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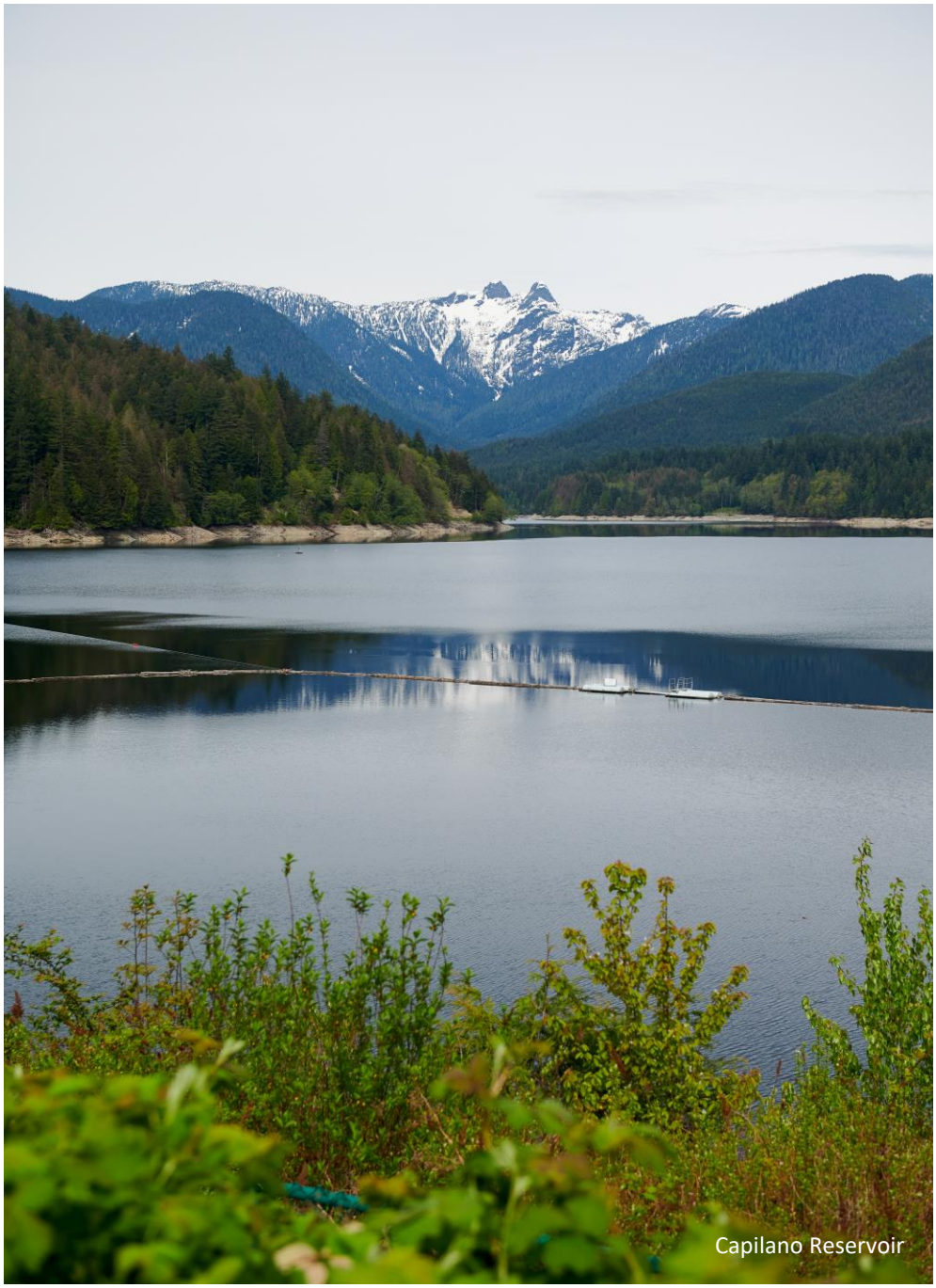

Capilano Reservoir

Greater Vancouver Water District – Water Supply System 2021 Annual Update

March 2022

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EXECUTIVE SUMMARY

The *Greater Vancouver Water District Water Supply System 2021 Annual Update* report summarizes key initiatives undertaken by Metro Vancouver in 2021, including water conservation, risk management, capital projects to accommodate regional growth, and responding to emergencies affecting the drinking water system. The 2021 Update is the first edition of this annual report, which will be issued annually hereafter. This report was prepared following guidance from the Ministry of Health (the Ministry) found in their draft *Guidance for Water User Communication*.

Report Background

The purpose of the report is to meet the communication requirements stipulated in the provincial *Drinking Water Protection Act* and *Drinking Water Protection Regulation*. As a Water Supplier regulated under the *Drinking Water Protect Act* and *Drinking Water Protection Regulation*, Metro Vancouver, also known as the Greater Vancouver Water District, must communicate with water users on topics defined in the legislation.

The Ministry has developed the draft *Guidance for Water User Communications* to create a standardized approach to meeting the legislated communication requirements. The Ministry provided the draft guidance document to Metro Vancouver for review and comment in October 2021. To remain at the forefront of regulatory requirements and best practices and aligned with the Ministry's initiatives, Metro Vancouver has undertaken the *Greater Vancouver Water District - Water Supply System 2021 Annual Update* in a manner consistent with the recommendations in the Ministry's draft guidance. Given that the guidance is still in draft, there may be changes to the format of this report in the future year's versions.

By completing the *Greater Vancouver Water District - Water Supply System 2021 Annual Update* report, Metro Vancouver aligns with the Ministry's direction and new initiatives. This report provides transparent and proactive communication with water users and promotes public involvement and awareness of the drinking water system, which is one of the six elements of Health Canada's *Multi-Barrier Approach to Safe Drinking Water*.

Report Summary

Metro Vancouver sources the region's drinking water from three protected watersheds, Coquitlam, Seymour and Capilano. The water is then treated at one of two water treatment plants and distributed throughout the region via 520 km of transmission mains, pump stations and reservoirs. This water is tested throughout all of the processes to guarantee high-quality drinking water is being distributed to member jurisdictions. To ensure consistent and reliable high-quality water, Metro Vancouver maintains, upgrades and builds infrastructure to meet current and future needs. This includes seismic upgrades, reservoir cleaning, and building new infrastructure to meet the growth needs of the region. Community engagement is undertaken to increase awareness about the need for residential water conservation.

