metrovancouver

Greater Vancouver Water District

Water Supply System 2023 Annual Update

March 2024

Jericho Reservoir

Indigenous Territorial Recognition

Metro Vancouver acknowledges that the region's residents live, work, and learn on the shared territories of many Indigenous peoples, including 10 local First Nations: qićəýʼ (Katzie), q̓ʷɑ:ńƛ̓əń (Kwantlen), kʷikʷəƛ̓əm (Kwikwetlem), máthxwi (Matsqui), xʷməθkʷəy̓əm (Musqueam), qiqéyt (Qayqayt), seʼmyaʼme (Semiahmoo), Sḵwx̱wú7mesh Úxwumixw (Squamish), scəẃaθən məsteyəxʷ (Tsawwassen) and səlilwətaɬ (Tsleil-Waututh).

Metro Vancouver respects the diverse and distinct histories, languages, and cultures of First Nations, Métis, and Inuit, which collectively enrich our lives and the region.

About Metro Vancouver

Metro Vancouver is a diverse organization that plans for and delivers regional utility services, including water, sewers and wastewater treatment, and solid waste management. It also regulates air quality, plans for urban growth, manages a regional parks system, provides affordable housing, and serves as a regional federation. The organization is a federation of 21 municipalities, one electoral area, and one treaty First Nation located in the region of the same name. The organization is governed by a Board of Directors of elected officials from each member jurisdiction.

4515 Central Boulevard, Burnaby, BC, V5H 0C6
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EXECUTIVE SUMMARY

The *Greater Vancouver Water District Water Supply System 2023 Annual Update* report summarizes key initiatives undertaken in 2023 by the Greater Vancouver Water District, operating under the name Metro Vancouver. In 2023, Metro Vancouver undertook water system risk mitigation, water conservation, water quality sampling and testing, and maintenance activities to continue to meet service objectives. Capital projects were undertaken to maintain and upgrade the existing infrastructure, increase resiliency, and accommodate regional growth.

This report was prepared following the Ministry of Health's (the Ministry) *Guide for Communicating with Water Users*.

Report Background

The purpose of the report is to remain aligned with the communication requirements stipulated in the provincial *Drinking Water Protection Act* and *Drinking Water Protection Regulation*. As a water supplier regulated under this legislation, Metro Vancouver communicates with water users on topics defined within associated guidance.

The Ministry has developed the *Guide for Communicating with Water Users* to create a standardized approach to stay aligned with the legislated communication requirements. By completing the *Greater Vancouver Water District Water Supply System 2023 Annual Update* report, Metro Vancouver aligns with the Ministry's direction. This report provides transparent and proactive communication with water users. It also promotes public awareness and involvement in the drinking water program, one of the six elements of Health Canada's *Multi-Barrier Approach to Safe Drinking Water*.

Report Summary

Metro Vancouver's drinking water comes from rainfall and snowmelt in three protected water supply areas. The water supply areas provide a source of drinking water for over 2.8 million residents in the region. Rain and melting snow flow into three main reservoirs; Capilano, Seymour, and Coquitlam. The water is then treated at either Seymour Capilano Filtration Plant or Coquitlam Water Treatment Plant and distributed, wholesale, to member jurisdictions within the region via over 520 kilometres of transmission mains, 19 pump stations, 27 in-system storage reservoirs, and eight re-chlorination stations. Member jurisdictions then distribute the water to residents and businesses via their local distribution system. This water is tested throughout the system to ensure that high-quality drinking water is distributed to member jurisdictions. Metro Vancouver maintains, upgrades, and builds infrastructure to ensure its ability to continue providing high-quality drinking water to meet the current and future needs of a growing region.

Key initiatives undertaken by Metro Vancouver in 2023 included the following:

Water Quality Sampling and Testing:

- Conducting over 165,000 tests of drinking water through the *Water Quality Monitoring and Reporting Plan for Metro Vancouver and Member Jurisdictions*; the results of which can be found in the *GVWD 2023 Water Quality Annual Report*.

Water System Risk Mitigation:

- Auditing the *Quality Management System for Drinking Water Operational Plan* and conducting long-term water supply infrastructure planning to mitigate risks to the drinking water system.

Water Conservation:

- Tracking, monitoring, and analyzing drinking water demand for each of our members. The highest peak day consumption in the summer of 2023 was 1.56 billion litres, which was recorded on Wednesday, July 5, 2023.
- Promoting water conservation through the We Love Water Campaign and the Water Wagon Program.
- Rolling out communication and education related to the *Drinking Water Conservation Plan* (DWCP), which sets water use restrictions.
- Managing the Summer Support Program to assist member jurisdictions in the monitoring and enforcement of the DWCP.
- Moving to Stage 2 of the DWCP on August 4, 2023.

Financial Planning:

- Total water sales of $345 million with seasonal bulk water rates intended to incentivize members to control demand in the high demand season.
- Progressing the development of a new development cost charge for regional water infrastructure. The concept of funding regional water infrastructure through development cost charges was a Metro Vancouver Board priority (2019-2022) and is a critical component of the long-term financial plan.

Water System Management:

- Producing the *State of the Assets Report – Water Services* as part of the Asset Management Program.
- Conducting annual maintenance projects, including the cleaning of eight in-system reservoirs, completing 72 detailed condition assessments, performing 4,887 preventative maintenance work orders, and conducting thousands of asset inspections, rehabilitation, and replacement activities to ensure the existing infrastructure continues to perform as required to meet service objectives.
- Completing the construction of the deep vertical shaft on the south side of the Fraser River and commencing the north shaft construction for the Annacis Water Supply Tunnel.
- Completing the installation of steel water mains inside the Second Narrows Water Supply Tunnel under Burrard Inlet, between North Vancouver and Burnaby, to increase the reliability of supply in the event of a major earthquake as well as to provide additional long-term supply capacity.
- Completing the seismic upgrade of the Pebble Hill Reservoir Units 1 and 2 to withstand and remain in operation during a major earthquake.
- Commencing construction of the Capilano Raw Water Back-up Power system to maintain water delivery to the Seymour Capilano Filtration Plant in the event of a power outage.

ACRONYMS

BC	British Columbia
BL	Billion Litres
CWTP	Coquitlam Water Treatment Plant DBPs
DCC	Development Cost Charge
DWCP	Drinking Water Conservation Plan
ERP	Emergency Response Plan
GVWD	Greater Vancouver Water District
ha	Hectares
km	Kilometres
LSCR	Lower Seymour Conservation Reserve
m	Metres
ML	Million Litres
MLD	Million Litres per Day
QMSDW	Quality Management System for Drinking Water
SCFP	Seymour Capilano Filtration Plant
SSP	Summer Support Program
UOCG	Utility Operational Coordination Guide
UV	Ultraviolet
WSEMP	Water Services Emergency Management Plan

1. INTRODUCTION

1.1 Purpose

As a water supplier regulated under BC's *Drinking Water Protection Act* and *Drinking Water Protection Regulation*, Metro Vancouver is required to communicate with water users on various topics defined in the legislation. This report was prepared following guidance from the Ministry of Health's *Guide for Communicating with Water Users*.

The purpose of the *Greater Vancouver Water District Water Supply System 2023 Annual Update* is to proactively communicate with member jurisdictions and the public by providing an annual update on the drinking water supply system. Through this report, Metro Vancouver seeks to promote public awareness of the drinking water program, which has been identified as one of the components of the *Multi-Barrier Approach to Safe Drinking Water* by Health Canada.

1.2 Greater Vancouver Water District

The *Greater Vancouver Water District* (GVWD) was created and constituted under the provincial statute, the *Greater Vancouver Water District Act*, to supply drinking water to member jurisdictions within the region. The GVWD is governed by an administration board (the Board) consisting of representatives from the member jurisdictions of the GVWD. The Board appoints a Commissioner (the GVWD Commissioner) who provides management and oversight of the activities of the GVWD.

The GVWD membership consists of 18 municipalities, one Electoral Area, and one Treaty First Nation. The GVWD, working together with its members, plans for and delivers regional-scale drinking water services to approximately 2.8 million people. Table 1 shows the list of member jurisdictions that are supplied water from the GVWD.

Greater Vancouver Water District Member Jurisdictions

Village of Anmore

Village of Belcarra

City of Burnaby

City of Coquitlam

City of Delta

Electoral Area A

City of Langley

Township of Langley

City of Maple Ridge

City of New Westminster

City of North Vancouver

District of North Vancouver

City of Pitt Meadows

City of Port Coquitlam

City of Port Moody

City of Richmond

City of Surrey

sc̓əw̓aθən məsteyəxʷ (Tsawwassen First Nation)

City of Vancouver

District of West Vancouver

Table 1: Member Jurisdictions

Metro Vancouver is responsible for the following:

- Protecting the water supply areas
- Storing, treating, and ensuring the quality of the water
- Supplying water to member jurisdictions
- Upgrading, maintaining, and expanding the system
- Promoting water conservation
- Planning for the future to meet the drinking water needs of the growing population
- Ensuring the region's resilience in the face of unpredictable annual impacts of climate change

Metro Vancouver and its members work together to supply high-quality drinking water to the region's businesses and 2.8 million residents.

