AGENDA

Infrastructure Committee Meeting

Tuesday, September 30, 2025, 6:00 p.m.

Council Chambers, 400 Centre Road, Lions Bay

And Via Zoom Video Conference

Zoom Invite Link: https://us02web.zoom.us/j/2780145720?omn=83365063095
To join via phone, dial 778-907-2071 | Meeting ID: 278 014 5720

We are privileged to be meeting and doing work on behalf of the residents of Lions Bay on the traditional unceded territory of the Squamish and Musqueam Nations.

Pages

1. Call to Order

2. Adoption of Agenda

Recommendation:
That the Infrastructure Committee Agenda of September 30, 2025, be adopted.

3. Public Participation

4. Approval of Minutes of Prior Meetings

4.1 Infrastructure Committee Meeting- June 10, 2025 3

Recommendation:
THAT the Infrastructure Committee Meeting Minutes of June 10, 2025, be approved.

5. Business Arising from the Minutes

6. Unfinished Business

- none

7. Reports

7.1 Harvey Creek Water System Inspection Report 10

A report on the inspections performed by Vancouver Coastal Health on the Harvey Creek Water System (potable water standards). Presented by Director of Operations Karl Buhr.

- for information

7.2 Magnesia Creek Water System Inspection Report 12

A report on the inspections performed by Vancouver Coastal Health on the Magnesia Creek Water System (potable water standards). Presented by Director of Operations Karl Buhr.

- for information

7.3 Lions Bay Drinking Water Quality 2024 Annual Report 14

The 2024 Annual Water Quality Report for Vancouver Coastal Health.

Presented by Director of Operations Karl Buhr.

- for information

7.3.1 Review of Water Distribution System Corrosion Potential 147

Corrosion Control Review EOCP by Anthony Greville - Presentation Paper may be read here.

- for information

**please also see additional files: Neptune Packaged Chemical Feed Systems & Primix Industrial Static Mixers*

Recommendation:
THAT the Infrastructure Committee recommends that Council pass a motion directing Staff to pursue next steps to correct the Lions Bay water chemistry in alignment with Vancouver Coastal Health requirements.

7.4 Union of BC Municipalities Resolution Update

A verbal update on the Resolution on Potable Water Treatment Plant being presented at the UBCM conference by Chair Neville Abbott.

- for information

7.5 2024/5 SCADA Budget Use 160

Director of Operations Karl Buhr on Supervisory Control and Data Acquisition (SCADA) system budget use.

- for information

7.6 Infrastructure Items for 2026 Budget Consideration

Director of Operations Karl Buhr to lead discussion on infrastructure related items for the 2026 Municipal budget.

- for discussion

8. Resolutions

- none

9. New Business

- none

10. Public Questions and Comments

11. Adjournment

Recommendation:
THAT the Infrastructure Committee Meeting be adjourned.

INFRASTRUCTURE COMMITTEE MEETING
OF THE VILLAGE OF LIONS BAY
HELD ON TUESDAY, 10 June, 2025 AT 6:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY
AND VIA ZOOM VIDEO CONFERENCE

MINUTES

In Attendance :	Councillor Neville Abbott (NTA) – Chair Mayor Ken Berry (KB) Councillor Michael Broughton (MB) Councillor Jaime Cunliffe (JC) – via Zoom. Committee Member Anthony Greville (ASG) Committee Member Mark Ignas (MI) – via Zoom. Committee Member Brian Ulrich (BU)
Absent with regrets :	
Absent :	Committee Member Hilary Monfared (HM)
Staff :	Director of Operations - Karl Buhr (DOO)

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1. Call to Order

The Chair called the Infrastructure Committee Meeting to order at 18:03 pm.

2. Appointment of Recorder

ASG was appointed recorder this meeting.

3. Approval of the Agenda

Moved/Seconded
THAT the agenda of 10 June, 2025, Infrastructure Committee be adopted as amened.
Amendment;
Add 6.3 – Work Plan for the Balance of 2025/6.
CARRIED.

4. Public Questions & Comments

No public comments or delegation were forthcoming.

5. Approval of Minutes

A. Infrastructure Committee Meeting Minutes – 08 April, 2025
THAT the Infrastructure Committee Meeting Minutes of 08 April, 2025 be approved as circulated.
CARRIED.

6. Business Arising from the Minutes

Infrastructure Committee Draft Report to Council : Union of B.C. Municipalities Resolution for Portable Water Facilities – The final letter to the UBCM was not available to review or for presentation to Council. It was agreed that BU would coordinate a listing of communities, First Nations and water associations which might benefit from the action step proposed and who would be likely to support the motion at the UBCM, to receive focused messaging from the Village.

7. Unfinished Business

25011 – ASG, BU and NTA reviewed the UBCM directory of communities and identified those most likely to support the UBCM motion. First Nations communities and Regional Districts were included. NTA to instruct staff to send out focused messaging letters requesting support.

025041 & 025041 – The DOO indicated he would be too busy with the other projects on hand to accomplish this task in a reasonable time and it was agreed ASG would at contact the VCH and MoE to attempt to fulfill the requirements of 025041.

8. New Business

A. **Long Term Water Supply Strategy** - BU confirmed the strategy document is now complete. He emphasised the broad finding was that peak shaving is the preferred option going forward and not total source replacement. With the increased supply due to ASAP and reduced demand due to leak detection and control, and future universal water metering, it is anticipated raw water supply, while always a concern, will not require replacement, but rather management.

B. **Corrosion internal to D.I piping for CUBB 3** - A sample of corrosion product, likely iron oxide tubercles, from the CUBB 3 mains were presented to the I.C. A portion of the sample is being send out for analysis. The presence of this level of corrosion supports the requirement to adjust pH in the distribution system. See Notes below for further details.

C. **Bridge Deck Corrosion** - All three bridges examined in the early spring for potential metal support corrosion were determined to be in good shape, and do not require significant remedial work. There are still three more bridges to exam later in the year.

D. **Active Transportation Plan** - While the preparation of an Active Transportation Plan has been somewhat sidelined by raw water concerns, it was agreed this is still a vital project to pursue and it should maintain a focus in the 2025/26 work plan.

E. **AZAP - All Zone All Property Metering** - This is the key project in the Village for the next 2 years. Currently in the planning stage, and receiving advise from engineering consultants and government officials. The project includes $50 K for public communications. Ground breaking is anticipated in early 2026 with project completion required by March 2027.

F. **CUBB 3 Project** - This project is at the detailed engineering stage, with over ground work anticipated to start in March 2026. Current budgeting may allow for the project to be expanded up Bayview Road and possibly to replace all the AC lines in the ground.

G. **IMP Up-date** - Another key project for the I.C. to undertake on behalf of the Village. BU volunteered to start the IMP review process before the end of the year. See below for tasks to be completed during the up-date.

9. Public Questions & Comments

No public comments or delegation were forthcoming.

10. Adjournment

Moved/Seconded
THAT the Infrastructure Committee Meeting be adjourned.
CARRIED

The meeting adjourned at 19:52.

11. Next Meeting

Next meeting of the Infrastructure Committee was scheduled for 09 September, 2025.

INFRASTRUCTURE COMMITTEE MEETING
OF THE VILLAGE OF LIONS BAY
HELD ON TUESDAY, 10 June, 2025 AT 6:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY
AND VIA ZOOM VIDEO CONFERENCE

Discussion and Background Notes

Contribution by : Anthony Greville (ASG)

Also in attendance : Councillor Neville Abbott (NTA) – Chair
Mayor Ken Berry (KB)
Councillor Michael Broughton (MB)
Councillor Jaime Cunliffe (JC) – via Zoom.
Committee Member Mark Ignas (MI) – via Zoom.
Committee Member Brian Ulrich (BU)

Absent with regrets :

Absent : Committee Member Hilary Monfared (HM)

Staff : Director of Operations - Karl Buhr (DOO)

Discussion and Background Notes.

Identifier	Description	Responsible	Status
23112	Convene a February I.C. Round Table Meeting to focus on a 10 and 20 year horizon plan to identify the new and replacement infrastructure requirements and related expenses.	NTA/All	
23117	BU will review the SCADA system on behalf of the I.C. and work with the PWM to up-grade the hardware and software. A Requirements Document is anticipated at mid 2024.	BU/PWM	Partial
23121	HM to assist the PWM in preparing REQ/RFP documentation for estimate and work on water main replacement Creekview Place and for the estimate for Highview Place. HM to assist the PWM and CAO in reviewing submissions once received.	HM/PWM	

24073	In light of discussion at the 03 July Finance and Audit Committee Meeting, the documents relating to asset management and asset replacement funding deficiencies need to be up-dated and presented to the F & A C, the CAO and staff and the Village as a whole. This should be an early Fall project for this group.	All	
24081	BU to set up and manage a Google Drive (or similar) to manage the water supply data as it is collected.	BU	
24112	The I.C. should provide direction and support to Staff in order for the Village to prepare an Active Transport Plan. Coordinating same with the Climate Action Committee should be evaluated.	HM	
24113	ASG to work with the DOO and VCH to revise the ENSuRe trigger points and guidelines recommendations.	DOO/ASG	✓
25011	NTA, ASG and MI to contact to contact various groups/associations they believe may support Lions Bay in advocating/petitioning higher levels of Governments to inventory portable potable WTP to use should raw water supplies become contaminated as a consequence of forest fires in their watersheds.	NTA/ASG/MI	✓
25031	An action step resulting from the Long Term Water Supply Strategy discussions, is the I.C. is to work with staff to put forward a recommendation to Council outlining the preferred steps to determine if well water has sufficient supply, recharge capacity and quality to be considered a viable option as a water source for peak shaving application.	ASG/DOO	
25032	ASG to prepare a training package for staff relating to UVT, chlorine dosage and distribution system residual, disinfection, required Ct, and water storage times as they relate to the ENSuRe protocol (Fall 2025).	DOO/ASG/BU	
025041	The I.C. will submit a recommendation to Council to direct Staff to contact the B.C. Ministries of Health and Environment regarding information and protocols for a license to drill a test well on Crown Land, to possibly expand any suitable test well to a production well(s), and to allow well water to be properly conditioned prior to addition to the municipal water supply system.	NTA	
25042	The I.C. will submit a recommendation to Council to direct Staff to engage a suitably qualified professional hydrogeologist to determine the most favourable location to drill a test well that will not compromise our existing water licenses by installing a Ranny Well.	NTA	

25061	The I.C. will begin a 10 year review of the IMP with the intention of up-dating all action items, adding in necessary new items, re-prioritizing action items, and, where possible, obtain current budget estimates for eh high priority items.	All	

NOTES:

CUBB 3 Project - The CUBB 3 project is currently at the detailed engineering stage and is expected to commence ground work in the spring of 2026. The DOO brought in a sample bag of corrosion tubercules, typical of cast iron and ductile iron corrosion product. Samples are to be sent for analysis at a local accredited laboratory.

While it is highly likely $Fe(II)(OH)_2$ and $Fe_2(III)O_3$ will constitute the bulk of the deposit, it is possible other metals, including corrosion product from upstream AC lines, and organic material (volatile at 500^0 C) will be present. Organic material content will be instructive, as the presence of colloidal and dissolved organic material impacts both UV and chlorine disinfection efficiencies. Lions Bay does not currently remove organic material from the raw water, and its presence is a critical part of the ENSuRe initiative.

Initial budget cost estimates have been positive, and it may be possible, within the existing budget allowance, to increase the scope of the project to include all distribution system water mains along Bayview Road, Bayview Place and possibly as far up as the centre of Bayview Road.

Chemical pH adjustment of finished potable water - The condition of the D.I. water main being replaced as the CUBB 3 project confirms that low pH in the finished water has contributed to corrosion within the water distribution system. Low raw water pH may also be having effects prior to the water plants as well.

The DOO also had a butterfly valve from the Magnesia Creek water plant, removed between the intake and the UV lamps in the WTP. The valve wings were showing indications of general corrosion, but more significantly of some pitting corrosion.

pH adjustment of the water supply was postponed for the 2025 budget cycle, but these two developments highlight the need to install a pH enhancement option at both water treatment plants in 2026. The VCH inspector is also “pushing the Village” in this direction.

Infrastructure Master Plan Up-date - One important task the I.C. can do to give direction to both Council and Village Staff, is to review and up-date the April 2016 IMP. A 10 year review is not unreasonable, and it is something the I.C. can be effective at completing. Tasks the I.C. has been asked to consider includes;

Remove Completed Items from the plan’s “to do listings”,
Add new items that have arisen over the past 10 years,

Shuffle the priorities to reflect the new reality
Obtain up-dated cost estimates for the higher priority items.

Kelvin Grove Sanitary Sewer System – There are two items with respect to the Kelvin Grove sanitary sewer system and WWTP that need consideration, and action step recommendations.

There continues to be a night-time flow of 1.4 $Lsec^{-1}$ into the KG WWTP. Calculated out, this totals 120,960 litres per day, or approximately 50% of the entire loading into the plant (and onto the RBC reactors). If we assume there are 300 residents in the 97 houses, them this I & I loading is 403 lpppd. This amount of I & I, in excess of the Canada, B.C. and M.V. average daily consumption of water, can be considered extraordinary. The "conventional" dry weather loading on a WWTP is considered to be 80% of the water demand, and at night, in Kelvin Grove, this should be almost zero, not 50% of the total daily loading.

Reducing this I & I would put a lower demand on the WWTP, and consequently lower the plant's effluent flow, which sometimes is in excess fo the permit; it will lengthen the time the wastewater is in contact with the biological reactors, thus improving effluent quality, and will reduce the "wear and tear" on the plant, increasing the reactor's life expectancy, before they need to be replaced. This should be a priority project for the PWD once the CUBB and AZAP projects are complete in early 2027.

The DOO brought to the table a second long term project to consider, especially in the IMP Up-date deliberations; namely a force main from the LBBP, up to the highway, and then back down into the KG WWTP. If the I & I issue noted above can be rectified, then the KG WWTP would have plenty of excess capacity. There are currently issues with the LBBP beach house toilets, causing a lot of unpleasant extra work for the PWD during the summer season when the visitor population is high. Additionally, such a system could allow for Lions Bay Avenue, Seaview Place, and Cloudview Place etc., to be added to the sewer system, lowering costs for all residents connected to the system, and increasing some property values etc.

FIRE-UP – Community Centre Heat Pump Project – While the FIRE-Up project is not an I.C. project, it was coordinated by the CAC, it was fully supported by the I.C. An up-date was forwarded which indicated the electrical work will be completed before the end of June and that the existing oil tank will be removed before the end of July. The FIRE-UP project is expected to be completed before the fall, allowing the Community Hall to be warm throughout the winter period. The I.C. group present at the end of the meeting was given a tour of the project to date.

WATER FACILITY INSPECTION REPORT
Health Protection

Premises Name **Harvey Creek Water System**	Tel: (604) 921-9333 Fax: (604) 921-6643	
Premises Address PO Box 141, 400 Centre Rd Lions Bay, BC V0N 2E0	Inspection Date September 03, 2025	Time Spent 3.5 hours
Operator (Person in Charge)		
Inspection Type Routine		

Observed Violations
There are no observed violations.

Section Details

Comments

Routine inspection of the Harvey Creek Water System was conducted with Public Works Manager Karl Buhr, Chief Water Operator Alberto Urrutia, Public Works Tech Gary Stamper, and VCH P. Eng Chris. Bacteriological sampling frequency was acceptable in 2024 and result meet the Schedule A potable standards outlined in the Drinking Water Protection Regulation. The 2024 annual report was submitted and review has been done with the operator with revisions required.

Construction Permit Condition Follow-up for Alberta Creek Augmentation Project

1. Pest proofing of the lid and vent for the Oceanview tank has been completed. Operator to send photos as confirmation.
2. Air gap/cross connection control needed at one of the Oceanview tank valve. This is not complete yet.
3. Chlorination CT calculation to confirm 4-log viruses reduction for the Harvey Creek System has not been completed yet.
4. It was discovered that the inlet and outlet lines on the Oceanview tank drawing were different than the as-built design. Operator to send updated drawings.

Projects in progress

1. Watermain Upgrade

Section of the watermain along Bayview Rd will be replaced. Project to break ground in March 2026. No construction permit submitted yet.

2. Filtration exemption

Source water protection is posted online, which includes watershed control program to minimize the potential for fecal contamination in the source water. This satisfies criteria 4 of the filtration exemption. The remaining criteria not satisfied for filtration exemption is criteria 3. As noted in the previous inspection report, the treatment currently does not meet the BC Surface Water Treatment Objectives because there is no control for turbidity episodes.

Criteria 3: "Average daily turbidity levels measured at equal intervals (at least every four hours) immediately before the disinfectant is applied are around 1 NTU, but do not exceed 5 NTU for more than two days in a 12-month period." Previous turbidity data review back to 2018 showed multiple short turbidity spikes >5NTU, but the average daily turbidity does not exceed 5 NTU for more than two days in a 12-month period. To satisfy this criteria, the turbidity spikes must be addressed to ensure turbidity levels of "around 1 NTU" or less. VCH recommends managing the intake of water by "bypassing" the source when turbidity levels are greater than 1 NTU. This will require a Construction Permit to install an

actuated valve system for bypassing the source. Written procedures would be required on how the treatment plant would operate during a bypass situation. Alternatively or in addition to the by-pass, VCH would support the addition of filtration to the water system treatment process.

Operator has requested council for budget to bring power up to the Harvey intake in order to install UVT/turbidity meter for real time data at the intake to allow shut off when NTU goes above 1.
Once the outstanding criteria has been satisfied, VCH would recommend a filtration exemption for this water supply system. On-going monitoring of the required filtration exemption criteria would be required to ensure the criteria continue to be met.

3. UV Dosage
Based on the UV reactor's settings, the UV reactor is only validated to provide a dose of 26.25mL/cm2 for water with a UVT of 90%. During the times when the UVT drops below 90%, the water would be considered "off specification", which means the UV equipment is not achieving the required UV dose or log inactivation. In order to receive pathogen log reduction credits, at least 95% of the water delivered to users needs to be operating within its validation envelope. Operator is working on CP for the previous installation of two additional UV bulbs and to increase the UV dosage to receive the pathogen log reduction credits.

Future plans
There are plans for pH adjustment in the future, as the pH of the source water is at around 6.9, causing corrosion concerns. Operator is aware CP is required for this project.

Actions
1. Submit the final version of the 2024 annual report to VCH.
3. Complete the outstanding conditions listed in the CP for Alberta Creek Augmentation Project.
2. Submit the CP for the ongoing projects to VCH. This includes the CP for the watermain replacement, two to four lamp UV changes with the increase of UV dose, and bypassing the source during high turbidity event.

Action Taken
☒ Information Exchanged

Hazard Rating For Your Facility:	☐ High	☐ Moderate	☒ Low

DWO
DWO Printed Name **Celine Hsin**

WATER FACILITY INSPECTION REPORT
Health Protection

Premises Name **Magnesia Creek Water System**	Tel: (604) 921-9333 Fax: (604) 921-6643	
Premises Address PO Box 141, 400 Centre Rd Lions Bay, BC V0N 2E0	Inspection Date September 03, 2025	Time Spent 3.5 hours
Operator (Person in Charge)		
Inspection Type Routine		

Observed Violations
There are no observed violations.

Section Details

Comments

Routine inspection of the Magnesia Creek Water System was conducted with Public Works Manager Karl Buhr, Chief Water Operator Alberto Urrutia, Public Works Tech Gary Stamper, and VCH P. Eng Chris. Bacteriological sampling frequency was acceptable in 2024 and result meet the Schedule A potable standards outlined in the Drinking Water Protection Regulation. The 2024 annual report was submitted and review has been done with the operator with revisions required.

Projects in progress

1. Filtration exemption

Source water protection is posted online, which includes watershed control program to minimize the potential for fecal contamination in the source water. This satisfies criteria 4 of the filtration exemption. The remaining criteria not satisfied for filtration exemption is criteria 3. As noted in the previous inspection report, the treatment currently does not meet the BC Surface Water Treatment Objectives because there is no control for turbidity episodes.

Criteria 3: "Average daily turbidity levels measured at equal intervals (at least every four hours) immediately before the disinfectant is applied are around 1 NTU, but do not exceed 5 NTU for more than two days in a 12-month period." Previous turbidity data review back to 2018 showed multiple short turbidity spikes >5NTU, but the average daily turbidity does not exceed 5 NTU for more than two days in a 12-month period. To satisfy this criteria, the turbidity spikes must be addressed to ensure turbidity levels of "around 1 NTU" or less. VCH recommends managing the intake of water by "bypassing" the source when turbidity levels are greater than 1 NTU. This will require a Construction Permit to install an actuated valve system for bypassing the source. Written procedures would be required on how the treatment plant would operate during a bypass situation. Alternatively or in addition to the by-pass, VCH would support the addition of filtration to the water system treatment process.

As part of the filtration exemption requirement to control turbidity events, operator has started the Magnesia Intake Implementation Cutoff project. Real Tech UVT and camera at the Magnesia intake screen has been installed in 2025. Trial runs will soon commence on manually shutting off the intake on SCADA when NTU is above 1, and reopen the intake once NTU drops below 1. The final part of the project is to install a control valve for automatically bypassing the source during high turbidity events. Currently, the UV reactor automatically shuts off when NTU goes above 5.

Operator was reminded that a Construction Permit application is required for this project. Once the outstanding criteria has been satisfied, VCH would recommend a filtration exemption for this water supply

system. On-going monitoring of the required filtration exemption criteria would be required to ensure the criteria continue to be met.

2. UV Dosage
The installation of the real-time UVT analyzer will help capture how often the UV equipment is “off-specification”, as based on the UV reactor’s settings, the UV reactor is only validated to provide a dose of 26.25mL/cm2 for water with a UVT of 90%. During the times when the UVT drops below 90%, the water would be considered “off specification”, which means the UV equipment is not achieving the required UV dose or log inactivation. In order to receive pathogen log reduction credits, at least 95% of the water delivered to users needs to be operating within its validation envelope. Operator is working on CP to increase the UV dosage of the two reactors to receive the pathogen log reduction credits.

3. CT calculation
CT calculation for Magnesia has been reassessed. Construction Permit will be submitted to VCH to review changes in CT.

Actions
1. Submit the final version of the 2024 annual report to VCH upon completion
2. Submit the CP for the ongoing projects to VCH. This includes the CT calculation changes, UV dose increase changes, and bypassing the source during high turbidity event upgrade.

Action Taken
☒ Information Exchanged

Hazard Rating For Your Facility: ☐ High ☐ Moderate ☒ Low

DWO
DWO Printed Name **Celine Hsin**

Village of Lions Bay

2024 ANNUAL REPORT ON DRINKING WATER QUALITY

VERSION 1 (SUBMITTED TO VANCOUVER COASTAL HEALTH 21 JUL. 2025)
VERSION 2 (SUBMITTED TO VANCOUVER COASTAL HEALTH 8 SEP. 2025)
VERSION 2.1 (SUBMITTED TO VANCOUVER COASTAL HEALTH 12 SEP. 2025)

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EXECUTIVE SUMMARY

The Village of Lions Bay is a small British Columbia municipality of 1368 census residents, located on Highway 99 midway between Vancouver and Squamish, on the steep slopes of Howe Sound. Unlike most members of the Metro Vancouver Regional District, which receive drinking water wholly or partly from the Greater Vancouver Water District, Lions Bay is a standalone municipal water utility and produces its own drinking water. Water quality is sampled from the collection, treatment and distribution system throughout the year.

In 2024, Lions Bay:

- **Met the *Drinking Water Protection Regulation* that no fully treated water sample tested positive for *E. coli;* and "In each 30-day period, over 90 percent of…samples [had] zero Total Coliform, and no sample [had] more than 10 Total Coliform per 100 millilitres." One partially treated sample (post-UV but pre-chlorination on Nov. 4) was positive for *E. coli* after a week of heavy rain, but no samples were positive post-chlorination. See p.17 for details.**
- **Met all guidelines and recommendations for chemicals, metals and other water quality measures, except for lead results from the first draw of two in-building sample points over the *Canada Guidelines'* Maximum Allowable Concentration (post-flush readings were acceptable, but the result demonstrates the need to flush domestic services before use. See p.28 for details).**
- **Continued to meet two of four conditions for continued raw water filtration exemption, and is progressing sufficiently on the remaining two to satisfy VCH; see p.39 for details.**
- **Assesses its water infrastructure as workable but needing upgrading, especially certain watermains for fireflow reasons. Accelerating leakage is an issue, to be addressed in 2025 and 2026 by implementation of universal property and zone water metering. Day-to-day, tactical and strategic management and planning is in hand.**

This detailed report is presented as a record of the year's water. Audiences include Vancouver Coastal Health (the drinking water regulator), Council (the elected representatives of the community), and the public. It should be read in conjunction with the Lions Bay Source Water Protection Plan available on the municipality's website.

GLOSSARY/ABBREVIATIONS

cu.m, m^3	Cubic meter, 1000 litres
DWO	VCH's Drinking Water Officer
EOCP	The BC Environmental Operators Certification states as its mission "To protect human health and the environment by investing in Operators and facilities through increased knowledge, skill, and proficiency in all matters related to the water cycle."
GPD	(US) gallons per day. There are 264 USG/cu.m
ID	Inside Diameter (of a pipe; tubes are sized by outside diameter)
L	Litre or liter, 1/1000 of a cubic meter of liquid
mg/L	Because the kilogram was originally defined as the mass of one litre of water at 0 °C, concentrations of water solutions and suspensions stated in traditional volume-per-volume measures such as parts per million (ppm) are equivalent to more rigorous mass-per-volume measures such as milligrams per litre (mg/L). For uniformity, concentrations are stated in this report in mg/L or µg/L (micrograms per litre).
MHO	VCH's Medical Health Officer
MVRD	The Metro Vancouver Regional District comprising a treaty First Nation, an Electoral Area and 21 municipalities including Lions Bay[1]. Known as the Greater Vancouver Regional District until 2015, Metro includes the Greater Vancouver Water District and Greater Vancouver Sewerage and Drainage District, which Lions Bay does not participate in.
USG	US gallon of 3.79 L, as distinct from the imperial gallon of 4.55 L, in common use in Canada due to most equipment being supplied from the US
UVT	Ultraviolet transmittance, a measure of the amount of ultraviolet light able to pass through water, expressed as a percentage
VCH	Vancouver Coastal Health, the regional health authority and Lions Bay's water regulator

[1] sc̓əw̓aθən məsteyəxʷ (Tsawwassen First Nation), Electoral Area A, Anmore, Belcarra, Bowen Island, Burnaby, Coquitlam, Delta, Langley City, Langley Township, Lions Bay, Maple Ridge, New Westminster, North Vancouver City, North Vancouver District, Pitt Meadows, Port Coquitlam, Port Moody, Richmond, Surrey, Vancouver, West Vancouver, White Rock.

1. INTRODUCTION

REGULATION

As a standalone municipal water utility under the *Local Government Act,* the *Drinking Water Protection Act* and the *Drinking Water Protection Regulation*, Lions Bay is required to:

1. Operate under permits issued by the BC Ministry of Health Services
2. Engage in water quality monitoring
3. Prepare this annual report on water quality.

Administration and enforcement of the regulations falls to regional Health Authorities. Lions Bay's health authority is Vancouver Coastal Health (VCH), represented by a Drinking Water Officer (DWO) who works with municipal staff on a daily, weekly and monthly basis.

Water quality is sampled from the collection, treatment and distribution system throughout the year according to 1) Health Canada *Guidelines for Drinking Water Quality*; 2) direction from the Drinking Water Officer; and 3) where no Canadian regulations exist, using U.S. Environmental Protection Agency (EPA) guidelines.

ECONOMICS

With low economies of scale, Lions Bay drinking water is expensive: 2024 water spending was $1,217,790, 9% over a budget that was approximately 24 percent of the municipality's total operating budget including amortisation and interest. Water cost is largely independent of the amount of water produced:

ITEM	FIXED COST	VARIABLE COST
Maintenance and repair:		
Access roads & intake	86,468	
Plants	55,443	
Watermain/distribution	31,994	
Amortisation of capital assets	219,226	
Bulk chlorine		12,996
Data connectivity, SCADA maintenance	28,774	
Electricity, plants, UV reactors	2889	13,050
Financing and interest	85,982	
Insurance	53,908	
Laboratory	22,122	
Water license	450	450
Staffing:		
Treatment plants	242,032	
Intakes	101,343	
On-call	109,863	
Payroll costs, certification, training	81,474	
Allocated Administrative Dept.	68,325	1000
	1,190,293	27,496
	97.7%	2.3%

Water operating costs are funded by a flat annual utility fee that in 2024 averaged $2091 over 559 residential and commercial properties:

ANNUAL WATER RATE COMPARISONS

Lions Bay (527 single family, 20 multi-family, 1 institutional, 5 commercial)	$2091
Vancouver (single family)	$867
Surrey (single family)	$1082
Coquitlam (single family)	$699
Belcarra (single family)	$1403

2024 water capital expenditure was budgeted at $721,000 for the Alberta Supply-Augmentation Project (delivered under budget after a mid-project reconceptualisation), and $205,000 for process control system upgrades.

The volume of water produced in 2024 was 497,400 cu.m or 131,400,000 USG, an average of 359,100 USG per day, which was a significant reduction on 2023's 618,600 GPD average. 2024's water demand represents 978 liters per capita per day, approximately double the regional average (see EXCESSIVE DEMAND on p.47 for further discussion). A high 86 percent of the year's production was from the Harvey Plant to utilise available zone flowmeters to track leakage; the Magnesia Plant was cycling the entire period, ready to bring online if needed.

Municipal staff are proud of Lions Bay's water quality and that there have been no Boil Water Advisories in 11 years.

2. SOURCE WATER

See the Lions Bay Source Water Protection Plan for details on the barriers and measures in place to protect Lions Bay's drinking water from source hazards.

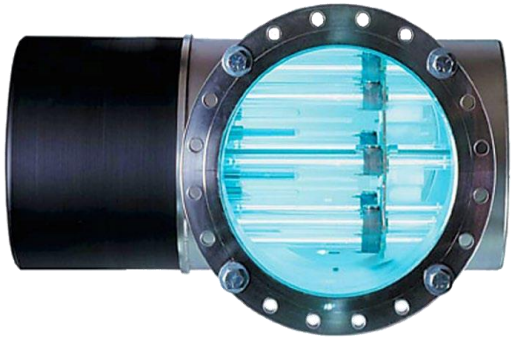
Operationally, when the volume of treated water in a given plant's storage tank drops to a set level, an automated sequence starts to warm up one of two alternating UV reactors, open the inlet from the weirs and screens on Harvey, Alberta or Magnesia creeks, and draw water through the reactors, injecting chlorine before refilling the tank to a set level.

3. TREATMENT

PLANT PERMITS

	Magnesia Plant	Harvey Plant
VCH Operating Permit	Facility 3317552347	Facility 3317552348
Environmental Operators Certification Program (EOCP) classification	Class I Water Treatment Facility, certification renewed 2023, valid to November 16, 2028	

PRIMARY DISINFECTION: ULTRAVIOLET TREATMENT

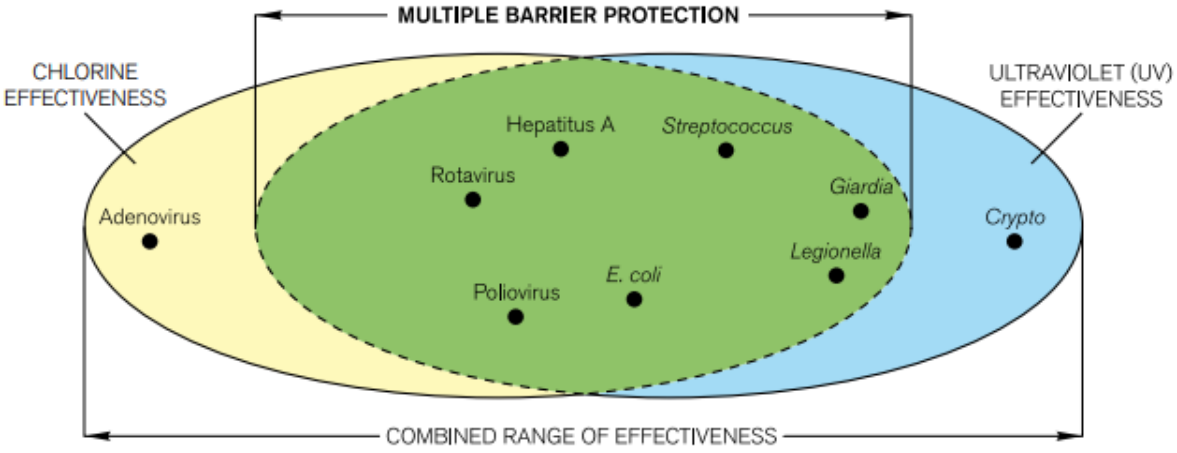


Lions Bay does not filter raw water (see FILTRATION EXEMPTION on p.36), but review the Lions Bay Source Water Protection Plan for information on screening that takes place before raw water flows to the Harvey and Magnesia treatment plants.

Both plants operate virtually identically and their first treatment step is ultraviolet (UV) irradiation of the incoming raw water. Reactors automatically adjust lamp power to maintain the UV dose required to achieve a 3-log (thousand-fold, 99.9%) reduction of a wide range of microorganisms, particularly chlorine-resistant *Giardia* and *Cryptosporidium* protozoa. When dosing cannot be maintained due to incoming raw water parameters such as high turbidity or low ultraviolet transmissivity, the reactor alarms, and the plant process control system halts flow.

UV DOSING

UV is effective against a wide range of microorganisms:



In 2021 the Harvey Plant's two alternating UV reactors were upgraded from two lamps each to four, to provide sufficient capacity for occasional turbidity spikes at the 700,000+ GPD flowrates being experienced at the time. In 2024, as part of the application for the outstanding VCH Construction Permit (CP) to formalize the upgrade, the reactor manufacturer advised that the original reactor parameters had been set on the basis of five raw water qualification samples that happened to be over 90% ultraviolet transmittance (UVT). Lions Bay raw water UVT often goes below 90% and the reactors were immediately reconfigured to expect 80% UVT. Reactor specifications provide a 3-log (99.9% or one thousand-fold) reduction of *Cryptosporidium* and *Giardia* at raw water ultraviolet transmittance (UVT) values down to 70%:

UV REACTORS		***Harvey 2-lamp (prior)***	**Harvey 4-lamp**	**Magnesia 2-lamp**
Qualification raw water UVT		*90%*	80%	90%
Min. cryptosporidium inactivation per chamber		*3 log (99.9%)*	3 log (99.9%)	3 log (99.9%)
Max. flow, single chamber	ML/d	*3.25*	6.52	2.79
	GPD	*858,562*	1,722,407	737,280
	GPM	*596*	1,196	512
Avg. daily flow, single chamber	ML/d	*1.85*	3.70	1.84
	GPD	*488,719*	977,437	486,077
	GPM	*312*	679	338
Target dose per chamber, MS2-RED*, mJ/cm^2		*26.25*	36.46	26.25
Max. cycles/day for warrantee purposes		*4*	4	4

*Male Specific 2 (bacteriophage)-Reduction Equivalent Dose

Operating procedures were changed in 2024 to reduce cycles per day, and both plants' inlet valves will be upgraded in 2025 to control flowrate rather than simply outlet pressure. The 4-lamp Harvey configuration now provides for 977,000 GPD of throughput, achieving the original capacity goal of the upgrade project, but with now-continual leak fixing and the advent of universal water metering in 2025 and 2026 (see METERING on p.50), this throughput will not be seen again, somewhat negating the need for four lamps. Nonetheless, the dose will be increased to the specified 36.5 mJ/cm^2 (40 mJ/cm^2 nominal) once VCH issues the CP. UVT for incoming raw water was always above 70% in 2024 (full data on p.60):

RAW WATER UVT, 2024		
	Harvey (no Alberta supply utilised in 2024)/%	**Magnesia/%**
SAMPLES	244	240
MIN	73.6	77.0
MAX	98.3	97.9
MED	92.2	95.0
AVG	91.3	94.3

SECONDARY DISINFECTION: CHLORINE TREATMENT

After UV disinfection, water is injected with 12% sodium hypochlorite-water solution at a rate to produce chlorine concentrations above 0.2 mg/L throughout the system "Hypo" is the same substance used to disinfect swimming pools and the active ingredient of laundry bleach. It is used worldwide as a safe, inexpensive and effective barrier against cholera, polio, typhoid, hepatitis, enteric and other

waterborne disease organisms. It works by disrupting organism respiration and reproduction, and as stated above, is particularly effective against simpler lifeforms such as viruses, which UV is not. The presence of chlorine in the distribution network prevents organism regrowth by continuing to disrupt reproduction.

Chlorine level in drinking water is not directly regulated by BC's *Drinking Water Protection Act* or *Drinking Water Protection Regulation.* Instead, Health Canada's *Guidelines for Canadian Drinking Water Quality (*summarised on p.56) indicate that setting a maximum chlorine value "is not necessary due to low toxicity at concentrations [typically] found in drinking water" and state "free chlorine concentrations in most Canadian drinking water distribution systems range from 0.04 to 2.0 mg/L." Health Canada's supplemental *Guideline Technical Document—Chlorine* publication states that:

- The *US EPA Surface Water Treatment Rule* requires a minimum disinfectant residual of 0.2 mg/L for water entering the distribution system and that a detectable level be maintained throughout the distribution system.
- The World Health Organization (WHO) has suggested that, for areas with little risk of cholera or related outbreaks, a free chlorine residual range of 0.2-0.5 mg/L be maintained at all points in the supply (WHO, 1997 and that in general, a free chlorine residual of 0.2 mg/L is considered a minimum level for the control of bacterial regrowth in the distribution system

American Water Works Association (AWWA) standards and guidelines lay out that for safe drinking water in the distribution system, levels are generally low (0.04-2.0 mg/L free chlorine) to ensure disinfection while maintaining consumer acceptability. These guidelines cover a wide range. **In Lions Bay the objective is to maintain 0.20 mg/L of chlorine residual in all parts of the system at all times**. In practice the following results were achieved in 2024:

SUMMARY: 2024 CHLORINE RESIDUALS/mg/L								
	Harvey Plant Tank	PRV-3 (Highway Tank)	Café/Store (inside)	Lions Bay Ave (cul-de-sac)	Kelvin Grove (Works Yard)	Magnesia Plant Tank	PRV-5 (north Bayview)	Brunswick Beach (cul-de-sac)
SAMPLE COUNT	248	249	248	249	249	243	249	249
MIN	0.64	0.35	0.34	0.23	0.19	0.42	0.64	0.20
MAX	0.99	0.95	0.97	0.83	0.83	1.10	1.03	0.93
MED	0.85	0.81	0.71	0.57	0.50	0.85	0.80	0.65
AVG	0.85	0.81	0.70	0.57	0.51	0.85	0.79	0.63

Further information is provided at DISTRIBUTION NETWORK SAMPLING on p.19.

CONCENTRATION TIME (CT)

The concentration-time (CT) parameter determines a disinfectant dosage as the product of the concentration of free chlorine and the contact time with the water being disinfected, expressed mg-min/L. At the concentrations above, CT is achieved in storage and transit as follows:

AVERAGE RETENTION TIMES AT VARIOUS OVERALL CONSUMPTION RATES				
At a consumption of…	**In Harvey tank (when supplying 80% of total demand)/hours**	**In Magnesia tank (when supplying 20% of total demand)/hours**	**Watermains/hours**	**In system overall, including Highway Tank and watermains/hours**
350,000 GPD	54	43	7	60
500,000 GPD	37	30	5	42
650,000 GPD	29	23	4	32

4. SAMPLING

Water sampling assures water quality during treatment and throughout the distribution network. Every workday, municipal staff draw samples to test in-house for turbidity and chlorine residual (and pH in 2025). Weekly samples are sent to the VCH laboratory for bacteriological testing for *E. coli* and Total Coliform. More extensive semi-annual testing at an accredited third-party lab is conducted for general chemistry, metals and contaminants. There are 14 sample locations in all:

Sample Location	Usual source[2]	SAMPLING FOR…			
		Residual chlorine	Turbidity	Bacteriological	Metals, chemicals
Harvey Plant raw	Harvey Creek	Before chlorination	Daily	Weekly	Semi-annual
Harvey UV reactor	Harvey Plant			Monthly	
Harvey Tank		Daily	Daily	Weekly	Semi-annual
PRV-3 (Highway Tank)		Daily	Daily	Weekly	NA: mid-system
Store/Cafe inside (network end)		Daily	Daily	Weekly	Semi-annual
Lions Bay Avenue cul-de-sac (network end)		Daily	Daily	Weekly	Semi-annual
Kelvin Grove (Works Yard, network end)		Daily	Daily	Weekly	Semi-annual
Kelvin Grove control room (new, network end)		Realtime	-	-	-
Community Centre (municipal offices)		None		Semi-annual	
Lions Bay Beach Park		None		Semi-annual	
Magnesia Plant raw	Magnesia Creek	Before chlorination	Daily	Weekly	Semi-annual
Magnesia UV reactor	Magnesia Plant			Monthly	
Magnesia Tank		Daily	Daily	Weekly	Semi-annual
PRV-5 north Bayview		Daily	Daily	Weekly	NA: mid-system
Brunswick Beach cul-de-sac		Daily	Daily	Weekly	Semi-annual

In consultation with VCH, the municipality's response to unexpected results depends on the significance of the parameter and how out of range it is, as outlined in OPERATING PROTOCOLS starting on p.43.

BACTERIOLOGICAL ANALYSIS

The *Drinking Water Protection Regulation* requires routine sampling and testing for the *E. coli*[3] bacterium and the larger Total Coliform (TC) bacteria group. The standard for *E. coli* in treated water is None

[2] The entire distribution network can be and often is fed from either treatment plant for plant turnaround, flow testing and other operational requirements.

[3]First described by Theodor von Escherich in 1885, *Escherichia coliform* is a group of bacteria that form in the colons of warm-blooded animals, that is mammals and birds. Presence of *E. coli* in a water sample indicates recent fecal contamination, and thus the possible presence of disease-causing bacteria, viruses and protozoa.

Detectable and for TC (for systems with more than 1 sample taken per month, as is the case at Lions Bay), at least 90 percent of samples with no detectable TC bacteria per 100 ml; and not any sample with more than 10 TC bacteria per 100 ml.

- I**n 2024, no weekly sample of treated water was positive for *E. coli*, but one monthly sample of partially treated water at the Harvey Plant UV reactor (post-UV but pre-chlorination) was positive, during a period of heavy rain. No sample, weekly or monthly, was positive for *E. coli* post-chlorination.**
- **Similarly, no weekly sample of treated water was positive for Total Coliform (other than one deemed a lab error by VCH), well exceeding the standard. However, two monthly samples of partially treated water at the Harvey Plant UV reactor and one at the Magnesia Plant UV reactor were positive for TC at the same time as the positive E. coli result.**

See the testing results below for details.

2024 Date	Days since	Harvey Ck.		Mag Ck.		Alberta Ck.		Harvey Tank		PRV-3		Store-Café		Lions Bay Ave		Kelvin Grove		Mag Tank		PRV-5		Brunswick		Notes
		TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	
02-Jan		27.5	ND	N/A	N/A	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	Mag intake not operating
08-Jan	6	21.1	ND	16.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
15-Jan	7	21.6	ND	4.1	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
22-Jan	7	21.3	2.0	81.3	2.0	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
29-Jan	7	27.9	ND	12.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
05-Feb	7	14.8	ND	7.4	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
12-Feb	7	24.6	ND	21.6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
20-Feb	8	11.9	ND	10.8	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
26-Feb	6	24.6	ND	11.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
04-Mar	7	13.5	ND	N/A	N/A	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	Mag intake not operating
11-Mar	7	36.4	ND	7.3	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
18-Mar	7	9.8	ND	15.8	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
25-Mar	7	12.2	ND	12.1	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
02-Apr	8	17.5	ND	10.9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
08-Apr	6	18.7	ND	9.8	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
15-Apr	7	14.8	ND	21.8	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
22-Apr	7	20.1	ND	16.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
29-Apr	7	14.8	1.0	11.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
06-May	7	17.1	ND	18.5	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
13-May	7	14.5	ND	7.4	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
21-May	8	42.6	ND	14.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14	ND	ND	ND	Mag Tank lab error
27-May	6	21.6	ND	6.3	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
03-Jun	7	51.2	ND	253.9	6.3	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
10-Jun	7	N/A	N/A	N/A	N/A	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Verbal only
17-Jun	7	27.5	ND	18.5	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
24-Jun	7	59.8	ND	20.1	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	ND	ND	Kelvin Grove sample missed
02-Jul	8	93.1	ND	21.6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
08-Jul	6	99.1	1.0	44.1	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
15-Jul	7	115.3	ND	70.8	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
22-Jul	7	209.8	2.0	187.2	1.0	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
29-Jul	7	488.4	2.0	613.1	3.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

2024 Date	Days since	Harvey Ck.		Mag Ck.		Alberta Ck.		Harvey Tank		PRV-3		Store-Café		Lions Bay Ave		Kelvin Grove		Mag Tank		PRV-5		Brunswick		Notes
		TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml	
06-Aug	8	261.3	2.0	86.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
12-Aug	6	410.6	ND	155.3	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
19-Aug	7	275.5	1.0	125.0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
26-Aug	7	260.3	2.0	290.9	2.0	272.3	5.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
03-Sep	8	142.1	ND	135.4	ND	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
09-Sep	6	115.3	ND	235.9	ND	126.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
16-Sep	7	95.9	2.0	98.8	ND	108.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
23-Sep	7	123.6	1.0	109.2	1.0	71.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
01-Oct	8	53.7	1.0	RM	RM	101.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Verbal only
07-Oct	6	56.1	ND	46.4	ND	156.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
15-Oct	8	83.3	ND	33.1	ND	270.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
21-Oct	6	128.1	2.0	547.5	25.9	198.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
28-Oct	7	98.8	ND	46.5	ND	198.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
04-Nov	7	1413.6	146.7	153.9	20.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
12-Nov	8	48.7	2.0	920.8	15.8	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
18-Nov	6	41.4	1.0	21.1	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
25-Nov	7	35.5	ND	24.3	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
02-Dec	7	22.8	1.0	17.5	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
09-Dec	7	20.1	ND	19.5	1.0	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
16-Dec	7	23.1	ND	18.7	ND	-	-	ND	ND	RM	RM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
23-Dec	7	LC	LC	LC	LC	-	-	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	

ND Non-detectable
RM Result missing (from laboratory)
- Not operating
LC Laboratory closed
N/A Not available (see Notes column)

POST-UV, PRE-CHLORINATION EXCEEDANCES IN NOVEMBER

Monthly samples are collected after UV and before chlorination to confirm UV effectiveness:

SAMPLE DATE	Days since last	Post-UV Reactor, Harvey		Post-UV Reactor, Magnesia	
		TC/100 ml	E. coli/100 ml	TC/100 ml	E. coli/100 ml
08-Jan	-	ND	ND	ND	ND
12-Feb	35	ND	ND	ND	ND
11-Mar	27	ND	ND	ND	ND
02-Apr	22	ND	ND	ND	ND
13-May	41	ND	ND	ND	ND
17-Jun	35	ND	ND	ND	ND
02-Jul	15	ND	ND	ND	ND
06-Aug	35	ND	ND	ND	ND
03-Sep	28	ND	ND	ND	ND
01-Oct	28	ND	ND	ND	ND
4-Nov	34	8.7	6.4	ND	ND
12-Nov (retest)	8	ND	ND	-	-
18-Nov (retest)	6	1.0	ND	1.0	ND
25-Nov	7	ND	ND	ND	ND
02-Dec	7	ND	ND	ND	ND

ND Non-detectable
- Not available or plant not operating.

