Attachment - A

Bellevue Utilities

Strategic Asset Management Plan (SAMP)

JANUARY 2021

Document History and Status

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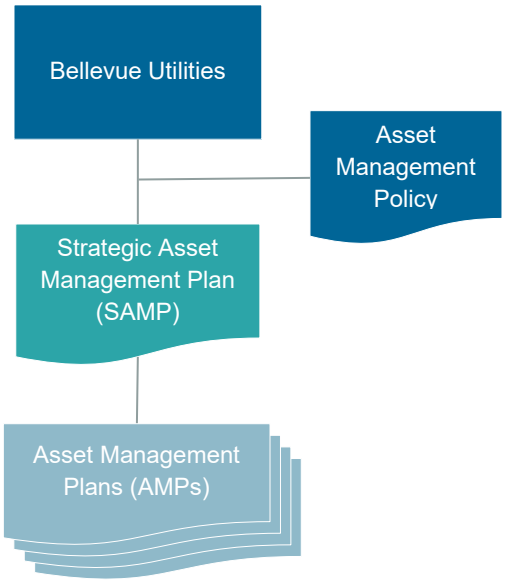
1 Executive Summary

At Bellevue Utilities, we own infrastructure for one reason—to support the provision of essential services: drinking water, wastewater, storm and surface water, and solid waste. We provide services to people who live, work and play in the City of Bellevue and many adjacent communities and we also support environmental stewardship. We take pride in making sure our services are dependable, a good value for the money, and delivered with the customer in mind. We are an infrastructure-intensive organization with substantial investments in infrastructure assets and we place high priority on making well-informed decisions regarding replacement, rehabilitation, and maintenance strategies.



We commit to adopting Asset Management as a coordinated activity to realize value from our assets and will employ the strategies and tactics necessary to build, operate and maintain our infrastructure in order to deliver reliable and sustainable services.

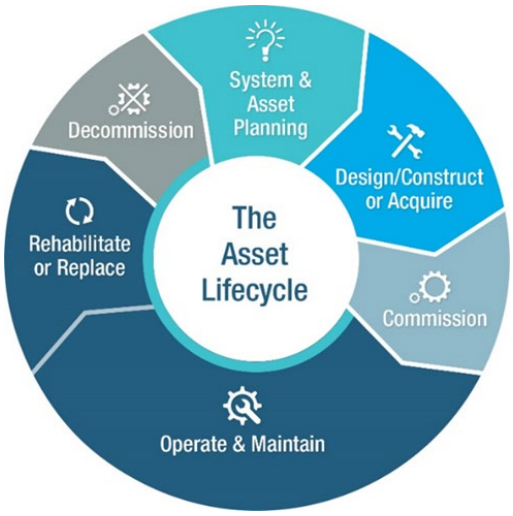
This initial version of our Strategic Asset Management Plan (SAMP) documents and communicates our vision, policy, objectives, and the improvement initiatives necessary to achieve our asset management vision. This SAMP describes the drivers for asset management and links the work throughout Bellevue Utilities with our asset management strategy and objectives. This SAMP brings our asset management policy to life and establishes the framework for how we implement asset management through more specific and operational Asset Management Plans (AMPs).

Asset management will benefit our customers by helping us make well-informed and balanced decisions regarding three interrelated imperatives:

1. Understand the needs and expectations of customers and the broader community (including affordability and ability to pay).
2. Understand the state of the infrastructure and the ability of the system to provide expected services.
3. Understand what it will cost to provide required services today and into the future; this includes financial strategies and making sure lifecycle costs and benefits are taken into consideration.

The work to understand and balance these three imperatives must consider risk, therefore we will also incorporate risk management into our decision making.

Our vision for asset management is to become a leader in infrastructure management by optimizing performance, risk, and life cycle costs for the wellbeing of our communities. In order to achieve this vision, we established an Asset Management Policy in 2019, which informs the organizational processes linking all stages of the asset lifecycle. It also empowers staff to deliver services using the most effective and efficient means.



The asset management policy provides the following Utilities Asset Management Principles:

- Adopt a lifecycle approach to managing infrastructure assets to include planning, acquisition, operation, maintenance, renewal, and disposal
- Balance cost, risk, and performance of assets
- Place a high priority on environmental and financial sustainability, while meeting desired levels of service
- Endorse evidence-based decisions utilizing robust software systems to manage and analyze information
- Achieve organizational priorities and objectives through continuous improvement

This SAMP provides the foundation for implementing our commitment to holistic asset management. We recognize that adopting and instilling asset management best practices is a journey that will take time, effort, and resources. We intend to apply an agile approach, wherein we will practice continuous learning, respond to issues and needs as they arise, and make course corrections as appropriate based on changing internal and external drivers. In addition, we will continue to involve staff, collaborate across functional areas, provide opportunities for input and learning, ask and answer difficult questions, encourage innovation and creative engagement, and communicate progress along the way.

We expect this journey to lead us to achieve our vision and reach asset management maturity. While it may take many years to become fully mature, our improvement initiatives will establish the shorter-term projects that will have immediate benefits and result in the ultimate achievement of our asset management vision. This SAMP and our improvement initiatives will evolve as we move along our journey to asset management maturity.

Within this SAMP, we have woven together the most-needed improvement initiatives, which we will prioritize and implement within the next six years; they are grouped in the following seven categories.

People and Processes	AM Governance & Decision Making	Strategy & AM Program Management
Improve readiness for organizational change and make sure attention is given to the people-side of asset management.	Ensure that decisions are made by the right people at the right time, that a risk management framework is established and that associated processes are established and implemented.	Ensure effective and efficient roll-out of the AM policy and SAMP, management of the AM Implementation Plan, and important elements of a two-way communications plan.

Performance Management	Asset Lifecycle Management	Data & Technology	Maintenance & Reliability
Improve performance and ensure that targets are based on service level objectives.	Define and implement processes to ensure optimal decisions and outcomes at all stages of the asset lifecycle.	Provide availability of accurate and useful data and ensure that technology systems support asset management.	Improve reliability through maintenance optimization.

Additional improvement initiatives are expected to be identified periodically, including through development of the Asset Management Plans (AMPs). We will prioritize new improvement initiatives along with the others and make decisions annually regarding which to implement.

.The development of the SAMP was made possible through the active engagement and dedication of Bellevue Utilities leadership, management and staff across the department, and Jacobs Engineering as our consultant. The resiliency and dedication of our staff to adapt to challenges brought on by the global pandemic allowed us to continue to collaborate well and to overcome new obstacles of our remote work situation in 2020. Together we completed nine SAMP workshops, two Asset Management assessment workshops, and numerous other development meetings in order to learn as a departmental team about asset management best practices and to develop the material for this Strategic Asset Management Plan. Completion of this SAMP during the unprecedented challenges of 2020 is evidence of how we work together to deliver on our commitments to the community and our customers.

2 Introduction

The mission of Bellevue Utilities (Utilities) is to actively support public health and safety, quality neighborhoods, and a healthy and sustainable environment and economy by effectively managing drinking water, wastewater, storm and surface water, and solid waste (1). To achieve this mission, Utilities depends on the knowledge, experience, and coordination of its staff to gain the most value from the $3.5 billion of infrastructure assets it operates and maintains (based on the estimated replacement cost). Utilities leadership has committed to adopting asset management practices throughout Utilities to ensure that its staff learn, understand, and employ the strategies and tactics necessary to attain and maintain asset infrastructure that effectively and efficiently delivers reliable and sustainable services to its customers.

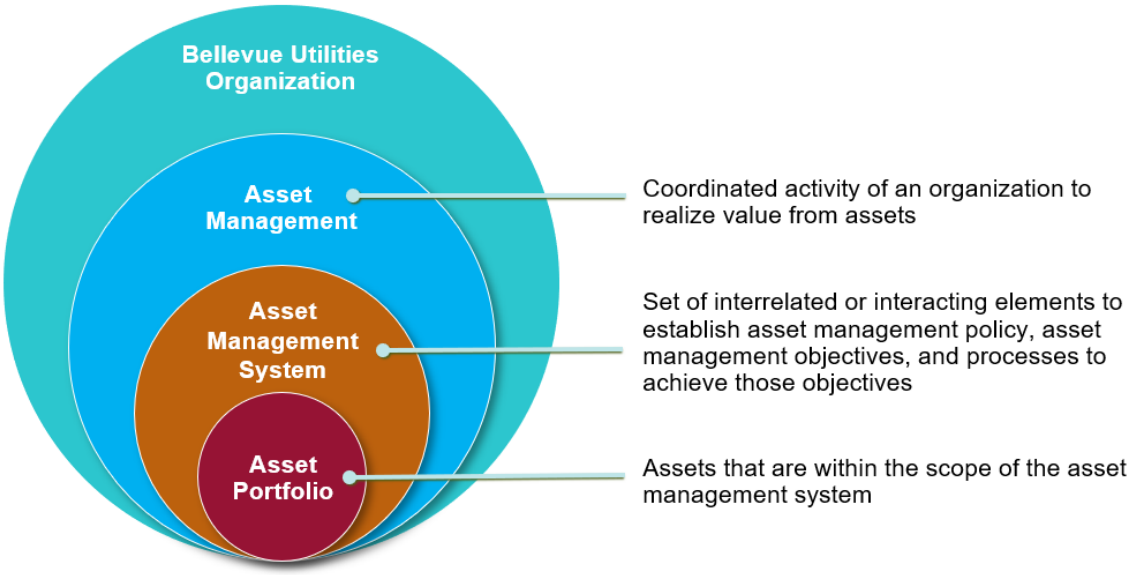
2.1 Purpose of the SAMP

The purpose of this Strategic Asset Management Plan (SAMP) is to establish Utilities' asset management framework, which includes the following:

- Asset management vision, policy, and objectives
- Line-of-sight that begins to link each employee's asset management contributions to Utilities' organizational objectives
- Asset management governance, roles and responsibilities, and principles for decision making
- Asset management implementation plan with improvement initiatives
- Expectations for development of Asset Management Plans (AMPs)

The SAMP is the foundation of Utilities' Asset Management System (AMS). The AMS is the set of interacting and interrelated elements that guide the development and implementation of asset management activities. Utilities' AMS includes the SAMP, AMPs, Asset Management Policy, the Asset Management Objectives, and the needed leadership, governance, and processes to achieve those objectives and help accomplish Utilities' mission, vision, and organizational goals. The AMS also includes the asset portfolio and how the assets in the portfolio are to be managed throughout their lifecycles as guided by AMPs, which focus on a set of assets having a similar purpose or similar characteristics. Figure 2-1 illustrates how the AMS relates to Utilities' organization, its overarching asset management activities, and its asset portfolio.

Figure 2-1: The Asset Management System as an Element of Asset Management

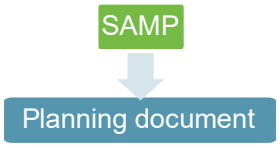


Adapted from Asset Management – An Anatomy (2)

The AMS should not be confused with an asset management information system (AMIS), which is a combination of processes, data, software, and hardware, such as a computerized maintenance management system (CMMS), that is used to enable the essential outputs for effective asset management.

The SAMP serves as a direct link between the organizational strategy and the asset management activities, resources, and timeframes specified in AMPs. However, the SAMP must also align with other planning endeavors undertaken by Utilities. Some of these other planning efforts may lie within the AMS, while others may lie outside. For those inside of the AMS, the SAMP should be the influencing document. For example, future master plans should base rehabilitation and replacement of assets on the risk framework contained in this SAMP. Conversely, updating of Utilities' Financial Plan, which lies outside of the AMS, should be coordinated with the asset management strategies presented in the SAMP, while financial constraints identified in the Six-Year Financial Plan should influence future updates of the SAMP and AMPs. Table 2-1 provides some examples of plans that should be influenced by the contents of the SAMP and others that should be carefully coordinated with the SAMP to maintain consistency and avoid ambiguity.

Table 2-1: Examples of Plans and Their Relationship to the SAMP



Planning Documents Influenced by the SAMP
Current (or in development) Plans • Capital Improvement Plan Budget • Water, Wastewater, and Storm and Surface Water System Plans • Emergency Water Supply Plan and Seismic Resiliency Study (expected 2021) • Update Asset Renewal and Replacement Forecast Plan (2021) • 2016-2020 Asset Management Roadmap **Potential Future Plans** • Asset Management Implementation Plan • Asset Management Plans • Maintenance Strategies and Plans • Asset Management Information System Plan • Asset Management Competency Plan • Asset Management Organizational Change and Communications Plan • Risk Management Plan

Planning Documents to be Coordinated with the SAMP
• Utilities Strategic Plan • Six-Year Rates Forecast • Biennial Budget (Operational/Capital) • Risk and Resiliency Assessment (AWIA) • Utilities Smart City Plan • Emergency Response Plan • Operational Plans • Wastewater System Plan • Water System Plan • Storm and Surface Water System Plan • Utilities Information Technology Strategic Plan • Seven-Year Capital Investment Plan

2.2 Structure of the SAMP

This SAMP is structured to align with the ongoing work of asset management at Utilities. Utilities staff throughout the organization, including members of the Board of Utilities Directors (BUD) were actively engaged in developing this SAMP over a period of 14 months. While achieving ISO 55001 (3) certification in asset management is currently not being considered by Utilities, the ISO 55000 suite of standards was used as a guide in structuring this SAMP, along with other well-recognized asset management reference documents such as the International Infrastructure Management Manual (4), Asset Management – An Anatomy (2), and the Asset Management Landscape (5).

Table 2-2 presents the structure of the SAMP.

Table 2-2: Structure of the SAMP

SAMP Section		Description
1.	Executive Summary	A succinct overview of the SAMP including a brief explanation of its purpose, key issues and highlights covered, and an abridged version of any recommendations.
2.	Introduction	The purpose of the SAMP, its alignment with other Utilities planning activities, how the SAMP was developed and structured, and the scope of the SAMP (i.e., assets within the AMS).
3.	Infrastructure in the Organizational Context	A brief history of Utilities, its organizational structure, service area, asset management drivers and stakeholders, as well as Utilities' approach for identifying and treating organizational risks.
4.	Asset Management Strategy and Objectives	Presents Utilities' asset management vision, asset management policy, asset management objectives, and asset lifecycle strategies; how they relate and interact.
5.	Financial Strategies	Utilities' financial policies and strategies, current processes for establishing O&M and CIP budgets, and importance of mature asset management practices to sound financial planning.
6.	Performance Management	Utilities' approach to measuring and reporting performance, establishing service levels and performance indicators, and approach for future adjustments.
7.	Asset Management Plan Framework	Requirements of an AMP and an AMP's alignment to the SAMP; recommended asset groupings for each AMP and a typical outline for an AMP; also, the asset risk framework.
8.	Asset Data and Asset Management Technology Systems	Importance of current and accurate data for asset management, Utilities' asset hierarchy, the use of technology systems and decision-making tools; also, information needed to understand and optimize asset performance.
9.	Asset Management Enablers	The key resources that will enable Utilities to institutionalize asset management, including asset management governance, asset management competencies and training, organizational change management, and communications.
10.	Framework for Continuous Improvement	Guidance for Utilities to continuously improve on its asset management journey, including approaches to benchmarking, engagement and networking, innovation, and measuring and reporting.
11.	Asset Management Implementation Plan	Describes Utilities' asset management current state and maturity level, Utilities' asset management desired state, and the plan to move from the current to the desired state.
	Appendix A	Acronyms and Abbreviations
	Appendix B	Glossary of Terms and Definitions
	Appendix C	References (Note: these are source documents for citations in parentheses)
	Appendix D	Utilities Asset Management Policy
	Appendix E	Improvement Initiative Schedule

2.3 Improvement Initiatives

Improvement initiatives (IIs) are the tasks and activities Utilities has determined to be most needed to achieve its asset management objectives. IIs were identified and prioritized during the development of this SAMP. IIs are grouped into seven categories as shown in Figure 2-2. Throughout this SAMP, markers have been placed where IIs relate to the content, as shown in Figure 2-3.

See Section 11 for further description and implementation plan for identified IIs.

Figure 2-2: Improvement Initiative Categories

People & Processes	AM Governance & Decision Making	Strategy & AM Program Management
Improve readiness for organizational change and make sure attention is given to the people-side of asset management.	Ensure that decisions are made by the right people at the right time, that a risk management framework is established and that associated processes are established and implemented.	Ensure effective and efficient roll-out of the AM policy and SAMP, management of the AM Implementation Plan, and important elements of a two-way communications plan.

Performance Management	Asset Lifecycle Management	Data & Technology	Maintenance & Reliability
Improve performance and ensure that targets are based on service level objectives.	Define and implement processes to ensure optimal decisions and outcomes at all stages of the asset lifecycle.	Provide availability of accurate and useful data and ensure that technology systems support asset management.	Improve reliability through maintenance optimization.

Figure 2-3: Improvement Initiative Marker Used Throughout this SAMP

IMPROVEMENT INITIATIVE
- Title

2.4 Asset Portfolio

Utilities provides drinking water, wastewater, storm and surface water, and solid waste services for customers in the City of Bellevue and some surrounding municipalities. The City contracts with a third party to provide solid waste services to residents and businesses. The solid waste line of business is not included in this SAMP because of the small amount of assets managed by Utilities. The subsections below provide overviews of the water, wastewater, and storm and surface water systems. Additional details on these systems can be found in their respective system plans.

2.4.1 Water System

The mission of Utilities' water system is to provide a reliable supply of safe, secure, high-quality drinking water that meets all the community's water needs in an environmentally responsible manner.

Bellevue's drinking water comes from the Cedar River and Tolt River watersheds in the Cascade Mountains. It is purchased from Cascade Water Alliance, an organization that provides water to Bellevue and six other cities and water districts in the Puget Sound region.

Over 600 miles of water mains comprise the backbone of Bellevue's water system. Most were built over 50 years ago and are past midlife.

Utilities is upgrading all customer water meters to Smart Water Meters. The new meters will allow customers to monitor their water use in near real time and promptly detect leaks in their home plumbing. The new meters will wirelessly transmit customer usage data, so meter readers will no longer need to visit homes. Customers will be able to connect to an online portal to view their water use information, receive potential leak alerts, and more. The total estimated cost is $23.1 million, with $10.3 million allocated in the current water CIP.

Table 2-3 provides a summary of Utilities' water system.

Table 2-3: Drinking Water System Overview

Parameter	Value
System	
Water connections	40,000+
Water main pipes	610 miles
Water reservoirs	24 reservoirs / 41.6 million gallons (MG) of storage in City limits 4 reservoirs / 4.6 MG of storage outside city Limits
Pump stations	22
Pressure zones	62
Fire hydrants	5,800+
Employees	80
2020 Operating Budget without Reserves	$70.4 million

Major challenges facing the water system include:

- Drinking water infrastructure is aging and most of the system is well past its midlife; Utilities needs to update appropriate strategies for maintenance, renewal, and replacement in order to minimize system failures and mitigate future rate spikes.

- Bellevue's water system includes asbestos cement (41% of the system by length), ductile iron (52%) and cast iron (7%). Whereas ductile iron pipe failures often start out as small leaks that can be detected before much damage is done, asbestos cement (AC) pipe tends to fail "catastrophically" without warning. Cast iron pipe failures may cause less damage than AC, but cast iron pipes have no lining or coating (unlike ductile iron pipe) and significantly corrode over time, such that all cast iron pipe will eventually leak at some point. In addition, Utilities' older pipes are generally undersized and inadequate in provision of fire protection. They also typically have very few valves, thus large shutdowns are required during planned or unplanned outage events.
- Drinking water for the City of Bellevue is purchased from Cascade Water Alliance (Cascade) and water supply costs are established by Cascade. The cost of water supply is the single largest cost center for the water utility.
- State and federal water quality mandates are becoming more stringent.
- Investment is needed to build facilities that provide capacity for Bellevue's expected growth.

Over the next seven-year CIP (2021-2027) Utilities is planning to invest approximately $135 million in capital improvement projects in the water system. A significant portion of this investment is intended to address replacement and rehabilitation of aging infrastructure, including in the following areas:

- The drinking water system is complex. In some areas, gravity is all that is needed to deliver water to residents and businesses. In other areas, pumps are required to move water to reservoirs or directly to customers. To equalize the water pressure through the system, Utilities relies on pressure-reducing valves to ensure that water flows out of the tap with acceptable pressure. Like all mechanical devices, these valves wear out and have to be replaced.
- Similarly, reservoirs experience wear and tear and occasionally require structural retrofitting for earthquakes. With 24 reservoirs in the system, Utilities is investing to ensure water is consistently available, even after emergencies, for peak demands and to fight fires.
- New growth brings with it many challenges, including increased water needs. Utilities continues to look at and provide means to satisfy these demands, either through expansion of existing storage and supply inlet facilities or by optimizing system operation.

2.4.2 Wastewater System

The mission of Utilities' wastewater system is to provide a reliable wastewater disposal system that ensures public health and safety and protects the environment.

Utilities wastewater system consists of pipes (mainlines and laterals), pump stations, and manholes that collect wastewater and convey the flow to King County's wastewater interceptor system. King County conveys the flow to their South Wastewater Treatment Plant in Renton and their Brightwater Treatment Plant in Woodinville for treatment and discharge to the Puget Sound.

Typically, wastewater systems rely on gravity sewers to pass flows to major regional lines (trunklines). In some locations, pump stations are needed to lift the sewage to higher levels to again take advantage of gravity flow. For the lake lines (described below), low-pressure flush stations periodically "flush" the sewer lake lines with lake water to keep the lines clean.

Table 2-4 provides a summary of Utilities' wastewater system.

Table 2-4: Wastewater System Overview

Parameter	Value
System	
Maintenance holes	13,000+
Mainline pipes	516 miles
Lateral pipes	120 miles
Pump and flush stations	47
Major connections to King County wastewater system	34
Employees	52
2020 Operating Budget without Reserves	$62.9 million

Challenges facing the wastewater system include:

- Utilities owns 14.6 miles of submerged wastewater pipeline in Lake Washington and 4 miles of submerged wastewater pipeline in Lake Sammamish. These "lake lines" were constructed in the late 1950s and 1960s and may be nearing the end of their useful life. Most are buried within the lakebed or near shore on land; others are in water up to 10 feet deep. Almost all are difficult to access. The city is evaluating the condition of the pipes to determine when rehabilitation and/or replacement will be necessary. The cost for this work will be substantial. The Wastewater Maintenance Section has a direct connection to maintaining and protecting water quality in Lake Washington and Lake Sammamish, protecting Chinook salmon spawning grounds, and reducing the potential for direct human contact with raw wastewater.

- The city of Bellevue contracts with King County for treatment and disposal of wastewater. The cost of wastewater treatment services is established by King County. These costs are the single largest cost center for the Sewer Utility.

- Investment is needed to build facilities that provide capacity for Bellevue's expected growth.

Over the next seven-year CIP (2021-2017) Utilities is planning to invest approximately $58 million in capital improvement projects in the wastewater system. A significant portion of this investment is intended to address replacement and rehabilitation of aging infrastructure, including in the following areas:

- Upgrades or replacement of sewer pump stations and force-mains have significant costs.

- Starting in 2023, Utilities is planning to rehabilitate or replace 14.6 miles of wastewater pipelines submerged along the shores of Lake Washington. These lake lines will require rehabilitation, replacement, or additional infrastructure to facilitate cleaning. Utilities also owns and operates lake lines in Lake Sammamish; however replacement is not expected until 2060.

- Similar to the Water capital investment projects, Wastewater capital investment is necessary to accommodate future growth within the downtown and Bel-Red corridor.

2.4.3 Storm and Surface Water System

Utilities' mission for storm and surface water is to provide a system that controls damage from storms, protects surface water quality, supports fish and wildlife habitat, and protects the environment.

Much of the built storm and surface water system was inherited by the City through annexations. In 1953 when the City incorporated, the city area was less than 10 square miles and by 2015 the city limits expanded in area to almost 37 square miles. The Bellevue Storm and Surface Water Utility was formed in 1974, so stormwater infrastructure built prior to that date was designed to King County Standards and areas developed after 1974 were either designed to City standards or the County, depending on the annexation date and the date of development. Knowing the development date of each parcel and which jurisdictional standards were used is important for flood protection analyses and to explain why some of the stormwater infrastructure data are missing.

Bellevue's storm and surface water system is a direct result of the topography, current and historic land uses, regulations, and geology of the area. The city covers approximately 37

square miles. There are about 79 miles of streams within the city limits; approximately 13 miles of large-lake shoreline (Lake Washington and Lake Sammamish); and 3 small lakes (Larsen Lake, Lake Bellevue, and Phantom Lake).

The system is a combination of publicly- and privately-owned infrastructure and natural components working together to collect, treat, and carry stormwater runoff to lakes, streams, and wetlands. The system consists of inlets, manholes, pipes, ditches, culverts, open streams, City- or privately-owned stand-alone detention and/or water quality treatment facilities, and large City-owned regional detention and water quality facilities.

Utilities was issued a National Pollutant Discharge Elimination System (NPDES) permit from the Department of Ecology for the operation of the stormwater system. The NPDES Permit is a requirement of the Federal Clean Water Act, intended to protect and restore waters for "fishable, swimmable" uses. The permit requires development/redevelopment projects to use low-impact, best-management, state-of-the-art practices where feasible. The permit has also increased requirements in Utilities stormwater operations and maintenance (O&M). Other requirements include cleaning catch basins, assessing source control for certain businesses, responding to and reporting illicit discharges, and providing public education and outreach on stormwater issues. The state issues a new permit every five years with revised conditions intended to improve surface water quality.

Utilities updated the Storm and Surface Water System Plan in 2015 to address changes in regional practices and to identify strategic initiatives to work towards for the next 10 years.

Table 2-5 summarizes Utilities' storm and surface water system.

Table 2-5: Storm and Surface Water System Overview

Parameter	Value
System	
Open streams	81 miles
Protected wetlands	864 acres
Public storm drains	22,664
Pipe	408 miles
Open ditches	86 miles
City-owned regional detention facilities	11
City-owned detention facilities	350+
Privately-owned detention facilities	900+
Employees	50
2019 Operating Budget without Reserves	$26.4 million

Major challenges facing the storm and surface water system include:

- Infrastructure is aging and most of the system is well past its midlife; Utilities needs to update appropriate strategies for maintenance, renewal, and replacement in order to minimize system failures and mitigate future rate spikes.

- The storm and surface water system is a combination of private and public systems. These systems, over half of which are private, work together to convey stormwater, control flooding, and protect water quality. Utilities establishes the standards for private property owners to develop and manage their systems to comply with local, state, and federal regulations and to protect surface water.

- Compliance with the city's NPDES Permit has significant impacts on the way the city does business, on city expenses, and on private development costs.

- The inventory of stormwater infrastructure records is inconsistent. Often, the infrastructure location, material, size, and date of construction are missing. Prior to 1974 (when the Storm and Surface Water Utility formed), organizing and keeping detailed records of stormwater infrastructure appears to have been a low priority. It was common practice to install drainage facilities in a manner that simply removed stormwater runoff from the site as quickly as possible, often without regard to downstream impacts and with inconsistent records of the built system.

Over the next seven-year CIP (2021-2027), Utilities is planning to invest approximately $42.5 million in capital improvement projects in the storm and surface water system. Areas of investment include:

- Flood control is a vital component of Utilities' work. The City is proposing a budget of $9.3M for the Factoria Boulevard Flood Reduction Project (funded by the King County Flood Control District) and an additional $9.5M in the Flood Control Program to reduce flooding on parts of Valley Creek and upper Kelsey Creek. Utilities also spends $1 to $2 million annually to rehabilitate or replace defective drainage pipelines and rehabilitate roadside ditches. With close to 400 miles of piped system alone, this program will continue in perpetuity.

- The Stream Channel Modification Program works to resolve unstable stream sections on public land to protect banks, in-stream habitat, and sediment movement.

- The Storm and Surface Water Planning Program includes the development of a Watershed Management Plan and Stream Culvert Assessment. These plans will guide future investments in culvert replacements, water quality, and stream improvement projects,

2.5 SAMP Updates

Bellevue Utilities views the SAMP as a "living document." It must be valid in the current context of the organization and appropriate to Utilities' contemporary external environment of stakeholders and drivers. Consequently, Utilities has established the review and updating schedule for the SAMP as follows:

- The SAMP will be reviewed and revised annually (concurrent with the development of the capital improvement plan and operations budget) to address any inconsistencies found within the document, incorporate changes in the asset portfolio, clarify the risk framework, and update data management and technologies.
- Every five years the SAMP will undergo a comprehensive review and update, including a reconsideration of the asset management vision, asset management policy, and asset management objectives. The update should reflect advances in the discipline of asset management, asset management standards and guidance, lessons learned from implementing asset management practices, and gaps in best practices as identified through benchmarking and networking. The asset management improvement plan should be revisited, including the development of any new improvement initiatives and an updated roadmap for implementing those initiatives.
- A significant change in circumstances impacting Utilities, such as a substantial modification to the organizational strategy or a major new regulatory requirement affecting the approach to managing assets, may require a comprehensive review and update to the SAMP prior to the five-year timeframe. Such a decision will be made by the Board of Utilities Directors (BUD).
- Updates to the SAMP will be initiated and coordinated by the Asset Management Program Manager.
- All updates of the SAMP must be approved by the BUD.

In addition, new Improvement Initiatives (IIs) are expected to be identified periodically. These will be prioritized along with the others, and decisions will be made annually regarding which to implement. The Asset Management Program Manager will maintain the master list of IIs.