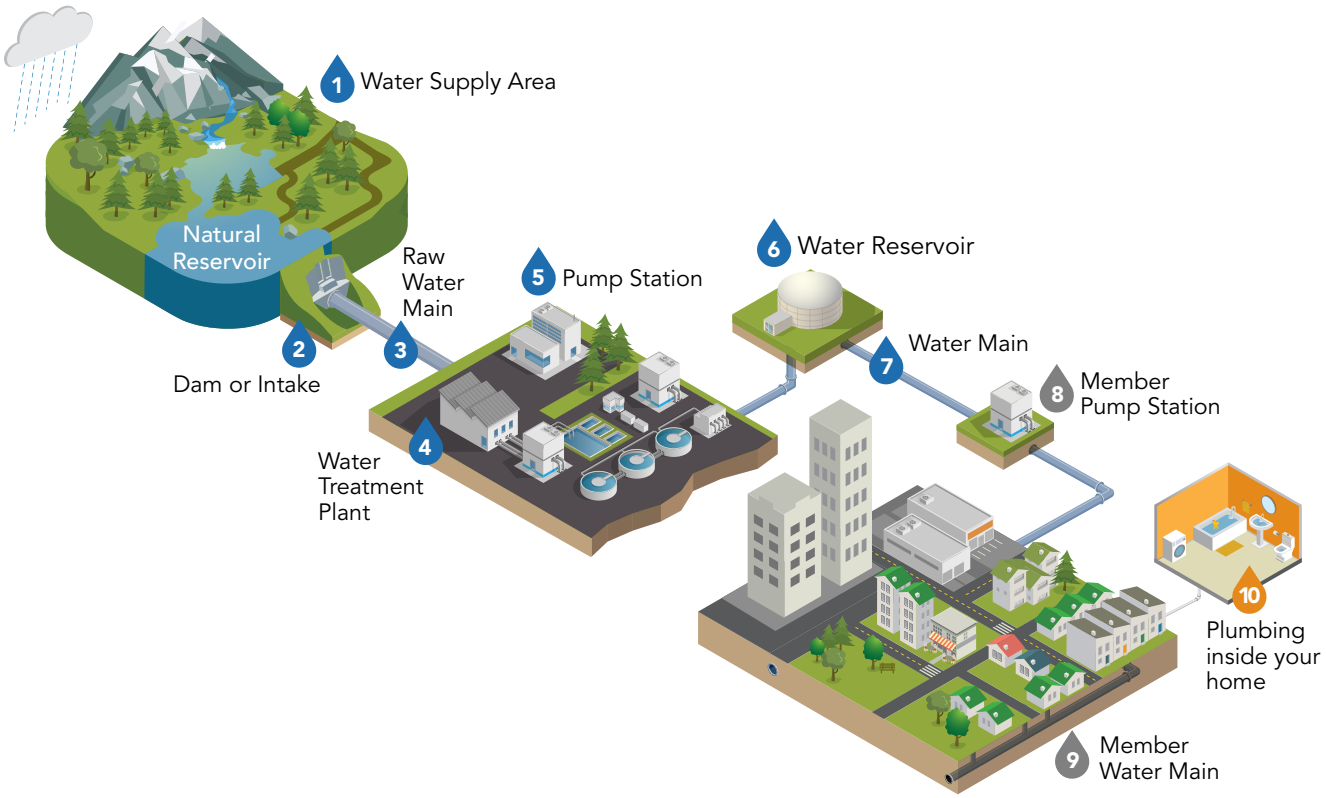


Figure 1: Metro Vancouver Drinking Water System Overview

2. DRINKING WATER SYSTEM OVERVIEW

Metro Vancouver's drinking water comes from rainfall and snowmelt stored in three protected reservoirs: Capilano, Seymour, and Coquitlam. Three alpine lakes, Loch Lomond, Burwell Lake, and Palisade Lake, provide additional water storage. To control water storage in the reservoirs, Metro Vancouver operates and maintains the Cleveland, Seymour Falls, and alpine lake dams, while the Coquitlam Dam is owned and operated by BC Hydro. Water is collected, stored, treated, and distributed to member jurisdictions through a network of dams, treatment plants, transmission mains, pump stations, and in-system storage reservoirs located throughout the region. The entire water system, including the water supply areas, encompasses a total land area of 2,860 square kilometres. Figure 2 provides an overview of the Metro Vancouver water supply system.

