

Water Conservation Plan

Village of Slocan



ENGINEERING ■ PLANNING ■ URBAN DESIGN ■ LAND SURVEYING

April 2025

Project No. 966-081

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List of Acronyms

CBT	Columbia Basin Trust
ICI	Industrial, Commercial, and Institutional
MoE	BC Ministry of Environment and Parks
SCADA	Supervisory Control and Data Acquisition
TRUE	TRUE Consulting
USEPA	United States Environmental Protection Agency
Village	Village of Slocan

Units of Measure

km	kilometre
L/d	Litres per day
L/m	Litres per minute
L/s	Litres per second
lpcd	Litres per capita per day
m	metre
m ³ /day	cubic metres per day
psi	pounds per square inch
USgpm	US gallons per minute

Referenced Reports

- 1 “Living Water Smart”, 2008, BC Ministry of Environment.
- 2 “BC’s Water Conservation Guide”, Dec 2013, BC Ministry of Community, Sport and Cultural Development.
- 3 “The Columbia Basin Water Smart Initiative, Building Sustainable Futures for Community Water Use”, December 2016, Columbia Basin Trust.
- 4 “Village of Slocan Water Smart Action Plan”, May 2011, Columbia Basin Trust.
- 5 “BC Stats - Population Estimate by Sub-provincial Areas 2011-2024”, spreadsheets from <https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-estimates>
- 6 “Evaluation of Community Water Conservation Efforts in the Columbia Basin 2009 to 2015”, July 2016, Columbia Basin Trust.
- 7 “Design Guidelines for Rural Residential Community Water Systems”, 2012, BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development.
- 8 “Water Conservation Plan Guideline”, August 1998, USEPA.

1.0 Introduction

Drinking water is increasingly becoming one of the world's most precious resources. In British Columbia we benefit from a relative abundance of drinking water. However, it is not uncommon for residents of this province to take the availability of fresh water for granted - and as a result, as described in the BC *Living Water Smart Plan*¹, British Columbians have one of the highest per capita water use rates in the world. Water conservation initiatives benefit each and every community – regardless of size and fresh-water availability – and are vital to ensuring the long-term sustainability of British Columbia's fresh-water resources.

In 2008, the province created the BC *Living Water Smart Plan*, which set out the following conservation goals:

- By 2020, overall water use in British Columbia will be 33% more efficient (compared to 2008).
- By 2020, 50% of new municipal water needs will be acquired through conservation.

This Water Conservation Plan was prepared with consideration for BC's *Water Conservation Guide*², produced by the province in 2013. As described in the BC *Water Conservation Guide*, water conservation plans are now a requirement for local governments who receive capital grants from the province for drinking water and wastewater infrastructure.

2.0 Water Conservation - Regional Lessons Learned

This section provides background information from a regional initiative completed by the Columbia Basin Trust (CBT), as described in the report titled *The Columbia Basin Water Smart Initiative, Building Sustainable Futures for Community Water Use*³. This information is pertinent to Slocan's water conservation planning.

Between 2009 and 2015, CBT organized and funded a Water Smart Initiative as a collaborative, regional, data-driven water conservation initiative with two goals: reduce community water demands and support local governments in implementing effective water conservation plans, policies, and actions. The Village of Slocan participated in a portion of that program, which included twenty-six local governments from all areas of the Columbia Basin at different stages of the initiative.

The Water Smart Initiative confirmed four factors that can influence community water use, including:

- Human factors: beliefs, norms, and behaviours affecting water use choices.
- Infrastructure and technology: public water infrastructure, metering, and the use of water efficient fixtures.
- Land use.
- Climate and weather.

With the exception of climate/weather, local governments have the ability to influence or change all of those factors and impact how water is used within their community.

The Water Smart Initiative identified four key lessons learned, as follows:

1. Good data illuminates priorities.
“Collecting and assessing water data is essential to effective community water conservation efforts. Good quality data shows where the greatest gains can be made and which efforts are successful over the long term.”
2. Leaks are the Columbia Basin communities biggest water conservation opportunity.
“Water loss through system leakage constitutes the single largest community water demand. Reducing leakage reduces infrastructure costs and improves climate resilience by reducing demand on local ecosystem supply.”
3. Reducing peak demand reduces infrastructure costs.
“Peak demand, typically driven by irrigation, presents the second largest water conservation opportunity for community water systems. Reducing peak demand helps minimize costs associated with maintaining and expanding water supply infrastructure,

and improves climate resilience. Addressing peak demand proved to be a challenge because it is influenced by so many factors, including temperature, precipitation, type of outdoor and indoor water use, and commercial, institutional and agricultural practices. Further, individual behaviors, perceptions and biases can be difficult to influence.”

4. Collaboration accelerates capacity development.

“Water Smart’s collaborative approach and support for peer-to-peer engagement was a driving factor in community success. This approach empowered Basin water managers and operators with knowledge, tools and technical support needed to build local and regional capacity for water conservation.”

3.0 Village of Slocan Water System Description

The Village of Slocan's water is sourced from Gwillim Creek. Following are the major water system components:

- Gwillim Creek water source: The Village's *Water Smart Action Plan*⁴ (2011) included historical records showing a minimum daily creek flow of 36,700 m³/day between 1950 and 1953.
- Water treatment building with pumpstation: The treatment plant's rated capacity is 2,180 m³/day (400 USgpm).
- Treated Water Storage Reservoir: Useable storage volume of 954,000 liters (252,000 USgallons).
- 12,600m of distribution system watermains, ranging in size from approximately 40mm diameter to 200mm diameter. In relation to this water conservation plan, it is worth noting that the Village's system includes:
 - 1,800m of galvanized and steel watermains.
 - 1,300m of asbestos cement watermains, installed in the early 1960's.
 - 1,000m of small diameter (approximately 40mm) polyethylene watermain with inadequate pressure capacity, installed in the late 1970's and early 1980's. Approximately 400m of this pipe is within the Village, and 600m is outside of the municipal boundary.
- Water services, as described below.

The Village provides treated water service to 263 connections (230 residential and 33 industrial/commercial/institutional), all unmetered, summarized as follows:

- 230 residential services, all 19mm diameter:
 - 206 residential services within the municipal boundary.
 - 24 residential services outside of the municipal boundary.
- 12 commercial services, ranging in size from 19mm to 50mm diameter:
 - 705 Delaney, Former Mill Office, 19mm.
 - 501 Harold, Hotel, 51mm.
 - 505 Harold, The Col Guesthouse, 25mm.
 - 509 Harold, Flaca's Bistro, 19mm.
 - 519 Harold, Village Market, 19mm.
 - 520 Harold, Mixed Occupancy, 19mm.
 - 617 Harold, Mixed Occupancy (3 commercial suites), 25mm.
 - 717 Harold, Harold Street Café, 19mm.
 - 801 Harold, Motel, 25mm.
 - 812 Harold, Telus, 19mm.
 - 704 Arlington, Gas Station, 19mm.

- 704B Arlington, Food Truck, 19mm.
- 10 institutional/public/government services within the municipal boundary:
 - 503 Slocan, Village office, 19mm.
 - 503 Slocan, Village workshop, 19mm.
 - 502 Harold, Legion, Village owned, 19mm.
 - 602 Harold, WI Hall, Village owned, (vacant/unused), 19mm.
 - 710 Harold, Wellness Building, Village owned, 38mm.
 - 711 Harold, Church, 19mm.
 - 804 Harold, Post office, 19mm.
 - 915 Harold, School (includes playing field irrigation with potable water, approx. 3,800m², 51mm.
 - 1001 Harold, Community Services.
 - 619 Arthur, Church, 19mm.
- 4 institutional/public/government services outside of the municipal boundary:
 - 1020 Giffin, Village of Slocan RV Campground, Village owned, 100mm
 - 910 Arlington Road, Riding Grounds, Village owned, 25mm service, 38mm service
 - 8875 Slocan South Road, RDCK Transfer Station, 25mm
 - 8877 Slocan South Road, RDCK Fire Hall, 38mm service, 150mm hydrant
- 3 industrial services:
 - 1014 Slocan, Licensed Cannabis Grow Facility, 19mm.
 - Former mill site, Village owned, (vacant/unused), 38mm.
 - Former mill site, Village owned, (vacant/unused), 51mm.
- 4 parks, including:
 - Beach, north end Main Street, 51mm service, irrigating approx. 2,000 m².
 - Playground, Main and Ward, 51mm service, irrigating approx. 1,500 m².
 - Cemetery, Arlington Road, tree line emitters only, 19mm service, irrigating approx. 50 m².
 - Planter, Slocan and Giffin, emitters/sprayers, 19mm line, irrigating approx. 12 m².

In addition to the parks that are serviced with treated water, the Village also operates a non-potable seasonal water system using a source on Springer Creek which provides irrigation to the Village's Expo Park (approx. 11,000 m²).

4.0 Water Use Profile

To understand the impacts and outcomes of past water management practices, the current state of the system must be clearly defined from a water consumption and system operational cost standpoint. An accurate understanding of 'how much', 'when', and 'where' water is used, is crucial to assessing the viability and practicality of water conservation options, the corresponding demand reductions, and the social, economic, and environmental benefits.

4.1 Water Consumption

Water use in Slocan is measured by three flow meters in the water treatment building, including:

- Raw water (inlet) volumes withdrawn from Gwillim Creek, measured by an ABB Watermaster electromagnetic flowmeter.
- Backwash water volumes taken from the treated water storage reservoir, to clean the filtration system (and then discharged to waste), measured by an Endress & Hauser Promag W electromagnetic flowmeter.
- Distribution volumes supplied to the community, measured by a Sparling Tigermag electromagnetic flowmeter.

