

ALBERNI CLAYOQUOT REGIONAL DISTRICT

BAMFIELD WATER SYSTEM

ANNUAL REPORT
2024



**ALBERNI-CLAYOQUOT
REGIONAL DISTRICT**

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1.0 Background

Purpose of the Annual Report

This annual report offers a comprehensive overview of the Alberni-Clayoquot Regional District's (ACRD) Bamfield Water System (BWS). As part of our commitment to the community, the ACRD provides this report to ensure transparency and keep residents informed. It serves as a resource for water consumers to better understand the status of their individual water system and stay updated on the annual activities and services provided.

Regulating Authority

The Province of British Columbia's Drinking Water Protection Act and Regulation prescribes the required performance of drinking water suppliers. Island Health is responsible for overseeing water systems within the ACRD, with the primary goal of minimizing health risks to the public and ensuring safe drinking water is supplied to communities. In accordance with these regulations, water systems are required to have operators certified by the Environmental Operators Certification Program (EOCP) at a classification level that aligns with the system's requirements.

Management

The ACRD's Community Services Department is responsible for the overall management of the BWS. The Bamfield Area Services Committee, consisting of the Bamfield Electoral Director, a Huu-ay-aht First Nations representative, a Uchucklesaht Tribe Government representative and community members, provides guidance and recommendations to ACRD management on matters regarding infrastructure improvements, bylaws and costs.

Bamfield Water System Overview

Bamfield makes up a significant portion of Electoral Area "A" with a population of 256 (2021 Census). During the summer months, the population swells to the thousands. The majority of the BWS was originally constructed in 1979-1980. Water is sourced from Sugsaw Lake and is treated by a Dissolve Air Flotation (DAF) water treatment plant. Commissioned in August 2018, the DAF plant addresses high organic content in the source water and the related formation of disinfection byproducts (DBP) in the drinking water. Water quality testing has shown that the treatment plant is highly effective in improving water quality, including reducing colour and taste issues and lowering DBP levels.

The BWS complexity is partially due to the subsurface water lines that cross the inlets in various locations. These underwater marine water lines are challenging to repair and are often buried under layers of sediment. The BWS has a Level 3 Water Treatment Classification and a Level 2 Water Distribution Certification through the Environmental Operators Certification Program (EOCP). Daily operations of the distribution system and treatment plant are managed by a contracted operator who is certified by EOCP in these classifications.

The Bamfield Water System includes:

- Water source: Sugsaw Lake
- Water treatment plant: Dissolved Air Flotation (DAF) with UV and chlorine disinfection
- Two bolted steel reservoirs: 517 m³ capacity
- Current metered service connections: 242
- Total Length of mains: 18 km

- Water main material: Polyvinyl Chloride (PVC) and High-Density Polyethylene (HDPE)
- Average daily flow: 225 m³

2.0 Goal and Targets

It is our mission to provide potable, cost effective and reliable drinking water through continuous improvements

To achieve this mission, measurable targets for potability, cost-effectiveness and reliability have been set.

Potable Targets:

- 1) No E. coli, no total coliform in any water samples
- 2) Minimum 0.20 mg/L chlorine residual throughout the distribution system
- 3) Less than 1 NTU turbidity in the treated water
- 4) Meet the Drinking Water Quality Guidelines for all parameters (including DBPs)

Regular potability sampling of drinking water is conducted for physical, chemical and biological parameters. This testing ensures the water meets the Canadian Drinking Water Quality Guidelines and remains safe for consumption. Each water system operates under an Operational Certificate issued by Island Health, which may specify testing requirements and sampling frequencies.

