2019 INTEGRATED WATERSHED MANAGEMENT UPDATE

Prepared by the Water Resources Business Unit

Contents

1. INTRODUCTION

1.1 PLANNING FOR A HEALTHY WATERSHED

Water is our most valuable natural resource. A healthy, resilient watershed provides clean, reliable water and is vital for current and future generations in Calgary and the region. The heart of Calgary is situated where the Bow River meets the Elbow River, highlighting the interaction of the natural system with our built environment.

Council's decisions and significant investments over the past 30 years have prepared Calgary for population growth and climate change. We continue to take a forward-looking, adaptive approach to integrated watershed management in a climate-constrained future.

Through One Calgary, **Calgarians reinforced how much they value healthy river areas, reliable safe drinking water, and the management of their wastewater.** The City is committed to ensuring a resilient watershed to make life better for Calgarians. Aligning with Council's Healthy and Green City Directive, The City of Calgary (The City) is dedicated to an integrated watershed-scale management approach. This is important because increased pressure on watersheds from growth in the region, as well as the impacts of a changing climate, makes watershed management one of Calgary's most critical resiliency challenges and requires a collaborative, flexible approach.

Land and water resources in the Bow and Elbow watersheds are used for traditional purposes by indigenous peoples and The City of Calgary acknowledges that our watersheds are a part of the traditional territories of the Treaty 7 First Nations.

With guidance from Council, The City's commitment to watershed protection considers the **needs of a growing customer base and maximizing the economic, social and environmental benefits of decisions, programs, and investments.** Building resiliency of shared water resources is the driving force behind an integrated watershed management approach.

Working inclusively with the Province, regional partners, stakeholders and citizens, The City aims to protect the water supply, use water wisely, keep rivers healthy and build resiliency to flooding. The City's Water Utility (Water Utility) delivers on this commitment through three lines of service: water treatment and supply, wastewater collection and treatment, and stormwater management.

1.2 OUR GOALS

The Water Utility's integrated watershed management (IWM) framework (Figure 1.1) is designed to be flexible, inclusive, and considers social, environmental, and economic benefits of delivering the Water Utility's four IWM goals across the Water Utility's Lines of Service (Figure 1.2). This report describes the 2019 actions taken to achieve the goals, how these actions support the services delivered to customers and addresses watershed challenges and priorities.

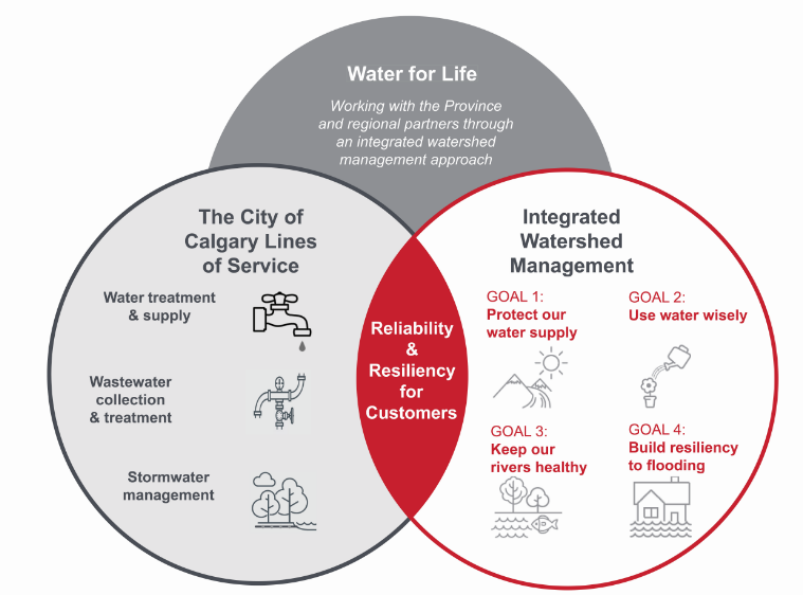


FIGURE 1.1 THE WATER UTILITY'S INTEGRATED WATERSHED MANAGEMENT STRATEGIC FRAMEWORK

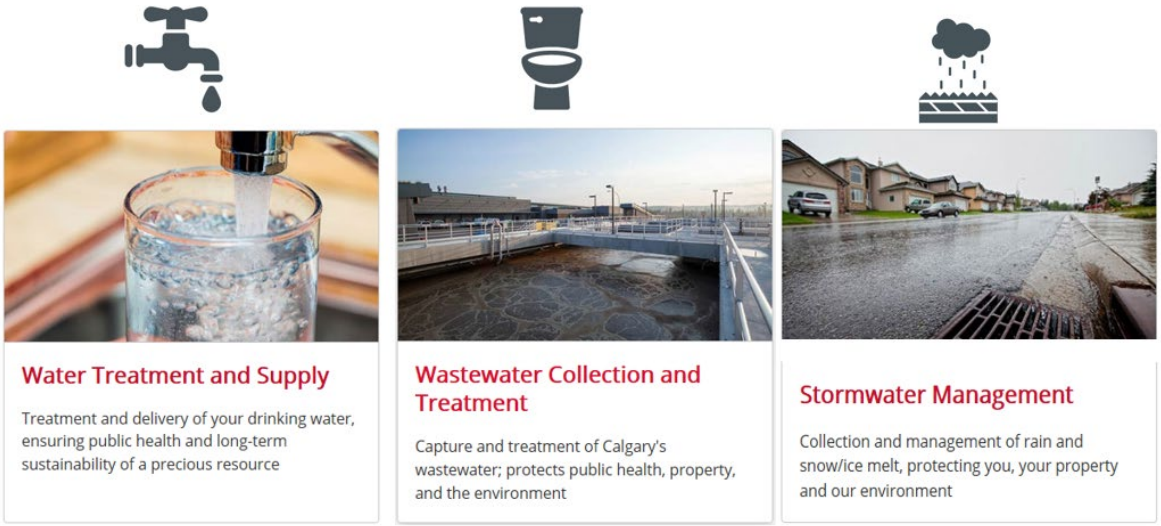


FIGURE 1.2 THE CITY ADVANCES ITS INTEGRATED WATERSHED MANAGEMENT APPROACH THROUGH THREE LINES OF SERVICE

1.3 ALIGNMENT WITH CORPORATE PRIORITIES

The Water Utility's watershed management goals are aligned with One Calgary's Council Directive of **A Healthy and Green City**, and **A City of Safe and Inspiring Neighbourhoods**. A Healthy and Green City: Calgary is a leader in caring about the health of the environment and promotes resilient neighbourhoods where residents connect with one another and can live active, healthy lifestyles. Advancing integrated watershed management goals aligns to the following One Calgary Council Directives:

- Integrated watershed management is essential to protect public health and the environment, while strengthening our resiliency to a changing climate.
- Calgary must develop our communities with a focus on achieving future water security and a sustainable water supply.
- Watershed management must be integrated into our land use policies, plans and decisions.
- Accomplishing sustainable, effective watershed management within Calgary and the region will also require working collaboratively with other orders of government, adjacent municipalities, residents, Watershed Planning and Advisory Councils (WPACs), stakeholders, landowners, the development industry, businesses and the First Nations.

1.4 RESILIENT WATER MANAGEMENT AND CLIMATE CHANGE

We are taking action to **ensure that Calgary's watersheds are resilient to climate impacts through proactive planning of water management practices** and storage capacity for both extreme flood and drought as priorities. In support of the Climate Resilience Strategy, the Water Utility is considering climate impacts in its programs, projects, strategies and plans, ensuring flexibility to adjust these along the way. Several mitigation and adaptation actions are integrated into programs and projects in the 2019-2022 business cycle.

Climate change is altering how and when Calgary's watershed receives precipitation, affecting both water quantity and water quality. Precipitation will fall with greater intensity, summers will become hotter, drier and longer, and mountain snowpack melting may occur earlier in the year. With increasing temperatures and drought conditions, water demands will likely increase. Increasing threat of wildfire in our source watersheds is a risk to our source water quality.

Our integrated watershed management work supports The City's Climate Resilience Strategy and Resilient Calgary Strategy (Figure 1.3). Examples of how the Water Utility's work helps achieve these corporate priorities are highlighted throughout this report.

