding scenarios could be assessed by varying the amounts of one funding source (e.g. debt financing) and ascertaining what impacts would be required on other funding sources (e.g. reserves/reserve funds, contributions from operating, etc.) to keep the financing strategy in balance.

Integrated Funding Analysis – Example

To demonstrate an integrated funding analysis, consider the following assumptions:

- A municipality anticipates capital needs of $35.3 million over five years and $63.3 million over ten years to meet optimal expected levels of service.
- Due to fiscal constraints, some capital works are deferred until later years. Only $24.3 million is considered available to be completed within five years and $54.2 million within ten years.
- This creates an infrastructure gap representing the amount required to be spent to bring the assets up from current levels of service to optimal expected levels of service. This is summarized in Table 6-10 below:

Table 6-10
Sample Integrated Funding Analysis

Category	Optimal Expected LOS	Scenario 1 Capital Deferral, Use of External Debt	Scenario 2 Capital Deferral, No External Debt
Capital (Inflated) over 5 Years	$35,300,000	$24,291,100	$24,291,100
Capital (Inflated) over 10 Years	$63,300,000	$54,197,800	$54,197,800
Infrastructure Gap (Inflated)	None	$11,008,900 – First 5 Years	$11,008,900 – First 5 Years
		$9,102,200 – Next 5 Years	$9,102,200 – Next 5 Years

For the purposes of this example, the municipality is considering two scenarios:

1. Issue $3.5 million in debt for non-growth capital expenditures; or
2. No debt to be issued.

Scenario 1 – Issue $3.5 Million in Debt over Ten Years:

The following represents the capital forecast for ten years (2018 to 2027), with capital financing including a total of $3.5 million in new debt for projects not related to growth. (Note: debt financing for growth-related projects in the total amount of $800,000 in 2025 and 2026 is assumed to represent internally financed debt via DCs).

The impacts of the new debt issuance are highlighted in yellow in the tables. Transfers between funds which are affected by the different financing scenarios are colour coded to match. In this way, the key differences between scenarios can be more easily identified.

Table 6-11
Scenario 1 – Supported Capital Forecast

Scenario 1: Use of Debt

2017 Asset Management Plan
Financing Strategy

Table 1: Tax Supported Capital Forecast

Description	Forecast									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Historical Capital										
General Government / Administration	-	-	-	-	-	-	-	-	-	-
Roads	-	-	-	-	-	-	-	-	-	-
Bridges	-	-	-	-	-	-	-	-	-	-
Storm Mains	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Vehicles & Equipment	-	-	-	-	-	-	-	-	-	-
Land Improvements	-	-	-	-	-	-	-	-	-	-
Replacement (and Disposal) Forecast										
General Government / Administration	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Roads	2,500,000	2,600,000	2,704,000	2,812,200	2,924,700	3,041,700	3,163,400	3,289,900	3,421,500	3,558,400
Bridges	400,000	416,000	432,600	449,900	467,900	486,600	506,100	526,300	547,400	569,300
Storm Mains	400,000	416,000	432,600	449,900	467,900	486,600	506,100	526,300	547,400	569,300
Facilities	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Vehicles & Equipment	70,000	72,800	75,700	78,700	81,800	85,100	88,500	92,000	95,700	99,500
Land Improvements	60,000	62,400	64,900	67,500	70,200	73,000	75,900	78,900	82,100	85,400
Rehabilitation Forecast										
General Government / Administration	-	-	-	-	-	-	-	-	-	-
Roads	300,000	312,000	324,500	337,500	351,000	365,000	379,600	394,800	410,600	427,000
Bridges	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Storm Mains	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Facilities	150,000	156,000	162,200	168,700	175,400	182,400	189,700	197,300	205,200	213,400
Vehicles & Equipment	50,000	52,000	54,100	56,300	58,600	60,900	63,300	65,800	68,400	71,100
Land Improvements	20,000	20,800	21,600	22,500	23,400	24,300	25,300	26,300	27,400	28,500
Expansion Forecast										
General Government / Administration	-	-	-	-	-	-	-	-	-	-
Roads	-	-	-	500,000	-	-	-	-	700,000	-
Bridges	-	-	-	-	200,000	-	-	-	-	-
Storm Mains	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	500,000	-	-
Vehicles & Equipment	-	30,000	-	-	-	-	40,000	-	-	-
Land Improvements	-	-	-	-	-	-	-	-	-	-
Total Capital Expenditures	**4,350,000**	**4,554,000**	**4,705,000**	**5,393,200**	**5,288,900**	**5,292,400**	**5,544,300**	**6,224,400**	**6,653,700**	**6,191,900**
Capital Financing										
Provincial/Federal Grants	-	-	-	-	-	-	-	-	-	-
Debt (Non-Growth)	-	550,000	900,000	700,000	500,000	400,000	250,000	200,000	-	-
Debt (Growth)	-	-	-	-	-	-	-	500,000	300,000	-
Reserve Fund: Development Charges	-	30,000	-	500,000	200,000	-	40,000	-	400,000	-
Reserve Fund: Gas Tax	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Reserve Funds: Capital Related	4,130,000	3,754,000	3,585,000	3,973,200	4,368,900	4,672,400	5,034,300	5,304,400	5,733,700	5,971,900
Total Capital Financing	**4,350,000**	**4,554,000**	**4,705,000**	**5,393,200**	**5,288,900**	**5,292,400**	**5,544,300**	**6,224,400**	**6,653,700**	**6,191,900**
Total Capital Expenses less Capital Financing	-	-	-	-	-	-	-	-	-	-

Table 6-12
Scenario 1 – Debt Schedules

Table 2: New Debt Requirements

New Debt (Non-Growth)	Principal	Forecast										
Year	(Inflated)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
2018	-			-	-	-	-	-	-	-	-	-
2019	550,000				44,133	44,133	44,133	44,133	44,133	44,133	44,133	44,133
2020	900,000					72,218	72,218	72,218	72,218	72,218	72,218	72,218
2021	700,000						56,170	56,170	56,170	56,170	56,170	56,170
2022	500,000							40,121	40,121	40,121	40,121	40,121
2023	400,000								32,097	32,097	32,097	32,097
2024	250,000									20,061	20,061	20,061
2025	200,000										16,049	16,049
2026	-											-
2027	-											
Total Annual Non-Growth Related Debt Charges	**3,500,000**	-	-	-	44,133	116,352	172,522	212,643	244,740	264,801	280,849	280,849

New Debt (Growth)	Principal	Forecast										
Year	(Inflated)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
2018	-			-	-	-	-	-	-	-	-	-
2019	-				-	-	-	-	-	-	-	-
2020	-					-	-	-	-	-	-	-
2021	-						-	-	-	-	-	-
2022	-							-	-	-	-	-
2023	-								-	-	-	-
2024	-									-	-	-
2025	500,000										40,121	40,121
2026	300,000											24,073
2027	-											
Total Annual Internal Debt Charges	**800,000**	-	-	-	-	-	-	-	-	-	40,121	64,194

Table 6-13
Scenario 1 – Reserve/Reserve Fund Schedules

Table 3: Reserve and Reserve Fund Continuity Schedules

	Forecast									
Development Charges Reserve Funds	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	505,000	572,771	613,041	686,235	257,383	129,566	227,014	287,460	391,335	54,251
Development Charge Proceeds	84,100	86,200	88,400	90,600	92,900	95,200	97,600	100,000	102,500	105,100
Transfer to Capital	-	30,000	-	500,000	200,000	-	40,000	-	400,000	-
Transfer to Operating (Debenture Payments - Growth)	22,000	22,000	22,000	22,000	22,000	-	-	-	40,121	64,194
Interest Earned	5,671	6,070	6,794	2,548	1,283	2,248	2,846	3,875	537	952
Closing Balance	572,771	613,041	686,235	257,383	129,566	227,014	287,460	391,335	54,251	96,108

	Forecast									
Gas Tax Reserve Fund	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	-	-	-	-	-	-	-	-	-	-
Transfers From Operating	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Transfer to Capital	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Interest Earned	-	-	-	-	-	-	-	-	-	-
Closing Balance	-	-	-	-	-	-	-	-	-	-

	Forecast									
Capital Related Reserve Funds (All Tax Supported)	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	2,070,500	772,092	253,067	297,566	272,309	210,500	249,110	185,179	135,507	288,156
Transfers from Operating	2,823,948	3,232,469	3,626,552	3,945,247	4,305,007	4,708,543	4,968,536	5,253,386	5,883,496	6,218,751
Transfer to Capital	4,130,000	3,754,000	3,585,000	3,973,200	4,368,900	4,672,400	5,034,300	5,304,400	5,733,700	5,971,900
Transfer to Operating	-	-	-	-	-	-	-	-	-	-
Interest Earned	7,644	2,506	2,946	2,696	2,084	2,466	1,833	1,342	2,853	5,350
Closing Balance	772,092	253,067	297,566	272,309	210,500	249,110	185,179	135,507	288,156	540,357
Note: Closing reserve fund balances as a percentage of capital asset current cost	**0.39%**	**0.13%**	**0.14%**	**0.13%**	**0.10%**	**0.11%**	**0.08%**	**0.06%**	**0.12%**	**0.21%**

Table 6-14
Scenario 1 – Operating Budget Summary

Table 4: Tax Supported Operating Budget Forecast Summary

Net Impact on Taxation	Forecast									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Expenditures (excluding Maintenance):										
Council & CAO	277,000	283,000	289,000	295,000	301,000	307,000	313,000	319,000	325,000	332,000
Clerks	530,000	541,000	552,000	563,000	574,000	585,000	597,000	609,000	621,000	633,000
Finance	574,000	585,000	597,000	609,000	621,000	633,000	646,000	659,000	672,000	685,000
Fire	718,000	732,000	747,000	762,000	777,000	793,000	809,000	825,000	842,000	859,000
Public Works	1,269,000	1,294,000	1,320,000	1,346,000	1,373,000	1,400,000	1,428,000	1,457,000	1,486,000	1,516,000
Parks & Recreation	960,000	979,000	999,000	1,019,000	1,039,000	1,060,000	1,081,000	1,103,000	1,125,000	1,148,000
Other	691,000	705,000	719,000	733,000	748,000	763,000	778,000	794,000	810,000	826,000
Revenues (Other than Taxation):										
Grants	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)
User Fees	(700,000)	(711,000)	(722,000)	(733,000)	(744,000)	(755,000)	(766,000)	(777,000)	(789,000)	(801,000)
Penalties & Interest	(130,000)	(132,000)	(134,000)	(136,000)	(138,000)	(140,000)	(142,000)	(144,000)	(146,000)	(148,000)
Other	(80,000)	(81,000)	(82,000)	(83,000)	(84,000)	(85,000)	(86,000)	(87,000)	(88,000)	(89,000)
Maintenance (Current Levels):										
Fire	85,000	87,000	89,000	91,000	93,000	95,000	97,000	99,000	101,000	103,000
Public Works	145,000	148,000	151,000	154,000	157,000	160,000	163,000	166,000	169,000	172,000
Parks & Recreation	120,000	122,000	124,000	126,000	129,000	132,000	135,000	138,000	141,000	144,000
LOS: Non-Infrastructure Solutions:										
Fire	5,000	5,100	5,200	5,300	5,400	5,500	5,600	5,700	5,800	5,900
Public Works	15,000	15,300	15,600	15,900	16,200	16,500	16,800	17,100	17,400	17,700
Parks & Recreation	10,000	10,200	10,400	10,600	10,800	11,000	11,200	11,400	11,600	11,800
LOS: Maintenance & Operations:										
Fire	30,000	30,600	31,200	31,800	32,400	33,000	33,700	34,400	35,100	35,800
Public Works	55,000	56,100	57,200	58,300	59,500	60,700	61,900	63,100	64,400	65,700
Parks & Recreation	42,000	42,800	43,700	44,600	45,500	46,400	47,300	48,200	49,200	50,200
Transfers to Reserve Funds:										
Transfer to Gas Tax Reserve	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Transfer to Capital Related Reserve Funds	2,823,948	3,232,469	3,626,552	3,945,247	4,305,007	4,708,543	4,968,536	5,253,386	5,883,496	6,218,751
Debentures Payments:										
Debt Payments (Non Growth)	325,000	325,000	369,133	441,352	497,522	537,643	569,740	589,801	280,849	280,849
Debt Payments (Growth)	22,000	22,000	22,000	22,000	22,000	-	-	-	40,121	64,194
Growth Debt Recovery - DCs	(22,000)	(22,000)	(22,000)	(22,000)	(22,000)	-	-	-	(40,121)	(64,194)
Total Taxation Levy	**7,534,948**	**8,039,569**	**8,577,986**	**9,069,098**	**9,588,329**	**10,137,286**	**10,537,776**	**10,954,087**	**11,386,845**	**11,836,700**
Taxation Levy Analysis										
Prior Year Taxation Levy	7,062,000	7,534,948	8,039,569	8,577,986	9,069,098	9,588,329	10,137,286	10,537,776	10,954,087	11,386,845
Add: Provision for Assessment Growth (see below)	105,930	113,024	120,594	128,670	136,036	143,825	152,059	158,067	164,311	170,803
Current Year Taxation Levy at 0.0% Increase	7,167,930	7,647,972	8,160,163	8,706,656	9,205,135	9,732,154	10,289,346	10,695,842	11,118,398	11,557,648
Additional Increase in Taxation Levy for the year	367,018	391,597	417,823	362,443	383,194	405,133	248,430	258,245	268,447	279,052
Total Taxation Levy	7,534,948	8,039,569	8,577,986	9,069,098	9,588,329	10,137,286	10,537,776	10,954,087	11,386,845	11,836,700
Annual Percentage Increase	**5.1%**	**5.1%**	**5.1%**	**4.2%**	**4.2%**	**4.2%**	**2.4%**	**2.4%**	**2.4%**	**2.4%**

	Forecast									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Assessment Growth Estimate (%)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%

Scenario 2 – No Debt

The following represents the capital forecast for ten years (2018 to 2027) with no debt issued. (Note: debt financing for growth in the total amount of $800,000 in 2025 and 2026 represents internally financed debt via DCs).

The impacts of the municipality not issuing new debt are highlighted in yellow in the tables. Transfers between funds which are affected by the different financing scenarios are colour coded to match. In this way, the key differences between scenarios can be more easily identified.

Table 6-15
Scenario 2 – Supported Capital Forecast

Scenario 2: No Debt

2017 Asset Management Plan
Financing Strategy

Table 1: Tax Supported Capital Forecast

Description	Forecast 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Historical Capital										
General Government / Administration	-	-	-	-	-	-	-	-	-	-
Roads	-	-	-	-	-	-	-	-	-	-
Bridges	-	-	-	-	-	-	-	-	-	-
Storm Mains	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Vehicles & Equipment	-	-	-	-	-	-	-	-	-	-
Land Improvements	-	-	-	-	-	-	-	-	-	-
Replacement (and Disposal) Forecast										
General Government / Administration	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Roads	2,500,000	2,600,000	2,704,000	2,812,200	2,924,700	3,041,700	3,163,400	3,289,900	3,421,500	3,558,400
Bridges	400,000	416,000	432,600	449,900	467,900	486,600	506,100	526,300	547,400	569,300
Storm Mains	400,000	416,000	432,600	449,900	467,900	486,600	506,100	526,300	547,400	569,300
Facilities	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Vehicles & Equipment	70,000	72,800	75,700	78,700	81,800	85,100	88,500	92,000	95,700	99,500
Land Improvements	60,000	62,400	64,900	67,500	70,200	73,000	75,900	78,900	82,100	85,400
Rehabilitation Forecast										
General Government / Administration	-	-	-	-	-	-	-	-	-	-
Roads	300,000	312,000	324,500	337,500	351,000	365,000	379,600	394,800	410,600	427,000
Bridges	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Storm Mains	100,000	104,000	108,200	112,500	117,000	121,700	126,600	131,700	137,000	142,500
Facilities	150,000	156,000	162,200	168,700	175,400	182,400	189,700	197,300	205,200	213,400
Vehicles & Equipment	50,000	52,000	54,100	56,300	58,600	60,900	63,300	65,800	68,400	71,100
Land Improvements	20,000	20,800	21,600	22,500	23,400	24,300	25,300	26,300	27,400	28,500
Expansion Forecast										
General Government / Administration	-	-	-	-	-	-	-	-	-	-
Roads	-	-	-	500,000	-	-	-	-	700,000	-
Bridges	-	-	-	-	200,000	-	-	-	-	-
Storm Mains	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	500,000	-	-
Vehicles & Equipment	-	30,000	-	-	-	-	40,000	-	-	-
Land Improvements	-	-	-	-	-	-	-	-	-	-
Total Capital Expenditures	**4,350,000**	**4,554,000**	**4,705,000**	**5,393,200**	**5,288,900**	**5,292,400**	**5,544,300**	**6,224,400**	**6,653,700**	**6,191,900**
Capital Financing										
Provincial/Federal Grants	-	-	-	-	-	-	-	-	-	-
Debt (Non-Growth)	-	-	-	-	-	-	-	-	-	-
Debt (Growth)	-	-	-	-	-	-	-	500,000	300,000	-
Reserve Fund: Development Charges	-	30,000	-	500,000	200,000	-	40,000	-	400,000	-
Reserve Fund: Gas Tax	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Reserve Funds: Capital Related	4,130,000	4,304,000	4,485,000	4,673,200	4,868,900	5,072,400	5,284,300	5,504,400	5,733,700	5,971,900
Total Capital Financing	**4,350,000**	**4,554,000**	**4,705,000**	**5,393,200**	**5,288,900**	**5,292,400**	**5,544,300**	**6,224,400**	**6,653,700**	**6,191,900**
Total Capital Expenses less Capital Financing	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Table 6-16
Scenario 2 – Debt Schedules

Table 2: New Debt Requirements

New Debt (Non-Growth) Year	Principal (Inflated)	Forecast 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
2018	-		-	-	-	-	-	-	-	-	-
2019	-			-	-	-	-	-	-	-	-
2020	-				-	-	-	-	-	-	-
2021	-					-	-	-	-	-	-
2022	-						-	-	-	-	-
2023	-							-	-	-	-
2024	-								-	-	-
2025	-									-	-
2026	-										-
2027	-										
Total Annual Non-Growth Related Debt Charges	-	-	-	-	-	-	-	-	-	-	-

New Debt (Growth) Year	Principal (Inflated)	Forecast 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
2018	-		-	-	-	-	-	-	-	-	-
2019	-			-	-	-	-	-	-	-	-
2020	-				-	-	-	-	-	-	-
2021	-					-	-	-	-	-	-
2022	-						-	-	-	-	-
2023	-							-	-	-	-
2024	-								-	-	-
2025	500,000									40,121	40,121
2026	300,000										24,073
2027	-										
Total Annual Internal Debt Charges	800,000	-	-	-	-	-	-	-	-	40,121	64,194

Table 6-17
Scenario 2 – Reserve/Reserve Fund Schedules

Table 3: Reserve and Reserve Fund Continuity Schedules

	Forecast									
Development Charges Reserve Funds	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	505,000	572,771	613,041	686,235	257,383	129,566	227,014	287,460	391,335	54,251
Development Charge Proceeds	84,100	86,200	88,400	90,600	92,900	95,200	97,600	100,000	102,500	105,100
Transfer to Capital	-	30,000	-	500,000	200,000	-	40,000	-	400,000	-
Transfer to Operating (Debenture Payments - Growth)	22,000	22,000	22,000	22,000	22,000	-	-	-	40,121	64,194
Interest Earned	5,671	6,070	6,794	2,548	1,283	2,248	2,846	3,875	537	952
Closing Balance	572,771	613,041	686,235	257,383	129,566	227,014	287,460	391,335	54,251	96,108

	Forecast									
Gas Tax Reserve Fund	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	-	-	-	-	-	-	-	-	-	-
Transfers From Operating	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Transfer to Capital	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Interest Earned	-	-	-	-	-	-	-	-	-	-
Closing Balance	-	-	-	-	-	-	-	-	-	-

	Forecast									
Capital Related Reserve Funds (All Tax Supported)	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Opening Balance	2,070,500	975,282	341,162	234,759	271,491	463,413	824,454	1,155,985	1,454,857	2,045,291
Transfers from Operating	3,025,126	3,666,502	4,376,273	4,707,244	5,056,233	5,425,278	5,604,386	5,788,867	6,303,883	6,499,600
Transfer to Capital	4,130,000	4,304,000	4,485,000	4,673,200	4,868,900	5,072,400	5,284,300	5,504,400	5,733,700	5,971,900
Transfer to Operating	-	-	-	-	-	-	-	-	-	-
Interest Earned	9,656	3,378	2,324	2,688	4,588	8,163	11,445	14,405	20,250	25,730
Closing Balance	975,282	341,162	234,759	271,491	463,413	824,454	1,155,985	1,454,857	2,045,291	2,598,721
Note: Closing reserve fund balances as a percentage of capital asset current cost	**0.50%**	**0.17%**	**0.11%**	**0.13%**	**0.21%**	**0.36%**	**0.49%**	**0.60%**	**0.83%**	**1.02%**

Table 6-18
Scenario 2 – Operating Budget Summary

Table 4: Tax Supported Operating Budget Forecast Summary

Net Impact on Taxation	Forecast									
	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Expenditures:										
Council & CAO	277,000	283,000	289,000	295,000	301,000	307,000	313,000	319,000	325,000	332,000
Clerks	530,000	541,000	552,000	563,000	574,000	585,000	597,000	609,000	621,000	633,000
Finance	574,000	585,000	597,000	609,000	621,000	633,000	646,000	659,000	672,000	685,000
Fire	801,000	817,000	833,000	850,000	867,000	884,000	902,000	920,000	938,000	957,000
Public Works	1,414,000	1,442,000	1,471,000	1,500,000	1,530,000	1,561,000	1,592,000	1,624,000	1,656,000	1,689,000
Parks & Recreation	1,082,000	1,104,000	1,126,000	1,149,000	1,172,000	1,195,000	1,219,000	1,243,000	1,268,000	1,293,000
Other	691,000	705,000	719,000	733,000	748,000	763,000	778,000	794,000	810,000	826,000
Revenues (Other than Taxation):										
Grants	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)	(450,000)
User Fees	(700,000)	(711,000)	(722,000)	(733,000)	(744,000)	(755,000)	(766,000)	(777,000)	(789,000)	(801,000)
Penalties & Interest	(130,000)	(132,000)	(134,000)	(136,000)	(138,000)	(140,000)	(142,000)	(144,000)	(146,000)	(148,000)
Other	(80,000)	(81,000)	(82,000)	(83,000)	(84,000)	(85,000)	(86,000)	(87,000)	(88,000)	(89,000)
LOS: Non-Infrastructure Solutions:										
Fire	5,000	5,100	5,200	5,300	5,400	5,500	5,600	5,700	5,800	5,900
Public Works	15,000	15,300	15,600	15,900	16,200	16,500	16,800	17,100	17,400	17,700
Parks & Recreation	10,000	10,200	10,400	10,600	10,800	11,000	11,200	11,400	11,600	11,800
LOS: Maintenance & Operations:										
Fire	30,000	30,600	31,200	31,800	32,400	33,000	33,700	34,400	35,100	35,800
Public Works	55,000	56,100	57,200	58,300	59,500	60,700	61,900	63,100	64,400	65,700
Parks & Recreation	42,000	42,800	43,700	44,600	45,500	46,400	47,300	48,200	49,200	50,200
Transfers to Reserve Funds:										
Transfer to Gas Tax Reserve	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Transfer to Capital Related Reserve Funds	3,025,126	3,666,502	4,376,273	4,707,244	5,056,233	5,425,278	5,604,386	5,788,867	6,303,883	6,499,600
Debentures Payments:										
Debt Payments (Non Growth)	325,000	325,000	325,000	325,000	325,000	325,000	325,000	325,000	-	-
Debt Payments (Growth)	22,000	22,000	22,000	22,000	22,000	-	-	-	40,121	64,194
Growth Debt Recovery - DCs	(22,000)	(22,000)	(22,000)	(22,000)	(22,000)	-	-	-	(40,121)	(64,194)
Total Taxation Levy	**7,736,126**	**8,474,602**	**9,283,573**	**9,715,744**	**10,168,033**	**10,641,378**	**10,928,886**	**11,223,767**	**11,524,383**	**11,833,700**
Taxation Levy Analysis										
Prior Year Taxation Levy	7,062,000	7,736,126	8,474,602	9,283,573	9,715,744	10,168,033	10,641,378	10,928,886	11,223,767	11,524,383
Add: Provision for Assessment Growth (see below)	105,930	116,042	127,119	139,254	145,736	152,520	159,621	163,933	168,357	172,866
Current Year Taxation Levy at 0.0% Increase	7,167,930	7,852,168	8,601,721	9,422,826	9,861,480	10,320,554	10,800,999	11,092,819	11,392,124	11,697,249
Additional Increase in Taxation Levy for the year	568,196	622,435	681,851	292,917	306,553	320,824	127,887	130,948	132,260	136,451
Total Taxation Levy	7,736,126	8,474,602	9,283,573	9,715,744	10,168,033	10,641,378	10,928,886	11,223,767	11,524,383	11,833,700
Annual Percentage Increase	**7.9%**	**7.9%**	**7.9%**	**3.1%**	**3.1%**	**3.1%**	**1.2%**	**1.2%**	**1.2%**	**1.2%**

	Forecast									
	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Assessment Growth Estimate (%)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%

<u>Comparison of Scenarios</u>

The above analyses allow the municipality to better assess the impacts of the two financing strategies. Table 6-19 (below) summarizes the results.

Table 6-19
Scenario Impact Comparison

Category	Optimal Expected LOS	Scenario 1 Capital Deferral, Use of External Debt	Scenario 2 Capital Deferral, No External Debt
Capital (Inflated) over 5 Years	$35,300,000	$24,291,100	$24,291,100
Capital (Inflated) over 10 Years	$63,300,000	$54,197,800	$54,197,800
External Debt Issued (Non-Growth)		$3,500,000	-
Capital Reserve Funds – After 10 Years		$540,357	$2,598,271
2027 Reserve Fund Balance, % Asset Cost		0.21%	1.02%
Tax Rate Impacts (Annual % Increase)		5.1% - First 3 Years	7.9% - First 3 Years
		4.2% - Next 3 Years	3.1% - Next 3 Years
		2.4% - Last 4 Years	1.2% - Last 4 Years
Infrastructure Gap	None	$11,008,900 – First 5 Years	$11,008,900 – First 5 Years
		$9,102,200 – Next 5 Years	$9,102,200 – Next 5 Years

Depending on the municipality's financial targets, an assessment can be made as to the most optimal financing strategy. Decisions can be made related to the sensitivity to rate impacts, the level of reserve fund availability, and debt levels over the forecast period.

6.11 Identifying Funded Capital Priorities

With capital priorities identified within the Lifecycle Management Strategy (see Chapter 5) based on the optimal forecast, it is important to identify the capital priorities that are actually funded within the Financing Strategy.

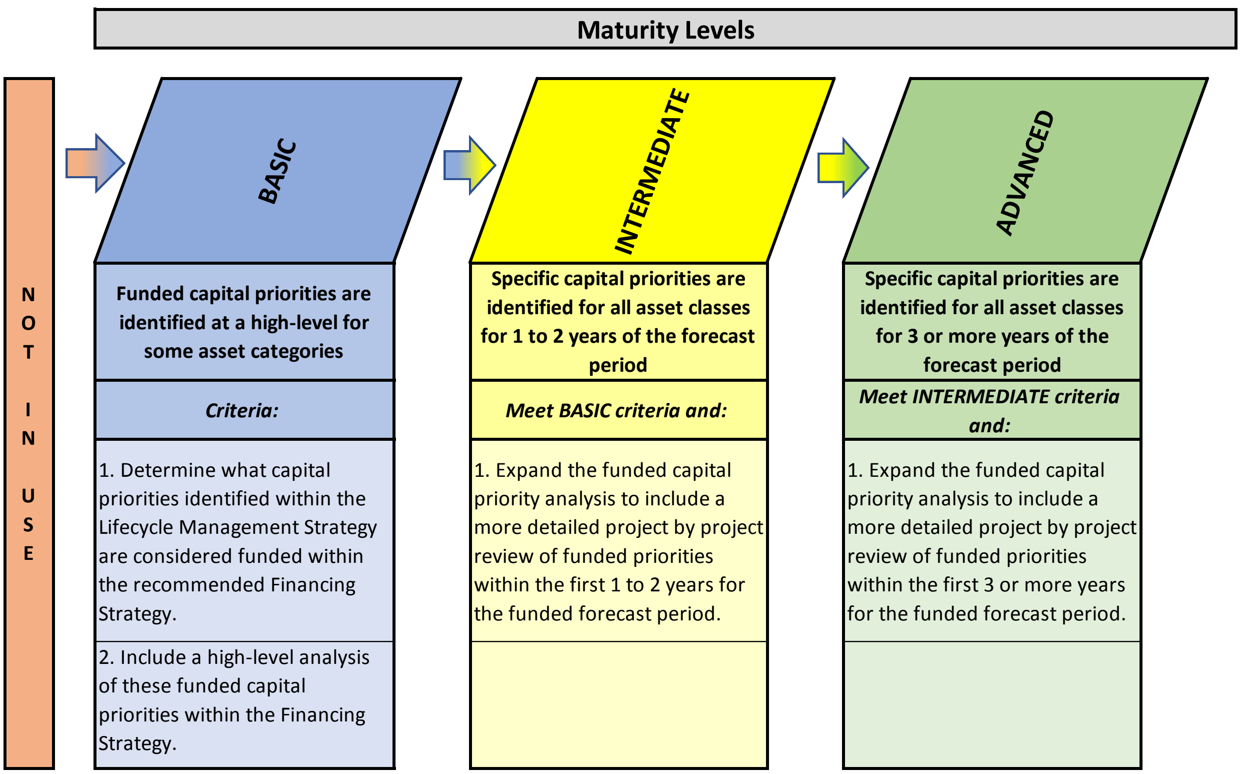
Are clear capital priorities established in the short-term within the Financing Strategy?

Background

Including funded capital priorities within the Financing Strategy allows municipal staff to identify what capital priorities included in the Lifecycle Management Strategy are actually unfunded versus funded. This assists in outlining the consequences of not being able to fund the optimal long-term forecast.

Levels of Maturity – Identifying Funded Capital Priorities

Are clear capital priorities established in the short-term within the Financing Strategy?