3 Infrastructure in the Organizational Context

3.1 History and Overview of Bellevue Utilities

The City of Bellevue was incorporated in March 1953. The Storm and Surface Water Utility was established in 1974 (one of the first in the nation), which became a part of Utilities in 1993. For many years Utilities also managed the Fleet and Communications as well as the Street Maintenance departments; however, since 2012 Utilities has only managed the piped utilities.

Additional history and background on Utilities' lines of business can be found in their respective system plans:

- Wastewater System Plan: https://bellevuewa.gov/city-government/departments/utilities/utilities-projects-plans-standards/utilities-plans-and-reports/wastewater-system-plan
- Drinking Water Plan: https://bellevuewa.gov/city-government/departments/utilities/utilities-projects-plans-standards/utilities-plans-and-reports/water-system-plan
- Storm and Surface Water Plan: https://bellevuewa.gov/city-government/departments/utilities/utilities-projects-plans-standards/utilities-plans-and-reports/storm-and-surface-water-system-plan

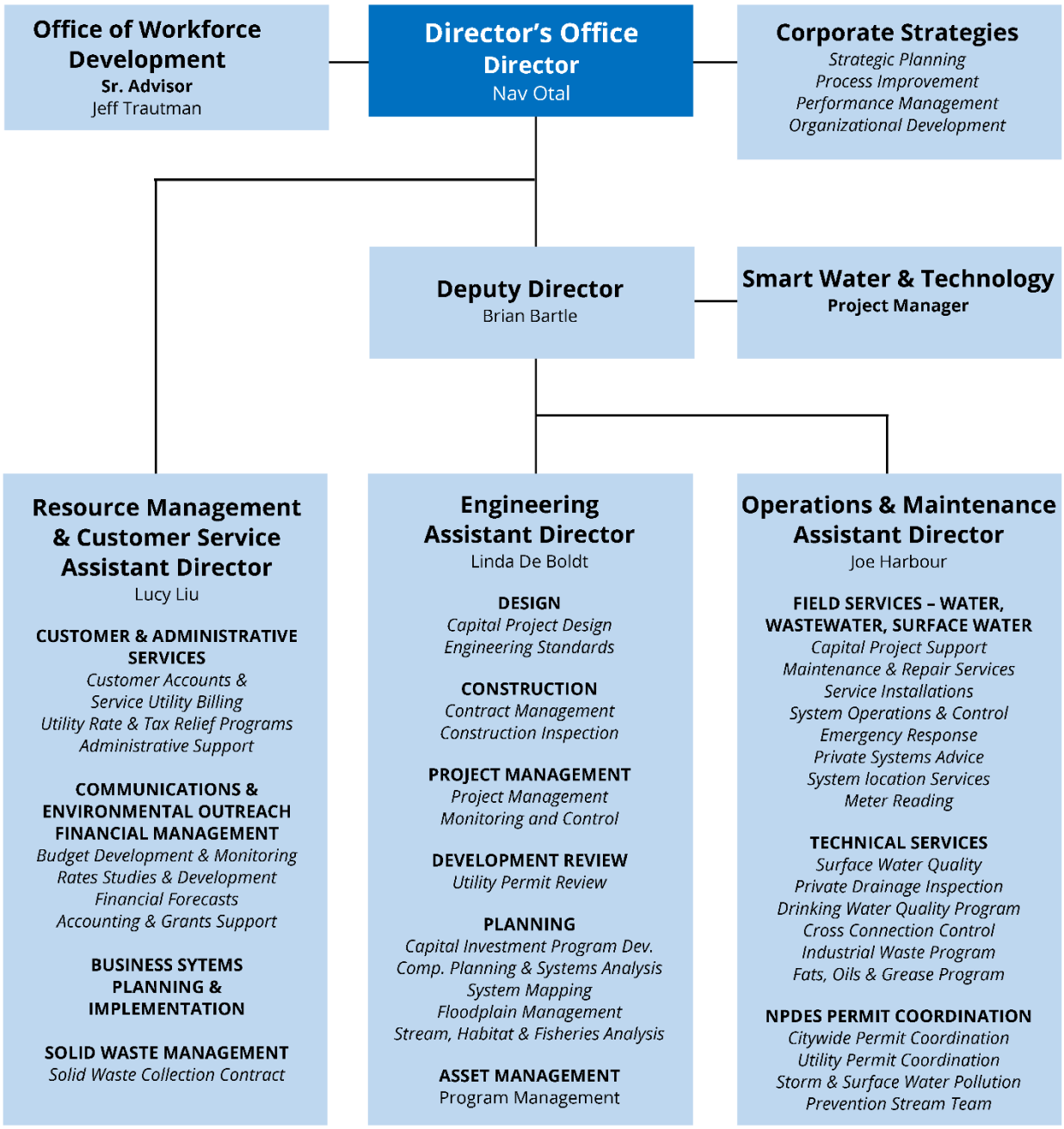
3.1.1 Governance and Leadership Structure

Utilities is a financially self-supporting enterprise comprised of four lines of business: Drinking Water, Wastewater, Storm and Surface Water, and Solid Waste. Each line of business is a stand-alone business operating within the city and must be financially sustainable.

Utilities operates as a department within the City of Bellevue, under the authority of the City Manager and City Council. The Utilities Department Director and Deputy Director oversee management of the department and serve as the primary point of contact for the Bellevue City Manager, City Council, and Environmental Services Commission. Additional discussion on the roles and interests of the City Manager, City Council, and Environmental Services Commission is included in Section 3.3 Stakeholder Expectations.

The Utilities Department is separated into three divisions, as shown in Figure 3-1 and described in the paragraphs that follow. Each Division is led by an Assistant Director, who reports to the Director or a Deputy Director. The Utilities Director's Office oversees process improvement, workforce development, intergovernmental affairs, interdepartmental relations, and other functions.

Figure 3-1: Utilities Governance and Leadership Structure



- Resource Management & Customer Service (RMCS). The RMCS Division oversees finance, public outreach, customer service, and administrative support services for all of the City's public utilities and manages the City's solid waste contract. These functions include billing, customer accounts and other related services. RMCS coordinates bi-annual budget development and monitoring; performs rate

development, forecasting, and financial planning; and manages accounts payable and receivable. In addition, RMCS's Systems Group manages automation projects and data reporting, and serves as Utilities Department liaison for projects in the City's Information Technology (IT) Department.

- Engineering. The Engineering Division oversees water, sewer, and storm drainage system planning, analysis, mapping, design, construction, and development review functions. This division is divided into four sections:
    - The Asset Management Section is responsible to advance the development and management of asset management at Utilities, including the SAMP and the Asset Management Implementation Plan. These efforts guide investments in rehabilitation, renewal, replacement, condition assessment, and operations and maintenance of the Utilities' water, sewer, and stormwater assets.
    - The Utilities Systems Planning Section is responsible for system planning, hydraulic modeling, mapping, and data management. This section develops the Utilities' Capital Investment Program (CIP) and system functional plans. This section also reviews and evaluates developer requests to determine their effect on system operation.
    - The Project Management Section is responsible for capital project design and project management. Design of projects is performed primarily by consultants, in order to effectively deliver the Utilities CIP workload. Some minor work requiring rapid response is done by in-house staff. The Project Management Section also maintains and updates the Utilities Engineering Design Standards.
    - The Construction Services Section manages construction work for the department to assure timely and efficient completion of projects. This section also provides inspection services to ensure City- and developer-built utility projects are installed and constructed according to approved design plans and specifications.
    - The Development Services Section conducts permit reviews and administers other development processes requiring coordination within Utilities and other City departments. The section also manages and staffs the utility desk at the Permit Center, which is the first contact for customer service and information on development requests. The Development Section is responsible for approving developer extension designs for construction.
- Operations & Maintenance. The Operations & Maintenance (O&M) Division maintains and operates the City's public water, sewer, and storm drainage

infrastructure. This includes physical components as well as system telemetry. O&M monitors and assesses the condition of infrastructure to minimize failures and extend the life of system components. It also provides water quality regulatory compliance and code enforcement and works to ensure the integrity of the existing infrastructure during development and redevelopment. O&M manages the City's unidirectional flushing program, provides emergency response, and responds to customers who report system problems.

3.1.2 Service Area and Customer Base

As described in the 2020 Bellevue Utilities Business Profile, Utilities' services areas and customer bases are described as follows, and are shown in Figure 3-2 and Figure 3-3.

- As of 2020, Utilities provides drinking water to about 37,000 customer accounts, and the service area covers over 37 square miles, including the adjacent communities of Clyde Hill, Hunts Point, Medina, Yarrow Point, and sections of Kirkland.
- As of 2020, Utilities provides storm and surface water utility service to all properties in the City of Bellevue, (33,064 customer accounts). There are 26 drainage basins in the city, most with year-round streams.
- As of 2020, Utilities provides wastewater services to about 37,000 customer accounts, and the service area covers over 37 square miles, including the adjacent communities of Beaux Arts, Clyde Hill, Hunts Point, Medina, and Yarrow Point.

Figure 3-2: Utilities' Services Areas

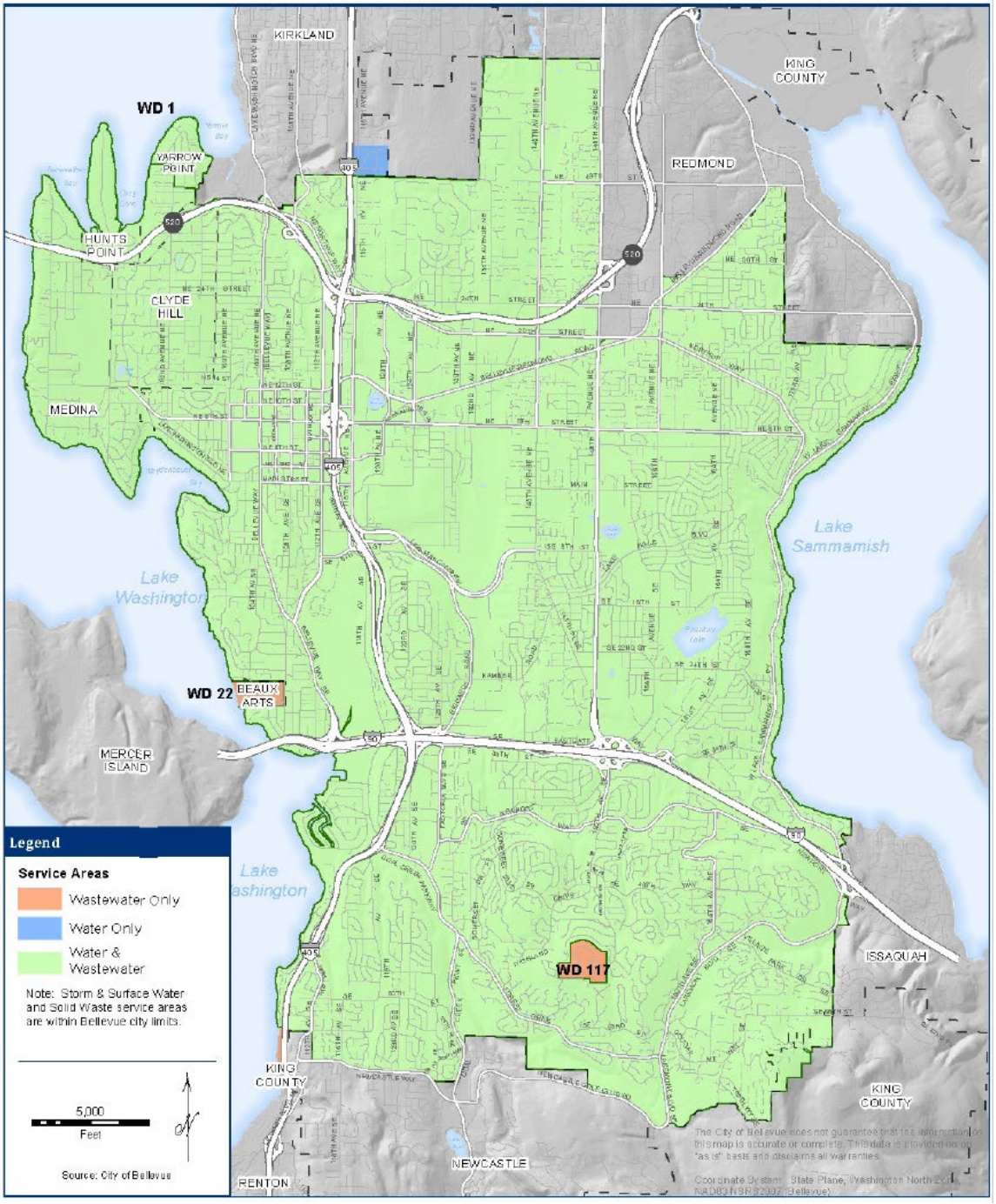
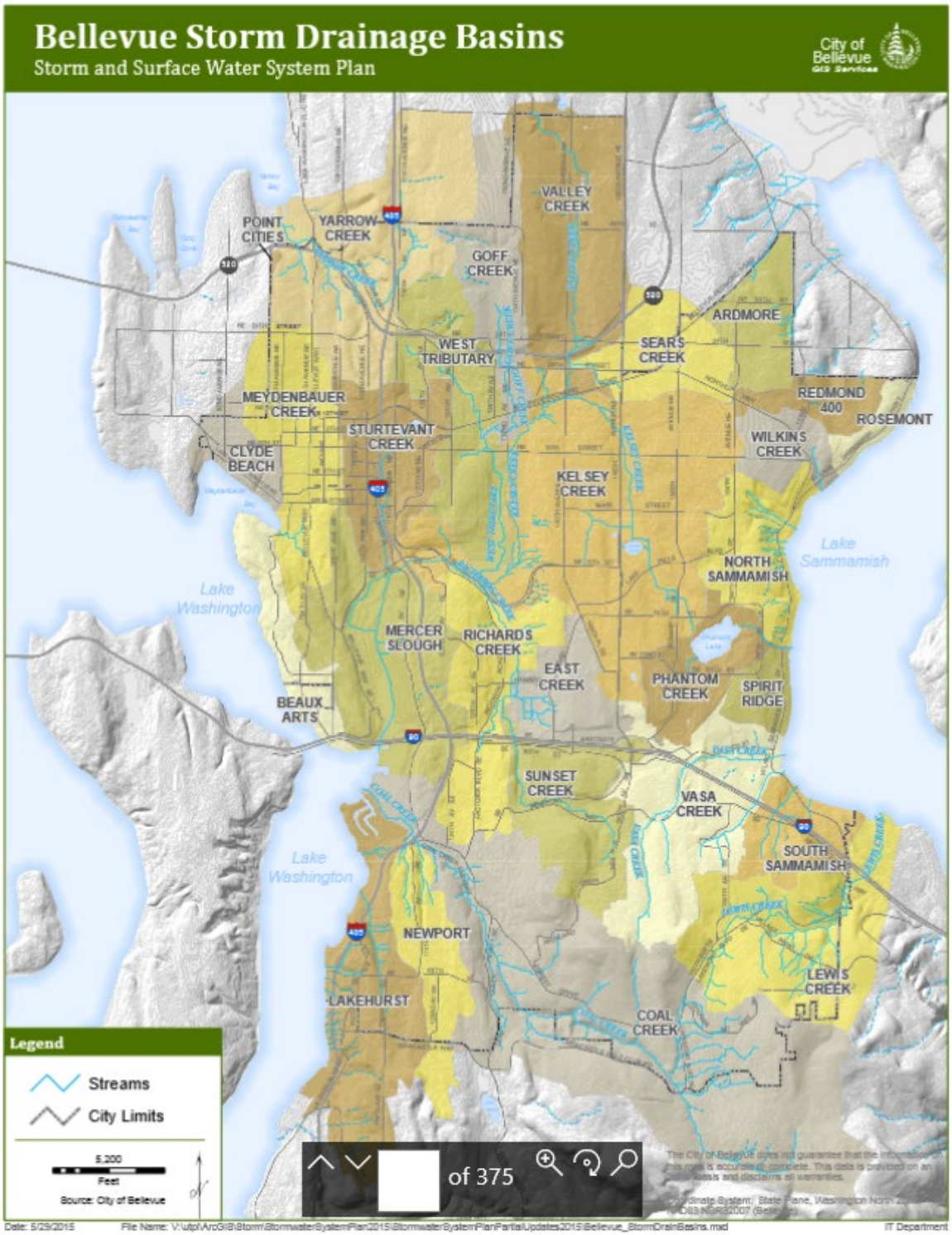


Figure 3-3: Bellevue Storm and Surface Water Drainage Basins



3.2 Organizational Drivers and Stakeholders

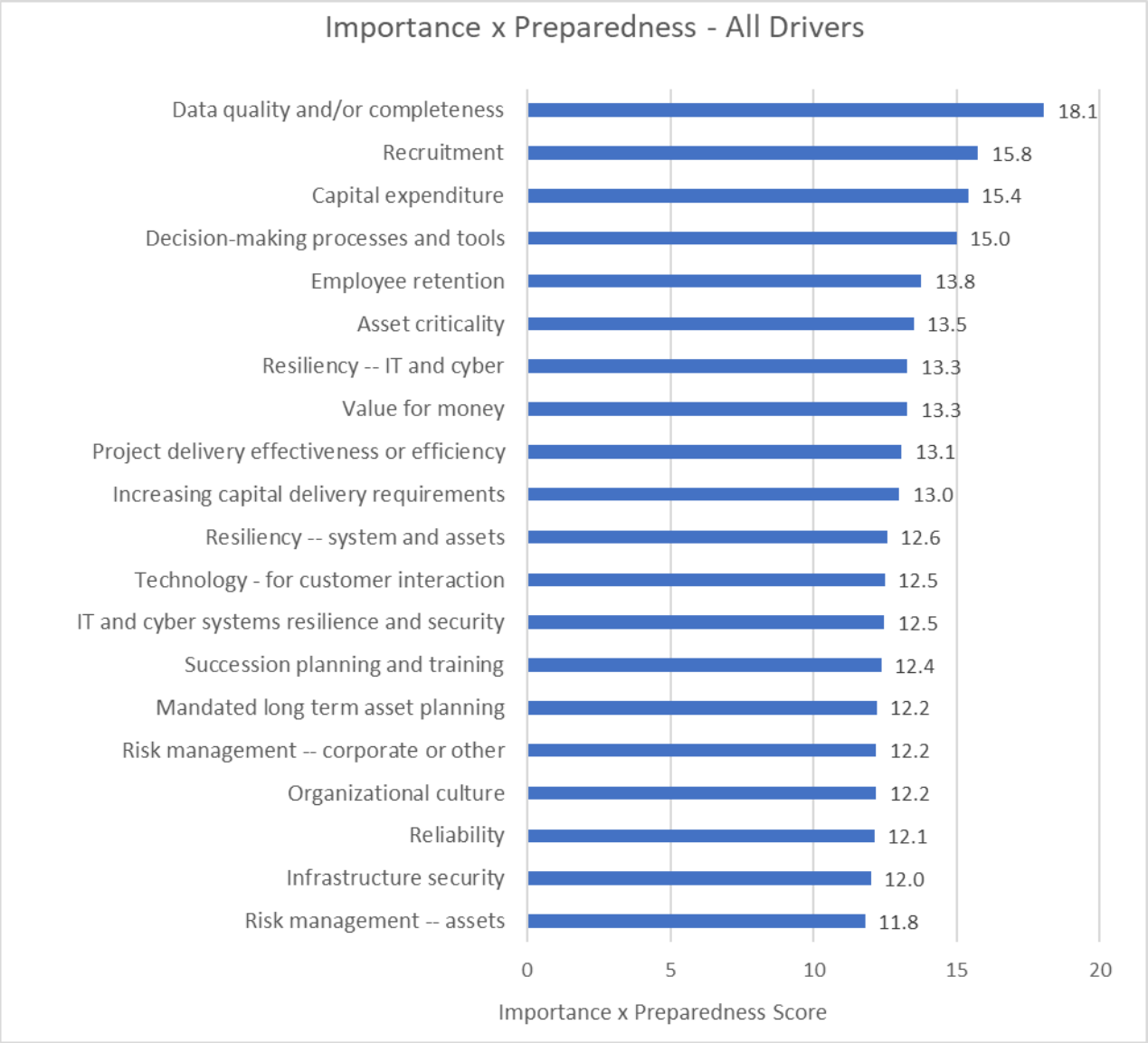
Numerous influences contribute to the decision-making process for investing in infrastructure, including capital investment for new, replacement or rehabilitation, and investments to gain value by optimizing operations and maintenance. Traditionally in the utility industry, these influencers (or drivers) have been future demand increases, regulatory compliance, and aging infrastructure. However, new drivers have emerged over the past few decades, including climate resiliency, security, technology, and workforce demographics. This section discusses both the traditional and emerging drivers to be considered by Utilities.

Utilities conducted an evaluation of asset management drivers as part of developing this SAMP. Over 50 drivers were identified and then scored for how important each is in terms of shaping Utilities' asset management priorities, and Utilities' current preparedness to respond to the driver.

Figure 3-4 presents the top 20 drivers based on the product of the importance and preparedness scores. The drivers cover many different areas, but the top drivers center around:

- Data. Quality and completeness of data
- Staffing. Ability to recruit and retain a high-quality workforce, and succession planning
- Project delivery. Increasing efficiency and transparency of project delivery and decision-making
- Risk. Understanding and managing risks

Figure 3-4: Top 20 Asset Management Drivers



3.2.1 Future Demand

The following subsections describe projected future demand for Utilities water, wastewater, and storm and surface water systems. Growth impacts are further discussed in the 2019 Utilities Business Profile, Supplementary Reference 3: Growth Impacts, which highlights that:

- Planning for growth is coordinated throughout the city and is critical to ensure that adequate utilities capacity is available for new development.

- Utilities capacity improvements needed for growth, while initially rate-funded, are ultimately paid for by the benefited properties.
- Residential growth in the downtown area is presenting challenges with regard to the scheduling of maintenance work, construction, and garbage collection.
- Utilities System Plans are updated every 10 years. During this time, staff monitor redevelopment progress and forecasts to ensure infrastructure will be in place to support planned growth as it happens. The plans are schedule to be updated as follows: Wastewater 2023, Stormwater 2025, Water 2026.

3.2.1.1 Water

Detailed projections for future water demand can be found in Section 3.7 of the 2016 Water System Plan (6).

In summary, the water system will not need to expand much because the city is essentially built out geographically, but two areas of the city have been rezoned for higher density development—downtown and the Bel-Red Corridor. Because these two areas are expected to grow in the next 15 years, new water system infrastructure with increased capacity (pipes and reservoir storage) will be needed to meet that anticipated growth.

To ensure that members have water for the future, Cascade will be developing new water supplies and connecting regional systems. In 2010, Cascade and Puget Sound Energy finalized the purchase of Lake Tapps in Pierce County. During the next 20-50 years, Cascade will develop a new municipal water supply while managing the lake for recreation and enhancing fish habitat in the White River.

3.2.1.2 Wastewater

Detailed projections for future wastewater flows can be found in Section 4 of the 2014 Wastewater System Plan (7).

In summary, Bellevue is essentially built out and will not require significant new wastewater utility extensions. Most remaining undeveloped property is in the service area's southeast corner, where localized sewer extensions will be needed. However, like the drinking water system, Bellevue's wastewater system will be impacted by multifamily and commercial growth in the downtown area and new development projects expected in the Bel-Red corridor, which was rezoned for higher density. Increased system capacity (larger pipes and pump stations) will be needed to support the new growth.

3.2.1.3 Storm and Surface Water

Demand for the storm and surface water system is primarily driven by precipitation amount and the degree of impervious cover, which generates stormwater runoff during precipitation events. In addition, water quality standards for the receiving waterbodies of Bellevue stormwater can drive the level of treatment required for stormwater discharges.

Utilities' 2016 Storm and Surface Water System Plan (8) identifies emerging challenges specific to storm and surface water system:

- Reduced forest cover that contributes to stream and water quality degradation (discussed further the Storm and Surface Water System Plan)
- Climate change (discussed further in Section 3.2.4)

3.2.2 Regulations and Permit Conditions

Regulations and permit conditions are discussed in detail in each of the respective system's master plans, in the specific locations listed below:

- Water System Plan, Chapter 2, starting on page 2-1
- Wastewater System Plan, Section 1.2, starting on page 1-1
- Storm and Surface Water System Plan, Table 3-1, page 3-3

Regulatory requirements are also discussed in the 2020 Utilities Business Profile, Supplementary Reference 6: Regulatory Mandates, which outlines that:

- Utilities monitors potential future regulatory mandates and works to proactively influence their outcome when appropriate.
- Utilities uses resources effectively and efficiently to comply with current regulatory mandates.
- As Utilities faces new and stricter regulatory mandates, additional resources may be required to remain in compliance.

3.2.3 Aging Infrastructure

As described in the 2020 Utilities Business Profile, Utilities owns, operates, and maintains over $3.5 billion of infrastructure assets, with over 1,500 miles of pipeline to provide drinking water, wastewater, and storm and surface water services. This infrastructure was primarily constructed from the 1940s through the 1980s, and most of the assets are well past midlife. As the infrastructure ages, it becomes less reliable and more failures occur. As a result, the cost to operate, maintain, rehabilitate, and replace the various assets increases. System renewal is, and will continue to be, the most significant driver of the Utilities CIP.

Utilities work on asset management has been directed towards maintaining customer service by minimizing system failures and mitigating future rate spikes through proactive planning focused on optimal system life costs.

Further discussion of Utilities approach to addressing aging infrastructure can be found in each system's respective system plan.

3.2.4 Climate Resilience

As described in Utilities Storm and Surface Water System Plan, global climate change represents the greatest amount of uncertainty to the Storm and Surface Water System, and is the most difficult for which to plan. Climate change presents challenges to all of Utilities' lines of business, including the potential for changes in snow pack; the intensity and timing of rain events, which could lead to summer drought; increased winter flooding magnitude and frequency; and changes to receiving water biology and chemistry. Potential modifications to address these issues include changes to 1) system maintenance requirements (need, frequency, and schedule), 2) design standards to provide adequate protection for changed conditions, and 3) regulatory and operational response to flooding and other storm-related emergencies. Global climate change could add complexity for meeting water quality standards and recovering salmon populations, particularly if summers are warmer and drier, increasing water temperatures and changing the chemical balance in receiving waters.

3.2.5 Security, Risk, and Resiliency

Bellevue Utilities, like most utilities in the US, has made significant investments to improve the physical securing of their water systems after the September 11, 2001 terrorist attacks and enactment of the Public Health Security and Bioterrorism Preparedness Response Act of 2002. Most of these investments were for constructing perimeter fencing and other barriers, hardening structures, converting from gas chlorination to liquid hypochlorite, and installing access control to treatment plants, pump stations, reservoirs, and other utility facilities. Some utilities also incorporated intrusion detection systems, such as video monitoring, microwave sensors, infrared detectors, and traditional alarms. Utilities with both water and wastewater systems frequently applied similar security approaches to their wastewater facilities. Some utilities also installed online contaminant warning systems to monitor their distribution systems in real-time.

Utilities has undertaken a water system risk and resilience assessment (RRA) addressing its physical operational assets and cyber networks in compliance with the America's Water Infrastructure Act (AWIA). The RRA identifies the water system's vulnerabilities to malevolent acts, natural hazards, and dependency-and-proximity risks. It also provides

documentation and discussions to inform an AWIA-required update of a water-system emergency response plan (ERP).

The information and knowledge gained from the risk and resilience assessment can influence Utilities capital improvement planning, and possibly operations. It will also be valuable to risk assessments conducted within the context of asset management because the consequences an asset failing may be the same whether that failure is due to a breakdown or due to a malevolent attack.

3.2.6 Technology

Advances in technology continue to provide Utilities with new opportunities to improve effectiveness and efficiency. Examples associated with operations and condition assessment, some of which have already been incorporated by Utilities, include the following:

- Remote monitoring of equipment condition and performance
- Remote monitoring of water levels in sewers using cellular networks
- Advanced metering infrastructure to gather flow data via radio networks
- Hand-held devices for plant and field staff to collect and transmit data wirelessly
- Online water quality monitoring of distribution systems
- Trenchless installation of large pipes in addition to installation of small pipes
- New methods and materials for lining pipes
- Assessment of internal and external condition of pipes without excavation
- Continuous remote monitoring of pipe condition

Utilities can benefit from advances in technology, but should continue to perform due diligence, including business case evaluations, before making such investments. Benchmarking, industry engagement, and networking, as presented in Section 10.2, are crucial prerequisites for making decisions about adopting new technology.

3.2.7 Workforce Demographics

Currently Utilities employs individuals from four different generations (9):

- Baby Boomers, born between 1946 and 1964
- Generation X, born between 1965 and 1980
- Generation Y, born between 1981 and 1996
- Generation Z, born between 1997 and 2012

Integrating new team members into the organization (beginning with onboarding) and effective knowledge transfer are both crucial. Consequently, it is important to understand how each generation absorbs information and what each values from employment. Guidance from human resource professionals and training in generation diversity is advantageous.

Some broad observations about the three generations from the International Association for Continuing Education and Training (10) are shown in Table 3-1.

Table 3-1: Generational Characteristics

Type	Generation X Born 1965-1980	Generation Y (Millennials) Born 1981-1996	Generation Z Born 1997-2012
Personal Traits	• Independent • Self-reliant • Resilient	• Ambitious • Tech savvy • Give back to community	• Inclusive • Tech and media savvy
Work Environment	• Casual • Flexible	• Diverse • Work-life balance	• Diverse • Teamwork
Work Traits	• Hard work • Optimization	• Meaningful work • Stay with an employer for 2 to 3 years	• Equality among team members

The following workforce demographics for Utilities are current as of September 30, 2020. Demographics reports are available at the end of each quarter based on data within the JD Edwards payroll system. There are 167 total Utilities employees, which make up 10.7% of the total employee population for the City of Bellevue.