Generally, electromagnetic flowmeters (ie. magmeters) have a high level of accuracy (within 0.5% of flow). But over time, their accuracy can degrade. The Sparling Tigermag is an original component of the water treatment plant, and is approaching 25 years of service life. As such, the accuracy of the 'distribution volume' measured by this flowmeter could be questionable. Initial short-duration checks of the data accuracy suggest that the distribution flowmeter could be 'reading high' by 10-12%; further work would be needed to confirm this. Regardless, the distribution flowmeter totalizer provides the most direct and complete information on community water use, and is therefore used for the quantifications of annual and 'per capita' water use in this report.

4.1.1 Daily Water Use

Since daily totalized flows from the distribution flowmeter are not readily usable, instantaneous SCADA data from the 'Raw water' and 'Backwash water' flowmeters has been used instead, to calculate 'Net Supply' water use data. This 'Net Supply' SCADA data appears to be 3-9% lower than the distribution magmeter totalizer for the 2019 to 2023 period. The 'net supply' volumes are taken as approximate daily water use, and shown in the figure below.

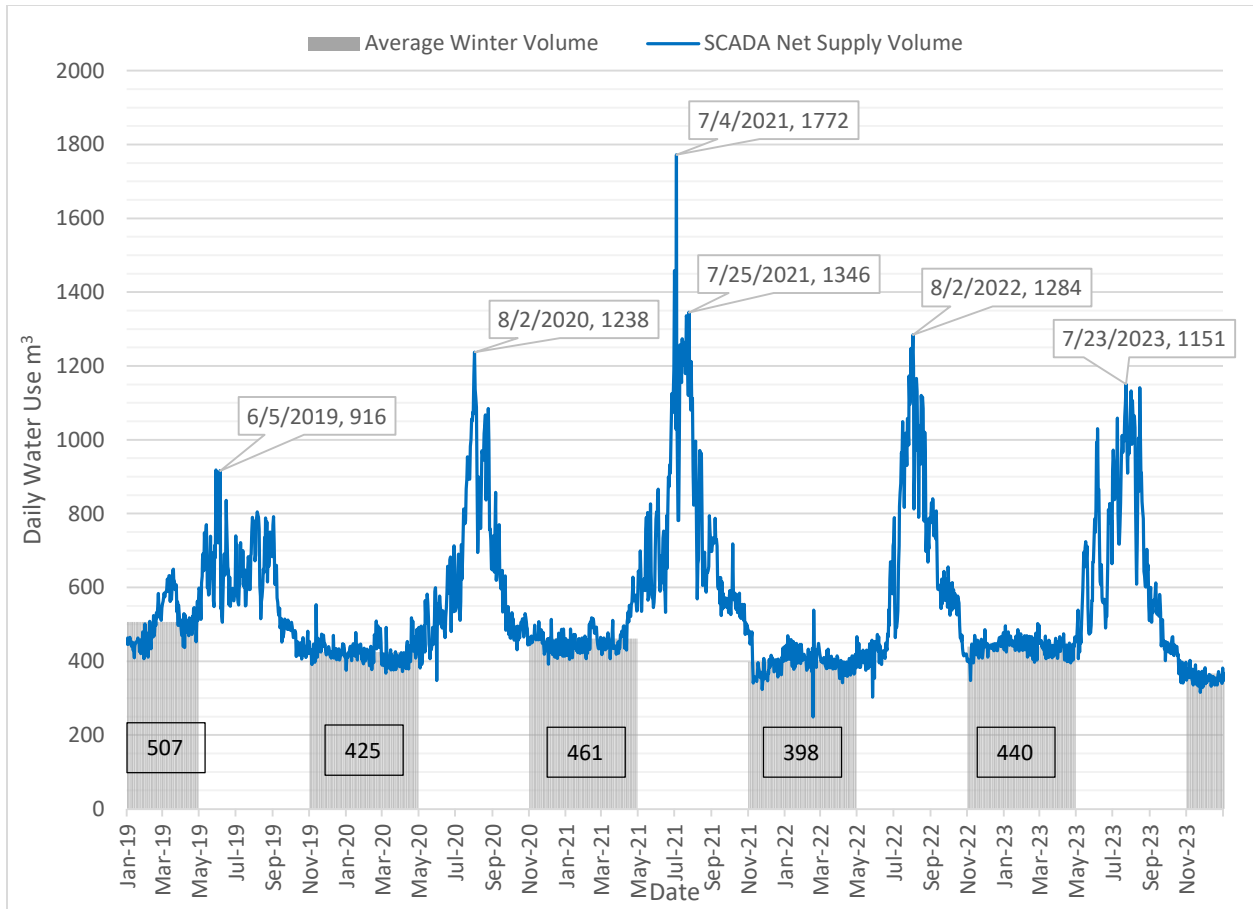


FIGURE 4-1: VILLAGE OF SLOCAN - DAILY WATER USE (2019 - 2023)

The following observations are made with regard to the Village’s daily water use:

- Some random spikes may be erroneous data; the apparent maximum water use day on July 4, 2021 is a result of a power failure at the treatment plant. This data point does not correspond to actual water use in the Village, and is disregarded.
- Maximum daily water use usually occurs in late July or early August and has generally been between 1,150 to 1,350 m³/day (250,000 to 300,000 Imperial gallons/day).
- The ‘base’ daily water use seen through winter months was generally between 400 to 500 m³/day (90,000 to 110,000 Imperial gallons/day). This is extremely high in comparison to the Village population.

4.1.2 Annual Water Use

The annual water use as recorded by the Village (distribution mag totalizer) has been compiled in the figure below, to assess overall trends with time.

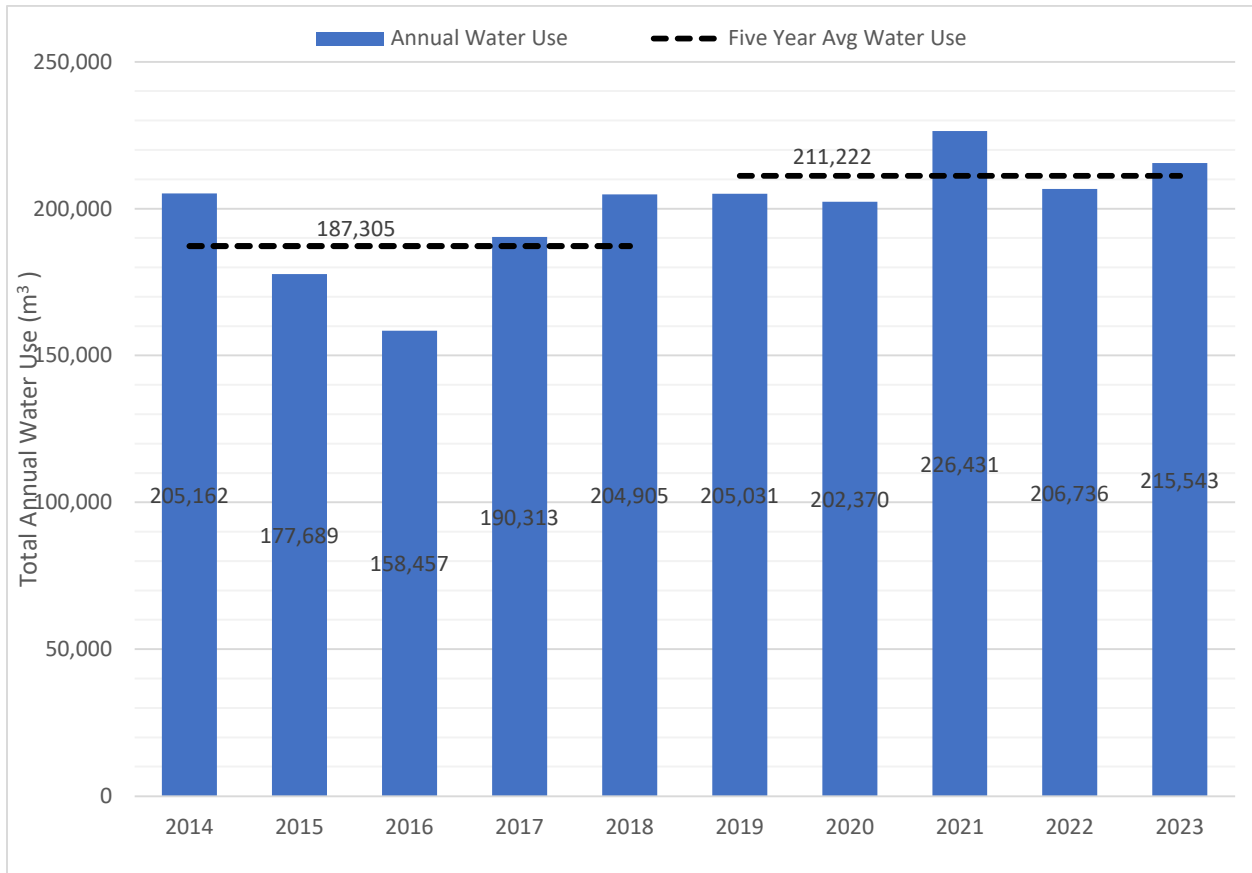


FIGURE 4-2: VILLAGE OF SLOCAN - ANNUAL WATER USE (2014 - 2023)

The following observations are made with regard to the Village’s annual water use:

- The more recent five-year average (2019-2023) of 211,222 m³ (~46,000,000 Imp.gallons) is a 13% increase over the previous five-year average. This is likely a result of the increase in Village population, as described in the next section.

4.1.3 Per Capita Water Demand

In addition to the total community water use, consideration is given to the 'per capita' water use. Slocan's population data was obtained from *BC Stats - Population Estimate by Sub-provincial Areas 2011-2026⁵* as shown in **Figure 4-3**.