At the **basic level of maturity**, municipalities include a high-level analysis of capital priorities that are funded within the Financing Strategy. This analysis would be non-project specific and/or provide no timing with respect to the priorities.

At the **intermediate level of maturity**, the analysis of capital priorities that are funded will be more detailed within the Financing Strategy. This would include project or asset specific priorities and be outlined based on timing of the priority. Priorities would be identified as funded for 1 to 2 years of the funded forecast period.

At the **advanced level of maturity**, the analysis of capital priorities that are funded will be more detailed within the Financing Strategy. This would include project or asset specific priorities and be outlined based on timing of the priority. Priorities would be identified as funded for 3 or more years of the funded forecast period.

<u>Funded Capital Priorities</u>

Capital priority identification, as discussed in Chapter 5, is critical in that it provides valuable information relating to:

- Determining capital projects or assets to include in upcoming budgets;
- Identifying capital projects or assets to fund through Gas Tax Funding; and
- Selecting which capital projects or assets to include in Provincial grant funding applications.

Capital project or asset priorities are identified within the Lifecycle Management Strategy (see Chapter 5) under the preferred or optimal forecasts discussion. If these forecasts can't be fully funded under the recommended Financing Strategy, then it is important to outline the funded versus unfunded components of the priority list. This funded identification can play a number of important roles:

- Ensure Council, the public and other stakeholders understand the implications of not funding the optimal forecast; and
- Identify capital projects or assets that should be funded, if additional funding becomes available (such as grants).

6.12 Performance and Sustainability Measures

Developing and continuously tracking objective performance measures can assist with assessing the effectiveness and sustainability of the financing strategy as well as the overall asset management plan.

Does your financing strategy include a detailed analysis of your infrastructure funding gap?

<u>Background</u>

Identifying and analyzing the various infrastructure funding gaps within an asset management process provides a significant performance/sustainability measure that can be used to measure the overall success of the recommendations within the entire AM process.

Levels of Maturity – Infrastructure Funding Gap

Does your financing strategy include a detailed analysis of your infrastructure funding gap?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	A high level or ad-hoc analysis of the infrastructure funding gap exists for the initial 1 to 2 years of the forecast period	**A high level or ad-hoc analysis of the infrastructure funding gap exists for all years of the forecast period**	**A detailed analysis of the infrastructure funding gap exists for all years of the forecast period**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Identify the infrastructure funding gap by funding source (i.e. taxation, water, wastewater funding) for the initial 1 to 2 years of the forecast period.	1. Identify the infrastructure funding gap by funding source (i.e. taxation, water, wastewater funding) for all years of the forecast period.	1. Identify the infrastructure funding gap by funding source (i.e. taxation, water, wastewater funding) for all years of the forecast period.
	2. Provide a high-level analysis of the implications of the funding gap on capital priorities, risk and levels of service.	2. Provide a high-level analysis of the implications of the funding gap on capital priorities, risk and levels of service. Include a discussion on how the gap is being reduced over time.	2. Provide a detailed analysis of the implications of the funding gap on capital priorities, risk and levels of service. Include a graph and discussion on how the gap is being reduced over time.

At the **basic level of maturity**, municipalities identify the infrastructure funding gaps for the first 1 to 2 years of the forecast period. This calculation would typically be carried out for preferred financing strategies in order to provide a metric for assessing the relative impacts of these financing strategies. A high-level analysis and discussion on the infrastructure funding gap would be included.

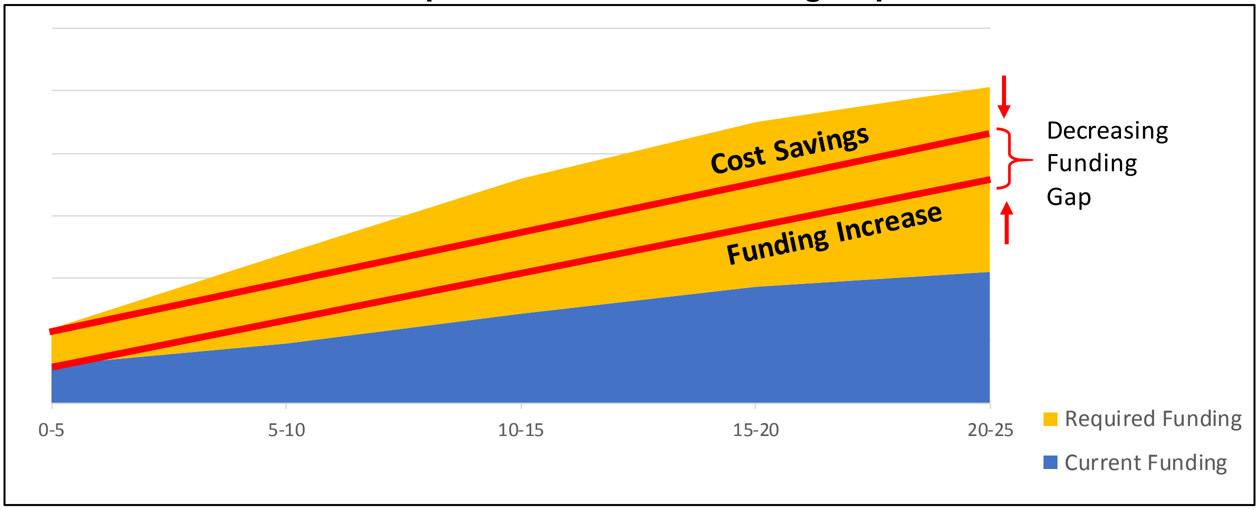
At the **intermediate level of maturity**, municipalities identify the infrastructure funding gaps for all years of the forecast period. This calculation would typically be carried out for preferred financing strategies in order to provide a metric for assessing the relative impacts of these financing strategies. A high-level analysis and discussion on the infrastructure funding gap would be included, including a discussion of how the funding gaps are being reduced over time.

At the **advanced level of maturity**, municipalities identify the infrastructure funding gaps for all years of the forecast period. This calculation would typically be carried out for preferred financing strategies in order to provide a metric for assessing the relative impacts of these financing strategies. A detailed analysis and discussion on the infrastructure funding gap would be included, including a discussion of how the funding gaps are being reduced over time. This information would be shown visually (i.e. graphically) within the Financing Strategy.

Infrastructure Funding Gap

As part of a long-term funding strategy, municipalities should determine the level of annual investment in capital assets that is required as determined by the asset management plan and compare to the amount of annual capital investment included in the operating budget/forecast. The difference between these amounts represents the annual infrastructure funding gap. This is illustrated in Figure 6-5 (below). In order to reduce the gap, either some cost savings must be achieved in the overall required lifecycle costs, or the amount of the annual capital funding must be increased.

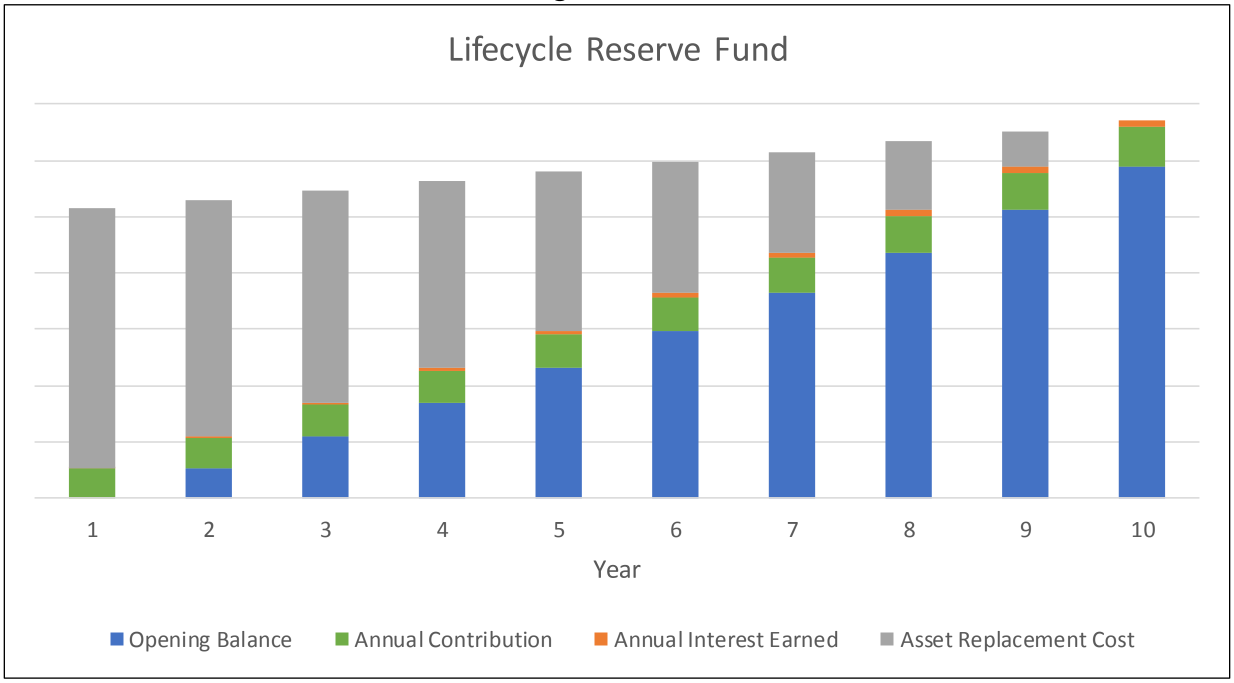
Figure 6-5
Sample Infrastructure Funding Gap



A fundamental approach to calculating the cost of using a capital asset, and for the provision of the revenue required when the time comes to retire and replace it, is the "sinking fund method".

- This method first estimates the future replacement cost of the asset at the time of replacement by inflating the current replacement cost of the asset at an assumed annual capital inflation rate.
- A calculation is then performed to determine annual contributions which, when invested in a reserve fund, will grow with interest to a balance equal to the future replacement cost.
- The contributions are calculated such that they also increase annually with inflation.
- Under this approach, an annual capital investment amount is calculated where funds are available for short-term needs while establishing a funding plan for long-term needs.
- Annual contributions in excess of capital costs in a given year would be transferred to a “capital replacement reserve fund” for future capital replacement needs.
- This approach provides for a stable funding base and eliminates variances in annual funding requirements, particularly in years when capital replacement needs exceed typical capital levy funding. Please refer to Figure 6-6 (below) for an illustration of this method.

Figure 6-6
Sinking Fund Method



Under this approach, funding is available in reserves/reserve funds based on the estimated date of requirement. This methodology represents the “reserve/reserve fund” financing strategy discussed earlier in this chapter and would not be used by municipalities under a “pay as you go” strategy. Alternatively, a hybrid approach can be used where a portion of the lifecycle costs are planned for in reserve/reserve fund contributions, with other portions treated as “pay as you go” strategy.

An illustrative example of a funding gap diagram is as follows:

Example – Funding Gap

In order to mitigate the funding gap (as defined above), it is typical to approach it with a long-term view. A multi-year plan could be instituted which would allow for annual contributions that increase steadily such that the annual funding deficit shrinks.

The figures below represent the funding gaps resulting from the scenarios outlined in the previous sections. It is assumed that the municipality represented in this example wishes to mitigate its infrastructure funding gap by the year 2027 under either scenario.

In these figures, the different components of capital investment are stratified by colour, which indicate:

- Blue: Current capital investment amounts, shown increasing at inflationary levels;
- Green: Grants that are expected to remain consistent over the forecast period;
- Light Orange: External debt maintaining slightly above historical levels until later in the forecast period then decreasing;
- Dark Orange: Indicates the result of implementing recommended increases in available funding sources as outlined within the asset management financing strategy (resulting in increases in capital investment annually); and
- Grey: Represents optimal annual capital investment amounts (as defined/described above). Please note “optimal” capital investment funding can come from a number of additional sources, such as grants, donations, and other contributions.

As can be seen from the figures, the infrastructure funding gap continues to 2027 under Scenario 1. However, under scenario 2 where no additional debt is issued, the gap is mitigated by the year 2023.

Figure 6-7
Scenario 1 – Annual Infrastructure Funding Gap

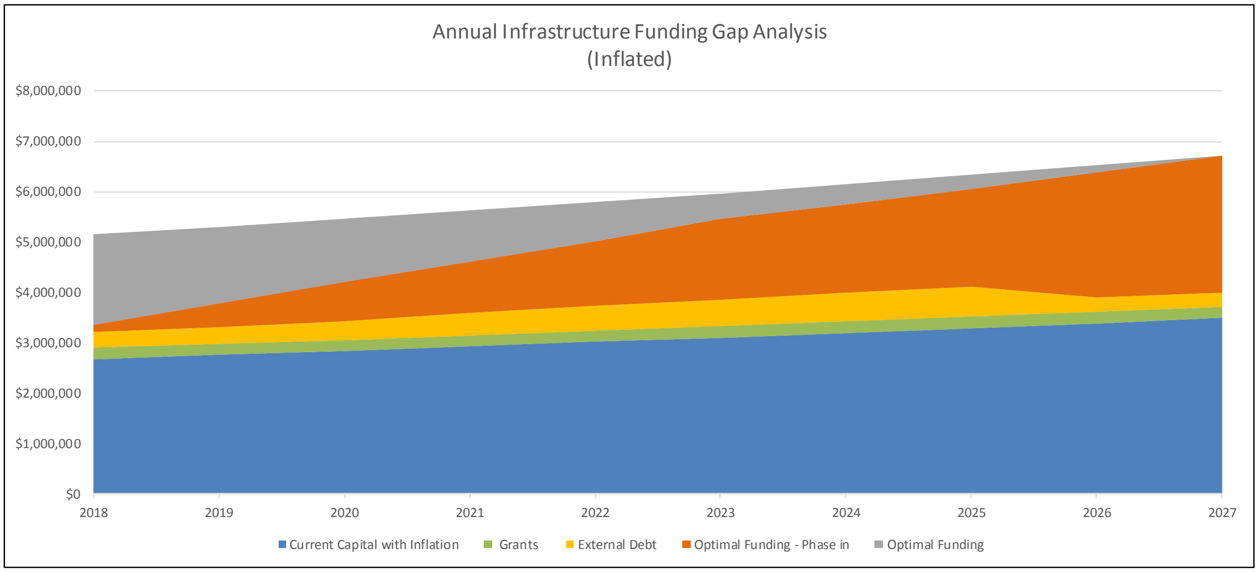
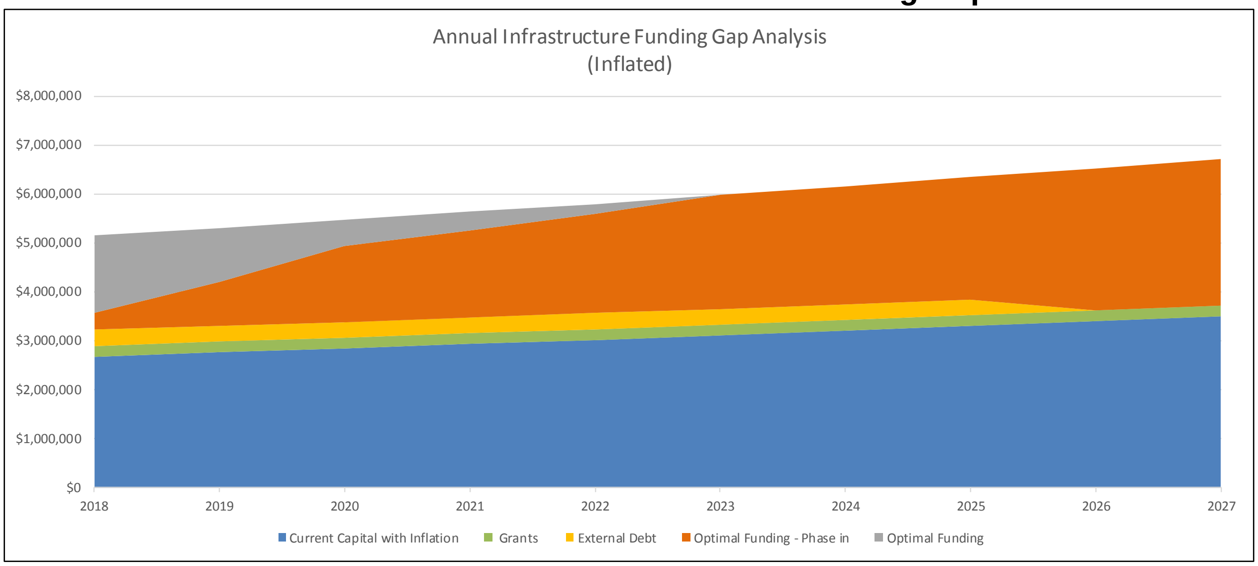


Figure 6-8
Scenario 2 – Annual Infrastructure Funding Gap



Does your financing strategy include other performance and sustainability measures?

Background

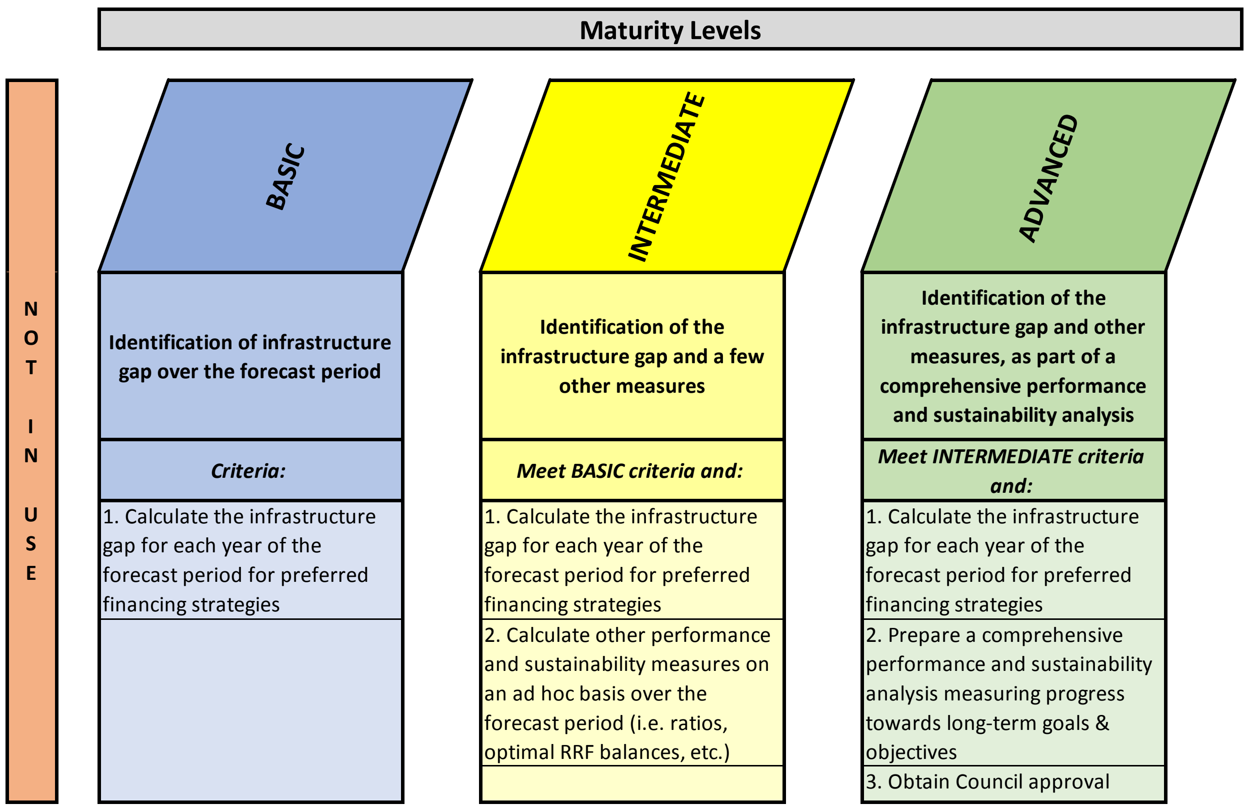
The current and ongoing performance of the asset management financing strategy as well as the level of sustainability that is being achieved can be evaluated by a number of financial indicators. It is important to develop objective measures and track them over time to identify areas in need of improvement and evaluate progress towards meeting targets. Therefore, performance measures should be developed that are SMART:

- Specific;

- Measurable;
- Achievable;
- Relevant; and
- Timebound.

<u>Levels of Maturity – Performance and Sustainability Measures</u>

Does your financing strategy include other performance and sustainability measures?



At the **basic level of maturity**, municipalities identify the amount of the infrastructure gap for each year of the forecast period. This calculation would typically be carried out for preferred financing strategies in order to provide a metric for assessing the relative impacts of these financing strategies.

At the **intermediate level of maturity**, not only would the infrastructure gap be calculated for preferred financing strategies for each year of the forecast period, but additional performance and sustainability measures would also be calculated. These additional measures would include calculations of ratios, optimal reserve/reserve fund balances, etc., and be generally done on an ad hoc basis over the forecast period.

At the **advanced level of maturity**, the identification of the infrastructure gap and other measures as identified in the intermediate level of maturity would be undertaken, but as part of a comprehensive performance and sustainability analysis. To accomplish this, municipalities would undertake the calculation of the infrastructure gap for each year of the forecast period for preferred financing strategies. A comprehensive performance and sustainability analysis would be prepared with the objective of measuring progress towards long-term goals and objectives. Finally, the results of the analysis would be presented to Council regularly (i.e. annually) for their approval.

Infrastructure Gap

As municipalities strive to balance the desire to maintain an affordable tax rate (and/or user fee rate) with the annual funding requirements identified in the asset management plan, often, the resulting strategy is to defer significant capital replacements in order to minimize short-term budget impacts. This approach creates an infrastructure gap, which affects levels of service, creates a higher risk of asset failure, and/or results in increased costs associated with maintaining an asset past its useful life. Municipalities often have not other option, even with these disadvantages considered.

For example, a municipality may be aware that a $1 million asset is in need of replacement this year to maintain expected levels of service. However, due to financial constraints, the municipality has decided not to replace the asset. This means an infrastructure gap of $1 million has been created. An illustrative example is provided below, at the end of this section.

Other Performance/Sustainability Measures

Other performance measures can also be used to evaluate the financing strategy effectiveness. For example:

1. Customer affordability comparison of rates/fees to neighbouring municipalities or provincial averages.
2. The ratio of total capital reserves/reserve fund balances to total assets' replacement cost (inflated) provides an indication of sustainability and the financial preparedness of a municipality to cover lifecycle costs without the expectation of taking on debt.
3. The ratio of total debt outstanding to tangible capital assets (at replacement cost) provides another measure of sustainability and the financial preparedness of a

municipality to cover lifecycle costs without the expectation of taking on additional debt.

4. The calculation of the availability of annual debt capacity, as described earlier in this Chapter. Municipalities must ensure they remain below the annual repayment limit, and therefore, it is prudent to analyse impacts of the financing strategy on this constraint.

Example – Infrastructure Gap

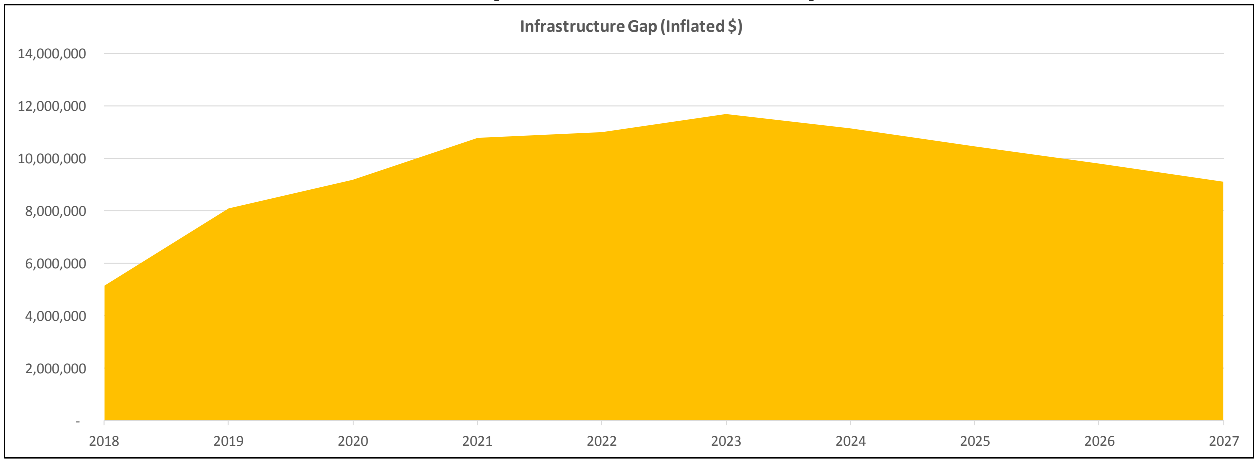
Under both scenarios, the infrastructure gap is identical, as shown in Table 6-20 (below) (and previously discussed in other sections):

Table 6-20
Sample Scenario Comparison – Infrastructure Gap

Category	Optimal Expected LOS	Scenario 1 Capital Deferral, Use of External Debt	Scenario 2 Capital Deferral, No External Debt
Capital (Inflated) over 5 Years	$35,300,000	$24,291,100	$24,291,100
Capital (Inflated) over 10 Years	$63,300,000	$54,197,800	$54,197,800
Infrastructure Gap (Inflated)	None	$11,008,900 – First 5 Years	$11,008,900 – First 5 Years
		$9,102,200 – Next 5 Years	$9,102,200 – Next 5 Years

Figure 6-9 provides a graphical representation of the infrastructure deficit over the forecast period under either scenario. The cumulative infrastructure gap is projected to grow until 2023, and then begins to reduce annually thereafter. However, by 2027, an infrastructure gap still remains. While the infrastructure funding gap outlined in Figures 6-7 and 6-8 reflect the municipality reaching optimal annual investment amounts by 2027, an infrastructure gap still exists from a cost perspective as a “backlog” of infrastructure accumulated while the municipality increased investments levels over time towards optimal levels. This outlines the benefit of calculating gaps, both from an investment (i.e. funding) and from an infrastructure (i.e. cost) perspective within the asset management plan. Target years can be documented, outlining the desired years that both the infrastructure funding gap and the infrastructure gap are eliminated. Alternatively, a municipality’s goal could be to illustrate gaps that are consistently being mitigated over the forecast period.

Figure 6-9
Sample Infrastructure Gap



Does your infrastructure funding gap analysis consider how the gap will be managed?

Background

In the section above, the importance of including a funding gap analysis within the Financing Strategy was discussed. Taking this one step further, the ability to plan how that funding gap will be reduced and eventually eliminated over the forecast period (or beyond) provides significant performance metrics with respect to the overall success of the AM plan.

Levels of Maturity

Does your infrastructure funding gap analysis consider how the gap will be managed?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	High level plan to reduce/eliminate the funding gap, or the plan only exists for some assets.	**More detailed plan to reduce/eliminate the funding gap for significant assets, with a high level plan for other assets.**	**Detailed plan to reduce/eliminate the funding gap for all assets.**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Ensure significant assets that contain funding gaps are addressed.	1. Expand on the high level plan for more significant assets, such as roads, bridges, water and wastewater assets.	1. Provide the expanded plan to reduce and eliminate the funding gaps for all assets.
	2. Include a high-level plan with respect to how funding increases and/or cost reductions are anticipated for these assets, resulting in a mitigating funding gap over the forecast period.	2. Provide more detailed calculations with respect to the anticipated gap mitigation over the forecast period, including the anticipated year(s) the gap will be eliminated, and a sensitivity analysis regarding funding increases and/or cost reductions.	

At the **basic level of maturity**, municipalities have a high-level plan in place to reduce or eliminate the funding gap. The plan may not cover most assets, but it should address funding gaps for *significant* assets. The plan should detail approaches for mitigating funding gaps during periods of anticipated funding increases/reductions.

At the **intermediate level of maturity**, municipalities have a moderately detailed plan to reduce or eliminate the funding gap for significant assets, such as bridges, water and wastewater assets. The plan should include a sensitivity analysis regarding funding increases/reductions as well as detailed calculations to reduce the gap over the forecast period. At this level, municipalities also have a high-level plan for other assets.

At the **advanced level of maturity**, municipalities have a detailed plan to reduce or eliminate the funding gap for all assets.

Mitigating the Infrastructure Funding Gap

The ability to forecast the planned reduction in the infrastructure funding gaps allows municipalities to illustrate the overall effectiveness of a recommended financing strategy over AM plan itself. The use of the terminology "gaps" refers to the fact that municipalities can have multiple funding gaps, such as tax supported and user fee supported (i.e. water, wastewater, solid waste, parking, etc.).

Including a sensitivity analysis within this area also provides a "cause/effect" or consequence of decisions to both Council and the public. For example, if a municipality is recommending a 2.0% capital levy increase to support the AM plan and Council is willing to adopt a 1.0% increase, the following information can be provided:

- 1.0% Capital Levy Increase: Anticipated Funding Gap Elimination: 2055
- 1.5% Capital Levy Increase: Anticipated Funding Gap Elimination: 2045
- 2.0% Capital Levy Increase: Anticipated Funding Gap Elimination: 2035

This data, along with the other implications of a reduced Financing Strategy (asset condition, risk and level of service) can be presented to Council and the public during budget deliberations.

6.13 Expenditure Reporting

A systematic approach to reporting historical and forecast expenditures by lifecycle cost category allows trends to be analyzed and promotes discussions regarding future asset investment levels.

Does your financing strategy include a yearly expenditure breakdown (both historical and forecast) by lifecycle category?

Background

To complete many of the analyses detailed in this chapter, the necessary background financial information will need to be documented as part of the asset management plan. It may be useful to complete the financial information separately for activities supported by taxation versus user fee(s).

To integrate the financial strategy into the asset management plan, a long-term forecast of expenditures and revenues will be required. The forecast should cover a minimum of ten years, but best practice would suggest using a timeframe that coincides with the lifecycle time period of all capital assets.

Annual expenditures should be forecasted for the following lifecycle categories:

a) Non-infrastructure solutions;
b) Maintenance activities;
c) Renewal/Rehabilitation activities;
d) Replacement activities;
e) Disposal activities; and
f) Expansion activities.

To provide historical perspective, the actual expenditures for the above categories should also be included for a defined period.

