Abbotsford and Mission Water and Sewer Services

Water Efficiency Plan - 2022-2032

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Executive Summary

The Abbotsford Mission Water and Sewer Commission (AMWSC) is committed to providing regional water supplies to the City of Abbotsford and District of Mission to enable residents, businesses and institutions, and the natural environment to thrive. Efficient use will ensure that this invaluable resource will be there for all in the future.

This Water Efficiency Plan sets out a refreshed direction for 2022 to 2032. It provides objectives for this next operational period, sets out a renewed program and suite of actions, establishes data-based targets, and outlines implementation strategies and schedules. It strikes a balance between ensuring customers can use water to enjoy the amenities of their homes and businesses while continuously improving efficiency. It also supports ongoing implementation of the Joint Abbotsford-Mission Water Master Plan.

A History of Conservation

This plan builds on many years of work to improve water use efficiency in both Abbotsford and Mission. Basic education and water use restrictions have been in place for decades, but work expanded through the mid-2000s, driven by historically high summer demand and the urgent need to defer construction of new bulk supply infrastructure.

A target 25% reduction in peak demand was set and a swath of new conservation measures were introduced in the early 2010s. The City of Abbotsford also took the additional step of installing automated metering infrastructure for all residential and non-residential connections and switched from annual to bi-monthly billing. The people of Mission and Abbotsford responded positively. Over the next five years, maximum day demand dropped by approximately 20% and average day demand also decreased by approximately 10%.

While demand has subsequently stabilized, both communities have retained their commitment to conservation. This is reflected in recent Official Community Plan updates in both Mission and Abbotsford and in targets in the 2018 Joint Master Plan.

Water Efficiency Plan Objectives

Driven by the direction the Joint Water Master Plan, the following supporting objectives will guide implementation of this plan:

- reduce per capita total water production to meet targets in the 2018 Joint Water Master Plan;
- manage residential per capita demand in Abbotsford and Mission;
- manage peak season demand in summer;
- continue progress towards universal metering across the region;
- focus limited resources on users with higher than average consumption;
- help commercial, industrial and institutional (CII) customers control demand; and,
- improve water use accounting and management of non-revenue water.

The new program places strong emphasis on helping residents becoming more efficient, working with businesses and institutions, and improving water utility management.
The actions in this strategy are organized around the following five themes:

1. **Reduce Outdoor Water Use**: enhance effectiveness of existing incentives and regulations that help residents reduce outdoor irrigation of lawns and gardens.
2. **Continue "Our Water Matters" Education and Outreach:** raise awareness of the importance of water conservation, assist residents to reduce use indoors and continue outreach to youth through ongoing successful current campaigns.
3. **Improve Commercial, Industrial, Institutional and Agricultural Water Use Efficiency:** help non-residential customers, especially those currently using large volumes of water, to control their consumption.
4. **Measure Water Use and Adopt Volume-Based Pricing:** continue to move toward universal metering across the region and ensure water service pricing provides incentives to people to conserve.
5. **Improve Non-Revenue Water Management:** improve data on consumption and production, identify sources of non-revenue water including leakage, and implement cost effective actions to control losses.

The following table provides a summary of program actions, their current status, and the sectors they target.

2022 to 2032 Water Efficiency Plan Program Summary

Theme	Code	Action	Status	Sector
Theme 1: Reduce Outdoor Water Use	1.1	Irrigation System and Landscape Water Efficiency Program - Assessments	Enhance	Residential
	1.2	Irrigation System and Landscape Water Efficiency Program - Rebates	Continue	
	1.3	Outdoor watering restrictions	Continue	All
Theme 2: Continue "Our Water Matters" Education and Outreach	2.1	Community events	Enhance	Residential
	2.2	Garden guides	Continue	
	2.3	School educational program	Continue	
	2.4	City of Abbotsford Water Wise Portal and Customer Leak Program	Continue	
	2.5	High efficiency toilet rebate	Discontinue	
	2.6	Rain barrel sales	Discontinue	
	2.7	Water saving kit sales	Discontinue	
	2.8	Smart Wash Rebate Program	Continue	
Theme 3: Improve Commercial, Industrial, Institutional and Agricultural Water Use Efficiency	3.1	Commercial, industrial, and institutional water use efficiency pilot project	New	Non-Residential
	3.2	Commercial, industrial, institutional and agricultural continuing program	New	
Theme 4: Measure Water Use and Adopt Volume-Based Pricing	4.1	Universal metering and volume-based pricing in District of Mission	Continue	All
	4.2	Automated metering infrastructure in City of Abbotsford	Continue	
	4.3	Conservation-oriented water service pricing in City of Abbotsford	Continue	
Theme 5: Improve Non-Revenue Water Management	5.1	Maintain the existing loss management program for the transmission system	Continue	Water Utility
	5.2	Water audit analysis of the AMWSC transmission system every five years	Continue	
	5.3	Loss management strategy for District of Mission	New	
	5.4	Loss management strategy for City of Abbotsford	New	

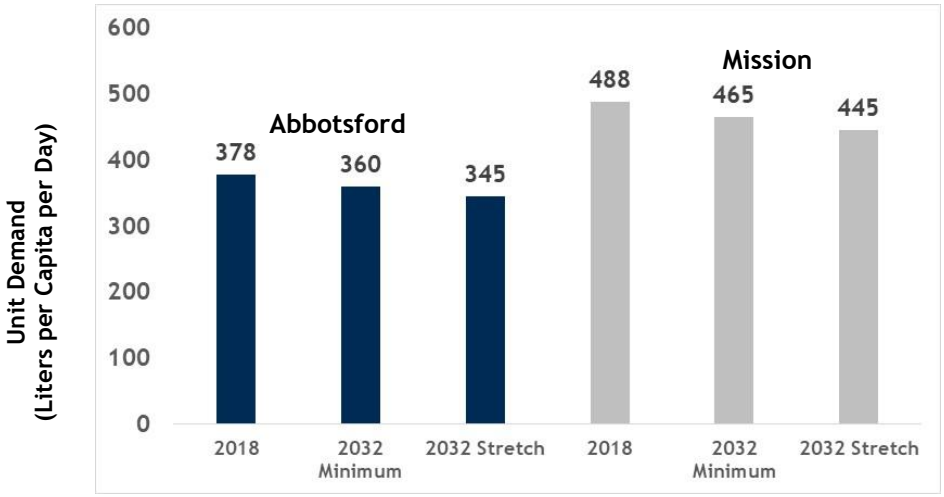
Plan Targets and Implementation

AMWSC will pursue realistic water production and consumption targets to measure success:

Target 1: Total Water Production

- Minimally, reduce water consumption for all customer types by 0.35% year-over-year, in line with the 2018 Water Master Plan target.
- As a stretch target, reduce water consumption for all customer types by 0.7% year-over-year, in line with the 2018 Water Master Plan "medium demand" scenario.

This will result in per capita water production as displayed in the figure below.



Abbotsford and Mission Total Water Production Targets

Target 2: Residential Consumption

- Reduce single family residential consumption in Abbotsford to 180 liters per capita per day by 2032.
- Establish a single family residential consumption target for Mission upon completion of universal metering.

Target 3: Commercial, Industrial and Institutional Consumption

- Develop sector-specific water savings targets as part of detailed implementation planning for the new CII program in 2022. As a starting point, a 10-20% overall reduction in ICI demand by 2032 is likely achievable.

Target 4: Peak Season Demand

- Maintain the peak demand factor at below 1.5, defined as Maximum Day Demand/Average Day Demand (MDD/ADD).

Target 5: Non-Revenue Water

- Quantitative targets will be established as an early implementation priority.

Early implementation priorities include the following:

- by 2022, discontinue the toilet rebate program and rain barrel sales;
- in 2022, identify and implement enhancements to the irrigation assessment and rebate program;
- by 2024, complete a universal metering business case study for Mission;
- in 2023, design and implement the commercial, institutional and multi-family residential pilot project; and,
- in 2023 develop a water loss management strategy for Abbotsford (2028 for Mission following implementation of universal metering).

Plan implementation will be led by AMWSC. City of Abbotsford and District of Mission will be responsible for matters within their areas of responsibilities, notably water service pricing, customer metering and management of non-revenue water, including system loss, within their respective distribution networks.

By continuing to encourage efficient use, this plan will play an integral role in making both Abbotsford and Mission more water sustainable. It will support adaptation to future pressures from climate change and provide a range of other social, ecological and financial benefits.

1.0 Introduction

The Abbotsford Mission Water and Sewer Commission (AMWSC) is committed to providing regional water supplies to City of Abbotsford and District of Mission to enable residents, businesses and institutions, and the natural environment to thrive. Efficient use will ensure that this invaluable resource will be there for all in the future.

In 2013, the predecessor Water Efficiency Plan to this document was completed (AMWSC, 2013). It provided a strategic direction that contributed to sustained reductions in residential demand over more than half a decade. In 2018, the Joint Abbotsford-Mission Water Master Plan was completed and approved by the AMWSC Board. This led to the need to update the 2013 conservation plan, set quantified targets for the future, and called for a renewed commitment to efficiency (Urban Systems, 2018).

This updated Water Efficiency Plan sets out a refreshed direction for 2022 to 2032. It provides objectives for this next operational period, sets out a renewed program and suite of actions, establishes data-based targets, and outlines implementation strategies and schedules. It strikes a balances between ensuring that customers can use water to enjoy the amenities of their homes, businesses and outdoor spaces and continuously improving efficiency. It also supports ongoing implementation of the Water Master Plan.

The plan has seven main parts, as follows:

- Section 2 discusses the benefits of water conservation;
- Section 3 provides background and history on the plan;
- Section 4 is an overview of the AMWSC service area and a profile of water use in both Abbotsford and Mission;
- Section 5 sets out the plan objectives;
- Section 6 is a brief inventory of current water conservation programs;
- Section 7 outlines the 2022 - 2032 Water Efficiency Program under five themes;
- Section 8 provides a high level implementation plan including targets, a schedule, early priorities, and a monitoring and evaluation framework.