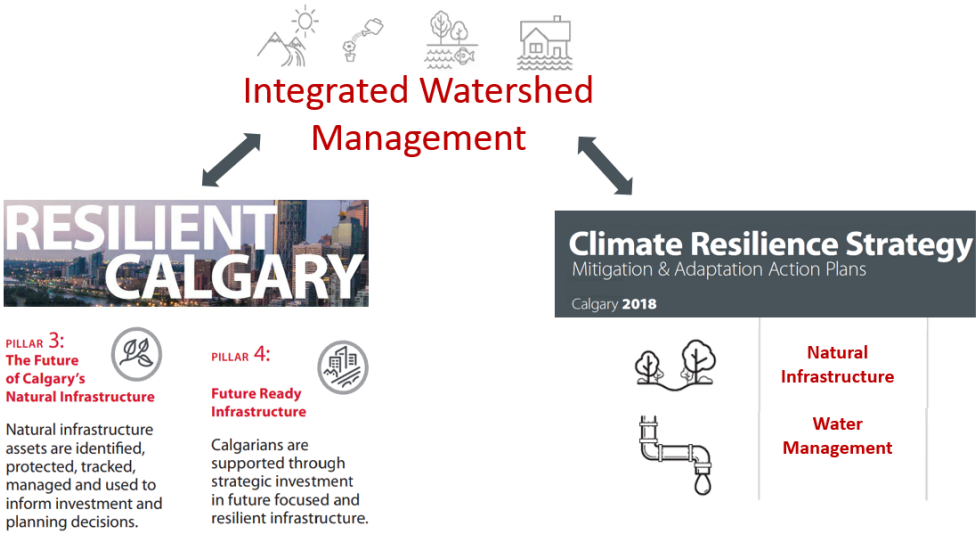


FIGURE 1.3 THE CITY'S INTEGRATED WATERSHED MANAGEMENT PROGRAMS HELP ACHIEVE OUTCOMES OF THE RESILIENT CALGARY STRATEGY AND THE CLIMATE RESILENCE STRATEGY

2. GOAL #1: PROTECT OUR WATER SUPPLY

The value of ensuring a water secure future

Economic and urban growth in Calgary and the region relies on a safe, reliable, and secure water supply. The region is prone to drought and future water security may be impacted by climate change and regulatory and surface water licence restraints. Urban growth and climate uncertainties are expected to increase pressures on Calgary's source water. Our new water security framework will help protect our water supply and address water security risks including impacts to both water quality and quantity, and allows us to continue to take actions to address these challenges.

2.1 WATER SECURITY

One Calgary One Water: A framework for Calgary's water secure was **developed to support the OneCalgary Directive to develop our communities with a focus on achieving future water security** and provide action on the Water Utilitiy's Water Treatment and Supply service commitment to provide long-term sustainability of water resources.

One Calgary One Water was finalized in 2019 and accepted for information at Calgary City Council on 2020 January 13. This **framework provides guidance around the critical question of water security: Will there be enough safe clean water to meet the needs of customers, the environment and ensure a sustainable economy in the future?**

The Framework identifies three major risks that impact water security (Figure 2.1):

- A changing climate introduces uncertainty regarding water quality and quantity in the future, particularly around disruptive and costly events such as drought and wildfire;

- Regulatory and water licence limits impact river water availability to Calgary's Water Treatment Plants within a 20-year timeframe; and
- Population and economic growth pressures continue to change the balance of water supply and demand.

The Framework highlights current Supply, Demand and Systems Operations initiatives that maintain water security today. Six priority actions recommended in the Framework are underway to guide critical long-term work:

1. Develop future water supply scenarios
2. Address water licence limits on high demand days
3. Ensure collaboration on a regional solution for water security
4. Advocate for a new upstream reservoir on the Bow River
5. Finalize the Drought Management Plan
6. Finalize the Source Water Protection Plan and Policy

Next steps on each of these actions for 2020 are outlined in Table 2.1 at the end of this section.

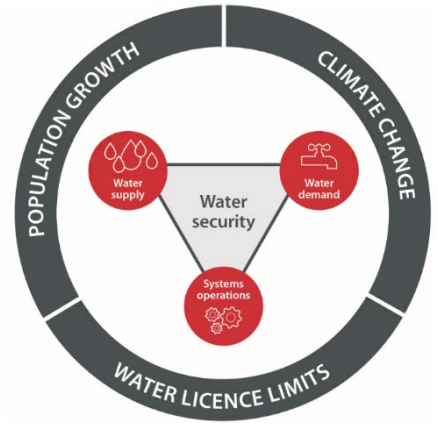


FIGURE 2.1 WATER SECURITY RISKS (OUTSIDE) AND LEVERS (INSIDE)

2.2 DROUGHT RESPONSE AND MANAGEMENT

The summer of 2019 provided a reprieve from the hot temperatures and below average precipitation experienced in the Calgary region between 2015 and 2018. Climate variability is expected and provides The City an opportunity to **advance collaborative efforts to prepare for future drought conditions and provide input to the Drought Management Plan - Priority Action 5 from the water security framework.**

FIGURE 2.2 ALBERTA WATER COUNCIL GUIDE, 2019

To assist communities in preparing for and responding to multi-year drought, The City supported the Alberta Water Council (AWC) with the development of the guide *Building Resiliency to Multi-Year Drought* (Figure 2.2). The guide brings together Alberta's drought resources including lessons learned from major drought events (Figure 2.3) and the most current tools and information to prepare for drought.

The City's internal **Drought Risk and Vulnerability Assessment was completed in 2019 to better understand and respond to drought**. The Water Utility examined four future climate scenarios for the mid-to late century and evaluated the risks and vulnerabilities to seven drought impacted systems: Water Supply, Stormwater, Wastewater, Operational, Environmental, Organizational and Regional/Communities. This work will **help prioritize systems which may have significant consequences** should droughts occur at longer durations or greater frequency under a changing climate.

Starting in 2020, these two projects will form the basis for developing The City of Calgary's Drought Mitigation and Response Strategies project. Building on the collaborative work in 2019, new drought mitigation and response strategies will be developed in 2020.

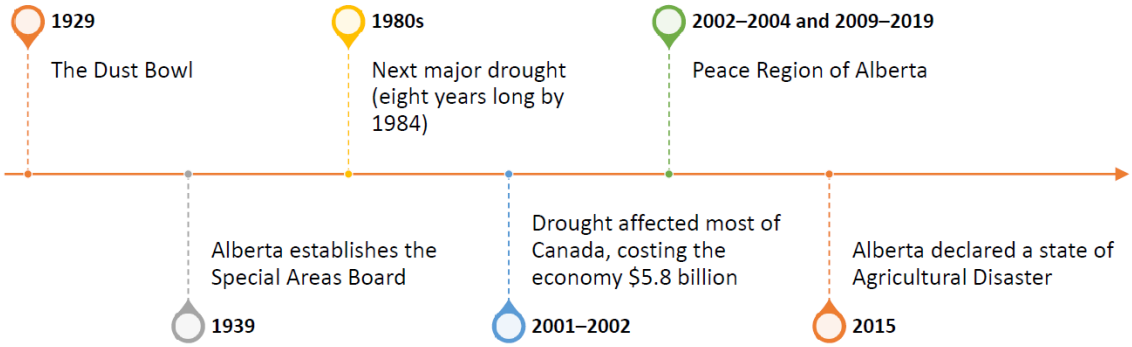


FIGURE 2.3 MAJOR DROUGHT EVENTS IN RECENT ALBERTA HISTORY (AWC, 2019)

2.3 SOURCE WATER PROTECTION

The value of protecting Calgary's source water
The purpose of Calgary's Source Water Protection Plan vision is that "*Our source watershed continues to provide clean, high quality water to the region, through proactive stewardship and management*". As Calgary's population continues to grow, so does the demand on the rivers. The Plan's four key goals and targeted priority actions aim to proactively protect the quality of our source water supplies.

As part of the *One Calgary One Water: A Framework for Calgary's Water Secure Future,* a commitment was made to bring a Source Water Protection Policy to Council by Q2 in 2020. This has since been delayed to likely Q3 as a result of the Covid-19 pandemic. A Council-approved Source Water Protection Policy will **ensure that actions in the Source Water Protection Plan and the Riparian Action Program are corporate priorities and will meet Council's One Calgary directive to integrate watershed management into our land use policies, plans and decisions.**

Other high priority source water protection activities in 2019 included:

- The Bearspaw Reservoir Tri-lateral Task Force (Bearspaw Task Force), a collaborative effort by The City, Rocky View County and TransAlta, completed a Consensus Report in 2019. The report establishes recommendations and next steps for local and regional risk management of the Reservoir. Some of the high risks include: growth and land use change and associated stormwater runoff, recreation activities, and runoff after major wildfires upstream. The City is actively engaged with Rocky View County to scope the next stages of work for a risk management strategy for the Bearspaw Reservoir.

- Run-off from landscapes burned by wildfires in our source watersheds contaminating water supplies was identified as one of two biggest risks to Calgary's source water. A collaborative Source Water Wildfire Task Force initiated by The City completed its analysis and evaluation of

wildfire risks to source water and proposed a series of management options. Strategies include actions related to: communications and coordination, research partnerships, water treatment and asset planning, and reduce large wildfire risks through actions such as prescriptive burns and other forest management techniques.

2.4 WATER QUALITY

The value of safe and reliable drinking water

The City works hard to ensure all Calgarians have a safe and reliable supply of drinking water, a key performance metric for the Water Utility. Calgary's water treatment plants operate 24 hours a day, 365 days a year. As water travels from the mountains and foothills, through our water treatment plants, across the city through the distribution system and to customer taps, Calgary's water is tested at every step to ensure its quality is maintained. Calgary's drinking water is safe and reliable, and meets or is better than the Guidelines for Canadian Drinking Water Quality. The City's monitoring results on key drinking water quality parameters can be found at www.calgary.ca/water.

