SQUAMISH
HARDWIRED *for* ADVENTURE

2016 DRINKING WATER QUALITY

ANNUAL REPORT

DISTRICT OF SQUAMISH
July 2017
FINAL

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Executive Summary

This report summarizes the District of Squamish's water quality program for 2016. The District of Squamish's Water Supply and Distribution (WS&D) 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 2016, 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 systems is Operated and Maintained by the District of Squamish Water Utility Operations Team and is monitored 24 hours/365 days per year via the Supervisory Control and Data Acquisition (SCADA) system to ensure optimal conditions. In addition, 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 protection of our clean drinking water delivery. 2016 saw the implementation of several Operational and Capital Improvement/Renewal initiatives intended to increase system reliability and ensure long-term sustainability. Examples of such projects included the renewal of several sections of the watermain throughout the distribution network, improvement of isolation procedures for back-up surface water sources, and optimization of the unidirection flushing program to reduce operating costs.

1.0 Introduction

The purpose of this report is to increase the understanding of the District's efforts to provide potable drinking water to its residents and provide the results of the water quality testing that occurred in 2016. It also serves to raise awareness of the importance of protecting our drinking water sources.

As a water supplier in British Columbia, the District of Squamish is regulated by the Drinking Water Protection (DWP) Act and Regulation. This Annual Drinking Water Quality Report is a requirement of the DWP Act and Regulation and of Vancouver Coastal Health (VCH), as one of many conditions to the District's Permit to Operate. 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 draw water from three sources that include one primary groundwater source, and two surface water sources reserved for emergency backup. All water supplies are equipped with either primary or secondary chlorine disinfection. The distribution system consists of seven reservoirs, twenty control valve stations, two pump stations and over 140 km of watermain. The system is required to deliver potable water to nearly 20,000 residents, over 400 industrial, commercial and institutional (ICI) customers, and several Indian Reserves located within the District of Squamish (see Appendix B - District of Squamish Water Distribution Map). In 2016, the District provided over 4.1 million cubic meters (m^3) of potable water for consumption with an Average Daily Demand (ADD) of 11,225,216 L/day and Maximum Daily Demand (MDD) of 16,431,704 L/day.

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

3.0 Water Source

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

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

The District's water system is supplied by seven groundwater wells at the Powerhouse Springs Well Field. In the event that the Well Field were to be compromised or be 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 2016 there was no surface water use in the District of Squamish's water system.

3.1 Powerhouse Springs Well Site

Powerhouse Springs well site, located near the confluence of Ring/Powerhouse Creek and the Mamquam River, contains seven ground water wells that draw from the Ring Creek Aquifer. A full description of the system's potential is described in the *District of Squamish – Water Master Plan*, which can be found on the District's website. Secondary chlorination (also referred to as secondary disinfection) is provided to ensure the microbial safety of the water as it travels throughout the distribution network.

3.1.1 Ring Creek Aquifer

The Ring Creek Aquifer provides a steady supply of water that is recharged by rainfall and snowmelt seepage through the lava flow (31%), and seepage from Ring Creek and Skookum Creek (69%)[1]. In 2014, a Hydrogeological Assessment was conducted, which concluded that the water withdrawn by Powerhouse Springs Well Field is at "low risk of containing pathogens". As such, primary disinfection of the water would be unnecessary.

3.1.2 Powerhouse Springs Wells Rehabilitation

Powerhouse Springs Well #3, which was rehabilitated in 2015, has been taken off line, due to poor performance post-rehabilitation. A new well will be drilled in the well field in 2017/2018 to regain lost capacity.

3.1.3 Powerhouse Springs Well Pump Control Improvements

Implementation in 2015 of Pressure Control of reservoirs has succeeded in minimizing excessive pump cycling. It is anticipated that this will result in increasing the lifecycle of the pumps, minimizing aquifer surging, and hopefully extending the period between well redevelopment.

3.1.4 Powerhouse Springs Chlorination of Drinking 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 manually monitoring, free chlorine residuals are continuously measured using online chlorine analyzers and monitored by the SCADA system at six locations within the network to alert the crews of potential low concentrations.

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

3.2 Emergency Surface Water Sources: Stawamus River & Mashiter Creek

Please note: The District of Squamish did not require the use of raw surface water sources to supplement water distribution in 2016.

The District of Squamish has two additional water sources in the event that the demand for water exceeds the limit of the Powerhouse Springs well field: Stawamus River and Mashiter Creek. 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, it is now only maintained for back up and emergency purposes. Resuming their use as a primary source would require expensive capital upgrades and ongoing treatment costs. Surface water sources have unpredictable water quality due to rain events and upstream use by humans and animals. Water samples from both raw surface water sources are tested weekly for *E. coli* and total coliform. The District holds a water license for the Stawamus River and Mashiter Creek for 132 L/s and 184 L/s, respectively.

3.2.1 Treatment of Surface Water

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 potentially implement a Water Quality or Boil Water Advisory should water from either of the surface water sources enter the distribution system.

3.3 Challenges

The District of Squamish is fortunate to live in an area with multiple sources of freshwater. There are still some challenges that are present which drives the importance for water conservation:

- 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 flows in the distribution system;
- Surface water sources are at risk of contamination from human and animal activity upstream;
- Development causing breaks from ground disturbances.

4.0 Improvements & Maintenance

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 2016:

- The District of Squamish completed replacement of 950 meters of watermain valued at $1.2 million. Watermains were replaced in Brackendale (Eagle Run Drive), Garibaldi Estates (Pat Goode Park), Garibaldi Highlands (Kintyre Drive), and Industrial Park (Mid Way);

- Revised procedure for activating Mashiter Creek and Stawamus River emergency backup sources to prevent inadvertent leakage of surface water into the potable water distribution system. In the event of an emergency necessitating the use of the backup water sources, activation must now be done manually;
- Maintenance at Powerhouse Springs well field included replacement of a broken motor serving Well #5 and installation of a new sampling station at Well #2.
- Hired a Utilities Technician to take on the role of Water Conservation Educator, to manage the Water Conservation Program and to provide general technical support to the Utilities department.