Key initiatives undertaken by Metro Vancouver in 2021, included the following:

- Water Quality Sampling Program, involving:
  - Conducting over 160,000 tests on water through the drinking water quality program. The results of which can be found in the 2021 Annual Water Quality report; and
  - The adjustment of the finished water's pH to 8.3 and alkalinity to 20 mg/L as $CaCO_3$ to reduce the corrosiveness of the water and improve the stability of the water in the distribution system.
- Water System Risk Mitigation, involving:
  - Mitigating risk for the drinking water system including long-term water supply infrastructure planning through the consideration of filtration pre-treatment, intake location and treatment designs for the Coquitlam Water Supply, and the Regional Water Supply System Lifeline Study: Seismic Vulnerability Assessment.
- Water Conservation, involving:
  - Tracking, monitoring and analysis of drinking water demand. The highest peak day consumption in the summer of 2021 was 1.80 billion litres/day, which was recorded on Sunday, June 27, 2021; and
  - Undertaking the *We Love Water* campaign, promoted to increase awareness of Metro Vancouver's drinking water system and the need for residential water conservation.
- Financial Planning, involving:
  - Total water sales of $320 million with differential water rates intended to incentivize drinking water conservation efforts and reduce long-term pressure on the capital budget.
- Water System Management involving:
  - Finalizing the Quality Management System for Drinking Water (QMSDW), which forms the foundation for specific prioritized actions to safeguard drinking water and to aid in the strategic decision-making, planning, and resource allocation, while focusing on continuous improvement;
  - Annual maintenance projects including the isolation, draining, and cleaning of six in-system reservoirs to maintain water quality throughout the distribution system and the completion of 3,875 preventative maintenance work orders;
  - Finalizing the Port Mann Corridor Upgrades with the commissioning of the fourth leg, the Whalley Main, connecting the Whalley Reservoir to 148th Street; and
  - Commissioning the Jericho Reservoir, the 27th in-system reservoir that will be used to continue to supply water to the Township of Langley, and the City of Surrey.
- Emergency Response, involving:
  - Responding to two natural storm events that resulted in dam discharge flows that exceeded the minimum flood levels selected for the initiation of the Seymour Falls Dam Emergency Response Plan, however there were no hazardous conditions, no persons placed in danger and no impacts to the delivery of drinking water.
  - Continuing to respond to the changing COVID-19 situation and adjusting control measures following the Guidance of the Provincial Health Officer.

ACRONYMS

BC	British Columbia
BL	Billion Litres
CWTP	Coquitlam Water Treatment Plant
DBPs	Disinfection By-Products
DCC	Development Cost Charges
DWCP	Drinking Water Conservation Plan
GVWD	Greater Vancouver Water District
ML	Million Litres
MLD	Million Litres per Day
NBCC	National Building Code of Canada
QMSDW	Quality Management System for Drinking Water
SCFP	Seymour Capilano Filtration Plant
SFD	Seymour Falls Dam
UV	Ultraviolet
WSEMP	Water Services Emergency Management Plan

1.0 INTRODUCTION

1.1. Purpose

As a Water Supplier regulated under BC's *Drinking Water Protect Act* and *Drinking Water Protection Regulation,* Metro Vancouver is required to communicate with water users on various topics defined in the legislation. The *Greater Vancouver Water District Water Supply System 2021 Annual Update* is recommended by the Ministry of Health to meet the *Drinking Protection Act* and *Regulation*'s public communication requirements. This report was prepared following guidance from the Ministry of Health found in their draft *Guidance for Water User Communication*.

The purpose of the *Greater Vancouver Water District - Water Supply System 2021 Annual Update* is to proactively communicate with member jurisdictions and the public by providing an annual update on the water supply system. Through the *Greater Vancouver Water District - Water Supply System 2021 Annual Update*, Metro Vancouver seeks to build public awareness and involvement in 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

Under the legal entity of the *Greater Vancouver Water District* (GVWD), Metro Vancouver provides drinking water to its customer within the region. The GVWD was created and constituted under the provincial statute, the *Greater Vancouver Water District Act*, to supply drinking water to the Metro Vancouver 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.

GVWD and its member jurisdictions work together to provide clean, safe drinking water to the region. 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 2.7 million people. The following are the member jurisdictions that are supplied water from the GVWD.

Table 1: GVWD Member Jurisdictions

Village of Anmore	Electoral Area A	City of North Vancouver	City of Richmond
Village of Belcarra	City of Langley	District of North Vancouver	City of Surrey
City of Burnaby	Township of Langley	City of Pitt Meadows	Tsawwassen First Nation
City of Coquitlam	City of Maple Ridge	City of Port Coquitlam	City of Vancouver
City of Delta	City of New Westminster	City of Port Moody	District of West Vancouver

Metro Vancouver is responsible for:

- managing and protecting the water supply areas;
- treating the water at the source and throughout the Metro Vancouver network;
- transmission of drinking water to local water distribution networks;
- monitoring, testing, and reporting on Metro Vancouver water quality; and
- planning for the Metro Vancouver water system's sustainability.

Once the water leaves Metro Vancouver's transmission system and enters into the local distribution mains, the water is the responsibility of the member jurisdiction.

2.0 DRINKING WATER SYSTEM OVERVIEW

Metro Vancouver's drinking water originates from rain 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 the 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 and distributed to local jurisdictions through a network of dams, treatment plants, water mains, pumping 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 1 provides an overview of the Metro Vancouver water supply system.

