

DEMAND MANAGEMENT RESEARCH & PLANNINGSeptember 2024

Background

The management of the CRD (Capital Regional District) Regional Water Supply System has undergone a shift merely providing an adequate supply of water to incorporate demand management and the active promotion of responsible water use, thereby enhancing the sustainability and quality of the existing supply.

The program takes an analytical approach (e.g., research, data and analysis) that complements the water conservation strategy (e.g., bylaw, outreach, education) to support stakeholders (e.g., water purveyors and residents, businesses and institutions) in understanding current and future water supply and demand, effects from climate change, and how to achieve efficient water use. Currently, targeted outreach and education informed by research and data analysis of regional water use trends are the focus of the program.

The demand curve, which illustrates the total regional water use each year, is influenced by several factors, including population growth, climate change, changes in land use, replacement and densification of the existing housing stock, new industries and commercial developments, technology changes, and population variation from seasonal tourism. The program seeks to understand the temporal and spatial variations in the demand curve and to examine the effect of various strategies on demand over time.

The research and planning component to the Demand Management program seeks to understand how, when and where water is being used, which then informs the water conservation strategy. Data analysis and monitoring trends also contribute to our understanding of the timing and need for a new supply system infrastructure.

In order to support the regional water service, the program has several key objectives:

- 1) undertake research both on the who/what/where/when of water use in the region and track the demand curve, including an explicit recognition of within-region variability (i.e., between local governments) and variability over time
- 2) develop strategies and tools to encourage water conservation
- 3) forecast the demand curve into the future
- 4) promote water conservation across the region to achieve lower possible per capita water consumption while recognizing other regional priorities related to food security and tourism, etc.
- 5) educate our customers and stakeholders on the predicted water supply versus demand curves over time; and
- 6) work with internal departments to inform and support long-term strategic planning for the regional water supply service

To achieve these objectives, the program focuses resources on the sectors and initiatives likely to result in the most immediate and cost-effective reductions in water use. The program uses an adaptive approach that adjusts resources and targets programs in response to observed trends in water use.