The regular November sample was positive for *E. coli* and TC at the Harvey Plant, and positive for TC at both plants upon a second retest on Nov. 18. Nov. 4 raw water turbidity reached 2.7 and 4.5 at Harvey and Magnesia respectively, and UVT dropped to 75% and 80%. The operator logs state that sand was found in the Harvey reactor. Clearly, UV alone was not sufficient, although the post-chlorination samples in the respective tanks were in all cases non-detectable. *The Nov. 4 and Nov. 12 results were missed in the first version of this report and procedures have been changed to require a crosscheck on the recording of lab data.*

TURBIDITY ANALYSIS

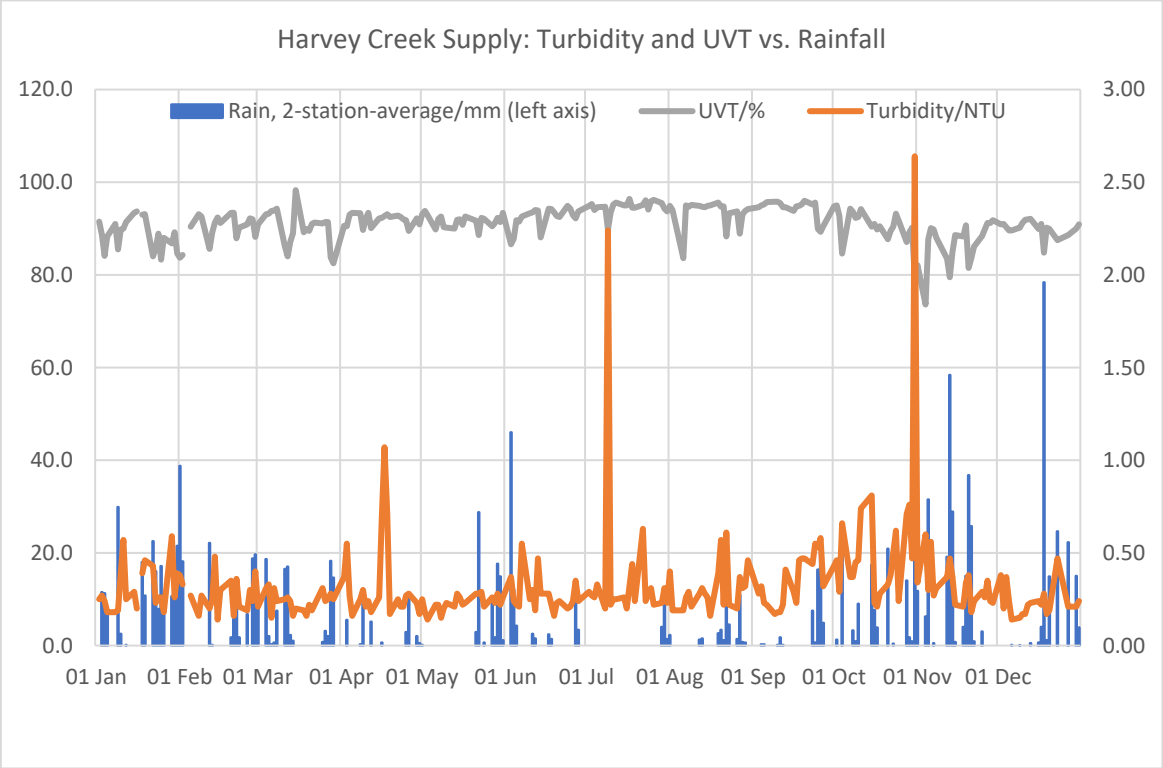
As outlined in the Lions Bay Source Water Protection Plan, the system's raw water arises in steep, forested catchments, and is particularly subject to turbidity caused by soil washing into the creeks during rain events. Turbidity is a measure of particles in a sample of water determined using a light-scattering method and measured in Nephelometric[4] Turbidity Units (NTU).

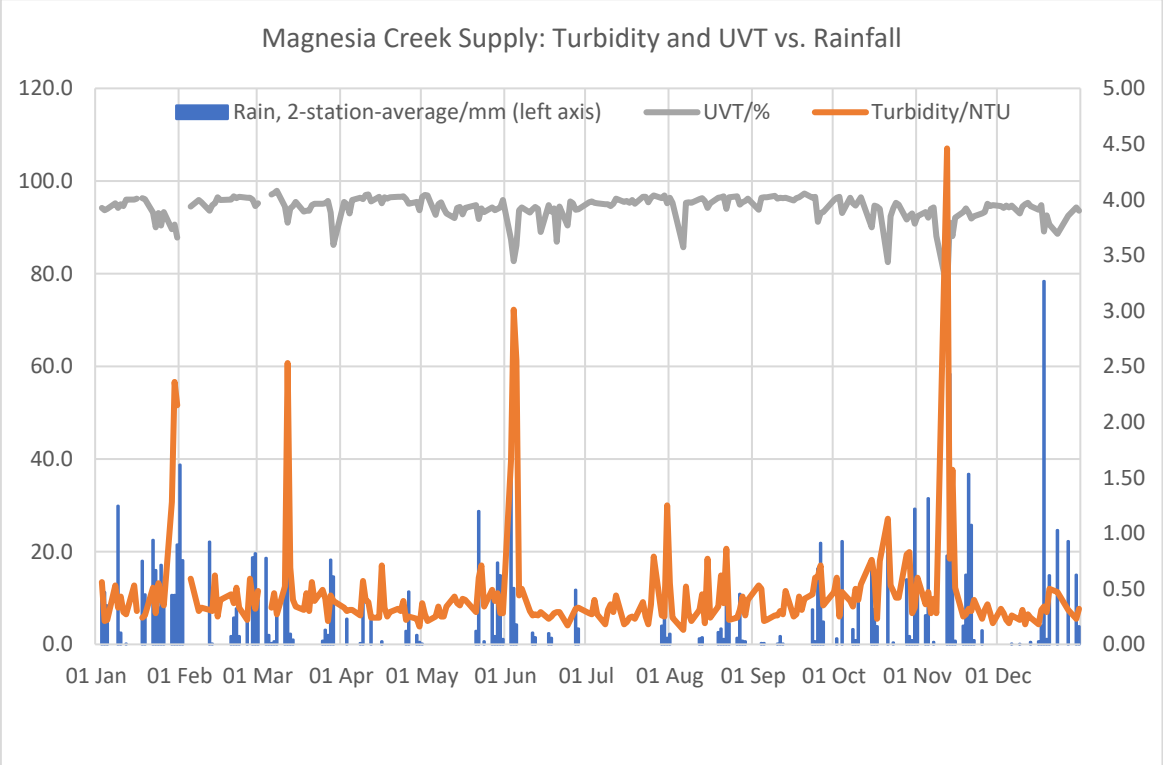
Both UV and chlorine treatment are affected by turbidity, which shadows, absorbs and scatters UV light, and which provides crevices where bacteria may avoid direct contact with chlorine. **Chlorine dosing is therefore increased whenever turbidity rises above 1 NTU in source water.**

In 2024, based on daily samples, raw water turbidity was generally 0.25 NTU in Harvey Creek and 0.5

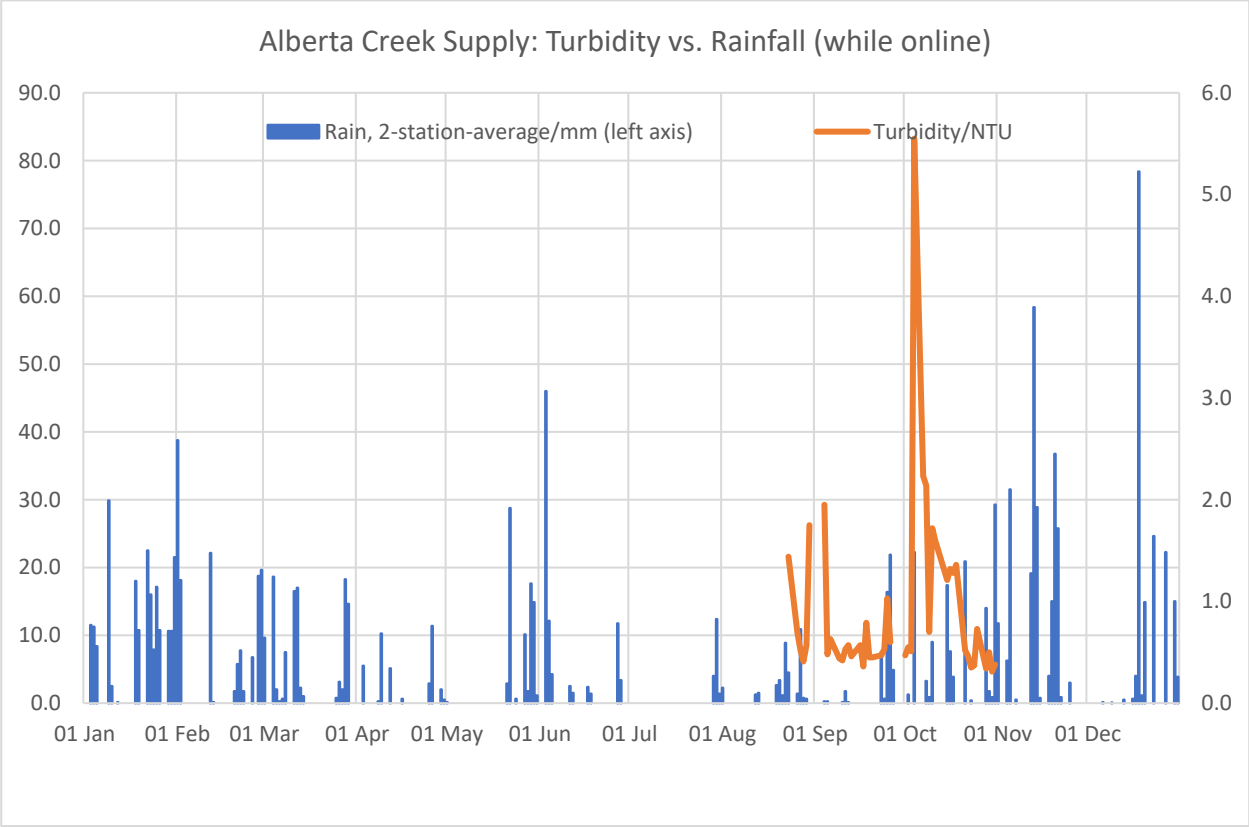
[4] Nephelometry (from the Greek nephelo: cloud) is an analytical technique used to measure the amount of turbidity or cloudiness in a solution caused by the presence of suspended insoluble particles.

NTU in Magnesia Creek, but spiked as high as 2.75 NTU and 4.5 NTU respectively during significant rain events:





After coming online in mid-August (but not utilised for production), Alberta Creek was also sampled for turbidity:



See APPENDIX 3: *SOURCE* WATER TURBIDITY & UVT for detailed readings, and CONDITION 3: LOW TURBIDITY on p.41 for further discussion on how Lions Bay is addressing turbidity for continued filtration exemption.

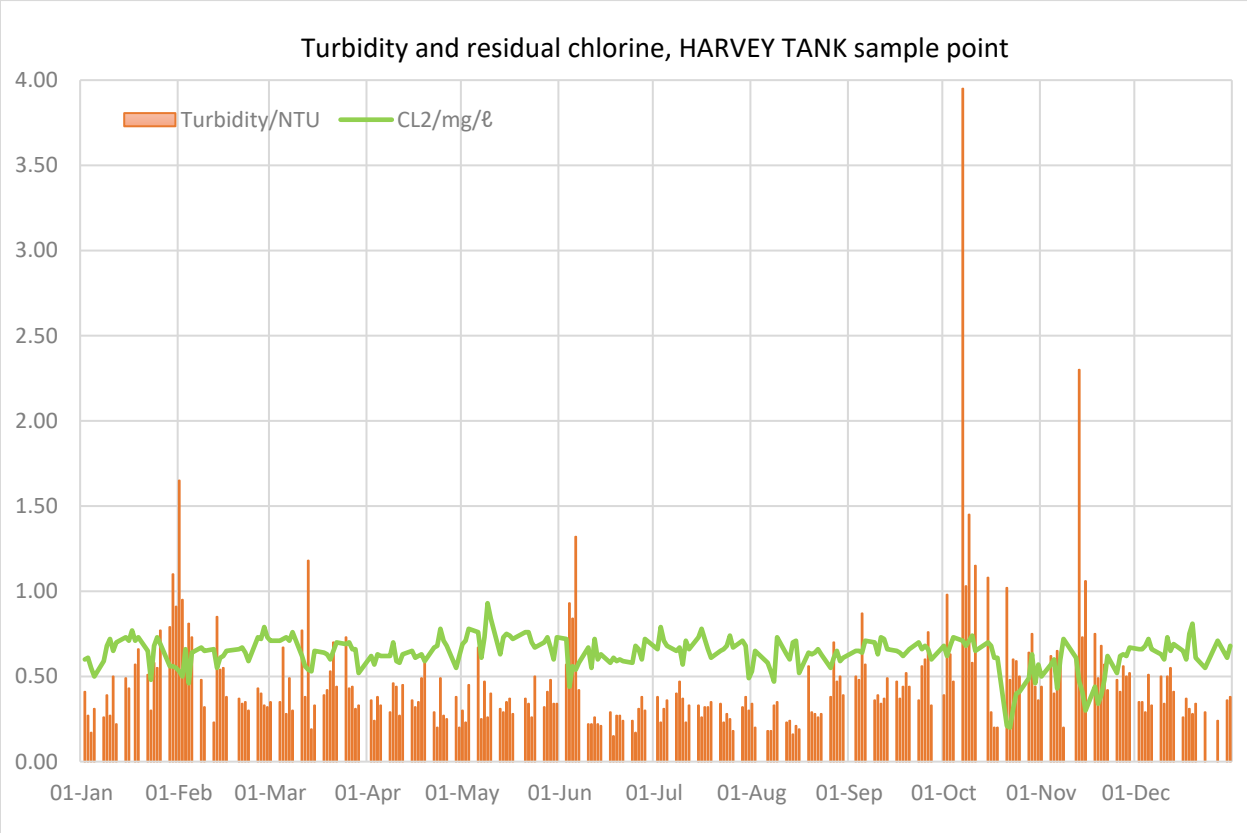
DISTRIBUTION NETWORK SAMPLING

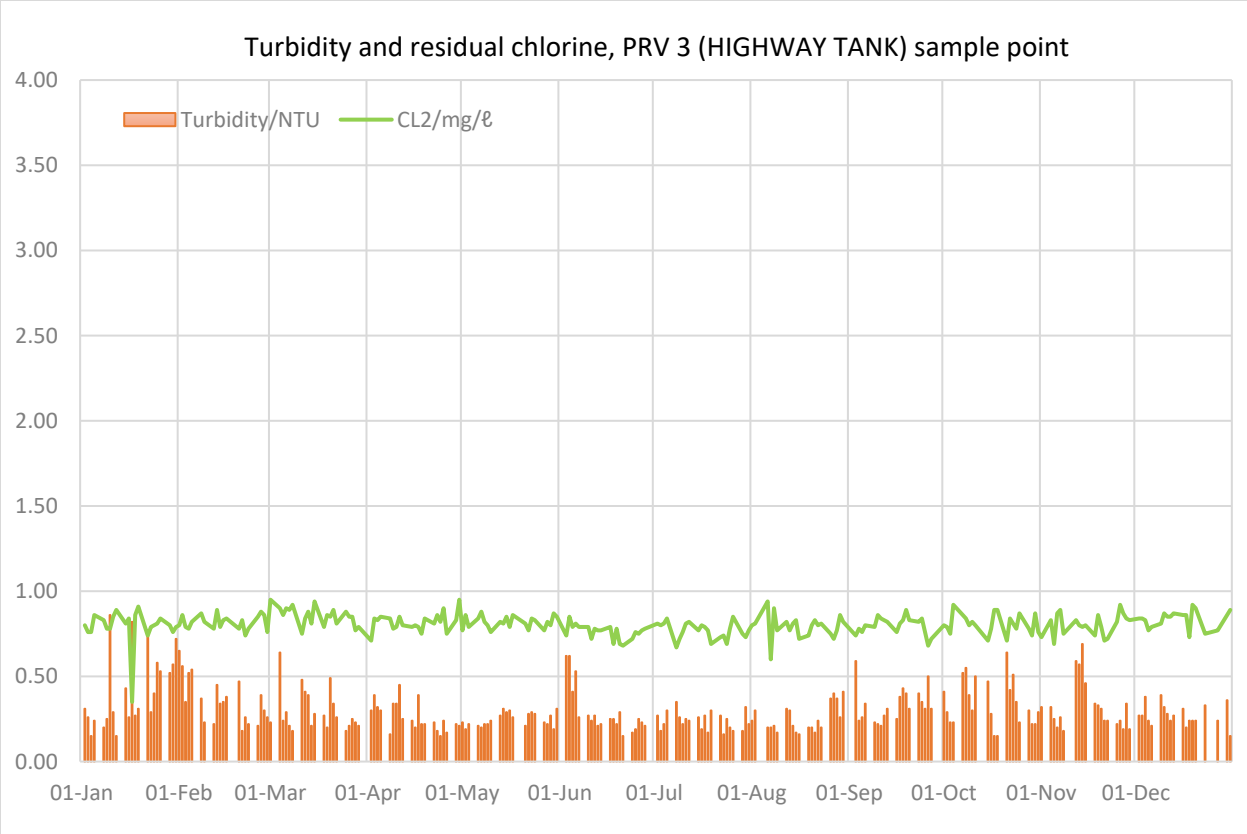
The municipality collects daily samples at eight locations agreed with VCH[5] for testing in house for turbidity and chlorine residual. Detailed data are provided in APPENDIX 4: *TREATED* WATER TURBIDITY, CHLORINE RESIDUAL on p.66, summarised as follows:

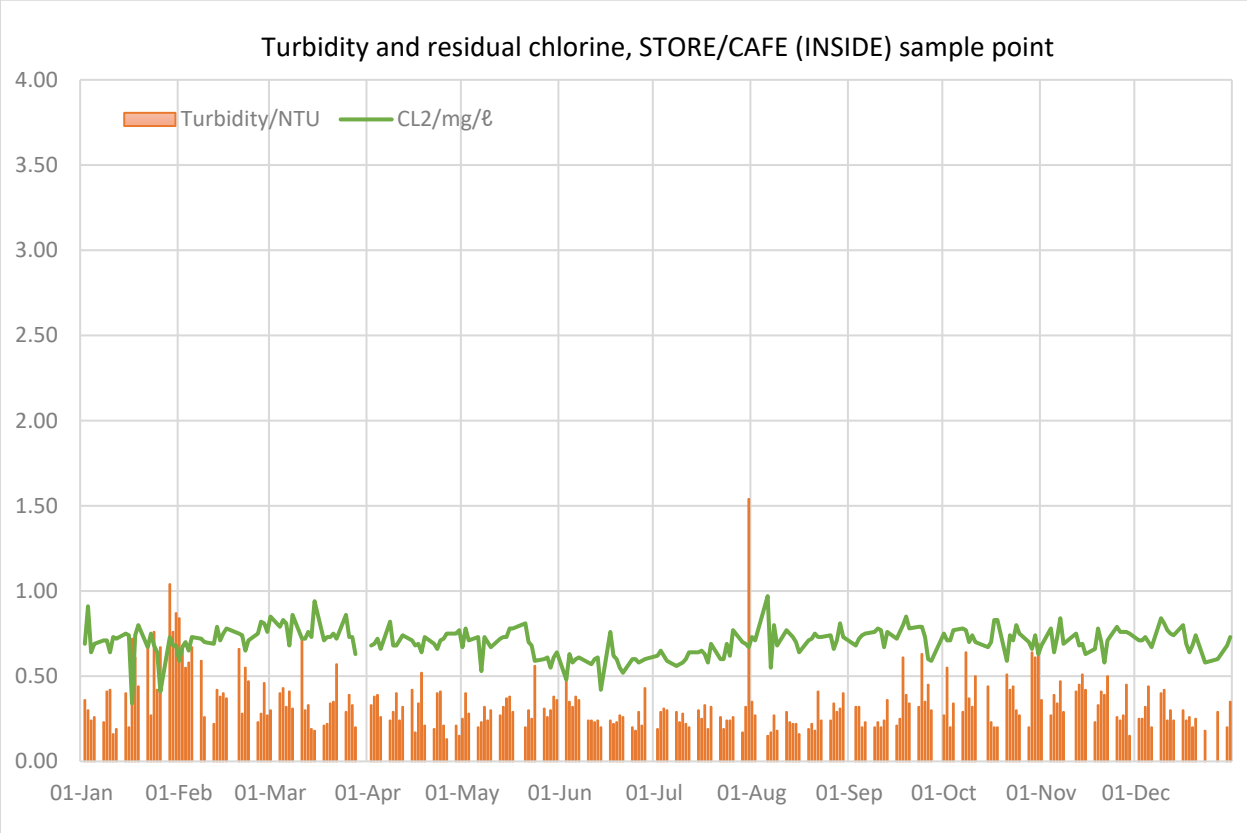
[5] In 2025 the municipality will formalise VCH permission to move the "Kelvin Grove" chlorine sample from the Public Works Yard sink to the live reading taken at the Kelvin Grove control room, plus turbidity when the instrument is upgraded.

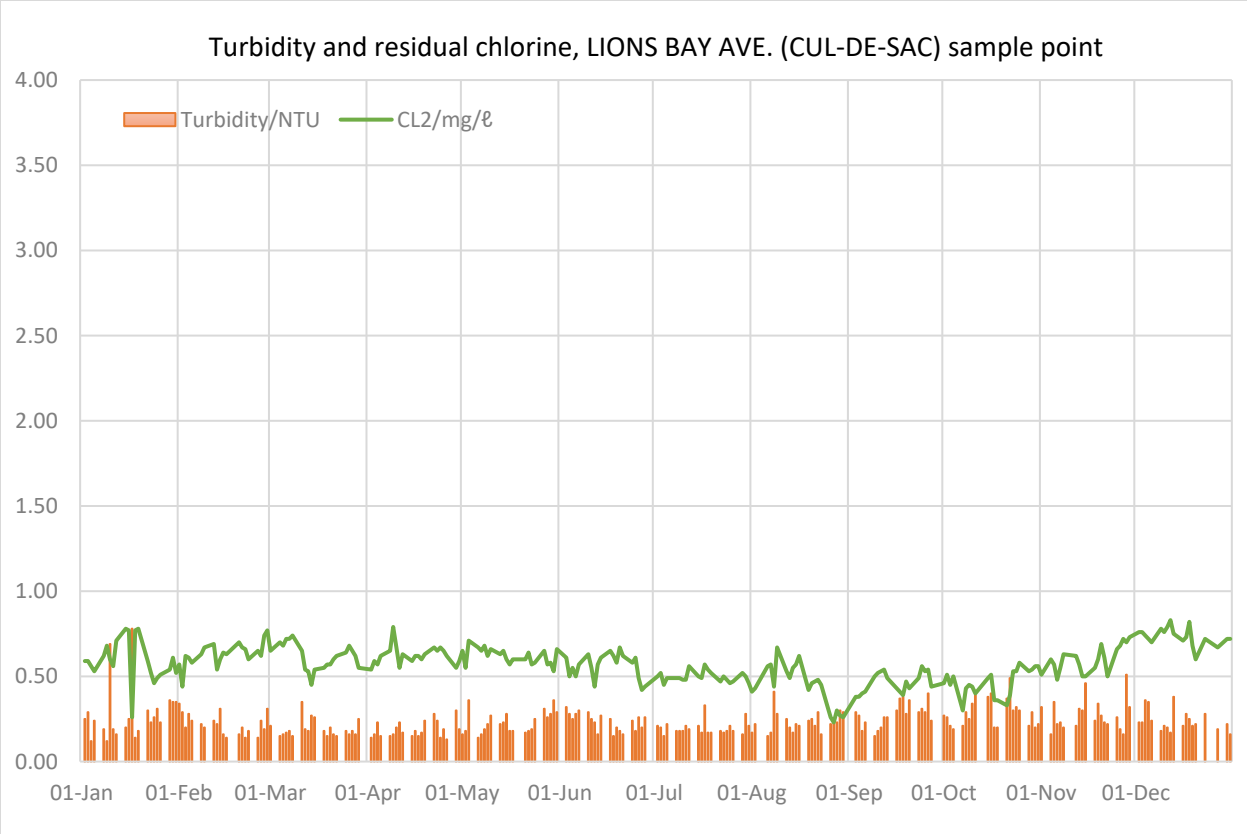
SUMMARY: 2024 CHLORINE RESIDUALS/mg/L								
	Harvey Plant Tank	PRV-3 (Highway Tank)	Café/Store (inside)	Lions Bay Ave (cul-de-sac)	Kelvin Grove (Works Yard)	Magnesia Plant Tank	PRV-5 (north Bayview)	Brunswick Beach (cul-de-sac)
SAMPLE COUNT	248	249	248	249	249	243	249	249
MIN	0.64	0.35	0.34	0.23	0.19	0.42	0.64	0.20
MAX	0.99	0.95	0.97	0.83	0.83	1.10	1.03	0.93
MED	0.85	0.81	0.71	0.57	0.50	0.85	0.80	0.65
AVG	0.85	0.81	0.70	0.57	0.51	0.85	0.79	0.63

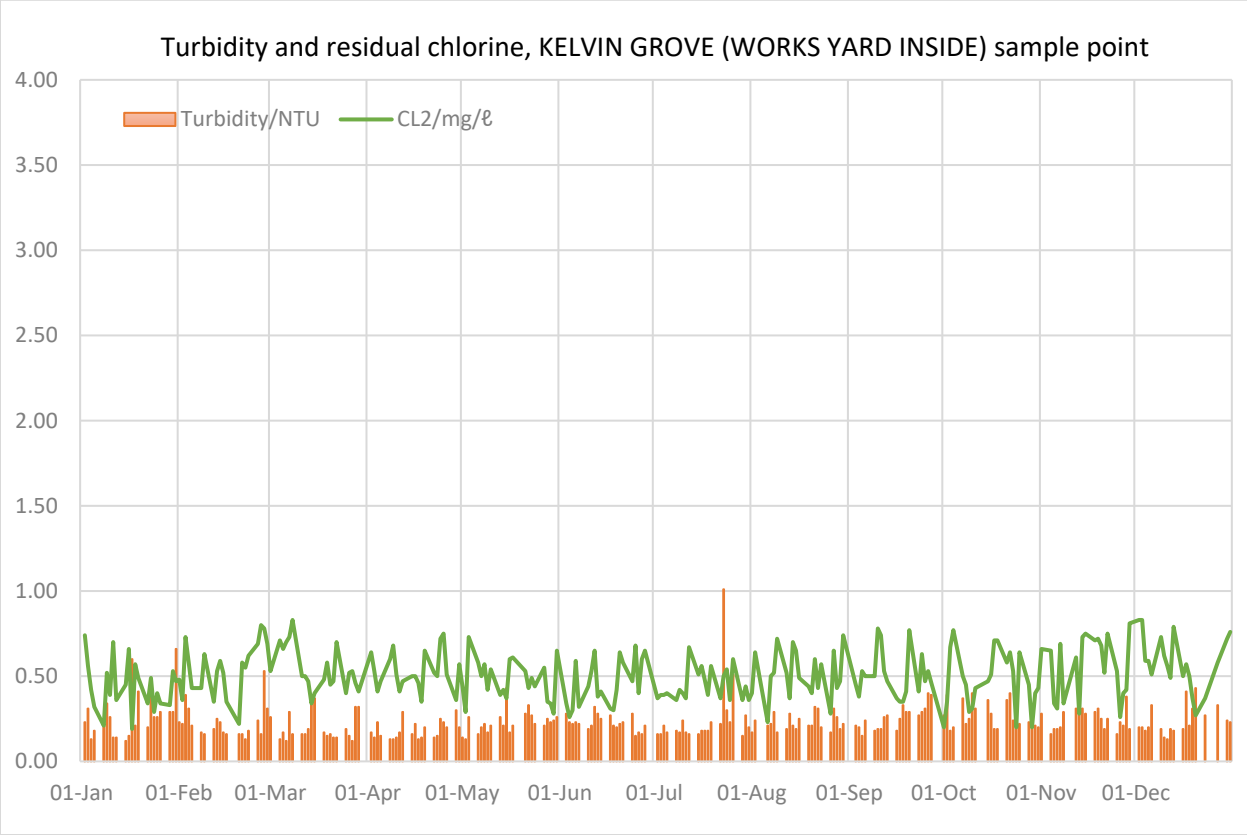
Graphical summaries of each sample location follow, scaled to 4 NTU, the highest reading obtained in 2024:

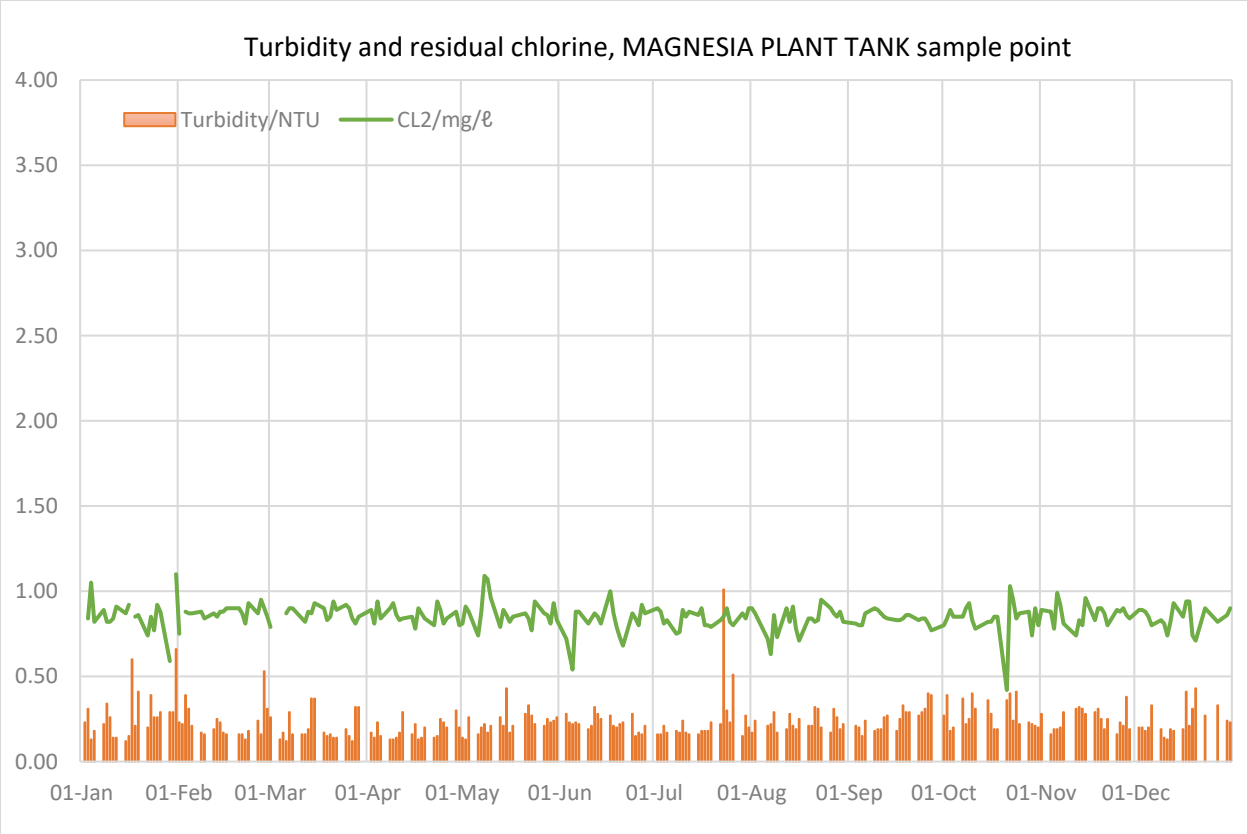


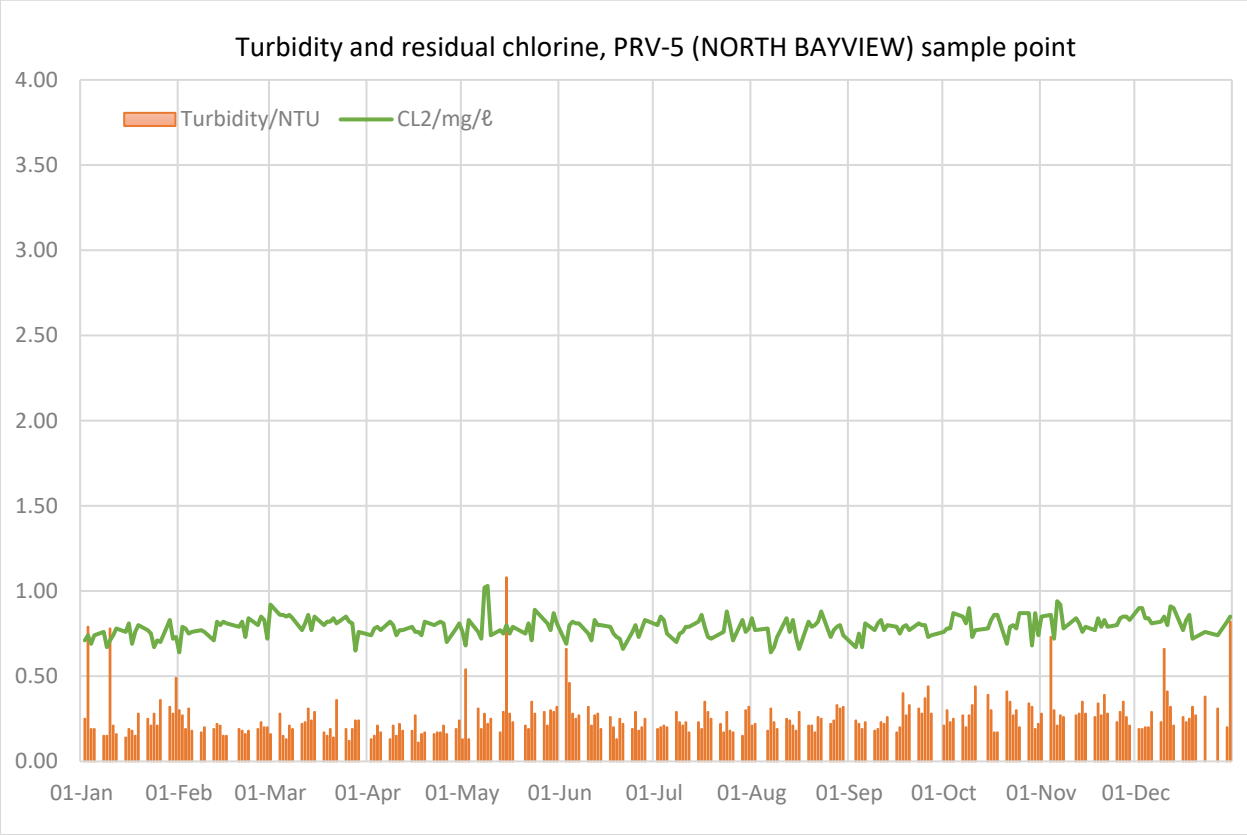

Turbidity and residual chlorine, PRV 3 (HIGHWAY TANK) sample point
Turbidity/NTU
CL2/mg/ℓ
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
01-Jan
01-Feb
01-Mar
01-Apr
01-May
01-Jun
01-Jul
01-Aug
01-Sep
01-Oct
01-Nov
01-Dec

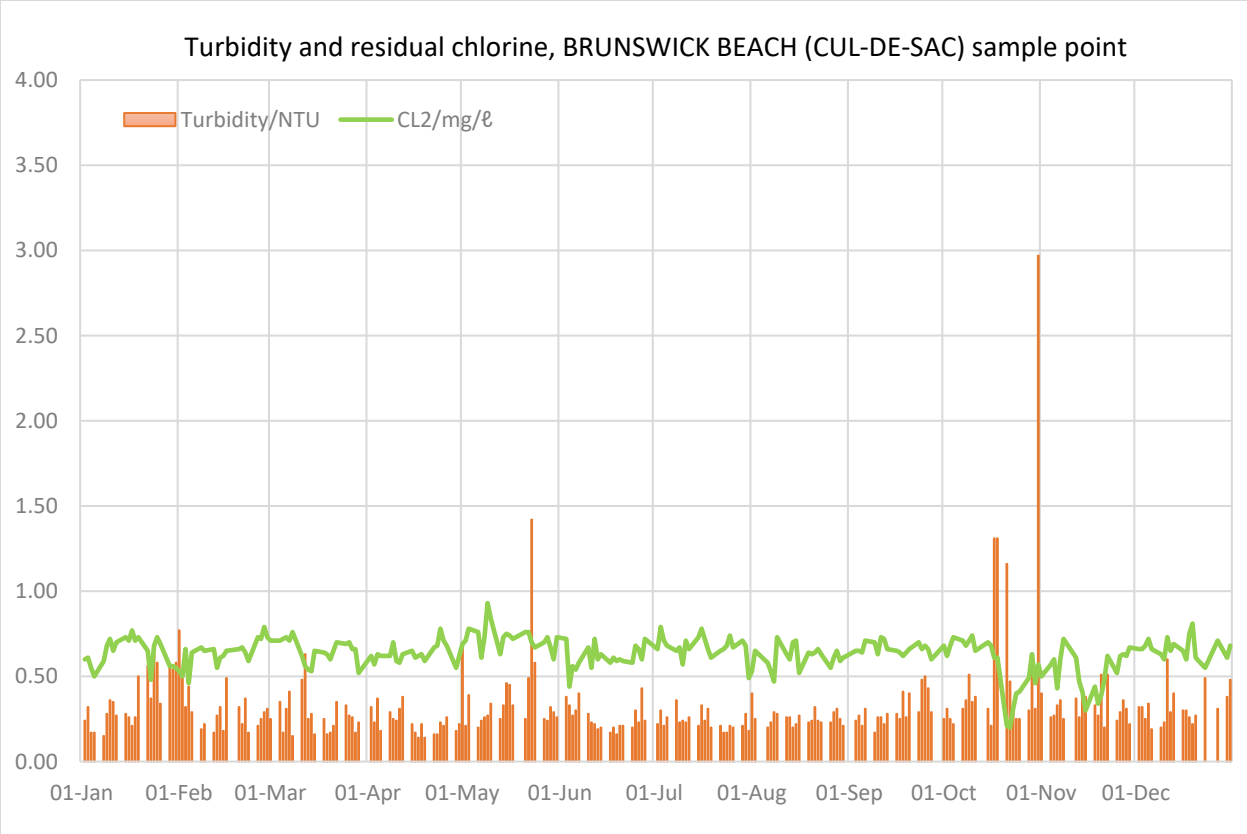

Turbidity and residual chlorine, STORE/CAFE (INSIDE) sample point
Turbidity/NTU
CL2/mg/ℓ
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
01-Jan
01-Feb
01-Mar
01-Apr
01-May
01-Jun
01-Jul
01-Aug
01-Sep
01-Oct
01-Nov
01-Dec


Turbidity and residual chlorine, LIONS BAY AVE. (CUL-DE-SAC) sample point
Turbidity/NTU
CL2/mg/ℓ
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
01-Jan
01-Feb
01-Mar
01-Apr
01-May
01-Jun
01-Jul
01-Aug
01-Sep
01-Oct
01-Nov
01-Dec


Turbidity and residual chlorine, KELVIN GROVE (WORKS YARD INSIDE) sample point
Turbidity/NTU
CL2/mg/ℓ
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
01-Jan
01-Feb
01-Mar
01-Apr
01-May
01-Jun
01-Jul
01-Aug
01-Sep
01-Oct
01-Nov
01-Dec


Turbidity and residual chlorine, MAGNESIA PLANT TANK sample point
Turbidity/NTU
CL2/mg/ℓ
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
01-Jan
01-Feb
01-Mar
01-Apr
01-May
01-Jun
01-Jul
01-Aug
01-Sep
01-Oct
01-Nov
01-Dec


Turbidity and residual chlorine, PRV-5 (NORTH BAYVIEW) sample point
Turbidity/NTU
CL2/mg/ℓ
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
01-Jan
01-Feb
01-Mar
01-Apr
01-May
01-Jun
01-Jul
01-Aug
01-Sep
01-Oct
01-Nov
01-Dec

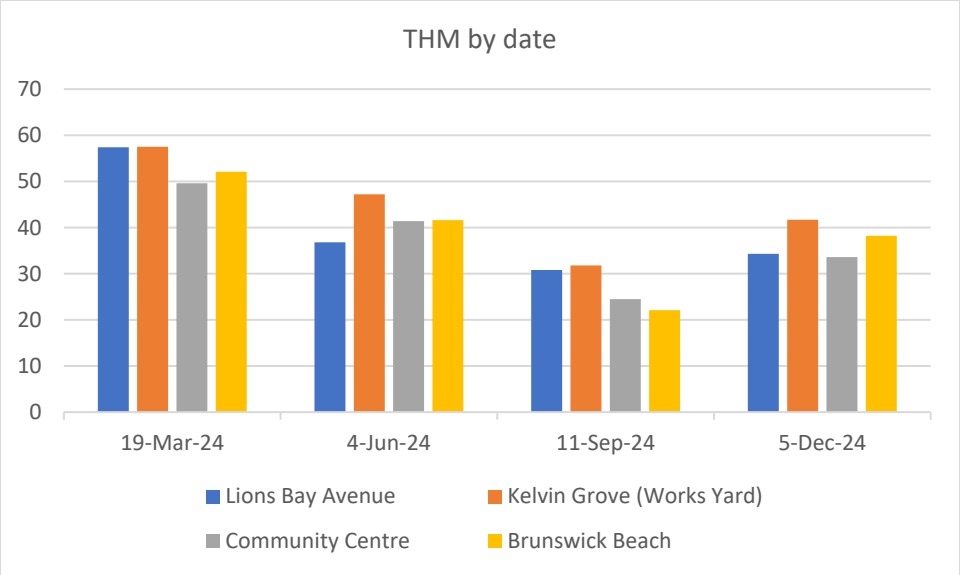


NOTE ON CHLORINE DISINFECTION BY-PRODUCTS

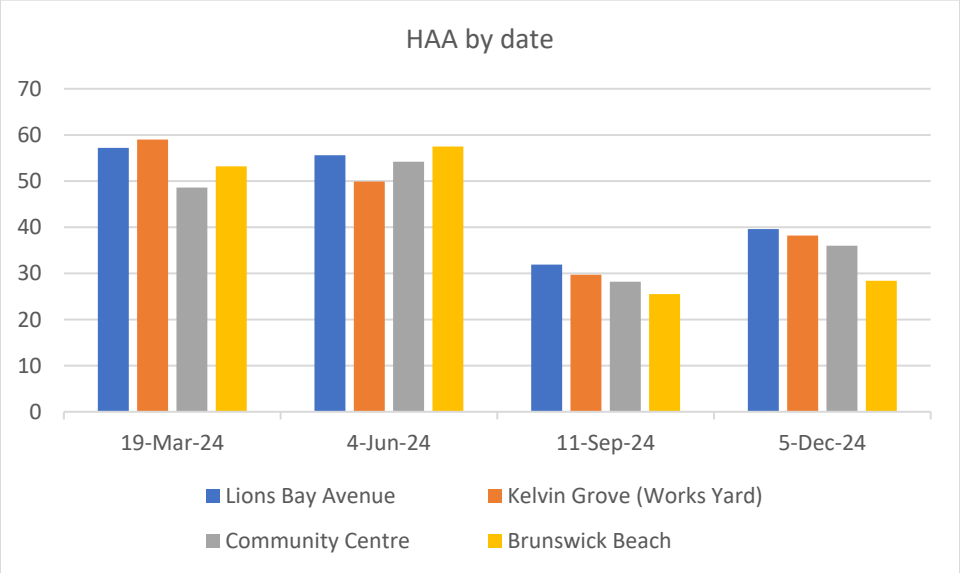
Chlorine reacts with naturally occurring organic and inorganic matter, especially arising in surface supply raw water, to form disinfection byproducts, DBPs. Lions Bay tests for the DBPs trihalomethane[6] (which is considered potentially harmful to the liver, kidneys and central nervous system, and potentially carcinogenic) and the haloacetic acid (HAA) group, considered probably carcinogenic:

2024 TOTAL TRIHALOMETHANES/µg/L Health Canada MAC: 100 micrograms per litre (µg/L) averaged over quarterly sample results[7]				
Sample location → Sample date ↓	**Lions Bay Avenue**	**Kelvin Grove (Works Yard)**	**Community Centre**	**Brunswick Beach**
19 Mar.	57.4	57.5	49.6	52.1
4 Jun.	36.8	47.2	41.4	41.6
11 Sep.	30.8	31.8	24.5	22.1
5 Dec.	34.3	41.7	33.6	38.2
Average	39.8	44.6	37.3	38.5

[6] *Halo*gens are the elements in the same periodic table group as chlorine: fluorine, bromine and iodine.
[7] US EPA's limit for THM has been 80 µg/L since Dec. 1998.



2024 HALOACETIC ACIDS/µg/L Health Canada MAC: 80 micrograms per litre (µg/L) averaged over quarterly sample results[8]				
Sample location ➔ Sample date ➘	**Lions Bay Avenue**	**Kelvin Grove (Works Yard)**	**Community Centre**	**Brunswick Beach**
19 Mar.	57.2	59.0	48.6	53.2
4 Jun.	55.6	49.9	54.2	57.5
11 Sep.	31.9	29.7	28.2	25.5
5 Dec.	39.6	38.2	36.0	28.4
Average	46.1	44.2	41.8	41.2



[8] US EPA's limit for HAA5 (the total of monochloroacetic, dichloroacetic, trichloroacetic, monobromoacetic and dibromoacetic acids) of 60 µg/L was set in Nov. 2004.

The *Guidelines* state that utilities should make every effort to maintain concentrations ALARA (As Low As Reasonably Achievable) without compromising the effectiveness of disinfection. While Lions Bay water met the MACs in all cases, the *Guidelines* also state that precursor removal limits formation, a pointer to future flocculation and filtration as a solution to DBPs.

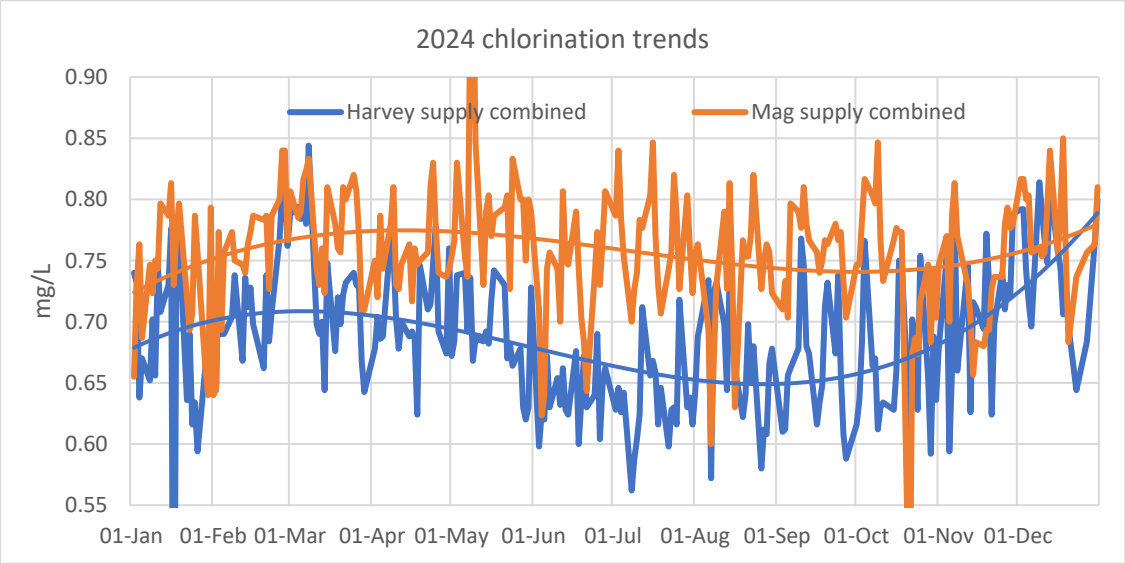
NOTE ON CHLORINE DOSING

The effect of tighter control of chlorine dosing in the 3rd and 4th quarters is apparent in the DBP results above: less chlorine leads to lower DBP. Operators dial in conservative (high) chlorine dosing to ensure residual throughout the distribution network, particularly in preparation for rain, resulting in many daily samples with two to five times the municipality's 0.2 mg/L chlorine target. High chlorine certainly assists disinfection, but DBPs besides, also gives rise to complaints of bleach taste and smell, especially closer to the treatment plants.