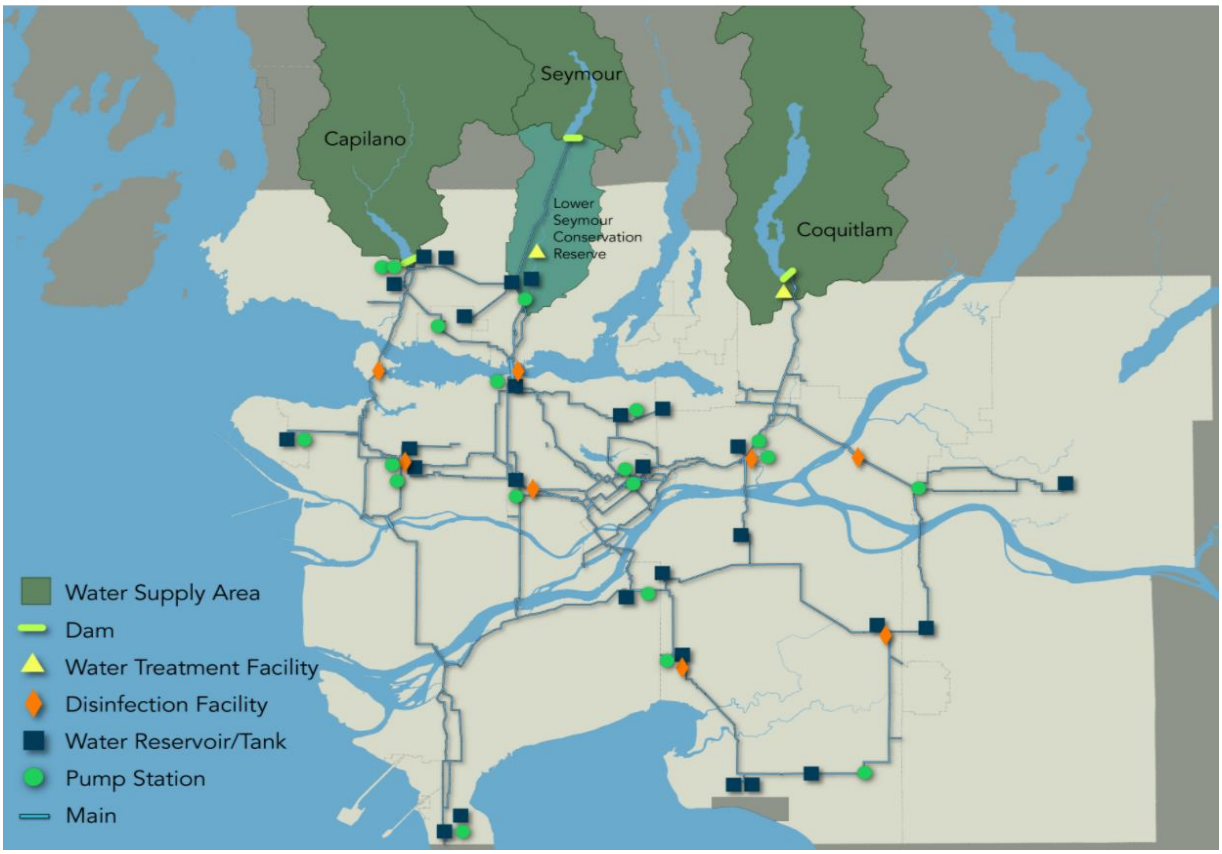

Figure 1: Metro Vancouver Drinking Water System Overview

2.1. Source Water

Metro Vancouver's water supply areas are approximately 60,000 hectares of protected lands north of the metropolitan area. The three water supply areas (drainages, catchments) are, in order from east to west, Coquitlam (20,461 hectares), Seymour (12,375 hectares), and Capilano (19,535 hectares). In addition, there are off-catchment lands of the Lower Seymour Conservation Reserve, which are a total of 5,600 hectares in area. Access to these lands is controlled and limited through the *Watershed Access Policy*. Protecting the water supply areas by restricting access is a fundamental component of the multiple barrier approach to safe drinking water, as outlined by Health Canada.

The Capilano Water Supply Area is 19,535 ha in area and the most western of Metro Vancouver's water supply areas. The Cleveland Dam is located on the Capilano River to store drinking water for the region; it is a concrete dam that was built in 1954. The Capilano Water Supply Area has one alpine lake, Palisade Lake, which provides an additional 10 BL of storage.

The Seymour Water Supply Area is 12,375 ha and is located north of the District of North Vancouver. The Seymour Falls Dam and the reservoir created behind it is the highest of three sources of supply for the water system. The Seymour Falls Dam was built in 1961 to replace a dam that was built in 1927. Also within the Seymour Water Supply Area are two alpine lakes, Burwell Lake and Loch

Lomond Lake. Burwell Lake provides 12,000 ML of storage, and Loch Lomond Lake provides 7,000 ML of storage. The dams for these lakes are opened during high-demand periods in the summer.

Metro Vancouver's most eastern water supply is Coquitlam Reservoir. Coquitlam Reservoir is owned by the Province and managed by BC Hydro for power generation. Metro Vancouver is licenced by the Province to use 451,000 ML per year from Coquitlam Reservoir. Additional water is purchased from BC Hydro annually. In 2021 Metro Vancouver purchased an additional nomination of 84,500 ML.

2.2. Water Treatment Facilities

As Metro Vancouver's source water is surface water, Metro Vancouver is required by the Ministry to treat the water to meet the *Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in British Columbia.* Metro Vancouver's water is treated at two water treatment plants, either the Seymour Capilano Filtration Plant (SCFP) or the Coquitlam Water Treatment Plant (CWTP).

2.2.1. Seymour Capilano Filtration Plant

The Capilano and Seymour reservoir's water is treated at the Seymour Capilano Filtration Plant (SCFP). An underground tunnel transports water over 7 km from the Capilano Reservoir to SCFP so that water from both Seymour and Capilano can be treated at one facility.

The primary drinking water treatment processes at the Seymour Capilano Filtration Plant are filtration and ultraviolet (UV) disinfection. Filtration treats drinking water by removing particulates, organic matter, and micro-organisms. An added benefit of filtration is that less chlorine is required to maintain water quality in the transmission and distribution systems. Treatment after filtration includes UV disinfection, which works by inactivating micro-organisms in the source water. Following the UV, sodium hypochlorite (chlorination) is added for disinfection, and then the pH and alkalinity are adjusted using a combination of lime (calcium hydroxide) and carbon dioxide before the water enters the transmission system. Figure 2 describes the individual treatment processes. SCFP in 2021 treated a maximum day demand of 1,049 ML and an average of 670 ML per day; the plant is designed to treat up to 1,800 ML per day.