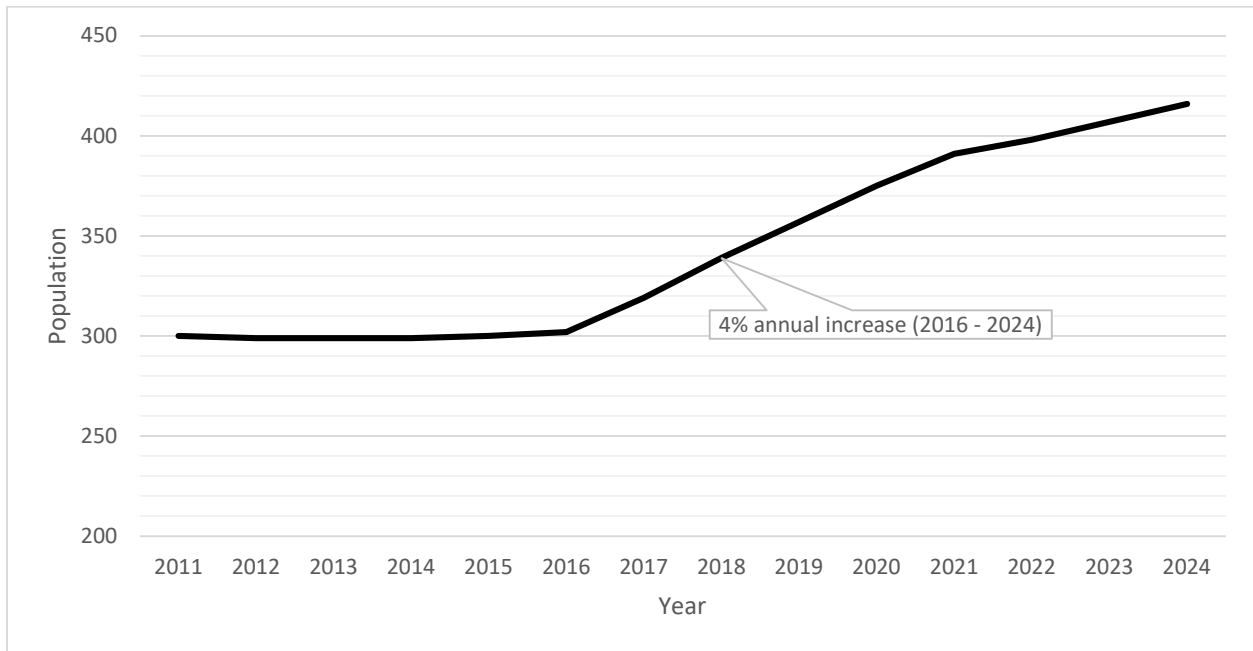


FIGURE 4-3: VILLAGE OF SLOCAN POPULATION (2011 - 2024)

Using annual water use data (Figure 4-2) combined with the population estimates shown above, Slocan's per capita water use is then presented in **Figure 4-4**.

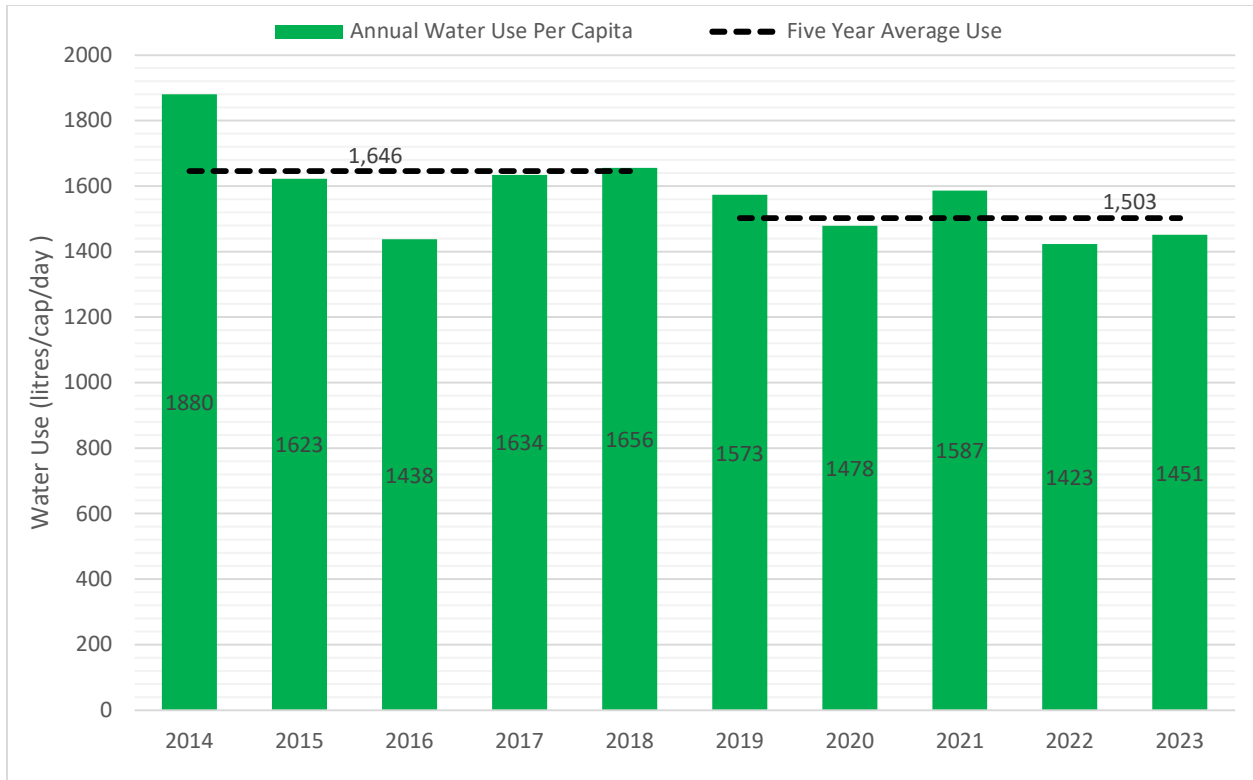


FIGURE 4-4: VILLAGE OF SLOCAN - AVERAGE DAILY WATER USE PER CAPITA (2014-2023)

The following observations are made with regard to the Village’s annual per capita water demand:

- The recent five-year average (2019-2023) of 1,503 litres/cap/day (~330 Imp.gal/cap/day) is a 9% decrease as compared to previous five-year average.
- The noted reduction could be a result of actual reduced water use on a ‘per capita’ basis; however, it is most likely indicative of an unchanged base amount of water system leakage being compared against the increase in population.

Further to the Village of Slocan’s per capita water use, **Figure 4-5** presents a comparison between the annual average ‘per capita’ water use in Slocan (2019-2023) and other communities in the Kootenay region (2009-2015), as well as regional, provincial and national averages. Data for the other Kootenay communities is taken from the Columbia Basin Trust’s Water Smart Initiative, as described in the report titled *Evaluation of Community Water Conservation Efforts in the Columbia Basin 2009 to 2015*⁶.

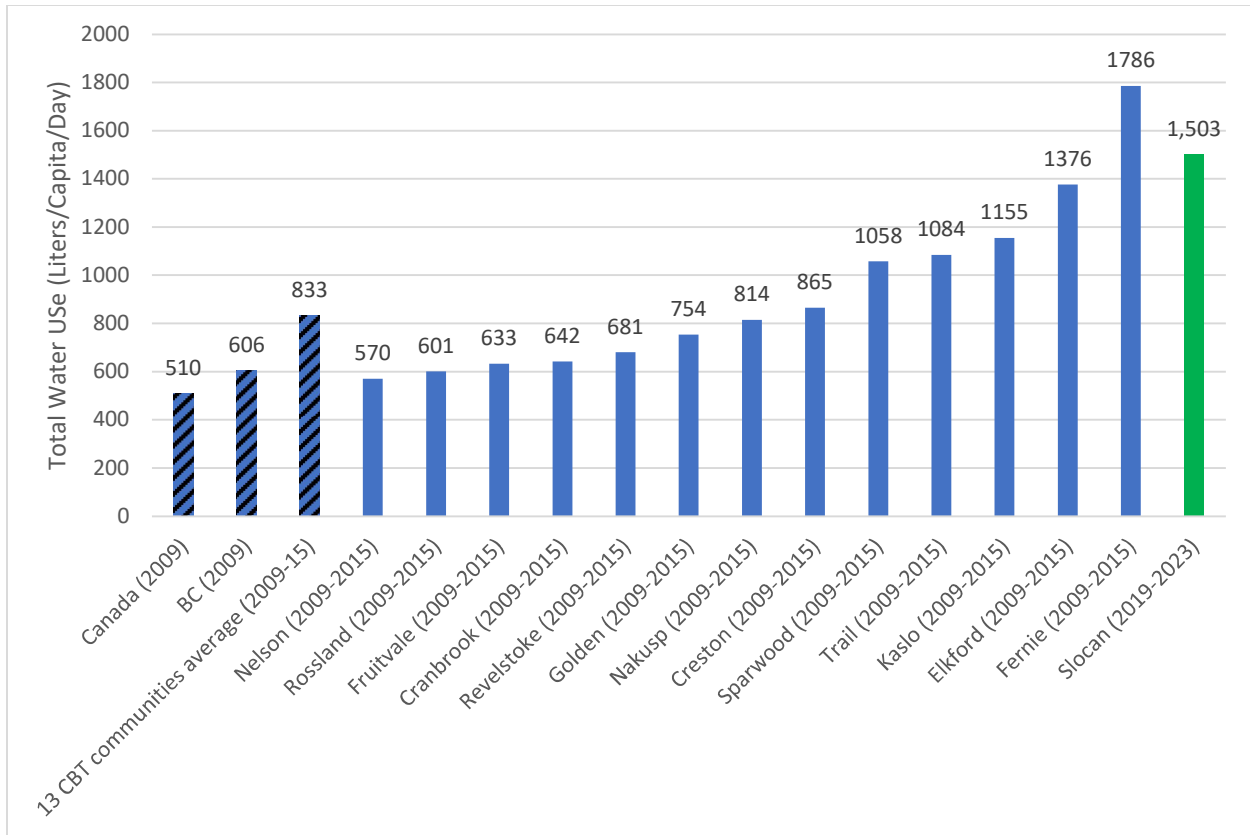


FIGURE 4-5: ANNUAL AVERAGE DAILY WATER USE COMPARISON (PER CAPITA)

Of the 13 communities described in the CBT *Evaluation of Community Water Conservation Efforts in the Columbia Basin 2009 to 2015*⁶ report, only one of those communities’ annual average per capita water use was higher than Slokan’s. It is worth noting that all of the communities above 1,100 litres/capita/day were estimated to have significant water system leakage. As described in Section 2.0, one of the key lessons learned by the CBT Water Smart Initiative is ‘collaboration accelerates capacity development’. Moving forward, the Village of Slokan should look to collaborate and understand other communities’ experiences with various water conservation strategies.

