CITY OF SALMON ARM

COMMUNITY WATER CONSERVATION PLAN

July 2022

CITY OF SALMON ARM

Executive Summary

Water conservation is becoming an increasingly important necessity in Salmon Arm as summers become hotter leading to increasingly high daily water use. Multiple elements of the water distribution system are operating at maximum capacity during these times, causing undue strain to the system and putting it at higher risk of minor system failures that could lead to reduced available supply or water quality complications depending on the nature of the failure. Not only does it add costs to treat and distribute more water to the City, but strain experienced by certain elements of the system leads to more frequent costly maintenance and repairs.

Water conservation has long been identified as a community priority and is outlined in the Official Community Plan (OCP) where it has policies stating:

- Manage water, sanitary sewer, and storm drainage utilities in a manner that emphasizes energy conservation, environmental sustainability and fiscal responsibility. Consider long term maintenance programs and cost-effective operation of existing and future services in relation to financial sustainability when planning new utilities.
- Continue to develop demand management strategies for water, sanitary sewer, and storm drainage utilities (e.g., reducing water use through metering, conservation measures, low water-use fixtures and appliances).
- Update and implement the comprehensive water conservation strategy (i.e., the following document).

Over the last 10 years (2012-2021) the average baseline daily demand is 6.4 ML/day. The average maximum daily demand over the same time period is 22 ML/day, 3.4 times higher than the baseline. In 2021, the maximum daily demand was 27.6 ML/day, the current record high daily demand seen by the system. There is a relatively constant baseline demand from October – April, varying slightly from year to year. Maximum daily demands typically occur in July depending on climactic conditions. The timing and activities observed in Salmon Arm strongly indicate that the majority of the increase daily demands during summer months is irrigation.

It is predicted that with increased climate variability brought on by climate change, especially with the heat waves Salmon Arm has experienced in 2021 and 2022, there will be increases to the maximum daily demands and on-going summer demands. Forecasting based on data from the last 10 years shows that the maximum daily demands are expected to increase, with the worst case scenario prediction being that water treatment plant will be unable to supply sufficient water volumes by 2042 if no conservation measures are taken. The best case scenario, which includes the implementation of universal water metering and public education and outreach, predicts daily demands that will cause little to no strain on the system for the foreseeable future.

There are two main consequences of the strained water distribution system on the community. Primarily it is a safety risk. There are requirements for a minimum amount of water to be present in the reservoirs at all times to provide sufficient flows for firefighting. The volumes vary by zone and by reservoir. If there were a fire in an area at the time when the reservoir had insufficient capacity for

firefighting, consequences could be severe. Secondly, there is the financial burden. Beyond the additional treatment and pumping costs due to increased demand, when the system is strained it requires more maintenance, repairs, replacement of parts, and expansions. All of these are of high cost to the City and its water users and taxpayers. In already challenging financial times, there will be resistance to increases to utility bills. Both consequences are immediate as the system is already experiencing exceptionally high water demands in the summer.

Water conservation can be approached from multiple angles depending on the desired outcome. Goals have been developed by City Staff in order to guide the planning of conservation measures based on the desired outcome. They are as follows.

Goal #1: Delay infrastructure upgrades due to increased demand – no infrastructure is replaced until it has exceeded a minimum of 85% its anticipated useful life.

Goal #2: Reduce peak demand to within double the average day use.

Goal #3: Quantify non-revenue water using high confidence data.

Goal #4: Spread awareness of water conservation efforts and encourage public action and participation.

Goal #5: Increase information available for decision making.

Using the Water Conservation Goal, Local Priorities were developed with input from the City's Engineering Department, Utilities Department and Head WTP Operator. The Local Priorities reflect the Water Conservation Goals, and were used to score conservation measures' ability to achieve these goals.

The Local Priorities are as follows:

- Reduction of maximum daily demand
- Ability to spread awareness of the importance of water conservation
- How much information it provides to aid the City in future decision making
- If the conservation measure will delay infrastructure upgrades and the need for construction of additional infrastructure
- The amount of resources and staffing required (cost) to implement the conservation measure

The Local Priorities were weighted based on their importance by City staff and used as evaluation criteria to rank each water conservation measure. The following conservation measures were identified by the evaluation table as the top 5 measures that best met the City's Local Priorities:

1. Universal water metering paired with a usage based pricing strategy

This conservation measure scored the highest (see evaluation in Appendix C) as it forces water users to become aware of how much water they are using, provides valuable usage information to City Staff, and reduces peak consumption, which in turn will delay infrastructure upgrades and additions. Other municipalities have found metering to be an extremely effective water conservation measure, for

example in 2018 the City of Kamloops observed a 25% reduction in monthly usage with 90% of homes metered.

2. Xeriscaping

Xeriscaping reduces the demand for irrigation, which accounts for the majority of the summer (peak) usage. This will delay infrastructure upgrades and additions. Xeriscaping is relatively low cost and gives residents and the City a chance to lead by example and spread water conservation awareness to their neighbours.

3. Leak detection and repair program

Leak detection and repair will decrease overall water usage in the City and help delay the need for new infrastructure. This would also provide valuable information to City staff about the condition of the water system and encourage proactive asset management.

4. Multistage Watering Restrictions

Multistage watering restrictions have potential to reduce peak consumption and delay infrastructure upgrades and additions. They also spread awareness to the community about the importance of water conservation and are inexpensive to implement.

5. Excessive User Program

Flat rate billing is used in conjunction with water meters (currently residential properties), staff monitor usage and determine where water use is excessive. At properties where usage is considered to be excessive, both education and enforcement measures are used to reduce usage.

With a combination of these options, forecasts show that there will be a decrease in water consumption that can significantly reduce the risks put on the City and the water system by the high water demands. Options will be implemented following the schedule in **Section 8**. Impacts and water use trends will continue to be observed and used for future decision making. The plan will be updated at least once every 5 years to ensure the available information and direction are a reflection of the current state of the condition of the water supply system and the community in Salmon Arm.

CITY OF SALMON ARM

Table of Contents

Table of Figures

CITY OF SALMON ARM

1. Introduction

Despite the abundant volume of Shuswap Lake, water conservation is still an issue of concern for the City of Salmon Arm. High demand exerts an unnecessarily high amount of strain and wear on expensive infrastructure, and may result in the need for infrastructure maintenance or replacement early in the infrastructure lifetime. Water conservation reduces demand on a finite resource and prolongs the lifetime of water infrastructure, as well as the need for infrastructure upgrading or upsizing. With climate change and an increasing population, water conservation is necessary to preserve the City of Salmon Arm's (The City) water system and water sources.

Salmon Arm is a city in the Shuswap Region of the Southern Interior of British Columbia with a population of 19,432 (Statistics Canada, 2021 Census of Population). The City's water is supplied by two (2) primary sources: East Canoe Creek at Metford Dam and Shuswap Lake at Canoe Beach.

The Shuswap Lake source has a Water Treatment Plant (WTP) that meets the Interior Health Authority 4-3-2-1-0 water treatment objective of four (4) log inactivation of viruses, three (3) log removal/inactivation of *Giardia Lamblia* and *Cryptosporidium*, two (2) treatment processes for surface water sources, one (1) for less than 1 NTU of turbidity, and zero (0) total and fecal coliforms and *Escherichia coli*. The Metford Dam WTP has been upgraded to use two forms of disinfection: ultra-violet light (UV) and sodium hypochlorite chlorination. The water from Metford Dam is only used when the turbidity is less than 1 NTU.

The City's reservoir storage capacity for the water system is 33.14 ML (including seasonally dependent capacity of Metford Dam) and services a population of approximately 13,030 (2021 Annual Water System Return) people through approximately 6,200 connections. Approximately 45% of the City's customers are on water meters with over 96% of Industrial, Commercial and Institutional (ICI) users metered, and approximately 42% of residential users metered.

The City is a mixture of rural and urban areas and is comprised mainly of year-round residents with a minor influx of summer tourism. Economically, the City has transformed over time from being primarily agricultural to having a mix of agriculture, tourism, and industrial and commercial businesses. The City also provides potable water through agreement to two Secwepemc Bands, the Adam's Lake and the Neskonlith First Nations.

1.1 Purpose

The City considers environmental sustainability a high priority which is reflected throughout the Official Community Plan (OCP), with the Environment being one of five strategic drivers in the Corporate Strategic Plan. The following are relevant policies specific to water conservation from the OCP.

- Strive to protect the quality and quantity of surface water and groundwater.
- Manage water, sanitary sewer, and storm drainage utilities in a manner that emphasizes energy conservation, environmental sustainability and fiscal responsibility. Consider long term

maintenance programs and cost-effective operation of existing and future services in relation to financial sustainability when planning new utilities.

- Continue to develop demand management strategies for water, sanitary sewer, and storm drainage utilities (e.g., reducing water use through metering, conservation measures, low water-use fixtures and appliances).
- Update and implement the comprehensive water conservation strategy (i.e., the following document).

Beyond environmental sustainability, a Community Water Conservation Plan will help the City's water system meet future needs. Although the City's water system is very robust, issues like ageing infrastructure, population growth, and climate change may challenge its ability to meet the needs of future generations. The City wants to address these issues to ensure a sustainable and fiscally responsible supply of potable water for generations to come. Creating, maintaining and adhering to a Community Water Conservation Plan (Plan) will be a significant step in achieving this goal.

The process to develop this Plan was initiated by the City's Corporate Strategic Plan which lists a Water Metering Cost/Benefit Analysis as medium-term priority project. Reflecting the OCP policies, a Water Conservation Plan and Policy is the first step towards a Water Metering Cost/Benefit Analysis. The City's Water Conservation Policy No. 519 was adopted by Council in August of 2021 and contained five (5) water conservation objectives:

1. **Water Conservation Planning**: The City will create and maintain a Water Conservation Plan that embodies the Principles listed in this Policy. The plan will be updated at minimum every five (5) years and will outline the City's current Water Conservation Goals along with a draft work plan outline for achieving the goals.
2. **Water Conservation Awareness**: The City will promote awareness of water conservation goals, challenges and successes to the community. Public engagement, education and awareness is key to the success of water conservation initiatives.
3. **Sustainable Service Delivery**: Water conservation is a powerful tool for overall sustainable Asset service delivery. Water conservation strategies shall be identified and prioritized in conjunction with the City's Asset Management practices to delay infrastructure upgrades, reduce system risks and deliver sustainable water service to the community.
4. **Emergency Preparedness**: The City will use water conservation programs to help ensure water demand is available for unforeseen emergencies such as a major service disruption and firefighting.
5. **Environmental Awareness**: The City shall consider climate change impacts and system resiliency when evaluating water conservation strategies.

This plan outlines processes and projects that will allow the City to achieve the objectives of Policy No. 519.

1.2 Stakeholders

The Community Water Conservation Plan's geographical boundaries are the City limits. However, the Shuswap Watershed is a multi-jurisdictional region shared with the Columbia Shuswap Regional Districts and the Secwepemc People. Stakeholders have not been engaged during the preparation of this version of the Community Water Conservation Plan. In future plan updates, the following stakeholders should be engaged to better understand the project as it applies to all watershed users.

- Adam's Lake First Nation
- Neskonlith First Nation
- Environmental Advisory Committee (EAC)
- Student Council
- Shuswap Watershed Council
- Columbia Shuswap Regional District

1.3 Plan Development

The Community Water Conservation Plan was developed using the Water Conservation Guide for British Columbia. The plan has been developed by the City using in-house resources, with technical assistance and review by Associated Environmental Consultants Inc.

The Community Water Conservation Plan is intended to be revised and updated by City Staff and stakeholders every five years to revisit previously set Goals and Targets and ensure the plan remains relevant to the City.

1.4 Community Water Goals

The OCP was developed by the City with extensive community engagement and is intended to reflect the community's goals and values.

The Shuswap Watershed Council (SWC) was established in 2014 as a watershed-based partnership to enhance the water quality and safe recreation in the Shuswap Watershed. The members form a collaborative team that represents the local regional districts and cities, the Secwepemc Nations, and two provincial government agencies. The SWC created a strategic plan for 2021-2026 to achieve their objectives which are closely aligned with the community values of the OCP, and represent water values beyond City limits.

The Adams Lake Indian Band (ALIB) belongs to the Secwepemc Nation. ALIB is a member of the Shuswap Nation Tribal Council which consists of nine Secwepemc Bands. In 2015 ALIB created *SWIXWEYTEC – Our Ancestral Voice,* the Adams Lake Indian Band Comprehensive Community Strategic Plan. The Comprehensive Community Strategic Plan is a guiding tool to help ALIB grow sustainably, and is a community driven plan that represents the values of ALIB.

The Community Water goals are primarily based on the City's OCP, but consider the goals of the SWC and ALIB to help ensure that the goals of the larger community are met. These goals are as follows:

- Protect the quality and quantity of source water to maintain a healthy environment, strong economy and a high quality of life.
- Consider climate change impacts on water quality and quantity from flooding, drought and other climate change factors when planning for the future to ensure sustainable development.
- Regulate the use of land and water surfaces to preserve the communities natural assets, including sources of groundwater and surface water
- Manage water demand and infrastructure in a fiscally responsible manner which reduced maintenance and energy costs of the City's water system

1.5 Challenges in Reaching Goals

Shuswap Lake's abundant volume can create the illusion that water in Salmon Arm is unlimited. Therefore, the importance of water conservation and the associated benefits are not understood by many water users. The City struggles with low compliance from residents with current water conservation initiatives such as sprinkling restrictions.

Like all water systems, the City's water system loses a certain volume of water due to leakage. Because residential properties, which account for the majority of water use, are not universally metered, detecting leakage in the system is a challenge. Also, the region has seen the effect of a changing climate. The intensity of storms has been increasing in the shoulder seasons and drier and/or drought conditions can persist longer in the summer. An increase in runoff volumes during freshet have also been causing increases in turbidity and erosion issues at Metford Dam and longer drier and/or drought conditions have been causing excess irrigation leading to potential supply volume concerns.

The City has had a commercial metering program for some time and has good data for these users (including institutional and industrial). However, only new residential or renovated residential properties have water meters so demand data for existing residential properties is poor. Having gaps in the usage data creates challenges in finding system leakage, and in developing effective water conservation strategies.

1.6 Opportunities

There are many water conservation strategies that could be implemented by the City to reduce the volume of water consumed in the community. These strategies could include universal water metering, sprinkling restrictions, inefficient appliance rebates, pricing strategies, retrofit kits to update inefficient appliances, water audits and new plumbing requirements. These potential water conservation strategies will be explored in greater detail in **Section 5.2**.

2. Water System Profile

2.1 Community Snapshot

2.1.1 Population

The population of Salmon Arm is 19,432 (2021 Census). Of the population, approximately 13,030 residents are served by city water. The remaining population are served by private groundwater wells. The average household size for Salmon Arm is 2.3 persons per household (2021 Census).

The City sees only a minor influx in the population in the summer.

2.1.2 Water Demand by Sector

The City's water users can be categorized as either residential, agricultural, industrial, commercial, non-revenue or institutional water users. It is noteworthy that many residential properties perform farming activities. The annual water demand per sector in 2021 is summarized in **Figure 1**, based on metered rates and pro-rated volumes for non-metered users.

Note that in accordance with the Water Rates and Waterworks Regulation Bylaw 1274, irrigation of a property greater than 0.5 acres in size with City Water is prohibited. Agricultural facilities may use City water for processing or use in the homestead.

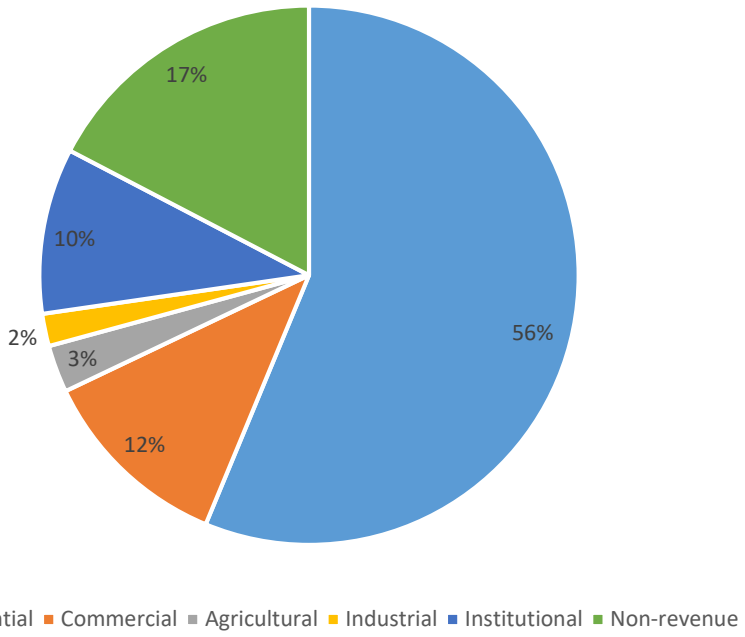


Figure 1: 2021 Annual Demand by Sector

2.1.4 Annual Water Demand

The annual water usage for all connections in the City has stayed relatively steady over the last 10 years despite a steadily growing population. The average annual water consumption from 2010 to 2021 is 3,517 ML. An increase in the average annual water demand can be seen in especially dry years, such as 2017 and 2021.

