2019 Annual Water Report

DISTRICT OF BARRIERE

TABLE OF CONTENTS

INTRODUCTION

The District of Barriere is working to continually improve the water system and public awareness to meet the changing needs of our community.

Water safety is of the utmost importance to the District of Barriere. The supply of good, clean drinking water has been taken for granted by the general public in Canada until events such as the Walkerton E. Coli outbreak brought the safety of the water supply into the public eye.

This report has been submitted to Interior Health and is posted on the District of Barriere website: www.barriere.ca

We are dedicated to providing safe, clean water to the residents of Barriere as indicated in the following report.

WATER UTILITY OBJECTIVES

- To ensure adequate supply of high quality water to the community.
- To effectively treat the raw water to provide potable water of integrity to the community.
- To ensure the adequate delivery of high quality potable water to all points within the system for domestic and emergency purposes.
- To ensure effective management of all water system aspects and provide excellent customer service and information to the community.
- To manage water demand by effectively assessing and managing water losses from leakage in the system.
- To develop an effective water conservation program for operations and the wider community.
- To maintain water rates that encourage conservation and resource awareness while providing quality accessible water to consumers.

PROVINCIAL REQUIREMENTS

All drinking water in the water system must meet the Canadian Guidelines for Drinking Water Quality. In British Columbia, the Ministry of Health regulates water suppliers through the Drinking Water Protection Act. This legislation ensures safe drinking water in the Province. It requires that the water supplier monitor the drinking water source and distribution system to ensure compliance with the Drinking Water Protection regulations and report all results to the Health Authority. Water monitoring, inspection and testing, emergency response planning, cross connection control and security standards are all regulated for persons operating a water system.

Changes in water systems must be approved by the Interior Health Authority (IHA), and conform to the District's specifications.

Under the *BC Water Act*, the District must acquire licenses for withdrawal from water bodies.

Under the *Community Charter*, the District may, by bylaw, regulate, prohibit and impose requirements in relation to municipal service and public health. The District must make reports available to the public on request regarding fees imposed under this section.

SUPPLY SOURCES

Photo by Ellen Monteith

The District of Barriere's potable water system is supplied by a system of two wells, one being constructed during the 1990s, the second as recent as 2019. Both wells are located in the northeast quadrant of the community, adjacent to the Barriere River. Two deep wells are located at the north end of Spruce Crescent, and a third production well, is located on Bradford Road. The wells are summarized in Table 3.1 below. The location of these wells can be seen on the overall water system plan on the following page.

Table 3.1: Barriere's Supply Wells

Well	Year Built	Pumping Capacity (L/s)	Approximate Depth (m)	Known Issues Or Concerns
PW1 Bradford Park	2019	22	91.44	High Iron, Manganese
DW2 Spruce Crescent	1997	63	35	Increasing evidence of iron and manganese - limited lifespan

WATER TREATMENT

The well water is injected with a chlorine solution at the pump stations such that it contains an approximate free residual chlorine concentration of 0.5mg/L adjacent to the pump stations, and has been measured to 0.3 mg/L at the more remote parts of the system. In terms of the Interior Health Authority requirements, this treatment is satisfactory in a ground water source that is not under the influence of surface water, as these types of supply are given credit for filtration. Referencing the 4-3-2-1-0 requirements, the chlorine addresses the 4 and the 0, while the fact that the supply is a non-GWUDI well appears to be protected by a confining layer and addresses points 3, 2, and 1.

