SQUAMISH
HARDWIRED *for* ADVENTURE

2019 DRINKING WATER QUALITY

ANNUAL REPORT

DISTRICT OF SQUAMISH
June 2020
FINAL

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Executive Summary

This report details the District of Squamish's drinking water supply and distribution water program for 2019. The District of Squamish is located within the Squamish Nation Traditional Territory. The District of Squamish's Water Supply and Distribution (WS&D) system is governed by the Province of British Columbia's Drinking Water Protection Act and Regulation, Water Sustainability Act and Ground Water Protection Regulation, as well as a Permit to Operate, issued by Vancouver Coastal Health. In 2019, water samples were tested weekly for *E. coli* and total coliform bacteria and semi-annually for numerous physical and chemical parameters to ensure the water quality met the applicable Guidelines for Canadian Drinking Water Quality set out by Health Canada and the potable water quality standards of the BC Drinking Water Protection Act.

The Squamish WS&D system is operated and maintained by the District of Squamish Water Utility Operations Team and is monitored 24 hours/day 365 days/year via the Supervisory Control and Data Acquisition (SCADA) system to ensure optimal and uninterrupted service to the community. The District of Squamish continues active programs relating to water conservation, unidirectional flushing and cross connection control in effort to reduce the demand on the water supply system and ensure the provision of clean and safe drinking water to the community. In addition to the implementation of several Operational and Capital Improvement/Renewal initiatives to increase system reliability and ensure long-term sustainability, the WS&D system expanded in 2019 in certain areas as a result of community growth. The main projects included the renewal of several sections of watermain throughout the distribution network; end-of-life replacement of a PRV station; installation of a new PRV station; emergency well rehabilitation at the primary source and completion of the installation of a replacement supply well.

1.0 Introduction

The purpose of this report is to meet the requirements of the Drinking Water Protection Act and Regulation, the requirements of the District's permit to operate, as well as to increase the understanding of the District's efforts to provide first class potable drinking water to its residents, to raise awareness of the importance of protecting our drinking water sources, and provide the results of the water quality testing that occurred in 2019. Samples collected from source water and the distribution system are analyzed and referenced to the applicable Guidelines for Canadian Drinking Water Quality set out by Health Canada, and the DWP Act and Regulation.

2.0 General Description

The District of Squamish has the ability to supply water to the community from three sources that include one primary groundwater source, and two surface water sources which are reserved for emergency backup. All water supplies are equipped with either primary or secondary chlorine disinfection. The distribution system consists of seven reservoirs; twenty-one active pressure reducing valve (PRV) stations, five pump stations and 157.5 km of watermain. The system delivers potable water to approximately 22,400 residents, nearly 800 industrial, commercial and institutional (ICI) customers, and the St'á7mes (Stawamus 24), Yekw'ápsem (Yeakwapsem 18), Kewtín (Kowtain 17), Siyí7ch'em (Seaichem 16) and Wíwk'em (Waiwakum 14) First Nations Reserves within the District of Squamish (see Appendix B - District of Squamish Water Distribution Map). In 2019, the District provided 4.24 million cubic meters (m^3) of potable water for consumption with an Average Daily Demand (ADD) of 11.6 ML/day and Maximum Daily Demand (MDD) of 16.4 ML/day.

The District employs a Supervisory Control And Data Acquisition (SCADA) system that continuously monitors the WS&D system, records data, and alerts District staff to areas of concern, faults and failures in the system.

3.0 Water Source

The District of Squamish has the ability to obtain its water from three sources:

- Primary Supply: Powerhouse Springs Well Field (Main Water Supply to both South and North distribution)
- Emergency Backup Supply:
    - Stawamus River (South distribution Emergency Backup Water Supply)
    - Mashiter Creek (North distribution Emergency Backup Water supply)

Primary supply infrastructure is comprised of seven groundwater wells at the Powerhouse Springs Well Field. In the event that the Well Field is compromised or unable to meet the distribution system demands (due to a watermain break, pump failure or major fire flow demand or other emergency), water can be drawn from Stawamus River and/or Mashiter Creek. These surface water sources are available as backup only. **In 2019, there was no surface water use in the District of Squamish's water system.**

3.1 Powerhouse Springs Well Site

In 2019, the Powerhouse Springs well site, located near the confluence of Ring Creek and the Mamquam River, operated six active ground water wells as one well was under re-construction. A full description of the system's potential can be found in the District of Squamish – Water Master Plan, located on the District's website. Secondary chlorination is provided to ensure the microbial safety of the water as it travels throughout the distribution network by maintaining a chlorine residual above 0.20mg/L.

3.1.1 Ring Creek Aquifer

The Ring Creek Aquifer is recharged primarily by seepage from Ring Creek and Skookum Creek (69%). Rainfall and snowmelt seepage through the lava flow also recharges the aquifer (31%)[1]. A Hydrogeological Assessment conducted in 2014 concluded that the water withdrawn by Powerhouse Springs Well Field is at "low risk of containing pathogens". As such, primary disinfection of the Powerhouse Springs water is not necessary.

3.1.2 Powerhouse Springs Wells Rehabilitation

Powerhouse Springs Well No. 3, which was rehabilitated in 2015, was taken off line shortly thereafter due to poor performance post-rehabilitation. As such, a new well was drilled in 2018 to regain lost capacity. Work took place in 2019 to connect it to the distribution system but completion was delayed. Commissioning of the new Well No. 3.1 will be completed in 2020.

Additionally, as the District was headed into the dryer summer months of 2019, well productivity from three of the six active wells were observed to be in decline. In response, the District hired a professional hydrogeologist to determine a corrective action plan. See section 7.0 for details of the successful well rehabilitation project.

3.1.3 Chlorination of Powerhouse Springs Water

The groundwater that is pumped out of the Powerhouse Springs well field is chlorinated with sodium hypochlorite to achieve a secondary disinfection Free Chlorine Residual to ensure the safety of the water as it travels throughout the distribution network.

In addition to manual monitoring, free chlorine residuals are continuously measured using online chlorine analyzers monitored by SCADA at nine locations.

3.2 Emergency Surface Water Sources: Stawamus River & Mashiter Creek

In the event of an emergency or water demand in excess of Powerhouse Springs well field capacity, water drawn from the Stawamus River and Mashiter Creek is treated using sodium hypochlorite chlorination as a primary disinfectant. Surface water sources are prone to highly variable water quality, unlike groundwater taken from an aquifer. For this reason, VCH would be consulted to assess conditions and

[1] Powerhouse Springs Well Protection Plan, Piteau Associates Engineering Ltd, 2014

likely implement a Boil Water Advisory should water from either of the surface water sources enter the distribution system. A double block and bleed system is in place to ensure water from the surface water sources cannot enter the system without operator intervention. The District holds a water license for the Stawamus River and Mashiter Creek for 132 L/s and 184 L/s, respectively.

3.3 Potential Risks Under Ongoing Consideration

The District of Squamish is fortunate to live in an area with multiple sources of freshwater. However the District is constantly monitoring the supply and distribution system for potential risks. Risks may include:

- Aging infrastructure causing water loss;
- Aquifer recharge rate may be adversely affected by climate change if the glaciers recede and snowpack is lower than usual;
- Increasing population causing increased consumption and requiring capital upgrades to maintain adequate fire flow capacity within the distribution system;
- Surface water sources are at risk of contamination from human and animal activity in the catchment area;
- Increased development rates causing water main and service breaks during ground disturbance and construction activity.

Taking the following proactive measures and maintaining ongoing programs mitigates potential risks:

- A Water Master Plan and Public Works Asset Management Plan are in place and scheduled for periodic updates;
- A Monitoring well is installed upstream of the PHS well field to monitor for fluctuations in aquifer capacity;
- A Water Conservation Plan and ongoing program is in place;
- Community water supply land designations are in place for both emergency surface water sources.

4.0 Asset Management, Upgrades, Major Maintenance and Developer Contributions

The District of Squamish maintains and continues to improve its water distribution system to provide the best service possible. The following were some of the key successes from 2019:

- Annual Asset Replacement Program (0.85 km, valued at $1.22M):
    - Diamond Head Road: Replacing an old watermain which will improve fire flows reduce reactive and emergency maintenance. Work coordinated with the annual paving program.
    - Garibaldi Avenue Looping: Ensuring adequate fire flow water volumes and improving water quality for this neighbourhood.