The total annual water use trendline in Figure 2 indicates that the average annual water demand is increasing, however the increase is small relative to the increasing number of connections to the City water ditribution system and growing populations. This could be due in part to several factors including low water use fixtures in residential homes. Figure 2 also indicates a decline in the use of Metford Dam as a water source. Because Metford Dam does not have a filtration system, it can only be used when turbidity is below 1 NTU. The decline in use is an indicator of an increasing volume of spring freshet and the increased turbidity this causes.

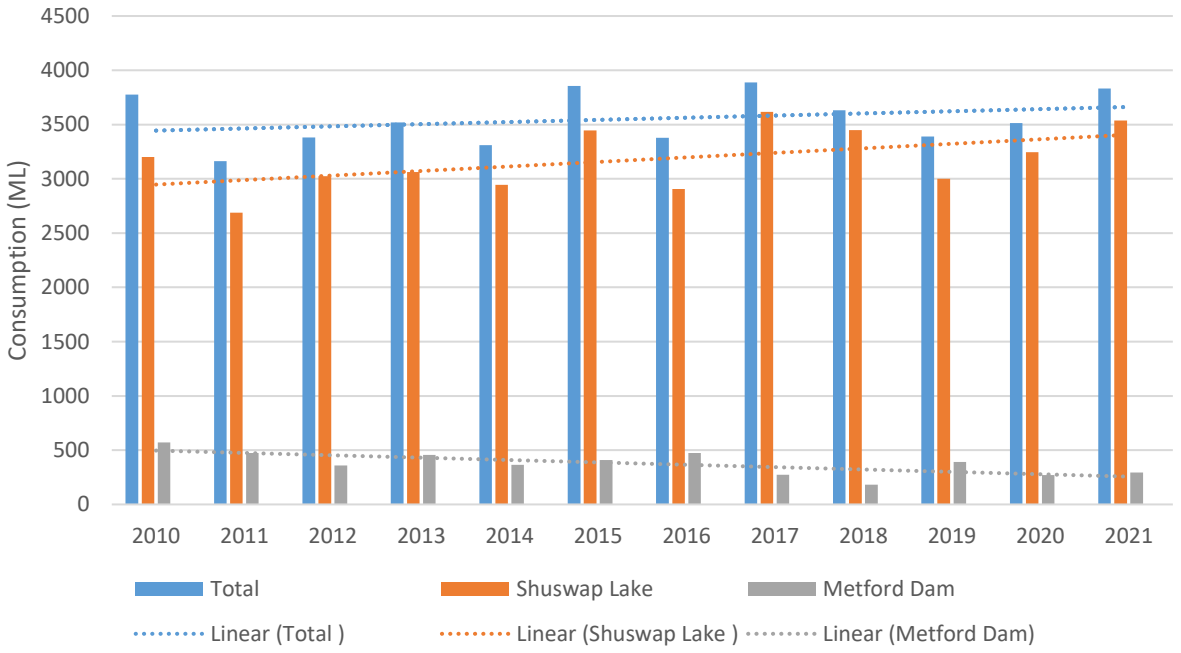


Figure 2: Annual Water Demand

2.1.5 Monthly Water Demand

Reviewing the monthly water demand profile for the City (**Figure 3**), it can be observed that one of the City's major conservation challenges is seasonal water usage, specifically outdoor irrigation during the dry summer months. During especially dry years, the average monthly water demand can increase more than three times the average winter demand.

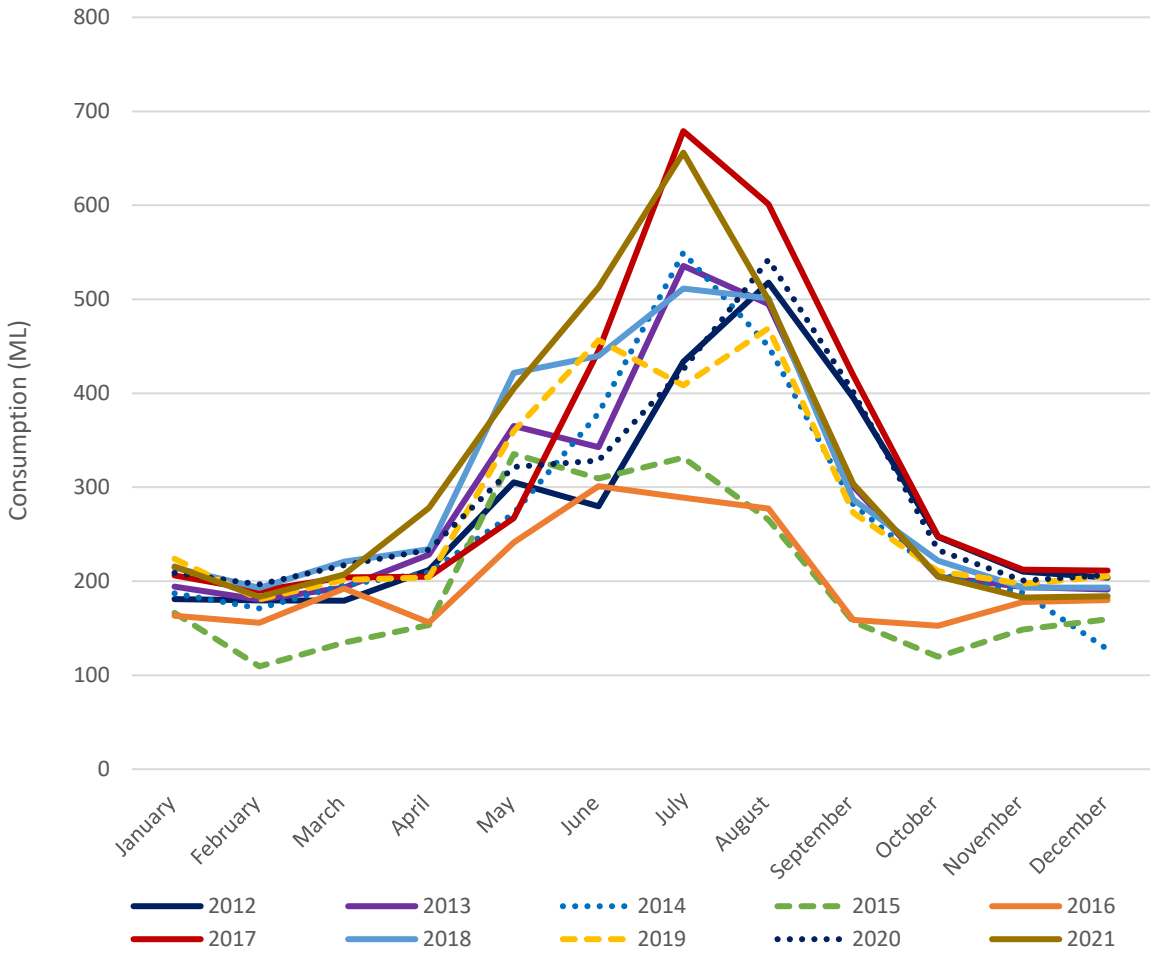


Figure 3: Monthly Water Demand

2.1.6 Daily Water Demand

The City's maximum and minimum daily water demand has been steadily increasing over the last 10 years (**Figure 4**). The maximum daily demand since 2010 has been on average 22 ML, which is approximately 3.4 times the baseline daily demand of 6.4 ML. Baseline daily demand is calculated using the average daily demand in months October through April when there is presumably little to no irrigation taking place. The maximum daily water demand occurs during the summer months (July and August) when most residents are irrigating, with the highest historical maximum daily demand occurring in drought years. The minimum daily water demand occurs during the winter months.

The highest recorded maximum daily water demand occurred on June 30, 2021, where the City's system recorded 27.6 ML. This high occurred following an unusually dry spring, during an extreme heat wave. The lowest daily water demand in the last 10 years was 3.1 ML, occurring on October 23, 2017.

The average daily demand from 2010-2021 is 9.7 ML. The average daily demand has remained relatively steady over the past 10 years, and is increasing at a rate similar to the minimum daily demand.

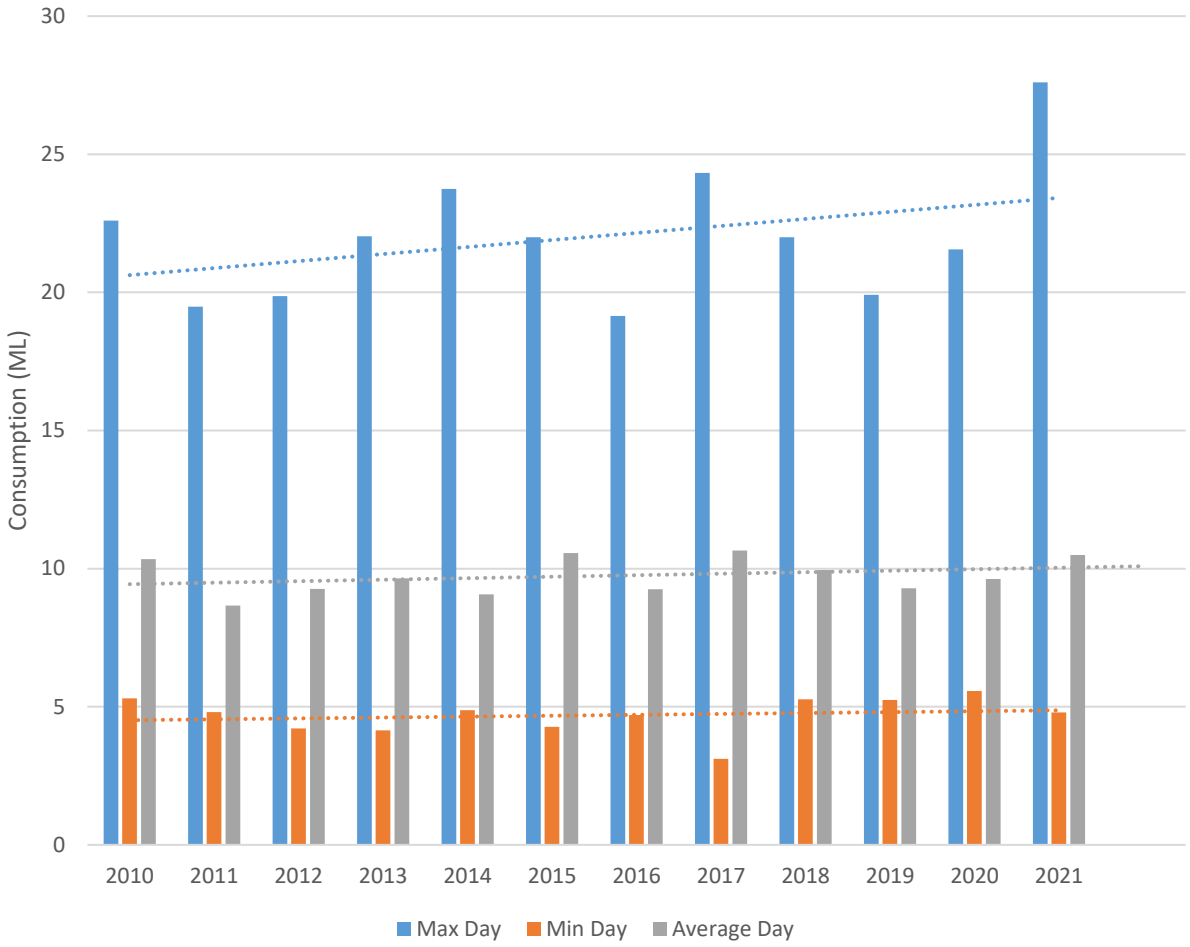


Figure 4: Minimum and Maximum Daily Water Demand (all connections included)

The trend lines indicate that both the maximum and minimum daily demand are increasing over time.

Cities in the Okanagan and Shuswap regions tend to have higher water usage in the summer months, and higher maximum daily demands due to more residential outdoor irrigation, and increased commercial use through carwashes, golf courses, and parks.

2.1.7 Total Per Capita Demand

The total per capita water demand for the City, which includes residential, commercial and non-revenue use of water, was estimated to be 540 litres per capita per day (LPCD) in 2021. This value was determined using the 2021 average daily water consumption and the total population of the City of Salmon Arm. For comparison, in 2019 the average total per capita water demand in Canada was 411 LPCD and 472 LPCD in BC (Statistics Canada 2019).

2.1.8 Residential Per Capita Water Demand

Under half of the residential properties within the City are metered; however, using the metered data available, an average annual residential per capita usage of 406 LPCD was calculated. The Okanagan and Shuswap region tend to have a higher residential per capita water demand than other regions within BC, particularly metropolitan areas, due to having a higher proportion of single family residences, larger property sizes and drier summers with hotter temperatures.

For comparison, in 2017, the residential per capita demand in the City of Vernon was approximately 317 LPCD. While in 2011 the residential per capita demand of the City of West Kelowna was approximately 439 LPCD, although since 2011, the City of West Kelowna has reduced their consumption significantly through conservation efforts. In 2019 the average residential per capita water demand in Canada was 215 LPCD and 274 LPCD in BC (Statistics Canada 2019).

2.1.9 Non-Revenue Water Demand

Non-revenue water is any water that is not billed for. There are a variety of sources of non-revenue water demand in the City including main flushing, fire flows, fire hydrant flow testing, water used for construction, street cleaning and leakage. Leakage is typically the major cause of water loss and needs to be estimated and accounted for to prioritize infrastructure upgrades. However, without universal water metering it is difficult to accurately estimate leakage in the system.

In 2021 non-revenue water demand for the City was estimated at 665 ML, or approximately 17% of the total system demand. Considering the many uses of non-revenue water in the City, this suggests that the total leakage in the system is quite low.

However, this volume of unquantified water makes the City vulnerable to significant leaks going unnoticed.

2.2 Watershed Snapshot

2.2.1 Catchment Area and Water Sources

The Shuswap Watershed is located near the headwaters of the Fraser River system and covers an area of over 1.5 million hectares. See **Appendix A** for map of the Shuswap Watershed. This area feeds Shuswap Lake, the 7th largest lake in B.C.

The City's Water is supplied by two primary sources: East Canoe Creek at Metford Dam, and Shuswap Lake at Canoe Creek. A secondary water source at Rumball Creek formerly provided untreated and non-disinfected water for irrigation at the Mt. Ida Cemetery, but this source was decommissioned in 2020.

Shuswap Lake is a very large lake, 19,100,000 ML in volume, located in South-Central British Columbia. Shuswap Lake consists of four arms, forming an 'H' shape. Salmon Arm is located on the south end of Shuswap Lake. Shuswap Lake is the main source for the City's water system. Water from this source is treated in the WTP and is pumped throughout the system's seven pressure zones. The City holds a water license on Shuswap Lake totaling 7,600 ML/year.

Metford Dam is an earth fill dammed reservoir located on East Canoe Creek. The water supply reservoir was originally constructed in 1949 and is estimated to have a water volume of 15.8 ML. The City holds four water licenses on East Canoe Creek totaling 1,600 ML/year and a water storage license for 18.157 ML/year (East Canoe Creek Watershed Source-to-tap Assessment, Stantec 2010).

The water from Metford Dam is treated with UV disinfection and chlorination. The Metford Dam WTP does not have a filtration system, thus water from Metford Dam can only be used when turbidity is below 1 NTU. Metford Dam is located at an elevation of 567 meters above sea level, which is higher than any connections it services. Thus, the Utilities Department attempts to maximize the supply of water from East Canoe Creek to minimize the pumping costs that would otherwise be incurred. With climate change and warming temperatures increasing the severity of storms, and the volume of freshet, the period of time that Metford Dam is a viable water source is steadily decreasing. The historic decline in the usage of Metford Dam can be seen in **Figure 2**.

Figure 5 shows that despite efforts to maximizes the use of Metford Dam, only a small portion of the City's total water supply comes from Metford Dam.