With availability in 2024 of continuous chlorine measurement at the Kelvin Grove control room network-end sample point, new operating guidelines were established to safely reduce chlorine dosing at at least the Harvey Plant (which almost always supplies this location):

CHLORINE TARGET DOSING (mg/L)		
SUPPLY SITUATION	**HARVEY TANK OUTLET**	**MAG TANK OUTLET**
June 1 – 15 Sep. (lower rain)	0.4 VCH permit minimum	0.6 VCH permit minimum
16 Sep. – May 31 (higher rain)	0.6	0.8
Day before rain expected	*0.5 min.*	*0.7 min.*
Light rain days (2-10 mm expected)	*0.6*	*0.8*
Moderate rain days (10-20 mm expected)	*0.7*	*0.9*
Heavy rain days (20+ mm expected)	*0.9*	*1.1*
Landslide weather	*1.0*	*1.2*

With no continuous end-point sampling for Magnesia supply yet (coming in 2025), chlorine levels at the Magnesia Plant are more conservative. The arithmetic mean of all sample points chlorine results shows the tighter dosing control in the third quarter, before dosing was increased to anticipate winter rain and increased turbidity:



Continuous monitoring for chlorine and turbidity is also being implemented at the Brunswick and Lions Bay Ave. network end points in 2025.

CHLORINE FAQS

At the suggestion of VCH, the following Frequently Asked Questions on chlorine water treatment were distilled from various sources for public information.

What is chlorine?
Chlorine is a common element in nature, where it is always found combined with other elements. The largest amount of chlorine on earth is in the oceans as sodium chloride, salt. Salt and water are commonly used to manufacture the chlorine used to treat drinking water.

Why is chlorine added to drinking water?
Chlorine is a versatile disinfectant that kills many types of bacteria, viruses and parasites (pathogens) that cause water-borne infections. Some water-borne infections can cause severe illness and even death. Water producers add chlorine to drinking water to protect public health. For more information on water-borne infections, see HealthLinkBC File #49a Water-borne Infections in British Columbia.

How long has chlorine been used to disinfect water?
Chlorine disinfectants were first added to a public water supply in North America in 1908. By the 1920s, thousands of cities worldwide were using chlorine disinfectants to treat drinking water, leading to a drastic reduction in water-borne infections such as typhoid fever and cholera. Infant mortality also declined. All water utilities in Canada use some form of chlorine disinfectant to treat drinking water.

How is chlorine added to my drinking water?
There are many different chlorine disinfectant products and each is added to water differently, but once added to water they all work in a similar way. For this reason, they all get the generic labeling of "chlorine." Water suppliers choose the product used based on factors like cost, source water, size of the water system and whether other forms of treatment are needed.

What is secondary disinfection?
After being disinfected, water travels through the distribution system to your home through a network of pipes. In some cases, pipes can leak or break and contaminate the water. Chlorine disinfectants protect water against this contamination as it travels to the tap.

Can my water supplier use anything else to disinfect my drinking water?
Ultraviolet (UV) light and ozone are also used to disinfect drinking water. Because these approaches do not provide a residual effect, they cannot provide protection against regrowth in, or contamination from, the pipes water travels through. There are further benefits to using chlorine disinfectants over other treatments. They can be easier to handle and less expensive, making them a preferred choice for water supply systems with limited funds. If you do not like the smell or taste of chlorine in your drinking water you can use a filter system (such as a pitcher filter) or boil your water and allow it to cool before using.

Can the chlorine added to my drinking water harm me?
Chlorine can be dangerous in very high concentrations. But there is no evidence that chlorine disinfectants are harmful to people in the small amounts needed to disinfect drinking water. Most Canadian treated water does not have chlorine levels over 2 mg/L (also known as parts per million).

Can chlorine by-products harm me?

When chlorine is added to water it reacts with any organic content and creates chlorine by-products. Health Canada sets limits for chlorine by-products to reduce the risk to human health. The addition of chlorine to drinking water has greatly reduced the risk of waterborne diseases. Although other disinfectants are available, chlorine remains the choice of water treatment experts. Current scientific data show that the benefits of chlorination are much greater than any health risks from by-products.

Is there anything I can do about the taste and smell?

- *Put a pitcher of water in the refrigerator and let it sit uncovered for a few hours. This will allow the chlorine smell to leave the water.*
- *Use cold water for all drinking water. Cold water has fewer taste and smell concerns. (Using cold water also makes the water less likely to absorb lead and copper from plumbing.)*
- *Use a filter. All water treatment units, even those in your home, require regular maintenance to work properly. Water treatment units that are not properly maintained will lose their effectiveness over time. In some cases, unmaintained units can make water quality worse and make you sick.*
    - *Most common point-of-use filters (e.g. pitcher filters) will remove chlorine taste and smell.*
    - *Granular activated carbon filters will remove chlorine taste and smell. They are usually more expensive than point-of-use filters. They can be installed either at the tap/sink or as whole-house filters.*

METALS AND OTHER PARAMETERS

Trace metals enter the municipal raw water system from the environment, during treatment and from the distribution network. Some metals are essential for life, while others may cause chronic or even acute poisoning in high doses.

As with chlorine above, Health Canada sets limits for most metals in drinking water, summarised in APPENDIX 1: HEALTH CANADA *GUIDELINES FOR DRINKING WATER QUALITY* (CHEMICAL on p.56.

Trace metals and some other substances are analysed twice a year. Lab analysis results are tabulated below and provided verbatim in APPENDIX 5A: BIANNUAL METALS AND CHEMISTRY (p.77).

March 2024, selected metals and other parameters (note that the entire system was running on Harvey Creek supply when sampled)

19 Mar. 2024	Max. Allowable Concentration (MAC)	Units	Harvey Creek Raw Water	Harvey Tank		Store/Café		Lions Bay Ave. (end)		Lions Bay Beach Park (washroom)		Kelvin Grove (Works Yard sink)		Community Centre (municipal offices)		Magnesia Creek Raw Water	Magnesia Tank		Brunswick Ave (end)	
Water from Harvey Creek				1st Draw	After flush	1st Draw	After flush	1st Draw	After flush	1st Draw	After flush	1st Draw	After flush	1st Draw	After flush		1st Draw	After flush	1st Draw	After flush
Water from Magnesia Creek																				
Biochemical oxygen demand [BOD]		mg/L	<2.0	-	<2.0	-	<2.0	-	<2.0	-	<2.0	-	<2.0	-	<2.0	<2.0	-	<2.0	-	<2.0
Carbon, total organic [TOC]	7.0 - 10.5	mg/L	1.72	-	2.23	-	1.78	-	2.04	-	1.94	-	1.96	-	1.83	1.32	-	1.42	-	1.89
Aluminum	2.9	mg/L	0.0594	0.0542	0.0624	0.0583	0.0588	0.0594	0.0627	0.0440	0.0626	0.0436	0.0625	0.0390	0.0580	0.0403	0.0302	0.0572	0.0639	0.0631
Antimony	0.006	mg/L		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	0.010 ALARA	mg/L	0.00011	0.00011	0.00011	0.00013	0.00012	0.00015	0.00013	0.00013	0.00013	0.00016	0.00014	0.00014	0.00012	0.00013	0.00011	0.00015	0.00012	0.00014
Barium	2	mg/L	0.00128	0.00208	0.00137	0.00150	0.00136	0.00160	0.00148	0.00169	0.00153	0.00236	0.00165	0.00147	0.00134	0.00143	0.00212	0.00185	0.00155	0.00150
Beryllium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bismuth		mg/L	ND	ND	ND	ND	ND	0.000062	ND	0.000052	ND	ND	ND	0.00196	ND	ND	ND	ND	ND	ND
Boron	5	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.021	ND	0.018	ND	ND	ND	ND	ND	ND
Cadmium	0.007	mg/L	ND	0.0000291	ND	ND	ND	ND	ND	0.0000089	ND	0.0000065	ND	ND	ND	0.0000147	0.0000608	0.0000187	ND	ND
Calcium	None	mg/L	1.27	1.70	1.41	1.54	1.50	1.90	1.75	1.69	1.55	2.23	1.81	1.86	1.68	2.82	3.65	3.27	1.72	1.68
Cesium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	0.05	mg/L	ND	ND	ND	ND	ND	0.00111	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt		mg/L	ND	ND	ND	0.00026	ND	ND	ND	ND	ND	0.00024	ND	ND	ND	ND	ND	ND	ND	ND
Copper	2	mg/L	0.00126	0.714	0.00638	0.0511	0.00617	0.00124	0.00090	0.208	0.0201	0.0994	0.00409	0.125	0.0178	0.00648	0.753	0.00509	0.00104	0.00082
Iron	None	mg/L	ND	0.018	ND	0.032	0.030	0.014	0.012	0.024	0.010	0.263	0.025	0.016	0.032	0.011	0.016	0.021	0.019	0.017
Lead	0.005 ALARA	mg/L	ND	0.00474	0.000065	0.00283	0.000416	0.000051	ND	0.0131	0.000424	0.00874	0.000247	0.00138	0.000104	0.000110	0.00151	ND	ND	ND
Lithium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0044	ND	0.0022	ND	ND	ND	ND	ND	ND
Magnesium	None	mg/L	0.184	0.230	0.201	0.291	0.199	0.258	0.240	0.238	0.216	0.712	0.222	1.15	0.203	0.425	0.534	0.511	0.230	0.227
Manganese	0.12	mg/L	0.00024	0.00132	0.00031	0.00085	0.00038	0.00109	0.00024	0.00046	0.00028	0.00547	0.00034	0.00031	0.00037	0.00072	0.00127	0.00105	0.00036	0.00032
Mercury	0.001	mg/L	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	ND	-	ND	-	ND
Molybdenum		mg/L	0.000201	0.000228	0.000227	0.000252	0.000240	0.000332	0.000273	0.000244	0.000248	0.000273	0.000261	0.000262	0.000234	0.000155	0.000172	0.000171	0.000252	0.000261
Nickel		mg/L	ND	0.00064	ND	0.00134	ND	0.00065	ND	0.00083	ND	0.00318	ND	0.00062	ND	ND	0.00127	ND	ND	ND
Phosphorus		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium		mg/L	0.079	0.084	0.084	0.085	0.082	0.102	0.094	0.089	0.083	0.099	0.087	0.092	0.084	0.078	0.091	0.095	0.088	0.087
Rubidium		mg/L	ND	ND	ND	ND	ND	ND	0.00021	ND	ND	ND	ND	0.00021	ND	ND	ND	ND	ND	ND
Selenium	0.05	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000081	0.000127	0.000137	ND	ND
Silicon		mg/L	1.87	2.14	1.94	2.13	2.04	2.43	2.25	2.18	2.10	2.17	2.20	2.09	2.04	4.07	4.71	4.57	2.14	2.13
Silver	None	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000011	ND	ND	ND
Sodium	None	mg/L	0.606	2.13	2.08	2.15	2.12	2.25	2.27	2.24	2.19	2.36	2.23	2.26	2.12	1.36	3.14	3.06	2.25	2.22
Strontium	7	mg/L	0.00401	0.00543	0.00437	0.00461	0.00454	0.00554	0.00510	0.00510	0.00458	0.00567	0.00480	0.00522	0.00492	0.0150	0.0191	0.0169	0.00510	0.00511
Sulfur		mg/L	ND	ND	ND	ND	ND	0.50	ND	ND	ND	ND	ND	0.52	ND	1.98	2.97	2.64	ND	ND
Tellurium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00063	ND	ND	ND	ND	ND	ND
Titanium		mg/L	ND	0.00057	ND	ND	ND	ND	ND	ND	0.00031	ND	ND	ND	ND	ND	0.00032	0.00040	ND	0.00033
Tungsten		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium	0.02	mg/L	0.000062	0.000036	0.000067	0.000064	0.000067	0.000068	0.000072	0.000051	0.000069	0.000050	0.000069	0.000026	0.000068	ND	ND	ND	0.000071	0.000070
Vanadium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	0	mg/L	ND	0.134	ND	0.0238	ND	ND	ND	0.0311	ND	0.0569	ND	0.133	ND	0.0041	0.168	ND	ND	ND
Zirconium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND: Non-detectable

September 2024, selected metals and other parameters

17 Sep. 2024	Max. Allowable Concentration (MAC)	Units	Harvey Raw Water	Harvey Tank		Store/Café		Lions Bay Ave. (end)		Lions Bay Beach Park (washroom)		Kelvin Grove (Works Yard sink)		Community Centre (municipal offices)		Magnesia Raw Water	Magnesia Tank		Brunswick Ave (end)	
Water from Harvey Creek				1st Draw	After flush	1st Draw	After flush	1st Draw	After flush	1st Draw	After flush	1st Draw	After flush	1st Draw	After flush		1st Draw	After flush	1st Draw	After flush
Water from Magnesia Creek																				
Biochemical oxygen demand [BOD]		*mg/L*	*ND*	-	-	-	-	-	*ND*	-	*ND*	-	*ND*	-	*ND*	*ND*	-	*ND*	-	*ND*
Total organic carbon [TOC]		*mg/L*	*0.64*	-	*0.67*	-	*0.70*	-	*0.69*	-	*0.79*	-	*0.76*	-	*0.73*	*ND*	-	*ND*	-	*0.56*
Aluminum	2.9	mg/L	0.0222	0.0224	0.0222	0.0266	0.0214	0.0174	0.0240	0.0238	0.0232	0.0440	0.0290	0.0140	0.0221	0.0150	0.0134	0.0166	0.0169	0.0161
Antimony	0.006	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	0.010 ALARA	mg/L	ND	0.00010	0.00011	0.00010	0.00011	0.00010	0.00012	0.00012	0.00011	0.00011	0.00013	ND	ND	0.00013	0.00014	0.00014	0.00012	0.00011
Barium	2	mg/L	0.00223	0.00230	0.00221	0.00260	0.00220	0.00266	0.00231	0.00273	0.00254	0.00268	0.00275	0.00242	0.00213	0.00299	0.00288	0.00298	0.00334	0.00331
Beryllium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bismuth		mg/L	ND	ND	ND	ND	ND	0.000427	0.000062	0.000162	0.000067	ND	ND	0.000923	ND	ND	ND	ND	0.000536	ND
Boron	5	mg/L	ND	ND	ND	0.018	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012	0.012	0.012	0.012	0.012
Cadmium	0.007	mg/L	ND	ND	ND	0.0000056	ND	ND	ND	ND	ND	ND	ND	0.0000068	ND	0.0000207	0.0000466	0.0000193	0.0000181	0.0000174
Calcium	**None**	**mg/L**	**2.26**	**2.29**	**2.30**	**2.52**	**2.37**	**2.54**	**2.44**	**2.85**	**2.64**	**3.46**	**2.83**	**2.74**	**2.43**	**6.74**	**6.49**	**6.43**	**6.75**	**6.57**
Cesium		mg/L	ND	ND	ND	ND	ND	ND	ND	0.000010	ND	ND	ND	ND	ND	ND	ND	ND	0.000011	0.000010
Chromium	0.05	mg/L	ND	ND	ND	ND	ND	ND	ND	0.00135	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt		mg/L	ND	ND	ND	0.00022	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	2	mg/L	0.00050	0.00610	0.00538	0.0675	0.00364	0.0879	0.0174	0.00119	0.00090	0.0223	0.00230	0.0869	0.0221	0.00748	0.306	0.00517	0.0233	0.00114
Iron	None	mg/L	0.012	ND	ND	0.022	0.012	0.023	0.028	0.019	0.011	0.033	0.076	ND	0.016	ND	0.067	ND	0.016	0.017
Lead	0.005 ALARA	mg/L	ND	0.000061	0.000054	0.00290	0.000297	0.000681	0.000409	0.000065	ND	0.00162	0.000281	0.000625	0.000197	0.000137	0.00186	ND	0.000172	ND
Lithium		mg/L	ND	ND	ND	0.0016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium	**None**	**mg/L**	**0.286**	**0.282**	**0.276**	**0.497**	**0.267**	**0.289**	**0.274**	**0.305**	**0.282**	**0.403**	**0.251**	**0.454**	**0.262**	**0.669**	**0.635**	**0.637**	**0.637**	**0.614**
Manganese	0.12	mg/L	0.00021	0.00018	0.00018	0.00051	0.00028	0.00078	0.00037	0.00091	0.00025	0.00068	0.00056	0.00124	0.00031	0.00046	0.00067	0.00042	0.00110	0.00032
Mercury	0.001	mg/L	ND	-	ND	-	ND	-	ND	-	ND	-	ND	-	ND	ND	-	ND	-	ND
Molybdenum		mg/L	0.000700	0.000587	0.000574	0.000544	0.000557	0.000502	0.000570	0.000615	0.000554	0.000664	0.000584	0.000568	0.000563	0.000236	0.000235	0.000258	0.000249	0.000233
Nickel		mg/L	ND	ND	ND	0.00599	ND	0.00275	ND	0.00073	ND	0.00157	ND	0.0310	ND	ND	0.00530	ND	0.00063	ND
Phosphorus		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium		mg/L	0.127	0.135	0.133	0.136	0.133	0.144	0.135	0.163	0.148	0.145	0.139	0.150	0.133	0.100	0.103	0.106	0.112	0.113
Rubidium		mg/L	0.00024	0.00032	0.00030	0.00035	0.00030	0.00032	0.00028	0.00041	0.00031	0.00033	0.00029	0.00035	0.00030	ND	ND	ND	0.00020	ND
Selenium	0.05	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000071	0.000096	0.000087	0.000084	0.000081
Silicon		**mg/L**	**2.18**	**2.16**	**2.17**	**2.26**	**2.23**	**2.23**	**2.26**	**2.38**	**2.28**	**2.20**	**2.25**	**2.36**	**2.26**	**4.98**	**4.92**	**5.04**	**5.09**	**5.10**
Silver	None	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000028	ND	ND	ND
Sodium	None	mg/L	0.917	2.57	2.48	2.52	2.54	2.56	2.52	2.54	2.45	2.58	2.46	2.56	2.56	2.09	3.56	3.74	3.70	3.57
Strontium	7	mg/L	0.00631	0.00653	0.00633	0.00728	0.00630	0.00707	0.00666	0.00796	0.00738	0.00763	0.00706	0.00762	0.00661	0.0319	0.0315	0.0308	0.0318	0.0310
Sulfur		**mg/L**	**0.54**	**0.58**	**0.66**	**0.59**	**0.59**	**0.61**	**0.60**	**0.72**	**0.63**	**0.85**	**0.70**	**0.87**	**0.65**	**6.09**	**5.41**	**5.56**	**5.66**	**5.47**
Tellurium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin		mg/L	ND	ND	ND	ND	ND	ND	ND	0.00013	ND	ND	ND	0.00032	ND	ND	ND	ND	ND	ND
Titanium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tungsten		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium	0.02	mg/L	0.000028	0.000032	0.000031	0.000018	0.000030	0.000020	0.000031	0.000027	0.000032	0.000020	0.000032	0.000013	0.000030	ND	ND	ND	ND	ND
Vanadium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	0	mg/L	ND	ND	ND	0.0450	ND	0.165	ND	ND	ND	0.0193	ND	0.168	0.0037	0.0049	0.126	ND	0.0084	ND
Zirconium		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND: Non-detectable

All results were under the Maximum Allowed Concentration (MAC) or other limits set by the *Guidelines*, except for the March lead results for Lions Bay Beach Park and Kelvin Grove first draws, marked in red in the table above (readings approaching the MAC are marked in yellow). Exceedances were:

March samples for lead	Lions Bay Beach Park	Kelvin Grove
First draw/mg/L	0.0131 (262% of MAC)	0.00874 (175% of MAC)
After flush/mg/L	0.000424 (8.5% of MAC)	0.000247 (4.9% of MAC)
Location	Park washroom sink, essentially unused in March	Public Works Yard lunchroom sink, at the end of a 6-inch main with the preceding user over 200 m away

No lead is present in Lions Bay's raw water, nor in the the municipal treatment and distribution system[9], but the plumbing of most Lions Bay houses and buildings do contain lead solder. Lead readings, particularly on first draw, emphasize the need to **flush water before consumption to reduce lead before consumption**

VCH has directed that commencing in 2025 public messaging must be produced to raise awareness of the need to flush domestic plumbing before using water. Since the 2022 reporting year, the Medical Health Officer has required the following letter to be included in Annual Reports regarding lead in water arising from domestic plumbing:

[9] Note that significant first-draw lead readings at Harvey Tank (0.00474 mg/L in March) and Magnesia Tank (0.00186 mg/L in September) are ascribed to the sample lines themselves being lead-copper: these samples respectively went to 0.000065 mg/L and Non-Detectable after flush. These sample lines will be changed to stainless steel in 2025.

Vancouver Coastal Health
800 – 601 West Broadway
Vancouver, BC V5Z 4C2

May 12th, 2022

Water System Operators

Re: Metals in Drinking Water – "Flush" Message in Annual Reports

Vancouver Coastal Health (VCH) is requiring all water systems to include the following health message with your next annual reports to your users:

> ***Contamination of drinking water with Lead can have health impacts over time, and in BC the source is most likely to be plumbing fixtures within a building. Anytime the water in a particular faucet has not been used for six hours or longer, "flush" your cold-water pipes by running the water until you notice a change in temperature. This could take as little as five to thirty seconds if there has been recent heavy water use such as showering or toilet flushing. Otherwise, it could take two minutes or longer. The more time water has been sitting in your home's pipes, the more Lead it may contain.***
>
> ***Use only water from the cold-tap for drinking cooking, and especially making baby formula. Hot water is likely to contain higher levels of Lead.***
>
> ***The two actions recommended above are very important to the health of your family. They will probably be effective in reducing Lead levels because most of the Lead in household water usually comes from the plumbing in your house, not from the local water supply.***
>
> ***Conserving water is still important. Rather than just running the water down the drain you could use the water for things such as watering your plants.***

If you have any questions, please contact you closest Drinking Water Officer noted below.

Sincerely,

Dr. Michael Schwandt
Medical Health Officer
Vancouver Coastal Health

- (604) 983-6793 Central Coast
- (604) 983-6793 North Shore
- (604) 485-3310 Powell River
- (604) 233-3147 Richmond
- (604) 885-5164 Sechelt
- (604) 892-2293 Squamish
- (604) 675-3800 Vancouver
- (604) 932-3202 Whistler

NOTE ON FLUORIDE

Like most BC water producers the municipality does not add fluoride to Lions Bay drinking water. However, interested by mentions in the press in late 2024, the three creek water sources were analysed for naturally occurring fluoride:

26 NOV. 2024 FLUORIDE/mg/L			
Fluoride (detection limit 0.020)	Magnesia Creek	Alberta Creek	Harvey Creek
	0.027	0.033	Non-detectable

The *Guidelines* MAC is 1.5 mg/L and according to https://www.canada.ca/en/public-health/services/publications/healthy-living/community-water-fluoridation-across-canada.html , the recommended drinking water fluoride concentration for purposes of dental cavity prevention is 0.7 mg/L. Lions Bay water is thus not a source of fluoride for such purposes.

NOTE ON CAFFEINE

Raw water samples from all three creeks were tested for caffeine in July and August to determine if human-only ablutions could be detected reaching the creeks (see Appendix NOTE ON CAFFEINE on p.33). Results were non-detectable, but there was some doubt about the lab's handling of the samples, so the test will be repeated at the peak of the 2025 hiking season.

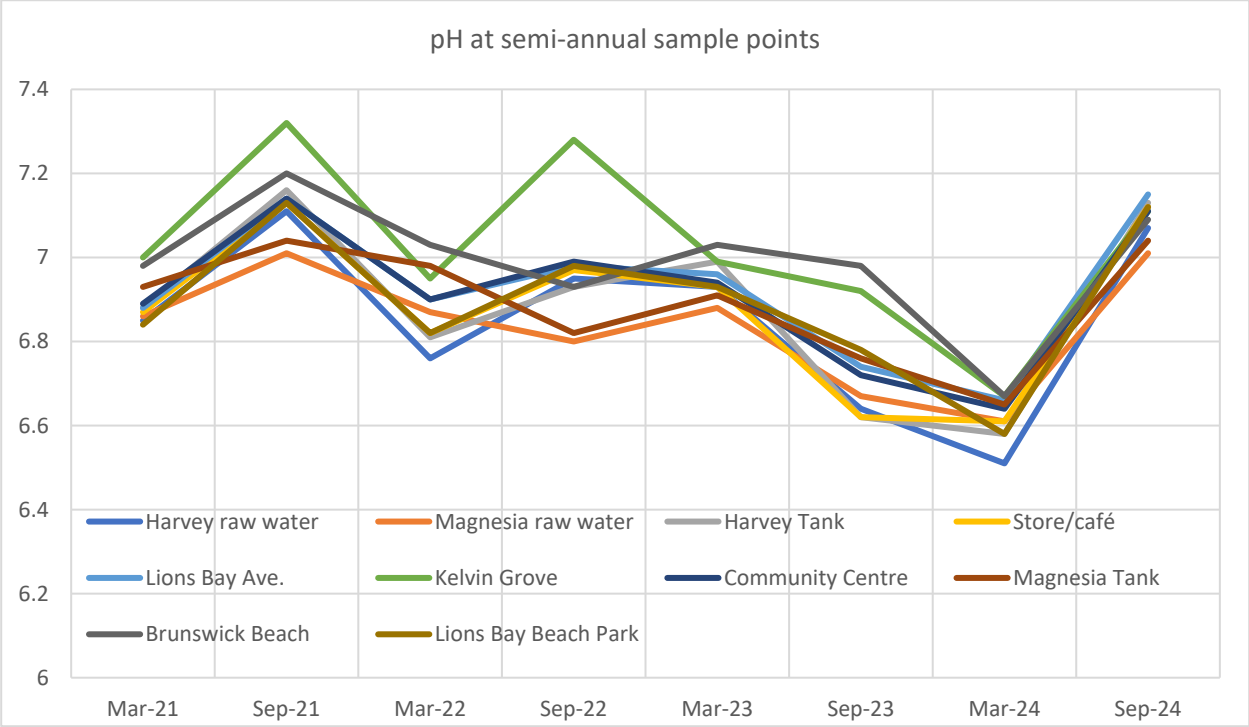
NOTE ON pH

pH is a measure of the acidity or basicity of water solutions, measuring the concentration of the hydrogen ion on a logarithmic scale from 0 to 14. pH is an important consideration in water systems because acidic water is corrosive to metals, including the iron and steel in water mains, and the copper and lead in residential plumbing. Conversely, at high pHs, alkaline water is scaling, and chlorine disinfection is less efficient (see box). Health Canada Guidelines indicate a pH range for drinking water of 7.0 to 10.5. Lions Bay water was well below this range on all March readings, and just over 7.0 on all September readings:

Sodium hypochlorite hydrolyses in water: $NaOCl + H_2O \leftrightarrow Na^+ + HOCl + OH^-$. HOCl, hypochlorous acid, disassociates to $H^+ + OCl^-$, more so at high pH. The OCl^- hypochlorite ion is 20 times less germicidal than hypochlorous acid, so overall, sodium hypochlorite is less effective at higher pHs.

pH AFTER SAMPLE STATION FLUSH		
Sample date → Sample location ↓	**19 Mar. 2024**	**17 Sep. 2024**
Harvey raw water	6.51	7.07
Magnesia raw water	6.61	7.01
Harvey Tank	6.58	7.13
Store/café	6.61	7.12
Lions Bay Ave.	6.66	7.15
Kelvin Grove	6.67	7.11
Community Centre	6.64	7.11
Magnesia Tank	6.65	7.04
Brunswick Beach	6.67	7.09
Lions Bay Beach Park	6.58	7.12

Plotting the last four years' data illustrates the significant increase in pH for all September 2024 samples:



pH is not under sufficient control, and consideration of active pH control commenced in 2023. A bench pH measurement station is being commissioned in 2025 to analyse all daily hand samples to inform pH control plans.

NOTE ON ALKALINITY, HARDNESS & WATER STABILITY

Alkalinity is a measure of bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and hydroxide (OH^-) ion concentrations in water. Alkalinity affects taste (positively) and represents a water's capacity to absorb pH swings. Control of alkalinity helps control acid corrosion, avoids scaling, and ensures the effectiveness of disinfection processes. Excessive alkalinity promotes scaling. Water alkalinity is measured in milligrams of calcium carbonate equivalent per litre; the guideline range for drinking water is 20-200 mg/L. Lions Bay's alkalinity ranges from 3-7 mg/L, as would be expected from catchment geologies with no carbonate rocks. Taste and pH buffering would be improved by increased alkalinity and will be considered in 2025 for implementation as part of a pH control program in 2026.

Hardness is a measure of calcium and magnesium minerals dissolved in water. Hard water is not a health risk, but a nuisance because of mineral buildup and poor soap and detergent performance. Water hardness is measured in milligrams of calcium carbonate equivalent per litre; in general, water with less than 60 mg/L is considered soft, water with 60-120 mg/L moderately hard, and water with greater than 120 mg/L is hard. At 4-10 mg/L hardness, Lions Bay water is very soft, for the same reasons it is not alkaline. 2024 results were:

2024 ALKALINITY AND HARDNESS/mg/L $CaCO_3$				
Sample date → / Sample location, after flush ↓	19 Mar. 2024		17 Sep. 2024	
	Alkalinity (> 20 indicated)	Hardness (<60 is soft)	Alkalinity (> 20 indicated)	Hardness (<60 is soft)
Harvey raw water	3.3	3.93	6.0	6.62
Magnesia raw water	4.7	8.79	5.2	19.60
Harvey Tank (glass-lined steel)	4.3	4.35	6.7	6.88
Store/café	4.2	4.56	6.3	7.02
Lions Bay Ave.	5.0	5.36	7.0	7.75
Kelvin Grove	5.1	5.43	6.3	8.10
Community Centre	5.0	5.03	6.1	7.15
Magnesia Tank (concrete)	4.7	10.30	5.4	18.70
Brunswick Beach	4.7	5.13	5.6	18.90
Lions Bay Beach Park	4.1	4.76	6.2	7.22
Min.	3.3	3.93	5.2	6.62
Max.	5.1	10.30	7.0	19.60
Avg.	4.5	5.76	6.1	10.79

Langelier Saturation Index (LSI) is a measure of the balance between the corrosiveness and scale-forming nature of water, calculated from pH, bicarbonate and calcium ion concentrations, conductivity and temperature. An LSI under 0 is undersaturated with respect to calcium carbonate and tends to remove existing calcium carbonate protective coatings in pipelines and equipment, and indicates corrosive water. An LSI of zero is neutral and neither scale-forming nor scale-removing. An LSI over 0 is supersaturated with respect to calcium carbonate ($CaCO_3$) and scaling may occur:

LSI RANGE	CONSEQUENCE
< -0.5	Corrosive
-0.5 – 0	Slightly corrosive but non-scale forming
0	Balanced but pitting corrosion possible
0 – 0.5	Slightly scale forming and corrosive
> 0.5	Scaling but non-corrosive

Using online calculators with parameters provided by the metals analyses, Lions Bay raw water LSI was:

Analysis	Langelier Saturation Index		
	Harvey Creek	Magnesia Creek	Alberta Creek
Mar.	-4.1	-3.5	-
Sep.	-3.1	-2.7	-
Dec	-	-	-2.3

Lions Bay raw water is thus highly corrosive. As above, a partially budgeted project for pH and alkalinity control will be resurrected in 2025.

5. DISTRIBUTION SYSTEM

After treatment, water flows to consumers through an EOCP Class II Water Distribution System (certification renewed in 2023, valid until November 16, 2028, see APPENDIX 1: CERTIFICATIONS on p.124). The system comprises:

- 3 potable water tanks, Harvey, Magnesia and Highway (see table below)
- 16.1 km of watermain of various sizes and materials from the 1960s to 2010
- 13 pressure reducing valve stations (3 updated, 10 due for replacement)
- 569 private property curb stop connections:
    - 26 multi-family units are covered by three curb stops
    - 35-student school and field
    - Three commercial accounts (café/store, marina, marine service centre)
    - A dozen municipal facilities and parks
- 72 fire hydrants
- 250 shutoff, blowoff, sampling and isolation valves.

STORAGE TANKS

UNIT (NAMES REFER TO LEGACY NOMINAL IMPERIAL GALLON CAPACITIES)	MATERIAL	DIMENSIONS	ACTUAL CAPACITY			YEAR
			L	iG	USG	
		CORRECTED FROM PREVIOUS REPORTS				
500,000 Harvey Tank	Glass-fused bolted steel	16.220 m ID, 11.446 m max. operating depth	2,367,000	520,200	624,600	2019
100,000 Magnesia Tank	Concrete	10.0 m X 10.0 m interior footprint, 4.729 m max. operating depth	473,000	104,000	124,800	1997
20,000 Highway Tank, obsoleted for fire reserve purposes in 2017 with advent of Harvey Tank. Slated for replacement by small break-head tank or PRV.	Concrete	5.87 m ID, 3.66 m operating depth	99,000	21,800	26,100	1959
100,000 Oceanview Tank. Obsoleted for potable service in 2017 with the advent of the upsized Harvey Tank. Repurposed in 2024 as a buffer tank for Alberta Supply-Augmentation Project's raw water supply.	*Concrete*	*8.6 m ID, 7.3 m operating depth.*	*424,000*	*93,000*	*112,000*	*1984*
20,000 iG Phase IV Tank	Fire reserve functions replaced by 2017 Harvey Tank upsizing. Demolished July 2024.					
25,000 iG Phase V Tank						
30,000 iG Brunswick Tank, obsoleted mid-2000s	Air gap to distribution network.					
35,000 iG Phase VI (Sunset) Tank, obsoleted late 1990s						

Inspection and cleaning of tanks occurs on a five-year cycle, using either a remotely operated vehicle (ROV) or a diver disinfected with chlorinated water. All drinking water tanks were inspected and cleaned in March 2022, next due in 2027[10].

WATERMAINS

Watermains are primarily ductile iron, with some asbestos-cement (AC), cast iron and polyvinyl chloride (PVC) lines also in service:

TREATED WATER MAINS (EXCLUDES LINES FROM INTAKES TO PLANTS)		
Nominal ID		Length/m
mm	inch	
100	4	602
150	6	10,060
200	8	4,430
250	10	1,010
	Total	16,102

The municipality aims to flush distribution mains twice per year, which is accomplished by opening fire hydrants and blow off valves to briefly produce flowrates high enough to scour pipe walls. To not affect summer conservation efforts, flushing usually takes place March-April and October-November. Scouring and pressure fluctuations often cause additional breaks and leakage, so flushing is not engaged in lightly. **The Spring flush was cancelled to sidestep service breaks that inevitably occur, in anticipation of a low-supply summer. The Fall flush took place Dec. 9-13.**

See LEAKAGE on p.49 for discussion of the effect of leakage on consumption.

ASBESTOS FROM THE DISTRIBUTION MAINS

About 1200 m of Lions Bay's 16,100 m of watermains are 60-year-old asbestos-cement. Health Canada concludes there is no convincing evidence that asbestos ingested through drinking of water is harmful to health and has not established drinking water guidelines for asbestos. However, US EPA's enforceable maximum contaminant level (MCL) for asbestos is set at 7 million fibres per litre (MFL), based on findings that some people who drink water containing asbestos fibres well in excess of the MCL for many years may have an increased risk of developing benign intestinal polyps.

In an abundance of caution Lions Bay takes asbestos samples once per year in two pertinent locations. 2024 results are zero asbestos above an analytical sensitivity of 0.21 million fibers per liter:

[10] The floor of the Harvey Tank was briefly ROV inspected in 2024 to determine whether apparent chlorine depletion in the tank was due to organic sediment build-up, which it proved not to be (rather, the issue was determined to be due to the chlorine sensor being located close to one of the five tank inlets measuring freshly treated water chlorine concentration, rather than the tank average).

Asbestos analysis by transmission electron microscope to EPA Standard 100.2*		
Sample 19 Nov. 2024 Analysis 22 Nov. 2024	**Upper Bayview Rd.**	**Oceanview Rd.**
Analytical sensitivity (AS), million fibers per liter (MFL)**	0.21	0.21
Total chrysotile, count	<AS	<AS
Total amosite, count	<AS	<AS
Total crocidolite, count	<AS	<AS
Total actinolite, count	<AS	<AS
Total tremolite, count	<AS	<AS
Total anthophyllite, count	<AS	<AS
***TOTAL ASBESTOS*, count**	*<AS*	*<AS*

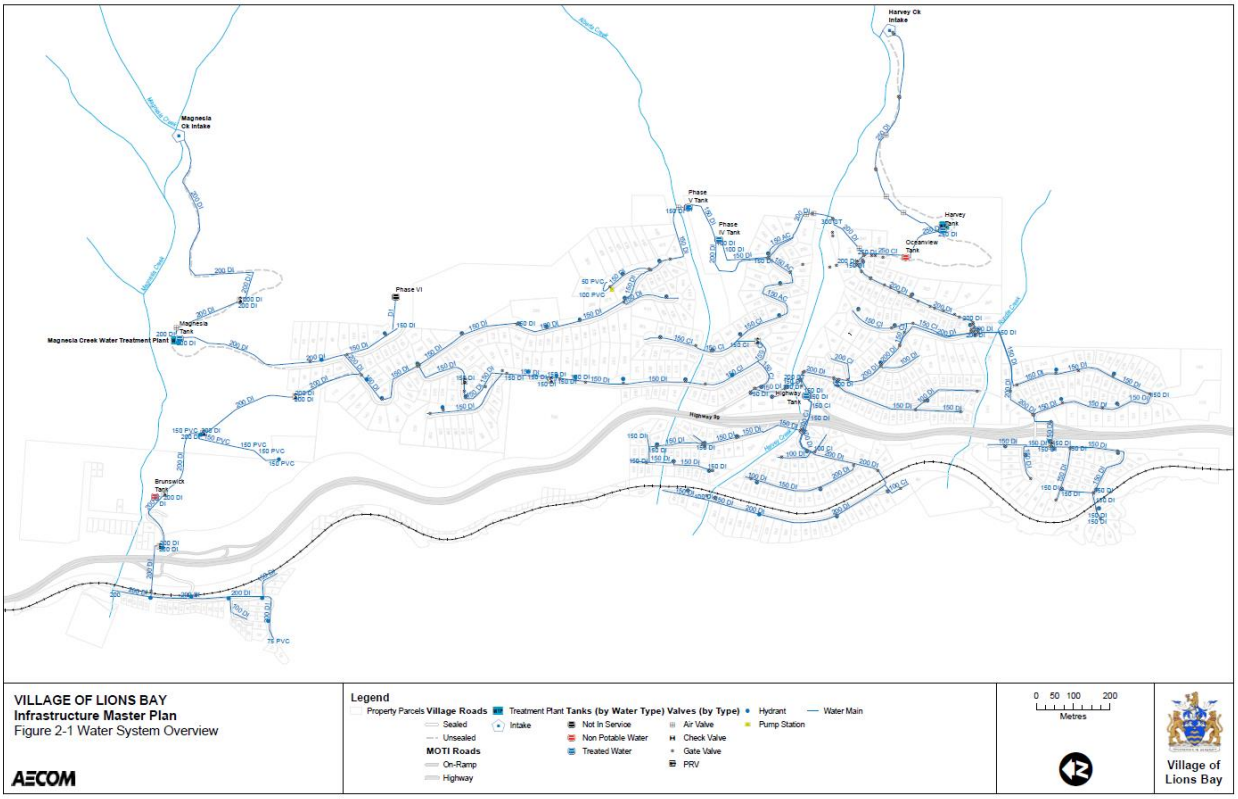
*"EPA 100.2" refers only to US EPA compliance drinking waters analyzed at >10,000x magnification, for asbestos fibers >10µm long only.

**US EPA indicates an analytical sensitivity less than 0.2 MFL is desired for drinking water, and that a sufficient volume is analyzed to yield the same. However, waters containing excessive solids may require filtration of volumes too low to achieve the desired AS. Lions Bay's prior year samples had seen AS above 0.4 MFL, so for the 2024 sample, the lab was requested to achieve this sensitivity by analysing sufficient volumes of sample, which at an AS of 0.21 was accomplished, or close enough.

PRESSURE REDUCING STATIONS, OTHER SPECIALISED VALVES

LIONS BAY WATERMAINS VALVES. All valves manufactured by Cla-Val Co. unless stated otherwise. Pressure turndown capability to be installed under 2025-27 All-Zone All-Property Metering Project.			
#	**VAULT/KIOSK**	**DOMESTIC FLOW**	**FIREFLOW**
1	Upper Oceanview	4" PRV (2014)	8" PRV (1982)
2	Oceanview Bend (down feed)	4" PRV (2019)	6" PRV (1982)
6	Oceanview Bend (cross feed)	2" PRV (2015) 2" pressure relief (2015)	4" PRV (2015)
3.1	Highway (feeds Isleview)	2.5" PRV (2008) 3" pressure relief (2020)	4" PRV (1985)
3.2	*Future Highway2 (feeds Lions Bay Ave., planned replacement of break head tank)*	2" PRV (2027)	4" PRV (2027)
3.0	Highway Tank fillstation	4" altitude valve (2015)	-
4	Lower Upper Bayview	2" PRV (2018)	4" PRV (1982?)
5	North Bayview	2" PRV (2007) 2" pressure relief (non-ClaVal)	4" PRV (2007?)
7	Tidewater	2" PRV (2015) 2" pressure relief (2015)	4" PRV (2015)
8	Soundview	2" PRV (2022)	6" PRV (2003)
9	Brunswick Pit	2" PRV (2015)	6" PRV (2003)
10	Crystal Falls @ Brunswick Tank	2" PRV (2015)	6" PRV (2003)
11	Brunswick at 99	2" PRV (2010) 2" pressure relief (2008)	6" PRV (2003)
12	Mag pre-fillstation	2" PRV (2015)	6" PRV (2015)
13	School	4" PRV (2021)	8" PRV (2021)
14	Upper Upper Bayview @ Alberta	4" PRV (2021)	8" PRV (2021)
W	Mountain flow control valve (conceived to add Harvey supply to augment fire service at school; now likely unnecessary)	6" gate valve (2021)	-
X	Oceanview Tank at ASAP pumphouse fillstation	6" altitude valve (TBC)	-

Y	Harvey Plant fillstation (8" line from intake and ASAP pump feed)	4” PRV (2012)	6” PRV (2009)
Z	Mag Plant fillstation (8" line from PRV-12)	Upstream & downstream 2” PRVs (2009) 2” blowoff (2008) 3” in-plant PRV (2009)	Upstream & downstream 6” PRVs (2009)



FILTRATION EXEMPTION

The system operates under Vancouver Coastal Health filtration exemption. *Drinking Water Microbial Treatment Objectives for Surface Water Supplies in BC* recommends filtration and one form of disinfection for drinking water treatment, but provides for filtration exemption under four conditions:

CONDITION 1: ADEQUATE DISINFECTION

“Provide overall inactivation, using a minimum of two disinfection processes, of 4-log reduction of viruses and 3-log reduction of Cryptosporidium *and* Giardia*.”*

The municipality achieves this condition by utilising UV as primary and chlorine as secondary disinfection, discussed in detail in PRIMARY TREATMENT: UV DISINFECTION and SECONDARY TREATMENT: CHLORINE on p.10.

Status at end of 2024: condition met.