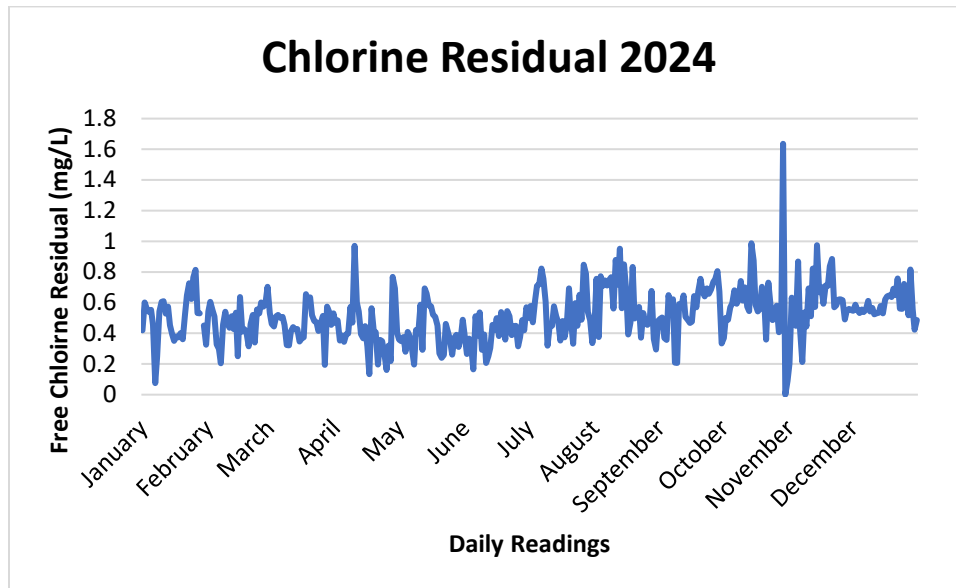
Target 1 – No E. coli and No Total Coliform in Any Water Samples

Bacterial testing is conducted monthly at multiple locations throughout the distribution system to monitor for total coliforms and E. coli. These sampling points are strategically selected to provide a comprehensive representation of water quality each month. According to Island Health's 2024 Water Sample Report, all 66 samples collected tested negative for bacterial contamination.

Total coliforms and E. coli are tested because they are reliable indicator organisms. They are cost-effective and easy to detect, and their presence can signal potential contamination. Importantly, these organisms are not found in clean, unpolluted water, making them valuable tools for assessing water safety.

Target 2 - Minimum 0.20 mg/L Chlorine Residual

As water moves through a distribution system, chlorine is gradually depleted by organic matter in the water and by materials that may have accumulated inside the pipes. Measuring the residual chlorine levels provides a quick indication of whether the water is likely safe to drink, but the absence of chlorine residual does not automatically mean the water is unsafe. Low to no chlorine residuals can suggest poor water circulation within the system and may indicate the need for increased flushing.

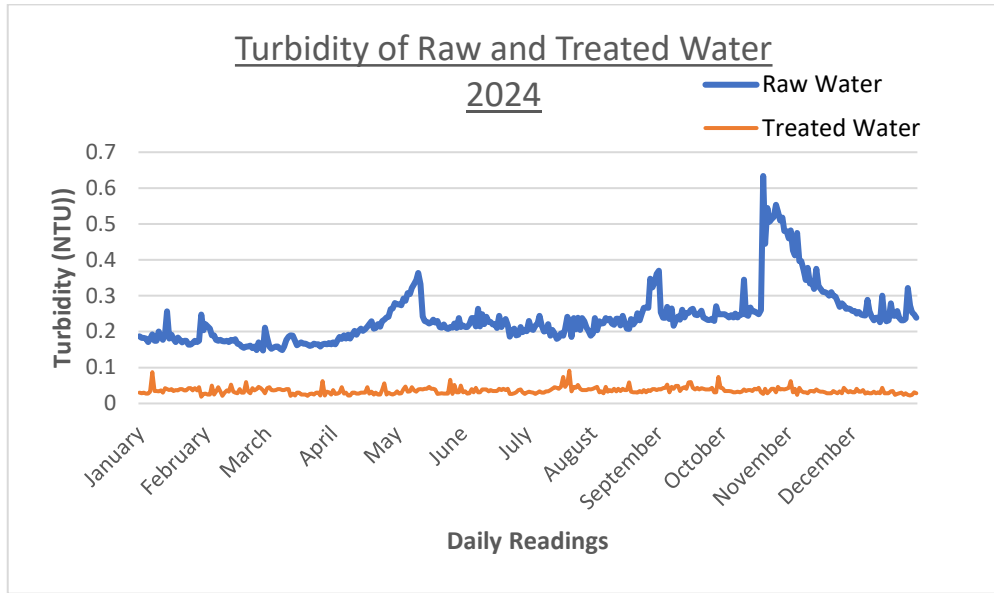


The graph above illustrates that the free chlorine levels leaving the water treatment plant typically range between 0.2 and 0.8 ppm, with occasional fluctuations outside this range. Since the treatment plant became operational, the variability in chlorine levels has significantly decreased. Prior to its operation, levels ranged more widely, from 0.2 up to 3.0 ppm. To ensure consistent and adequate disinfection throughout the entire water system, additional chlorine is injected at the reservoirs.