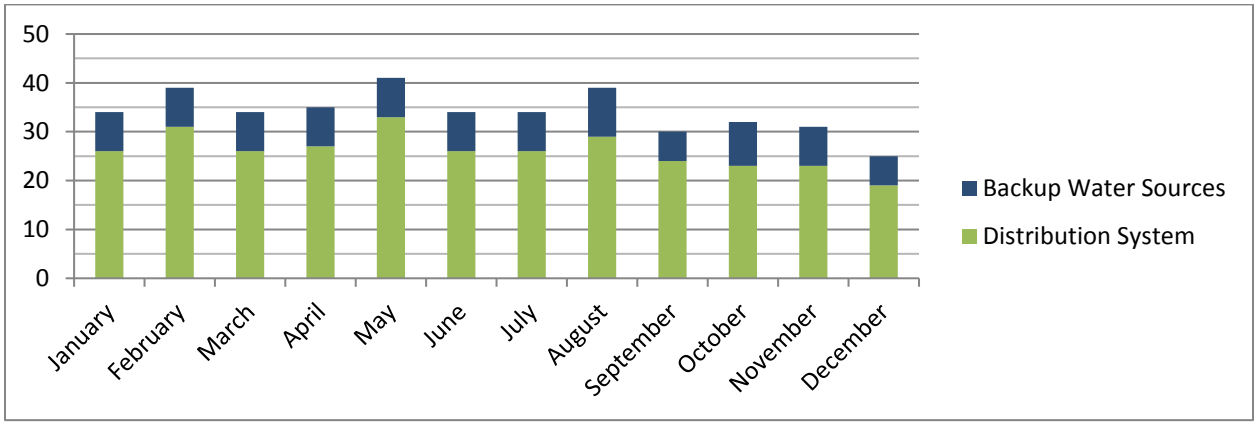
5.0 Standards & Testing Results for Water Supply System

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 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 complete a minimum bacteriological sampling frequency of 20 per month in its distribution system. Typically, six sample locations throughout the distribution system are sampled weekly in effort to ensure the monthly minimum average number of samples meet the permit requirement in the event of unforeseen sample delivery challenges. In addition, weekly samples are collected from Powerhouse Springs well site (before secondary disinfection) and from the Stawamus and Mashiter raw backup surface water sources. Figure 1 shows the actual number of monthly samples analyzed for bacteriological testing in 2016. The bacteriological 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 2016.



The average number of water samples tested per month was 26, which exceeded the minimum requirements of twenty samples per month required by the Permit to Operate a Water Supply System.

The water quality standards for potable water[2] is 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

Summary of the bacteriological testing results for the District of Squamish in 2016 is shown in Table 1.

Table 1. Summary of the bacteriological testing results for the District of Squamish in 2016.

Water Distribution Sample Location	**# of Samples**	***E. coli* (EC/100 mL)**			**Total Coliform (TCU/100 mL)**		
		minimum	**maximum**	**average**	**minimum**	**maximum**	**average**
Birken	49	<1	<1	<1	<1	<1	<1
Perth	50	<1	<1	<1	<1	<1	<1
Lomond	50	<1	<1	<1	<1	<1	<1
Quest University	50	<1	<1	<1	<1	<1	<1
Health Unit	33	<1	<1	<1	<1	<1	<1
Westway Avenue	32	<1	<1	<1	<1	<1	<1
Powerhouse Springs (Pre-chlorination)	49	<1	1 *	<1	<1	8.5 *	<1
Total Samples	**313**						
Additional Sample Locations	**# of Samples**	***E. coli* (EC/100 mL)**			**Total Coliform (TCU/100 mL)**		
		minimum	**maximum**	**average**	**minimum**	**maximum**	**average**
Stawamus River (Raw Surface Water)	50	<1	54.7	6.7	1	1732.9	180.9
Mashiter Creek (Raw Surface Water)	45	<1	4.1	1.7	<1	307.6	31.7

* The results from December 12, 2016 were removed from one location as the data was invalid due to sample handling error.

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

Based on the 2016 results, there were no detectable *E.coli* in the distribution system over the monitoring period.

One sample at Powerhouse Springs (Pre-chlorination) tested positive for Total Coliform bacteria (8.5 TCU/100 mL) and for *E.coli* (1 TCU/100 mL). This sample is taken pre-chlorination and water further down the distribution system from Powerhouse Springs did not show any presence in the water. The results found were due to sample handling error. VCH was notified and a verification sample was sent for testing and came back with no presence of Total Coliform or *E.coli*.

Water from the backup water sources were not used in 2016 by the District of Squamish, however samples were monitored weekly for information in the event that their water use would be required.

5.2 Physical and Chemical Parameters

Water is tested for a wide range of physical and chemical parameters in a Full Spectrum Report carried out by an independent lab to ensure that potable water delivered in the District of Squamish meets the *Guidelines for Canadian Drinking Water Quality (GCDWQ)*. Water samples are tested semi-annually at Powerhouse Springs, Stawamus River and Mashiter Creek (despite the latter two sources not in use in 2016). The results of the independent lab's reports for summer and fall 2016 are included in Appendix C - Water Sample Results.

Analysis results from 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.

Samples are collected and analyzed for disinfection by-products at 4 other sample locations. Disinfection by-products are a by-product of disinfecting the water with sodium hypochlorite, some of which are known carcinogens. None of the samples showed levels of disinfection by-products in excess of the GCDWQ's MAC.

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 the pipes, 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 0.010 mg/L. The semi-annual Physical and Chemical Parameters test results indicated < 0.00050 mg/L of lead in the District's source water samples, which is well below the MAC. Even though the District's water source contains no detectable lead, it is soft (low in hardness), low in alkalinity, and neutral to slightly basic water (pH>7). These conditions may lead to a slightly corrosive environment. 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. Backflow or back-syphon is the undesired reverse flow of water coming back into the potable water supply system when there is negative pressure.

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.

In 2016, the CCC Program focused on assessing high risk industrial, commercial and institutional (ICI) users in the system and performed approximately 175 assessments of a total 411 ICI customers (the total number of ICI customers can vary throughout the year). Many users were also alerted to run-on toilets (continuously flowing water) and small leaks. Existing backflow preventers were identified and added to an online CCC Program management software to ensure they are tested annually. The CCC team is also working with the building department to ensure that CCC requirements are identified for new buildings.