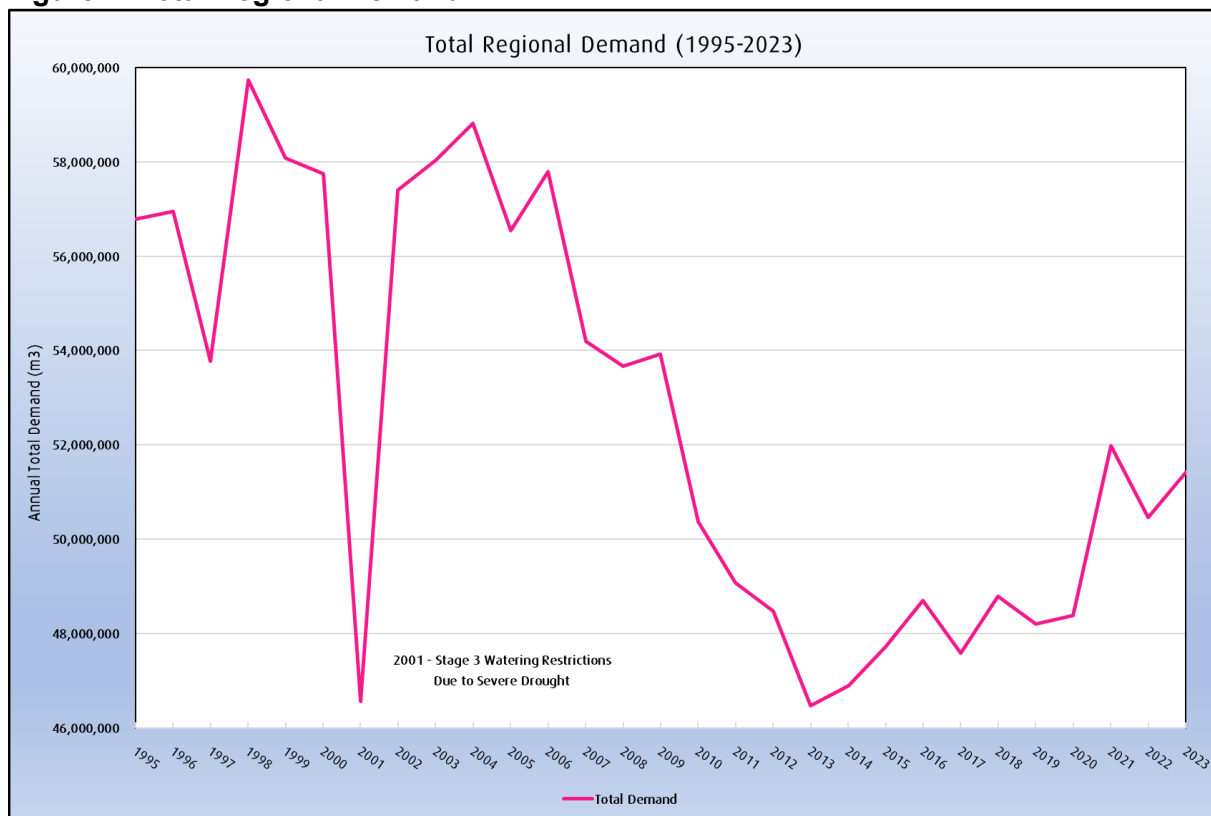
Current Demand Trends in the Region

Like most North American utilities, total regional demand has steadily decreased for about 20 years (Figure 1) since the late-1990s due to advancements in water efficiencies and conservation efforts. Beginning around 2018, total regional demand began to plateau and, in recent years, appears to show a slight increase.

The primary drivers of increasing demand are population growth and climate change (more frequent and extreme heat events and prolonged droughts leading to more outdoor watering), but other factors, such as complacent water use behaviours and a lack of conservation messaging, may also be influencing demand upward.

Total regional demand reached its lowest point in 2013 and has shown an increasing trend to present. Total regional demand increased by +2% between 2022 and 2023, and the three-year average is an increase of +2%. This indicates that population growth, increased watering in response to weather conditions, and possibly behaviour changes, such as complacency, are beginning to overtake ongoing water conservation efforts and advancements in water efficiency.

Figure 1. Total Regional Demand



Like total regional demand, per capita demand had also shown a decreasing trend since the mid-1990s (Figure 2). However, since approximately 2017, regional per capita demand shows a levelling out trend that has begun to increase slightly in recent years. Regional per capita demand has fluctuated around 340 litres per capita per day and increased +2% between 2022 and 2023, and the three-year annual average is an increase of +3%. This increase is slightly greater than

the regional population growth rate of +1.6%, meaning regional water demand is slightly outpacing population growth. This indicates a shift in water use behaviour in the region, which may be partially driven by increasingly longer, drier summers.

Demand Management efforts began in the mid-1990s, and by the early 2000s, decreases in demand were largely driven by improvements in water efficiencies in household fixtures and appliances, such as low-flow toilets and high-efficiency washing machines, as well as financial incentives in the form of rebates. In more recent years, decreases in demand have been driven by ongoing conservation messaging and targeted outreach.