2.4.1 CALGARY'S SOURCE WATER QUALITY

The City regularly tests water near its treatment plants and Calgary's source water quality continues to meet a high standard. **Safeguarding our high-quality source water provides the first line of defense in a multi-barrier approach to delivering safe, clean drinking water, something that is valued highly by customers**. Both the Bow River near the Bearspaw Dam and the Elbow River near the Glenmore Reservoir provide very high-quality water supply to The City's water treatment plants. The federal Water Quality Index (WQI) is used to track conditions, which translates data from multiple water quality parameters into a score. The Bow River typically has 'Excellent' water quality, while the Elbow River typically has 'Good' water quality. The lower flow rates of the smaller Elbow River result in higher sensitivity to water quality conditions, so guidelines are more often exceeded. Over the last decade, consistently high WQI ratings have been observed near The City's water treatment plants (Figure 2.4). **This means the water is easier to treat before it goes to customer taps.**

With growth in Calgary's source watersheds, understanding the risk of stormwater contamination to The City's drinking water supplies remains a key priority for water quality monitoring in 2020. Continued monitoring is being completed to characterize the risk of pollutants introduced to Calgary's source waters and the potential impacts to the drinking water treatment process. Broader Water Utility-wide discussions are occurring to examine possible mitigation strategies through stormwater infrastructure and best management practices.

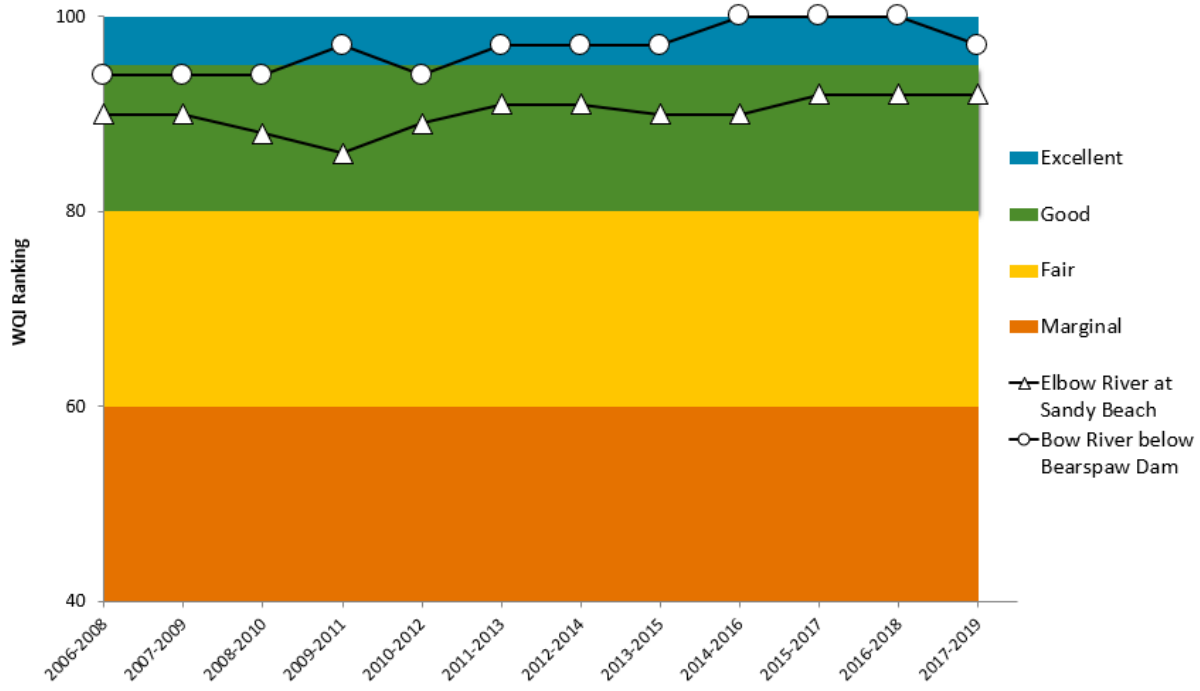


FIGURE 2.4: WATER QUALITY INDEX - CALGARY'S SOURCE WATER

2.4.2 LEAD SERVICE LINES

Lead is not naturally occurring in the Bow and Elbow Rivers. There are also no lead pipes at Calgary's water treatment plants or in the network of water mains that deliver water to households. In Calgary, any issues of elevated levels of lead are related to older homes that have lead water service lines connecting the water main under the street to the home, and/or from pipes and plumbing inside the home. Water service lines are a shared responsibility between The City and customer at the property line.

About 550 homes have public lead service connections, representing about 0.2% of water service.

Replacement of lead water service lines is a best practice in lead mitigation across Canada. **To address the public health risk posed by lead water services and from pipes and plumbing inside the home, The City will implement a revised lead mitigation strategy in 2020.** A foundational component of this strategy is the accelerated removal of the remaining lead services lines. The City will replace 550 known public lead services and 150 known lead services on private property. Replacement of these known public and private lead water services is estimated to be complete by the end of 2023.

In 2019 several significant changes were made in how lead is expected to be managed in drinking water in Alberta. In 2019 March, Health Canada lowered the Maximum Acceptable Concentration (MAC) for lead from 10 per billion (ppb) to 5 ppb. In the past, a utility's compliance was based on samples taken from its treatment and distribution system. The new guidelines will require that compliance to be based on concentration levels at customer's taps.

In addition to accelerated lead service replacement, The City will implement a revised lead mitigation strategy, in 2020, focused on increased sampling and customer education in alignment with Alberta Environment and Parks Guidance Document for Managing Lead in Municipal Drinking Water Systems in Alberta. The increased sampling will occur throughout the distribution system, including in homes built in a variety of different years.

2.5 REGIONAL COLLABORATION

The Water Utility's integrated Watershed Management Strategic Framework recognizes the importance of working with the Province and regional partners. Many of the programs and projects in this report speak to those relationships. In addition, the Water Utility takes a broad, programmatic approach to ensure clear, consistent and intentional decisions and actions across all of its regional activities.

Regional servicing

The City is dedicated to **ensuring reliable and resilient water and wastewater servicing for Calgary and its regional customers.** The Water Utility has been providing water and wastewater services outside of its corporate boundaries since 1961 and continues to receive and address formal requests for services outside of the Calgary's boundaries. The City retains full ownership of its water licences and has reserved roughly two percent of Calgary's annual water allocation for existing regional customers through 2022.

The Water Utility worked with regional customers in 2019 to amend regional Master Servicing Agreements (MSAs) following the completion of the 2019-2022 Cost of Service Study. The purpose of these MSAs is to reinforce the commitment of both parties to **integrated long term planning and full cost recovery for services** provided.

Regional planning

As part of the Corporate team, the Water Utility continued to be involved in the work of the Calgary Metropolitan Region Board (CMRB) throughout 2019. The CMRB was established in 2018 with a membership of 10 municipalities to promote regional long-term sustainability, ensure environmentally responsible growth management, coordinate regional infrastructure investment and service delivery, and promote the economic well-being of the region.

2019 provided an opportunity to **express some of The City's top priorities related to integrated watershed management to ensure they are considered in the CMRB's long-term growth plan and servicing plan** being developed by January 2021. Work in 2019 work focused on the development of background reports and technical studies intended to inform the growth plan development in 2020. In parallel, the Water Utility continues to support development of a corporate regional strategy and to provide technical review and comment on regional planning circulations to ensure The City's interests and intermunicipal planning commitments are upheld in the development plans of our neighboring municipalities.

Partnerships with the Province

The Water Utility's commitment to IWM recognizes the authorities and responsibilities of the Government of Alberta in delivering on the goals and actions articulated in Alberta's Water for Life strategy. The three main goals are:

- Safe, secure drinking water supply
- Healthy aquatic ecosystems
- Reliable, quality water supplies for a sustainable economy.

As such, the Water Utility's relationship with the Province involves many staff from across both orders of government. The Water Utility continues to carefully manage and foster long-term, successful relationships with counterparts in Alberta Environment and Parks and Alberta Transportation, in particular.

2.6 PRIORITIES IN 2020

Table 2.1 summarizes activities The City plans to take to continue protecting our water supply in 2020.

Table 2.1 Goal #1: Protect Our Water Supply – 2020 focus

2020 Planned Actions
Water Security #1: Refine Bow River flow modelling work with research partner Global Water Futures.
Water Security #2: Explore water licence discussions with major stakeholders TransAlta and the Government of Alberta.
Water Security #3: Continue work with the CMRB to develop Regional Growth and Servicing Plans.
Water Security # 4: Remain an active member of the Bow River Working Group. Advocate for Phase 2 of the Bow River Reservoir Options project to explore feasibility of the three options for an upstream water management reservoir on the Bow River.
Water Security #5: Complete Phase 2: Drought Mitigation and Response Strategies.
Water Security #6: Report to Council on the Source Water Protection Plan and Policy in 2020.
Continue working with Rocky View County on managing risks at the Bearspaw Reservoir.
Continue to advance implementation actions of the Wildfire-Source Water Task Force Strategy.
Broaden understanding of stormwater contamination risk to The City's drinking water supplies.

3. GOAL #2: USE WATER WISELY

Significant investments over the past 30 years have helped ensure Calgary's water security despite population growth and a changing climate. The City has invested heavily (over $700M) to reduce per capita demand through leak detection, main replacement, water metering, educational programs and water treatment plant upgrades. Today, our per capita target is 350 litres per day. This foresight on water conservation and plant efficiency has kept the Water Utility on track to achieve our water conservation targets. **Effective water**

efficiency and conservation programing enables The City to continue to supply all Calgarians with the water they need, even as our population increases over time.

3.1 WATER EFFICIENCY PLAN

The value of water conservation initiatives

The City's 30-in-30 Water Efficiency Plan continues to guide sustainable water management with a goal to maintain Calgary's total water use at 2003 levels through 2033, even as the population grows. Through strategic investments in infrastructure, bylaw adjustments and water efficiency programs, overall water demand has declined since 2003, keeping more water in the river and ensuring water supply and licence security. To encourage wise water use, citizen-focused initiatives continue to keep water demand on track to meet our Water Efficiency Plan goals, while also providing customers' savings on their monthly bills.