CONDITION 2: CLEAN SUPPLY

"E. coli *in* raw *water not to exceed 20 colony-forming units per 100 ml…in at least 90% of weekly samples from the previous six months."*

In 2024 this criterion was met: *E. coli* in raw water did not exceed 20 colony-forming units per 100 mL in 51 of 52 (98%) of samples for Harvey Creek, 50 of 52 (96%) of samples for Magnesia Creek, and 10 of 10 (100%) of samples for Alberta Creek:

Raw water							
2024	**Days since**	**Harvey Ck Raw**		**Mag Ck Raw**		**Alberta Ck Raw**	
		TC	**E. coli**	**TC**	**E. coli**	**TC**	**E. coli**
		E. coli, colony-forming units/100 ml					
02-Jan		27.5	ND	N/A	N/A	-	-
08-Jan	6	21.1	ND	16.0	ND	-	-
15-Jan	7	21.6	ND	4.1	ND	-	-
22-Jan	7	21.3	2.0	81.3	2.0	-	-
29-Jan	7	27.9	ND	12.0	ND	-	-
05-Feb	7	14.8	ND	7.4	ND	-	-
12-Feb	7	24.6	ND	21.6	ND	-	-
20-Feb	8	11.9	ND	10.8	ND	-	-
26-Feb	6	24.6	ND	11.0	ND	-	-
04-Mar	7	13.5	ND	N/A	N/A	-	-
11-Mar	7	36.4	ND	7.3	ND	-	-
18-Mar	7	9.8	ND	15.8	ND	-	-
25-Mar	7	12.2	ND	12.1	ND	-	-
02-Apr	8	17.5	ND	10.9	ND	-	-
08-Apr	6	18.7	ND	9.8	ND	-	-
15-Apr	7	14.8	ND	21.8	ND	-	-
22-Apr	7	20.1	ND	16.0	ND	-	-
29-Apr	7	14.8	1.0	11.0	ND	-	-
06-May	7	17.1	ND	18.5	ND	-	-
13-May	7	14.5	ND	7.4	ND	-	-
21-May	8	42.6	ND	14.0	ND	-	-
27-May	6	21.6	ND	6.3	ND	-	-
03-Jun	7	51.2	ND	253.9	6.3	-	-
10-Jun	7	N/A	N/A	N/A	N/A	-	-
17-Jun	7	27.5	ND	18.5	ND	-	-
24-Jun	7	59.8	ND	20.1	ND	-	-
02-Jul	8	93.1	ND	21.6	ND	-	-
08-Jul	6	99.1	1.0	44.1	ND	-	-
15-Jul	7	115.3	ND	70.8	ND	-	-
22-Jul	7	209.8	2.0	187.2	1.0	-	-

Raw water							
2024	Days since	Harvey Ck Raw		Mag Ck Raw		Alberta Ck Raw	
		TC	E. coli	TC	E. coli	TC	E. coli
		E. coli, colony-forming units/100 ml					
29-Jul	7	488.4	2.0	613.1	3.1	-	-
06-Aug	8	261.3	2.0	86.0	ND	-	-
12-Aug	6	410.6	ND	155.3	ND	-	-
19-Aug	7	275.5	1.0	125.0	ND	-	-
26-Aug	7	260.3	2.0	290.9	2.0	272.3	5.2
03-Sep	8	142.1	ND	135.4	ND	-	-
09-Sep	6	115.3	ND	235.9	ND	126.6	ND
16-Sep	7	95.9	2.0	98.8	ND	108.6	ND
23-Sep	7	123.6	1.0	109.2	1.0	71.7	ND
01-Oct	8	53.7	1.0	RM	RM	101.7	ND
07-Oct	6	56.1	ND	46.4	ND	156.5	ND
15-Oct	8	83.3	ND	33.1	ND	270.0	1.0
21-Oct	6	128.1	2.0	547.5	25.9	198.9	ND
28-Oct	7	98.8	ND	46.5	ND	198.8	ND
04-Nov	7	1413.6	146.7	153.9	20.1	-	-
12-Nov	8	48.7	2.0	920.8	15.8	-	-
18-Nov	6	41.4	1.0	21.1	ND	-	-
25-Nov	7	35.5	ND	24.3	ND	-	-
02-Dec	7	22.8	1.0	17.5	ND	-	-
09-Dec	7	20.1	ND	19.5	1.0	-	-
16-Dec	7	23.1	ND	18.7	ND	-	-
23-Dec	7	LC	LC	LC	LC	-	-
COUNT		52	52	52	52	10	10
MIN		9.8	ND	4.1	ND	71.7	ND
MAX		1413.6	146.7	920.8	25.9	272.3	5.2
>20 E. coli		N/A	1	N/A	2	N/A	0

ND = Non-detectable
RM = Results Missing From Laboratory
LC = Lab closed

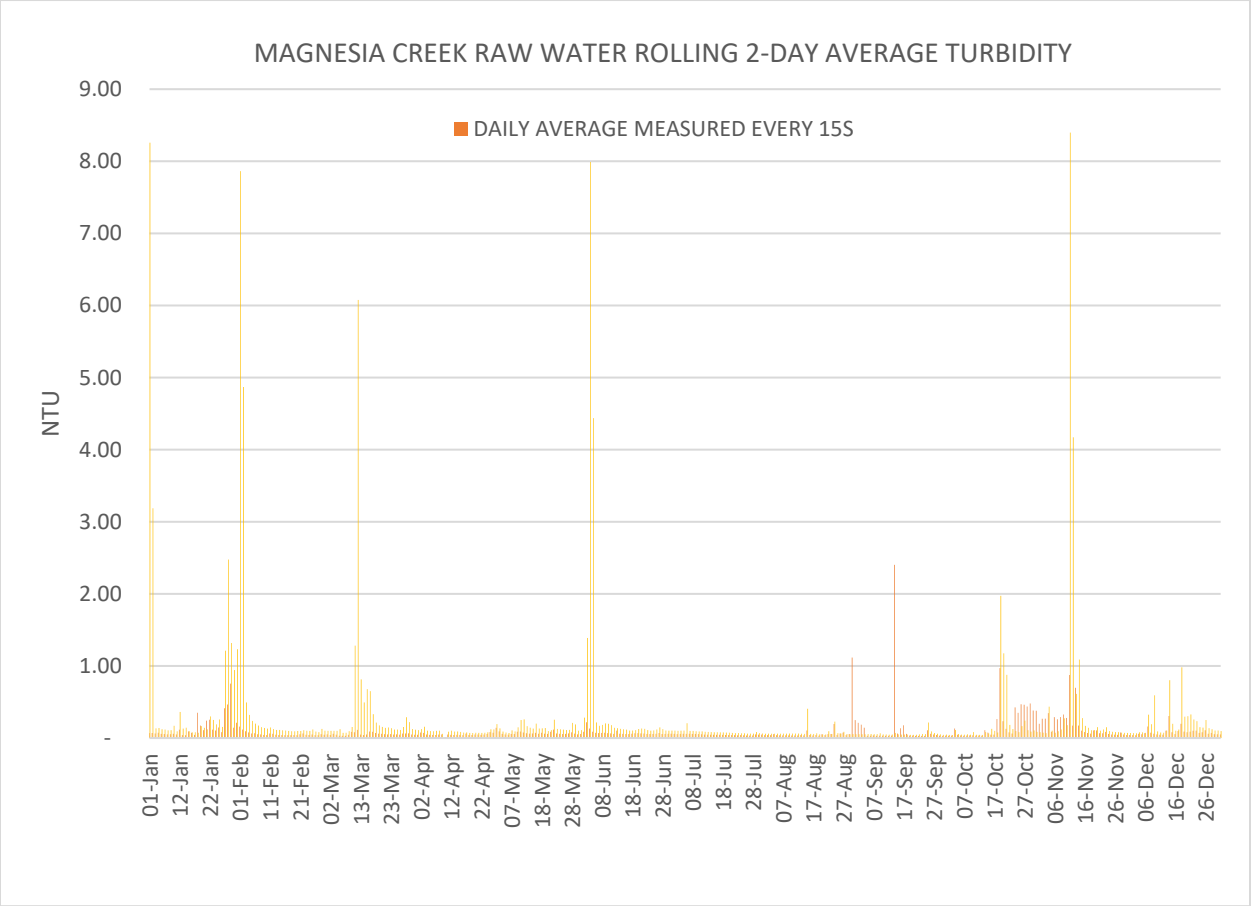
Status in 2024: condition met.

CONDITION 3: LOW TURBIDITY

"[Maintain] average daily turbidity levels measured at equal intervals (at [most] every four hours) immediately before the disinfectant is applied…around 1 NTU, but…not exceed[ing] 5 NTU for more than two days in a 12-month period."

As discussed in TURBIDITY ANALYSIS on p.18 above, no *daily* grab sample turbidity readings reached 5

NTU, but to satisfy the 4-hour criterion of the Condition, 2024's 3,020,455 readings taken every 15 seconds by the turbidity meters on the plants' incoming raw water were summarised programmatically (see Appendix 8 on p.116). There were **no days in which the rolling two-day average of such readings exceeded 5 NTU for Harvey Creek, but there were five such instances for Magnesia Creek for one or two days each** (no instances were more than two days):



As identified in 2023, both plants' turbidity meters' upper limits are 10 NTU and do not record higher values. However, for hourly periods in which the reading is at 10 NTU, adjacent hours are almost always less than 10, so out-of-range periods are short. The ability of the meters to report full NTU ranges will be investigated in 2025.

Magnesia Creek's geomorphology is troublesome and being addressed as described in WORK PROGRAM on p.51.

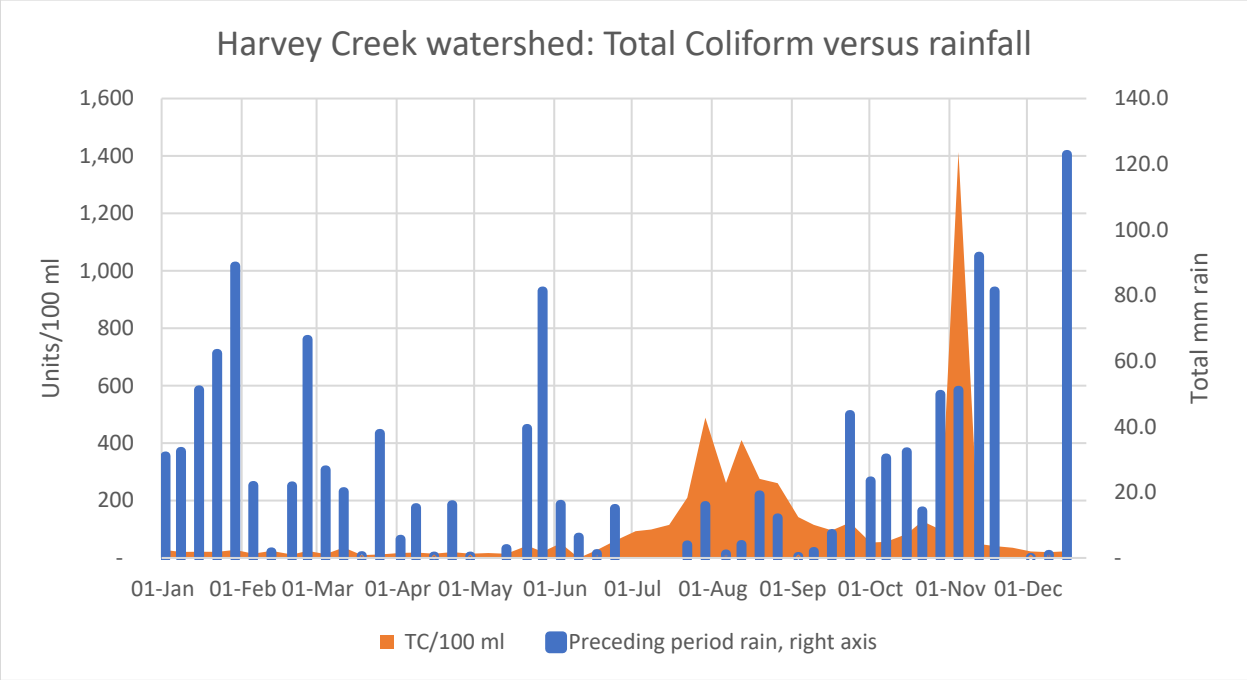
Status in 2024: open.

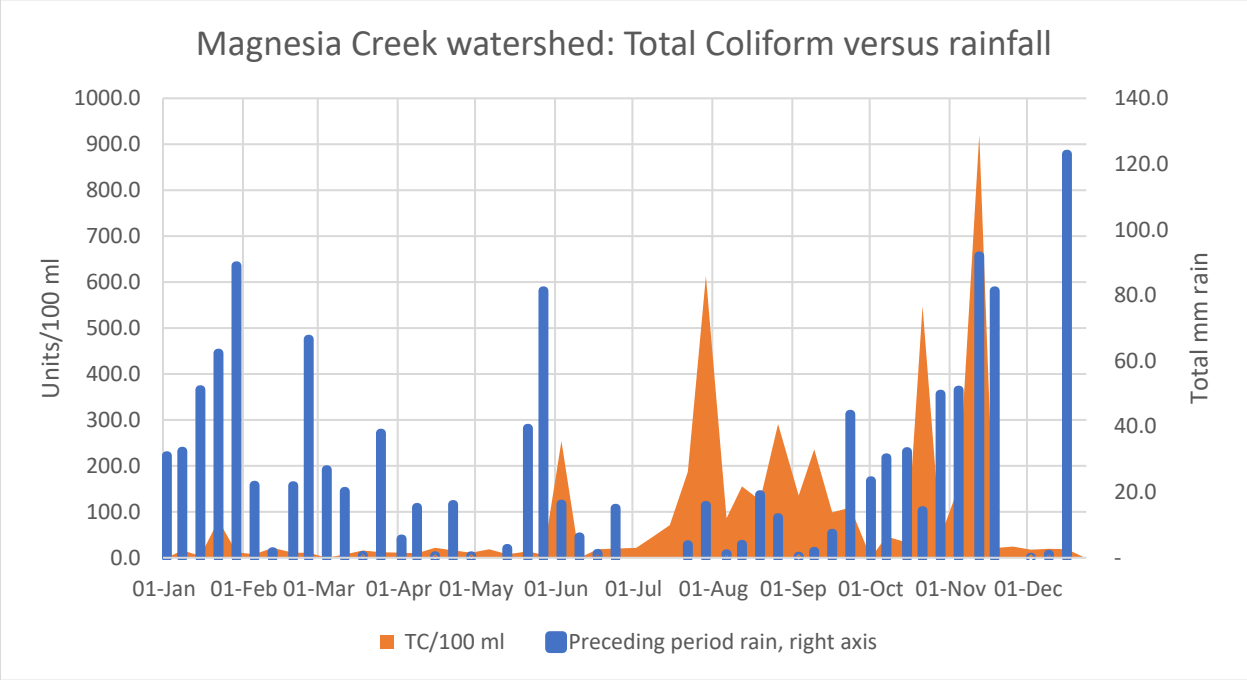
CONDITION 4: CONTROL FECAL COLIFORM IN THE WATERSHEDS

"[Maintain] A watershed control program…that minimizes the potential for fecal contamination in the source water."

The Lions Bay Source Water Protection Plan outlines ongoing measures and programs to control and

protect the watersheds, including from fecal contamination. 2024-specific Total Coliform results are:





TC spikes in different watersheds in the same week in November are notable and assumed to be due to the first significant rain, which fell in both watersheds that week, and washed the preceding three months of detritus into the creek. Seemingly independent of rain, TC readings also climb in summer due to rising temperature.

Status in 2024: open.

6. OPERATORS

The municipality's annual drinking water work program is driven by regulatory monitoring and reporting requirements. The Environmental Operators Certification Program (EOCP) classifies water supply and distribution systems to determine operator training requirements:

- Each system is required to have at least one Chief Operator certified to the classification level of the system.
- Additionally, any person whose actions may affect the operation of a water system requires certification.

Operators must earn continuing education units to remain certified.

EOCP classifies Lions Bay's water treatment system as Class 1, and distribution system as Level 2 (certificates p.50). In 2024, EOCP-certified personnel were:

STAFF MEMBER	JOB CLASSIFICATION ON DEC. 31	RELEVANT EOCP CERTIFICATIONS
AU	Treatment Plant Operator	Water Treatment Plant Operator 1 Water Distribution System Operator 2
AY	Operations Supervisor	Water Treatment Plant Operator 1 Water Distribution System Operator 2
GS	Operator 2 from March	Small Water Systems Operator Water Treatment Plant Operator 1

7. ABNORMAL OPERATION PROTOCOLS

VOLB = Village of Lions Bay Public Works Manager (or designee)
VCH = Vancouver Coastal Health

SITUATION	NOTIFYING AGENCY	AGENCY NOTIFIED	NOTIFICATION TIME FRAME
E. coli positive for any treated water sample	VCH Labs	VOLB & VCH	Immediate
VOLB and VCH are notified immediately by VCH Labs. Any later samples from the same station will be immediately examined by the laboratory. The chlorine residual noted on the field sheet will be reviewed by VCH Labs and compared to lab analysis test results to determine if there is any local decrease of chlorine residual. Immediate collection and test of a repeat sample, where possible both upstream and downstream of the positive sample location. VCH and VOLB determine the need for a Boil Water Advisory (BWA) to be issued by VCH. VCH Lab will test subsequent samples. Once consecutive negative sample results are returned, VOLB will liaise again with VCH and determine whether the BWA can be lifted.			
Total coliform >10/100 ml in raw water AND low chlorine residual in treated water in any sample station	VCH Labs (for TC), VOLB (for chlorine)	VCH	Immediate
VOLB and VCH will be notified immediately by VCH Labs of a TC reading over 10, but it is unlikely that the low chlorine residual co-condition would apply, since the municipality maintains at least 0.2 mg/L throughout the network, with response times to dose changes ranging from minutes close to source, to over 24 hours at the far ends of the network. Nevertheless, any available samples from the same sampling station will be immediately examined by the laboratory, and a repeat sample will be collected, where possible both upstream and downstream of the positive sample location. All other station's TC results will be compared, and VCH and VOLB will liaise and determine the need for a Boil Water Advisory (BWA) to be issued by VCH. Where possible the distribution network will be reconfigured to shut out the creek producing the high TC until offline samples are clear, after which VOLB will again liaise with VCH on lifting the BWA.			
Chemical contamination	VOLB	VCH	Immediate
Chemical contaminants may include nitrates and nitrites, salts, pesticides, metals and toxins. While it is recognised that with only semi-annual sampling, timely detection may not be possible, when they are, VCH will immediately be notified, and steps will commence to isolate the contaminated area. The level of contamination will be determined through sampling and analysis, and public health risk factors will be determined. If necessary, a public advisory will be issued and carried out by VOLB under the guidance of VCH. Once the contamination is remedied and consecutive negative sample results are returned from VCH Lab, VOLB will again liaise with VCH and determine whether the public advisory can be lifted.			
Turbidity events >5 NTU	VOLB	VCH	Immediate
UV treatment effectiveness diminishes with increased turbidity due to UV absorbance and reflection and a correspondingly low UV transmittance (UVT) rate. The system automatically increases UV lamp intensity to counter lower UVT. Once the UV dose drops below a minimum of 26.25 mJ/cm^2, the UV reactors stop flow and alert on-call VOLB staff. Long before 5 NTU is reached, high turbidity readings are flagged, with affected sections of the distribution system field-checked and flushed if deemed advisable by VOLB. For turbidity > 5 NTU, microbiological testing is increased at all sampling locations; chlorine residual sampling and testing is likewise increased and VOLB contacts VCH, which may issue a Boil Water Advisory.			
Disinfection failures/continued loss of residual	VOLB	VCH	Immediate for continued loss of residual
If a daily chlorine residual anywhere in the system is below 0.2 mg/L, operators increase dosage at the affected plant, and depending on conditions may dump stored water from the tank to bring in higher chlorine.			

SITUATION	NOTIFYING AGENCY	AGENCY NOTIFIED	NOTIFICATION TIME FRAME
Should chlorine residual remain below 0.2 mg/L for 24 hours, chlorine will be added directly to the tank and chlorine residuals will be checked frequently throughout the system, while investigating the root cause. VOLB will contact VCH, who may issue a Boil Water Advisory if continued loss of residual is observed.			
Loss of distribution pressure due to high demand	VOLB	VCH	Immediate
In the event of adverse pressure loss due to high demand, VOLB will adjust the distribution system to supplement pressure in the affected area. VCH will be notified.			
Water main breaks	VOLB	VCH	Immediate
In the event of a water main break where chemical or microbiological contamination of the system is suspected, VOLB will adjust the system to isolate the contaminated section and consult with VCH regarding further actions; all water quality complaints from the public will be immediately and thoroughly investigated for potential contamination. Water samples will be taken from the vicinity and downstream of the break if possible and tested for the suspected contamination. The same procedures as noted under *E. coli* above will be implemented if required.			
Low supply due to drought or other causes	VOLB	EMCR & VCH	Information only; as drought situation progresses
The control system alarms if supply pressure at a plant decreases rapidly, and staff ascertain and address the root cause of the problem (i.e. whether the decrease is due to an intake blockage or a break in the intake supply line). Low supply results in conservation measures being instituted. Level 1 of the municipality's Outdoor Water Use Bylaw entails only restricting lawn watering to three days a week, and is set around June 1 every year, as much for awareness as conservation. Level 2 is utilized to further reduce outdoor use of water, and Level 3 is reserved for serious supply shortage. In late 2023, in anticipation of unprecedented supply shortage in 2024, further conservation considerations were mooted to Council with no decision taken: CODE RED: 3-day-average supply within 125% of demand. • Town Hall and information campaign • Activate Outdoor Water Use Bylaw Level 3 with stringent enforcement, including drone overflight (subject to Federal regulations) and zero-tolerance ticketing for offenses. • Building Inspector lock out of private irrigation systems and decommissioning of indoor and outdoor water features. CODE ORANGE: 3-day-average supply within 110% of demand. • Town Hall and information campaign • Subject to prospects for worthwhile rain, declaration of a state local emergency to allow shutoff of suspect service connections (known faulty services can already be shut off by bylaw as noted above) • Because the critical requirements for a residence to remain habitable are flushing toilets and dishwashing, commence sourcing curbside water barrels labelled "*NON-POTABLE WATER: NOT FOR HUMAN OR ANIMAL CONSUMPTION. Free to residents for indoor use only: bathing, cleaning, toilet tanks, dishwashing (use warm water, then sanitise for 30 s in 5 mL of bleach per liter of water and air dry).*" • Commence sourcing bottled drinking and cooking water • Mutual aid negotiations, including but not limited to shower facilities at West Vancouver's Gleneagles community centre, mobile laundromat trailer (filtered non-potable water), nearby fire departments, firefighting water trailers.			

SITUATION	NOTIFYING AGENCY	AGENCY NOTIFIED	NOTIFICATION TIME FRAME
CODE WHITE: supply less than demand. • Declare State of Local Emergency • Town Hall and information campaign • In sufficient time for no user to receive water that has been exposed to dried mains, shut off all street mains and 550+ service curb stops • With hydrants no longer operational, institute previously recruited citizen/contractor firewatch • Place remaining curbside barrels and commence roving tanker top-up service • Activate mutual aid agreements • When creek supply reliably returns, in consultation with VCH flush and hyper-chlorinate tanks and mains (7 – 14 days) • Reopen curb stops under Boil Water Order, then Boil Water Advisory. VOLB will liaise with EMCR and VCH for a coordinated response as events unfold.			

8. STRATEGIC ISSUES

SUPPLY

Flow in Lions Bay's three raw water source creeks is produced by:

- Rainfall
- Groundwater entering the channel, influenced by when groundwater was last fully replenished
- Snowmelt, subject to rain-on-snow, insolation (sunshine), wind and cloud cover.

Current regional climate projections call for warmer winters and longer hotter summers, with precipitation similar to today, but occurring more intensely as rain rather than snow. *With no raw water storage, Lions Bay relies entirely on water being in the creeks as needed*. For much of the year, creek flows exceed the capacity of their respective treatment plants. In August and September however, creekflows dwindle, other than in periods of sporadic rain. In some years, daytime consumption has been higher than supply, and the tank levels only start rising overnight. In recent late summers supply has been as low as 300,000 GPD in Harvey Ck. and 190,000 GPD in Magnesia Ck. The Alberta Supply-Augmentation Project (ASAP) system went into operation on Aug. 15 after obtaining a VCH Construction Permit, for pumping up to 50 GPM (72,000 GPD) to the Harvey Treatment Plant if and when Harvey Creek supply needs augmentation. In summer staff watch rainfall predictions and manage fill levels to use as much of the creeks as possible.

In 2017 the municipality commenced working with the Hydrotechnical Engineering group at UBC's Civil Engineering Department, to jointly collect data from the watersheds to model the relationship between snowpack, weather and supply to make operating decisions:

- In the short term by knowing what creek supply will do until the next rainfall event, to know what conservation level to set;
- In the long term by knowing when to begin considering supply alternatives: wells, desalination—in 2018 the municipality acquired the last remaining undeveloped waterfront land in the community to hold in reserve for a desal plant site—or a pipeline to the MVWD.

Little of use to Lions Bay was forthcoming from this effort and it was wound down in 2024, with funds redirected to implementing direct measurement of creek supply[11].

PROBLEMATIC INTAKES

Lions Bay's water catchments are mountainous and geotechnically unstable—landslides into the creeks occur frequently. Access to the intakes is on narrow gravel roads subject to rock and tree fall, and on which safety protocols restrict access whenever rainfall parameters are exceeded, just when decreased flow or increased turbidity need to be investigated. The watersheds are heavily forested with deciduous and conifer trees producing copious leaves and needles which build up on intake screens,

[11] Using pressure transducers in the whole flow pools above the intakes to measure pool depth. Pool depth directly correlates to creek flow, determine from custom rating curves produced from salt-dosing proportional measurements just downstream, and compared to plant throughput in periods when they take the entire production of the creek.

occasionally requiring clearing twice a day. Large rocks (over 0.5 m) move down the creeks during heavy rain and fill the intake weirs. Medium rocks (10 – 50 cm) block the intake grates. Small rocks (1-10 cm) fill the settling chambers.

A 2017 design to screen small solids at the Magnesia weir was a failure; in late 2023 engineers were engaged to consider a better approach, perhaps an open raceway/riffle design to float off vegetation and to drop out medium and small rocks, not requiring confined-space safe work protocols to clear, with a powered gate valve to close off feed when not in use to prevent debris buildup on the grate, the so-called WHIRL (Weir Height and Inclination ReaLign) project. A better-conceived 2018 upgrade to the profile of the Harvey weir allows it to self-clear blockages at the intake grate.

See 2024 PROJECTSon p.51 for further information.

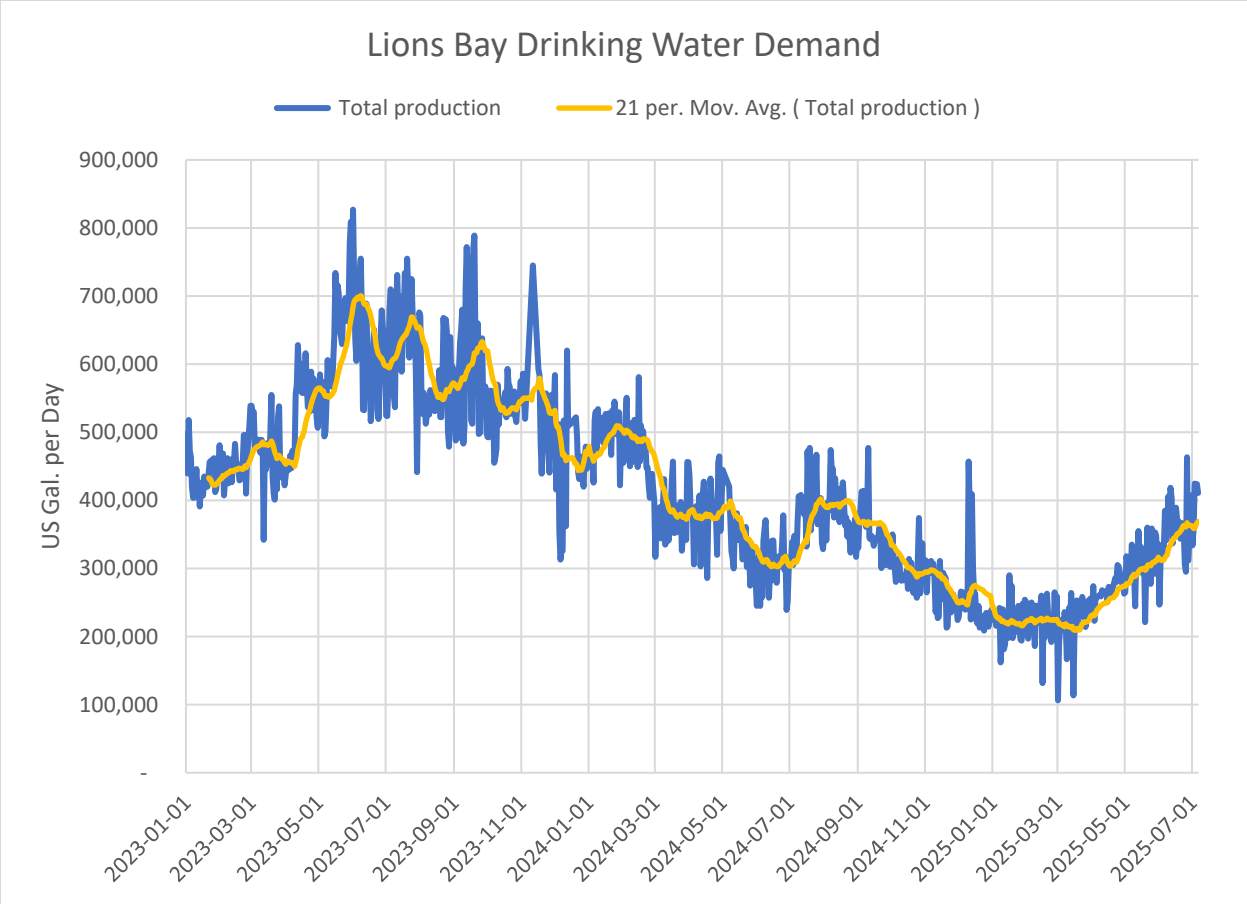
EXCESSIVE DEMAND

LEAKAGE

As identified in the 2022 and 2023 Annual Reports, water demand had been increasing since 2015 at an average rate of 14% a year, reaching an all-time high in early summer 2023 of 810,000 GPD. Lions Bay had not significantly changed population in the period, and there is no reason to believe residents use water differently. Instead, increasing demand is due to accelerating leakage, primarily in the service lines connecting properties to the mains. Service lines run through front and side yards and are damaged by tree roots: what was a 10 cm sapling when a line was installed 50 years ago is today a 60 cm tree pushing rocky backfill into the line. Municipal mains and their service lines to the curb stop mostly run in roads and boulevards, where there are no trees. Leaks here are fewer. Private lines were often installed in a hurry by private developers, and due to Lions Bay's major development phases, often in the polybutylene used extensively from the late 1970s to the late 1990s before it was banned by the National Plumbing Code in 1997 due to inevitable failure in service.

Through a crash program starting in Sep. 2023, the municipality in 2024 located and addressed 8 public-side and 18 private-side leaks (including one alone of 110,000 GPD, undetected on the surface, and with no noticeable pressure drop). Demand went from an average 618,600 GPD in 2023 to 359,100 GPD in 2024, a 42 percent decrease:

Year	Consumption/m^3	Change	GPD	Census population	L/capita/day
2016	351,318	-	253,600	1334	722
2017	472,527	35%	341,100		970
2018	533,000	13%	384,800		1095
2019	508,000	-5%	366,700		1043
2020	623,000	23%	449,700		1279
2021	612,000	-2%	441,800	1390	1206
2022	699,000	14%	504,600		1378
2023	856,939	23%	618,600		1689
2024	497,400	-42%	359,100		978



METERING

359,100 GPD is still double the per capita consumptions of comparable communities:

COMMUNITY	Litres per capita per day (L/c/d)
Lions Bay, 2024 average	978
Lions Bay, early 2025 lows of 200,000 GPD	545 (still significantly higher than regional averages)
West Vancouver	493[12]
Anmore	356
North Van District	510

The municipality believes that the only sustainable means to control demand is meter all use, both to immediately find unintended use fast, and in future to incentivise conservation by charging for water used. In early 2025 the municipality was awarded a $3.94 mil. grant under the provincial Water Metering Pilot Program for 100 percent funding of universal metering of all 580 properties in Lions Bay (plus watermain zone metering and nighttime pressure turndown). Metering will be implemented from late 2025 through March 2027.

[12] Other community data sourced from latest (2023) GVWD report

OUTDOOR WATER USE

Outdoor Water Use Bylaw No. 484, 2015 restricts residential, commercial, and public water uses during low supply periods:

In 2024, Conservation Level 1 was set on June 1 and removed October 25. Levels 2 and 3 were not required despite low rainfall in late summer, and the main rain only returning in mid October. As laid out above, climate change may affect the community's long term water supply, and the municipality is taking long term steps to ensure that demand does not outstrip it.

LIMITED CAPITAL

As a small residential community with a small tax base, Lions Bay's infrastructure spending shortfall is growing. While an Infrastructure Levy has been collected since 2019, capital spending still requires federal and provincial grant help. Outstanding water capital projects include:

- Replacing 1065 meters of 1960s era cast iron and asbestos-cement pipe, the Centre-Upper Bayview-Bayview Place, or CUBB Project. Three grant applications for this $3-4 mil. project have been unsuccessful, and for the 2025 budget year Council has funded a $1.3 mil. subset of the project from reserves, now in the design phase for groundbreaking early in 2026.

Distribution system modelling undertaken for CUBB indicate that replacement of 795 meters of water main at north Bayview Road, the so-called DWIP (Drainage & Water Infrastructure Project) can be superseded by instead delivering the firefighting flows and volumes required for Lions Bay School via CUBB, saving $2-4 mil. permanently. See LOOKING AHEAD below.

- Pressure reducing valve stations that are not compliant with confined-space worker safety requirements, and that have outlived twice the best practice replacement cycles, at a cost of $300,000-500,000 each.
- The 20,000 iG Highway Tank was obsoleted for fire reserve volume in 2017 with the advent of the upsized Harvey Tank. Slated for future replacement with a PRV.
- Filtration, which based on unstable turbidity results in 2024 is now being long-range planned, for implementation at the Harvey Plant.
- The problematic Magnesia Intake, as discussed above.
- pH adjustment to meet *Guidelines for Canadian Drinking Water Quality*, and as discussed above.

9. WORK PROGRAM

The municipality's Core Service Level Review (available at www.lionsbay.ca) details the routine tasks and staff resources involved in operating and maintaining the water system. All core maintenance was completed in 2024, other than the Spring watermain flush as discussed above.

PLANT LOGS

Harvey Plant 2024			
From	**To**	**Days**	**Notes**
1 Nov.	4 Nov.	4	High turbidity, and sand in the reactors on Nov. 4

Magnesia Plant 2024			
From	**To**	**Days**	**Notes**
1 Jan.	7 Jan.	7	Intake clogged w. vegetation. System fed from Harvey Plant.
22 Jan	22 Jan	1	Comms fault
29 Jan.	22 Feb.	3	Intake clogged. System fed from Harvey Plant.
1 Mar.	29 Apr.	60	Entire system fed from Harvey Plant to allow use of Harvey network flowmeters to deduce overnight leakage rates. Magnesia Plant on lo-flow bypass to maintain chlorine residual.
6 Jun.	19 Jun.	17	Intake blocked by rocks. Entire network fed from Harvey Plant.
21 Oct.	24 Oct.	4	Intake blocked. System fed from Harvey Plant.
11 Nov.	20 Nov.	9	Intake blocked. System fed from Harvey Plant.

2024 PROJECTS

- The Alberta Supply-Augmentation Project (ASAP) system went into operation on Aug. 15. It gravity feeds up to 110 GPM from a refurbished 1960s-era weir on Alberta Creek weir a 900 m 3" surface pipeline to the 100,000 iG Oceanview tank, for pumping at 50 GPM to the Harvey Treatment Plant if and when Harvey Creek supply needs augmentation. In 2024, other than for testing and commissioning purposes, no Alberta supply was required[13].
- Significant SCADA control system upgrades were delivered:
    - Online Cl monitoring at KG Control Room mains endpoint, with a view to providing operators confidence to reduce chlorine dosing
    - Replaced copper data circuits with fibreoptic at Office, Yard, Harvey Plant, Magnesia Plant, WWTP (0 install cost and net savings monthly).
    - Wi-Fi; cameras at Oceanview pumphouse, Mag Plant, Harvey Plant
    - Replace 6-channel voice alarm dialler with cloud alarm platform to provide unlimited alarm inputs delivered by text, email and voice, obsoleting the PLC panel at the Works Yard

[13] Project was delivered on time at a capital cost of $680,000 ($721,000 budgeted). It comprised approach grading, a metering weir, reuse of the legacy penstock/shutoff valve/catchbasin, new 4" flush valves and a Y-strainer, an automatic runaway flow shutoff station, cable crossing of Harvey Creek, a repurposed Oceanview fillstation and tank as buffer storage, and reconfiguration of available power to provide a SCADA-controlled pump station. The Harvey Plant fillstation was modified to accept a new supply stream. Security fencing and signage was provided. The disused Phase IV and V treated water tanks were demolished while heavy equipment was available.

- Replaced failed fireflow Y-strainer at PRV-1
- Pressure transducers were installed in the total-flow pools upstream of the Magnesia and Harvey weirs to correlate to the streams' rating curves, in order to provide direct measurement of available creek supply. These installations were connected to the municipality's Flowworks logging tool in late 2024.
- A and B services on all 72 fire hydrants using a contractor.

2024 OPERATING CHANGES

- Tank fill bands were widened to reduce lamp cycles to four per day to comply with UV reactor warrantees.
- Tank top fill height was lowered to store less water to reduce water age while maintaining required fire reserve and providing chlorine CT.
- Chlorine injection was reduced as discussed above.
- The Harvey Plant flowmeter was removed and inspected in an attempt to explain inconsistencies in flowrates calculated from tank height changes. The hydraulic cross section of the meter was unaffected by any sort of deposit, and the conductivity electrodes were clean (the meter's conductivity threshold is 20 micro siemens per centimeter (µS/cm), below which the signal to noise ratio is low. Lions Bay water was found from additional tests run as part of the 2024 metals analyses to have very low conductivities from 13 to 31 µS/cm). The next meters installed in Lions Bay will be ultrasonic, not conductance based. In the end, in this case it was found that the meter's low-flow cutoff had been set too high at plant commissioning ten years ago, and it was missing lower flows; with reconfiguration we believe it is now reporting satisfactorily enough.
- The Harvey Tank was ROV-inspected to explain high chlorine consumption in the tank (see above)
- A programmatic process control change named ENSuRe (Excessive Ntu ShUtdown RoutinE) locks out the plant if the UV reactor has not already shut down due to insufficient UV dosage when the plant NTU meter determines source water exceeds parameters, and throws necessary alarms to bring operators to site to:
    - Reconfigure the network to bring the Village's entire supply onto the unaffected plant (unless the excess NTU period is likely to be short)
    - Watch the affected intake for clearing, and flush the line when it does
    - Bring the affected plant back online.

LOOKING AHEAD

- To address highly restricted fireflow due to rust nodules in a cast iron watermain, commence CUBB.3, a subset of the Centre-Upper Bayview-Bayview (CUBB) watermain replacement project, funded in the 2025 municipal budget at $1,300,000. An update to the 2016 hydraulic/flow model is underway.

  CUBB.3 includes the 1970s era 6-inch cast iron line in lower Bayview Road from the south side of the Alberta Creek bridge to the intersection of Centre, down Centre past the Firehall and municipal campus, to the other side of the Crosscreek intersection. CUBB.1 is the 8-inch asbestos-cement line from the Upper Bayview cul-de-sac to approx. 455 Upper Bayview. CUBB.2 is the 6-inch cast iron line from the Bayview Place cul-de-sac to the intersection with

Upper Bayview, to Centre (the section from 455 Upper Bayview to Bayview Place was replaced in the early 2000s after a break). Preliminary design indicates that the entire CUBB project might be achievable with not much more budget if we forgo drainage and cambering changes. With approx. $200,000 additional budget, our most needful PRV Station at the intersection of Upper Bayview and Bayview Place can be replaced if done at the same time, so a 2026 budget proposal is being prepared, awaiting a Class C design from the engineers.

- Investigate ability of plant turbidity meters to report true NTU ranges.
- Ensure all future flowmeters are ultrasonic rather than magnetic, to address Lions Bay's low conductivity water.
- Reinforce operating standard of 0.20 mg/L average chlorine residual and 0.25 mg/L max. throughout the distribution network, by installing high capacity automated blowoffs to flush low-use watermains to reflect the actual water being delivered to users.
- Obtain the VCH Construction Permit to allow changing the Harvey UV dose to the manufacturer's recommended 36.46 mJ/cm^2 (40 mJ nominal)
- Continue MAGIIC (Magnesia Intake Instrumentation & Cutout) of ENSURE (Excessive NTU Shutdown Routine):
    - 600 V power and fibreoptic data 990 meters (in previously abandoned conduit) to the intake, operational May 2025.
    - Change operating procedures to utilize continuous UVT (Aug. 2025) to throttle or shut off out-of-spec water until better is available.
    - Change the piloting of both plants' fillstation PRVs to control flowrate as opposed to taking max. supply until tank height setpoint is reached.
    - Fund continuous turbidity meter at the intake to shut down the plant before even the supply line fills.
    - In Phase 3, a powered control valve will be installed in the 10" feed line between the weir and the screening building to not only shut off supply when water is out of spec, but also to divert the constant bypass flow through the screens to reduce binding with vegetation.
    - After gaining experience with MAGIIC, the same functionality will be considered at the Harvey Intake, using direct bury power and data cable in the access road, the so-called HAWAII (Harvey Weir And Intake Instrumentation) Project.
- The Weir Height and Inclination Realign (WHIRL) project at Magnesia will reconfigure the weir to self-flush rocks stuck behind the weir.
- Given undesirable turbidity results in 2024, commence consideration of filtration at one primary plant, presumably Harvey due to its larger creek, and the Magnesia plant on standby for high demand-low supply periods, with turbidity low due to low creekflow.
- Add continuous chlorine/turbidity stations at watermain network ends Lions Bay Ave. and Brunswick Beach.
- Overdue replacement of 8 UV reactor shutoff valves at both plants (completed June 2025)
- New Water Bylaw.
- Commence planning for some form of active pH control.

APPENDIX 1: HEALTH CANADA *GUIDELINES FOR DRINKING WATER QUALITY* (CHEMICAL)

In general, high priority guidelines are those dealing with microbiological contaminants. Any measure taken to reduce chemical contaminants should not compromise the effectiveness of disinfection. Guidelines for chemical parameters are:

1. Health based and listed as maximum acceptable concentrations (MAC);
2. Based on aesthetic considerations and listed as aesthetic objectives (AO);
3. Established based on operational considerations and listed as operational guidance values (OG);
4. Established, taking into account available treatment technology and analytical methods, in order to reduce exposure through drinking water, and listed as an objective.

PARAMETER	TYPE*	MAC (mg/L)	OTHER VALUE (mg/L)	COMMON SOURCES IN WATER	HEALTH CONSIDERATIONS	APPLYING THE GUIDELINE, COMMENTS
1,2-Dichloroethane	O	0.005	None	Releases or spills from industrial effluents; leachate from wase disposal	Health basis of MAC: Cancer of the mammary gland	The MAC protects against both cancer and non-cancer effects and takes into consideration all exposures from drinking water, which include ingestion as well as inhalation and dermal absorption during showering and bathing.
1,4-Dichlorobenzene	O	0.005	AO: LT 0.001	Releases or spills from industrial effluents; use of urinal deodorants	Health basis of MAC: Benign liver tumours and adrenal gland tumours (classified as probable carcinogen)	AO based on odour; levels above the AO would render drinking water unpalatable.
1,4-Dioxane	O	0.050		Generally not detected in Canadian water supplies, but there have been contaminations of drinking water supplies near landfills and industrial sites	Basis of MAC: liver effects that occur before the development of cancer	1,4 Dioxane is difficult to remove using conventional drinking water treatment. Treatment technologies such as advanced oxidation processes and synthetic adsorbents need to be considered. Reverse osmosis membranes may be capable of removing 1,4-dioxane at both the municipal and residential scale.
2,4,6-Trichlorophenol	O	0.005	AO: LT 0.002	By-product of drinking water disinfection with chlorine; industrial effluents and spills	Health basis of MAC: Liver cancer	AO based on odour; levels above the AO would render drinking water unpalatable.
2,4-Dichlorophenoxy acetic acid	P	0.1	None	Leaching and/or runoff from agricultural and non-cropland use	Health basis of MAC: Kidney effects	High potential to leach into groundwater
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	P	0.35	None	Leaching and/or runoff from agricultural and other uses	Health basis of MAC: Kidney effects Other: Systemic, liver, testicular, reproductive/developmental and nervous system effects	Can potentially leach into groundwater.
Aluminum	T	2.9	OG: 0.1	Naturally occurring; aluminum salts used as coagulants in drinking water treatment; leaching from cement-based materials; dissolution of activated alumina media;	Health basis of MAC: Neuromuscular effects, urinary tract effects and general toxicity.	The MAC and OG apply to all drinking water supplies and are to be applied as locational running annual averages. The OG value is established to minimize the potential for the accumulation and release of metals in the distribution system and to avoid other operational and aesthetic issues. It takes treatment achievability into consideration.
Ammonia	I	None required	None	Naturally occurring; released from agricultural or industrial wases; added as part of chloramination for drinking water disinfection	Levels of ammonia, either naturally present in the source water or added as part of a disinfection strategy, can affect water quality in the distribution system and should be monitored. A guideline value is not necessary as it is produced in the body and efficiently metabolized in healthy people; no adverse effects at levels found in drinking water.	To help prevent nitrification, limit excess free ammonia entering the distribution system to below 0.1 mg/L, and preferably below 0.05 mg/L, measured as nitrogen. Nitrification can lead to the formation of nitrite/nitrate, decreased chloramine residual and increased bacterial count.
Antimony	I	0.006	None	Naturally occurring; soil runoff; industrial effluents; leaching from plumbing materials and solder	Health basis of MAC: Changes in liver histology along with the changes in serum biochemistry	MAC takes into consideration anticipated treatment challenges for private wells and small systems
Arsenic	I	0.010 ALARA	None	Naturally occurring; releases from mining; industrial effluent	Health basis of MAC: Cancer Other: Skin, vascular and neurological effects	MAC based on treatment achievability; elevated levels associated with certain groundwaters; levels should be kept as low as reasonably achievable.
Asbestos	I	None required	None	Naturally occurring; decay of asbestos-cement pipes	None	Guideline value not necessary; no evidence of adverse health effects from exposure through drinking water.
Atrazine	P	0.005	None	Leaching and/or runoff from agricultural use	Health basis of MAC: Developmental effects. Other: Potential increased risk of ovarian cancer or lymphomas	MAC applies to sum of atrazine and its N-dealkylated metabolites - diethylatrazine, deisopropylatrazine, hydroxyatrazine, diaminochlorotriazine; Persistent in source waters.
Barium	I	2.0	None	Naturally occurring; releases or spills from industrial uses	Health basis of MAC: Kidney effects	MAC is for total barium and takes into consideration exposure estimates from all sources.
Benzene	O	0.005	None	Releases or spills from industrial uses	Health basis of MAC: Bone marrow changes and cancer Other: Blood system and immunological responses	MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing.
Benzo[a]pyrene	O	0.00004	None	Leaching from liners in water distribution systems	Health basis of MAC: Stomach tumours	None

PARAMETER	TYPE*	MAC (mg/L)	OTHER VALUE (mg/L)	COMMON SOURCES IN WATER	HEALTH CONSIDERATIONS	APPLYING THE GUIDELINE, COMMENTS
Boron	I	5	None	Naturally occurring; leaching or runoff from industrial and agricultural use	Health basis of MAC: Reproductive effects in males Other: Developmental effects	MAC based on treatment achievability.
Bromate	DBP	0.01	None	Contaminant in hypochlorite solution; by-product of drinking water disinfection with ozone	Health basis of MAC: Reproductive effects in males Other: Developmental effects	Efforts to reduce bromate concentrations must not compromise the effectiveness of disinfection. Bromate is difficult to remove from drinking water once formed. The recommended strategy is controlling the ozonation process; use of certified treatment chemicals and; appropriate handling and storage of hypochlorite. Quarterly monitoring of raw water bromide is recommended to allow correlation to bromate or brominated DBPs.
Bromoxynil	P	0.03	None	Leaching or runoff from agricultural use	Health basis of MAC: Increased clinical signs and liver weight, as well as both decreases in body weight and body weight gain	None
Cadmium	I	0.007	None	Leaching from galvanized pipes and solders; industrial and municipal wase	Health basis of MAC: Kidney damage Other: Bone effects	MAC is for total cadmium and takes into consideration exposure estimates from all sources. Sampling should be done at the tap to reflect average exposure similar to sampling done for lead. The contribution of cadmium in drinking water is generally from the galvanized steel used in pipes and well components. The best approach to minimize exposure to cadmium from drinking water is to replace galvanized steel and components. Drinking water treatment devices are also an effective option.
Calcium	I	None required	None	Naturally occurring	No evidence of adverse health effects from calcium in drinking water.	Guideline value not necessary. Calcium contributes to hardness.
Carbon tetrachloride	O	0.002	None	Industrial effluents and leaching from hazardous wase sites	Health basis of MAC: Liver toxicity Other: Kidney damage; liver tumours	MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing.
Chloramines	D	None required	None	Monochloramine is used as a secondary disinfectant; formed in drinking water when chlorine is added in the presence of ammonia	Guideline value not necessary due to low toxicity at concentrations found in drinking water	Chloramine residuals in most Canadian drinking water distribution systems are typically below 4 mg/L
Chlorate	DBP	1	None	By-product of drinking water disinfection with chlorine dioxide; possible contaminant in hypochlorite solution	Health basis of MAC: Thyroid gland effects	As chlorate is difficult to remove once formed, its formation should be controlled by respecting the maximum feed dose of 1.2 mg/L of chlorine dioxide and managing /monitoring formation in hypochlorite solutions.
Chlorine	D	None required	None	Used as drinking water disinfectant	A guideline value is not necessary due to low toxicity at concentrations found in drinking water	Free chlorine concentrations in most Canadian drinking water distribution systems range from 0.04 to 2.0 mg/L.
Chlorine dioxide	D	None required	None	Used as drinking water disinfectant	A guideline value for chlorine dioxide is not required because of its rapid reduction to chlorite in drinking water	A maximum feed dose of 1.2 mg/L of chlorine dioxide should not be exceeded to control the formation of chlorite and chlorate.
Chlorite	DBP	1	None	By-product of drinking water disinfection with chlorine dioxide	Health basis of MAC: Neurobehavioral effects, decreased absolute brain weight, altered liver weights	Chlorite formation should be controlled by respecting the maximum feed dose of 1.2 mg/L of chlorine dioxide and managing /monitoring formation in hypochlorite solutions.
Chlorpyrifos	P	0.09	None	Leaching and/or runoff from agricultural or other uses	Health basis of MAC: Nervous system effects	Not expected to leach significantly into groundwater.
Chromium	I	0.05	None	Naturally occurring; releases or spills from industrial uses	Health basis of MAC: Hyperplasia of the small intestine from chromium. Other: No definitive evidence of toxicity to Chromium(III).	MAC protects against both cancer and non-cancer effects from Chromium and is established for total chromium.
Colour	T	None	AO: LT 15 TCU	Naturally occurring organic substances, metals; industrial wases	A guideline value is not necessary as health effects are not of concern at levels found in drinking water.	May interfere with disinfection; removal is important to ensure effective treatment.
Copper	I	2	AO: 1	Naturally occurring; leaching from copper piping	Health basis of MAC: Gastrointestinal effects, liver and kidney effects.	Water samples should be taken at the tap. MAC is for total copper and protects against both short-term and long-term exposures. AO is based on tase and water discolouration.
Cyanide	I	0.2	None	Industrial and mining effluents; release from organic compounds	Health basis of MAC: No clinical or other changes at the highs dose tested	At the levels seen in Canadian waters, cyanide is not a concern as it can be detoxified to a certain extent in the human body.
Cyanobacterial toxins	O	0.0015	None	Naturally occurring - released from populations of cyanobacteria	Health basis of MAC: Liver effects	MAC is for total microcysins Note that infants can ingest a significantly larger volume of water per body weight. As a precautionary measure, where levels of total microcysins in treated water are detected above a reference value of 0.4 µg/L, the public in the affected area should use an alternate suitable source of drinking water to reconstitute infant formula.
Dicamba	P	0.11	None	Leaching or runoff from agricultural or other uses	Health basis of MAC: Clinical chemistry and inflammation of the prostate	Readily leaches into groundwater.
Dichloromethane	O	0.05	None	Industrial and municipal wastewater discharges	Health basis of MAC: Liver effects. Other: Classified as probable carcinogen	The MAC protects against both cancer and non-cancer effects and takes into consideration all exposures from drinking water, which include ingestion as well as inhalation and dermal absorption during showering and bathing.
Dimethoate and omethoate	P	0.02	None	Leaching and/or runoff from agricultural and non-agricultural use	Health basis of MAC: Nervous system effects	MAC is for dimethoate. An additive approach should be taken in which the sum of the detected concentrations of dimethoate and omethoate does not exceed the MAC for dimethoate.