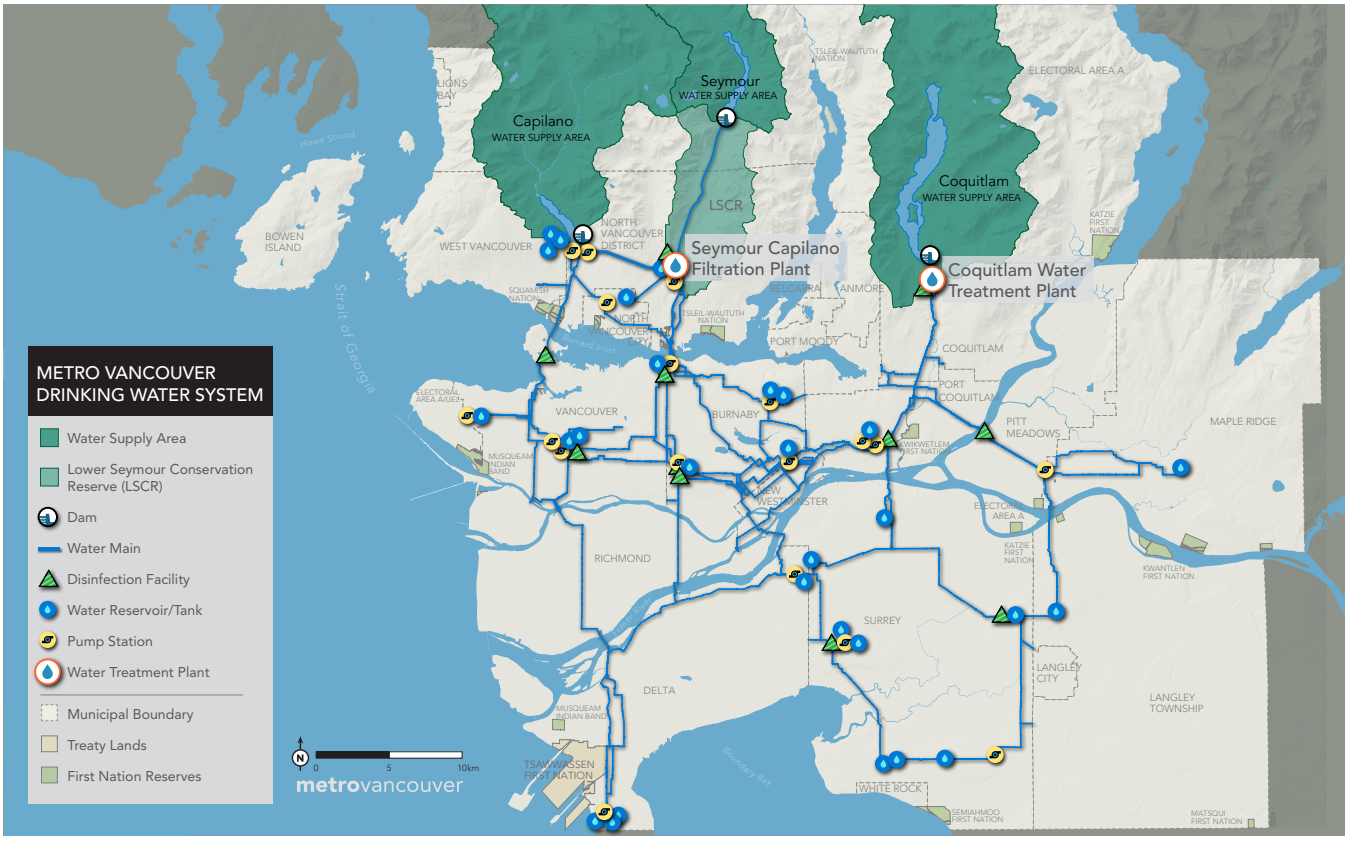


Figure 2: Metro Vancouver Drinking Water System Map

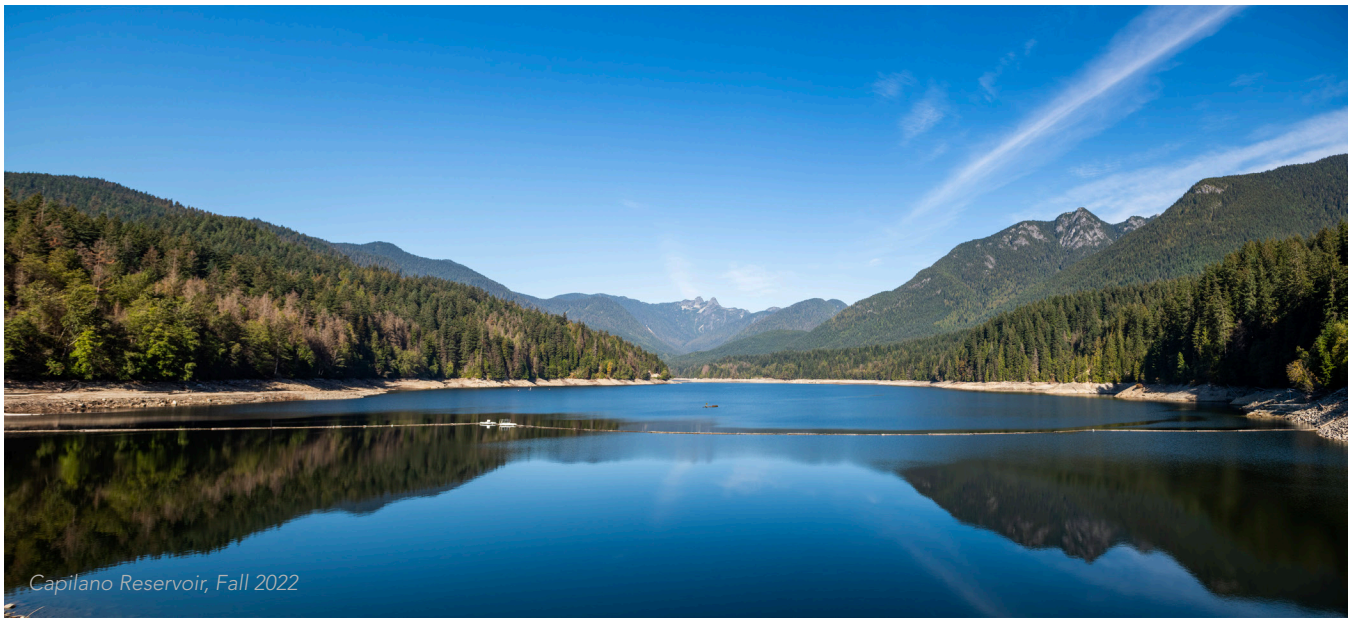
2.1 Source Water

Metro Vancouver's water supply areas and the Lower Seymour Conservation Reserve total approximately 60,000 hectares (ha) of protected lands north of the metropolitan area. The three water supply areas are, in order from west to east, Capilano (19,535 ha), Seymour (12,375 ha), and Coquitlam (20,461 ha). Access to the water supply areas is controlled and limited through the *Watershed Access Policy*. Protecting the water supply areas by restricting access is a fundamental component of the *Multi-Barrier Approach to Safe Drinking Water*, as outlined by Health Canada.

The Capilano Water Supply Area is the most western of Metro Vancouver's water supply areas. The Cleveland Dam and Capilano Reservoir created behind it is located on the Capilano River. The Cleveland Dam is a concrete dam built in 1954. The Capilano Water Supply Area has one alpine lake, Palisade Lake, with an annually usable storage capacity of 10 BL.

The Seymour Falls Dam and the Seymour Reservoir created behind it is located on the Seymour River and is at the highest elevation of the three water system supply sources. The Seymour Falls Dam was built in 1961 to replace the original dam that was built in 1927. Also, within the Seymour Water Supply Area are two dammed alpine lakes, Burwell Lake and Loch Lomond, which have storage capacities of 12 BL and 7 BL, respectively. Water from the alpine lakes is typically used only during high-demand periods in the summer.

Metro Vancouver's most eastern water supply is Coquitlam Reservoir. BC Hydro manages the Coquitlam Dam and the Coquitlam Reservoir through the provincially authorized Coquitlam-Buntzen Water Use Plan. The Province licences Metro Vancouver to use 451 billion litres (BL) of water per year. Every year, additional water is purchased from BC Hydro by Metro Vancouver for additional drinking water. In 2023, Metro Vancouver purchased an additional 81.5 BL



Capilano Reservoir, Fall 2022

2.2 Water Treatment Facilities

Metro Vancouver's source water is required by the Ministry to be treated to meet the *Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in British Columbia*. In addition, Metro Vancouver's treated water meets the requirements for physical and chemical parameters listed in the federal *Guidelines for Canadian Drinking Water Quality*. Metro Vancouver's water is treated at either the Seymour Capilano Filtration Plant (SCFP) or the Coquitlam Water Treatment Plant (CWTP).

2.21 Seymour Capilano Filtration Plant

The Capilano and Seymour Reservoirs' water is treated at the SCFP. Twin tunnels transport both raw and treated water over 7 km between Capilano Reservoir and SCFP. Raw water is pumped from Capilano Reservoir for treatment at SCFP. Since the SCFP is at a higher elevation than the Capilano Reservoir, excess pressure is available from the returning treated water, for which an energy recovery system is utilized. The recovered energy partially offsets the power requirements for the Capilano Raw Water Pump Station.

The primary water treatment processes at the SCFP are filtration and ultraviolet (UV) disinfection. Filtration treats water by removing particulates, organic matter, and microorganisms. Treatment after filtration includes UV disinfection, which works to inactivate microorganisms. Sodium hypochlorite (chlorination) is then added to maintain disinfection within the transmission and distribution mains. An added benefit of filtration is that less chlorination is required to maintain a residual in the transmission and distribution systems. The pH and alkalinity are adjusted at SCFP using a combination of lime (calcium hydroxide) and carbon dioxide before the water enters the transmission system. Figure 3 describes the individual treatment processes. In 2023, SCFP treated an average of 681 million litres per day (MLD) and a maximum of 994 MLD; the plant is designed to treat up to 1,800 MLD. For more information see *Seymour Capilano Filtration Plant Brochure (metrovancouver.org)*.

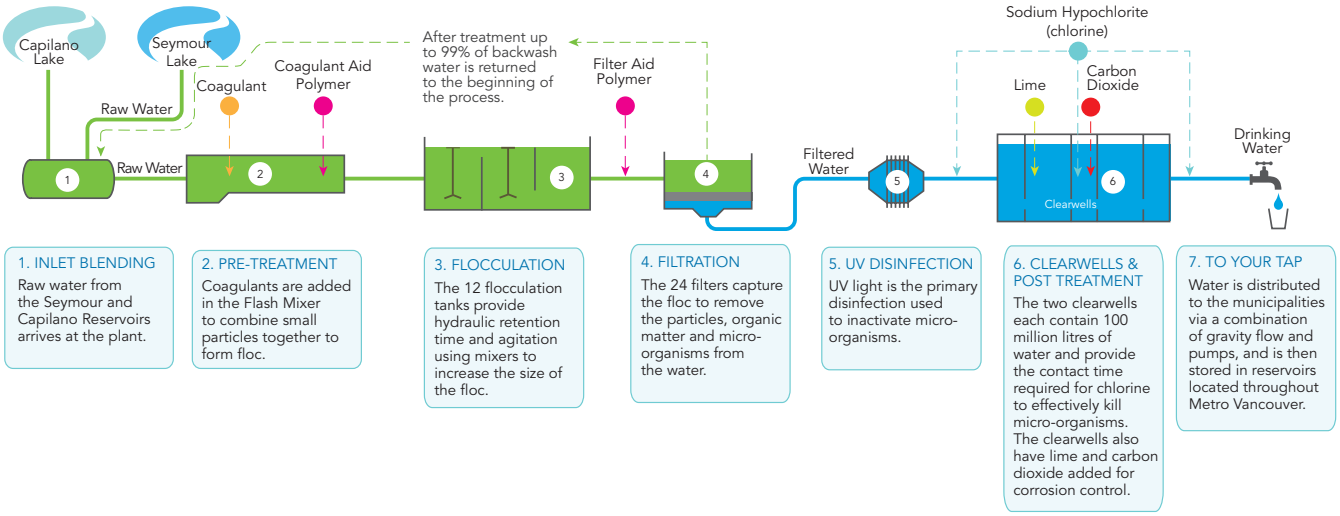


Figure 3: Seymour Capilano Filtration Plant Process Overview

2.22 Coquitlam Water Treatment Plant

The CWTP is located within the City of Coquitlam's northern boundary and treats water from the Coquitlam Reservoir. In 2023, CWTP treated an average of 428 MLD and a maximum of 834 MLD; the plant is designed to treat a maximum of 1,200 MLD.