Levels of Maturity – Expenditure Reporting

Does your financing strategy include a yearly expenditure breakdown (both historical and forecast) by lifecycle category?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Both historical expenditures for 2 - 4 years and forecast of future annual expenditures included by lifecycle category, but not linked	**At least 5 years of historical expenditures linked with forecast of future annual expenditures included by lifecycle category**	**At least 5 years of historical expenditures linked with forecast of future annual expenditures included by lifecycle category, complete with trend analysis**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Compile 2 - 4 years of historical expenditure data, broken down by lifecycle category for inclusion in the AM plan	1. Compile at least 5 years of historical expenditure data, broken down by lifecycle category for inclusion in the AM plan	1. Compile at least 5 years of historical expenditure data, broken down by lifecycle category for inclusion in the AM plan
	2. Create a summary table of projected future costs, broken down by lifecycle category for use in creating the financing strategy	2. Create a summary table of projected future costs, broken down by lifecycle category for use in creating the financing strategy	2. Create a summary table of projected future costs, broken down by lifecycle category for use in creating the financing strategy
		3. Combine historical expenditure data with projected future costs into a consolidated table	3. Combine historical expenditure data with projected future costs into a consolidated table, and complete a trending analysis and discussion

At the **basic level of maturity**, municipalities prepare two expenditure summaries by lifecycle category, with one representing historical annual expenditures and the second including projected annual expenditures. The two summaries would be prepared in isolation and not linked. The historical annual expenditures for the past two to four years would be compiled by lifecycle category and included in the asset management plan. A summary table would also be created of the projected future annual costs which would be broken down by lifecycle category for use in creating the financing strategy.

At the **intermediate level of maturity**, expenditures are summarized by lifecycle category, with at least five years of historical expenditures being linked with a forecast of future annual expenditures. This would require the municipality to compile at least five years of historical expenditure data by lifecycle category and include this information in the asset management plan. Projected annual future costs summarized by lifecycle category would be included in a summary table for use in creating the financing strategy. These two expenditure summaries would be combined into a consolidated table, providing a more comprehensive and informative representation.

At the **advanced level of maturity**, the same steps undertaken at the intermediate level of maturity are followed. However, once the consolidated table of historical and projected expenditures was prepared, a trend analysis would be undertaken. This would provide the opportunity to identify any tendencies that need further investigation and to promote discussion about opportunities for managing costing levels.

Expenditure Reporting – Example

The example tables and figures below are based on the financing strategy example (Scenario 1 – Issue Debt) outlined in other sections above:

Table 6-21
Sample Capital Expenditure Reporting – Table Format

Capital (Historical & Forecast)

	Historical					Forecast		
	2013	2014	2015	2016	2017	2018	2019	2020
Replacement	1,848,000	2,330,000	1,928,000	2,357,000	3,032,000	3,630,000	3,775,200	3,926,200
Rehabilitation	372,000	440,000	442,000	513,000	568,000	720,000	748,800	778,800
Expansion	-	-	-	-	-	-	30,000	-
Total	**2,220,000**	**2,770,000**	**2,370,000**	**2,870,000**	**3,600,000**	**4,350,000**	**4,554,000**	**4,705,000**
	Forecast							
	2021	2022	2023	2024	2025	2026	2027	
Replacement	4,083,200	4,246,500	4,416,400	4,593,200	4,776,800	4,968,100	5,166,900	
Rehabilitation	810,000	842,400	876,000	911,100	947,600	985,600	1,025,000	
Expansion	500,000	200,000	-	40,000	500,000	700,000	-	
Total	**5,393,200**	**5,288,900**	**5,292,400**	**5,544,300**	**6,224,400**	**6,653,700**	**6,191,900**	

Figure 6-10
Sample Capital Expenditure Reporting – Chart Format

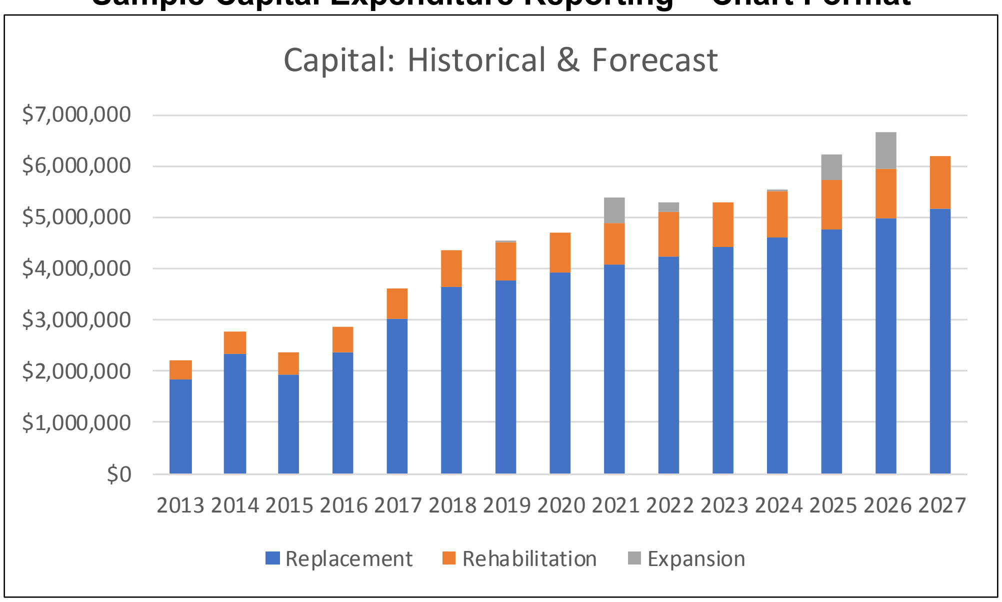
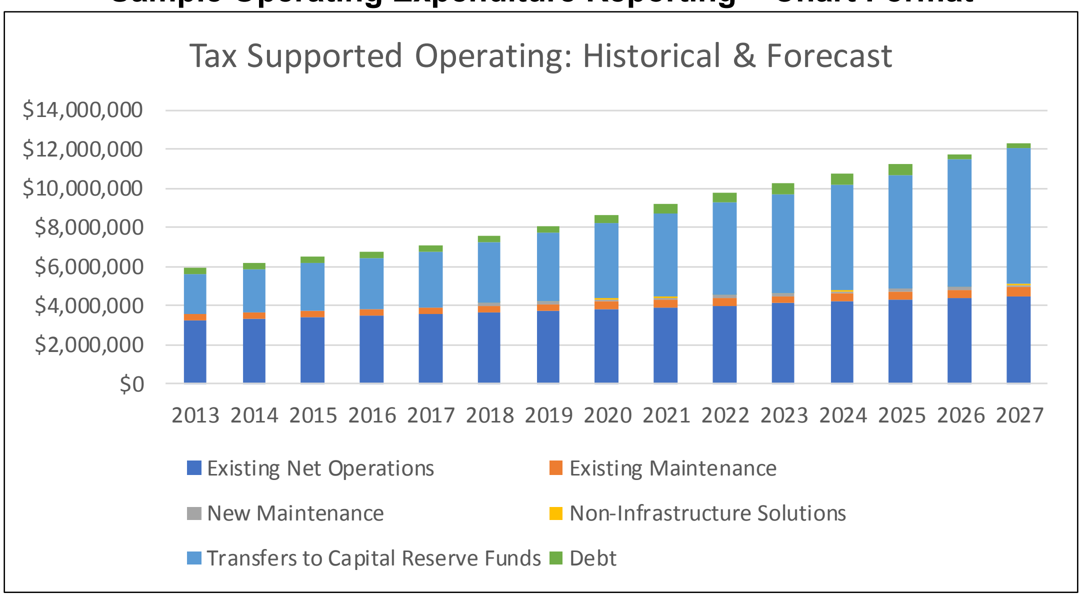


Table 6-22
Sample Operating Expenditure Reporting – Table Format

Tax Supported Operating (Historical & Forecast)

	Historical					Forecast		
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Existing Net Operations	3,252,000	3,330,000	3,410,000	3,492,000	3,574,000	3,659,000	3,745,000	3,835,000
Existing Maintenance	315,000	322,000	329,000	336,000	343,000	350,000	357,000	364,000
New Maintenance	-	-	-	-	-	127,000	129,500	132,100
Non-Infrastructure Solutions	-	-	-	-	-	30,000	30,600	31,200
Transfers to Capital Reserve Funds	2,070,000	2,220,000	2,420,000	2,620,000	2,820,000	3,051,261	3,468,082	3,871,552
Debt Payments	325,000	325,000	325,000	325,000	325,000	325,000	325,000	369,133
Total	**5,962,000**	**6,197,000**	**6,484,000**	**6,773,000**	**7,062,000**	**7,542,261**	**8,055,182**	**8,602,985**
	Forecast							
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	
Existing Net Operations	3,925,000	4,017,000	4,111,000	4,208,000	4,308,000	4,408,000	4,511,000	
Existing Maintenance	371,000	379,000	387,000	395,000	403,000	411,000	419,000	
New Maintenance	134,700	137,400	140,100	142,900	145,700	148,700	151,700	
Non-Infrastructure Solutions	31,800	32,400	33,000	33,600	34,200	34,800	35,400	
Transfers to Capital Reserve Funds	4,284,191	4,749,566	5,063,425	5,403,705	5,775,523	6,499,708	6,936,600	
Debt Payments	441,352	497,522	537,643	569,740	589,801	280,849	280,849	
Total	**9,188,043**	**9,812,888**	**10,272,168**	**10,752,945**	**11,256,223**	**11,783,057**	**12,334,549**	

Figure 6-11
Sample Operating Expenditure Reporting – Chart Format



6.14 Revenue Reporting

Providing a summary of historical and forecast revenues by source will enable municipalities to analyze trends in significant funding sources, and the ability to outline the contribution of each funding source to the overall asset management plan financing strategy over the long-term forecast period.

Does your financing strategy include yearly revenues broken down by confirmed source?

Background

Annual revenues by confirmed source should be reported as part of the asset management plan. This includes revenue sources such as taxation, user fees, debt, gas tax, other grants, reserves/reserve funds, etc. In addition, both historical and projected future revenue need to be represented in the analysis, either independently or in a combined analysis.

Levels of Maturity – Revenue Reporting

Does your financing strategy include yearly revenues broken down by confirmed source?

Maturity Levels

NOT IN USE	BASIC	INTERMEDIATE	ADVANCED
	Both historical revenues of 2 - 4 years with forecast of future annual revenues included by confirmed source	**At least 5 years of historical revenues linked with forecast of future annual revenues by confirmed source**	**At least 5 years of historical revenues linked with forecast of future annual revenues included by confirmed source, complete with trend analysis**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Compile 2 - 4 years of historical revenue data, broken down by confirmed source for inclusion in the AM plan	1. Compile at least 5 years of historical revenue data, broken down by confirmed source for inclusion in the AM plan	1. Compile at least 5 years of historical revenue data, broken down by confirmed source for inclusion in the AM plan
	2. Create a summary table of projected future revenues, broken down by confirmed source for use in summarizing the financing strategy	2. Create a summary table of projected future revenues, broken down by confirmed source for use in summarizing the financing strategy	2. Create a summary table of projected future revenues, broken down by confirmed source for use in summarizing the financing strategy
		3. Combine historical revenue data with projected future revenues into a consolidated table	3. Combine historical revenue data with projected future revenues into a consolidated table, and complete a trending analysis and discussion

At the **basic level of maturity**, municipalities prepare two revenue summaries by confirmed source, with one representing historical annual revenues and the second including projected annual revenues. The two summaries would be prepared in isolation and not linked. The historical annual revenues for the past two to four years would be compiled by confirmed source and included in the asset management plan. A summary table would also be created of the projected future annual revenues, by confirmed source, for use in summarizing the financing strategy.

At the **intermediate level of maturity**, revenues are summarized by confirmed source with at least five years of historical revenues being linked, with a forecast of future annual revenues. This would require the municipality to compile at least five years of historical revenue data, by confirmed source, and include this information in the asset management plan. Projected annual future revenues summarized by confirmed source would be included in a summary table for use in summarizing the financing strategy. These two revenue summaries would be combined into a consolidated table, providing a more comprehensive and informative representation.

At the **advanced level of maturity**, the same steps undertaken at the intermediate level of maturity are followed. However, once the consolidated table of historical and projected revenues was prepared, a trend analysis would be undertaken. This would provide the opportunity to identify any tendencies that need further investigation, and to promote discussion about opportunities for managing revenue levels.

Revenue Reporting - Example

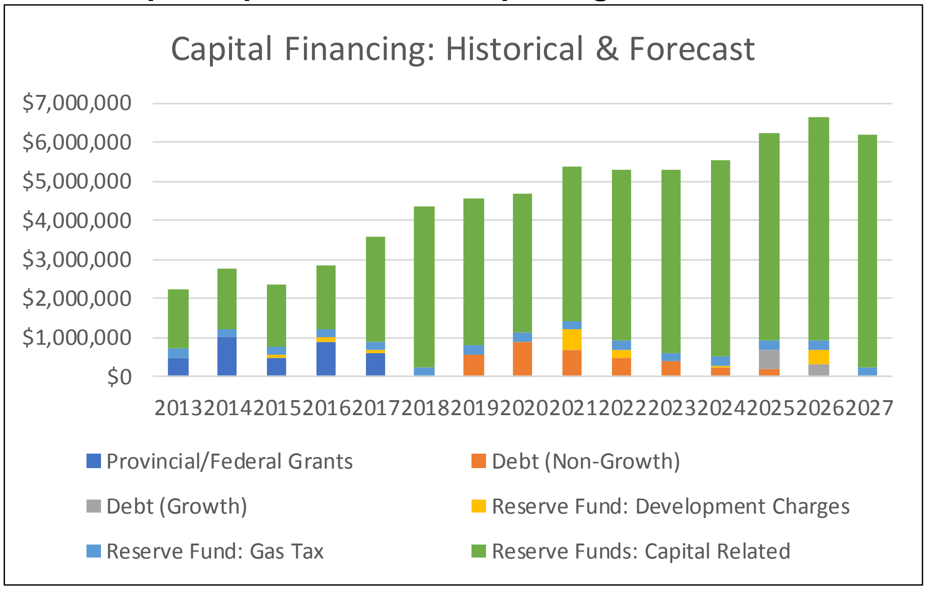
Table 6-23 and Figure 6-12 below are based on the financing strategy example (Scenario 1 – Issue Debt) outlined in other sections above:

Table 6-23
Sample Capital Revenue Reporting – Table Format

Capital Financing: Historical & Forecast

	Historical					Forecast		
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Provincial/Federal Grants	500,000	1,000,000	500,000	900,000	600,000	-	-	-
Debt (Non-Growth)	-	-	-	-	-	-	550,000	900,000
Debt (Growth)	-	-	-	-	-	-	-	-
Reserve Fund: Development Charges	-	-	50,000	100,000	80,000	-	30,000	-
Reserve Fund: Gas Tax	220,000	220,000	220,000	220,000	220,000	220,000	220,000	220,000
Reserve Funds: Capital Related	1,500,000	1,550,000	1,600,000	1,650,000	2,700,000	4,130,000	3,754,000	3,585,000
Total	**2,220,000**	**2,770,000**	**2,370,000**	**2,870,000**	**3,600,000**	**4,350,000**	**4,554,000**	**4,705,000**
	Forecast							
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	
Provincial/Federal Grants	-	-	-	-	-	-	-	
Debt (Non-Growth)	700,000	500,000	400,000	250,000	200,000	-	-	
Debt (Growth)	-	-	-	-	500,000	300,000	-	
Reserve Fund: Development Charges	500,000	200,000	-	40,000	-	400,000	-	
Reserve Fund: Gas Tax	220,000	220,000	220,000	220,000	220,000	220,000	220,000	
Reserve Funds: Capital Related	3,973,200	4,368,900	4,672,400	5,034,300	5,304,400	5,733,700	5,971,900	
Total	**5,393,200**	**5,288,900**	**5,292,400**	**5,544,300**	**6,224,400**	**6,653,700**	**6,191,900**	

Figure 6-12
Sample Capital Revenue Reporting – Chart Format



6.15 Resources and References

Institute of Public Works Engineering Australasia, 2015, International Infrastructure Management Manual, https://www.ipwea.org/publications/bookshop/ipweabookshop/iimm

International Organization for Standardization (ISO), 2014, ISO 55000:2014, Asset management – Overview, principles and terminology, http://www.iso.org/iso/catalogue_detail?csnumber=55088

Province of Ontario, 1997, Development Charges Act, https://www.ontario.ca/laws/statute/97d27

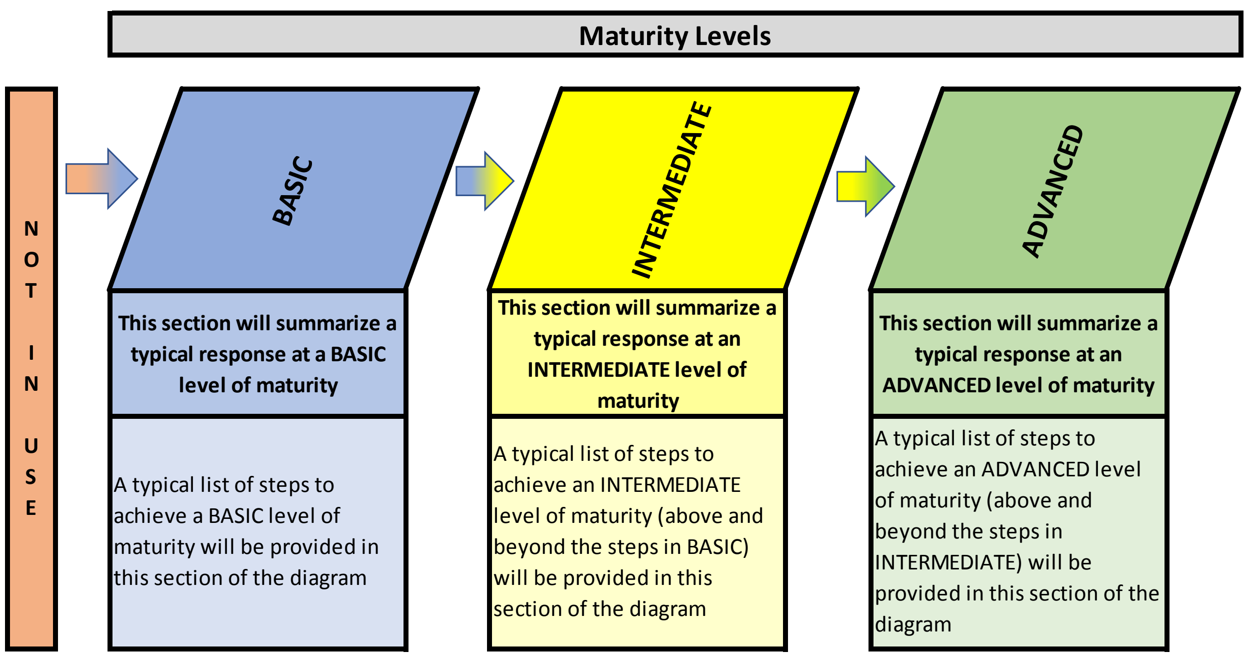
Province of Ontario, 2001, Municipal Act, 2001https://www.ontario.ca/laws/statute/01m25

Province of Ontario, Ministry of Infrastructure, 2012, Building Together: Guide for Municipal Asset Management Plans, https://www.ontario.ca/page/building-together-guide-municipal-asset-management-plans

7 Asset Management Integration

7.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices

to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

7.2 Overview

Asset management should not be conducted as a stand-alone process. The elements of asset management, including identifying capital and operating budget requirements, financing options, delivery of services, risk assessment, and stewardship of assets impact other key processes across a municipality, and in some cases, are indelibly linked. As a municipality pursues its strategic goals, the integration of asset management with other processes helps facilitate a co-ordinated and consistent approach to meeting these goals.

From an operational perspective, integrating systems with common data can provide an opportunity for identifying efficiencies that may otherwise be missed. For example, by integrating related systems, data may only need to be recorded and updated once for various uses. This may reduce the staff effort needed to perform related data management duties. Further, having a more integrated set of systems reduces the chance for inconsistencies and errors between systems. In addition, integrated systems may facilitate more timeliness and help to ensure consistency of outputs when reporting is required from these systems.

When considering integration, it is important to keep in mind that this could entail a two-way interaction between asset management and other related processes. The impacts of changes to any one process should automatically trigger consideration of making corresponding adjustments to related policies and/or procedures. This chapter discusses the importance of integrating asset management planning with:

- Capital budget;
- Operating budget;
- Strategic plan; and
- Other policies and processes.

<u>Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements</u>

O.Reg 588/17 outlines the following requirements with respect to AM Integration:

A Strategic Asset Management Policy (SAMP) must be developed and adopted by *July 1, 2019* and reviewed and updated at least every 5 years. The SAMP should outline a number of potential areas of integration, including the requirement to/ for:

1. Identify which municipal goals, plans or policies the AM plan would support (e.g. official plan, strategic plan, master plans, etc.);
2. A process for how the AM plan is to be considered in the annual budget and any applicable long-term financial plans;
3. The principles to guide AM planning in the municipality, including principles identified in section 3 of the IJPA;
4. A process to ensure alignment of AM planning with water and wastewater financial plans, including any financial plans prepared under the Safe Drinking Water Act, 2002.
5. A process to ensure alignment of AM planning with Ontario’s land-use planning framework, including any relevant policy statements issued under section 3(1) of

the *Planning Act*; Provincial plans as defined in the *Planning Act*; and, municipal official plans;

6. A discussion of capitalization thresholds used to determine which assets should be included in the AM plan and how the thresholds compare to the municipality's Tangible Capital Asset policy;
7. A commitment to coordinate planning between interrelated infrastructure assets with separate ownership structures by pursuing collaborative opportunities with upper-tier municipalities, neighbouring municipalities, and jointly-owned municipal bodies.

Every municipality shall prepare an asset management plan in respect of its core municipal infrastructure assets, as defined in the Regulation, by *July 1, 2021*, and in respect of all of its other municipal infrastructure assets by *July 1, 2023*.

7.3 Capital Budget Integration

Integrating the asset management plan with the capital budget process ensures that the asset management forecast is implemented. Conversely, updating the AM plan to reflect capital budget decisions allows a municipality to understand the long term impacts of those budget decisions.

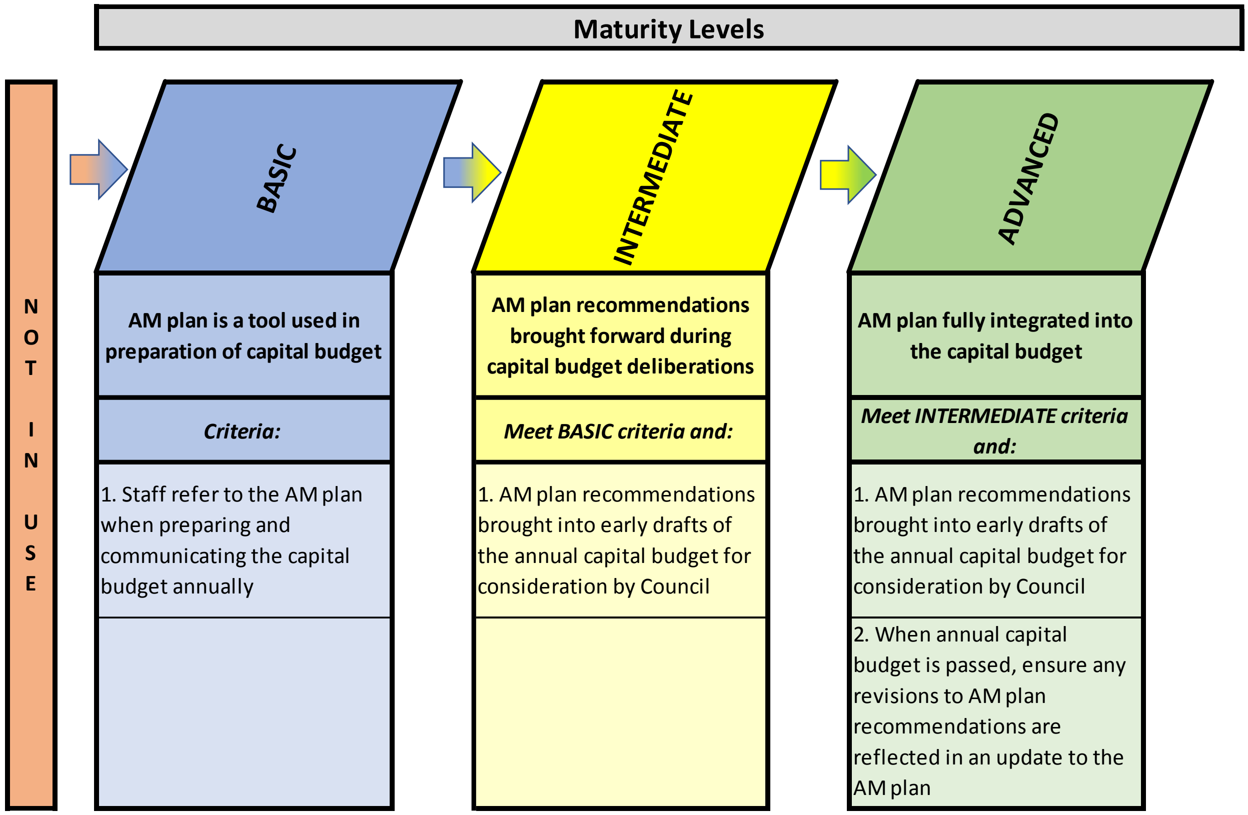
To what extent is the asset management plan integrated into the capital budget?

Background

The asset management plan forms the foundation for prioritizing long-term capital project requirements. Capital priorities and spending can be forecasted through the preparation of lifecycle management strategies, taking factors such as risk, condition, and service levels into account. This mirrors many of the decisions made when preparing a capital budget and long-term forecast each year as part of the budget process.

Levels of Maturity

To what extent is the asset management plan integrated into the capital budget?



At the **basic level of maturity**, the asset management plan is used as a source of information in preparing the capital budget. Typically, staff refer to relevant elements of the asset management plan as they prepare and communicate details related to the capital budget. However, at the basic level of maturity, as the capital budget progresses through the deliberation process, the connection to the asset management plan may be lost.

At the **intermediate level of maturity**, asset management recommendations are brought forward during the early drafts of the annual capital budget deliberations with Council. This provides the opportunity to link the benefits gained from proper asset management into the capital budget process, and the opportunity to assess the related impacts on each at the Council level. At the intermediate level of maturity, as the capital budget process progresses its connection and relationship to the asset management plan may still be broken.

At the **advanced level of maturity**, the asset management plan is fully integrated into the annual capital budget. Asset management recommendations are brought forward during the early drafts of the annual capital budget deliberations with Council. This provides the opportunity to link the benefits gained from proper asset management into the capital budget process, and the opportunity to assess the related impacts on each at the Council level. When the annual capital budget is passed, any impacts to the asset management plan recommendations should be identified and included in an update to the asset management plan.

Asset Management and the Capital Budget

The capital budget preparation process mirrors the processes required to prepare an asset management plan. In a way, they can be treated as one and the same process, in that:

- Capital assets are analyzed to identify priorities;
- Service levels to be provided to the community are identified; and
- A recommended approach to financing capital priorities is determined.

The combination of the state of local infrastructure, levels of service analysis, lifecycle management strategies, and financing strategies outlined in the asset management plan form a logical foundation upon which the capital budget (and long-term capital forecast) can be prepared.

As municipalities deliberate on the capital budget, it is common for capital priorities to change or for financing alternatives to be amended based on ongoing communication and interaction with Council. This can occur for many reasons such as new financial constraints, changing direction from Council, legislative changes, levels of service amendments. Depending on the municipality's level of integration, updates to both the capital budget and AM plan may be required to keep them aligned when the capital budget is passed. Keeping these processes aligned allows staff to coordinate the impact of Council decisions on the capital budget over a long-term time horizon from an asset condition/risk, service level, and available financing perspective, all within the AM plan.

7.4 Operating Budget Integration

Similarly to the capital budget integration, integrating the AM process with the operating budget ensures the implementation of AM recommendations and an understanding of the impacts of operating budget decisions on AM performance.

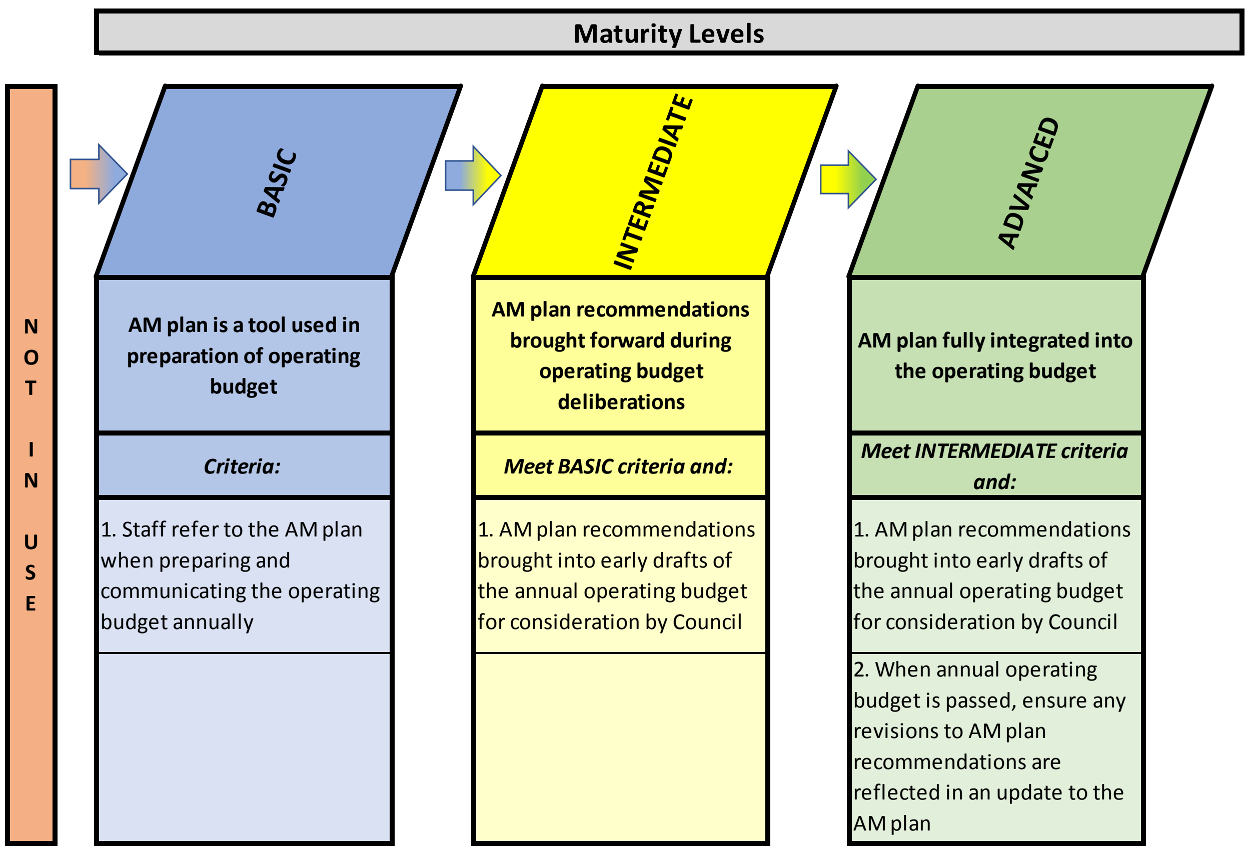
To what extent is the asset management plan integrated into the operating budget?