Table 3-2: Workforce by Years of Service

0 – 6 Months	7 – 11 Months	1 – 5 Years	6 – 9 Years	10 – 14 Years	15 – 19 Years	20 + Years	Average
4	5	75	22	19	22	20	9.3

Table 3-3: Workforce by Age Tier

<20	20 – 29	30 – 39	40 – 49	50 – 59	60 +	Average
0	19	43	45	40	20	45

Table 3-4: Workforce by Generation

Generation Z	Millennial	Generation X	Baby Boomer
4	58	68	37

3.3 Stakeholder Expectations

Utilities understands the importance of stakeholders' expectations, the impact stakeholders have on asset management, and how asset management decisions impact stakeholders. Several internal and external stakeholders were identified as important to Utilities asset management decision-making methodology, with many of the external stakeholders and their interests listed below:

- Associated General Contractors (AGC)
- American Consulting Engineers Council (ACEC)
- Bellevue Downtown Association / Chamber of Commerce
- Cascade Water Alliance
- Customers
- Environmental advocacy groups (e.g. Washington Environmental Council, Friends of Lake Sammamish, Puget Sound Keeper Alliance)
- Friends of Bridle Trails
- Homeowners associations
- King County Wastewater Treatment Division
- Major developers
- Municipal customer agency (not in city limits)
- Neighboring jurisdictions
- Seattle Public Utilities
- Shoreline customers and Washington Sensible Shorelines Association (WSSA)
- Tribes (including Muckleshoot and Snoqualmie)
- United States Army Corps of Engineers
- Washington State Department of Ecology
- Washington State Department of Fish and Wildlife
- Washington State Department of Health
- Washington State Department of Transportation
- Water Districts - Coal Creek, Rose Hill
- Water Resource Inventory Area (WRIA) 8

Typical interests of external stakeholders include:

- Business and economy
- Community impact
- Compliance with agreements
- Comprehensive Planning
- Contract agreement
- Contracting methods
- Data sharing
- Easements

- Emergency preparedness
- Habitat
- Joint use
- Lake line project
- Lake water quality
- Points of connection in systems
- Property rights
- Regulatory compliance
- Salmon health
- Shoreline management planning
- Stormwater discharge from highways
- Stream health
- Surface water quality
- Treated water quality and quantity
- Utility conflicts
- Water supply
- Work in streams or sensitive areas

3.4 Risk Management

3.4.1 Purpose of Risk Management

Understanding and managing risk are important in asset management for several reasons. With effective risk management, Utilities can:

IMPROVEMENT INITIATIVE
G2 - Risk Framework

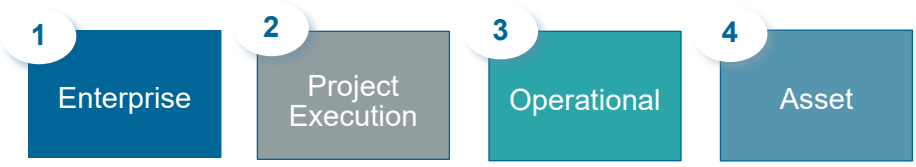
- Minimize surprises and losses
- Identify, discuss, and manage cross-enterprise risks
- Create meaningful linkages between risk management and performance
- Prompt new and meaningful conversations
- Provide an objective new framework for day-to-day staff and management actions
- Define risk tolerance
- Identify risk treatments and align with strategy
- Seize opportunities
- Align with stakeholders and enhance external communications
- Enhance internal communications and encourage desired behaviors
- Supplement financial reporting
- Inform business decision making

Risk management is iterative in nature, drawing on new experiences and emphasizing learning, continual improvement, knowledge, and analysis for the revision of process elements, actions, and controls at each stage of the process. Effective management of risk involves demonstrably improving the ability of the organization to meet its objectives in a repeatable fashion.

3.4.2 Types of Risk at Bellevue Utilities

Many infrastructure-intensive organizations have chosen to define and address risk in to four types, as shown in Figure 3-5.

Figure 3-5: Four Types of Risk



1. Enterprise risks are those key risks facing an organization as a whole. Typically, enterprise risks may impact the financial viability or reputation of the organization. Enterprise risks are usually assessed by executive or senior management, who drive management initiatives down through the organization.
2. Project execution risks arise during the planning, design, construction, and commissioning of capital projects. These risks are assessed by project managers (along with authorizers or teams) and are documented as part of business case analyses (BCAs) and project execution/management plans. Project execution risks drive reserve or contingency budgeting and treatment actions as part of the project scope. Types of project risks include:
    - Political (for example, change in City administration results in reduced political support/appetite for the project)
    - Regulatory, permitting, other agencies (for example, delays in permit review impact project schedule)
    - Scope, schedule, budget, and quality
    - Asset fails before project is completed
    - Emerging issues, findings, and late changes
    - Scope creep
    - Selected alternative achieves expectations
    - Community input/customer impacts
    - Construction risks
    - Technical challenges

3. Operational risks arise from implementing processes and day-to-day operations and maintenance activities, including shutdowns, outages, community, employee issues, and safety. Operational risk is usually assessed by O&M managers, who drive process and procedure changes and improvements.
4. Asset risks are those arising from the asset base, primarily after construction or acquisition and also throughout the entire asset lifecycle. Asset risk is usually assessed by planning or O&M staff and is documented as part of asset management plans (AMPs). Asset risks drive the needs for action on specific assets or asset types, such as renewal, replacement, change in maintenance strategies, increase in performance monitoring or condition assessment, and contingency planning. Asset risk is described in more detail in Section 7.4.

Utilities also considers risks when prioritizing investments. For example, when prioritizing capital improvement projects, reduction in asset risk is an important consideration, as is reduction in enterprise and operational risk.

3.4.3 Risk Management Activities

Effective management of risk involves establishing a risk framework to standardize how Utilities will identify, manage, and treat risk in a repeatable fashion while meeting its service level objectives. A risk framework will help Utilities staff understand the concepts of risk management and provide guidance to ensure consistent application of principles. The framework should document the purpose of risk management; the definition of terms important to risk management; and the way risk management activities will be carried out, including the risk scoring formula and calibrated scales for likelihood and consequence.

Managing risk is foundational to the work of Utilities, and staff conduct many risk management activities on an ongoing basis that may not be specifically defined as risk management activities (for example, staff training that leads to a reduction in safety risk).

Risk management contains three primary phases of activities, as shown in Figure 3-6.

Figure 3-6: Phases of Risk Management

1. Risk Identification. Identifying risk depends on defining outcomes that could occur from events. For enterprise, project, and operational risks, events could originate internal to Utilities or external. For asset risk, this phase assumes failure of the asset to be the event.

2. Risk Analysis. Analyzing risk involves developing a risk score based on the likelihood of the event multiplied by the consequences if the event occurs. For asset risk, ability to understand, in an objective manner, the likelihood of failure (LoF) and the consequence of failure (CoF) is the core of many asset management activities.

3. Risk Treatment. Utilities treats risks by determining the most desirable action to help reduce the likelihood of an event or reduce the consequences of the event, but only when a risk is greater than what Utilities is willing to tolerate. This requires understanding the benefit of an action (typically risk reduction) and the lifecycle costs of a risk reduction action.

   Before identifying a risk treatment, it is important to understand which side of the risk equation is driving the risk, LoF or CoF, since different risk treatments typically lower only one of the equation variables.

   Examples of techniques that reduce LoF include:

   - Asset rehabilitation
   - Asset replacement
   - New redundant asset (under certain conditions)
   - Clearly written O&M standards and operating procedures and training
   - Improved proactive maintenance job plans and training
   - Enhanced remote monitoring
   - Reduction of service levels with stakeholder involvement (under certain conditions)

   Examples of techniques that reduce CoF include:

   - New redundant asset
   - Improved O&M response and recovery
   - Contingency planning and exercises
   - Demand management
   - Reduction of service levels with stakeholder involvement

3.4.4 Ongoing Risk Treatment Efforts

Risk management is a core function executed by Utilities staff on many levels. The following subsections summarize Utilities' ongoing risk treatment efforts.

3.4.4.1 Project Execution Risks

When project risks arise during the execution of capital projects, project managers, project sponsors, and project teams are responsible for identifying, analyzing, and treating risks, which are documented in BCAs and project management plans. Management of project risks leads to the establishment of project reserves and contingencies, as well as treatment actions (such as scope modifications, etc.). CIP project teams primarily use a risk register to track and manage risk.

Utilities addresses project risk treatment in several ways:

- Contracts. Project specifications and professional services contracts are designed to allocate risk between Utilities and the contractor and/or consultant.
- Engineering standards, boiler plate specifications. These are used to reduce risk by standardizing designs or technical work that occurs frequently.
- Project governance. This methodical approval process ensures that proper reviews and approvals are obtained as a project moves forward. Additional information on the City's governance process can be found in the Engineering Capital Project Governance Guidelines (11) and CIP Project Management Manual (12).
- Project management tools and procedures include:
    - Quality assurance and quality control procedures
    - Manuals, standard operating procedures, and training
    - Phase gates
    - Development of project charters
    - Business case analyses
    - Failure mode, effects, and criticality analyses
    - Risk registers
- Community engagement using the informed consent model

3.4.4.2 Operational Risks

O&M staff and management are responsible for identifying, analyzing, and treating operational risks, which are documented in business or operational plans and budget requests. Management of operational risks leads to the development and implementation of standard operating procedures, processes changes/improvements, and training.

Utilities addresses operational risk treatment in several ways:

- Executing preventive maintenance activities (e.g. condition assessments and inspections)
- Proactive water leak detection and response
- Quarterly meetings with the Planning and O&M Departments to coordinate on projects
- Emergency preparedness and response
- Implementation of the 24-Hour Standby Response Program to ensures the continuity of Utilities services
- Use of Utilities' SCADA system for real time monitoring, response, and operations
- Recruitment and retention of staff
- Incorporating maintenance reliability practices (e.g. failure modes, effects, and criticality analysis)
- Meeting regulatory requirements

4 Asset Management Strategy and Objectives

As stewards of more than $3.5 billion in essential public infrastructure, Utilities is committed to develop and implement asset management as a best practice. This commitment is identified in the City's Comprehensive Plan, Utilities Strategic Plan, and detailed in the Utilities System Plans.

IMPROVEMENT INITIATIVE
P3 - Business Processes

IMPROVEMENT INITIATIVE
M4 - Failure Analysis

4.1 Asset Management Vision

Utilities recognizes that adopting and instilling asset management as a best practice throughout the organization is a journey that will take time, effort, and resources. It is important that employees and stakeholders understand the destination that the asset management journey will take them. The purpose of a vision statement is to provide a concise statement regarding the desired state or Utilities asset management journey. Utilities believes that the vision can be achieved through effective asset management governance, adequate resources, and willingness of staff and management to adopt and implement the best practices of asset management. Based on guidance in this SAMP, subsequently developed AMPs, and the Asset Management Implementation Plan (provided in Section 11), the vision can be achieved.

Utilities Asset Management Vision Statement:

> We strive to become a leader in infrastructure management by optimizing performance, risk, and lifecycle costs for the wellbeing of our communities.

4.2 Asset Management Policy

Utilities established an Asset Management Policy in 2019, which is provided in Appendix D.

The policy is intended to inform organizational processes that link the work of O&M, capital project planning and delivery, and utility financial management. As a result, staff are empowered through the use of reliable data, using systems and processes to determine the most effective and efficient means for delivering infrastructure related services, while controlling exposure to risk and loss.

IMPROVEMENT INITIATIVE
S4 - AM Policy Roll Out

Utilities' Asset Management Policy Statement:

> This policy applies to all Utilities owned infrastructure and related services, such as delivering high quality reliable drinking water, wastewater conveyance, and storm and surface water infrastructure services. City assets support many services and require significant resources over their lifecycles to continue to deliver those services effectively. Asset management is a management strategy used to optimize performance, risk, and cost of these assets. Bellevue Utilities is committed to implementing the principles and objectives of Asset Management (AM) as a core component in managing the Utilities infrastructure, facilities, equipment, and related assets to achieve the Department's priorities.

4.3 Asset Management Principles

Asset management principles are the basic concepts to be followed and complied with in the performance of asset management functions and activities throughout the lifecycles of Utilities' assets. These functions and activities include, but are not limited to the following:

- Delivering services
- Engaging stakeholders
- Decision making
- Conducting business case analyses
- Prioritizing capital projects and O&M expenses
- Developing maintenance job plans and standard operating procedures
- Scheduling work
- Performing maintenance
- Operating assets
- Making repairs
- Procuring goods and services
- Constructing facilities and systems
- Providing resources
- Training employees

As a crucial part of the Asset Management Policy, Asset Management Principles align with the organizational strategy and inform the Asset Management Objectives. Abiding by the Asset Management Principles provides staff and management the confidence that they are collectively working toward Utilities Asset Management Vision.

As stated in the Utilities Asset Management Policy, the Utilities Asset Management Principles are as follows:

- Adopt a lifecycle approach to managing infrastructure assets to include planning, acquisition, operation, maintenance, renewal, and disposal
- Balance cost, risk, and performance of assets
- Place a high priority on environmental and financial sustainability, while meeting desired levels of service
- Endorse evidence-based decisions utilizing robust software systems to manage and analyze information
- Achieve organization priorities and objectives through continuous improvement

4.4 Asset Management Objectives

Asset Management Objectives describe what Utilities desires as outcomes from adopting and implementing asset management, and from complying with the Asset Management Principles.

As stated in the Utilities Asset Management Policy, the Utilities Asset Management Objectives are as follows:

- Develop a sustainable approach to manage asset information and systems
- Build and maintain strong partnerships and communication for effective program implementation
- Develop strategies for capital investment planning and replacement programs
- Develop strategies for operations and maintenance activities and programs
- Create sustainable short- and long-term financial strategies
- For each utility (water, sewer, storm):
    - Define levels of service that are achievable at a low lifecycle cost
    - Identify critical assets needed for sustained performance
    - Define and maintain a risk tolerance level and procedure

4.5 Asset Lifecycle Strategies

4.5.1 Asset Lifecycle Stages

An asset is often defined as an item, thing or entity that has potential or actual value to the organization. An asset lifecycle is the period from planning for the asset to its end-of-life. Effective asset management requires attention to all stages of the asset lifecycle, which are shown in Figure 4-1.

Figure 4-1: Asset Lifecycle Stages

4.5.2 Managing the Asset Lifecycle

4.5.2.1 Purpose and Best Practices

Activities occurring during each stage require cross-functional, team-based collaboration and decision making. An organization must have open and transparent communications to ensure that decisions at each stage consider implications to later stages. At each stage of the asset lifecycle, employees should make decisions that will best achieve asset management objectives.

There are several reasons why it is important to take a lifecycle view when managing assets, and these vary depending on the type of asset, but in general the following apply:

- Risks introduced at each stage of the asset lifecycle can have major implications on future stages and influence the organization's ability to achieve desired outcomes. Risk events or asset failures with potential to occur during one stage of the asset lifecycle may not be fully understood when decisions are made that influence them. For example, capital project decision making must consider lifecycle costs, benefits, and risks at the time of project planning, design, construction, and commissioning to be aware of hidden costs that can materialize during the later stages of the asset lifecycle.
- Roughly 60 to 90 percent of the total lifecycle cost of many types of assets is expended after commissioning, as illustrated in Figure 4-2. For example, the actual cost of maintenance, operations, rehabilitation, and decommissioning is largely dependent on how the asset is planned, designed, built, and its operating conditions. Cost-cutting measures implemented during the early lifecycle stages can cause higher failures and increase the costs incurred post-construction.
- Opportunities to optimize the total cost of asset ownership are greatest during the early lifecycle stages. For example, care taken during project planning and design to minimize maintenance requirements, reduce risk, or improve safety can pay off with decades of safer and lower-cost maintenance and operations.

Effective asset management consists of best practices that should occur routinely during each stage. While these activities may vary depending on the type of asset, the level of risk, and other considerations, there are common principles and desired outcomes.

Figure 4-2: Typical Asset Lifecycle Costs

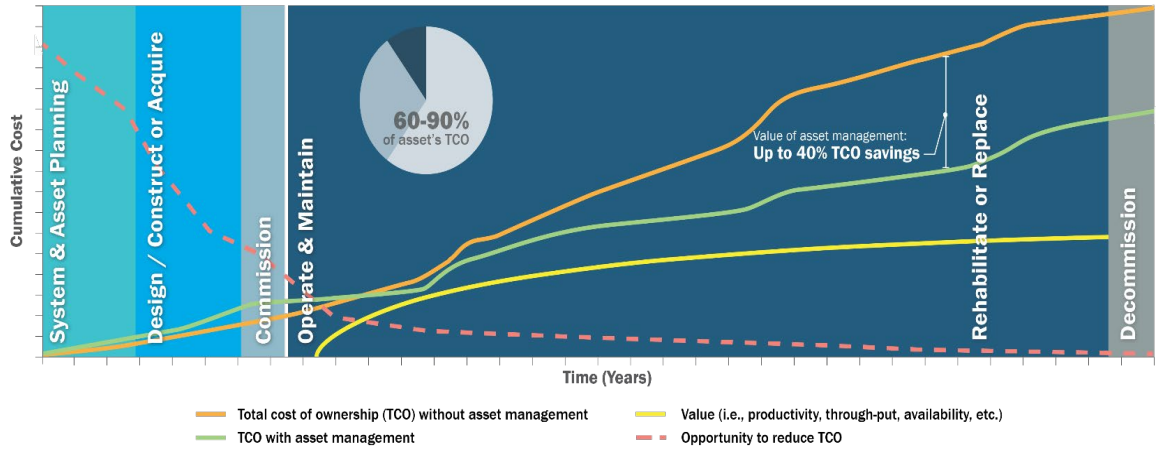


Table 4-1 summarizes various best practices related to managing the asset lifecycle.

Table 4-1: Asset Lifecycle Best Practices

Lifecycle Stage	Asset Management Best Management Practices	Examples Illustrating Importance to asset management
System and Asset Planning For existing assets, activities occur prior to acquiring replacement assets or during the O&M stage	• Assess asset risk • Forecast demands and anticipate new regulations • Model system performance • Establish service levels • Identify critical equipment through a consequence of failure analysis • Conduct condition assessments • Identify needs and prepare Business Case Analysis • Prioritize based on objective and repeatable criteria • Conduct risk-based design, hazard and operability analysis, and consider value engineering • Review and update design standards • Draft asset management plans	• Determination, confirmation, or modification of service levels (with input from stakeholders) leads to strong relationships with customers, end users, and the public • Clarity of service levels leads to effective risk-based system planning, asset design, and maintenance strategies • Understanding asset condition leads to knowledge of asset risk • Knowledge of asset risk leads to objective and transparent decisions regarding asset acquisition and renewal
Design / Construct or Acquire	• Maximize value, including lifecycle considerations • Consider alternate project delivery and construction methods • Award contracts based on lifecycle considerations • Standardize equipment • Require robust submittal review and inspection processes • Maintain spares for high risk assets	• Equipment standardization leads to increased safety, simplified spares management, and streamlined maintenance
Commissioning	• Operate all equipment under load • Ensure calibration of instruments • Pressure test force mains and valves • Clean and video gravity pipelines • Perform inspections (including appurtenances) • Onboard asset data, including upload to the Asset Management Information System (AMIS) • Receive preventative maintenance (PM) job plans and validate • Prepare baseline risk and performance information for asset(s) • Establish maintenance strategy • Conduct Failure Modes and Effects Analysis (FMEA) for high risk assets • Conduct O&M training • Receive and review O&M manuals • Ensure all warranty documents are in order	• Testing new processes and assets prior to transition to operations and maintenance leads to reduction in design or construction related problems and resolution prior to operations • Onboarding of asset data prior to operations and maintenance leads to reduction in maintenance problems and potential for failure during initial months of operations • Transmittal of manuals and training of O&M staff leads to reduction in safety incidents

Lifecycle Stage	Asset Management Best Management Practices	Examples Illustrating Importance to asset management
Operations and Maintenance	• Continue activities listed in the System and Asset Planning Stage • Comply with regulations and permit conditions • Monitor for service level compliance • Track performance indicators • Conduct ongoing training for O&M staff • Optimize operations through assessment of chemicals, power, labor, materials, etc. • Optimize PM job plans based on FMEA • Employ technology for monitoring and control • Use risk-based approaches	• Timely tracking of asset performance and condition as well as maintenance performance indicators leads to performance and condition based proactive maintenance planning and ability to make correction actions based on data. • Tracking data regarding failures leads to the ability to develop maintenance strategies based on understanding failure modes
Rehabilitate or Replace	• Monitor condition and performance to identify appropriate time to rehabilitate • Use statistical methods for estimating rehabilitation needs for sewers and force mains • Monitoring condition and performance for equipment and pipelines • Follow Scheduled Replacement Program (SRP) or modify the SRP • Track risk and make investment decisions based on risk • Prepare business case analyses as appropriate	• Use of statistical methods for predicting asset failures leads to precision in planning for asset renewals • Tracking likelihood of failure (LoF) and consequence of failure (CoF) and the resultant asset risk score leads to risk-based decision-making, and tracking real-time changes in LoF and CoF results in just-in-time adjustments to strategies
Decommission	• Sell, auction, reuse, repurpose, or dispose • Ensure hazardous materials are properly handled and disposed of • Evaluate the pros and cons of abandoning and filling sewers in-place or removing • Properly indicate abandoned/removed assets from AMIS and financial system(s) • Evaluate total cost of ownership and reliability of the disposed asset	• Proper disposal of hazardous materials leads to reduced risks • Complete data regarding total cost of ownership leads to improved decision-making for future asset decisions

4.5.2.2 Utilities' Lifecycle Strategies

This section documents current asset lifecycle strategies and procedures implemented by Utilities. Utilities has adopted the terminology for asset lifecycle stages as shown in Figure 4-3.

System and Asset Planning. This asset lifecycle stage focuses on how Utilities decides to invest in different programs. A number of approaches are used to identify and prioritize system needs and projects, including:

- Replacement and rehabilitation projections, which are used to estimate long-term investment needs and rates
- Utilities' Seven-Year CIP, which establishes the budget and corresponding rates for Utilities. Prioritization of projects within the CIP is conducted annually. Prioritization criteria consists of system importance and external driver criteria.
    - System importance criteria include:
        - Public health and safety
        - Remaining useful life of asset
        - Asset, age and condition
        - System resiliency
        - Employee safety
        - Level of service
        - Number of customers benefited from the project
        - System growth
        - Operational efficiency
    - External driver criteria include:
        - Status of project in current CIP
        - Impact to grant or external funding if investment is not included in current CIP
        - Investment supports an initiative by Council/City Manager Office/City Leadership
        - Investment has federal or state or legal mandate with hard deadlines
        - The infrastructure project's schedule aligns with time-sensitive schedules of private and public projects (city and external agencies)
        - Part of inter-local agreement (not dependent on other projects)
- Utilities' CIP is contained within the City of Bellevue's CIP; more information is available on the City's CIP website
- Planning of projects is often challenged by staff resource availability and coordination with other CIPs (e.g. Transportation).

- Capacity analyses, such as water and wastewater capacity modeling based on projected land use and zoning.
- System planning, includes updating the Utilities' Water (6), Wastewater (7), and Storm and Surface Water System (8) Plans.
- Monitoring and analysis of assets includes updating and calibrating water and wastewater hydraulic models, stream flow and monitoring.
- System resilience evaluations, such as the Water Utility's seismic resiliency study and Emergency Water Supply Plan (currently in development).
- System problems and solutions are identified and coordinated between the Engineering and O&M Divisions. Not all problems result in a capital solution, but both divisions work together to develop the solution.

Design/Construction/Commissioning. These asset lifecycle stages are currently governed by Utilities' Gate process, which is illustrated in Figure 4-3 and summarized in Table 4-2. Further details on Utilities project delivery can be accessed by those internal to Bellevue Utilities on the Project Management SharePoint site.

Figure 4-3: Overview of Utilities Project Delivery Process and Gates

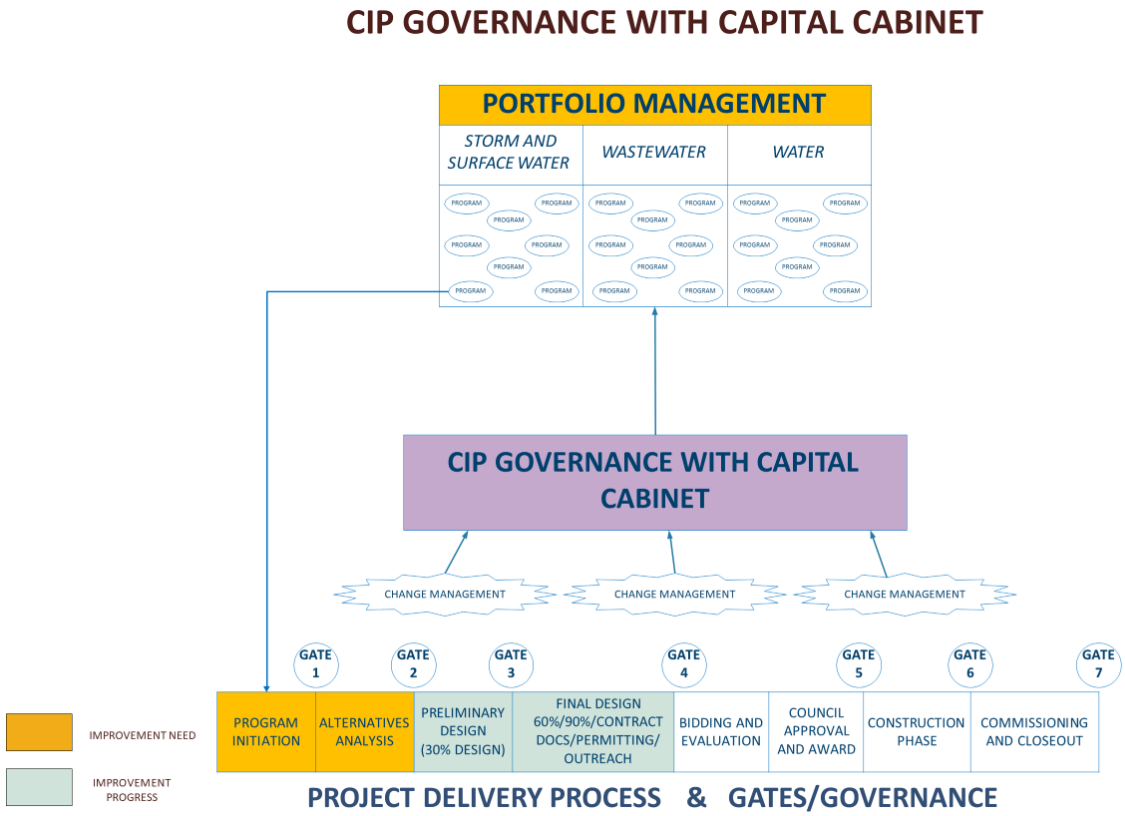


Table 4-2: Summary of Utilities Gates

Gate Number	Description of Gate	Approved By
Gate 1	Project initiation – Approval of Project Charter and authorization to proceed with Alternatives Analysis	Section Manager, or Assistant Director if threshold is met
Gate 2	Selection of the Approved Alternative and authorization to proceed with Preliminary Design	Assistant Director, or CIP Cabinet if threshold is met
Gate 3	Approval of Preliminary Design and authority to proceed with Final Design	Assistant Director, or CIP Cabinet if threshold is met
Gate 4	Approval of Final Design and authorization to proceed with Bid Advertisement	Assistant Director, or CIP Cabinet if threshold is met
Gate 5	Approval of the apparent low bidder and authorization to proceed with Construction Contract Award	Assistant Director, or CIP Cabinet if threshold is met
Gate 6	Approval of Construction Contract Completion and Acceptance, and authorization to proceed with Project Closeout	Construction Manager
Gate 7	Approval of Project Closeout	Section Manager

O&M. The level of O&M for a given asset is based on targeted service levels and achieving Key Performance Indicators (KPIs) and is budgeted in an annual work plan that is based on a five-year trend. Plans are developed by analyzing previous plan accomplishments, staff resource availability, asset performance, and asset condition data. On average, approximately 60 percent of Utilities maintenance work is preventive, and 40 percent is reactive. O&M staff also collaborates with engineering and development review staff to provide review and input for upcoming CIP and development projects.

Replacement and Rehabilitation. Many of the strategies and practices used to determine when assets need to be replaced or renewed are identified in the System and Asset Planning section. In addition, a 75-year renewal and replacement forecast is developed to determine financial needs and provide a replacement schedule for each asset grouping and individual assets. The forecast is informed by strategies and statistical analysis for estimating remaining useful life, rehabilitation needs, condition assessment studies, maintenance work order history and operational data.

Decommissioning. Utilities addresses this stage of the asset lifecycle on a project by project basis. Project managers work in collaboration with O&M to determine whether any elements of a project need to be decommissioned or remain for potential future use. In addition, there is a commissioning and decommissioning process for new pump stations written in the Project Management Manual and decommissioning of asbestos cement pipe is

addressed in engineering specifications. Utilities has a draft property management plan which address management of property, including surplus property.