Figure 2. Historical Proportional Regional Demand by Land Use Categories

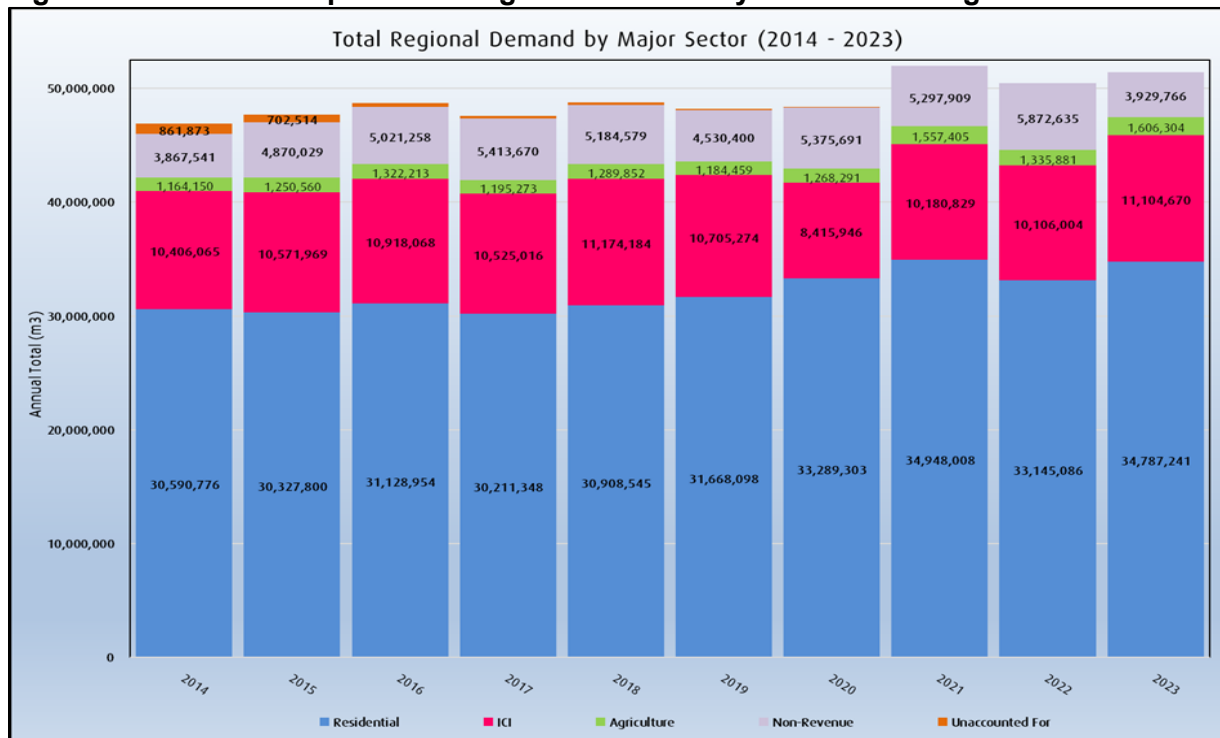
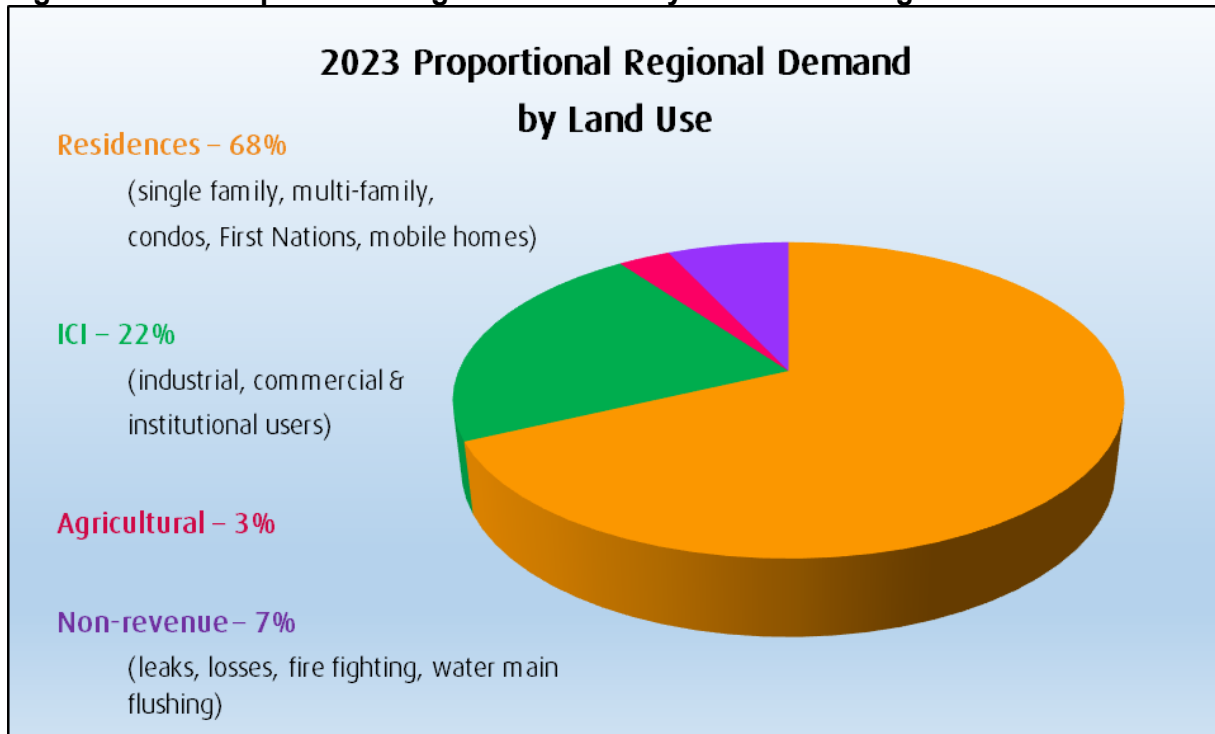