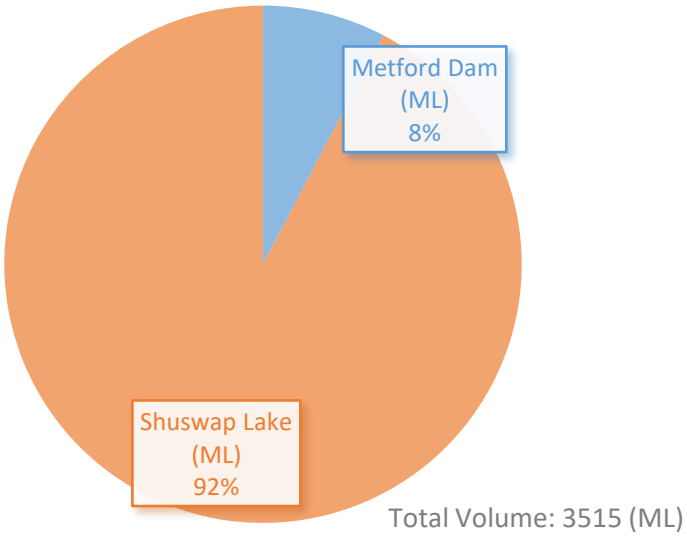


Figure 5: 2021 Total Supply by Source

2.2.2 Maximum Daily Supply Capacity

The WTP at Canoe Beach is a high rate direct filtration plant with a capacity of 40 ML/day and future expansion provisions to provide an additional 20 ML/day when needed by the City. A realistic sustained treatment level is approximately 36 ML/day without the plant expansion, and 52 ML/day with the plant expansion.

The maximum daily supply capacity for Metford Dam is seasonal and weather dependent.

2.2.3 Governance Issues

The Shuswap Watershed is a multi-jurisdictional region and contains many important stakeholder groups.

The Shuswap Lake Integrated Planning Process (SLIPP) was created in 2006 in response to the intense pressure that the lake was experiencing due to an increase in development, an increase in wastewater discharge and conflicting demands on recreational use. The many agencies that have control over a portion of the lake were creating a complicated regulatory environment. SLIPP was created with the goal of creating a single table for land and water use, and governance issues affecting the Shuswap watershed.

From the initiatives of the SLIPP, the Shuswap Watershed Council (SWC) emerged. The SWC is a collaborative, non-regulatory group with a mandate to enhance water quality and safe recreation in the Shuswap Area. The SWC includes representatives from the Columbia-Shuswap Regional District, Thompson-Nicola Regional District, District of Sicamous, City of Salmon Arm, Regional District of North Okanagan, Secwepemc Nation and the Province of British Columbia.

The Shuswap Watershed is located within the traditional territory of the Secwepemc Nation. The Shuswap Nation Tribal Council (SNTC) is a collaborative effort between nine Secwepemc Bands created to advance the issues of Aboriginal rights. The SNTC primary objectives are the development of self-government and the settlement of the aboriginal land title question.

The City is committed to engagement and collaboration with the aforementioned parties to support future developments in the Community Water Conservation Plan.

2.2.4 Social and Cultural Aspects

The land within the Shuswap Watershed offers many recreational opportunities to residents and visitors including hiking, biking, camping and the use of recreational vehicles.

Shuswap Lake, is used for many forms of recreation including boating and swimming.

Shuswap Lake is recognized as culturally important for the Secwepemc Nation. The Secwepemc traditional territory located within the Shuswap Watershed includes historic sites such as Secwepemc winter villages, traditional harvesting and spiritual sites. Many Secwepemc traditions are tied to the land, thus it holds significant cultural value.

2.2.5 Changes in Watershed

Changes in the Shuswap Watershed are likely to occur due to climate change and population growth in the Shuswap Region.

Climate change is expected to result in more frequent fires in many boreal forests with more severe environmental and economic consequences. From global climate models and scenarios, researchers are interpreting how climate change and climate variability may alter patterns of lightning, fuel moisture, temperature and vegetation, all factors that can effect fire occurrence. Fire-prone conditions are

predicated to increase across Canada, which will likely result in the increase of the amount of area burned.

The result of an increase in the area burned may result in more debris and contaminants entering the City's water sources. Metford Dam is especially at risk as it is vulnerable to turbidity. A reduction of canopy and ground cover may result in more snowpack melt earlier in the season, which could increase flood risk. The Zone 2 pump station is especially vulnerable to flooding.

An increase in the population of the Shuswap region will result in more people sharing a finite water resource. This could mean lower lake levels, and increased strain on existing water infrastructure.

For future temperature and climate trends in the Columbia-Shuswap region, see **Appendix B**.

2.3 Infrastructure Snapshot

2.3.1 Service Connections

The City's water system serves a population of approximately 13,030 residents through 5,665 residential connections. This estimate assumes 2.3 people per household (2021 Census). Additionally, the City services 531 other connections, which account for Industrial, Commercial, and Institutional (ICI) and agricultural connections. The remainder of residents not serviced by City water are serviced through private groundwater wells.

2.3.2 Metering

All new developments within the City require installation of a water meter. The City has implemented a meter installation program for existing ICI properties resulting in 96% of properties being metered. Existing residential properties are required to install meters as a condition of building permit approval. Figure 6 shows the percentage of connections metered per sector.

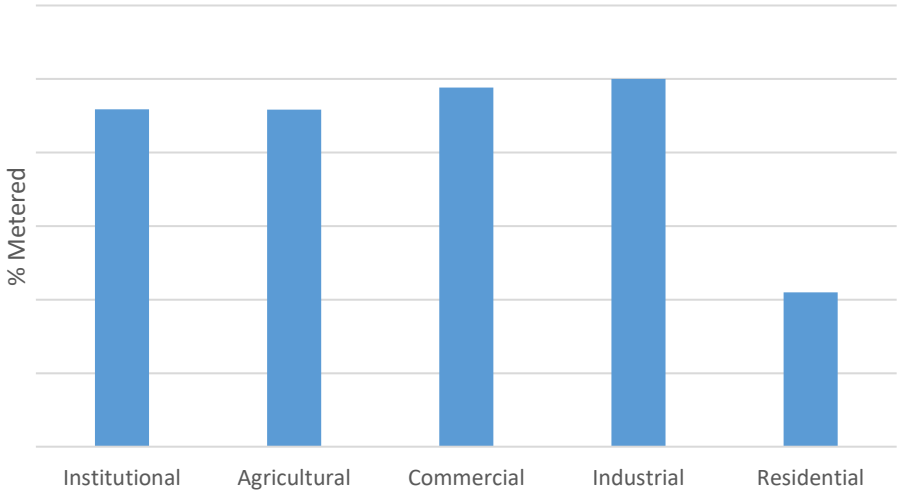


Figure 6: Percentage of Metered Connections per Sector 2021

2.3.3 Water Treatment

The Shuswap Lake source has a relatively new WTP (became operational in 2009) that meets the Interior Health Authority 4-3-2-1-0 water treatment objective of four (4) log inactivation of viruses, three (3) log removal/inactivation of Giardia Lamblia and Cryptosporidium, two (2) treatment processes for surface water sources, one (1) for less than 1 NTU of turbidity, and zero (0) total and fecal coliforms and E. Coli. The East Canoe Creek source has been upgraded to use two forms of disinfection: ultra-violet light (UV) and sodium hypochlorite chlorination.

The new WTP was online in May 2009 and dramatically improved the water quality for all City residents. The treatment process includes coagulation, flocculation, and filtration, followed by disinfection with ultraviolet light and chlorine (via sodium hypochlorite generated on-site). The raw water intake was extended further offshore and lowered to provide a more consistent raw water supply for the water treatment plant.

2.3.4 Distribution System

The distribution system includes approximately 204 km of water main, varying in diameter from 100 mm to 600 mm. The City's waterworks system provides water through gravity and pump systems. The waterworks system is complex and is comprised of eight pressure zones, 1005 hydrants (844 City owned), seven pumping stations, fourteen reservoirs and one dam. There is a total concrete reservoir storage capacity of 17.34 ML and Metford Dam reservoir storage capacity of 15.8 ML. The total storage capacity of the system is 33.14 ML.

2.3.5 Sewage Collection System

The City's sanitary sewer collection system consists of 14 sewerage sub areas and 127 km of gravity and force main sanitary sewer pipes covering approximately 1.8 km^2. There are approximately 6,180 residential, and ICI lots fronting onto the sanitary sewer system (2019 Court of Revision Report). There are seven (7) sewer lift stations that collect and pump sewerage to the Lakeshore Sewer Interceptor located on the foreshore where the main lift station, Wharf Street Pump Station, pumps the sewerage directly to the WPCC. The Interceptor provides storage and flow equalization capabilities.

2.3.6 Sewage Treatment System

The sanitary flows to a Wastewater Pollution Control Centre (WPCC) in the downtown foreshore area. The WPCC is a biological nutrient removal (BNR) system, provides tertiary treatment prior to effluent into Shuswap Lake.

The process of wastewater treatment can be separated into two flow streams – liquid and solids also referred to as the liquid train and solids train.

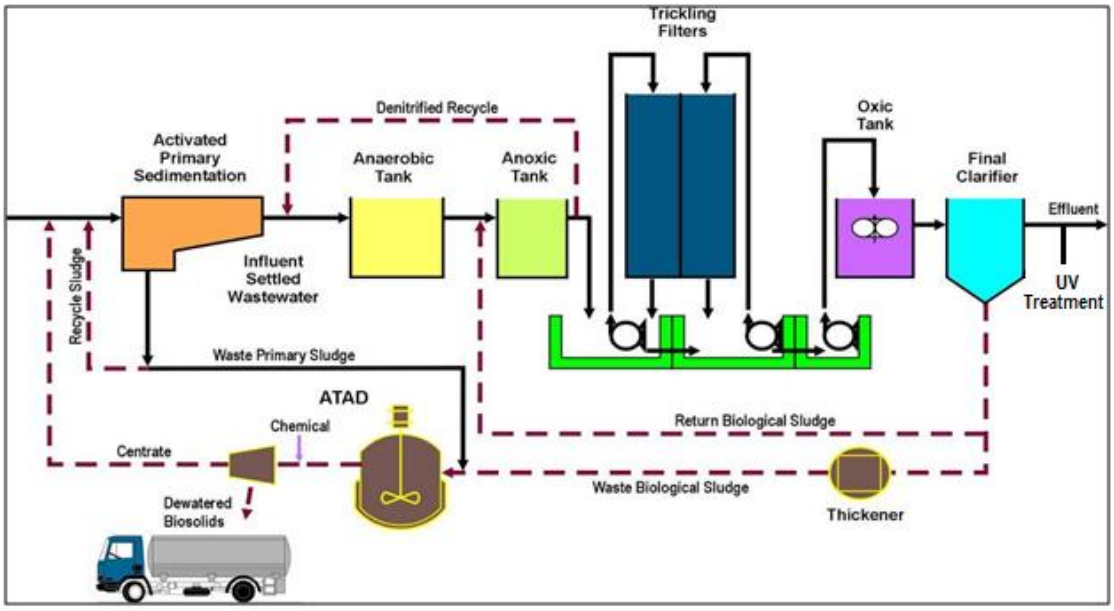


Figure 7: Overview of Wastewater Treatment Process

Initially the wastewater flows into the plant from a sewage lift station located at Marine Park Drive. The influent then passes through several mechanical devices to remove large particles including rocks, rags, plastics and grit. This is done in the headwork of the facility and prevents damage to downstream equipment.

The flow then enters the Primary Sedimentation Tanks where heavier organic and inorganic solids are settled out of the liquid stream. These particles are then pumped to the ATAD for stabilization. The liquid, on the other hand, then enters the tertiary BNR and SGR-FGR part of the facility for further treatment.

The tertiary treatment involves the use of bacteria to convert degradable organic matter into bacterial cells. These cells are then separated from the liquid in the secondary clarifiers.

The growth portion of the bacteria is removed from the process by thickening and pumped to the ATAD while the remainder is recycled back to the incoming wastewater. This maintains a balance of food (wastewater organics) to microorganisms.

The secondary effluent then passes through the Aqua Aerobics disk filtration system which provides 10 micron filtration, the effluent is then disinfected using a Wedeco Ideal Horizons Ultra Violet Light (UV) disinfection system prior to it being discharged into the Salmon Arm Bay in the Shuswap Lake.

Solids are digested to form biosolids in the high temperature ATAD. This process uses high temperature bacteria (60 to 70 degrees Celsius) to stabilize and pasteurize the biosolids.

Odour control is another major component of the plant operation. The odour control has been separated into two trains based on the concentration of odour generating compounds. One train deals with a large air volume of low odour concentration while the second train deals with a low air volume

with a high concentration of odour compounds. The latter system uses a multi treatment system – biofilter, ozone contact, four (4) stage chemical scrubber and dilution while the other system uses a single stage chemical scrubber.

3. Forecasting Future Demand

3.1 Water Demand Forecast

3.1.1 Method

Water demand in the City does not appear to be strongly connected to population growth in the City. Between the years of 2006 and 2021 the City's population grew by about 20%, however annual water usage remained relatively consistent.

The City's WTP has abundant capacity to support the City's annual water demand for the foreseeable future. However, the maximum daily demand, and the "peaks" in water demand during summer months (**Figure 3**) are predicted to encroach on the WTP's capacity if drought conditions and irrigation demand in the City continue.

For these reasons, the Community Water Conservation Plan only forecasts the future maximum daily demand.

3.1.2 Daily Demand Forecast

The Maximum Daily Demand (MDD) is expected to continue to rise slowly over time both due to population increase prolonged drier conditions due to climate change. The forecast below is based on projecting the previous data trend line from 2010 to 2021 up to 2045. A second projection for maximum daily demand is shown based on the projected trend line offset by the Standard Deviation of the existing 11 year data set. This line represents the calculated "worst case scenario" based on variation of historic data. A final "worst case scenario" projection was calculated adding 25% usage to the forecasted average daily demand trend line to account for unexpected climactic changes and drought that may not be reflected in historic data trends. The current maximum daily usage that occurred in 2021 was approximately 25% greater than the average maximum daily demand in the last 11 years. The 2021 MDD occurred during an extreme heatwave after an unseasonably dry spring. Therefore, it has been assumed that a 25% increase will account for worst case future drought conditions.

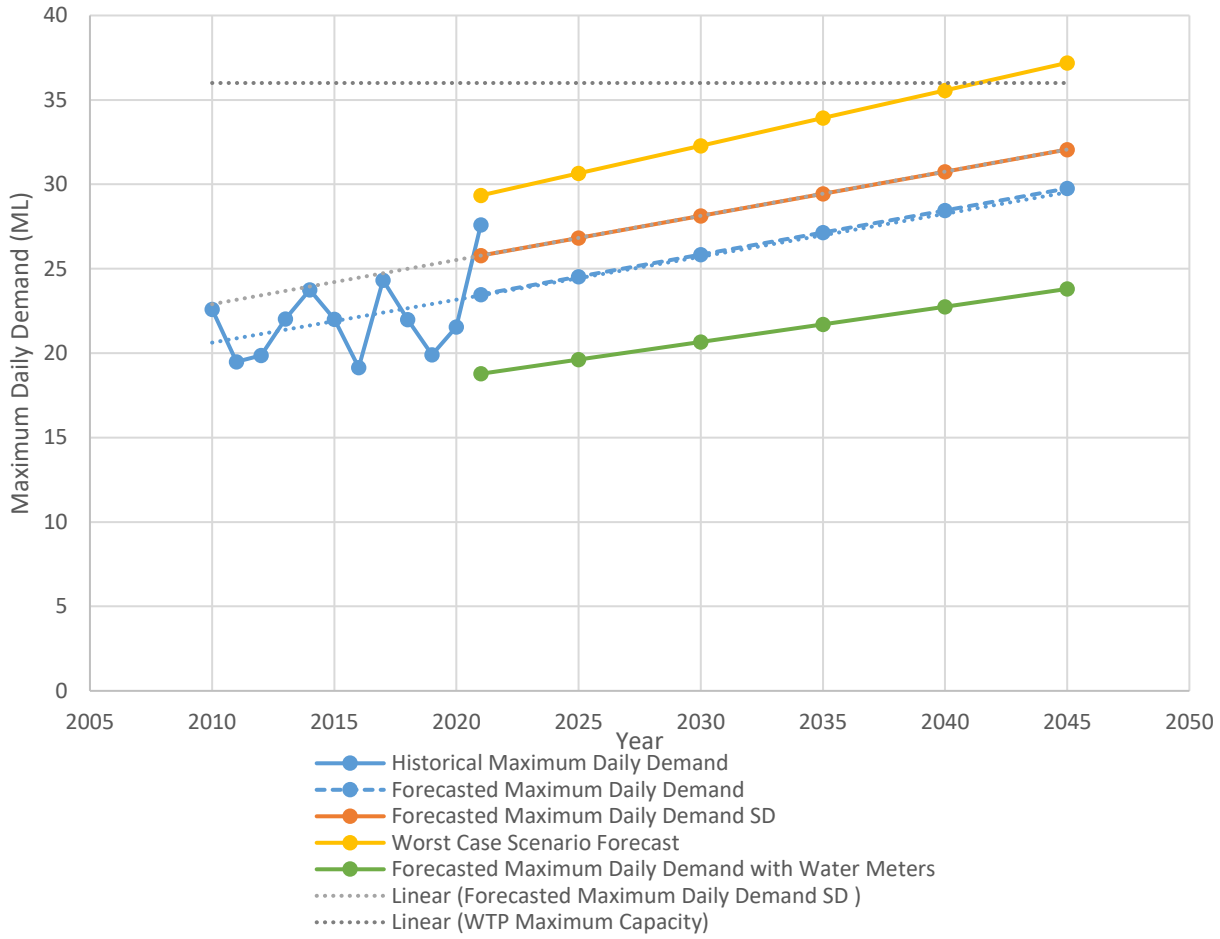


Figure 8: Maximum Daily Water Demand Forecast

Though the maximum daily water demand is not forecasted to exceed the realistic sustained capacity of the water treatment plant in the near future, with more frequent droughts and hotter temperatures predicted for the future, the treatment plant's realistic sustained capacity could be exceeded as early as 2042.