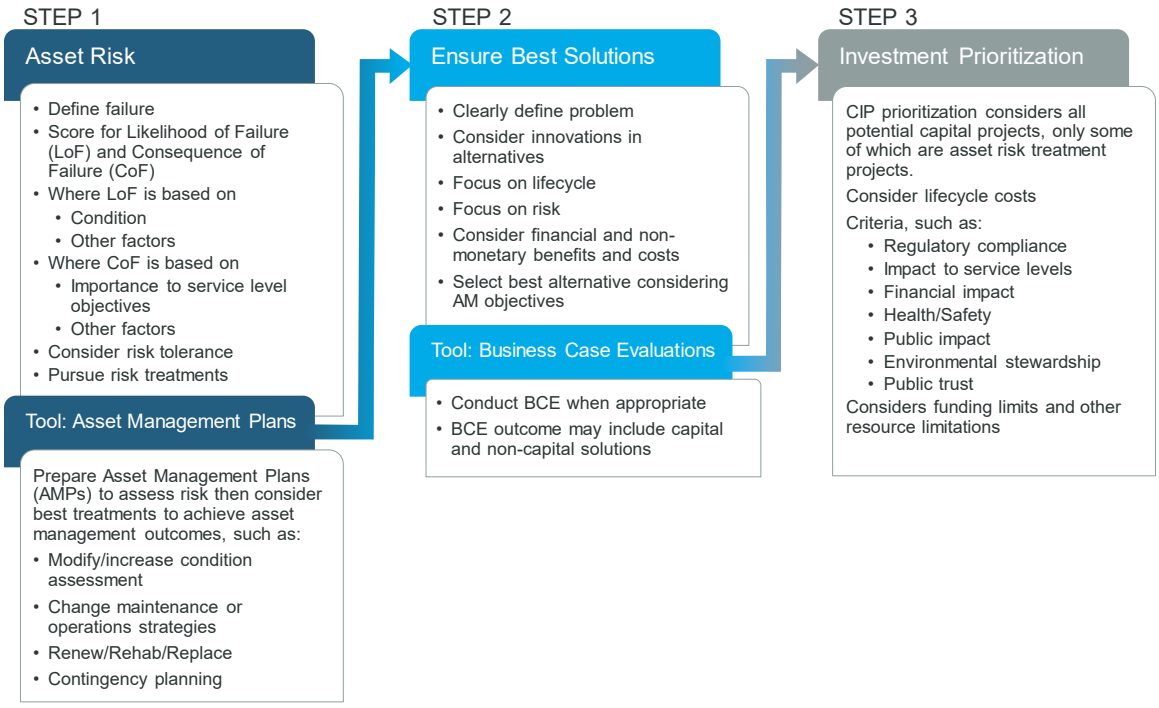
4.5.2.3 Key Steps to Effective Investment Decision-Making

Figure 4-4 illustrates three key steps to effective investment decision-making, which are:

IMPROVEMENT INITIATIVE
A3 - Business Case Analyses (BCAs)

1. Understanding asset risk
2. Determine the most cost-effective way to treat risks
3. Investment prioritization

Figure 4-4: Three Steps to Effective Investment Decision-Making



Step 1 Asset Risk. This step is further described in Section 3.4 Risk Management and Section 7 Asset Management Plan Framework.

Step 2 Ensure Best Solutions. Upon determining asset risk scores, and for situations where risks exceed the desired risk tolerance, BCAs provide the tool for making investment decisions to treat the risk. BCAs can be developed for investment needs driven by risk reduction or for needs driven by other factors, such as regulations, growth, efficiency enhancements, or new technologies. BCAs establish a formal, unbiased, and uniform process

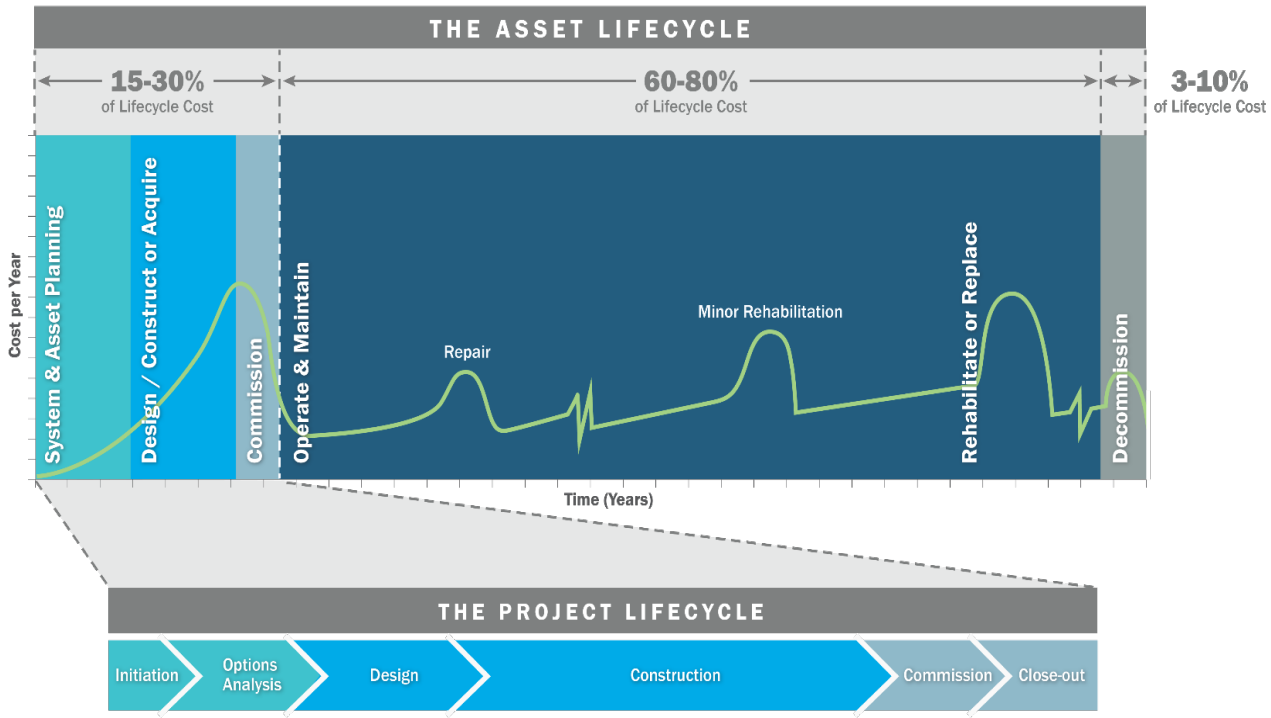
to define the problem, then analyze and document key issues so that alternative selection can be made based on objective information. One inherent value of this step is confidence that the right solution has been selected.

Step 3 Investment Prioritization. This step typically occurs annually. This process should consider all potential capital needs, only some of which emerge based on the need to treat asset risks. An effective prioritization process uses objective criteria and links investments to the organization's strategic objectives. One inherent value of this step is confidence that the organization is spending limited capital dollars on the highest priority needs.

4.5.3 Project Lifecycle

The project lifecycle is a subset of the asset lifecycle, starting with asset planning and ending with commissioning, as illustrated in Figure 4-5. Many important decisions are made during the project lifecycle, and these decisions can either help or hinder the ability to effectively manage the costs, risks, schedules, and outcomes across the whole asset lifecycle. Project execution risks are identified during the initiation phase of the project lifecycle, then incrementally during the latter phases of the project lifecycle and are managed as part of project management activities.

Figure 4-5: A Typical Project Lifecycle and Stage Gates



5 Financial Strategies

A broad objective with asset management for all infrastructure-intensive organizations is to balance three main imperatives:

1. Understand the needs and expectations of customers and the broader community (including affordability and ability to pay)
2. Understand the state of the infrastructure and the ability of the system to provide expected services
3. Understand what it will cost to provide required services today and into the future; this includes financial strategies and making sure lifecycle costs and benefits are taken into consideration

Figure 5-1: Balancing Asset Management Imperatives

The work to understand and balance these three imperatives must consider risk and thus incorporate risk management into decision making. These imperatives and the relationship of each to the other is illustrated in Figure 5-1.

Utilities can address these three main imperatives by aligning the outputs from their asset management processes and tools (such as AMPs) with their broader financial plans, budget process, rate setting, and forecasting. For example, the funding needs projected as a result of AMPs (for the cohort of assets addressed by each AMP) need to feed directly into Utilities financial plans and rate setting processes, and the BCAs should feed directly into the CIP development process. In addition, a broad utilities-wide risk management process will include risk tolerance levels that directly align with funding needs (i.e., where greater funding is needed in order to sustain a low risk tolerance level) and customer service levels

5.1 Financial Policies and Procedures

All Utilities operations are governed by the Waterworks Utility Financial Policies. The Waterworks Utility is the financial consolidation of the Sewer, Storm and Surface Water and Water Utilities of the City of Bellevue for debt rating and coverage purposes. It pledges the strengths and revenues of the three separate Utilities for the common financial good while keeping each Utility financially separate for budgeting, rate-setting, revenues, expenditures, debt, and accounting. These Financial Policies apply uniformly to the Sewer, Storm and

Surface Water, and Water Utilities with few, unique exceptions which are identified separately.

These policies do not stand alone. They must be taken in context with the other major City and Utilities documents and processes. For instance, each Utility has its own System Plan, which documents its unique objectives, planning, operations, and capital needs. These System Plans have historically had a 20-year planning horizon. Future System Plans will need to evaluate long term renewal and replacement of aging facilities, much of which were constructed in the 1950s and 1960s during periods of high growth rates and are approaching the end of their useful life. Lifecycle costs should be considered in planning the future capital facilities and infrastructure needs.

Utilities has a seven-year Capital Investment Program (CIP) Plan, which is updated with each biennial budget cycle. These CIP programs include specific near-term capital projects that are consistent with each Utility System Plan and are developed in response to system needs for renewal and rehabilitation, system capacity to accommodate growth, and other system needs. Generally, capital projects are described as over $100,000, involving development of new physical infrastructure, reconstruction of existing infrastructure, acquisition of land or existing facilities, and involving City funding or other agency funding when project implementation is the responsibility of the City.

The sub-sections below summarize these policies.

5.1.1 General Policies

Fiscal Stewardship. The Waterworks Utility funds and resources shall be managed in a professional manner in accordance with applicable laws, standards, City financial practices and these Financial Policies.

Self-sufficient Funding. Each Utility shall remain a self-supporting enterprise fund.

Comprehensive Planning Policies. Utility System Plans shall be updated every six to ten years, or as required by changed conditions or regulatory requirements. All Utility system plans shall use a 20-year planning horizon or greater, and shall consider lifecycle costs to identify funding needs. Studies to analyze specific geographic areas or issues will be completed as required using similar criteria for planning infrastructure needs.

5.1.2 Capital Investment Program Policies

General Scope. The Utilities CIP will provide sufficient funds from a variety of sources for implementation of both short- and long-term capital projects identified in each Utility System Plan and the City-wide CIP as approved by the City Council.

Financial planning for long-term capital investment shall be based on principles that result in smooth rate transitions, maintain high credit ratings, provide for financial flexibility, and achieve inter-generational equity.

Funding Levels. Funding for capital investments shall be sustained at a level sufficient to meet the projected capital program costs. Funding from rate revenues shall fund current construction and engineering costs, contributions to the Capital Facilities Renewal and Replacement (R&R) Account, and debt service, if any. Inter-generational equity will be assured by making contributions to and withdrawals from the R&R Account in a manner which produces smooth rate transitions over the planning period.

Use of Debt. The Utilities should fund capital investment from rates and other revenue sources and should not plan to use debt, except to provide rate stability in the event of significantly changed circumstances, such as disasters or external mandates.

Use of Capital Facilities R&R Account. Revenues to the R&R Account may include planned and one-time transfers from the operating funds, transfers from the CIP Funds above current capital needs, unplanned revenues from other sources, Capital Recovery Charges, Direct Facility Connection Charges and interest earned on the R&R Account. Funds from the R&R Account shall be used for system renewal and replacement as identified in the CIP. The R&R Account will accumulate high levels of funds in advance of major expenses. These funds will provide rate stability over the long-term when used for this purpose.

5.1.3 System Expansion and Connection Policies

Responsibilities. Customers seeking or required to have Utility service are responsible for extending and/or upgrading the existing Utility systems prior to connecting.

Cost Recovery. The Utility shall establish fees and charges to recover Utility costs related to services to the property. The Utility may enter into Latecomer Agreements with developers for recovery of their costs for capital improvements, which benefit other properties in accordance with State law.

Use of Revenues. All capital-related revenues such as Capital Recovery Charges and Direct Facility Connection Charges should be deposited in the Capital Facilities R&R Accounts.

5.1.4 Rate Policies

Rate Levels. Rates shall be set at a level sufficient to cover current and future expenses and maintain reserves consistent with these policies and long-term financial forecasts. Changes in rate levels should be gradual and uniform to the extent that costs (including CIP and R&R transfers) can be forecast. Cost increases or decreases for wholesale services shall be

passed directly through to Bellevue customers. Local and/or national inflation indices such as the Consumer Price Index (CPI) shall be used as a basis for evaluating rate increases.

Debt Coverage Requirements. Utility rates shall be maintained at a level necessary to meet minimum debt coverage levels established in the bond covenants and to comply with Resolution No. 5759, which establishes a target coverage ratio of 2.00.

Frequency of Rate Increases. Utility rates shall be evaluated annually and adjusted as necessary to meet budgeted expenses, including wholesale cost increases and to achieve financial policy objectives.

Rate Structures. The Water Utility rate structure will be based on a financial analysis considering cost-of service and other policy objectives and shall support water conservation and wise use of water resources. The Sewer Utility rate structure will be based on a financial analysis considering cost-of-service and other policy objectives and will provide for equity between customers based on use of the system and services provided. The Storm and Surface Water Utility rate structure will be based on a financial analysis considering cost-of-service and other policy objectives and will provide adjustments for actions taken under approved City standards to reduce related service impacts.

Rate Equity. The rate structure shall fairly allocate costs between the different customer classes. Funding of the long-term CIP also provides for rates that fairly spread costs over current and future customers.

Rate Uniformity. Rates shall be uniform for all utility customers of the same class and level of service throughout the service area. However, special rates or surcharges may be established for specific areas, which require extraordinary capital investments and/or maintenance costs. Revenues from such special rates or surcharges and expenses from capital investments and/or extraordinary maintenance shall be accounted for in a manner to assure that they are used for the intended purposes.

Rate Assistance. Rate assistance programs shall be provided for specific low-income customers as permitted by State law.

5.1.5 Operating Reserve Policies

Operating Reserve Levels. The Utilities' biennial budget and rate recommendations shall provide funding for working capital, operating contingency, and plant emergency reserve components on a consolidated basis in accordance with the Summary of Recommended Consolidated Reserve Levels table, which is an attachment to the policy.

Management of Operating Reserves. Related to the recommended target reserve levels, a working range of reserves is established with minimum and target levels. Management of reserves will be based on the level of reserves with respect to these established thresholds.

Asset Replacement Reserves. Utility funds will maintain separate Asset Replacement Accounts to provide a source of funding for future replacement of operating equipment and systems.

Additional details and discussion can be found in the adopted Waterworks Utility Financial Policies as published with the City's biennial budget.

5.2 Capitalization Policy

Utilities assets are capitalized following the procedures outlined in the City's Policy/Procedure No. 6 – Accounting for Capital Assets.

5.2.1 Purpose of the Policy

The purpose of Accounting for Capital Assets policy is to articulate the Council-adopted procedures to properly account for capital assets in accordance with state regulations and generally accepted accounting principles (GAAP) applicable to governments. The reporting procedures and definitions in this document are designed to comply with Governmental Accounting Standards Board (GASB) standards.

The underlying purpose of capital asset accounting is to provide reasonably accurate summary estimates of the value of Utilities' capital assets. For the most part, decisions about the replacement and/or renovation of specific infrastructure relies on information systems targeted to the management of those assets.

5.2.2 Scope of the Policy

While there is substantial overlap between the two, capital asset accounting is different in purpose and scope from the CIP budget. The CIP budget is needed in order to fund one-time projects and ongoing capital investment that do not fit into departments' ongoing operating budgets. While these projects are always related to existing or potential long-term assets, their cost doesn't necessarily meet the threshold for capital assets in the accounting system, and the purpose of the spending does not necessarily fit the definition of capital assets. In the accounting system, the decision about whether to "capitalize" a particular expenditure—that is, treat it as an expenditure that creates or adds to a capital asset—must follow the criteria contained in this policy, regardless of whether capital funding sources were used to build or buy the asset. The exception is for grant-funded projects, where the requirements of a particular grant may supersede the criteria contained in this policy.

5.2.3 Capital Asset Definition

Broadly defined, assets are resources expected to add value to the organization. Assets may be real, tangible, or intangible personal property, and they may be acquired through purchase, donation, or construction.

In concept, capital assets are expensive, long-lived assets such as buildings and land. Assets that are less costly or consumable, such as calculators or gasoline, are classified as supply inventory. The high cost and long life of a capital asset requires additional accounting transactions that are not necessary when accounting for supply inventory.

A more formal definition follows:

An asset is a "capital asset" if it meets the following conditions:

1. The original cost (or fair value if received by donation) of the asset must exceed the cost threshold amount set out below for its category.
2. The estimated useful life of the asset must exceed one year.

5.2.4 Capital Asset Cost Thresholds

Table 5-1 lists the standard threshold amounts that are used for some of the major asset categories:

Table 5-1: Capital Asset Threshold Amounts

Asset Category	Examples	Dollar Threshold
Land	Property parcels; Right of way; Easements	Capitalize All
Land improvements	Walkways Parking lots Landscaping	$100,000
Building & Improvements	Structure Major refurbishment/renovation New Roof/HVAC	$100,000
Infrastructure	Roadways, sidewalks and bike paths Bridges & tunnels Marina Utility lines	Capitalize all new construction
Intangible Assets	Software developed or obtained for internal use (such as ERP software)	$100,000
Leasehold improvements	Land/Building improvements made to leased property	$10,000
Grant-funded equipment or improvements	Any asset funded or partially funded by federal or state grants	As required by grant

Additional information concerning upgrading, acquiring, purchasing, and constructing capital assets, as well as intangible assets, donated assets and capital leases can be found in the City's Accounting for Capital Assets policy.

5.3 Nexus of Asset Management to the Long-term Financial Plan

This inaugural SAMP has potential to impact the future financial picture for Utilities. In addition, many improvement initiatives will benefit the long-term financial planning function and this will improve risk management and the predictability of financial needs, which will also benefit customer and community relations, public trust, and confidence in Utilities.

IMPROVEMENT INITIATIVE
A1 - Update the AM Renewal and Replacement Strategy

5.3.1 Financial Benefits of Asset Management

Asset management, when fully implemented, will benefit financial strategies in several ways

- Clarity of community and customer expectations and service levels, applied to operating and capital investments to achieve desired outcomes
- Understanding of system and asset risk, enabling operating and capital investments to appropriately reduce risks
- Predictability in investment needs to renew and replace aging infrastructure, with forecasting of 5 years, 10 years, and longer term
- Lifecycle optimization during capital project planning and design to ensure lowest lifecycle costs
- Financial policies and forecasts that recognize optimal investments in the short and long term

In order to realize these benefits, Utilities must move towards asset management processes and practices, including:

- Consistent use of the Computerized Maintenance Management System (CMMS) for work management, which will enable complete information regarding the costs of operating and maintaining assets
- Full asset costing, which, in addition to the work management information generated from the CMMS, incorporates power, chemical, and other costs so that well-informed decisions can be made regarding maintenance and renewal strategies
- Understanding of asset economic life (which considers cost of ownership relative to renewal and replacement options) and its use for financial planning rather than

asset useful life (which is typically a way to roughly predict asset failure and is generally not very accurate)

- Developing a risk culture, which includes consistent and effective risk management processes and decision making for assets, projects, operations activities, and enterprise risks, which will help to ensure that Utilities' risk profile is as desired, and risk tolerance is as desired
- Project delivery protocols including implementation of a complete phase gates process to help ensure decisions regarding project investments are made fully informed by overall Utilities and system needs, and that there are appropriate off-ramps
- Consistent, transparent, and predictable protocols for prioritizing operational budget needs and the capital program
- Development of individual AMPs to document and address asset needs and create clarity regarding current asset risk profiles and risk tolerance, renewal, rehabilitation, and maintenance strategies and funding needs
- Comprehensive BCA processes to ensure that funding decisions are made based on appropriate problem definition and complete consideration of alternative solutions

Effective workforce, leadership, and stakeholder training and engagement to help ensure necessary alignment and performance

5.3.2 Moving from Strategy to Implementation

Once Utilities produces mature AMPs that are integrated with other plans and strategies, the rate and fee policies and processes will more objectively address aging infrastructure needs. Rate and fee policies will be based on:

- Understanding asset risk (including condition and criticality)
- Best solutions (operations and capital) for continued service provision
- Right-sizing of infrastructure
- Consideration of changes in demand and other external drivers
- Best time for infrastructure investment

Utilities will also be able to establish financial plans to forecast future needs with each AMP. These plans can be informed by stochastic modeling, will address risks and incorporate uncertainty, and will address service level needs as well as equity considerations.

6 Performance Management

Managing performance is fundamental to the success of any program, project, operation, or activity. Performance management is a broad topic that consists of:

- Initial development and effective communication of desired outcomes and specific goals
- Two-way conversations about desired outcomes and goals
- The ability of the organization to achieve desired outcomes
- Reporting against these targets and goals
- Making course corrections

Utilities needs to have a common understanding of the meaning of success; clear and deliberate strategies, governance, training, mentoring, and understanding of employee capabilities; and meaningful performance indicators that are tracked routinely and modified as needed. Action should be taken when desired outcomes are achieved or not achieved (i.e., celebrating successes and addressing deficiencies).

It is important to set up a performance management system that fosters learning and continual improvement. This consists of making adjustments when warranted, listening to new ideas, undertaking new approaches, and creating an organizational environment that encourages questioning of the status quo and the desire to achieve high performance.

Effective performance management can help justify financial and other resource investments and improve communications among internal and external stakeholders. Consistent and uniform performance management and the associated performance measurements provide information necessary to continually improve processes and outcomes.

When Utilities has effectively addressed the items important to performance management, a high-performance culture will result. While a high-performance culture does not necessarily mean the organization is achieving peak performance, it does mean it's on the right course.

6.1 Performance Measures

Performance measurement may be quantitative or qualitative. Quantitative performance indicators (PIs) use metrics and are objective and data driven (e.g., the cost of energy). Qualitative PIs may be expressed using numbers, but the input is subjective (e.g., a survey of customers may indicate that 90 percent are satisfied with the services provided, but the determination of satisfaction is subjective).

IMPROVEMENT INITIATIVE
L6 - Performance Indicators

IMPROVEMENT INITIATIVE
L7 - Clean Up Pentana

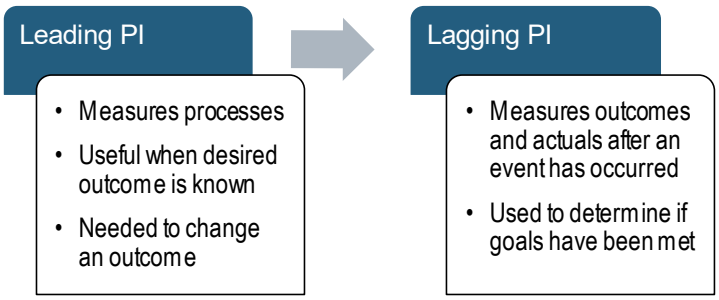
A PI is typically expressed as a ratio (e.g., the cost of energy per million gallons of wastewater treated). Other ratios indicate performance of a system (e.g., number of sanitary sewer overflows per 100 miles of pipe) or condition of a system (e.g., number of water main breaks per 100 miles of pipe). PIs can indicate the effectiveness of an activity, such as proactive maintenance (e.g., mean time between failures), whereas resource/activity indicators metrics can be used to access workload and resource allocation (e.g., miles of water main replaced).

PIs can be "leading" or "lagging." A leading PI measures a process, while lagging PIs measure outcomes (see Figure 6-1). Leading PIs are useful when the desired outcomes are known for the processes being measured. For example, the number of miles of video-inspected sewer per year may measure the productivity of a work crew, but whether the video inspections add value cannot be determined exclusively with this PI. Similarly, measuring the number of planned maintenance work orders compared to the total number of work orders may help understand whether an agency has achieved a desired goal, but these values themselves are only helpful to the extent there is an understanding of the relationship to the agency's desired outcomes.

Lagging indicators measure outcomes and actuals that can only be measured after an event has occurred (e.g., the number of sewer overflows per 100 miles of pipe, or percent of days in full compliance with drinking water standards).

Generally, if there is a desire to change an outcome, something must change with a leading indicator. If no leading indicator has been established related to the outcome, one or more should be established as part of an improvement process.

Figure 6-1: Types of Performance Indicators



A key performance indicator (KPI) measures performance having a significant impact on the primary goals of Utilities. KPIs may change from time to time depending on changing priorities, areas needing attention, or other reasons. There should be many PIs throughout the organization, but relatively few KPIs in order to convey importance and sense of urgency.

Data used for calculating PIs, including those chosen as KPIs, must be consistently and systematically measured to ensure accuracy and repeatability. Calculations must be clearly defined and unambiguous. If performance will be compared with other utilities, it is crucial to determine whether the data are accurate, the calculations are the same, and characteristics of what is being measured are similar enough to make comparisons between utilities.

Although sector comparisons of PIs can be useful, the most advantageous use of PIs is tracking performance within the organization, especially in tracking improvements. Target values for PIs should be established so that achievement of a performance goal is clear to stakeholders. However, it is just as important to understand the trend of a PI. In some cases, understanding how and why a PI is trending may be more important than setting an actual target value. The direction of the trend and its rate of change provide valuable information for identifying whether a process is working and how it may be improved.

Reporting of PIs is important to process improvement and asset management. Communicating PIs, targets, and trends to the workforce can encourage improvement in work practices. It is common to report KPIs monthly. PIs may be established for individuals and become part of personal performance plans, and they may be established to report on accomplishment of projects or improvement initiatives. PIs may be reported daily, weekly, or monthly depending on the activity and the need to improve performance.

To be of value, KPIs and PIs must have the following characteristics:

- Specific. Describes a specific attribute of service or activity
- Measurable. Information/data is available or can be obtained easily
- Meaningful. Provides a clear picture of performance relevant to stakeholders
- Time-bound. Measured over a specific timeframe
- Consistent. Measurements use the same methods and tools so they are repeatable by others
- Useful. Provides a clear direction for improvement

Performance management at Utilities is currently focused on annual reporting on 18 KPIs, which are documented in the Biennial Budget. All Utilities staff is informed of the department's performance outcomes. Table 6-1, summarizes Utilities' KPIs and shows alignment to service level objectives and line-of-business mission.

KPI reporting is managed through the Pentana software program. KPI owners upload values for KPIs on an annual basis.

6.2 Service Levels

Service levels are statements of desired performance outcomes that reflect high priorities from customers and the community, as well as outcomes important to environment protection, or as required by regulators. Service levels established by Utilities are shown in Table 6-1.

Service levels are important in asset management decision making because they form the "target" for maintenance strategies and capital investments. In order to be most useful for decision making, service levels should be largely within the control of Utilities and have performance-level data that can be accurately and consistently collected and audited.

PIs are used to track and measure service levels, providing a line-of sight to the Asset Management Policy and to the organizational strategy.

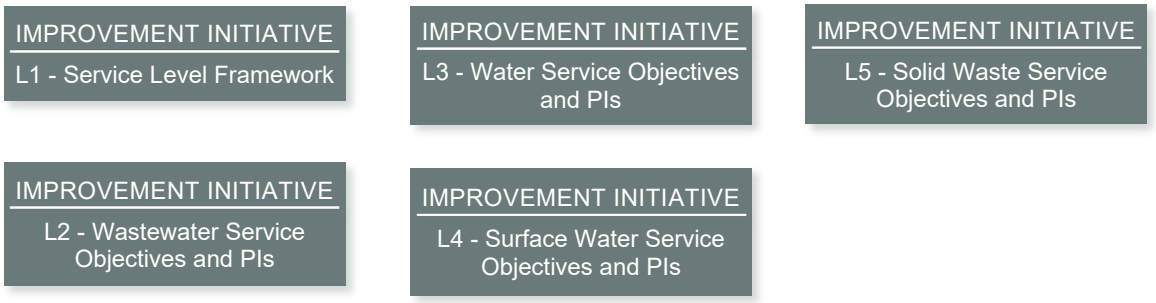


Table 6-1: Current Mission, Service Level Objectives, KPIs, and Targets for Utilities

Line of Business	Mission	Service Level Objectives	KPI	Target
Bellevue Utilities	Actively support public health and safety, quality neighborhoods, and a healthy and sustainable environment and economy by effectively managing drinking water, wastewater, storm and surface water, and solid waste.		Overall satisfaction with Bellevue Utilities Department (survey)	85% satisfied or very satisfied
Solid Waste	Provide a convenient, unobtrusive solid waste collection system that contributes to a healthy and pleasing cityscape in an environmentally sensitive way.		Customer satisfaction with Solid Waste services	80% satisfaction
Water	Provide a reliable supply of safe, secure, high-quality drinking water that meets all the community's water needs in an environmentally responsible manner.	Maintain an adequate and uninterrupted supply of water	Unplanned service interruptions	3 per 1000 customers/year
			Frequency of water main breaks	10 per 100 miles pipe
		Provide water that is safe and healthy to drink	Percent of days per year compliance with state and federal drinking water regulations	100%
Wastewater	Provide a reliable wastewater disposal system that ensures public health and safety and protects the environment.	Provide reliable uninterrupted sewer service	Wastewater overflow events per 100 miles of pipe	< 4 overflows per 100 miles of pipe
Storm and Surface Water	Provide a storm and surface water system that controls damage from storms, protects surface water quality, supports fish and wildlife habitat, and protects the environment	Providing effective drainage programs, including flood control	Structural flooding occurrences for storms less than 100-year storm event	5 per year

7 Asset Management Plan Framework

7.1 Overview of an Asset Management Plan

IMPROVEMENT INITIATIVE
A2 - Asset Management Plans (AMPs)

IMPROVEMENT INITIATIVE
M2 - Asset Risk

IMPROVEMENT INITIATIVE
M3 - Strategic Maintenance and Reliability Program

Asset Management Plans (AMPs) specify the activities, resources, and timescales required for a grouping of assets to achieve the organization's asset management objectives (see Section 4 Asset Management Strategy and Objectives). Two commonly adopted definitions for AMPs are listed below from asset management guidance documents:

- The International Infrastructure Management Manual (IIMM) defines an AMP as a long-term plan (usually 10-20 years or more for infrastructure assets) that outlines the asset activities and programs for each service area and resources applied to provide a defined level of service in the most effective way.
- ISO 55000 defines an AMP as documented information that specifies the activities, resources and timescales required for an individual asset, or grouping of assets, to achieve the organization's asset management objectives.