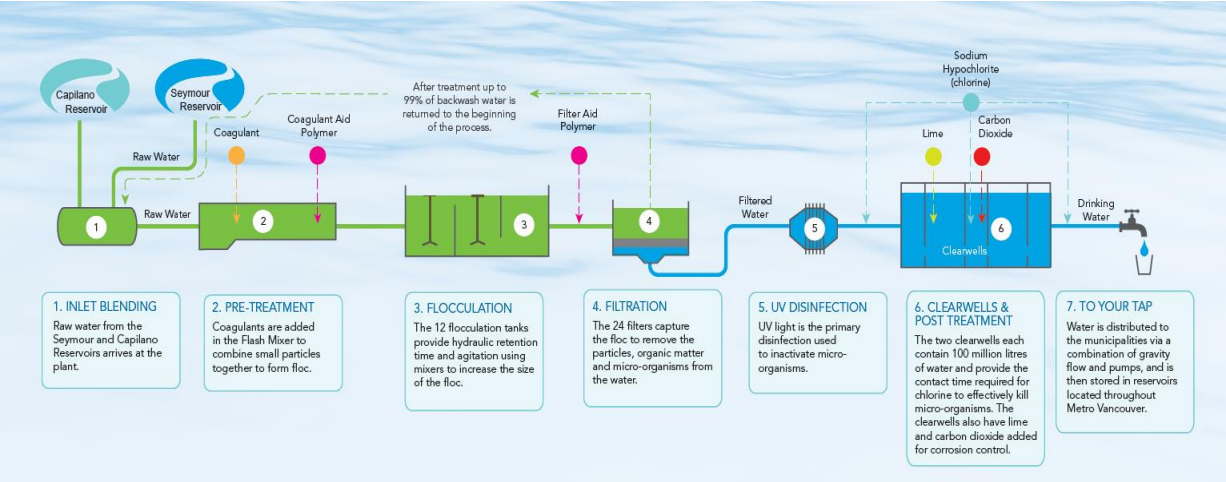

Figure 1: SCFP Treatment Processes

2.2.2. Coquitlam Water Treatment Plant

The Coquitlam Water Treatment Plant (CWTP) is located north of the City of Coquitlam and treats water from the Coquitlam Reservoir. In 2021 CWTP treated an average of 401 MLD and a maximum of 868 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, and the water is typically less turbid even during heavy rain events, and as such, this system relies on different forms of treatment. At CWTP, ozone is used as a pre-treatment to help break down the organics and reduce the production of disinfection by-products (DBPs). 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. The following Figure 3 shows the process flow diagram for CWTP.

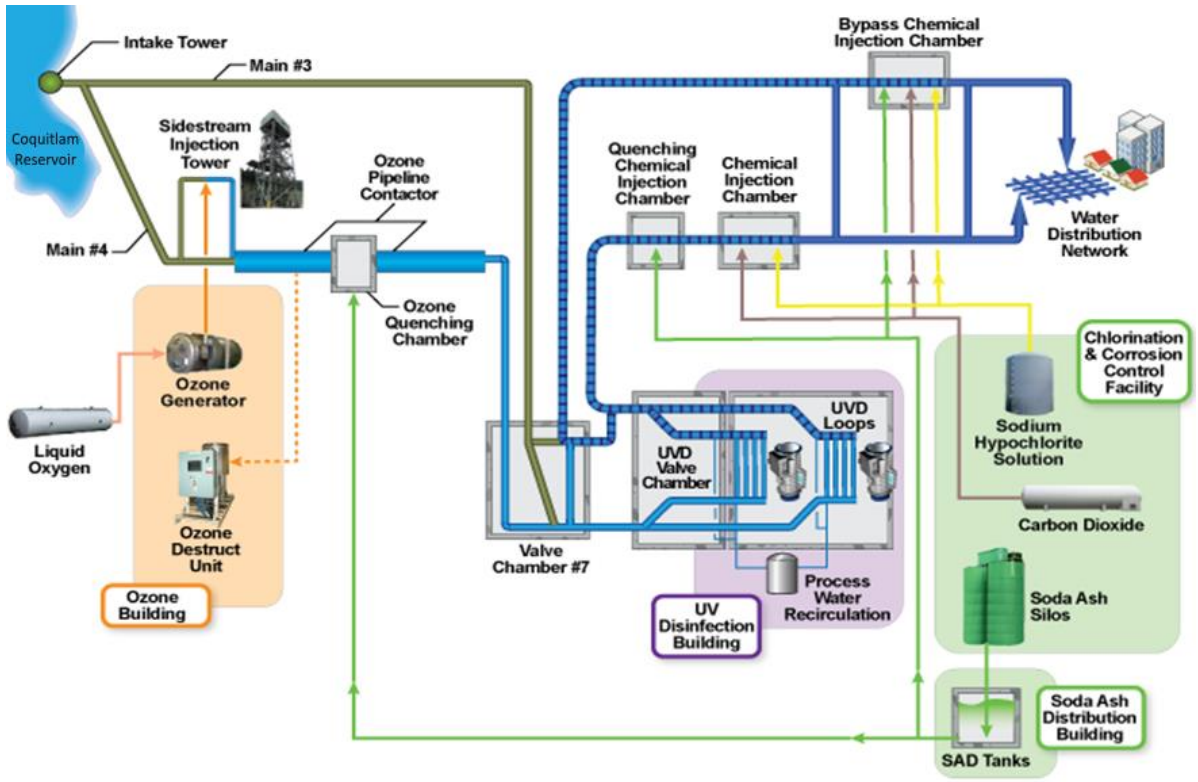

Figure 2: Coquitlam Water Treatment Plant Process Overview

2.3. Transmission System

Metro Vancouver supplies approximately one billion litres of drinking water each day (rising to over 1.5 billion litres in the summer) to member jurisdictions through a network of 19 pump stations, 27 in-system storage reservoirs, eight secondary disinfection facilities, and over 520 km of transmission water mains ranging from 350 mm to 3 m in diameter. Thousands of kilometres of additional municipal distribution mains deliver water to the consumer's tap.

Water transmission from the Capilano and Seymour sources across the Burrard Inlet is achieved via the First Narrows and Second Narrows marine crossings. The Coquitlam supply is conveyed south without 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.

The geography of the region provides, in large part, for conveyance supported by gravity, for much of the region when demands are relatively low. However, when demand is higher 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.