How This Plan Was Developed

Creation of this updated plan commenced in mid-2019. The first step involved a review of AMWSC's current conservation program including strengths, challenges and opportunities (see Appendix 1: Existing Program Review). Subsequent steps included quantitative analysis of water production and consumption trends (see Appendix 2: Baseline Water Demand Analysis), a study of metering options for Mission (see Appendix 3), case studies of best practices from other leading jurisdictions (see Appendix 4), and demand forecasting (see Appendix 5). Work was facilitated by virtual and in-person workshops with AMWSC, City of Abbotsford and District of Mission staff engaged in utility management and conservation program administration. They provided input on issues such as program objectives, targets, delivery themes, and selection of actions. Plan development was generally guided by direction in the Province's Water Conservation Guide (Province of BC et. al., 2013) as well as North American industry best practices set out in AWWA (2006), AWWA (2013), Maddaus et al. (2014), and Vickers (2001).

2.0 Benefits of Water Conservation

Benefits of conservation vary from community to community depending on capital expansion plans, operating costs, energy use, the current demand profile, the water loss rate, and environmental drivers, among other factors. However, some typical environmental, financial, and community benefits Mission and Abbotsford residents might gain from implementation of this plan include the items listed in Table 1, below.

Table 1: Benefits of Water Conservation

Community Benefits	**Financial Benefits**
• enhanced resilience to prolonged drought and a changing climate • retained water in aquifers and reservoirs for firefighting and other emergency needs • potentially enhanced drinking water quality, particularly during times of shortage • enhanced aquatic recreation opportunities • greater equity and fairness (those who waste and put excessive demand on the system will pay more than those who conserve) • promotion of a stewardship ethic within the community • offers ways for individuals to reduce their own ecological footprints	• deferred or avoided capital investment in new bulk supply and treatment infrastructure (i.e., needs are met with conservation rather than new supplies) • reduced operations and maintenance costs • avoided costs for AMWSC and for residents from reduced energy use with less water pumping and heating • improved chances of Provincial and Federal Government infrastructure funding and other grants by adoption of best practices • reduced peak demand – the point at which water use is greatest (usually hot summer days) - provides the opportunity to downsize new pipes, pumps, treatment plants and reservoirs, resulting in significant cost savings
Environmental Benefits	**Policy and Legislative Linkages**
• reduced or avoided impacts from construction of new infrastructure • reduced chemical use in water and wastewater treatment • reduced sewage disposal to the environment • reduced energy use and greenhouse gas emissions due to reductions in water treatment and pumping • enhanced stormwater attenuation on the land during heavy rainfall events (for example, improved soils hold more water longer) • maintained environmental flows for streams, fish, and aquatic ecosystems	• supports objectives in the Abbotsford and Mission updated *Official Community Plans* (2016/17) • supports a key Council priority in City of Abbotsford *2019-2022 Strategic Plan* • supports objectives in the *Abbotsford Community Sustainability Strategy* and the Mission *Environmental Charter* • supports implementation of 2018 *Joint Abbotsford-Mission Water Master Plan* • contributes to meeting obligations under the Province's *Water Sustainability Act*, the *Drinking Water Protection Act* and the *Environmental Management Act*

3.0 A History of Conservation

This plan builds on many years of work to improve water use efficiency in both Abbotsford and Mission. Basic education and water use restrictions have been in place for decades, but awareness grew significantly through the mid-2000s.

In 2006 and 2007, the service area experienced its highest historical use. Also in 2006, a Drought Management and Water Conservation Study noted that high demand and extended dry conditions in recent summers had resulted in shortages. It recommended immediate implementation of a conservation program consisting of bylaws, audits, rebates, leakage reduction, metering and pricing measures (KWL, 2006).

In 2008, District of Mission approved its Environmental Charter, which recognized emerging water supply concerns, and provided a framework to implement a range of conservation measures including leak detection, fixture replacement, rainwater harvesting and metering. In the same year, AMWSC tightened the watering restrictions regime, followed in 2009 by a service area-wide summer sprinkling ban because of high peak demand.

Also in 2009, the University of Victoria's POLIS Water Sustainability Project completed a study that included demand forecasts. This noted that heavy growth had increasingly strained the region's supplies, and that AMWSC needed to choose between either building costly infrastructure or deferring this by engaging in long-term conservation planning (Maas and Porter Bopp, 2009). This position was supported by the 2010 AMWSC Water Master Plan, which indicated that a 20% reduction in maximum day demand was urgently needed until a new source would be commissioned in 2016 (AECOM, 2010).

AMWSC set a target to reduce peak demand by 25%. A swath of new conservation programs were introduced. This included introduction of high efficiency toilet rebates (2009), efficient clothes washer rebates (2010) and an irrigation and landscape assessment and rebate program (2011). Effort in public and school education and outreach was bolstered, watering restriction enforcement stepped up, and subsidized rain barrels and water conservation kits were put on offer. City of Abbotsford also took the additional step of installing automated metering infrastructure at all residential and non-residential connections and switched from annual to bi-monthly billing. Many of these measures remain in place today, and are discussed further in Section 7, below.

The people of Mission and Abbotsford responded positively. Over the next five years, maximum day demand dropped by approximately 20% and average day demand also decreased by approximately 10%. For the past five years or longer, demand has remained relatively steady.

While demand has stabilized, both communities have retained their commitment to conservation. For example, City of Abbotsford's Community Sustainability Strategy (2013) pledged to promote efficient technology and programs (Strategy 2: Transform & Learn through Innovation). It also committed that the "City should continue to play a significant role in water conservation through incentives and programs for efficient water use, while also managing land use and its impact on water quality" (Strategy 5: Water, Energy & Waste Management, p. 14).

Also in 2013, the AMWSC approved the regional Water Efficiency Plan, the predecessor to this document. This proposed several new demand reduction targets and additional water conservation programs and policies. While not all the strategies in that plan were subsequently adopted, it reiterated AMWSC's commitment to conservation, and enabled continuation of many long running and successful programs first established in the late 2000s.

In 2016/2017, Abbotsford and Mission updated their individual Official Community Plans. In both cases, commitments to water use efficiency and environmental stewardship were renewed (see Section 5, below for more detail). In response, AMWSC updated its Water Master Plan in 2018 to reflect the population growth and land use changes these OCPs anticipate.

Based on updated demand projections, the Master Plan identified a need to attain at least a 0.35% year-over-year system-wide water demand reduction, totaling 10% by 2041 relative to a 2016 baseline (Urban Systems, 2018). Section 8.1 discusses how implementation of this water efficiency plan will contribute to attaining the Master Plan targets.

Figure 1 provides a timeline of key water conservation events over the past two decades.

2006	Drought Management and Water Conservation Study Highest historical summer use
2008	District of Mission Environmental Charter
2009	AMWSC tightens watering restrictions in response to high peak demand POLIS Water Sustainability Project Soft Path study Toilet rebate program commences
2010	AMWSC Water Master Plan indicates 20% reduction in maximum day demand needed Clothes washer rebate program commences
2011	Landscape assessment and rebate program commences
2013	City of Abbotsford's Community Sustainability Strategy First Water Efficiency Plan receives Commission approval
2016	Mission and Abbotsford commence OCP updates
2018	AMWSC updates Water Master Plan
2019	AMWSC commences update of Water Efficiency Plan

Figure 1: Timeline of Key Water Efficiency Events and Actions

The updated plan set out in this document builds on this impressive history and is also informed by an understanding of recent water use trends, as discussed in the next section.

4.0 Service Area Overview and Water Use Profile

This section provides a brief overview of AMWSC's service area and a summary of recent water use trends in both Abbotsford and Mission. Note that considerably more detail on these topics can be found in Appendix 1: Baseline Usage Analysis.

4.1 Water Service Area Overview

The AMWSC was formed in 2005 when City of Abbotsford and District of Mission took over ownership of bulk water and transmission infrastructure from Fraser Valley Regional District. City of Abbotsford was designated to oversee capital projects, operations, and maintenance of the system. Most of the supply to both communities (about 85%) comes from the Norrish Creek source and Dickson Lake reservoir. The remainder comes from the dam at Cannell Lake or from 19 wells in the southern part of Abbotsford. There are approximately 95 kilometers of transmission mains and two regional reservoirs that deliver from bulk sources to major distribution points. From there, the two municipalities operate their respective distribution systems independently. For more information on the regional system, see www.ourwatermatters.ca/water-system.

About 170,000 residents get their water from AMWSC, with about 80% of those in Abbotsford and 20% in Mission. The water serviced population has grown by about 15% over the past decade.

In addition to providing bulk water services, AMWSC also delivers most community conservation programs to both Mission and Abbotsford residents. This includes education campaigns, product rebates and watering restrictions awareness, for example. The various existing programs are outlined in Section 6.

4.2 City of Abbotsford Water Use Profile

Total water supplied to the City of Abbotsford fell significantly during the early 2010s, coinciding with introduction of advanced metering infrastructure and conservation programs. While it has been quite stable for the past seven years, population has grown steadily through this entire period.

Figure 2 shows total production (the total of all water supplied to the City from AMWSC from all sources) on a per capita basis. Base demand is showing a downward trend but more recently is not declining as quickly as it did before 2014.

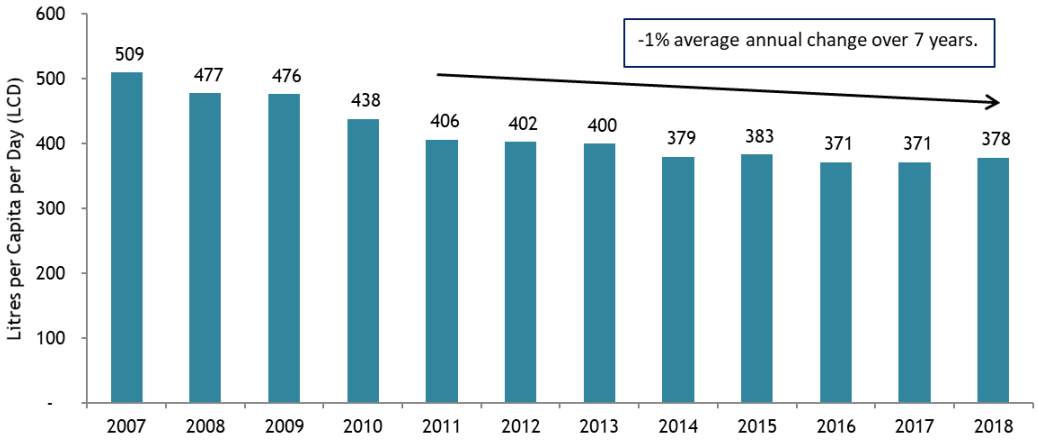


Figure 2: Total Water Production Per Capita, Abbotsford (2007 to 2018)

Figure 3 shows annual average single family residential per capita consumption in Abbotsford for the past four years. Consistent with the trend in Figure 2, it has been very stable for the past four years.