An elevated chlorine reading observed in late October was likely the result of instrument calibration or another technical anomaly, as the analyzer can occasionally produce erratic measurements. According to the water technician, the highest free chlorine concentration that reached customers was just over 1.0 mg/L. Operational targets are maintained between 0.8 and 1.0 mg/L to ensure adequate residual levels throughout the distribution system.

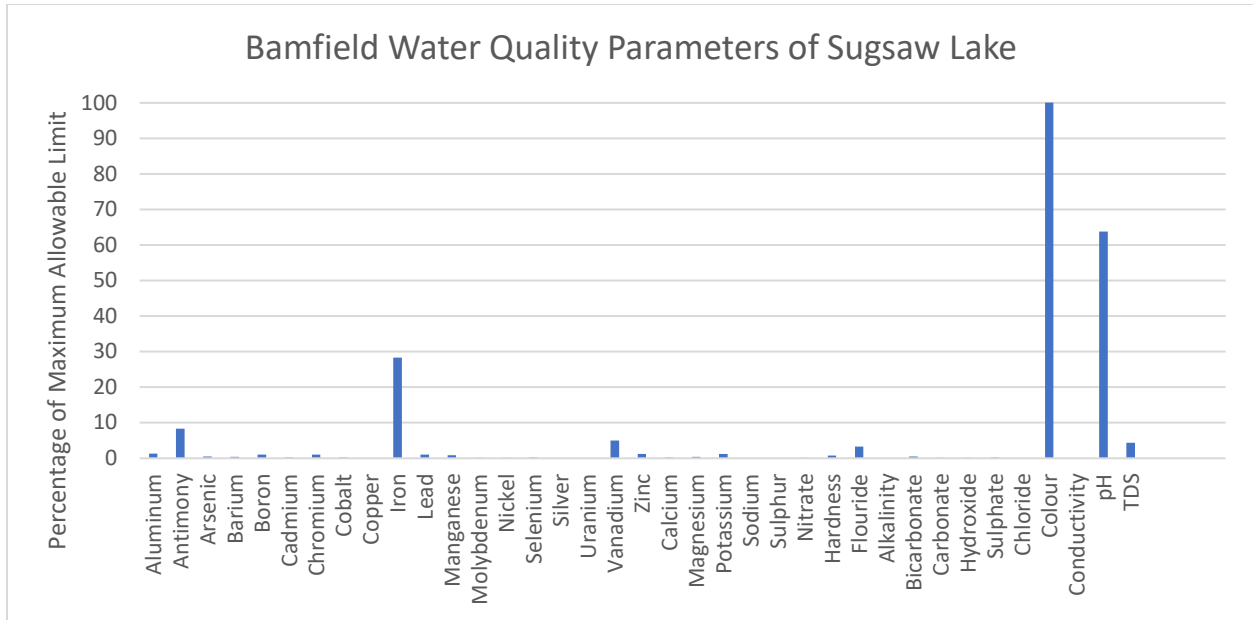
Target 3 - Less Than 1 NTU Turbidity in the Treated Water

Turbidity refers to the cloudiness or haziness of a fluid caused by suspended particles, and it is continuously monitored due to its impact on chlorine's disinfection effectiveness. The graph below indicates elevated turbidity levels in the raw water source during October and November, primarily due to heavy rainfall. Despite these events, the turbidity of the treated water consistently remains between 0.02 and 0.04 NTU, demonstrating that the water treatment plant has proven effective in removing turbidity from the raw water.