- Highway 99 at Stawamus Drive: Abandoning approximately 750m of unserviceable watermain off Highway 99 and installing a water meter for tracking industrial water usage.
- Government Road at Dryden Creek: Finishing watermain upgrades that were part of 2017 project. Required 90 meters of directional drilling.

- Developer Infrastructure Contributions:
  - Second Avenue watermain installation;
  - Government Road in Northyards;
  - Servicing Waterfront Landing development; (New PRV and other upgrades);
  - New PRV at Quest University;
  - 3 new fire hydrants installed, 2 fire hydrants upgraded.
- Industrial/Commercial/Institutional Metering Program progress: 95 meters installed ($0.17M).
- End-of-life replacement of Loggers Lane PRV station;
- Successful emergency rehabilitation of PHS Wells #5 and #6 to improve production capacity;
- Ongoing work on installation of replacement PHS Well #3, with commissioning completing in spring 2020;
- UDF program had crews focused on flushing in the Garibaldi Highlands and Quest University area in October; new blow off assemblies installed and improved existing ones, to improve the dead end flushing program.

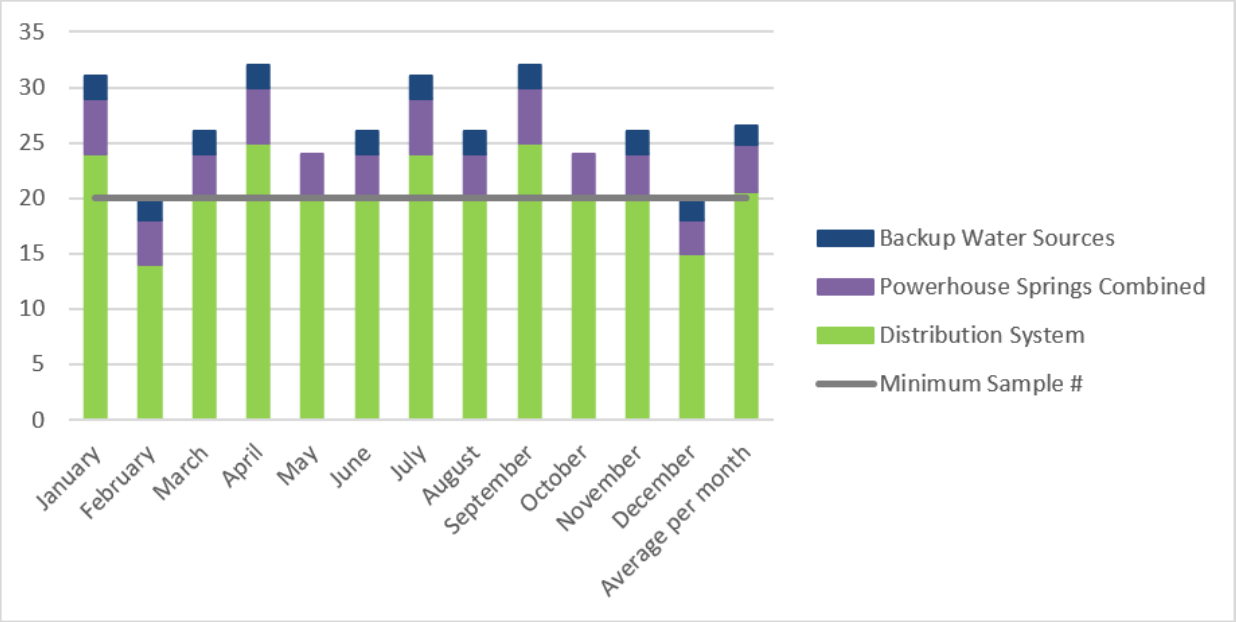
5.0 Standards & Testing Results for Water Supply System

The District of Squamish holds a "Permit to Operate" a water supply system under VCH. The permit includes conditions that must be met in order to maintain this permit in good standing which are outlined in the following subsections. A copy of the permit is included in Appendix A - Permit to Operate.

5.1 Bacteriological Sampling

According to the Permit to Operate, the District of Squamish must collect and analyze a minimum of 20 bacteriological samples per month from the distribution system. Figure 1 shows the number of monthly samples analyzed for bacteriological parameters in 2019. Sample test results are summarized in Appendix C - Water Sample Results.

Figure 1. Number of monthly samples analyzed for bacteriological testing for the District of Squamish in 2019.



The average number of water samples from the distribution system tested per month was 20.6, which exceeds the minimum requirements of twenty samples per month required by the permit.

Water quality standards for potable water[2] are as follows:

Drinking Water Protection Act

DRINKING WATER PROTECTION REGULATION

[includes amendments up to B.C. Reg. 352/2005, December 9, 2005]

Parameter:	Standard:
Fecal coliform bacteria	No detectable fecal coliform bacteria per 100 ml
Escherichia coli	No detectable *Escherichia coli* per 100 ml
Total coliform bacteria	
(a) 1 sample in a 30 day period	No detectable total coliform bacteria per 100 ml
(b) more than 1 sample in a 30 day period	At least 90% of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml

[2] http://www.bclaws.ca/civix/document/id/loo72/loo72/200_2003#section2

Summary of the bacteriological testing results for the District of Squamish in 2019 is shown in Table 1.

Table 1. Summary of the bacteriological testing results for the District of Squamish in 2019.

Water Distribution Sample Location	# of Samples	*E. coli* (EC/100 mL)			Total Coliform (TCU/100 mL)		
		minimum	maximum	average	minimum	maximum	average
Birken	25	<1	<1	<1	<1	<1	<1
Rockridge	25	<1	<1	<1	<1	<1	<1
Perth	25	<1	<1	<1	<1	<1	<1
Progress Way	25	<1	<1	<1	<1	<1	<1
Guildford	26	<1	<1	<1	<1	<1	<1
Quest University	24	<1	<1	<1	<1	<1	<1
Lomond	24	<1	<1	<1	<1	<1	<1
Parkway *	25	<1	<1	<1	<1	2	<1
Pemberton	24	<1	<1	<1	<1	<1	<1
Crumpit Woods	25	<1	<1	<1	<1	<1	<1
Powerhouse Springs (Pre-chlorination)	51	<1	<1	<1	<1	<1	<1
Total Samples:	**299**						

* Parkway: Aug 5, 2019 Total Coliform result was 2 TCU/100 mL; re-test result was found to be <1 TCU/100ml.

There was one (1) sample that contained Total Coliform and zero detectable *E.coli* in the distribution system over the monitoring period. Investigation of the positive Total Coliform result suggests that the sample may have been contaminated during the sampling procedure and as such is not an indication of conditions within the water system.

5.2 Physical and Chemical Parameters

Water is tested for a wide range of physical and chemical parameters carried out by an independent lab to ensure that potable water distributed within the District of Squamish meets the Guidelines for Canadian Drinking Water Quality (GCDWQ). Water samples are tested semi-annually for physical and chemical parameters at Powerhouse Springs (the District's primary water source), and annually at Stawamus River and Mashiter Creek (emergency backup water sources). The results of the independent lab's reports for summer and fall 2019 are included in Appendix C - Water Sample Results.

Analysis results from all samples taken from Powerhouse Springs, the primary water source, fell within the Maximum Allowable Concentration (MAC) or Aesthetic Objective (AO) for all physical and chemical parameters tested in 2019.

Samples are collected and analyzed for disinfection by-products at four (4) other sample locations. Disinfection by-products (DPB's) are chemical compounds that form when chlorine compounds react with organic matter dissolved in water. All samples analyzed contained levels of disinfection by-products below

the GCDWQ's MAC and were also below the detectable limit of the laboratories standard analytical method.

5.2.1 Corrosivity Factor in Water

In 2016, VCH published a flushing guideline to reduce potential lead exposure in drinking water. The most recent version of the flushing guideline can be found in Appendix D - VCH Advice re Lead in Drinking Water. As stated in VCH's flushing guideline, lead may enter the drinking water system from building plumbing (i.e., on private property) when water sits unused in pipes for long periods of time, such as overnight or over weekends. This is particularly true for soft (low hardness) and slightly acidic (low pH and alkalinity) water typically found in many water systems in the South Coast of BC.

The current guideline for lead in drinking water is a maximum acceptable concentration (MAC) of 0.005 mg/L. Even though the District's water source contains no detectable lead, the water is soft (low in hardness), low in alkalinity, and exhibits a neutral to slightly basic pH (pH>7). These characteristics mean that the District's water has a tendency to dissolve some materials that it may come into contact with. If water sits unused in building piping for extended periods, it can draw out metals, including lead, from metal fixtures and pipes in homes. The District encourages its residents to follow VCH's flushing guideline to reduce potential lead exposure.