In organizations with a low level of asset management maturity, AMPs may initially depend on best available staff knowledge and limited documented data. Mature AMPs clearly document service level and performance objectives and demonstrate the relationship between:

- The ability of the existing assets to achieve service levels, and
- Maintenance, rehabilitation, and replacement strategies.

Mature AMPs also document the investment levels needed to treat risks and meet future demands. In addition, progressive iterations of AMPs are informed by more complete and current data and information, including asset performance, condition, criticality, and other factors that are used to determine the likelihood and consequence of asset failure.

Utilities developed an Infrastructure Asset Management Plan Conceptual Framework in 2007 and updated/reviewed the document in 2015. This document strove to provide an introduction to asset management, identified and defined the ten core processes of asset management as defined by the United Stated Environmental Protection Agency, and establishes best appropriate asset management practices.

The AMP Conceptual Framework document was followed by Best Appropriate Asset Management Practices (BAP) that drove the implementation of improvements to asset management processes. An improvement strategy was prepared for pipeline assets in 2007 and reviewed/updated in 2015.

7.2 Objectives of an Asset Management Plan

The objectives of an AMP are:

- Document the activities to be implemented and the resources needed to meet the Asset Management Objectives
- Link the Asset Management Strategy to the work "on the ground"
- Describe the current state of the assets
- Identify planned actions and activities to ensure the assets are providing the expected service levels
- Support funding requirements and provide input to long-term financial plans

In more colloquial terms, an AMP answers the following questions about assets in a collaborative, cross-functional team setting:

- What do we have?
- How does it help us achieve objectives?
- What is the risk?
- What are we going to do about it?
- What will it cost?

7.3 Developing Asset Management Plans

Developing an AMP typically proceeds in the steps outlined below. Prior to beginning the development of an AMP, it is best to have an AMP framework developed, which provides clarity of purpose, process and role expectations, completeness and governance expectations, and AMP asset groupings. The AMP framework is typically contained within the SAMP.

1. Establish team: Identify lead and team members
2. Write a team charter:
    a. Team education regarding the AMP
    b. Team chartering (discussion and buy-in to the purpose)
    c. Review and concur on AMP template and decide who will author and provide review of each section
    d. Define AMP path forward, including schedule discussion and buy-in
3. Gather asset data:
    a. Develop asset profile
    b. Gather raw data to be used for asset risk assessment
    c. Collect best available asset condition information
4. Asset risk assessment:
    a. Develop consequence and likelihood matrices (criteria and weights, calibration)
    b. Score assets for consequence and likelihood
5. Write the AMP
6. Review/approve/maintain the AMP:
    a. Review by an independent party if desired
    b. Approval by governance individual or group (especially if seeking funding)
    c. Maintain by re-visiting if important inputs change
    d. Update AMP per schedule and based on needs of agency planning and finance

7.4 Asset Risk Framework

Section 3.4 defines four types of risk addressed by Utilities; AMPs focus on asset risks, which are those arising from the individual or group of assets addressed in the AMP. Such risks primarily occur after construction or acquisition and throughout the remaining asset lifecycle. The risk framework described in Section 3.4 is the basis for identifying, analyzing, and treating asset risks, and should be followed in an AMP.

7.4.1 Risk Identification

For asset risk, the work of risk identification centers around understanding asset failure. This requires knowledge of Utilities service levels and an understanding of process and asset performance expectations required to support service levels. Failure should be defined for whichever level of the asset hierarchy the risk assessment is being conducted on. Asset failure should be considered to have occurred if the asset does not meet expectations considering the operating context.

7.4.2 Risk Analysis

IMPROVEMENT INITIATIVE
G5 - Asset Risk Analysis Process

Risk analysis for assets involves developing a risk score based on the quantification of likelihood that a failure will occur and the quantification of the consequences if the failure occurs.

Risk Scoring. A risk score is determined by multiplying the likelihood of failure (LoF) times the consequence of failure (CoF).

$$\text{Risk Score} = \text{LoF} \times \text{CoF}$$

Where likelihood and consequence are both scored on a scale of 1 to 5, with 5 representing the highest likelihood or consequence and 1 the lowest likelihood or consequence. Thus, a score of 25 is the highest risk score possible and represents the most severe risk.

Likelihood Scoring. For asset risk, this score answers the question, "What is the likelihood the asset will fail?"

There are several factors that may help predict asset likelihood of failure:

IMPROVEMENT INITIATIVE
G4 - Asset Condition Assessment Scales

- Remaining useful life
- Performance
- History of reliability
- Physical condition
- Adherence to O&M strategy
- Other considerations

If good information is available for remaining useful life, then this would lead directly to the likelihood of failure score. However, remaining useful life information is generally just an estimate and is not helpful in scoring likelihood of failure. Therefore, Utilities will apply one or more of the other factors. The factors to apply to the likelihood of failure determination are based directly on the type of assets in consideration.

Consequence Scoring. For asset risk, this score answers the question, "How bad will it be if the asset fails?"

In order to ensure consistency of scoring for CoF, organizations typically establish categories of consequence will be applied and for each a score of 1 to 5 is selected. Each CoF category may be weighted based on the importance of each to the other or weights may not be applied, and in this case the CoF score equals the score for each of the categories multiplied by one-seventh and added together.

Some common CoF categories used by organizations similar to Utilities are:

IMPROVEMENT INITIATIVE
G3 - Consequence of Failure

1. Regulatory Compliance. Relating to regulatory requirements, permit obligations, or enforcement actions.
2. Impact to Service Levels. Relating to the organization's ability to achieve service level targets.
3. Financial Impact. Relating to requirements for funds.
4. Health and Safety. Relating to near- and long-term health or safety impacts on the public or staff.
5. Public Impact. Relating to community priorities, such as equity, quality of life, or aesthetics.
6. Environmental Stewardship. Relating to near- or long-term environmental impacts.
7. Public Trust. Relating to the organization's image and public confidence.

7.4.3 Risk Treatment

Risks determined to be intolerable can be treated in one or a combination of ways:

- Remove the source of the risk (e.g., by eliminating a process)
- Transfer or share the risk (e.g., through outsourcing)
- Retain the risk possibly with increased monitoring
- Mitigate the risk through reduction in the likelihood or consequence of failure through such actions as:
    - Capital investment, including asset renewal, rehabilitation, or replacement
    - Modification of O&M protocols, including maintenance strategies
    - Development/change in contingency plans

- Other management strategies, such as improvement in work practices, procedures, and competencies

Application of a pre-determined asset renewal decision model or development of an individual Business Case Analysis will lead to preferred alternatives regarding risk treatment.

7.5 Asset Management Plan Outline

There is no single correct way to structure AMPs. Whatever structure is followed, the AMP should be fully integrated into corporate business planning frameworks and contain sufficient information to support and justify the long-term programs and financial forecasts which are a key output of asset management planning.

A typical AMP outline is presented in Table 7-1.

Table 7-1: Example AMP Outline

Section / Subsection	
1. Executive Summary 2. Introduction 2.1. Purpose of the AMP 2.2. Scope of the AMP 2.3. Asset Performance 2.4. Expectations for Use and Future Updates of the AMP 3. Asset Drivers 3.1. Regulatory Requirements 3.2. Stakeholder Expectations 3.3. Service Levels and Performance Indicators 4. Asset Profile 4.1. Asset Definition 4.2. Asset Hierarchy 4.3. Data Sources 4.4. Inventory 4.5. Condition 4.6. Criticality 5. Asset Risk 5.1. Data Sources 5.2. Consequence of Failure 5.3. Likelihood of Failure	5.4. Business Risk 5.5. Risk Tolerance and Introduction to Mitigation Strategies 6. Operations and Maintenance 6.1. Operational Strategies 6.2. Maintenance Strategies 7. Renewal and Rehabilitation 7.1. Renewal Strategies 7.2. Replacement Strategies 8. Replacement 8.1. Asset Replacement Planning 9. Other Risk Mitigation Activities 9.1. Condition Assessment 9.2. Contingency Planning 10. Funding Needs 10.1. 5-Year CIP and O&M Plan 10.2. 20-Year CIP and O&M Plan 10.3. Long-Term Financial Plan 11. Improvement Initiatives 11.1. Reference Asset Management Roadmap Initiatives 11.2. Reference Asset Management Programs AMP Improvement Initiatives

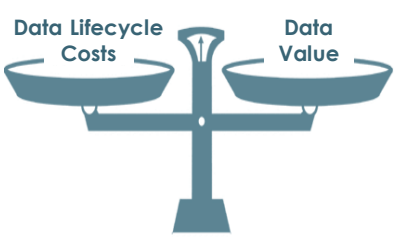
7.6 Asset Groupings

AMPs can be developed at different levels and complexity. AMPs conducted at a system level may be referred to as a "top-down" AMP. Top-down AMPs consist of broad assumptions and, subsequently, broad conclusions. Such an approach utilizes the 80/20 rule (obtain 80 percent of the benefits from the first 20 percent of effort) and can be used when there is a lack of precise data. It makes use of available, existing data, and staff experience and judgment.

AMPs conducted at a more granular level may be referred to as "bottom-up" AMPs. This type of AMP allows for more focused attention on smaller groups of assets. These AMPs can be helpful in developing maintenance strategies. It is particularly useful for a group of assets that are generally maintained in a similar way or that tend to fail in a similar manner. Bottom-up AMPs are more data-driven and provide opportunities for more hands-on ownership and deeper organizational engagement by employees who have direct responsibility for the assets covered by the AMP.

8 Asset Data and Asset Management Technology Systems

8.1 Value of Data



IMPROVEMENT INITIATIVE
D1 - Asset Information Strategy

IMPROVEMENT INITIATIVE
D2 - Data Governance

IMPROVEMENT INITIATIVE
M1 - CMMS Management Policy/Process

Data—when effectively converted into information—is critical for any organization intending to operate based on asset management principles. Asset data drives asset management decision making. The value of the data is based on the level of influence it has (or its potential to have in the future) over decisions. Improving the accuracy and completeness of asset data increases the confidence level in the resulting decisions made from the asset data. However, collecting, storing, auditing, and updating asset data require investments of time and effort. An effective information strategy provides a means of balancing the value of the data against lifecycle costs. Data investments make good business sense only when the benefits of the data exceed the costs associated with data collection, maintenance, and accessibility.

Having the right data is important to Utilities because it drives timely decision making, produces outcomes that are defensible and repeatable, creates confidence in the asset management processes, creates transparency, and when used well, results in reduced lifecycle costs of asset ownership.

For example, in order to minimize lifecycle costs of owning, operating, and maintaining assets, there must be tools in place to track current costs and forecast future costs. In order to understand and predict likelihood and consequence of failure (the elements of risk), critical data elements are needed. In order to understand the organization's current performance relative to customer expectations, data is necessary.

Table 8-1 summarizes the various data collected at Bellevue Utilities, why the data is collected, and the information systems that manage the data. Table 8-2 describes the current information systems used at Utilities.

Table 8-1: Summary of Utilities' Data

Data Type	What Data is Collected	Information System Where the Data is Managed	Why the Data is Collected
Asset Attributes	Asset location and physical characteristics (invert elevations, basin boundaries, pipe diameter, design capacity, dimensions etc.)	• ArcGIS • As-builts / record drawings • Project reports • Maximo	• System planning • Project delivery • O&M
Asset Operational Data	Flow monitoring data (flow, depth, velocity, stormwater pond level)	• InfoWater – Water Model • InfoSWMM – Sewer Model • SharePoint or J-Drive	• Understand system performance • System planning • Project delivery • O&M • Regulatory requirements • Regulatory and voluntary compliance • Facility inspections
	Equipment performance (pump on/off status, pump runtime, gate position, etc.)	• SCADA System Wonderware • BI Platform • SharePoint • SCADA Historian	
	• Fats, Oils, Grease (FOG) monitoring data • Backflow cross connection	SwiftComply	
	Spills, illicit discharges to MS4, illicit connections to stormwater or sewer	Maximo	• O&M • Regulatory requirements • Regulatory and voluntary compliance • System Planning
	Life-safety monitoring data (gas detection, monitor function, exposure detection)	• Hard Copy • Shared Drive • SharePoint	• Determine if facility is safe for maintenance crews to enter confined spaces • Protect employees • Instrument calibration
	• Water quality data (constituents in stormwater and/or creek, etc.) • Reservoir / pump station drinking water quality (chlorine, pH, temperature) • Distribution system drinking water quality (collected by SPU)	• SharePoint • Internal Drives • SCADA • Water Quality Reports from Seattle Public Utilities	• Regulatory requirements • System planning
	Rain gauge data	SCADA	System planning

Data Type	What Data is Collected	Information System Where the Data is Managed	Why the Data is Collected
Asset Maintenance Data	Work orders	Maximo	• Prioritization, execution, and documentation of maintenance activities • Asset performance and issues tracking • AMP preparation • Regulatory requirements • Maintenance analysis and project planning • CIP Project Planning
	Inspection and/or condition assessment data • Pipeline/MH condition rating • Water inspections (valves and fire hydrants) • Wastewater inspections (manhole) • Stormwater inspections (catch basins, water quality, and flow control facilities) • Wastewater pump stations checks • Water pump stations and reservoirs checks	• GIS collector is the interface used to collect inspection data. The inspection tables are stored in webGIS and Maximo • Granite Net • GIS Collector App • Project reports • Shared Drive • Hard copy book at each station	• AMP preparation/updates • System planning • Project delivery • O&M - Prioritization of maintenance activities • Stormwater – NPDES requirements • Asset operation and performance
Financial Data	Cost to operate and maintain asset	JD Edwards	• Budget development and tracking • System planning • Project delivery • Life-cycle cost tracking
	Project development cost	JD Edwards SharePoint Internal Drive	
Capital Projects	Project information (scope, schedule budget, contract documents, plans, reports)	• PRS • Internal Drives • SharePoint	Project and Contract Management
Customer Data	Customer name, location, meter information, billing, contact information, water usage,	• CIS and Itron	Process billing, contact customer, track issues and complaints, claims, relief program, new/terminate connections, meter changes

Table 8-2: Current Information Systems

Information System	Summary of Data Managed in Information System	Owner
Maximo	• Work order initiation, execution, closeout, and tracking • O&M timekeeping and reporting • Asset Numbers • Asset attribute data • Workload Annual Planning	Enterprise
ArcGIS	• Asset attribute data (location, physical parameters, etc.)	Enterprise
GraniteNet	• Pipe Condition Data and Reporting	Utilities
SwiftComply/XC2	• Backflow and FOG inspection software	Utilities
CIS Infinity	• Customer information data • Utilities Billing • Water Meters	Utilities
Amanda	• Development/redevelopment data, including permit management, billing, etc.	Enterprise
SharePoint	• Collaboration Tool • Data Repository	Enterprise
JD Edwards (JDE)	• Financial information management system	Finance - Enterprise
Hydraulic models for water/sewer (InfoWater Suite, InfoSWMM)	• Used to simulate performance of system and support system planning and project development	Utilities Engineering
Location Information System (LIS)	• Asset physical location by address	Information Systems
Blue Beam Studio	• Used to manage permit plans associated with development / redevelopment	Utilities License-Enterprise
MyBellevue App	• Service request portal for customers	Information Technology Department (ITD)
Voice Utility (IVR)	• Allows customers to pay bills by phone	Utilities
My Utility Bill (CIS Portal)	• Allows customers to pay bills online	Utilities
iTron Analytics and Collection Manager (SaaS)	• Manages automated meter reading data	Utilities
FCS	• Manages meter reads for billing	Utilities
Insight	• Project and budget performance reporting	Finance
The PLaCE	• Staff Management, Training, Appraisal, Performance, Individual Development Plan	Human Resources - Enterprise

8.2 Asset Hierarchy

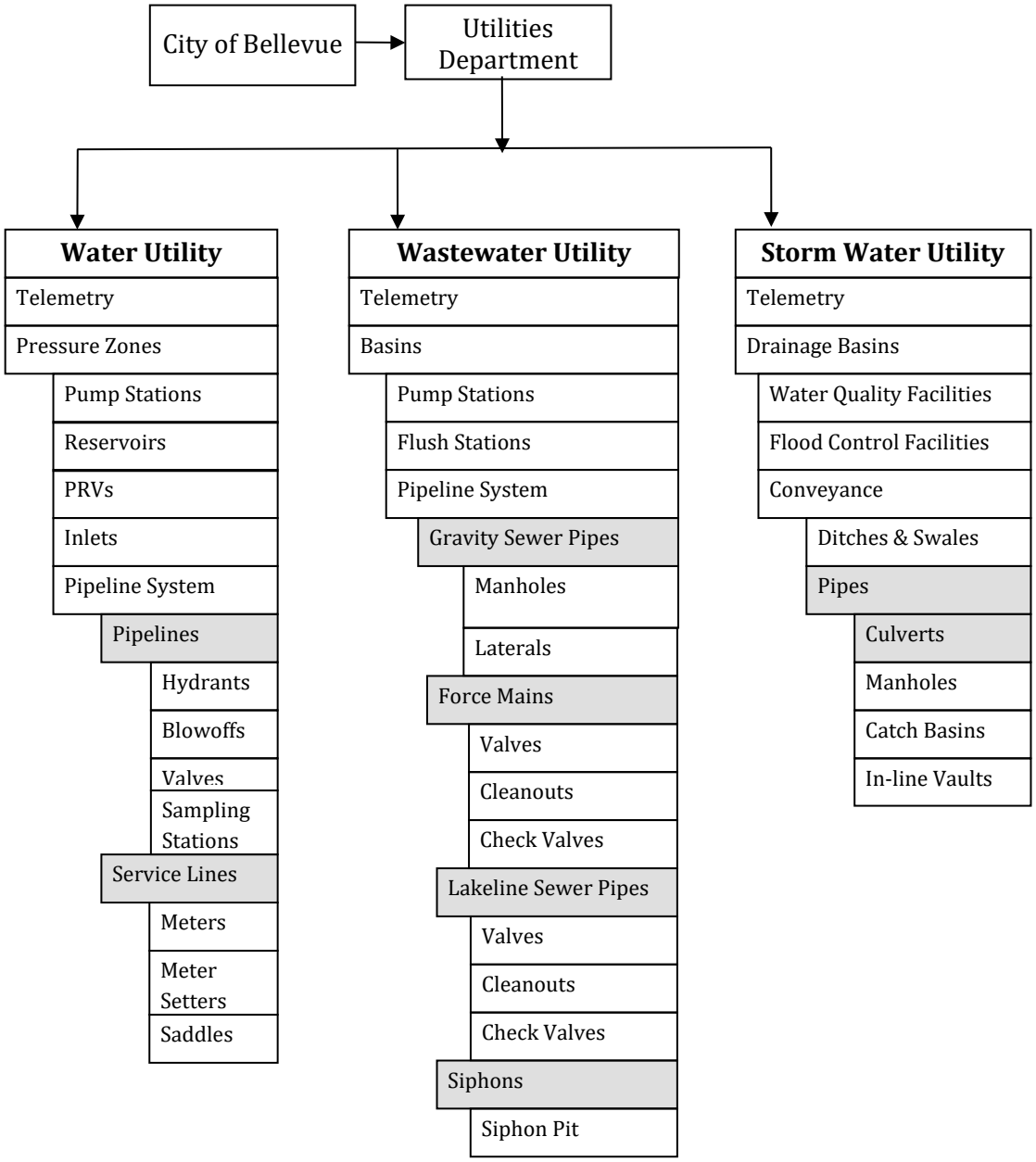
An asset hierarchy is a representation of the relationship between assets contained in the asset register arranged as a family tree (i.e., in a parent-child format). The asset hierarchy provides context and organization to the asset register. When organizing an asset hierarchy, data can always be aggregated to higher levels from the lower levels.

The key benefits of an asset hierarchy include:

- Ability to roll-up costs to higher levels in the hierarchy
- Ability to assess the impact of an asset failure on related assets
- Improved reporting capabilities (e.g., financial, performance, work order management)
- Improved decision making when data is captured at the appropriate level
- Consistency in identifying assets
- Ability to provide an overview of the system to assist in communication (staff training; stakeholder education)
- Ability to provide contractors and engineers a consistent protocol for supplying asset data to Utilities to be entered into the AMIS

Figure 8-1 depicts the partial Utilities asset management hierarchy, represented as parent-child relationship with examples.

Figure 8-1: Partial Utilities Asset Hierarchy



8.3 Technology Systems

Many infrastructure-intensive organizations have made significant investments in systems to manage asset information and capture data to assist in managing their assets with improved efficiency and performance. The procurement of software tools, coupled with the optimization of data capture and information analysis processes, can provide timely, accurate, and useful asset information. As an organization's asset management practices mature, the data to support asset management becomes more complex and often requires multiple software tools to realize the benefits of using asset information to inform business decisions.

New and emerging technologies enable access to asset knowledge and information that was previously unavailable or too difficult and time-consuming to mine from legacy systems. Additionally, new and emerging technology systems offer the potential to interface and integrate across software platforms to gain a more holistic view of the organization and to better leverage data to inform decision-making processes.

How different software tools are configured and integrated, coupled with the information processes implemented to ensure asset management objectives are supported, describes an asset management information system (AMIS). An AMIS can enable asset management practitioners to better manage asset data. However, a lack of standardized workflows and underutilization of software tools are common challenges for many organizations, including Utilities.

8.4 Decision Making Tools

As Utilities' asset management matures, additional decision-support software tools can help to achieve the vision of asset management. These tools will not replace Utilities' current systems, but can provide better access and analysis of existing data. These tools can help to mine the data in Utilities' existing systems and provide advanced algorithms for data analytics.

These decision-support tools may include systems that deliver lifecycle cost analysis, failure analytics, predictive maintenance trending, condition monitoring tools, risk determination and modeling tools, asset performance tracking, business case evaluations, and asset decay modeling. Table 8-3 provides additional information on these types of tools that Utilities should evaluate in the future.

Table 8-3: Decision Support Tools

Decision Support Application/Tool	Purpose	Benefit
Asset & Maintenance Management Assessment Tools	Quickly review an organizations alignment to asset management principles, capture where progress has been achieved and develop new improvement initiatives	Provides a quick assessment of asset management alignment and guidance for annual planning and AMP development.
Asset Condition & Performance Monitoring Systems	Stores and analyzes asset condition and performance on all types of assets. Ability to include static and real-time information.	Tracks asset condition and performance. Some tools also have the ability to estimate remaining useful life based on standardized criteria using condition and performance data.
Asset Lifecycle Cost / Decay Model	Determines the remaining asset life based on standardized decay models. Also incorporates asset installation, operation and maintenance data to calculate the asset lifecycle cost.	Provides a standard approach to determine remaining useful life of an asset based on existing data, along with the lifecycle cost for that asset.
Asset Replacement Model	Models calculated risk score of an asset based on its age and annualized maintenance spending	Optimizes capital replacement prioritization, including asset replacement schedule
Asset Risk Model	Increases the efficiency of data gathering and improves the detailed asset risk calculation, analysis, and prioritization.	Utilizes and analyzes existing data to provide a more robust and real-time risk scoring and prioritization method.
Business Case Evaluation Tool (could be part of a Project Management Information System)	Evaluates projects on the basis of capital and lifecycle costs	Optimizes the prioritization of projects utilizing existing data from other systems.
Capital Planning Tool (could be part of a Project Management Information System)	Provides systematic, objective way to identify the capital projects across multiple asset classes that provide the greatest value in addressing priority goals for the utility.	Helps to identify the highest priority projects that should be funded immediately as well as capital planning time frames. Ability to run multiple capital improvement scenarios to determine the long-term effect on budget, risk and service levels.
Enterprise Risk Analysis Tool	Assesses enterprise risk for an organization and tracks the risk in a centralized location.	Documents the enterprise risk associated with the operation of a utility
Preventative Maintenance Optimization Tool	Mines PM data to be able to easily view and effectively optimize PM tasks	Optimized PM work orders to remove unnecessary PMs and focus maintenance efforts on critical assets
Reliability Analytics Tool	Supports reliability functions such as failure analysis, Reliability Centered Maintenance (RCM), Failure Modes and Effects Analysis (FMEA), Failure Modes Effects and Criticality Analysis (FMECA); uses existing data from the CMMS to provide more detailed analytics.	Provides a more detailed analysis of existing maintenance and reliability data. Some tools can assist in implementing recommended changes from an RCM, FMEA, FMECA or similar type of analysis.

9 Asset Management Enablers

For asset management principles and practices to be successfully and sustainably ingrained in how Utilities does business, how its staff make decisions, and how they perform their day-to-day work, the purpose of asset management and its benefits must be understood and promoted. Further, asset management activities must be consistent and coordinated throughout Utilities. Staff must also have the knowledge, skills, and willingness to adopt new methods of executing their work. The organizational practices and frameworks that Utilities uses to support the adoption and effective implementation of asset management are the asset management enablers described in this section.

IMPROVEMENT INITIATIVE
P1 - AM Program Manager Role Clarification

IMPROVEMENT INITIATIVE
P4 - AM Roles & Responsibilities

IMPROVEMENT INITIATIVE
S5 - AM Definitions Establishment

9.1 Asset Management Governance

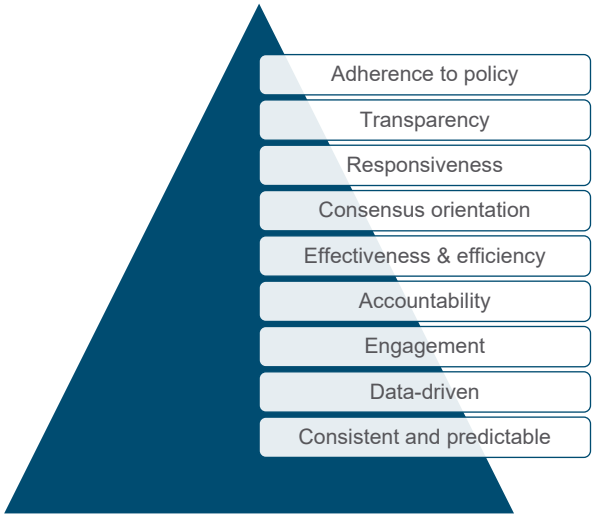
Asset management governance ensures that the roles and responsibilities for enterprise-wide asset management activities are clear and followed in a way that allows for continual improvement and articulates the roles and responsibilities of the teams and employees who are responsible for developing and sustaining asset management at Utilities. The key roles and responsibilities include:

IMPROVEMENT INITIATIVE
G1 - Asset Management Committee

- Updates to the asset management policy and procedures
- Continuously monitoring the proper implementation of asset management policy and procedures
- Keeping the SAMP and AMPs up to date
- Ensuring compliance with the Asset Management Policy, SAMP, AMPs and their principles
- Driving continuous improvement to Utilities' asset management capabilities in part by ensuring delivery of approved improvement initiatives

Figure 9-1 lists the characteristics of effective governance at Utilities.

Figure 9-1: Characteristics of Effective Governance



9.2 Asset Management Competencies

Effective and sustainable asset management requires ever-evolving organizational proficiency in a wide range of disciplines including engineering, finance, operations, maintenance, information systems, management, contracting, supply-chain management, and organizational development.