RESERVOIR STORAGE

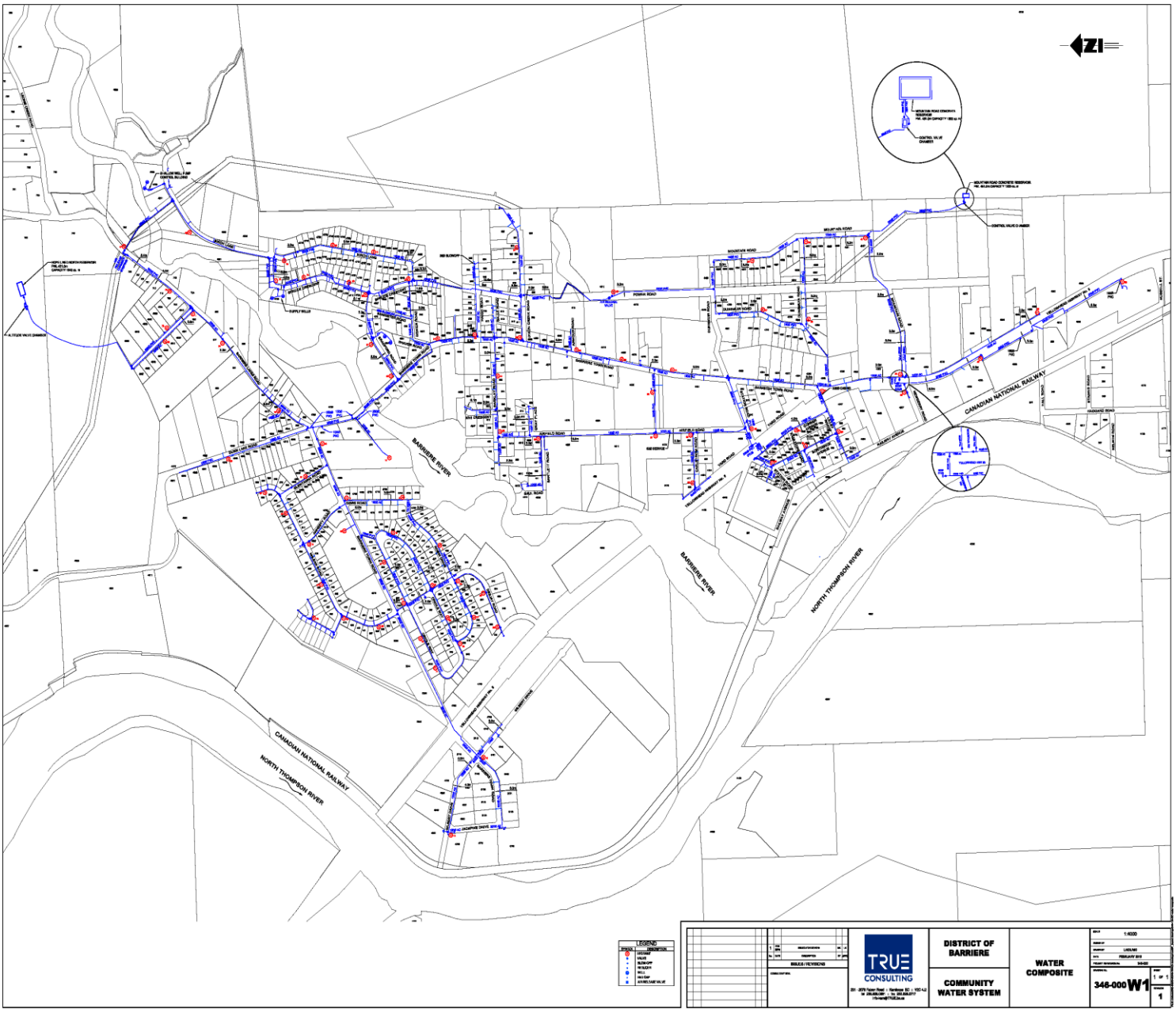
The North reservoir is a rectangular concrete tank with sloping sides and a capacity of 1,540 m^3 (406,560 USG). It is located at the north end of the community adjacent to Barriere Lakes Road and has a free water level of 451 metres. A 350mm diameter supply main connects the reservoir with the rest of the system at the intersection of Lodgepole Road and Barriere Lakes Road.

The South reservoir is a rectangular concrete tank and has a capacity of 1,300m^3 (343,200 USG). It is located at the south end of the community near the top of Mountain Road and has a free water level of 451 metres. A 250mm diameter supply main connects the reservoir with the rest of the system at Mountain Road.