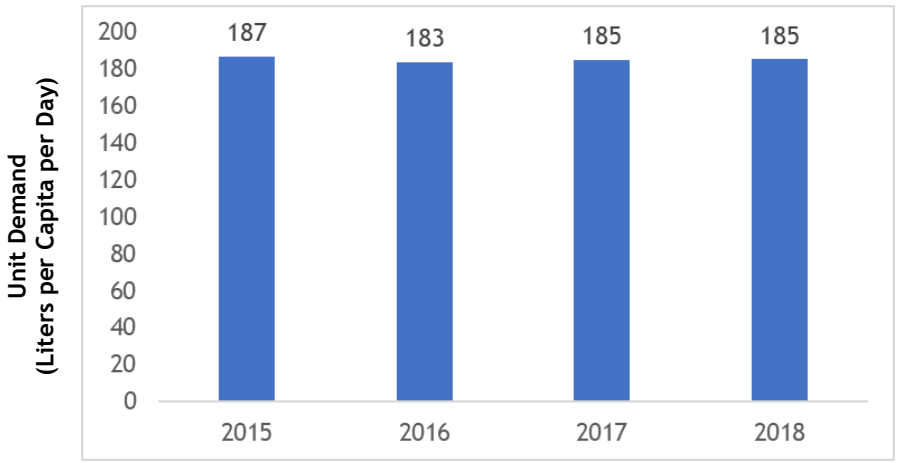


Figure 3: Single Family Residential Consumption Per Capita, Abbotsford (2015 to 2018)

Figure 4 isolates 2018 commercial, institutional and industrial (CII) annual demand disaggregated into City of Abbotsford billing categories. Industrial customers make up more than half the water consumption in these sectors, concentrated in a relatively small number of accounts. Commercial and institutional consumption is also significant, but spread across a larger number of subsectors and accounts.

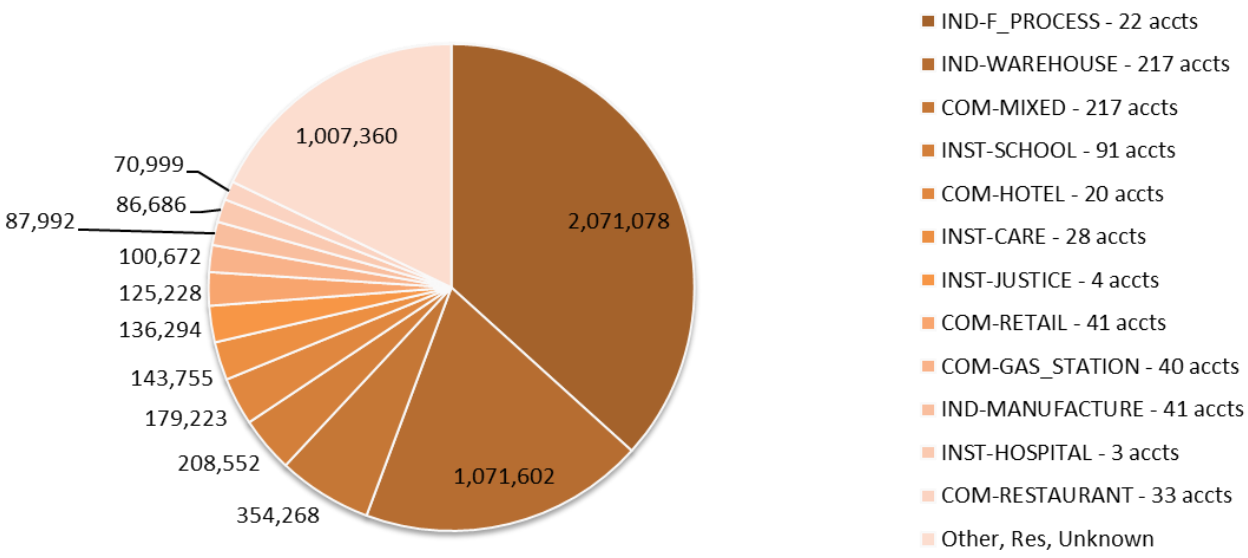


Figure 4: Commercial/Institutional/Industrial Consumption by Subsector, Abbotsford (2018, m^3)

Figure 5 shows metered agricultural consumption. Dairy, greenhouse, poultry, and berry businesses are the largest water consuming subsectors.

Demand management opportunities for AMWSC's non-residential customers is discussed in Section 7.3, below.

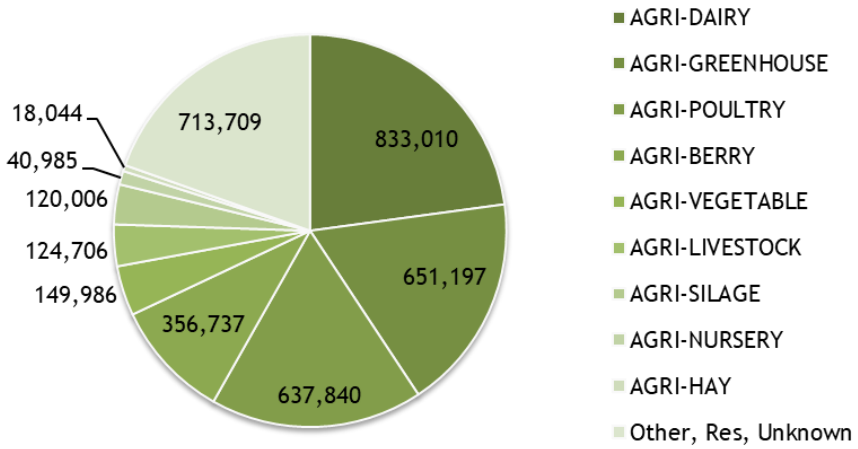


Figure 5: Agricultural Annual Consumption by Subsector, Abbotsford (2018, m^3)

Abbotsford's non-revenue water is calculated by subtracting annual billed consumption from total annual production and is expressed as a percentage of the total. This is water that has been produced and is lost before it reaches the customer. Losses can be real (through leaks and other sources) or apparent (for example through theft, main flushing or metering inaccuracies). At 6% in 2018, this is quite low by national and regional standards, and

considerably higher than comparable results in Mission. However, it is important to note that previous studies have found considerably higher figures than this for Abbotsford (see Urban Systems, 2018, Technical Memo 16). This is discussed further in Section 7.5.

Figure 6 shows a breakdown of consumption for 2018 by major billing category for Abbotsford. As with almost all communities, residential is the largest water using sector. However, agricultural and industrial use also account for a relatively large portion of total demand (at 35% in total).

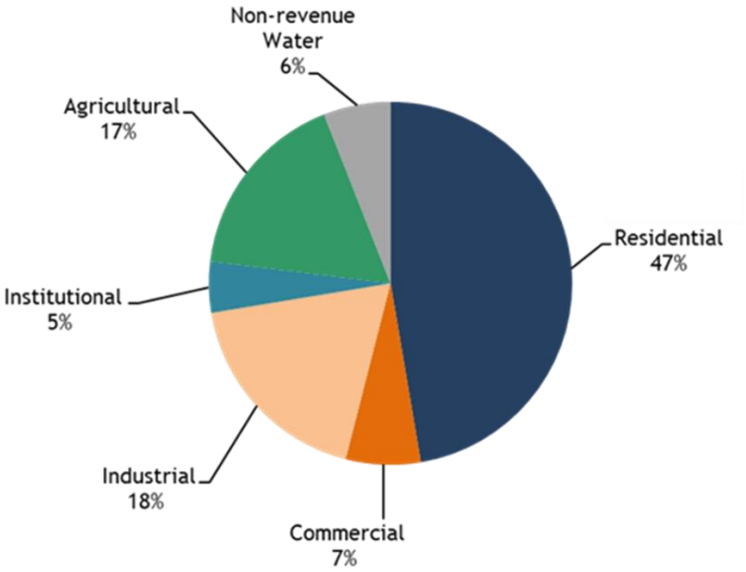


Figure 6: Annual Consumption by Sector, Abbotsford (2018)

4.3 District of Mission Water Use Profile

Water production and use in Mission has been very stable for over a decade, likely explained in large part by the fact that Mission's residential customers remain mostly unmetered. However, it is also important to recognized that population growth is being offset by improved efficiency (e.g., through replacement of old fixtures and appliances).

Figure 7 shows total production (the total of all water supplied to the District from AMWSC from all sources) on a per capita basis. Per capita base demand is generally trending down, consistent with trends in other Canadian communities, but remains well above City of Abbotsford (see Figure 2). This is primarily because Mission does not have universal residential metering.

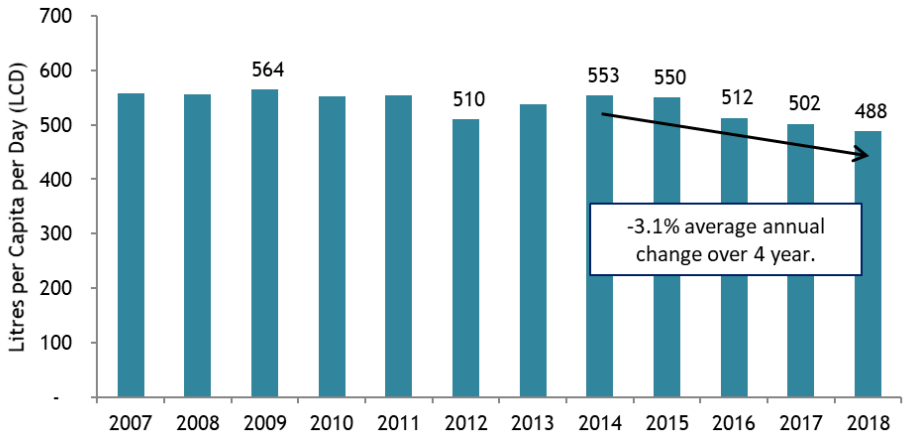


Figure 7: Total Water Production Per Capita, Mission (2007 to 2018)

Figure 8 shows a breakdown of consumption for 2018 by major billing category for Mission. Some data points are derived from metered consumption and others are estimated based on assumptions. The estimate of the relative distribution of unmetered single family residential, unmetered multi-family residential and non-revenue is very uncertain. However, it is important to note that the total of the three is not (being based on measured water in and the remainder after measured water out). Collectively, all three are relatively high on a unit basis. This indicates that, between them, there is potential for a relatively large reduction in water use and/or leakage.