Background

Asset management plans provide key inputs into the operating budget. This is due to the fact that lifecycle management strategy outlines non-infrastructure solutions, asset maintenance needs, and other operational costs, which provides a more exact level of operating expenditure requirement than simply basing maintenance budgets on previous year plus an inflationary increase.

Levels of Maturity

To what extent is the asset management plan integrated into the operating budget?



At the **basic level of maturity**, the asset management plan is used as a source of information in the preparation of the operating budget. Typically, staff refer to relevant elements of the asset management plan as they prepare and communicate details related to the operating budget. However, at the basic level of maturity, the connection to the asset management plan may be lost as the operating budget progresses through the deliberation process.

At the **intermediate level of maturity**, asset management recommendations are brought forward during the early drafts of the annual operating budget deliberations with Council. This provides the opportunity to link the benefits gained from proper asset management into the operating budget process, and the opportunity to assess the related impacts on each at the Council level. At the intermediate level of maturity, as the operating budget process progresses its connection and relationship to the asset management plan may be broken.

At the **advanced level of maturity**, the asset management plan is fully integrated into the annual operating budget. Asset management recommendations are brought forward during the early drafts of the annual operating budget deliberations with Council. This provides the opportunity to link the benefits gained from proper asset management into the operating budget process, and the opportunity to assess the related impacts on each at the Council level. When the annual operating budget is passed, any impacts to the asset management plan recommendations are identified and reflected in an update to the asset management plan.

Asset Management and the Operating Budget

Operating impacts identified though the asset management process include:

- Non-infrastructure solutions;
- Asset maintenance and operating needs; and
- Financing strategy related implications.

Non-infrastructure solutions that are considered part of the lifecycle management strategy will generally have operating-related financial impacts, while affecting capital related decisions, such as useful life and lifecycle costing. Non-infrastructure solutions may include additional costs (e.g. study costs), or cost savings (e.g. fewer inspections of low risk assets). In either circumstance, these impacts should be reflected in the lifecycle management strategy of the AM plan and will have implications on future operating budgets. Non-infrastructure solutions are discussed in more detail within Chapter 5.

Similar to non-infrastructure solutions, asset maintenance and operating-related needs have financial impacts on the operating budget. These impacts may be in the form of costs (e.g. road crack sealing program) or savings (e.g. hydro impacts from LED streetlight program). Whether costs or savings, the impacts are reflected in the lifecycle management strategy and have implications on future operating budgets.

A funding analysis is useful to undertake as part of the financing strategy of the AM plan and as part of the operating budget (i.e. analyses of taxation, user fees, other revenue, debt, and reserves/reserve funds). Both processes can have very similar funding strategies. However, Council may ultimately pass an operating budget that could look quite different from the AM plan estimates. Some areas of impact include:

- **Taxation levy and user fee amounts:** The operating budget will determine the actual taxation levy or user fee rates (e.g. water and wastewater, recreation facilities, etc.) for the year which might differ from estimates within the AM plan.
- **New debt:** The anticipated issuance of debt to fund budgeted capital projects will create future principal and interest costs to be included in current and future budgets. These financial impacts may not have been anticipated in the preparation of the AM plan, or proposed debt within the AM plan may not be approved within the budget process.
- **Reserve/reserve funds:** The reserve/reserve fund strategies will also impact on the operating budget, as the funding of the capital reserve funds from the operating budget will need to be incorporated. These strategies may differ between what has been originally projected in the AM plan and what is ultimately approved to be included in the operating budget.
- **Other revenues**: Grants or other irregularly available revenues may become known during the budget process that may not be reflected in the AM plan, or vice versa.

As municipalities deliberate on the operating budget, it is common for operating priorities to change, variables (such as inflation) to be amended, or financing alternatives to be edited. These changes can occur for many reasons such as new financial constraints, changing direction from Council, legislative changes, or levels of service amendments. It is important to revise the asset management plan accordingly to ensure consistency between the asset management plan and final operating budget passed by Council.

Timing and sequence determines whether or not the AM plan or budget is most accurate (i.e. which one was created last, based on most recent data, assumptions and variables?). Full integration of the operating budget with the AM plan ensures both use consistent and accurate results. Therefore, it is recommended that as one is updated, the other is also.

7.5 Strategic Plan Integration

Integration with the strategic plan ensures that the asset management process is aligned with the municipality's overall goals and objectives.

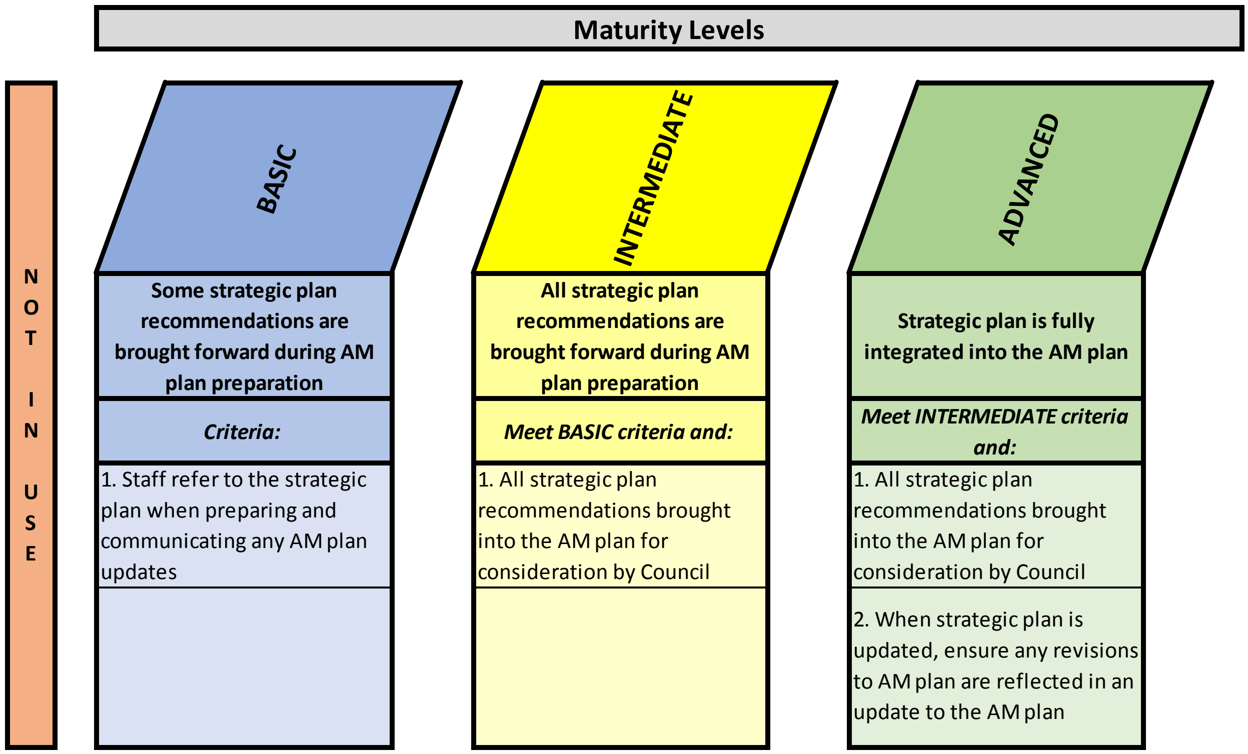
To what extent is the asset management plan integrated with the municipality's strategic plan?

Background

A strategic planning process can help a municipality establish an overall corporate vision, mission, and goal. It is a critical process that examines where a municipality is now, where it wants to go, and how it should get there. It will help the municipality identify action priorities that are consistent with the established corporate goals. A strategic plan is a "living document" that is regularly updated (usually every 5 years). AM-related missions and goals can become a component of the overall corporate strategic plan. Moreover, the decisions made within the strategic planning process can provide valuable input into the AM planning process.

Levels of Maturity

To what extent is the asset management plan integrated with the municipality's strategic plan?



At the **basic level of maturity**, some strategic plan recommendations are brought forward during the preparation of the asset management plan. Typically, staff refer to relevant elements of the strategic plan as they prepare or update the asset management planning process. However, there may be some gaps or inconsistencies between the strategic plan and the asset management planning process. At this level, asset management is likely not a key component to the strategic plan.

At the **intermediate level of maturity**, all strategic plan recommendations are brought forward during the preparation of the asset management plan. Staff should be aware of all interrelated strategic plan recommendations and should strive to maintain consistency between the objectives of the strategic plan and the asset management planning process, where applicable. This should allow Council to consider the asset management plan since they will know that it conforms to provisions of the strategic plan.

At the **advanced level of maturity**, all strategic plan recommendations are brought forward during the preparation of the asset management plan. Staff are aware of all interrelated strategic plan recommendations and strive to maintain consistency between the objectives of the strategic plan and the asset management plan. This should allow Council to consider the asset management plan since they will know that it conforms to provisions of the strategic plan. In addition, when there are updates to the strategic plan, possible updates to related provisions in the asset management planning process should be considered.

Asset Management and Strategic Planning

The overall corporate vision, mission, and goals of the municipality should be considered when updating or creating an asset management plan. Typically this information is recorded in a municipality's strategic plan. Like the strategic plan, the asset management planning process has a long-term view. To meet strategic planning goals, all necessary infrastructure must be in place to successfully provide necessary service levels. Thus, there must be a connection between the two processes. Such connection can happen by updating related provisions of the asset management plan any time the strategic plan is modified. Doing so will maintain consistency between the plans. This can be done by aligning the timing of a new strategic plan with a corresponding planned update to a municipality's AM plan. It should be noted, however, that aligning the timing does not necessarily mean undertaking both at the same time as this could be difficult to do. Alignment in this context refers to the need to recognize the latest updates of the other document, whenever these take place.

The levels of service analysis is a key component to asset management (see Chapter 4). Initial sections of Chapter 4 discuss the identification of municipal services and the process of determining community expectations on those services. This process, while directly related to asset management, can also form future updates to the strategic plan. If the ultimate objective of a municipality is to provide services to the community, overall levels of service and changes to levels of service should be reflected in the strategic plan. Conversely, to initiate the process in Chapter 4 (of establishing a levels-of-service analysis), future anticipated strategic plan updates could form the foundation of this analysis. This methodology can produce the additional benefit of ensuring that the levels of service expectations would have been discussed and approved by Council before making its way into the AM planning process. Consequently, the levels of service analysis would then be consistent with Council's vision for the municipality.

A second aspect to the strategic planning process is the possibility to link the strategic plan to departmental goals and objectives and then link individual staff goals and objectives to these departmental goals and objectives. With this philosophy, municipal staff work towards departmental goals, which in turn assists departments in working towards corporate goals, which in turn are in line with the overall organizational mission and vision within the strategic plan. This extended process could also be used to enhance the levels of service analysis within AM planning, as discussed in Chapter 4. What the various departments and staff members do on a day-to-day basis to meet respective departmental goals and objectives could inform the technical levels of service analysis, which demonstrates what the municipality will do to move towards expected levels of service.

7.6 Integration with PSAB 3150 (Tangible Capital Assets)

Integration with a municipality's tangible capital asset listing (used for accounting purposes) assists with a more efficient upkeep of all asset data.

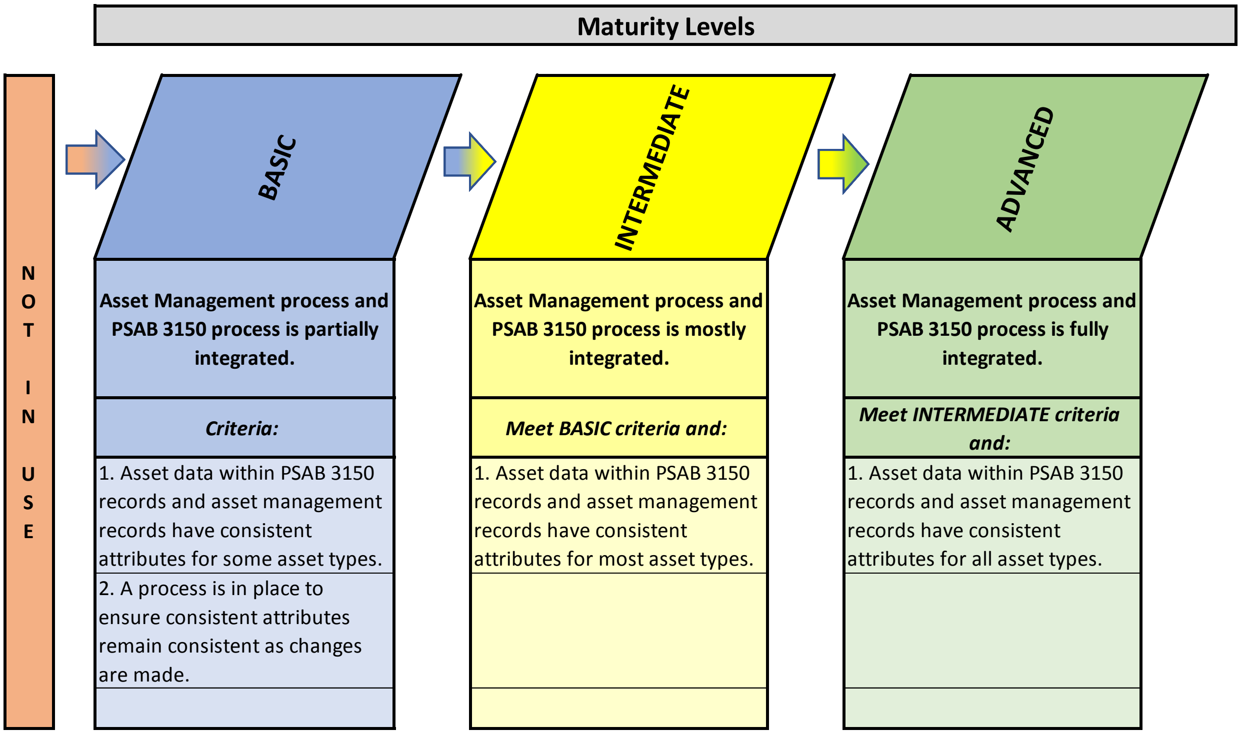
To what extent is the asset management plan integrated with PSAB 3150 asset data?

Background

Both the PSAB 3150 requirements and the asset management requirements are based on a list of assets with key attributes and asset costing. However, the approaches of attribute identifying and costing differ in each requirement. Both require the ability to keep the asset listing up-to-date and accurate, so that resulting calculations are accurate. Municipalities must determine if there is enough commonality among the PSAB 3150 process and AM process to justify integration.

Levels of Maturity

To what extent is the asset management plan integrated with PSAB 3150 asset data?



At the **basic level of maturity**, the asset management process is partially integrated with PSAB 3150. Asset attributes are consistent for some asset types, and a process exists to ensure consistency as change occurs.

At the **intermediate level of maturity**, the asset management process is mostly integrated with PSAB 3150. Asset attributes are consistent for most asset types, and a process exists to ensure attribute consistency as changes are made.

At the **advanced level of maturity**, the asset management process is fully integrated with PSAB 3150. Asset attributes are consistent for all asset types.

<u>Asset Management and PSAB 3150</u>

Integrating the asset management and PSAB processes enables a municipality to use asset attributes that are consistent between processes to perform calculations and meet legislative requirements. While the calculations (i.e. lifecycle costing versus amortization) and the costing (replacement cost versus historical cost) are quite different, information such as asset additions, disposals, asset impairments, length, width, and material type can be useful in both cases. Rather than having this data updated and maintained twice each time an asset changes, integration allows the ability to only update and maintain this data once.

Some areas to consider when determining whether to integrate asset management and PSAB 3150 data:

- **The level of effort to establish the integration**. Some municipalities have determined that the most efficient approach to this integration is to use a municipality's asset management data to "restate" PSAB 3150 asset data. This involves recalculating historical cost, accumulated amortization, net book value, etc. based on asset management data. External auditors should be consulted during this exercise.
- **The amount of savings (time and resources) from having the integration in place**. If a municipality has under a dozen capital transactions a year, the amount of time it takes to establish the integration may greatly exceed the annual savings with respect to time and resources.
- Establishing a common asset identifier (see Chapter 3).
- **What will the relationship be between asset processes?** Will the asset data reside in one consolidated register, or will the data reside in multiple registers that "speak to each other"?
- Determine if any asset management tools may make this process more efficient (see Chapter 9).

7.7 Integration with Other Processes/Documents

Integration with broader municipal processes and documents enables more consistent and efficient organizational planning towards stated corporate objectives.

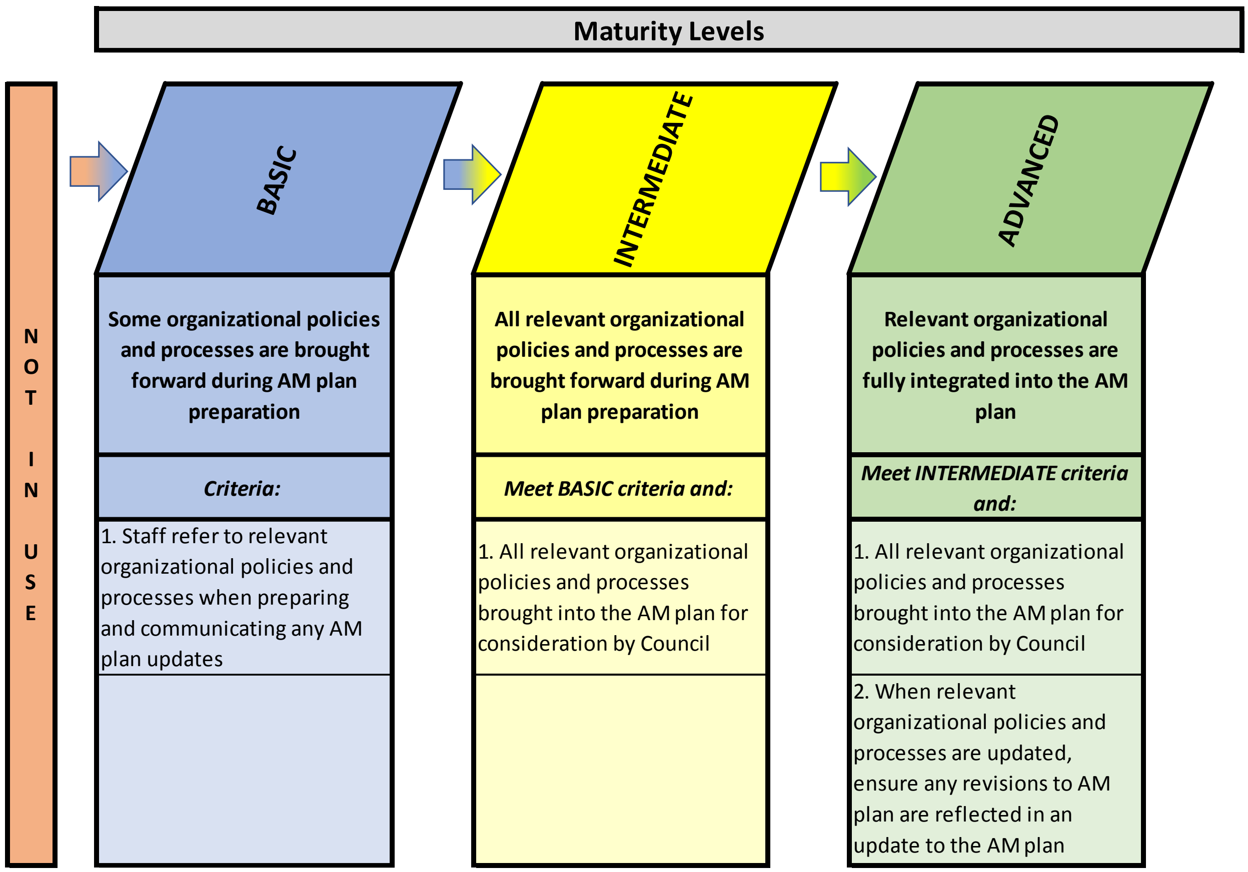
To what extent is the asset management plan integrated with other policies/processes?

Background

A municipality ability to meet its goals and service levels largely depends on whether it has sufficient infrastructure/assets with appropriate conditions, functionalities and capacities, and whether it can mitigate risk. This infers that many policies and processes, from all aspects of the municipality, will have a connection to elements of the asset management planning process. The more asset management is integrated into the fabric of municipal operations, the more efficient and effective these policies and processes become.

Levels of Maturity

To what extent is the asset management plan integrated with other policies/processes?



At the **basic level of maturity**, some organizational policies and processes are brought forward into the asset management planning process. Typically, staff refer to relevant organizational policies and processes as they prepare or update the asset management plan. However, staff may not be in a position to be aware of all potentially interrelated policies and processes, and thus some inconsistencies may occur between objectives of these policies and processes and the asset management planning process.

At the **intermediate level of maturity**, all organizational policies and processes are brought forward within the asset management planning process. Staff are aware of all interrelated policies and processes and strive to maintain consistency between the objectives of these policies and processes and the asset management planning process. This allows Council to consider the asset management plan, since they will know that it conforms to provisions of other policy directions.

At the **advanced level of maturity**, all organizational policies and processes are brought forward during the asset management planning process. Staff are aware of all interrelated policies and processes and strive to maintain consistency between the objectives of these policies and processes and the asset management plan. This allows Council to consider the asset management plan, since they will know that it conforms to provisions of other policy directions. In addition, when there are updates to other policies and processes, consideration can be given to making corresponding updates to related provisions in the asset management planning process. In essence, full integration of policies and plans across the municipality is the goal.

Asset Management and Other Municipal Processes

The following list provides examples of municipal processes, policies or strategies that have some connection to the AM process:

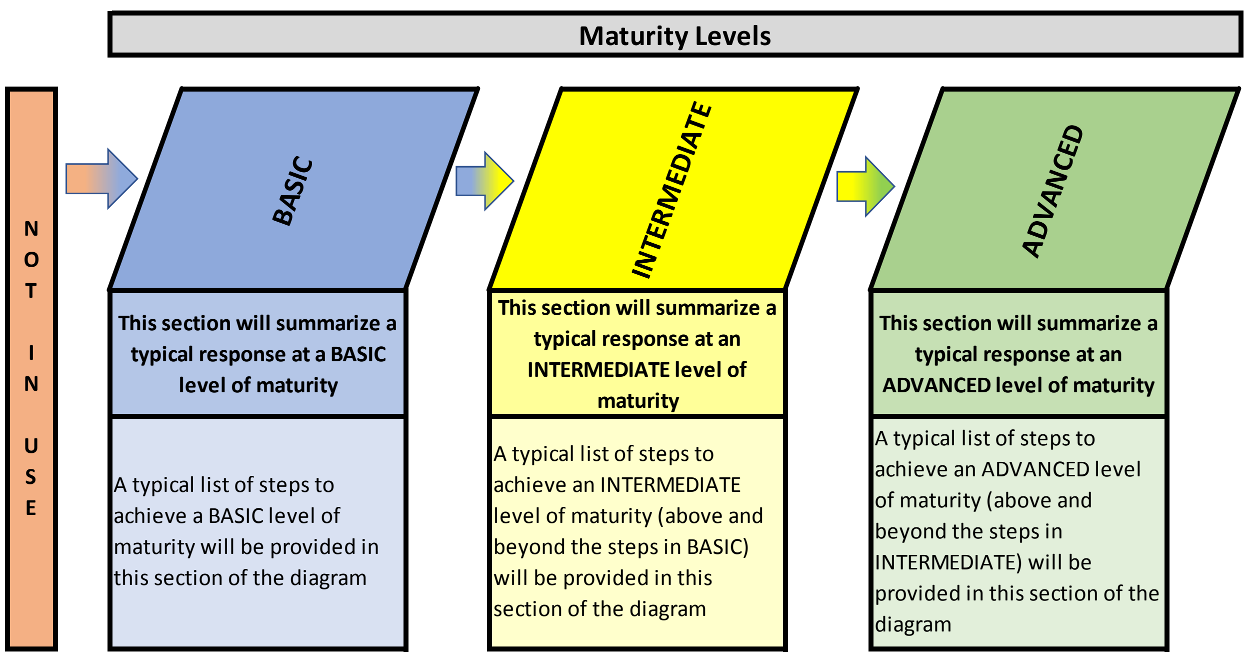
- Official Plan (and Secondary Plans);
- Purchasing (Procurement) Policy;
- Service Standards Policy;
- Master Plans (Transportation, Fire, Parks, Recreation, etc.);
- Fees & Charges Bylaws/Studies;
- Growth/Servicing Plans;
- Financial Policies/Strategies:
    - Use of reserves/reserve funds;
    - Use of debt;
    - Use of Gas Tax funds;
    - Grant application policy;
    - Overall budget funding (or Council direction) policies.

These processes, if used and integrated into the asset management planning process, ensure not only increased accuracy of future asset management plans, but they also provide Council with the comfort that all municipal policies they have approved were followed in the development of the AM plan.

8 Continuous Updates and Improvements

8.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake in order to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices

to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

8.2 Overview

Asset management planning is a continuous process, meaning municipalities should view their asset management plans as “living documents”, which will need continuous updates and improvements. Maintaining and updating the various tools, plans, policies, and strategies of an asset management plan is a major part of the ongoing work required to keep an asset management process operational. Furthermore, implementing improvements to the asset management process introduced brought about by innovation, technological and process advancements, or upgrades to existing assets are necessary in order to ensure optimal planning over time.

This chapter discusses ideas and strategies of how to navigate the analysis, planning, and execution needed in order for a municipality to nurture its asset management process over time.

Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements

O.Reg 588/17 outlines the following requirements with respect to AM Updates and Improvements:

A Strategic Asset Management Policy (SAMP) must be developed and adopted by *July 1, 2019* and reviewed and updated at least every 5 years. The SAMP outlines the requirement to consider the municipality's approach to continuous improvement and adoption of best practices regarding AM planning.

In addition, a municipality's AM plan must be reviewed and updated at least every 5 years.

8.3 Updates to Asset Management Planning Process

Continuous updates to the asset management planning process are needed due to changes in asset data, calculation assumptions, policies and strategies, and overall corporate direction.

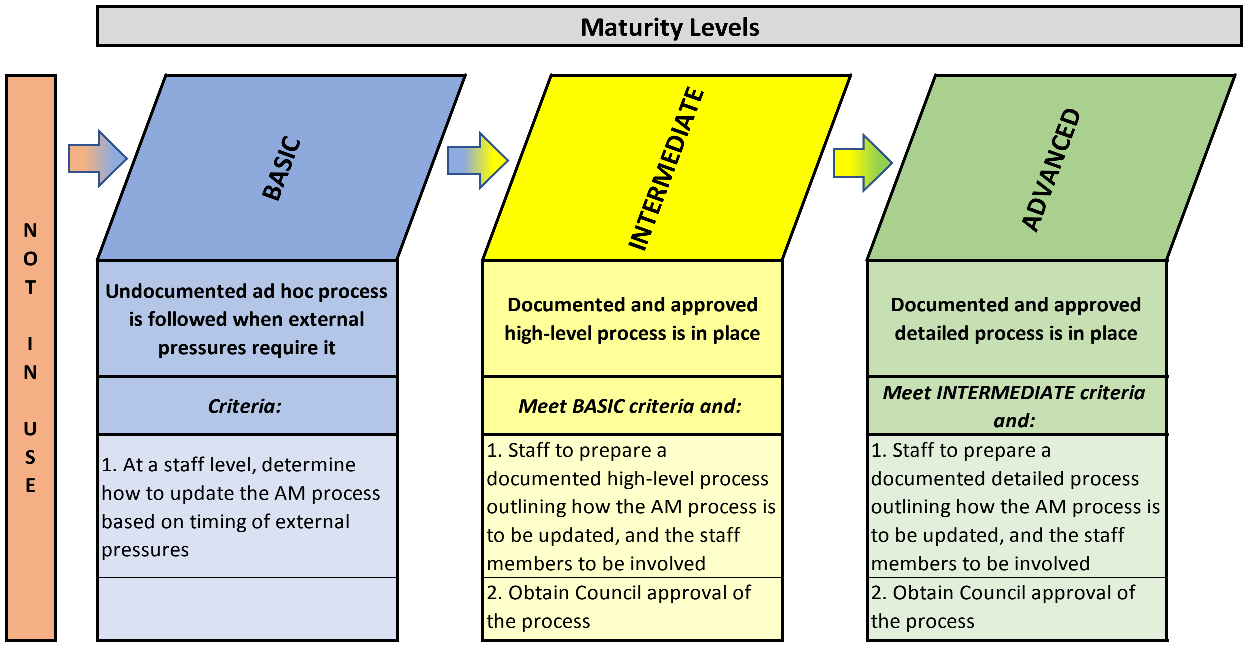
Does the municipality have a process in place to update the asset management planning process?

Background

A municipality that has an established long-term asset management process will, over time, encounter situations where updates to the assumptions, variables, and content need to be made. These types of updates are vital for the AM process as it ensures all planned actions are based on the most current data available. To this end, this section discusses updates that a municipality may undertake to ensure its asset management process can remain accurate.

Levels of Maturity – Updating the Asset Management Planning Process

Does the municipality have a process in place to update the asset management planning process?



At the **basic level of maturity**, municipalities update the asset management planning process when external pressures necessitate it (such as applying for a capital grant). Further, there is typically no documentation available to outline the process to follow when updating the asset management planning process (including the AM plan). As such, updates to the asset management planning process are typically carried out on a reactionary basis. Municipal staff determine how and when to update the asset management process based on the timing of external pressures. Some high level commentary on AM updates can be found in the municipality's AM policies/strategies (see Chapter 2) as required in O.Reg 588/17.