3.0 WATER QUALITY SAMPLING PROGRAM

Metro Vancouver conducts daily tests on the water. In 2021, Metro Vancouver conducted over 160,000 tests on the water. Results are public and found in annual Water Quality reports on the Metro Vancouver Website. The *2021 Annual Water Quality* report will be available in April 2022. This Water Quality report provides a summary the water quality analysis results for source, treated and distributed water in 2021.

As part of Metro Vancouver's corrosion control program, the alkalinity and pH levels were adjusted on June 7, 2021 at both SCFP and CWTP. The treatment systems have been running reliably and steadily at a pH of 8.3, which is within Health Canada's Guidelines for Canadian Drinking Water Quality range of a pH of 7 to 10.5. To help improve the stability of the target pH level in the water transmission and distribution pipes, the alkalinity target was doubled to about 20 mg/L (expressed as calcium carbonate).

4.0 WATER SYSTEM RISK MITIGATION

Metro Vancouver follows the *Quality Management System for Drinking Water* (QMSDW) *Operational Plan*, which was finalized in 2021. A formal internal audit is completed through this process, including 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 to 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.

4.1. Water Supply Area Risks

Climate change is a significant source of risk for the Metro Vancouver water supply areas. With climate change, it is anticipated that significant precipitation events will occur more frequently, with higher intensity and less snow accumulation; this may result in landslides of higher frequency and magnitude in our water supply areas. Increased turbidity and other climate change risks have been considered in long-term water supply infrastructure planning by considering filtration pre-treatment, intake location and treatment designs. Metro Vancouver is fortunate to have three independent and well-protected water supply areas, which is an added measure of resiliency, particularly during the wet season when two of the three sources can currently meet regional water demand. Additional mitigation measures such as upgrading reservoir debris booms, monitoring wildfire risks and replacing stream-road crossings are underway.

4.2. Treatment System Risks

The current treatment for the Coquitlam system does not include filtration. Although the current water quality in Coquitlam Reservoir is very good, turbidity events do happen, and more frequent significant events are expected to occur in the future due to climate change.

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 also reduces the levels of DBPs, which are health-regulated parameters under the federal Guidelines for Canadian Drinking Water Quality.

Metro Vancouver is in the process of planning for a new filtration plant for the Coquitlam source water. 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.

4.3. Transmission System Risks

In 2021 Metro Vancouver prepared the "Regional Water Supply System Lifeline Study: Seismic Vulnerability Assessment", which updates the previous Lifeline Study completed in 1993. The 2021 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 draft 2020 National Building Code of Canada (NBCC) requirements. This study recommends additional site-specific assessments and structural analysis for facilities to improve the predictions of seismic damage. The study also provides recommendations on other seismic resiliency measures.

4.4. Evolving Guidelines

In Canada, 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 if treatment system or other upgrades are required.

5.0 WATER USE AND CONSERVATION

5.1. Water Availability and Use Trends

The Metro Vancouver region experienced a higher than average snowpack in early 2021. Record high temperatures in the second half of June contributed to a faster than normal snowmelt, resulting in reservoir drawdown starting in early July. The source reservoirs were proactively managed to capture the incoming streamflow to ensure Seymour and Capilano Reservoirs reached their respective targeted full pool elevations before June 1, 2021, and July 1, 2021.

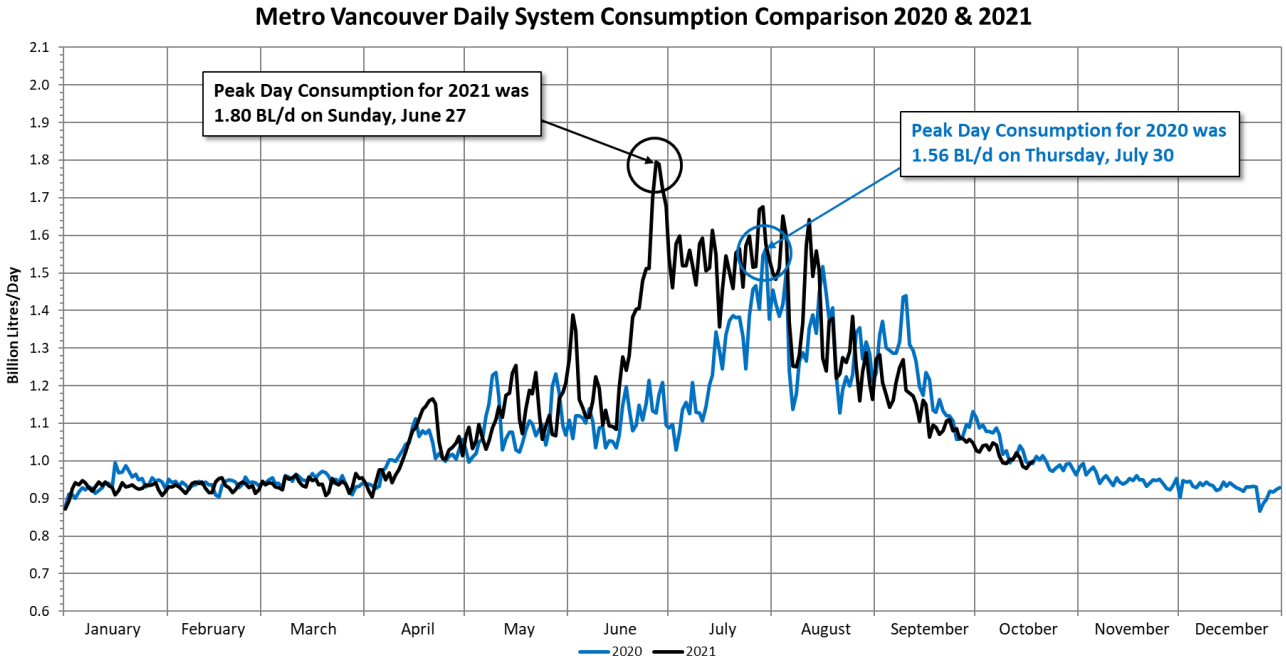

Figure 3: 2020 and 2021 Daily Water Consumption

As shown in Figure 4, the highest peak day consumption in summer 2021 of 1.80 billion litres/day was recorded on Sunday, June 27, 2021. An extreme heatwave affected the lower mainland from late June through mid-July and peaked on June 28 – 29, 2021. The above normal water use was sustained during this period. The 2021 peak day consumption was observed a few weeks earlier than recorded in previous years.