6.0 Conditions of Permit to Operate a Water Supply System

6.1 Cross-Connection Control Program

The District of Squamish continues to operate its Cross Connection Control (CCC) Program in order to protect the safety of the drinking water system. Contamination of the potable water system can happen from backflow through cross connections with private plumbing systems. A cross connection is a physical connection between a potable water supply system and a source of contamination. A backflow or back-syphon event is the undesired reverse flow of water creating the potential for contaminants to be drawn back into the potable water supply system if a negative pressure event, such as a water main break or unauthorized hydrant use, occurs in the system.

The District of Squamish is working to ensure the proper installation of backflow prevention assemblies to mitigate the hazards of cross connections. A backflow prevention assembly is a series of "one-way" valves that only allows water to flow in the desired direction and physically impedes reverse flow.

6.2 Well Protection Plan

Implementation of a Well Protection Plan is a condition of the District's Permit to Operate. The Powerhouse Springs Well Protection Plan was developed in May 2014 for the seven wells operating at Powerhouse Springs well field at the time. The Well Protection Plan can be found on the District's website. This plan follows the Province's "Well Protection Toolkit" which includes defining the well protection area, identifying potential contaminants, developing management strategies and contingency plans, and finally, implementing, monitoring and evaluating the plan.

In accordance with the recommendations, the District of Squamish installed signage at the Powerhouse Springs well field to inform recreational trail users that they are entering the groundwater protection zone. The District continues to monitor the wells using the SCADA system and to test the wells semi-annually for potential contaminants (results in section 5.1 and 5.2). In 2019, the District commissioned Kalwij Groundwater Dynamics to undertake a Well productivity review.

6.3 Dead End and Unidirectional Flushing Program

The utilities waterworks crew conducts watermain flushing to scour water mains, maintain distribution system capacity and remove aged water. The District flushes 20% of the town's water mains annually and does 100% of the dead end lines each year to ensure high quality water. The Garibaldi Highlands and Quest University areas were flushed in 2019, as well as all of the dead ends and low flow areas of the system. Through the District's capital water projects, water mains are looped when possible to eliminate dead ends in the system.

6.4 Online Monitoring

District staff continuously monitor the operation of the water supply system using a SCADA system to monitor the District's water network in real-time. Collected data ranges from the well field pump output to rainfall collection data. Alarms are generated if control point values go below minimum or above maximum thresholds. The SCADA system allows for operational optimization by automatically controlling variables such as reservoir levels and pump outputs to ensure that water is available to meet demand and also allows for remote operator intervention if necessary.

Surface water sources are monitored for turbidity at both the Stawamus River and Mashiter Creek using online turbidity analyzers. If a backup surface water source were to be used, the chlorine levels would be measured by on-line analyzers and communicated via the SCADA system after chlorine is added to the water entering the distribution system.

6.5 Long-Term Water Supply Strategy

The District of Squamish – Water Master Plan was completed in July 2015. The Water Master Plan can be found on the District's website. This report analyzed the District's existing water system, estimated future demands to the year 2031 and provided recommendations for long-term strategies. Recommendations identified in the Water Master Plan include a long-term source development strategy, a water meter implementation strategy, a water conservation plan, a watermain renewal program, and recommendations for Developer Cost Charge (DCC) projects.

Under current growth projections, the current water source capacity at the Powerhouse Springs Well field will be able to service the District beyond 2031. When demand approaches the current water source capacity, the District has a number of options to provide additional water supply. A replacement well, No. 3.1, was drilled in 2018 and brought on line in early 2020 to replace the well #3. It provides additional capacity and increases the total combined well field pumping rate.

Although the Stawamus River and Mashiter Creek used to be the primary supply of potable water to the District prior to the development of the Powerhouse Springs well field, they are now only maintained for back up and emergency purposes. Resuming their use as a primary source would require expensive capital upgrades to provide a surface water treatment that meets current regulations and the associated ongoing maintenance costs.

6.5.1 Water System Renewals and Upgrades

Upgrades and replacements to the water distribution system were completed in 2019 in Brackendale, Garibaldi Estates, Dentville, and off Highway 99 at I.R. 24. Loggers Lane PRV station was replaced (end of life). System maintenance and upgrades will continue in future years as per the Water Master Plan's recommendations and best asset management practices to maintain quality service to the District of Squamish.

6.5.2 Water Conservation

An important factor considering the rate of growth of the community and aging infrastructure is the need to reduce per capita water consumption. This will assist in maintaining adequate water supply while reducing substantial costs associated with capacity increase. Outdoor water use is the primary target for water use reduction. The total combined[3] average day demand per capita was 519 L/c/d. Since 2014, the Average Day Demand (ADD) has decreased an average of 5.4 L/c/d per year, which is on track with the District's Water Conservation Plan reduction target of 5.0 L/c/d each year.

6.5.3 Water Metering

The District of Squamish continued its ongoing grant assisted program to install water meters for ICI customers. All new ICI and multi-family buildings are required to have a water meter included in their construction. Existing buildings are having meters installed as part of a multi-year capital project that will progress as funds become available. In 2019, 70 new meters were installed, for a total of 199 meters at year end.

6.6 Emergency Response and Contingency Plan

As per the requirements set out by the VCH's Permit to Operate, the District of Squamish reviews and submits updates to the Water System – Emergency Response and Contingency Plan (ERCP) annually. This document provides guidelines for action that will be taken by District staff in the event of an emergency.

The document outlines that in the event there is a threat to the quality of drinking water, VCH's Drinking Water Officer (DWO) will be informed. During an emergency, the DWO and other health authority staff will provide advice about public notification and monitoring of water quality, however the District of Squamish Communications Department will take the lead role as spokesperson for media inquiries and releases.

[3] Total water consumption including industrial, commercial, institutional and residential users.

7.0 Significant Events & Public Notification

In June 2019, the District initiated an emergency well rehabilitation project at Power House Springs in response to low level SCADA alarms at the Power House Springs well field. Initially, an instrument or automation system error was suspected. This was ruled out after detailed investigation and analysis by a local mechanical engineering contractor. Concurrently, a draft report from the District's hydrogeology consultant, received mid-May of 2019, revealed that the productivity of wells 5, 6, and 7 were reduced and that a rehabilitation program was required to restore productivity. Immediate mitigation measures included operating wells No. 5, 6 and 7 at reduced production capacity to prevent trigging alarms and tripping out pumps.

A well rehabilitation and pump servicing contractor was mobilized to commence inspection, emergency step testing and rehabilitation of PHS Well No. 6 (June 19-26) and Well No. 5 (July 2-10) using the "surge and bail" technique. During the rehabilitation work, the District organized a water conservation campaign, imposing stage 2 watering restrictions earlier than in typical years, and appealed to residents to reduce outdoor water use until the work was completed. The efforts proved to be successful in increasing the wells' production capacities all the while meeting daily water demands.

7.1 Drinking Water Advisory/Boil Water Advisory

No Drinking Water Advisories or Boil Water Advisories were issued in 2019.

8.0 Operator Qualifications and Training

According to the Drinking Water Protection Regulation, under the Drinking Water Protection Act, staff working on the water system must have a minimum level of certification with the Environmental Operators Certification Program (EOCP). This ensures that District staff are adequately trained to operate, maintain and repair water supply and distribution system in order to protect the safety and quality of drinking water that is delivered to the end user.

The District of Squamish Water Distribution System is classified by the EOCP as a Class 3 facility (WD-III). The District of Squamish provides regular training opportunities to ensure staff maintain their certifications and supports its staff in achieving further education and training in their respective fields in order to provide the best service to its residents. Environmental Operators Certifications for Water Distribution and Water Treatment held for the District of Squamish in 2019 are shown in Table 2.

Table 2. Total number of District of Squamish Utility staff that hold certificates for each level of training in the Environmental Operators Certification Program.

Level of Certification	Water Distribution
Operator in Training	0
Level 1	3
Level 2	3
Level 3	2
Total	**8**

9.0 Closing

The District of Squamish delivers a very high quality of drinking water to its residents and end users. Citizens of Squamish are fortunate to have access to groundwater from the Ring Creek Aquifer as the primary source for our drinking water.