At the **intermediate level of maturity**, municipalities have an approved and documented high-level process in place to guide updates to the asset management planning process (including the AM plan). To reach this level, staff will need to prepare a document that outlines how the asset management process is to be updated, and which staff members should be involved in the process.

At the **advanced level of maturity**, municipalities have an approved, documented and detailed process in place to guide updates to the asset management planning process in place (including the AM plan). Staff prepare a document that outlines how the asset management planning process is to be updated, the schedule to which to adhere for the updates, and which staff members should be involved in the updates.

Strategy and Policy Updates

As discussed in *Chapter 2: Policies*, asset management strategies and policies guide the development and ongoing maintenance of the asset management process. This document (or documents) should mandate the frequency and content of asset management updates (both process related and asset management plan related). Municipal staff should use the strategies and policies in place as a starting point on how to initiate updates. Strategies and policies may suggest the timing of a review process for all components of the asset management process, including: plans, inventories, tools, and the strategies and policies themselves. For example, a potential policy could be to “perform a comprehensive review of all components of the asset management process every four years”.

Another purpose of performing updates to asset management policies and strategies is to ensure the asset management process remains consistent with overall corporate strategies and objectives. As corporate strategies change, corresponding changes should be made to the asset management process.

Asset Management Plan Updates

Updates to an asset management plan can come in formats and complexities that can result in a wide range of actions necessary to implement them. For instance, a municipality that has recently discovered that it will receive increased grant funding for a major capital project may have to look into updating the lifecycle management strategy for updated project costing and timing, and the financing strategy to account for the grant itself. This is more of a “self-contained” update that flows through the entire asset management plan. However, if a municipality identifies that a specific level of service in a particular area is no longer sufficient, it may require the entire asset management plan to be updated (i.e. a more comprehensive update).

A clearly defined process should be included in the asset management policies and strategies that spells out who is responsible for carrying out updates, and how frequently these updates should be performed. Examples are as follows:

- Identify roles of staff who are responsible for updates.
- Determine how frequently staff should be performing updates while considering future needs. This could be tied to legislative requirements, such as updating condition assessments for bridges every 2 years in line with Ontario Structure

Inspection Manual (OSIM) requirements, or recording asset acquisitions and disposals annually in accordance with financial reporting (PSAB) requirements.

- Outline exactly what is to be updated, and how. This ensures consistency from one update to the next.
- Document the approval process needed for each update (including Council input/approval and public involvement). This will be discussed in more detail in later Chapters.

Examples of asset management plan updates include:

State of Local Infrastructure (see Chapter 3)

- How and when asset acquisitions and disposals should be monitored and updated (i.e. is this in conjunction with annual PSAB updates?);
- Asset condition, risk, and current valuation are constantly evolving and should be reviewed/updated;
- Remaining service life should be updated annually (as condition is updated); and
- Other asset attributes that a municipality may collect should be reviewed and updated (e.g. asset maintenance levels, capacity, functionality, etc.).

Levels of Service (see Chapter 4)

- How and when to review and reassess services being provided, and community/customer expectations for each service;
- How and when to review strategic (community) LOS and technical LOS including whether or not “current LOS” has changed since the last update, and if “expected LOS” is any different than originally stated;
- Update performance measures, review the trending analysis to determine progress towards expected service levels, and determine if new performance measures are needed; and
- Reassess the overall impact the LOS analysis has on the lifecycle management strategy.

Lifecycle Management Strategy (see Chapter 5)

- Review projected lifecycle costs (non-infrastructure solutions, maintenance and operations, rehabilitation, replacement, and expansion) over the forecast period based on:
    - Revised asset data;

  - Updated LOS analysis;
  - Updates to other inter-related processes (master plans, capital needs studies, expansion related studies, budget process, etc.); and
  - Updates to the municipality's capital priorities.

Financing Strategy (see Chapter 6)

- Updates from other sections of the asset management plan (State of Local Infrastructure, Levels of Service, and the Lifecycle Management Strategy) and how they impact potential funding sources;
- Updates to other inter-related processes (budget process, rate studies, etc.);
- Updates due to new information on available funding sources (grants, third party contributions, taxation, user fees, debt, etc.);
- Adjustments to financial indicators (i.e. infrastructure gap, funding gap, other ratios) due to actual results; and
- Updates to historical operating and capital information due to actual results.

8.4 Improvements to the Asset Management Process

Continuous improvements to the AM process ensure that it keeps pace with the changing needs of the organization, as well as with evolving best practices, legislative requirements, and new technologies.

Does the municipality have a process in place to incorporate improvements into the asset management planning process?

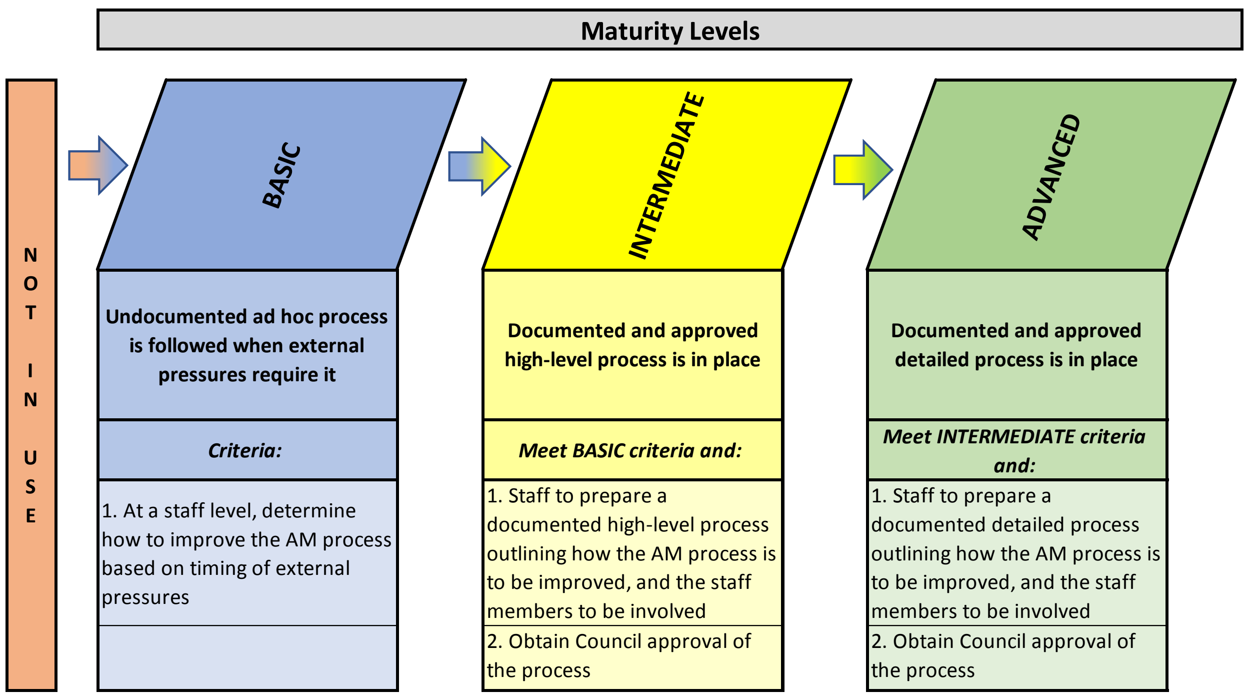
Background

Improvements to elements of an asset management process are important for ensuring that it is meeting the evolving needs of the municipality. Remaining in line with best practices, new technologies, and legislative changes is key to meeting these needs. Networking with colleagues in other municipalities, attending relevant seminars/conferences, remaining current with related technological journals and/or magazines, and becoming involved in professional organizations can provide different approaches and strategies to succeeding in asset management planning.

This section on updates and improvements differs from the previous section (which focused on "updates" to your asset management *process*), and focuses instead on updates related to ensuring your *existing strategies*, *policies*, *data*, and *variables* are updated as needed over time. Improvements relate to evolving and changing a municipality's strategies, policies, and asset management framework to make them better. "Better" in this context can mean more effective, more efficient, more informative, more accurate, and so forth. It is safe to say that a municipality will never be "done" implementing asset management planning. It is a process that develops and evolves over time.

Levels of Maturity – Asset Management Planning Improvements

Does the municipality have a process in place to incorporate improvements into the asset management planning process?



At the **basic level of maturity**, municipalities incorporate improvements into the asset management planning process when external pressures necessitate it. Further, there would be no documentation available which would outline how to incorporate improvements into the asset management planning process. As such, asset management planning improvements are done on a reactionary basis with municipal staff determining how and when to incorporate improvements into the asset management process based on the timing of external pressures. Some high level commentary on AM improvements can be found in the municipality's AM policies/strategies (see Chapter 2) as required in O.Reg 588/17.

At the **intermediate level of maturity**, municipalities have an approved and documented high-level process in place for incorporating improvements into the asset management planning process. To implement improvements, staff prepare a document outlining how the asset management process is to be updated to reflect improvements as well as the staff members to be involved in the process.

At the **advanced level of maturity**, municipalities have an approved and documented detailed process in place for incorporating improvements into the asset management planning process. To accomplish this, staff need to prepare a document that outlines how the asset management process should be updated to reflect improvements, the schedule to adhere to for implementing the improvements, and for which staff members should be involved in the improvements.

Identifying Areas of Improvement

There are challenges that come from improving an asset management process, including: identifying where areas of weakness are; what “ideal” means specifically to the municipality: how to provide solutions to bridge any gaps: and which improvement solution is right to pursue. In addition, the frequency of implementing improvements should be identified. The following represents a suggested approach:

- **Develop an Asset Management Improvement Strategy**: An improvement strategy should be included in a municipality’s overall asset management strategies and policies. Aspects of the improvement strategy might include an indicator for how and when asset management improvements are to be sought out and implemented. For example, if a municipality decides to complete a full update of their asset management plan every “X” years at a minimum, the improvement strategy should require an analysis of ways to improve the process before the update is started.
- **Identify Shortcomings and Weaknesses**: Locating all shortcomings may not be an easy task, especially if the outputs from the system appear to be functioning adequately. However, “functioning adequately” does not necessarily translate into “functioning optimally”.
    - This guide provides differing levels of maturity (basic, intermediate, and advanced) for many asset management components and can be a useful tool in identifying areas of improvement in a municipality’s current processes.

  - A municipality should look at asset management areas that, if improved, could provide increased benefit inside the organization (both in asset management and in other areas). An approach for assessing weaknesses/deficiencies would be to identify areas of the asset management process that the municipality struggled with during the last round of updates.
- **Identify Optimal or Ideal Solutions**: With a weakness identified, the municipality should attempt to define what the asset management area should look like or how it should function in order to provide increased or optimal benefit to the organization. A review of asset management best practices or discussing asset management with other municipalities could identify improvements that were not considered in the past. It should be noted that there may be multiple approaches to dealing with a single issue. In such cases, each municipality will need to determine what the optimal solution is, based on their specific circumstances.
- **How to Close the Gap**: A potential improvement to the asset management process involves closing (or minimizing) the gap between what is currently being done and what is considered optimal. This is a vital step in understanding the divide between what improvements would look like and where a municipality currently resides in specific asset management process areas. With this information, a municipality is better able to understand what solutions are appropriate for implementing asset management improvements.
- **Cost-Benefit Analysis**: Once weaknesses have been identified and compared to optimal, and once potential solutions drafted, the final step in the improvement process is to determine the solutions to implement. A proposed solution may easy to implement for the municipality, and may also bridge the gap between what is current and desired (optimal).But the municipality may still choose to forgo implementation due to the cost, time and/or resources associated. In addition, solutions to numerous problems may be identified, but it may not be feasible to implement all of them at once. In such a situation, performing cost-benefit analysis allows a municipality to apply a priority ranking to improvement solutions and determine which solutions would be most beneficial to pursue in the short term versus long-term. This cost-benefit analysis should be performed for each proposed improvement solution to ensure that the costs of implementation do not exceed the benefits. In determining this cost-benefit analysis, a municipality should pay particular attention to:

Benefits

- Cost savings;
- Time/effort efficiency savings;
- Increased accuracy and completeness to the asset management process;
- Improved integration with other municipal processes;
- Added transparency/understanding of resultant outputs;
- Risks mitigated; and
- Legislative adherence.

Costs

- Monetary costs;
- Risks involved;
- Time horizon;
- Staff/Council resourcing required; and
- Difficulty inserting into current operational workflows.

Examples of improvements that could be made to an asset management process include:

- Creating a business process manual for inclusion with the asset management policies and strategies;
- Introducing methods of evaluating and tracking asset management progress over time;
- Developing a more efficient and effective condition assessment process for assets; and
- Enhancing the level of service analysis to incorporate input from Council and new performance measures.

Summary

The improvement review process is a framework for staff and Council to follow that guides how to execute overall asset management objectives. Identifying the areas that need improvement is an important step that outlines what needs to be done to move towards that asset management vision.

This review process should specify the frequency at which it should occur and identify the roles of staff and Council during the improvement process. It should state how to evaluate the municipality’s maturity levels, past performance, identify best practices that are currently not being employed, and perform a cost-benefit analysis in order to determine which solutions to employ. It should be a formalized process that is included in the municipality's asset management strategies and policies (see Chapter 2). It may be prudent to synchronize the schedules of the improvement process and the timing for updating the asset management plan, as scheduling the improvement process to run preceding any updates to the asset management plan will ensure any improvements make their way into the newest iteration of the plan.

8.5 Frequency of Updates/Improvements to the Asset Management Process

The frequency of updates and improvements is an important factor to the overall AM process. Ensuring the AM process and plan consistency meet internal needs as well as external pressures ensures its overall usefulness.

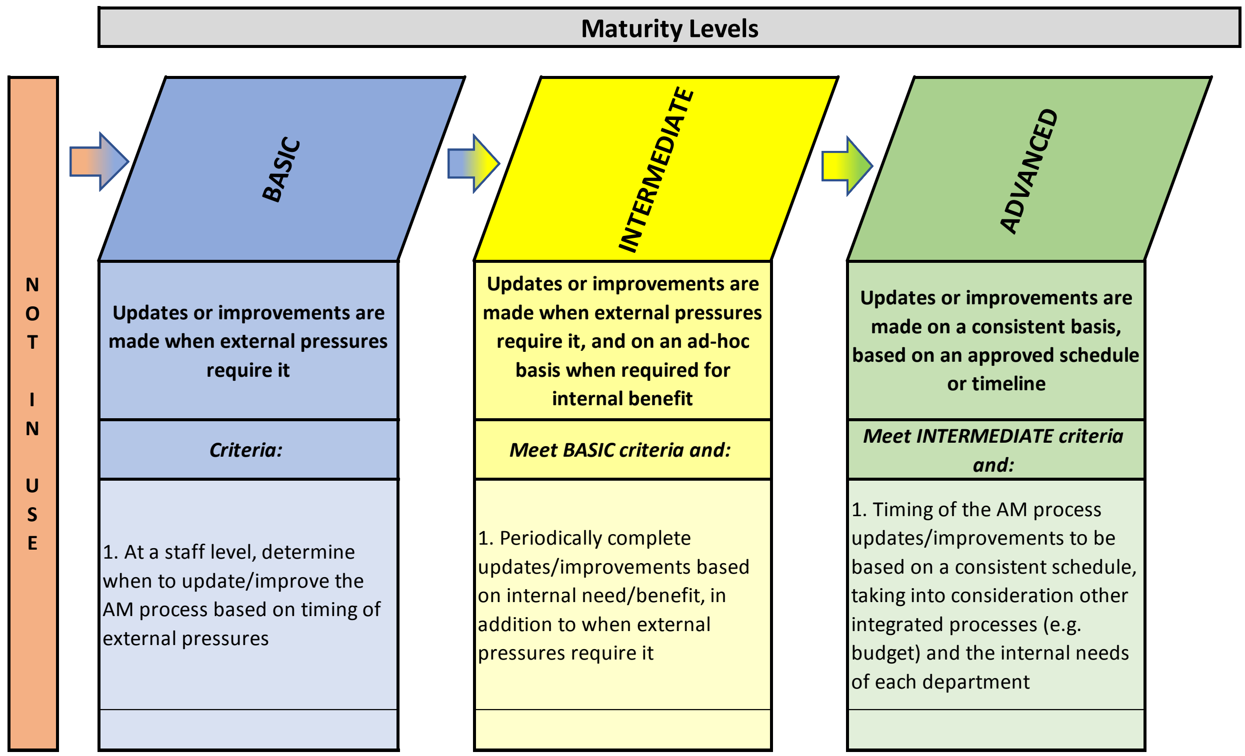
How often are asset management updates or improvements implemented/integrated into the AM process?

Background

AM updates and improvements (as discussed above) are important to the overall AM process. The ongoing needs of the municipality are constantly evolving to the point where many policies and strategies corporately have to be reviewed and updated on a periodic basis. As technology, existing processes/policies, services offered, and staff change, the AM process should also change to adapt to the municipality.

Levels of Maturity – Frequency of Updates/Improvements

How often are asset management updates or improvements implemented/integrated into the AM process?



At the **basic level of maturity**, municipalities incorporate updates/improvements into the asset management planning process on an ad hoc basis when external pressures necessitate it. Asset management planning updates/improvements are done on a reactionary basis.

At the **intermediate level of maturity**, municipalities update/improve the asset management process both based on external pressures (i.e. reactionary changes), and occasionally as needed for significant changes to internal needs.

At the **advanced level of maturity**, municipalities update/improve the asset management process based on a consistent and regular schedule. The schedule would account for any externally required changes as well as regular updates/improvements for internal needs. The types of updates and/or improvements would also been planned for and tracked.

<u>Frequency of Updates and Improvements</u>

With the increasing importance to asset management planning and the associated regulation in place under IJPA, municipalities will be searching for approaches to make their process more efficient and more effective. In addition, municipalities will not put in place perfect AM processes during regulation implementation. Therefore, there should be processes in place to look at the strengths, weaknesses, opportunities and threats of the overall AM process and plan in order to determine what updates or improvements are needed, and when. This should take into account both external and internal needs.

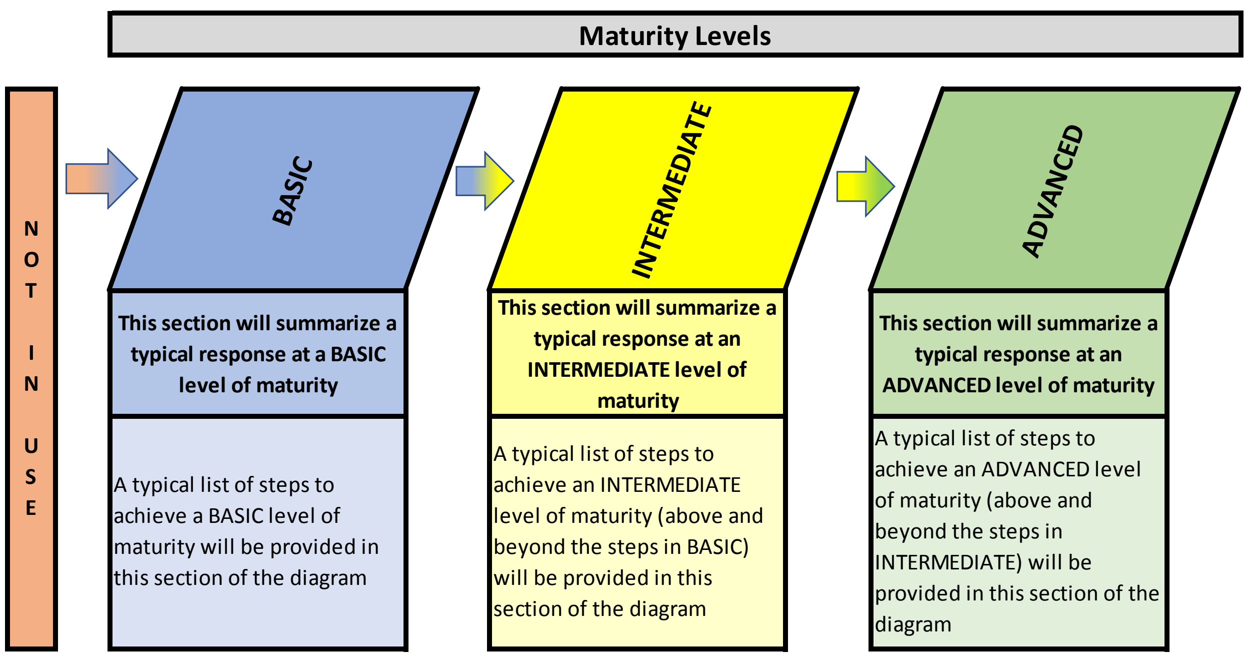
The need to continuously update and improve a municipality's AM process is consistent with Ontario Regulation 588/17 requirements for a "strategic asset management policy". Therefore, each municipality has a requirement to have a process in place to incorporate updates and improvements as needed. Examples are as follows:

- Update the AM plan:
  - Annually?
  - Every 2 to 3 years?
  - Every 5 years? (Ontario Regulation 588/17 requires updates to occur, at a minimum, every 5 years).
- Improve the AM process and plan:
  - Annually?
  - Every 2 to 3 years?
  - Every 5 years?
  - When a planned significant improvement is needed? (Ontario Regulation 588/17 requires municipalities to incorporate improvements, however a frequency is not provided).

9 Asset Management Tools

9.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake in order to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management

should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic level* requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

9.2 Overview

In the context of this chapter, *asset management tools* refer to any tool that allows a municipality to more efficiently and accurately manage and execute actions throughout the course of asset management planning. These tools often support data management and modelling of asset lifecycle needs to ensure that available data is used effectively to make informed decisions. They can vary greatly in complexity -- from simple spreadsheets to sophisticated software that can fulfill numerous functions within and beyond asset management. Each municipality will need to determine which tools are most appropriate for its asset management needs given its circumstances and desired asset management maturity level. Some municipalities may have staff with adequate technical skills and time capacity to develop tools internally, while others may have to rely on commercially available off-the-shelf software to meet their needs. The purpose of this chapter is not to advocate for the use of certain tools versus others. Instead, this chapter attempts to highlight what these various tools can accomplish for municipalities and some of the specific tools that municipalities should consider using as they determine what is appropriate for asset management purposes.

Similar to general trends in the IT industry, many asset management software tools have migrated from desktop applications, maintained locally by a municipality's IT staff/department, to cloud-based services. While these tools may not be physically located on a municipality's premises, the data are still generated, maintained, and utilized by a municipality's staff, which may lower the ongoing implementation resources and costs for a municipality. Whether a tool is a local or cloud-based system, it will ultimately make it easier for a municipality to effectively execute their asset management process.

Additionally, it is critical that any asset management tool used by the municipality has the ability to be versioned, indexed, and backed-up. Data loss disasters can still occur, but they can be avoided or mitigated with proper systems and controls in place. Any tool employed by a municipality should have the capability to perform these vital functions.

Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements

While O.Reg 588/17 does not specify a need to use "tools" in a municipality's AM process, there are a number of requirements within the regulation that may become less time and resource intensive if a municipality considered the use of various tools to assist in meeting the requirements.

9.3 Asset Register Form

Asset information is a key input into the asset management process. Therefore, a well-structured asset register that can be utilized by all relevant municipal staff and that ensures data integrity is foundational to good asset management.

In what form is the asset register kept?

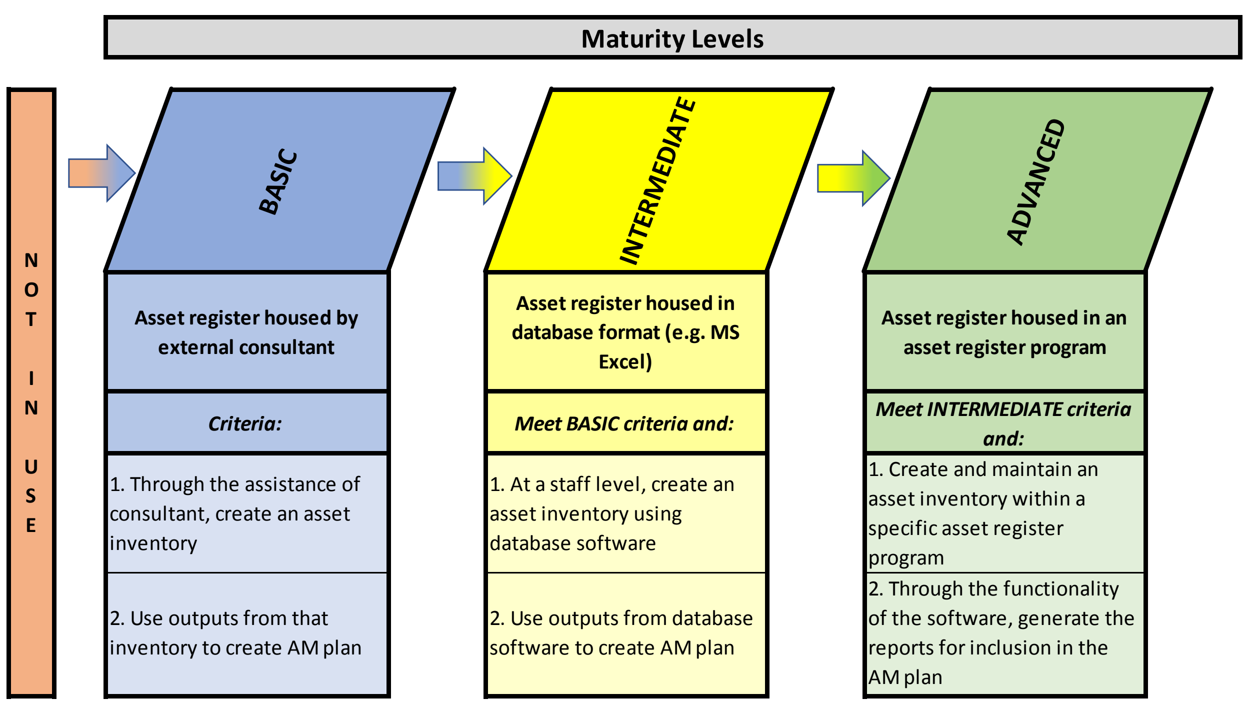
Background

As discussed in Chapter 3, an asset register is a list of municipal capital assets and related attribute data (e.g. cost, condition, quantity, size, etc.) for each individual asset. The mechanism by which the asset register is housed can vary greatly in form -- from state-of-the-art integrated asset management programs, to spreadsheet solutions (e.g. Microsoft Excel), to contracting out the maintaining of asset data to a consultant. Further, it is common for municipalities to have more than one repository of asset data, and therefore different technologies may be in use at one municipality.

Municipalities must decide how they will develop and store these inventories, given the availability and usability of the various computer software and spreadsheet solutions. As part of the decision-making process, consideration should be given to either the integration of asset register(s) within a municipality, or a reconciliation of differences between alternative systems where they overlap. Having confidence that the asset register is accurate, timely, and complete is critical in ensuring optimal use of its information for asset management planning purposes.

Levels of Maturity

In what form is the asset register kept?



At the **basic level of maturity**, staff create an asset register with assistance from an external consultant. The complete register, or inventory, is likely housed externally with the consultant. The asset inventory is used to generate outputs that can be included in the development of a municipal asset management plan.

At the **intermediate level of maturity**, the development/maintenance of the register is completed by municipal staff and is housed internally in a database format (e.g. Microsoft Access or Excel spreadsheet). Direct involvement by staff in the creation of the asset register ensures a better understanding of the resources required to keep an up-to-date inventory. The outputs from the register that feed into the asset management plan may be more customized to the needs of a municipality due to more direct involvement by staff.

At the **advanced level of maturity**, the development/maintenance of the register is co-ordinated between staff and the vendor/implementation partner of specialized asset management inventory software. By using the software, staff should be able to exert less effort to maintain an accurate register. Additionally, the software package should be able to generate specialized outputs that can be easily inserted into an asset management plan and other reporting needs. An asset register solution developed in-house can also demonstrate qualities associated with an advanced level of maturity. However, many municipalities may not have the internal capacity to develop solutions that would fully meet their own needs.

Types of Asset Register

There are generally two types of asset register: those housed in databases (e.g. spreadsheets), and those housed in specialized asset register software. Databases are often constructed within a municipality to host the asset register. Some pros and cons of using databases are:

Database Pros:

- Relatively inexpensive to use with minimal training;
- Freedom to structure the asset register in a desired format (within limits); and
- A good approach when establishing an initial asset register before deciding on whether to proceed to formal software.

Database Cons:

- These databases are often not designed to be updated by multiple users (not without significant manipulation);
- Can require more effort to ensure that only accurate data is permitted; and
- Very easy to make mistakes/errors, and difficult to control the editing/updating process.

Asset register software is an “off-the-shelf” tool that allows more seamless user control, better data integrity, and greater access to the latest technology. These software databases are purpose-built tools by software vendors that specialize in creating custom asset registers for municipalities. Some pros and cons of utilizing asset register software are:

Software Pros:

- Designed to be used and updated by multiple users;
- Data controls are natively built into the software, restricting editing capabilities and read capabilities (while data validation is possible in databases and spreadsheets, there is more effort required to set this up);
- Editing process is automated, minimizing mistakes/errors;
- Task of maintaining the asset data’s accuracy and completeness is more efficient than databases;
- Reports tend to be generated automatically;
- Some software includes other enhanced asset management capabilities, such as integration with other systems; and
- Availability of updates to address issues and advancements.

Software Cons:

- More expensive than databases (actual cost depends on the software used);
- Software can have some freedom in how the asset register is setup, however there is usually a basic structure that must be adhered to; and
- Training and implementing the software takes extra time and effort.

9.4 Asset Register as a Dynamic Tool

An ability of the asset register to function as a dynamic tool that is easy to update and seamlessly integrates with other systems further enhances the asset management process.