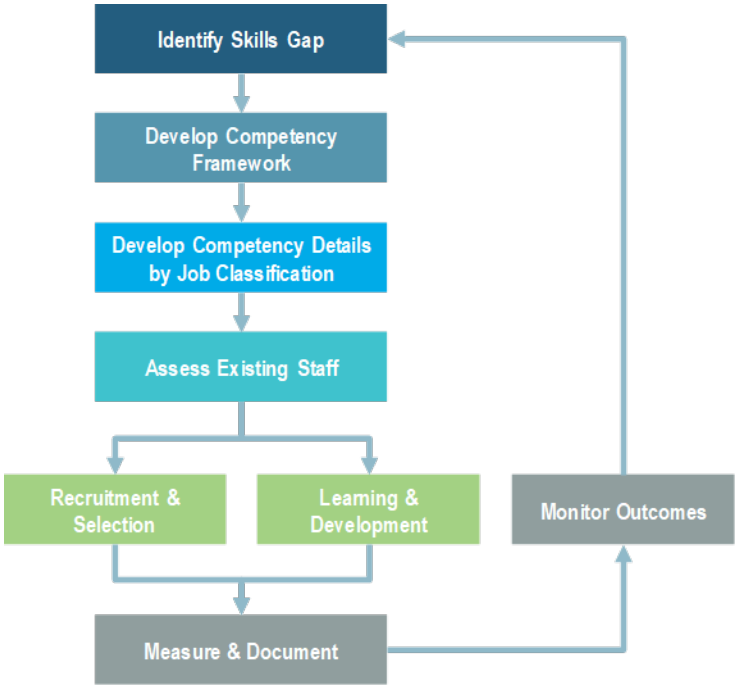
IMPROVEMENT INITIATIVE
P5 - Staffing Competencies

An asset management competency framework will clarify the capabilities that are required at all levels, so leadership can consistently define roles and responsibilities and select, develop, and review people appropriately and ensure that there is a systematic process for embedding the best asset management practices to deliver established service levels. The elements of a competency framework should include:

- A written description of what the people involved in the management of physical assets within Utilities should be able to do, in relation to asset management
- A methodical assessment process to determine the skills needed to effectively deliver asset management processes and practices
- A system for evaluating Utilities staff alignment to the competency framework, methods to resolve any skills gaps through recruitment or learning and development
- Effective feedback processes to ensure that management is aware of its success in achieving the competencies and the effectiveness of the competency framework in delivering organizational outcomes

Figure 9-2 illustrates a competency management system that Utilities can use to identify required asset management competencies at all levels to determine the proper learning and development tools to sustain them, and to ensure staff and management can deliver the services to customers. It is meant to ensure employees working in asset management are developed in accordance with the Utilities asset management strategy and objectives. A subset of this process is the competency framework discussed above.

Figure 9-2: Competency Management System



Common outcomes of an asset management competency framework include those listed in Table 9-1.

Table 9-1: Competency Framework Outcomes

Type	Components
Succession Planning	Progression: staff advance a level upon achieving competencies Apprenticeship program Mentorship program Knowledge transfer
Internal Training	Employee orientation On-the-job training On-the-job shadowing Group training (such as brown bag sessions) Self-paced training

Type	Components
External Training	Tuition reimbursement Licensing and certification programs College and university programs

9.3 Asset Management Learning and Development

Competence, grown through relevant learning and development activities, does not necessarily guarantee good performance. Good performance, however, is impossible without competence. To be successful with asset management, Utilities must ensure it has a sufficient number of suitably competent people who can undertake the asset management activities. Understanding the type and level of proficiencies that are essential to asset management within Utilities will enable leadership to design and commit to a resourcing strategy for ensuring the right number and type of employees are available at all times.

IMPROVEMENT INITIATIVE
P6 - Skills & Competencies

A key part of instilling and sustaining those capabilities at all levels of the organization is developing and maintaining a learning and development plan that is integral to the competency framework.

The City has an internal application for employees which is a one-stop-shop called “the PlaCE” (Performance, Learning, and Career for Employees). This application connects employees to a wealth of resources, upcoming trainings, city events and information. Every city employee has their own personal site that connects work goals, contributions, training, individual development plan for growth, and performance all in one place.

Utilities management and supervisors support staff to attend conferences, trainings and to network outside of our organization. Staff in the engineering and fiscal functions consists of many unique positions therefore training and development is based more on individual needs as it relates to the position. O&M has the most advanced approach for developing skills, knowledge and experience within the department. O&M has a more structured approach for training and developing staff. Every new staff member learns the necessary skills within each of the three utility sections using a training matrix. O&M revised a cross-training program allowing for a more robust program which builds resilience for emergency situations and provides efficiencies to share staff across utilities in the O&M division.

9.4 Asset Management Organizational Change Management

Asset management consists of a permanent and ongoing set of practices that needs to be ingrained into the normal work of staff at all levels of your organization. In this sense, asset management should not be viewed as an isolated initiative, but as an embedded way of doing business that requires altering your business processes along with active and ongoing collaboration among your staff.

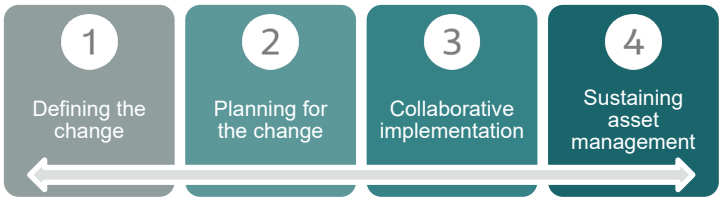
IMPROVEMENT INITIATIVE
P2 - AM Change Mgmt Strategy and Approach

In order to be effective the organization's approach to change management must:

- Engage staff at all levels
- Be actively supported by leadership
- Identify champions and early adopters

A successful transformation requires the Utilities leadership to be engaged, willing, and able to act as champions of organizational change. In addition, Utilities should adopt a change management framework to engage staff at all levels. A typical change management framework has four elements, as shown in Figure 9-3.

Figure 9-3: Elements of a Change Management Framework



In addition, asset management should not be viewed as a stand-alone initiative, but rather as an embedded way of doing business. In order to become mature with asset management, significant change will be required to some current processes, and resources will be required.

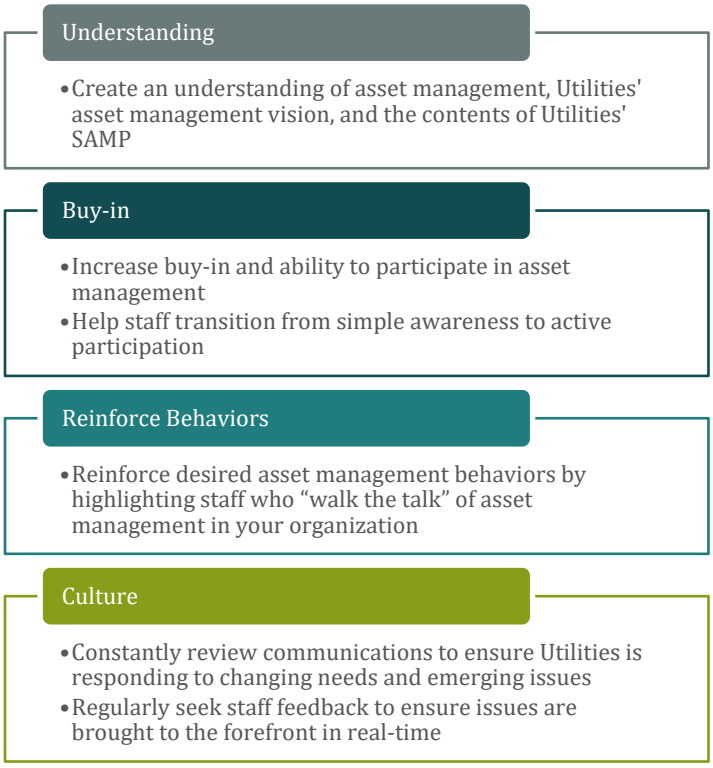
9.5 Asset Management Communications

Adopting asset management as a way of doing business requires changing familiar business processes. Utilities will need to design effective internal communications to foster the acceptance of these changes so that staff can become aware, willing, and capable of working in line with new asset management requirements. Communications with external stakeholders—including customers and the broader

IMPROVEMENT INITIATIVE
S2 - AM Communications

community—should also include concepts of asset management. For both internal and external communications, the dialogue must be two-way. Asset management communications should provide understanding and buy-in, and reinforce behaviors and culture, as shown in Figure 9-4.

Figure 9-4: Asset Management Communications



10 Framework for Continual Improvement

IMPROVEMENT INITIATIVE
G6 - Quality Management Procedures

Looking for opportunities to improve processes and practices is an attribute of all forward-looking organizations. Continual improvement is a basic precept of all management systems, including asset management. ISO 55001, in clause 10.3, states: "The organization shall continually improve the suitability, adequacy and effectiveness of its asset management and the asset management system" (3).

The overall goal of continual improvement efforts is to continually inspire and support internal efforts to identify and implement improves to service quality, effectiveness, efficiency, and the Utilities asset management practices.

This section of the SAMP describes the methods used by Utilities to understand how its current performance aligns with other infrastructure intensive organizations and how it will stay abreast of developments in the water sector.

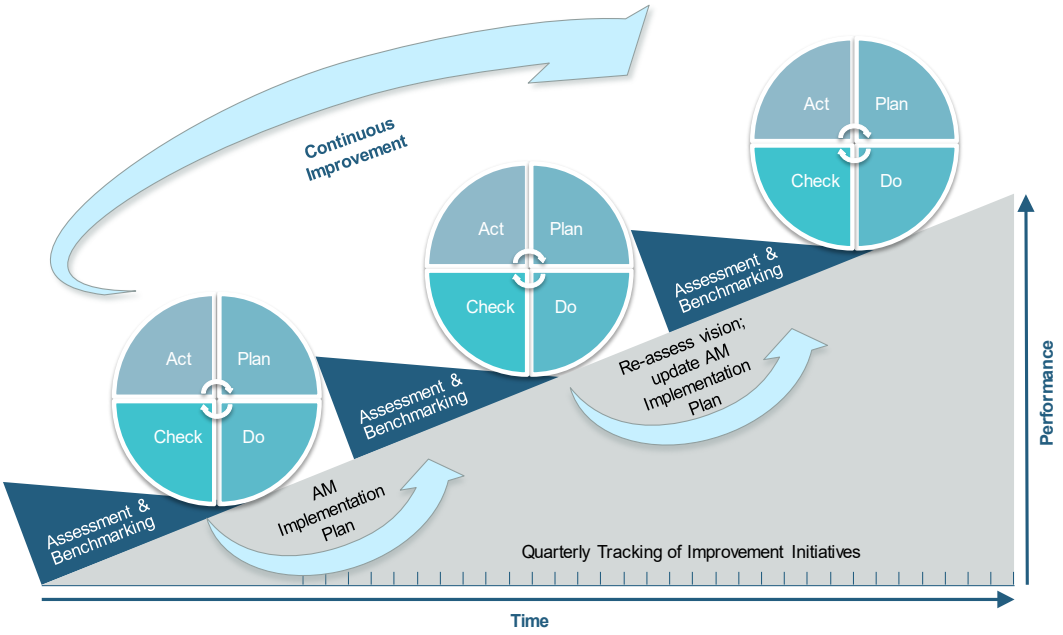
10.1 Asset Management Assessments

As illustrated in Figure 10-1, periodic asset management assessments and benchmarking are important steps in achieving continual improvement in an organization. These assessments typically use of one of several available tools to evaluate the maturity of the organization in various assets management categories. The categories vary from tool to tool. Asset management best practice involves updating the maturity assessment approximately every five years and re-assessing the implementation roadmap.

Utilities has conducted two asset management assessments:

- In 2015, Utilities conducted an asset management maturity assessment (13) that focused on the operations and maintenance (O&M) aspects of asset management. The assessment resulted in over 140 improvement initiatives, which were prioritized and organized into a roadmap. Over the past five years, some of these improvement initiatives have been implemented, others have been put on hold or de-prioritized.
- In 2020, as part of the project to prepare this SAMP, Bellevue Utilities completed an updated asset management maturity assessment (14). This assessment was department-wide, and was broken down in to seven focus areas, which included a total of 38 themes (specific areas of the asset management program that are assessed).

Figure 10-1: Role of Assessments and Benchmarking in Achieving Continual Improvement



10.2 Benchmarking

10.2.1 Types of Benchmarking

Several types of benchmarking can be used depending upon the needs and interests of the organization.

Metric benchmarking is a quantitative comparative assessment of organizational performance, normally expressed as ratios. Metric benchmarking can be external or internal.

- Internal metric benchmarking—comparing performance within Bellevue Utilities over time—can yield benefits by identifying where improvement is continual, stagnant, or deteriorating.
- External metric benchmarking—comparing Bellevue Utilities to similar organizations—is widely used to establish an organization's relative effectiveness and efficiency within a business sector. External metric benchmarking should be used with the caveat that organizations operate within different operating conditions (such as differences in service area density, topography, climate, water resources, treatment processes, permit conditions, and political governance), which may cause external metric benchmarking to result in ambiguous conclusions. Nevertheless, if carefully and deliberately employed, metric benchmarking can be a useful starting point in identifying specific areas and activities in an organization to be targeted for further evaluation.

Process benchmarking compares how an organization performs a process or activity, typically with another organization that is recognized for performing the process or activity in a highly effective and efficient manner. Process benchmarking can be time consuming. It takes dedicated personnel from the organization looking to improve and the organization that is willing to share its optimized process. Process benchmarking may involve site visits and mapping of both the as-is process and the to-be process. With appropriate resourcing and commitment, process benchmarking can be valuable in an organization's basket of continual improvement approaches.

10.2.2 Benchmarking at Utilities

Utilities participates in benchmarking surveys from multiple agencies, covering a variety of general topics related to Utility Engineering, Financial, Planning, and Operations. Information from these surveys is used to inform leadership decision making regarding operations, procedures, and policy. In addition, Utilities staff conduct ad-hoc surveys as needed of local/regional jurisdictions to help inform decisions regarding specific issues as they arise.

Utilities views benchmarking as a useful tool to help ensure that services provided are of consistently high quality and that they remain among the leaders in the industry. Some of the organizations Utilities uses for benchmarking include:

- APWA – American Public Works Association
- WRF – Water Research Foundation
- AMWA – Association of Metropolitan Water Agencies - INSIGHT Survey
- AWC – Association of Washington Cities - TUFS Utility Survey
- AWWA – American Water Works Association - National Water Rate Survey, and Performance Management
- MLGW – Memphis Light, Gas and Water - Annual Utility Bill Comparison
- MRSC – Municipal Research and Services Center - Utility Staffing Levels and Reserve Accounts

10.3 American Public Works Association Accreditation

Utilities, first accredited with the American Public Works Association in 2004, was reaccredited for the fourth time in 2019. Utilities Director Nav Otal said,

> "We are pleased that we have again been reaccredited by the APWA. It's confirmation that we are not only effectively delivering daily essential services to all residents of Bellevue but meeting our mission to support public health and safety, quality neighborhoods and a healthy and sustainable environment and economy."

Reaccreditation means the department has met all applicable accreditation documentation and practices over time. The purpose of the accreditation program is to provide a means of formally verifying and recognizing public works agencies for compliance with the recommended practices set forth in the Public Works Management Practices Manual. It is a voluntary, self-motivated approach to objectively evaluate, verify, and recognize compliance with the recommended management practices.

The objectives of the accreditation program are to:

- Create impetus for organization self-improvement and stimulate general raising of standards
- Offer a voluntary evaluation and education program rather than government regulated activity
- Recognize good performance and provide motivation to maintain and improve performance
- Improve public works performance and the provision of services
- Increase professionalism
- Instill pride among agency staff, elected officials, and the local community

10.4 Industry Engagement and Networking

Many organizations are willing to share their asset management discoveries, results, and lessons learned with others on a similar journey. In addition, there are many international, national, and regional non-profit (and some for-profit) organizations with a mission to assist infrastructure intensive organizations similar to Bellevue Utilities on the journey to asset management maturity.

Following is a list of organizations, most of which have remote or in-person conferences as well as training sessions that provide and networking opportunities.

Institute of Asset Management. The IAM is the international professional body for asset management professionals. The IAM develops asset management knowledge and best practice and generates awareness of the benefits of the asset management discipline for the individual, organizations, and wider society. Established in 1994, the IAM currently has over 2,700 members and a network of over 30,000 people globally. The IAM is a not-for-profit, professional body.

IAM's Two-minute asset management Overview Video

IAM's Nine-minute asset management Overview Video

American Public Works Association

Guide to Successful Asset Management System Development

Federation of Canadian Municipalities

Asset Management Resources

Four-minute video: Why Invest in Asset Management?

ReliabilityWeb. A website and organization focused on the delivery of informational articles, videos, audio podcasts, case studies, presentation tutorials, web workshops, benchmark data, tips, and how-to information for maintenance reliability leaders and asset management professionals.

ReliabilityWeb.com® Publishes Uptime® Magazine

Society of Maintenance and Reliability Professionals. SMRP is a nonprofit professional organization providing educational opportunities, networking events and resources for maintenance, reliability and physical asset management.

Global Forum on Maintenance and Asset Management. GFMAM is a non-profit international organization founded to promote and develop the maintenance and asset management professions by collaborating on knowledge, standards and practices. It is an organization of other asset management organizations and it is the author of the Asset Management Landscape and competency specification, which outlines the 39 subject areas (facets) of asset management.

Association of Asset Management Professionals. AMP, formerly the Association for Maintenance Professionals, has a mission to create a new era for the practice of maintenance, reliability in the context of asset management for organizations to enhance the delivery for the triple bottom line of economic prosperity, environmental sustainability and social responsibility.

ISO55000 – Asset Management TC251. The International Organization for Standardization (ISO) is an organization that develops and publishes international standards for numerous products and services. ISO 55000:2014 provides an overview of asset management, its principles, and the expected benefits from adopting asset management.

Brief paper: Managing Assets in the Context of Asset Management

10.5 Innovation

Common goals of innovation programs include:

- Reduce costs and improve efficiencies and overall performance
- Harness and empower staff and team creativity
- Develop a culture of positive performance and attitude

Asset management best practices provide several key points in the asset lifecycle during which there are significant opportunities for innovation. These are described below along with the innovation potential.

Asset Risk Identification, Analysis, and Treatment. During risk workshops (which typically occur as AMPs are developed), teams discuss and learn about high risk assets based on scoring of asset likelihood of failure (LoF) and consequence of failure (CoF). These discussions regarding the absolute and relative scoring of each asset brings new information to light and new ideas emerge with understanding of the roles of likelihood and consequence. For example, maintenance personnel often focus primarily on reduction in likelihood of failure, but this is only one part of the risk equation. Innovative ideas for reducing risk score can emerge when staff consider opportunities for reduction in the consequence of failure score. In addition, risk workshops are most often conducted with a cross section of employees from different functional groups. New ideas emerge when staff with different perspectives on the asset lifecycle discuss potential opportunities.

Business Case Analysis. During cross functional team workshops for business case analyses, the work of defining the problem becomes an opportunity to see challenges from different perspectives and new innovative solutions can emerge. In addition, when a deliberate and disciplined process of "solutions searching" is facilitated, participants begin to offer ideas they might not otherwise feel comfortable suggesting.

Also, the BCA discipline of considering lifecycle cost estimates rather than capital estimates only, provides an opportunity to discuss and see benefits and costs from a broader perspective and new innovative ideas emerge. And the incorporation of the non-financial considerations (such as public trust, community impact, health and safety, etc.) brings rise to potential new and otherwise un-explored ways to meet customer and community desires.

Project Delivery. Project managers and designers, upon obtaining a full understanding of the importance of the entire asset lifecycle, introduce lifecycle considerations into all phases of the project lifecycle, including important opportunities to impact the O&M phase during preliminary and final engineering. In addition, there are innovation opportunities during analysis of various contracting approaches.

When O&M personnel are engaged during project planning, design, and construction they can raise efficiency, maintainability, operability, and safety opportunities and solutions.

Recognition Program. Recognition and reinforcement are fundamental to the development of any innovative culture and sustaining its benefits. The purpose of the recognition program is to motivate, recognize, and reward, both Utilities staff who submit good ideas and the recipients of good ideas who help perform the evaluation and assessment. Utilities is committed to inspiring and capitalizing on technical, operational, and process innovations that can help the organization become more effective in attaining its business objectives, and asset management provides important opportunities for innovation.

10.5.1 Innovation at Utilities

Utilities encourages and rewards ideas and solutions, with Innovation identified as one of the department's core values. Utilities has an informal Innovation Program that allows employees to submit innovative ideas, or to address emergent needs not identified during the normal budget development process. When an innovative idea arises, or a need is identified, a request is submitted to BUD to provide funding to complete the proposed work. Following are some of the criteria used by BUD when evaluating requests:

Evaluation Criteria:

IMPACT	Impact on City of Bellevue employees Number of employees affected
PEOPLE	Benefit to customers
STEWARDSHIP	Environmental impact
SUSTAINABILITY	Long-term sustainability
ALIGNMENT	Alignment with Utilities Strategic Plan Alignment with Utilities Diversity Strategic Plan Alignment with high-performing organization principles Alignment with Strategic Asset Management Plan "New"
CREATIVITY	Level of innovation/ creativity Thinking outside the box

11 Asset Management Implementation Plan

The work of developing the Utilities Asset Management Implementation Plan consisted of defining the current asset management state and maturity level, defining the desired state, identifying potential Improvement Initiatives (IIs) to improve maturity, and developing the plan to move from the current to the desired state. This plan provides the general benefits of asset management, the Utilities asset management current and desired state, and the asset management journey ahead. It provides the IIs required for achieving the desired state, along with the sequencing, pacing, agile delivery, schedule, and resources. The plan also provides important processes for measuring progress and next steps.

IMPROVEMENT INITIATIVE
S1 - AM Implementation Plan Management

11.1 Asset Management Benefits

Asset management will enable Utilities to optimize value realized from assets in the achievement of its organizational objectives. The benefits of asset management include, but are not limited to the following:

- Improved return on investments and reduced costs, while preserving asset value and improving financial performance
- Better informed asset investment decisions, which will enable Utilities to effectively balance costs, risks, and performance
- Effective management of risk, which will result in reduced financial losses, improved health and safety, positive good will and reputation, minimized environmental and social impact; and can result in reduced liabilities such as insurance premiums, fines, and penalties
- Improved services and outputs based on clarity of customer, community, and public expectations and targeted investments (capital as well as operations and maintenance) to ensure achievement of desired performance
- Enhanced public confidence and reputation based on demonstrating risk management as well as focused and prioritized investments
- Demonstrated regulatory compliance, social responsibility, and organizational sustainability based on clarity of desired outcomes and performance reporting
- Improved efficiency and effectiveness based on review and improvement of processes and procedures

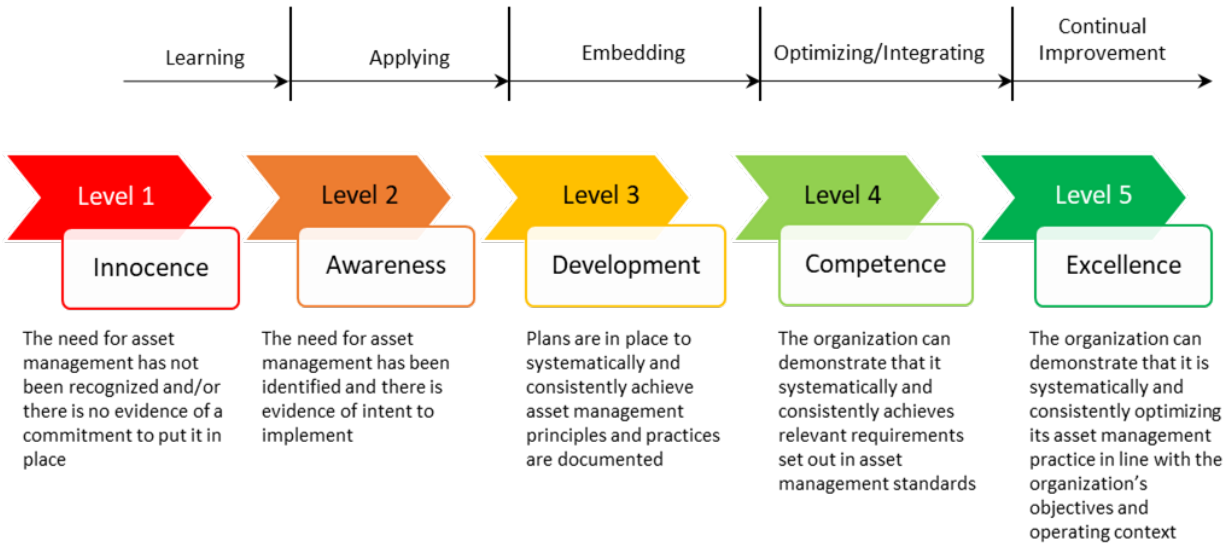
11.2 Utilities Current Asset Management State

The Jacobs Comprehensive Asset Management Review and Assessment (CAMRA) tool was used to conduct a current-state asset management assessment. CAMRA focuses on asset management practices, not assets. It is workshop-based with the objective to capture a single maturity level score by consensus of workshop participants for each of 38 asset management themes.

The CAMRA workshop was conducted remotely on August 26 and September 2, 2020. There were 16 participants from Utilities. Attendees consisted of representatives from leadership, management, and staff from each division. The names of the Utilities participants, the CAMRA Workshop Materials, and the detailed results are provided in the Utilities Strategic Asset Management Plan and Assessment technical memo provided by Jacobs.

Asset Management maturity is ranked on a five-point Asset Management Maturity Scale as shown in Figure 11-1.

Figure 11-1: Asset Management Maturity Scale



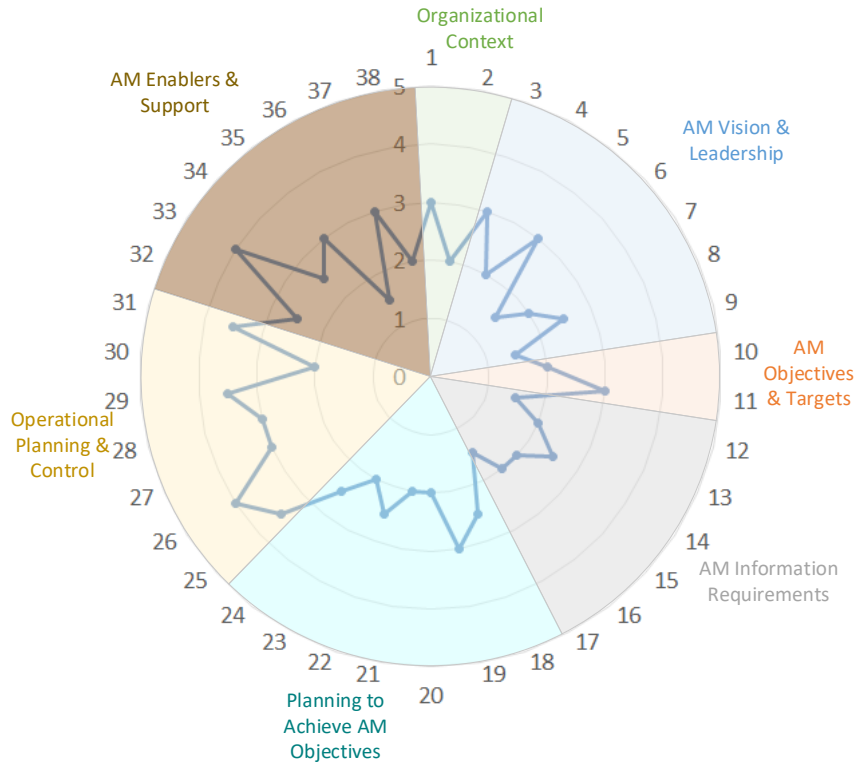
Utilities' current maturity level over the 38 themes ranged from 1.5 (scored on 5 themes) to 4 (scored on 2 themes). The 38 themes are grouped into seven key focus areas listed in Table 11-1. Figure 11-2 provides the Utilities current maturity level for each of the 38 themes.

Table 11-1: Maturity Level Key Focus Areas and Themes

Key Focus Area		Theme	
1	Organizational Context	1	Organizational Strategic Plan and Organizational Objectives
		2	Understanding the Needs of Stakeholders
2	Asset Management Vision and Leadership	3	Asset Management Policy
		4	Asset Management Strategy / Strategic Asset Management Plan
		5	Asset Management Leadership and Governance
		6	Asset Management Roles and Responsibilities
		7	Prioritized Plan for the Development of Asset Management Business Processes and Procedures
		8	Prioritized Plan for the Development of Asset Management Skills and Competences
		9	Prioritized Plan for Information Technology Functional Requirements
3	Asset Management Objectives and Targets	10	Asset Management Objectives – Performance Metrics
		11	Future Trends
4	Asset Management Information Requirements	12	Asset Information Strategy and Asset Information Improvement Plan
		13	Asset Information Standards
		14	Asset Inventory
		15	Asset Attributes, Cost, and Failure Data
		16	Information Management
		17	Asset Knowledge / Analysis of Data
5	Planning to Achieve Asset Management Objectives	18	Asset Strategies
		19	Long-Term Renewals Planning
		20	Risk Framework – Strategic Level
		21	Risk Framework – Asset Level
		22	Optimized Asset Intervention Planning
		23	Asset Management Plans
		24	Capital Investment Plan Development and Governance

Key Focus Area		Theme	
6	Operational Planning and Control	25	Capital Projects – Planning, Design, Construction and Commissioning
		26	Operations Management
		27	Maintenance Management
		28	Investigation and Recording of Routine Asset Failures and Reactive Work
		29	Contracted Operations and Maintenance
		30	Materials Management
		31	Emergency Preparedness and Response
7	Asset Management Enablers and Support	32	Investigation of Major Asset Failures and Incidents
		33	Shutdown and Outage Management
		34	Control of Documented Information
		35	Knowledge Retention and Succession Planning
		36	Asset Management Quality Assurance and Management Review
		37	Continual Improvement Culture
		38	Communication and Change Management

Figure 11-2: Utilities Maturity Level



Jacobs' general observations and conclusions based on the CAMRA workshops, along with a review of written materials and reports, the SAMP workshops, and other conversations, are provided below. Specific findings are provided in the Utilities Strategic Asset Management Plan and Assessment technical memo.