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 performed routine maintenance on the wells that were underperforming (see section 3.1.2), and continues to monitor the wells using the SCADA system, and by testing the wells semi-annually for potential contaminants (results in section 5.1 and 5.2). Following one of the key administrative measures recommended in the Well Protection Plan, the District is in the process of applying with the Province of BC for expansion of the Groundwater Protection Zone (GPZ) to the 1 year capture zone. Approval of the expansion would limit use of land within the GPZ to acceptable activities.

6.3 Unidirectional Flushing Program

The utilities waterworks crew conducts watermain flushing to improve water flow and remove potential contaminant build-up. The program was modified for 2016, whereby one quarter of the distribution system will be flushed annually, plus all dead ends flushed annually. This program ensures 100% of the distribution system is flushed every four years. More frequent flushing is not required because of the high quality of water supplied to the system. This reduction in annual system flushing lowers the operational cost of the UDF program. In 2016, Valleycliffe and Hospital Hill areas were flushed, as well as all dead ends.

6.4 Online Monitoring

The District of Squamish uses the SCADA system to monitor multiple variables in the District's water network in real-time, ranging from the well field pump output to rainfall collection data. As such, District staff are able to continuously monitor the operation of the water supply system. Alarms are generated if control point values go below minimum or above maximum thresholds. The SCADA system allows for operational optimization by automatically controlling reservoir levels and the well pumps output to ensure that water is always available.

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

6.5 Long-Term Water Supply Strategy

The District of Squamish contracted Opus Dayton Knight Consultants Ltd. to complete the *District of Squamish – Water Master Plan* which 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* were a long-term source development strategy, a water meter implementation strategy, a water conservation plan, and a watermain renewal program.

As mentioned in section 4.0, upgrades to the water distribution system were made in 2016 in Brackendale, Garibaldi Estates, Garibaldi Highlands and Industrial Park and improvements to surface water isolation procedures. System maintenance and upgrades will continue in future years as per the report's recommendations and best asset management practices to maintain quality service to the District of Squamish.

An important factor with the growth of the community and aging infrastructure will be the need to reduce per capita water consumption. This will assist in maintaining adequate water supply while keeping upgrade costs to a minimum. Currently outdoor water use is the target for water reduction, however future plans for indoor water use, including water audits, will be implemented as well.

The District of Squamish is in the beginning stages of using 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 the meters installed on existing connections, as part of a multi-year capital project that will progress as funds become available.

When the demand exceeds the current water source capacity at the Powerhouse Springs Well field, the District has a number of options to provide the necessary water to its residents.

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 is updates to its *Water System – Emergency Response and Contingency Plan (ERCP)* annually. This document outlines the necessary steps that need to be taken by District staff in the event of an emergency situation. The ERCP was substantially updated in 2016.

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 water quality, however the District of Squamish Communications Department will take the lead role as spokesperson for media inquiries and releases.

7.0 Significant Events & Public Notification

There were no significant events affecting the District's supply and distribution of good quality drinking water in 2016.

7.1 Drinking Water Advisory/Boil Water Advisory

No Drinking Water Advisories or Boil Water Advisories were issued in 2016.

8.0 Operator Qualifications and Training

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

The District of Squamish Water Distribution System is registered with the EOCP as a Class 3 facility (WD-III). The District does not have a water treatment facility. The District of Squamish supports its staff in achieving further education and training in their respective fields in order to provide the best service to its residents. A total of 16 Water Distribution and Water Treatment Certifications are held by the District's Utility staff. Water Distribution accounts for 12 of the certifications held, the most qualified being Level 3. Environmental Operators Certifications for Water Distribution and Water Treatment held for the District of Squamish in 2016 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	Water Treatment
Operator in Training	2	1
Level 1	3	1
Level 2	5	1
Level 3	2	0
Level 4	0	1
Total	**12**	**4**

9.0 Conclusions

Overall, the District of Squamish delivers a very high quality of drinking water to its residents and end users, not to mention ranking #2 in the BCWWA taste test. The District and all its members are fortunate to have access to the groundwater from the Ring Creek Aquifer as the source for our drinking water which is already of high quality prior to any treatment.

The District of Squamish was consistently able to satisfy the conditions for the Permit to Operate a Water Supply System. Bacteriological sampling was completed weekly. All results met the potable water quality standard of 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 the Unidirectional Flushing Program 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* for emergency events.

The District continues to work to maintain and upgrade the existing infrastructure while aiming to reduce the overall demand on the system through the Water Conservation Program. This will be particularly important with the District's rapidly growing population. Overall, the District of Squamish is proud of the water it delivers to its residents and aims to continue to strive for the highest quality standards possible as the District grows.

Appendix A - Permit to Operate

Vancouver CoastalHealth
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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

vancouver coastalHealth

WATER FACILITY INSPECTION REPORT
Health Protection

Premises Name **District Of Squamish Waterworks**	Tel: (604) 815-6864 Fax:	
Premises Address 1009 Centennial Way Squamish, BC V0N 3G0	Inspection Date March 31, 2016	Time Spent 1 hour
Operator (Person in Charge) Bob Smith		
Inspection Type Routine		

Observed Violations
There are no observed violations.

Section Details

Comments

The bacteriological sample range report for 2015 indicates satisfactory water quality was maintained throughout the year. Of the 253 samples on record, one was positive for total coliform (0.40%); and none were positive for E coli (0%), as you will note in the attached report. From our earlier discussion the one positive result is thought to be due to sampling error. Thank you for your new centralized email contacts for the DOS. We will incorporate those email distribution lists to our automated delivery system as agreed. As discussed, you may wish to give consideration to an enhanced sampling pattern by dividing the sampling sites into two discreet sampling patterns such as week A; week B. This is entirely at your discretion and we are happy to assist with setting up additional sampling sites should you wish to pursue this option. With regard to water chemistry profile, we note your water quality complies with the Guidelines for Canadian Drinking Water Quality for the parameters tested. We note the water is undersaturated with respect to hardness, however it is uncertain if supplementation would be cost effective.

The Well Protection Plan has been completed and currently being implemented. This complies with the conditions of your Permit to Operate and represents best industry practice.