3.2 Future Trends

3.2.1 Population Changes

Between 2016 and 2021, the population of Salmon Arm has grown by 9.7% and is still projected to increase due to the City's diversified economy and popularity as a retirement destination. A result of the COVID-19 pandemic was a significant migration of people from urban centers to more rural areas of BC such as Salmon Arm. Therefore, it is predicted that the rate of population growth in the City may have been impacted by the COVID-19 pandemic.

Any increase or decrease to the population would influence the Water Demand Forecast.

3.2.2 Water Use by Sector

A significant contributor to high demand rates in the summer is outdoor irrigation on residential properties. Rural properties and large residential lots tend to use more water for irrigation, and are more likely to have unnoticed leaks on the property. An increase in rural residential development and larger lot sizes will likely increase the residential per capita demand, where high density housing developments will likely lower it.

Other land use changes that could significantly affect the future projections could be the introduction or removal of water intensive industries such as green houses, meat processing facilities and dairy farms. Breweries, wineries and cideries are growing industries in the Okanagan and Shuswap region and tend to be water intensive operations.

3.2.3 Aging Infrastructure

Ageing infrastructure is more prone to leaking which can account for a large percentage of system water use. Underfunding of infrastructure renewal will lead to a deteriorating infrastructure condition rating which could significantly increase water system losses.

3.2.4 Climate Change

See Appendix B for detailed climate trends in the Columbia-Shuswap region.

Climate change trends and impacts that the Columbia-Shuswap are experiencing and expected to experience in the future include:

- An increase in average temperatures in both winter and summer
- Snow pack losses, causing lower peak flows earlier in the year and lower minimum flows in the summer
- More intense and frequent heavy rain events
- Increased drought and water shortages
- Larger and more frequent wildfires
- Changes in streamflow patterns and lake levels

The City's water supply is most vulnerable from the forecasted increase in droughts. More frequent and intense droughts will increase the amount of irrigation demand, which is the largest threat to the water system capacity. The projections for Future Water Demand in **Figure 8** include allowances for increased irrigation related water demand in the future projection plus 25% scenario.

Warmer winters and reduced snow pack will have an effect on the water levels in Shuswap Lake; however, due to the overall lake volumes and positioning of the water intake, it is unlikely that reduced lake levels will have an effect on access to water.

More frequent and severe storms will have a negative impact on the Metford Dam water supply. The City already has seen a reduction of usage from Metford Dam over the years due to increased turbidity levels during spring freshet and lower water volumes throughout the summer. The City's water

demands can be met solely through the WTP; however, there are financial impacts due to increased pumping and other operational costs.

The City has seen an increase in wind storms which pose a threat to above ground services, specifically electrical service. More intense storms may potentially bring an increased frequency of power outages which can impact the functionality of the WTP as it only has limited backup power.

3.3 Impacts of Future Demand and Trends

3.3.1 Infrastructure Impacts

Although the City's WTP has a large capacity, the maximum daily demand due to summer irrigation is increasing steadily and is nearing the City's WTP's maximum capacity. The maximum daily demand historically has occurred in the driest and hottest part of the summer, and is expected to increase in the future due to the effects of climate change and population growth. As shown in **Figure 8**, maximum daily demand may exceed the capacity of the WTP in worst case scenarios by the year 2042 without increased water conservation measures.

The Zone 4 pump station is also vulnerable to an increase in water demand in pressure Zones 4 and 5. The Zone 4 pump station is currently being upgraded to add another "back up" pump in case of emergency. Pressure Zone 5 services the City's industrial park, which requires the Zone 5 reservoir to maintain a significant volume of water for fire flows. This means that the Zone 4 pump station must continually pump water from the Zone 4 reservoirs to Zone 5 to meet demand and maintain fire flows. The Zone 4 reservoirs currently have ample capacity, however if demand in Zone 4 and 5 increases, an additional pump at the Zone 4 pump station, and potentially additional reservoir storage in both Zone 4 and 5 will be required. Additional storage in the Zone 2 is required in the near future to accommodate additional balancing storage. Summer irrigation demand will also impact the timing of the upgrade; more demand will necessitate a quicker timeline.

3.3.2 Impacts on Local Hydrology

The City has a relatively stable water supply in Shuswap Lake (not glacier or aquifer fed), but it is not immune to the impacts of increased water demand and climate change. **Figure 9** shows historical maximum and minimum Shuswap Lake levels.

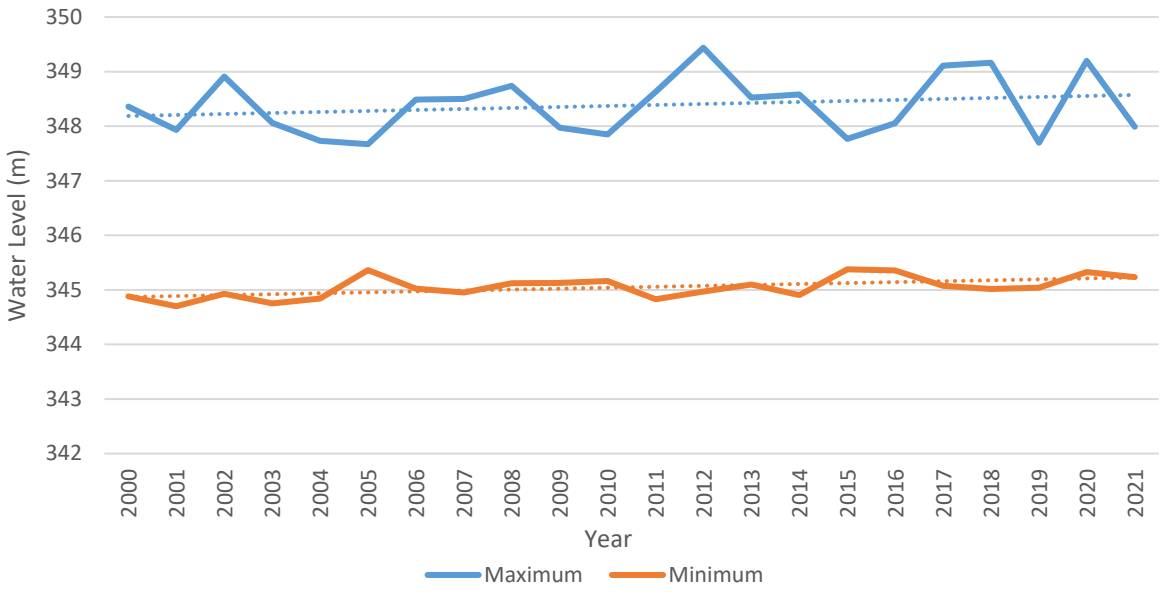


Figure 9: Shuswap Lake Historic Elevations

Both the maximum and minimum lake elevations are trending upward. This may be a result of a loss of snowpack due to climate change and the associated warmer temperatures increasing spring melt volumes. The majority of the City water system is not susceptible to flooding; however, two major components, the Zone 2 pump station and the WTP low lift pumps exist at an elevation of 349 meters and are susceptible to flooding. The capital works renewal plan includes mitigation measures and the possible relocation of infrastructure out of the flood zone.

Little research has been devoted to long term predictions of future lake levels. If climate change trends affecting the Shuswap watershed result in increasingly high lake levels, significant spending may be required to relocate infrastructure along the foreshore.

The Metford Dam water source; however, is likely to be significantly impacted by droughts and increased intensity of precipitation which will reduce available flows and increase turbidity respectively.

3.3.3 Impacts on Community

The Community will mainly be impacted by the financial costs associated with infrastructure upgrades to accommodate an increase in demand.

Extreme weather events due to climate change may impact the City by causing more frequent power outages. Power outages affecting the WTP may result in a boil water advisory and severe water use restrictions.

To delay infrastructure upgrades and lower the maximum daily demand due to irrigation in summer months, the City may face more severe multistage watering restrictions and stricter enforcement that force changes to irrigation habits.

4. Conservation Objectives

4.1 Conservation Goals from the Official Community Plan

The City of Salmon Arm Official Community Plan Bylaw 4000, adopted November 14, 2011, outlines four water conservation objectives as follows.

Objective 1:

"4.6.2 Continue to promote water conservation strategies such as the Water Wise program, incorporation of innovative irrigation technologies, the installation of low flush toilets and low flow aeration faucets, and xeriscaping (i.e., drought resistant landscaping) for all developments."

Objective 2:

"Groundwater protection is a significant concern in the community. The watersheds for the City's water system are largely outside City boundaries, and many rural residents use groundwater wells as their source of potable water. Some actions available to protect groundwater include restricting access to sensitive watersheds that are sources of drinking water and a review of the quality and quantity of groundwater, particularly where access to the City water service is not available. Another option may be establishment of a Development Permit Area for water conservation. This could include guidelines for construction such as low water-use fixtures and rainwater capture systems."

"5.3.12 Review opportunities to prepare a Development Permit Area for water conservation."

Objective 3:

"13.3.5 Continue to develop demand management strategies for water, sanitary sewer, and storm drainage utilities (e.g., reducing water use through metering, conservation measures, low water-use fixtures and appliances)."

Objective 4:

"13.3.19 Update and implement the comprehensive water conservation strategy."

4.2 Water Conservation Goals

Using the information gathered in **Section 1 and 2**, the Water Demand Forecast in **Section 3.1** and the Future Trends outlined in **Section 3.2**, 5 water conservation goals have been created with input from City Staff.

Goal #1: Delay infrastructure upgrades due to increased demand

Infrastructure replacement, upgrades and expansion instead should be driven by age and condition of assets. Focusing capital dollars to renewals and replacements as opposed to capacity upgrades will help maintain the working condition of the City supply system and help maintain the current levels of service.

Goal #2: Reduce peak demand

Peak summer demands due to outdoor irrigation poses the greatest threat to the future of the City's water system. For the majority of the year, the City's WTP and distribution system is has abundant capacity to meet demand. However, with intensification of summer droughts and summer temperatures rising, it is projected that the maximum daily demand may exceed the capacity of the water treatment plant by the year 2042. A reduction of peak demand by adopting more responsible irrigation practices will increase water security and help make the City more resilient to the effects of climate change.

Goal #3: Quantify non-revenue water

It is estimated that a significant percentage of water is unaccounted for in the system. Locating, and quantifying non-revenue water in the system will help to detect system leakage and reduce the amount of treated water wasted.

Goal #4: Spread awareness of water conservation efforts

Although the City is an environmentally conscious community as is reflected in the OCP, the presence of Shuswap Lake has led to a lack of awareness around the need for water conservation. Ultimately it is up to the community members to support water conservation initiatives and reduce their water usage. Better public education and promotion of water conservation initiatives and their benefits will increase community buy-in and generate better results.

Goal #5: Increase information available for decision making

The City of struggles with a lack of information available about where water flows In the City and where demand is increasing. Better understanding of overall system demands will help inform decision making in regards to infrastructure upgrades, targeted water conservation efforts and system repairs. More data will lead to more informed decisions that better meet community needs.

4.3 Water Conservation Targets

Target #1: Reduce peak water usage to within double the average day use. In 2021 the average daily water use was 10.5 ML/day and double would be 21 ML/day. The maximum daily demand was above the average double by 31% at 27.6 ML/day. **Figure 10** illustrates the historical trends of double the average daily use and the yearly maximum daily use with comparisons to current maximum demand forecast and forecast with conservation efforts.

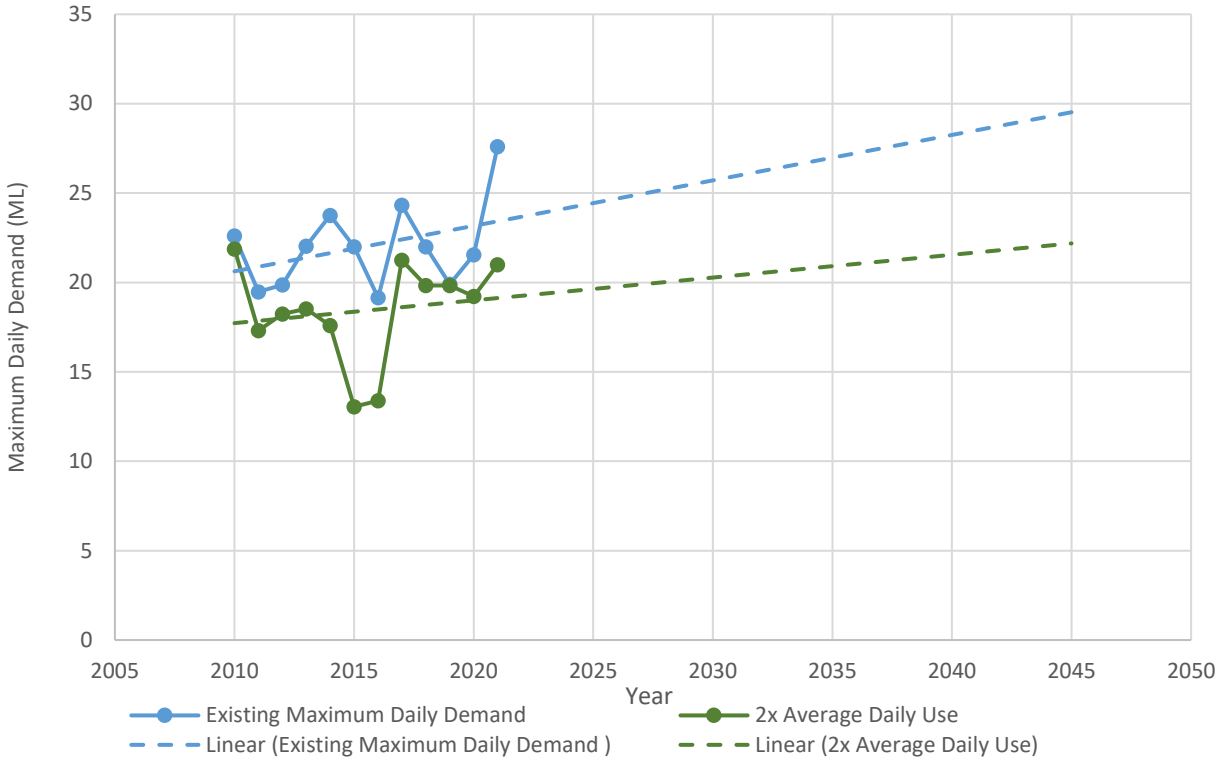


Figure 10: Maximum Daily Demand and Double Average Daily Demand to Achieve Target #1

As can be seen in **Figure 10**, the trend lines forecasting maximum daily water demand and average daily water demand diverge. Conservation efforts, such as summer irrigation restrictions, must be enforced in order to reduce the maximum daily demand to meet Target #1.

Target #2: No infrastructure is replaced until it has exceed a minimum of 85% of its anticipated useful life

Target #3: Quantify all system water demands, including non-revenue water demand, using high confidence level data rather than pro-rated or estimated data

Target #4: The City and the community engage in communication and education regarding water conservation at least once annually4.4 Future Water Needs

Shuswap Lake is a very large water source, and it is unlikely that City will face any challenges in the near future to meet annual water demand. However, without increased conservation efforts to lower the maximum daily demand, significant and costly upgrades may be required to the WTP and supply infrastructure to facilitate treatment and pumping and storage of the future maximum daily water demand.