When completing observations and comparisons of water demand statistics in various communities, it is important to note the following:

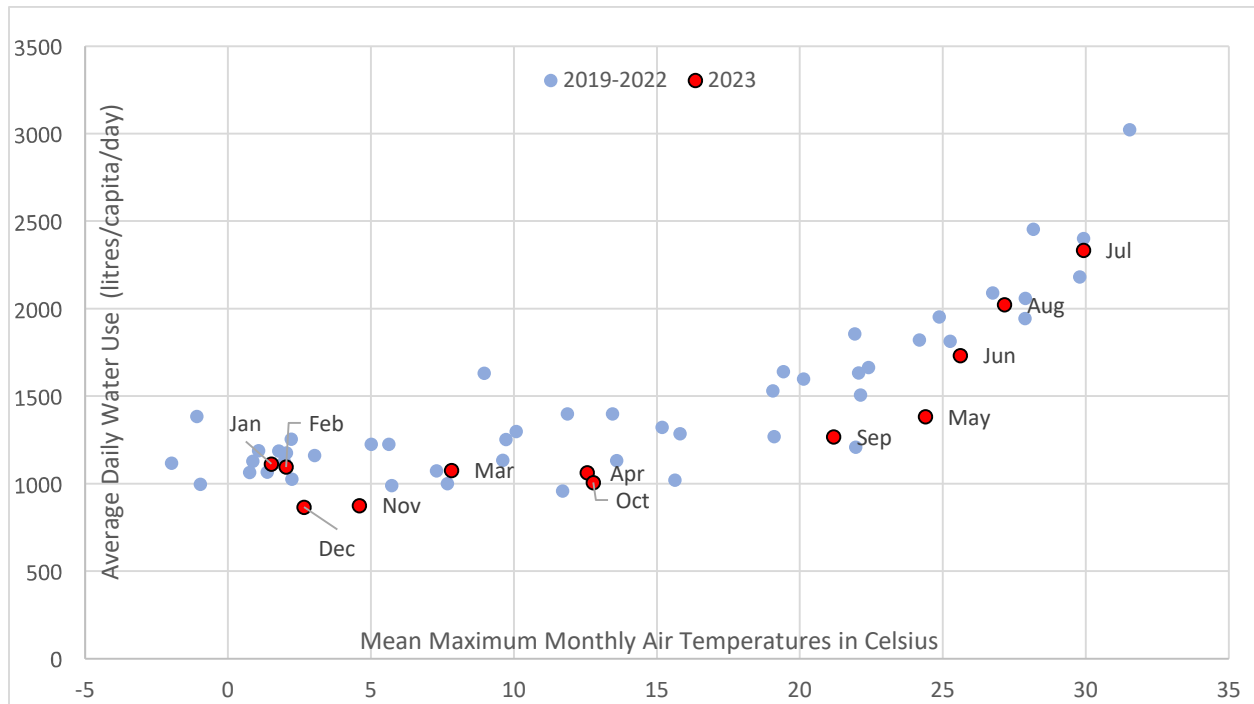
- The per-capita water use includes all non-residential water use (institutional, commercial and industrial). Accordingly, the relative impacts of the non-residential water use will affect each community’s per capita demands differently (ie. communities with larger ICI sectors would tend to have correspondingly higher ‘per capita’ water use).

- Due to the fact that only full-time residents are counted as water users in the associated population estimates, fluctuations in seasonal populations can also influence the water demand statistics for certain communities.

4.1.4 Summer Water Use

In the 2016 report *Evaluation of Community Water Conservation Efforts in the Columbia Basin 2009 to 2015*⁶, researchers recognized that water use during the winter months remained relatively constant. As air temperatures increased so did water use. The same methodology is shown in the figures below, with temperature data collected from the New Denver RCS weather station (source: climatedata.ca).

The research from the *2016 Evaluation Report*⁶ recognized that the growth of water use in the Columbia Basin was approximately linear from maximum daily air temperatures of 14 degrees Celsius and up. These relationships between water use and ‘mean maximum air temperature’ (ie. the average of the daily maximum temperatures each month) are depicted on **Figure 4-6** through **Figure 4-8**.



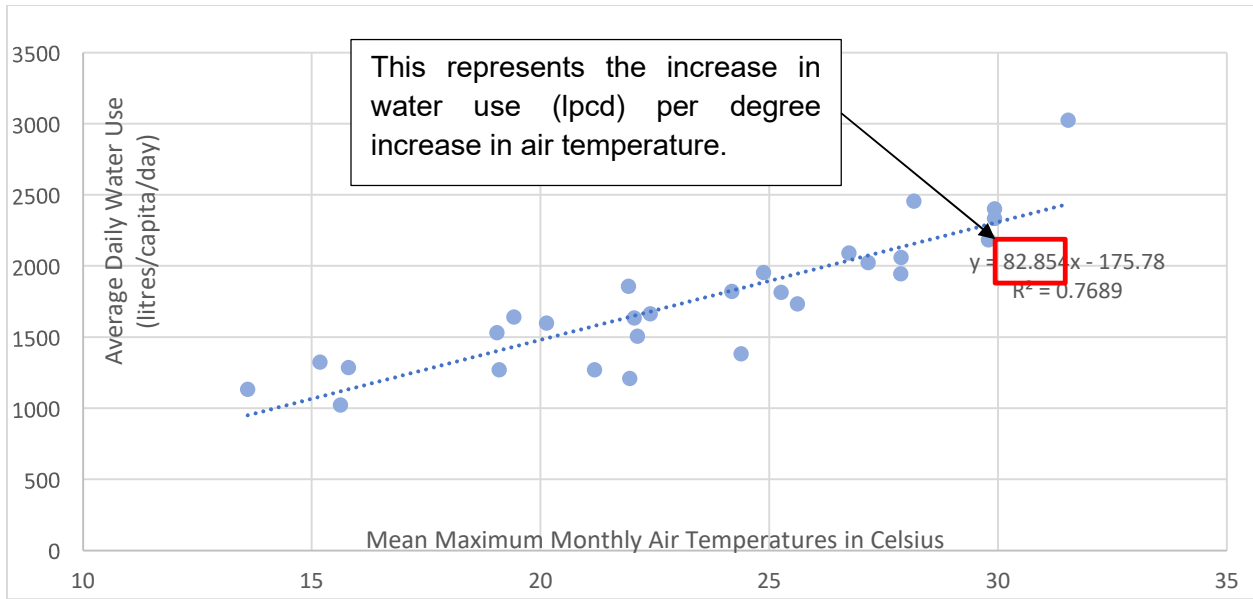


FIGURE 4-7: VILLAGE OF SLOCAN - PER CAPITA WATER USE VS TEMPERATURE (SHOWING MONTHS WITH MEAN MAXIMUM TEMPERATURE ABOVE 14 DEGREES CELSIUS)