Between 1994 and 2021, Metro Vancouver's service population has grown by 940,000 people, at an annual growth rate of approximately 1.97%. Despite the population growth, average daily water demand has remained relatively constant over the past 28 years, as shown in Figure 5. Thus, per capita water use has been declining over the past 28 years, as shown in Figure 6, which is often attributed to more efficient plumbing fixtures, increasing public awareness about water conservation and increasingly stringent lawn watering. For similar reasons, most communities across Canada have seen comparable declines in per capita water use.

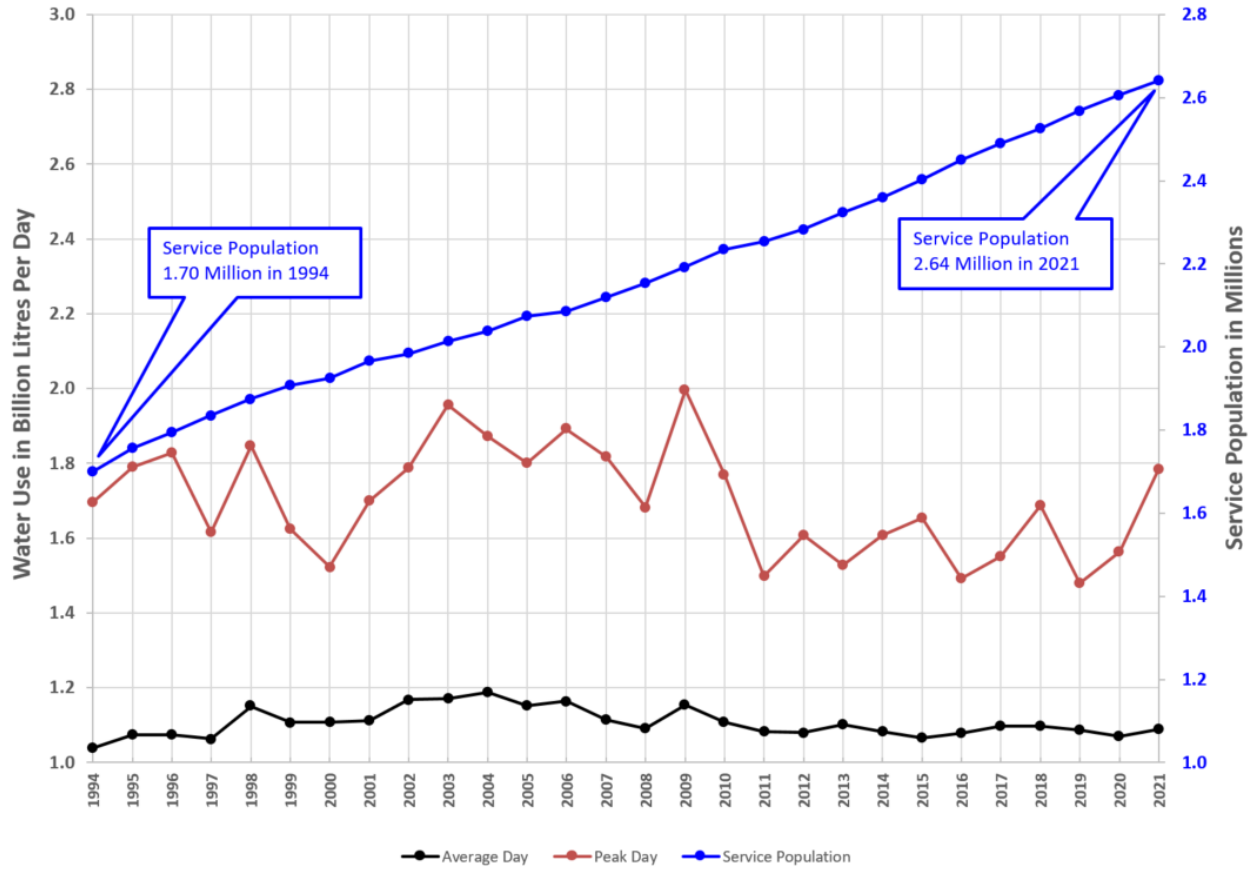

Figure 4: Regional Population and Water Use from 1994 to 2021

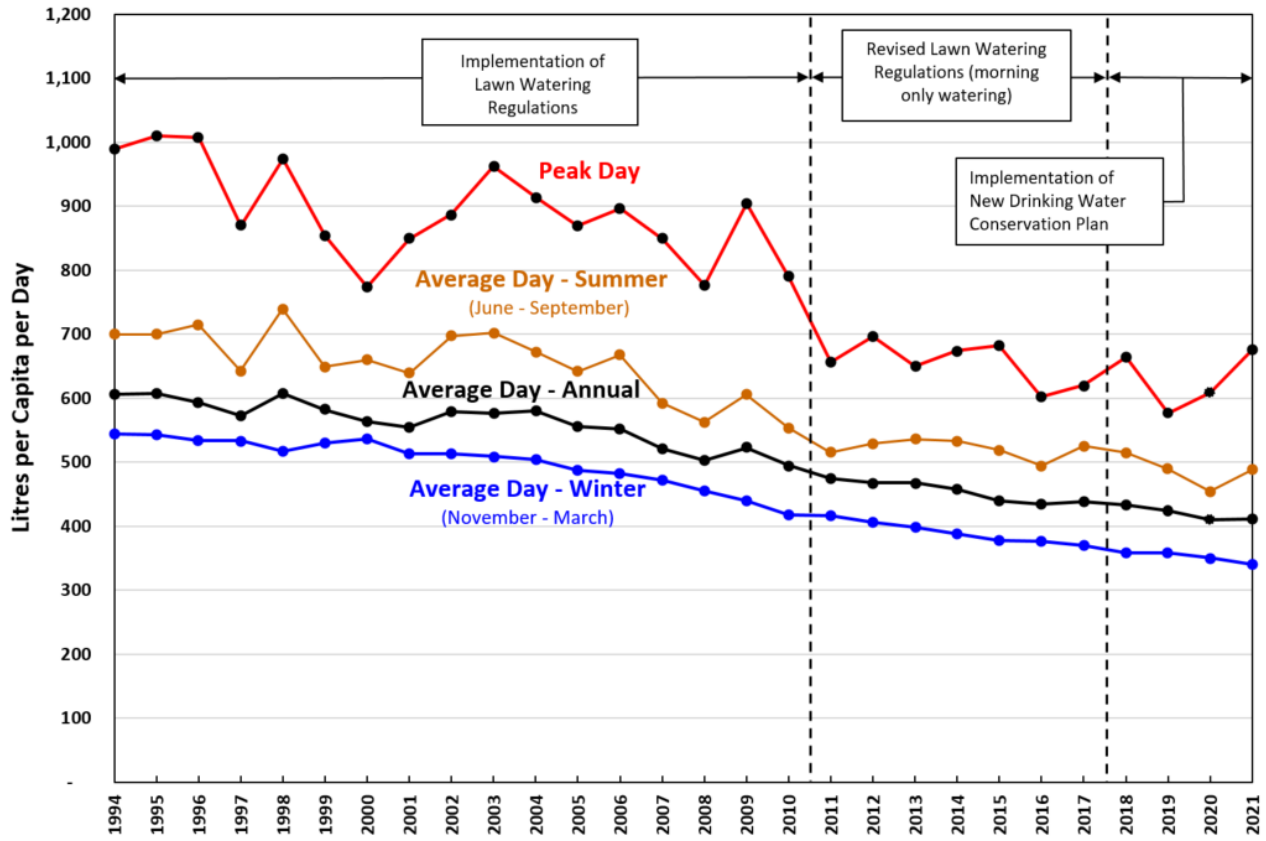

Figure 5: Regional Per Capita Water Use from 1994 to 2021

5.2. Water Conservation Measures

Metro Vancouver undertakes several communications initiatives annually to ensure water resources are used efficiently throughout the region. Key initiatives in 2021 included the communication of the region-wide watering regulations and the communications campaign – *We Love Water* – to increase awareness of Metro Vancouver's water system and the need for residential water conservation. The promotional strategy for both initiatives included a broad reach through television, radio, print, and outdoor advertising and targeted and weather-triggered digital tactics, in total, broadcast and digital promotions delivered over 36.6 million impressions with 35% more web visits than in 2020, including 9,479 visits to Metro Vancouver's Lawn Watering Regulation web page and over 599,000 social media views.

Despite the campaign's reach, water use was at a record high in 2021 during the ongoing hot and dry weather. In 2022 Metro Vancouver will update water conservation communications to reflect the changes to the Drinking Water Conservation Plan (DWCP).

Figure 6: Example of 2021 Lawn Water Regulations Public Communications

To help reduce seasonal demands, Metro Vancouver updated the DWCP, reducing the allowable residential and non-residential lawn watering days from two days per week to one day per week during Stage 1. Changes to Stage 2 include a ban on residential and non-residential lawn watering. Member jurisdictions will be responsible for their respective bylaw amendments for implementation in 2022.

The water supply system performed without significant stresses over the 2021 summer season. Water conservation will continue to be an important factor in determining future system needs. Sustained reductions in per capita water use over the coming years could potentially defer the significant capital investments required to meet the needs of a growing region.

6.0 FINANCIAL PLANNING

The 2021 total water sales revenues of approximately $320 million, with higher summer rates of $0.9546/m^3 for June through September and the lower rate of $0.7119/m^3 applying for the rest of the year (equating to an overall average water rate of $0.8110/m^3). The differential rates are intended to incentivize conservation efforts in the region and reduce long-term pressures on the capital budget.

7.0 WATER SYSTEM MANAGEMENT

7.1. Asset Management Program

Metro Vancouver's Asset Management Program ensures that assets are managed in a manner that minimizes asset failure risks and impacts to customers and optimizes the lifecycle value of assets to meet asset performance targets consistently, and enables evidence-based decision-making to provide quality services continuously. In 2019, the Board approved the *Asset Management for Water Services* policy. This policy establishes asset management principles and framework to balance asset performance, risk, and cost to deliver Metro Vancouver water services.