Figure 3. 2023 Proportional Regional Demand by Land Use Categories



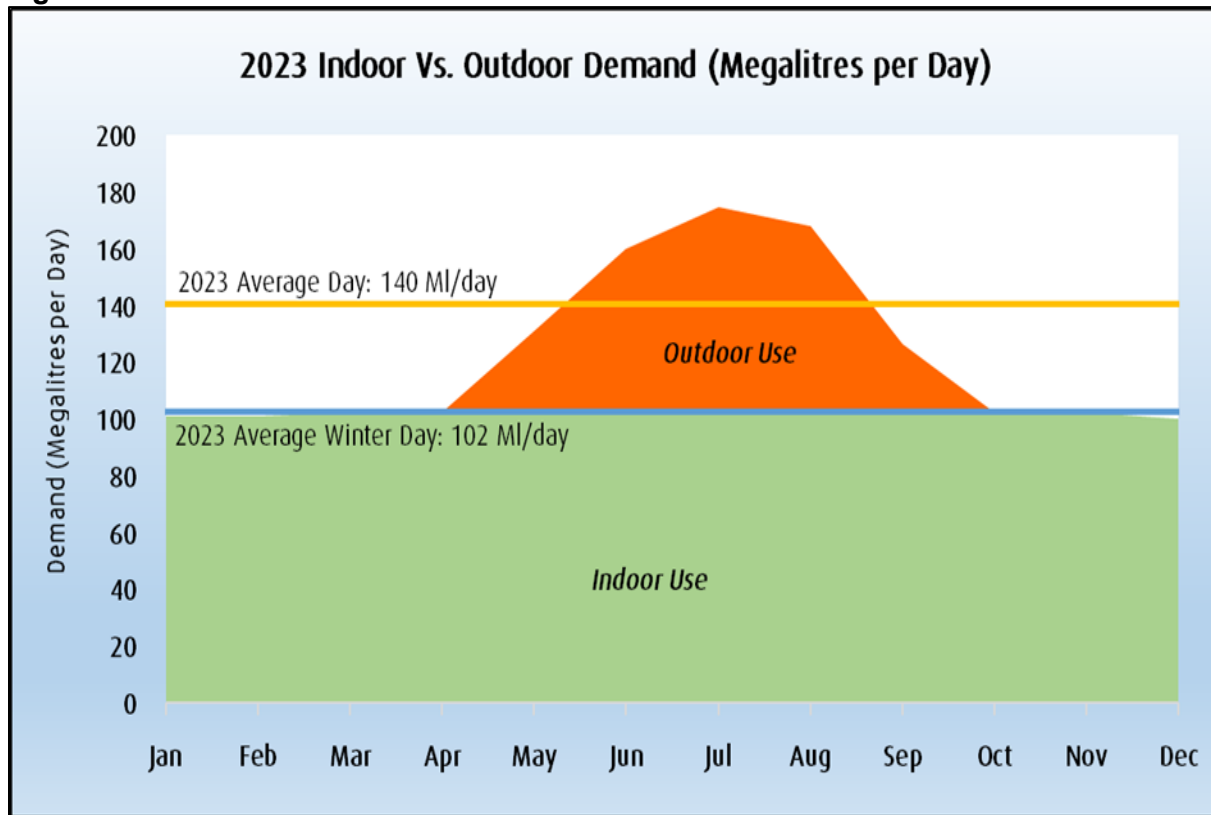
Residential demand accounts for the majority of water use at 68% of total demand, while the ICI sector comprises 22% of total demand.