- There is a need to continue educating staff and management on the benefits of asset management, and how—in many cases—it is part of the work currently done, though perhaps not at a best-practice level. In general, staff tended to see asset management as something external from the work they do on a daily basis. Bellevue Utilities is already doing asset management, and this assessment and the implementation plan in the SAMP are focused on modifying and improving how Utilities currently conducts ongoing work, rather than just adding new processes and requirements.
- Several "foundational" improvement needs emerged during the assessment, including development of several frameworks to guide further implementation—one for service levels, and one for risk management. These frameworks should be established prior to engaging in the important work of making improvements in these areas.
- There is need to improve data quality and completeness as well as the need to use data for decision-making. This includes considerations regarding performance indicators and consistency in use of systems and data across functional areas.
- The need to re-consider Utilities' maintenance management information system (MMIS) emerged as a very important. Maximo's current MMIS configuration and governance pose significant challenges to maximizing the use of the program and addressing other asset management challenges. Bellevue Utilities needs to identify the functional and technical requirements of the MMIS (and other related systems), decide which platforms to use, configure the software, document and establish processes for using the software, and train staff and hold them accountable.
- Utilities is eager to make improvements to how work is conducted and decisions are made. Staff are innovative, creative, and have many ideas for how to improve processes. As a result, there are many improvement initiatives (both new ones identified through this effort and existing ones). It is important to prioritize these improvement initiatives to achieve the best results, deliver the overall implementation plan consistent with change management principles and best practice, and "projectize" many of the improvement initiatives. Projectize means assigning a lead or project manager, identifying a delivery team, and developing a scope, schedule, and budget, that is then tracked.

11.3 Business Case for Asset Management

Some benefits of asset management can be directly measured and quantified, such as the reduction in maintenance costs based on transitioning from a reactive to a proactive maintenance approach. However, many organizations (including Utilities) do not have adequate asset life cycle data to quantify the base case. In a similar manner, reduction in capital expenditure can also be an outcome of asset management. However, because many organizations (including Utilities) are faced with aging infrastructure and a need to ramp up infrastructure investments, it becomes difficult to measure a lower cost lifecycle solution if another investment filled in the gap. In addition, although many asset management financial benefits may be realized in the short-term, savings in the asset lifecycle may not be delivered for many years.

Many asset management benefits are important, but difficult to quantify in dollars. These include benefits associated with risk management, asset reliability, safety, system resiliency, standardization, communication with stakeholders, knowledge management, employee satisfaction, and public trust.

While few organizations go to the effort to generate objective cost benefit metrics for asset management implementation (primarily due to the difficulty of establishing a robust baseline), Jacobs has experience with organizations where reductions in operations and maintenance of 20-40% have been documented, where there has been a return on investment of $8 for every $1 spent on an asset management program, where there was a 31% reduction in reactive maintenance, where overtime was reduced by 17%, where there was a reduction of 36% in reportable accidents, where there was a reduction of 15% ($150 million) in the six-year capital program, and where rate increases were reduced over earlier projections.

The Institute of Asset Management has researched several case studies and concluded that:

> "… improving asset management capability can deliver savings up to 8% from the total cost of operations for a business over a minimum 5-year period."

These benefits are attributed to:

- Better alignment
- Enhanced processes
- Enhanced asset information to plan interventions during lifecycle decision making

11.4 Utilities Desired Asset Management State

11.4.1 Asset Management Vision

The Utilities Asset Management Vision Statement is:

> We strive to become a leader in infrastructure management by optimizing performance, risk, and life cycle costs for the wellbeing of our communities.

Utilities believes that the vision can be achieved through effective asset management governance, adequate resources, and willingness of staff and management to adopt and implement the best practices of asset management.

11.4.2 Asset Management Attributes

In order to more fully "sketch the picture" of Utilities' asset management desired state, a set of asset management attributes should be created to help illustrate what it will "feel" like to staff once asset management is fully operationalized. The statements below are generic and can provide ideas and a starting point for the attributes. The Utilities specific attributes should be developed with staff and management (perhaps in small focus groups) to help make sure they are meaningful and effectively relate to staff day-to-day activities. Once these are developed, they can be used to communicate with staff and engage them in a conversation regarding the principles and objectives of asset management.

IMPROVEMENT INITIATIVE
S3 - AM Attributes

- Asset management policy, objectives, and governance are embedded into the organization.
- Each employee understands their own and others' roles in the organization and how their roles relate to business objectives.
- Employees understand the concepts and principles of asset and risk management and how asset management applies to their job.
- Asset and system reliability expectations are documented, and appropriate investments are made to achieve reliability.
- Maintenance strategies have been developed and documented based on asset management principles; activities are conducted based on these strategies.
- Asset emergencies are tracked, and there is understanding of how asset failures and other incidents impact the ability to achieve service levels.
- Structures and frameworks are in place to support effective, efficient, deliberate, and transparent decision-making.
- Decisions are justified, documented, and made in a collaborative manner.

- Maintenance staff, engineers, and planners have good information about asset risk (including likelihood of failure and consequence of failure) and how risk may change in the future.
- Outcomes of decisions (including assumed benefits) are tracked and made available for future decision-making.
- Employees are accountable.
- Work processes are documented, and roles and responsibilities are clear.
- Effective data systems and core business software tools are in place to capture, store, and provide the data and analysis needed to make informed decisions.
- Workforce performance and skills are aligned to organizational needs.
- Employees are willing and able to cooperate across levels and functions to address identified performance issues.

11.4.3 Asset Management Policy Statement

The Utilities Asset Management Policy is intended to inform organizational processes that link the work of O&M, capital project planning and delivery, and utility financial management. As a result, staff are empowered through the use of reliable data, using systems and processes to determine the most effective and efficient means for delivering infrastructure related services while controlling exposure to risk and loss.

Utilities' Asset Management Policy Statement:

> This policy applies to all Utilities owned infrastructure and related services, such as delivering high quality reliable drinking water, wastewater conveyance, and storm and surface water infrastructure services. City assets support many services and require significant resources over their lifecycles to continue to deliver those services effectively. Asset management is a management strategy used to optimize performance, risk, and cost of these assets. Bellevue Utilities is committed to implementing the principles and objectives of Asset Management (AM) as a core component in managing the Utilities infrastructure, facilities, equipment, and related assets to achieve the Department's priorities

11.4.4 Asset Management Principles

As stated in the Utilities Asset Management Policy, the Utilities Asset Management Principles are as follows:

- Adopt a lifecycle approach to managing infrastructure assets to include planning, acquisition, operation, maintenance, renewal, and disposal
- Balance cost, risk, and performance of assets

- Place a high priority on environmental and financial sustainability, while meeting desired levels of service
- Endorse evidence-based decisions utilizing robust software systems to manage and analyze information
- Achieve organization priorities and objectives through continuous improvement

11.4.5 Asset Management Objectives

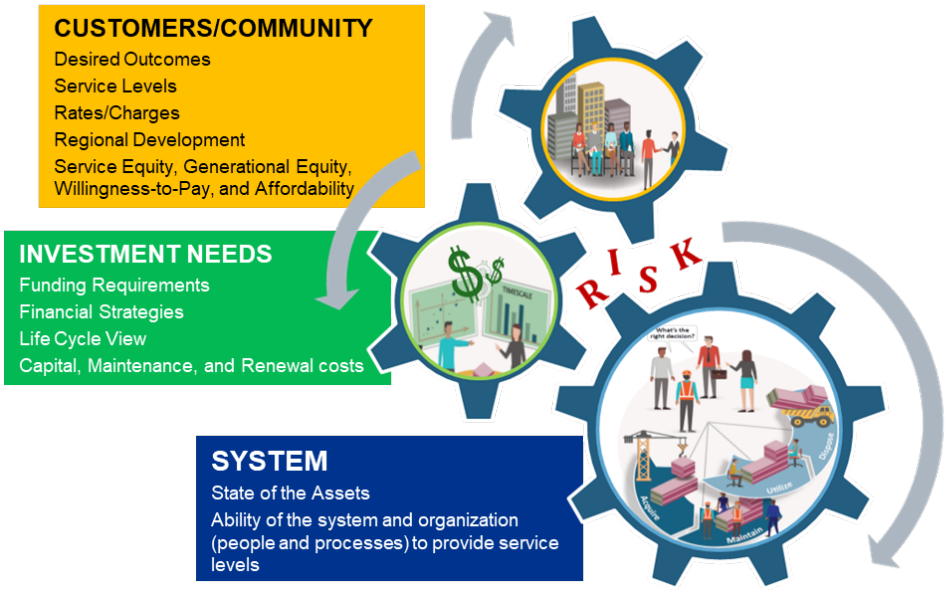
Asset Management Objectives describe what Utilities desires as outcomes from adopting and implementing asset management, and from complying with the Asset Management Principles.

As stated in the Utilities Asset Management Policy, the Utilities Asset Management Objectives are as follows:

- Develop a sustainable approach to manage asset information and systems
- Build and maintain strong partnerships and communication for effective program implementation
- Develop strategies for capital investment planning and replacement programs
- Develop strategies for operations and maintenance activities and programs
- Create sustainable short- and long-term financial strategies
- For each utility (water, sewer, storm):
    - Define levels of service that are achievable at a low lifecycle cost
    - Identify critical assets needed for sustained performance
    - Define and maintain a risk tolerance level and procedure

11.4.6 Ultimate Goal of Asset Management

As discussed in Section 5, when asset management is implemented at public-sector, asset-intensive organizations, these organizations become capable of balancing three primary imperatives: 1) understanding and achieving community desires, 2) delivering services while managing risk within the existing infrastructure and system configuration, and 3) investing as required to continue to deliver services to meet community needs. Best-in-class asset management organizations have the people, processes, and tools that work together in a coordinated way to create balance among those three imperatives.



11.4.7 Service Level Achievement

As discussed in Section 6, when service level objectives have been established with clear performance indicator targets, they provide an important "desired state" for asset management. They create a target for operations and maintenance strategies, renewal and rehabilitation plans, and infrastructure improvements. Service levels are based on an understanding of customer, community, and public desires (regarding costs and services); therefore, they provide important targets that when achieved, provide confidence that Utilities has balanced the desires of the public with the investments in infrastructure. This signifies a successful outcome for asset management at Utilities.

11.4.8 Asset Lifecycle

An important "desired state" of asset management is to pay due consideration to the whole asset lifecycle (see Figure 11-3 – Figure 11-5). There are several reasons for this, as follows:

- Risks are introduced at each stage of the asset lifecycle. Often, these risks are not well understood. Risk events or asset failures occurring during one stage of the asset lifecycle may not be fully realized until a future stage. Unless there is a full understanding of the

Figure 11-3 Asset Lifecycle

importance of each state of the lifecycle, it is difficult to avoid or treat risks.

  - One example of this is capital project decision-making. If asset lifecycle costs, benefits, and risks are not appreciated at the time of initial project scoping, then hidden costs may materialize during the later stages of the asset lifecycle.

- While the actual amount varies depending on the type of assets and other considerations, it is estimated that 60-80% of total asset lifecycle cost is expended after construction.
  - For example, the actual cost of maintenance, operations, renewal, and salvage is largely dependent on how the asset is designed, built, and installed. Cost-cutting measures during the asset planning, design, and construction state (such as low-cost, unreliable components) cause higher failures and increases the costs incurred post-construction.
- Opportunities to optimize the total cost of asset ownership are greatest during the initial stages of the asset lifecycle.
  - For example, care taken during asset design to minimize maintenance requirements, reduce risk, or improve safety can pay off with decades of lower-cost maintenance and operations. Also, modifications made during or following construction are much costlier than those initially planned or designed.

Figure 11-4: Total Cost of Ownership

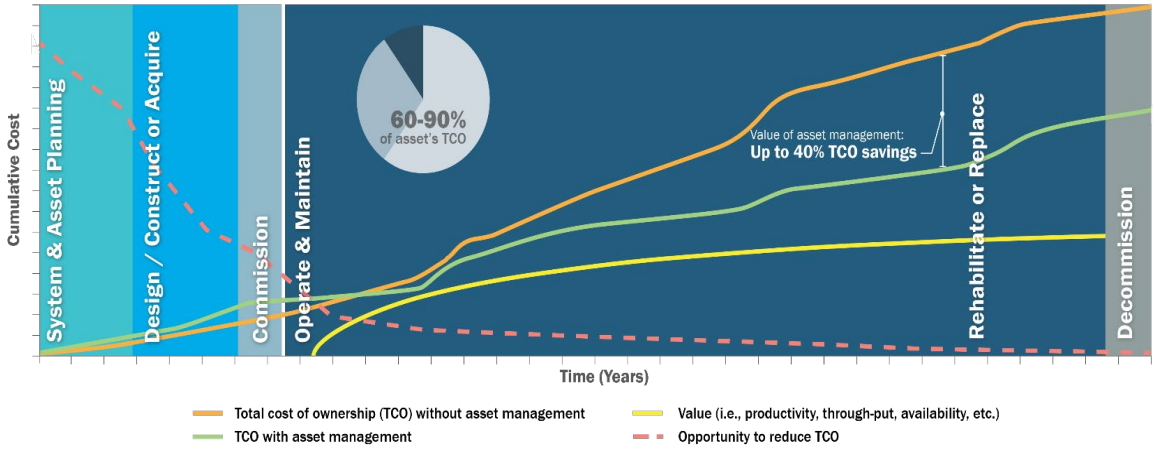
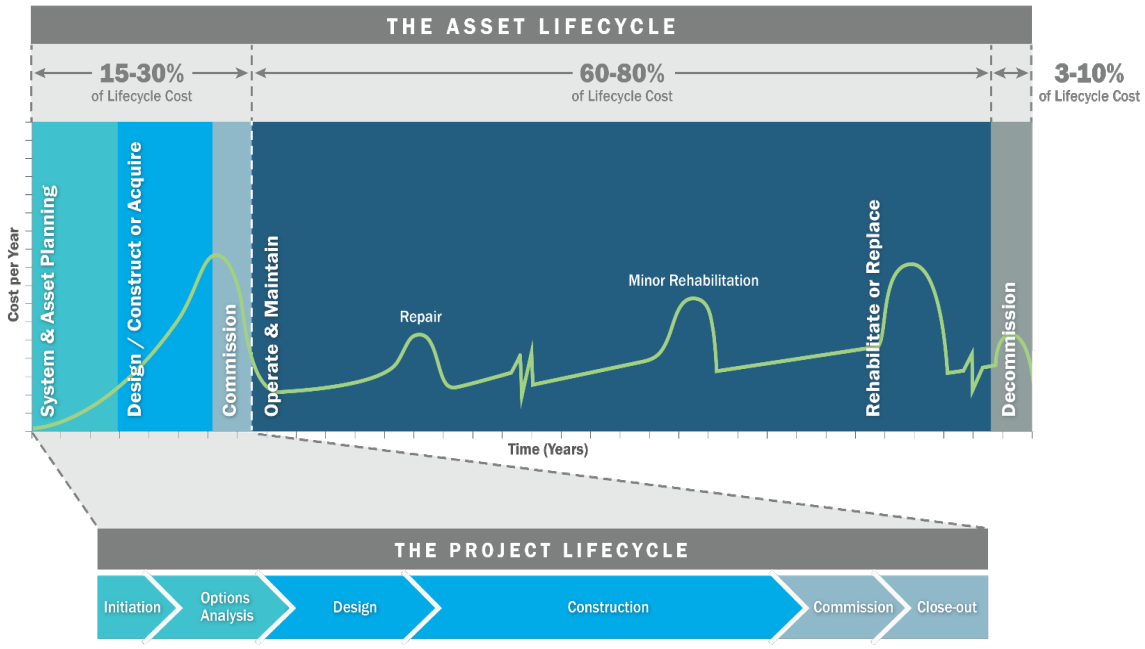


Figure 11-5: Asset and Project Lifecycles



11.4.9 Risk Management

While it is not always wise to strive for maximum risk reduction (costs may be prohibitive), effective risk management is an important "desired state" of asset management. Risk management is defined as:

> "A coordinated set of activities and methods that is used to direct an organization and control the many risks that can affect its ability to achieve its objectives."

Risks are defined as:

> "Effect of uncertainty on objectives."

Risk management is foundational to asset management for several reasons. Effective risk management will minimize surprises and losses, create meaningful linkages between investments and performance, and inform business decision-making. Risk management must occur at all stages of the asset lifecycle. Because it centers on timely and right-sized interventions to ensure delivery of service levels, risk management will demonstrably improve the ability of Utilities to meet its objectives. Risk management is further discussed in Section 3.4.

11.4.10 Utilities Asset Management Desired Maturity Level

During the CAMRA workshop, Utilities also identified desired maturity level targets for the short-, medium-, and long-term timeframes. These timeframes are defined as:

Short-term = 1-2 years (achieve by the end of 2022)

Medium-term = 3-4 years (achieve by the end of 2024)

Long-term = 5-6 years (achieve by the end of 2026)

Figure 11-6, Figure 11-7, and Figure 11-8 show target future maturity levels.

Figure 11-6: Short-Term Maturity Level Targets

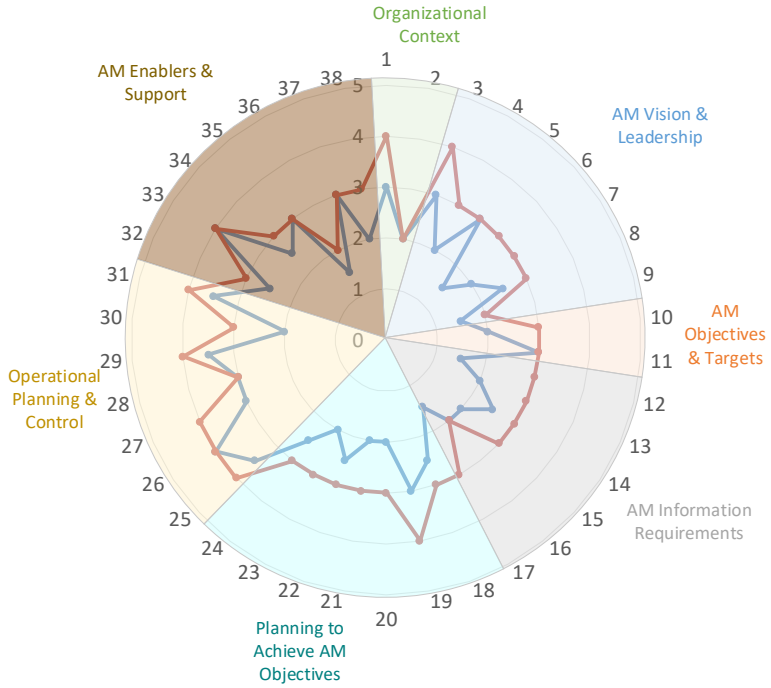


Figure 11-7: Medium-Term Maturity Level Targets

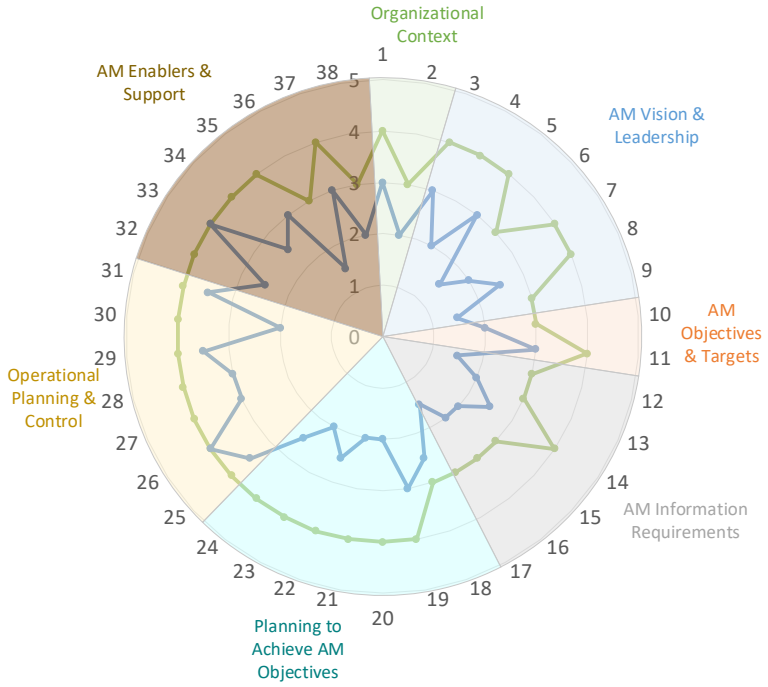
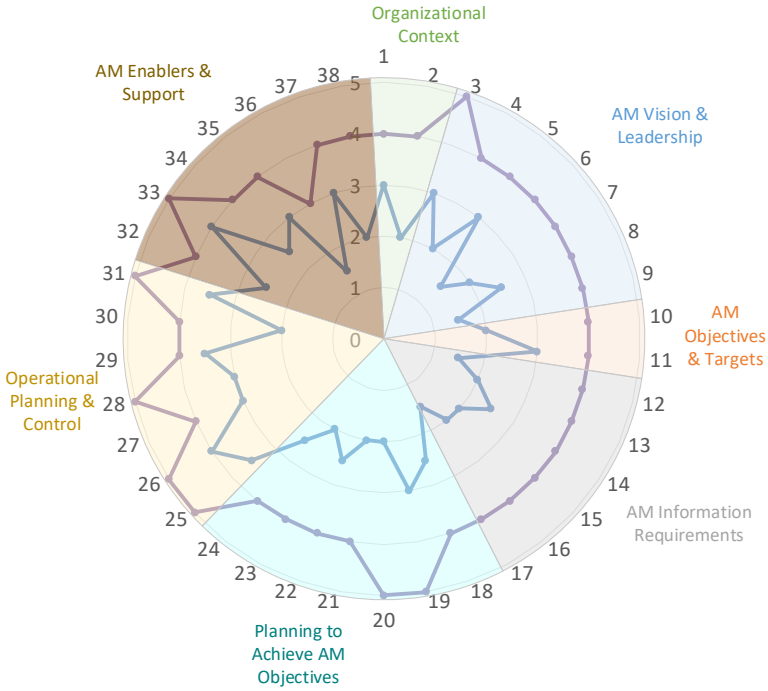


Figure 11-8: Long-Term Maturity Level Targets



11.5 Asset Management Journey

Utilities intends to make meaningful progress toward its vision of being a leader in infrastructure management. Utilities understands that its desired state of asset management is a moving target and that asset management is best viewed as a journey, not a destination. With that understanding, Utilities has developed plans to achieve its desired state of asset management in ten to fifteen years. This is reasonable and can be achieved with clear expectations, focus on human resources and change management, leadership engagement and resolve, and acknowledgement that the target will change with time due to external influences. Thus, the desired state must be one of continuous improvement. The greatest clarity of needs is provided by the IIs required in the upcoming five years.

In addition, Utilities will not achieve asset management maturity through a straight line of ascension from current to desired state. There are several reasons for this—different parts of the organization are likely to change at a pace faster or slower than others; resources needed for new systems, technologies, and processes may be available in some years and not others; external drivers, such as regulatory requirements, may be more influential for some parts of the organization than others; and Utilities staff and management serving as important change agents will jump start activities in their areas of influence, while the transition in other areas may seem to stagnate without change agents. The Utilities pathway to asset management maturity may at times seem iterative and choppy. During these times it is most important to have clarity of vision regarding the desired state, effective communication regarding expectations, and persistence. Strong leadership is required.

11.6 Improvement Initiatives

11.6.1 About Improvement Initiatives

IIs are the actions needed to transition from Utilities' current asset management state to the desired state. IIs are typically grouped into sets of tasks and activities.

Sixty-one IIs have been identified. Based on prioritization conducted by Jacobs with input from Utilities, there are over 50 IIs considered to be of high enough priority and urgency for attention in the upcoming two years. Some of these, specifically those related to capital project delivery, are already underway. The prioritization was based on the current state assessment and the desired state as discussed above.

11.6.2 Improvement Initiatives – First Six Years

The IIs are grouped into seven bundles based on similar topics, the close relationship of the IIs, and a logical grouping for II governance. There are also important relationships between IIs across the bundles. Several IIs could logically be placed in more than one bundle.

Each of these IIs will be initiated in the upcoming six years. Due to the importance for the II teams to have ownership and accountability, each team will propose the scope and schedule for their IIs. Coordination across each swim lane will be determined in the Asset Management Implementation Plan Management II. Oversight for the IIs will be provided by the Asset Management Team, though this group may delegate some direct oversight to others.

The seven bundles, overall objectives of each, and the IIs within each are listed below.

Bundle: People and Processes Objective: Improve readiness for organizational change and make sure attention is given to the people-side of asset management.	
II# P1 AM Program Manager Role Clarification	Discuss and clarify the role of the BU central AM program manager and what this means for implementation of the broad AM Implementation Plan. Should include how others are to interact with this person and take ownership of IIs and AM outcomes.
II# P2 AM Change Management Strategy and Approach	Create a change management strategy specifically for AM (follow BU change management framework and link to other broad BU changes), to include assessment, sponsorship, competencies, communications, resistance management, training plan, and reinforcement.
II# P3 Business Processes	Develop plan for mapping and improving needed processes. Define and communicate the asset management business processes (includes changes needed in current processes in order to incorporate asset management principles).
II# P4 AM Roles & Responsibilities	Define and communicate asset management roles and responsibilities. Clarify in job descriptions and ensure that AM related expectations are discussed as part of each group and individual performance expectations and performance review.
II# P5 Staffing Competencies Model	Develop a staffing model to support new processes for a wide range of disciplines including engineering, finance, operations, maintenance, information systems, management, contracting, supply-chain management, and organizational development.
II# P6 Skills & Competencies	Determine needed AM skills and competencies and develop a training plan.
II# P7 Succession Planning	Build on knowledge capture efforts to develop succession planning process.

Bundle: AM Governance & Decision Making Objective: Ensure that decisions are made by the right people at the right time, that a risk management framework is established, and that associated processes are established and implemented.	
II# G1 Asset Management Committee	Establish an oversight group, likely called an Asset Management Committee. Likely to include oversight of the AM Implementation Plan and also future decision-making authority and delegation authority regarding funding decisions, establishment and tracking of service levels, tracking of performance towards AM goals. Include attention to embedding AM decision making principles into everyday and periodic decisions.
II# G2 Risk Framework	Develop a broad risk framework to clarify the types of risk to be managed at BU, the activities of risk management, and how risk information will be used at BU.

Bundle: AM Governance & Decision Making Objective: Ensure that decisions are made by the right people at the right time, that a risk management framework is established, and that associated processes are established and implemented.	
II# G3 Consequence of Failure	Develop process, criteria, and (potentially) weighting for evaluating consequence of failure, which is an important element of risk management, and thus important for prioritizing projects and asset replacements.
II# G4 Asset Condition Assessment Scales	Synchronize asset condition assessment scales (for likelihood of failure calibrated scoring).
II# G5 Asset Risk Analysis Process	Develop and document a consistent asset risk identification and analysis process.
II# G6 Quality Management Procedures	Develop, document, and initiate quality management processes and procedures.

Bundle: Strategy & AM Program Management Objective: Ensure effective and efficient roll-out of the AM policy and SAMP, management of the AM Implementation Plan, and important elements of a two-way communications plan.	
II# S1 AM Implementation Plan Management	Includes progress tracking, quarterly reporting, resource management, annual updates to roadmap, and communications of progress. May include future AM assessments and benchmarking, and updates to the SAMP. This II needs to include documentation of expectations for the roles in delivery of IIs, including leaders, sponsor, team-member. Also, clarify how to deal with competing priorities of team-members, and develop system to provide accountability on maintaining progress with initiative execution.
II# S2 AM Communications	AM communications initiative - being clear on visions/goals for the program, elements of change management, gather input from people impacted by change (thus two-way communications), develop "elevator speech" for AM program goals. Should include communicating status and successes. Could leverage quarterly and annual State of the Utilities presentations/reports.
II# S3 AM Attributes	Break vision statement into attributes that are specific and meaningful to various functional groups, in order to make it clear what the desired state will “feel” like.
II# S4 AM Policy Roll Out	AM policy needs to be refined and communicated to staff on the value and importance of the policy and AM in general. Combine with roll-out and communication of SAMP.
II# S5 AM Definitions Establishment	Complete the definition dictionary in order to identify a BU definition for each important AM term. Effort will provide clarity on definitions so users are using terms consistently, which will accelerate adoption of asset management practices and enhance agreement.

Bundle: Performance Management Objective: Improve performance and ensure that targets are based on service level objectives.	
II# L1 Service Level Framework	Develop a framework for service levels that defines terms (e.g. service level, performance indicator, etc.), contains an internal communications plan for what needs to be communicated, to whom, and why the data is being collected.

Bundle: Performance Management Objective: Improve performance and ensure that targets are based on service level objectives.	
II# L2 Wastewater Service Objectives and Performance Indicators (PIs)	Formally define service level objectives and associated KPIs for the wastewater utility. Includes reviewing existing KPIs and their sources/genesis, establishing whether the KPIs are realistic or aspirational, and establishing clear line-of-sight to section-level activities.
RII# L3 Water Service Objectives and Performance Indicators (PIs)	Formally define service level objectives and associated KPIs for the water utility. Includes reviewing existing KPIs and their sources/genesis, establishing whether the KPIs are realistic or aspirational, and establishing clear line-of-sight to section-level activities.
II# L4 Surface Water Service Objectives and Performance Indicators (PIs)	Formally define service level objectives and associated KPIs for the surface water utility. Includes reviewing existing KPIs and their sources/genesis, and establishing whether the KPIs are realistic or aspirational, and establishing clear line-of-sight to section-level activities.
II# L5 Solid Waste Service Objectives and Performance Indicators (PIs)	Formally define service level objectives and associated KPIs for the solid waste utility. Includes reviewing existing KPIs and their sources/genesis, and establishing whether the KPIs are realistic or aspirational, and establishing clear line-of-sight to section-level activities.
II# L6 Performance Indicators	Establish Performance Indicators (PIs) that support the service level objectives, including asset management related performance indicators (those PI that are important to asset reliability).
II# L7 Clean Up Pentana	Update or modify (perhaps clean up) Pentana (City-wide system for collecting and reporting on measures) to align better to service levels and performance indicators.