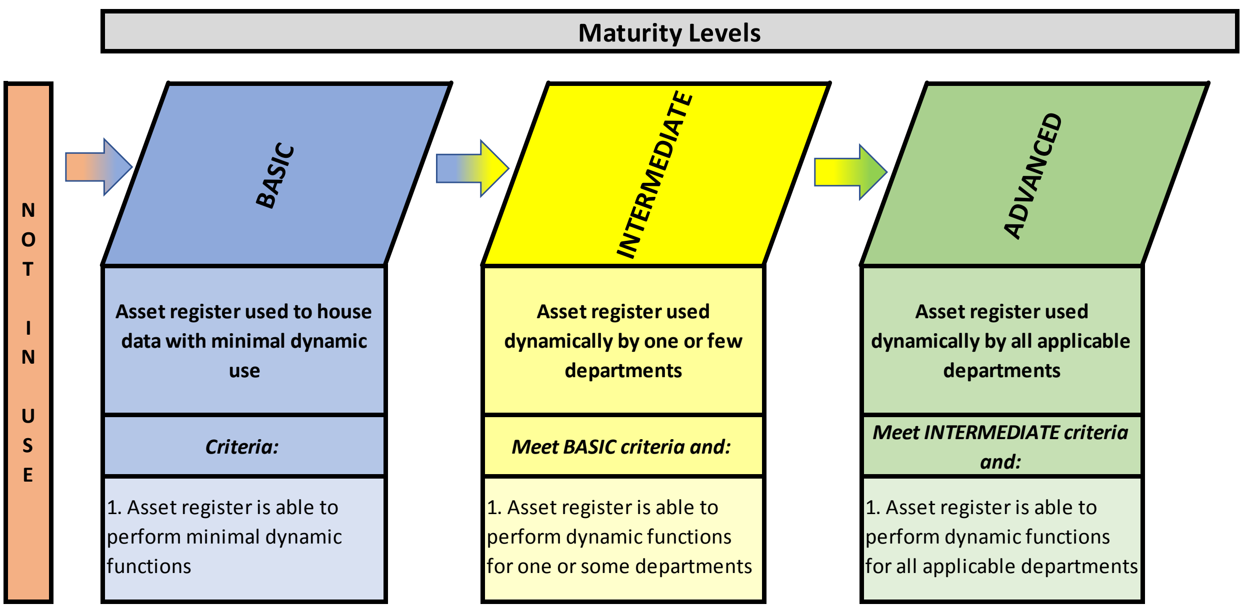
To what extent is the asset register used as a dynamic tool?

Background

The definition of dynamic is "constant change, activity, or progress". The ability for an asset register to be dynamically updated is an important consideration. A static inventory provides a snapshot of the state of assets at a fixed point in time (i.e. the view of assets only as of when the register was created or last updated). A dynamic register allows for updates to easily be integrated, and calculated data to be updated instantaneously. This is not to say that a static inventory cannot be updated or is not recommended, but that it requires more manual effort to update all values for all assets over time.

Levels of Maturity

To what extent is the asset register used as a dynamic tool?



At the **basic level of maturity**, the asset register has little to no dynamic functionality. In other words, most of the work involved with updates to the inventory is manually entered throughout the register. This may lead to future problems due to time commitments necessary to maintain the asset inventory.

At the **intermediate level of maturity**, dynamic functions are fully integrated for a few asset classes or assets belonging to specific departments. When an asset class is dynamic, updates to specific variables will force updates to other parts of the system that are dependent on these variables. These dynamic functions may only be developed for certain departments or assets of the municipality, while other areas rely on static updates.

At the **advanced level of maturity**, all aspects of the asset register are dynamic, for all departments and assets. Updates to any metric will propagate to all other areas of the asset register that depend on that metric. Hence, the burden of ensuring that the asset register is maintained and reflective of the current state of infrastructure is minimized.

Dynamic Function Examples

The examples below should help readers visualize an asset register with dynamic functions It should be noted that while a broad cross-section of examples are provided, this is not an exhaustive list of all possible dynamic functions.

A dynamic function might:

- Update all age-related metrics (e.g. service life remaining, age, age-based condition, etc.) upon receiving date of implementation and useful life parameters.
- Automatically perform financial calculations (e.g. net book value, amortization, additions, disposals, betterments, etc.) necessary for PSAB 3150 reporting requirements for each fiscal cycle.
- Automatically update replacement cost metrics, every year, based on capital inflation or when new benchmark cost data are input (e.g. cost per m^2 of local road).
- Update complex calculations, such as asset risk, when updating condition data.
- Read and store pertinent data from other systems. Data from another software tool may provide some of the updates to the asset register. A dynamic link between these systems ensures the register stays up-to-date and eliminates a point of human error, as duplication of work is prevented.
- Update data from another system. In more sophisticated business cases, data from another data store may need to be updated from the asset register if the asset register is the main point-of-input for all inventory-related tasks. In these cases, special database/software instructions may propagate the updates from the register to other systems.

9.5 Geographic Information System (GIS)

GIS is a tool that can assist with both visually locating and presenting asset management decisions.

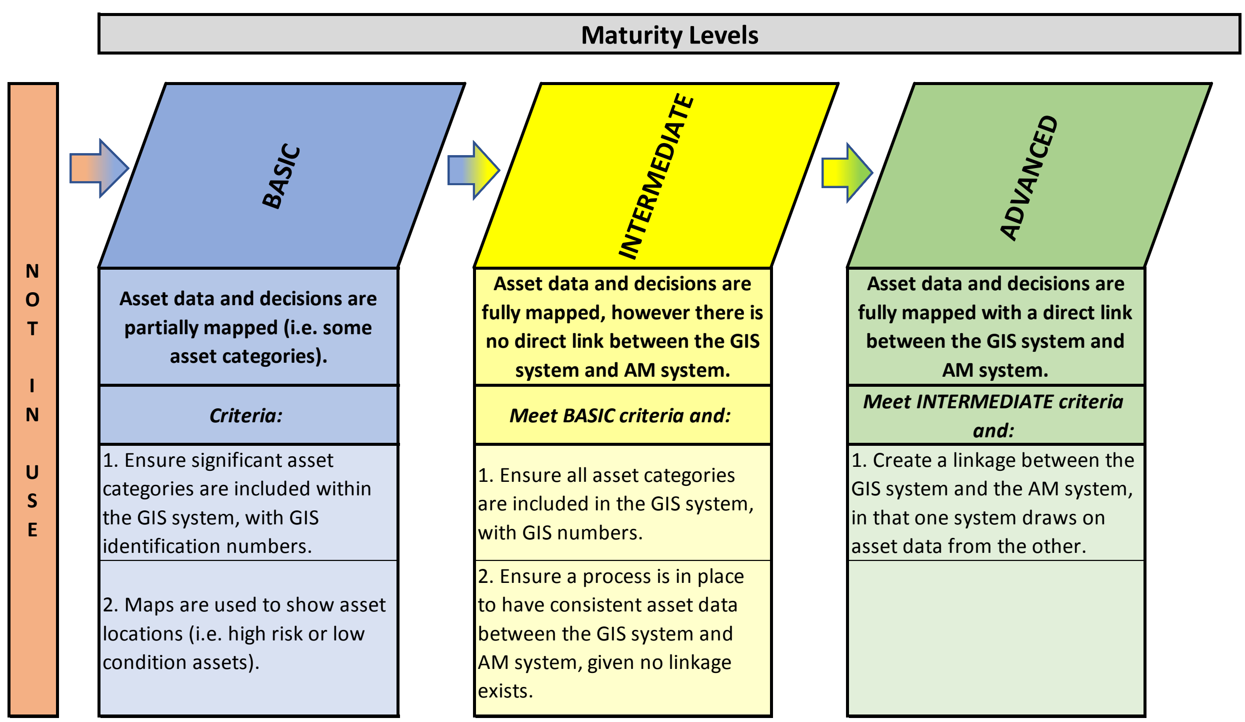
Is the asset data and decisions spatially mapped?

Background

Geographic Information System (GIS) is a tool that spatially maps assets such that the location of assets can be overlaid on a map of a municipality. Other information can be spatially mapped, such as the condition of the asset (i.e. red indicating a poor asset condition, green indicating a good asset condition).

Levels of Maturity

Are the asset data and decisions spatially mapped?



At **the basic level of maturity**, municipalities have partially mapped asset data. Municipalities at this level should ensure that the significant asset categories are included within the GIS system. Maps should also be used to show asset locations, and should be easily categorized by high risk, or low condition.

At the **intermediate level of maturity**, municipalities have fully mapped asset data. Municipalities at this level should ensure that all asset categories are included in the GIS system, and should establish a process that maintains consistent data between the GIS and AM systems.

At the **advanced level of maturity**, municipalities have fully mapped asset data with a direct link between the GIS and AM systems. Municipalities at this level should also develop their GIS and AM linkage to draw asset data from each other.

Geographic Information System (GIS)

As mentioned above, a GIS spatially maps assets such that the location of assets can be overlaid on a map of a municipality. Most assets owned by a municipality are fixed in terms of geography, be it roads, water and/or sewer mains, or facilities. Therefore, it can be easier to interpret the data when the assets are presented visually on a map. Some municipal assets (such as vehicles and equipment) do “travel”. However, these assets can be spatially mapped based on their “home” location.

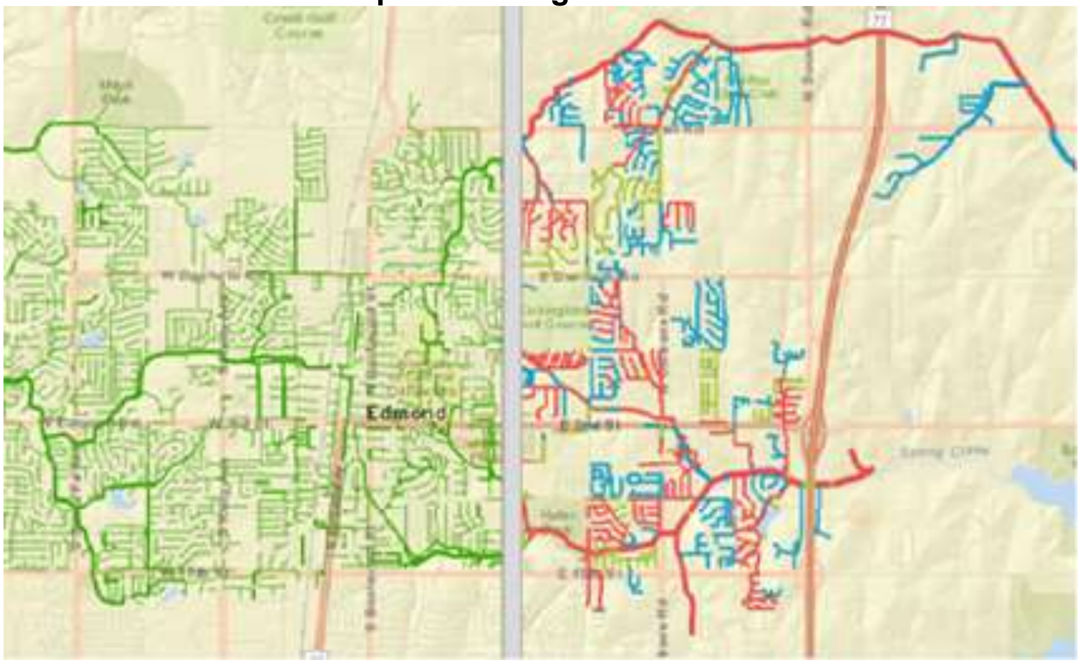
A properly configured GIS file should allow all assets contained in the asset register to be tagged with geographical data so they can be tied to physical locations. Therefore, maps of the municipality can be drawn and assets can be visually represented where they actually reside.

Once these maps are created, the GIS allows for analytics to be performed that may reveal new insights into decision-making processes. The priority and timing of executing projects can be an important decision for municipalities to make, which can be made easier when utilizing a GIS. For example, it may be easier to make decisions developing strategies and plans when presented with GIS data that highlights the condition of all assets in a specific area, or highlights nearby assets. This can be useful because the timing of applying lifecycle management strategies to these assets can be clustered to promote efficiency. This capital forecast integration was discussed in Chapter 5 (non-infrastructure solutions).

The GIS is only as good as the data recorded within it. To accurately map these assets, the exact GPS locations must be recorded. Therefore, it may take a significant amount of resources to map out all assets in a municipality if this data is not already available.

Figure 9-1 (below) is an example of a GIS image depicting one area of a municipality (roads highlighted in red) in poor condition:

Figure 9-1
Sample GIS Image – Condition



9.6 Other Asset-Related Systems/Tools

Other asset-related tools can provide additional information and/or clarity into the asset management process. These additional tools often augment the asset register to leverage different types of data, based on a municipality's needs.

Are there other asset-related systems/tools utilized by your municipality and how connected are they to the asset register?

Background

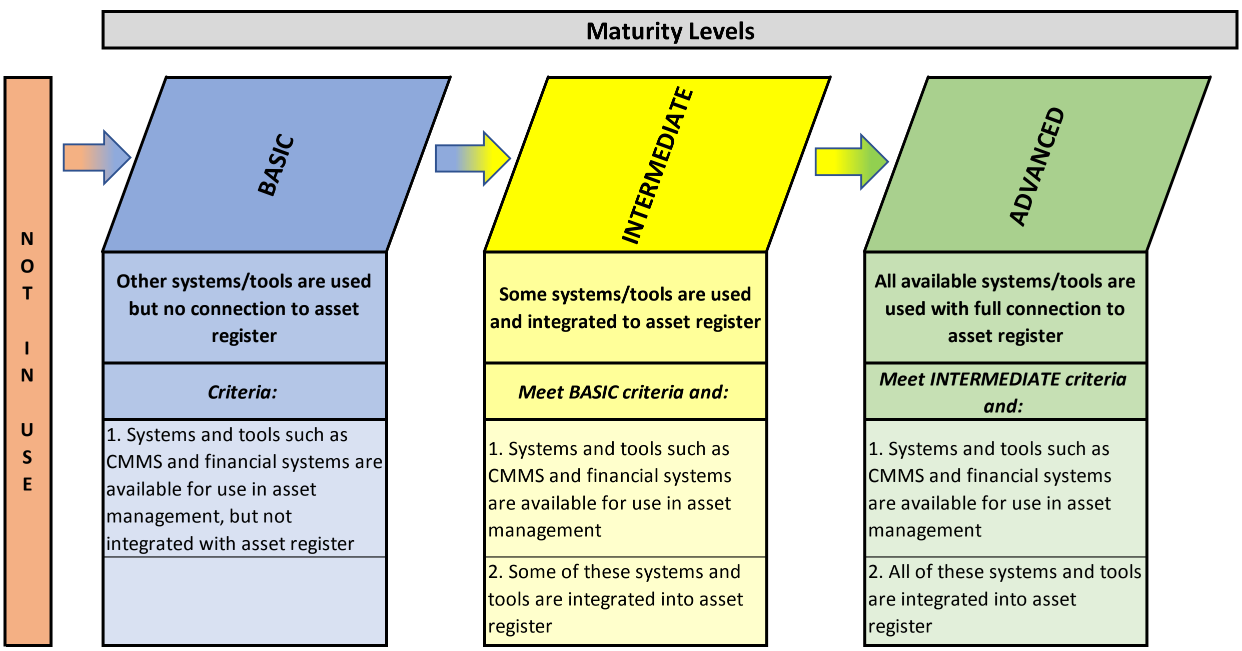
Additional technological tools can be adopted by a municipality to expand functionality, or provide ease-of-use, when managing the asset register or the overall asset management process. These tools may already be implemented within a municipality with other primary functions outside of asset management. Examples of each are discussed in this section.

1. **Computerized Maintenance Management System (CMMS):** CMMS allows a municipality to plan and track the maintenance, repair, and rehabilitation operations it performs on its assets on an ongoing basis.
2. **Financial reporting tools:** Financial reporting tools are often used to produce the outputs necessary to complete legislated annual financial reporting requirements, and these systems can be integrated with an asset register to more easily generate these outputs.

Whatever tools a municipality ultimately decides to use, they all intend to enhance the ability of a municipality to manage its assets through the asset register.

Levels of Maturity

Are there other asset-related systems/tools utilized by your municipality and how connected are they to the asset register?



At the **basic level of maturity**, a municipality has at least one type of asset management tool. However, these tools are typically not integrated with the asset register (i.e. no dynamic linkages exist). The result is that the tools can inform staff on asset characteristics and forecasts, but all insights must be manually inputted into the asset register or the overall asset management process on a continual basis.

At the **intermediate level of maturity**, a municipality has some of the asset management tools in place, but only a few of these tools are linked to the asset register or asset management process.

At the **advanced level of maturity**, a municipality has implemented all types of software tools (e.g. CMMS and financial reporting) and has created dynamic linkages between the asset register and each distinct system. A municipality at the advanced level is therefore able to provide its Council and staff with up-to-date snapshots of its assets in unique and insightful ways without the burden of maintaining the asset register.

Computerized Maintenance Management System (CMMS)

As discussed above, a CMMS is a tool that allows a municipality to track the maintenance, repair, and rehabilitation operations that it performs on all its assets on an ongoing basis. A well integrated system might tie into a municipality's existing asset register and other IT systems. This provides the municipality the ability to effectively plan and manage their assets on an ongoing basis, minimizes the chances that maintenance activities are overlooked, and helps staff coordinate operations in an efficient manner.

A CMMS allows "work orders" to be automatically generated based on asset condition or the existing risk data found in the asset register. The plans and schedules developed by the system can either be set by staff recommendations, maintenance schedules (as set forth in the lifecycle management strategy), or from reports/readings taken from the assets themselves.

A CMMS will keep an accurate historical record of any actions performed on all assets, which easily allows auditors to verify what has occurred to each asset. This data can be used by a municipality to estimate asset condition. In addition, a CMMS helps manage inventory, as it can document the amount of inventory that is warehoused and in the field. This can provide ease in the process of restocking assets that are frequently used (e.g. water meters).

CMMS's can be a vital component of the ongoing process of updating the asset register. Inspections are common actions to maintain an accurate and up-to-date snapshot of an asset's condition. A modern CMMS could be responsible ensuring contents of the asset register are updated. Additionally, with mobile technology, these updates could be performed 'on location' by maintenance staff, potentially increasing efficiency, mitigating data gaps, and reducing the potential for error.

A functional CMMS may look different for any given municipality, as the greatest value of such a system is determined by how easy it is to implement given municipal structure, existing IT environment, and the features it provides.

9.7 Modelling and Optimization

Modelling can assist with developing lifecycle management strategies that make sense to the municipality and optimize the allocation of scarce financial resources to provide the best possible service outcomes at the lowest cost.

Does your municipality have the ability to perform modelling optimization?

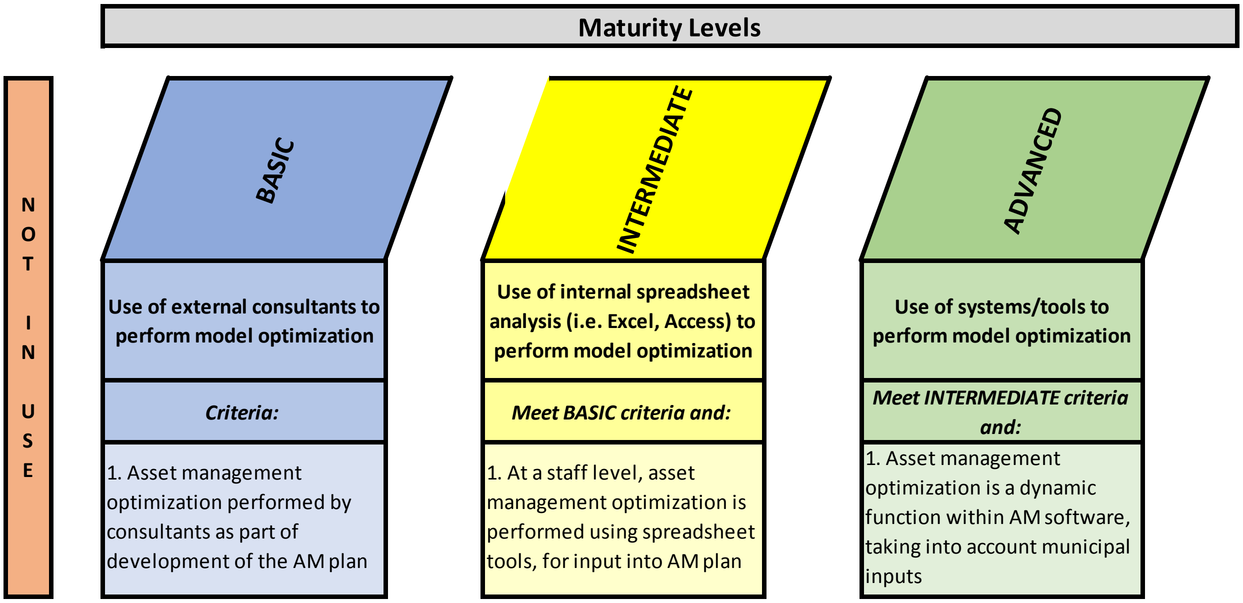
Background

Modelling uses tools to optimally allocate a municipality's resources in their ongoing asset management practices. In simple terms, modelling optimization is using software that helps develop the lifecycle management strategy (e.g. long term forecast) in the most optimal way, given a set of instructions and parameters supplied by a municipality.

Ideally, optimization considers factors such as asset deterioration characteristics, treatment costs, treatment effects, and takes this and other criteria into account. Modelling tools should enable the optimization of the lifecycle management strategy so that the timing and extent of proposed lifecycle activities achieves service level targets at the lowest cost. Modelling optimization tools can assist municipalities determine where they should be spending limited resources to achieve the highest possible returns, whether measured by level of service, risk, or another metric.

Levels of Maturity

Does your municipality have the ability to perform modelling optimization?



At the **basic level of maturity,** municipalities hire outside consultants to perform modelling optimization. This process is generally performed by the consultant(s) who is preparing the asset management plan (or components of an asset management plan). For example, a road asset will require a study that optimizes roads needs, which should be used in the asset management plan.

At the **intermediate level of maturity**, municipalities use internal tools (e.g. spreadsheets) to perform modelling optimization. At this level, municipalities use the knowledge and experience of their staff to 'fine tune' their model and generate outputs, which should be used in the asset management plan.

At the **advanced level of maturity**, municipalities use purpose-built tools (e.g. asset management software) that apply advanced statistical techniques to perform the modeling optimizations. At this level, municipalities set criteria and parameters for the software to adhere to and with this information, the software will calculate the most efficient path.

<u>Modelling Optimization Tools</u>

Modelling optimization tools allocate a municipality's resources in their ongoing asset management practices. Optimization tools, whether developed in house or in the form of commercially available software, should be able to easily interface with the asset register to perform this function (or already be imbedded into the asset register itself). Further, the outputs should easily integrate into existing municipal reporting practices.

Budgeting and other constraints can make it impossible to complete all required capital projects in any given year, which requires the use of selective criteria to determine what projects to undertake. Weighing the benefits of projects and factoring in levels of service further compounds the difficulty and complexity of creating strategies and plans. The next step of forecasting these models to ensure the municipality can provide the resources to maintain and provide specific service levels can be a difficult task to tackle manually.

Scenario modelling can be an effective approach for assessing and developing solutions to complex issues. Scenario modelling can reveal the optimal course of action that provides the greatest benefit to the municipality with the lowest risk. Since this method relies heavily on logic, there is a reasonable measure of accountability with this approach.

Effective use of the modelling tool requires a considerable amount of specialized knowledge. The inputs used in modeling tools should come from the raw register data as well as staff decisions. This is important to note since the process of verifying the results/outputs of the model without knowledge of the data sources/inputs is very difficult. Inputs are usually logical criterion, such as the various criterion associated with the decision-making process around asset maintenance, rehabilitation, or replacement.

For example:

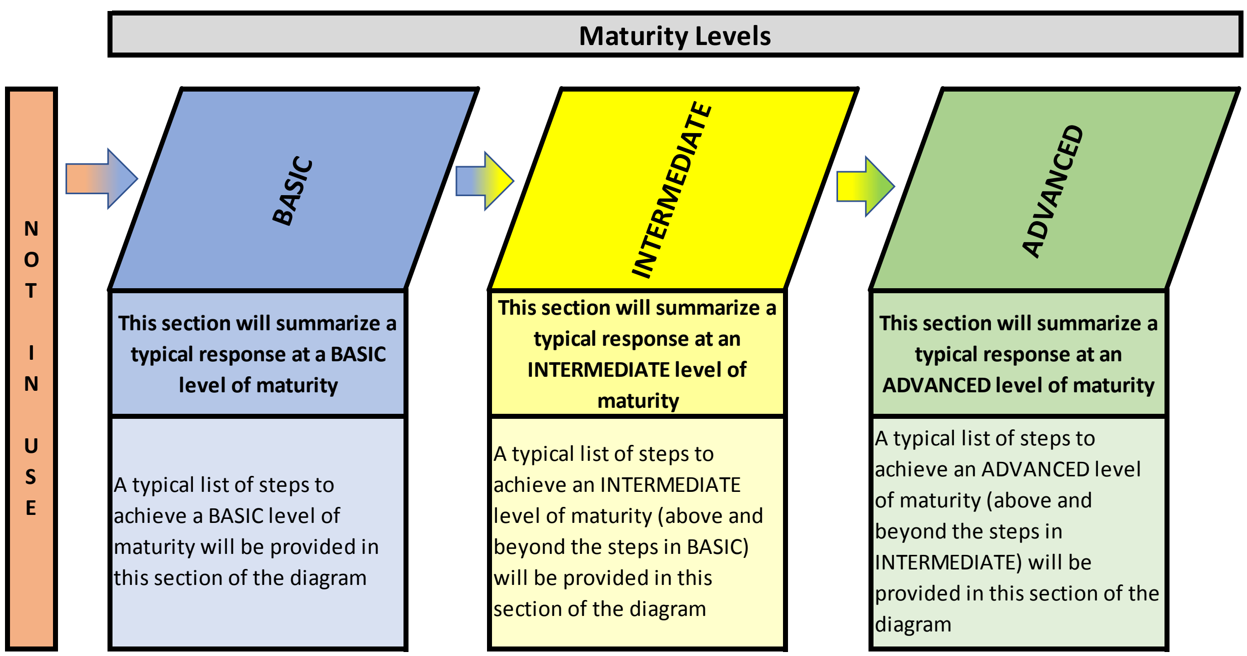
- When asset risk or condition falls under a set score;
- When connected assets' risk or condition falls under a set score (i.e. attempting to integrate roads, stormwater, water, and wastewater capital needs);
- When maintenance levels reach a certain level; and/or
- When customer complaints reach a certain level.

Through the use of well-defined decision criteria in combination with the right formulas and algorithms, a municipality can ensure that the asset management tool provides appropriate optimized outputs.

10 Internal Governance and Ownership

10.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



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The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management

should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

10.2 Overview

A key element of a successful asset management planning process is the effective assignment of roles and responsibilities to ensure that the process is being properly followed and maintained, once in place. To take this one step further, staff need to embrace their own specific roles and responsibilities within the asset management process and take ownership.

Municipalities should consider developing a strong framework for leadership and staff support within the asset management process. The design of this framework will vary from municipality to municipality because they differ in size, staff complement, available skill sets, and organizational structure, and, as a result, the design of this framework will need to be dependent.

In larger municipalities, an asset management department or steering committee may be formed to provide leadership and decision-making capabilities, with dedicated asset management staff to carry out the day-to-day duties. In small to medium municipalities, existing management and/or support staff might be called upon to incorporate asset management responsibilities into their other job duties (with the ability to create a multi-departmental asset management committee). In either case, there are strategies and actions available that can enhance the foundation for success.

Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements

O.Reg 588/17 outlines the following requirements with respect to AM Internal Governance:

A Strategic Asset Management Policy (SAMP) must be developed and adopted by *July 1, 2019* and reviewed and updated at least every 5 years. The SAMP outlines a requirement to include:

1. A commitment to coordinate planning between interrelated infrastructure assets with separate ownership structures by pursuing collaborative opportunities with upper-tier municipalities, neighbouring municipalities, and jointly-owned municipal bodies; and
2. Identification of who would be responsible for AM planning, including an executive lead.

In addition, a municipality's AM plan must adhere to the following:

1. Review and update the asset management plan at least every 5 years.
2. The asset management plan (or update) must be endorsed by the executive lead of the municipality and approved by Council resolution.
3. Municipalities are required to provide Council with an annual update on asset management planning progress, by *July 1st of each year*.

4. Municipalities are required to post their strategic asset management policy and asset management plan on the municipality's website, if one exists, and make copies of these documents available to the public, if requested.

10.3 Organizational Awareness of Asset Management

Using a corporate perspective to asset management ensures that specific departmental expertise is embedded into the decision making process.

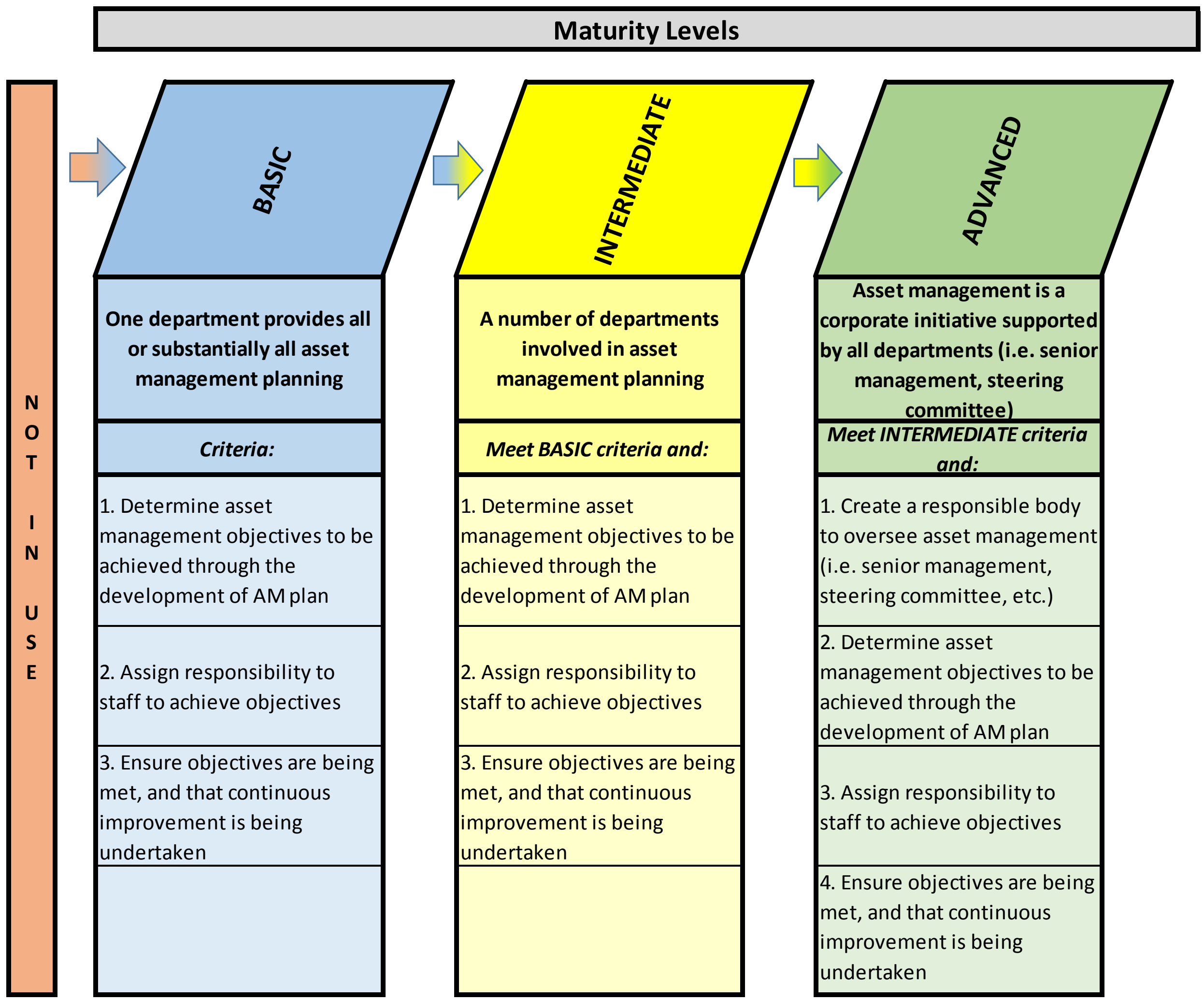
To what extent is the asset management planning process embedded within the organizational structure?