The Coquitlam Water Supply Area is of different geology than the Seymour and Capilano Water Supply Areas. The water is typically less turbid even during heavy rain events, and as such, this system relies on different forms of treatment than SCFP. At CWTP, ozone is used as a pretreatment to help break down organics and reduce the production of disinfection by-products (DBPs). DBPs are chemicals that can be formed when chlorine is used for disinfecting drinking water. The primary treatment is UV disinfection followed by sodium hypochlorite (chlorination) for disinfection. The pH and alkalinity are adjusted using a combination of soda ash (sodium carbonate) and carbon dioxide before it enters the transmission system. Figure 4 shows the process flow diagram for CWTP. For more information see *coquitlam-ultraviolet-fact-sheet-update.pdf (metrovancouver.org).*

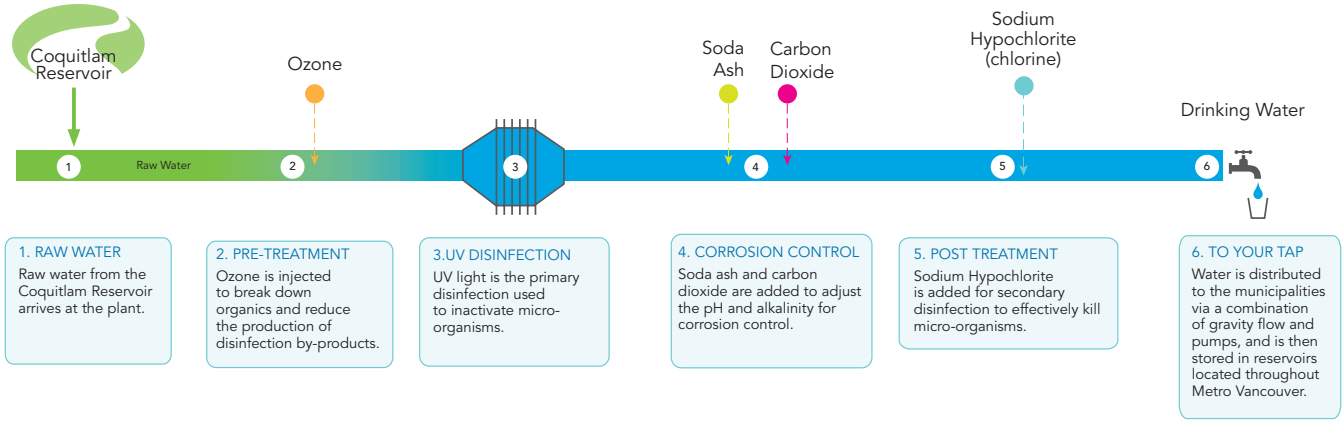


Figure 4: Coquitlam Water Treatment Plant Process Overview

2.3 Transmission System

Metro Vancouver supplies approximately 1 billion litres (BL) of drinking water each day, rising to over 1.5 BL in the summer, to member jurisdictions through a network of 19 pump stations, 27 in-system storage reservoirs, 8 secondary disinfection facilities, and over 520 km of transmission water mains ranging from 0.35 to 3 m in diameter. Thousands of kilometres of additional local distribution mains deliver water directly to residents and businesses.

Water transmission from the Capilano and Seymour sources cross under Burrard Inlet via the First Narrows and Second Narrows marine crossings. The Coquitlam supply is conveyed south without immediately crossing major waterways. From these points, the conveyance of water is predominantly in a north-to-south direction, with interconnecting east-west transmission mains and pump stations.

When water demands are relatively low, the geography of the region provides, in large part, conveyance supported by gravity due to the higher elevation of the water treatment plants for much of the region. However, when water demand is high during the summer months or if portions of the system are out of service for construction or maintenance work, pumping is required at many locations as gravity flow capacity alone is insufficient.

3. WATER QUALITY SAMPLING PROGRAM

Metro Vancouver conducts daily tests on the drinking water. In 2023, Metro Vancouver conducted over 165,000 tests on the water; the results of which are published in *Water Quality Annual Reports* available on the Metro Vancouver website. The *GVWD 2023 Water Quality Annual Report* will be available in April 2024. The *Water Quality Annual Report* summarizes the water quality analysis results for source, treated, and distributed water.

The *Water Quality Monitoring and Reporting Plan for Metro Vancouver and Member Jurisdictions* is currently being updated from its 2018 edition and will be completed in 2024.

Water quality testing at Seymour Capilano Filtration Plant

4. EVOLVING GUIDELINES

Canadian drinking water guidelines are developed by Health Canada's Water and Air Quality Bureau. BC's Ministry of Health is responsible for selecting and implementing the guidelines. As new guidelines are developed and implemented, Metro Vancouver proactively reviews the water supply system and ensures that the system is capable of meeting the latest guidelines or identifies and plans for treatment systems or other upgrades as required.

5. WATER SYSTEM RISKS AND MITIGATION

Metro Vancouver follows the *Quality Management System for Drinking Water* (QMSDW) *Operational Plan*, which includes risk assessment outcomes and implementation of critical control measures. Risk assessment is a fundamental part of the QMSDW Operational Plan process. It forms the foundation for building a set of specific prioritized actions to safeguard drinking water and aid in strategic decision making, planning, and resource allocation. The analysis includes identifying, assessing, controlling, and mitigating the risks of the hazardous events that may occur in Metro Vancouver's drinking water system. A formal audit of the QMSDW Operational Plan was completed in late 2022, and all of the action items were responded to in 2023. The QMSDW has an annual audit requirement, and the 2023 audit is now in progress and will be completed in March 2024.

5.1 Water Supply Area Risks and Mitigation

Metro Vancouver's water supply areas are restricted access to minimize human-caused pollution, environmental damage, and wildfires. A changing climate continues to pose significant risk to water quality and quantity in the water supply areas. Climate models predict more frequent and intense precipitation events through the winter and spring and hotter, drier summers and falls. This shift in weather patterns may increase landslide and wildfire activity, which could result in turbidity events capable of overwhelming current treatment systems.

A reduction in snowpack accumulation is also anticipated with the warming climate which will reduce spring-summer reservoir inflow and potentially increase wildfire risk at higher elevations. Increased turbidity and changes in precipitation patterns that may impact source supply volumes have been considered in long-term water supply infrastructure planning through filtration pretreatment, changes in intake location, and treatment designs. Additional mitigation measures are underway including enhanced snowpack monitoring and wildfire risk planning.

Snow pack montoring

5.2 Treatment System Risks and Mitigation

The existing raw water quality at Coquitlam Reservoir and treated water quality at CWTP meet the current federal and provincial objectives for filtration exemption, and on this basis, CWTP was designed to include ozone, UV, and chlorine disinfection. Although the water quality in Coquitlam Reservoir is good, turbidity events do occur at the existing intake location, and more frequent events are expected to occur in the future due to climate change. Therefore, filtration of water from the Coquitlam Reservoir may be required in the future to comply with regulatory requirements as well as to increase the resiliency of the CWTP to the anticipated impacts of climate change that would affect water quality.

Turbidity is just one water quality parameter among other parameters that would require filtration of the Coquitlam source water in the future. Filtration is beneficial for turbidity removal and removes a portion of naturally occurring organics. Organics reduction has several benefits, including reducing the amount of chlorination required to maintain adequate residual levels in the transmission and distribution systems. Reduced chlorination and organics also lowers the levels of DBPs, which are health-regulated parameters under the federal *Guidelines for Canadian Drinking Water Quality*. Filtration provides resiliency and risk mitigation against changing future regulations and emerging contaminants. The past decision to filter the Capilano and Seymour sources was predicated on similar considerations. Metro Vancouver is in the early works of designing a new water supply intake, water supply tunnel, and filtration plant for the Coquitlam source water.

5.3 Transmission System Risks and Mitigation

Some of the risks that Metro Vancouver faces in the transmission system include potential seismic events, power outages, aging infrastructure, and strain on the system during peak day demand.

SEISMIC

In 2021, Metro Vancouver completed the "*Regional Water Supply System Lifeline Study: Seismic Vulnerability Assessment*". This study investigated Metro Vancouver's water mains' seismic vulnerabilities and all other facilities, excluding dams. This report evaluated the water mains and facilities for earthquakes with a 1:2,475-year and 1:10,000-year return period, respectively, per *Metro Vancouver's Seismic Design Criteria* and 2020 *National Building Code of Canada* requirements. This study recommended additional site-specific assessments and structural analysis for facilities to improve the predictions of seismic damage. The study also provided recommendations on other seismic resiliency measures. Metro Vancouver is working on implementing specific recommendations with the consideration of budgetary constraints.

POWER OUTAGES

Power outages can cause operational issues in the transmission system, particularly at pump stations. Back-up power generation is in place at most critical sites to ensure a robust water supply system. Additional back-up power is being implemented to improve system resiliency to planned and unplanned power outages.

AGING INFRASTRUCTURE

Aging infrastructure poses a risk to the transmission system with leakage and disrupted services. Metro Vancouver has an *Asset Management for Water Services Policy*, where condition assessments of assets are carried out, which may lead to repair and replacement projects. See Section 9.0 for more information on the Asset Management Program for the regional water utility.

PEAK DAY DEMAND

Peak day is defined as that day of the year when the highest volume of water is drawn from the region's three water supply sources. The transmission system is at risk of being strained during this time. Peak day water use is responsive to summer weather conditions. The annual outdoor watering restrictions, in combination with strong education and enforcement programs, encourages increased drinking water conservation and helps minimize peak day demand.