Further details on how this distribution was derived can be found in Appendix 3: Water Metering Feasibility Study for District of Mission.

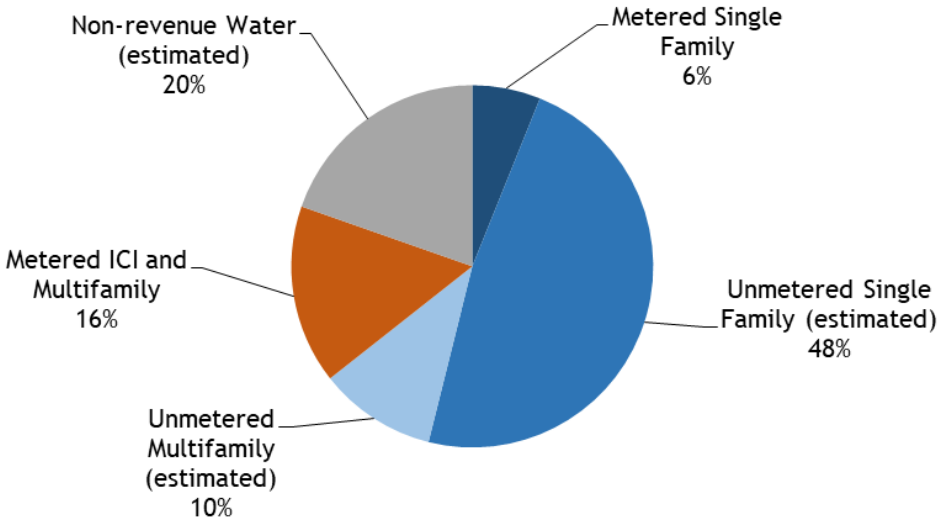


Figure 8: Estimated Annual Consumption by Sector, Mission (2018)

Due to the absence of universal residential metering, no time series analyses of per capita residential consumption are provided here since results from year to year can only be roughly estimated. However, residential consumption in unmetered single-family residential households is approximately 350 liters per capita per day, nearly double the result in

Abbotsford. As we would expect, consumption in the small portion of metered households in Mission is more in line with what is found in Abbotsford. Implications are discussed further in Section 7.4, below.

4.4 Summary

Analysis of recent water demand trends leads to a few major conclusions that helped shape the direction of this strategy, outlined below:

- Significant demand reductions took place in Abbotsford in the first part of the 2010s, coinciding with introduction of advanced metering infrastructure, bi-monthly billing, and roll-out of an aggressive demand management program. However, this has levelled off more recently. This is explained in part by the fact that seasonal (mostly outdoor) use appears to be on the upswing.

- Average per capita consumption in Mission remains significantly higher than in Abbotsford and has been stable for many years, consistent with what one would expect from a community that has not yet implemented universal metering and volume-based pricing. Non-revenue water figures are also quite high, and universal metering is a key factor in better controlling this.

- Agricultural and industrial water use account for a significant portion of demand in Abbotsford at about 35% of the total, with additional CII demand in Mission. The largest sub-sectors (food and beverage processing, warehousing, dairy, poultry) consist of a relatively small number of accounts with high average consumption. Based on experience in other jurisdictions, these types of businesses have potential for large, cost-effective use reductions if targeted with robust programs and incentives. The opportunity could be comparable to metering in Mission, but likely attainable at lower cost.

The implications of these findings are discussed further in Section 7, below.

5. Water Efficiency Plan Objectives

AMWSC's efficiency objectives are driven by the policies and goals in Abbotsford and Mission's Official Community Plans and the Joint Water Master Plan. This section summarizes the guiding direction found in these and other strategic documents.

5.1 District of Mission Official Community Plan

Mission's OCP envisions a sustainable, safe community that supports healthy lifestyles and engaged citizens (District of Mission, 2017, p. 9). Highly relevant objectives and policies from the OCP for this plan are captured in Table 2.

Table 2: Objectives and Policies in District of Mission OCP Relevant to Water Conservation

Chapter 7.1. Infrastructure - Water Supply

Objective:

1. Provide a reliable, safe, and sustainable water supply and delivery system to residents.

Policies:

7.1.6 Encourage water conservation through a variety of means, including public education, seasonal water restrictions, and encouraging innovative solutions.

7.1.7 Explore the potential for water metering as a means to encouraging water conservation and to delay the required multi-million dollar infrastructure upgrade cost.

7.1.8 Develop a program to work with businesses to assess water conservation practices at the business.

District of Mission (2017, p. 88)

5.2 City of Abbotsford Official Community Plan and Strategic Plan

Abbotsford's OCP envisions a city with efficient and effective systems, where citizens collectively conserve resources and reduce greenhouse gas emissions through more efficient, well designed, and cost-effective systems of open space, housing and buildings, infrastructure, and transportation (City of Abbotsford, 2016, p. I-1-3). Highly relevant policies from the OCP for this plan are captured in Table 3.

Table 3: Polices in City of Abbotsford OCP Relevant to Water Conservation

Policies Part 5: Improve Natural + Built Systems

Resource Conservation and Responsibility: Reduce consumption and conserve water and energy resources for current and future generations. Plan with a long term perspective to address the challenges associated with climate change, and minimize Abbotsford's contributions to climate change.

Sustainable Infrastructure: Emphasize a sustainable approach to managing municipal infrastructure by maximizing the efficiency and performance of the existing infrastructure, and planning for infrastructure to support long term growth.

Policy 5.13: Drinking Water

Continue to work with Abbotsford Mission Water and Sewer Commission to ensure drinking water supply and distribution is managed and expanded to safeguard public health, protect the environment, and provide adequate supply for a growing population:

- Monitor demand and implement conservation strategies including awareness and education.
- Implement system efficiencies to ensure infrastructure use is maximized.
- Plan for short, medium and long term water supply sources.
- Replace infrastructure reaching the end of its useful life cycle, and coordinate replacing with other road and utility replacement programs.

City of Abbotsford (2016, Part III-5-4)

Actions in this plan also align with priorities under the "Complete Community" cornerstone of the Abbotsford 2019-2022 Strategic Plan as shown in Table 4.

Table 4: Principles in City of Abbotsford Strategic Plan Relevant to Water Conservation

Complete Community

Council Principle: Value our community's connection with the environment

The City of Abbotsford is a community of inclusive, safe and green neighbourhoods, connected to convenient and affordable transportation and vibrant commercial centres, built on the foundation of our cultural heritage and natural beauty.

2019-2022 Priority: Focus on developing key environmental and green strategies including Urban Forestry Strategy, and Green Environment and Green Fleet Strategies.

City of Abbotsford (2020, p. 4)

5.3 Joint Abbotsford-Mission Water Master Plan (2018)

The 2018 Joint Abbotsford-Mission Water Master Plan views improved efficiency as core to supply planning. It notes that water consumption is projected to increase over the next two decades with population growth, but that "conservation allows current and future customers to use only what they need, which helps to manage costs of services and delays the need for bigger infrastructure before it's actually required" (Urban Systems, 2018, p. 6). It articulates supporting objectives in its investment summary as set out in Table 5.

Table 5: Outcomes in Joint Water Master Plan Relevant to Water Conservation

Update Water Conservation

Purpose: Renew water conservation plan for all customers and reduce losses to achieve a highly efficient system

- Create new standards for development
- Expand metering and review economic incentives
- Reduce losses and non-revenue water

Outcomes:

- Maximize existing supply assets
- Meet public goals to respect water
- Control costs of service and keep water rates predictable
- Builds on strengths of existing program and recent successes

Urban Systems (2018, p. 9)

The Joint Master Plan sets a target of achieving a 0.35% year over year reduction for all sectors to achieve a total savings of 13 MLD (10% overall) by 2041 (Urban Systems, 2018, p. 7). However, it must be stressed that this target is considered a minimal or "floor" required to meet essential infrastructure planning requirements. Section 8.1 discusses how implementation of this water efficiency plan will contribute to attaining the Master Plan targets.

5.4 Specific Objectives for the 2022-2032 Water Conservation Plan

Driven by the direction of these strategic documents, the following supplemental and supporting objectives pertain specifically to this plan:

- reduce per capita total water production to meet targets in the 2018 Joint Water Master Plan;
- manage residential per capita demand in Abbotsford and Mission;
- manage peak season demand in summer;
- continue progress towards universal metering across the region;
- focus limited resources on users with higher than average consumption;
- help commercial, industrial, and institutional customers control demand; and,
- improve water use accounting and management of non-revenue water.

6.0 Overview of Current Conservation Programs

The actions recommended in this plan build on years of work by AMWSC, Abbotsford, Mission and residents under the 2013 Water Efficiency Plan. This section provides a very brief inventory of current actions, many of which will continue under the updated program. Readers wanting more information can consult Appendix 1: Existing Program Review.

Most aspects of the program are presented under the AMWSC brand, with the supporting "our water matters" wordmark (see Figure 9).

Figure 9: Water Efficiency Program Branding

Relevant education and outreach measures include:

- school education resource kits and workshops;
- garden guides and other print resources;
- staffed booths at community events;
- waterwise workshops for residents on topics such as rainwater harvesting and efficient irrigation; and,
- online resources distributed through www.ourwatermatters.ca and social media channels.

Relevant incentives include:

- a high efficiency toilet rebate program;
- a "top up" rebate on BC Hydro's efficient clothes washer rebate;
- subsidized rain barrel sales;
- indoor and outdoor water savings kits for sale at Abbotsford City Hall;
- other periodic giveaways including showerheads, rain gauges, soil moisture sensors, and pre-rinse spray valves for restaurants;
- free residential irrigation system assessments, where a qualified representative from the Irrigation Industry Association of BC completes a 30 minute evaluation of landscape and watering systems; and,
- landscape rebates for qualified residents, including for turf replacement, mulch, soil amendments or irrigation system upgrades.