Agricultural demand has remained proportionately at 3% of total demand for many years. While this sector is overall still a small water use category in the region, it has seen growth on this small scale in terms of volume used year over year. In 2023, the volume of water for agricultural use was +16% greater than the previous three-year average. The agricultural sector has grown ~10%/year since 2019 and is therefore one of the fastest growing water demand sectors in the region. Increasing demand in the agriculture sector is likely due to small increases in active farming, coupled with more irrigation due to more frequent and extreme heat events and recent drought conditions.

The non-revenue (e.g., water main flushing, fire fighting, leaks and breaks/repairs) demand proportion, the difference between the bulk water sales to the municipalities and their retail water sales, averaged 10% over the previous three years and comprised 7% of total demand in 2023. Annual water main flushing of CRD water distribution mains, which is done to maintain good water quality and to maintain infrastructure, accounts for approximately 0.3% of total demand per year. A review of comparable utilities in the Pacific Northwest revealed that non-revenue demand proportions are typically in the range of 11-18%. However, a reduction of water loss through leaks, which is a discretionary non-revenue demand, is part of asset management best practices and should be addressed by all regional water purveyors.

Seasonal Demands

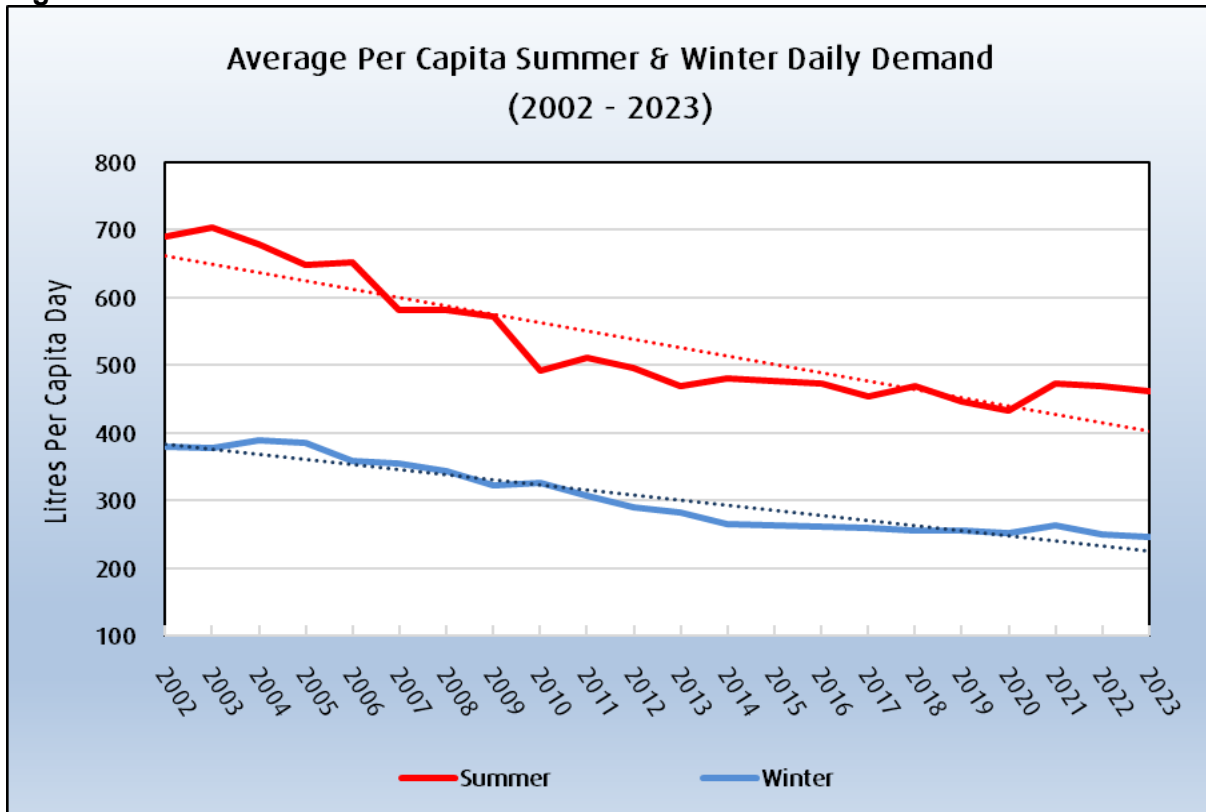
Figure 4. Indoor vs. Outdoor Demand



Summer demand is approximately 40% higher than winter demand (Figure 4). Outdoor demand typically begins in May and extends through September. In hotter years, outdoor demand can begin earlier and extend later into the fall. Typically, November and December are the region’s wettest months when we rely on rain to fill the Sooke Lake reservoir.

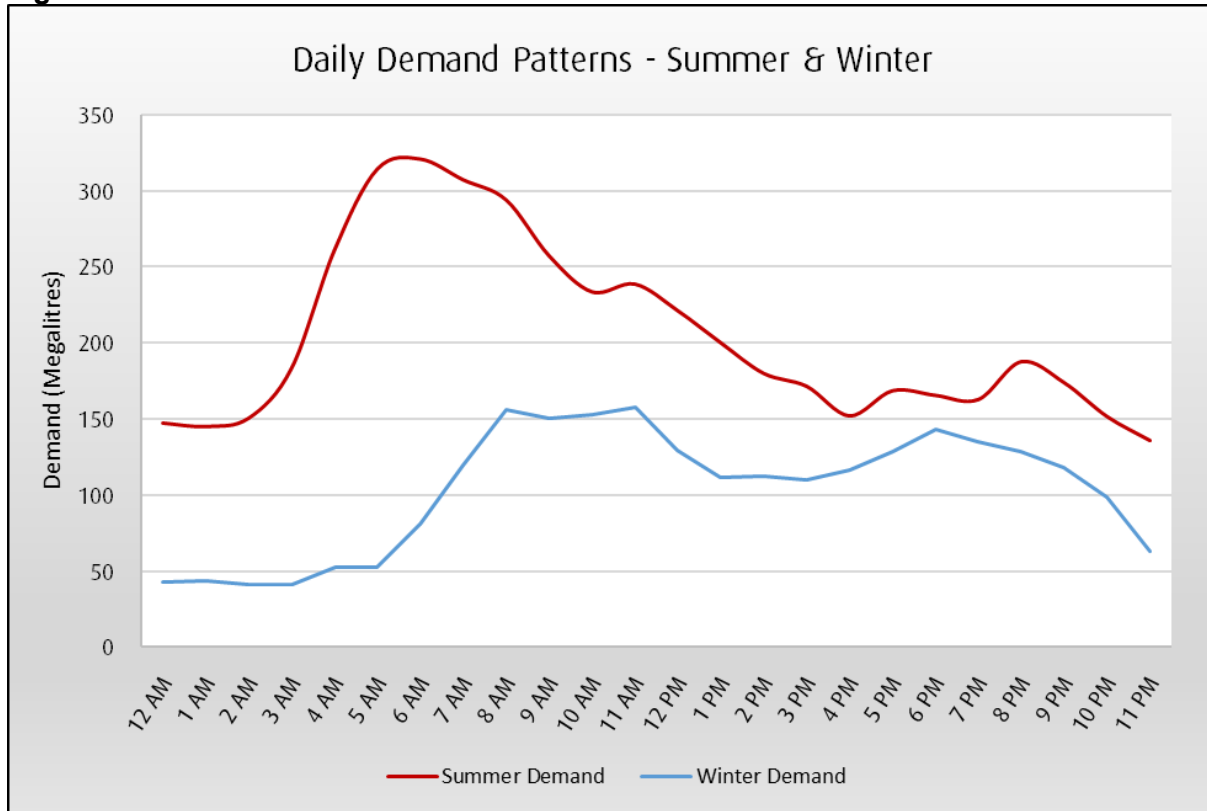
Similar to total per capita demand, both summer and winter demands have exhibited a declining trend, followed by a plateau and more recently an increasing trend (Figure 5). Winter demand is considered to be the base demand because it is very predominately indoor water use. The increasing trend in winter demand indicates that reductions in demand from water efficiencies and conservation activities may have achieved their maximum effectiveness at reducing demand.