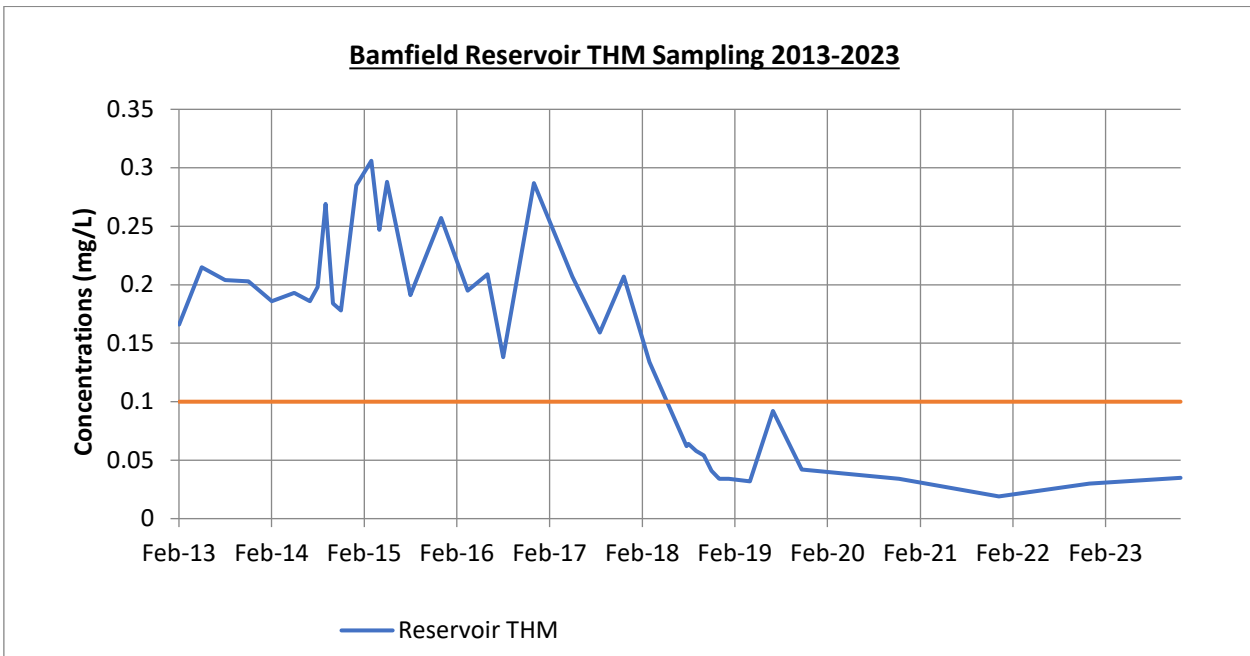


Target 4 - Meet the Drinking Water Quality Guidelines

The ACRD conducts regular testing to ensure that water meets all required standards. The most recent comprehensive potability sample for the water system is presented in the following Water Quality Parameters graph.



The colour in the raw water from Sugsaw Lake exceeds the acceptable limit due to elevated levels of dissolved organic matter. Once treated, the water exceeds all quality standards. While colour itself is not harmful, the associated organics within it can lead to the formation of disinfection byproducts (DBPs). The treatment plant is effective at removing the DBP precursors (colour and organics). The graph below illustrates the plant’s success in significantly reducing trihalomethanes (THMs), a key DBP.



Cost-Effective Targets:

- 1) Total water demand below 626 m³/day
- 2) Peak demand ratio of less than 2:1 PDD: ADD
- 3) O&M cost per customer less than \$1,500

Many factors influence the cost-effectiveness of a water system. Strategic management and planning, efficient operational practices and evolving water demands all play a role in shaping overall system costs.

Cost-Effective Target 1 - Total Water Demand Less Than 626 m³/day

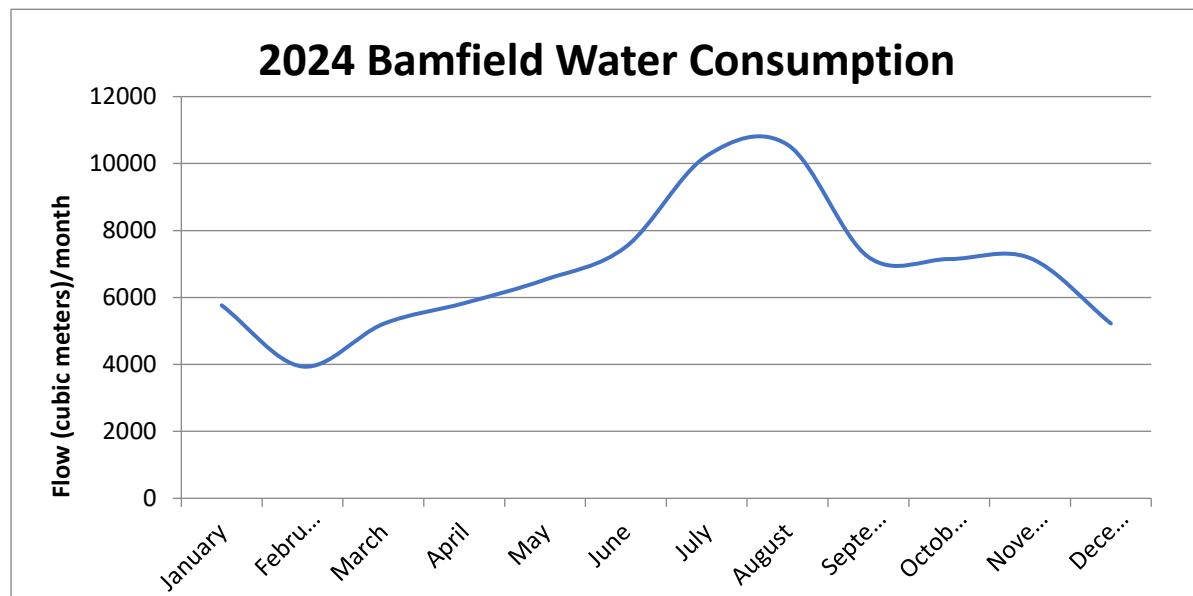
The treatment plant has a maximum capacity of 626 m³ per day. In 2024, the system supplied a total of 82,341 m³ of water to the community, with an average daily demand of 225 m³. During the summer, peak daily demand reached 304 m³. Both figures are well within the plant’s capacity and below operational targets.