PARAMETER	TYPE*	MAC (mg/L)	OTHER VALUE (mg/L)	COMMON SOURCES IN WATER	HEALTH CONSIDERATIONS	APPLYING THE GUIDELINE, COMMENTS
Diquat	P	0.05	None	Leaching and/or runoff from agricultural use; added directly to water to control aquatic weeds	Health basis of MAC: Cataract formation	Unlikely to leach into groundwater.
Ethylbenzene	O	0.14	AO: 0.0016	Emissions, effluents or spills from petroleum and chemical industries	Health basis of MAC: Effects on the liver and pituitary gland. Other: Tumour formation at various sites in animals, including kidney, lung, liver and testes.	MAC protects against both cancer and non-cancer health effects. MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing. AO is based on odour.
Fluoride	I	1.5	None	Naturally occurring; may be added to promote dental health	Health basis of MAC: Moderate dental fluorosis	Beneficial in preventing dental caries.
Formaldehyde	DBP	None required	None	By-product of disinfection with ozone; releases from industrial effluents	A guideline value is not necessary as health effects are not of concern at levels found in drinking water.	A guideline value is not necessary, as levels in drinking water are below the level at which adverse health effects may occur.
Glyphosate	P	0.28	None	Leaching and/or runoff from various uses in weed control	Health basis of MAC: Reduced body weight gain	Not expected to migrate to groundwater.
Haloacetic acids, total	DBP	0.08 ALARA	None	By-product of drinking water disinfection with chlorine	Health basis of MAC: Liver cancer; DCA is classified as probably carcinogenic to humans Other: Other organ cancers; liver and other organ effects	Refers to the total of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid and dibromoacetic acid; MAC is based on ability to achieve HAA levels in distribution systems without compromising disinfection; precursor removal limits formation.
Hardness	T	None required	None	Naturally occurring; levels generally higher in groundwater	Although hardness may have significant aesthetic effects, a guideline has not been established. Major contributors to hardness are not of health concern at levels found in drinking water. Public acceptance of hardness may vary considerably according to the local conditions.	Hardness levels are primarily based on calcium and magnesium in water. Water with a hardness greater than 200 mg/L is considered poor and in excess of 500 mg/L is generally unacceptable for domestic use. Where a water softener is used, a separate unsoftened supply for cooking and drinking purposes is recommended.
Hydrogen sulphide	I	None	AO: LT 0.05	Can occur in the distribution system from the reduction of sulphates by sulphate-reducing bacteria; a breakdown of organic matter in the absence of oxygen.	Not applicable	-
Iron	I	None	AO: LT 0.1	Naturally occurring; Released from iron-based drinking water materials or as iron corrosion by- products and in water treatment processes. Human activities such as mine drainage water. acid mine effluents and agricultural runoff.	A guideline value is not necessary as health effects are not of concern at levels found in drinking water and at the level at which the AO is set.	AO is for total iron and is based on minimizing the occurrence of discoloured water and to improve consumer confidence in drinking water quality. Removal of iron also improves the removal of manganese, reducing the health risk associated with this metal.
Lead	I	0.005 ALARA	None	Leaching from plumbing	Health basis of MAC: Reduced intelligence in children measured as decreases in IQ is the most sensitive and well-established health effect of lead exposure. There is no known safe exposure level to lead. Other: Possible effects include behavioural effects in children. Reduced cognition, increased blood pressure, and renal dysfunction in adults are also possible; classified as probably carcinogenic to humans	MAC is for total lead. Lead levels should be kept as low as reasonably achievable. Sampling should be done at the tap to reflect average exposure. The most significant contribution of lead in drinking water is generally from the lead service line that supplies drinking water to the home. The best approach to minimize exposure to lead from drinking water is to remove the full lead service line. Drinking water treatment devices are also an effective option.
Magnesium	I	None required	None	Naturally occurring	No evidence of adverse health effects from magnesium in drinking water, therefore a guideline value is not necessary.	Guideline value not necessary. Magnesium contributes to hardness.
Malathion	P	0.29	None	Leaching and/or runoff from agricultural and other uses	Health basis of MAC: Kidney effects Other: Nervous system effects	Unlikely to leach into groundwater. When using oxidation or advanced oxidation processes for malathion removal, water utilities should be aware of the potential for the formation of degradation by products.
Manganese	I	0.12	AO: LT 0.02	Dissolution of naturally occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills	Health Basis of MAC: Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. Other: Formula-fed infants may be especially at risk	AO based on minimizing the occurrence of discoloured water, consumer complaints and saining of laundry.
Mercury	I	0.001	None	Releases or spills from industrial effluents; wase disposal; irrigation or drainage of areas where agricultural pesticides are used	Health basis of MAC: Irreversible neurological symptoms	Applies to all forms of mercury; mercury generally not found in drinking water, as it binds to sediments and soil.
Methyl tertiary-butyl ether	O	None	AO: LT 0.015	Spills from gasoline refineries, fling stations and gasoline- powered boats; seepage into groundwater from leaking storage tanks	The AO is lower than levels associated with potential toxicological effects, it is considered protective of human health. Studies on toxic effects remain inconclusive.	AO based on odour; levels above the AO would render water unpalatable.
Metribuzin	P	0.08	None	Leaching and/or runoff from agricultural use	Health basis of MAC: Liver effects	Leaching into groundwater depends on topography, precipitation and site-specific soil characteristics, such as organic matter content and soil pH.

PARAMETER	TYPE*	MAC (mg/L)	OTHER VALUE (mg/L)	COMMON SOURCES IN WATER	HEALTH CONSIDERATIONS	APPLYING THE GUIDELINE, COMMENTS
Nitrate	I	45 as nitrate; 10 as nitrate-nitrogen	None	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or nitrification in the distribution system	Health basis of MAC: Methaemoglobinaemia and effects on thyroid gland function in bottle-fed infants Other: Classified as possible carcinogen under conditions that result in endogenous nitrosation	Systems using chloramine disinfection or that have naturally occurring ammonia should monitor the level of nitrate in the distribution system. Homeowners with a well should test concentration of nitrate in their water supply.
Nitrilotriacetic acid (NTA)	I	0.4	None	Sewage contamination	Health basis of MAC: Kidney effects Other: Classified as possible carcinogen	MAC is based upon exposure mainly attributable to drinking water with 20% of exposure attributable to food.
Nitrite	I	3 as nitrite; 1 as nitrite-nitrogen	None	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or nitrification in the distribution system	Health basis of MAC: methemoglobinemia in bottle-fed infants less than 6 months of age. Other: classified as possible carcinogen under conditions that result in endogenous nitrosation	Systems using chloramine disinfection or that have naturally occurring ammonia should monitor the level of nitrite in the distribution system. Homeowners with a well should test concentration of nitrite in their water supply.
N-nitroso dimethylamine	DBP	0.00004	None	By-product of drinking water disinfection with chlorine or chloramines; industrial and sewage treatment plant effluents	Health basis of MAC: Liver cancer	MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing. Levels should be kept low by preventing formation during treatment.
Odour	A	None	Inoffensive	Biological or industrial sources	Not applicable	Important to provide drinking water with no offensive odour, as consumers may seek alternative sources that are less safe.
Pentachlorophenol	O	0.06	AO: LT 0.03	By-product of drinking water disinfection with chlorine; industrial effluents	Health basis of MAC: Reduced body weight, changes in clinical parameters, histological changes in kidney and liver, reproductive effects	AO based on odour; levels above the AO would render drinking water unpalatable.
Per- and poly-fluoroalkyl substances (PFAS)	O	None	Objective: 0.00003 ALARA	Synthetic chemicals used in consumer products and fire-fighting foams for their water and oil repellant properties.	Certain PFAS may have effects on the liver, immune system, kidney, reproduction, development, endocrine system (thyroid), the nervous system, and metabolism (lipids, glucose homeostasis, body weight). The lower the levels of exposure to PFAS, the lower the risk to public health.	The objective is based on analytical and treatment achievability and applies to the sum of 25 specified PFAS. If measurements of PFAS in drinking water are approaching or exceed the 30 ng/L objective, it may be useful to examine the types of PFAS that are present in the greatest concentrations.
pH	T	None	7.0-10.5	Not applicable	Not applicable	The control of pH is important to maximize treatment effectiveness, control corrosion and reduce leaching from distribution system and plumbing components.
Selenium	I	0.05	None	Naturally occurring and release from coal ash from coal- fired power plants and mining, refining of copper and other metals.	Health basis of MAC: chronic selenosis symptoms in humans following exposure to high levels Other: Hair loss, tooth decay, weakened nails and nervous system disturbances at extremely high levels of exposure	Selenium is an essential nutrient. Mos exposure is from food; little information on toxicity of selenium from drinking water. Selenium can be found in non-leaded brass alloy where it is added to replace lead.
Silver	I	None required	None	Naturally occurring	Not applicable	Guideline value not required as drinking water contributes negligibly to an individual's daily intake.
Sodium	I	None	AO: LT 200	Naturally occurring; sewage and industrial effluents; sodium-based water softeners	For persons on strict sodium reduced diets applying to all sources, levels in drinking water should be below 20 mg/L	Based on tase; where a sodium-based water softener is used, a separate unsoftened supply for cooking and drinking purposes is recommended.
Strontium	I	7.0		Naturally occurring; effluents from mining or other industries	Health basis of MAC: Bone effects	MAC is protective of the most sensitive sub-population, infants.
Sulphate	I	None	AO: LT 500	Naturally occurring: Industrial wases	High levels can cause physiological effects such as diarrhoea or dehydration	Based on tase and operational considerations related to corrosion.
Taste	A	None	Inoffensive	Biological or industrial sources	Not applicable	Important to provide drinking water with no offensive tase, as consumers may seek alternative sources that are less safe.
Tetrachloroethylene	O	0.01	None	Spill or other point source of contamination	Health basis of MAC: Neurological effects in humans. Other: Classified as probably carcinogenic to humans, based on sufficient evidence in experimental animals and limited evidence in humans	Primarily a concern in groundwater, as it volatilizes easily from surface water; MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing.
Toluene	O	0.06	AO: 0.024	Emissions, effluents or spills from petroleum and chemical industries	Health basis of MAC: Adverse neurological effects, including vibration thresholds, colour discrimination, auditory thresholds, attention, memory and psychomotor functions Other: Insufficient information to determine whether toluene is carcinogenic to humans.	MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing. AO is based on odour.
Trichloroethylene	O	0.005	None	Industrial effluents and spills from improper disposal	Health basis of MAC: Developmental effects Other: Classified as probable carcinogen	MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing.
Trihalomethanes (THM)	DBP	0.1	None	By-product of drinking water disinfection with chlorine; industrial effluents	Health basis of MAC: Liver effects Other: Kidney and colorectal cancers	Refers to the total of chlorodibromomethane, chloroform, bromodichloromethane and bromoform; MAC based on health effects of chloroform. MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing. Utilities should make every effort to maintain concentrations as low as reasonably achievable without compromising the effectiveness of disinfection.

PARAMETER	TYPE*	MAC (mg/L)	OTHER VALUE (mg/L)	COMMON SOURCES IN WATER	HEALTH CONSIDERATIONS	APPLYING THE GUIDELINE, COMMENTS
						Recommended strategy is precursor removal. The separate MAC for BDCM was rescinded in April 2009.
Uranium	I	0.02	None	Naturally occurring; mill tailings; emissions from nuclear industry and combustion of coal and other fuels; phosphate fertilizers	Health basis of MAC: Kidney effects	Based on challenges and operational cos impacts for some private wells and small systems; MAC is for total uranium and is protective in relation to both chemical and radiological hazards.
Vinyl chloride	O	0.002 ALARA	None	Industrial effluents; degradation product from organic solvents in groundwater; leaching from polyvinyl chloride pipes	Health basis of MAC: Liver cancer Other: Raynaud's disease, effects on bone, circulatory system, thyroid, spleen, central nervous system	Based on analytical achievability. MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing. Leaching from polyvinyl chloride pipe is not expected to be significant.
Xylenes	O	0.09	AO: 0.02	Emissions, effluents or spills from petroleum and chemical industries	Health basis of MAC: Adverse neuromuscular effects Other: Insufficient information to determine whether xylenes are carcinogenic to humans.	MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing. AO is based on odour.
Zinc	I		AO: LT 5.0	Naturally occurring; industrial and domestic emissions; leaching may occur from galvanized pipes, hot water tanks and brass fittings	Zinc is an essential element and is generally considered to be non-toxic, however levels above the AO in water would render it unpalatable.	AO based on tase; water with zinc levels above the AO tends to be opalescent and develops a greasy film when boiled; plumbing should be thoroughly flushed before water is consumed.

*Type:
A, Acceptability
D, Disinfectant
DBP, Disinfection byproduct
P, Pesticide
I, inorganic chemical
O, organic chemical
T, treatment related parameter.

APPENDIX 2: DISINFECTION BYPRODUCTS ANALYSES

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Kelvin Grove	Lions Bay Avenue	Brunswick Beach	Community Centre	----
					Client sampling date / time	19-Mar-2024 05:35	19-Mar-2024 07:00	19-Mar-2024 08:45	19-Mar-2024 06:25	----
						VA24A5718-001	VA24A5718-002	VA24A5718-003	VA24A5718-004	--------
						Result	Result	Result	Result	----
Volatile Organic Compounds [THMs]										
Bromodichloromethane	75-27-4	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Bromoform	75-25-2	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Chloroform	67-66-3	E611B/VA	1.0	µg/L		57.5	57.4	52.1	49.6	----
Dibromochloromethane	124-48-1	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Trihalomethanes [THMs], total	----	E611B/VA	2.0	µg/L		57.5	57.4	52.1	49.6	----
Volatile Organic Compounds [THMs] Surrogates										
Bromofluorobenzene, 4-	460-00-4	E611B/VA	1.0	%		87.5	89.2	85.2	90.8	----
Difluorobenzene, 1,4-	540-36-3	E611B/VA	1.0	%		98.8	99.2	99.9	95.2	----
Haloacetic Acids										
Bromochloroacetic acid	5589-96-8	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dibromoacetic acid	631-64-1	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L		24.7	25.0	23.7	21.0	----
Monobromoacetic acid	79-08-3	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L		1.12	<1.00	<1.00	1.02	----
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L		33.2	32.2	29.5	26.6	----
Haloacetic acids, total [HAA5]	n/a	E750/WT	5.00	µg/L		59.0	57.2	53.2	48.6	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Harvey Raw Water	Magnesia Raw Water	----	----	----
					Client sampling date / time	04-Jun-2024 08:10	04-Jun-2024 08:45	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24B2790-005	VA24B2790-006	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm		14.2	18.5	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Kelvin Grove	Lions Bay Ave.	Brunswick Beach	Community Centre	----
					Client sampling date / time	04-Jun-2024 05:55	04-Jun-2024 07:10	04-Jun-2024 09:45	04-Jun-2024 06:35	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24B2790-001	VA24B2790-002	VA24B2790-003	VA24B2790-004	--------
						Result	Result	Result	Result	----
Volatile Organic Compounds [THMs]										
Bromodichloromethane	75-27-4	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Bromoform	75-25-2	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Chloroform	67-66-3	E611B/VA	1.0	µg/L		47.2	36.8	41.6	41.4	----
Dibromochloromethane	124-48-1	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Trihalomethanes [THMs], total	----	E611B/VA	2.0	µg/L		47.2	36.8	41.6	41.4	----
Volatile Organic Compounds [THMs] Surrogates										
Bromofluorobenzene, 4-	460-00-4	E611B/VA	1.0	%		83.8	86.5	86.0	86.6	----
Difluorobenzene, 1,4-	540-36-3	E611B/VA	1.0	%		108	109	110	108	----
Haloacetic Acids										
Bromochloroacetic acid	5589-96-8	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Bromodichloroacetic acid	7113-14-7	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Chlorodibromoacetic acid	5278-95-5	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dalapon	75-99-0	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dibromoacetic acid	631-64-1	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L		15.9	22.7	25.0	23.4	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

					Client sample ID	Kelvin Grove	Lions Bay Ave.	Brunswick Beach	Community Centre	----
					Client sampling date / time	04-Jun-2024 05:55	04-Jun-2024 07:10	04-Jun-2024 09:45	04-Jun-2024 06:35	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24B2790-001	VA24B2790-002	VA24B2790-003	VA24B2790-004	--------
						Result	Result	Result	Result	----
Haloacetic Acids										
Iodoacetic acid	64-69-7	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Monobromoacetic acid	79-08-3	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Tribromoacetic acid	75-96-7	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L		34.0	32.9	32.5	30.8	----
Haloacetic acids, total [HAA5]	n/a	E750/WT	5.00	µg/L		49.9	55.6	57.5	54.2	----
Haloacetic acids, total [HAA7]	n/a	E750/WT	5.00	µg/L		49.9	55.6	57.5	54.2	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

					Client sample ID	Kelvin Grove	Lions Bay Ave.	Brunswick Beach	Community Centre	----
					Client sampling date / time	11-Sep-2024 05:55	11-Sep-2024 07:15	11-Sep-2024 08:10	11-Sep-2024 06:30	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24C3724-001	VA24C3724-002	VA24C3724-003	VA24C3724-004	--------
						Result	Result	Result	Result	----
Volatile Organic Compounds [THMs]										
Bromodichloromethane	75-27-4	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Bromoform	75-25-2	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Chloroform	67-66-3	E611B/VA	1.0	µg/L		31.8	30.8	22.1	24.5	----
Dibromochloromethane	124-48-1	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Trihalomethanes [THMs], total	----	E611B/VA	2.0	µg/L		31.8	30.8	22.1	24.5	----
Volatile Organic Compounds [THMs] Surrogates										
Bromofluorobenzene, 4-	460-00-4	E611B/VA	1.0	%		88.1	87.6	90.9	93.4	----
Difluorobenzene, 1,4-	540-36-3	E611B/VA	1.0	%		97.3	97.1	96.8	96.4	----
Haloacetic Acids										
Bromochloroacetic acid	5589-96-8	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Bromodichloroacetic acid	7113-14-7	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Chlorodibromoacetic acid	5278-95-5	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dalapon	75-99-0	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dibromoacetic acid	631-64-1	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L		8.83	8.78	10.0	10.8	----
Iodoacetic acid	64-69-7	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Monobromoacetic acid	79-08-3	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Tribromoacetic acid	75-96-7	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L		20.9	23.1	15.5	17.4	----
Haloacetic acids, total [HAA5]	n/a	E750/WT	5.00	µg/L		29.7	31.9	25.5	28.2	----
Haloacetic acids, total [HAA7]	n/a	E750/WT	5.00	µg/L		29.7	31.9	25.5	28.2	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Kelvin Grove	Lions Bay Ave.	Brunswick Beach	Community Centre	----
					Client sampling date / time	05-Dec-2024 05:30	05-Dec-2024 06:50	05-Dec-2024 08:50	05-Dec-2024 06:10	----
						VA24D2888-001	VA24D2888-002	VA24D2888-003	VA24D2888-004	----
						Result	Result	Result	Result	----
Volatile Organic Compounds [THMs]										
Bromodichloromethane	75-27-4	E611B/VA	1.0	µg/L		<1.0	<1.0	1.2	<1.0	----
Bromoform	75-25-2	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Chloroform	67-66-3	E611B/VA	1.0	µg/L		41.7	34.3	37.0	33.6	----
Dibromochloromethane	124-48-1	E611B/VA	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Trihalomethanes [THMs], total	----	E611B/VA	2.0	µg/L		41.7	34.3	38.2	33.6	----
Volatile Organic Compounds [THMs] Surrogates										
Bromofluorobenzene, 4-	460-00-4	E611B/VA	1.0	%		94.3	93.8	94.2	94.6	----
Difluorobenzene, 1,4-	540-36-3	E611B/VA	1.0	%		99.4	99.3	100	100	----
Haloacetic Acids										
Bromochloroacetic acid	5589-96-8	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dibromoacetic acid	631-64-1	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L		10.5	16.0	10.2	14.4	----
Monobromoacetic acid	79-08-3	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L		<1.00	<1.00	<1.00	<1.00	----
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L		27.7	23.6	18.2	21.6	----
Haloacetic acids, total [HAA5]	n/a	E750/WT	5.00	µg/L		38.2	39.6	28.4	36.0	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)				Client sample ID	Harvey Raw Water	Magnesia Raw Water	----	----	----
				Client sampling date / time	05-Dec-2024 09:55	05-Dec-2024 08:25	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA24D2888-005	VA24D2888-006	----	----	----
					Result	Result	----	----	----
Physical Tests									
Conductivity	----	E100/VA	2.0	µS/cm	13.3	30.9	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

APPENDIX 3: *SOURCE* WATER TURBIDITY & UVT

RAW WATER UVT (< 90% FLAGGED) AND TURBIDITY (> 1 NTU FLAGGED) HAND SAMPLES							
			HARVEY		MAGNESIA		ALBERTA
2024 workdays	Days since last sample	Rain, 2-station-average/mm	UVT/%	Turbidity /NTU	UVT/%	Turbidity /NTU	Turbidity /NTU
Tue 02 Jan		0.0	91.5	0.25			
Wed 03 Jan	1	11.5	88.7	0.27	94.2	0.56	
Thu 04 Jan	1	11.3	84.1	0.24	93.7	0.21	
Fri 05 Jan	1	8.4	88.3	0.18	94.0	0.22	
Mon 08 Jan	3	0.0	91.0	0.18	95.2	0.53	
Tue 09 Jan	1	29.9	85.5	0.19	94.2	0.33	
Wed 10 Jan	1	2.5	89.8	0.39	95.0	0.43	
Thu 11 Jan	1	0.0	90.0	0.57	94.6	0.29	
Fri 12 Jan	1	0.1	91.4	0.25	96.0	0.27	
Mon 15 Jan	3	0.0	93.4	0.29	96.0	0.53	
Tue 16 Jan	1	0.0	93.7	0.20	96.2	0.30	
Wed 17 Jan	1						
Thu 18 Jan	1	18.0	93.0	0.39	96.3	0.24	
Fri 19 Jan	1	10.8	93.1	0.46	96.1	0.26	
Mon 22 Jan	3	22.5	84.0	0.43	93.2	0.51	
Tue 23 Jan	1	16.0	85.7	0.23	90.0	0.28	
Wed 24 Jan	1	7.9	88.9	0.26	93.1	0.55	
Thu 25 Jan	1	17.1	83.3	0.26	90.4	0.43	
Fri 26 Jan	1	10.8	88.0	0.18	93.3	0.35	
Mon 29 Jan	3	10.6	86.8	0.59	89.6	1.28	
Tue 30 Jan	1	10.6	89.2	0.26	90.6	2.36	
Wed 31 Jan	1	21.5	84.6	0.39	87.8	2.15	
Thu 01 Feb	1	38.8	83.7	0.38			
Fri 02 Feb	1	18.1	84.3	0.33			
Sat 03 Feb	1	0.0					
Sun 04 Feb	1	0.0					
Mon 05 Feb	1	0.0	90.4	0.27	94.5	0.59	
Thu 08 Feb	3	0.0	93.1	0.16	95.9	0.30	
Fri 09 Feb	1	0.0	92.6	0.27	95.4	0.33	
Mon 12 Feb	3	22.1	85.6	0.20	93.6	0.31	
Tue 13 Feb	1	0.1	89.2	0.25	94.8	0.30	
Wed 14 Feb	1	0.0	91.3	0.48	95.2	0.62	
Thu 15 Feb	1	0.0	92.4	0.14	96.5	0.25	
Fri 16 Feb	1	0.0	91.2	0.30	95.9	0.40	
Tue 20 Feb	4	1.8	93.4	0.35	96.0	0.45	
Wed 21 Feb	1	5.8	93.4	0.16	96.7	0.37	
Thu 22 Feb	1	7.8	87.9	0.36	96.3	0.51	
Fri 23 Feb	1	1.8	90.2	0.21	96.6	0.33	
Mon 26 Feb	3	6.8	90.9	0.19	96.4	0.22	
Tue 27 Feb	1	0.0	92.2	0.30	96.4	0.59	
Wed 28 Feb	1	18.8	92.0	0.24	96.0	0.42	
Thu 29 Feb	1	19.6	88.2	0.40	94.6	0.32	
Fri 01 Mar	1	9.6	90.9	0.21	95.2	0.48	
Mon 04 Mar	3	18.6	93.1	0.31			
Tue 05 Mar	1	2.0	93.2	0.33			
Wed 06 Mar	1	0.3	93.8	0.15	97.1	0.33	
Thu 07 Mar	1	0.6	93.9	0.31	97.4	0.46	
Fri 08 Mar	1	7.5	94.3	0.24	97.9	0.27	
Mon 11 Mar	3	16.5	86.1	0.25	94.5	0.52	
Tue 12 Mar	1	17.0	84.0	0.26	91.0	2.53	
Wed 13 Mar	1	2.3	87.1	0.24	94.1	0.69	
Thu 14 Mar	1	1.0	89.0	0.16	94.6	0.40	

RAW WATER UVT (< 90% FLAGGED) AND TURBIDITY (> 1 NTU FLAGGED) HAND SAMPLES							
			HARVEY		MAGNESIA		ALBERTA
2024 workdays	Days since last sample	Rain, 2-station-average/mm	UVT/%	Turbidity /NTU	UVT/%	Turbidity /NTU	Turbidity /NTU
Fri 15 Mar	1	0.0	98.3	0.20	95.5	0.34	
Mon 18 Mar	3	0.0	89.2	0.19	93.4	0.31	
Tue 19 Mar	1	0.0	89.9	0.16	93.6	0.46	
Wed 20 Mar	1	0.0	89.5	0.22	93.6	0.30	
Thu 21 Mar	1	0.0	91.0	0.19	94.8	0.56	
Fri 22 Mar	1	0.0	91.3	0.22	95.1	0.39	
Mon 25 Mar	3	0.8	91.1	0.31	95.1	0.49	
Tue 26 Mar	1	3.1	91.4	0.24	95.2	0.41	
Wed 27 Mar	1	2.0	91.4	0.25	95.7	0.21	
Thu 28 Mar	1	18.3	83.8	0.28	93.2	0.44	
Fri 29 Mar	1	14.6	82.5	0.25	86.2	0.39	
Tue 02 Apr	4	0.0	90.6	0.37	95.5	0.33	
Wed 03 Apr	1	5.5	90.5	0.55	95.0	0.30	
Thu 04 Apr	1	0.0	93.0	0.27	93.0	0.31	
Fri 05 Apr	1	0.0	93.4	0.16	95.9	0.31	
Mon 08 Apr	3	0.3	93.3	0.25	96.4	0.26	
Tue 09 Apr	1	10.3	89.7	0.30	96.1	0.57	
Wed 10 Apr	1	0.0	92.1	0.21	97.0	0.40	
Thu 11 Apr	1	0.0	93.4	0.24	97.1	0.38	
Fri 12 Apr	1	5.1	90.1	0.18	95.6	0.24	
Mon 15 Apr	3	0.0	92.2	0.26	96.6	0.24	
Tue 16 Apr	1	0.6	92.3	0.69	95.2	0.71	
Wed 17 Apr	1	0.0	92.7	1.07	96.5	0.33	
Thu 18 Apr	1	0.0	93.1	0.71	96.2	0.25	
Fri 19 Apr	1	0.0	92.5	0.17	96.5	0.29	
Mon 22 Apr	3	0.0	92.8	0.25	96.6	0.32	
Tue 23 Apr	1	0.0	92.5	0.21	96.6	0.30	
Wed 24 Apr	1	0.0	92.0	0.21	96.7	0.39	
Thu 25 Apr	1	2.9	91.8	0.27	96.1	0.22	
Fri 26 Apr	1	11.4	89.5	0.28	95.1	0.25	
Mon 29 Apr	3	2.0	92.2	0.23	95.5	0.23	
Tue 30 Apr	1	0.5	90.9	0.17	93.7	0.16	
Wed 01 May	1	0.1	93.1	0.25	96.6	0.37	
Thu 02 May	1	0.0	93.8	0.18	97.0	0.27	
Fri 03 May	1	0.0	92.9	0.14	96.9	0.21	
Mon 06 May	3	0.0	89.8	0.22	92.7	0.25	
Tue 07 May	1	0.0	92.1	0.22	95.0	0.34	
Wed 08 May	1	0.0	92.6	0.15	95.4	0.25	
Thu 09 May	1	0.0	90.3	0.20	94.1	0.25	
Fri 10 May	1	0.0	90.2	0.23	93.0	0.34	
Mon 13 May	3	0.0	90.0	0.21	92.0	0.43	
Tue 14 May	1	0.0	91.9	0.28	94.2	0.37	
Wed 15 May	1	0.0	92.0	0.26	94.4	0.35	
Thu 16 May	1	0.0	90.8	0.22	92.8	0.41	
Fri 17 May	1	0.0	92.6	0.23	94.2	0.40	
Tue 21 May	4	2.9	91.7	0.28	94.8	0.29	
Wed 22 May	1	28.8	88.6	0.28	91.8	0.60	
Thu 23 May	1	0.0	92.3	0.29	94.1	0.71	
Fri 24 May	1	0.6	92.1	0.21	93.3	0.34	
Mon 27 May	3	10.1	90.5	0.26	94.3	0.49	
Tue 28 May	1	1.8	91.2	0.23	93.7	0.39	
Wed 29 May	1	17.6	92.3	0.28	94.0	0.46	
Thu 30 May	1	14.9	91.4	0.22	94.3	0.28	
Fri 31 May	1	1.1	93.4	0.26	95.9	0.28	

RAW WATER UVT (< 90% FLAGGED) AND TURBIDITY (> 1 NTU FLAGGED) HAND SAMPLES							
			HARVEY		MAGNESIA		ALBERTA
2024 workdays	Days since last sample	Rain, 2-station-average/mm	UVT/%	Turbidity /NTU	UVT/%	Turbidity /NTU	Turbidity /NTU
Mon 03 Jun	3	46.0	86.6	0.37	87.4	1.65	
Tue 04 Jun	1	12.1	87.8	0.24	82.7	3.01	
Wed 05 Jun	1	4.3	91.8	0.22	86.1	2.55	
Thu 06 Jun	1	0.0	91.5	0.21	93.7	0.44	
Fri 07 Jun	1	0.0	92.6	0.55	94.3	0.50	
Mon 10 Jun	3	0.0	93.3	0.25	93.2	0.30	
Tue 11 Jun	1	2.5	93.5	0.30	93.9	0.26	
Wed 12 Jun	1	1.5	94.0	0.19	94.4	0.27	
Thu 13 Jun	1	0.0	93.9	0.47	94.0	0.26	
Fri 14 Jun	1	0.0	88.1	0.28	89.0	0.29	
Mon 17 Jun	3	2.4	94.3	0.28	94.8	0.23	
Tue 18 Jun	1	1.4	94.2	0.22	93.4	0.25	
Wed 19 Jun	1	0.0	93.5	0.16	94.1	0.28	
Thu 20 Jun	1	0.0	92.7	0.23	86.9	0.29	
Fri 21 Jun	1	0.0	92.5	0.24	94.5	0.29	
Mon 24 Jun	3	0.0	94.9	0.20	90.4	0.17	
Tue 25 Jun	1	0.0	94.3	0.21	95.6	0.22	
Wed 26 Jun	1	0.0	92.9	0.24	95.2	0.27	
Thu 27 Jun	1	11.8	92.2	0.35	93.8	0.32	
Fri 28 Jun	1	3.4	93.7	0.24	93.9	0.33	
Tue 02 Jul	4	0.0	94.9	0.29	95.4	0.28	
Wed 03 Jul	1	0.0	95.3	0.27	95.6	0.27	
Thu 04 Jul	1	0.0	94.0	0.26	95.3	0.40	
Fri 05 Jul	1	0.0	94.6	0.33	95.2	0.27	
Mon 08 Jul	3	0.0	94.7	0.20	95.0	0.18	
Tue 09 Jul	1	0.0	89.8	2.24	95.0	0.31	
Wed 10 Jul	1	0.0	93.4	0.22	94.6	0.36	
Thu 11 Jul	1	0.0	95.2	0.25	95.1	0.29	
Fri 12 Jul	1	0.0	95.6	0.25	96.2	0.44	
Mon 15 Jul	3	0.0	95.0	0.26	95.5	0.18	
Tue 16 Jul	1	0.0	95.0	0.20	95.7	0.20	
Wed 17 Jul	1	0.0	96.4	0.32	95.3	0.24	
Thu 18 Jul	1	0.0	94.5	0.44	95.9	0.25	
Fri 19 Jul	1	0.0	94.5	0.24	95.1	0.23	
Mon 22 Jul	3	0.0	95.1	0.63	96.6	0.38	
Tue 23 Jul	1	0.0	96.1	0.24	96.6	0.25	
Wed 24 Jul	1	0.0	94.1	0.28	95.4	0.18	
Thu 25 Jul	1	0.0	95.9	0.31	96.4	0.36	
Fri 26 Jul	1	0.0	96.2	0.22	96.9	0.79	
Mon 29 Jul	3	4.0	95.5	0.23	96.3	0.26	
Tue 30 Jul	1	12.4	94.3	0.31	96.9	0.25	
Wed 31 Jul	1	1.4	93.7	0.23	95.2	1.25	
Thu 01 Aug	1	2.3	94.9	0.40	96.4	0.55	
Fri 02 Aug	1	0.0	94.0	0.19	95.3	0.24	
Tue 06 Aug	4	0.0	83.6	0.19	85.7	0.13	
Wed 07 Aug	1	0.0	95.0	0.26	95.3	0.52	
Thu 08 Aug	1	0.0	94.7	0.29	95.4	0.28	
Fri 09 Aug	1	0.0	95.1	0.21	95.3	0.21	
Mon 12 Aug	3	1.3	94.9	0.28	96.1	0.31	
Tue 13 Aug	1	1.5	94.7	0.31	96.3	0.45	
Wed 14 Aug	1	0.0	94.6	0.28	95.7	0.19	
Thu 15 Aug	1	0.0	94.9	0.26	94.2	0.77	
Fri 16 Aug	1	0.0	95.0	0.16	95.2	0.24	
Mon 19 Aug	3	2.6	95.6	0.39	96.4	0.34	

RAW WATER UVT (< 90% FLAGGED) AND TURBIDITY (> 1 NTU FLAGGED) HAND SAMPLES							
			HARVEY		MAGNESIA		ALBERTA
2024 workdays	Days since last sample	Rain, 2-station-average/mm	UVT/%	Turbidity /NTU	UVT/%	Turbidity /NTU	Turbidity /NTU
Tue 20 Aug	1	3.4	94.7	0.57	96.5	0.62	
Wed 21 Aug	1	1.1	94.8	0.22	96.7	0.37	
Thu 22 Aug	1	8.9	88.3	0.61	94.0	0.86	
Fri 23 Aug	1	4.5	93.3	0.22	96.5	0.22	1.44
Mon 26 Aug	3	1.4	93.7	0.20	96.7	0.24	0.69
Tue 27 Aug	1	10.9	88.9	0.37	94.9	0.31	0.52
Wed 28 Aug	1	0.8	93.1	0.31	95.4	0.43	0.41
Thu 29 Aug	1	0.6	93.8	0.32	95.7	0.26	0.57
Fri 30 Aug	1	0.0	94.2	0.46	96.2	0.40	1.75
Tue 03 Sep	4	0.0	94.6	0.28	93.8	0.53	
Wed 04 Sep	1	0.3	95.0	0.32	96.4	0.50	1.95
Thu 05 Sep	1	0.3	95.2	0.23	96.5	0.21	0.48
Fri 06 Sep	1	0.0	95.7	0.22	96.5	0.22	0.63
Mon 09 Sep	3	0.0	95.8	0.17	96.8	0.26	0.44
Tue 10 Sep	1	0.1	95.8	0.18	96.2	0.26	0.42
Wed 11 Sep	1	1.8	95.5	0.18	96.4	0.30	0.53
Thu 12 Sep	1	0.1	94.6	0.22	96.3	0.27	0.57
Fri 13 Sep	1	0.0	94.6	0.41	96.4	0.48	0.46
Mon 16 Sep	3	0.0	93.8	0.29	95.8	0.25	0.57
Tue 17 Sep	1	0.0	94.8	0.23	96.3	0.27	0.36
Wed 18 Sep	1	0.0	94.9	0.46	96.5	0.43	0.79
Thu 19 Sep	1	0.0	95.2	0.47	96.9	0.31	0.45
Fri 20 Sep	1	0.0	96.0	0.47	97.3	0.41	0.45
Mon 23 Sep	3	7.5	95.2	0.44	96.4	0.45	0.47
Tue 24 Sep	1	0.6	95.6	0.55	96.6	0.60	0.53
Wed 25 Sep	1	16.4	89.9	0.53	91.2	0.61	1.03
Thu 26 Sep	1	21.9	89.3	0.58	93.1	0.71	0.6
Fri 27 Sep	1	4.9	90.5	0.32	93.3	0.35	
Tue 01 Oct	4	0.0	94.8	0.43	95.9	0.47	0.47
Wed 02 Oct	1	1.3	95.0	0.46	96.4	0.60	0.55
Thu 03 Oct	1	0.0	92.7	0.29	96.6	0.25	0.51
Fri 04 Oct	1	22.3	84.6	0.66	93.1	0.47	5.55
Mon 07 Oct	3	0.0	94.3	0.37	96.4	0.39	2.23
Tue 08 Oct	1	3.3	93.6	0.37	95.2	0.34	2.14
Wed 09 Oct	1	0.9	92.3	0.45	94.7	0.50	0.70
Thu 10 Oct	1	9.0	92.5	0.46	95.6	0.40	1.72
Fri 11 Oct	1	0.0	94.2	0.74	96.5	0.54	1.60
Tue 15 Oct	4	17.4	90.4	0.81	90.0	0.76	1.21
Wed 16 Oct	1	7.6	91.0	0.23	94.7	0.61	1.32
Thu 17 Oct	1	3.9	89.8	0.21	94.5	0.23	1.28
Fri 18 Oct	1	0.0	90.5	0.28	94.0	0.75	1.36
Mon 21 Oct	3	20.9	87.7	0.33	82.5	1.13	0.52
Tue 22 Oct	1	0.0	89.5	0.38	92.4	0.53	0.46
Wed 23 Oct	1	0.4	90.4	0.50	94.1	0.48	0.35
Thu 24 Oct	1	0.0	93.2	0.62	95.3	0.42	0.37
Fri 25 Oct	1	0.0	91.7	0.24	94.9	0.42	0.73
Mon 28 Oct	3	14.0	87.1	0.71	91.7	0.81	0.34
Tue 29 Oct	1	1.8	89.2	0.76	92.5	0.83	0.50
Wed 30 Oct	1	0.9	90.2	0.47	93.0	0.28	0.31
Thu 31 Oct	1	29.3	79.3	2.64	90.8	0.33	0.38
Fri 01 Nov	1	11.8	82.1	0.34	92.4	0.60	
Mon 04 Nov	3	6.3	73.6	0.60	93.3	0.36	
Tue 05 Nov	1	31.5	87.7	0.30	92.1	0.47	
Wed 06 Nov	1	0.0	90.1	0.56	94.0	0.28	

RAW WATER UVT (< 90% FLAGGED) AND TURBIDITY (> 1 NTU FLAGGED) HAND SAMPLES							
			HARVEY		MAGNESIA		ALBERTA
2024 workdays	Days since last sample	Rain, 2-station-average/mm	UVT/%	Turbidity /NTU	UVT/%	Turbidity /NTU	Turbidity /NTU
Thu 07 Nov	1	0.5	89.8	0.27	94.3	0.41	
Fri 08 Nov	1	0.0	88.0	0.31	88.1	0.28	
Tue 12 Nov	4	19.1	83.5	0.37	77.0	4.46	
Wed 13 Nov	1	58.4	79.5	0.47	91.0	0.77	
Thu 14 Nov	1	28.9	84.9	0.37	88.1	1.57	
Fri 15 Nov	1	0.8	88.6	0.22	92.1	0.51	
Mon 18 Nov	3	4.0	88.3	0.21	93.3	0.25	
Tue 19 Nov	1	15.0	90.7	0.34	94.1	0.27	
Wed 20 Nov	1	36.8	81.5	0.38	93.2	0.32	
Thu 21 Nov	1	25.8	83.6	0.18	91.9	0.30	
Fri 22 Nov	1	0.9	86.1	0.24	92.4	0.40	
Mon 25 Nov	3	3.0	88.4	0.29	93.0	0.23	
Tue 26 Nov	1	0.0	89.8	0.26	93.3	0.31	
Wed 27 Nov	1	0.0	91.2	0.35	95.1	0.36	
Thu 28 Nov	1	0.0	91.2	0.24	94.6	0.28	
Fri 29 Nov	1	0.0	91.8	0.23	94.8	0.19	
Mon 02 Dec	3	0.0	90.9	0.38	94.6	0.32	
Tue 03 Dec	1	0.0	91.0	0.20	94.2	0.28	
Wed 04 Dec	1	0.0	90.3	0.37	94.7	0.22	
Thu 05 Dec	1	0.0	89.6	0.24	94.3	0.19	
Fri 06 Dec	1	0.1	89.6	0.14	94.7	0.26	
Mon 09 Dec	3	0.1	90.2	0.15	93.0	0.22	
Tue 10 Dec	1	0.0	91.2	0.17	94.5	0.31	
Wed 11 Dec	1	0.0	91.9	0.17	95.0	0.18	
Thu 12 Dec	1	0.0	92.0	0.22	95.3	0.27	
Fri 13 Dec	1	0.5	92.1	0.23	94.6	0.24	
Mon 16 Dec	3	0.6	89.9	0.24	93.8	0.18	
Tue 17 Dec	1	4.0	91.0	0.22	94.8	0.31	
Wed 18 Dec	1	78.4	84.8	0.28	89.1	0.34	
Thu 19 Dec	1	1.1	90.2	0.17	92.6	0.29	
Fri 20 Dec	1	14.9	89.9	0.19	90.6	0.50	
Mon 23 Dec	3	24.6	87.5	0.47	88.6	0.47	
Fri 27 Dec	4	22.3	88.6	0.21	92.5	0.31	
Mon 30 Dec	3	15.0	90.0	0.21	94.3	0.23	
Tue 31 Dec	1	3.9	90.9	0.24	93.6	0.32	
COUNT			**244**	**244**	**240**	**240**	**45**
MIN			**73.60**	**0.14**	**77.00**	**0.13**	**0.31**
MAX			**98.30**	**2.64**	**97.90**	**4.46**	**5.55**
MED			**92.20**	**0.26**	**95.00**	**0.33**	**0.55**
AVG			**91.27**	**0.32**	**94.27**	**0.45**	**0.90**

APPENDIX 4: *TREATED* WATER TURBIDITY & CHLORINE RESIDUAL

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
02-Jan		0.41	0.88	0.31	0.80	0.36	0.69	0.25	0.59	0.23	0.74			0.25	0.71	0.24	0.60
03-Jan	1	0.27	0.84	0.26	0.76	0.30	0.91	0.29	0.59	0.31	0.56	1.05	0.84	0.79	0.74	0.32	0.61
04-Jan	1	0.17	0.81	0.15	0.76	0.24	0.64	0.12	0.56	0.13	0.42	0.36	1.05	0.19	0.69	0.17	0.55
05-Jan	1	0.31	0.95	0.24	0.86	0.26	0.69	0.24	0.53	0.18	0.32	0.31	0.82	0.19	0.74	0.17	0.50
08-Jan	3	0.26	0.89	0.20	0.83	0.23	0.71	0.19	0.62	0.22	0.21	0.58	0.89	0.15	0.76	0.15	0.59
09-Jan	1	0.39	0.82	0.25	0.78	0.41	0.71	0.12	0.68	0.34	0.52	0.43	0.82	0.15	0.67	0.28	0.68
10-Jan	1	0.27	0.87	0.86	0.78	0.42	0.64	0.69	0.60	0.26	0.39	0.80	0.82	0.78	0.71	0.36	0.72
11-Jan	1	0.50	0.89	0.29	0.85	0.16	0.73	0.19	0.56	0.14	0.70	0.68	0.84	0.21	0.74	0.35	0.65
12-Jan	1	0.22	0.86	0.15	0.89	0.19	0.72	0.16	0.71	0.14	0.36	0.18	0.91	0.16	0.78	0.27	0.70
15-Jan	3	0.49	0.86	0.43	0.81	0.40	0.75	0.20	0.78	0.12	0.45	0.78	0.87	0.14	0.76	0.28	0.73
16-Jan	1	0.43	0.87	0.26	0.84	0.20	0.74	0.25	0.77	0.15	0.66	0.25	0.92	0.19	0.81	0.26	0.71
17-Jan	1			0.82	0.35	0.72	0.34	0.78	0.26	0.60	0.19			0.18	0.69	0.21	0.77
18-Jan	1	0.57	0.88	0.27	0.86	0.61	0.74	0.14	0.77	0.21	0.57	0.29	0.85	0.15	0.76	0.26	0.71
19-Jan	1	0.66	0.88	0.31	0.91	0.44	0.80	0.18	0.78	0.41	0.49	0.69	0.86	0.28	0.80	0.50	0.73
22-Jan	3	0.51	0.84	0.76	0.74	0.68	0.67	0.30	0.59	0.20	0.34	0.81	0.74	0.25	0.77	0.56	0.65
23-Jan	1	0.30	0.90	0.29	0.79	0.27	0.75	0.23	0.52	0.39	0.49	0.36	0.85	0.21	0.75	0.37	0.48
24-Jan	1	0.58	0.85	0.40	0.80	0.76	0.68	0.26	0.46	0.26	0.29	0.78	0.77	0.28	0.67	0.68	0.68
25-Jan	1	0.55	0.83	0.58	0.81	0.42	0.64	0.31	0.49	0.26	0.40	0.63	0.92	0.21	0.71	0.58	0.73
26-Jan	1	0.77	0.87	0.53	0.84	0.67	0.41	0.23	0.51	0.29	0.34	0.46	0.88	0.36	0.70	0.34	0.69
29-Jan	3	0.79	0.92	0.52	0.80	1.04	0.73	0.36	0.54	0.29	0.33	2.08	0.59	0.32	0.83	0.56	0.56
30-Jan	1	1.10	0.85	0.57	0.76	0.76	0.68	0.35	0.61	0.29	0.53			0.28	0.72	0.54	0.56
31-Jan	1	0.91	0.87	0.72	0.79	0.87	0.68	0.35	0.52	0.66	0.47	1.40	1.10	0.49	0.73	0.58	0.55
01-Feb	1	1.65	0.86	0.65	0.80	0.84	0.59	0.34	0.57	0.23	0.48	1.89	0.75	0.30	0.64	0.77	0.53
02-Feb	1	0.95	0.89	0.56	0.86	0.68	0.67	0.29	0.44	0.22	0.36			0.27	0.79	0.53	0.50
03-Feb	1	0.62	0.88	0.35	0.79	0.55	0.70	0.20	0.62	0.39	0.73	1.12	0.88	0.19	0.78	0.32	0.66
04-Feb	1	0.81	0.83	0.52	0.78	0.58	0.65	0.28	0.61	0.31	0.58	0.67	0.87	0.31	0.75	0.44	0.46
05-Feb	1	0.73	0.89	0.54	0.82	0.67	0.73	0.24	0.58	0.21	0.43	0.56	0.87	0.18	0.76	0.29	0.64
08-Feb	3	0.48	0.87	0.37	0.87	0.59	0.72	0.22	0.63	0.17	0.43	0.38	0.88	0.17	0.77	0.19	0.67
09-Feb	1	0.32	0.87	0.23	0.82	0.26	0.70	0.20	0.67	0.16	0.63	0.43	0.84	0.20	0.76	0.22	0.65
12-Feb	3	0.23	0.83	0.22	0.78	0.22	0.69	0.24	0.69	0.19	0.35	0.29	0.87	0.19	0.71	0.17	0.66
13-Feb	1	0.85	0.93	0.45	0.89	0.42	0.79	0.22	0.54	0.25	0.53	0.45	0.85	0.22	0.82	0.27	0.55
14-Feb	1	0.54	0.87	0.34	0.79	0.38	0.71	0.31	0.60	0.23	0.59	0.52	0.88	0.21	0.80	0.32	0.61
15-Feb	1	0.55	0.90	0.35	0.83	0.40	0.75	0.16	0.64	0.17	0.52	0.40	0.88	0.15	0.82	0.18	0.62
16-Feb	1	0.38	0.89	0.38	0.84	0.37	0.78	0.14	0.63	0.16	0.35	0.13	0.90	0.15	0.81	0.49	0.65