The District of Squamish meets all of the conditions set out by VCH for the Permit to Operate a Water Supply System. In 2019 bacteriological sampling was completed weekly. All results met the potable water quality standard set out by the BC Drinking Water Protection Act and Regulation. Physical and chemical tests were carried out semi-annually and align with the Guidelines for Canadian Drinking Water Quality. The Cross Connection Control Program, Well Protection Plan and Flushing Programs were all carried out as outlined in the Conditions of the District's Permit to Operate. The SCADA system continues to monitor the water distribution system to ensure ongoing quality. Lastly, the District of Squamish has a long-term water supply strategy and an up to date Emergency Response and Contingency Plan to guide its response during emergency events.

The District continues to work to maintain, replace and upgrade the existing infrastructure, and to integrate operations and maintenance of new infrastructure, while aiming to reduce the overall demand on the system through the Water Conservation Program. Overall, the District of Squamish is proud of the water it delivers to its customers and residents and will continue to strive for the highest quality standards possible.

Appendix A - Permit to Operate

Vancouver CoastalHealth
Promoting wellness. Ensuring care.

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HEALTH PROTECTION

PERMIT TO OPERATE

A Water Supply System

Purveyor: District Of Squamish
Facility Name: District Of Squamish Waterworks

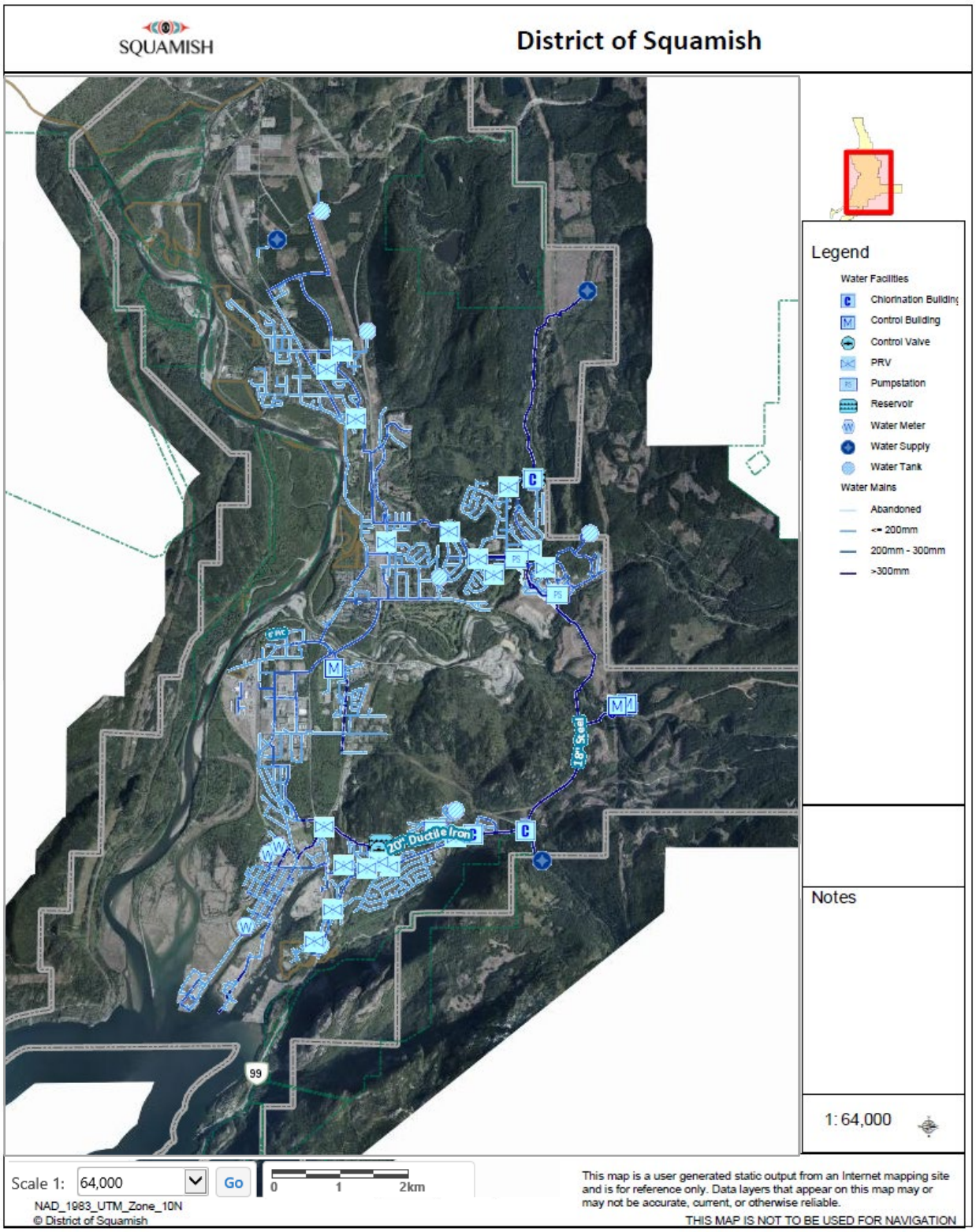
Conditions of Permit

Minimum bacteriological sampling frequency is 20 / month (distribution).
Test for physical and chemical parameters in accordance with your monitoring plan.
Operate in accordance with your Cross-Connection Control Program.
Implement your Well Protection Plan.
Maintain your Unidirectional Flushing Program annually
Maintain continuous on-line monitoring of the water disinfection process.
Maintain continuous on-line turbidity sampling for each surface water source.
Review and update the Emergency Response and Contingency Plan annually.

May 21, 1997
Effective Date
April 26, 2016
Revised Date

Drinking Water Officer

Appendix B - District of Squamish Water Distribution Map



Appendix C - Water Sample Results

1. Weekly Water Sample Results (bacteriological)
2. Semi-Annual Drinking Water Sampling Report June 2019
3. Annual Surface Sampling Report August 2019
4. Semi-Annual Drinking Water Sampling Report November 2019

Weekly Bacteriological Water Sample Results

Sample Range Report

Vancouver Coastal Health

Facility Name: District Of Squamish Waterworks
Date Range: Jan 1 2019 to Jan 1 2020

Operator Bob Smith
Box 310
Squamish, BC V8B 0A3

Sampling Site	Date Collected	Total Coliform	E. Coli	Fecal Coliform
41974 Birken Rd, Brackendale				
	1/2/2019	L1	L1	
	1/14/2019	L1	L1	
	1/28/2019	L1	L1	
	2/11/2019	L1	L1	
	2/25/2019	L1	L1	
	3/11/2019	L1	L1	
	3/25/2019	L1	L1	
	4/8/2019	L1	L1	
	4/23/2019	L1	L1	
	5/6/2019	L1	L1	
	5/21/2019	L1	L1	
	6/3/2019	L1	L1	
	6/17/2019	L1	L1	
	7/2/2019	L1	L1	
	7/15/2019	L1	L1	
	7/29/2019	L1	L1	
	8/12/2019	L1	L1	
	8/26/2019	L1	L1	
	9/9/2019	L1	L1	
	10/7/2019	L1	L1	
	10/21/2019	L1	L1	
	11/4/2019	L1	L1	
	11/18/2019	L1	L1	
	12/2/2019	L1	L1	
	12/16/2019	L1	L1	
	Total Positive :	**0**	**0**	
Perth Sample Station, Garibaldi Highlands				
	1/2/2019	L1	L1	
	1/14/2019	L1	L1	
	1/28/2019	L1	L1	
	2/25/2019	L1	L1	
	3/11/2019	L1	L1	
	3/25/2019	L1	L1	
	4/8/2019	L1	L1	
	4/23/2019	L1	L1	

	5/6/2019	L1	L1
	5/21/2019	L1	L1
	6/3/2019	L1	L1
	6/17/2019	L1	L1
	7/2/2019	L1	L1
	7/15/2019	L1	L1
	7/22/2019	L1	L1
	7/29/2019	L1	L1
	8/12/2019	L1	L1
	8/26/2019	L1	L1
	9/9/2019	L1	L1
	9/23/2019	L1	L1
	10/7/2019	L1	L1
	10/21/2019	L1	L1
	11/4/2019	L1	L1
	11/18/2019	L1	L1
	12/2/2019	L1	L1
	12/16/2019	L1	L1
	Total Positive :	**0**	**0**
Quest University, University Lands			
	1/7/2019	L1	L1
	1/21/2019	L1	L1
	2/4/2019	L1	L1
	2/19/2019	L1	L1
	3/4/2019	L1	L1
	3/19/2019	L1	L1
	4/1/2019	L1	L1
	4/15/2019	L1	L1
	4/29/2019	L1	L1
	5/13/2019	L1	L1
	5/27/2019	L1	L1
	6/10/2019	L1	L1
	6/24/2019	L1	L1
	7/8/2019	L1	L1
	7/22/2019	L1	L1
	8/6/2019	L1	L1
	8/19/2019	L1	L1
	9/3/2019	L1	L1
	9/16/2019	L1	L1
	9/30/2019	L1	L1
	10/15/2019	L1	L1
	10/28/2019	L1	L1
	11/12/2019	L1	L1
	11/25/2019	L1	L1
	12/9/2019	L1	L1
	Total Positive :	**0**	**0**
Lomond Sample Station, Garibaldi Highlands			
	1/7/2019	L1	L1