DISTRIBUTION SYSTEM

Approximately 24,750 metres of watermain are joined together to create the District of Barriere water system. The water system has been under going upgrades to ensure the water quality is safe for consumption. The first upgrades were from 1966 onwards when the pipes were asbestos cement. Beginning in the 1980's the pipes began to be upgraded to PVC pipes due to the potential health risks of leakage from decaying asbestos/cement pipe. The PVC pipes range in diameter from 100 mm to 350 mm and provide potable water to approximately 780 residential and 75 commercial service connections in Barriere.

Several sections of pipe within the District's water supply system are undersized, limiting flows and negatively impacting fire protection and pressures in certain parts of the network. Piping has been upgraded at the High School intersection along to Bradford Road, and from Barriere Town Road to Spruce Crescent.



WATER SUPPLY SYSTEM

DISTRICT OF BARRIERE
2019 ANNUAL WATER REPORT

WATER SAMPLING AND TESTING

Bacteriological:
As required by the Interior Health Authority (IHA), staff takes weekly water samples for bacteriological testing for total coliforms and e-Coli bacteria. There are 3 different sampling sites used throughout Barriere.

Full Spectrum Analysis:
Water samples have been sent from the source water for a full spectrum analysis. Parameters such as alkalinity, metals, pH, turbidity, and hardness are tested. *SEE APPENDIX IV*

EMERGENCY RESPONSE PLAN

The District of Barriere has an Emergency Response Plan for the water system. It identifies a number of potential emergencies that could occur and provides a systematic approach on how the District will deal with those emergencies. The plan is available for public viewing at the District Office, 4936 Barriere Town Road.

WATER QUALITY COMPLAINTS

The Utilities department received complaints in 2019 in respect to the quality of water being provided, after a failure of the main production well (DW2), forcing operations to quickly start up a newly drilled well which had not been properly developed. The newly developed well had elevated iron and manganese levels, which once combined with chlorine created a brownish precipitate that showed up throughout the distribution system, therefore creating an aesthetically unpleasing water quality. Although the water was still safe for human consumption, the District of Barriere along with the Interior Health authority (IHA), implemented a water quality advisory (WQA).

SYSTEM UPGRADES COMPLETED IN 2018

- Development of new reservoir
- Development of 2 production wells in Bradford Park on Bradford Road
- Upgrade Barriere Town Road waterline from High school to Bradford Road
- Back-up generator for Bradford Wells.

POTENTIAL SYSTEM UPGRADES

- Check sedimentation level in reservoir
- Upgrade Barriere Town Road from Bradford Road to Mountain Road
- Loop waterline from old Industrial Park to Borthwick Ave
- Since all upgrades in the past 20 year plan will be completed by the end of 2017, we will be formulating a new 20 year plan for the future.

CROSS CONNECTION PROGRAM

The municipality has a Cross Connection Control Program (Bylaw # 0038) to address the potential for the water system to be compromised by high risk service connections which could introduce contaminated water into the water system.

APPENDIX I
WATER CONSUMPTION

Month	2019 DW #1	2018 DW#1	2017 DW#1	2016 DW#1	2015 DW#1	2014 DW#1
January	0	0	0	0	0	0
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	0	0	1,904	0	0	0
May	0	0	0	0	231,874	0
June	0	0	83,045	0	0580,216	0
July	0	0	120,245	0	537,987	1,645,111
August	0	0	0	6901	270,974	663,823
September	0	0	0	0	0	25
October	0	0	0	0	0	5
November	0	0	0	0	0	0
December	0	0	0	0	0	0