7.2. Operations and Maintenance Program

Through the Asset Management Program, the repairs and improvements required for the drinking water system are identified. These repairs and improvements are undertaken either as annual maintenance projects or one-time minor capital projects. Annual maintenance is an essential component of the long-range plan and addresses 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 maintenance daily to ensure the existing equipment and facilities are in a good state of repair and to know when additional maintenance or replacement is needed.

Multi-year maintenance projects that are underway, include the following:

Annual Reservoir Cleaning – Metro Vancouver's in-system water storage reservoirs are periodically isolated and drained for interior cleaning, inspection, and repair or upgrade construction. Cleaning is conducted either through draining and using high-pressure water spray or using divers to remove sediment from the interior. In 2021, six reservoirs were isolated, drained and cleaned, and one reservoir was cleaned by divers.

Water Meter Upgrade Program – There are over 200 water meters located at the points of connection to the member jurisdiction's systems. The Water Meter Upgrade Program started in 2018, it involves installing seven new water meters, and replacing 30 existing water meters. In 2021, two new water meters were installed, one water meter was replaced and the design for the installation or replacement was progressed on nine of the other water meters.

Capilano Energy Recovery Facility Corrosion Mitigation – The coating on some of the piping, valves, and other various equipment inside the Capilano Energy Recovery Facility's Machine Hall room was recently replaced to mitigate surface corrosion. This work involved cleaning and removing any existing corrosion, repassivation of stainless steel surfaces, and applying a corrosion prevention coating.

Valve Replacement Program – Metro Vancouver is continually reviewing the water transmission system to ensure valve chambers are in good working order through condition assessments and isolation tests. A number of air valves were assessed and replaced in 2021. A 2021 minor capital project was used to plan the refurbishment of a valve chamber south of the Second Narrows Crossing. The Capital Program is also used to replace valves identified during assessments such as the First Narrows Crossing valve replacement. A more formalized valve maintenance program is currently being developed to improve system operations and budgeting.

Condition Assessments – Condition assessments follow the Asset Management for Water Services Policy, and improve understanding of the system's health and resiliency and can lead to asset repair and replacement projects. In 2021 Metro Vancouver completed condition assessments of three

critical aerial crossings, two sections of a submerged crossing, isolation valve chambers for three aerial crossings, and 12 other chambers in the water system.

Mechanical, Instrumentation, and Electrical Maintenance – In 2021, the maintenance team performed 3,875 preventative maintenance work orders. Examples of maintenance work includes eight pump re-builds at various pump stations; and program troubleshooting for instrumentation at Newton Pump Station.