In 2019, The City reviewed progress on the 2016 Water Efficiency Plan and developed a plan to research additional water conservation solutions for residential outdoor water use and in the business (industrial, commercial and institutional or ICI) sector. The development of a Business Water Efficiency Program continued in 2019. This business-friendly Program was refined to develop quality services for a broader ICI audience, supporting the Calgary's Comeback initiative for economic recovery. The Program will include water audits and a rebate initiative to support large and small businesses to reduce their operational costs and achieve water savings. By the end of 2020, we will build upon existing programs with new recommendations for water conservation solutions in residential outdoor settings and the business sector. These recommendations will be designed with the Calgary market in mind and will align with existing work in climate change, drought, stormwater and land use planning. This work ensures a secure and sustainable water supply while protecting public health and the environment for generations to come.

In 2019, The Utility developed a plan to research additional **water conservation** solutions for **residential outdoor** water use and in the **business** (industrial, commercial and institutional or ICI) sector.

2019 highlights:

- Increased reach of the residential water leak detection program to support high water use messaging
- Continued focus on peak day specific messaging to reduce outdoor water use
- Launched the Homeowner Water Guide Series to reduce both indoor and outdoor water use
- Participated in industry wide cooling tower research to further knowledge of our business customers and their technology
- Continued delivery of the multifamily toilet replacement program
- Supported the local irrigation industry in educating members about efficient outdoor water use
- Provided public tours of the Glenmore Water Treatment Plant to 240 Calgarians.

We shared water conservation messaging with over 10,000 citizens and launched a Homeowner Water Guide in 2019.

3.2 CALGARY'S WATER USAGE

Water efficiency measures implemented by The City, improvements in water efficient technology, and effective citizen outreach and education have been successful in helping Calgary remain below the Water Efficiency Plan benchmark. The City's water efficiency measures have been successful in helping Calgarians reduce water usage over the years, despite population growth during that time in Calgary and the region (Figure 3.1).

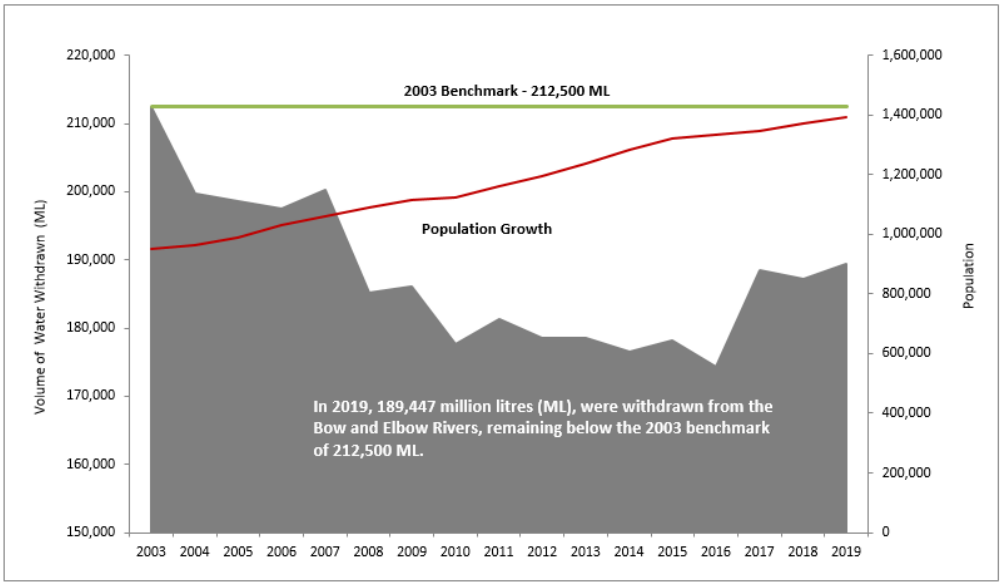


FIGURE 3.1 RIVER WITHDRAWALS OVER TIME

3.3 CALGARY'S PER CAPITA WATER DEMAND

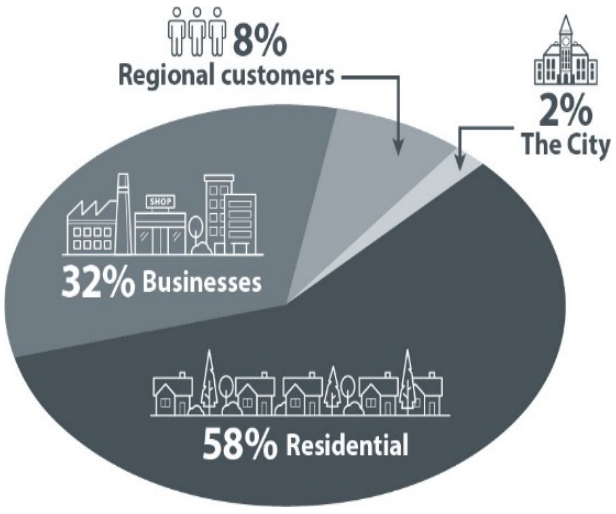


FIGURE 3.2 CALGARY'S 2018 WATER DEMAND BY CUSTOMER

Most of Calgary's water demand is made up of single-family and multi-family customers, followed by business customers (Figure 3.2).

Per capita water demand is the average volume of water used per person per day. In 2019, Calgary's overall water use, including all residential, business and municipal, was 356 litres per capita per day (lpcd), well on track to meet the 2033 target of 350 lpcd (Figure 3.3).

Of the overall water use in 2019, **single-family residential demand was estimated to be 197 lpcd, the lowest on record for this customer group. This**

shows that customers are doing their part, and The City's water conservation programs are working.

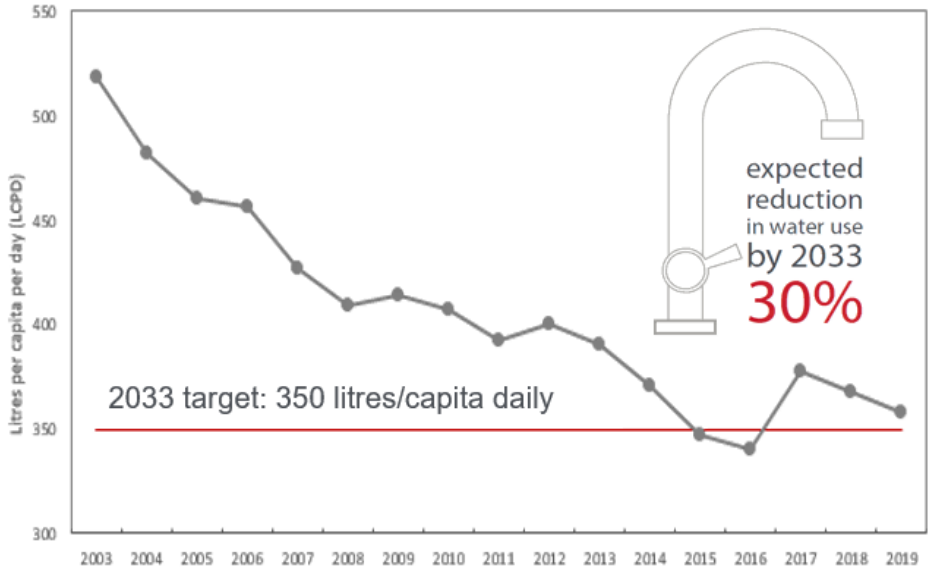
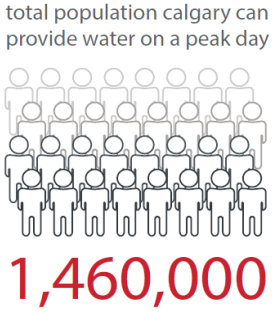


FIGURE 3.3 CALGARY'S TOTAL PER CAPITA WATER DEMAND OVER TIME

Citizen and business focused **initiatives around water conservation help to ensure that Calgary is on track to meet the goals of the Water Efficiency Plan**. In 2019 The City launched the Homeowner Water Guide series on Calgary.ca/waterguide. These guides are meant to educate Calgarians on all aspects of indoor and outdoor water use on their property. Topics range from seasonal 'how-to" checklists to checking toilets and faucets for leaks. The guides were made available to citizens at a variety of events and were promoted to Calgarians on social media and on the ReThink Water Facebook page.

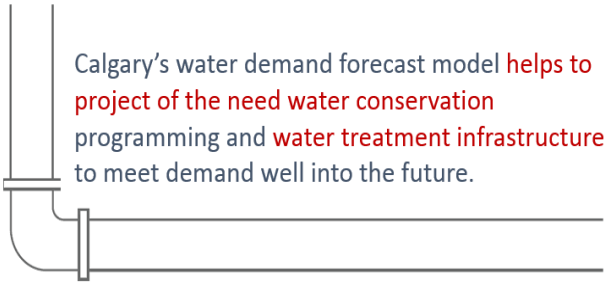
Water savings of over 32 million litres were achieved at multifamily properties in 2019, by replacing more than 580 toilets at 16 different locations, contributing to the continued reduction in per capita water demand. This program will continue in 2020 and is available to any multi-unit building in Calgary where high-efficiency toilets have been purchased and installed to replace old 13L toilets.