AMWSC also coordinates regionally harmonized outdoor watering restrictions that specify days of the week and times that residents can irrigate lawns and gardens, staged to escalate requirements in the event of drought or other shortages.

City of Abbotsford and District of Mission also have some individual responsibility for some key aspects of demand management. Notably, this includes retail water service pricing, enforcing watering restrictions, metering policy and installation, and managing non-revenue water including repairing leaks in their respective distribution systems.

More information on these successful programs and how they will continue under this plan is provided in the next section.

7.0 2022 to 2032 Water Conservation Program

This section sets out the new and continuing actions that AMWSC, District of Mission and City of Abbotsford will implement over the next decade to attain the objectives set out in Section 5.4.

The new program places strong emphasis on helping residents become more efficient, working with businesses and institutions, and improving water utility management. In some cases, the actions are enhancements of approaches already in use. In other cases, new programs will be developed and implemented.

The actions in this plan are organized around five themes:

1. **Reduce Outdoor Water Use**: enhance effectiveness of existing incentives and regulations that help residents reduce outdoor irrigation of lawns and gardens.

2. **Continue "Our Water Matters" Education and Outreach:** raise awareness of the importance of water conservation, assist residents to reduce use indoors, and continue outreach to youth through ongoing successful current campaigns.

3. **Improve Commercial, Industrial, Institutional and Agricultural Water Use Efficiency:** help non-residential customers, especially those currently using large volumes of water, to control their consumption.

4. **Measure Water Use and Adopt Volume-Based Pricing:** continue to move towards universal metering across the region and ensure water service pricing provides incentives to people to conserve.

5. **Improve Non-Revenue Water Management:** improve data on consumption and production, identify sources of non-revenue water including leakage, and implement cost effective actions to control losses.

Elaboration is provided in the following pages.

7.1 Theme 1: Reduce Outdoor Water Use

As discussed in Section 4, water use in the AMWSC goes up dramatically in the summer and is trending up slightly in recent years on a per capita basis. The 2018 Joint Water Master Plan stresses that controlling peak season and peak day demand is an important objective for conservation efforts going forward.

Fortunately, there is already a strong foundation of programs in place to help residents reduce the amount of water they use on their gardens and lawns. AMWSC will continue to implement and enhance the following actions as a top priority under this plan.

Irrigation System and Landscape Water Efficiency Program

AMWSC offers free irrigation system assessments and rebates to eligible customers. Upon registering, a contracted representative of the Irrigation Industry Association of BC contacts the resident and completes a 30 minute assessment of their landscape and irrigation system. For example, this might include suggesting upgrades to equipment, tips on drought tolerant plants, or ideas for replacing turf grass with other features.

After completing an assessment, participants may apply for rebates for waterwise plants, soil amendments, or replacement of landscapes with more efficient materials (see Table 6).

Table 6: AMWSC Irrigation System and Landscape Water Efficiency Program Rebates

Rebate Item	Rebate Amount	Requirements[1]
Turf replacement, mulch, soil amendments	$250 ($500 for MF or CII)	• Min. $500 spend ($1,000 for MF or CII) • Improvement of min. 50% of landscape with waterwise materials
Irrigation system upgrades	$500 ($1,500 for MF or CII)	• Min. $1,500 spend ($6,000 for MF or CII) • Work completed by certified Irrigation Industry Association of BC contractor • Irrigation efficiency improved by min. 20%

MF: multi-family residential development CII: commercial/industrial/institutional

This program has been in place since 2011. While participation has been variable over the years, AMWSC will intensify efforts in the next operational period of this plan. Enhancements may include the following:

- improve program delivery by incorporating best practices from other North American jurisdictions with similar programs and utilizing the principles of community based social marketing (see McKenzie-Mohr, 2011);
- actively recruit participants from homes with known high water use or that self-identify as owning automatic irrigation systems, for example at community events (see Theme 2, below);
- better measure the impact of the program on water use and behavior through structured and scheduled follow up with participants;
- increase the scale of the program by working with more residents and setting annual recruitment targets.

[1] For complete details on program terms and conditions see https://www.ourwatermatters.ca/files/File/2019%20-%20Irrigation%20System%20%26%20Landscape%20Water%20Efficiency%20Program.pdf

Watering Restrictions

Regulatory approaches like watering restrictions are highly cost effective because they can make significant contributions to cutting demand without requiring large operational budgets, beyond modest enforcement and communications costs.

AMWSC implements seasonal lawn watering restrictions each year under the Water Shortage Response Plan (AMWSC, nd). Restrictions escalate in the event of drought or other shortages (see Figure 10) and are tied to supply conditions at the Dickson Lake reservoir. Under ordinary conditions, "Stage 1" restrictions allow lawn watering two days per week from 1 May to 30 September, on an "evens and odds" house number system. Permitted hours for lawn watering are limited to mornings only, between 6am and 8am, which is consistent with North American best practice.

Figure 10: AMWSC Water Restriction Levels

AMWSC will work with City of Abbotsford and District of Mission bylaw enforcement staff to continue to implement the watering restrictions, with an emphasis on attaining broad and voluntary community compliance rather than on punitive enforcement. Planned efforts for the next operational period include the following:

- continue to heavily promote awareness of restrictions, particularly during the start of the season, and through many channels including web, social media, billing inserts, posters, collateral such as fridge magnets, community events, and newspaper ads;
- review marketing material to ensure that it sends the right messages and strikes the right tone;
- use market research surveys to objectively measure levels of awareness of restrictions and self-reported compliance; and,
- implement targeted and escalating enforcement at properties with known instances of repeat non-compliance.

Table 7 provides a summary of key actions and expected outcomes under Theme 1.

Table 7: Theme 1 Summary

Theme 1: Reduce Outdoor Water Use		
1.1	Irrigation System and Landscape Water Efficiency Program - Assessments	Enhance
1.2	Irrigation System and Landscape Water Efficiency Program - Rebates	Continue
1.3	Outdoor Watering Restrictions	Continue
Expected Outcome	Manage peak season demand and peaking factor	

7.2 Theme 2: Continue "Our Water Matters" Education and Outreach

Many long-running and successful community education initiatives will continue under the next phase of the Water Efficiency Plan, building on past efforts. We will also celebrate the fact that some long running community programs have fully matured and can now be phased out to free up resources for new, more targeted activites.

Community Education

Continuing community education programs under this updated plan include the following:

Community Events - AMWSC operates booths at community events such as Canada Day and the "Jam in Jubilee" arts and music festival. Typically, these are conducted by seasonal (student) employees. Events are often done in conjunction with the Solid Waste Department to offer broad sustainability education. They are interactive and include games for children and giveaways such as hose timers for adults. Information on programs such as watering restrictions and rebates is offered on request.

Garden Guides - AMWSC publishes a series of guidebooks on lawn and garden best practice including irrigation system management. These are attractively designed and include extensive detail for those residents wanting to take a deeper dive into outdoor conservation (see Figure 11). Additional resources can be found at a dedicated area of the website (www.ourwatermatters.ca/outdoor-conservation).

Figure 11: "Our Water Matters" Garden Guides

School Educational Program - AMWSC will continue to distribute and promote a suite of six comprehensive Water Conservation Resource Kits for K-12 teachers (see Figure 12). Field trips are also encouraged across all age groups to increase understanding and a sense of connection to Abbotsford and Mission's water system and natural resources. AMWSC will continue to engage third party service providers to deliver workshops in schools either in support of the Resource Kits. It will also continue to support adult English-as-a-second-language seminars and other similar events as opportunities arise.

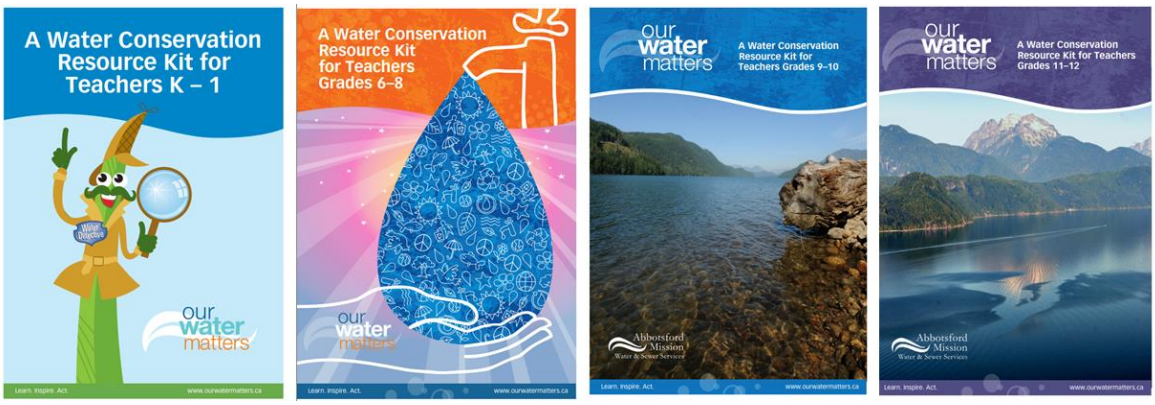


Figure 12: Water Conservation School Resource Kits

City of Abbotsford Water Wise Portal and Customer Leak Program – AMWSC will encourage City of Abbotsford to continue to independently offer the "Water Wise Portal" to its customers, an online and mobile app tool linked to the City's automated meter infrastructure. This tool allows customers to access, track and chart consumption, set water budget goals, compare use to neighborhood averages, identify leaks or problems, and engage with conservation programs. Abbotsford should also continue its customer leak detection program, wherein a letter is sent to customers if unusual consumption patterns are detected that might indicate a high volume leak. This is supported by a brochure that explains how to find leaks and what to do about them. When Mission makes the transition to universal customer metering, the option of extending these successful measures to its customers will also be explored.

Plans for community education going forward include the following:

- continue to market programs under the "Our Water Matters" sub-brand;
- continue to emphasize online platforms (www.ourwatermatters.ca and social media channels) as a central channel to engage residents;
- maintain strong focus on outdoor water use, particularly on promoting the Irrigation System and Landscape Water Efficiency Program and outdoor watering restrictions under Theme 1;
- focus in-person outreach at community events on outdoor water use programs; invest effort in measuring the impact of these contacts by following up with participants to assess whether they acted on advice.