1/21/2019	L1	L1
2/4/2019	L1	L1
2/19/2019	L1	L1
3/4/2019	L1	L1
3/19/2019	L1	L1
4/1/2019	L1	L1
4/15/2019	L1	L1
4/29/2019	L1	L1
5/13/2019	L1	L1
5/27/2019	L1	L1
6/10/2019	L1	L1
6/24/2019	L1	L1
7/22/2019	L1	L1
8/6/2019	L1	L1
8/19/2019	L1	L1
9/3/2019	L1	L1
9/16/2019	L1	L1
9/30/2019	L1	L1
10/15/2019	L1	L1
10/28/2019	L1	L1
11/12/2019	L1	L1
11/25/2019	L1	L1
12/9/2019	L1	L1
Total Positive :	**0**	**0**

Parkway Sample station, 40464 Park Crescent

1/7/2019	L1	L1
1/21/2019	L1	L1
2/19/2019	L1	L1
3/4/2019	L1	L1
3/19/2019	L1	L1
4/1/2019	L1	L1
4/15/2019	L1	L1
4/29/2019	L1	L1
5/13/2019	L1	L1
5/27/2019	L1	L1
6/10/2019	L1	L1
6/24/2019	L1	L1
7/8/2019	L1	L1
7/22/2019	L1	L1
8/6/2019	2	L1
8/19/2019	L1	L1
9/3/2019	L1	L1
9/16/2019	L1	L1
9/30/2019	L1	L1
10/15/2019	L1	L1
10/28/2019	L1	L1
11/12/2019	L1	L1
11/25/2019	L1	L1
12/9/2019	L1	L1
Total Positive :	**1**	**0**

Progress Way sample station, 38917 Progress Way			
	1/2/2019	L1	L1
	1/14/2019	L1	L1
	1/28/2019	L1	L1
	2/25/2019	L1	L1
	3/11/2019	L1	L1
	3/25/2019	L1	L1
	4/8/2019	L1	L1
	4/23/2019	L1	L1
	5/6/2019	L1	L1
	5/21/2019	L1	L1
	6/3/2019	L1	L1
	6/17/2019	L1	L1
	7/2/2019	L1	L1
	7/15/2019	L1	L1
	7/29/2019	L1	L1
	8/12/2019	L1	L1
	8/26/2019	L1	L1
	9/9/2019	L1	L1
	9/23/2019	L1	L1
	10/7/2019	L1	L1
	10/21/2019	L1	L1
	11/4/2019	L1	L1
	11/18/2019	L1	L1
	12/9/2019	L1	L1
	12/16/2019	L1	L1
	Total Positive :	**0**	**0**

Guilford sample station, East of Guilford & Valley Dr.			
	1/2/2019	L1	L1
	1/14/2019	L1	L1
	1/28/2019	L1	L1
	2/11/2019	L1	L1
	2/25/2019	L1	L1
	3/11/2019	L1	L1
	3/25/2019	L1	L1
	4/8/2019	L1	L1
	4/23/2019	L1	L1
	5/6/2019	L1	L1
	5/21/2019	L1	L1
	6/3/2019	L1	L1
	6/17/2019	L1	L1
	7/2/2019	L1	L1
	7/15/2019	L1	L1
	7/29/2019	L1	L1
	8/12/2019	L1	L1
	8/26/2019	L1	L1
	9/9/2019	L1	L1
	9/23/2019	L1	L1

	10/7/2019	L1	L1
	10/21/2019	L1	L1
	11/4/2019	L1	L1
	11/18/2019	L1	L1
	12/2/2019	L1	L1
	12/16/2019	L1	L1
	Total Positive :	**0**	**0**

Crumpet Woods sample station, 2252 Windsail Pl			
	1/7/2019	L1	L1
	1/21/2019	L1	L1
	2/11/2019	L1	L1
	2/19/2019	L1	L1
	3/4/2019	L1	L1
	3/19/2019	L1	L1
	4/1/2019	L1	L1
	4/15/2019	L1	L1
	4/29/2019	L1	L1
	5/13/2019	L1	L1
	5/27/2019	L1	L1
	6/10/2019	L1	L1
	6/24/2019	L1	L1
	7/8/2019	L1	L1
	7/22/2019	L1	L1
	8/6/2019	L1	L1
	8/19/2019	L1	L1
	9/3/2019	L1	L1
	9/16/2019	L1	L1
	9/30/2019	L1	L1
	10/15/2019	L1	L1
	10/28/2019	L1	L1
	11/12/2019	L1	L1
	11/25/2019	L1	L1
	12/9/2019	L1	L1
	Total Positive :	**0**	**0**

Rockridge sample station, across from 41215-Rockridge Pl.			
	1/2/2019	L1	L1
	1/14/2019	L1	L1
	1/28/2019	L1	L1
	2/25/2019	L1	L1
	3/11/2019	L1	L1
	3/25/2019	L1	L1
	4/8/2019	L1	L1
	4/23/2019	L1	L1
	5/6/2019	L1	L1
	5/21/2019	L1	L1
	6/3/2019	L1	L1
	6/17/2019	L1	L1

7/2/2019	L1	L1
7/15/2019	L1	L1
7/29/2019	L1	L1
8/12/2019	L1	L1
8/26/2019	L1	L1
9/9/2019	L1	L1
9/23/2019	L1	L1
10/7/2019	L1	L1
10/21/2019	L1	L1
11/4/2019	L1	L1
11/18/2019	L1	L1
12/2/2019	L1	L1
12/16/2019	L1	L1
Total Positive :	**0**	**0**

Pemberton sample station, across from 1551 Pemberton Ave

1/7/2019	L1	L1
1/21/2019	L1	L1
2/19/2019	L1	L1
3/4/2019	L1	L1
3/19/2019	L1	L1
4/1/2019	L1	L1
4/15/2019	L1	L1
4/29/2019	L1	L1
5/13/2019	L1	L1
5/27/2019	L1	L1
6/10/2019	L1	L1
6/24/2019	L1	L1
7/8/2019	L1	L1
7/22/2019	L1	L1
8/6/2019	L1	L1
8/19/2019	L1	L1
9/3/2019	L1	L1
9/16/2019	L1	L1
9/30/2019	L1	L1
10/15/2019	L1	L1
10/28/2019	L1	L1
11/12/2019	L1	L1
11/25/2019	L1	L1
12/9/2019	L1	L1
Total Positive :	**0**	**0**

Result Values: **E - estimated** **L - less than** **G - greater than**

Samples that contain total coliform:	1	0.40% of total
Samples that contain e. coli:	0	0.00% of total
Samples that contain fecal coliform:	0	0.00% of total
Number of consecutive samples that contain total coliform:	0	
Number of samples that contain total coliform in last 30 days:	0/11	
Total number of samples:	249	

Comments:

_____
Environmental Health Officer
Jan 6 2020

FOR FURTHER INFORMATION PLEASE CALL: Dan Glover (604) 892-2293

DISTRICT OF SQUAMISH
ATTN: Karine Le Du
PO Box 310
Squamish BC V8B 0A3

Date Received: 04-JUN-19
Report Date: 26-JUN-19 16:09 (MT)
Version: FINAL

Client Phone: 604-815-6864

Certificate of Analysis

Lab Work Order #: L2284950

Project P.O. #: 116197
Job Reference: SEMI ANNUAL DW SAMPLING
C of C Numbers: 17-765804
Legal Site Desc:

Carla Fuginski
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2284950-1	L2284950-2	L2284950-3	L2284950-4	L2284950-5
Description	G	G	G	G	G
Sampled Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
Sampled Time	08:50	08:30	08:17	07:55	07:40
Client ID	POWEROUSE SPRINGS	VIEW PL	PEMBERTON AVE	LOMOND WAY	BIRKEN RD.
Grouping / **Analyte**					
WATER					
Physical Tests Colour, True (CU)	<5.0				
Conductivity (uS/cm)	77.2				
Hardness (as CaCO3) (mg/L)	21.1 HTC				
pH (pH)	7.59				
Total Dissolved Solids (mg/L)	78				
Turbidity (NTU)	<0.10				
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	20.3				
Ammonia, Total (as N) (mg/L)	<0.0050				
Bromate (mg/L)	<0.010 U				
Bromide (Br) (mg/L)	<0.050				
Chlorate (mg/L)	<0.020 U				
Chloride (Cl) (mg/L)	4.52				
Chlorite (mg/L)	<0.020 U				
Fluoride (F) (mg/L)	0.088				
Nitrate (as N) (mg/L)	0.0561				
Nitrite (as N) (mg/L)	<0.0010				
Total Kjeldahl Nitrogen (mg/L)	<0.050				
Phosphorus (P)-Total (mg/L)	0.0377				
Silicate (as SiO2) (mg/L)	31.5				
Sulfate (SO4) (mg/L)	7.72				
Cyanides Cyanide, Total (mg/L)	<0.0050				
Organic / Inorganic Carbon Total Organic Carbon (mg/L)	<0.50				
Total Metals Aluminum (Al)-Total (mg/L)	<0.010				
Antimony (Sb)-Total (mg/L)	<0.00050				
Arsenic (As)-Total (mg/L)	0.00063				
Barium (Ba)-Total (mg/L)	<0.020				
Boron (B)-Total (mg/L)	<0.10				
Cadmium (Cd)-Total (mg/L)	<0.00020				
Calcium (Ca)-Total (mg/L)	6.33				
Chromium (Cr)-Total (mg/L)	<0.0020				
Copper (Cu)-Total (mg/L)	0.0092				
Iron (Fe)-Total (mg/L)	<0.030				
Lead (Pb)-Total (mg/L)	<0.00050				
Magnesium (Mg)-Total (mg/L)	1.28				
Manganese (Mn)-Total (mg/L)	<0.0020				
Mercury (Hg)-Total (mg/L)	<0.00020				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2284950-1 G 04-JUN-19 08:50 POWEROUSE SPRINGS	L2284950-2 G 04-JUN-19 08:30 VIEW PL	L2284950-3 G 04-JUN-19 08:17 PEMBERTON AVE	L2284950-4 G 04-JUN-19 07:55 LOMOND WAY	L2284950-5 G 04-JUN-19 07:40 BIRKEN RD.
WATER						
Total Metals	Potassium (K)-Total (mg/L)	1.33				
	Selenium (Se)-Total (mg/L)	<0.0010				
	Sodium (Na)-Total (mg/L)	5.1				
	Uranium (U)-Total (mg/L)	<0.00010				
	Zinc (Zn)-Total (mg/L)	<0.050				
Aggregate Organics	COD (mg/L)	<20				
Trihalomethanes	Bromodichloromethane (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Bromoform (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Dibromochloromethane (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Total THMs (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020
Haloacetic Acids	Bromochloroacetic Acid (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Dibromoacetic Acid (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Dichloroacetic Acid (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Total Haloacetic Acids 5 (mg/L)		<0.0054	<0.0054	<0.0054	<0.0054
	Monobromoacetic Acid (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Monochloroacetic Acid (mg/L)		<0.0050	<0.0050	<0.0050	<0.0050
	Trichloroacetic Acid (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Surrogate: 2,3-Dibromopropionic Acid (SS) (%)		97.4	93.0	105.0	119.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Total	MS-B	L2284950-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L2284950-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2284950-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
U	Not Detected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

BROMATE-KL	Water	Bromate analysis in water	EPA 300.1 - Ion Chromatography
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLORATE-KL	Water	Chlorate analysis in water	EPA 300.1 - Ion Chromatography
CHLORITE-KL	Water	Chlorite analysis in water	EPA 300.1 - Ion Chromatography
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HAA-WP	Water	Haloacetic Acids	EPA 552 (modified)

HAA concentration is determined using liquid-liquid extraction, capillary column, GC/electron capture techniques.

HAA5-SUM-CALC-WP	Water	Total Haloacetic Acids 5 (HAA5)	CALCULATION

Total Haloacetic Acids 5 (HAA5) represents the sum of monobromoacetic acid, monochloroacetic acid, dibromoacetic acid, dichloroacetic acid and trichloroacetic acid. For the purpose of calculation, results less than the detection limit (DL) are treated as zero.

Reference Information

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-TOT-CVAFS-VA Water Total Hg in Water by CVAFS LOR=50ppt EPA 1631E (mod)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

THM-HSMS-VA Water VOC (THM) by Headspace GCMS EPA SW-846, METHOD 8260

This procedure is suitable for the analysis of trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) in chlorinated waters that have been treated to prevent the formation of trihalomethanes after sample collection. The analysis involves the headspace extraction of the sample prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS). The trihalomethanes analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).

THM-SUM-CALC-VA Water Total Trihalomethane-THM CALCULATION

Total Trihalomethanes (where not conducted as part of a formation potential analysis) is equal to the sum of the individual parameter concentrations with non-detect results treated as zero.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Reference Information

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
KL	ALS ENVIRONMENTAL - KELSO, WASHINGTON, USA

Chain of Custody Numbers:

17-765804

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour 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.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

DISTRICT OF SQUAMISH
ATTN: Craig Halliday
PO Box 310
Squamish BC V8B 0A3

Date Received: 14-AUG-19
Report Date: 09-SEP-19 11:17 (MT)
Version: FINAL

Client Phone: 604-815-6864

Certificate of Analysis

Lab Work Order #: L2328830

Project P.O. #: 117240
Job Reference: SURFACE SAMPLING
C of C Numbers: 17-759746
Legal Site Desc:

Carla Fuginski
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2328830-1	L2328830-2			
	Description	Grab	Grab			
	Sampled Date	14-AUG-19	14-AUG-19			
	Sampled Time	08:00	09:00			
	Client ID	STAWAMUS	MASHITER			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0			
	Conductivity (uS/cm)	47.8	55.1			
	Hardness (as CaCO3) (mg/L)	14.1 HTC	18.3 HTC			
	pH (pH)	7.04	7.53			
	Total Dissolved Solids (mg/L)	33	62			
	Turbidity (NTU)	<0.10	0.19			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	8.7	21.6			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromate (mg/L)	<0.010 U	<0.010 U			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chlorate (mg/L)	<0.040 U	<0.040 U			
	Chloride (Cl) (mg/L)	<0.50	0.65			
	Chlorite (mg/L)	<0.040 U	<0.040 U			
	Fluoride (F) (mg/L)	0.032	0.036			
	Nitrate (as N) (mg/L)	0.0601	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0153			
	Sulfate (SO4) (mg/L)	9.31	5.51			
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050			
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.80	0.72			
Total Metals	Aluminum (Al)-Total (mg/L)	0.067	0.022			
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050			
	Arsenic (As)-Total (mg/L)	0.00017	0.00028			
	Barium (Ba)-Total (mg/L)	<0.020	<0.020			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020			
	Calcium (Ca)-Total (mg/L)	4.82	5.96			
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020			
	Copper (Cu)-Total (mg/L)	0.0071	<0.0010			
	Iron (Fe)-Total (mg/L)	<0.030	<0.030			
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050			
	Magnesium (Mg)-Total (mg/L)	0.50	0.83			
	Manganese (Mn)-Total (mg/L)	0.0066	<0.0020			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.00020			
		<0.00020	<0.0000050			
	Potassium (K)-Total (mg/L)	0.23	0.66			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2328830-1	L2328830-2			
	Description	Grab	Grab			
	Sampled Date	14-AUG-19	14-AUG-19			
	Sampled Time	08:00	09:00			
	Client ID	STAWAMUS	MASHITER			
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010			
	Sodium (Na)-Total (mg/L)	<2.0	3.1			
	Uranium (U)-Total (mg/L)	0.00034	<0.00010			
	Zinc (Zn)-Total (mg/L)	<0.050	<0.050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2328830-1, -2
Matrix Spike	Phosphorus (P)-Total	MS-B	L2328830-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
U	Not Detected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