3.4 PEAK DAY DEMAND



The one day in a year that customers use the most water is referred to as the peak day demand. This typically occurs in the spring or summer months, as water demand can spike from outdoor watering activities and cooling. In 2019, Calgary's peak day water demand occurred on August 5th, and was 626 megalitres (ML), below the 950 ML threshold which is the current capacity of Calgary's water treatment plants (Figure 3.4). **This means we can continue to provide water for 1.46 million people on a peak day.** This year's peak day was lower than observed in recent years and can likely be attributed to cooler and wetter than average summer conditions.

The Water Utility **partners with customers to conserve water and reduce peak day demand**. An emphasis on outdoor water conservation and making low water use landscaping choices played an important role in saving water through the summer months. The YardSmart Program continued delivering its peak day messaging to target outdoor watering. In 2019, through continued work with partners, the YardSmart program delivered 10 Water Wise landscape design workshops, sold 1300 rain barrels and reached over 3000 Calgarians at public events.



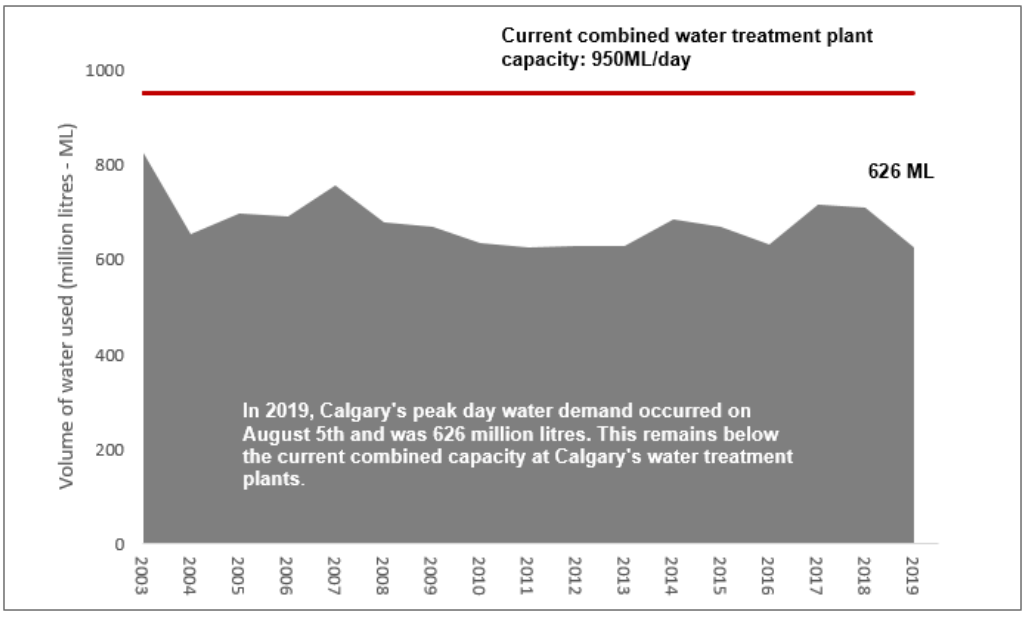


FIGURE 3.4 - PEAK DAY DEMAND – MAXIMUM VOLUME OF WATER USED IN CALGARY IN ONE DAY

3.5 WATER LOSS MANAGEMENT

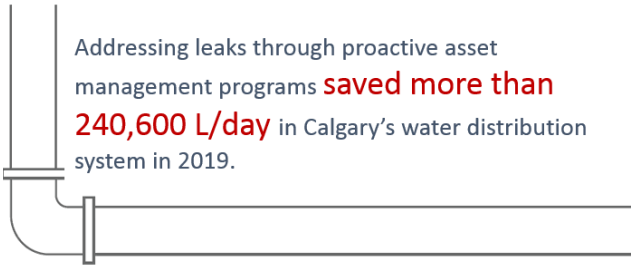
Non-revenue water is a term used to describe water that's treated and distributed, but not billed to a customer. **The Water Utility undertakes several proactive initiatives to reduce non-revenue water loss.** Water loss includes real losses, which is water lost through system leakage and main breaks, as well as apparent losses – water lost through inaccurate metering and systematic data handling issues associated with billing. Non-revenue water also includes water used for delivery of City services such as main flushing and firefighting, but this water is not considered loss. Apparent water losses are those incurred when customers are not appropriately metered and billed for the water they use. The Water Utility completes proactive meter testing and replacement for customers across the city to ensure meter accuracy.

Water loss strategy

In 2019, the Water Utility developed **a Water Loss Strategy to provide a holistic view of water loss across the Water Utility and coordinate water loss reduction efforts.** In 2019, the focus of the strategy was the completion of a thorough water audit to understand the current state of water loss across the Water Utility, as well as recent and ongoing water loss reduction activities. Plans for 2020 include working on the short, medium and long-term activities required to reduce Water Utility water loss and build the structure of the strategy and water loss targets.

Leak detection

To reduce real losses, as well as protect property, the environment, and drinking water quality, we conduct proactive asset management on City water infrastructure. In addition to addressing main breaks and other leaks that present themselves, leak detection and feeder main inspections are critical pieces of our infrastructure maintenance program as it relates to water loss. The identification of leaks prior to the surfacing of the leak can reduce the overall leak run time and the volume of water lost, and reduces the likelihood for catastrophic failure. Additionally, there are areas in the city where due to the geotechnical conditions, water leaving a distribution main may never come to surface and would instead drain into other infrastructure or to the river.



In 2019, crews tested new equipment that is more effective at locating leaks on plastic (PVC and polyethylene) pipes. This is critical as plastic pipe materials comprise an increasing percentage of the water distribution system. Leaks identified through the leak detection and feeder main inspection programs are scheduled for repair.

In 2019, City crews identified and fixed leaks in water mains, copper service connections, and feeder mains, leading to a savings of more than 204,600 L per day.

3.6 PRIORITIES IN 2020

The City will continue working with customers to encourage responsible and efficient use of water. Activities planned for 2020 are summarized in Table 3.1.

Table 3.1 Goal #2: Use Water Wisely – 2020 Focus

2020 Planned Actions
Implement Business Water Efficiency Program including water audits and a rebate initiative. Create new recommendations for water conservation in residential outdoor settings and the business sector.
Promote the Homeowner Water Guide Series
Continue delivery of the multifamily toilet replacement rebate program
Expand program delivery for business customers
Continue to partner with the irrigation industry to support efficient outdoor water use
Continue to work on short, medium, and long-term activities required to reduce utility water loss
Utilize water demand forecast modeling to support peak day management programming initiatives.

4. GOAL #3: KEEP OUR RIVERS HEALTHY

The value of wastewater, stormwater and riparian improvements to keep rivers healthy

Calgary is a big, growing city on relatively small rivers and requires ongoing efforts to keep our waterways healthy. Excess nutrients, sediment, bacteria and other pollutants that enter our rivers can negatively impact fish and wildlife, the ecosystem and drinking water. Managing water quality is a major component of our alignment to the Provincial South Saskatchewan River Basin Regional Plan and protecting Calgary's waterways is guided by Provincial objectives for the Bow River. We work diligently to manage these risks through efficiencies in wastewater treatment, mitigating the impacts of city-building on stormwater, and protecting the areas adjacent to rivers and creeks.

4.1 WASTEWATER MANAGEMENT

4.1.1 APPROVAL TO OPERATE

The City operates its three wastewater treatment plants (Bonnybrook, Pine Creek and Fish Creek) and a wastewater collection system. In 2019, The Government of Alberta renewed Calgary's wastewater operating approval for the next ten years. **The renewal helps optimize operational efficiency while ensuring our commitment to a clean and healthy river.** Following substantial collaboration and negotiation with provincial regulators, this is a major milestone for The City of Calgary.

Received **Approval to Operate** WWTPs to ensure **healthy watersheds** and **manage costs** for stormwater and wastewater treatment upgrades

Bow River Water Quality Model upgrade

The Water Utility upgraded its Bow River Water Quality Model (BRWQM) to simulate water quality conditions in the Bow River to incorporate changes in the wastewater treatment plants and stormwater infrastructure. Modelling results were used to support The City's Wastewater Approval to Operate.

Total Loading Objective Assessment

The goal of the total loading objective assessment (TLOA) study was to **identify watershed loading objectives for select water quality parameters to protect fish health and habitat.** The TLOA screened more than 123 parameters to assess potential impacts to the Bow River and confirmed stormwater and wastewater loading objectives for the Approval renewal.

City-wide stormwater loading targets

The Water Utility developed a new, fine-resolution stormwater management model to simulate Calgary's non-point source loadings going into the Bow River. The new model also includes updated information on Calgary's impervious cover to simulate the city-wide runoff. This model will be used to provide guidance on stormwater management to optimize best management practices.

Through these studies, The City **negotiated Provincial water quality guidelines to keep Calgary's watershed healthy and potentially save millions of dollars in future wastewater and stormwater upgrades.** In 2020, the Water Utility will initiate a study on ammonia toxicity to inform the development

of site-specific ammonia guidelines appropriate for Calgary's watershed. The Water Utility's continued rigorous analysis ensures that the Bow River and its aquatic species are kept healthy, while allowing operational flexibility and balancing investments in wastewater treatment upgrades.