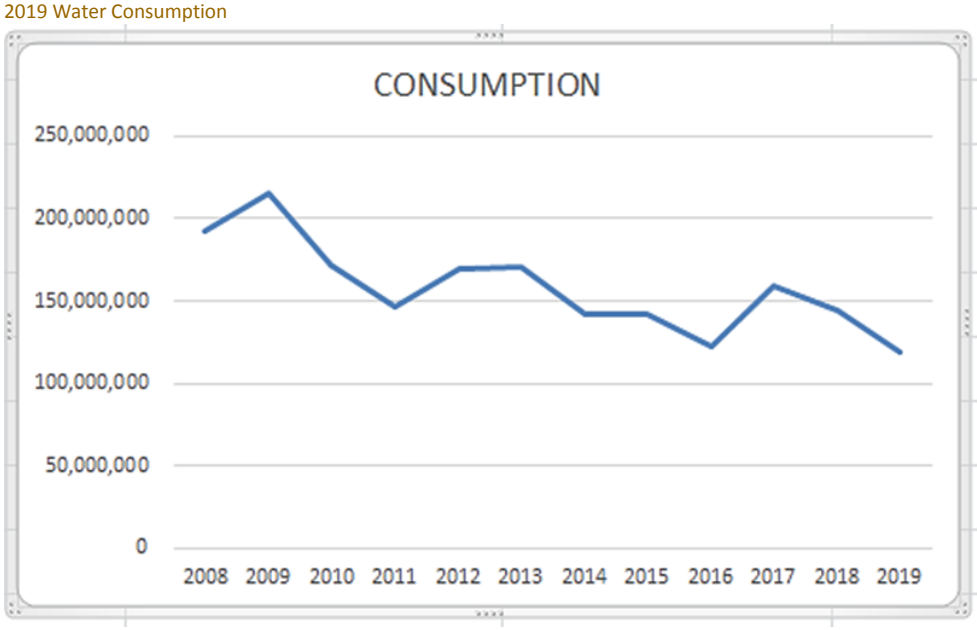
Month	2019 DW#2	2018 DW#2	2017 DW#2	2016 DW#2	2015 DW#2	2014 DW#2
January	7,358,400	6,412,300	7,629,400	4,931,000	5,819,900	6,365,300
February	6,008,155	5,847,300	6,897,000	6,322,000	5,767,600	5,473,200
March	7,132,632	5,912,900	6,292,600	4,934,600	10,512,500	5,737,310
April	9,876,852	6,691,300	6,600,696	7,709,200	7,865,100	7,093,209
May	9,152,742	17,302,700	13,297,400	17,569,100	15,735,326	12,119,478
June	18,399,654	19,729,400	22,456,500	17,845,000	20,584,284	16,604,300
July	18,752,814	23,890,600	35,345,355	17,679,600	20,468,173	25,899,936
August	11,149,300	22,315,700	22,934,300	21,965,999	23,200,226	20,898,575
September	9,736,024	10,752,300	15,454,700	8,767,500	11,904,700	13,218,656
October	7,593,404	7,878,900	7,513,400	5,742,000	7,276,100	9,987,876
November	6,130,388	7,597,200	6,111,800	4,161,900	5,827,800	8,116,200
December	8,256,120	8,322,100	8,127,500	4,578,300	5,640,800	8,551,000

Total Consumption for 2019: 119,537,215 US Gallons
Total Consumption for 2018: 145,826,200 US Gallons
Total Consumption for 2017: 158,865,845 US Gallons
Total Consumption for 2016: 122,206,199 US Gallons
Total Consumption for 2015: 142,223,460 US Gallons
Total Consumption for 2014: 141,532,585 US Gallons
Total Consumption for 2013: 172,664,965 US Gallons