6. WATER USE AND CONSERVATION

6.1 Water Availability and Use Trends

Metro Vancouver experienced significant seasonal drought throughout the summer of 2023, with warmer temperatures and less precipitation than usual on the BC South Coast. The snowpack began to melt rapidly in May 2023 when temperatures were almost four degrees warmer than normal. The source reservoirs were proactively managed through the spring and early summer to capture the incoming streamflow to ensure Capilano and Seymour Reservoirs reached their respective full pool elevations on June 10, 2023, and May 22, 2023, respectively.

As shown in Figure 5, the peak day consumption in the summer of 2023 was 1.56 BL, recorded on Wednesday, July 5. The 2022 peak day consumption was 1.59 BL/d, which occurred on Saturday, July 30.

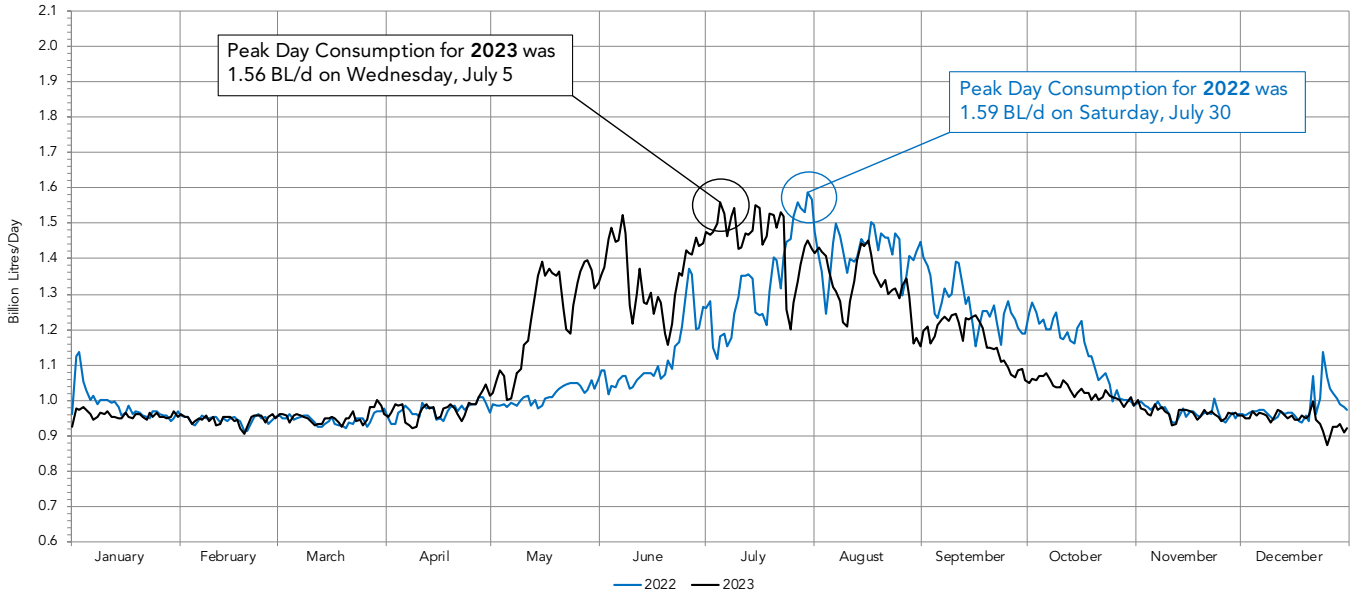


Figure 5: 2022 and 2023 Daily Water Consumption

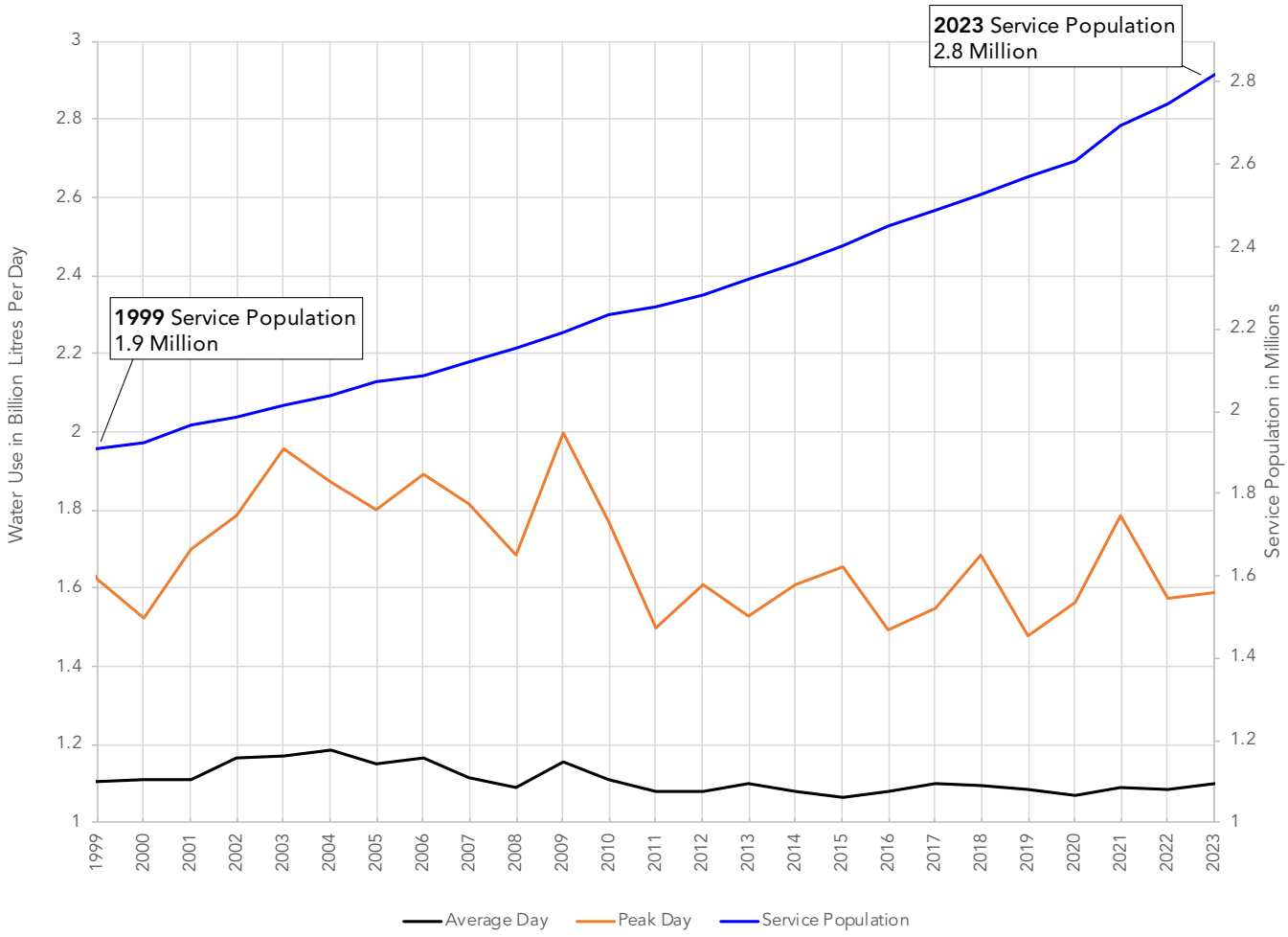


Figure 6: Regional Population and Water Use from 1999 to 2023

Water consumption was significantly higher in May, June, and July of 2023 than in 2022, leading to a more pronounced drawdown of the reservoirs and ultimately the decision to activate Stage 2 watering restrictions considering the long-term forecast in late July for continued drought conditions into the fall. Overall, in terms of volume, the region used about 5.4 per cent more water during the entire high demand season of 2023 (216.0 BL) than that of 2022 (204.9 BL).

Between 1999 and 2023, Metro Vancouver's service population has grown by 910,000 people at an annual growth rate of approximately 1.9 per cent. Despite the population growth, average daily water demand has remained relatively constant over the past 25 years, as shown in Figure 6. Thus, per capita water use has been declining over the past 25 years, as shown in Figure 7, which is often attributed to more efficient plumbing fixtures, densification, increasing public awareness about water conservation, and increasingly stringent watering restrictions.

To ensure the region's collective needs for drinking water are met affordably and sustainably now and in the future, the Drinking Water Conservation Plan (DWCP) was developed by Metro Vancouver with member jurisdictions. The DWCP is a regional policy developed to manage the use of drinking water during periods of high demand, mostly during late spring to early fall, and during periods of water shortages and emergencies. Figure 7 shows the regional per capita water use graphs from 1999 to 2023, together with the major milestones of the DWCP during this period.