4.1.2 WASTEWATER TREATMENT PLANTS

In 2019, The City's wastewater treatment plants continued to produce treated effluent compliant with Provincial regulations. **Major upgrades to the Bonnybrook Wastewater Treatment Plant are ongoing to protect our rivers by ensuring continued compliance with regulatory requirements and support population growth** (Figure 4.1). Progress on these upgrades continue to be on time and on budget. In 2019, two new treatment channels in the Ultraviolet Light Disinfection Building were commissioned to increase both the treatment quality and liquid stream treatment capacity to accommodate future growth.

Construction of the Plant D Secondary Treatment project was in full flight in 2019 and is progressing well. This project **will increase treatment capacity of the plant by 20 per cent when it becomes operational.** Construction of the Plant D Primary Treatment project was started in 2019 and will increase the treatment capacity at the plant in conjunction with the Secondary Treatment Project. Construction of the Bonnybrook cogeneration facility also started in 2019. This project will use biogas generated by the wastewater treatment process to generate additional electricity for use at Bonnybrook. All three projects are expected to be operational in 2021.

FIGURE 4.1: MAJOR UPGRADES AT BONNYBROOK WILL HELP ACCOMMODATE GROWTH AND IMPROVE WATER QUALITY FOR DOWNSTREAM USERS.

20%
Increased capacity at Bonnybrook WWTP from Plant D Secondary treatment **upgrades by 2021**. Work is proceeding on time, on budget.

Significant progress was also made on the construction of the new Bonnybrook Plant outfall in 2019. The new, upsized twin outfall will provide for additional treatment capacity for Bonnybrook and additional flood protection for the critical wastewater treatment infrastructure at the plant. The design study for upgrades at the Fish Creek Wastewater Treatment Plant was also started. The primary objective of this study is to evaluate and select a technology for treating ammonia to meet the Federal Wastewater Systems Effluent Regulations and treat peak wet weather flows.

4.1.3 WASTEWATER BUSINESS CUSTOMERS

Some ICI customers produce wastewater that may have a higher concentration and contain different contaminants that exceed Wastewater Bylaw requirements. This is called high-strength wastewater. **The Water Utility's Wastewater Loading Management Program aims to improve management of high-strength wastewater from ICI customers, as this wastewater is technically challenging and expensive to manage and treat.** The program identifies and implements cost-effective, resource-efficient, reliable and equitable strategies that meet customer needs for wastewater load management and optimize use of wastewater treatment plant capacity.

The Water Utility advanced this program in 2019 by initiating an options analysis for the management of ICI wastewater loadings to Calgary's wastewater treatment plants. A comprehensive flow monitoring program was introduced and continued with high-strength wastewater monitoring. The program is scheduled for completion in 2020, and the work done will form the basis of how the Water Utility moves forward with wastewater management solutions for customers based on their individual needs.

4.2 TOTAL LOADING MANAGEMENT

The City's **Total Loading Management Plan (TLMP) is a planning tool used to derive loading objectives for both stormwater infrastructure and wastewater treatment plants, to manage impacts from our wastewater and stormwater loadings on the Bow River.** The City's TLMP identifies total suspended solids (TSS) and total phosphorus (TP) as the key parameters that require management to mitigate environmental impact to Calgary's watershed.

The City reassesses watershed water quality related threats every five years to determine if there are other water quality parameters that require management to protect Bow River aquatic habitat. The next update is planned for 2024 and work on this will start in 2021.

4.2.1 TOTAL SUSPENDED SOLIDS IN THE BOW RIVER

Stormwater and treated wastewater contain total suspended solids, which include organic and inorganic materials. These materials enter waterways and can impact water quality and aquatic habitat. Figure 4.2 shows that The City has remained under the Provincial objective for TSS loadings into the river from stormwater and wastewater sources.

Urban runoff from stormwater contributes a significantly higher proportion of total suspended solids to the Bow River compared to wastewater effluent. In 2019, estimated TSS loadings from stormwater to the Bow River were 39,978 kg/day, which is below The City's 2005 benchmark. This **demonstrates the effectiveness of The City's stormwater quality investments and pollution prevention programming considering population growth and urban expansion.**

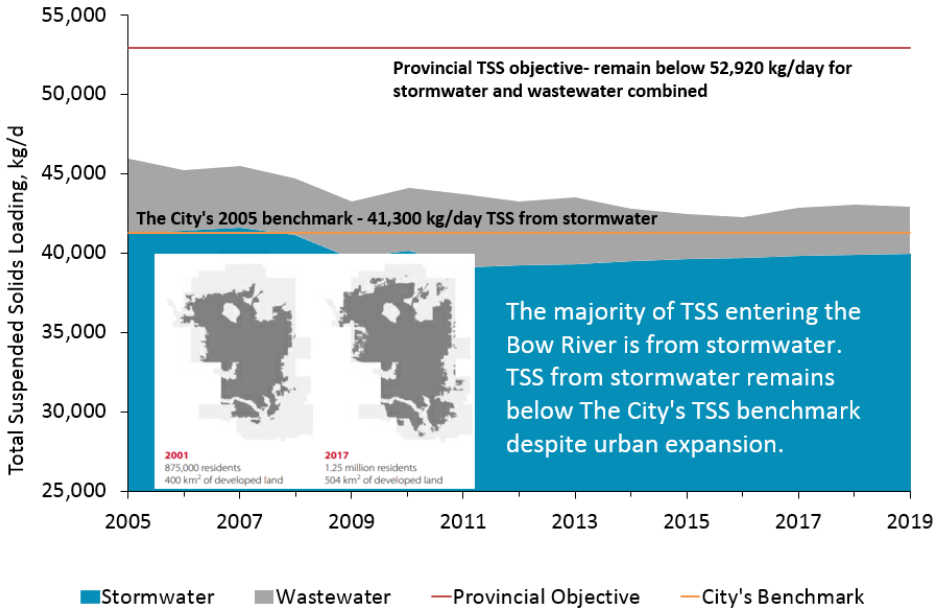


FIGURE 4.2 TOTAL SUSPENDED SOLIDS (TSS) LOADING TO THE BOW RIVER FROM STORMWATER AND WASTEWATER

4.2.2 PHOSPHORUS IN THE BOW RIVER

Too much phosphorus in waterways can cause accelerated plant growth, algae blooms and low dissolved oxygen, which is detrimental to aquatic life. The City's TLMP has a total loading objective for Total Phosphorus (TP) to ensure Calgary's aquatic habitats remain healthy and safe. The primary source of TP entering the Bow River in Calgary is from treated wastewater effluent, with the remaining amount contributed by stormwater. Figure 4.3 shows the reported **amount of TP entering the river from both stormwater and wastewater to be below the Provincial objectives in 2019, demonstrating that our wastewater treatment continues to be effective.** Treated wastewater contributes more than double the amount of TP to the Bow River compared with stormwater sources.

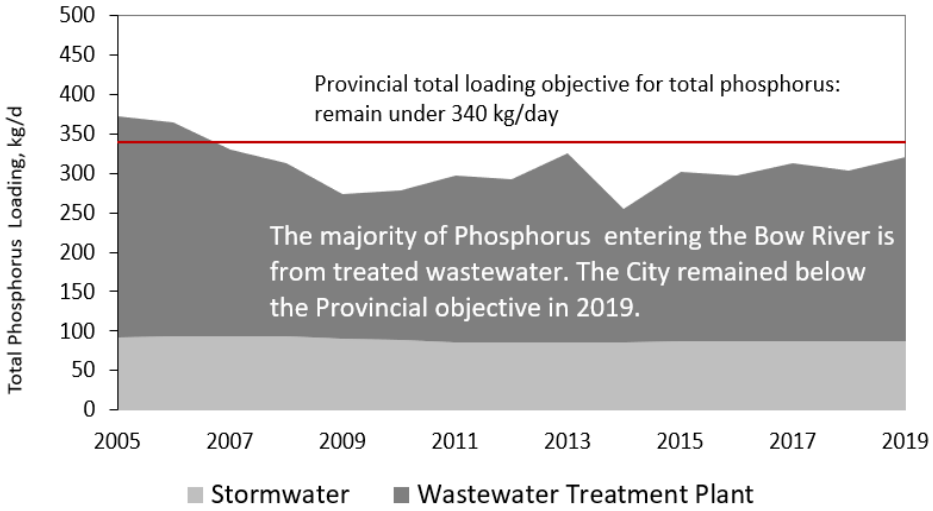


FIGURE 4.3 TOTAL PHOSOPHORUS LOADINGS TO THE BOW RIVER FROM STORMWATER AND TREATED WASTEWATER

4.3 STORMWATER MANAGEMENT

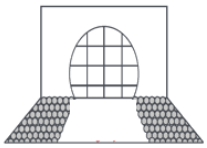
The value of stormwater management initiatives

The Water Utility manages water from rain or snow/ice melt by either collecting, storing, or moving it into the nearest river or creek through storm drains, pipes and ponds. Parts of Calgary's stormwater system are designed to limit the sediment going into the river, ensuring healthy rivers and river banks and allowing the quality of the rivers to be maintained for Calgarians and downstream users. Stormwater management is a key component in the design of vibrant, safe and resilient communities. The City's investments in stormwater retrofits, the Community Drainage Improvement Program (CDI), and green stormwater infrastructure help manage the impacts of climate change and a growing city as well as reducing the impacts of localized and river flooding on citizens and businesses.