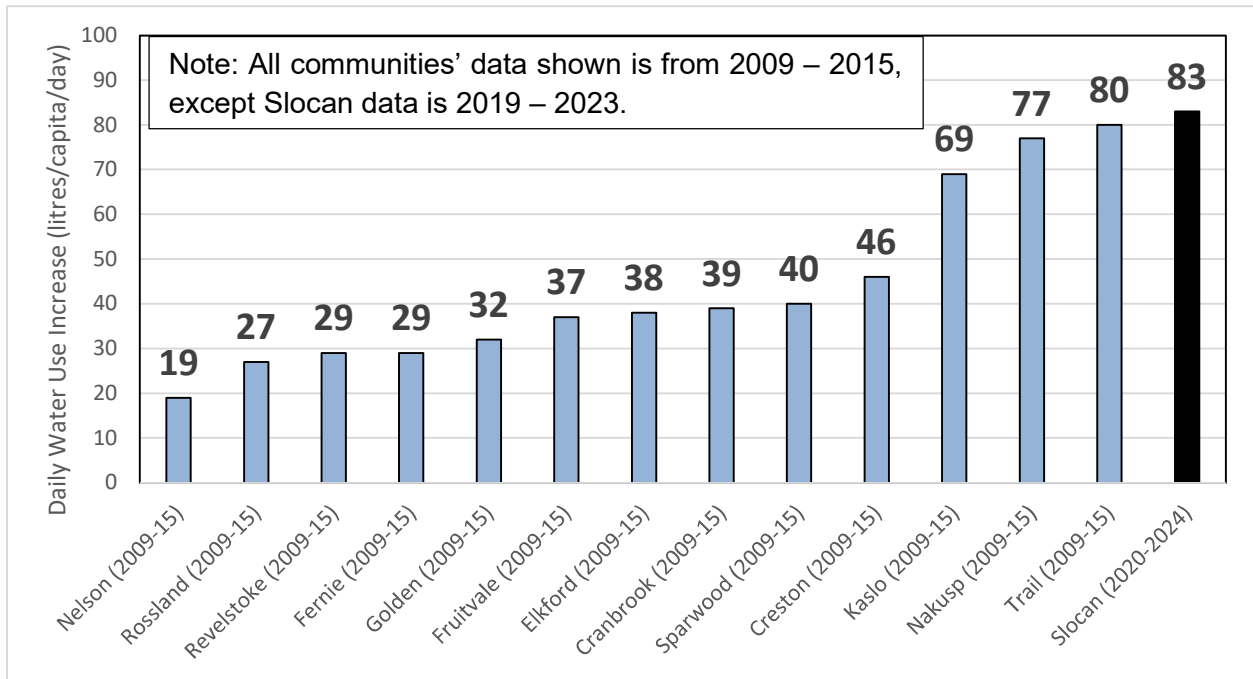


FIGURE 4-8: COLUMBIA BASIN COMMUNITIES PER CAPITA WATER USE INCREASE PER DEGREE CELSIUS INCREASE IN MEAN MAXIMUM DAILY AIR TEMPERATURE (ABOVE 14 DEGREES CELSIUS)

The key observations regarding **Figure 4-6**, **Figure 4-7**, and **Figure 4-8** are as follows:

- On Figure 4-7, the best fit line showing the average of the plotted values indicates that for every degree increase in maximum daily air temperature, approximately 83 liters/day of additional water is used per person in Slovan.
- On Figure 4-8, Slovan's 'per capita' water use correlation to temperature is high compared to other communities in the Columbia Basin.

It is worth noting that the summer 'per capita' water use in Slovan is likely influenced by system leakage, as described in section 4.1.6. Potentially, system leakage could be around 300 m³/day. If that leakage was eliminated, Slovan's per capita value depicted in Figure 4-11 would be reduced from 83 lpcd to approximately 65 lpcd. Regardless, an opportunity exists to enhance water conservation efforts throughout the summertime and reduce the peak demands when the temperatures increase.

4.1.5 Water Use Breakdown (Water Balance)

A current 'water balance' is depicted for the 2019-2023 period in **Figure 4-9**. This figure has been prepared using a similar methodology to what was done previously in the Village's 2011 *Water Smart Action Plan*⁴. However, the Water Smart Action Plan tried to estimate water use based on the sector or type of service (residential, commercial, institutional). The approach taken in the current report is a water use breakdown based on how the water is used (indoor vs. outdoor). It must be noted that, without any water meter data for individual services, this water use breakdown is a cursory estimate.

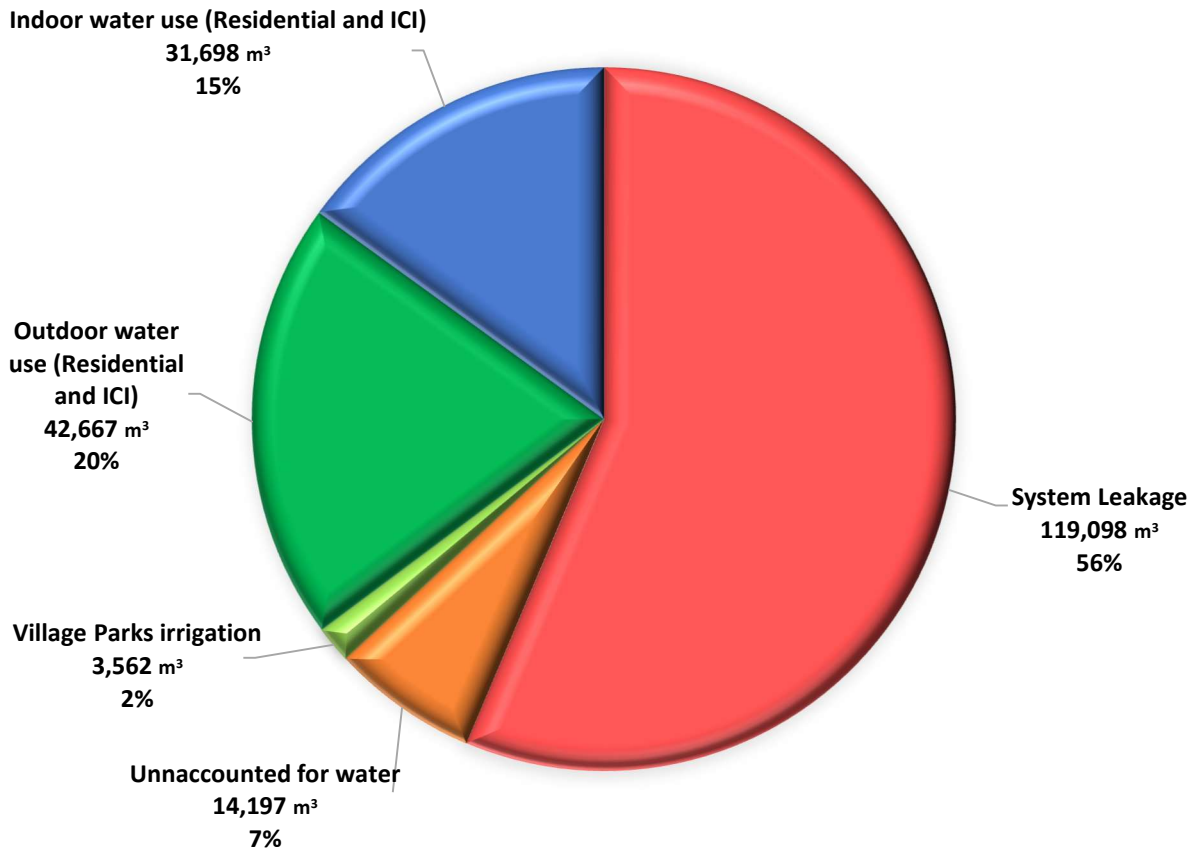


FIGURE 4-9: VILLAGE OF SLOCAN – ANNUAL WATER USE BREAKDOWN (2019 - 2023)

Key points regarding Figure 4-12 include:

- Indoor water use (15% of annual water use) was estimated using an assumed 200 litres/capita/day. This is a textbook value that compares favourably with residential indoor water use data gathered regionally during the CBT Water Smart program. For simplicity, each ICI water service is assumed to use an equal amount of indoor water as a residential service.
- The estimated system leakage (56% of annual water use) is extreme. This value was estimated by reviewing water use in November (typically the lowest water use month in Slocan), and subtracting the 'indoor water use'. The remaining November water use was assumed to be system leakage (326 m³/day). For reference, this 'leakage' value was compared against the minimum night-time (1am to 5am) instantaneous flows recorded by the distribution flowmeter SCADA on November 15th (a random day) in each of the years 2019-2023. The minimum night-time flows through those five years average a flow equal to 418 m³/day. As described previously, the distribution flowmeter is assumed to be

measuring inaccurately high by on average 20% from 2019-2023. Reducing the instantaneous minimum night-time flow data by 20% results in a value of 334 m³/day, which compares favourably to the 326 m³/day leakage estimate shown in Figure 4-9. The system leakage is assumed to be constant throughout the year.

- Village parks irrigation was estimated as 1 m³ of total water use per m² of irrigated area (parks irrigation areas noted in Section 3.0) per irrigation season. This is specifically limited to the parks supplied with treated water from the community water system. Irrigation estimates are based on information in BC's *Design Guidelines for Rural Residential Community Water Systems*⁷, which includes factors such as the regional climate (evapotranspiration rate), irrigation efficiency, and length of irrigation season.
- Outdoor water use was calculated by subtracting the other water uses (indoor, leakage, parks irrigation) from the total water use during the irrigation season (May 1st through October 31st).
- The 'unaccounted for' water use is simply the remaining water use that is unaccounted for by the other estimated segments, in comparison to the average annual community water use (211,000 m³). Potentially, this 'unaccounted for' water use could be a portion of any other segments.

In addition to the treated water breakdown, the Village also operates a non-treated system to irrigate Expo Park. Assuming 1 m³ of total water use per m² of irrigated area, Expo Park irrigation could be as much as 11,000 m³ of water use per year. If Expo Park was connected to the Village's treated water system, the treated system water use would increase by ~ 5% per year.

4.2 Water System Operating Costs

Figure 4-10 illustrates the Village's water system operational costs breakdown from 2019 to 2023 – in relation to the amount of water used. The costs are split into two categories:

- 'Water Unrelated Costs': Items which are not directly related to the amount of water used. This includes labour (wages, benefits), testing, certification/training, maintenance (parts, supplies, contracted services), and administrative costs.
- 'Water Related Costs': Items which tend to vary directly in relation to the amount of water used. This includes power for pumps and chemical use for treatment.