Cost-Effective Target 2 - Peak Demand Ratio of Less Than 2:1 PDD: ADD

A water system must be designed to meet both peak demand and fire flow requirements. When peak demands are excessively high, larger pipes are required, which increases costs and creates operational challenges in maintaining water quality during periods of lower flow. The target is to keep the peak day demand (PDD) below twice the average daily demand (ADD). In 2024, PDD reached 304 m³, compared to an ADD of 225 m³, resulting in a PDD ratio of 1.35 to 1. In comparison, the 2023 PDD was 239 m³ with an ADD of 199 m³, a ratio of 1.2 to 1.

The graph below highlights the sharp increase in water use during the summer months, particularly in July and August, when system demand peaks. This seasonal surge reflects growing summer population and business activity in the community. Compared to 2023, both peak day and average daily demands were higher in 2024, pointing to a broader trend of increasing summer water use. As the community

continues to grow and attract more seasonal activity, this upward pressure on the water system is expected to continue, emphasizing the importance of proactive infrastructure planning.



Cost-Effective Target 3 - O&M Cost per Customer Less Than \$1,500

Total operating costs for the Bamfield Water system in 2024 amounted to \$256,233, excluding capital contributions and debt repayment. When divided among the 242 services connected to the system, this equates to an average cost of \$1,058 per customer. This is a decrease from the 2023 rate of \$1,116 per customer and below the established target.

Reliability Targets:

- 1) Unaccounted water loss less than 15%.
- 2) Maximum # of breaks less than 5/year.
- 3) Annual contribution to capital meets AMP targets of \$905/year

Reliability Target 1 – Unaccounted for Water Loss Less Than 15%.

The water system supplied a total of 82,341 m³ of water to the community. The total amount consumed through all water meters in Bamfield was 51,984 m³. The difference between the total water supplied and the amount consumed represents the unaccounted for or non-revenue water loss. This loss can be attributed to factors such as filter backwash, meter errors, water main breaks, flushing, unauthorized consumption and leaks. In 2024, the unaccounted-for water loss was 30,357 m³, accounting for 37% of all water produced. This marks a significant increase from the 2023 loss of 17%, highlighting the ongoing challenges of managing system losses. While progress was made in previous years, these results reinforce the need to continue investing in system monitoring, maintenance and leak detection. With rising water production costs, it is crucial to focus on reducing this loss. Leaks within the system remain the primary cause of water loss and will remain a key focus.

Reliability Target 2 - Maximum # of Breaks Less Than 5/year.

In 2024, a total of five leaks were reported within the system, which is a decrease from the nine leaks recorded in 2023. Notably, two of these leaks occurred on the West Bamfield submarine line. Leaks on

the submarine line are particularly challenging to pinpoint and as a result, they can contribute to greater water loss which helps explain the increase in overall loss compared to last year. The water operator continues to monitor the system flows closely to detect and resolve leaks as efficiently as possible.

Reliability Target 3 – Annual Contribution to capital meets AMP targets

In the fall of 2021, an Asset Management Plan (AMP) was developed for the Bamfield Water System to guide the renewal of infrastructure in a way that minimizes service interruptions, reduces risk and lowers overall costs. Together with the Infrastructure Renewal and Long-Range Plan prepared by Koers & Associates, the AMP assessed the age and condition of all system assets, determined replacement costs and identified the required annual capital investment of \$321,000.

This annual contribution target helps evaluate whether sufficient funds are being collected to proactively replace aging or failing infrastructure. Investing in infrastructure replacement can reduce long-term costs by lowering non-revenue water loss and minimizing emergency and corrective repairs.