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
20-Feb	4	0.37	0.86	0.47	0.78	0.66	0.75	0.16	0.70	0.16	0.22	0.50	0.90	0.19	0.79	0.32	0.66
21-Feb	1	0.34	0.87	0.18	0.83	0.28	0.74	0.20	0.67	0.16	0.58	0.49	0.87	0.18	0.82	0.22	0.67
22-Feb	1	0.35	0.82	0.26	0.74	0.55	0.65	0.14	0.66	0.13	0.55	0.53	0.81	0.16	0.73	0.37	0.64
23-Feb	1	0.30	0.83	0.22	0.78	0.47	0.71	0.18	0.60	0.18	0.62	0.24	0.93	0.18	0.84	0.17	0.59
26-Feb	3	0.43	0.90	0.21	0.85	0.23	0.75	0.14	0.65	0.24	0.69	0.29	0.87	0.19	0.80	0.21	0.73
27-Feb	1	0.40	0.92	0.39	0.88	0.28	0.82	0.24	0.62	0.16	0.80	0.37	0.95	0.23	0.85	0.25	0.72
28-Feb	1	0.33	0.90	0.30	0.86	0.46	0.81	0.19	0.74	0.53	0.78	0.48	0.90	0.20	0.83	0.29	0.79
29-Feb	1	0.32	0.83	0.26	0.76	0.27	0.76	0.31	0.77	0.31	0.69	0.45	0.85	0.20	0.72	0.31	0.73
01-Mar	1	0.35	0.96	0.23	0.95	0.30	0.85	0.21	0.65	0.26	0.53	0.28	0.79	0.16	0.92	0.25	0.71
04-Mar	3	0.35	0.87	0.64	0.90	0.40	0.79	0.15	0.70	0.13	0.71			0.28	0.86	0.35	0.71
05-Mar	1	0.67	0.89	0.24	0.86	0.43	0.83	0.16	0.68	0.17	0.66			0.15	0.86	0.17	0.72
06-Mar	1	0.28	0.88	0.29	0.90	0.32	0.81	0.17	0.72	0.12	0.70	0.35	0.87	0.13	0.85	0.31	0.73
07-Mar	1	0.49	0.88	0.21	0.89	0.41	0.68	0.18	0.72	0.29	0.73	0.26	0.90	0.21	0.86	0.41	0.71
08-Mar	1	0.30	0.87	0.18	0.92	0.31	0.86	0.15	0.74	0.16	0.83	0.25	0.90	0.19	0.84	0.15	0.76
11-Mar	3	0.77	0.87	0.48	0.75	0.71	0.72	0.35	0.65	0.16	0.50	0.76	0.84	0.22	0.77	0.48	0.62
12-Mar	1	0.38	0.85	0.41	0.84	0.30	0.72	0.19	0.54	0.16	0.50	2.68	0.82	0.23	0.81	0.63	0.56
13-Mar	1	1.18	0.86	0.39	0.88	0.33	0.76	0.18	0.53	0.19	0.47	1.91	0.88	0.31	0.86	0.25	0.54
14-Mar	1	0.19	0.89	0.21	0.81	0.19	0.73	0.27	0.45	0.37	0.34	1.21	0.87	0.24	0.77	0.28	0.53
15-Mar	1	0.33	0.92	0.28	0.94	0.18	0.94	0.26	0.54	0.37	0.40	0.86	0.93	0.29	0.85	0.16	0.65
18-Mar	3	0.39	0.85	0.27	0.79	0.21	0.71	0.18	0.55	0.17	0.48	0.83	0.90	0.17	0.80	0.25	0.64
19-Mar	1	0.42	0.86	0.20	0.86	0.22	0.73	0.15	0.57	0.15	0.58	0.56	0.83	0.15	0.82	0.16	0.63
20-Mar	1	0.53	0.89	0.49	0.85	0.34	0.73	0.20	0.57	0.16	0.45	0.45	0.85	0.19	0.82	0.17	0.60
21-Mar	1	0.70	0.90	0.34	0.89	0.35	0.75	0.16	0.60	0.14	0.47	0.43	0.94	0.14	0.84	0.21	0.65
22-Mar	1	0.44	0.81	0.26	0.81	0.57	0.72	0.15	0.62	0.14	0.70	0.38	0.89	0.36	0.81	0.35	0.70
25-Mar	3	0.73	0.92	0.18	0.88	0.29	0.86	0.18	0.64	0.19	0.40	0.49	0.92	0.19	0.85	0.33	0.69
26-Mar	1	0.43	0.87	0.21	0.85	0.39	0.73	0.16	0.68	0.15	0.52	0.34	0.90	0.12	0.82	0.27	0.70
27-Mar	1	0.44	0.88	0.25	0.85	0.33	0.73	0.18	0.65	0.12	0.53	0.37	0.84	0.19	0.81	0.26	0.66
28-Mar	1	0.31	0.86	0.23	0.77	0.20	0.63	0.16	0.62	0.32	0.46	0.38	0.81	0.24	0.65	0.17	0.66
29-Mar	1	0.33	0.82	0.21	0.79			0.25	0.55	0.32	0.41	0.41	0.85	0.24	0.76	0.23	0.52
02-Apr	4	0.36	0.82	0.30	0.71	0.33	0.68	0.14	0.54	0.17	0.64	0.30	0.89	0.13	0.74	0.32	0.62
03-Apr	1	0.24	0.87	0.39	0.84	0.38	0.69	0.16	0.59	0.14	0.53	0.45	0.81	0.15	0.78	0.23	0.57
04-Apr	1	0.38	0.90	0.32	0.83	0.39	0.72	0.23	0.57	0.23	0.41	0.38	0.94	0.21	0.79	0.37	0.63
05-Apr	1	0.33	0.84	0.30	0.85	0.26	0.66	0.15	0.62	0.15	0.47	0.41	0.84	0.17	0.77	0.18	0.62
08-Apr	3	0.29	0.94	0.16	0.84	0.24	0.82	0.15	0.65	0.13	0.60	0.41	0.90	0.13	0.82	0.29	0.62
09-Apr	1	0.46	0.85	0.34	0.78	0.29	0.68	0.16	0.79	0.13	0.68	0.61	0.93	0.21	0.80	0.25	0.70
10-Apr	1	0.44	0.86	0.34	0.79	0.40	0.68	0.20	0.67	0.14	0.51	0.43	0.86	0.15	0.74	0.24	0.59

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
11-Apr	1	0.27	0.87	0.45	0.85	0.24	0.71	0.23	0.55	0.17	0.41	0.27	0.83	0.22	0.77	0.31	0.58
12-Apr	1	0.45	0.86	0.25	0.80	0.32	0.74	0.17	0.63	0.29	0.47	0.42	0.84	0.18	0.77	0.38	0.63
15-Apr	3	0.36	0.85	0.24	0.79	0.42	0.71	0.15	0.59	0.16	0.50	0.35	0.85	0.18	0.79	0.22	0.65
16-Apr	1	0.32	0.86	0.20	0.80	0.17	0.68	0.18	0.62	0.22	0.50	0.38	0.78	0.27	0.76	0.17	0.61
17-Apr	1	0.35	0.87	0.39	0.79	0.34	0.69	0.15	0.62	0.13	0.46	0.18	0.90	0.11	0.76	0.14	0.62
18-Apr	1	0.49	0.78	0.22	0.75	0.52	0.64	0.17	0.60	0.14	0.35	0.34	0.87	0.16	0.74	0.22	0.63
19-Apr	1	0.58	0.88	0.22	0.84	0.21	0.73	0.24	0.63	0.20	0.65	0.41	0.84	0.17	0.82	0.14	0.59
22-Apr	3	0.29	0.86	0.23	0.81	0.19	0.69	0.28	0.67	0.14	0.52	0.19	0.80	0.16	0.80	0.16	0.67
23-Apr	1	0.20	0.90	0.18	0.86	0.40	0.66	0.24	0.65	0.15	0.50	0.33	0.94	0.17	0.81	0.16	0.68
24-Apr	1	0.49	0.82	0.15	0.82	0.41	0.71	0.14	0.67	0.25	0.72	0.28	0.89	0.17	0.82	0.23	0.78
25-Apr	1	0.27	0.87	0.24	0.90	0.21	0.72	0.19	0.65	0.23	0.75	0.38	0.81	0.21	0.81	0.21	0.71
26-Apr	1	0.25	0.83	0.17	0.75	0.13	0.75	0.13	0.62	0.20	0.51	0.24	0.84	0.16	0.70	0.26	0.68
29-Apr	3	0.38	0.88	0.22	0.83	0.21	0.75	0.30	0.55	0.30	0.36	0.28	0.88	0.19	0.78	0.18	0.55
30-Apr	1	0.20	0.92	0.21	0.95	0.15	0.77	0.19	0.59	0.20	0.57	0.22	0.80	0.24	0.81	0.22	0.62
01-May	1	0.30	0.83	0.23	0.77	0.25	0.67	0.16	0.65	0.14	0.44	0.32	0.81	0.13	0.76	0.67	0.69
02-May	1	0.23	0.94	0.19	0.86	0.40	0.78	0.18	0.55	0.13	0.29	0.23	0.91	0.54	0.68	0.21	0.71
03-May	1	0.45	0.75	0.22	0.79	0.28	0.71	0.36	0.71	0.26	0.73	0.26	0.88	0.13	0.83	0.39	0.78
06-May	3	0.67	0.88	0.21	0.84	0.20	0.73	0.14	0.67	0.16	0.58	0.29	0.74	0.31	0.76	0.20	0.76
07-May	1	0.25	0.90	0.20	0.88	0.23	0.53	0.16	0.65	0.20	0.50	0.43	0.88	0.19	0.72	0.24	0.61
08-May	1	0.47	0.88	0.22	0.82	0.32	0.73	0.19	0.68	0.22	0.57	0.36	1.09	0.28	1.02	0.26	0.73
09-May	1	0.26	0.80	0.22	0.80	0.24	0.70	0.22	0.62	0.17	0.42	0.30	1.07	0.22	1.03	0.27	0.93
10-May	1	0.40	0.80	0.24	0.76	0.30	0.67	0.27	0.66	0.21	0.54	0.43	0.96	0.25	0.74	0.34	0.84
13-May	3	0.31	0.86	0.27	0.82	0.27	0.72	0.22	0.63	0.26	0.39	0.36	0.79	0.17	0.77	0.25	0.63
14-May	1	0.29	0.85	0.31	0.81	0.32	0.73	0.23	0.65	0.21	0.42	0.37	0.89	0.29	0.75	0.33	0.73
15-May	1	0.35	0.86	0.29	0.85	0.37	0.73	0.28	0.60	0.43	0.37	0.58	0.86	1.08	0.80	0.46	0.75
16-May	1	0.37	0.85	0.30	0.79	0.38	0.78	0.18	0.57	0.17	0.60	0.44	0.82	0.28	0.75	0.45	0.74
17-May	1	0.28	0.86	0.26	0.86	0.29	0.78	0.18	0.60	0.21	0.61	0.27	0.85	0.23	0.79	0.33	0.72
21-May	4	0.37	0.90	0.21	0.81	0.20	0.81	0.17	0.60	0.28	0.53	0.35	0.87	0.21	0.75	0.25	0.76
22-May	1	0.34	0.81	0.28	0.77	0.30	0.70	0.18	0.64	0.33	0.43	0.45	0.84	0.19	0.81	0.49	0.76
23-May	1	0.26	0.83	0.29	0.84	0.25	0.68	0.19	0.57	0.27	0.49	0.42	0.77	0.35	0.71	1.42	0.70
24-May	1	0.50	0.88	0.28	0.83	0.56	0.59	0.25	0.58	0.22	0.44	0.41	0.94	0.28	0.89	0.58	0.67
27-May	3	0.32	0.82	0.23	0.77	0.31	0.60	0.31	0.65	0.21	0.55	0.32	0.87	0.29	0.83	0.25	0.70
28-May	1	0.41	0.80	0.22	0.82	0.26	0.61	0.26	0.57	0.25	0.35	0.38	0.86	0.21	0.81	0.24	0.73
29-May	1	0.48	0.83	0.27	0.80	0.30	0.55	0.28	0.58	0.23	0.34	0.50	0.81	0.30	0.77	0.32	0.67
30-May	1	0.34	0.86	0.19	0.87	0.38	0.61	0.36	0.53	0.24	0.28	0.46	0.93	0.29	0.87	0.29	0.60
31-May	1	0.34	0.84	0.31	0.85	0.36	0.64	0.29	0.66	0.26	0.65	0.39	0.83	0.32	0.81	0.26	0.73

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
03-Jun	3	0.57	0.82	0.62	0.74	0.47	0.48	0.32	0.61	0.28	0.34	0.71	0.72	0.66	0.69	0.38	0.72
04-Jun	1	0.93	0.89	0.62	0.85	0.35	0.63	0.28	0.50	0.23	0.26	0.53	0.63	0.46	0.80	0.33	0.44
05-Jun	1	0.84	0.88	0.41	0.79	0.32	0.58	0.25	0.55	0.22	0.30	0.61	0.54	0.28	0.82	0.27	0.56
06-Jun	1	1.32	0.86	0.53	0.81	0.38	0.60	0.28	0.50	0.23	0.59	0.64	0.88	0.25	0.81	0.30	0.54
07-Jun	1	0.42	0.86	0.26	0.79	0.36	0.61	0.30	0.57	0.22	0.32	0.66	0.88	0.27	0.81	0.40	0.58
10-Jun	3	0.22	0.83	0.27	0.79	0.24	0.58	0.29	0.63	0.19	0.44	0.35	0.81	0.32	0.75	0.28	0.67
11-Jun	1	0.22	0.79	0.24	0.72	0.24	0.57	0.25	0.55	0.21	0.53	0.35	0.84	0.21	0.71	0.23	0.55
12-Jun	1	0.26	0.84	0.27	0.78	0.23	0.60	0.23	0.44	0.32	0.65	0.31	0.87	0.27	0.83	0.22	0.72
13-Jun	1	0.22	0.81	0.21	0.77	0.24	0.61	0.16	0.57	0.28	0.38	0.23	0.85	0.28	0.80	0.19	0.60
14-Jun	1	0.21	0.91	0.22	0.77	0.20	0.42	0.27	0.61	0.25	0.41	0.27	0.81	0.19	0.80	0.20	0.63
17-Jun	3	0.29	0.87	0.25	0.79	0.24	0.76	0.25	0.65	0.27	0.31	0.23	1.00	0.26	0.79	0.17	0.58
18-Jun	1	0.15	0.77	0.25	0.69	0.22	0.62	0.15	0.62	0.21	0.30	0.20	0.87	0.20	0.75	0.20	0.61
19-Jun	1	0.27	0.80	0.22	0.78	0.23	0.60	0.20	0.58	0.20	0.42	0.28	0.79	0.13	0.73	0.16	0.59
20-Jun	1	0.27	0.81	0.29	0.69	0.27	0.55	0.18	0.67	0.22	0.64	0.28	0.73	0.25	0.72	0.21	0.60
21-Jun	1	0.24	0.75	0.15	0.68	0.26	0.52	0.16	0.62	0.23	0.58	0.20	0.68	0.22	0.66	0.21	0.59
24-Jun	3	0.24	0.83	0.17	0.72	0.20	0.60	0.24	0.58	0.28	0.47	0.29	0.87	0.19	0.76	0.20	0.58
25-Jun	1	0.17	0.80	0.19	0.76	0.18	0.60	0.18	0.61	0.15	0.68	0.18	0.84	0.29	0.80	0.30	0.68
26-Jun	1	0.31	0.80	0.25	0.75	0.29	0.58	0.26	0.49	0.17	0.40	0.28	0.80	0.18	0.73	0.23	0.66
27-Jun	1	0.38	0.86	0.23	0.77	0.21	0.59	0.20	0.42	0.16	0.60	0.32	0.92	0.20	0.78	0.43	0.60
28-Jun	1	0.30	0.84	0.21	0.78	0.43	0.60	0.26	0.44	0.21	0.65	0.35	0.87	0.25	0.83	0.24	0.72
02-Jul	4	0.38	0.84	0.27	0.81	0.19	0.62	0.21	0.50	0.16	0.37	0.37	0.90	0.19	0.80	0.22	0.66
03-Jul	1	0.23	0.87	0.18	0.80	0.29	0.65	0.20	0.52	0.16	0.39	0.20	0.88	0.20	0.85	0.30	0.79
04-Jul	1	0.31	0.86	0.22	0.81	0.31	0.62	0.15	0.45	0.21	0.39	0.29	0.81	0.21	0.83	0.21	0.71
05-Jul	1	0.36	0.89	0.30	0.84	0.30	0.59	0.22	0.49	0.17	0.40	0.30	0.83	0.20	0.75	0.26	0.68
08-Jul	3	0.40	0.73	0.35	0.67	0.29	0.56	0.18	0.49	0.18	0.36	0.31	0.75	0.29	0.70	0.36	0.65
09-Jul	1	0.47	0.74	0.26	0.72	0.23	0.57	0.18	0.49	0.17	0.42	0.21	0.76	0.23	0.75	0.23	0.67
10-Jul	1	0.37	0.80	0.22	0.76	0.28	0.58	0.18	0.48	0.24	0.40	0.21	0.89	0.21	0.76	0.24	0.57
11-Jul	1	0.23	0.86	0.25	0.81	0.22	0.60	0.21	0.48	0.17	0.37	0.21	0.85	0.23	0.79	0.23	0.71
12-Jul	1	0.33	0.87	0.24	0.82	0.20	0.64	0.19	0.56	0.16	0.67	0.32	0.88	0.17	0.79	0.26	0.66
15-Jul	3	0.33	0.86	0.26	0.77	0.30	0.64	0.21	0.50	0.16	0.51	0.22	0.86	0.23	0.82	0.21	0.73
16-Jul	1	0.26	0.84	0.19	0.80	0.25	0.65	0.17	0.49	0.18	0.56	0.21	0.90	0.19	0.86	0.33	0.78
17-Jul	1	0.32	0.82	0.27	0.79	0.33	0.63	0.33	0.57	0.18	0.48	0.32	0.80	0.35	0.79	0.24	0.72
18-Jul	1	0.32	0.80	0.17	0.77	0.19	0.58	0.17	0.54	0.18	0.39	0.30	0.80	0.29	0.73	0.31	0.66
19-Jul	1	0.35	0.77	0.30	0.69	0.32	0.69	0.17	0.52	0.23	0.56	0.24	0.79	0.25	0.72	0.20	0.61
22-Jul	3	0.34	0.82	0.27	0.73	0.26	0.60	0.18	0.47	0.22	0.37	0.72	0.83	0.22	0.75	0.21	0.65
23-Jul	1	0.23	0.80	0.16	0.74	0.19	0.60	0.17	0.50	1.01	0.50	0.22	0.85	0.17	0.76	0.17	0.66

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
24-Jul	1	0.28	0.75	0.25	0.69	0.24	0.69	0.18	0.48	0.30	0.54	0.24	0.90	0.29	0.88	0.17	0.68
25-Jul	1	0.25	0.86	0.20	0.78	0.24	0.62	0.21	0.46	0.23	0.36	0.35	0.82	0.18	0.80	0.21	0.74
26-Jul	1	0.18	0.90	0.18	0.85	0.26	0.77	0.18	0.47	0.51	0.60	0.20	0.80	0.17	0.71	0.20	0.67
29-Jul	3	0.32	0.82	0.18	0.75	0.17	0.70	0.16	0.52	0.15	0.36	0.23	0.87	0.15	0.83	0.21	0.71
30-Jul	1	0.38	0.83	0.32	0.73	0.32	0.69	0.28	0.50	0.27	0.44	0.41	0.84	0.30	0.76	0.28	0.68
31-Jul	1	0.30	0.82	0.22	0.77	1.54	0.67	0.21	0.46	0.20	0.36	0.46	0.90	0.32	0.78	0.18	0.49
01-Aug	1	0.34	0.87	0.24	0.80	0.35	0.73	0.17	0.41	0.17	0.40	0.68	0.90	0.21	0.84	0.40	0.53
02-Aug	1	0.20	0.85	0.30	0.81	0.27	0.71	0.22	0.43	0.24	0.64	0.22	0.87	0.22	0.77	0.25	0.65
06-Aug	4	0.18	0.97	0.20	0.94	0.15	0.97	0.15	0.56	0.21	0.23	0.21	0.72	0.18	0.78	0.20	0.58
07-Aug	1	0.18	0.64	0.20	0.60	0.17	0.55	0.17	0.57	0.22	0.50	0.44	0.63	0.31	0.64	0.23	0.53
08-Aug	1	0.33	0.96	0.21	0.90	0.27	0.80	0.41	0.44	0.29	0.52	0.38	0.86	0.23	0.67	0.29	0.47
09-Aug	1	0.35	0.82	0.17	0.77	0.18	0.68	0.28	0.67	0.17	0.72	0.19	0.73	0.19	0.73	0.28	0.73
12-Aug	3	0.23	0.85	0.31	0.82	0.29	0.77	0.25	0.53	0.19	0.52	0.39	0.90	0.25	0.84	0.26	0.63
13-Aug	1	0.24	0.84	0.30	0.77	0.23	0.75	0.20	0.49	0.28	0.37	0.37	0.82	0.24	0.76	0.26	0.60
14-Aug	1	0.16	0.89	0.21	0.81	0.22	0.73	0.17	0.55	0.21	0.70	0.20	0.91	0.21	0.83	0.20	0.70
15-Aug	1	0.21	0.77	0.17	0.83	0.22	0.70	0.22	0.57	0.19	0.65	0.18	0.78	0.18	0.73	0.22	0.71
16-Aug	1	0.19	0.84	0.16	0.72	0.16	0.64	0.21	0.62	0.25	0.49	0.30	0.71	0.29	0.66	0.27	0.52
19-Aug	3	0.56	0.80	0.20	0.74	0.19	0.71	0.24	0.42	0.21	0.44	0.24	0.84	0.21	0.82	0.23	0.64
20-Aug	1	0.29	0.82	0.20	0.80	0.22	0.72	0.25	0.46	0.21	0.40	0.45	0.84	0.21	0.79	0.24	0.63
21-Aug	1	0.28	0.84	0.17	0.83	0.18	0.75	0.21	0.47	0.32	0.60	0.51	0.82	0.17	0.80	0.32	0.64
22-Aug	1	0.26	0.81	0.24	0.80	0.41	0.73	0.29	0.48	0.31	0.43	0.58	0.83	0.26	0.82	0.24	0.66
23-Aug	1	0.28	0.84	0.20	0.81	0.24	0.73	0.16	0.45	0.20	0.57	0.26	0.95	0.25	0.88	0.23	0.63
26-Aug	3	0.38	0.87	0.37	0.75	0.24	0.74	0.22	0.26	0.17	0.28	0.25	0.90	0.22	0.73	0.23	0.55
27-Aug	1	0.70	0.80	0.40	0.72	0.34	0.66	0.24	0.23	0.31	0.65	0.36	0.87	0.24	0.77	0.29	0.61
28-Aug	1	0.47	0.83	0.37	0.77	0.29	0.71	0.23	0.30	0.26	0.43	0.35	0.85	0.33	0.79	0.31	0.65
29-Aug	1	0.50	0.92	0.26	0.86	0.31	0.81	0.30	0.27	0.19	0.47	0.43	0.88	0.31	0.80	0.25	0.59
30-Aug	1	0.39	0.84	0.41	0.82	0.40	0.73	0.29	0.26	0.22	0.74	0.63	0.82	0.32	0.74	0.21	0.61
03-Sep	4	0.50	0.80	0.59	0.74	0.32	0.68	0.29	0.38	0.21	0.45	0.37	0.81	0.24	0.67	0.24	0.65
04-Sep	1	0.48	0.80	0.24	0.78	0.32	0.72	0.27	0.38	0.20	0.38	0.49	0.80	0.22	0.75	0.27	0.65
05-Sep	1	0.87	0.85	0.26	0.76	0.20	0.74	0.18	0.40	0.15	0.53	0.19	0.80	0.19	0.67	0.21	0.64
06-Sep	1	0.57	0.85	0.34	0.80	0.23	0.75	0.23	0.41	0.24	0.50	0.23	0.87	0.23	0.81	0.31	0.71
09-Sep	3	0.36	0.84	0.23	0.79	0.20	0.76	0.15	0.50	0.18	0.50	0.39	0.90	0.18	0.77	0.17	0.70
10-Sep	1	0.39	0.90	0.22	0.86	0.23	0.78	0.18	0.52	0.19	0.78	0.21	0.89	0.19	0.81	0.26	0.63
11-Sep	1	0.34	0.85	0.21	0.84	0.20	0.77	0.20	0.53	0.19	0.74	0.23	0.87	0.23	0.83	0.26	0.73
12-Sep	1	0.37	0.83	0.27	0.83	0.24	0.67	0.26	0.54	0.26	0.53	0.21	0.85	0.22	0.77	0.22	0.72
13-Sep	1	0.49	0.83	0.31	0.82	0.36	0.76	0.26	0.49	0.27	0.47	0.39	0.84	0.26	0.80	0.28	0.66

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
16-Sep	3	0.47	0.80	0.25	0.76	0.21	0.72	0.30	0.43	0.18	0.37	0.22	0.83	0.17	0.79	0.28	0.65
17-Sep	1	0.37	0.84	0.38	0.81	0.25	0.76	0.37	0.41	0.25	0.35	0.23	0.83	0.20	0.75	0.25	0.64
18-Sep	1	0.44	0.87	0.43	0.83	0.61	0.80	0.38	0.39	0.33	0.35	0.58	0.84	0.40	0.79	0.41	0.62
19-Sep	1	0.52	0.94	0.40	0.89	0.39	0.85	0.28	0.47	0.29	0.41	0.52	0.86	0.27	0.80	0.26	0.64
20-Sep	1	0.44	0.85	0.31	0.83	0.34	0.78	0.36	0.43	0.29	0.77	0.61	0.86	0.33	0.77	0.40	0.66
23-Sep	3	0.36	0.86	0.40	0.82	0.32	0.79	0.29	0.49	0.27	0.41	0.30	0.83	0.31	0.81	0.29	0.70
24-Sep	1	0.56	0.87	0.35	0.84	0.63	0.79	0.31	0.56	0.29	0.63	0.76	0.84	0.28	0.80	0.48	0.66
25-Sep	1	0.60	0.80	0.31	0.76	0.35	0.73	0.29	0.53	0.31	0.47	0.40	0.84	0.37	0.80	0.50	0.68
26-Sep	1	0.76	0.69	0.50	0.68	0.45	0.60	0.40	0.54	0.40	0.53	0.83	0.81	0.44	0.73	0.43	0.66
27-Sep	1	0.33	0.73	0.31	0.72	0.30	0.59	0.24	0.44	0.39	0.46	0.38	0.77	0.28	0.74	0.29	0.60
01-Oct	4	0.39	0.87	0.41	0.80	0.27	0.75	0.27	0.46	0.27	0.20	0.47	0.80	0.21	0.76	0.25	0.68
02-Oct	1	0.98	0.82	0.29	0.79	0.55	0.71	0.26	0.51	0.39	0.35	0.47	0.84	0.30	0.78	0.31	0.62
03-Oct	1	0.63	0.84	0.23	0.75	0.20	0.71	0.21	0.45	0.18	0.67	0.19	0.89	0.23	0.78	0.25	0.68
04-Oct	1	0.47	0.87	0.23	0.92	0.34	0.77	0.19	0.50	0.20	0.77	0.41	0.85	0.25	0.87	0.22	0.73
07-Oct	3	3.95	0.88	0.52	0.86	0.29	0.78	0.21	0.30	0.37	0.50	0.17	0.85	0.27	0.85	0.31	0.71
08-Oct	1	1.03	0.86	0.55	0.84	0.64	0.77	0.29	0.43	0.22	0.45	0.39	0.90	0.20	0.81	0.36	0.68
09-Oct	1	1.45	0.82	0.39	0.80	0.37	0.70	0.25	0.45	0.25	0.29	0.36	0.93	0.27	0.90	0.51	0.71
10-Oct	1	0.58	0.84	0.30	0.82	0.32	0.74	0.34	0.44	0.40	0.31	0.39	0.83	0.33	0.73	0.35	0.74
11-Oct	1	1.15	0.84	0.50	0.80	0.50	0.70	0.39	0.40	0.31	0.43	0.78	0.78	0.44	0.77	0.38	0.65
15-Oct	4	1.08	0.80	0.47	0.71	0.44	0.67	0.38	0.49	0.36	0.47	0.70	0.82	0.39	0.78	0.31	0.70
16-Oct	1	0.29	0.80	0.28	0.78	0.23	0.70	0.40	0.51	0.28	0.51	0.91	0.82	0.30	0.83	0.21	0.68
17-Oct	1	0.20	0.96	0.15	0.89	0.20	0.83	0.20	0.36	0.19	0.71	0.58	0.85	0.17	0.86	1.31	0.61
18-Oct	1	0.20	0.96	0.15	0.89	0.20	0.83	0.20	0.36	0.19	0.71	0.58	0.85	0.17	0.86	1.31	0.61
21-Oct	3	1.02	0.84	0.64	0.71	0.51	0.59	0.37	0.33	0.36	0.58	0.59	0.42	0.41	0.69	1.16	0.21
22-Oct	1	0.48	0.90	0.42	0.84	0.42	0.74	0.49	0.39	0.40	0.64	0.78	1.03	0.35	0.79	0.47	0.20
23-Oct	1	0.60	0.84	0.51	0.81	0.44	0.71	0.30	0.53	0.24	0.53	0.52	0.95	0.27	0.80	0.32	0.31
24-Oct	1	0.59	0.83	0.35	0.78	0.30	0.80	0.32	0.53	0.41	0.20	0.64	0.84	0.30	0.78	0.25	0.40
25-Oct	1	0.50	0.93	0.23	0.87	0.27	0.75	0.30	0.58	0.22	0.64	0.39	0.87	0.20	0.87	0.25	0.41
28-Oct	3	0.64	0.81	0.30	0.78	0.20	0.70	0.21	0.53	0.23	0.45	0.61	0.88	0.34	0.87	0.30	0.49
29-Oct	1	0.75	0.82	0.22	0.74	0.64	0.66	0.29	0.54	0.22	0.20	1.28	0.74	0.32	0.68	0.63	0.63
30-Oct	1	0.44	0.87	0.22	0.87	0.61	0.74	0.20	0.56	0.21	0.40	0.80	0.90	0.19	0.87	0.31	0.46
31-Oct	1	0.36	0.80	0.29	0.76	0.69	0.63	0.22	0.56	0.20	0.43	0.42	0.80	0.22	0.74	2.97	0.57
01-Nov	1	0.44	0.81	0.32	0.73	0.36	0.68	0.32	0.51	0.28	0.66	0.40	0.89	0.28	0.85	0.40	0.50
04-Nov	3	0.62	0.90	0.32	0.83	0.27	0.78	0.16	0.60	0.16	0.65	0.25	0.88	0.73	0.86	0.26	0.57
05-Nov	1	0.40	0.73	0.25	0.69	0.39	0.64	0.35	0.57	0.19	0.34	0.69	0.78	0.30	0.72	0.27	0.60
06-Nov	1	0.65	0.91	0.20	0.87	0.34	0.73	0.22	0.48	0.19	0.31	0.29	0.99	0.21	0.94	0.33	0.43

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
07-Nov	1	0.58	0.99	0.26	0.89	0.47	0.84	0.23	0.55	0.20	0.69	0.41	0.92	0.27	0.92	0.36	0.60
08-Nov	1	0.20	0.89	0.18	0.75	0.29	0.69	0.20	0.63	0.29	0.34	0.29	0.81	0.26	0.78	0.25	0.72
12-Nov	4	0.61	0.92	0.59	0.83	0.41	0.75	0.21	0.62	0.31	0.61	0.50	0.74	0.27	0.84	0.37	0.61
13-Nov	1	2.30	0.80	0.57	0.80	0.45	0.68	0.31	0.57	0.32	0.28	0.79	0.83	0.28	0.81	0.26	0.47
14-Nov	1	0.73	0.87	0.69	0.79	0.51	0.69	0.30	0.50	0.31	0.73	0.69	0.80	0.35	0.76	0.40	0.41
15-Nov	1	1.06	0.88	0.46	0.80	0.42	0.63	0.46	0.50	0.28	0.75	0.77	0.96	0.28	0.79	0.38	0.30
18-Nov	3	0.75	0.81	0.34	0.74	0.23	0.66	0.24	0.55	0.29	0.71	0.40	0.83	0.26	0.77	0.33	0.44
19-Nov	1	0.49	0.90	0.33	0.86	0.33	0.78	0.34	0.60	0.31	0.72	0.56	0.90	0.34	0.84	0.27	0.34
20-Nov	1	0.68	0.80	0.31	0.79	0.41	0.70	0.27	0.69	0.25	0.68	0.55	0.90	0.27	0.79	0.51	0.39
21-Nov	1	0.57	0.70	0.24	0.71	0.39	0.58	0.23	0.61	0.19	0.52	0.32	0.87	0.39	0.83	0.20	0.48
22-Nov	1	0.42	0.81	0.24	0.72	0.50	0.71	0.22	0.50	0.25	0.75	0.43	0.80	0.28	0.79	0.51	0.62
25-Nov	3	0.48	0.90	0.22	0.82	0.26	0.79	0.26	0.66	0.16	0.53	0.33	0.89	0.23	0.80	0.24	0.52
26-Nov	1	0.41	0.93	0.24	0.92	0.24	0.76	0.19	0.68	0.23	0.26	0.31	0.88	0.29	0.84	0.29	0.62
27-Nov	1	0.56	0.90	0.19	0.87	0.27	0.76	0.16	0.72	0.21	0.40	0.31	0.90	0.35	0.85	0.36	0.63
28-Nov	1	0.50	0.88	0.34	0.84	0.45	0.76	0.51	0.70	0.38	0.42	0.40	0.86	0.26	0.85	0.31	0.62
29-Nov	1	0.52	0.82	0.19	0.83	0.15	0.75	0.32	0.73	0.19	0.81	0.21	0.84	0.21	0.83	0.22	0.67
02-Dec	3	0.35	0.82	0.27	0.84	0.25	0.71	0.23	0.76	0.20	0.83	0.37	0.89	0.19	0.90	0.32	0.66
03-Dec	1	0.35	0.82	0.27	0.84	0.25	0.71	0.23	0.76	0.20	0.83	0.37	0.89	0.19	0.90	0.32	0.66
04-Dec	1	0.29	0.82	0.38	0.83	0.32	0.73	0.36	0.74	0.18	0.59	0.26	0.88	0.20	0.84	0.25	0.68
05-Dec	1	0.51	0.80	0.24	0.77	0.44	0.70	0.35	0.72	0.20	0.59	0.26	0.85	0.20	0.84	0.34	0.72
06-Dec	1	0.33	0.81	0.21	0.79	0.20	0.67	0.24	0.70	0.33	0.51	0.29	0.80	0.29	0.81	0.19	0.66
09-Dec	3	0.50	0.91	0.39	0.81	0.40	0.84	0.18	0.78	0.19	0.73	0.23	0.83	0.23	0.82	0.20	0.63
10-Dec	1	0.34	0.89	0.32	0.87	0.42	0.81	0.21	0.76	0.14	0.62	0.54	0.81	0.66	0.85	0.23	0.60
11-Dec	1	0.50	0.86	0.28	0.85	0.24	0.77	0.20	0.79	0.13	0.56	0.34	0.74	0.41	0.80	0.60	0.73
12-Dec	1	0.55	0.82	0.24	0.85	0.30	0.75	0.17	0.83	0.19	0.49	0.40	0.82	0.32	0.91	0.29	0.65
13-Dec	1	0.41	0.90	0.27	0.87	0.24	0.74	0.38	0.75	0.18	0.79	0.34	0.93	0.21	0.90	0.40	0.69
16-Dec	3	0.26	0.92	0.31	0.86	0.30	0.80	0.21	0.71	0.19	0.50	0.45	0.85	0.26	0.77	0.30	0.65
17-Dec	1	0.37	0.87	0.20	0.86	0.24	0.69	0.28	0.73	0.41	0.57	0.40	0.94	0.23	0.83	0.30	0.60
18-Dec	1	0.31	0.84	0.24	0.73	0.26	0.64	0.25	0.82	0.21	0.50	0.26	0.94	0.25	0.86	0.26	0.75
19-Dec	1	0.28	0.98	0.24	0.92	0.20	0.68	0.21	0.68	0.31	0.37	0.44	0.74	0.32	0.72	0.22	0.81
20-Dec	1	0.34	0.97	0.24	0.90	0.25	0.74	0.22	0.60	0.43	0.27	0.39	0.71	0.27	0.73	0.27	0.61
23-Dec	3	0.29	0.80	0.33	0.75	0.18	0.58	0.28	0.72	0.27	0.37	0.67	0.90	0.38	0.76	0.49	0.55
27-Dec	4	0.24	0.80	0.24	0.77	0.29	0.60	0.19	0.67	0.33	0.58	0.39	0.82	0.31	0.74	0.31	0.71
30-Dec	3	0.36	0.85	0.36	0.86	0.20	0.68	0.22	0.72	0.24	0.72	0.29	0.86	0.20	0.82	0.38	0.61
31-Dec	1	0.38	0.90	0.15	0.89	0.35	0.73	0.16	0.72	0.23	0.76	0.30	0.90	0.82	0.85	0.48	0.68

2024 workdays	Days since last sample	SAMPLE LOCATION (SOURCED FROM EITHER THE HARVEY/ALBERTA SYSTEM OR THE MAGNESIA SYSTEM BASED ON OPERATIONAL NEEDS). TURBIDITY > 0.9 NTU IS FLAGGED, SEE KEY END OF TABLE)															
		HARVEY PLANT TANK		PRV-3 (HIGHWAY TANK)		STORE/CAFÉ (INSIDE)		LIONS BAY AVE. (CUL-DE-SAC)		KELVIN GROVE (WORKS YARD INSIDE)		MAG. PLANT TANK		PRV-5 (NORTH BAYVIEW)		BRUNSWICK BCH (CUL-DE-SAC)	
		Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L	Turbidity/NTU	CL2/mg/L
COUNT		248	248	249	249	248	248	249	249	249	249	243	243	249	249	249	249
MIN		0.15	0.64	0.15	0.35	0.13	0.34	0.12	0.23	0.12	0.19	0.13	0.42	0.11	0.64	0.14	0.20
MAX		3.95	0.99	0.86	0.95	1.54	0.97	0.78	0.83	1.01	0.83	2.68	1.10	1.08	1.03	2.97	0.93
MEDIAN		0.37	0.85	0.26	0.81	0.29	0.71	0.22	0.57	0.21	0.50	0.37	0.85	0.23	0.80	0.26	0.65
AVERAGE		0.46	0.85	0.30	0.81	0.34	0.70	0.24	0.57	0.24	0.51	0.45	0.85	0.26	0.79	0.32	0.63

Missing data
Turbidity > 0.90 NTU
Cl_2 residual <0.2 mg/L (none where data is not missing)

APPENDIX 5A: BIANNUAL METALS & CHEMISTRY, 19 MAR. (ABRIDGED)

Analytical Results

Sub-Matrix: Surface Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Harvey Raw Water	Magnesia Raw Water	----	----	----
					Client sampling date / time	19-Mar-2024 10:30	19-Mar-2024 11:20	----	----	----
						VA24A5754-017	VA24A5754-018	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
Absorbance, UV (@ 254nm)	----	E404/VA	0.0050	AU/cm		0.0480	0.0280	----	----	----
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		3.3	4.7	----	----	----
Conductivity	----	E100/VA	2.0	µS/cm		11.1	27.1	----	----	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		3.93	8.79	----	----	----
pH	----	E108/VA	0.10	pH units		6.51	6.61	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	<3.0	----	----	----
Turbidity	----	E121/VA	0.10	NTU		<0.10	0.18	----	----	----
Transmittance, UV (@ 254nm)	----	E404/VA	1.0	% T/cm		89.5	93.8	----	----	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		1.72	1.32	----	----	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0594	0.0403	----	----	----
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00011	0.00013	----	----	----
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00128	0.00143	----	----	----
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	----	----	----
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	<0.000050	----	----	----
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	<0.010	----	----	----
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		<0.0000050	0.0000147	----	----	----
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		1.27	2.82	----	----	----
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	----	----	----
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	----	----	----
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00126	0.00648	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L		<0.010	0.011	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		<0.000050	0.000110	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	<0.0010	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.184	0.425	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00024	0.00072	----	----	----

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Harvey Raw Water	Magnesia Raw Water	----	----	----
					Client sampling date / time	19-Mar-2024 10:30	19-Mar-2024 11:20	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24A5754-017	VA24A5754-018	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000201	0.000155	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	<0.00050	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	<0.050	----	----	----
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.079	0.078	----	----	----
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	0.000081	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		1.87	4.07	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	<0.000010	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		0.606	1.36	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00401	0.0150	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		<0.50	1.98	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	<0.00020	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	<0.000010	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	<0.00030	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000062	<0.000010	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	<0.00050	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	0.0041	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	----	----	----
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		<2.0	<2.0	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Harvey Tank First Draw	Harvey Tank	Store / Cafe First Draw	Store / Cafe	Lions Bay Ave. First Draw
					Client sampling date / time	19-Mar-2024 10:20	19-Mar-2024 10:20	19-Mar-2024 09:35	19-Mar-2024 09:35	19-Mar-2024 07:00
						VA24A5754-001	VA24A5754-002	VA24A5754-003	VA24A5754-004	VA24A5754-005
						Result	Result	Result	Result	Result
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		----	4.3	----	4.2	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		5.19	4.35	5.04	4.56	5.81
pH	----	E108/VA	0.10	pH units		----	6.58	----	6.61	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		----	<3.0	----	<3.0	----
Turbidity	----	E121/VA	0.10	NTU		----	<0.10	----	<0.10	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		----	2.23	----	1.78	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0542	0.0624	0.0583	0.0588	0.0594
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00011	0.00011	0.00013	0.00012	0.00015
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00208	0.00137	0.00150	0.00136	0.00160
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	0.000062
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		0.0000291	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		1.70	1.41	1.54	1.50	1.90
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	0.00111
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	<0.00010	0.00026	<0.00010	<0.00010
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.714	0.00638	0.0511	0.00617	0.00124
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.018	<0.010	0.032	0.030	0.014
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		0.00474	0.000065	0.00283	0.000416	0.000051
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.230	0.201	0.291	0.199	0.258
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00132	0.00031	0.00085	0.00038	0.00109
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		----	<0.0000050	----	<0.0000050	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000228	0.000227	0.000252	0.000240	0.000332
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		0.00064	<0.00050	0.00134	<0.00050	0.00065
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

					Client sample ID	Harvey Tank First Draw	Harvey Tank	Store / Cafe First Draw	Store / Cafe	Lions Bay Ave. First Draw
					Client sampling date / time	19-Mar-2024 10:20	19-Mar-2024 10:20	19-Mar-2024 09:35	19-Mar-2024 09:35	19-Mar-2024 07:00
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24A5754-001	VA24A5754-002	VA24A5754-003	VA24A5754-004	VA24A5754-005
						Result	Result	Result	Result	Result
Total Metals										
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.084	0.084	0.085	0.082	0.102
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		2.14	1.94	2.13	2.04	2.43
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.13	2.08	2.15	2.12	2.25
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00543	0.00437	0.00461	0.00454	0.00554
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	0.50
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		0.00057	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000036	0.000067	0.000064	0.000067	0.000068
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		0.134	<0.0030	0.0238	<0.0030	<0.0030
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		----	<2.0	----	<2.0	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Lions Bay Ave.	Kelvin Grove First Draw	Kelvin Grove	Community Centre First Draw	Community Centre
					Client sampling date / time	19-Mar-2024 07:00	19-Mar-2024 05:35	19-Mar-2024 05:35	19-Mar-2024 06:25	19-Mar-2024 06:25
						VA24A5754-006	VA24A5754-007	VA24A5754-008	VA24A5754-009	VA24A5754-010
						Result	Result	Result	Result	Result
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		5.0	----	5.1	----	5.0
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		5.36	8.50	5.43	9.38	5.03
pH	----	E108/VA	0.10	pH units		6.66	----	6.67	----	6.64
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	----	<3.0	----	<3.0
Turbidity	----	E121/VA	0.10	NTU		<0.10	----	<0.10	----	<0.10
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		2.04	----	1.96	----	1.83
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0627	0.0436	0.0625	0.0390	0.0580
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00013	0.00016	0.00014	0.00014	0.00012
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00148	0.00236	0.00165	0.00147	0.00134
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	0.00196	<0.000050
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	0.021	<0.010	0.018	<0.010
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		<0.0000050	0.0000065	<0.0000050	<0.0000050	<0.0000050
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		1.75	2.23	1.81	1.86	1.68
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	0.00024	<0.00010	<0.00010	<0.00010
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00090	0.0994	0.00409	0.125	0.0178
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.012	0.263	0.025	0.016	0.032
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		<0.000050	0.00874	0.000247	0.00138	0.000104
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	0.0044	<0.0010	0.0022	<0.0010
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.240	0.712	0.222	1.15	0.203
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00024	0.00547	0.00034	0.00031	0.00037
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	<0.0000050	----	<0.0000050
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000273	0.000273	0.000261	0.000262	0.000234
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	0.00318	<0.00050	0.00062	<0.00050