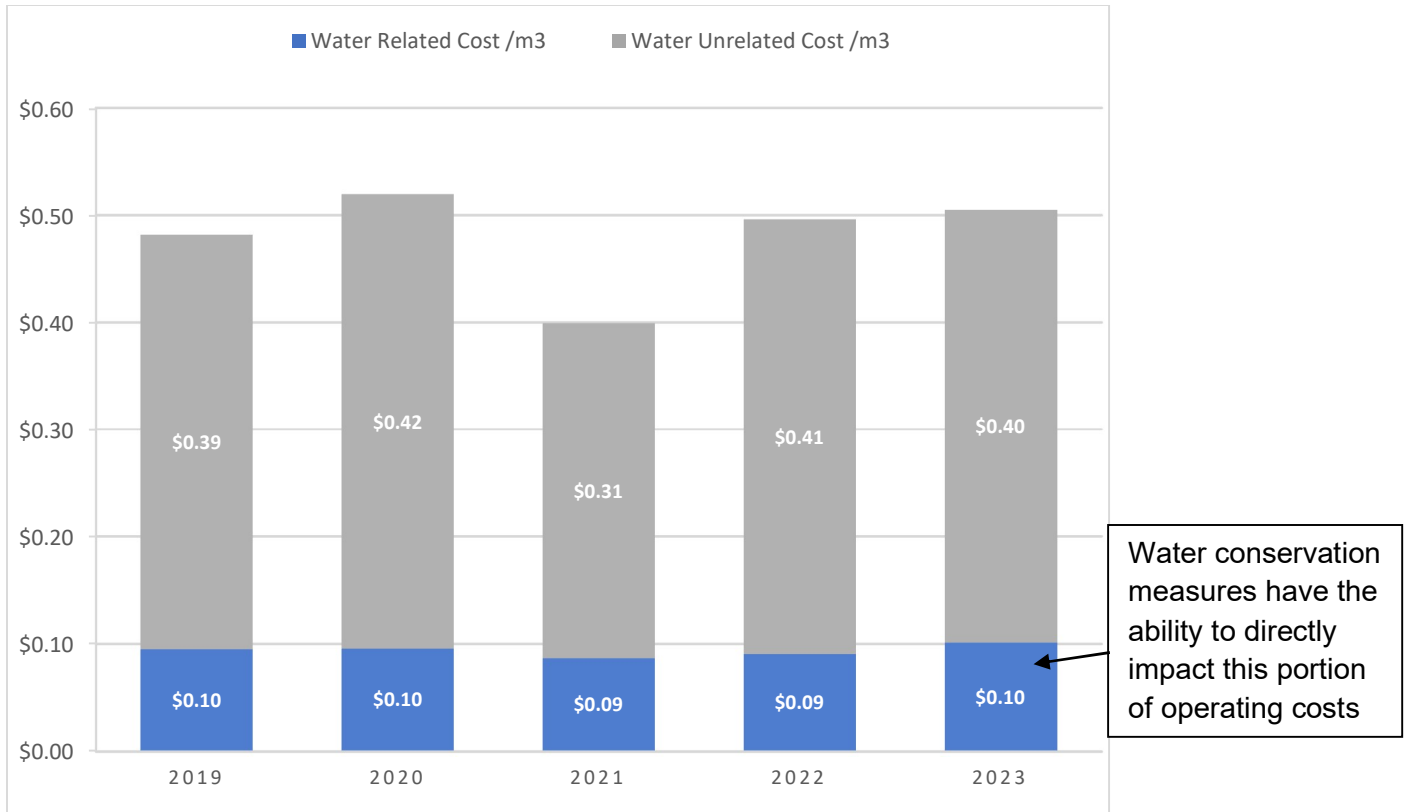


FIGURE 4-10: VILLAGE OF SLOCAN - WATER OPERATING COSTS BREAKDOWN (2019 - 2023)

As shown in **Figure 4-10**:

- The 'Unrelated Costs' varied from a low of \$0.31 to a high of \$0.42 per m³ of water produced.
- The 'Related Costs' have remained quite consistent in comparison to water use, averaging \$0.10/m³ of water use. The 'Related Costs' have also totalled on average ~\$20,000 per year from 2019 to 2023. For perspective, a 10% reduction in the Village's total annual water use each year (ie. a reduction of 21,000 m³/year) would be expected to result in a similar 10% savings of annual 'Related Costs' – which would be a savings of ~\$2,000/year. That cost savings is likely a low estimate since the amount of water used will also have indirect impacts on the service life of certain components. In particular, the service life of the filtration membranes is related to the volume of water treated. The water treatment plant was constructed in 2003. The membranes were replaced in 2010, 2019 and are going to be replaced in 2025. Replacement of the membranes costs in excess of \$135,000.

4.3 Future Water System Upgrading Costs

A common benefit of a water conservation program is the deferral or reduction of future capital infrastructure improvements. A cursory overview of potential benefits with regard to the Village's water system infrastructure is as follows:

- Water supply and treatment infrastructure sizing is directly related to the maximum day water demand; accordingly, a reduction in peak water use would have a corresponding impact on water supply infrastructure requirements. The Village's water supply is likely limited by the capacity of the water treatment plant, which has a rated capacity of 2,180 m³/day (400 USgpm). The actual capacity of water treatment plant varies seasonally – the plant currently struggles to produce an adequate volume of potable water during the Gwillim Creek spring freshet due to the high turbidity in the raw water at that time. During spring freshet when the raw water quality degrades, Village staff report that the treatment plant capacity can decline to 545 m³/day (120,000 Imp.gallons/day). The Village is actively reviewing long term options for alternate water supply.
- Water storage (reservoir) infrastructure sizing is also related to the maximum day water demand; although, water use will only factor into ~ 1/3 of the reservoir size requirements since reservoir size is primarily dictated by fireflow storage requirements.
- Water distribution infrastructure (watermains) sizing in small communities is typically dictated by fireflow requirements – not related to the amount of water used.

The Village's maximum day water use was depicted on Figure 4-1 (close to 1,200 m³/day during the past 5 years), and population trend was depicted on Figure 4-3. Since a significant portion of the Village water use is estimated to be leakage, the relation between current maximum day water use and population is not expected to be fixed. For the purposes of a simple projection, we assume that if the estimated leakage (~300m³/day) is removed, the remaining 900 m³/day of water use on maximum days will be more closely related to recent population and future population growth (ie. maximum day water use of approximately 2.3 m³/day per capita).

Figure 4-11 depicts a number of future water use scenarios, including:

- Future water use with 4% increase per year in population. This is considered a 'high' projection, but is in-line with population growth during the past 8 years.
- Future water use with 1% increase per year in population.
- Both of the above scenarios are also shown coupled with a 300 m³ reduction in maximum day water use during the next 10 years.

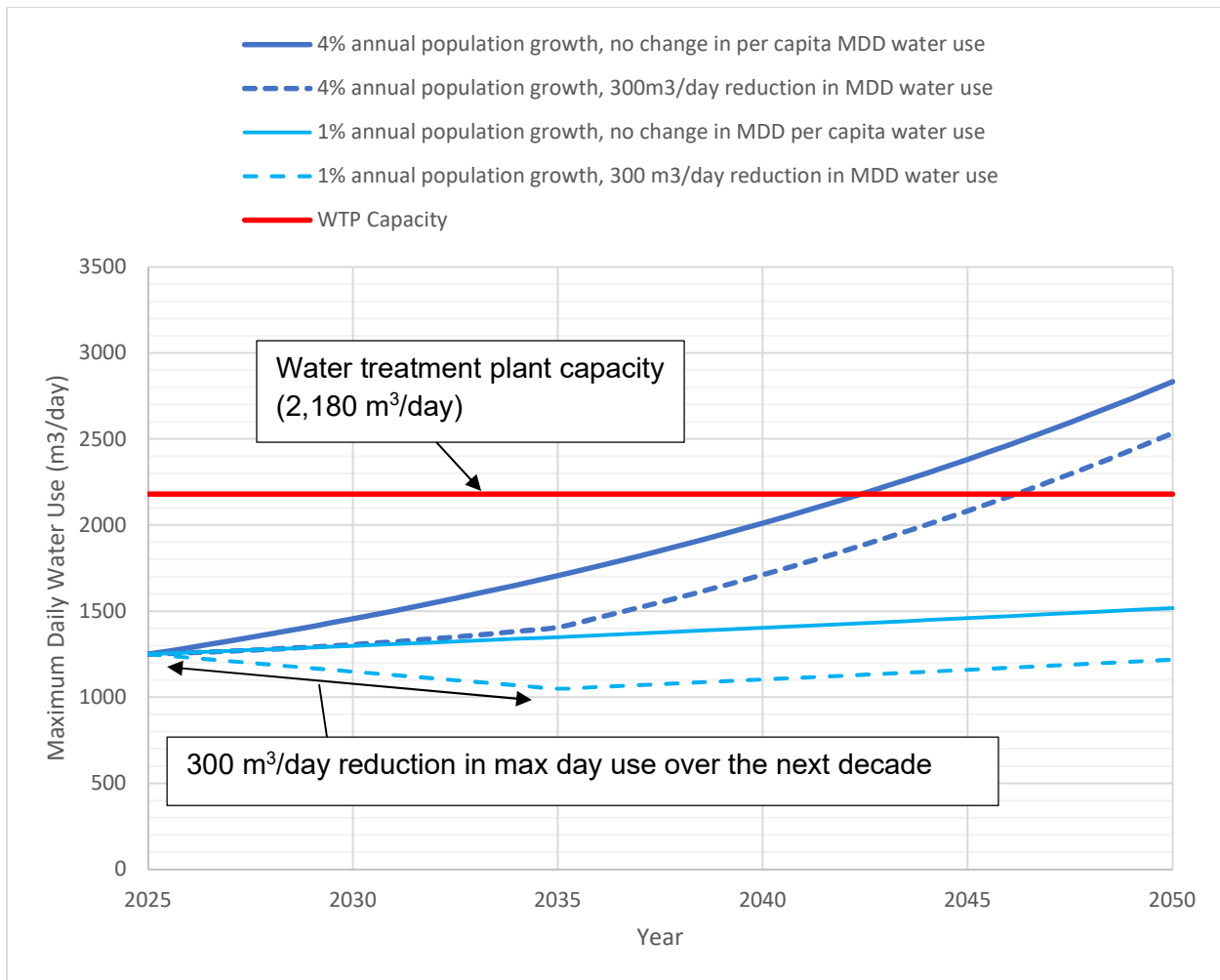


FIGURE 4-11: VILLAGE OF SLOCAN – FUTURE WATER USE SCENARIOS

As shown on Figure 4-11:

- If Village population increases at a rate of 4% per year, the theoretical capacity of the water treatment plant will be exceeded sometime in the next 17-21 years.
- If Village population increases at a rate of 1% per year, the theoretical capacity of the water treatment plant capacity will not be exceeded during the service life of the plant.
- The future peak summer water service population is not certain. Regardless, it is worth considering the impacts that maximum day water use has on the water system infrastructure – and acknowledging that a reduction in per capita water use can effectively ‘create’ water capacity for future growth in population, thereby deferring the need or reducing the size of infrastructure upgrades. This is important, since the Village is currently reviewing options for replacement of its water supply – improvements which could cost in excess of \$5,000,000.