4.3.1 STORMWATER MANAGEMENT STRATEGY UPDATE

Since the 2005 Stormwater Management Strategy was implemented, municipal stormwater management practices have advanced and the potential impacts of climate change on stormwater runoff are better understood. Using a customer-centric approach, The City is updating the Strategy to consider these changes and set a strategic course on how stormwater is managed over the next 20 years. **The Strategy will help us better understanding of the complexities of the stormwater issues and contributing factors needed to enable more practical, and innovative solutions.**

To inform this update, The City began engagement with internal and external stakeholders including businesses, the building and development industry, non-government agencies, academia, regional municipalities, regulators and communities and customers. The first phase of the engagement concluded at the end of 2019 and focused on understanding stakeholder values and perspectives and building a stronger understanding of opportunities to address stormwater management challenges. The input gathered from this phase informed an aspirational draft vision, principles and goals.



Stakeholder engagement underway to inform a renewed Stormwater Strategy draft by the end of 2020

The second phase of stakeholder engagement will continue until mid-2020 to help identify short, medium and long-term actions. The input from stakeholders will inform The City, as it considers technical expertise, best management practices, and a Triple Bottom Line analysis to update the Stormwater Management Strategy. In alignment with the second phase of engagement, a draft green stormwater infrastructure (GSI) strategy will be completed by 2021.

The Stormwater Management Strategy will align with other corporate strategies and policies such as the updated Municipal Development Plan, The City's Climate Resilience Strategy, the Corporate Resilience Strategy, the BiodiverCity and Wetland Policy. A draft of the updated Strategy will be completed for the end of 2020.

4.3.2 STORMWATER QUALITY RETROFIT INVESTMENTS

The City constructs **stormwater quality retrofit projects** such as wet ponds or constructed wetlands to **improve water quality by removing solids and other pollutants before it enters our rivers**. Design of South Highfield stormwater quality retrofit pond was initiated in 2019. This pond will help reduce

pollutants from this industrial area. The City also started construction of the Bebo Grove Storm Pond and diversion trunk in the Woodland-Woodbine neighborhood.

4.3.3 STORMWATER PONDS

Calgary's stormwater drainage system contains over 300 wet and dry storage ponds. These **ponds reduce the amount of sediment and other pollutants entering our rivers. They also provide some localized flooding mitigation** by holding stormwater during high rainfalls, releasing it slowly back into The City's stormwater system. The City's Pond Condition Assessment identified the need for regular maintenance of Calgary's ponds to ensure they are operating effectively, meeting water quality and stormwater volume requirements. In 2019, The Water Utility continued work on upgrades to the Hanson Ranch stormwater pond.

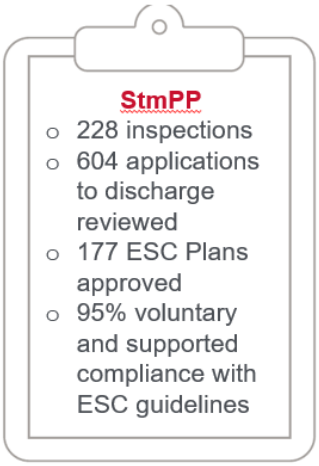
4.3.4 GRAVEL LANE SEDIMENT ABATEMENT STUDY

Gravel back lanes produce disproportionate amount of TSS loadings into Calgary's rivers. These sediments can become trapped in stormwater infrastructure and maintenance costs. It's estimated that gravel lanes generate up to 11 per cent of total sediment (TSS) loadings in our waterways but compromise only 1.4 per cent of Calgary's land area.

Many of Calgary's residential areas still have gravel as the surface in their back lanes. Gravel back lane related complaints are in The City's top ten 311 customer complaints. The City is undertaking a **collaborative study between the Water Utility and the Transportation Department, along with other City stakeholders on various approaches to reduce gravel lane sediment from reaching Calgary's waterways.** Phase I has evaluated gravel lanes alternatives, identified pilot sites, and collected baseline data. This data confirmed modelling predictions on gravel back lane TSS loads. A preliminary action plan, designs and cost estimates are being developed. Phase 2 includes the implementation of pilot designs at three locations and monitoring the effectiveness with respect to TSS reduction.

4.3.5 STORMWATER POLLUTION PREVENTION PROGRAM (STMPP)

The Stormwater Pollution Prevention (StmPP) program ensures customers and City staff plan, implement and monitor effective practices to **reduce stormwater pollutant loadings from construction activity** and ensure regulatory compliance.



Construction activity in Calgary exposes highly erosive subsoil, which is easily transported by wind and water. In 2019, to protect our watershed and storm infrastructure from the impacts of construction site sediment, City staff reviewed 367 Erosion and Sediment Control (ESC) Plan applications resulting in the approval of 177 ESC Plans. Approved ESC Plans are estimated to reduce soil loss from active construction sites by 28,346 tonnes per year. Soil losses then generally decrease once sites are stabilized with natural vegetation, buildings, roads, etc. During 2019,

there were a total of 883 construction sites in Calgary with an active approved ESC Plan. StmPP performed 338 inspections at 212 of those sites.

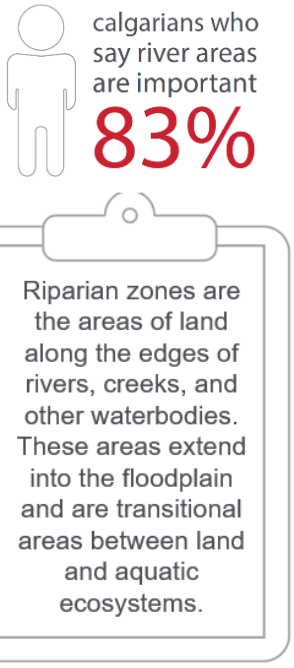
In 2019, StmPP reviewed 604 applications to discharge drainage from construction, commercial, and industrial sites and operational activities to storm infrastructure.

To continue customer service improvements, StmPP delivered training sessions in 2019 to inform and support customers with the 2018 updated requirements for successful implementation of The of City's ESC Guidelines and Standard Specifications.

New efficiencies in monitoring and compliance included collaboration with Community Standards (Bylaw) and Law to enhance customer compliance. This is being achieved by referring non-compliant files to Bylaw for enforcement under the Drainage Bylaw.

4.4 RIPARIAN ACTION PROGRAM

Riparian areas are natural assets that provide many ecological, social and economic benefits including water quality protection, resilience to flood and drought, biodiversity enhancements and recreational opportunities. The City's **Riparian Action Program (RAP) delivers on the Municipal Development Plan's goal of greening the city and objectives related to green infrastructure, watershed protection and ecological networks.** Protection and management of riparian areas aligns to the Natural Infrastructure pillar of Corporate Resilience and to the Corporate Climate Strategy and complements the Flood Mitigation and Resiliency Program. The City's RAP is a comprehensive and coordinated approach to protect riparian areas in Calgary and contains three specific program areas: (i) Riparian Health Restoration and Monitoring, (ii) Riparian Land Use Planning and (iii) Outreach and Education. The sections below summarize the activities conducted in 2019 to support the goals and objectives of the RAP.



4.4.1 RESTORING RIPARIAN AREAS

The value of restoring riparian areas

Riparian restoration projects lead to a more resilient natural infrastructure that provides protection against floods and erosion and improves water quality. In 2019, The City continued efforts to improve riparian health and restore riparian areas through bioengineering and riparian planting projects. Bioengineering is an approach to river bank engineering that incorporates living plants with natural and synthetic support materials to stabilize slopes and reduce erosion. Riparian planting projects use native vegetation with deep-rooted plants that stabilize riparian areas.

Approximately 30 bioengineering and riparian planting projects were ongoing or completed in 2019. Several of these projects were delivered through a partnership between Water Utility and Parks. Sharing of internal resources and expertise provides financial benefits and ensures business units meet their respective goals and objectives more effectively. These projects include those part of the Fish Habitat Compensation Program, which offset the loss of fish habitat caused by the 2013 flood.

FIGURE 4.4 THE NEW BOWMONT PROJECT IS BEING USED AS A SPAWNING CHANNEL FOR BROWN TROUT

- The Bowmont West Fish Habitat Project was completed in early 2019 (Figure 4.4) and by the fall was being used by over 160 brown trout as a spawning channel.
- Construction of the Elbow Island Fish Habitat Project began in 2019 with an expected completion date by the end of 2020. The project incorporates public art into the engineering design.
- The Inglewood Bird Sanctuary Reconnection Project is nearing completion of the design phase. This project will reinstate natural processes and improve the local ecology of the park while at the same time creating a significant amount of fish habitat offsets.
- In 2019 construction was completed at the multi-award-winning Bioengineering Demonstration and Education Project (BDEP) site. The project has now entered its monitoring phase to assess the effectiveness of the various bioengineering techniques and to ensure fish habitat and wildlife goals are being met.

4.4.2 MONITORING RIPARIAN HEALTH

Monitoring of riparian areas is one of the **key actions of the RAP to measure the improvement of riparian health over time.** The City's 2026 riparian restoration target is an average riparian health score of 72 per cent. 2019 marked the second year of The City's 5-year Riparian Monitoring Program.