Meeting the Water Conservation Targets (**Section 4.3**) minimizes the risk of costly upgrades by reducing the future water demand and reducing peak demand.

The City has enacted a Cross Connection Control Bylaw #3934 to protect the potable water supply once in the supply system. At this time, the majority of properties have been audited and complied with the Cross Connection Control requirements and ongoing testing.

4.5 Cost of New Supply Infrastructure

An upgrade to the WTP to expand the plant's capacity to 60 ML per day is expected to cost a minimum of $40,000,000, barring any inflation. This cost would be spread among the users over a period of 20-25 years. Assuming the amount of water users continues to grow at the same rate, the WTP upgrade would cost water users an extra $95-$145 annually, depending on the amount of time available to pay back the debt. The fees would be in the form of an increase to utilities fees already paid by water and sewer customers.

In the time before the upgrade, it is expected that there will be minor upgrades to existing infrastructure such as pumps, reservoirs, and water mains. These will have an associated cost corresponding to the installation, equipment and maintenance. Minor upgrades will be performed as necessary, however, they will be more frequent with high water demands that put strain on the water distribution system.

5. Conservation Options

5.1 Community Experience

5.1.1 Historical Water Conservation Initiatives

5.1.1.1 Metering

The City runs an annual Water Meter Installation Program to install meters on existing properties without meters. The City has targeted ICI properties through this program and has succeeded in almost 100% metering compliance on these properties. Metered ICI properties are charged on a usage based rate structure.

All new residential developments are required to install a water meter at the full cost of the owner or developer in accordance with the Subdivision and Development Servicing Bylaw No. 4163. Meters are also required to be installed when water services are upgraded, or service demand is increased during renovations or the installation of a pool. Metered residential properties continue to be charged on an annual flat rate.

5.1.1.2 Sprinkling Restrictions

City sprinkler regulations are in effect from May 15 to September 15 yearly. Sprinkling is allowed 7:00 am to 11:00 am and 7:00 pm to 11:00 pm two days per week based on the last two numbers of the house or business address. Customers with underground irrigation systems are encouraged to water lawns between 12:00 a.m. (midnight) and 7:00 a.m. on the appropriate days.

5.1.1.3 Water Conservation Education

The City previously took part in an educational program called Water Wise from 2005 to 2011. A water conservation pamphlet was mailed out to all residents once a year and included water conservation tips, water facts and other useful information.

The City has also on occasion taken on a summer student to do door-to-door water conservation education, concentrated on irrigation reduction.

5.1.1.4 Cross Connection Control

The City currently runs a Cross Connection Control (CCC) program to protect the City's potable water supply. The program has successfully implemented CCC for the vast majority of the ICI properties, but to date has not expanded to Agricultural or Residential properties. All new construction is required through building code and the City's bylaw to comply with CCC best practices.

5.1.1.5 Excessive User Program

Metered residential households are considered to be "excessive users", if they are estimated to use more than 0.46 ML/year, or double the provincial average demand per household. These users are documented and regulated more closely by bylaw enforcement to ensure compliance with annual sprinkling restrictions.

In extreme cases excessive users have been moved to a metered billing system if their consumption is unreasonably high. Prior to this, the City will send excessive users warning letters and encourage users to check their property for leaks.

5.1.2 Factors for Success

Public buy-in is the biggest factor for success in water conservation, as it is ultimately up to the community to commit to reducing their water usage. Education is a favorable method of increasing public buy-in for water conservation. When the community understand the consequences of their action they are more inclined to change their behavior. Financial incentive is also a strong motivator for the community. If water-users were able to see financial benefit from decreasing their water usage, they would be more motivated to change their behavior.

5.1.3 What to Avoid in the Future

Restrictions and enforcement imposed upon the community without proper public education efforts are ineffective and may result in feelings of resentment from the community towards their government.

5.2 Potential Water Conservation Methods

5.2.1 Universal Metering

Water metering has been identified as one of the most effective tools for increasing awareness of water conservation and inefficient water usage. When rates are set on a consumption basis rather than a flat

rate, there is increased incentive to decrease water consumption in order to decrease the amount paid in utilities. In the City of Salmon Arm, water is often perceived as a "free" resource. Universal metering combined with a usage-based rate structure would help discredit this misconception.

Other benefits of universal metering include more accurate water usage data and early leak detection inside the home and within the City's water system.

5.2.2 Pricing Strategies

The following pricing structures may be paired with universal metering to harness its full conservation potential.

5.2.2.1 Volumetric Rates

Volumetric rates simply charge water users for each unit of water (often each cubic meter) rather than flat rate. Volumetric rates can greatly reduce the average water demand as water users are incentivized to use less to save money. This would be a single rate per cubic meter of water used. To further incentivize decreasing water use, tiered rates can be enforced. These are discussed further in sections 5.2.2.2 to 5.2.2.5.

5.2.2.2 Inclining Block Rates

Inclining block rates refer to a pricing structure where the system charges a higher price at larger volumes of water. For example, a household may be charged $1.00 for the first 50 m^3 of water used, and then $2.00 for the next 50 m^3 used. With this rate structure, water users are encouraged to minimize their consumption and stay within the lowest block possible.

5.2.2.3 Seasonal Rates

With a seasonal rate pricing structure, prices during the season of peak use are higher. This rate structure helps municipalities reduce peak demand and increase awareness of water scarcity which the City may encounter in dry months.

5.2.2.4 Excess Use Rates

Excess use rates mean that above average (excessive) water users pay more for water. Similar to an inclining block rate structure, this pricing structure encourages water users to minimize their consumption to prevent their water rates from increasing.

5.2.2.5 Sliding Scale Rates

With sliding-scale rates, the price per unit for all water increases or decreases based on average water consumption in the community. This rate structure encourages the community to come together in order to decrease their utility bills, but requires continuous usage data updates and changes to the water rate.

5.2.3 Residential Use

There are several conservation initiatives that aim to reduce water consumption inside and outside the home. In **Section 2.1** it was observed that residential water use is the most prevalent use of water in the City in 2021, so this the area that should be targeted most to see a reduction in consumption.

5.2.3.1 Retrofit Kits

Retrofit kits help residents to modify their existing fixtures so that they use less water when operating. Retrofit kits may be available for free or at a low cost subsidized by the City. Retrofit kits may include water saving devices such as the following:

- Low flow faucet aerators
- Low flow showers heads
- Low flow outdoor hose nozzle
- Toilet dye tabs (for leak detection)
- Replacement flapper valves
- Educational material

Retrofit kits may be distributed to the entire community, or through a target program which distributes retrofit kits to older residential housing units with inefficient plumbing system, or to a specific customer class (residential, commercial, industrial, institutional, agricultural).

5.2.3.2 Low Flush Toilet Rebates

Several cities across BC have adopted a low flush or ultra-low flush toilet rebate programs. A rebate may be offered for the replacement of older toilets that may use 13-20 liters of water every flush whereas low flush toilets use only 1-8 liters of water per flush (Sustainable Sanitation and Water Management Toolbox, 2019). This program offers the highest incentive when paired with a metered pricing strategy, reducing water consumption will reduce treatment costs and offer savings for everyone as well as environmental benefit.

5.2.3.3 Household Water Audits

A household water audit is an assessment of how much water is used and how much water can potentially be conserved in a home. Conducting a water audit involves calculating water use and identifying simple ways for saving water in the home. A typical household water audit includes a review of the residential water use pattern and billing, leak check of the water connection, leak check of the toilets and faucets, and outdoor landscaping and sprinkler assessment. Water audits may be performed by the City directly, or the City may provide various educational material and encourage residents to perform a water audit themselves.

5.2.3.4 New Plumbing Requirements

Many municipalities have building and plumbing bylaws requiring the installation of low flush toilets, faucets, showerhead restrictors and other water conservation devices. With the implementation of these bylaws, the City is able to gain insight into how many residents have installed low-flow fixtures.

5.2.4 Leak Detection and Repair Program

Every water system loses water through leakage and breaks. A leak detection and repair program can be implemented to reduce the volume of non-revenue water related to system losses. A leak detection program may include leak detection strategies such as a system water audit, ICI water audits, identifying areas of historical pipe problems, infrastructure analysis such as night flow analysis and acoustic analysis and regional flow rate analysis in each pressure zone.

5.2.5 Education

Education can take on many forms such as mail-outs, info booths at community gatherings, school visits, door-to-door visits, social media, open houses, etc.

5.2.6 Rainwater Re-use

The collection of rainwater for irrigation and other non-potable uses may be encouraged by the provision of free or subsidized rain barrels for the City. In the summer months, most residential water is used for irrigation so the reduction of potable water used for irrigation could significantly the City's peak water demand and result in savings for residents.

5.2.7 Xeriscaping

Xeriscaping is water conservation through creative landscaping. The goal of xeriscaping is to create a visually attractive landscape that uses plants selected for their water efficiency. Xeriscaping uses native, drought-resistant plants that have a reduced need for irrigation, fertilizer and require infrequent mowing. A well established and properly maintained xeriscape should require less water than turf landscape, while also contributing to local biodiversity and benefiting native pollinators.

5.2.8 Multistage Watering Restrictions

Many communities in BC use multistage watering restrictions. Each stage is defined by either infrastructure capacity, drought or climate conditions, or a combination of both. There are clear, predetermined triggers that initiate movement between stages to increase or decrease the severity of restrictions. Communication plans explaining purpose and reasoning for each stage of watering restrictions to ensure universal messaging are often created in conjunction with multistage watering restrictions.

5.3 Lessons from Others

5.3.1 City of Campbell River

The City of Campbell River promotes the use of rain barrels for outdoor irrigation and other non-potable water uses to residents. For many residents of Campbell River, a rain barrel can supply a sufficient volume of water to entirely meet their outdoor irrigation needs. One (1) centimeter of rain on an average sized roof in Campbell River (1100 square feet) allows a rain barrel to collect approximately 258 liters of water. Campbell River is located in a temperate climate, and even during the summer months,

Campbell River averages 2.3 centimeters of rain per week. This corresponds to a possible savings of up to 593 L/week. Even in a significantly drier summer, rain barrels could save residents a significant amount of water.

Rain barrels are advertised to residents through various educational materials distributed by the City, and through the City website.

5.3.2 City of Kamloops

The City of Kamloops undertook a pilot project in 2006 to better understand the benefits of universal water metering by starting a volunteer metering program. 94 residential homes qualified for the volunteer metering program, while 67 residential homes acted as a control group. The qualified resident received a water meter from the City, water conservation tips, and notifications about how much water was consumed each month. The residents in the volunteer metering program were given the option to pay either the metered rate or the current flat rate, whichever is lower.

The Pilot Project resulted in approximately 84% of the volunteers saving money, likely due to the increased incentive to conserve water and pay less than the flat rate. Due to the success of the Pilot Project, the City of Kamloops has started a Universal Water Metering Program. In 2018 approximately 90% of residents had water meters and the City of Kamloops has seen a 25% decrease in average monthly water usage.

The City of Kamloops encourages xeriscaping as a method of water conservation. Xeriscaping is promoted to residents through educational material and YouTube videos on the City website, and through local media.

5.3.2 City of Kelowna

The City of Kelowna has a comprehensive Water Smart program which aims to empower residents to make positive water use choices by providing them with the necessary information to do so. The Water Smart program helps residents to conserve water outdoors by offering free irrigation assessments to City Water Utility customers to ensure that landscaping water is being used efficiently, and encourages the employment of Qualified Water Efficient Landscapers. The Water Smart Program helps residents to conserve water indoors by encouraging the use of low flow appliances and by providing water conservation tips for indoor use. The Water Smart program also has an extensive public education program which includes a biannual newsletter, YouTube videos, and interactive school presentations.

The City of Kelowna implemented a soil amendment program for 2006 which includes the spreading of locally produced compost, “Ogogrow” as top soil. The compost amends the soil’s water absorption, allowing the soil to stay moist during Kelowna’s hot summers. Initially, the program was a cost-shared incentive where the homeowner pays for topdressing of compost, and the Water Smart Program provides delivery and spreading. Presently, Ogogrow is advertised on the City’s website for its ability to correct the soil’s deficiencies and amend its water absorption.

5.3.3 City of Prince George

The City of Prince George has utilized partnerships with the local university, the University of Northern British Columbia (UNBC), to assist the City and its residents to meet their water conservation goals. The City is partnered with UNBC to develop the "Sustainable Landscapers" program, which featured education on water efficient landscaping. The City promoted ongoing data collection regarding water usage in the City through the environmental planning, environmental sciences and geography programs at UNBC. It was also recommended in the City's 2016 Water Conservation Plan that the City again partner with UNBC to give the students experience in performing water audits on the Industrial, Commercial and institutional facilities connected to City water to determine existing water uses, losses and suggest potential conservation methods.

5.3.4 City of Vernon

From 2000-2008 the City of Vernon ran a Low Flow Toilet subsidy program as an incentive to homeowners to reduce water consumption and effluent discharge. The City subsidized the toilet purchase at 75 dollars for the first toilet replacement and 50 dollars for each subsequent toilet. The program resulted in the replacement of over six hundred toilets, and the retrofitting of high water use toilets contributed in an estimated reduction in water consumption of approximately 10 ML.

The City of Vernon utilizes all effluent from the wastewater treatment plant for land application. Wastewater is treated at the Vernon Water Reclamation Centre which currently serves a population of 36,000 in Greater Vernon. Wastewater undergoes primary, secondary and tertiary treatment and is suitable for reuse as determined by the British Columbia Ministry of Environment. Most of the reclaimed water is pumped to a reservoir, chlorinated and used for golf course irrigation from late April to early October as a part of the City's "spray irrigation program".

5.3.5 District of West Vancouver

The District of West Vancouver uses an inclining block rate structure to bill for water usage. All residential properties in the District of West Vancouver are metered and residents are charged increasingly more for their water as their usage increases. Residents are initially charged a "base water charge" determined by the property type and size. The inclining block rates for usage are as follows:

- Block 1: 0-30 cubic meters – residents are charged $1.39 per cubic meter
- Block 2: 31-60 cubic meters – residents are charged $1.59 per cubic meter
- Block 3: 61-180 cubic meters – residents are charged $2.43 per cubic meter
- Block 4: over 180 cubic meters – residents are charged $3.32 per cubic meter With this rate structure, residents are encouraged to stay within the lowest block and keep their usage to a minimum.

5.3.6 The City of Penticton

The City of Penticton uses a multistage watering restriction structure, which is tied to the City's Drought Management Plan. The City moves between 4 drought stages, ranging from *Normal/Dry* to *Emergency.*

Each stage of drought triggers different watering restrictions, which increase with the severity of drought. Triggers that cause movement between drought stages include storage volumes, projected daily demands, elevation of Okanagan Lake, failure or malfunction in the treated water system and regional drought levels from the Ministry of Water, Land and Air Protection. Each stage of restrictions have corresponding reduction goals and targets, enforcement and fines, and communication efforts.

The City of Penticton also created a communication plan to communicate the various stages of drought and their corresponding watering restrictions. This plan specifies messaging for each stage of drought tailored to each communication pathway used by the City, as well as recommending specific branding efforts so that water conservation efforts are easily recognizable.

6. Choosing Conservation Measures

6.1 Evaluating Conservation Measures

6.1.1 Local Priorities

Using the Water Conservation Goals and Targets developed by City Staff, Local Priorities were developed with input from the City's Engineering Department, Utilities Department and Head WTP Operator. The Local Priorities reflect the Water Conservation Goals and Targets, and were used to score conservation measures' ability to achieve these goals and targets.

The Local Priorities are as follows:

- Reduction of maximum daily demand
- Ability to spread awareness of the importance of water conservation
- How much information it provides to aid the City in future decision making
- If the conservation measure will delay infrastructure upgrades and the need for construction of additional infrastructure
- The amount of resources and staffing required (cost) to implement the conservation measure

See **Appendix C** for Evaluation Criteria and Evaluation Table

6.2 Selected Measures

6.2.1 Top Ranked Conservation Measures

The Local Priorities were weighted based on their importance by City staff and used as evaluation criteria to rank each water conservation measure. Each conservation measure was given a score out of 3 for each Local Priority, which was multiplied by the Local Priority's weighting to determine the overall score. See **Appendix C.**

The following conservation measures were identified by the evaluation table as the top 5 measures that best met the City's Local Priorities:

6. Universal water metering paired with a usage based pricing strategy

This conservation measure scored the highest (see evaluation in Appendix C) as it forces water users to become aware of how much water they are using, provides valuable usage information to City Staff, and reduces peak consumption, which in turn will delay infrastructure upgrades and additions.