Significant progress has been made with the implementation of your Cross Connection Control plan, including field survey work. This complies with the conditions of your Permit to Operate and represents best industry practice.

Thank you for your DOS - Water Master Plan. This approach exceeded our expectations as it not only addresses your long term supply strategy, but also incorporates asset management and infrastructure renewal. This complies with the previously listed condition of your Permit to Operate and represents best industry practice. A revised Permit to Operate has been attached.

As we discussed the Stawamus River and Mashiter Creek supplies do not have the appropriate infrastructure for treatment and disinfection, thus do not comply with current treatment objectives. Any use of these supplies must be recorded in your annual monitoring report. We have some questions with regard to your preliminary calculation of CT values to achieve 4 log reduction for viral disinfection of the Stawamus supply, and will arrange to meet with your staff further to review this matter. As we further discussed, these sources must be segregated from the potable water supply in a more formal manner. In this regard we are prepared to accept a 'double block and bleed' approach, which should address leakage across a single valve. Please advise as to when this modification can be achieved, or if you have a better approach.

The DOS annual report on monitoring continues to improve and we look forward to your 2015 report (not due until June 30th 2016).

Please update your ERCP document in view of recent staff changes. VCH updated contacts will be provided independently of this report.

The condition on your Permit to Operate relative to your UDF program remains, however it is understood that the entire system does not need to be flushed annually. In view of the water quality, current expectations are that approximately 25% of the system will be flushed on an annual basis with an emphasis on flushing dead ends. This complies with your Permit to Operate and represents best industry practice.

Little is known about the integrity of the Thunderbird and Plateau bedrock storage reservoirs. Kindly advise when there is an opportunity to inspect the Thunderbird reservoir.

Action Taken

☒ Issue Permit

We recognize the District of Squamish has completed a Water Master Plan (September 2015). Accordingly we have removed the following condition from your Permit to Operate: Provide an update on your long-term water supply strategy. A revised permit will be printed with the following conditions which remain and as described in the comment section of this report:; 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.

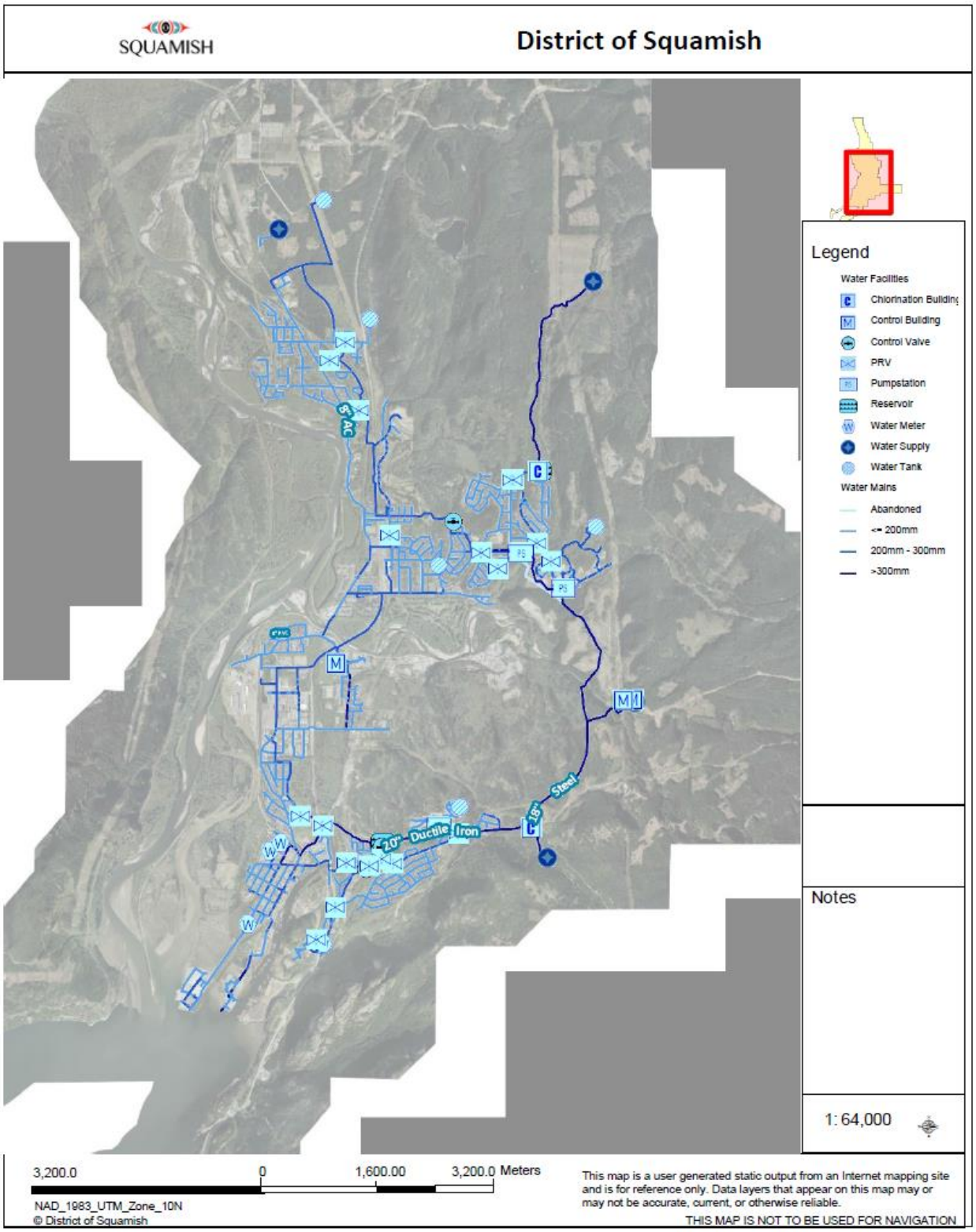
Hazard Rating For Your Facility: ☐ High ☐ Moderate ☒ Low

DWO

DWO Printed Name

Len Clarkson

Appendix B - District of Squamish Water Distribution Map



Appendix C - Water Sample Results

1. Weekly Water Sample Results (bacteriological)
2. Semi-Annual ALS Full Spectrum Report July 2016
3. Semi-Annual ALS Full Spectrum Report November 2016