Consumer Incentive Programs

Consumer incentives include things like product rebates, low cost access to services, or giveaways of water efficient products. Planned changes to AMWSC's current incentive programs are described below:

Phase Out of High Efficiency Toilet Rebate - For many years AMWSC has offered a $50 rebate to residents who swap older, 13-litre toilets with more efficient models (CSA-approved 4.8L or dual flush). This has been tremendously successful. Since 2011, over 11,000 toilets have been replaced through this popular program.

At the same time, participation has dropped significantly in recent years due to market saturation. While toilet rebate programs were once very prevalent, there has been a general move across North America to phase them out given the overwhelming prevalence of efficient technology at most retailers. In the case of BC, there is also the fact that 4.8L toilets are now a Building Code requirement (BC Plumbing Code s. 2.6.1), meaning that rebates are currently issued to customers who have no other legal option when replacing a toilet.

As a result, while the success of toilet rebate program will be celebrated, it will be discontinued following a short phase-out period. This will provide the opportunity to redirect funds to more targeted and forward looking new programs under this plan.

Phase Out of Rain Barrel Sales and Water Saving Kit Sales - For many years AMWSC has also offered subsidized rain barrels for sale at civic venues, as well as low cost indoor and outdoor home water savings kits. Like the toilet rebate program, interest in these offers has declined in recent years and the impact on demand is quite small (see Appendix 1 for more detail). These programs will also be phased out when current inventory is exhausted, allowing redirection of resources to more effective activities.

Smart Wash Rebate - Since 2011, AMWSC has participated along with various other water service providers in Fortis and BC Hydro's clothes washer rebate. This offers an additional "top up" rebate of $50 on select ENERGY STAR qualified machines. Uptake in this program has also diminished in recent years. However, because it is administered by other agencies, participation is very easy for AMWSC. Replacing clothes washers with more efficient models also has the added benefit of significantly reducing in a home's energy use, so has greenhouse gas abatement impacts. As a result, support for this program will carry on, provided that BC Hydro and Fortis continue to offer it.

Table 8 provides a summary key actions and expected outcomes under Theme 2.

Table 8: Theme 2 Summary

Theme 2: Continue "Our Water Matters" Education and Outreach		
2.1	Community Events	Enhance
2.2	Garden Guides	Continue
2.3	School Educational Program	Continue
2.4	City of Abbotsford Water Wise Portal and Customer Leak Program	Continue
2.5	High Efficiency Toilet Rebate	Discontinue
2.6	Rain Barrel Sales	Discontinue
2.7	Water Saving Kit Sales	Discontinue
2.8	Smart Wash Rebate	Continue
Expected Outcome	Reduce residential per capita average day demand	

7.3 Theme 3: Improve Commercial, Industrial, Institutional and Agricultural Efficiency

As noted in Section 4.2, non-residential customers in the commercial, industrial, institutional and agricultural sectors account for nearly half of community water consumption in Abbotsford, with industrial and agricultural making up 18% and 17% of the total respectively.[2] Experience in other jurisdictions tells us that low cost/high impact savings can be found in these sectors.

To date, AMWSC has had little chance to work with these customers to help them manage their water use and the associated costs. Between 2011 and 2013, about 20 indoor or outdoor audits were completed at various non-residential and multi-family residential facilities in the service area. These identified significant potential savings. However, there was little incentive for facilities to implement the measures recommended due to the declining block water rate structure that was in place at that time.

A commercial, industrial, institutional and agricultural water conservation program will be developed. This will be driven by best practices in leading Canadian and international jurisdictions (see the case studies provided in Appendix 4, for example). It will have the following parameters:

- The program will start with a pilot project limited to a few sectors and customers, which will inform development of broader implementation later.
- Initial focus will be on high volume use customers and sectors in the industrial, commercial and institutional sectors. Promising possible early targets include industrial food processing facilities, and warehouses (see Figure 4, above, and Appendix 2: Baseline Water Demand Analysis).
- In the agricultural sector, dairy and poultry facilities have water use profiles similar to industrial food processing (compared to other agri-food businesses) and are among the largest consuming subsectors (see Figure 5). They are prime targets for cost-effective and large water savings.

Based on typical practice elsewhere, the pilot project will likely use an "audit and incentive" delivery model. Typically, this would take the general approach described below:

1. Potential participants go through a pre-screening and application process where they must sign off on program terms and conditions. The objective of this is to ensure that they are qualified, likely to benefit, and committed to implementing efficiency improvements.
2. AMWSC engages highly qualified technical consultants, who conduct comprehensive, on site facility audits.

[2] CII consumption accounts for a smaller portion of total demand in Mission. See Figure 8, above.

3. After the audit, a report is completed using a standard template that includes:
    - a water balance that attributes estimated volumes to different end uses;
    - evaluation of conservation opportunities such as recommendations on potential process improvements or equipment replacement options;
    - evaluation of opportunities to improve wastewater management to reduce contaminant loadings to the sewer;
    - sub-metering options to improve understanding of where water is used in the facility; and,
    - cost savings estimates.
4. If the facility manager subsequently implements recommendations from the report, they may then be eligible for various incentives to offset capital costs, subject to a verification process. For example, these incentives might be based on a dollar amount per liter of water saved daily.
5. Typically, a case study will be prepared that provides a way for the business to showcase their corporate social responsibility and posted to AMWSC's website.

AMWSC should be mindful that the biggest challenge with this kind of program usually involves failure by the customer to implement recommended process and technology changes after the audit is complete, even if findings indicate that financial payback is favorable. This risk can be mitigated by ensuring that the participant recruitment process is robust. Strong buy-in from senior management, facility managers and finance departments must be an essential condition of participation. Incentives also need to be sufficiently attractive.

Finally, when examining opportunities with CII customers, it is important to consider facility and process equipment lifecycle and timing of major capital upgrades. Water efficiency objectives can then be built into performance criteria for new facility assets. Reductions can be reliably built into AMWSC's demand forecasts if they are tied to development approvals. This approach is a win-win because it makes best use of the facility owner's capital while achieving community demand targets in a paced way.

Developing this program will begin with crafting a more detailed implementation plan. This should include establishing sector-specific targets for water demand reductions (see Section 8.1). Learning from the experience of similar programs in other jurisdictions and the results of the pilot project will ensure that AMWSC is well positioned for success with this new initiative.

Table 9 provides a summary of key actions and expected outcomes under Theme 3.

Table 9: Theme 3 Summary

Theme 3: Improve Commercial, Industrial, Institutional and Agricultural Water Use Efficiency		
3.1	Commercial, Industrial, and Institutional Water Use Efficiency Pilot Project	New
3.2	Commercial, Industrial, Institutional, and Agricultural Continuing Program	New
Expected Outcome	Reduce total community water consumption	

7.4 Theme 4: Measure Water Use and Adopt Volume-Based Pricing

As noted in Section 6, while AMWSC has many accountabilities around water conservation, the overall task is shared with District of Mission and City of Abbotsford. When it comes to decisions about metering and volume-based pricing, each individual municipality makes its own decisions.

In Abbotsford, all customers are metered and pay for water based on the volume they use. In Mission, about 14% of single-family residential customers are already metered, as are some multi-family and the great majority of CII ones.

A metering study was conducted as part of preparation of this plan (see Appendix 3: Water Metering Feasibility Study for District of Mission). This found that installing meters for all customers in Mission will entail significant up-front capital costs. As well, it would create a few initial logistical challenges and some residents may have concerns, but most of these can be satisfactorily addressed through an effective accompanying communications program.

The study demonstrated that, by completing universal metering, substantial savings are likely. If accompanied by the demand management programs described in this plan and active management of non-revenue water including system loss, it is reasonable to expect total savings in excess of 20% of all the water supplied to Mission. Water metering also provides a range of other ecological, social and financial benefits. It is fairer for customers (those who use more and therefore create more costs pay more) and is critical for effective control of non-revenue water. Universal metering is an accepted and recommended best practice for utility management, both nationally and internationally.

As a next step, the District will complete a more in-depth business case study as part of its pending water master plan update, to be completed by 2022. The results of this analysis will inform decision making on next actions towards universal metering.

A single one- or two-year capital works project is the simplest, lowest cost and most reliable way to implement universal metering and is recommended by this plan. However, this also obviously entails high upfront expense. If for some reason Mission leadership resolve not to take this path in the short term, alternatives include:

- additional pilot or partial metering of single family residential accounts;
- gradual metering through a voluntary program, where customers are incentivized to participate by the possibility of lower water bills under a volume based rate (this approach has been used successfully in Surrey and Richmond);
- extensive application of zone metering, district metered areas, and active leak detection (to better pinpoint the extent and location of leakage in the network); or
- a combination of these methods.

Meanwhile, City of Abbotsford is encouraged to continue to use and manage its established automated metering infrastructure. It enables important programs like the Water Wise Portal, leak alerts and volume-based pricing. Experience has proven that this infrastructure is a highly effective tool to help residents manage demand.

City of Abbotsford is also encouraged to continue to utilize its volume-based water pricing approach to motivate residents and businesses to control demand. Abbotsford uses a uniform

(or single block) rate structure and bills customers by volume for both water and wastewater services on a bi-monthly basis. Charges are entirely volume-based (i.e., there is no fixed component to the bill), which has significant benefits for promoting fairness and for incentivizing conservation.

Abbotsford could also look for opportunities to further enhance conservation-oriented pricing during its next regular rate update, along with considering other important objectives such as affordability, fairness, and revenue sufficiency.

More information about water pricing in both communities can be found in Appendix 1 (Existing Program Review). References in Section 10.1, below, provide links to useful resources that can help with further optimizing programs in the future.

Table 10 provides a summary of key actions and expected outcomes under Theme 4.

Table 10: Theme 4 Summary

Theme 4: Measure Water Use and Adopt Volume-Based Pricing		
4.1	Universal metering and volume-based pricing in District of Mission	Continue
4.2	Maintain automated metering infrastructure in City of Abbotsford	Continue
4.3	Continue conservation-oriented water service pricing in City of Abbotsford	Continue
Expected Outcome	Reduce per capita water demand	

7.5 Theme 5: Improve Non-Revenue Water Management

There are many components of non-revenue water. Some are legitimate uses, such as main flushing and fire hydrant testing. Others are sources of waste, such as easily repairable leaks and overflows. Managing non-revenue water, including system losses through leaks, is often one of the most effective and low cost ways to conserve. This approach also has the added benefit that, when implemented carefully, it requires no behavior change by residents and has little or no impact on people's lifestyles.

