

DEMAND MANAGEMENT PLANNING
June 2019

PROGRAM

The demand management program will include:

- Demand Management Planning – responsible for the research and data analysis on regional demand; providing feedback to water conservation initiatives.
- Water Conservation Strategies – develop and deliver various water conservation strategies for the Institutional/Commercial/Industrial/Agricultural/Residential sectors using a variety of tools (e.g., outreach, education, programs, projects, campaigns, model bylaws, best management practices, bylaws, and rebates, when applicable).
- Integrated Water Services engineering and operational programs – supporting water loss management, short-term infrastructure planning, and long-term strategic planning.

This appendix will focus on the recent research initiatives of the planning function.

PLANNING/RESEARCH

Water demand curves are typically a function of population growth and per capita consumption and are essential for evaluating water system capacities (Figure 1). While the total demand comprises various water use categories, such as residential indoor and outdoor usage and industrial/commercial/institutional (ICI) uses, it is also subject to seasonal variations, impacts from climate change, land use change, urban densification, seasonal tourism and the effects of water conservation measures. For example, improvements in water efficiencies for appliances and household fixtures reduces water use as the building stock is replaced and upgraded.

The demand management program aims to understand who is using our water (when, where) and how much is being used (daily, seasonally, annually). Understanding the regional demand aids the CRD in influencing how water is being used and predicting how much is likely to be consumed in the future. It also allows staff to plan and prepare for operational/capital upgrades and with infrastructure and strategic planning for the region.

OBJECTIVES

Evidence-based data and research will enable the CRD to understand the current demand, as well as forecast future demand and its impact on critical water supply infrastructure. Understanding how and where water is used in the region is critical for effectively manipulating/reducing demand to effectively manage and utilize our regional water supply infrastructure.

The research will inform strategic planning, short-term infrastructure planning in both the regional and municipal distribution systems, and water conservation strategies across all land use sectors.

Research and data analyses will also inform water quality oversight related to daily and long-term treatment capacity. Water demand varies significantly across the 24-hour daily period (e.g., early morning, evening peaks), as well as seasonally, with increased summer demand through warmer weather. Integration of treatment capacity and demand analysis will allow operators to manage the treatment functions to ensure stable, potable water quality.

STRATEGIC PLANNING

Research and data analysis will inform the critical question of when demand will meet current supply. At some point, CRD staff will expect the summer demand to exceed the current storage capacity of the Sooke Lake Reservoir. The Goldstream Reservoir system has a smaller finite capacity to support the main storage and, at some point in the future, the Capital Regional District (CRD) will need to consider options for increased overall supply. The Leech River watershed provides that potential supplemental source, as does the development of the Sooke Lake Reservoir's deep north basin but the planning to design and build any infrastructure to manage the use of these sources relies on the timeline predicted by the demand management modelling.

INFRASTRUCTURE PLANNING

Short-term considerations in infrastructure planning include distribution system expansion, storage capacity in the distribution system, water quality treatment capacity, and flushing programs. Research and data analyses will focus on tracking and forecasting peak demands, as well as system hydraulic capacity versus peak flows to identify ways to reduce peak flows to extend the life of supply mains, pumps and valves.

OPERATIONAL SUPPORT

Demand management will impact on flushing programs, timing of reservoir volume replacements, and pressure management through the distribution system. The development of demand curves, reviews of peak demand and forecasting consumption will assist operational staff to anticipate and plan for operational challenges and future capital needs.

WATER QUALITY

Reducing per capita demand can limit the reservoir draw-down during the summer season, which affects water temperature and lake stratification, reduces stress on Sooke Lake Reservoir as an ecosystem and, therefore, positively affects the overall source water quality. Larger supply and distribution reservoirs may be needed to manage peak flows if demand increases, which has water quality implications resulting from long attenuation times in those reservoirs during low-use periods (winter months). Increasing peak flows also have the potential to impact disinfection effectiveness.

CONSERVATION & OUTREACH

The water conservation programs are designed to reduce demand through critical periods. Research and data analysis will provide information and direction for targeted conservation programs and examine the efficacy of these programs to achieve their objectives.