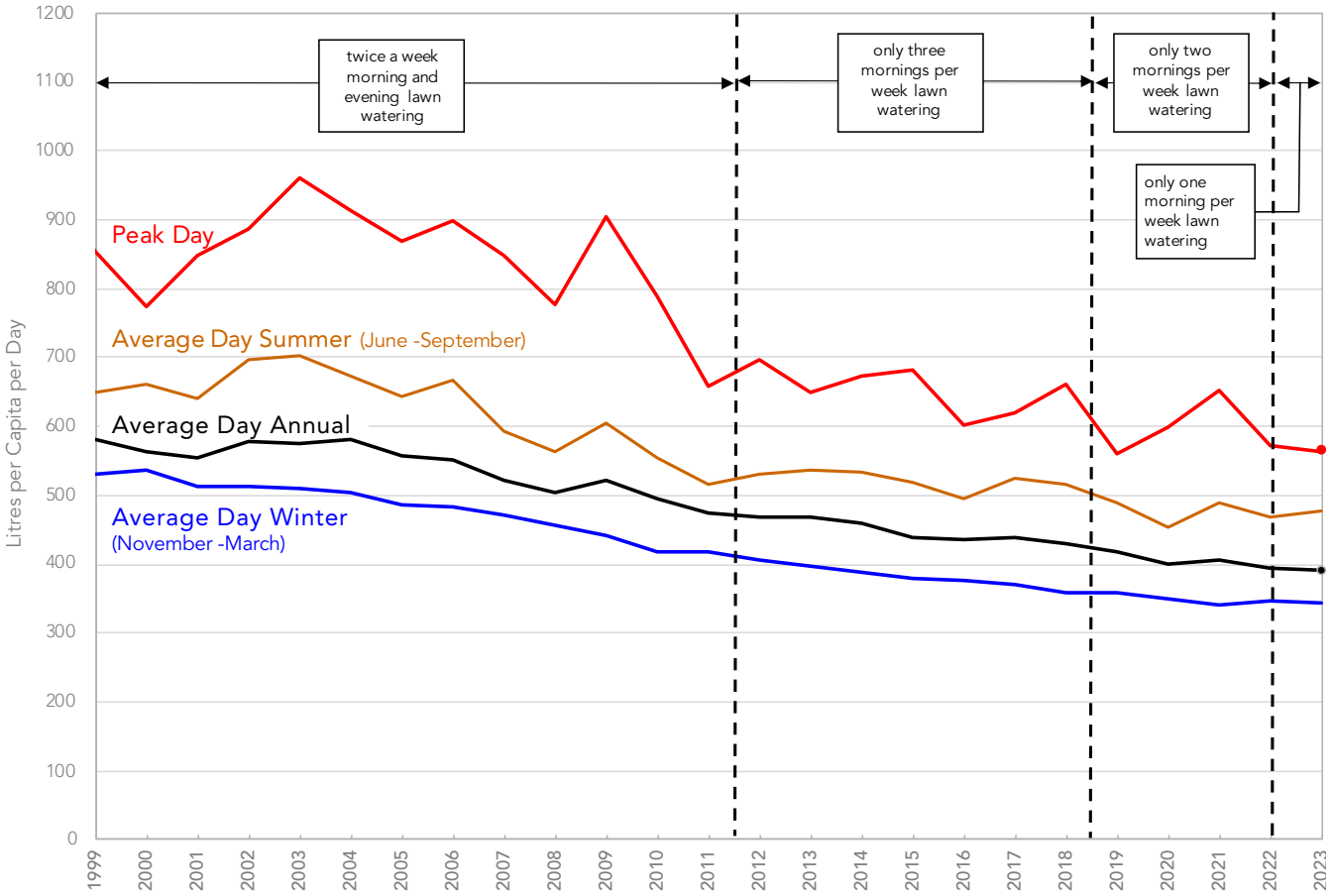


Figure 7: Regional Per Capita Water Use from 1999 to 2023

6.2 Water Conservation Measures

Metro Vancouver utilizes many means to promote water conservation. These include the following key initiatives:

WATER COMMUNICATIONS AND PUBLIC OUTREACH

Metro Vancouver undertakes several communication initiatives annually to promote the efficient use of drinking water resources throughout the region. These include the We Love Water campaign, the Water Wagon program, and communication of lawn watering restrictions per the Drinking Water Conservation Plan. Figure 8 shows an example of the 2023 public awareness communication campaign.

The promotional strategies for these initiatives in 2023 included region-wide reach through television, radio, multicultural print, direct mail, online, outdoor digital billboards, and social media. These broadcast and digital promotions delivered a combined total of 59.7 million impressions.

Earned media resulted in a total potential combined reach and impressions of 1.4 billion (compared to 69 million in 2022) with an ad value equivalent of $52 million. The hot, dry weather and province-wide drought made water conservation and supply top of mind for both residents and the media. The Water Wagon program resulted in 24,104 water bottle refills and fountain uses and 3,094 engagements with residents about drinking water conservation and quality.

Figure 8: Example of 2023 Lawn Watering Regulations' public communication

ACTIVATION OF STAGE 2 OF THE DRINKING WATER CONSERVATION PLAN

Based on hotter and drier weather conditions experienced from May through July 2023, seasonal drought projections, and higher than typical water demands, Stage 2 watering restrictions were implemented. The GVWD Board was informed by the Chief Administrative Officer of the intent to activate Stage 2 restrictions on July 28, and the region-wide lawn watering ban came into effect on August 4. All member jurisdictions have enacted bylaws to support the requirements of the DWCP and are responsible for enforcement. Metro Vancouver staff worked closely with member jurisdiction staff to ensure sufficient notification of the move to Stage 2, enabling them to enact their respective bylaws, notify the public and plan for enhanced enforcement. Figure 9 shows an example of the 2023 public awareness communication campaign.

SUMMER SUPPORT PROGRAM

Metro Vancouver also delivered the DWCP Summer Support Program (SSP) to assist member jurisdictions with promoting and monitoring the regional lawn watering restrictions outlined in the DWCP from July to September 2023. Data indicates that non-compliant manual watering is more prevalent later in the morning and in the evenings than non-compliant automatic watering, and that increased non-compliant lawn watering happens during the hotter and drier periods, as expected. Enforcement of watering restrictions bylaws is, and remains, a member jurisdiction's responsibility with the SPP noted as being beneficial and supportive of local education and enforcement efforts.

Figure 9: 2023 Stage 2 Water Restriction public communication

IMPACTS OF STAGE 2 ON WATER DEMAND

For May, June, and July, the average day water demand increased steadily from 1.23 BLD to 1.35 BLD to 1.46 BLD. Following activation of Stage 2 watering restrictions, the average day water demand was slightly reduced to 1.32 BLD. The peak day water demand during Stages 1 and 2 were 1.56 BLD on July 5 and 1.45 BLD on August 16, respectively. During Stage 2 watering restrictions, from August 4 to August 31, there were no days with regional water demands over 1.5 BLD compared to 11 days during Stage 1.

7. SOURCE WATER PROTECTION

Metro Vancouver's approach is to protect the water supply areas for drinking water and to restrict public access.

Access to the water supply areas is managed and enforced by Metro Vancouver staff. Regular patrols are conducted to intercept trespassers and inspect approved work activities to assure compliance with the requirements of the *GVWD Watershed Regulations*.

In addition, Metro Vancouver has its own dedicated wildfire crews, maintains a resource sharing agreement with the BC Wildfire Service, and partners with municipal fire departments to plan for and respond to wildfires in the water supply areas and adjacent lands.

Metro Vancouver's wildfire crew

8. EMERGENCY RESPONSE AND CONTINGENCY PLAN SUMMARY

8.1 Water Services Emergency Management Plan Summary

The *Water Services Emergency Management Plan* (WSEMP) covers all aspects of the Water Services Emergency Management structure. The WSEMP comprises a suite of documents: an overarching Emergency Management Plan and ten emergency response plans (ERPs) that cover the different components of the water supply system. These plans are updated on an annual basis with the last updated plan issued in 2023.

Together with the *Corporate Emergency Management Plan*, Emergency Management Standard, business continuity plans, and ERPs, all activities related to emergencies that may affect water supply are addressed. The WSEMP is intended to meet all requirements of the *Drinking Water Protection Act* and *Regulation for an Emergency Response and Contingency Plan*. Similarly, this summary of the WSEMP is intended to meet the *Drinking Water Protection Regulation* Section 13 (4), which requires water suppliers to make public a summary to the water users.

Water system operations and emergency management are shared responsibilities between Metro Vancouver and its member jurisdictions. The overall purpose of the WSEMP is to provide general guidance to Metro Vancouver in preparing for, responding to, and recovering from an emergency. Emergencies may include but are not limited to earthquakes, floods, wildland and interface fire, and severe weather. The WSEMP defines Water Services' roles and responsibilities during incidents, emergencies, and disasters.

A Utility Operational Coordination Guide (UOCG) guides the operational-level interactions between Metro Vancouver and local government partners when responding to an emergency. Overall guidance during a major emergency is provided by the regional and local government Emergency Operations Centres.