4.4 Water Conservation Priorities and Goals

As described in previous sections, the Village of Slocan's water use is extremely high with consideration for the Village population. The Village's priority areas / key opportunities for water conservation are:

- **Water system leakage.** Leakage is estimated to be over 50% of the Village's annual water use. Reducing system leakage will not only result in a reduction in annual operating costs, it will also prolong the service life of key water treatment components such as the membrane filters.
- **Outdoor water use.** Outdoor water use is estimated to be 20% of the Village's annual water use. As shown previously on Figure 4-8, the Village's daily increase in water use in summer months is higher than most other communities in the region. Reductions to outdoor water use and peak day demands will have a direct impact on sizing and replacement costs of water supply infrastructure. This is extremely important to the Village, since the Village is actively reviewing options to replace its water supply.

Given the magnitude of the water usages noted above, and with consideration for the looming costs associated with future water supply infrastructure replacement, it would be prudent for the Village to set aggressive water reduction targets as follows:

- Reduce water system leakage by 80% or more. This would be equivalent to a reduction of $\sim 250 \text{ m}^3$ (55,000 Imperial gallons/day) in the base daily water use, resulting in water use through the winter months of around $200 \text{ m}^3/\text{day}$ (44,000 Imperial gallons/day).
- Reduce outdoor water use by 25% on peak summer days. This would be equivalent to a reduction of $\sim 200 \text{ m}^3/\text{day}$ on peak summer days.

Combining those two goals would reduce maximum day water use from $\sim 1,200 \text{ m}^3/\text{day}$ (265,000 Imperial gallons/day = existing) to $\sim 750 \text{ m}^3/\text{day}$ (165,000 Imperial gallons/day = target), which would have a significant impact on sizing and costs of future water supply infrastructure. These targets are based on the current population of 410 people.

5.0 Water Conservation Strategies

The BC *Water Conservation Guide* describes a process for identifying and assessing water conservation options. The assessment process includes consideration of:

- past experience; what worked and what didn't
- water savings and the reliability of anticipated savings
- cost effectiveness
- social and political acceptability

The *Water Conservation Guide* suggests that the assessment criteria list be kept short and the process kept as simple as possible. In this section, water conservation options are listed and a commentary provided on applicability to the Village of Slocan.

5.1 Past Water Conservation Initiatives

The Village of Slocan's *Water Smart Action Plan (2011)*⁴ was prepared through the Columbia Basin Trust's regional Water Smart Initiative. The Village's 2011 Action Plan included four broad objectives:

1. Develop a comprehensive leak detection and repair program that also addresses data gaps and unaccounted for water.
2. Reduce peak demand by building community awareness around current water demands and providing opportunities for residents to reduce indoor and outdoor water use.
3. Develop and implement new and innovative conservation policies that will result in reduced water use in both the short term and the long term.
4. Explore innovative options for providing untreated water for non-potable uses.

Those objectives were supported by numerous recommended actions and strategies. The Village made strides on several of the 2011 objectives in the years following that plan. But as described in this current water conservation plan, there is still much work to be done.

5.2 Future Water Conservation Options

There are a number of potential water conservation initiatives that can be considered by the Village. The sections below describe a number of water conservation options with a discussion of applicability to the Village. These are generally listed in order of priority for the Village. Implementing these measures could allow the Village to reduce costs for future infrastructure upgrades, save some money in annual operating and maintenance costs, reduce energy consumption, and reduce impact to the creek that supplies the community.

5.2.1 Water Loss Management: Leak Monitoring, Detection and Repair

Description

The BC *Water Conservation Guide* notes that water loss management can be one of the least expensive sources of water for a municipality. The Columbia Basin Trust's *Water Smart Initiative* highlighted opportunity for water loss management in many communities throughout the Columbia Basin area. This strategy can involve many tools, including water loss identification, system monitoring, minimum night-time flow monitoring, pressure management, and leakage management.

Slocan Context

As described in Section 4.1.4, water system leakage is estimated to be the largest 'consumer' of water within the Village. Leak monitoring, detection and repair should be the highest priority for the Village. This is recommended to include the following:

1. Calibration check potential followed by replacement of the 'distribution' flowmeter in the water treatment plant, to improve the accuracy of the water use data on flows to the community. The new flowmeter should be capable of low flow detection and include self-check diagnostics. The new flowmeter calibration should be checked to ensure the 4-20mA signal to the SCADA system is accurate.
Budget cost allowance = \$15,000.
2. Monitoring of night-time flows leaving the water treatment plant can be a useful tool for assessing trends throughout the year. In particular, night-time flows (ie. 1am to 5am) during 'shoulder' months like March and November can be particularly useful for checking for system leakage. The 'previous night flow total' should be added to the control panel display in the water treatment plant, so that information is readily available to operations staff.
Budget cost allowance = \$2,000.
3. Complete a system-wide leak detection survey. It is worth noting that this type of survey is limited to the Village watermains; water services are not assessed for leakage.
Budget cost allowance = \$20,000.

4. Identify and prioritize replacement of known problematic watermain types. Prioritization is expected to include all ~1,800m of galvanized steel and steel watermains (galvanized steel watermains are not only prone to leakage, but they also represent a risk to public health). The Village’s experiences with leak repairs have shown that the ~1,000m of smaller diameter polyethylene watermains have widespread leakage problems, and replacement of these watermains should be prioritized. Further, leakage repair history should be monitored and recorded for the ~1,300m of asbestos cement watermains; likely, these watermains will be reaching their service life limits within the next 10 to 20 years.
 - Step-testing can and should be used to assist in prioritization of the watermain replacement program. Step-testing involves temporarily shutting down sections of the water system and monitoring changes in water supply flow from the reservoir.
 - Implementation of a multi-year capital plan to replace the aging and failing watermains is anticipated to cost in the range of \$1,000,000 to \$5,000,000. The Village should review options to achieve these replacements, including seeking funding assistance from senior levels of government if appropriate grant funding becomes available.
5. In addition to reducing water system leakage, the Village should review options to reduce other water losses such as reducing water service bleeding (‘running a tap’ to prevent water service freezing during winter months). This could include a survey of residents to assess the extent of water service bleeding, followed by appropriate measures to reduce this occurrence. If water service bleeding is associated with absentee homeowners (ie. ‘snow birds’), some communities offer free water services shut-offs for the winter months.

5.2.2 [Water Use Bylaw](#)

Description

As noted in the CBT *Water Smart Initiative*, “*peak demand, typically driven by irrigation, presents the second largest water conservation opportunity for community water systems*”. One of the most commonly used regulatory measures to assist with water conservation during peak water use periods is *outdoor watering restrictions*, which limit the number of days and/or specify the timing of outdoor water use. These restrictions help to reduce peak day demand and prevent the system from reaching capacity on hot summer days. This strategy must be designed to include public education and enforcement of fines for violations. Fines can vary depending on how scarce water is in a particular region. For example, in Penticton violators face fines from \$25 to \$400, whereas in Calgary fines run up to \$1,000.

Slocan Context

The Village’s Water Regulation Bylaw #603, paragraph 12.8 states “Sprinkling restrictions may be enforced from time to time by the Village”, and paragraph 13.1 notes that lawn and garden sprinkling is only permitted from 7am to 9am and from 7pm to 9pm, from June 1st to September 30th. The Village of Slocan currently sends a reminder notice to residents at the start of each

irrigation season. The bylaw (paragraph 14.4) allows the Village to disconnect a water service for violation of regulations concerning watering or sprinkling. However, there is currently no enforcement of these sprinkling restrictions, and Village staff perspective is that the public generally does not comply with the sprinkling restrictions.

The Village's sprinkling restrictions should be updated and improved. The current expectations in the bylaw may be too restrictive, leading to general non-compliance. In addition, the enforcement clause may be perceived as overly punitive, which likely leads to a lack of enforcement by Village staff.

The Village should review similar sprinkling restriction requirements of other communities in the Kootenays, collaborate and seek feedback as needed. The Village sprinkling restrictions could be enhanced to describe where and how water can be used outdoors. In addition, a broader spectrum of escalating enforcement clauses should be introduced - including formal warnings, leading to fines, prior to water disconnects.

The Village should also consider supplementary actions to support the public in this endeavor, such as rebates or 'give aways' for garden hose / sprinkler timers to facilitate outdoor water use restrictions.

5.2.3 Public Education and Outreach

Description

A public information and outreach program is highly recommended. The *BC Water Conservation Guide* indicates that general information tends to be less effective than community or area specific information. Public education is beneficial on its own but can also be used effectively to support all other water conservation strategies. This type of program would explain:

- how each measure will promote water conservation;
- what are the specific benefits of the measures;
- what individuals need to do to participate; and
- why water conservation is important.