7. Xeriscaping

Xeriscaping reduces the demand for irrigation, which accounts for the majority of the summer (peak) usage. This will delay infrastructure upgrades and additions. Xeriscaping is relatively low cost and gives residents and the City a chance to lead by example and spread water conservation awareness to their neighbours.

8. Leak detection and repair program

Leak detection and repair will decrease overall water usage in the City and help delay the need for new infrastructure. This would also provide valuable information to City staff about the condition of the water system and encourage proactive asset management.

9. Multistage Watering Restrictions

Multistage watering restrictions have potential to reduce peak consumption and delay infrastructure upgrades and additions. They also spread awareness to the community about the importance of water conservation and are inexpensive to implement.

10. Excessive User Program

Flat rate billing is used in conjunction with water meters (currently residential properties), staff monitor usage and determine where water use is excessive. At properties where usage is considered to be excessive, both education and enforcement measures are used to reduce usage.

6.2.2 Complementary Measures

6.2.2.1 Voluntary Water Audits and Leak Detection

Voluntary Water Audits may be incorporated into a larger scale leak detection and repair project. Residential and Commercial water users may request a water audit, or it may be strongly suggested to the users if water use at the property is suspected to be excessively high. The City Utilities Staff can use their time and resources to conduct the water audit, but the user is responsible for repairing any identified leaks. This may also be an opportunity to install a water meter at the property if one does not already exist.

6.2.2.2 Community Education

Community education is a complement to any conservation measure. The community is more likely to adopt a water conservation measure if they understand why it has been implemented. Therefore, community education increases the success of any conservation measure implemented.

CITY OF SALMON ARM

7. Taking Action

This section gives a high level work plan of the future projects to be undertaken by the City to implement the selected conservation measure. This section gives a high level review of the conservation objectives (See **Section 4**) addressed in each project, the project scope, the expected water savings, the resources required (cost), and the project timeline.

7.1 Universal water metering paired with a usage based pricing strategy

7.1.1 Conservation Objectives Addressed:

- **Reduce peak demand** as residents must pay for what they use, incentivizing them to use less
- Delay infrastructure upgrades by reducing overall demand
- Quantify non-revenue water
- **Spread awareness of water conservation efforts** as residents will be better informed about how much water they use, and how much money could be saved through conservation.
- Increase information available for decision making

7.1.2 Project Scope

There are three different approaches to universal water metering paired with usage based pricing that could be taken by the City.

Option 1: Universal Metering Program

A universal metering program would mean that the City commits to metering all connections to City water in a relatively short time period.

Firstly a “Rate and Roll-Out” study must be completed to assess the most effective way to deliver universal meters and usage based pricing to the community. This study would:

- Review water system expenditures and anticipated reduced usage to recommend inclining block rates for water utility
- Review options for funding including:
    - City funded meter and installation
    - Sharing the cost between the City and residents (Ex. City purchases meters while residents are responsible for installation costs)
    - Homeowner funded meter and installation
    - Optional participation paired with a punitive flat rate price
- Develop a strategy to meter the City considering:
    - Number of years required to become universally metered
    - Annual funding requirements
    - Method of delivering meters to homes
    - Priority Areas that should be targeted

The City must develop a communication plan to consistently inform residents of new changes, such as an increase in rates.

Education on the benefits of water meters and using mock billing to show the potential savings residents may see should also be completed before residents are switched to a usage based pricing strategy.

The City must review and update the Water Rates and Waterworks Regulation Bylaw 1274 and Fee for Service Bylaw.

As of May 2022, the City has allocated a budget of $50,000 for this option.

Option 2: Expansion of Existing Meter Installation Program

The existing metering program in City includes annual funding of $15,000 for the installation of water meters for ICI properties. The vast majority of these meter installations have already been complete.

With the expansion of the existing meter installation program, the City would continue to have an annual budget under the water utility for meter installations. The City must create a program expansion plan and begin to meter potential high use properties such as large lot properties, or those with multiple sprinkling infractions. Eventually, the program will include all connections to City water and residents will be switched to a usage based pricing strategy.

The City must develop a communication plan to inform residents whose properties will be incorporated into the meter installation program, and prepare residents to eventually be switched to metered billing.

The City would be responsible for reviewing and updating the Water Connection Bylaw and Fee for Service Bylaw.

Option 3: Continue with Current Meter Installation Program

The City could continue with the existing meter installation program outlined in **Section 5.1.1.1**.

In the case that the City does become universally metered, residents would be switched to a usage based pricing strategy. The City should prepare a communication plan to inform residents of changes in billing.

The City must review and update the Water Rates and Waterworks Regulation Bylaw 1274 and Fee for Service Bylaw.

7.1.3 Water Savings

BC municipalities that have implemented universal water metering paired with usage based pricing have typically seen a 20% decrease in their water usage. **Figure 11** shows the Daily Water Demand Forecast after the implementation of water meters, or a 20% decrease in the forecasted maximum daily demand.

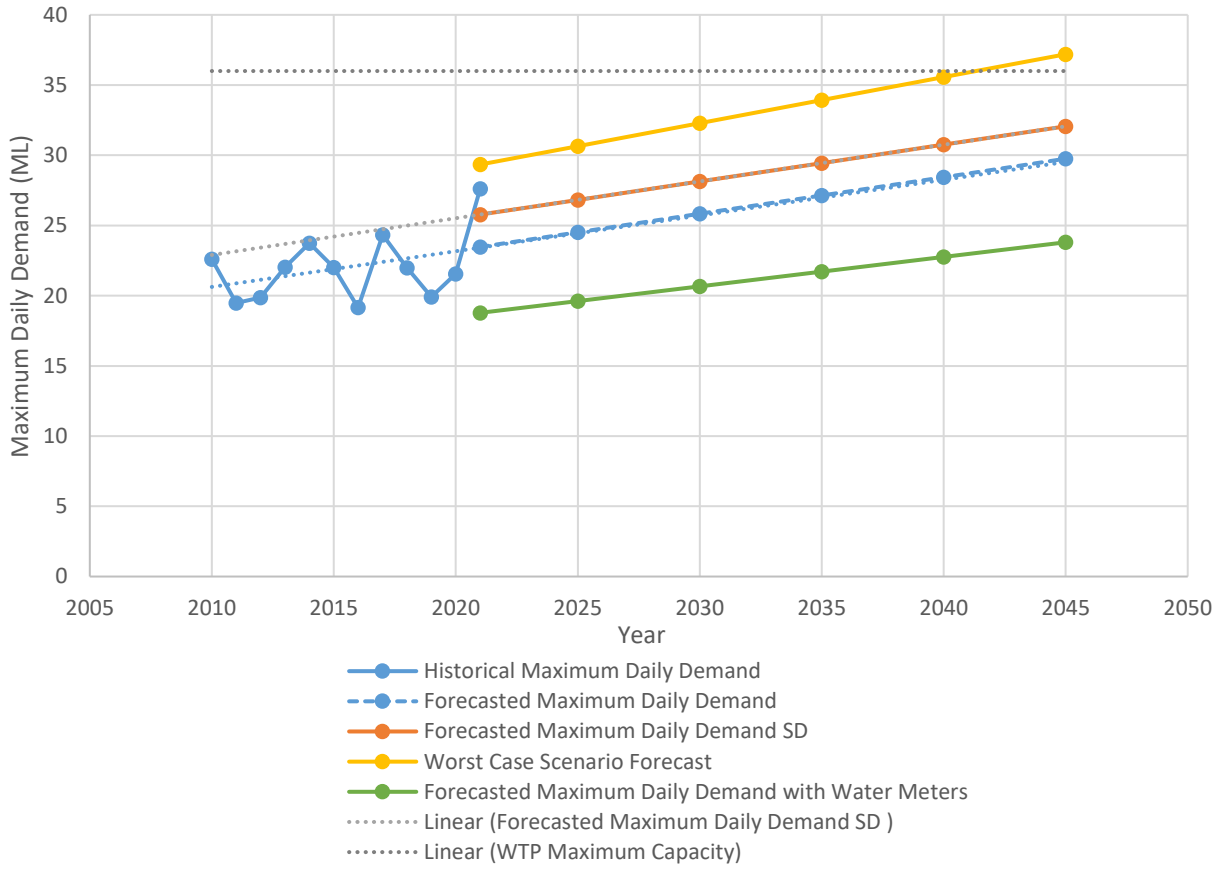


Figure 11: Daily Water Demand with Water Meter Installation

7.1.4 Resources Required

Resources required will be dependent upon what approach to universal metering is taken.

Option 1: Universal Metering Program

Developing a new universal metering program will be resources intensive. The City must first fund a Rate and Roll-Out study to be completed. Depending on the results of the study, the City may have to cover the capital and labor costs of meters and meter installation. The City will also have to expend resources developing a communication plan and bylaw. However, grant opportunities are available to assist BC municipalities in becoming universally metered. Currently there is a budget of $50,000 for this option.

Option 2: Expansion of Existing Meter Installation Program

To expand the meter installation program, the City must continue to allocate $15,000 per year for meter installation. The City also must expend resources to develop a communication plan and bylaw, as well as a program expansion strategy to target potential high water users.

Option 3: Continue with Current Meter Installation Program

Continuing with the current meter installation program is the least resource intensive approach to universal metering. In the case that the City becomes universally metered, the City will have to expend resources to prepare a communication plan and bylaw to enact a usage-based pricing strategy.

7.1.5 Timeline

Option 1: Universal Metering Program

As of May 2022, the City has allocated $50,000 for the strategy and implementation of a Universal Water Metering Plan. The Request for Proposal will be posted in early June and awarded by late June. The consultant will propose an implementation timeline, however the City aims to be fully metered within the next 5 years.

Option 2: Expansion of Existing Meter Installation Program

This approach will take more time and is inhibited by budget constraints. The City would aim to be fully metered within 15-20 years.

Option 3: Continue with Current Meter Installation Program

This approach has no definite timeline as it is dependent upon actions of residents.

7.2 Xeriscaping and Water Efficient Landscaping

7.2.1 Conservation Objectives Addressed:

- **Reduce peak demand** by reducing the need for outdoor irrigation
- **Delay infrastructure upgrades** by reducing water use for outdoor irrigation
- **Spread awareness of water conservation efforts** by creating visually appealing, “water smart” landscapes

7.2.2 Project Scope

The City can lead the community by example by executing xeriscaping initiatives on public property such as City boulevards.

Educational programs can be used to promote xeriscaping though the City website, community mail-outs, or partnerships with local nurseries. Opportunities with School District 83 may be established to educate children and youth by creating school or community gardens with xeriscaping.

High efficiency irrigation can be promoted through financial incentives such as rebates on high efficiency irrigation systems.

7.2.3 Water Savings

This conservation measure has potential to greatly reduce peak water demand. However, this conservation measure is entirely dependent on the adoption of xeriscaping by the community, therefore water savings cannot be accurately predicted.

7.2.4 Resources Required

Overall, xeriscaping requires a low amount of resources.

The City will need to invest some capital and labor costs to construct and maintain xeriscapes on public property.

Educational material and workshops in the community may be produced and executed by Co-Op or summer students.

7.2.5 Timeline

Xeriscaping initiatives run by the City, such as constructing xeriscapes on public property and partnerships with local nurseries can begin in spring of 2022. The adoption of xeriscaping by the community is likely to take much longer and is dependent on promotion of xeriscaping by the City.

7.3 Leak Detection and Repair Program

7.3.1 Conservation Objectives Addressed:

- **Reduce peak demand** by reducing the volume of water lost through leakage
- Quantify non-revenue water
- **Spread awareness of water conservation efforts** by bringing awareness to the volume of water wasted in the distribution system and household leaks
- Increase information available for decision making

7.3.2 Project Scope

The City will purchase sounding equipment and train staff to complete in-house condition assessments on City mains. The City will develop a priority leak detection and condition assessment plan to identify City mains most at risk of leaks. The repair of leaks is to be prioritized through the City's asset management process.

The City will also begin a voluntary water audit program for residential water users. This program will be leveraged through the excessive user program as excessive users often owe their high water usage to household leaks. This program will also aim to deliver educational material and leak detection kits to interested homeowners.

The City will monitor their own properties for leaks through regular water audits.

7.3.3 Water Savings

As per **Section 2.1.9**, approximately 17% of annual water demand is unbilled for, or non-revenue demand. System leakage makes up a portion of non-revenue demand, and is estimated to be between 5-10% of annual water demand.

7.3.4 Resources Required

Sounding equipment to be used in the leak detection and repair program comes with a significant capital investment. If the sounding equipment is purchased and City staff are trained in using it, the remaining work can be completed in-house.

Summer or Co-Op students may be responsible for running the residential voluntary water audit program. Partnerships may be formed with nearby colleges or universities for students to gain experience in conducting household water audits. No additional funding should be allocated for conducting water audits unless the City is required to seek additional resources to meet demand.

7.3.5 Timeline

The City would aim to purchase sounding equipment before 2023. One year would be allocated for training staff on sounding equipment, and the leak detection program should begin before 2025.

7.4 Multistage Watering Restrictions

7.4.1 Conservation Objectives Addressed

- **Delay infrastructure upgrades due to increased demand** by reducing summer water demand, which causes the greatest challenges for infrastructure
- **Reduce peak demand** by reducing demand from outdoor irrigation
- **Spread awareness** of drought conditions and the need for water conservation

7.4.2 Project Scope

The City will adopt a new four stage water restriction program. Each stage will have different associated restriction and triggers, and there will be clear criteria for moving between stages. See an example of multistage watering restrictions in **Appendix D.** The water restrictions will be created in-house, with input from the WTP Operators and Utilities Staff.

The Water Rates and Waterworks Regulation Bylaw 1274 must be updated with the implementation of new watering restrictions.

The City must also create a communication strategy to inform the community of the change. This strategy must include an initial educational campaign pre and post change. This campaign should utilize communication pathways such as:

- Social media
- Local radio
- Newspapers
- Mail-outs
- City website
- Notice boards

The communication strategy must also include strategies for communication changes in restriction levels. Sign boards throughout the community should be utilized to communicate these changes as well as the aforementioned communication pathways.

7.4.3 Water Savings

Outdoor irrigation during summer months accounts for approximately 30% of annual water demand across the City. Multistage watering restrictions will not lower water demand by 30%, however they will reduce the percentage of water demand made up by outdoor irrigation.

The exact water savings that will result from multistage watering restrictions are dependent upon compliance from residents and weather patterns.

7.4.4 Resources Required

Multistage watering restrictions require a low amount of resources to implement. The City must expend some resources to develop a communication strategy and to review and update the Water Rates and Waterworks Regulation Bylaw 1274, however all work can be completed in-house.

7.4.5 Timeline

Multistage watering restrictions may be implemented by May of 2023.

7.5 Excessive User Program

7.5.1 Conservation Objectives Addressed

- Spread awareness of water conservation efforts with targeted education and enforcement
- Increase information available for decision making by monitoring meters for excessive use

7.5.2 Project Scope

City Staff should review criteria to determine excessive users, and make adjustments as necessary.

While flat rate billing is in effect, meters should be read biannually. After metering data is collected:

- Excessive users should be identified as per the City's criteria (customers using excess of double the provincial average, over 0.46 ML/year)
- Review the excessive users' usage profile and develop targeted educational or disciplinary material as needed
    - Excessive users with high overall usage are asked to check their properties for leaks
    - Excessive users with high summer usage (irrigation) are asked to comply with annual sprinkling restriction
- Use RFI meter technology, water audits, and staff resources to help excessive users identify areas of high water use

- Where residential excessive users are not compliant within a one year period, switch to metered billing
- In cases where excessive users are violating the Water Rates and Waterworks Regulation Bylaw 1274 by irrigating over 0.5 acre, they should be targeted with education, fines and eventually have service cut off if compliance is not achieved.

ICI and Agricultural properties that are not on a metered billing system should be switched to metered billing upon discovery.

7.5.3 Water Savings

The top 50 excessive users in the City typically use 6 times more water than the average resident, although in extreme cases an excessive user may be using 10-15 times more. There are significant savings to be seen by targeting these users.

7.5.4 Resources Required

The Excessive User Program can be completed entirely with in-house resources.

Summer or Co-Op students may be responsible for developing target material for excessive users, and reviewing their usage profile to determine the nature of the material.