Figure 5. Seasonal Demand



Peak Demands

Figure 6. Peak Seasonal Demands



Reducing peak demands is a key objective of the regional service. Decreasing peak daily and instantaneous demands reduces the impacts to the water disinfection and conveyance systems, protects water quality and will extend the life of existing infrastructure.

Peak demands are observed as spikes in the morning and evening (Figure 6). Summer peak demands occur earlier in the morning than in winter due to summer irrigation. Peak demands during the summer often occur on the top of the hour on watering days (e.g., peaks occur at 4 am, 5 am, 6 am), indicating that irrigation systems are being programed to begin watering at those times. While those times are within the allowable watering periods, the instantaneous demand for water all at one time presents a challenge for infrastructure to meet that demand and also has the potential to stir up sediments in the supply system, leading to water quality issues.

The *Water Conservation Bylaw* was amended in April 2024, to include a wider range of watering times for programmable irrigation systems to be set to. The intent is to reduce the instantaneous demands that occur on the top of the hour on watering day mornings and to spread out the demand from irrigation systems over a larger window. Lawn watering using irrigation systems is now allowed from 12:01 am to 10:00 am on the historically assigned watering days for all addresses on their specified watering days during the watering bylaw period (May 1 to September 30). Furthermore, outreach and education are underway, targeting irrigation professionals to encourage them to choose a start time that doesn't fall on the top of the hour (e.g., 1:13 am, 2:46 am, 9:09 am etc.).

Future Regional Development and Per Capita Demands

The program will investigate the variability across the region in growth rates, urban planning and housing stock and their impacts on per capita and overall water demand.

Annual growth rates in some municipalities (Victoria & Esquimalt +2%, Sooke +4%, Colwood, Langford & View Royal +5%) are significantly higher than the regional annual growth rate (+1.6%). We continue to assess changes in per capita demands related to increasing densification and potential decreases in outdoor water demands resulting from smaller yards and less irrigatable area. Data will continue to be collected and analyzed to assess and identify trends.

The current total regional per capita demand is approximately 340 lcpd. Staff will continue to refine this value, with inter-regional and year to year variability and update projections on a regular basis. Water consumption is dynamic both in the short-term and long-term and it will be a main focus of the program to accurately quantify current demand and predict future demand.