In 2024, a total of \$190,886 was contributed to the capital fund. Based on the AMP, approximately \$321,000 should be collected each year, which equates to \$1294 per parcel for the 248 parcels in the system. Last year’s contribution averaged \$770 per parcel, an improvement over 2023, but still below the target.

Summary of Target Results for 2024

Over the past year, most performance targets were achieved, with the exception of unaccounted for water loss, the number of system breaks and capital contributions. The water treatment plant has continued to perform exceptionally well, consistently exceeding all water quality standards. Unaccounted-for water loss, which had dropped to 17% in 2023, rose to 37% in 2024, highlighting a critical area for improvement. As the cost of producing water continues to rise, it remains essential to focus on further reducing this figure. Replacing the West Bamfield submarine line, a known source of recurring leaks, is expected to contribute significantly to future reductions.

	Target	2024 BWS
Bacteria Results	0	0
Chlorine Residual	> 0.20 mg/l	> 0.20 mg/l
Turbidity	< 1.0 NTU	< 1.0 NTU
CDWQG	100%	100%
Total Demand	< 626 m ³ /day	225 m ³ /day
Peak Demand Ratio	< 2	1.35
Cost per customer	< \$1,500	\$1,090
Contribution to Capital	\$1,294	\$770
Water Loss	< 15%	37%
Breaks	< 5	5

3.0 Improvement Plan

2024 Projects Completed

Pumphouse Control Panel Replacement

In 2024, a new Intertek certified control panel was installed at the Bamfield pumphouse to replace the aging system identified as a reliability concern in late 2023. The custom-built panel includes a new programmable logic controller, updated human-machine interface and modifications to the SCADA program. These upgrades significantly improve the system reliability and provide more intuitive and efficient control of pumphouse operations. The result is a more consistent and cost-effective delivery of potable water to the community.

West Bamfield Submarine Line Engineering Design & Permitting Project

Engineering design work for the replacement of the West Bamfield submarine watermain began in 2024, with the contract for engineering services awarded to GreatPacific Engineering. Significant progress was made toward completing the design and advancing the permitting process. Due to the complexity of the project, permitting extended into 2025, particularly as the Department of Fisheries and Oceans (DFO) required substantial investigative work to support the application. Part A of the construction services contract was awarded to Fraser-Burrard Diving, who collaborated with GreatPacific Engineering to finalize the design. By working together to complete the design, the partnership ensured the final plans included the most cost-effective and reliable construction methods.

Upcoming Projects 2025

West Bamfield Submarine Line Construction Project

GreatPacific Engineering continues to navigate the complex permitting process required by the DFO. Part B of the construction services contract will be completed, allowing for the submarine watermain replacement to begin once the DFO permit is received. The project, valued at approximately \$1.2 million, is funded in part by an Investing in Canada Infrastructure Program grant of \$861,802 and approximately \$360,000 through Community Works funding. The total project cost may be subject to minor adjustments once Part B of the construction contract is officially executed. Work is expected to start in 2025, dependent on final permit issuance.

Reservoir Cleaning

Both reservoirs are scheduled for interior inspection using a remotely operated vehicle (ROV) and will be cleaned using a combination of the ROV and a remotely operated robotic crawler. The work will be completed while the reservoirs remain online, with continuous water quality monitoring in place. A detailed report on the condition of the reservoirs will be provided following the inspections.

Danger Tree Removal

Several trees located near the water treatment plant will be removed as a precautionary safety measure. These trees have been identified as potential fall hazards that could damage the facility and have therefore been scheduled for removal.

Water Operator Contract Tender

The current contract for the Bamfield Waterworks operator is set to expire on August 31, 2025. In preparation, staff will be issuing a public tender in the spring of 2025 to secure a qualified contractor to provide continued water system operation and maintenance services. This process ensures transparency, competitiveness and the continued delivery of safe and reliable water service to the community.

Long-Term Financial Strategy

The Finance Department will continue to work on the development of a long-term financial strategy for the water system. While a stepped rate increase introduced in Fall 2022 led to higher monthly water rates, those adjustments only addressed the increased costs of the waterworks contract.

A significant funding gap remains between current contributions to capital reserves and the level of investment needed to support essential infrastructure upgrades. Many watermains are undersized or constructed with substandard materials, contributing to leaks and increased maintenance costs. Staff are working to identify sustainable funding options for future infrastructure renewal and replacement, which may include further rate increases, parcel taxes or other funding mechanisms.