Ultimately, Metro Vancouver will endeavour to maintain the continuity of drinking water delivery to member jurisdictions. In an emergency, Metro Vancouver's priorities for water supply are:

1. Deliver drinking water whenever possible to members for consumption and/or firefighting.
2. Protect the integrity of water in its system for public health.

In meeting these priorities, Metro Vancouver subscribes to the following response objectives, in this order of priority:

1. Ensure the safety and health of all responders and Metro Vancouver staff
2. Save lives
3. Reduce suffering
4. Protect the public
5. Protect critical infrastructure
6. Protect property
7. Protect the environment
8. Reduce social and economic losses

8.2 Emergency Repairs

Metro Vancouver was involved in 27 emergency water main leak repairs in 2023 as summarized in Table 2.

Table 2: Summary of Water Main Leaks

Name	Location	Date of Leak	Flowrate of Discharge	Impact on Residents	Comments
Little Mountain Link Main	Vancouver	05-Jan-23	6 L/m	No	Leak Repaired
Tilbury Main Disinfection	Delta	30-Jan-23	3400 L/m	No	Leak Repaired
Annacis Main No.2	New Westminster	23-Feb-23	100 L/m	No	Leak Repaired
Capilano Main No. 4	Vancouver	10-May-23	250 L/m	No	Leak Repaired. Replacement infrastructure in progress.
Capilano Main No. 7	North Vancouver (City)	21-May-23	1500 L/m	No	Leak Repaired
Capilano Main No. 7 Hunter Street	North Vancouver (District)	18-Jun-23	1500 L/m	No	Leak Repaired
North Burnaby Main	Burnaby	07-Jun-23	1 L/m	No	Leak Repaired
Capilano Main No. 7 Mountain Hwy	North Vancouver (District)	17-Jul-23	1500 L/m	No	Leak Repaired
Pitt River Secondary Rechlor Station	Pitt Meadows	15-Aug-23	400 L/m	No	Leak Repaired. Replacement infrastructure in progress.
Douglas Road Main No. 2	Burnaby	26-Aug-23	1 L/m	No	Leak Repaired
Annacis Main No. 3	Surrey	26-Aug-23	1500 L/m	No	Leak Repaired
Annacis Main No. 2	Delta	29-Aug-23	400 L/m	No	Leak Repaired
86th Avenue Main	Delta	03-Sep-23	30 L/m	No	Leak Repaired
29th Avenue Main	Vancouver	07-Sep-23	1 L/m	No	Leak Repaired
Lulu Island - Delta Main	Richmond	18-Sep-23	7 L/m	No	Leak Repaired
Central Park Main 10th Avenue	New Westminster	18-Sep-23	400 L/m	No	Leak Repaired. Replacement infrastructure in progress.
Central Park Main 8th Avenue	New Westminster	20-Sep-23	100 L/m	No	Leak Repaired. Replacement infrastructure in progress.

Table 2: Summary of Water Main Leaks continued

Name	Location	Date of Leak	Flowrate of Discharge	Impact on Residents	Comments
Douglas Road Main - Elwell Street	Burnaby	26-Sep-23	100 L/m	No	Leak Repaired
Clayton Langley Main	Surrey	11-Oct-23	1 L/m	No	Leak Repaired
Haney Main No. 2	Port Coquitlam	12-Oct-23	20 L/m	No	Leak Repaired
Port Moody Main No. 2	Port Moody	13-Oct-23	10 L/m	No	Leak Repaired
Capilano Main No. 4	Vancouver	16-Oct-23	2 L/m	No	Leak Repaired
Capilano Main No. 4 Arbutus & W 33rd	Vancouver	28-Nov-23	0.5 L/m	No	Leak Repaired
Grandview Sunnyside Main	Surrey	29-Nov-23	1 L/m	No	Leak Repaired
Mathers Avenue Main	West Vancouver	05-Dec-23	60 L/m	No	Leak Repaired
East Burnaby Main	Burnaby	12-Dec-23	5 L/m	No	Leak Repaired
Capilano Main No. 4 Arbutus & W 33rd	Vancouver	13-Dec-23	0.5 L/m	No	Leak Repaired

9. WATER SYSTEM MANAGEMENT

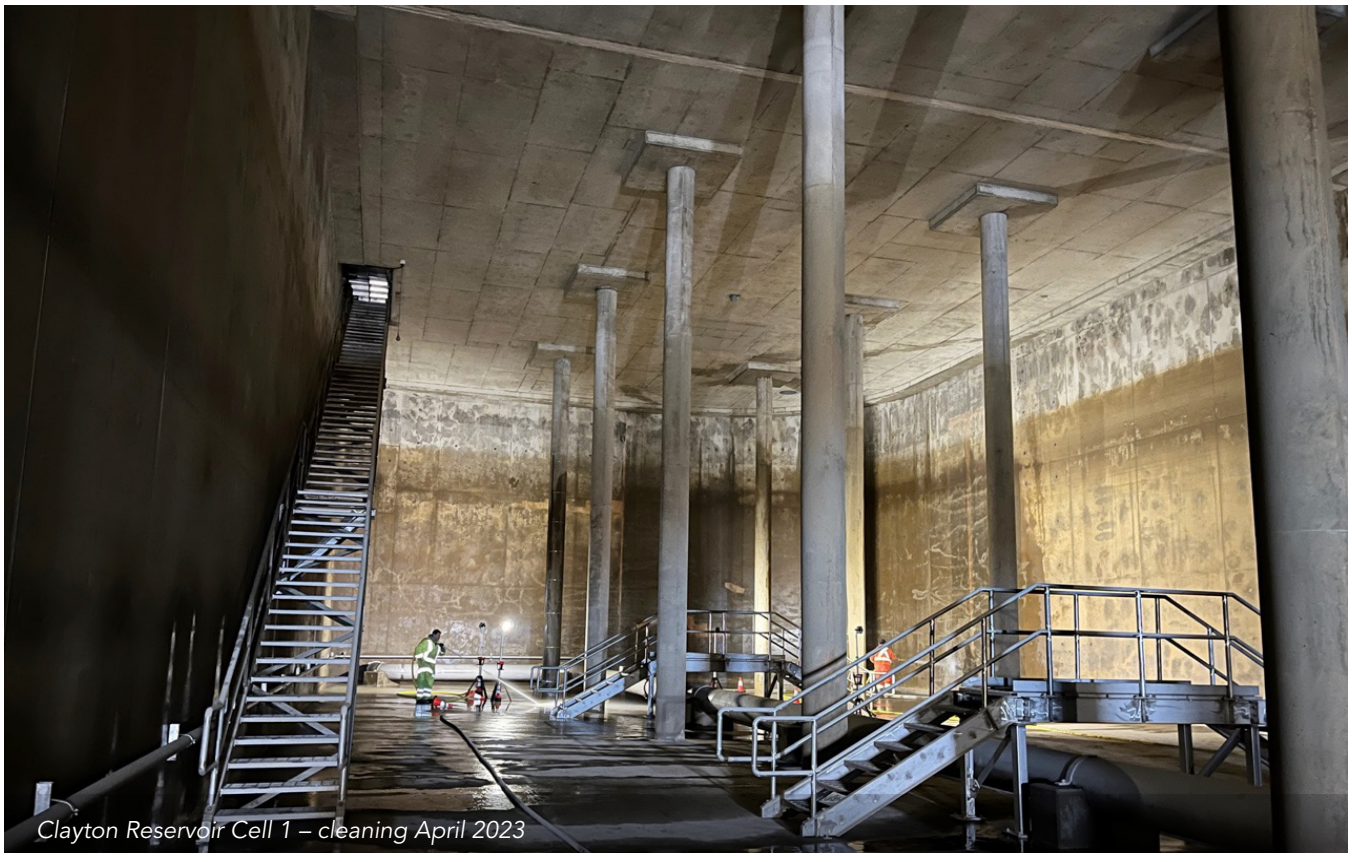
9.1 Asset Management Program

Metro Vancouver's asset management program ensures that assets are managed in a manner that minimizes asset failure risks and optimizes the lifecycle value of assets to meet asset performance targets. In 2019, the Board approved the *Asset Management for Water Services Policy*. This policy establishes asset management principles and a framework to balance asset performance, risk, and cost to deliver Metro Vancouver drinking water services. As part of the Asset Management Program, in 2022, Metro Vancouver produced and presented the *State of the Assets Report – Water Services* to the Board.

9.2 Operations and Maintenance Program

Repairs and upgrades required for the drinking water system are identified through the Operations and Maintenance Program. These repairs and improvements are undertaken as ongoing maintenance projects or as replacement/upgrade projects. Annual maintenance is an essential component of the asset management program and identifies the need for replacement or refurbishment of existing infrastructure to ensure that it continues to perform as required to meet service objectives.

Metro Vancouver undertakes system preventative maintenance daily through scheduled work orders performed by certified trades staff to ensure that existing equipment and facilities are kept in a good state of repair and to identify when additional maintenance or replacement is needed.