Bundle: Asset Lifecycle Management Objective: Define and implement processes to ensure optimal decisions and outcomes at all stages of the asset lifecycle.	
II# A1 Update Asset Renewal and Replacement Strategy and Approach	Update the asset management renewal and replacement strategy.
II# A2 Asset Management Plans (AMPs)	Develop AMPs for groupings of assets (determine asset hierarchy, maintenance, inspection, capital strategies, etc.) Then collect asset information as required. Needs to include conducting a high-level assessment of groupings of assets to decide where to start with AMPs. May also include further detailing of the SAMP section Asset Management Plan Framework.
II# A3 Business Case Analyses (BCAs)	Develop process for consistent application of business case analyses and develop standard approach for estimating and including O&M costs.
II# A4 Life Cycle Cost Tracking	Ensure that all costs are captured and associated with each specific asset (at an appropriate place in the asset hierarchy) in order to understand full cost of owning and managing assets. Such as: all the CIP costs, planning or engineering time and consulting services, maintenance, operations, power, chemicals, parts.
II# A5 CIP Governance	Improved process for capital improvement project identification (and how they emerge from one or more problems) and oversight for governing projects once in implementation. Also, develop a business process for oversight of the regular updates to the renewal and replacement capital funding needs projection, for the rationalization of the reserve fund.

Bundle: Asset Lifecycle Management Objective: Define and implement processes to ensure optimal decisions and outcomes at all stages of the asset lifecycle.	
II# A6 CIP Prioritization Criteria	Establish prioritization criteria for the entire CIP (and also possibly criteria with greater precision for specific CIP Funds and Programs).
II# A7 CIP Planning/Control Software	Develop functional requirements and identify a software system for managing CIP planning and control, and project management/construction management -- separate systems for PM and construction management. Establish, map, and train business processes.
II# A8 PM/CM Coordination	Define roles and responsibilities around how project management and construction management interface.
II# A9 O&M Impact of New Assets	Develop a process to project and track increase (or decrease) in operational cost and other resources as new assets are added, and how the impact to operations budgets is determined. This should be done at the same time as the capital budget is approved. Also include bringing the cumulative information to the budget process.
II# A10 Operations Planning During Construction	Develop a documented process for operational planning and control (project/contract/construction management) during construction. Planning protocols for shutdowns. Coordination across team members to ensure that system operations are considered.
II# A11 O&M Manuals	Develop process to make sure that there are consistent expectations and protocols for O&M manuals (including what is in it and how/when received) to be provided by consultant design teams or contractors.
II# A12 Document Management	Assess and develop consistent and well documented processes for document and information management for the entire asset life cycle.
II# A13 Capturing Issues	Develop and implement a process to address how to capture and communicate specific asset issues identified through modeling/analysis. Also sending and communicating issues that emerge from O&M, to others as needed in BU.
II# A14 Commissioning Improvements	Develop and implement a process to improve commissioning, including taking O&M needs (long term operability and maintainability) into account as projects are delivered.
II# A15 Donated Assets	Improve communication around asset acquisition and the level of maintenance that has been conducted on acquired assets. E.g. Sound Transit - being built in phases with assets coming on-line over time.

Several of the IIs in Asset Lifecycle Management are being addressed currently by the capital project group.

Bundle: Data & Technology Objective: Provide availability of accurate and useful data and ensure that technology systems support asset management.	
II# D1 Asset Information Strategy	Develop an asset information strategy and asset data/information improvement plan.
II# D2 Data Governance	Determine and establish data governance (likely a committee combined with clarity of decision-making authority for certain individuals). Focus on overseeing other data related IIs, which will include identifying and addressing data quality issues and lack of data.
II# D3 Data Needs	Establish clarity regarding what data is needed, why data is being collected, how is it stored, and communicate internally. Should be driven by performance indicators and decisions needed.
II# D4 Data Processes	Define and document the "as-is" processes for how people interact with systems to input data, as well as how to store, protect, review, correct errors, and how data it is used for reporting and decisions. Also document who uses the data and for what purpose.
II# D5 Data Resourcing	Document staffing resources required for data management and ensure that roles and responsibilities are clearly defined and part of job descriptions. Consider data collection, data review and auditing, and data management.
II# D6 Asset Information System Strategy	Develop the strategy for AM Information Systems including the CMMS, GIS, and other asset-centric information technology systems. Include analysis tools used to support program development (such as models) and how they are used together.
II# D7 System Architecture Plan	Prepare a system architecture plan for BUs systems and technologies. This should include the vision, goals, objectives, and strategies for the systems, linking to governance needs, address interface between BU and City IT, establish roles and responsibilities, establish processes to manage systems, and identify needed integration between systems (e.g. hydraulic models, Maximo, Granite Net, GIS).
II# D8 System Functional Requirements	Define functional requirements for asset management technology systems.
II# D9 EAM System	Decide whether to pursue a separate instance of Maximo for Utilities, and if yes, develop approach for implementation. Need to consider having a separate instance of GIS and other system dependencies as well. Likely would include a threshold decision regarding looking at other systems instead of Maximo.
II# D10 Asset Hierarchy	Document and evaluate the asset hierarchies for all BU assets. Evaluate the challenges and the relationship with how data is used and identify gaps or needs. If needed, develop new hierarchy for each asset class. Determine the system of record for each asset and associated attributes.
II# D11 Data Standards	Develop standards for each data element. Consider precision and data storage systems. Will include quality metrics around data accuracy and completeness.
II# D12 Asset Inventory	Improve completeness of asset inventory (data "clean-up") and establish and implement processes for keeping asset inventory complete. This II is about making sure all assets are accounted for in the data systems.
II# D13 Data Audits/Review/Clean up	Develop and implement processes around auditing/reviewing data and data entry.

Bundle: Data & Technology Objective: Provide availability of accurate and useful data and ensure that technology systems support asset management.	
II# D14 Data Access and Analysis	Improve staff's ability to access data. For example, flow monitoring data, zone metering data, condition of assets, AMI data, etc. Make sure data is being effectively used for performance analysis and improvements.
II# D15 CMMS Codes	Review and create clarity and consistency in codes, such as failure codes, problem codes, work order codes.
II# D16 Water Meter Data	Review and determine appropriate turn-around time for inputting water meter data into the system. Establish and track a metric.
II# D17 Easement Data	Map easements in GIS and include supporting documentation, legal descriptions, and record drawings.

Several of the IIs in the Data & Technology bundle will be addressed by a group focusing on Utilities technology system needs.

Bundle: Maintenance & Reliability Objective: Improve reliability through maintenance optimization.	
II# M1 CMMS Management Policy/Process	Develop and implement a policy and process for use of the CMMS, including tracking of proactive maintenance activities.
II# M2 Asset Risk	Determine risk scores for assets.
II# M3 Strategic Maintenance and Reliability Program	Develop a program to determine best maintenance strategies for achieving the desired levels of asset reliability.
II# M4 Failure Analysis	Develop a better understanding of the relationship between preventive maintenance and failures, which will allow for a more compelling argument for budgeting and resources for O&M.

11.6.3 Improvement Initiatives – Beyond Six Years

Additional IIs required for achievement of the desired state will be identified from time to time based on Utilities learnings, implementation of the initial IIs, and external influences. Some may be incorporated into the IIs listed above (if approved by the Asset Management Committee) or addressed by efforts outside of this Asset Management Implementation Plan. Potential additional IIs to be addressed beyond six years are listed below.

People and Processes

- Track and review outcomes from IIs in the People and Processes bundle listed above for the first six years, and consider additional IIs, with cross-functional coordination and oversight by the Asset Management Committee
- Review and implement a knowledge management approach

- Establish asset management certification requirements for Utilities jobs
- Conduct an internal survey to assess staff familiarity with asset management principles, objectives, and processes

AM Governance and Decision-Making

- Track and review outcomes from IIs in the AM Governance and Decision-Making bundle listed above for the first six years, and consider additional IIs, with cross-functional coordination and oversight by the Asset Management Committee
- Establish and implement a process for benefits tracking
- Implement additional decision-making rules and tools
- Develop additional internal economic analysis capability
- Expand regional and cross-sector collaboration for infrastructure management
- Review and enhance insource/outsource strategies

Strategy and AM Program Management

- Track and review outcomes from IIs in the Strategy and AM Program Management bundle listed above for the first six years, and consider additional IIs, with cross-functional coordination and oversight by the Asset Management Committee
- Develop an explicit approach to communicate the Strategic Plan across department staff and integrate objectives into other plans (including the SAMP) to ensure/confirm alignment between plans and priorities.
- Prioritize all organizational initiatives and communicate relationship of each to the others and communicate tracking of progress in completing Strategic Plan elements and status/completion of initiatives.
- Develop an approach to engage external stakeholders in asset management objectives, including service level establishment and early planning decisions for projects.
- Update the Utilities Strategic Plan to include future challenges and trends.
- Prepare annual or biennial State of the Assets Reports
- Consider an organizational structure that places greater emphasis on asset management processes and outcomes
- Consider ISO 55000 certification

Performance Management

- Track and review outcomes from IIs in the Performance Management bundle listed above for the first six years, and consider additional IIs, with cross-functional coordination and oversight by the Asset Management Committee
- Analyze service equity across the customer base
- Conduct affordability and willingness-to-pay studies
- Review service level performance and targets and use asset costing, reliability performance metrics, and system performance information to consider changes (increase or decrease) in service level targets to better address customer and community desires

Asset Lifecycle Management

- Track and review outcomes from IIs in the Asset Lifecycle Management bundle listed above for the first six years, and consider additional IIs, with cross-functional coordination and oversight by the Asset Management Committee
- Conduct appropriately scaled design for reliability assessments for all capital projects
- Transition to all digital AMPs (for which asset risk information is contained in corporate asset systems, updated in real time, and analytics used to determine appropriate actions is also generated directly from asset costing and risk data)

Data and Technology

- Track and review outcomes from IIs in the Data and Technology bundle listed above for the first six years, and consider additional IIs, with cross-functional coordination and oversight by the Asset Management Committee
- Implement advanced technologies for asset performance and deterioration monitoring, including proactive alarming

Maintenance and Reliability

- Track and review outcomes from IIs in the Maintenance and Reliability bundle listed above for the first six years, and consider additional IIs, with cross-functional coordination and oversight by the Asset Management Committee
- Develop a comprehensive view and scoring system for asset LoF (to include performance, history of reliability, physical condition, adherence to O&M strategy, other considerations based on the asset class)
- Establish and implement a routine asset condition strategy and program for vertical and horizontal assets
- Conduct Preventative Maintenance Optimization (PMO)

- Review current maintenance practices and identify, document, and train to best practices, also consider conducting a deliberate peer exchange process
- Establish role for reliability engineers and initiate an asset reliability strategy and program
- Establish a configuration management policy and process
- Review consumables, spares, and inventory management to align to needs for highest risk assets

Other

- Participate in industry benchmarking for asset management processes and practices
- Establish and implement an audit and review procedure for asset management processes, use this information to ensure accountability and improve processes
- Establish an enterprise risk management approach including a corporate risk governance committee
- Review asset decommissioning and salvage processes and improve if needed
- Review contracting, supply chain approaches, procurement best practices and improve if needed

11.7 Success with Improvement Initiatives

The following are several keys to successful implementation of IIs:

1. Line of Sight to Overall Organizational Vision as well as the Utilities Asset Management Vision and Objectives. It is important for team members working on IIs and for outside observers to understand how each initiative supports the Utilities vision, strategy, and objectives.
2. Clarity of Objectives. It is important that the goal of each initiative is clear and for there to be clarity regarding the outcomes. That is, the team working on the II must discuss and agree upon "what is the problem we are solving" and "how will we know when we're done," and the appropriate governance body must concur. In addition, scope management is important, since during the course of working on an II, there may be forces in play to change (increase or decrease) scope.
3. Ownership and Accountability. Clarity of leadership and team operations, as well as clarity and communication of milestone completion targets is important in order to predict and measure progress. Frequently, one II is dependent on others or has impact on others, so there are predecessor and successor relationships and interfaces that need to be identified and managed.
4. Business Unit Engagement, Team Identification, and Team Chartering. Utilities staff and management with knowledge of current processes and those that are likely to

be impacted by changed processes must be engaged in the II. Preparation of a RACI chart (to identify those who will have responsibility, accountability, be consulted, and be informed) will be helpful. In addition, deliberate chartering of the teams to establish clear expectations will be critical.

5. Executive Sponsorship. The most important and broad-reaching IIs should have an Executive Sponsor to help provide oversight, make sure resources are available, and assist in managing challenging interfaces and external stakeholder relations. It is important that the Executive Sponsor have a sense of urgency regarding the initiative and adequate time to focus and assist the team.

6. Resources. Work on IIs must not be considered to be additional responsibilities beyond an individual staff member's regular work duties, without appropriate time or skilled staffing being made available. There should be clarity regarding how and how much time staff and management are expected to work on the IIs, and how that individual's regular work will be accomplished. While impacted staff must be engaged in IIs, there also needs to be consideration to not impact ongoing operations. At Utilities, due to high workloads of key individuals, effective team management, best practice meeting operations, and overall efficient use of staff time is important.

7. Pacing, Sequencing, and Change Management. Utilities must be cautious to not expect too much change to occur all at once. That is, do not take on too many IIs all at once. In many cases, IIs successfully implemented will result in efficiencies. However, they generally also introduce changed processes, new tools, and new work group relationships. Taking the time to understand and manage impacts on people and to deliberately manage organizational change is important.

8. For major IIs, it is important to conduct similar planning, scoping, team chartering, and tracking processes that are used for best practice capital project delivery. This is referred to as "projectizing" the II, and while it may require initial up-front tasks, it will be beneficial in that it helps to increase likelihood of success.

Each of the items listed above must be applied at the appropriate scale. For small and straightforward IIs, more streamlined processes may be applied, or some steps may be skipped. For more complex and higher risk IIs, there is benefit to greater investment in the processes because implementation risks will be reduced. Selection of these processes should be appropriate to the need of the II.

11.8 Sequencing, Pacing, Agile Delivery, Schedule, and Resources

11.8.1 Sequencing Improvement Initiatives

For many IIs there are predecessors and successors. In some instance, predecessor IIs are helpful but not required. In many instances there can be efficiencies in team member work if IIs are planned and delivered concurrently. These considerations are being addressed in development of the asset management roadmap.

11.8.2 Pace of Change

Utilities intends to achieve the desired state in 10 to 15 years. This is somewhat aggressive when considering the amount of cultural change required. Defining and incorporating new technology tools and modifying and embedding new business processes is time consuming.

11.8.3 Agile Delivery

Many concepts of agile project management should be applied to the Utilities asset management transformation. A primarily benefit of agile project management is the ability to learn from successes and failures, respond to issues as they arise, and make course corrections as needed based on changing internal and external drivers.

With asset management IIs, there is a need to collaborate across functional areas of the organization and a general desire to implement solutions as soon as possible. This is frequently a benefit to utilizing a pilot project approach for which new processes can be developed and tested for limited work groups prior to undergoing refinement then full implementation. These features, along with examples of success in other organizations where decision making is deliberately pushed into the organization, lead to a type of agile delivery as a good fit.

11.8.4 Schedule

The schedule for the IIs is provided in Appendix E.

11.8.5 Resources

The IIs necessary to transition from the current to the desired state of asset management will require greater resources than have historically been dedicated to asset management at Utilities. Resource estimates for the Utilities asset management journey will be provided in a separate document.

11.9 Measuring Progress

11.9.1 Interim Targets

Interim targets toward achieving the asset management desired state will be established with a combination of two methods:

1. Upon confirmation of resourcing of the IIs, a target can be established for completing a group of them by a certain date. For example, all of those listed above within the "First Six Years" grouping must be substantially complete by the end of 2026. The team assigned to II# S1 (Asset Management Plan Implementation Management) will track this.
2. Establish targets as part of II# L6 (Performance Indicators). With this, performance indicators will be selected with targets proposed for achievement in future years.

11.9.2 Overall Progress Toward Desired State

In order to track Utilities progress toward the asset management desired state, the following will be measured routinely (monthly or quarterly):

1. Achievement of service level objectives
2. Performance indicators
3. Accomplishment of improvement initiatives
4. Results of future asset management assessments

11.9.2.1 Tracking Service Levels

The only way to truly understand Utilities progress with asset management is to track service level actuals relative to targets established with meaningful input from customers, the community, and the public. Thus, II#s L2 to L5 (establishment of Service Level Objectives) are very important. Along with this, Utilities must understand and achieve expectations regarding affordability and willingness-to-pay.

11.9.2.2 Performance Indicators

Performance indicators will be identified by the team working on II# L6 (Performance Indicators), and these indicators will provide a structure to track progress.

11.9.2.3 Tracking Progress on Improvement Initiatives

Initial scope and schedule development for each II will be developed by each II team and reviewed. Then it must be approved by the appropriate governing body. Once this is completed and other II chartering activities are complete, the work of the II team will begin.

Quarterly reports will be submitted for compilation into an II Progress Report to be reviewed as desired by the Asset Management Committee. The team assigned to II# S1 (Asset Management Plan Implementation Management) will establish specifics for this process.

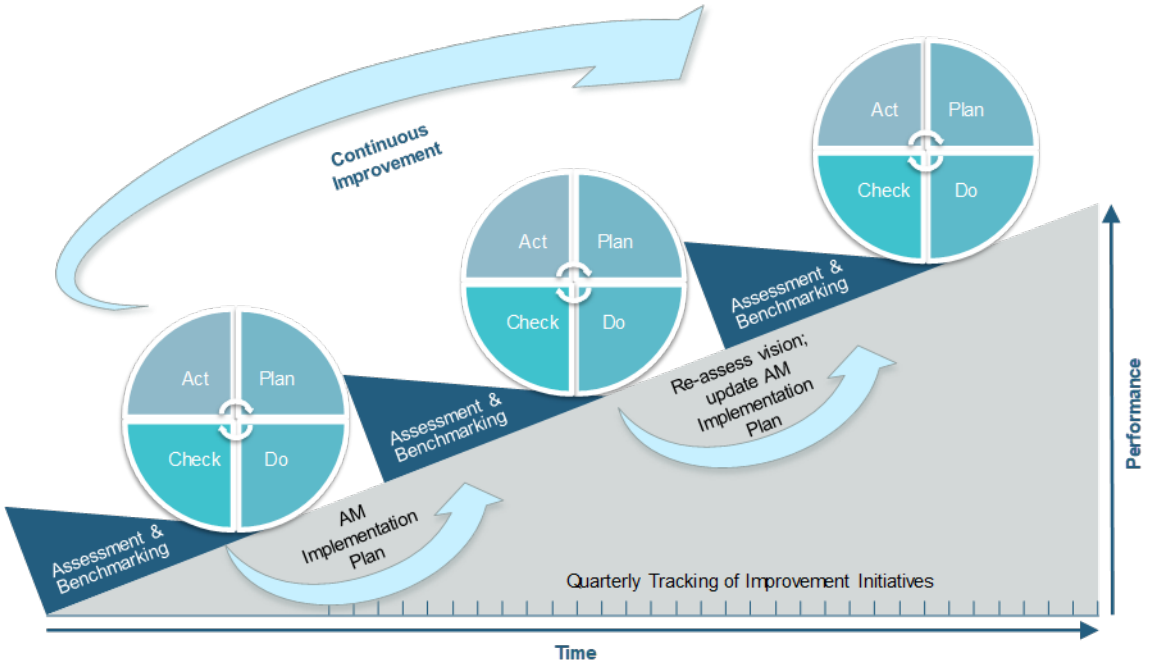
Newly identified IIs will be delivered to the Asset Management Committee, and this group will determine if immediate action needs to be taken and ensure resource allocation. Periodically, (once every year or every two years), the Asset Management Committee will arrange a process for re-prioritization of the IIs and determination of those to be initiated in the coming year, or the coming biennial period. This process should happen concurrent with the Utilities budgeting process.

11.9.2.4 Future Asset Management Assessments

Utilities intends to conduct future Asset Management Assessments. The Asset Management Program Manager will make a proposal to the Asset Management Committee regarding this.

Figure 11-9 illustrates an approach wherein an assessment is conducted about once every four or five years. Following each assessment, the organization revisits the implementation plan and adjusts based on implemented improvement, learnings, and modified targets.

Figure 11-9: Asset Management Continuous Improvement



11.10 Next Steps

The team delivering II# S1 will define next steps for Asset Management Implementation, with oversight provided by the Asset Management Committee (II# G1), and this will likely include identification of leads (project managers) for the IIs to be initiated in 2021 and identification and chartering of the teams delivering the IIs.

In addition, the team delivering II# S1 will establish the metrics to be tracked for progress with the AM Implementation Plan (discussed in Section 11.9).

Status of the IIs will be tracked quarterly in an II Register. New IIs will be added to the II Tool, prioritized periodically, and resourced if determined to be urgent. About once per year there will be a strategic re-assessment of the entire list of IIs, including the prioritization criteria.

Appendix A – Acronyms and Abbreviations

Acronym or Abbreviation	Definition
AC	Asbestos cement
AM	Asset management
AMIS	Asset management information system
AMP	Asset management plans
AMS	Asset management system
AWIA	America's water infrastructure act
BAP	Best appropriate asset management practices
BCE	Business case evaluations
BUD	Board of Utilities Directors
CIP	Capital investment program
CMMS	Computerized maintenance management system
CoF	Consequence of failure
CPI	Consumer price index
CWA	Clean Water Act
ERP	Emergency response plan
FMEA	Failure modes and effects analysis
FMECA	Failure modes effects and criticality analysis
GAAP	Generally accepted accounting principles
GASB	Governmental accounting standards board
IAM	Institute for Asset Management
II	Improvement initiatives
IIMM	International Infrastructure Management Manual
IT	Information technology
KPIs	Key performance indicators
LoF	Likelihood of failure
MG	Million gallons
NPDES	National pollutant discharge elimination system
O&M	Operations & maintenance
PIs	Performance indicators
PM	Preventative maintenance
R&R	Renewal and replacement

RCM	Reliability centered maintenance
RMCS	Resource management and customer service
RRA	Risk and resilience assessment
SAMP	Strategic asset management plan
SCADA	Supervisory control and data acquisition
SRP	Scheduled replacement program

Appendix B – Glossary of Terms and Definitions

Term	Definition
Asset	Item, thing or entity that has potential or actual value to Bellevue Utilities.
Asset hierarchy	A representation of the relationship between assets arranged in a parent-child format
Asset lifecycle	Period from asset creation to asset end-of-life
Asset management	The coordinated activities of Bellevue Utilities to realize value from assets
Asset management objectives	Results to be achieved with respect to asset management
Asset management plan	A document that specifies the activities, resources, and timescales required for a grouping of assets to achieve the Bellevue Utilities asset management objectives
Asset management policy	A high-level statement of Bellevue Utilities principles and approach to asset management
Asset management roadmap	A simple schedule that represents the intended timing to implement improvement initiatives
Asset management system	The set of interacting and interrelated elements that guide the development and implementation of asset management activities
Asset portfolio	Assets that are within the scope of the asset management system
Improvement Initiatives	The tasks and activities Utilities has determined to be most needed to achieve its asset management objectives
ISO 55000	International standard covering management of assets of any kind
Key performance indicator	A performance indicator that has a significant impact on the primary goals of Utilities
Lagging performance indicator	A performance indicator that measures outcomes and actuals after an even has occurred.
Leading performance indicator	A performance indicator that measures a process.
Performance indicator	A qualitative or quantitative measure of performance; sometimes referred to as a performance metric
Qualitative performance indicator	A performance indicator that is expressed using numbers, but the input is subjective
Quantitative performance indicator	A performance indicator that is objective and data driven
Risk	Effect of uncertainty on objectives
Risk management	A coordinated set of activities and methods that is used to direct Bellevue Utilities and control the many risks that can affect its ability to achieve its objectives
Service level	Statements of desired performance outcomes that reflect high priorities from Utilities customers and the community, as well as outcomes important to environment protection, or as required by regulators

Appendix C – References

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Appendix D – Bellevue Utilities Asset Management Policy

Policy Title	Department	
Utility Asset Management Policy	Utilities Department	
Responsibility	**Version**	**Pages**
Utilities Department – Asset Management Program	001	1
Utility Department Director Approval	**Effective Date**	
	September 6, 2019	

BACKGROUND AND PURPOSE

The Utilities Asset Management Policy documents the Utility's commitment to develop and implement asset management as a best practice. This commitment is identified in the City's Comprehensive Plan, Utilities Strategic Plan, and detailed in the Utilities Systems Plans. The principles and objectives in this policy provide a sustainable approach to managing assets and delivering optimal value over the long and short term. This policy is intended to inform organizational processes that link the work of Operations and Maintenance, Capital Project Planning and Delivery and Utility Financial Management. As a result, staff are empowered through the use of reliable data, systems and processes to determine the most effective and efficient means for delivering infrastructure related services, while controlling exposure to risk and loss.

POLICY STATEMENT

This policy applies to all Utilities owned infrastructure and related services such as delivering high quality reliable drinking water, wastewater conveyance, storm and surface water infrastructure services. City assets support many services and require significant resources over their lifecycles to continue to deliver those services effectively. Asset Management is a management strategy used to optimize performance, risk, and cost of these assets. Bellevue Utilities is committed to implementing the principles and objectives of Asset Management (AM) as a core component in managing the Utilities infrastructure, facilities, equipment, and related assets to achieve the Departments priorities. Therefore, the following principles and objectives are required to realize efficiencies and support the long-term sustainability of both the services provided by the Utility and performance of the assets.

PRINCIPLES

- Adopt a life-cycle approach to managing infrastructure assets to include planning, acquisition, operation, maintenance, renewal, replacement, and disposal of assets
- Balance cost, risk, and performance of assets
- Place a high priority on environmental and financial sustainability, while meeting desired levels of service
- Endorse evidence-based decisions utilizing robust software systems to manage and analyze information
- Achieve the Utilities Asset Management priorities and objectives through continuous improvement

OBJECTIVES

- Develop a sustainable approach to manage asset information and systems
- Build and maintain strong partnerships and communication for effective program implementation
- Develop strategies for capital investment planning and replacement programs; and operations and maintenance activities and programs
- Create sustainable short- and long-term financial strategies
- For each utility (water, sewer, storm):
    - Achieve the defined level of service at the lowest lifecycle cost
    - Identify critical assets needed for sustained performance
    - Define and manage a risk tolerance level and procedure

Appendix E – Improvement Initiative Schedule

Bellevue Utilities Asset Management Roadmap

	2021				2022				2023				2024				2025				2026			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
People and Processes																								
P1 AM Program Manager Role Clarification																								
P2 AM Change Mgmt Strategy and Approach																								
P3 Business Processes																								
P4 AM Roles & Responsibilities																								
P5 Staffing Competencies Model																								
P6 Skills & Competencies																								
P7 Succession Planning																								
AM Governance and Decision-Making																								
G1 Asset Management Committee																								
G2 Risk Framework																								
G3 Consequence of Failure																								
G4 Asset Condition Assessment Scales																								
G5 Asset Risk Analysis Process																								
G6 Quality Management Procedures																								
Strategy & AM Program Management																								
S1 AM Implementation Plan Mgmt																								
S2 AM Communications																								
S3 AM Attributes																								
S4 AM Policy Roll Out																								
S5 AM Definitions Establishment																								
Performance Management																								
L1 Service Level Framework																								
L2 Wastewater Service Objectives and PIs																								
L3 Water Service Objectives and PIs																								
L4 Surface Water Service Objectives and PIs																								
L5 Solid Waste Service Objectives and PIs																								
L6 Performance Indicators																								
L7 Clean Up Pentana																								
Asset Lifecycle Management																								
A1 Update AM Renewal and Replacement Strategy and Approach																								
A2 Asset Management Plans (AMPs)																								
A3 Business Case Analyses (BCAs)																								
A4 Life Cycle Cost Tracking																								
A5 CIP Governance																								
A6 CIP Prioritization Criteria																								
A7 CIP Planning/Control Software																								
A8 PM/CM Coordination																								
A9 O&M Impact of New Assets																								
A10 Operations Planning During Construction																								
A11 O&M Manuals																								
A12 Document Mgmt																								
A13 Capturing Issues																								
A14 Commissioning Improvements																								
A15 Donated Assets																								
Data & Technology																								
D1 Asset Information Strategy																								
D2 Data Governance																								
D3 Data Needs																								
D4 Data Processes																								
D5 Data Resourcing																								
D6 Asset Information System Strategy																								
D7 System Architecture Plan																								
D8 System Functional Requirements																								
D9 EAM System																								
D10 Asset Hierarchy																								
D11 Data Standards																								
D12 Asset Inventory																								
D13 Data Audits/Review/Clean up																								
D14 Data Access and Analysis																								
D15 CMMS Codes																								
D16 Water Meter Data																								
D17 Map Easements																								
Maintenance and Reliability																								
M1 CMMS Management Policy/Process																								
M2 Asset Risk																								
M3 Strategic Maintenance and Reliability Program																								
M4 Failure Analysis																								