Slocan Context

As described in the *Water Conservation Guide*, communication of this Water Conservation Plan to the public is essential. A public education and outreach plan should be implemented and could include:

- postings to social media and on the Village's website under a "Water Conservation" heading;
- printed material insertions in the water billings and/or community newsletter; and,

- employment of a ‘water ambassador’ during summer months to help disseminate information to the public.

Water savings achieved by public engagement and communication are difficult to quantify. The USEPA *Water Conservation Plan Guideline*⁸ suggests that a 2 to 5 percent reduction in water usage is a realistic target range. There is also significant benefit to increasing the water conservation awareness of the public. The size of the public education program and cost dedicated to this initiative should consider the types of conservation strategies being employed. On its own, public education resulting in a 5% reduction in annual water use would save approximately \$1,000/year in water operating costs. However, as described in Section 4.2 and 4.3, the indirect benefits associated with reducing peak summer water use are far greater, since those maximum day water uses impact the costs of replacing the Village’s water supply infrastructure.

Ideally, public education should include discussion of an applicable water conservation strategy with an example of how the strategy can be implemented locally. This allows the public to gain a firsthand understanding of the benefits. As described in Section 4.4, the Village should strive to reduce outdoor water use. The public education program should be focused on this goal.

5.2.4 [Village Park Irrigation Monitoring and Optimization](#)

Description

As learned by the Columbia Basin Trust’s *Water Smart Initiative*, peak water demands are typically driven by outdoor irrigation and represent a large water conservation opportunity for community water systems. At the outset of a community water conservation program, there is benefit in a local government ‘leading by example’ in monitoring and altering water use at facilities over which it has direct control. Exploring options for community park irrigation services is a visible example which would have positive impacts for both water conservation and community engagement.

Slocan Context

Water use by Village parks is expected to be marginal (1-2% of the overall community water use), so data collection on water used by the parks would primarily be for public perception. Data collection would just be done once per year (each irrigation season). Installation of watermeters in chambers on the four (4) Village parks and green spaces connected to the potable water system is estimated to cost in the range of \$20,000 to \$30,000.

5.2.5 [ICI Metering and Major User Audits](#)

Description

Water utilities can work with larger water users to understand their water usage habits and opportunities for reducing their usage. When water meters are installed, the local government can review metering data and then contact the significant water users and offer assistance to undertake a comprehensive water audit with the objective of identifying potential water conservation opportunities. This type of program can be quite manageable for communities depending on the number of anticipated audits.

Slocan Context

Currently, there are no ‘metered’ water services on the Village water system. As learned by the Columbia Basin Trust’s *Water Smart Initiative*, “good data illuminates priorities”. The Figure 4-12 ‘pie chart’ shown earlier in this document is primarily based on estimates. Gathering water use data on any segment of the ‘pie’ will inherently reduce inaccuracies with all segments of the ‘pie’. There are 29 industrial, commercial, and institutional water services; installation of watermeters on this segment of the Village is estimated to cost in the range of \$30,000 to \$50,000 – which will be far less costly than gathering data from the residential segment.

Initially, watermeters would be installed solely as a data collection and feedback program (user audits), with watermeters read on a monthly basis. However, with time, the Village could consider using the metered data to implement a water use rate structure for the ICI services. That would also result in a more equitable rate structure for ICI services (as compared to the current ‘flat’ rate structure), since water usage often varies considerably from one ICI service to the next.

To reduce the potential future cost burden on the community associated with installation of watermeters, the Village should amend its building bylaw to require water meters on all new ICI water services.

5.2.6 [Universal Water Metering](#)

Description

The experience in British Columbia is that a universal water metering program can result in significant water use reduction both on an annual average and maximum day demand basis. A water metering program must however be combined with an appropriate volume-based rate structure to take full advantage of the opportunities available through a metering program. Some examples:

- Since the introduction of universal metering and volume-based rates between 1996 and 1998, residential average day water usage in the City of Kelowna has reduced by more than 20 percent compared to consumption prior to metering.

- As described in the Columbia Basin Trust Water Smart reporting, two communities - Rossland and Sparwood - have achieved consistent reductions in water use since completing their universal metering programs, resulting in 12 to 23% reduction in annual water use by 2015 as compared to their 2009 baseline data.

Slocan Context

Implementation of a universal water metering program in Slocan is possible. There is a substantial capital investment required to introduce universal metering - ranging from \$1,500 to \$5,000 per meter (depending on whether water meters are installed in homes, or in 'meter pits' at property line). In addition to the water meter installation cost, there is also a capital cost to setup a data collection system, and an ongoing cost to collect and utilize the data.

Implementation of a universal metering program can be challenging from a public perspective. Initially, the purpose of a universal metering program would be for data collection – to quantify and identify where water is being used (indoor vs outdoor). However, when watermeters are installed within homes, they do not collect information on whether leakage is occurring in the service between the watermain and the home. The economics of a universal water metering program are contingent on a number of factors, including the implementation of an appropriate usage-based rate bylaw. Given the costs associated with universal water metering, several of the other strategies described in this report should be implemented prior to considering universal water metering.

The Village could consider a voluntary residential water metering program. The purpose of a voluntary program would be to gather data and improve knowledge of residential water use. This could include installation of a representative number of water meters (10 or more) throughout the Village. Information gathered through a voluntary residential water metering program could be used to support a public education and outreach program (described in section 5.2.3).

5.2.7 Community Development Bylaws

Description

Community bylaws that promote water saving technologies or conservation are another common measure to reduce community water demands. To make these easier to enforce, they should be tied to a permit approval process. For example, water offset conditions can be added to building permits, requiring developers to prove any additional water demands for new developments will be offset by conservation improvements in existing homes or businesses. A community can also create landscaping bylaws that promote drought-tolerant landscaping or maintain a certain depth of topsoil – both of which reduce the need for outdoor water use. For example, the City of Kelowna requires applicants to develop mandatory landscaping standards that show a reduction in water use for permit approval. Changing the rules can help to literally build a water saving community.

Slocan Context

The 2020 *National Plumbing Code of Canada* and 2024 *BC Plumbing Code* both require low flow and low flush volumes for faucets, shower heads, and toilets. The Village of Slocan's *Building Bylaw #605, 2011* makes reference to the current BC Building Code, which includes the current plumbing code requirements.

Future development and growth within the Village of Slocan is not certain, but recent trends have shown significant growth rates. Accordingly, conservation efforts targeted at future development are expected to be worthwhile. In addition to the *Building Code* and *Plumbing Code* requirements for efficient plumbing fixtures, the Village could consider developing landscaping standards for incorporation into bylaw for future development.

5.2.8 Plumbing Fixture Replacement Program

Description

Today, there are many water saving technologies available - such as low-flow toilets, shower heads, sprinklers and appliances that use less water without impacting peoples' standard of living. A community can increase the uptake of these technologies through rebate or give away programs. In a rebate program, consumers are given money towards the purchase and/or installation of water saving technologies. In some cases, if the savings benefits are great enough, a community may choose to run a give away program – one in which free water saving technologies are distributed to reduce water demand. Providing installation services (professional or volunteer depending on the technology) are important to ensuring hardware is put to use. Rebate or give away programs can also be targeted to particular water users, such residential services.

Slocan Context

If the Village is interested in exploring plumbing fixture replacement options in the future, toilet replacements may offer the best return on investment as they make up a large portion of indoor water usage. The CBT report (*Evaluation of Community Water Conservation Efforts in the Columbia Basin 2009 to 2015*) notes that conversion from 13L flush toilets to 6L or less toilets can result in water savings of 50-75 litres per capita per day. Relative costs and savings for a toilet rebate program are summarized below. This assumes a rebate of \$100 per toilet, assumes no low flush toilets currently exist within the Village (unlikely) and assumes approximately 2 toilets per household or per business:

- Estimated Capital Cost (rebates): \$50,000
- Potential Annual Water Savings: 7,500 m³/year (3.5% water use reduction)
- Potential Annual Operational Cost Savings: \$750/year
- Potential 'Payback' Period on capital cost: ~70 years

6.0 Summary and Recommendations

The total annual water use by the Village of Slocan is excessive compared to its population. From 2019-2023 Slocan's per capita water use was 2.5 times higher than the BC provincial average, and higher than 12 out of 13 communities that participated in CBT's Water Smart initiative.

As described in Section 4.4, the Village's water conservation initiatives should prioritize reducing **water system leakage** and reducing **outdoor water use**. The Village should consider a number of water conservation initiatives to achieve those outcomes as described in Section 5.2. The priorities are as follows:








1. Water Loss Management: Leak Monitoring, Detection, and Repair (section 5.2.1).
2. Water Use Bylaw (section 5.2.2).
3. Public education and outreach (section 5.2.3).

Once those initiatives are underway, then the Village could expand its water conservation program as needed to gather data from specific water use 'sectors'. This will help the Village refine its future water conservation efforts.

4. Village park irrigation monitoring and optimization (section 5.2.4).
5. ICI watermetering and major user audits (section 5.2.5).
6. Voluntary residential watermetering (section 5.2.6)

An implementation schedule for these recommended water conservation initiatives is shown on Figure 6-1.

TABLE 6-1: VILLAGE OF SLOCAN - RECOMMENDED WATER CONSERVATION AND MANAGEMENT STRATEGIES

Strategy	Potential Water Savings	Focus for Outcome	Implementation Schedule									
			2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<ul style="list-style-type: none"> Water loss management. 		Technology										
<ul style="list-style-type: none"> Water use bylaw. 		Behavior change										
<ul style="list-style-type: none"> Public education and outreach. 		Technology & Behavior change										
<ul style="list-style-type: none"> Watermetering: Village parks, ICI sector, voluntary residential. 		Technology & Behavior change	