Clayton Reservoir Cell 1 – cleaning April 2023

Notable maintenance projects that took place in 2023 included the following:

Condition assessments – These follow the *Asset Management for Water Services Policy*, improve understanding of the water system's overall condition, and can lead to asset repair and replacement projects. In 2023, Metro Vancouver completed detailed condition assessments of 51 chambers, eight sections of water mains, six pump stations, and seven reservoirs.

Reservoir cleaning – Metro Vancouver's in-system water storage reservoirs are periodically isolated and drained for interior cleaning, inspection, and repair or upgrade. In 2023, eight reservoirs were isolated, drained, and cleaned using high-pressure water spray. Each reservoir was disinfected as per *AWWA C652-19 Disinfection of Water Storage Facilities* and tested prior to being returned to service.

Valve exercising program – Metro Vancouver's water transmission system contains over 7,000 valves. Valves are used to regulate and isolate the water flow through the water transmission system. Commencing in 2022, a pilot program was launched to formalize exercising critical valves and collect comprehensive data for the valves, chambers, and other components to assess the condition of these assets and conduct proactive maintenance as a strategy to reduce reactive and emergency mobilizations to repair or replace failed valves. Learning from this pilot program, a second phase is currently being planned to exercise additional valves in 2024, the goal being to exercise all valves in the system over a five year cycle.

Valve replacement program – Metro Vancouver is continually reviewing the water transmission system to ensure valves are in good working order through condition assessments and isolation tests. A need for a more formalized approach to valve maintenance, including valve replacement, has been identified. Metro Vancouver staff began developing formalized valve maintenance and replacement programs in 2022 and developed a draft risk ranking framework for the program in 2023.

Condition assessment at the Coquitlam Water Treatment Plant

Submerged water main crossings – Metro Vancouver continues to inspect and protect submerged water main crossings that are subject to hydraulic scour. Monitoring of all major submerged water main crossings is conducted annually to assess the requirement for installation or maintenance of existing scour protection. In 2023, Close Interval Potential Survey (CIPS) and Direct Current Voltage Gradient (DCVG) surveys were conducted on two water pipelines at water crossings to assess pipeline integrity The pipelines include the North Burnaby Main at the crossing with Burnaby Lake and the Annacis Main No. 2 at the crossing with Gunderson's Slough.

Aerial water main crossings – Metro Vancouver continues to inspect and maintain aerial water main crossings that are suspended over water bodies. Initial planning stages for accessibility requirements were reviewed to perform condition assessments at the Brunette River and Stoney Creek aerial crossings in 2023; these assessments are expected to be completed in early 2024.

Mechanical, instrumentation, and electrical maintenance – In 2023, the maintenance team performed 4,887 preventative maintenance work orders. Examples of maintenance work include seven pump rebuilds at various water pump stations.

Second Narrow Supply Water Tunnel south shaft portal

Annacis Water Supply Tunnel south shaft

9.3 Capital Program

The 2023-2027 Water Services capital budget included $399.9 million for capital projects in 2023 and a total of $2.7 billion over five years. In 2023, there were 145 projects on the five-year capital plan. These projects are driven by system expansion requirements to meet the needs of a growing population, upgrades to improve system resiliency, and maintenance of aging infrastructure. Capital investments addressing population growth are the largest component of the budget, representing slightly more than 64 per cent of spending between 2023 - 2027.

In 2023 many major projects reached significant milestones, including the following key projects:

Annacis Water Supply Tunnel – A 2.3 km long, 4.5-metre diameter water supply tunnel is required under the Fraser River between the City of New Westminster and the City of Surrey to meet growing water demand south of the Fraser River and to provide increased system resiliency. Construction commenced in early 2022 with the deep vertical shaft on the south side of the Fraser River complete, and the north shaft construction currently underway. Tunnel excavation is scheduled to commence in early 2024 and construction is anticipated to be completed in 2028. For more information, see Annacis Water Supply Tunnel | Metro Vancouver

Stanley Park Water Supply Tunnel – This 1.4 km long steel water main, in a tunnel, will replace the existing Capilano Main No. 4 through Stanley Park which is at the end of its service life. The new water main will meet growing water demand and provide increased system resiliency. Detailed design is complete and procurement for construction is underway with construction expected to take place between 2024 - 2029. For more information, see Stanley Park Water Supply Tunnel | Metro Vancouver

Second Narrows Water Supply Tunnel – This project comprises a 1.1 km long, 6.5-metre diameter water supply tunnel under the Burrard Inlet, between North Vancouver and Burnaby, to increase the reliability

Kennedy Newton Water Main installation of 1.8 m diameter water main

of supply in the event of a major earthquake as well as to provide additional long- term supply capacity. Construction of the north and south shafts and tunnel, as well as installation of the three steel water mains inside the tunnel and shafts, is complete. Construction of the north and south valve chambers is currently underway with overall construction, commissioning and restoration scheduled for completion in 2027. For more information, see Second Narrows Water Supply Tunnel | Metro Vancouver

Coquitlam Lake Water Supply Project (CLWSP)
A new water supply intake, tunnel, and treatment plant is proposed to increase the capacity to treat and deliver drinking water from the Coquitam source to meet the demands of the growing region. The project is currently in the permitting and regulatory phase, focusing on engagement with First Nations, the City of Coquitlam, regulators, and stakeholders. Procurement for Project Management Services, including treatment pilot testing, commenced in November 2023. For more information, see Coquitlam Lake Water Supply Project | Metro Vancouver

Coquitlam Water Main No. 4 – This 12 km long steel water main will increase the transmission capacity from the Coquitlam source to the Cape Horn Pump Station and Reservoir in the City of Coquitlam. This project is required to optimize the capacity of the existing Coquitlam supply system and also provide additional capacity for the future Coquitlam Lake Water Supply Project. Construction of the first section, Robson to Guildford, is currently underway and is scheduled to be completed in 2026. The other three sections are in various stages of design. For more information, see Coquitlam Water Main | Metro Vancouver

Kennedy Newton Water Main – This 1.8 metre-diameter, 8 km long water main will connect the Newton Reservoir to the Kennedy Reservoir in the City of Surrey and is being built to meet growing water demand south of the Fraser River. The work includes the construction of line valve chambers, cross-over chambers, air release valves, and blow down valves. Construction the first two of three phases is complete. The final phase of the project commenced in 2022 and is expected to be complete in 2025. For more information, see Kennedy Newton Water Main | Metro Vancouver

Pebble Hill Seismic Upgrade – Located in the City of Delta's Pebble Hill Park, this project involves the seismic upgrade of Pebble Hill Reservoir Unit 1 and

Unit 2 to withstand and remain in operation following a major earthquake. Construction achieved substantial completion in 2023, which involved strengthening the footings, walls, and roof of the reservoirs. For more information, see Pebble Hill Reservoir Seismic Upgrade | Metro Vancouver

Newton Pump Station No. 2 – This project replaces the existing Newton Pump Station located in the City of Surrey, and includes full backup power redundancy, connections to existing and future infrastructure, and installation of new outlets to the existing Newton Reservoir. The first reservoir outlet connection was made in spring 2023, and the second reservoir outlet connection will be made by spring 2024. Construction of the new pump station is anticipated to start in fall 2024. For more information, see Newton Pump Station Replacement | Metro Vancouver

Capilano Raw Water Back-up Power Project – A new back-up power system is being constructed for the Capilano Raw Water Pump Station to maintain water delivery to the Seymour Capilano Filtration Plant in the event of a power outage. The back-up power system includes an underground fuel vault and a new powerhouse. Construction is currently underway and is expected to be complete in 2025.

Seymour Capilano Filtration Plant Dry Polymer Upgrade – The purpose of this project is to improve the Filter Aid Polymer and Wash Water Recovery processes at the plant and consists of replacing the existing oil-emulsion based polymer systems with dry polymer make-up systems. The dry polymer system is simpler, more robust, and is easier to transport and recycle. Construction is currently underway and is expected to be completed in early 2024.

Rendering of Newton Pump Station No. 2

9.4 Financial Review

Metro Vancouver had 2023 total water sales revenues of approximately $345 million, with higher summer wholesale rates of $1.0927/m3 for June through September and a wholesale rate of $0.7119/m3 applying for the rest of the year (equating to an average water rate of $0.8691/m3). The differential rates are intended to incentivize conservation efforts by member jurisdictions. Each member jurisdiction determines the specific way they collect fees to cover the cost of water purchased from Metro Vancouver.

Metro Vancouver progressed with a new development cost charge (DCC) for regional water infrastructure. Once approved, Metro Vancouver plans to collects DCCs from new residential and non-residential developments in the region to pay for new water infrastructure needed to provide services to the future occupants of these buildings. The concept of funding regional water infrastructure through development cost charges is a critical component of maintaining regional affordability in the long-term financial plan.

Second Narrows Water Supply Tunnel North Shaft

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