7.3. Capital Program

The Water Services capital budget for 2021 includes 118 active projects with an estimated investment value of $2.36 billion over 2021-2025. These projects ensure the overall water system is being upgraded to meet service levels as well as applicable changing or new regulations. Capital investments addressing population growth are the largest component of the budget, representing slightly more than 51% of spending in the next 5-years.

In 2021 many major projects reached significant milestones, including the following key projects:

Douglas Road Main No. 2 – This new water main will replace the existing Douglas Road Main No. 1 between North Burnaby and New Westminster built in the 1940s. Construction of the 15-kilometre-long, 1,500 mm diameter water main began in 2007, and several project phases have already been completed and are in service. The two remaining sections are the Vancouver Heights Section, for which construction was completed in early 2021 and commissioning in the fall of 2021, and the Still Creek Section, which commenced construction in the summer of 2021. The Still Creek Section is the final phase of the project. When complete, it will ensure the continued delivery of clean, safe drinking water to the cities of Burnaby and New Westminster.

Second Narrows Water Supply Tunnel – In October of 2021, the tunnel excavation was completed for the Second Narrows Water Supply Tunnel, an important infrastructure project that will improve the seismic resiliency of the region's drinking water system. Now that the 5.8 m diameter tunnel is complete, three large diameter steel water mains will be installed and connected to the existing water system with new valve chambers. This project is one of several new regional water supply tunnel projects that are being constructed to meet current seismic standards and increase supply capacity.

Fleetwood Reservoir and Water Main – Work is underway on a new reservoir and water main in Surrey that will help Metro Vancouver meet the demands of the growing communities south of the Fraser River for clean, safe drinking water. The water main will connect the new reservoir to the regional drinking water system. The reservoir will be located in Meagan Anne MacDougall Park, and construction, which is expected to last about two years, will start in early 2022. The reservoir will be able to hold 13.6 million litres of water.

First Narrows Crossing North Shaft Valve Chamber – The valve chamber for the north shaft of the First Narrows Crossing houses underground pipe connections and large valves that control water flow

from the Capilano Transmission Main on the north shore to a tunnel carrying water under Burrard Inlet. The Capilano Transmission Mains No. 4 and 5 isolation valves were replaced, and both mains returned to service in 2021.

Little Mountain Reservoir – The upgrades for the Little Mountain Reservoir, located in Queen Elizabeth Park, included roof repairs, concrete sealing, and joint replacement. The work involved close collaboration with the Vancouver Parks Board and was completed in summer 2021. This work ensures that water quality is maintained throughout the lifespan of the reservoir.

CWTP Ozone Control System – Water from the Coquitlam Reservoir is pre-treated with ozone before it enters the Coquitlam UV Disinfection Plant. The three ozone generator reactors and their power supply units were originally installed in 1999. The power supply units are currently being replaced and, upon completion, will increase the ozone production capacity of the ozone generator reactor.

In 2021 there were also projects that were finalized and commissioned, bringing new infrastructure into the water transmission system, including the following:

Whalley Main – The Whalley Main was the fourth and final leg of the Port Mann Corridor Upgrades project. This project reached substantial completion in 2021 with final connections made in the fall of 2021 and was put into service in December of 2021. The Port Mann Corridor Upgrades project connects Metro Vancouver's water supply to the communities south of the Fraser River. The Whalley Main consists of approximately 2,000 meters of 1,500 mm diameter water main on 148th Street between Whalley Reservoir and 95A Avenue in the City of Surrey. The new water main is required to meet growth south of the Fraser River and twins a portion of the existing Whalley-Clayton Main, which connects the Whalley Reservoir to the Whalley-Kennedy Main.

Jericho Reservoir Cell #1 - In 2021, the Jericho Reservoir Cell #1 was connected to the drinking water system and became Metro Vancouver's twenty-seventh in-system storage reservoir. The Jericho Reservoir is a key component of Metro Vancouver's supply to the Township of Langley, and the City of Surrey. Located in the Township of Langley, the reservoir is being constructed in two phases and will have a total combined storage volume of 39.1 ML. Phase 1 is comprised of two cells with a combined total storage volume of 20.6 ML, Cell #1 was completed and was put into service in 2021. The second cell is anticipated to be brought online in 2022. The second phase of the reservoir is being planned for 2040.

8.0 EMERGENCY RESPONSE SUMMARY

8.1. Emergency Response and Contingency Plan Summary

The Water Services Emergency Management Plan (WSEMP) covers all aspects of the Metro Vancouver Emergency Management structure. Together with the Corporate Emergency Management Plan, Emergency Management Standard, business continuity plans, and Emergency Response Plans, 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 *Regulatio*n 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 of the emergency response and contingency plan 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 situation. Emergencies considered include, but may not be limited to, earthquakes, floods, wildland & interface fire, and severe weather. The WSEMP defines Water Services' roles and responsibilities during incidents, emergencies and disasters.

Ultimately, Metro Vancouver will endeavour to maintain the continuity of drinking water delivery to our member jurisdictions. In an emergency, Metro Vancouver's priorities 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, (sourced from Metro Vancouver's WSEMP V13).

In meeting these priorities, Metro Vancouver subscribes to the following Response Objectives, in order of priority they are as follows:

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; and
8. Reduce Social and Economic Losses.

8.2. Emergency Recovery

There were two natural storm events in 2021 that resulted in high flow releases from Seymour Falls Dam (SFD), on September 30 and November 15. Both events resulted in dam discharge flows that exceeded the minimum flood levels selected for the initiation of the Seymour Falls Dam Emergency Response Plan, and resulted in notification of external partners as listed in the plan. From staff discussions with external partners, neither natural storm event resulted in hazardous conditions or

persons placed in imminent danger. Similarly, there were no impacts on the delivery of drinking water to the member jurisdictions.

Additionally, Metro Vancouver continues to monitor the changing COVID-19 situation and periodically adjusts control measures following the guidance of the Provincial Health Officer to maintain the health and safety of staff. Access to drinking water facilities is being restricted to essential personnel only and all public tours are canceled until further notice. There have been some schedule impacts to the capital projects. However, there have been no negative impacts on the delivery of drinking water to the member jurisdictions.


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