BROMATE-KL	Water	Bromate analysis in water	EPA 300.1 - Ion Chromatography
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLORATE-KL	Water	Chlorate analysis in water	EPA 300.1 - Ion Chromatography
CHLORITE-KL	Water	Chlorite analysis in water	EPA 300.1 - Ion Chromatography
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-TOT-CVAFS-VA	Water	Total Hg in Water by CVAFS LOR=50ppt	EPA 1631E (mod)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

Reference Information

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
KL	ALS ENVIRONMENTAL - KELSO, WASHINGTON, USA

Chain of Custody Numbers:

17-759746

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour 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.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Date: 04-DEC-19
PO No.: 40438
WO No.: L2379395
Project Ref: SEMI ANNUAL DW SAMPLING - NOV
Sample ID: POWERHOUSE SPRINGS
Sampled By: CG/RC
Date Collected: 07-NOV-19
Lab Sample ID: L2379395-1
Matrix: G

DISTRICT OF SQUAMISH
39907 Government Road
PO Box 310
Squamish BC V8B 0A3
ATTN: Craig Halliday

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Total Alkalinity by Titration						
Alkalinity Species by Titration						
Alkalinity, Total (as CaCO3)	20.5		mg/L			12-NOV-19
Anions by Ion Chromatography						
Sulfate in Water by IC						
Sulfate (SO4)	8.24		mg/L		500	10-NOV-19
Nitrite in Water by IC (Low Level)						
*Nitrite (as N)	<0.0010		mg/L	1		10-NOV-19
Nitrate in Water by IC (Low Level)						
*Nitrate (as N)	0.0578		mg/L	10		10-NOV-19
Fluoride in Water by IC						
Fluoride (F)	0.099		mg/L	1.5		10-NOV-19
Chloride in Water by IC						
Chloride (Cl)	4.47		mg/L		250	10-NOV-19
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.050		mg/L			10-NOV-19
Total Metals in Water (DW)						
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	<0.010		mg/L		0.1	09-NOV-19
Antimony (Sb)-Total	<0.00050		mg/L	0.006		09-NOV-19
Arsenic (As)-Total	0.00063		mg/L	0.01		09-NOV-19
Barium (Ba)-Total	<0.020		mg/L	1		09-NOV-19
Boron (B)-Total	<0.10		mg/L	5		09-NOV-19
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		09-NOV-19
Calcium (Ca)-Total	6.73		mg/L			09-NOV-19
Chromium (Cr)-Total	<0.0020		mg/L	0.05		09-NOV-19
Copper (Cu)-Total	0.0085		mg/L	2.0	1.0	09-NOV-19
Iron (Fe)-Total	<0.030		mg/L		0.3	09-NOV-19
Lead (Pb)-Total	<0.00050		mg/L	0.005		09-NOV-19
Magnesium (Mg)-Total	1.28		mg/L			09-NOV-19
Manganese (Mn)-Total	<0.0020		mg/L	0.12	0.02	09-NOV-19
Potassium (K)-Total	1.26		mg/L			09-NOV-19
Selenium (Se)-Total	<0.0010		mg/L	0.05		09-NOV-19
Sodium (Na)-Total	4.9		mg/L		200	09-NOV-19
Uranium (U)-Total	<0.00010		mg/L	0.02		09-NOV-19
Zinc (Zn)-Total	<0.050		mg/L		5.0	09-NOV-19
Total Hg in Water by CVAFS LOR=50ppt						
Mercury (Hg)-Total	<0.00020		mg/L	0.001		13-NOV-19
Hardness						
Hardness (as CaCO3)	22.1	HTC	mg/L		500	09-NOV-19

Date: 04-DEC-19
PO No.: 40438
WO No.: L2379395
Project Ref: SEMI ANNUAL DW SAMPLING - NOV
Sample ID: POWERHOUSE SPRINGS
Sampled By: CG/RC
Date Collected: 07-NOV-19
Lab Sample ID: L2379395-1
Matrix: G

DISTRICT OF SQUAMISH
39907 Government Road
PO Box 310
Squamish BC V8B 0A3
ATTN: Craig Halliday

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Ammonia, Total (as N)	<0.0050		mg/L			13-NOV-19
Bromate	<0.010	U	mg/L	0.01		26-NOV-19
Chlorate	<0.040	U	mg/L	1.0		26-NOV-19
Colour, True	<5.0		CU		15	10-NOV-19
Conductivity	76.2		uS/cm			12-NOV-19
Cyanide, Total	<0.0050		mg/L	0.2		21-NOV-19
Total Dissolved Solids	70		mg/L		500	13-NOV-19
Phosphorus (P)-Total	0.0346		mg/L			14-NOV-19
*Turbidity	<0.10		NTU			10-NOV-19
pH	7.50		pH		7-10.5	12-NOV-19

CDWQG = Health Canada Guideline Limits updated JUNE 2019

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Carla Fuginski
Account Manager

Date: 04-DEC-19
PO No.: 40438
WO No.: L2379395
Project Ref: SEMI ANNUAL DW SAMPLING - NOV
Sample ID: VIEW PL
Sampled By: CG/RC
Date Collected: 07-NOV-19
Lab Sample ID: L2379395-2
Matrix: G

DISTRICT OF SQUAMISH
39907 Government Road
PO Box 310
Squamish BC V8B 0A3
ATTN: Craig Halliday

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
THM by Headspace GCMS						
Total THMs	<0.0020		mg/L	0.1		18-NOV-19
VOC (THM) by Headspace GCMS						
Chloroform	<0.0010		mg/L			14-NOV-19
Bromodichloromethane	<0.0010		mg/L			14-NOV-19
Bromoform	<0.0010		mg/L			14-NOV-19
Dibromochloromethane	<0.0010		mg/L			14-NOV-19
Total Haloacetic Acids 5	<0.0054		mg/L	0.080		20-NOV-19
Haloacetic Acids						
Monobromoacetic Acid	<0.0010		mg/L			15-NOV-19
Monochloroacetic Acid	<0.0050		mg/L			15-NOV-19
Bromochloroacetic Acid	<0.0010		mg/L			15-NOV-19
Dibromoacetic Acid	<0.0010		mg/L			15-NOV-19
Dichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Trichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Surr: 2,3-Dibromopropionic Acid (SS)	107.9		%			15-NOV-19

CDWQG = Health Canada Guideline Limits updated JUNE 2019

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* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Carla Fuginski
Account Manager

Date: 04-DEC-19
PO No.: 40438
WO No.: L2379395
Project Ref: SEMI ANNUAL DW SAMPLING - NOV
Sample ID: PEMBERTON AVE
Sampled By: CG/RC
Date Collected: 07-NOV-19
Lab Sample ID: L2379395-3
Matrix: G

DISTRICT OF SQUAMISH
39907 Government Road
PO Box 310
Squamish BC V8B 0A3
ATTN: Craig Halliday

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
THM by Headspace GCMS						
Total THMs	<0.0020		mg/L	0.1		18-NOV-19
VOC (THM) by Headspace GCMS						
Chloroform	<0.0010		mg/L			14-NOV-19
Bromodichloromethane	<0.0010		mg/L			14-NOV-19
Bromoform	<0.0010		mg/L			14-NOV-19
Dibromochloromethane	<0.0010		mg/L			14-NOV-19
Total Haloacetic Acids 5	<0.0054		mg/L	0.080		20-NOV-19
Haloacetic Acids						
Monobromoacetic Acid	<0.0010		mg/L			15-NOV-19
Monochloroacetic Acid	<0.0050		mg/L			15-NOV-19
Bromochloroacetic Acid	<0.0010		mg/L			15-NOV-19
Dibromoacetic Acid	<0.0010		mg/L			15-NOV-19
Dichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Trichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Surr: 2,3-Dibromopropionic Acid (SS)	103.2		%			15-NOV-19

CDWQG = Health Canada Guideline Limits updated JUNE 2019

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Carla Fuginski
Account Manager

Date: 04-DEC-19
PO No.: 40438
WO No.: L2379395
Project Ref: SEMI ANNUAL DW SAMPLING - NOV
Sample ID: LOMOND WAY
Sampled By: CG/RC
Date Collected: 07-NOV-19
Lab Sample ID: L2379395-4
Matrix: G

DISTRICT OF SQUAMISH
39907 Government Road
PO Box 310
Squamish BC V8B 0A3
ATTN: Craig Halliday