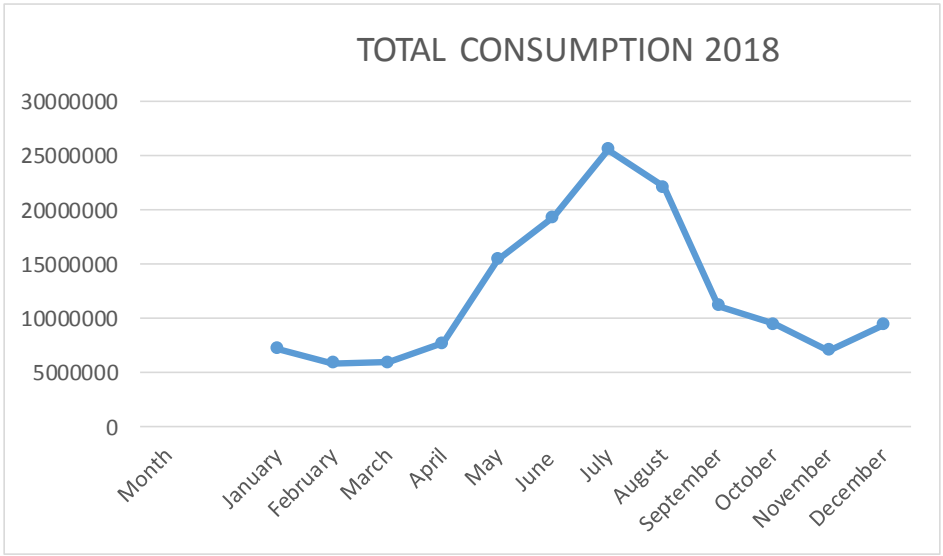
APPENDIX II

WATER CONSUMPTION

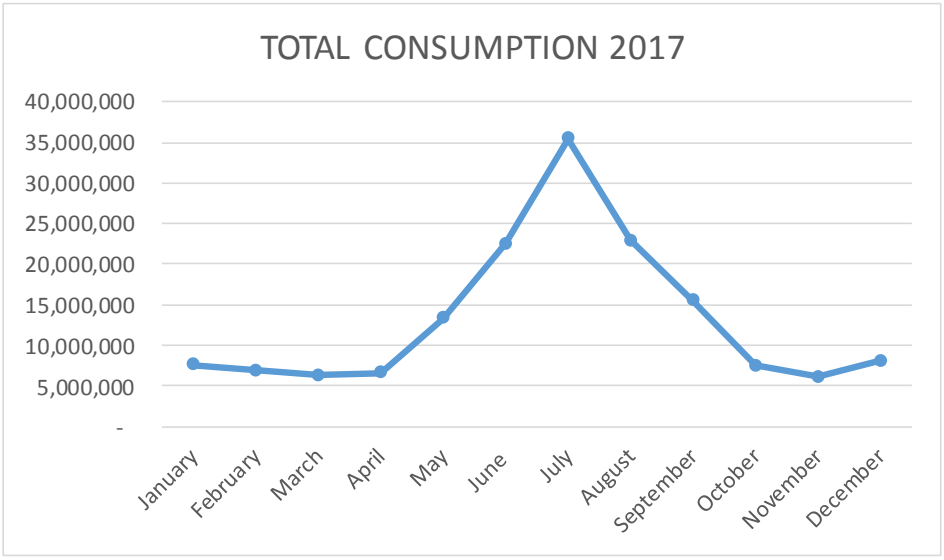
2019 Water Consumption



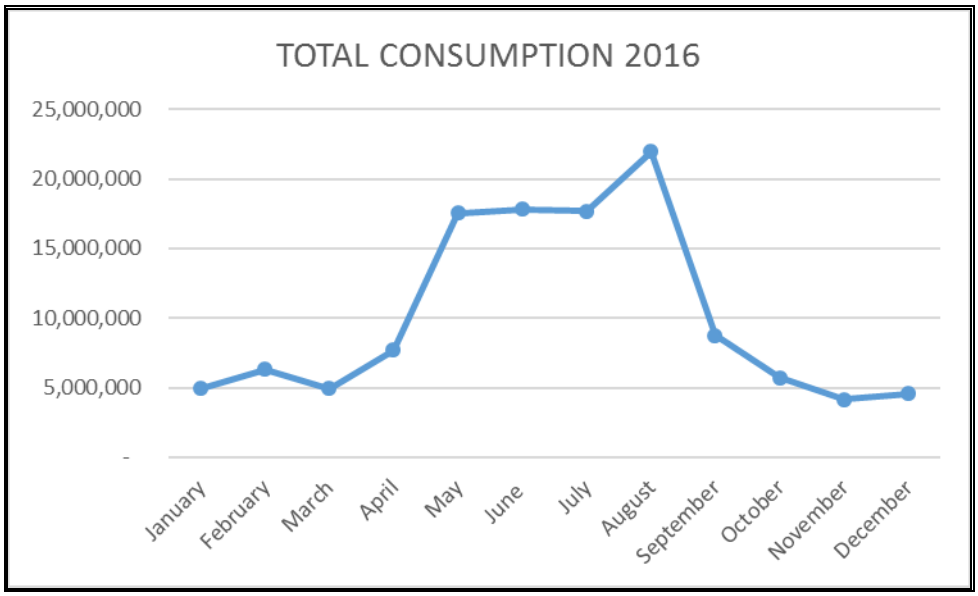
2018 Water Consumption