Weekly Water Sample Results (bacteriological)

	Birken		Perth		Lomond		Quest		Health Unit		Westway		Powerhouse Springs		Stawamus		Mashiter	
Sample Date	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL	Total Coliform per 100mL	*E. Coli* per 100mL
4-Jan-16	N/R		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	8.6	<1	3.1	<1
11-Jan-16	N/R		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	17.1	<1	<1	<1
18-Jan-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	61.7	<1	2	<1
25-Jan-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	48.7	<1	2	1
1-Feb-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	39.9	<1	2	<1
9-Feb-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	35.9	<1	2	<1
15-Feb-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	30.9	<1	5.2	<1
22-Feb-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	20.1	1		
29-Feb-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	65.7	<1		
7-Mar-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	31.3	<1	2	<1
14-Mar-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	34.1	<1	3	<1
21-Mar-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	83.6	<1	2	<1
29-Mar-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	28.5	<1	1	<1
4-Apr-16	<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	<1	<1	184.2	1	4.1	<1
11-Apr-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	53.8	<1	<1	<1
18-Apr-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	88	<1	<1	<1
25-Apr-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	88	<1	<1	<1
2-May-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	152.9	1	<1	<1
9-May-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	105.4	<1		
16-May-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	104.3	<1	<1	<1
18-May-16									<1	<1	<1	<1						
24-May-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	193.5	3.1	<1	<1
30-May-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	160.7	<1		
31-May-16									<1	<1	<1	<1						
6-Jun-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	209.8	<1	<1	<1
13-Jun-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	218.1	<1	<1	<1
20-Jun-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	209.8	1	<1	<1
27-Jun-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	178.9	1	<1	<1
4-Jul-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	238.2	<1	<1	<1
11-Jul-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	222.4	2	<1	<1
18-Jul-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	261.3	46.5	<1	<1
25-Jul-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	1732.9	54.7	<1	<1
2-Aug-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	260.2	2	<1	<1
8-Aug-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	547.5	1	22.8	2
15-Aug-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	307.6	<1	10.8	<1
22-Aug-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	387.3	2	4.1	<1
29-Aug-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	488.4	6.2	307.6	<1
6-Sep-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	410.6	6.3	<1	<1
12-Sep-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	166.9	<1	153.9	4.1
19-Sep-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1				
26-Sep-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	159.7	1	103.9	<1
3-Oct-16	<1	<1	<1	<1	<1	<1	<1	<1							113.4	14.6	86	<2
11-Oct-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	93.3	3.1	3	<1
17-Oct-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	209.8	7.4		
24-Oct-16	<1	<1							<1	<1					158.5	3.1	<1	<1
31-Oct-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	137.6	3	12.2	<1
7-Nov-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	261.3	6.3	9.5	<1
14-Nov-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	209.8	3.1	1	<1
21-Nov-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	66.9	<1	3.1	<1
28-Nov-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	79.8	2	3.1	1
5-Dec-16	<1	<1	<1	<1	<1	<1	<1	<1					<1	<1	65	1	63	1
12-Dec-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	8.5	1	1	1	29.5	1
19-Dec-16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	14.3	1	13.2	<1

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

Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: MASHITER
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-1
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0590		Abs/cm			21-JUL-16
Colour, True	10.9		CU			20-JUL-16
Conductivity	74.8		uS/cm			24-JUL-16
Hardness (as CaCO3)	34.2		mg/L		500	28-JUL-16
pH	9.39		pH		6.5-8.5	24-JUL-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	37.3		mg/L			24-JUL-16
Ammonia, Total (as N)	<0.0050		mg/L			26-JUL-16
Bromide (Br)	<0.050		mg/L			21-JUL-16
Chloride (Cl)	<0.50		mg/L		250	21-JUL-16
Fluoride (F)	0.024		mg/L	1.5		21-JUL-16
Nitrate (as N)	0.0402		mg/L	10		21-JUL-16
Nitrite (as N)	<0.0010		mg/L	1		21-JUL-16
Phosphorus (P)-Total	0.0164		mg/L			22-JUL-16
Phosphorus (P)-Total Dissolved	0.0106		mg/L			21-JUL-16
Silicate (as SiO2)	13.6		mg/L			20-JUL-16
Sulfate (SO4)	2.43		mg/L		500	21-JUL-16
Cyanides						
Cyanide, Total	<0.0050		mg/L	0.2		20-JUL-16
Organic / Inorganic Carbon						
Dissolved Organic Carbon	1.51		mg/L			22-JUL-16
Total Organic Carbon	1.79		mg/L			22-JUL-16
Total Metals						
Aluminum (Al)-Total	0.110		mg/L		0.1	26-JUL-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		26-JUL-16
Arsenic (As)-Total	0.00022		mg/L	0.01		26-JUL-16
Barium (Ba)-Total	<0.020		mg/L	1		26-JUL-16
Boron (B)-Total	<0.10		mg/L	5		26-JUL-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		26-JUL-16
Calcium (Ca)-Total	13.1		mg/L			26-JUL-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		26-JUL-16
Copper (Cu)-Total	<0.0010		mg/L		1.0	26-JUL-16
Iron (Fe)-Total	<0.030		mg/L		0.3	26-JUL-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		26-JUL-16
Magnesium (Mg)-Total	0.33		mg/L			26-JUL-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	26-JUL-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		20-JUL-16
Potassium (K)-Total	0.61		mg/L			26-JUL-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		26-JUL-16
Sodium (Na)-Total	<2.0		mg/L		200	26-JUL-16
Uranium (U)-Total	<0.00010		mg/L	0.02		26-JUL-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	26-JUL-16

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Date: 08-AUG-16
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WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: MASHITER
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-1
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Dissolved Metals						
Dissolved Metals Filtration Location	FIELD					20-JUL-16
Aluminum (Al)-Dissolved	0.108		mg/L		0.1	26-JUL-16
Iron (Fe)-Dissolved	<0.030		mg/L		0.3	26-JUL-16
Aggregate Organics						
Phenols (4AAP)	<0.0010		mg/L			20-JUL-16

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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
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Approved by

Courtney Duncan
Account Manager

DISTRICT OF SQUAMISH
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ATTN: Craig Halliday

Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: STAWAMUS
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-2
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.124		Abs/cm			21-JUL-16
Colour, True	20.6		CU			20-JUL-16
Conductivity	17.8		uS/cm			24-JUL-16
Hardness (as CaCO3)	6.91		mg/L		500	28-JUL-16
pH	6.88		pH		6.5-8.5	24-JUL-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	5.1		mg/L			24-JUL-16
Ammonia, Total (as N)	<0.0050		mg/L			26-JUL-16
Bromide (Br)	<0.050		mg/L			21-JUL-16
Chloride (Cl)	<0.50		mg/L		250	21-JUL-16
Fluoride (F)	<0.020		mg/L	1.5		21-JUL-16
Nitrate (as N)	0.0220		mg/L	10		21-JUL-16
Nitrite (as N)	<0.0010		mg/L	1		21-JUL-16
Phosphorus (P)-Total	0.0042		mg/L			22-JUL-16
Phosphorus (P)-Total Dissolved	<0.0020		mg/L			21-JUL-16
Silicate (as SiO2)	3.65		mg/L			20-JUL-16
Sulfate (SO4)	2.23		mg/L		500	21-JUL-16
Cyanides						
Cyanide, Total	<0.0050		mg/L	0.2		20-JUL-16
Organic / Inorganic Carbon						
Dissolved Organic Carbon	2.95		mg/L			22-JUL-16
Total Organic Carbon	3.17		mg/L			22-JUL-16
Total Metals						
Aluminum (Al)-Total	0.143		mg/L		0.1	26-JUL-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		26-JUL-16
Arsenic (As)-Total	0.00017		mg/L	0.01		26-JUL-16
Barium (Ba)-Total	<0.020		mg/L	1		26-JUL-16
Boron (B)-Total	<0.10		mg/L	5		26-JUL-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		26-JUL-16
Calcium (Ca)-Total	2.39		mg/L			26-JUL-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		26-JUL-16
Copper (Cu)-Total	0.0038		mg/L		1.0	26-JUL-16
Iron (Fe)-Total	0.079		mg/L		0.3	26-JUL-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		26-JUL-16
Magnesium (Mg)-Total	0.23		mg/L			26-JUL-16
Manganese (Mn)-Total	0.0074		mg/L		0.05	26-JUL-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		20-JUL-16
Potassium (K)-Total	0.17		mg/L			26-JUL-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		26-JUL-16
Sodium (Na)-Total	<2.0		mg/L		200	26-JUL-16
Uranium (U)-Total	0.00028		mg/L	0.02		26-JUL-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	26-JUL-16

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Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: STAWAMUS
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-2
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Dissolved Metals						
Dissolved Metals Filtration Location	FIELD					20-JUL-16
Aluminum (Al)-Dissolved	0.131		mg/L		0.1	26-JUL-16
Iron (Fe)-Dissolved	0.054		mg/L		0.3	26-JUL-16
Aggregate Organics						
Phenols (4AAP)	<0.0010		mg/L			20-JUL-16

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Approved by

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Account Manager

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Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: POWERHOUSE SPRINGS
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-3
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0030		Abs/cm			21-JUL-16
Colour, True	<5.0		CU			20-JUL-16
Conductivity	75.4		uS/cm			24-JUL-16
Hardness (as CaCO3)	22.5		mg/L		500	28-JUL-16
pH	7.39		pH		6.5-8.5	24-JUL-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	22.3		mg/L			24-JUL-16
Ammonia, Total (as N)	<0.0050		mg/L			26-JUL-16
Bromide (Br)	<0.050		mg/L			21-JUL-16
Chloride (Cl)	4.29		mg/L		250	21-JUL-16
Fluoride (F)	0.083		mg/L	1.5		21-JUL-16
Nitrate (as N)	0.0563		mg/L	10		21-JUL-16
Nitrite (as N)	<0.0010		mg/L	1		21-JUL-16
Phosphorus (P)-Total	0.0325		mg/L			22-JUL-16
Phosphorus (P)-Total Dissolved	0.0271		mg/L			21-JUL-16
Silicate (as SiO2)	30.5		mg/L			20-JUL-16
Sulfate (SO4)	7.83		mg/L		500	21-JUL-16
Cyanides						
Cyanide, Total	<0.0050		mg/L	0.2		20-JUL-16
Organic / Inorganic Carbon						
Dissolved Organic Carbon	<0.50		mg/L			22-JUL-16
Total Organic Carbon	<0.50		mg/L			22-JUL-16
Total Metals						
Aluminum (Al)-Total	<0.010		mg/L		0.1	26-JUL-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		26-JUL-16
Arsenic (As)-Total	0.00059		mg/L	0.01		26-JUL-16
Barium (Ba)-Total	<0.020		mg/L	1		26-JUL-16
Boron (B)-Total	<0.10		mg/L	5		26-JUL-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		26-JUL-16
Calcium (Ca)-Total	6.91		mg/L			26-JUL-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		26-JUL-16
Copper (Cu)-Total	0.0102		mg/L		1.0	26-JUL-16
Iron (Fe)-Total	<0.030		mg/L		0.3	26-JUL-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		26-JUL-16
Magnesium (Mg)-Total	1.27		mg/L			26-JUL-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	26-JUL-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		20-JUL-16
Potassium (K)-Total	1.32		mg/L			26-JUL-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		26-JUL-16
Sodium (Na)-Total	5.2		mg/L		200	26-JUL-16
Uranium (U)-Total	<0.00010		mg/L	0.02		26-JUL-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	26-JUL-16

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Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: POWERHOUSE SPRINGS
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-3
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Dissolved Metals						
Dissolved Metals Filtration Location	FIELD					20-JUL-16
Aluminum (Al)-Dissolved	<0.0010		mg/L		0.1	26-JUL-16
Iron (Fe)-Dissolved	<0.030		mg/L		0.3	26-JUL-16
Aggregate Organics						
Phenols (4AAP)	<0.0010		mg/L			20-JUL-16

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Courtney Duncan
Account Manager

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Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: PENNYLANE
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-4
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			21-JUL-16
Bromoform	<0.0010		mg/L			21-JUL-16
Dibromochloromethane	<0.0010		mg/L			21-JUL-16
Chloroform	<0.0010		mg/L			21-JUL-16
Total THMs	<0.0020		mg/L	0.1		21-JUL-16