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Lions Bay Ave.	Kelvin Grove First Draw	Kelvin Grove	Community Centre First Draw	Community Centre
					Client sampling date / time	19-Mar-2024 07:00	19-Mar-2024 05:35	19-Mar-2024 05:35	19-Mar-2024 06:25	19-Mar-2024 06:25
						VA24A5754-006	VA24A5754-007	VA24A5754-008	VA24A5754-009	VA24A5754-010
						Result	Result	Result	Result	Result
Total Metals										
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.094	0.099	0.087	0.092	0.084
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		0.00021	<0.00020	<0.00020	0.00021	<0.00020
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		2.25	2.17	2.20	2.09	2.04
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.27	2.36	2.23	2.26	2.12
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00510	0.00567	0.00480	0.00522	0.00492
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		<0.50	<0.50	<0.50	0.52	<0.50
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00063	<0.00010
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000072	0.000050	0.000069	0.000026	0.000068
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	0.0569	<0.0030	0.133	<0.0030
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		<2.0	----	<2.0	----	<2.0

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Magnesia Tank First Draw	Magnesia Tank	Brunswick Beach First Draw	Brunswick Beach	Lions Bay Beach Park First Draw
					Client sampling date / time	19-Mar-2024 11:10	19-Mar-2024 11:10	19-Mar-2024 08:45	19-Mar-2024 08:45	19-Mar-2024 07:35
						VA24A5754-011	VA24A5754-012	VA24A5754-013	VA24A5754-014	VA24A5754-015
						Result	Result	Result	Result	Result
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		----	4.7	----	4.7	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		11.3	10.3	5.24	5.13	5.20
pH	----	E108/VA	0.10	pH units		----	6.65	----	6.67	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		----	<3.0	----	<3.0	----
Turbidity	----	E121/VA	0.10	NTU		----	0.50	----	<0.10	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		----	1.42	----	1.89	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0302	0.0572	0.0639	0.0631	0.0440
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00011	0.00015	0.00012	0.00014	0.00013
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00212	0.00185	0.00155	0.00150	0.00169
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	0.000052
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		0.0000608	0.0000187	<0.0000050	<0.0000050	0.0000089
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		3.65	3.27	1.72	1.68	1.69
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.753	0.00509	0.00104	0.00082	0.208
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.016	0.021	0.019	0.017	0.024
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		0.00151	<0.000050	<0.000050	<0.000050	0.0131
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.534	0.511	0.230	0.227	0.238
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00127	0.00105	0.00036	0.00032	0.00046
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		----	<0.0000050	----	<0.0000050	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000172	0.000171	0.000252	0.000261	0.000244
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		0.00127	<0.00050	<0.00050	<0.00050	0.00083

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID: Magnesia Tank First Draw	Magnesia Tank	Brunswick Beach First Draw	Brunswick Beach	Lions Bay Beach Park First Draw
Client sampling date / time					19-Mar-2024 11:10	19-Mar-2024 11:10	19-Mar-2024 08:45	19-Mar-2024 08:45	19-Mar-2024 07:35
					VA24A5754-011	VA24A5754-012	VA24A5754-013	VA24A5754-014	VA24A5754-015
					Result	Result	Result	Result	Result
Total Metals									
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, total	7440-09-7	E420/VA	0.050	mg/L	0.091	0.095	0.088	0.087	0.089
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L	0.000127	0.000137	<0.000050	<0.000050	<0.000050
Silicon, total	7440-21-3	E420/VA	0.10	mg/L	4.71	4.57	2.14	2.13	2.18
Silver, total	7440-22-4	E420/VA	0.000010	mg/L	0.000011	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	7440-23-5	E420/VA	0.050	mg/L	3.14	3.06	2.25	2.22	2.24
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L	0.0191	0.0169	0.00510	0.00511	0.00510
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L	2.97	2.64	<0.50	<0.50	<0.50
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	7440-31-5	E420/VA	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L	0.00032	0.00040	<0.00030	0.00033	<0.00030
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L	<0.000010	<0.000010	0.000071	0.000070	0.000051
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L	0.168	<0.0030	<0.0030	<0.0030	0.0311
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics									
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L	----	<2.0	----	<2.0	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Lions Bay Beach Park	----	----	----	----
					Client sampling date / time	19-Mar-2024 07:35	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24A5754-016	--------	--------	--------	--------
						Result	---	---	---	---
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		4.1	----	----	----	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		4.76	----	----	----	----
pH	----	E108/VA	0.10	pH units		6.58	----	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	----	----	----	----
Turbidity	----	E121/VA	0.10	NTU		<0.10	----	----	----	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		1.94	----	----	----	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0626	----	----	----	----
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00013	----	----	----	----
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00153	----	----	----	----
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	----	----	----	----
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	----	----	----	----
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	----	----	----	----
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		1.55	----	----	----	----
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.0201	----	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.010	----	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		0.000424	----	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.216	----	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00028	----	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000248	----	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Lions Bay Beach Park	----	----	----	----
					Client sampling date / time	19-Mar-2024 07:35	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24A5754-016	--------	--------	-------	--------
						Result	---	---	---	---
Total Metals										
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.083	---	---	---	---
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	---	---	---	---
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	---	---	---	---
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		2.10	---	---	---	---
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	---	---	---	---
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.19	---	---	---	---
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00458	---	---	---	---
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		<0.50	---	---	---	---
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	---	---	---	---
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	---	---	---	---
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	---	---	---	---
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	---	---	---	---
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		0.00031	---	---	---	---
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	---	---	---	---
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000069	---	---	---	---
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	---	---	---	---
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	---	---	---	---
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	---	---	---	---
Aggregate Organics										
Biochemical oxygen demand [BOD]	---	E550/VA	2.0	mg/L		<2.0	---	---	---	---

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

APPENDIX 5B: BIANNUAL METALS & CHEMISTRY, 17 SEP. (ABRIDGED)

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Harvey Raw Water	Magnesia Raw Water	----	----	----
					Client sampling date / time	17-Sep-2024 08:30	17-Sep-2024 09:55	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24C4440-017	VA24C4440-018	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
Absorbance, UV (@ 254nm)	----	E404/VA	0.0050	AU/cm		0.0210	0.0180	----	----	----
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		6.0	5.2	----	----	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		6.82	19.6	----	----	----
pH	----	E108/VA	0.10	pH units		7.07	7.01	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	<3.0	----	----	----
Turbidity	----	E121/VA	0.10	NTU		<0.10	0.15	----	----	----
Transmittance, UV (@ 254nm)	----	E404/VA	1.0	% T/cm		95.3	95.9	----	----	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		0.64	<0.50	----	----	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0222	0.0150	----	----	----
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		<0.00010	0.00013	----	----	----
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00223	0.00299	----	----	----
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	----	----	----
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	<0.000050	----	----	----
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	0.012	----	----	----
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		<0.0000050	0.0000207	----	----	----
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		2.26	6.74	----	----	----
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	----	----	----
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	----	----	----
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00050	0.00748	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.012	<0.010	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		<0.000050	0.000137	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	<0.0010	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.286	0.669	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00021	0.00046	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----

Analytical Results

Sub-Matrix: Surface Water
(Matrix: Water)

					Client sample ID	Harvey Raw Water	Magnesia Raw Water	----	----	----
					Client sampling date / time	17-Sep-2024 08:30	17-Sep-2024 09:55	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24C4440-017	VA24C4440-018	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000700	0.000236	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	<0.00050	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	<0.050	----	----	----
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.127	0.100	----	----	----
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		0.00024	<0.00020	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	0.000071	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		2.18	4.98	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	<0.000010	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		0.917	2.09	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00631	0.0319	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		0.54	6.09	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	<0.00020	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	<0.000010	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	<0.00030	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	<0.00010	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000028	<0.000010	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	<0.00050	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	0.0049	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	----	----	----
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		<2.0	<2.0	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Harvey Tank First Draw	Harvey Tank	Store / Cafe First Draw	Store / Cafe	Lions Bay Ave. First Draw
					Client sampling date / time	17-Sep-2024 08:20	17-Sep-2024 08:20	17-Sep-2024 10:30	17-Sep-2024 10:30	17-Sep-2024 06:50
						VA24C4440-001	VA24C4440-002	VA24C4440-003	VA24C4440-004	VA24C4440-005
						Result	Result	Result	Result	Result
Physical Tests										
Alkalinity, total (as CaCO3)	---	E290/VA	1.0	mg/L		---	6.7	---	6.3	---
Hardness (as CaCO3), from total Ca/Mg	---	EC100A/VA	0.50	mg/L		6.88	6.88	8.34	7.02	8.37
pH	---	E108/VA	0.10	pH units		---	7.13	---	7.12	---
Solids, total suspended [TSS]	---	E160/VA	3.0	mg/L		---	<3.0	---	<3.0	---
Turbidity	---	E121/VA	0.10	NTU		---	<0.10	---	<0.10	---
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	---	E355-L/VA	0.50	mg/L		---	0.67	---	0.70	---
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0224	0.0222	0.0266	0.0214	0.0238
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00010	0.00011	0.00010	0.00011	0.00012
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00230	0.00221	0.00260	0.00220	0.00273
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	0.000162
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	<0.010	0.018	<0.010	<0.010
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		<0.0000050	<0.0000050	0.0000056	<0.0000050	<0.0000050
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		2.29	2.30	2.52	2.37	2.85
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000010
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	0.00135
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	<0.00010	0.00022	<0.00010	<0.00010
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00610	0.00538	0.0675	0.00364	0.00119
Iron, total	7439-89-6	E420/VA	0.010	mg/L		<0.010	<0.010	0.022	0.012	0.019
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		0.000061	0.000054	0.00290	0.000297	0.000065
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	<0.0010	0.0016	<0.0010	<0.0010
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.282	0.276	0.497	0.267	0.305
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00018	0.00018	0.00051	0.00028	0.00091
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		---	<0.0000050	---	<0.0000050	---
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000587	0.000574	0.000544	0.000557	0.000615
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	<0.00050	0.00599	<0.00050	0.00073
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Harvey Tank First Draw	Harvey Tank	Store / Cafe First Draw	Store / Cafe	Lions Bay Ave. First Draw
					Client sampling date / time	17-Sep-2024 08:20	17-Sep-2024 08:20	17-Sep-2024 10:30	17-Sep-2024 10:30	17-Sep-2024 06:50
						VA24C4440-001	VA24C4440-002	VA24C4440-003	VA24C4440-004	VA24C4440-005
						Result	Result	Result	Result	Result
Total Metals										
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.135	0.133	0.136	0.133	0.163
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		0.00032	0.00030	0.00035	0.00030	0.00041
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		2.16	2.17	2.26	2.23	2.38
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.57	2.48	2.52	2.54	2.54
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00653	0.00633	0.00728	0.00630	0.00796
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		0.58	0.66	0.59	0.59	0.72
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00013
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000032	0.000031	0.000018	0.000030	0.000027
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	<0.0030	0.0450	<0.0030	<0.0030
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		----	<2.0	----	<2.0	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Lions Bay Ave.	Kelvin Grove First Draw	Kelvin Grove	Community Centre First Draw	Community Centre
					Client sampling date / time	17-Sep-2024 06:50	17-Sep-2024 05:25	17-Sep-2024 05:25	17-Sep-2024 06:15	17-Sep-2024 06:15
						VA24C4440-006	VA24C4440-007	VA24C4440-008	VA24C4440-009	VA24C4440-010
						Result	Result	Result	Result	Result
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		7.0	----	6.3	----	6.1
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		7.75	10.3	8.10	8.71	7.15
pH	----	E108/VA	0.10	pH units		7.15	----	7.11	----	7.11
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	----	<3.0	----	<3.0
Turbidity	----	E121/VA	0.10	NTU		<0.10	----	<0.10	----	<0.10
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		0.79	----	0.76	----	0.73
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0232	0.0440	0.0290	0.0140	0.0221
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00011	0.00011	0.00013	<0.00010	<0.00010
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00254	0.00268	0.00275	0.00242	0.00213
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		0.000067	<0.000050	<0.000050	0.000923	<0.000050
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000068	<0.0000050
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		2.64	3.46	2.83	2.74	2.43
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00090	0.0223	0.00230	0.0869	0.0221
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.011	0.033	0.076	<0.010	0.016
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		<0.000050	0.00162	0.000281	0.000625	0.000197
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.282	0.403	0.251	0.454	0.262
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00025	0.00068	0.00056	0.00124	0.00031
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	<0.0000050	----	<0.0000050
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000554	0.000664	0.000584	0.000568	0.000563
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	0.00157	<0.00050	0.0310	<0.00050

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Lions Bay Ave.	Kelvin Grove First Draw	Kelvin Grove	Community Centre First Draw	Community Centre
					Client sampling date / time	17-Sep-2024 06:50	17-Sep-2024 05:25	17-Sep-2024 05:25	17-Sep-2024 06:15	17-Sep-2024 06:15
						VA24C4440-006	VA24C4440-007	VA24C4440-008	VA24C4440-009	VA24C4440-010
						Result	Result	Result	Result	Result
Total Metals										
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.148	0.145	0.139	0.150	0.133
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		0.00031	0.00033	0.00029	0.00035	0.00030
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		2.28	2.20	2.25	2.36	2.26
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.45	2.58	2.46	2.56	2.56
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00738	0.00763	0.00706	0.00762	0.00661
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		0.63	0.85	0.70	0.87	0.65
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00032	<0.00010
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000032	0.000020	0.000032	0.000013	0.000030
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	0.0193	<0.0030	0.168	0.0037
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		<2.0	----	<2.0	----	<2.0

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Magnesia Tank First Draw	Magnesia Tank	Brunswick Beach First Draw	Brunswick Beach	Lions Bay Beach Park First Draw
					Client sampling date / time	17-Sep-2024 09:45	17-Sep-2024 09:45	17-Sep-2024 10:50	17-Sep-2024 10:50	17-Sep-2024 11:10
						VA24C4440-011	VA24C4440-012	VA24C4440-013	VA24C4440-014	VA24C4440-015
						Result	Result	Result	Result	Result
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		----	5.4	----	5.8	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		18.8	18.7	19.5	18.9	7.53
pH	----	E108/VA	0.10	pH units		----	7.04	----	7.09	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		----	<3.0	----	<3.0	----
Turbidity	----	E121/VA	0.10	NTU		----	<0.10	----	<0.10	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		----	<0.50	----	0.56	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0134	0.0166	0.0169	0.0161	0.0174
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00014	0.00014	0.00012	0.00011	0.00010
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00288	0.00298	0.00334	0.00331	0.00266
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	<0.000050	0.000536	<0.000050	0.000427
Boron, total	7440-42-8	E420/VA	0.010	mg/L		0.012	0.012	0.012	0.012	<0.010
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		0.0000466	0.0000193	0.0000181	0.0000174	<0.0000050
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		6.49	6.43	6.75	6.57	2.54
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	<0.000010	0.000011	0.000010	<0.000010
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.306	0.00517	0.0233	0.00114	0.0879
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.067	<0.010	0.016	0.017	0.023
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		0.00186	<0.000050	0.000172	<0.000050	0.000681
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.635	0.637	0.637	0.614	0.289
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00067	0.00042	0.00110	0.00032	0.00078
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		----	<0.0000050	----	<0.0000050	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000235	0.000258	0.000249	0.000233	0.000502
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		0.00530	<0.00050	0.00063	<0.00050	0.00275

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

			Client sample ID		Magnesia Tank First Draw	Magnesia Tank	Brunswick Beach First Draw	Brunswick Beach	Lions Bay Beach Park First Draw
			Client sampling date / time		17-Sep-2024 09:45	17-Sep-2024 09:45	17-Sep-2024 10:50	17-Sep-2024 10:50	17-Sep-2024 11:10
Analyte	CAS Number	Method/Lab	LOR	Unit	VA24C4440-011	VA24C4440-012	VA24C4440-013	VA24C4440-014	VA24C4440-015
					Result	Result	Result	Result	Result
Total Metals									
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, total	7440-09-7	E420/VA	0.050	mg/L	0.103	0.106	0.112	0.113	0.144
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L	<0.00020	<0.00020	0.00020	<0.00020	0.00032
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L	0.000096	0.000087	0.000084	0.000081	<0.000050
Silicon, total	7440-21-3	E420/VA	0.10	mg/L	4.92	5.04	5.09	5.10	2.23
Silver, total	7440-22-4	E420/VA	0.000010	mg/L	0.000028	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, total	7440-23-5	E420/VA	0.050	mg/L	3.56	3.74	3.70	3.57	2.56
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L	0.0315	0.0308	0.0318	0.0310	0.00707
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L	5.41	5.56	5.66	5.47	0.61
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	7440-31-5	E420/VA	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000020
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L	0.126	<0.0030	0.0084	<0.0030	0.165
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics									
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L	----	<2.0	----	<2.0	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Lions Bay Beach Park	----	----	----	----
					Client sampling date / time	17-Sep-2024 11:10	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24C4440-016	--------	--------	--------	--------
						Result	---	---	---	---
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L		6.2	----	----	----	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		7.22	----	----	----	----
pH	----	E108/VA	0.10	pH units		7.12	----	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	----	----	----	----
Turbidity	----	E121/VA	0.10	NTU		<0.10	----	----	----	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		0.69	----	----	----	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0240	----	----	----	----
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00012	----	----	----	----
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00231	----	----	----	----
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	----	----	----	----
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		0.000062	----	----	----	----
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	----	----	----	----
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		2.44	----	----	----	----
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.0174	----	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.028	----	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		0.000409	----	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.274	----	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00037	----	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000570	----	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Lions Bay Beach Park	----	----	----	----
					Client sampling date / time	17-Sep-2024 11:10	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24C4440-016	--------	--------	--------	--------
						Result	---	---	---	---
Total Metals										
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.135	----	----	----	----
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		0.00028	----	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		<0.000050	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		2.26	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.52	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.00666	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		0.60	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		0.000031	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		<2.0	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

APPENDIX 6: METALS AND CHEMISTRY, ALBERTA CREEK RAW, APR.-DEC.

Page	:	3 of 4
Work Order	:	VA24A8827
Client	:	Village of Lions Bay
Project	:	----

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	24-Apr-2024 11:30	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA24A8827-001	--------	--------	--------	--------	
					Result	----	----	----	----	
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm	43.4	----	----	----	----	
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L	43	----	----	----	----	
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L	<3.0	----	----	----	----	
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L	<0.50	----	----	----	----	
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L	0.0536	----	----	----	----	
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----	
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----	
Barium, total	7440-39-3	E420/VA	0.00010	mg/L	0.00365	----	----	----	----	
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L	<0.000020	----	----	----	----	
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----	
Boron, total	7440-42-8	E420/VA	0.010	mg/L	0.012	----	----	----	----	
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L	0.0000206	----	----	----	----	
Calcium, total	7440-70-2	E420/VA	0.050	mg/L	4.92	----	----	----	----	
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L	<0.000010	----	----	----	----	
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----	
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L	0.00014	----	----	----	----	
Copper, total	7440-50-8	E420/VA	0.00050	mg/L	0.00092	----	----	----	----	
Iron, total	7439-89-6	E420/VA	0.010	mg/L	0.016	----	----	----	----	
Lead, total	7439-92-1	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----	
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L	<0.0010	----	----	----	----	
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L	0.695	----	----	----	----	
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L	0.00227	----	----	----	----	
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L	<0.0000050	----	----	----	----	
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L	0.000300	----	----	----	----	
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----	
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L	<0.050	----	----	----	----	
Potassium, total	7440-09-7	E420/VA	0.050	mg/L	0.102	----	----	----	----	

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Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	24-Apr-2024 11:30	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24A8827-001	--------	--------	--------	--------
						Result	---	---	---	---
Total Metals										
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		0.000110	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		6.22	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		1.84	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.0174	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		2.37	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	23-May-2024 11:30	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA24B1660-001	--------	--------	--------	--------	
					Result	----	----	----	----	
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm	36.7	----	----	----	----	
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L	36	----	----	----	----	
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L	<3.0	----	----	----	----	
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/CG	0.50	mg/L	0.75	----	----	----	----	
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L	0.0673	----	----	----	----	
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----	
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----	
Barium, total	7440-39-3	E420/VA	0.00010	mg/L	0.00304	----	----	----	----	
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L	<0.000020	----	----	----	----	
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----	
Boron, total	7440-42-8	E420/VA	0.010	mg/L	0.011	----	----	----	----	
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L	0.0000182	----	----	----	----	
Calcium, total	7440-70-2	E420/VA	0.050	mg/L	4.48	----	----	----	----	
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L	0.000010	----	----	----	----	
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----	
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L	0.00022	----	----	----	----	
Copper, total	7440-50-8	E420/VA	0.00050	mg/L	0.00093	----	----	----	----	
Iron, total	7439-89-6	E420/VA	0.010	mg/L	0.026	----	----	----	----	
Lead, total	7439-92-1	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----	
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L	<0.0010	----	----	----	----	
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L	0.607	----	----	----	----	
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L	0.00370	----	----	----	----	
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L	<0.0000050	----	----	----	----	
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L	0.000291	----	----	----	----	
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----	
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L	<0.050	----	----	----	----	
Potassium, total	7440-09-7	E420/VA	0.050	mg/L	0.110	----	----	----	----	

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	23-May-2024 11:30	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24B1660-001	--------	--------	--------	--------
						Result	----	----	----	----
Total Metals										
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		0.000079	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		5.24	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		1.68	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.0119	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		1.45	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		0.00046	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	27-Jun-2024 12:10	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA24B5501-001	--------	--------	--------	--------	
					Result	----	----	----	----	
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm	41.5	----	----	----	----	
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L	33	----	----	----	----	
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L	<3.0	----	----	----	----	
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L	1.04	----	----	----	----	
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L	0.0808	----	----	----	----	
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----	
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L	0.00011	----	----	----	----	
Barium, total	7440-39-3	E420/VA	0.00010	mg/L	0.00378	----	----	----	----	
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L	<0.000020	----	----	----	----	
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----	
Boron, total	7440-42-8	E420/VA	0.010	mg/L	0.012	----	----	----	----	
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L	0.0000240	----	----	----	----	
Calcium, total	7440-70-2	E420/VA	0.050	mg/L	4.72	----	----	----	----	
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L	0.000013	----	----	----	----	
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----	
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L	0.00028	----	----	----	----	
Copper, total	7440-50-8	E420/VA	0.00050	mg/L	0.00112	----	----	----	----	
Iron, total	7439-89-6	E420/VA	0.010	mg/L	0.031	----	----	----	----	
Lead, total	7439-92-1	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----	
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L	<0.0010	----	----	----	----	
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L	0.677	----	----	----	----	
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L	0.00465	----	----	----	----	
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L	<0.0000050	----	----	----	----	
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L	0.000296	----	----	----	----	
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----	
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L	<0.050	----	----	----	----	
Potassium, total	7440-09-7	E420/VA	0.050	mg/L	0.121	----	----	----	----	

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	27-Jun-2024 12:10	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24B5501-001	--------	--------	--------	--------
						Result	----	----	----	----
Total Metals										
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		0.000074	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		5.85	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		1.77	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.0151	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		2.02	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		0.00053	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **Surface Water**
(Matrix: **Water**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID: Alberta Creek	----	----	----	----
					Client sampling date / time: 24-Jul-2024 12:15	----	----	----	----
					VA24B8158-001	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
Conductivity	----	E100/VA	2.0	µS/cm	48.3	----	----	----	----
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L	40	----	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L	<3.0	----	----	----	----
Organic / Inorganic Carbon									
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L	1.34	----	----	----	----
Total Metals									
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L	0.0563	----	----	----	----
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L	0.00012	----	----	----	----
Barium, total	7440-39-3	E420/VA	0.00010	mg/L	0.00443	----	----	----	----
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L	<0.000020	----	----	----	----
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----
Boron, total	7440-42-8	E420/VA	0.010	mg/L	0.013	----	----	----	----
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L	0.0000216	----	----	----	----
Calcium, total	7440-70-2	E420/VA	0.050	mg/L	5.56	----	----	----	----
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L	0.000012	----	----	----	----
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L	0.00019	----	----	----	----
Copper, total	7440-50-8	E420/VA	0.00050	mg/L	0.00100	----	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L	0.019	----	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L	<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L	0.754	----	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L	0.00329	----	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L	<0.0000050	----	----	----	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L	0.000318	----	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L	<0.050	----	----	----	----
Potassium, total	7440-09-7	E420/VA	0.050	mg/L	0.116	----	----	----	----
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L	<0.00020	----	----	----	----

Analytical Results

Sub-Matrix: **Surface Water**
(Matrix: **Water**)

					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	24-Jul-2024 12:15	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24B8158-001	--------	--------	--------	--------
						Result	----	----	----	----
Total Metals										
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		0.000118	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		6.84	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.04	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.0193	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		2.79	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		0.00043	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	28-Aug-2024 12:10	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24C2252-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm		55.1	----	----	----	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		19.8	----	----	----	----
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L		56	----	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	----	----	----	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		1.04	----	----	----	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0298	----	----	----	----
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		0.00043	----	----	----	----
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		0.00096	----	----	----	----
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00375	----	----	----	----
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	----	----	----	----
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	----	----	----	----
Boron, total	7440-42-8	E420/VA	0.010	mg/L		0.016	----	----	----	----
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		0.0000225	----	----	----	----
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		6.63	----	----	----	----
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		0.000018	----	----	----	----
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00087	----	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.023	----	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		<0.000050	----	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.786	----	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00126	----	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000376	----	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	----	----	----	----

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	28-Aug-2024 12:10	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24C2252-001	--------	--------	--------	--------
						Result	---	---	---	---
Total Metals										
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.318	----	----	----	----
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		0.00044	----	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		0.000094	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		6.95	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.86	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.0195	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		3.23	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	24-Sep-2024 11:45	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit		VA24C5331-001	----	----	----	----
						Result	----	----	----	----
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm		57.6	----	----	----	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/WT	0.50	mg/L		20.5	----	----	----	----
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L		53	----	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	----	----	----	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		0.74	----	----	----	----
Total Metals										
Aluminum, total	7429-90-5	E420/WT	0.0030	mg/L		0.0219	----	----	----	----
Antimony, total	7440-36-0	E420/WT	0.00010	mg/L		0.00028	----	----	----	----
Arsenic, total	7440-38-2	E420/WT	0.00010	mg/L		0.00055	----	----	----	----
Barium, total	7440-39-3	E420/WT	0.00010	mg/L		0.00424	----	----	----	----
Beryllium, total	7440-41-7	E420/WT	0.000020	mg/L		<0.000020	----	----	----	----
Bismuth, total	7440-69-9	E420/WT	0.000050	mg/L		<0.000050	----	----	----	----
Boron, total	7440-42-8	E420/WT	0.010	mg/L		0.016	----	----	----	----
Cadmium, total	7440-43-9	E420/WT	0.0000050	mg/L		0.0000248	----	----	----	----
Calcium, total	7440-70-2	E420/WT	0.050	mg/L		6.85	----	----	----	----
Cesium, total	7440-46-2	E420/WT	0.000010	mg/L		0.000014	----	----	----	----
Chromium, total	7440-47-3	E420/WT	0.00050	mg/L		<0.00050	----	----	----	----
Cobalt, total	7440-48-4	E420/WT	0.00010	mg/L		<0.00010	----	----	----	----
Copper, total	7440-50-8	E420/WT	0.00050	mg/L		0.00123	----	----	----	----
Iron, total	7439-89-6	E420/WT	0.010	mg/L		0.026	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	24-Sep-2024 11:45	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	VA24C5331-001	----	----	----	----	
					Result	----	----	----	----	
Total Metals										
Lead, total	7439-92-1	E420/WT	0.000050	mg/L	<0.000050	----	----	----	----	
Lithium, total	7439-93-2	E420/WT	0.0010	mg/L	<0.0010	----	----	----	----	
Magnesium, total	7439-95-4	E420/WT	0.0050	mg/L	0.836	----	----	----	----	
Manganese, total	7439-96-5	E420/WT	0.00010	mg/L	0.00100	----	----	----	----	
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L	<0.0000050	----	----	----	----	
Molybdenum, total	7439-98-7	E420/WT	0.000050	mg/L	0.000308	----	----	----	----	
Nickel, total	7440-02-0	E420/WT	0.00050	mg/L	<0.00050	----	----	----	----	
Phosphorus, total	7723-14-0	E420/WT	0.050	mg/L	<0.050	----	----	----	----	
Potassium, total	7440-09-7	E420/WT	0.050	mg/L	0.232	----	----	----	----	
Rubidium, total	7440-17-7	E420/WT	0.00020	mg/L	0.00034	----	----	----	----	
Selenium, total	7782-49-2	E420/WT	0.000050	mg/L	0.000085	----	----	----	----	
Silicon, total	7440-21-3	E420/WT	0.10	mg/L	6.83	----	----	----	----	
Silver, total	7440-22-4	E420/WT	0.000010	mg/L	<0.000010	----	----	----	----	
Sodium, total	7440-23-5	E420/WT	0.050	mg/L	2.49	----	----	----	----	
Strontium, total	7440-24-6	E420/WT	0.00020	mg/L	0.0205	----	----	----	----	
Sulfur, total	7704-34-9	E420/WT	0.50	mg/L	3.97	----	----	----	----	
Tellurium, total	13494-80-9	E420/WT	0.00020	mg/L	<0.00020	----	----	----	----	
Thallium, total	7440-28-0	E420/WT	0.000010	mg/L	<0.000010	----	----	----	----	
Thorium, total	7440-29-1	E420/WT	0.00010	mg/L	<0.00010	----	----	----	----	
Tin, total	7440-31-5	E420/WT	0.00010	mg/L	<0.00010	----	----	----	----	
Titanium, total	7440-32-6	E420/WT	0.00030	mg/L	<0.00030	----	----	----	----	

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	24-Sep-2024 11:45	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit		VA24C5331-001	----	----	----	----
						Result	----	----	----	----
Total Metals										
Tungsten, total	7440-33-7	E420/WT	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/WT	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/WT	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/WT	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/WT	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.
Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	22-Oct-2024 12:00	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	VA24C8284-001	----	----	----	----	
					Result	----	----	----	----	
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm	52.9	----	----	----	----	
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/CG	0.50	mg/L	18.2	----	----	----	----	
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L	50	----	----	----	----	
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L	<3.0	----	----	----	----	
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/CG	0.50	mg/L	1.34	----	----	----	----	
Total Metals										
Aluminum, total	7429-90-5	E420/CG	0.0030	mg/L	0.0379	----	----	----	----	
Antimony, total	7440-36-0	E420/CG	0.00010	mg/L	<0.00010	----	----	----	----	
Arsenic, total	7440-38-2	E420/CG	0.00010	mg/L	0.00014	----	----	----	----	
Barium, total	7440-39-3	E420/CG	0.00010	mg/L	0.00401	----	----	----	----	
Beryllium, total	7440-41-7	E420/CG	0.000020	mg/L	<0.000020	----	----	----	----	
Bismuth, total	7440-69-9	E420/CG	0.000050	mg/L	<0.000050	----	----	----	----	
Boron, total	7440-42-8	E420/CG	0.010	mg/L	0.012	----	----	----	----	
Cadmium, total	7440-43-9	E420/CG	0.0000050	mg/L	0.0000241	----	----	----	----	
Calcium, total	7440-70-2	E420/CG	0.050	mg/L	6.02	----	----	----	----	
Cesium, total	7440-46-2	E420/CG	0.000010	mg/L	<0.000010	----	----	----	----	
Chromium, total	7440-47-3	E420/CG	0.00050	mg/L	<0.00050	----	----	----	----	
Cobalt, total	7440-48-4	E420/CG	0.00010	mg/L	0.00014	----	----	----	----	
Copper, total	7440-50-8	E420/CG	0.00050	mg/L	0.00103	----	----	----	----	
Iron, total	7439-89-6	E420/CG	0.010	mg/L	0.012	----	----	----	----	

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	22-Oct-2024 12:00	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit		VA24C8284-001	----	----	----	----
						Result	----	----	----	----
Total Metals										
Lead, total	7439-92-1	E420/CG	0.000050	mg/L		<0.000050	----	----	----	----
Lithium, total	7439-93-2	E420/CG	0.0010	mg/L		<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/CG	0.0050	mg/L		0.758	----	----	----	----
Manganese, total	7439-96-5	E420/CG	0.00010	mg/L		0.00250	----	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Molybdenum, total	7439-98-7	E420/CG	0.000050	mg/L		0.000235	----	----	----	----
Nickel, total	7440-02-0	E420/CG	0.00050	mg/L		0.00249	----	----	----	----
Phosphorus, total	7723-14-0	E420/CG	0.050	mg/L		<0.050	----	----	----	----
Potassium, total	7440-09-7	E420/CG	0.050	mg/L		0.113	----	----	----	----
Rubidium, total	7440-17-7	E420/CG	0.00020	mg/L		<0.00020	----	----	----	----
Selenium, total	7782-49-2	E420/CG	0.000050	mg/L		0.000079	----	----	----	----
Silicon, total	7440-21-3	E420/CG	0.10	mg/L		5.98	----	----	----	----
Silver, total	7440-22-4	E420/CG	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/CG	0.050	mg/L		1.89	----	----	----	----
Strontium, total	7440-24-6	E420/CG	0.00020	mg/L		0.0181	----	----	----	----
Sulfur, total	7704-34-9	E420/CG	0.50	mg/L		3.65	----	----	----	----
Tellurium, total	13494-80-9	E420/CG	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/CG	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/CG	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/CG	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/CG	0.00030	mg/L		<0.00030	----	----	----	----

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	22-Oct-2024 12:00	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit		VA24C8284-001	----	----	----	----
						Result	----	----	----	----
Total Metals										
Tungsten, total	7440-33-7	E420/CG	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/CG	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/CG	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/CG	0.0030	mg/L		0.0040	----	----	----	----
Zirconium, total	7440-67-7	E420/CG	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.
Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: Surface Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Alberta Creek	Harvey Creek	Magnesia Creek	----	----
					Client sampling date / time	26-Nov-2024 00:00	26-Nov-2024 00:00	26-Nov-2024 00:00	----	----
						VA24D1987-001	VA24D1987-002	VA24D1987-003	----	----
						Result	Result	Result	----	----
Physical Tests										
Conductivity	----	E100/VA	2.0	µS/cm		48.6	----	----	----	----
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L		16.3	----	----	----	----
pH	----	E108/VA	0.10	pH units		7.17	----	----	----	----
Solids, total dissolved [TDS]	----	E162/VA	10	mg/L		40	----	----	----	----
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L		<3.0	----	----	----	----
Turbidity	----	E121/VA	0.10	NTU		0.19	----	----	----	----
Anions and Nutrients										
Fluoride	16984-48-8	E235.F/VA	0.020	mg/L		0.033	<0.020	0.027	----	----
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L		<0.50	----	----	----	----
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L		0.0567	----	----	----	----
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Barium, total	7440-39-3	E420/VA	0.00010	mg/L		0.00409	----	----	----	----
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L		<0.000020	----	----	----	----
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L		<0.000050	----	----	----	----
Boron, total	7440-42-8	E420/VA	0.010	mg/L		<0.010	----	----	----	----
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L		0.0000248	----	----	----	----
Calcium, total	7440-70-2	E420/VA	0.050	mg/L		5.20	----	----	----	----
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----

Analytical Results

Sub-Matrix: Surface Water (Matrix: Water)					Client sample ID	Alberta Creek	Harvey Creek	Magnesia Creek	----	----
					Client sampling date / time	26-Nov-2024 00:00	26-Nov-2024 00:00	26-Nov-2024 00:00	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24D1987-001	VA24D1987-002	VA24D1987-003	----	----
						Result	Result	Result	----	----
Total Metals										
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L		0.00019	----	----	----	----
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00091	----	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L		<0.010	----	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		0.000065	----	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.800	----	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00311	----	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000262	----	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		0.00069	----	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	----	----	----	----
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.117	----	----	----	----
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		0.000097	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		6.68	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		2.11	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.0186	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		3.60	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----

Analytical Results

Sub-Matrix: Surface Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Alberta Creek	Harvey Creek	Magnesia Creek	----	----
					Client sampling date / time	26-Nov-2024 00:00	26-Nov-2024 00:00	26-Nov-2024 00:00	----	----
						VA24D1987-001	VA24D1987-002	VA24D1987-003	----	----
						Result	Result	Result	----	----
Total Metals										
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	17-Dec-2024 11:35	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA24D3735-001	----	----	----	----	
					Result	----	----	----	----	
Physical Tests										
Alkalinity, total (as CaCO3)	----	E290/VA	1.0	mg/L	11.4	----	----	----	----	
Conductivity	----	E100/VA	2.0	µS/cm	41.7	----	----	----	----	
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	0.50	mg/L	14.8	----	----	----	----	
pH	----	E108/VA	0.10	pH units	7.24	----	----	----	----	
Solids, total suspended [TSS]	----	E160/VA	3.0	mg/L	<3.0	----	----	----	----	
Turbidity	----	E121/VA	0.10	NTU	0.41	----	----	----	----	
Organic / Inorganic Carbon										
Carbon, total organic [TOC]	----	E355-L/VA	0.50	mg/L	1.08	----	----	----	----	
Total Metals										
Aluminum, total	7429-90-5	E420/VA	0.0030	mg/L	0.0296	----	----	----	----	
Antimony, total	7440-36-0	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----	
Arsenic, total	7440-38-2	E420/VA	0.00010	mg/L	0.00020	----	----	----	----	
Barium, total	7440-39-3	E420/VA	0.00010	mg/L	0.00335	----	----	----	----	
Beryllium, total	7440-41-7	E420/VA	0.000020	mg/L	<0.000020	----	----	----	----	
Bismuth, total	7440-69-9	E420/VA	0.000050	mg/L	<0.000050	----	----	----	----	
Boron, total	7440-42-8	E420/VA	0.010	mg/L	0.012	----	----	----	----	
Cadmium, total	7440-43-9	E420/VA	0.0000050	mg/L	0.0000173	----	----	----	----	
Calcium, total	7440-70-2	E420/VA	0.050	mg/L	4.85	----	----	----	----	
Cesium, total	7440-46-2	E420/VA	0.000010	mg/L	<0.000010	----	----	----	----	
Chromium, total	7440-47-3	E420/VA	0.00050	mg/L	<0.00050	----	----	----	----	
Cobalt, total	7440-48-4	E420/VA	0.00010	mg/L	<0.00010	----	----	----	----	

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	17-Dec-2024 11:35	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24D3735-001	----	----	----	----
						Result	----	----	----	----
Total Metals										
Copper, total	7440-50-8	E420/VA	0.00050	mg/L		0.00094	----	----	----	----
Iron, total	7439-89-6	E420/VA	0.010	mg/L		0.069	----	----	----	----
Lead, total	7439-92-1	E420/VA	0.000050	mg/L		<0.000050	----	----	----	----
Lithium, total	7439-93-2	E420/VA	0.0010	mg/L		<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/VA	0.0050	mg/L		0.659	----	----	----	----
Manganese, total	7439-96-5	E420/VA	0.00010	mg/L		0.00145	----	----	----	----
Mercury, total	7439-97-6	E508/VA	0.0000050	mg/L		<0.0000050	----	----	----	----
Molybdenum, total	7439-98-7	E420/VA	0.000050	mg/L		0.000291	----	----	----	----
Nickel, total	7440-02-0	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Phosphorus, total	7723-14-0	E420/VA	0.050	mg/L		<0.050	----	----	----	----
Potassium, total	7440-09-7	E420/VA	0.050	mg/L		0.117	----	----	----	----
Rubidium, total	7440-17-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Selenium, total	7782-49-2	E420/VA	0.000050	mg/L		0.000072	----	----	----	----
Silicon, total	7440-21-3	E420/VA	0.10	mg/L		5.98	----	----	----	----
Silver, total	7440-22-4	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Sodium, total	7440-23-5	E420/VA	0.050	mg/L		1.75	----	----	----	----
Strontium, total	7440-24-6	E420/VA	0.00020	mg/L		0.0144	----	----	----	----
Sulfur, total	7704-34-9	E420/VA	0.50	mg/L		2.51	----	----	----	----
Tellurium, total	13494-80-9	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Alberta Creek	----	----	----	----
					Client sampling date / time	17-Dec-2024 11:35	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		VA24D3735-001	----	----	----	----
						Result	----	----	----	----
Total Metals										
Tin, total	7440-31-5	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/VA	0.00030	mg/L		<0.00030	----	----	----	----
Tungsten, total	7440-33-7	E420/VA	0.00010	mg/L		<0.00010	----	----	----	----
Uranium, total	7440-61-1	E420/VA	0.000010	mg/L		<0.000010	----	----	----	----
Vanadium, total	7440-62-2	E420/VA	0.00050	mg/L		<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/VA	0.0030	mg/L		<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/VA	0.00020	mg/L		<0.00020	----	----	----	----
Aggregate Organics										
Biochemical oxygen demand [BOD]	----	E550/VA	2.0	mg/L		<2.0	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

APPENDIX 7: HIKING SEASON CAFFEINE TESTS

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.
Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	Description
µg/L	micrograms per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Surface Water**
(Matrix: **Water**)

				Client sample ID	Harvey Creek	Magnesia Creek	Alberta Creek	----	----
				Client sampling date / time	24-Jul-2024 07:15	24-Jul-2024 08:00	24-Jul-2024 12:15	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA24B8159-001	VA24B8159-002	VA24B8159-003	-------	-------
					Result	Result	Result	----	----
Pharmaceuticals & Personal Care Products									
Caffeine	58-08-2	E729A/WT	0.0050	µg/L	<0.0050	<0.0050	<0.0050	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	Description
µg/L	micrograms per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

Amendment (24/09/2024): This report has been amended following minor LIMS report formatting corrections. All analysis results are as per the previous report.

Analytical Results

Sub-Matrix: **Surface Water**
(Matrix: **Water**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	Harvey Creek	Magnesia Creek	Alberta Creek	----	----
					Client sampling date / time	28-Aug-2024 07:30	28-Aug-2024 08:10	28-Aug-2024 12:10	----	----
						VA24C2212-001	VA24C2212-002	VA24C2212-003	--------	--------
						Result	Result	Result	----	----
Pharmaceuticals & Personal Care Products										
Caffeine	58-08-2	E729A/WT	0.0050	µg/L		<0.0050	<0.0050	<0.0050	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

APPENDIX 8: ASBESTOS REPORT OF 25 NOV. 2024 (SAMPLES 19 NOV.)

Contact: Thomas Chang
Company: ALS Environmental
Address: 8081 Lougheed Highway
Burnaby BC Canada V5A 1W9

Project / Location: VA25D1402
PO Number: VA25D1402
ALS Work Order: CC2400880

NARRATIVE: Analysis performed on FEI Tecnai TEM equipped with EDAX Octane T Plus Silicon Drift Detector and Z2 Analyzer. Fiber morphology, selected area electron diffraction (SAED), and energy dispersive x-ray analysis (EDXA) used to determine species. All sample collection is performed outside of ALS Cincinnati is therefore the sole responsibility of the client. Contact your local authority for information on method selection, sampling instructions, and reporting requirements prior to submission.

NOTICE: All US EPA Public Water System (PWS) drinking water compliance samples must be filtered by the laboratory within 48 hours of sampling. ALS cannot report analytical results directly to the EPA unless all of the information required by the state EPA agency is provided via the COC at the time of receipt. Report revisions resulting from failure to provide this information via the COC will result in additional administrative fees. ALS is not responsible for late or inaccurate EPA reporting as a result of client sample collection errors or information omissions. Samples from outside the US are not subject to US EPA drinking water requirements and are therefore not required to meet the 48 hour hold time, the <0.20MFL RL, and results are not reported to any agency.

METHOD CODES: "EPA 100.2" refers only to US EPA compliance drinking waters analyzed at >10,000x for asbestos fibers >10µm long only. "ENV 005" refers to a modified version of EPA 100.2 developed for all other non-potable, non-compliance, and foreign waters also analyzed at >10,000x for asbestos fibers >10µm long only. "EPA 100.1" refers to any water analyzed for asbestos fibers of any size. All excess water is disposed immediately following adequate filtration. All filtered samples are disposed after 60 day archive. All TEM grids analyzed are archived for a minimum of 3 years. Results apply only to portions of samples analyzed.