7.5.5 Timeline

The Excessive User Program is already in place as per **Section 5.1.1.5**. Expansions to the Excessive User Program can be implemented in 2022.

7.6 Community Education

7.6.1 Conservation Objectives Addressed

- Spread awareness of water conservation efforts
- **Reduce peak demand** by educating the community on the importance of water conservation and best practice irrigation techniques

7.6.2 Project Scope

The City will update their website to include a water conservation page. This page will include information as follows:

- Benefits of water conservation
- On-going water conservation initiatives in the City
- Reporting on water conservation objectives
- Opportunities to participate in water conservation programs
- Educational information specific to each stage of watering restrictions

The City should also develop an annual water conservation campaign that includes the following outreach programs:

- An educational brochure that includes water conservation information, City Conservation Objectives, reporting, etc. to be sent out with utility billing
- School outreach program
- An educational brochure to be delivered alongside enforcement (written warnings for sprinkling infractions, or excessive user letters)
- Educational booths at community events such as farmer's markets

7.6.3 Water Savings

Potential water savings for this conservation project are dependent upon community buy in.

7.6.4 Resources Required

The City intends to employ an on-going student to run water conservation programs in the City. All educational initiatives can be completed with in-house resources and partnerships with local schools and community organizations.

7.6.5 Timeline

Community education campaigns and updates to the City website should be completed before the dry season in 2022.

8. Action Plan Roadmap

The actions associated with the WCP will begin in spring of 2022. All six of the major recommended projects will begin in spring and summer of 2022, and will be fully developed by 2024. Notably, in summer 2022 the City will be working with consultants to develop the Universal Water Metering Plan and will develop Multistage Watering Restriction Criteria to enforce irrigation restrictions. A roadmap of actions for all recommended projects is presented in **Figure 12**. Financial requirements and timelines are outlined here as well.

CITY OF SALMON ARM

Table 1: Water Conservation Action Plan Timeline

Projects	2022			2023				2024
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	
Universal Water Metering (UWM)	Issue RFP and award project	Begin project with consultants and contractors		Bill with flat rate and issue mock billing based of new volumetric rates*				Bill based on volumetric rates*
Financial	$50,000							
Xeriscaping	Partner with all local garden centres to provide seasonal promotions on native and watersmart plants				Create a Xeriscape on public property Continue to promote and further develop partnerships if successful			Revise and continue
Financial	$ promotional materials				$ public xeriscape and promotion		$ xeriscape maintenance	
Leak Detection and Repair Program		Develop program plan and source supplies and resources	Purchase equipment and hire/train staff*	Implement program*				Continue and expand the program
Financial		$ of sounding equipment and staff		$ staff hours, audits and equipment maintenance				$ dependent on program needs
Multistage Watering Restrictions	Create plan and stage criteria. Implement when complete.				Implement Multistage Restrictions	Continue monitoring stage criteria and update restrictions		Restrictions begin in May. Revise if necessary
Financial	$ sign boards and installation				$ advertising	$ O&M		$ O&M

Excessive User Program	Issue letters and educational materials to excessive users			Switch to metered billing early if necessary (after warnings are issued)			Billed based on volumetric rates (UWM)
	Re-evaluate excessive user criteria	Monitor changes in usage		Continue to monitor changes in usage and respond to changes as necessary			
Financial	$ pamphlets and distribution			$ pamphlets and distribution			
Community Outreach	Create and distribute educational materials for school age children, general public, and excessive users				Modify and distribute educational materials	Inform users of the UWM Program and strategies to reduce water usage	Inform users of changes and trends	Continue to educate public and adapt materials so suit current conditions
	School visits	Notify/educate excessive users	School visits*					
Financial	$ pamphlets and distribution				$ material costs			$ materials and distribution

*Subject to change upon further research and consultation

9. Summary

The City of Salmon Arm will follow the Water Conservation Plan and complete the actions associated to improve municipal water use. The primary recommendations are:

- Universal water metering paired with a usage based pricing strategy
- Multistage watering restrictions
- Xeriscaping and water efficient landscaping
- Excessive user targeted programming
- Community education and outreach

The plan will be updated as necessary every year and reviewed in full every five years. The effectiveness of the plan will be determined by the reduction in average and peak water use, especially in the summer months.

CITY OF SALMON ARM

References

Adams Lake Indian Band. (2015). *SWIXEYTEC - Our Ancestral Voice.* Adams Lake Indian Band.

(2020). *Annual Water System Return .* Salmon Arm: Ministry of Forests, Natural Resource Operations and Rural Development .

Belzile, J. w. (2013). *Water Conservation Guide for British Columbia .* British Columbia, Polis Project on Ecological Governance, Okanagan Water Basin Board .

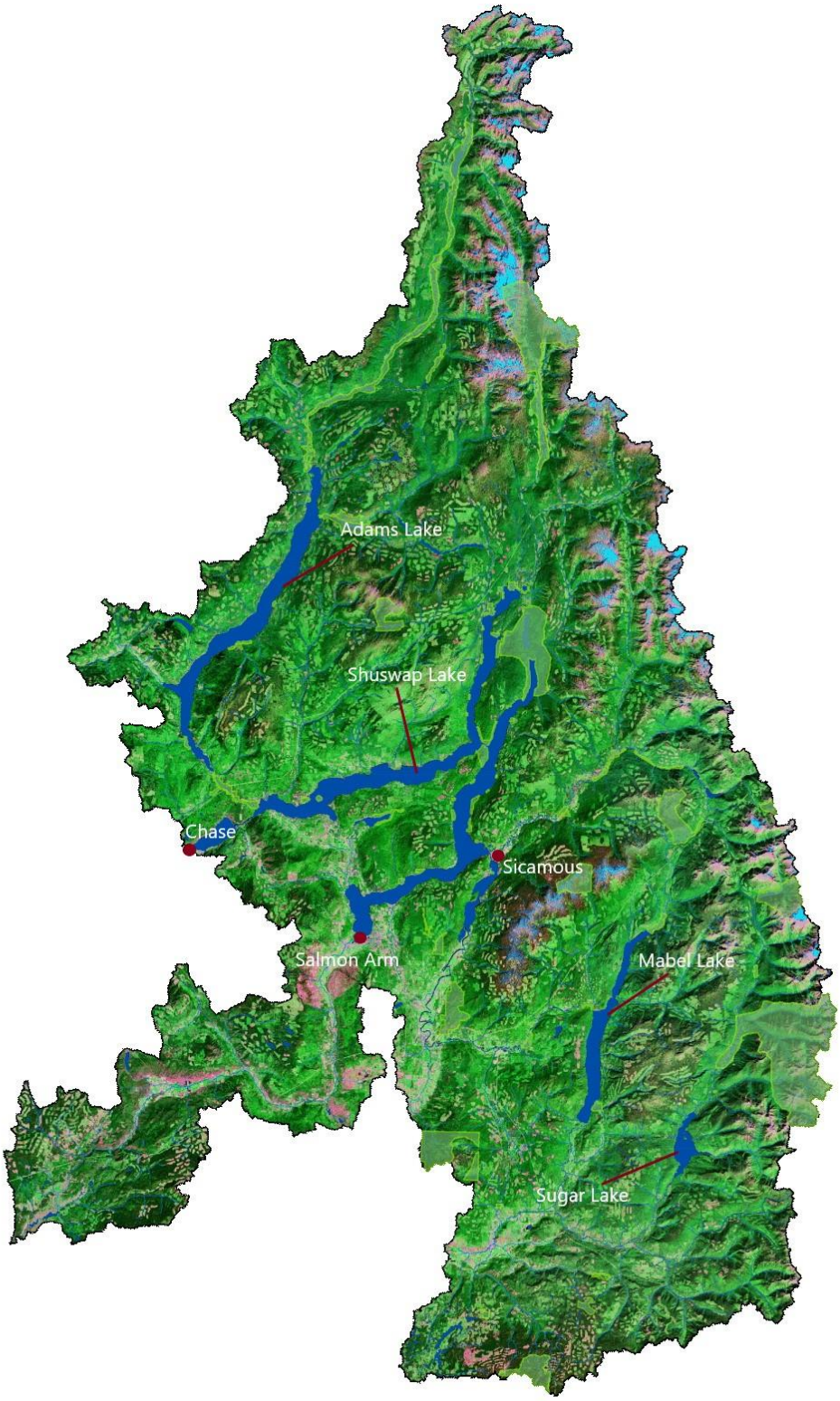
Stantec . (2010). East Canoe Creek Watershed Source-to-tap Assessment .

Sushwap Watershed Council. (2021). *2021-2026 Strategic Plan.*

Stauffer, B. (2019, May 13). *Low-flush toilets*. Sustainable Sanitation and Water Management Toolbox. Retrieved May 12, 2022, from https://sswm.info/water-nutrient-cycle/water-use/hardwares/toilet-systems/low-flush-toilets#:~:text=A%20low%2Dflush%20or%20low,and%20excreta%20with%20less%20water.

CITY OF SALMON ARM

Appendix A: Shuswap Watershed Map



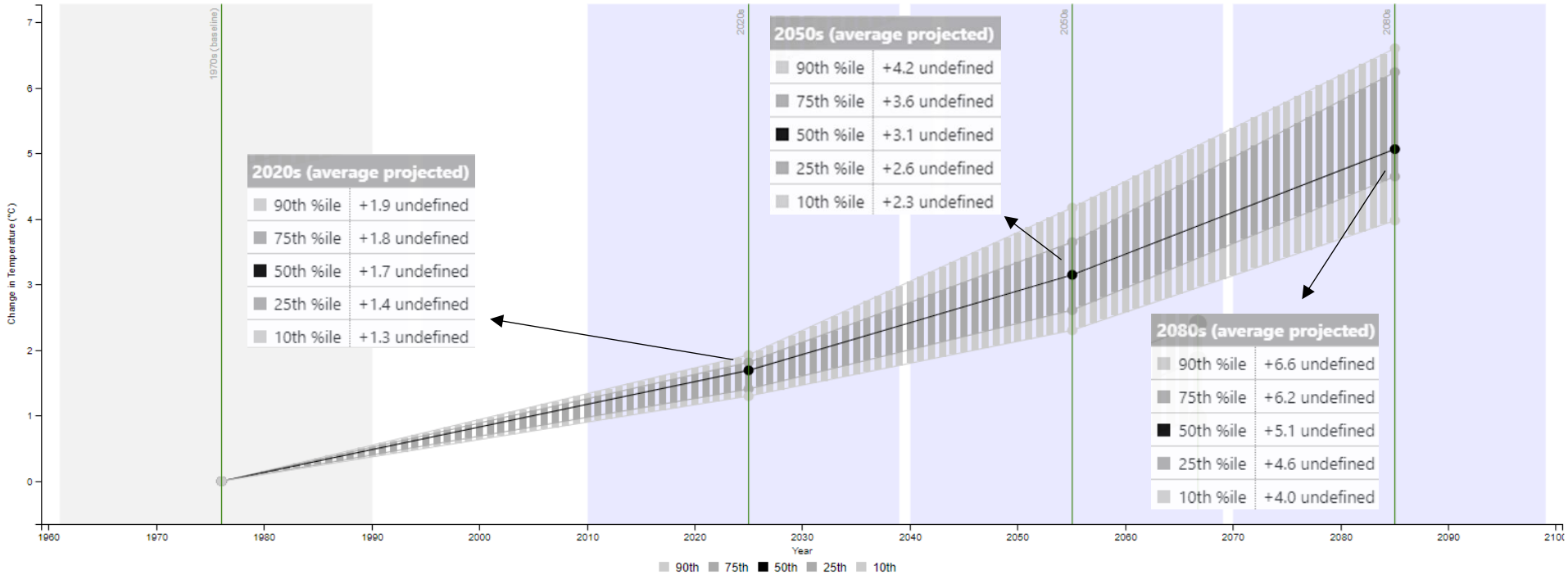
CITY OF SALMON ARM

Appendix B: Climate Trends in the Columbia-Shuswap Region

1. Temperature Predictions

Temperatures in the Columbia-Shuswap region are expected to increase steadily. Since the 1970s, average annual temperatures in the Columbia-Shuswap have increased at a rate of 0.03°C* annually, and are projected rise at a faster rate of 0.047°C between 2025 and 2055. The Pacific Climate Impacts Consortium (PCIC) predicts that average annual temperatures will have risen a total of 5.1°C from 1975-2085.

Figure 1: Average Annual Temperature Trend in the Columbia-Shuswap Region



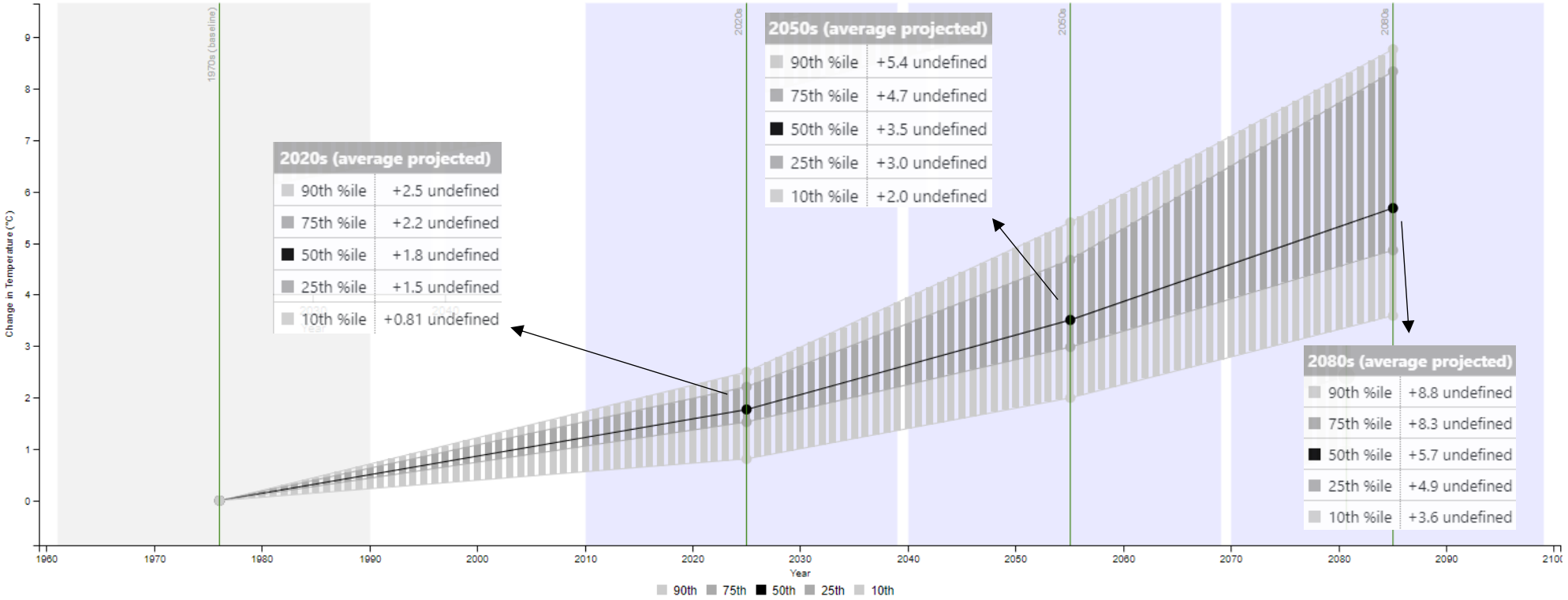
CITY OF SALMON ARM

*50th percentile used to express temperature predictions in the Columbia-Shuswap region.

1.1 Summer Temperature Predictions

Average summer* temperatures are predicted to rise at a slightly higher rate than average annual temperatures. PCIC predicts that the average summer temperature will have risen 5.7°C from 1975-2085.