Trend monitoring

Over 100 Riparian Health Inventory (RHI) sites will be monitored during the program to identify healthy areas and areas where further action is needed to improve riparian health. A comprehensive trend analysis will be completed in 2020 to determine progress towards the 2026 restoration target. In 2019, 26 RHI sites were visited, encompassing approximately 190 hectares of riparian habitat along 26 km of riverbank.

Effectiveness monitoring

In addition to trend monitoring, 55 bank restoration sites and 30 riparian planting projects are being monitored to assess the effectiveness of restoration practices. In 2019, the Water Utility examined the

effectiveness of 19 bank restoration and nine riparian planting projects. The majority of the sites were found to be successful.

FIGURE 4.5 RIPARIAN HEALTH AT THE BDEP HAS IMPROVED, WITH FISH AND WILDLIFE USING THE CONSTRUCTED HABITAT ENHANCEMENTS.

Bioengineering Demonstration and Education Project
2019 marked the first year of monitoring work at the BDEP site (Figure 4.5). The work included examining post-construction monitoring of fish and fish habitat, wildlife, riparian health and bioengineering structural integrity over a 10-year period. Preliminary results for 2019 show that planted vegetation survival is 80 per cent, both fish and wildlife are using the constructed habitat enhancements, and riparian health has improved.

4.4.3 RIPARIAN EDUCATION AND OUTREACH

In 2019, we continued our partnership with The RiverWatch River Ambassador Program **to engage with Calgarians about riparian stewardship and advance the Riparian Outreach and Education program**. The program engaged 1,703 pathway users in river awareness conversations and took 459 citizens on interpretive floats down the Bow River.

We continue to promote the Healthy Rivers Story Map among our watershed partners and to citizens through targeted education opportunities. The map is updated annually to capture new restoration projects within the City of Calgary and to promote education and volunteer opportunities for citizens.

In 2019 several education initiatives related to the Bioengineering Demonstration and Education Project were piloted including a one-day parks school, in partnership with Calgary Parks, and a Stream Rehabilitation Program in partnership with Trout Unlimited Canada. Interpretive signage and a website are in development and will be completed in 2020.

4.5 WATERSHED MANAGEMENT PLANNING PARTNERSHIPS

Watershed management plans and partnerships **provide important frameworks and support actions to improve watershed health in the region.** The City participates with regional partners, stakeholders and watershed groups on many watershed planning initiatives. City Council has endorsed three watershed management plans: the Bow Basin Watershed Management Plan (2008), the Elbow River Watershed Management Plan (2008) and the Nose Creek Watershed Water Management Plan (2007 – updated in 2019).

Nose Creek Watershed Management Partnership
The Nose Creek watershed is one of Calgary's most sensitive watersheds and it continues to experience significant land development pressures. In 2019, Council endorsed the update of the Nose Creek

Watershed Water Management Plan, which provides a framework for **balancing urban development with watershed protection.**

Recommendations in the updated Plan include actions to:

- Improve stormwater management and water quality
- Retain riparian areas and wetlands in urbanizing areas
- Preserve biodiversity in the watershed.

The work of the Partnership is directly linked to two of the four goals of Integrated Watershed Management including: 1) Protecting Water Supply, and 2) Keeping Rivers Healthy. The Partnership remains a model for inter-municipal collaborative watershed management across the Province and is viewed by the Government of Alberta and partner municipalities as a successful example of working together to protect a stressed watershed.

A key outcome of the Plan will see the development of a hydrologic model for the watershed, a tool to help the Partnership and The City understand how development decisions are impacting the Nose Creek Watershed. Calgary's endorsement of the Plan included direction to City Administration to report back to Council with a progress update on Plan implementation by Q3 2020.

4.6 WATERSHED HEALTH INDICATORS

To enhance our ability to **incorporate watershed resiliency in decision making**, the Water Utility is developing a watershed health index for Calgary. In 2019, The City partnered with the Southern Alberta Institute of Technology (SAIT) to deliver a stakeholder Watershed Health workshop to assess best practices and explore potential watershed health indicators for The City of Calgary. Local and international experts reviewed Calgary's existing monitoring programs and data and identified gaps that required further analysis. With the completion of Phase 1 in 2019, Phase 2 work will begin in 2020.

Local and international experts reviewed Calgary's watershed monitoring programs to inform the Watershed Health Indicator project.

4.7 PRIORITIES FOR 2020

To continue reducing the impacts on the watershed and keeping our rivers healthy, The City's focus areas for 2020 are summarized in Table 4.2.

Table 4.2 Goal #3: Keep Our Rivers Healthy – 2020 focus

2020 Planned Actions
Continue implementing major upgrades of Bonnybrook Wastewater Treatment plant.
Initiate ammonia toxicity study to inform guideline negotiations. Make refinement to BRWQ model to improve to 2D-3D.
Complete a draft of the updated Stormwater Management Strategy by the end of 2020.
Continue riparian monitoring and evaluate progress on riparian health target in 2020.
Continue progressing on riparian restoration and fish habitat compensation projects.
Report to Council on progress on the Nose Creek Watershed Water Management.
Initiate Phase 2 of the Watershed Health Indicators project
A draft green stormwater infrastructure strategy will be completed by 2021.

5. GOAL #4: BUILD RESILIENCY TO FLOODING

5.1 RIVER FLOOD MITIGATION AND RESILIENCE PROGRAM

A comprehensive update on river and stormwater flooding efforts undertaken by The City can be found in the 2019 Flood Resiliency and Mitigation Annual Update (UCS2020-0372).

In 2019, the Water Utility focused on **working closely with communities to progress on key community mitigation projects** that are core to the Flood Resilience Plan. This focus **ensured that robust, comprehensive community engagement was undertaken so that community stakeholder concerns were both well understood and considered as projects progressed.** Community feedback is of importance for the proposed Sunnyside and Bowness flood barrier projects which are undergoing conceptual design and feasibility study, respectively.

The City's Flood Resilience Plan includes a combination of upstream, community, and property-level flood mitigation to ensure that Calgary becomes **more resilient to river flooding**, despite **climate uncertainty** and continued **urban development**.

During 2019, construction of the Eau Claire Promenade continued, which will incorporate the Downtown Flood Barrier connect with flood barriers in West Eau Claire Park and the Centre Street Bridge to protect Calgary's Downtown from a 1:200 flood event (Figure 5.1). In 2019, The City advanced detailed design for the Downtown Flood Barrier and Upper Plateau Separation resilience projects.

Significant progress was also made on the gate upgrades at the Glenmore Dam. The gates will be operational before the 2020 flood season, minimizing flood damage from smaller more frequent flood events on the Elbow River.

FIGURE 5.1 DOWNTOWN FLOOD MITIGATION COMPONENTS WILL CONNECT TO PROTECT CALGARY'S DOWNTOWN FROM A 1:200 FLOOD EVENT.

The City continues to work closely with the Province to implement upstream mitigation on the Bow and Elbow Rivers. **Ensuring upstream mitigation is constructed remains the most crucial outstanding component of The City's overall flood strategy.** With the federal government's Environmental Impact Assessment (EIA) process for the Springbank Off-stream Reservoir (SR1) well underway, The City's advocacy efforts in 2019 were focused on mitigation on the Bow River.

In anticipation of future flood hazard mapping from the Province, the Water Utility has identified a need to develop policy direction that provides an optimal balance of flood resiliency outcomes in Calgary to ensure appropriate land use and policy measures to reduce Calgary's flood risk. Work to develop an initial policy framework that identifies potential policy tools and options to address future mapping changes was initiated in 2019 and will continue throughout 2020. This work is **intended to provide a consistent direction and application of policy and planning guidelines in flood risk areas to protect citizens, property, and Calgary's river valleys.** Work on developing an effective flood risk awareness and education program to support citizens was started in 2019.

5.2 LOCALIZED FLOODING AND THE COMMUNITY DRAINAGE IMPROVEMENT PROGRAM

The City manages stormwater to protect public safety and reduce damage to property from flooding and continues to address areas with high stormwater flooding risk through its Community Drainage Improvements (CDI) program.

The CDI program increases stormwater capacity to **minimize localized flooding** risks, address to address **climate impacts** and **future densification** in mature communities.

Starting in 2020, The City will **integrate successful lessons learned from its Integrated Stormwater Management Study** of Renfrew in 2019 into future CDI studies and projects. Integrating this approach will **ensure that factors such as water quality impacts, anticipating future redevelopment and densification, climate change impacts, enhanced asset management, and opportunities for green stormwater infrastructure are considered** and accounted for in future stormwater flooding mitigation opportunities.

In 2019, **The City integrated its prioritization of river flood and CDI projects to address all flooding as a single priority.** As new CDI studies are completed, additional projects will be added to the program list and prioritized based on their expected cost-benefit ratio and reduction of risk to communities

5.3 PRIORITIES FOR 2020

In 2020, The City will continue to build resiliency to river flooding and implement actions to reduce stormwater flooding, as summarized in Table 5.1.

Table 5.1 Goal #4: Build Resiliency to Flooding – 2020 focus

2020 Planned Actions
Continue to work with communities on design and construction of flood mitigation barriers.
Explore potential policy tools and options in advance of future flood hazard mapping updates from the Province.
Research and development of a future flood risk awareness and education program for Calgarians.
Continue advocacy efforts with the Province on the need for upstream mitigation, funding of flood mitigation projects and continuation of the TransAlta agreement.
Support delivery of the Community Drainage Improvement program and work on implementing integrated stormwater management initiatives within CDI and other drainage programs.