SUMMARY: An AS of <0.2 MFL is desired for drinking (potable) waters, and an AS of <7 MFL is generally acceptable for non-potable waters. Whenever possible, a sufficient volume is analyzed to yield the desired AS based on the detection of 1 confirmed asbestos fiber in the total area analyzed. However, waters containing excessive solids may require filtration of volumes too low to achieve the desired AS. In any case, a minimum of 4 and maximum of 10 grid openings are analyzed regardless of the AS reached or the asbestos concentration detected. Representative EDXA spectra and/or photomicrographs are available upon request for an additional fee.
NA=Not Applicable, AS=Analytical Sensitivity, MFL=Millions of Fibers per Liter, MRL=Method Reporting Limit
ALS Cincinnati is certified by NY ELAP for TEM by EPA 600/R-94/134, Method 100.2, "Determination of Asbestos Structures Over 10µm in Length in Drinking Water" (NY ELAP Lab#11371).
OH State Lab No.: 4077, OH Analyst Nos.: 2268 (P. Hizar), 3431 (A. Sohn)
PA State Lab No.: 68-01320, PA Certification No.: 003
WA State Lab No.: 211
NY State Lab No.: 11371

Pamela M. Hizar
Pamela M. Hizar
ALS Asbestos Technical Lead & Microscopy Department Manager

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Phone (513) 733-5336 Fax (513) 733-5347 www.alsglobal.com

IDENTIFICATION		
Client ID:	VA24D1402-001	VA24D1402-002
ALS ID:	CC2400880-001	CC2400880-002
Method:	ENV 005	ENV 005
MRL:	<7MFL	<7MFL
Collection:	11/19/24 2:30 PM	11/19/24 2:50 PM
Filtration:	11/22/24 12:00 PM	11/22/24 12:00 PM
Elapsed:	NA	NA
Sample Comments:	*HIGH SUSPENDED SOLIDS CONTENT*	*HIGH SUSPENDED SOLIDS CONTENT*
ANALYSIS		
Analyst:	Pamela Hizar	Pamela Hizar
Completed:	11/25/24 9:15 AM	11/25/24 9:45 AM
Volume (L):	0.05	0.05
Open Area (mm^2):	0.0102	0.0102
No. Open Analyzed:	10	10
Total Area (mm^2):	0.102	0.102
AS (MFL):	0.21	0.21
ASBESTOS <10µm CONCENTRATION (MFL)		
Chrysotile <10µm:	NA	NA
Amosite <10µm:	NA	NA
Crocidolite <10µm:	NA	NA
Actinolite <10µm:	NA	NA
Tremolite <10µm:	NA	NA
Anthophyllite <10µm:	NA	NA
Total <10µm:	**NA**	**NA**
ASBESTOS >10µm CONCENTRATION (MFL)		
Chrysotile >10µm:	<AS	<AS
Amosite >10µm:	<AS	<AS
Crocidolite >10µm:	<AS	<AS
Actinolite >10µm:	<AS	<AS
Tremolite >10µm:	<AS	<AS
Anthophyllite >10µm:	<AS	<AS
Total >10µm:	**<AS**	**<AS**
TOTAL ASBESTOS CONCENTRATION (MFL)		
Total Chrysotile:	<AS	<AS
Total Amosite:	<AS	<AS
Total Crocidolite:	<AS	<AS
Total Actinolite:	<AS	<AS
Total Tremolite:	<AS	<AS
Total Anthophyllite:	<AS	<AS
Total Asbestos:	**<AS**	**<AS**
Analysis Comments:	*NONE*	*NONE*

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APPENDIX 9: DAILY AVERAGE TURBIDITY, 15 SEC. METER READINGS

DATE	HARVEY CREEK		MAGNESIA CREEK	
	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)
01-Jan	0.07		8.26	
02-Jan	0.07	0.07	3.19	5.72
03-Jan	0.06	0.07	0.13	1.66
04-Jan	0.07	0.07	0.14	0.14
05-Jan	0.06	0.07	0.12	0.13
06-Jan	0.06	0.06	0.12	0.12
07-Jan	0.05	0.05	0.11	0.11
08-Jan	0.05	0.05	0.11	0.11
09-Jan	0.06	0.06	0.17	0.14
11-Jan	0.05	0.06	0.09	0.13
12-Jan	0.12	0.08	0.36	0.23
13-Jan	0.04	0.08	0.13	0.25
14-Jan	0.04	0.04	0.14	0.14
15-Jan	0.09	0.07	0.09	0.12
16-Jan	0.07	0.08	0.08	0.09
17-Jan	0.04	0.06	0.08	0.08
18-Jan	0.35	0.20	0.07	0.08
19-Jan	0.17	0.26	0.17	0.12
20-Jan	0.11	0.14	0.14	0.15
21-Jan	0.24	0.17	0.12	0.13
22-Jan	0.25	0.25	0.30	0.21
23-Jan	0.12	0.19	0.25	0.27
24-Jan	0.10	0.11	0.19	0.22
25-Jan	0.15	0.13	0.26	0.22
26-Jan	0.08	0.11	0.15	0.21
27-Jan	0.41	0.25	1.21	0.68
28-Jan	0.46	0.44	2.48	1.84
29-Jan	0.75	0.61	1.32	1.90
30-Jan	0.14	0.45	0.94	1.13
31-Jan	0.21	0.18	1.23	1.09
01-Feb	0.16	0.19	7.86	4.55
02-Feb	0.12	0.14	4.87	6.37
03-Feb	0.09	0.11	0.49	2.68
04-Feb	0.08	0.09	0.32	0.41
05-Feb	0.06	0.07	0.24	0.28
06-Feb	0.07	0.07	0.20	0.22
07-Feb	0.05	0.06	0.17	0.19
08-Feb	0.05	0.05	0.15	0.16
09-Feb	0.04	0.05	0.14	0.15
10-Feb	0.04	0.04	0.13	0.14
11-Feb	0.06	0.05	0.15	0.14
12-Feb	0.06	0.06	0.12	0.14
13-Feb	0.05	0.05	0.11	0.12
14-Feb	0.04	0.04	0.11	0.11
15-Feb	0.04	0.04	0.11	0.11
16-Feb	0.04	0.04	0.10	0.11
17-Feb	0.04	0.04	0.10	0.10
18-Feb	0.04	0.04	0.09	0.10
19-Feb	0.04	0.04	0.09	0.09
20-Feb	0.04	0.04	0.10	0.10
21-Feb	0.05	0.05	0.10	0.10
22-Feb	0.06	0.06	0.11	0.10
23-Feb	0.05	0.05	0.10	0.10
24-Feb	0.04	0.04	0.10	0.10
25-Feb	0.05	0.05	0.12	0.11
26-Feb	0.04	0.04	0.09	0.10
27-Feb	0.04	0.04	0.08	0.09

DATE	HARVEY CREEK		MAGNESIA CREEK	
	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)
28-Feb	0.05	0.05	0.13	0.10
29-Feb	0.05	0.05	0.10	0.11
01-Mar	0.05	0.05	0.10	0.10
02-Mar	0.04	0.05	0.10	0.10
03-Mar	0.06	0.05	0.10	0.10
04-Mar	0.05	0.05	0.10	0.10
05-Mar	0.03	0.04	0.12	0.11
06-Mar	0.03	0.03	0.07	0.10
07-Mar	0.03	0.03	0.07	0.07
08-Mar	0.04	0.04	0.10	0.08
09-Mar	0.09	0.07	0.15	0.12
11-Mar	0.08	0.08	1.28	0.72
12-Mar	0.11	0.10	6.08	3.68
13-Mar	0.05	0.08	0.81	3.45
14-Mar	0.04	0.04	0.49	0.65
15-Mar	0.05	0.05	0.68	0.59
16-Mar	0.09	0.07	0.65	0.66
17-Mar	0.09	0.09	0.33	0.49
18-Mar	0.07	0.08	0.21	0.27
19-Mar	0.06	0.07	0.18	0.20
20-Mar	0.06	0.06	0.15	0.17
21-Mar	0.05	0.06	0.14	0.15
22-Mar	0.05	0.05	0.15	0.14
23-Mar	0.05	0.05	0.14	0.14
24-Mar	0.05	0.05	0.12	0.13
25-Mar	0.05	0.05	0.12	0.12
26-Mar	0.05	0.05	0.11	0.11
27-Mar	0.06	0.05	0.15	0.13
28-Mar	0.06	0.06	0.29	0.22
29-Mar	0.07	0.06	0.22	0.25
30-Mar	0.05	0.06	0.13	0.17
31-Mar	0.05	0.05	0.12	0.12
01-Apr	0.05	0.05	0.11	0.11
02-Apr	0.08	0.06	0.12	0.12
03-Apr	0.07	0.07	0.16	0.14
04-Apr	0.05	0.06	0.10	0.13
05-Apr	0.04	0.05	0.10	0.10
06-Apr	0.04	0.04	0.09	0.10
07-Apr	0.04	0.04	0.10	0.10
08-Apr	0.05	0.04	0.10	0.10
09-Apr	0.05	0.05	0.06	0.08
10-Apr	0.00	0.03	0.01	0.03
11-Apr	0.05	0.03	0.09	0.05
12-Apr	0.04	0.05	0.10	0.10
13-Apr	0.04	0.04	0.09	0.10
14-Apr	0.04	0.04	0.09	0.09
15-Apr	0.04	0.04	0.08	0.09
16-Apr	0.04	0.04	0.08	0.08
17-Apr	0.06	0.05	0.08	0.08
18-Apr	0.04	0.05	0.07	0.07
19-Apr	0.04	0.04	0.07	0.07
20-Apr	0.05	0.05	0.07	0.07
21-Apr	0.05	0.05	0.07	0.07
22-Apr	0.04	0.05	0.07	0.07
23-Apr	0.05	0.05	0.07	0.07
24-Apr	0.06	0.05	0.08	0.08
25-Apr	0.08	0.07	0.12	0.10
26-Apr	0.07	0.08	0.12	0.12
27-Apr	0.14	0.11	0.19	0.16
28-Apr	0.09	0.12	0.13	0.16
29-Apr	0.06	0.07	0.09	0.11

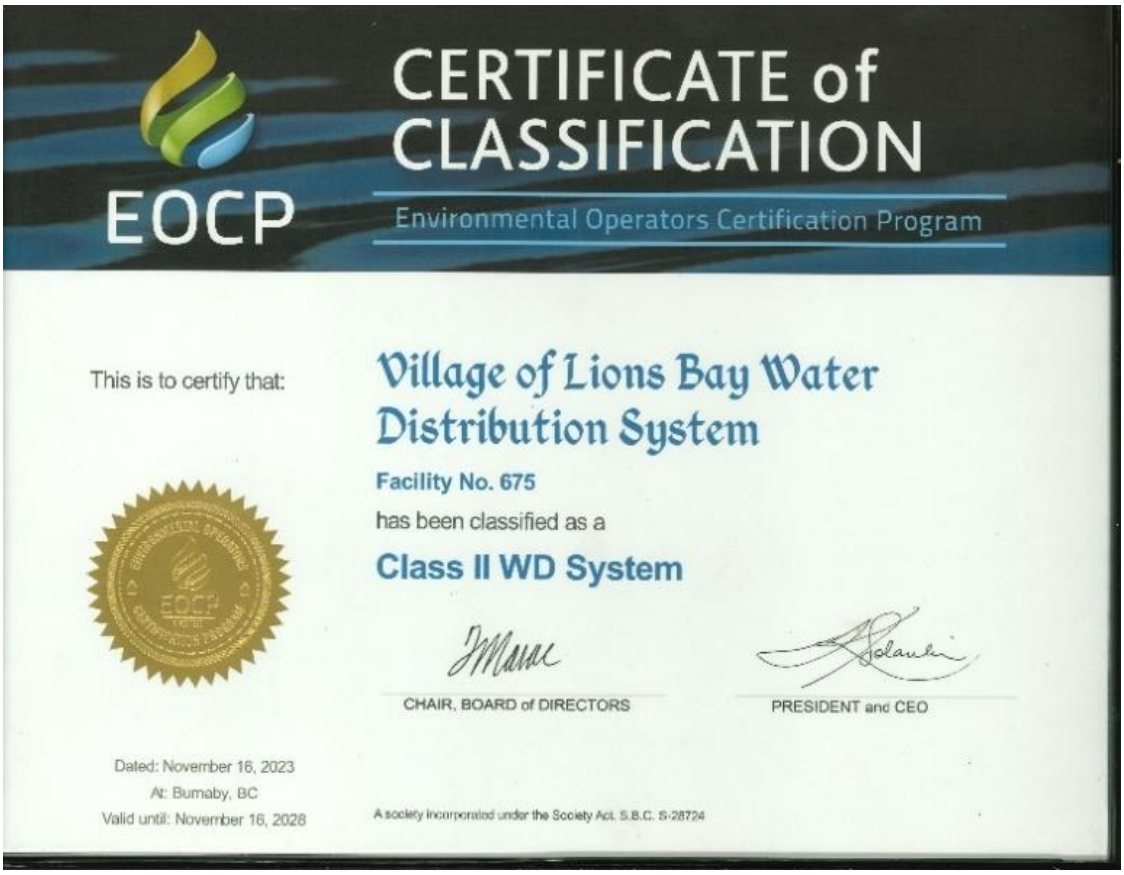
DATE	HARVEY CREEK		MAGNESIA CREEK	
	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)
30-Apr	0.05	0.05	0.08	0.08
01-May	0.05	0.05	0.07	0.07
07-May	0.06	0.05	0.11	0.09
09-May	0.06	0.06	0.09	0.10
10-May	0.09	0.07	0.15	0.12
11-May	0.09	0.09	0.25	0.20
12-May	0.08	0.08	0.26	0.25
13-May	0.07	0.07	0.16	0.21
14-May	0.06	0.06	0.14	0.15
15-May	0.06	0.06	0.13	0.14
16-May	0.07	0.07	0.20	0.17
17-May	0.06	0.07	0.13	0.17
18-May	0.07	0.07	0.13	0.13
19-May	0.06	0.07	0.14	0.14
20-May	0.06	0.06	0.10	0.12
21-May	0.09	0.07	0.11	0.10
22-May	0.12	0.10	0.25	0.18
23-May	0.06	0.09	0.13	0.19
24-May	0.06	0.06	0.12	0.12
25-May	0.06	0.06	0.12	0.12
26-May	0.06	0.06	0.11	0.11
27-May	0.06	0.06	0.11	0.11
28-May	0.08	0.07	0.21	0.16
29-May	0.06	0.07	0.19	0.20
31-May	0.05	0.06	0.10	0.15
01-Jun	0.06	0.05	0.11	0.11
02-Jun	0.09	0.07	0.28	0.20
03-Jun	0.22	0.15	1.39	0.84
04-Jun	0.13	0.18	7.99	4.69
05-Jun	0.09	0.11	4.44	6.21
06-Jun	0.07	0.08	0.22	2.33
07-Jun	0.07	0.07	0.17	0.19
08-Jun	0.07	0.07	0.18	0.18
09-Jun	0.07	0.07	0.20	0.19
10-Jun	0.07	0.07	0.20	0.20
11-Jun	0.07	0.07	0.18	0.19
12-Jun	0.06	0.06	0.14	0.16
13-Jun	0.10	0.08	0.14	0.14
14-Jun	0.06	0.08	0.13	0.13
15-Jun	0.06	0.06	0.12	0.12
16-Jun	0.06	0.06	0.12	0.12
17-Jun	0.06	0.06	0.10	0.11
18-Jun	0.06	0.06	0.10	0.10
19-Jun	0.07	0.06	0.11	0.11
20-Jun	0.07	0.07	0.13	0.12
21-Jun	0.06	0.07	0.13	0.13
22-Jun	0.06	0.06	0.13	0.13
23-Jun	0.06	0.06	0.11	0.12
24-Jun	0.06	0.06	0.10	0.11
25-Jun	0.06	0.06	0.11	0.10
26-Jun	0.06	0.06	0.12	0.11
27-Jun	0.07	0.07	0.15	0.13
28-Jun	0.06	0.06	0.12	0.14
29-Jun	0.06	0.06	0.10	0.11
30-Jun	0.06	0.06	0.10	0.10
01-Jul	0.06	0.06	0.10	0.10
02-Jul	0.06	0.06	0.10	0.10
03-Jul	0.05	0.06	0.10	0.10
04-Jul	0.06	0.06	0.10	0.10
05-Jul	0.06	0.06	0.10	0.10
06-Jul	0.06	0.06	0.21	0.15

DATE	HARVEY CREEK		MAGNESIA CREEK	
	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)
07-Jul	0.06	0.06	0.10	0.15
08-Jul	0.06	0.06	0.10	0.10
09-Jul	0.06	0.06	0.09	0.10
10-Jul	0.05	0.06	0.09	0.09
11-Jul	0.05	0.05	0.09	0.09
12-Jul	0.05	0.05	0.09	0.09
13-Jul	0.05	0.05	0.08	0.09
14-Jul	0.05	0.05	0.08	0.08
15-Jul	0.05	0.05	0.08	0.08
16-Jul	0.04	0.05	0.08	0.08
17-Jul	0.05	0.05	0.08	0.08
18-Jul	0.04	0.04	0.08	0.08
19-Jul	0.04	0.04	0.08	0.08
20-Jul	0.04	0.04	0.07	0.07
21-Jul	0.04	0.04	0.07	0.07
22-Jul	0.04	0.04	0.07	0.07
23-Jul	0.04	0.04	0.07	0.07
24-Jul	0.04	0.04	0.07	0.07
25-Jul	0.04	0.04	0.07	0.07
26-Jul	0.04	0.04	0.06	0.06
27-Jul	0.04	0.04	0.06	0.06
28-Jul	0.04	0.04	0.06	0.06
29-Jul	0.05	0.04	0.08	0.07
30-Jul	0.05	0.05	0.07	0.08
31-Jul	0.05	0.05	0.06	0.07
01-Aug	0.04	0.04	0.06	0.06
02-Aug	0.04	0.04	0.06	0.06
03-Aug	0.04	0.04	0.06	0.06
04-Aug	0.05	0.05	0.06	0.06
05-Aug	0.04	0.05	0.06	0.06
06-Aug	0.04	0.04	0.06	0.06
07-Aug	0.04	0.04	0.06	0.06
08-Aug	0.04	0.04	0.06	0.06
09-Aug	0.04	0.04	0.06	0.06
10-Aug	0.04	0.04	0.06	0.06
11-Aug	0.04	0.04	0.06	0.06
12-Aug	0.04	0.04	0.06	0.06
13-Aug	0.04	0.04	0.06	0.06
14-Aug	0.04	0.04	0.06	0.06
15-Aug	0.10	0.07	0.41	0.23
16-Aug	0.04	0.07	0.06	0.23
17-Aug	0.04	0.04	0.06	0.06
18-Aug	0.04	0.04	0.07	0.06
19-Aug	0.03	0.04	0.05	0.06
20-Aug	0.05	0.04	0.05	0.05
21-Aug	0.04	0.05	0.05	0.05
22-Aug	0.05	0.05	0.09	0.07
23-Aug	0.06	0.06	0.06	0.08
24-Aug	0.19	0.13	0.23	0.14
25-Aug	0.04	0.12	0.07	0.15
26-Aug	0.06	0.05	0.06	0.06
27-Aug	0.07	0.07	0.09	0.07
28-Aug	0.04	0.06	0.06	0.07
29-Aug	0.06	0.05	0.05	0.05
30-Aug	1.12	0.59	0.06	0.05
31-Aug	0.25	0.68	0.05	0.05
01-Sep	0.21	0.23	0.05	0.05
02-Sep	0.19	0.20	0.05	0.05
04-Sep	0.14	0.16	0.05	0.05
05-Sep	0.03	0.09	0.06	0.05
06-Sep	0.03	0.03	0.06	0.06

DATE	HARVEY CREEK		MAGNESIA CREEK	
	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)
07-Sep	0.04	0.03	0.05	0.05
08-Sep	0.03	0.03	0.06	0.05
09-Sep	0.03	0.03	0.07	0.06
10-Sep	0.03	0.03	0.05	0.06
11-Sep	0.03	0.03	0.05	0.05
12-Sep	0.03	0.03	0.05	0.05
13-Sep	0.03	0.03	0.05	0.05
14-Sep	2.40	1.22	0.07	0.06
15-Sep	0.06	1.23	0.05	0.06
16-Sep	0.14	0.10	0.05	0.05
17-Sep	0.18	0.16	0.05	0.05
18-Sep	0.06	0.12	0.05	0.05
19-Sep	0.04	0.05	0.05	0.05
20-Sep	0.03	0.03	0.04	0.04
21-Sep	0.03	0.03	0.05	0.04
22-Sep	0.03	0.03	0.05	0.05
23-Sep	0.03	0.03	0.06	0.05
24-Sep	0.03	0.03	0.05	0.05
25-Sep	0.11	0.07	0.22	0.13
26-Sep	0.06	0.08	0.09	0.15
27-Sep	0.05	0.05	0.07	0.08
28-Sep	0.04	0.05	0.06	0.06
29-Sep	0.03	0.04	0.05	0.06
30-Sep	0.03	0.03	0.04	0.05
01-Oct	0.03	0.03	0.05	0.05
02-Oct	0.03	0.03	0.04	0.05
03-Oct	0.03	0.03	0.04	0.04
04-Oct	0.13	0.08	0.11	0.08
05-Oct	0.05	0.09	0.05	0.08
06-Oct	0.04	0.04	0.05	0.05
07-Oct	0.03	0.03	0.05	0.05
08-Oct	0.03	0.03	0.05	0.05
09-Oct	0.04	0.04	0.05	0.05
10-Oct	0.04	0.04	0.08	0.06
11-Oct	0.03	0.04	0.05	0.06
12-Oct	0.03	0.03	0.04	0.05
13-Oct	0.03	0.03	0.04	0.04
14-Oct	0.11	0.07	0.08	0.06
15-Oct	0.08	0.09	0.06	0.07
16-Oct	0.05	0.06	0.13	0.10
17-Oct	0.05	0.05	0.10	0.11
18-Oct	0.26	0.16	0.08	0.09
19-Oct	0.97	0.62	1.97	1.02
20-Oct	0.23	0.60	1.18	1.57
21-Oct	0.13	0.18	0.88	1.03
22-Oct	0.08	0.10	0.18	0.53
23-Oct	0.06	0.07	0.12	0.15
24-Oct	0.42	0.24	0.10	0.11
25-Oct	0.35	0.39	0.08	0.09
26-Oct	0.47	0.41	0.17	0.12
27-Oct	0.46	0.46	0.24	0.20
28-Oct	0.44	0.45	0.11	0.18
29-Oct	0.48	0.46	0.09	0.10
30-Oct	0.38	0.43	0.11	0.10
31-Oct	0.38	0.38	0.09	0.10
01-Nov	0.20	0.29	0.08	0.08
02-Nov	0.27	0.23	0.07	0.08
03-Nov	0.27	0.27	0.07	0.07
04-Nov	0.35	0.31	0.43	0.25
05-Nov	0.09	0.22	0.10	0.27
06-Nov	0.29	0.19	0.07	0.09

DATE	HARVEY CREEK		MAGNESIA CREEK	
	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)	AVERAGE TURBIDITY MEASURED EVERY 15 S	ROLLING 2-DAY AVERAGE TURBIDITY (>5 HIGHLIGHTED)
07-Nov	0.26	0.27	0.09	0.08
08-Nov	0.29	0.27	0.12	0.11
09-Nov	0.33	0.31	0.27	0.20
10-Nov	0.28	0.30	0.18	0.23
11-Nov	0.88	0.58	8.40	4.29
12-Nov	0.17	0.52	4.17	6.28
13-Nov	0.70	0.44	0.61	2.39
14-Nov	0.17	0.44	1.09	0.85
15-Nov	0.10	0.14	0.28	0.68
16-Nov	0.08	0.09	0.17	0.22
17-Nov	0.07	0.08	0.14	0.16
18-Nov	0.06	0.07	0.11	0.13
19-Nov	0.11	0.08	0.11	0.11
20-Nov	0.11	0.11	0.15	0.13
21-Nov	0.07	0.09	0.10	0.13
22-Nov	0.07	0.07	0.12	0.11
23-Nov	0.09	0.08	0.15	0.13
24-Nov	0.06	0.07	0.10	0.12
25-Nov	0.05	0.05	0.09	0.09
26-Nov	0.05	0.05	0.08	0.08
27-Nov	0.04	0.05	0.08	0.08
28-Nov	0.08	0.06	0.08	0.08
29-Nov	0.05	0.06	0.07	0.07
30-Nov	0.04	0.05	0.07	0.07
01-Dec	0.04	0.04	0.07	0.07
02-Dec	0.04	0.04	0.07	0.07
03-Dec	0.04	0.04	0.07	0.07
04-Dec	0.06	0.05	0.08	0.07
05-Dec	0.05	0.06	0.08	0.08
06-Dec	0.07	0.06	0.07	0.08
07-Dec	0.16	0.11	0.32	0.20
08-Dec	0.07	0.12	0.19	0.26
09-Dec	0.06	0.07	0.59	0.39
10-Dec	0.05	0.05	0.09	0.34
11-Dec	0.05	0.05	0.08	0.08
12-Dec	0.05	0.05	0.07	0.08
13-Dec	0.10	0.07	0.10	0.09
14-Dec	0.31	0.20	0.80	0.45
15-Dec	0.08	0.19	0.20	0.50
16-Dec	0.05	0.07	0.10	0.15
17-Dec	0.10	0.08	0.12	0.11
18-Dec	0.20	0.15	0.98	0.55
19-Dec	0.09	0.14	0.30	0.64
20-Dec	0.08	0.08	0.30	0.30
21-Dec	0.09	0.08	0.33	0.32
22-Dec	0.10	0.09	0.26	0.29
23-Dec	0.10	0.10	0.23	0.25
24-Dec	0.07	0.09	0.15	0.19
25-Dec	0.08	0.08	0.14	0.15
26-Dec	0.11	0.09	0.25	0.20
27-Dec	0.06	0.08	0.14	0.19
28-Dec	0.07	0.07	0.12	0.13
29-Dec	0.05	0.06	0.10	0.11
30-Dec	0.05	0.05	0.10	0.10
31-Dec	0.05	0.05	0.10	0.10

APPENDIX 10: CERTIFICATIONS



EOCP

CERTIFICATE of CLASSIFICATION

Environmental Operators Certification Program

This is to certify that:

Village of Lions Bay Water Distribution System

Facility No. 675

has been classified as a

Class II WD System

CHAIR, BOARD of DIRECTORS

PRESIDENT and CEO

Dated: November 16, 2023
At: Burnaby, BC
Valid until: November 16, 2028

A society incorporated under the Society Act. S.B.C. S-28724

EOCP

CERTIFICATE of CLASSIFICATION

Environmental Operators Certification Program

This is to certify that:

Village of Lions Bay - Magnesia Water Treatment Plant

Facility No. 2330

has been classified as a

Class I WT Facility

CHAIR, BOARD of DIRECTORS

PRESIDENT and CEO

Dated: November 16, 2023
At: Burnaby, BC
Valid until: November 16, 2028

A society incorporated under the Society Act. S.B.C. S-28724


EOCP
CERTIFICATE of CLASSIFICATION
Environmental Operators Certification Program
This is to certify that:
Village of Lions Bay - Harvey Water Treatment Plant
Facility No. 2329
has been classified as a
Class I WT Facility
CHAIR, BOARD of DIRECTORS
PRESIDENT and CEO
Dated: November 16, 2023
At: Burnaby, BC
Valid until: November 16, 2028
A society incorporated under the Society Act, S.B.C. S-28724

Type	**Committee Review Document.**			
Title	**Water Distribution System Corrosion Potential and Solution Options.**			
Author	**Anthony Greville**	**Reviewed By:**	**Karl Buhr**	
Date	**September 18 2025**	**Version**		
Issued for	**I.C. Meeting of 30 September, 2025.**			

Discussion:

Introduction to Corrosion.

Municipal water purveyors are required to provide to end users water that meets the requirements of the *Guidelines for Canadian Drinking Water Quality* document as published by Health Canada. Generally, it is not enough to produce water that meets the requirements as it leaves the treatment facility; the municipality must also ensure water quality is maintained until the point of consumption. This means the water must be free from pathogens (so no biological re-growth in the distribution system – hence the need to add sodium hypochlorite after UV disinfection) and must also be non-corrosive, to prevent the leaching of iron, copper and lead etc., into the water.

Lions Bay has an issue with the corrosivity of our finished water as it leaves both water treatment plants. The Vancouver Coastal Health inspector requires the Village provide a caution notice to the Village residents outlining concerns relating to the potential presence of lead in the water due to corrosion in older homes. VCH also requires West Vancouver to provide their residents with a similar notice.

One measurement of corrosion is the Langelier Stability Index, LSI, which uses pH, carbonate and bicarbonate alkalinity, calcium hardness, conductivity, and temperature to determine corrosion potential. A more complicated AWWA corrosion index calculator is also available; the corrosion potential indexes obtained from both methods are comparable. In essence, the LSI is an indication of chemical stability, and should, ideally, be zero. A positive number means the water is scaling and a negative number means it is corrosive. It is generally accepted that a water slightly positive, less than +0.5, is ideal, as a protective $CaCO_3$ layer can be laid down on the internal pipe surfaces. A slightly negative response, again less than – 0.5 is also considered acceptable. I wrote a paper in 2024, which averaged several years of data to determine Lions Bay's finished water had an LSI of – 3.9. A more recent review, undertaken by the DOO, of the 2024 Village data, shows a range of LSI results between – 2.7 and – 4.1.

It is important to recognize the role that pH plays in determining the corrosivity of any water; it makes intuitive sense that acidic water will dissolve metal pipes. However, the reality is always more complicated, and while we have discussed elevating pH to control corrosion, the real discussion should be centered around both elevating pH and, perhaps, more significantly, enhancing hardness and bicarbonate alkalinity to arrest corrosion.

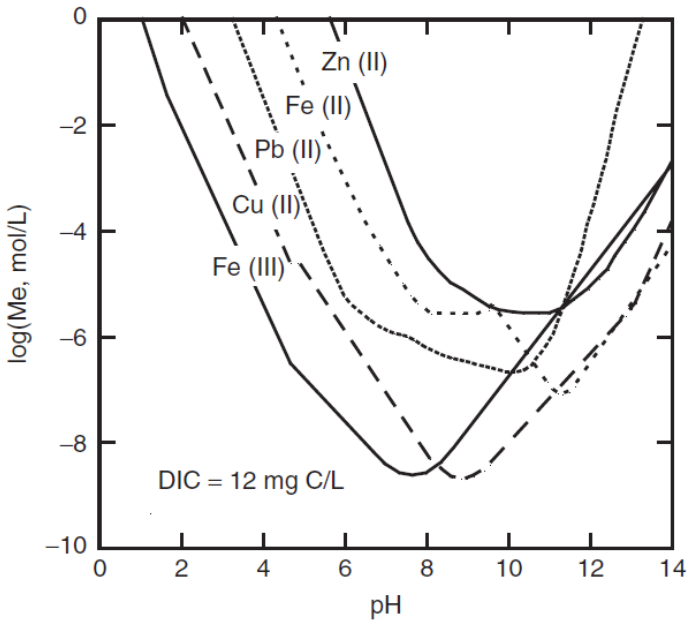


Figure 22-17
Solubility of principal corrosion cations.

The figure above, drawn from *MWH's Water Treatment: Principles and Design, Third Edition*, 2012 John Wiley & Sons, Inc. shows the solubility of various metals as a function of pH. We should strive to be at the bottom of the curves, or slightly to the right, (look for the lead, Pb, curve) where solubility is lowest. Lions Bay has a slightly acidic water with a pH values ranging between 6.7 – 7.3.

Of note in the figure above, is the comment the curve lines are representative when the DIC loading is at 12 mg C/L. DIC is an acronym for Dissolved Inorganic Carbon, or carbon associated with carbonate and bicarbonate alkalinity. The key point being, there must be carbonate and bicarbonate alkalinity present to mitigate the corrosive nature of water.

Corrosive Waters in British Columbia.

Lions Bay, and many, if not most, other coastal communities, and many interior communities utilizing rivers sourcing from highland snowmelt, enjoy the benefits of fresh spring water that tastes wonderful, soap lathers well, glass is always clean looking and it does not feel like drinking chalk.

While these waters are indeed good to drink, and require little treatment, the one downside is these sources are of low pH, do not carry any hardness (which some consider a benefit) alkalinity, or minerals that contribute conductivity (again, some consider this a benefit) and which are mostly corrosive to very corrosive.

Location	Water Source	LSI
Lions Bay	Harvey Creek	-3.9
Port Hardy	Tsulquate River	-0.44
SCFP	Seymour River	- 4.8
BMID (Kelowna)	Mission Creek	-2.5
Penticton	Penticton Creek	-2.6
Many Communities	Okanagan Lake	+0.3

There is an issue to attend to, and in fact, just about all the coastal and interior communities do indeed address corrosion potential in their treatment strategies. Recently, the Lions Bay Public Works personnel visited Metro Vancouver's Seymour Capilano Filtration Plant (SCFP), in North Vancouver, where they saw firsthand the very considerable effort necessary to distribute a chemically stable finished water.

There are several options when it comes to treating a chemically unstable and corrosive water to make it chemically stable and both non-corrosive and non-scaling. These options generally require the addition of chemicals; however, on balance, adding baking soda to potable water supplies is considered preferable to adding lead!

The option Penticton has taken is to blend corrosive Penticton Creek water with scaling Okanagan Lake water to generate a stable and refreshing water. It is interesting to note the residents can taste the difference when the ratio of Lake water increases in the summer months when Creek flow is reduced; the residents always complain the taste has changed and is worse! Lions Bay does not enjoy the possibility of employing creek and lake sources.

So, from a chemical perspective, the commonly considered options to control corrosion include calcium hydroxide (slaked lime), calcium carbonate (limestone), sodium carbonate (soda ash) sodium bicarbonate (baking soda), sodium hydroxide (caustic soda) and zinc ortho-polyphosphate.

The objective in Lions Bay (but not necessarily everywhere, as all waters are different) is to add some calcium hardness, some bicarbonate alkalinity and elevate pH. Metro Vancouver and Port Hardy have similar goals. West Vancouver and Vernon have taken a slightly different tack, and as mentioned, Penticton blend two water sources.

<u>Chemical Options to Condition Chemically Unstable Corrosive Waters.</u>

- Calcium hydroxide, lime, [$Ca(OH)_2$] will elevate pH, add calcium hardness and hydroxide alkalinity, but will not contribute to carbonate alkalinity. Metro Vancouver's SCFP, in North Vancouver, and utilizes lime, but also adds carbon dioxide after lime treatment as a "re-carbonation" step to lower pH and generate the necessary carbonate alkalinity.

- Calcium carbonate, limestone, [$CaCO_3$] will elevate pH, add calcium hardness, and carbonate alkalinity.

- Sodium carbonate, soda ash, [Na_2CO_3] will elevate pH, add carbonate alkalinity but will not add calcium hardness.

- Lime plus soda ash – often considered to be the best option!

- Sodium hydroxide, caustic soda, [NaOH] will elevate pH, add hydroxide alkalinity, but does not add carbonate alkalinity or calcium hardness.

- Zinc ortho-polyphosphate (Zn O-PO_4) is a different approach, whereby an inorganic protective film is laid down on the internal surfaces of the pipe which physically prevents the corrosive water from contacting the metallic pipe (a little like painting the hull on a metal boat) preventing the initial formation of a corrosion cell.

In terms of adding alkalinity to treated water to mitigate the effects of corrosion, the table below offers the generally accepted alkalinity benefits.

Chemical Option	Alkalinity added for each 1 mgL^{-1} added. (as mgL^{-1} $CaCO_3$)
Calcium carbonate ($CaCO_3$)	1.0
Calcium hydroxide ($Ca(OH)_2$)	1.35
Sodium carbonate (Na_2CO_3)	0.94
Sodium Bicarbonate ($NaHCO_3$)	0.71
Sodium Hydroxide (NaOH)	1.25
Sodium Hypochlorite (NaOCl)	pH dependent, but some.

Treatment Options Employed by other Communities.

Most of the treatment options described above have found utility in the local B.C. marketplace.

Zn O-PO_4 is the treatment option of choice for the Duteau Creek WTP that supplies Vernon, and it was initially the best option when West Vancouver opened its WTP at Eagle Lake. WV has since discontinued the use fo Zn O-PO_4 in favour of adding sodium hydroxide only. This is a less expensive option, however the District is now required to add a lead corrosion caution to their Annual Report. Eagle Lake WTP does add soda ash ahead of their membrane filters to add alkalinity to allow for efficient coagulation to occur. One would suspect Zn O-PO_4 is would not be an acceptable choice for many Lions Bay residents, and the extensive use of septic tanks might also make this a less attractive option for the Village.

The Sunshine Coast Regional District runs several WTPs between Gibsons and Pender Harbour, with the largest, and most significant, being the Chapman Creek WTP in Sechelt. The SCRD raw water source is alkalinity limited, and at Chapman Creek WTP two separate supplemental alkalinity feed points are necessary. Soda ash, sodium carbonate, is delivered as a dry granular product in bulk and is made down to a 12% liquid on site. Soda ash is added at the front of the plant to provide the alkalinity required to allow the coagulation reactions to proceed, but only in controlled quantities to maintain an optimum pH for organic insolubility and secondary disinfection with on-site generated hypochlorite. Post treatment additions of soda ash are made to ensure a stable and non-corrosive finished water.

Port Hardy and Metro Vancouver, at the Seymour-Capilano Filtration Plant (SCFP), both employ calcium hydroxide (lime) to stabilize their finished waters. Both facilities also employ sodium hypochlorite for secondary disinfection and re-carbonate with CO_2 gas.

Physical Parameter	Port Hardy		Metro Vancouver - SCFP	
	Raw	Finished	Raw	Finished
pH	6.5	7.8	6.5	8.5
Alkalinity	2	30	4	21
Hardness	5	20	1	10
Calcium			4	22
Conductivity			12	55

The sections following describe Lions Bay's raw water; the similarities will be obvious.

To achieve increased stability, Port Hardy adds lime and, like SCFP, re-carbonates with gaseous carbon dioxide. At Port Hardy, lime is added at a rate of up to 40 mgL^{-1}, however, the annual average is closer to 20 mgL^{-1}. Similar to Lions Bay, Port Hardy draws from a river source which is fed from a lake. Water quality fluctuates widely, as a function of heavy rains and seasonally dry weather, with the summer being the easiest time of the year.

Metro Vancouver enjoys the benefits of two very large raw water reservoirs (Capilano and Seymour Lakes) each of which contain up to 3 years supply of water. While raw water quality for SCFP does fluctuate, the large reservoirs moderate the effects, allowing for a more uniform operating protocol. Should one raw water source deteriorate in quality, due to a mud slide or similar, it is relatively easy to discontinue using that source until raw water quality improves.

Lions Bay is in the process of adopting this operating protocol as we have 3 raw water sources from which to draw.

<u>Alkalinity and pH Enhancement Chemical Feed Point.</u>

A short note concerning the necessary pH profile across a treatment plant. In the comments above, there is mention of dual feed points for alkalinity enhancing chemicals. As a consequence of the debacle at Flint, Michigan in 2014/5, Health Canada elevated the pH requirement range in their potable water quality guidelines. Many municipalities subsequently found it necessary to introduce chemical alkalinity to elevate pH to mitigate any possible lead corrosion potential. This was the proper response.

Alkalinity and pH are also necessary chemical parameters required to effect good coagulation to remove harmful organic contaminants (and any DBP precursors) present in the raw water. The issue is that organic instability (a good thing) and coagulant efficacy are optimized at a pH 6.0 – 6.5. Further, chlorine efficacy is also optimized in lower pH conditions. The GCDWQ requires a minimum pH of 7.0, and most municipal purveyors, to be on the safe side, like to operate at a pH of greater than 7.5. Clearly corrosion potential, and LSI calculations etc., played a role in determining the necessary increase in the pH of the finished water.

To manage the plant in the face of conflicting requirements – low pH for coagulation and disinfection, and higher pH for corrosion control and regulatory compliance, it is necessary to carefully manage the pH profile within the plant and during disinfection, while adding any alkalinity enhancement for corrosion control after final treatment.

The municipalities mentioned here, and just about all others in B.C. (and along the west coast of North America from Anchorage to San Diego) will clarify and filter their water at ambient pH, or even lower, which is often less than 7.0, disinfect via UV radiation, and add chlorine (increasingly as sodium hypochlorite) at this lower pH. Mixing is required to ensure the hypochlorous acid (and not hypochlorite ion, predominant at pH greater than 7.5) will kill any remaining resistant viruses (adenovirus) after UV disinfection. Once this has been achieved, alkalinity enhancing chemicals can be added at the inlet of the clearwell to allow for aqueous stabilization (distribution system corrosion control) during clearwell retention.

Lions Bay does not have clearwells as such; the two storage tanks, one at each plant, provide chlorine CT residence time, so should remain at as low a pH as possible. Any pH and alkalinity adjustment would ideally take place after the tanks, and ahead of an in-line static mixer.

A free chlorine residual is required in the treated water. The guideline is the chlorine residual must be greater than 0.2 mgL^{-1} at the last end user. This requires a higher addition rate, and a higher free chlorine residual, at the water treatment plant injection point (chlorine decay is a conversation for a different day) often close to, or greater than, 1.0 mgL^{-1} to ensure a biologically stable water. A pH of greater than 7.5, with associated alkalinity concentrations (plus conductivity and very temperature dependent) are required for chemical stability.

UV – NaOCl – mixing - $Ca(OH)_2$ or Na_2CO_3 – clearwell – retention time – stable water.

<u>Best Alkalinity and pH Enhancement Options for Lions Bay.</u>

For Lions Bay, the DOO has prepared the following table, derived from the 2024 full chemical bi-annual analyses, which show some seasonal fluctuations in raw water quality.

	Harvey Creek	**Magnesia Creek**
pH	6.5 – 7.0	6.5 – 7.0
Alkalinity	3.5 – 6.0	4.5 – 5.5
Hardness	4.0 – 6.0	9.0 – 20.0
Conductivity	10 - 15	20 – 30
Langelier Stability Index	-3.0 - -4.0	-2.5 - -3.5

The similarities to Port Hardy and Metro Vancouver are clear, and if comparisons were to be considered against raw water samples from Hadia Gwaii, to Summerland to Radium Hot Springs, Tofino, the Okanagan Valley, Sunshine Coast and Gulf Islands, it would be apparent that Lions Bay is by no means unique. The solutions to our water treatment concerns are well known and well developed. We know what to do!

The objective is to elevate the pH to greater than 7.5, and alkalinity to 40 – 50 mgL^{-1}.

	Langelier Stability Index	**AWWA Corrosion Index**
pH	7.8	7.8
Alkalinity	45	45
Hardness	35	35
Conductivity	100	100
Temperature	5	5
Corrosion Index	**-1.0**	**-0.96**

If we input the parameters shown in the table above into a Langelier Stability Index calculator, and into the AWWA corrosion index calculator, the resultant finished water corrosivity improves from as low as -4.5 to -1.0, which for Lions Bay, would probably be reasonable.

Alkalinity is expressed as calcium carbonate equivalents (no need to get into this here), but what this means in effect is the hardness of 35 mgL^{-1} as $CaCO_3$ is equivalent to 14 mgL^{-1} of calcium as ionic calcium.

Conventional wisdom would suggest Lions Bay strongly consider either adding soda ash or lime. To a certain extent it is 6 of one and half a dozen of the other. Lime additions might be the better technical fit, while soda ash is less expensive, much easier to feed and handle, and less abrasive in the plant setting.

It should be emphasised that Lions Bay has a highly corrosive water and that lead and copper corrosion is experienced in the municipal buildings and in older home with copper piping and lead/tin solder. Newer homes with Poly B or PEX water lines are less susceptible to corrosion. However, in addition to residence sourced corrosion, Village infrastructure in the water mains is also being corroded (CUBB 3 project is $1.3 mm for 2026 budget year). Proper water treatment will benefit the Village in terms of basic infrastructure longevity and maintenance expenses, and the residents in terms of improved finished water quality for some (less Fe, Cu and Pb) and improved taste and odour for all.

<u>Dosage Calculations.</u>

As a starting point, to increase alkalinity in the finished water from a raw water concentration of 4 mgL^{-1} (as $CaCO_3$) to 35 mgL^{-1} (as CaCO3), a lime addition rate of 26 mgL^{-1} or 35 mgL^{-1} of either soda ash or calcium carbonate will be required.

On a daily basis, in the winter, assuming 250,000 usgpd or 1.00 MLD demand, the daily demand of alkalinity chemical will be 26 - 35 Kg, system wide, so a little over one bag per day. If this was to be made down into a 10% solution, then daily volume would be 350 litres, spread over 2 plants. This would be a reasonable increase in operator time as a 500 litre tank in each plant would last for 2 days, meaning the operator would have to dissolve a bag of chemical once every two days.

The summer time, or when one plant is off line, will require extra operator time. If peak demand is 500,000 usg, so 2.00 MLD, and only one plant is running, sodium carbonate requirements would be close to 70 Kg a day, or 700 litres as a 10% solution. In the warmer temperatures, solubility is increased, up to as much as 20% solubility. A summertime solution of 14% would be manageable, but it would require 3 bags of soda ash to be made up every day into a 500 litre tank.

Smaller feeders are readily available in the market place; a 500 litre tank with a mixer and feed pump can be sourced for many and varied vendors. I have attached a brochure from Neptune for context; there are plenty of other local vendors to contact.

A point that is perhaps beyond the scope of this report is the potential for the water plants to be unmanned for an extended period over long weekends and other statutory holidays (Christmas etc.). The comments above have been predicted on a smaller 500 L make down tank, which could be fitted into the existing floor plants of the treatment plants. Should this be impractical, due to the need to set up the system for a 4 day gap between operator visits, then a 2,000 L tank (500 usg) might be more appropriate.

It should be possible to purchase a larger 2,000 L tank with a similar footprint as the smaller tank 500 L tank size if there is enough height in the buildings. A larger tank will not only address the issue of weekend coverage in the summer, but will also provide additional comfort and security during the winter months if heavy rain or snow prevent PWD personnel from accessing the roads due to WSBC restrictions etc.

Barr Plastics in Abbotsford offers this 500 usg (1,893 L) for $1,213.18 CAD.

These chemical solutions are temperature sensitive, and the usual “rule of thumb” is that all solutions should be stored in a clean and dry room, out of direct sunlight and maintained above 12^0 C. Spill containment would be necessary, although since these materials are basic,

and sodium hypochlorite is also shipped at a pH greater than 11.0, (and is stabilized with 0.5% NaOH added) alkalinity and sodium hypochlorite can be stored in the same room.

Budget Pricing.

I believe Lions Bay has a purchasing agreement with West Vancouver, or even Metro Vancouver, whereby the Village can purchase supplies at the same price as West Vancouver. If this protocol is still in effect, I would recommend a quick telephone call be made to the DoWV to determine their current delivered costing for sodium carbonate and sodium hydroxide. A similar telephone call could be made to either SCFP, Metro Vancouver Purchasing Dept., and even Port Hardy, to determine current lime market pricing to larger municipalities.

Both lime and soda ash, plus calcium carbonate, are best purchased in a dry granular form and made down to 10 – 15% solutions using a feeder. Economically this is by far the best option. However, dry product being made into a slurry does require operator attention. 25 Kg bags could be inventoried in the PWB and taken up to the WTPs as needed, but at certain times of the year, this could be on a daily basis.

Liquid soda ash, and liquid caustic are standard products. Soda ash as a 10 – 12% solution and caustic as either a 25% or 50% product. Lime slurries are newer to the marketplace.

At the present time there is a liquid calcium carbonate product available but it is not NSF certified for use in potable water; currently the liquid version it is only available for wastewater treatment and industrial applications. The dry granular product is an option for Lions Bay.

Another consideration for Lions Bay to factor into alkalinity enhancement dosage rates, feed equipment and overall costing is the ability to predict water demand, and therefore chemical consumption. In times past, the greater water demand in Lions Bay has been excessive, often 4 times the provincial and nation per capita daily average.

Recently, due to the efforts of the PWD, non-revenue water losses have been contained (or water leaks have been plugged!), lowering winter demand to only twice the local and national average. With universal water metering less than 18 months away, raw water demand at the treatment plants should be reduced further, as all leaks should be quickly identified and repaired, but more importantly, flow through the WTP's should be predictable.

A lower and predictable raw water demand curve will lower chemical costs and allow for improved, and more cost effective manpower assignments and labour costs.

Committee Recommendation:

The Infrastructure Committee recommends that Council commence planning to correct the Lions Bay water chemistry to bring finished water quality into alignment with Vancouver Coastal Health directives/requirements relative to the guideline values for pH and alkalinity, with the goal of reducing treated water corrosivity and the enhancing taste of water delivered to residents.

Each of the two water treatment plants may have to be upgraded as described.

1,500 – 1,900 L mixing tank, with redundancy for chemical feed pumping, room or immersion heater to ensure non-saturated solution does not precipitate in the colder month, a freshwater make-down water line, 25 kg bag storage handling provisions.

Test equipment and operator training for simple alkalinity titrations in the PWD laboratory.

SCADA upgrades to include tank outlet flowmeter to control dosing and plant lockout while solution is being made down.

Mechanical - major (rearrange chlorine room to fit lime or soda ash handling; if not possible, we need a new shed.

Electrical: minor (assuming supply sufficient) Civil: moderate (trenching, vault)

Project SCORE (SCADA Operations Rework), 300,000 budget (bold actual)

	Supplier	General	KG	LBA	BB	Mag	Harvey	Total <GST
DELIVERED								
Chlorine analizer at KG control room	Endress-Hauser		8,696					8,696
MAGIIC	-							-
UVT analyser	Endress-Hauser					**27,727**		27,727
Add NTU function	Endress-Hauser					8,888		8,888
Mag power and data	Corporate Electric					**52,993**		52,993
SCADA connectivity	C-P Automation					16,781		16,781
Mag intake misc electrical	Corporate Electric					5,720		5,720
Replacement SCADA computer	In-house (Amazon)	1,200						1,200
Flowrate control rather than pressure control	ClaVal (proprietary)					4,368	4,368	8,736
Mountain FCV direction indication		980						
COMMITTED								-
System-end chlorine/turbidity stations								-
Analysers	Endress-Hauser			22,271	22,271			44,542
Kiosk	Gescan/Valid			4,210	4,210			8,420
Hydro meter and breaker panels	Gescan/Valid			3,647	3,647			7,294
BCH drop	via C-E			3,600	3,600			7,200
Trench and lay conduit from pole to kiosk	inhouse conduit, hydrovac			300	300			600
Pave trench	BA			800	800			1,600
Concrete pad including plumbing	inhouse mix and pour			200	200			400
Cell modem or fiber data apputenances				800	800			1,600
Centrix commisioning				967	967			1,933
Replace KG chlorine/ph unit with E-H chlorine, NTU, pH			22,271					22,271
Move surplus unit to suitable zone (6?)			3,333					3,333
		2,180	34,300	36,795	36,795	116,478	4,368	229,935
FUTURE								
HAWAII								
Control shack							5,555	5,555
Direct-bury power, data cable							50,000	50,000
Trenching, pull boxes							12,500	12,500
UVT/NTU/particle size sensors (for filtration planning)							44,444	44,444
Electrical, SCADA							16,000	16,000
								128,499
							Unspent of 300,000	- 70,065
							2026 budget request	58,434