Background

Organizational awareness in the context of asset management planning relates to whether this process is managed and updated by one department, several departments, or corporately. Ideally, asset management planning should be considered a corporate initiative.

Levels of Maturity Asset Management Planning and Organization Structure

To what extent is the asset management planning process embedded within the organizational structure?



At the **basic level of maturity**, municipalities typically have all, or almost all, of their asset management planning undertaken by one department (with very little assistance from other departments). The department will determine the objectives to be achieved through the development and maintenance of the asset management process, assign responsibility to staff within the department for achieving these objectives, ensure the objectives are being met, and ensure that continuous improvement is being undertaken.

At the **intermediate level of maturity**, municipalities undergo the same steps as those at the *basic level* of maturity, however, multiple departments will be involved in asset management planning. At this level, there are still some departments that manage assets that are largely excluded from the asset management development process.

At the **advanced level of maturity**, municipalities establish the asset management planning process as a corporate initiative and have support from all departments. A responsible body, such as the senior management team or an asset management steering committee, oversees asset management activities by:

- Establishing the objectives to be achieved through the development and maintenance of the asset management planning process;
- Assigning responsibility to staff across multiple departments for achieving these objectives;
- Ensuring the asset management objectives are being met: and
- Ensuring that continuous improvements are being undertaken.

Organizational Awareness of Asset Management

Senior management should be responsible for providing the leadership and commitment necessary for a municipality to effectively manage the asset management process. Senior management here also includes Council (which will be discussed in the next chapter). This leadership structure helps ensure that the objectives of asset management planning, including strategies and risk management, are consistent with those of the municipality as a whole. Also, it is the responsibility of senior management to get buy-in and stress the importance of asset management to other staff and take ownership of the process. There are several ways to undertake this responsibility, including:

- Develop a corporate asset management strategy that assigns roles and responsibilities from an asset management perspective;
- Assign more specific roles and responsibilities for asset management functions to staff across functional areas;
- Ensure the availability of sufficient and effectively deployed resources to asset management;
- Communicate to staff and stakeholders the objectives of the asset management process and the importance of effective asset management;
- Ensure asset management objectives are being met, and that continuous improvement is being undertaken; and
- Ensure departments are making optimal use of the asset management process internally, and are effectively co-ordinating their asset management activities with each other.

There are numerous methods to promote awareness of the asset management process with all staff and other stakeholders. Some examples include:

- Internal municipal newsletters and/or website posts;
- Internal corporate asset management workshops, lectures, and meetings (i.e. education process);
- Incorporation of staff into the implementation of asset management activities, or changes/reviews to these activities; and
- Advising suppliers through the tender/ RFP process.

Departmental Involvement

The involvement of all departments in creating and updating the asset management process can support enhanced accuracy and completeness. Departments should already have detailed knowledge of the assets they maintain and operate in providing services to the community. Using this knowledge in the asset management process ensures more realistic asset data, levels of service analysis, and lifecycle management strategies. An additional advantage of this approach is that if departments are involved in the creation and updates to the asset management process, they are more likely to use the asset management process to make decisions within each department.

10.4 Asset Management Use

Having all departments use the AM process for asset-based decisions ensures consistency in achieving organizational and departmental goals and objectives.

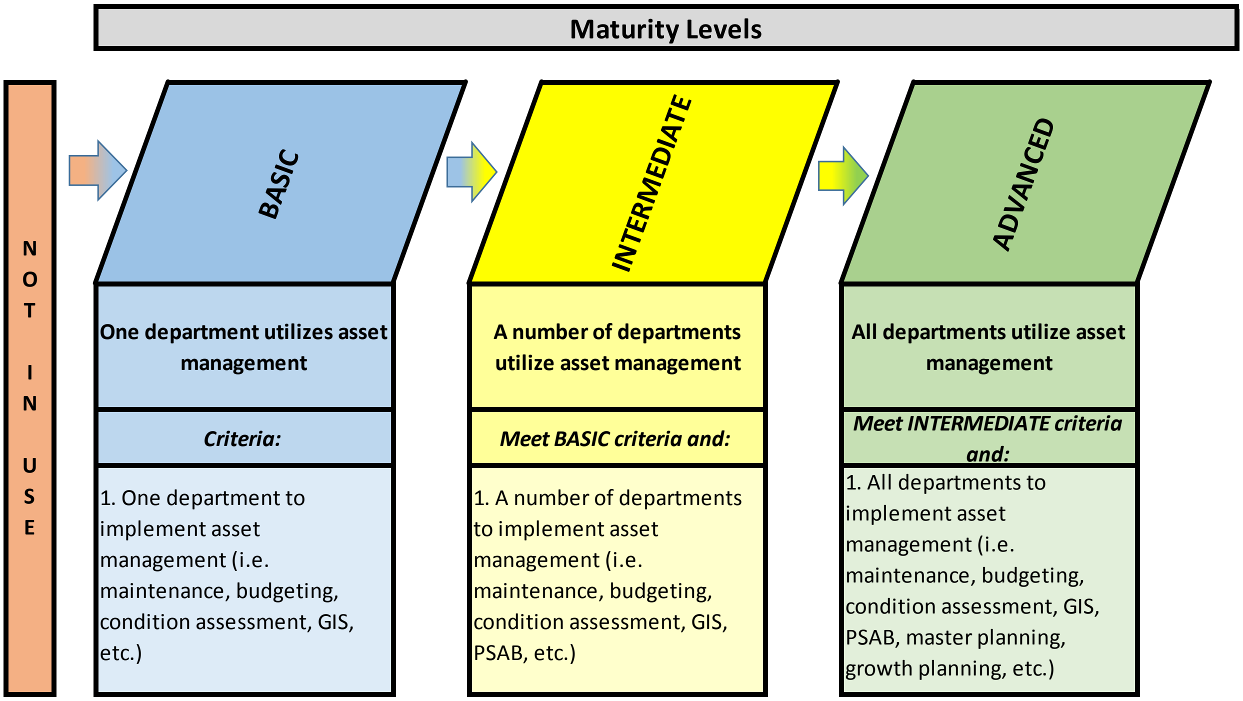
What is the level of use of asset management within all applicable municipal departments?

Background

There are many asset-based decisions that municipal departments make on a day-to-day basis in order to provide services to the community. Effective asset management can significantly assist each department in making these decisions.

Levels of Maturity Departmental Use of Asset Management

What is the level of use of asset management within all applicable municipal departments?



At the **basic level of maturity**, municipalities typically have one department using asset management. This type of use may include: planning all maintenance programs, performing condition assessments, maintaining the GIS, and preparing the budget requirements for managing the assets.

At the **intermediate level of maturity**, municipalities have a number of departments using asset management. In addition to the actions noted under the basic level of maturity, it would be expected that the asset data be used for PSAB 3150-related purposes within the Finance department.

At the **advanced level of maturity**, municipalities have all departments using asset management. In addition to the actions included under the intermediate level of maturity, advanced municipalities would be expected to integrate the asset management process with its master planning and growth planning.

Asset Management Use

Examples of the asset-based decisions that departments already make on a day-to-day basis include:

- Public Works and/or Engineering departments have the responsibility of constructing/rehabilitating capital assets such as roads, storm water, water, wastewater, solid waste, and facilities;

- Other service delivery departments also construct facility-related assets (e.g. Parks and Recreation, Fire, Police, etc.).
- All service delivery departments (e.g. Public Works, Parks and Recreation, Fire, Police, etc.) perform maintenance on assets and purchase more minor assets such as vehicles, equipment, and land improvements;
- Information Technology departments purchase and maintain assets (e.g. hardware and software) directly, and in some cases, in more of a support function to other departments;
- Finance departments may use asset management data for financial planning, budgeting, and/or accounting requirements; and
- Planning departments may incorporate growth planning into asset management planning.

The following are examples of departmental activities or processes that could already be in place that can be integrated into the corporation's asset management process:

- Performing visual inspections on assets (e.g. playground equipment, vehicles/equipment);
- Conducting condition assessments on assets (e.g. roads and bridges);
- CCTV inspections (e.g. wastewater mains and storm mains);
- Responding to community complaints (e.g. potholes);
- Mapping assets spatially in a GIS system;
- Calculating user fee rates (e.g. water, wastewater, storm water, parks and recreation);
- Preparing a DC Background Study, Master Plan or Strategic Plan; and
- Preparing the annual budget and long-term capital forecast.

Please see Chapter 7 for more discussions on integration.

The breadth of involvement of asset-related activities across an organization underscores the need for departments to use an asset management planning process to assist in making asset-based decisions. Communication by senior management to outline the importance and benefits of the asset management planning process to all staff, and how staff's work contributes to its effectiveness, can assist in promoting adoption. In addition, it can be useful to regularly communicate how the municipality is doing in relation to its asset management objectives for the purpose of facilitating organization-wide interest in the results.

10.5 Asset Management Resourcing

Allocating the right resources to AM planning ensures accountability and ownership of the AM process.

What resourcing is dedicated to asset management planning?

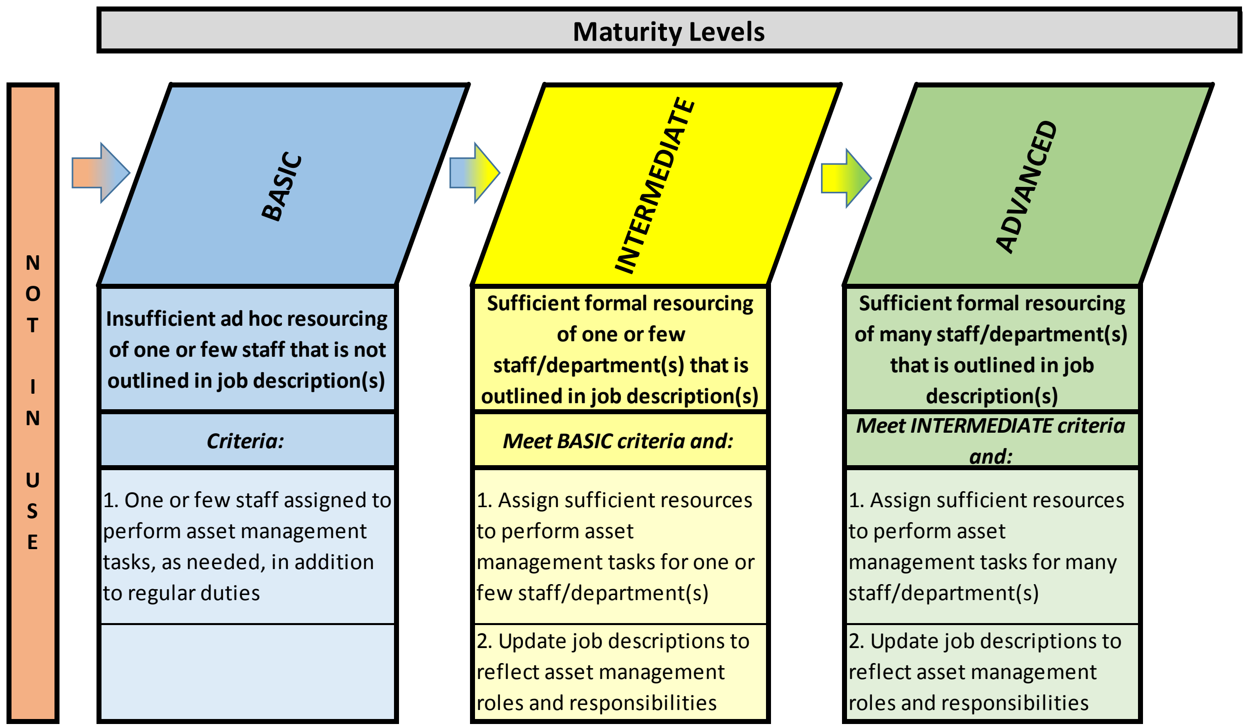
Background

As noted in the previous section, many departments can potentially be impacted by the asset management process, which highlights the importance of assigning resources to asset management and clearly defining roles and responsibilities. Additionally, co-ordination of the asset management resources/activities carried out in many departments should be a priority in order to promote efficiency, ensure adequate resourcing dedicated to asset management, and enhance clarity of responsibilities.

The first step to carry out the roles and responsibilities inherent in asset management planning is to ensure that sufficient staff resources have been allocated and assigned. This does not necessarily mean the assignment of full-time equivalents, but minimum means including asset management duties in staff job description(s).

Levels of Maturity Resourcing

What resourcing is dedicated to asset management planning?



At the **basic level of maturity**, municipalities typically perform asset management work on an ad hoc basis. The staff assigned to perform the work (i.e. municipal staff, not hired consultants) generally do not have these duties specified in their job descriptions. However, some form of asset management work constitutes part of their annual duties. As a result, the amount of resourcing at the basic level of maturity could be classified as minimal and insufficient.

At the **intermediate level of maturity**, one or more staff member(s) are formally assigned to carry out asset management duties. Asset management roles and responsibilities are outlined within the job description of the identified employee(s), in many cases along with other assigned duties (i.e. staff can be dedicated to asset management or do asset management in addition to other responsibilities). Sufficient staff resources are made available for performing asset management duties -- but typically one for several departments.

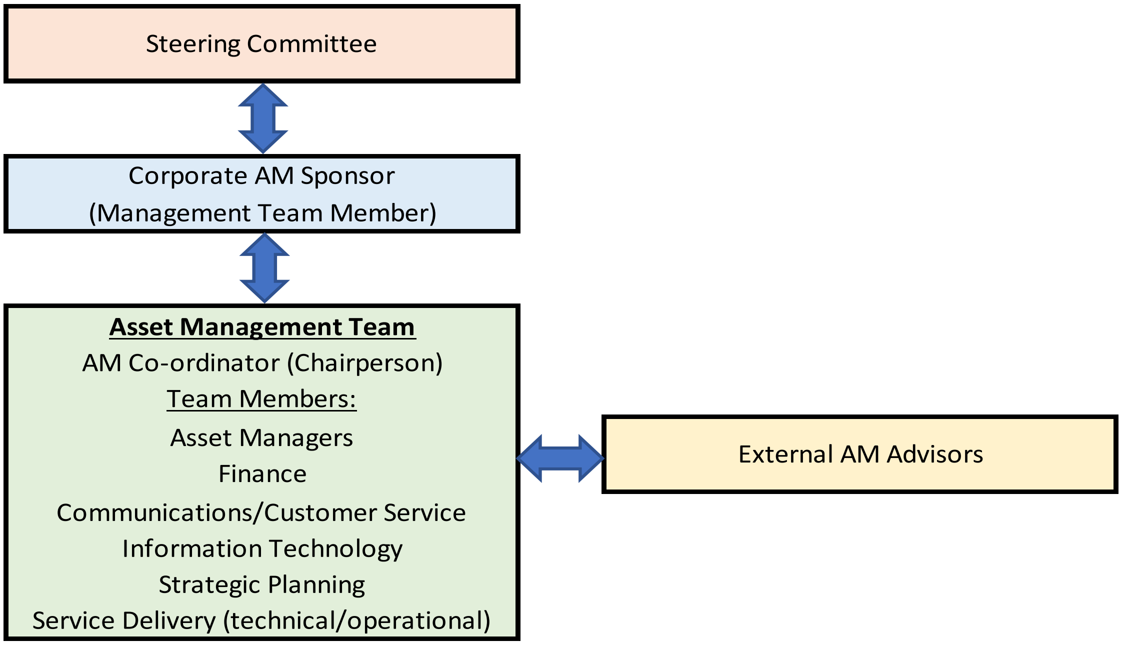
At the **advanced level of maturity**, asset management duties are formally assigned to many staff in applicable departments. The asset management roles and responsibilities are outlined in the job description of the identified employees. Sufficient staff resources are made available for performing asset management duties.

Asset Management Resourcing

Asset management resourcing requires an asset management project "champion" or "sponsor" to effectively gain resources and buy-in from the organization. The sponsor or champion should already be a leader within the municipality, such as the entire senior management, one (or a few) senior managers, or an asset management committee. The champion or sponsor helps ensure that communication, planning, and assessment of outcomes are being undertaken and that a manager(s) or committee is accountable for its success. In a committee setting, it would be beneficial to include representation from all applicable departments.

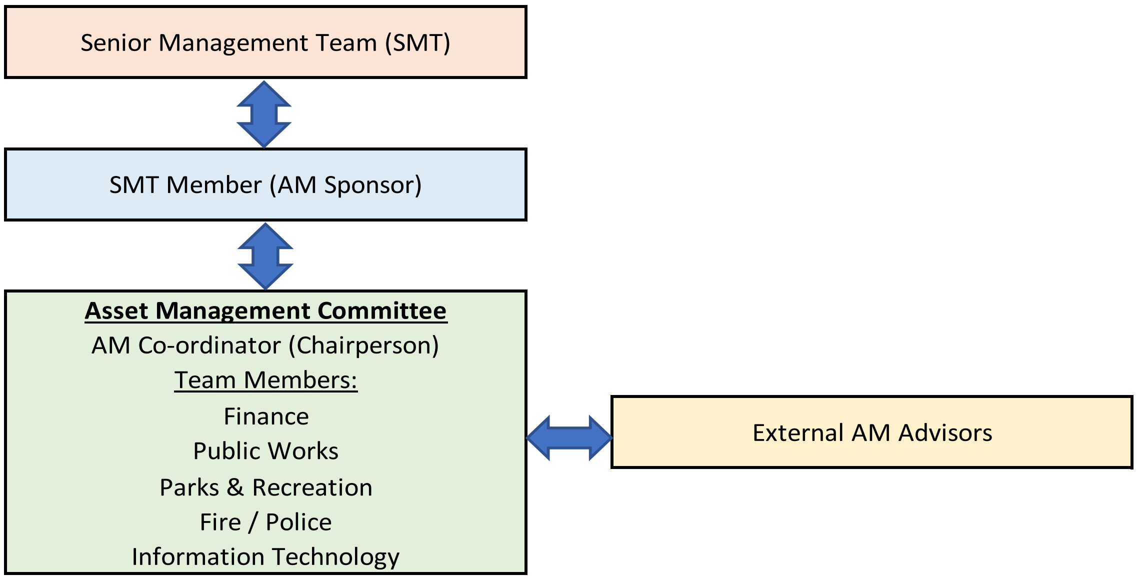
Depending on the complexity of the municipality, it may also be beneficial to assign the responsibility for facilitating the asset management process to an *Asset Management Coordinator* who reports to the manager(s) or committee representing the corporate asset management sponsor. The Asset Management Coordinator can lead the staff members who have been tasked with asset management (i.e. the asset management team), ensure that asset management is an integrated part of relevant municipal processes, and assist in promoting best practices. This position should also be responsible for liaising with external advisors, communicating asset management issues to affected departments, developing asset management plans and strategies, and ensuring sufficient staff and technology are available to meet goals. Figure 10-1 (below) provides a sample Asset Management Team structure:

Figure 10-1
Sample AM Project Team Hierarchy Large/Medium Municipalities



This team structure can also work in smaller municipalities with fewer departments and stakeholders involved. Figure 10-2 (below) shows a modified team structure to demonstrate how a smaller municipality can implement an Asset Management Team with representatives from all departments working on asset management on a part-time basis:

Figure 10-2
Sample AM Project Team Hierarchy Small Municipalities



An important role of the Asset Management Committee and the Asset Management Coordinator is to assess the amount of effort and resources needed to carry out asset management responsibilities within the municipality. Often, the ultimate success or failure of the asset management process hinges on the allocation of staff resources and the continued attention to staff skill levels.

International standards on asset management also stress the need for adequate asset management resources. According to ISO 55001:2014 (E) S.7.1:

> *The organization shall determine and provide the resources needed for the establishment, implementation, maintenance and continual improvement of the asset management system.*
>
> *The organization shall provide the resources required for meeting the asset management objectives and for implementing the activities specified in the asset management plan(s).*

Each municipality needs to determine how best to incorporate asset management roles and responsibilities into their organization structure. This decision often shaped by the size of the municipality. For example, although more easily instituted in larger municipalities, a separate asset management department, or asset management staff within an existing department, can bring benefits to a municipality. These benefits include the provision of specialized asset management expertise, clarity of reporting lines for asset management responsibility, ease of communication, and focused attention on meeting asset management objectives. While in smaller municipalities, asset management responsibilities are often integrated into existing job responsibilities of asset managers, engineering, and/or finance staff. In this case, it is important to ensure that the staff impacted by the additional duties have the necessary asset management competencies and time available to meet asset management objectives. An additional or supplementary approach might be to engage an external source of expertise (i.e. consultant) to provide guidance where necessary. However, it should be noted that it is important to ensure that the scope of work/responsibilities and expectations of outcomes are clearly defined and communicated when external consultants are used.

10.6 Staff Asset Management Capabilities

Given the evolution of AM best practices in Ontario, municipalities should encourage staff involved in the AM process to enhance their competencies through ongoing participation in educational opportunities.

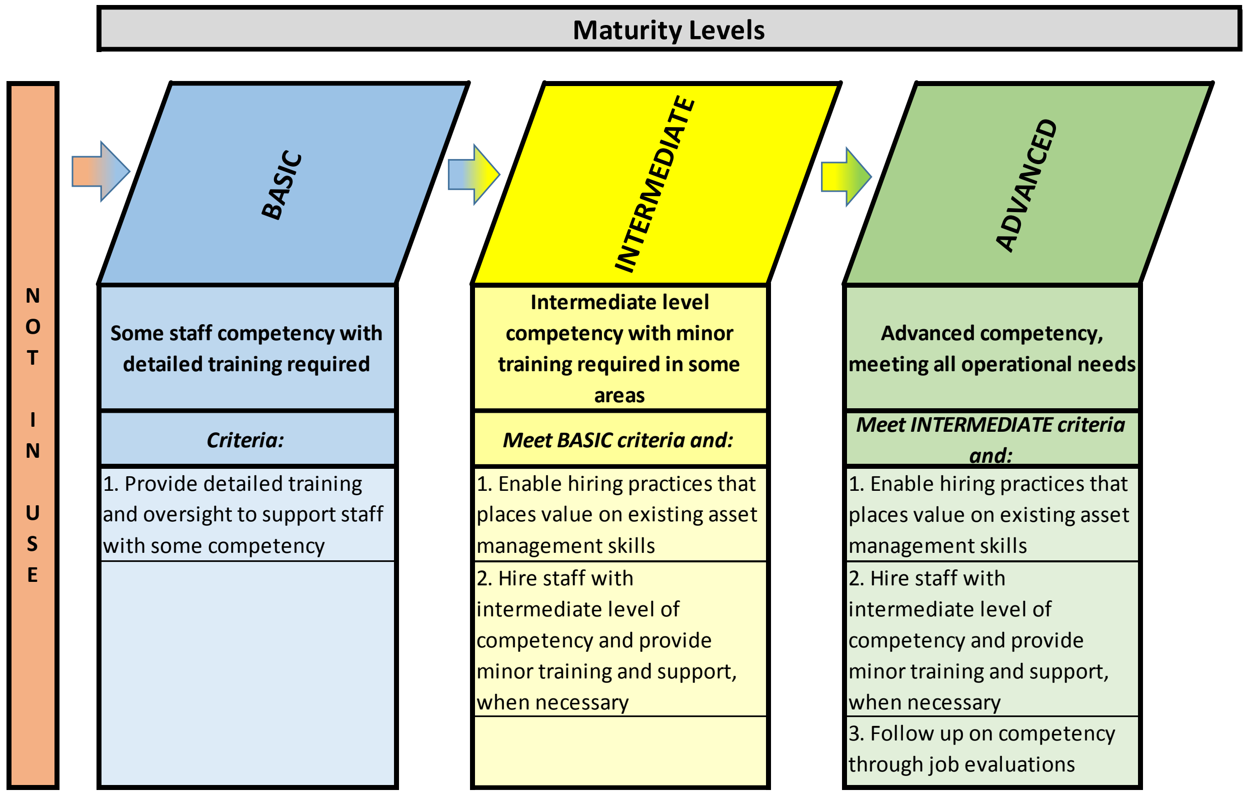
Are there sufficient staff with core competency skills in key operational activities with respect to asset management planning?

Background

Soft skills are important for asset management, regardless of the number of staff involved in asset management or the organizational structure in place. Job descriptions and job postings should be developed with asset management duties and both hard and soft skills clearly outlined. Once hired, it is important to create a framework for staff success in meeting asset management objectives. Training and mentoring of staff involved in asset management activities should be encouraged.

Levels of Maturity Core Competencies

Do staff possess or have sufficient opportunity to gain core competency skills in key operational activities with respect to asset management planning?



At the **basic level of maturity**, municipalities have some staff with competencies to carry-out asset management activities (i.e. maintenance, condition assessment, valuation, financial, etc.). However, the staff require detailed training and regular oversight to support them in these (as well as other) asset management duties.

At the **intermediate level of maturity**, municipalities employ staff with mid-level core competencies in operational asset management duties. Hiring practices should place value on candidates with existing asset management skills. This HR practice should create an environment where staff have sufficient ability to perform their duties with minor training and ongoing support, where needed.

At the **advanced level of maturity**, staff with high-level competencies are assigned to asset management duties. Appropriate hiring practices should be in place to fulfill this level of staffing, which should mean that employees only require training to keep up with the continuous evolution of asset management practices. As an additional step, employees should be provided with regular job evaluations to ensure competency levels and job goals are being met on an ongoing basis.

Asset Management Operational Capabilities

With asset management becoming an emerging topic in the municipal sector, it is likely that existing staff will require education and training on the subject through training courses, seminars, conferences, and webinars. In addition, a significant amount of training will occur during the development of a municipality's asset management process and asset management plan (i.e. learn through actual implementation). Some suggested approaches are:

- Establish a process for municipal staff to shadow external consultants (if used/hired), to assist in the implementation of asset management. Also have staff take on specific roles and responsibilities during the implementation process;
- Take advantage of available asset management courses, lectures/seminars, conferences, and webinars;
- Become familiar with online resources that provide tools and tips with respect to asset management;
- When hiring staff, pay attention to specific asset management expertise of the candidates;
- Conduct internal workshops on asset management to review both asset management concepts and approaches, and the internal workings of asset management within the organization. If one or many staff have asset management expertise, use them as a resource to train other staff; and
- Involve all applicable staff in the processes of ongoing asset management updates and improvements so they can learn while implementing asset management.

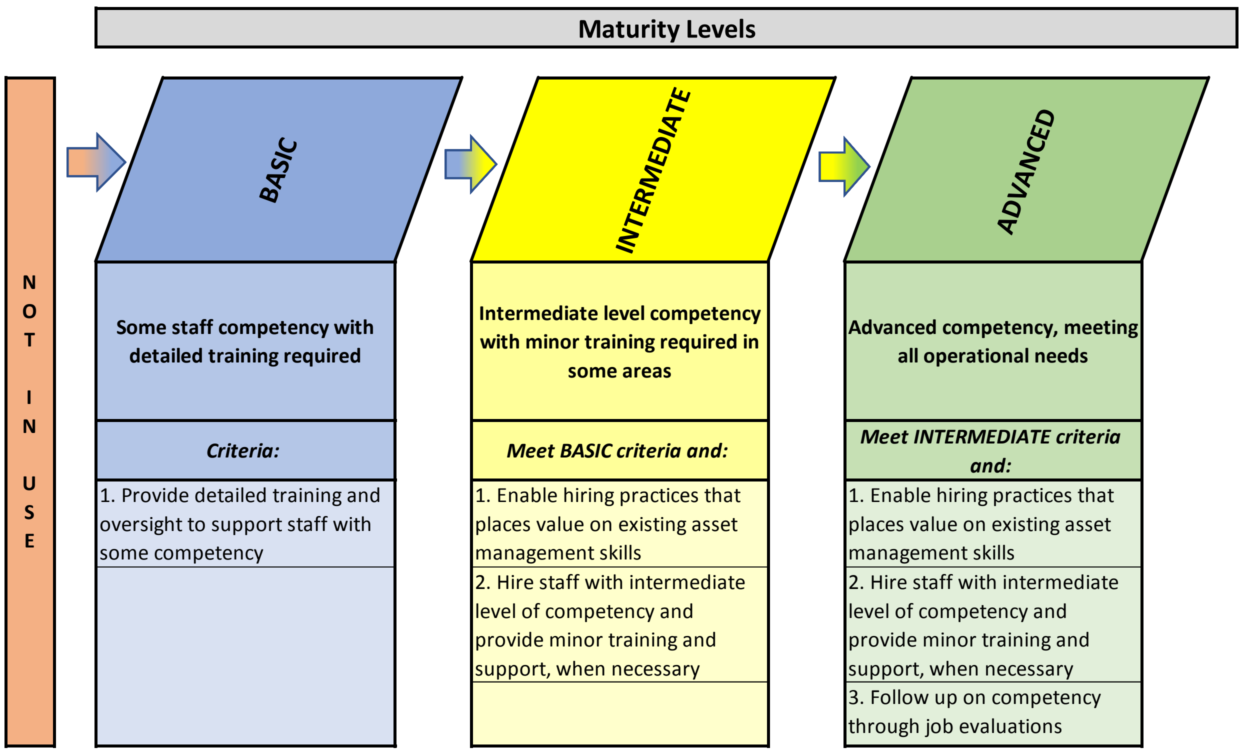
Are there sufficient staff with core competency skills in key financial activities with respect to asset management planning?