CURRENT DEMAND

Water use varies by municipality and seasonally. As seen in Figure 2, consumption increases dramatically once the weather warms, usually beginning in May, and then drops from the summer peak (July-August) to the winter low-use period (November-February). Use patterns also differ spatially; for example, the municipalities on the Saanich Peninsula hold the majority of the agricultural and food production properties, while increasing densification in the Western Communities and Victoria results in higher total residential water use in those areas. Along with the typical higher demand in the summer due to outdoor water use, the seasonal influx of tourists

exerts additional pressure on our system. Figure 3 illustrates the difference between consumption in the summer and winter periods compared to the average use.

Key factors for demand management predictions are population, per capita use and storage volumes. Currently, regional population growth is approximately 1% annually and per capita use still appears to be declining, albeit at a slower rate of approximately 1-1.5% annually, resulting in an overall reduction in total water demand (Figure 1). A comparison of the CRD's per capita use to BC and national statistics indicates our regional total and residential use are below the provincial and national averages.

Figure 4 shows the majority of regional water use is residential (65%), followed by ICI (23%), agricultural (3%) and leaks and losses (8%). Agricultural water use is greater than the majority of ICI sectors, but is matched by Hotels and Schools & Research Facilities. Retail & General Sales is the largest use sector (6%). Leaks and losses are sufficiently low that the distribution system is considered relatively "tight", with up to 10% being a generally accepted industry standard for water system losses.

Peak hour demand remains well below the treatment plant capacity. The peak hour demand is largely driven by the watering times stipulated under the Water Conservation Bylaw and typically occurs on Wednesday and Thursday mornings during July and August.

Available water in Sooke Lake Reservoir is limited by the lake's bathymetry and by the expectation to operate within an ecologically sustainable maximum draw-down range. The Reservoir has also reached maximum capacity in most years since the last dam expansion project. Water demand is highest in the summer months and Sooke Lake recharges only during winter months, making the summer months the critical period for available source water capacity. Staff have completed initial demand predictions with the available data and current uncertainty for population growth and reductions in per capita water consumption. Assuming a population increase of 1%/year and a relatively stable per capita consumption rate, regional demand can be satisfied until approximately 2050. Assuming a decline in per capita of 1% based on historic trends, regional demand may be extended to ~2070. With an assumption of more aggressive per capita consumption declines in the 2-3% range, water demand will likely exceed current supply storage around 2100. These values also assume the reservoir is fully replenished with winter rainfall at least every second year.

OUTSTANDING INFORMATION

Additional information and stronger conclusions can be drawn from available and new research. Continued and refined data gathering and evaluation will be done to better understand the impact of climate change, refine uncertainty around population estimates and potential ability to impact the per capita water consumption rate through research in the ICI sectors' usages, residential trends and agricultural demand. The program will also look at the seasonal influence from tourism and increasing summer demands, as well as developing reasonable and achievable consumption targets for our region. We will also invest in state-of-the-art forecasting tools to better predict trends and to develop robust demand forecasting models.

NEXT STEPS

Data analysis and research will continue to generate information that will expand the CRD's understanding and strengthen projections. Conservation and outreach initiatives will be adapted in response to water use trends. Water use targets will be identified that will help residents and

businesses with setting goals. Water conservation initiatives will be evaluated for their effectiveness and compared with forecasts. We will also provide annual program updates to this Commission.