AMWSC, Abbotsford and Mission all strive to operate their respective water transmission and distribution networks as efficiently as possible. AMWSC will lead a program to invest greater effort in this over the next decade.

There is currently some uncertainty about non-revenue water levels in both Mission and Abbotsford. This is inherent in a system like Mission's given lack of universal residential metering. Even in fully metered Abbotsford there have been variable findings from different studies in recent years. The cursory analysis conducted as part of the preparation of this plan found quite low levels of non-revenue water at 6% of total supply (see Appendix 2: Baseline Water Demand Analysis). However, studies in 2010 and 2016 found levels of 18% and 14% respectively (see Urban Systems, 2018).

Options to better manage non-revenue water were investigated as part of preparation of the Joint Water Master Plan. It found that, while levels in the AMWSC transmission network are quite low, there are likely opportunities to improve management in Abbotsford and Mission's respective distribution networks. It recommended developing an ongoing system loss

reduction program led by AMWSC and implemented collaboratively with the two member municipalities. Key tasks were as follows:

- develop clear objectives and goals for distribution loss management, including quantified targets;
- determine focus areas for loss management including:
    - enhance monitoring, data collection, and information review;
    - review strategies and best management practices;
    - develop an implementation schedule focused on activities with highest potential for loss reduction and cost effectiveness;
    - offer regulatory tools and financial incentives to each municipality; and,
    - allocate funds strategically to AMWSC and each municipal utility. (Urban Systems, 2018).

The Master Plan concludes by recommending that AMWSC, Mission and Abbotsford collaboratively maintain the existing loss management program for the transmission system and conduct water audit analysis and reporting about every 5 years. It also recommended initiating a loss management strategy through AMWSC that sets out strategies, actions, and resource allocations for activities at the municipal level (Urban Systems, 2018, p. 346).

Given current level of uncertainty about non-revenue water levels in both municipal distribution systems, early implementation priorities under this theme include:

-
- complete water audits using standard AWWA methodologies (see AWWA, 2016);
- depending on preliminary results of the water audit, compete additional data collection, potentially including night flow analysis or additional system metering.

Developing of this program will begin with crafting a more detailed implementation plan. The resources listed in Section 10.1, below, will assist with this planning process.

Table 11 provides a summary of key actions and expected outcomes under Theme 5.

Table 11: Theme 5 Summary

Theme 5: Improve Non-Revenue Water Management		
5.1	Maintain the existing loss management program for the transmission system	Continue
5.2	Conduct a water audit analysis of the AMWSC transmission system every five years	Continue
5.3	Initiate a loss management strategy for District of Mission	New
5.4	Initiate a loss management strategy for City of Abbotsford	New
Expected Outcome	Reduce total system water production	

8.0 Implementation

This section describes how the water conservation program will be implemented. It also provides a framework for monitoring, evaluation and continuous improvement.

Table 12 provides a summary of the program actions, their status, and the sectors they target.

Table 12: 2022 to 2032 Water Efficiency Plan Program Summary

Theme	Code	Action	Status	Sector
Theme 1: Reduce Outdoor Water Use	1.1	Irrigation System and Landscape Water Efficiency Program - Assessments	Enhance	Residential
	1.2	Irrigation System and Landscape Water Efficiency Program - Rebates	Continue	
	1.3	Outdoor watering restrictions	Continue	All
Theme 2: Continue "Our Water Matters" Education and Outreach	2.1	Community events	Enhance	Residential
	2.2	Garden guides	Continue	
	2.3	School educational program	Continue	
	2.4	City of Abbotsford Water Wise Portal and Customer Leak Program	Continue	
	2.5	High efficiency toilet rebate	Discontinue	
	2.6	Rain barrel sales	Discontinue	
	2.7	Water saving kit sales	Discontinue	
	2.8	Smart Wash Rebate Program	Continue	
Theme 3: Improve Commercial, Industrial, Institutional and Agricultural Water Use Efficiency	3.1	Commercial, industrial, and institutional water use efficiency pilot project	New	Non-Residential
	3.2	Commercial, industrial, institutional and agricultural continuing program	New	
Theme 4: Measure Water Use and Adopt Volume-Based Pricing	4.1	Universal metering and volume-based pricing in District of Mission	Continue	All
	4.2	Automated metering infrastructure in City of Abbotsford	Continue	
	4.3	Conservation-oriented water service pricing in City of Abbotsford	Continue	
Theme 5: Improve Non-Revenue Water Management	5.1	Maintain the existing loss management program for the transmission system	Continue	Water Utility
	5.2	Water audit analysis of the AMWSC transmission system every five years	Continue	
	5.3	Loss management strategy for District of Mission	New	
	5.4	Loss management strategy for City of Abbotsford	New	

8.1 Water Conservation Plan Targets

AMWSC will pursue realistic water production and consumption targets to measure progress toward achieving plan objectives.

Target 1: Total Water Production

- Minimally, reduce water consumption for all customer types by 0.35% year-over-year, in line with the 2018 Water Master Plan target.[3]
    - Reduce per capita water production in Abbotsford from 378 LCD (2018 level) to 360 LCD by 2032 (see Figure 13).
    - Reduce per capita water production in Mission from 488 LCD (2018 level) to 465 LCD by 2032 (note that this will be easily surpassed with implementation of universal metering).

- As a stretch target, reduce water consumption for all customer types by 0.7% year-over-year, in line with the 2018 Water Master Plan "medium demand" scenario.[4]
    - Reduce per capita water production in Abbotsford from 378 LCD (2018 level) to 345 LCD by 2032 (note that this may be challenging given the already low per capita consumption in Abbotsford).
    - Reduce per capita water production in Mission from 488 LCD (2018 level) to 445 LCD by 2032 (note that this will be very achievable with implementation of universal metering).

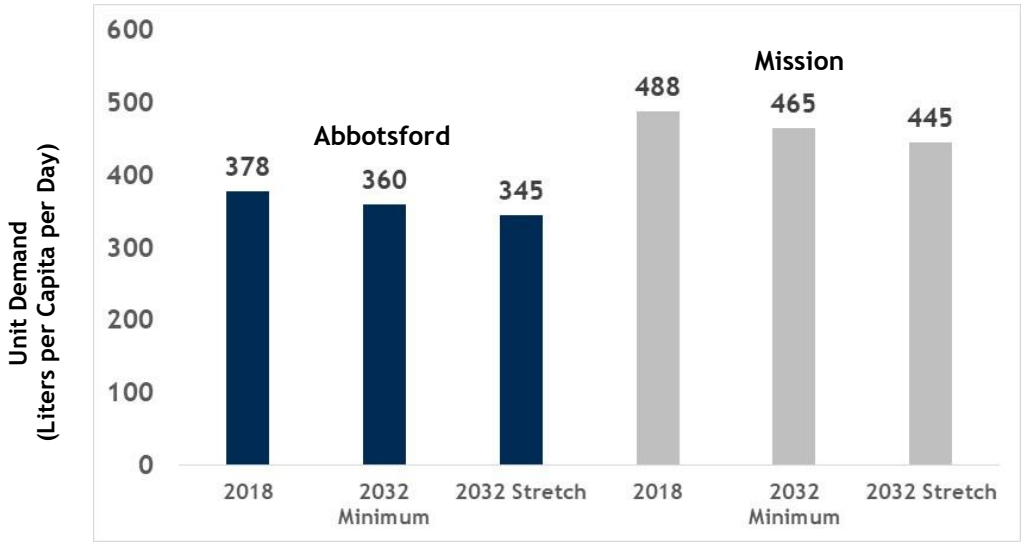


Figure 13: Abbotsford and Mission Total Water Production Targets

The 2018 Master Plan looked at the attainability of several future demand scenarios through to 2041.[5] In the final analysis, the "high demand" scenario was selected for infrastructure planning purposes. This requires achieving 0.35% reduction in per capita water production per year, or 10% over the 25 years from the 2016 baseline to 2041. However, over the horizon of this water efficiency plan (2022 to 2032), this is a relatively conservative goal (it is easier to save water at the beginning, when demand is higher, than it will be later when conditions will be generally more efficient). As a result, this should be considered a minimum target.

[3] This is in line with the Master Plan target reduction of 13 MLD or 10% overall by 2041 from a 2016 baseline.
[4] This is in line with a reduction of 20% overall by 2041 from a 2016 baseline (see Urban Systems, 2018, Technical Memo #2, p. 13).
[5] See Urban Systems, 2018, Technical Memo #2.

The Master Plan also explored a more aggressive "medium demand" scenario, requiring a 0.7% overall reduction in per capita production per year, or 20% over the 25 years from 2016. While this was not selected for planning purposes, 0.7% per year is readily achievable over the next decade assuming full implementation of this strategy including metering in Mission. As such, this is recommended as a "stretch" target. Front-end loading attainment of Master Plan goals provides considerable insurance that minimum requirements will be met by 2041 and will deliver more of the many benefits of conservation discussed in Section 2 sooner.

Project partner Kerr Wood Leidal modelled estimated demand for the next 20 years for both Mission and Abbotsford. Results are summarized in the Water Demand Forecast Technical Memo found in Appendix 5. Scenarios were developed based on continuation of current conditions and assuming implementation of the enhanced demand management programs set out above. The analysis found the potential for significant savings in both communities, and validated attainability of both the minimum and stretch targets, assuming this plan is fully implemented. Metering in Mission, the CII program in Abbotsford, and non-revenue water management will make the most significant contributions. See Appendix 5 for more detail.

Figure 13 and the analysis in Appendix 5 both demonstrate that attaining these per capita targets will be more difficult for Abbotsford. Mission simply has more discretionary use in the community and waste in the form of non-revenue water because it has not reduced demand to the same extent as Abbotsford in the past (see Figures 2 and 7 above). As a result, from both equity and practical points of view, more of the burden should fall in Mission to meet the efficiency goals in terms of reductions in absolute demand. Universal metering and greater attention to non-revenue water is the most certain route.

Target 2: Residential Consumption

The targets for future per capita single family residential demand are as follows:

- Reduce single family residential consumption in Abbotsford to 180 liters per capita per day by 2032 (see Figure 14).
- Establish a single family residential consumption target for Mission upon completion of universal metering.