Background

Financial skills are required to conduct complete AM planning. Job descriptions and job postings should be developed with asset management financial duties and skills clearly outlined. Training and mentoring of staff involved in financial asset management activities should be encouraged, and it is important to create a framework for staff success in meeting asset management objectives.

Levels of Maturity Core Competencies

Do staff possess or have sufficient opportunity to gain core competency skills in key financial activities with respect to asset management planning?



At the **basic level of maturity**, municipalities have some staff with asset management competencies, but on a whole require further detailed training. To advance from the basic level, municipalities will need to provide detailed training and oversight to staff.

At the **intermediate level of maturity**, municipalities have staff with moderate asset management competencies, but still require some minor training in certain areas. Municipalities at this level have hiring practices that place value on candidate's existing asset management skills, and engage new staff in minor training and support, when necessary.

At the **advanced level of maturity**, municipalities have staff with proficient asset management competencies. Municipalities at this level have hiring practices that place value on candidates existing asset management skills, and engage new staff in minor training and support, when necessary. Competencies should be consistently assessed through on-going job evaluations.

<u>Asset Management Financial Capabilities</u>

As with soft skills (discussed above), it is likely that existing staff will require education and training from a financial perspective related to asset management through training courses, seminars, conferences, and webinars. In addition, a significant amount of training will likely occur during the development of a municipality's asset management process and asset management plan (i.e. learn through actual implementation). Some suggested approaches include:

- Establish a process for municipal staff to shadow external consultants (if used/hired) to assist in the implementation of asset management. Also have staff take on specific roles and responsibilities during the implementation process;
- Take advantage of available asset management courses, lectures/seminars, conferences, and webinars (with a financial focus);
- Become familiar with online resources that provide tools and tips with respect to asset management from a financial perspective, such as the Municipal Finance Officers' Association of Ontario (MFOA) website;
- Pay attention to specific asset management expertise of candidates when hiring staff;
- Conduct internal workshops on asset management to review both asset management concepts and approaches, and the internal workings of asset management within the organization. If one or many staff have asset management expertise, use them as a resource to train other staff; and
- Involve all applicable staff in asset management updates and improvements so they can learn from the process while implementing asset management.

10.7 Resources and References

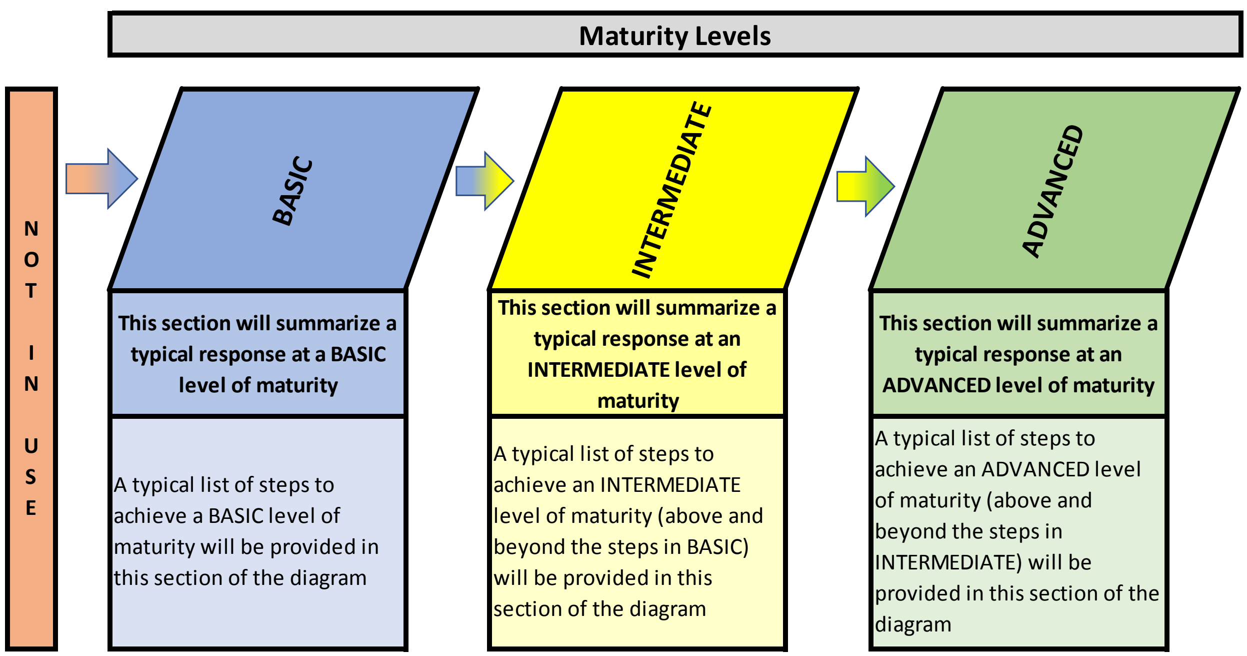
Institute of Public Works Engineering Australasia, 2015, International Infrastructure Management Manual, https://www.ipwea.org/publications/bookshop/ipweabookshop/iimm

International Organization for Standardization (ISO), 2014, ISO 55000:2014, Asset management – Overview, principles and terminology, http://www.iso.org/iso/catalogue_detail?csnumber=55088

11 Council Approval and Support

11.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake in order to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers’ understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices

to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic leve*l requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

11.2 Overview

In *Chapter 10: Internal Governance*, the role of staff and the management team was discussed in relation to the success of the asset management process. This chapter discusses Council's role in relation to the success of the asset management process. Council can assume a simple "approval" role, whereby asset management related plans, reports, and policies are endorsed by Council resolution. Or, Council can assume a more direct, supportive role in asset management planning.

<u>Infrastructure for Jobs and Prosperity (IJPA) Act and O. Reg 588/17 Requirements</u>

O.Reg 588/17 outlines the following requirements with respect to AM Council Approval and Support:

A Strategic Asset Management Policy (SAMP) must be developed and adopted by *July 1, 2019* and reviewed and updated at least every 5 years. The SAMP outlines a requirement to include an explanation of Council's involvement in AM planning within the municipality.

In addition:

1. The asset management plan (or update) must be endorsed by the executive lead of the municipality and approved by Council resolution.
2. Municipalities would be required to provide Council with an annual update on asset management planning progress, by July 1st of each year.

11.3 Council Approval of the Asset Management Plan/Process

The extent to which Council adopts the AM process (including the AM plan) indicates their commitment to the AM recommendations and outcomes.

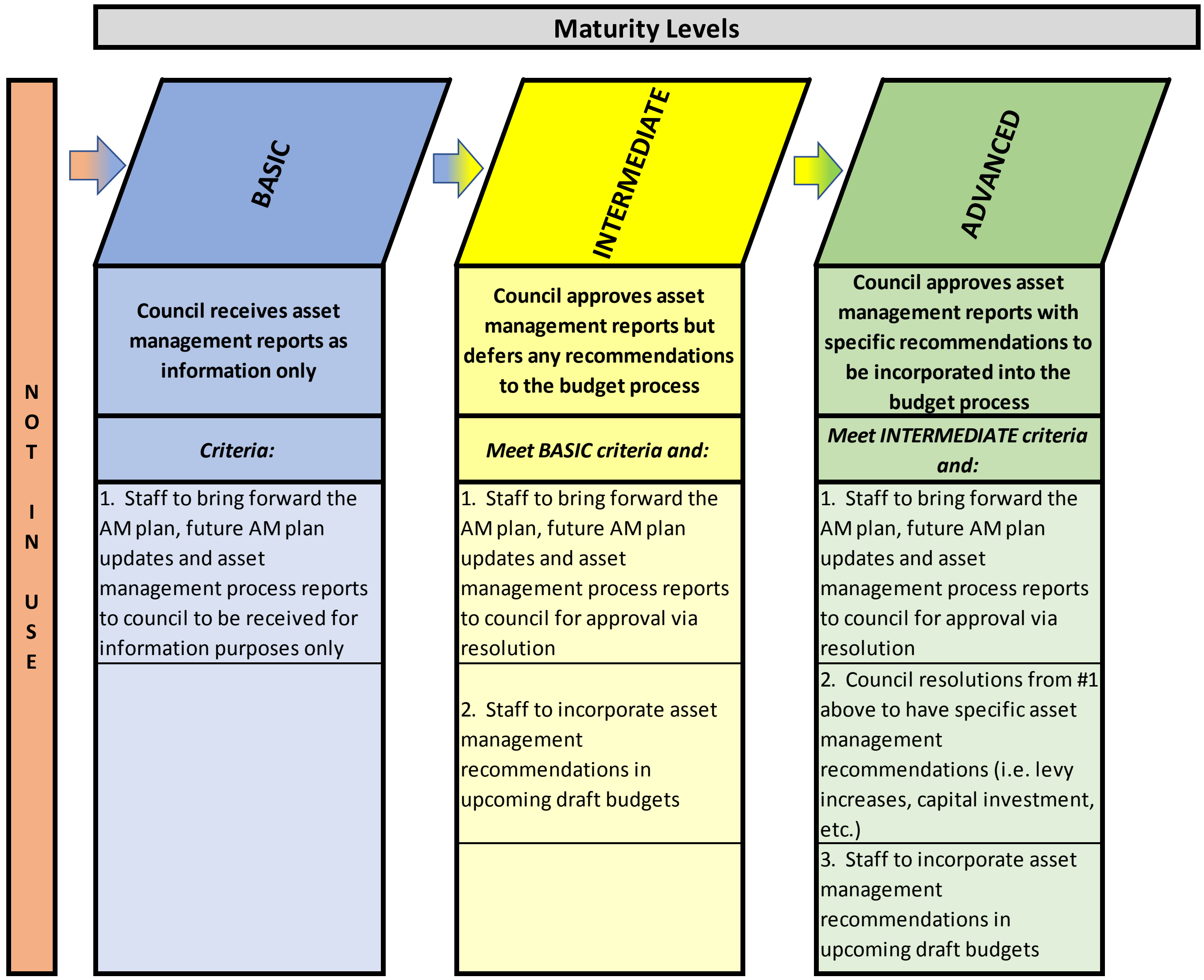
To what extent does Council approve the asset management plan?

Background

Council is responsible for approving the municipality's strategic goals and priorities. The strategic planning process puts a spotlight on service delivery outcomes expected by the community. Municipalities rely heavily on their capital assets to carry out service delivery to the public. As a result, the asset management process supports the goals of service delivery and is fundamentally linked to many service delivery outcomes. This makes the asset management plan a key document that underpins Council's strategic directions. Therefore, obtaining Council approval of the asset management process and the asset management plan ensures the asset management direction aligns with Council's corporate strategic direction.

Levels of Maturity Council Approval

To what extent does Council approve the asset management plan?



At the **basic level of maturity**, Council receives asset management related reports as information only.

At the **intermediate level of maturity**, Council approves asset management reports by resolution. However, specific recommendations are deferred to future budget processes.

At the **advanced level of maturity**, Council approves asset management reports and provides specific recommendations to include in the budget process. The recommendations are specific and include priority project identification, lifecycle cost investment levels, estimated impacts on rates, amongst others. Municipal staff would then incorporate the asset management recommendations into future budgets.

Council Approval

Council approval of the asset management plan/process provides a number of advantages, including:

- Staff will ensure the asset management process/plan is consistent with Council's corporate strategic directions;
- Council will have a better understanding of the contribution of capital assets in providing services for which they are the stewards;
- Council will know the planned approach to maintain capital assets in accordance with expected levels of service, and the corresponding impacts on rates to provide expected levels of service;
- Council and staff will have an established framework for future budgeting and planning processes; and
- Staff will have clarity on Council expectations related to asset management.

As discussed above, the levels of maturity change Council's approval process with respect to asset management as shown in Figure 11-1 and Table 11-1:

Figure 11-1
Sample Council Approval Process Level of Maturity

Table 11-1
Council Approval Process Pros/Cons Level of Maturity

Level of Approval	Pros	Cons
BASIC: Information only	Council is recognizing the existence of the AM Planning Process	No endorsement or commitment to AM
INTERMEDIATE: Approval, no specific recommendations	High-level endorsement and commitment to AM Process	No specific direction given to staff regarding action items
ADVANCED: Approval, with specific recommendations	Specific endorsement and commitment to AM, with action items	Can be difficult to obtain Council approval on specific recommendations

It should be noted that even at an *advanced level* of maturity (with specific asset management recommendations), there should be some type of follow-up on the specific recommendations as part of the budget process. For example, a Council may endorse a recommendation to increase capital investments by 3% per year over the next 5 years. This specific recommendation should be brought into the draft budget process and adjusted for any new asset management information that became available since asset management plan approval. In addition, any adjustments to the recommendation that are needed as a result of other budget recommendations should be brought back to the AM process.

11.4 Council Support of the Asset Management Process

To what extent does Council support the asset management process?

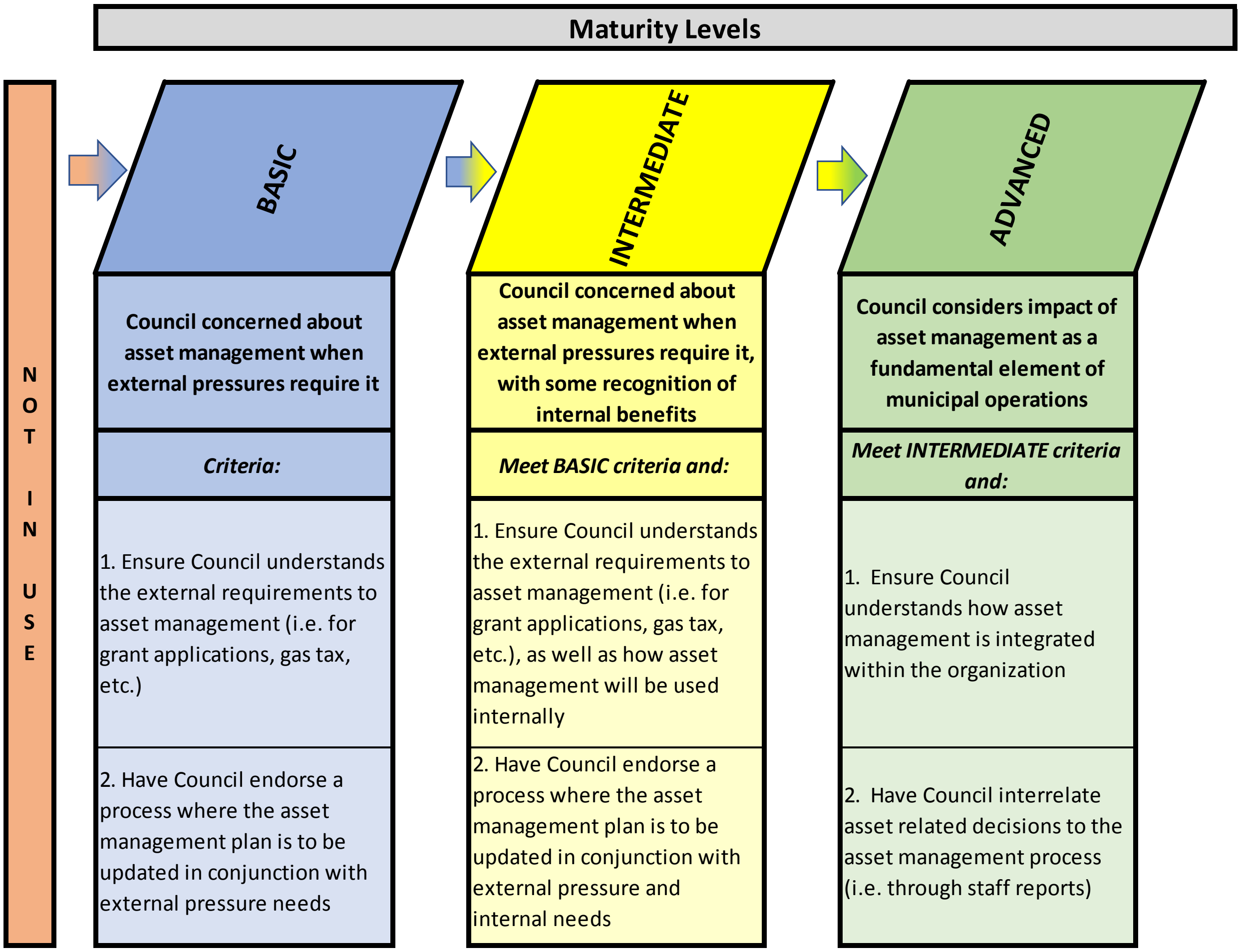
Having council support for the AM process ensures that asset-based decisions are being made in a consistent and informed manner.

Background

Once Council has approved the asset management process/plan, staff are able to undertake ongoing asset management actions knowing that they have Council's support/direction, and that they are operating in a manner consistent with the municipality's overall strategic direction. Going forward, where asset management related issues are brought to Council, the asset management process provides context for discussions between Council, staff, and the public. However, the question becomes, "How will Council use this asset management process as a tool to make decisions on an ongoing basis?"

Levels of Maturity Council Support

To what extent does Council support the asset management process?



At the **basic level of maturity**, municipalities have Council support of their asset management processes when external pressures require it. Examples of external pressures include: submission of asset management plans with grant applications, or meeting gas tax reporting requirements. Council will have endorsed a process whereby the asset management plan is updated in conjunction with external pressure needs.

At the **intermediate level of maturity**, Council becomes supportive of asset management processes when external pressures or internal needs require it (such as the budget process). Municipal staff must ensure Council understands both external pressures and internal benefits of asset management planning. Council will have endorsed a process whereby the asset management plan is updated in conjunction with external pressures and internal needs.

At the **advanced level of maturity**, Council considers the impact of asset management planning as a fundamental element of municipal operations. To reach this level of maturity, Council understands how asset management is integrated into the organization. Council also integrates asset-related decisions to the asset management process and asset management plan. This can be accomplished through appropriate wording within staff reports (referring to implications on the asset management process) and through discussions during meetings between Council, staff, and the public.

<u>Types of Council Support</u>

Council support of the asset management process on an ongoing basis demonstrates Council's trust in not only the asset management process, but the data, assumptions, and projections that result in the asset management recommendations. When Council and staff are consistently referring to the asset management process (when discussion topics warrant), an enhanced level of asset management integration in the municipal decision-making process is achieved.

As discussed above, the levels of maturity change Council's support with respect to asset management as shown in Figure 11-2 and Table 11-2:

Figure 11-2
Sample Council Support of AM Process Level of Maturity

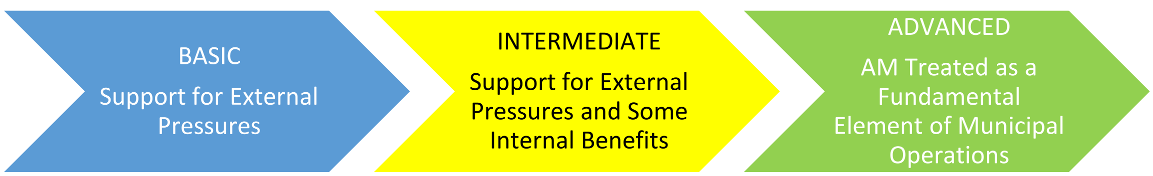


Table 11-2
Council Support of AM Process Pros/Cons Level of Maturity

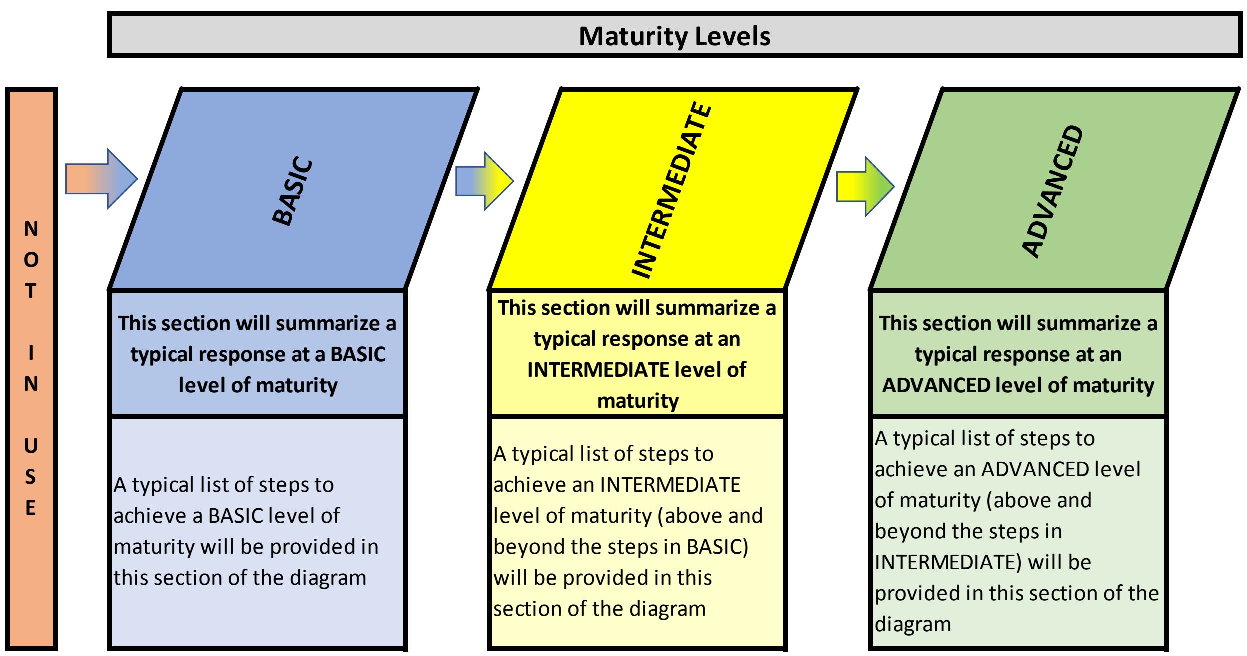
Level of Support	Pros	Cons
BASIC: External pressures only	Council is recognizing the benefits of the AM plan in applying for grants and meeting gas tax eligibility requirements	No reliance on the AM process internally, underutilization of a great planning and decision-making tool
INTERMEDIATE: External pressures and some internal benefits	Council is recognizing the benefits of the AM plan in meeting external pressures and some significant internal processes, such as the annual budget Opportunity to significantly improve the budget process	Full integration of asset management planning not utilized at this point Other internal processes may still benefit the AM process

Level of Support	Pros	Cons
ADVANCED: Fundamental element of municipal operations	Council and staff refer to the AM process whenever a decision impacts it All staff reports include a sub-section entitled “AM Implications” Potential processes directly tied to AM process: • Budget Process; • Strategic Planning; • Master (and Growth) Planning; and • All Asset/Financial Decisions	Additional time and effort required to assess AM impacts on decisions made

12 Public Engagement

12.1 Using this Framework

This framework is intended for municipalities of all sizes and maturity levels. The use of the maturity diagrams within this framework can help municipalities identify their current levels of maturity for each AM area. In addition, the diagrams provide possible approaches for municipalities to undertake to move to a higher level of maturity over time. Adaptations of the following diagram are used throughout this document to summarize maturity levels according to the themes and questions explored in each chapter:



This document is intended to help municipalities make progress on their asset management planning. By enhancing the readers' understanding of asset management maturity, they can more accurately determine their current, and work toward achieving the desired or appropriate, level of maturity for their municipality.

The asset management framework can be likened to a continuum, whereby municipalities should aim to implement the components described in a subsequent maturity level. For example, municipalities that are not practicing asset management

should strive to meet components at the *basic level*, and likewise, municipalities that currently meet the *basic* or *intermediate* levels should strive to advance their practices to meet the components of the next level. However, it should be noted that during this self-assessment process a municipality may decide to skip over maturity levels (i.e. move from basic to advanced, skipping intermediate). This is perfectly acceptable. Further, not every municipality will need to strive for the highest level of maturity in every area. For example, it may not make sense for a small municipality to meet certain advanced level components.

Readers can use the following descriptions of the maturity levels to guide their assessment throughout the various sections of this framework:

Municipalities that are not undertaking the components described in a particular section of this framework should focus on meeting the *basic level* requirements outlined in the maturity level diagram.

At the **basic level of maturity**, a municipality is undertaking the components of asset management shown in blue and will take steps to advance their asset management by implementing the components described under the *intermediate level* heading.

At the **intermediate level of maturity**, a municipality is currently meeting the requirements shown in yellow and to advance their asset management will take steps to implement the components described under the *advanced level* heading.

At the **advanced level of maturity**, a municipality is currently meeting the requirements shown in green.

These maturity framework visuals are found throughout this document. Preceding all maturity level diagrams is a self-assessment question for the reader to consider to help determine where their municipality best fits within the framework.

12.2 Overview

Municipalities can benefit from seeking the public's involvement in developing, reviewing, and approving various aspects of the asset management process. The public's input may be directly sought as part of asset management plan discussions concerning levels of service, lifecycle management strategy scenarios, various financing strategy options, and/or other elements of the asset management process. In addition, feedback related to asset management plan issues can be indirectly derived from other public processes such as budget approvals or master plan approvals. Overall, ensuring some level of public engagement throughout the asset management process not only assists in gaining a level of public acceptance on asset management, but also a level of public ownership in the process.

<u>I*nfrastructure for Jobs and Prosperity Act* (IJPA) and O. Reg 588/17 requirements</u>

O.Reg 588/17 outlines the following requirements with respect to AM Public Engagement:

A Strategic Asset Management Policy (SAMP) must be developed and adopted by *July 1, 2019* and reviewed and updated at least every 5 years. The SAMP outlines a requirement to include a commitment to provide opportunities for municipal residents and other interested parties to provide input into AM planning

Municipalities will be required to post their SAMP and asset management plan on the municipality's website, if one exists, and make copies of these documents available to the public, if requested.

12.3 Benefits of Public Engagement

Facilitating public engagements within the AM process ensures consideration is given to stakeholder expectations.

To what extent is the public involved in the asset management process?

<u>Background</u>

Citizens of a municipality are in the best position to develop an overarching vision of the type of community in which they want to live, work, and play. Undoubtedly, at the core of these visions are municipal services. The asset management process sets out long-term strategies in order to ensure the assets will perform sufficiently to meet service delivery objectives. By involving the public in developing this vision for the municipality, the public will become educated in the various pressures and impacts associated with asset management. The public has the opportunity to shape both the direction of the municipality, as well as to understand the underlying asset management implications.

Levels of Maturity Public Engagement

To what extent is the public involved in the asset management process?

Maturity Levels			
NOT IN USE	*BASIC*	*INTERMEDIATE*	*ADVANCED*
	The public can attend meetings where asset management is being discussed or approved	**The public can attend meetings where asset management is being discussed or approved, and**	**The public is invited to provide input into asset management during initial stages of development**
	Criteria:	***Meet BASIC criteria and:***	***Meet INTERMEDIATE criteria and:***
	1. Ensure the public is aware when asset management is to be discussed in a council or committee meeting (eg. agenda item, public notice, etc.)	1. Ensure the public is aware when asset management is to be discussed in a council or committee meeting (e.g. agenda item, public notice, etc.)	1. Provide opportunities for the public to directly participate in the asset management process (e.g. committee, workshop, detailed survey, etc.)
	2. Ensure that documents or reports being discussed are available to the public before the meeting (e.g. reports, AM plan, etc.)	2. Provide mechanisms for the public to provide comments on asset management related topics (e.g. delegations, written comments, surveys, etc.).	2. Ensure the public is aware when asset management is to be discussed in a council or committee meeting (e.g. agenda item, public notice, etc.)
		3. Ensure that documents or reports being discussed are available to the public before the meeting (e.g. reports, AM plan, etc.)	3. Provide mechanisms for the public to provide comments on asset management related topics (e.g. delegations, written comments, surveys, etc.)
			4. Ensure that documents or reports being discussed are available to the public before the meeting (e.g. reports, AM plan, etc.)

At the **basic level of maturity** municipalities ensure the public has an opportunity to attend council or committee meetings where asset management is discussed or approved. This can be facilitated through public notices, making the agenda public before the meeting, and encouraging attendance. Any asset management documents or reports could also be made available to the public prior to the meeting, to promote understanding and preparation for the meetings.

At the **intermediate level of maturity**, the public is invited to participate in an additional step to provide feedback on asset management topics prior to the council/committee approval meetings. Various methods can accomplish this including providing surveys, accepting delegations, or requesting written feedback.

At the **advanced level of maturity**, the public is invited to provide input during the development stages of asset management planning. In this manner, the public will have the opportunity to shape the fundamental direction of asset management processes.

Increasing Levels of Maturity for Public Engagement

As a municipality moves from basic to intermediate to advanced maturity, the level of public engagement increases, which provides the community with increased awareness and education on the intended asset management process. Moreover, increased public engagement can lead to increased acceptance of the proposed asset management recommendations, such as rate increases.

Some of the forms of public engagement are as follows:

Table 12-1
Sample Forms of Public Engagement

Engagement Type	Level of Engagement	Maturity Level
Attendance at Council/Committee meetings	Public received information only	Basic
Newspaper ads, fact sheets, website postings, videos, etc.	Public received information only	Basic
Surveys, questionnaires, etc.	Public provides comments	Intermediate
Community meetings, information session with questions and answers, delegations, etc.	Public provides comments	Intermediate
Community working groups	Public included in meetings with departments	Advanced
Asset Management Committee (with public members)	Public included in AM Committee meetings	Advanced

The degree of public participation and consultation can vary based on specific components to the asset management process. For example, varying degrees of public participation may be determined for:

- Creating asset management policies and strategies;
- Levels of service (in defining community expectations);
- Deciding on the most effective Lifecycle Management Strategy (i.e. long-term forecast);
- Agreeing on optimal Financing Strategies; and
- Reviewing and approving an AM Plan.

A municipality may decide that simply informing the public is acceptable for most asset management components but may prefer more public engagement when it comes to setting policies, strategies and determining community expectations.

It is important to note that members of Council are elected to make decisions on behalf of the public. However, those decisions should also be informed by information gathered from the public on a variety of issues. Therefore, if a municipality is not ready to move towards full public engagement within the AM process, a potential intermediate step would be to engage Council actively during the AM process, and thereby incorporate the public's view indirectly.