Figure 2: Average Summer Temperature Trend in the Columbia Shuswap Region



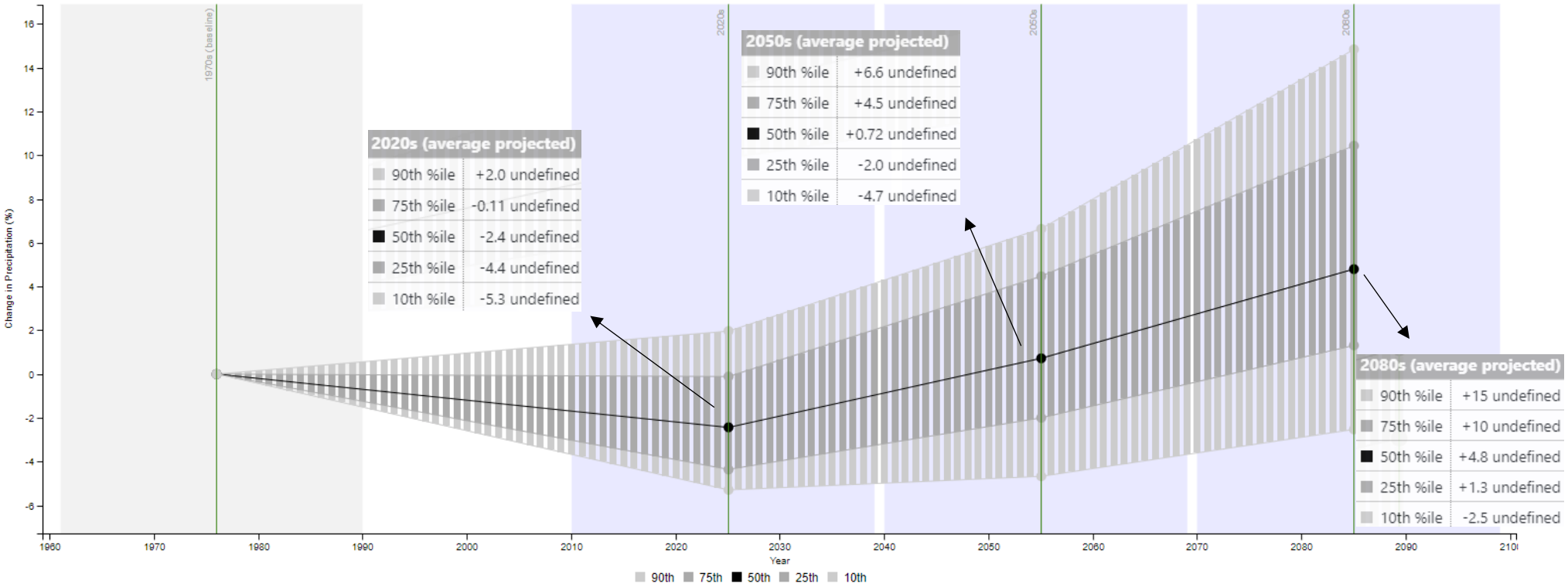
Note that the dispersion of average summer temperature predictions is much greater than the average annual temperatures, with the 75th percentile predicting a temperature rise of 8.3°C between 1975 and 2085.

*Summer is defined by PCIC as the months of June, July and August.

2. Precipitation Predictions

Precipitation in the Columbia-Shuswap region are expected to decrease until approximately 2025, and then increase steadily. Since the 1970s, average precipitation in the Columbia-Shuswap have decreased at a rate of 0.048%* annually and is projected decrease at a similar rate until 2025. Between 2025 and 2055, average annual precipitation is expected to increase at a rate of 0.1% annually, and 0.14% annually between 2055 and 2085. PCIC predicts 4.8% increase in annual precipitation between 1975 and 2085.

Figure 3: Average Annual Precipitation Trend in the Columbia-Shuswap Region

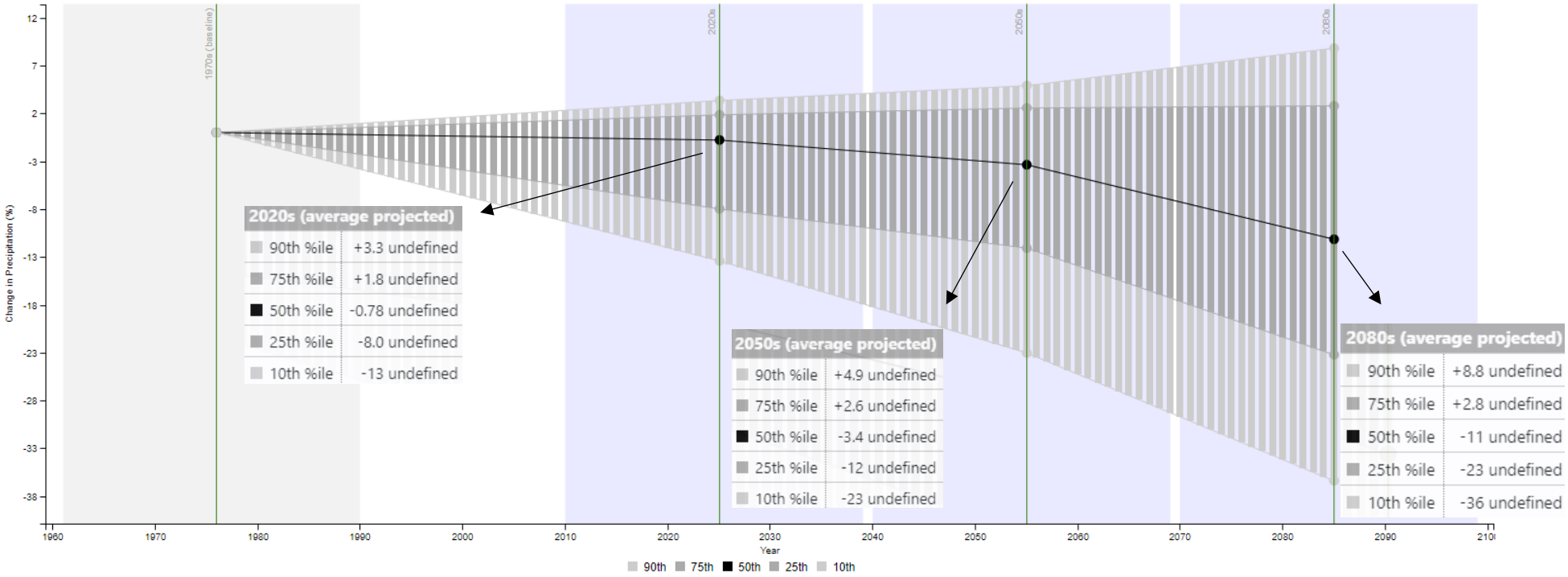


*50th percentile used to express temperature predictions in the Columbia-Shuswap region.

2.1 Summer Precipitation Predictions

Average summer precipitation is expected to decrease in the Columbia-Shuswap region. PCIC predicts an 11% decrease in average summer precipitation from 1975-2085.

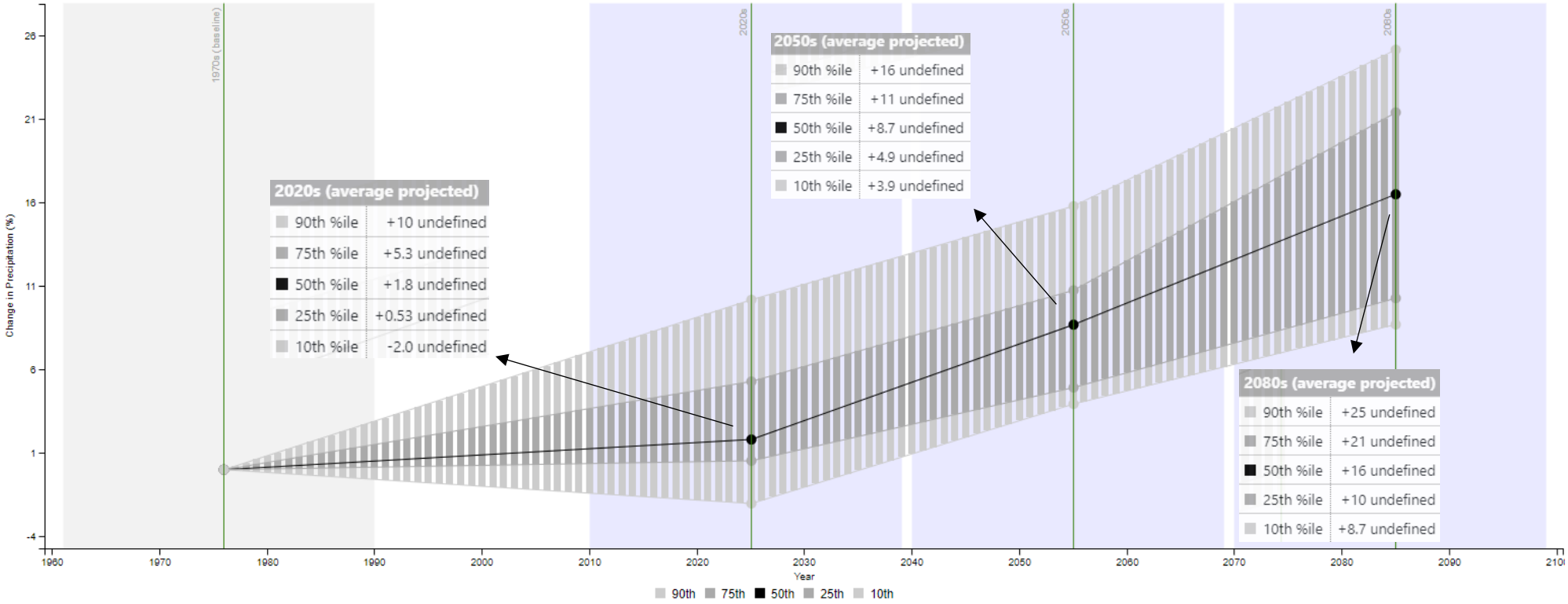
Figure 4: Average Summer Precipitation Trend in the Columbia Shuswap Region



2.2 Spring Precipitation Predictions

Average spring precipitation is expected to increase dramatically in the Columbia-Shuswap region. PCIC predicts a 16% increase in average spring precipitation from 1975-2085. This climate trend will likely have a significant impact on the volume spring freshet and cause it to occur earlier in the season.

Figure 5: Average Spring Precipitation Trend in the Columbia Shuswap Region

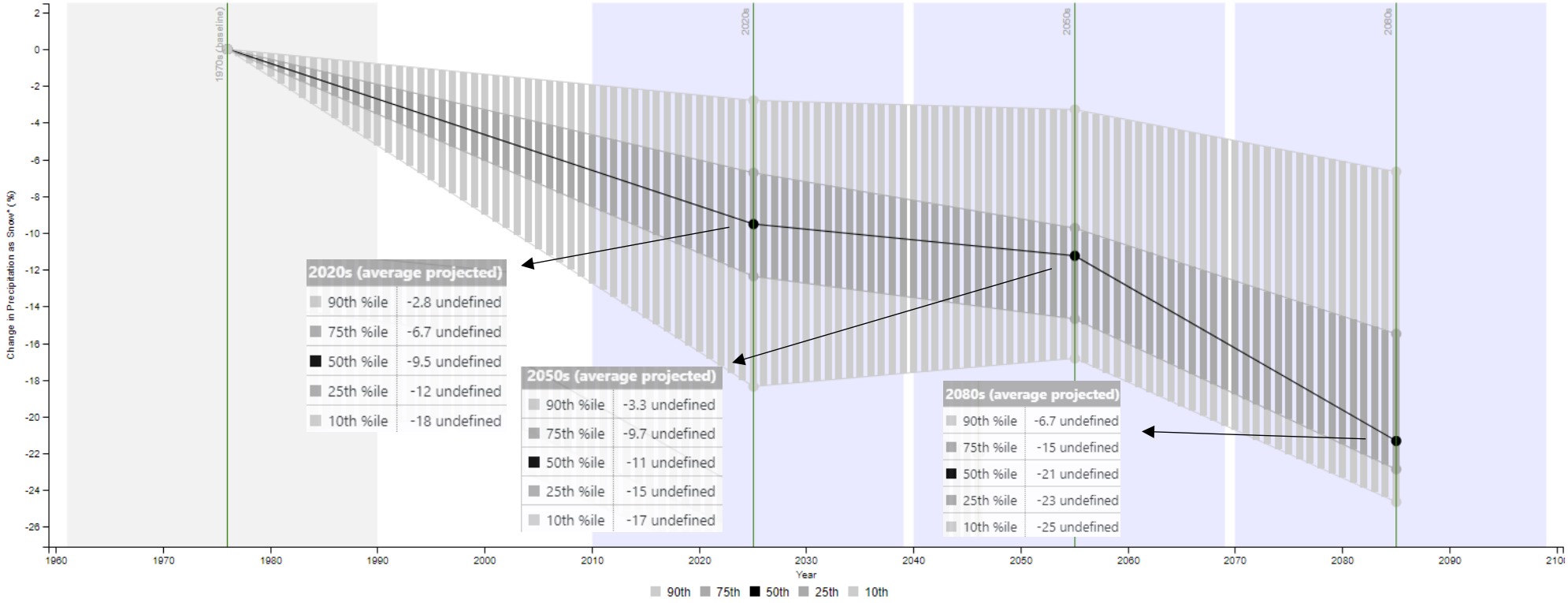


2.3 Precipitation as Snow Predictions

Precipitation as snow is expected to decrease dramatically in the Columbia-Shuswap region. PCIC predicts a 21% decrease in precipitation as snow from 1975-2085. This climate trend may affect lake levels and local hydrology.

CITY OF SALMON ARM

Figure 6: Precipitation as Snow Trend in the Columbia Shuswap Region



CITY OF SALMON ARM

Appendix C: Evaluation Criteria and Evaluation Table

Reduction in Peak Demand

Rating	Definition
1	Little or no reduction of maximum demand
2	Moderate reduction of maximum daily demand
3	Significant reduction of maximum daily demand

Spread Awareness

Rating	Definition
1	Does not educate water users about the importance of conservation
2	Moderately educates water users about the importance of conservation
3	Promotes the importance of water conservation to users

Increases Information Available

Rating	Definition
1	Does not gather useable information about water system and does not improve decision making
2	Gathers a moderate amount of usable information about water system and moderately improves decision making
3	Gathers a high amount of usable information and will benefit decision making

Delay infrastructure upgrades or additions

Rating	Definition
1	Does not delay infrastructure upgrades or additions
2	Somewhat delays infrastructure

3	Prolongs the life if existing infrastructure and mitigates the need to add additional infrastructure

Resources Required

Rating	Definition
1	Resources intensive
2	Moderate amount of resources requires
3	Minimal resources required

CITY OF SALMON ARM

Conservation Option	Criteria							
	Reduce Peak Demand	**Spread Awareness**	**Increase Information**	**Delay Infrastructure Upgrades and Additions**	**Resources Required**			
	30%	20%	25%	15%	10%	**Raw Score (/15)**	**Weighted Score (/100)**	**Rank**
Universal metering	1	2	3	1	1	8	56.7	9
Universal metering and usage based pricing	3	3	3	3	1	13	93.3	1
Community Education	2	3	1	2	3	11	68.3	7
Retrofit Kits	2	2	1	2	1	8	55.0	10
Toilet Rebates	2	2	1	2	1	8	55.0	10
Voluntary Water Audits	1	3	3	1	3	11	70.0	6
Leak Detection and Repair Program	2	2	3	2	1	10	71.7	5
Rain Barrel Program	2	2	1	2	2	9	58.3	8
Xeriscaping	3	2	1	3	3	12	76.7	3

Multistage Watering Restrictions	3	3	1	3	3	11	83.3	2
Excessive User Program	2	2	3	2	2	11	75.0	4

CITY OF SALMON ARM

Appendix D: Multistage Irrigation Restrictions

Irrigation regulations permit irrigation in designated days of the week depending on the last two numbers of the street address and the current Restriction Stage (see table below). Stage 1 is in effect by default.

At the Director's discretion, restrictions can be increased to Stage 2, 3, and 4 depending on environmental conditions and the Water Supply System's capacity. Residents will be notified of Restriction Stage changes via newspaper, sign boards, radio, social media, and the city website.

- On designated sprinkling days, lawn sprinkling is allowed for a maximum of 2 hours between the hours of **7 am – 11 am** and **7 pm – 11 pm**.
- If a user has an automatic sprinkling system, they are encouraged to sprinkle between **12 am – 7 am** on their appropriate day(s).
- Hand watering is allowed at any time.

Group 1: Addresses with house numbers ending in **00 – 33**

Group 2: Addresses with house numbers ending in **34 – 66**

Group 3: Addresses with house numbers ending in **67 – 99**

Stage	Irrigation Allowed*	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	3 days/week	1, 3	2	1, 3	2	3	1	2
2	2 days/week	3	---	1	2	3	1	2
3	1 day/week	---	---	1	2	3	---	---
4	No irrigation allowed	---	---	---	---	---	---	--

*on designated days

For more information on the City's water distribution system and the reasoning behind City-wide water conservation efforts go to https://www.salmonarm.ca/.

Your co-operation in adhering to these restrictions is greatly appreciated. Residents are encouraged to conserve wherever possible.

Failure to comply with these restrictions may result in a fine, metered water rates, or a discontinuation of service.

For clarification in mobile home parks and strata developments, please call City Hall at 250-803-4000.