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
THM by Headspace GCMS						
Total THMs	<0.0020		mg/L	0.1		18-NOV-19
VOC (THM) by Headspace GCMS						
Chloroform	<0.0010		mg/L			14-NOV-19
Bromodichloromethane	<0.0010		mg/L			14-NOV-19
Bromoform	<0.0010		mg/L			14-NOV-19
Dibromochloromethane	<0.0010		mg/L			14-NOV-19
Total Haloacetic Acids 5	<0.0054		mg/L	0.080		20-NOV-19
Haloacetic Acids						
Monobromoacetic Acid	<0.0010		mg/L			15-NOV-19
Monochloroacetic Acid	<0.0050		mg/L			15-NOV-19
Bromochloroacetic Acid	<0.0010		mg/L			15-NOV-19
Dibromoacetic Acid	<0.0010		mg/L			15-NOV-19
Dichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Trichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Surr: 2,3-Dibromopropionic Acid (SS)	103.6		%			15-NOV-19

CDWQG = Health Canada Guideline Limits updated JUNE 2019

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Carla Fuginski
Account Manager

Date: 04-DEC-19
PO No.: 40438
WO No.: L2379395
Project Ref: SEMI ANNUAL DW SAMPLING - NOV
Sample ID: BIRKEN
Sampled By: CG/RC
Date Collected: 07-NOV-19
Lab Sample ID: L2379395-5
Matrix: G

DISTRICT OF SQUAMISH
39907 Government Road
PO Box 310
Squamish BC V8B 0A3
ATTN: Craig Halliday

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
THM by Headspace GCMS						
Total THMs	<0.0020		mg/L	0.1		18-NOV-19
VOC (THM) by Headspace GCMS						
Chloroform	<0.0010		mg/L			14-NOV-19
Bromodichloromethane	<0.0010		mg/L			14-NOV-19
Bromoform	<0.0010		mg/L			14-NOV-19
Dibromochloromethane	<0.0010		mg/L			14-NOV-19
Total Haloacetic Acids 5	<0.0054		mg/L	0.080		20-NOV-19
Haloacetic Acids						
Monobromoacetic Acid	<0.0010		mg/L			15-NOV-19
Monochloroacetic Acid	<0.0050		mg/L			15-NOV-19
Bromochloroacetic Acid	<0.0010		mg/L			15-NOV-19
Dibromoacetic Acid	<0.0010		mg/L			15-NOV-19
Dichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Trichloroacetic Acid	<0.0010		mg/L			15-NOV-19
Surr: 2,3-Dibromopropionic Acid (SS)	121.8		%			15-NOV-19

CDWQG = Health Canada Guideline Limits updated JUNE 2019

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Carla Fuginski
Account Manager

Guidelines & Objectives

Sample Parameter Qualifier key listed:

Qualifier	Description
U	Not Detected.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).

Health Canada MAC Health Related Criteria Limits

Nitrate/Nitrite-N*	Criteria limit is 10 mg/L (1.0 mg/L if present as all Nitrite-N). High concentrations may contribute to blue baby syndrome in infants.
Lead*	A cumulative body poison, uncommon in naturally occurring hard waters.
Fluoride*	Present in fluoridated water supplies at 0.8 mg/L to reduce dental caries. Elevated levels causes fluorosis (mottling of teeth).
Total Coliforms*	Criteria is 0 CFU/100mL. Adverse health effects.
E. Coli*	Criteria is 0 CFU/100 mL. Certain E. Coli bacteria can be life threatening.
Manganese*	Criteria limit is 0.12 mg/L. Possible neurological effects in infants.

*Health Canada Canadian Drinking Water Quality Guidelines (MAC limit)

Aesthetic Objective Concentration Levels

Alkalinity	Acid neutralizing capacity. Usually a measure of carbonate and bicarbonates and calculated and reported as calcium carbonate.
Balance	Quality control parameter ratioing cations to anions
Bicarbonate	See Alkalinity. Report as the anion HCO3-1
Carbonate	See Alkalinity. Reported at the anion CO3-2
Calcium	See Hardness. Common major cation of water chemistry.
Chloride	Common major anion of water chemistry.
Conductance	Physical test measuring water salinity (dissolved ions or solids)
Hardness	Classical measure or capacity of water to precipitate soap (chiefly calcium and magnesium ions). Causes scaling tendency in water if carbonates/bicarbonates are present (if >200 mg/L). For drinking water purposes waters with results <200 mg/L are considered acceptable, results >200 mg/L are considered poor but can be tolerated. Results >500 mg/L are unacceptable.
Hydroxide	See alkalinity
Magnesium	See hardness. Common major cation of water chemistry. Elevated levels (>125 mg/L) may exert a cathartic or diuretic action.
pH	Measure of water acidity/alkalinity. Normal range is 7.0-8.5.
Potassium	Common major cation of water chemistry.
Sodium	Common major cation of water chemistry. Measure of salinity (saltiness).The aesthetic objective (not related to health) for sodium in drinking water is 200 mg/L. However, where sodium concentration of the drinking water exceeds 20 mg/L, it is recommended that any person on a sodium restricted diet consult with his/her physician or Medical Officer of Health concerning the use of that water.
Sulphate	Common major anion of water chemistry. Elevated levels may exert a cathartic or diuretic action.
Total Dissolved Solids	A measure of water salinity.
Iron	Causes staining to laundry and porcelain and astringent taste. Oxidizes to red-brown precipitate on exposure to air.
Heterotrophic Plate Count	Criteria is 500 cfu/mL Measure of heterotrophic bacteria present.

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Appendix D - VCH Advice re Lead in Drinking Water

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Protecting yourself from Lead in Drinking Water

Lead can be harmful to human health, even in very small amounts. Lead is most serious for pregnant women and young children because infants and children absorb lead more easily than adults and are more susceptible to its harmful effects, such as effects on behaviour and intelligence. The public's exposure to lead has decreased over the years as major sources of lead have been eliminated, and we have no reported cases of children being adversely affected by lead in drinking water in the Vancouver Coastal Health (VCH) region. Nonetheless, it is important to keep lead exposure as low as possible, particularly for pregnant women and children.

Drinking water is one possible, but not the only, source of lead. Lead-based paint in older homes is another potential source – further information is available at: http://www.healthlinkbc.ca/healthfiles/hfile31.stm. The current guideline for lead in drinking water is a maximum acceptable concentration of 0.010 mg/L (10 ppb). Most drinking water supply systems in B.C. have very low levels of lead. However, many water systems in the South Coast of B.C. have soft (low in hardness), and slightly acidic (low pH and alkalinity) drinking water. When this type of water sits unused in building piping, such as overnight or over weekends, lead can be released from the plumbing into the water. This is particularly true for older homes and buildings that may have lead or brass plumbing fixtures or fittings, or lead – containing solder. Some water systems have measures in place to help counter this problem. VCH is working with the operators to evaluate the effectiveness of these measures.

Water sampling results from various communities in VCH indicate that once sitting water is flushed, lead levels return to safe levels below the maximum acceptable concentration, even when the levels were elevated prior to flushing.

What Can You Do

If you are pregnant, trying to become pregnant, have young children in the home or simply wish to reduce your potential lead exposure:

- Anytime water has not been used for a prolonged period, flush the water from a tap in your home for 5 minutes or until the water is cold, whichever comes first.
- Examples of prolonged periods: Overnight, throughout the work day (if all households members are away from the home), and during vacations when the house is empty.

- Use only cold water that has been flushed for drinking, cooking and making baby formula. Hot tap water generally has higher lead levels compared to cold tap water.
- Once the lines have been flushed, water collected for drinking can be stored in a suitable container and kept refrigerated to minimize repeated unnecessary flushing.
- Also to assist conservation, the flushed water can be collected and used to water ornamental household plants.

Note: Households on water systems with corrosion control measures may not require flushing. VCH will adjust our advice as we evaluate these systems.

If you are still concerned about lead exposure from your drinking water, you can consider having your water tested. VCH Environmental Health Officers can advise you of the appropriate private laboratories that can do the testing for you at a cost.

In B.C., screening people's blood for lead is not generally recommended. If you are concerned about your family's current or past exposure to lead, discuss your concerns with your family physician.

For more information on lead in drinking water, visit this Health Canada web page: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/lead-plomb-eng.php

Contact information for Vancouver Coastal Health Environmental Health:

Area	Phone
Central Coast	604-983-6700
Powell River	604-485-3310
Sechelt	604-885-5164
Vancouver	604-675-3800
North Vancouver	604-983-6700
Richmond	604-233-3147
Squamish	604-892-2293
Whistler	604-932-3202