Figure 1: Per Capita Demand – Current and Projected

Figure 2: Monthly and Annual Average Consumption

Figure 3: Seasonal Demand

Figure 4: Water Use in the CRD

Figure 1: Per Capita Demand – Current and Projected

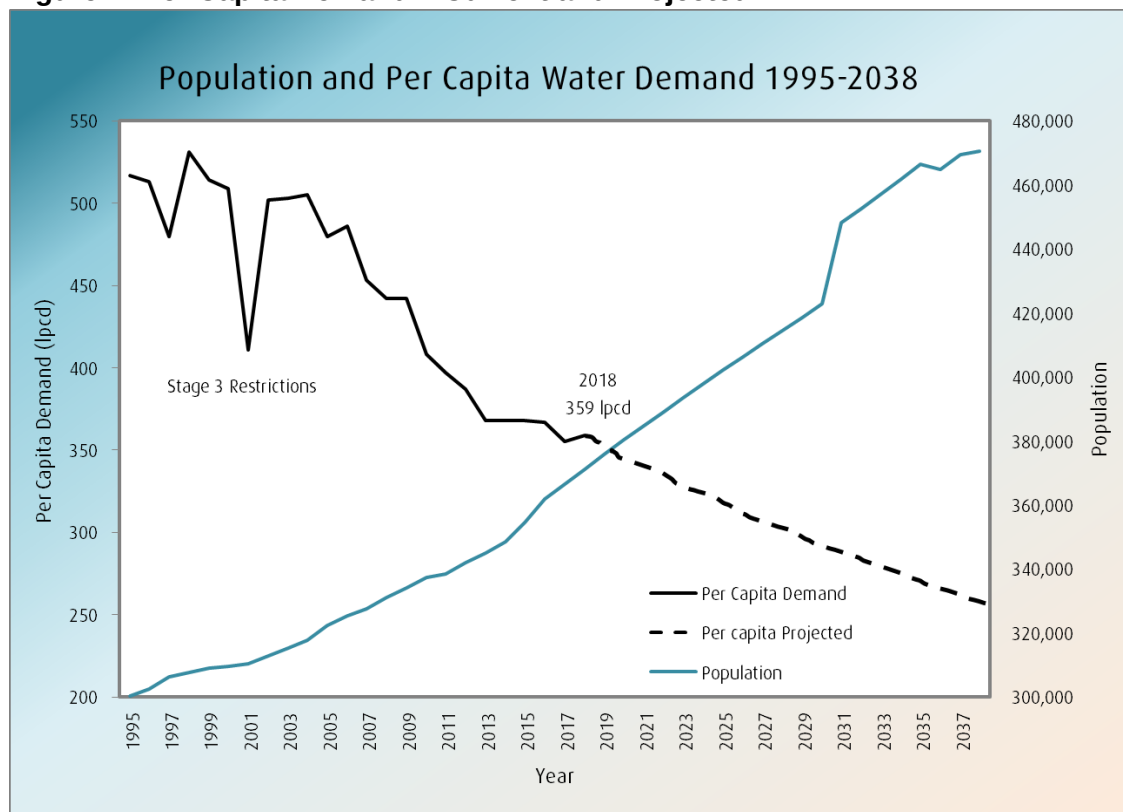


Figure 2: Monthly and Annual Average Consumption

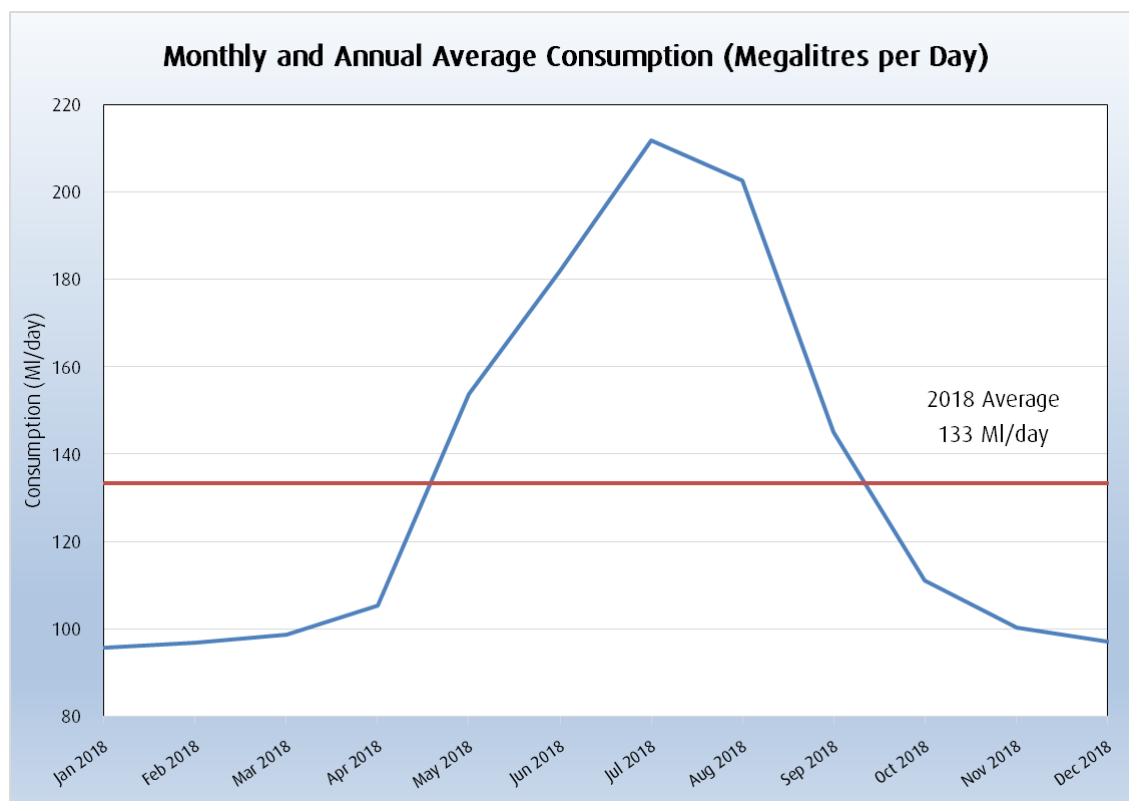


Figure 3: Seasonal Demand

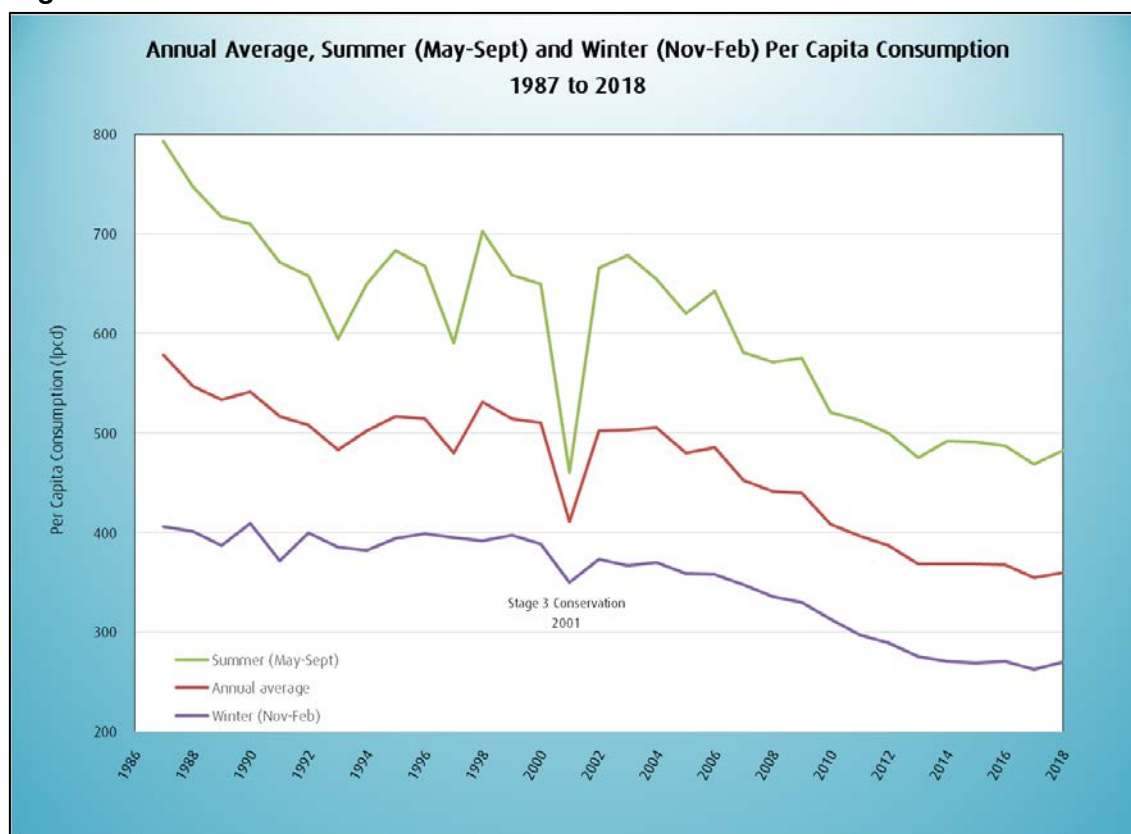


Figure 4: Water Use in the CRD