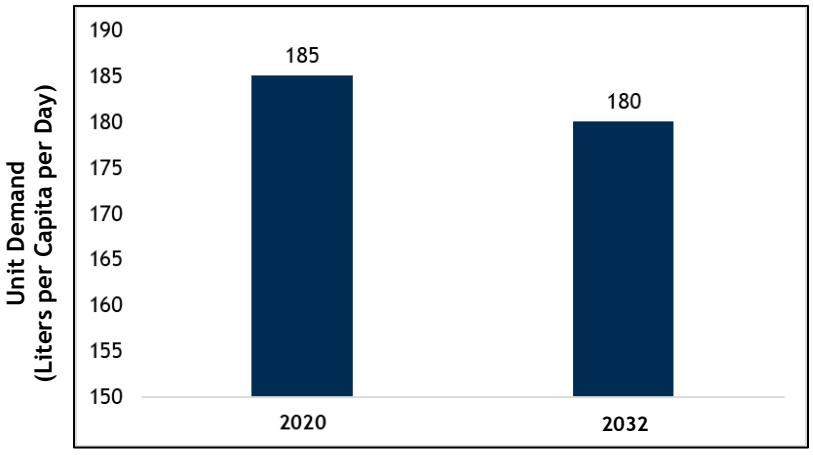


Figure 14: City of Abbotsford Single Family Residential Water Use Target

Note that the desired demand reduction for Abbotsford set out in Figure 14 is generally in line with requirements in the 2018 Water Master Plan. However, with Abbotsford's per capita residential consumption already low by national and regional standards, the targeted reduction is relatively modest. It is expected that a large portion of future overall savings will come from Mission's much higher consuming residential sector (with savings driven by universal metering), non-revenue water management, and efficiency gains in CII resulting from the planned new efficiency programs for that sector.

Target 3: Commercial, Industrial and Institutional Consumption

Based on experience in other jurisdictions (see Appendix 4), implementation of the CII program described under Theme 3 will result in substantial demand reductions in this sector, particularly since it has not been heavily targeted with efficiency measures in the past.

- Develop sector-specific water savings targets as part of detailed implementation planning for the new CII program in 2022.
- As a starting point, a 10-20% overall reduction in ICI demand by 2032
- is likely achievable given the very high demands spread across a small number of industrial and agricultural categories (see Figures 4 and 5, above).

Target 4: Peak Season Demand

Controlling peak season demand is an important objective for any water efficiency plan. The 2018 Water Master Plan does not specify a target peak demand factor but does include assumptions about the future in its supply modelling.[6] Based on this general direction, the following target is set for peak demand:

- Maintain the peak demand factor at below 1.5, defined as Maximum Day Demand/Average Day Demand (MDD/ADD).

Target 5: Non-Revenue Water

As discussed in Section 7.5, improving management of non-revenue water and system loss is a priority under this plan. However, there remains some uncertainty about the current situation. This will be investigated as an early implementation priority. Once these investigations have been completed, AMWSC, Abbotsford and Mission will set quantitative targets in this area. These will be expressed as a desired reduction of non-revenue water as a percentage of total production. Alternatively, they may be expressed as an Infrastructure Leakage Index (ILI) target based on the American Water Works Association methodology (see AWWA, 2016 and IWA, 2000).

8.2 Monitoring and Evaluation

Indicators from each program theme are compiled in Table 13. These are intended to support the strategic targets set out above. Performance will primarily be measured through staff tracking.

[6] See, for example, GeoAdvice Engineering Inc. (2017). Technical Memorandum #3: AMWSC Water Supply System Optimization Analysis. p. 7. Appendix to the 2018 Water Master Plan.

Table 13: Program Indicators and Metrics

Theme	Indicators	Metrics
Theme 1: Reduce Outdoor Water Use	Peak season demand	Maximum Day Demand/Average Day Demand (MDD/ADD)
	1.2 Compliance with the watering bylaw	Number of watering bylaw warnings issued per year
	Irrigation System and Landscape Water Efficiency Program - Assessments	Assessments per year
	Irrigation System and Landscape Water Efficiency Program - Rebates	Rebates per year
Theme 2: Continue "Our Water Matters" Education and Outreach	Community events	Number of community events per year
	School outreach	Number of class presentations delivered per year
	Smart Wash rebates	Number of rebates issued per year
Theme 3: Improve Commercial, Industrial, Institutional and Agricultural Water Use Efficiency	Audit completion	Number of facilities audited
	Reduced water use in target sectors	Percent change in average non-single family residential metered consumption
Theme 4: Measure Water Use and Adopt Volume-Based Pricing	Residential metering: City of Abbotsford	Percent of single family residential accounts that are metered and pay by volume used
	Residential metering: District of Mission	Percent of single family residential accounts that are metered and pay by volume used
Theme 5: Improve Non-Revenue Water Management	Volume of water losses (real and apparent)	m^3/service connection/year
	Volume of non-revenue water	Percent of total system production (or Infrastructure Leakage Index)

8.3 Implementation Schedule

A schedule for implementation is outlined in Table 14 on the next page. This may be modified as requirements are more clearly defined.

Early implementation priorities were identified in collaboration with AMWSC staff and include the following:

- by 2022, discontinue the toilet rebate program and rain barrel sales;
- in 2022, identify and implement enhancements to the irrigation assessment and rebate program;
- by 2024, complete a universal metering business case study for Mission;
- in 2023, design and implement the commercial, institutional and multi-family residential pilot project; and,
- in 2023 develop a water loss management strategy for Abbotsford (2028 for Mission following implementation of universal metering).

Table 14: Water Conservation Plan Implementation Schedule

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Theme 1: Reduce Outdoor Water Use											
Irrigation System and Landscape Water Efficiency Program											
Outdoor watering restrictions											
Theme 2: Continue "Our Water Matters" Education and Outreach											
Events, school outreach, and other community outreach											
Abbotsford leak program and Water Wise Portal											
Discontinue toilet rebates and rain barrel sales											
Smart Wash Rebate											
Theme 3: Improve Commercial, Industrial, Institutional and Agricultural Water Use Efficiency											
CII Water Use Efficiency Pilot Project											
CII Continuing Program (Including Agricultural Sector)											
Theme 4: Measure Water Use and Adopt Volume-Based Pricing											
Universal metering business case study in Mission											
Automated metering infrastructure in Abbotsford											
Theme 5: Improve Non-Revenue Water Management											
Water audit analysis of AMWSC transmission network											
Loss management strategy for City of Abbotsford											
Loss management strategy for District of Mission											

Legend	
	Begin Implementation
	Ongoing Implementation

8.4 Responsibilities and Governance

Plan implementation will be led by AMWSC. City of Abbotsford and District of Mission will be responsible for matters within their areas of responsibilities, notably water service pricing, customer metering, and managing non-revenue water (including system loss) within their respective distribution networks. Success will depend on the organizations working together collaboratively to implement key actions in this plan.

Implementation will follow an adaptive management framework. This means learning from experience and responding as needed to fine-tune delivery. Progress towards targets set out in Section 8.1 and objectives in Section 5 will guide this.

Regular progress reports will be provided to the AMWSC Board. Staff may also periodically seek advice from residents and other stakeholders as appropriate.

This plan serves the goals of the Joint Water Master Plan and its focus on meeting reasonable levels of service, maximizing the life of existing infrastructure and protecting public health and the environment (Urban Systems, 2018, p. 10).

9.0 Conclusion

This document sets out AMWSC's Water Conservation Plan for the period from 2022 to 2032. By continuing to encourage efficient use, this plan will play an integral role in making both Abbotsford and Mission more water sustainable. It will facilitate adaptation to future pressures from climate change and provide a range of other social, ecological and financial benefits. It will also support ongoing implementation of the Joint Abbotsford-Mission Water Master Plan.

10.0 References

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10.1 Resources

The following list provides various resources from leading jurisdictions, non-governmental organizations and other agencies that may assist with implementation of the themes and actions in this plan.

Theme 1: Reduce Outdoor Water Use

Water Smart Irrigation Professionals (York and Peel Regions and Landscape Ontario)
https://www.watersmartirrigationprofessional.ca/

Fusion Landscape Professional (York and Peel Regions and Landscape Ontario)
https://www.fusionlandscapeprofessional.ca/

Sustainable Landscapes: A Utility Program Guide (Alliance for Water Efficiency)
https://www.allianceforwaterefficiency.org/impact/our-work/sustainable-landscapes-utility-program-guide (note this is a "members only" benefit)

Theme 3: Commercial, Industrial, Institutional and Agricultural Water Use Efficiency

Canadian Best Practice Jurisdictions

York Region, Ontario
https://tinyurl.com/y8m5gxmn
Region of Peel, Ontario
https://www.peelregion.ca/watersmartpeel/businesses/indoorwater.htm
Waterloo Region, Ontario
https://www.regionofwaterloo.ca/en/doing-business/water-programs-and-funding.aspx

City of Guelph, Ontario
https://guelph.ca/living/environment/water/rebates/watersmartbusiness/

Seneviratne, M. (2007). A Practical Approach to Water Conservation at Commercial and Industrial Facilities. ISBN: 9781856174893

Resource Library (Alliance for Water Efficiency)

Theme 4: Measuring Water Use and Volume-based Pricing

AWWA (2017). M1 Principles of Water Rates, Fees and Charges, 7th Edition. ISBN 9781625761910.

Financing Sustainable Water (Alliance for Water Efficiency)
https://www.financingsustainablewater.org/

Brandes, Renzetti and Stinchcombe (2010). Worth Every Penny: A Primer on Conservation-Oriented Water Pricing. Prepared for the POLIS Water Sustainability Project
https://poliswaterproject.org/polis-research-publication/worth-every-penny-primer-conservation-oriented-water-pricing/

Waterworth Blog
https://waterworth.net/blog/

Value of Water Campaign
http://thevalueofwater.org/

Water Research Foundation (2016). Rate Approval Process Communication Strategy and Toolkit.
https://icma.org/sites/default/files/308295_Rate%20Approval%20Process%20Comm%20Strategy%20Toolkit.pdf

Theme 5: Non-Revenue Water Management

AWWA (2016). M36 Water Audits and Loss Control Programs, Fourth Edition. ISBN 9781625761002

AWWA Water Audit Software and Other Resources
https://www.awwa.org/Resources-Tools/Resource-Topics/Water-Loss-Control