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Account Manager

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

Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: MUNI HALL
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-5
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			21-JUL-16
Bromoform	<0.0010		mg/L			21-JUL-16
Dibromochloromethane	<0.0010		mg/L			21-JUL-16
Chloroform	<0.0010		mg/L			21-JUL-16
Total THMs	<0.0020		mg/L	0.1		21-JUL-16

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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

Courtney Duncan
Account Manager

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Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: LOMOND
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-6
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			21-JUL-16
Bromoform	<0.0010		mg/L			21-JUL-16
Dibromochloromethane	<0.0010		mg/L			21-JUL-16
Chloroform	<0.0010		mg/L			21-JUL-16
Total THMs	<0.0020		mg/L	0.1		21-JUL-16

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

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Date: 08-AUG-16
PO No.: 37148
WO No.: L1800590
Project Ref: SEMI-ANNUAL DRINKING WATER SAMPLING
Sample ID: BIRKEN
Sampled By: CALEM
Date Collected: 19-JUL-16
Lab Sample ID: L1800590-7
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			21-JUL-16
Bromoform	<0.0010		mg/L			21-JUL-16
Dibromochloromethane	<0.0010		mg/L			21-JUL-16
Chloroform	<0.0010		mg/L			21-JUL-16
Total THMs	<0.0020		mg/L	0.1		21-JUL-16

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

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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
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Guidelines & Objectives

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.

*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).
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.
Manganese	Elevated levels may cause staining of laundry and porcelain.
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.

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: MASHITER
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-1
Matrix:

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

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0460		Abs/cm			19-NOV-16
Colour, True	9.6		CU		15	17-NOV-16
Conductivity	37.9		uS/cm			18-NOV-16
Hardness (as CaCO3)	13.9	HTC	mg/L		500	22-NOV-16
pH	7.39		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	15.2		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	<0.50		mg/L		250	18-NOV-16
Fluoride (F)	0.023		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0403		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	18.0		mg/L			17-NOV-16
Sulfate (SO4)	2.74		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	6		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	78		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	0.060		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00022		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	4.60		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	0.0013		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	0.073		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	0.58		mg/L			19-NOV-16
Manganese (Mn)-Total	0.0130		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	0.59		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	<2.0		mg/L		200	19-NOV-16
Uranium (U)-Total	<0.00010		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

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Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: MASHITER
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-1
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

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Elwin Ko
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Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: STAWAMUS
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-2
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0650		Abs/cm			19-NOV-16
Colour, True	12.1		CU		15	17-NOV-16
Conductivity	24.0		uS/cm			18-NOV-16
Hardness (as CaCO3)	8.43	HTC	mg/L		500	22-NOV-16
pH	6.87		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	4.1		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	<0.50		mg/L		250	18-NOV-16
Fluoride (F)	0.023		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0276		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	5.83		mg/L			17-NOV-16
Sulfate (SO4)	5.52		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	2		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	45		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	0.143		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00012		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	2.82		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	0.0106		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	<0.030		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	0.34		mg/L			19-NOV-16
Manganese (Mn)-Total	0.0075		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	0.25		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	<2.0		mg/L		200	19-NOV-16
Uranium (U)-Total	0.00039		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

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Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: STAWAMUS
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-2
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

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Approved by

Elwin Ko
Account Manager

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Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 1
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-3
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0010		Abs/cm			19-NOV-16
Colour, True	<5.0		CU		15	17-NOV-16
Conductivity	80.8		uS/cm			18-NOV-16
Hardness (as CaCO3)	23.2	HTC	mg/L		500	22-NOV-16
pH	7.54		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	22.7		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	5.33		mg/L		250	18-NOV-16
Fluoride (F)	0.084		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0578		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	32.3		mg/L			17-NOV-16
Sulfate (SO4)	9.17		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	<1		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	<1		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	<0.010		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00061		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	7.28		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	0.0145		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	<0.030		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	1.23		mg/L			19-NOV-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	1.28		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	5.0		mg/L		200	19-NOV-16
Uranium (U)-Total	<0.00010		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

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LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 1
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-3
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed

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Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 2
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-4
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0010		Abs/cm			19-NOV-16
Colour, True	<5.0		CU		15	17-NOV-16
Conductivity	69.8		uS/cm			18-NOV-16
Hardness (as CaCO3)	20.4	HTC	mg/L		500	22-NOV-16
pH	7.53		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	22.0		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	3.86		mg/L		250	18-NOV-16
Fluoride (F)	0.082		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0562		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	31.0		mg/L			17-NOV-16
Sulfate (SO4)	7.20		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	<1		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	<1		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	<0.010		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00059		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	6.36		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	<0.0010		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	<0.030		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	1.10		mg/L			19-NOV-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	1.22		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	4.3		mg/L		200	19-NOV-16
Uranium (U)-Total	<0.00010		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

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Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 2
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-4
Matrix:

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Date: 25-NOV-16
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WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 4
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-5
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0030		Abs/cm			19-NOV-16
Colour, True	<5.0		CU		15	17-NOV-16
Conductivity	72.9		uS/cm			18-NOV-16
Hardness (as CaCO3)	21.3	HTC	mg/L		500	22-NOV-16
pH	7.56		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	22.4		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	4.33		mg/L		250	18-NOV-16
Fluoride (F)	0.085		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0578		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	32.2		mg/L			17-NOV-16
Sulfate (SO4)	7.84		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	<1		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	<1		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	<0.010		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00062		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	6.65		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	<0.0010		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	<0.030		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	1.13		mg/L			19-NOV-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	1.24		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	4.5		mg/L		200	19-NOV-16
Uranium (U)-Total	<0.00010		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 4
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-5
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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

Elwin Ko
Account Manager

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 5
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-6
Matrix:

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

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0010		Abs/cm			19-NOV-16
Colour, True	<5.0		CU		15	17-NOV-16
Conductivity	68.7		uS/cm			18-NOV-16
Hardness (as CaCO3)	20.0	HTC	mg/L		500	22-NOV-16
pH	7.55		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	22.1		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	3.83		mg/L		250	18-NOV-16
Fluoride (F)	0.082		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0558		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	31.8		mg/L			17-NOV-16
Sulfate (SO4)	7.05		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	<1		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	<1		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	<0.010		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00056		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	6.24		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	0.0132		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	<0.030		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	1.07		mg/L			19-NOV-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	1.18		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	4.2		mg/L		200	19-NOV-16
Uranium (U)-Total	<0.00010		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 5
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-6
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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

Elwin Ko
Account Manager

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 6
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-7
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0010		Abs/cm			19-NOV-16
Colour, True	<5.0		CU		15	17-NOV-16
Conductivity	76.2		uS/cm			18-NOV-16
Hardness (as CaCO3)	22.2	HTC	mg/L		500	22-NOV-16
pH	7.58		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	22.8		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	4.65		mg/L		250	18-NOV-16
Fluoride (F)	0.086		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0578		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	32.1		mg/L			17-NOV-16
Sulfate (SO4)	8.35		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	<1		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	<1		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	<0.010		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00066		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	6.92		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	0.0031		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	<0.030		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	1.20		mg/L			19-NOV-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	1.27		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	4.9		mg/L		200	19-NOV-16
Uranium (U)-Total	<0.00010		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

DISTRICT OF SQUAMISH
PO Box 310
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ATTN: Craig Halliday

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 6
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-7
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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.
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- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Elwin Ko
Account Manager

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 7
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-8
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Physical Tests						
UV Absorbance (254 nm)	0.0010		Abs/cm			19-NOV-16
Colour, True	<5.0		CU		15	17-NOV-16
Conductivity	74.1		uS/cm			18-NOV-16
Hardness (as CaCO3)	21.8	HTC	mg/L		500	22-NOV-16
pH	7.57		pH		6.5-8.5	18-NOV-16
Anions and Nutrients						
Alkalinity, Total (as CaCO3)	22.4		mg/L			18-NOV-16
Bromide (Br)	<0.050		mg/L			18-NOV-16
Chloride (Cl)	4.33		mg/L		250	18-NOV-16
Fluoride (F)	0.084		mg/L	1.5		18-NOV-16
Nitrate (as N)	0.0567		mg/L	10		18-NOV-16
Nitrite (as N)	<0.0010		mg/L	1		18-NOV-16
Silicate (as SiO2)	32.2		mg/L			17-NOV-16
Sulfate (SO4)	7.97		mg/L		500	18-NOV-16
Bacteriological Tests						
E. coli	<1		MPN/100mL	0		16-NOV-16
Coliform Bacteria - Total	<1		MPN/100mL	0		16-NOV-16
Total Metals						
Aluminum (Al)-Total	<0.010		mg/L		0.1	19-NOV-16
Antimony (Sb)-Total	<0.00050		mg/L	0.006		19-NOV-16
Arsenic (As)-Total	0.00062		mg/L	0.01		19-NOV-16
Barium (Ba)-Total	<0.020		mg/L	1		19-NOV-16
Boron (B)-Total	<0.10		mg/L	5		19-NOV-16
Cadmium (Cd)-Total	<0.00020		mg/L	0.005		19-NOV-16
Calcium (Ca)-Total	6.84		mg/L			19-NOV-16
Chromium (Cr)-Total	<0.0020		mg/L	0.05		19-NOV-16
Copper (Cu)-Total	0.0044		mg/L		1.0	19-NOV-16
Iron (Fe)-Total	<0.030		mg/L		0.3	19-NOV-16
Lead (Pb)-Total	<0.00050		mg/L	0.01		19-NOV-16
Magnesium (Mg)-Total	1.14		mg/L			19-NOV-16
Manganese (Mn)-Total	<0.0020		mg/L		0.05	19-NOV-16
Mercury (Hg)-Total	<0.00020		mg/L	0.001		17-NOV-16
Potassium (K)-Total	1.25		mg/L			19-NOV-16
Selenium (Se)-Total	<0.0010		mg/L	0.05		19-NOV-16
Sodium (Na)-Total	4.6		mg/L		200	19-NOV-16
Uranium (U)-Total	<0.00010		mg/L	0.02		19-NOV-16
Zinc (Zn)-Total	<0.050		mg/L		5.0	19-NOV-16

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PHS WELL 7
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-8
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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
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- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Elwin Ko
Account Manager

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PENNYLANE
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-9
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			18-NOV-16
Bromoform	<0.0010		mg/L			18-NOV-16
Dibromochloromethane	<0.0010		mg/L			18-NOV-16
Chloroform	<0.0010		mg/L			18-NOV-16

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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
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- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Elwin Ko
Account Manager

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Squamish BC V8B 0A3
ATTN: Craig Halliday

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: PEMBERTON
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-10
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			18-NOV-16
Bromoform	<0.0010		mg/L			18-NOV-16
Dibromochloromethane	<0.0010		mg/L			18-NOV-16
Chloroform	<0.0010		mg/L			18-NOV-16

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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.
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- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Elwin Ko
Account Manager

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: LOMOND
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-11
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			18-NOV-16
Bromoform	<0.0010		mg/L			18-NOV-16
Dibromochloromethane	<0.0010		mg/L			18-NOV-16
Chloroform	<0.0010		mg/L			18-NOV-16

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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.
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- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Elwin Ko
Account Manager

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

Date: 25-NOV-16
PO No.: 37410
WO No.: L1858651
LSD:
Project Ref: SEMI ANNUAL DRINKING WATER SAMPLING
Sample ID: BIRKEN
Sampled By: CRAIG
Date Collected: 16-NOV-16
Lab Sample ID: L1858651-12
Matrix:

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Trihalomethanes						
Bromodichloromethane	<0.0010		mg/L			18-NOV-16
Bromoform	<0.0010		mg/L			18-NOV-16
Dibromochloromethane	<0.0010		mg/L			18-NOV-16
Chloroform	<0.0010		mg/L			18-NOV-16

CDWQG = Health Canada Guideline Limits updated DECEMBER 2015

* 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

Elwin Ko
Account Manager

Guidelines & Objectives

Sample Parameter Qualifier key listed:

Qualifier	Description
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.

*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).
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.
Manganese	Elevated levels may cause staining of laundry and porcelain.
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