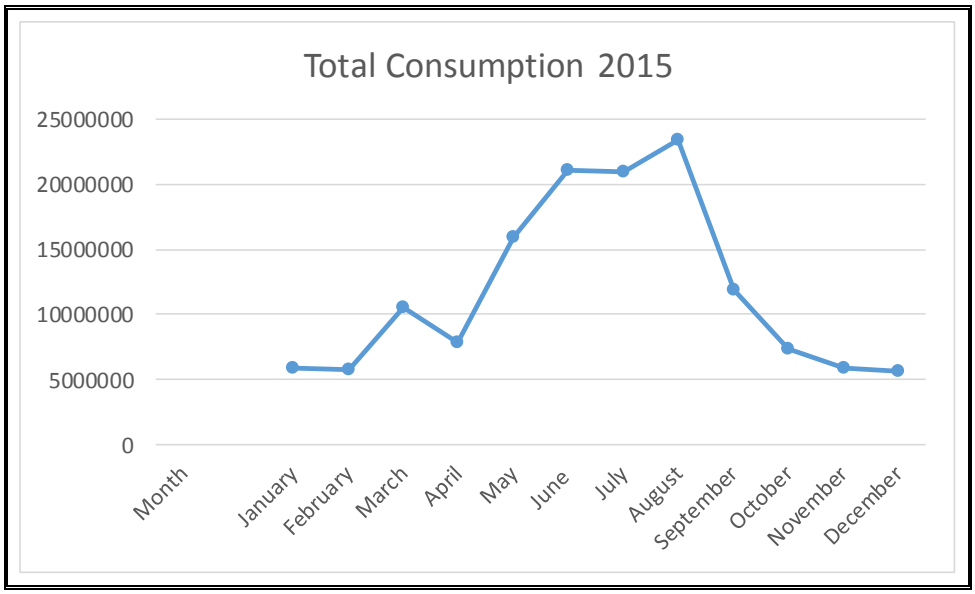
2017 Water Consumption



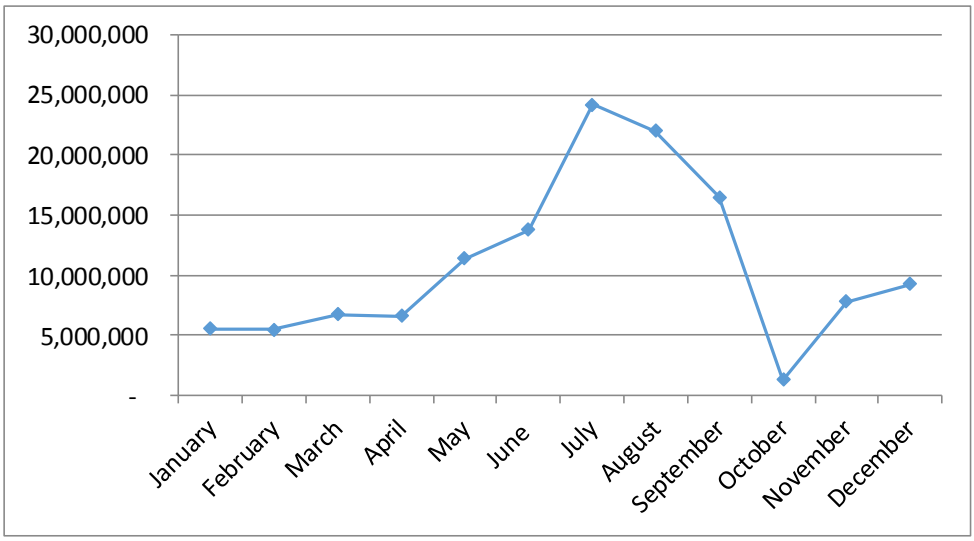
2016 Water Consumption



2015 Water Consumption



2014 Water Consumption



APPENDIX III

DISTRICT OF BARRIERE
2019 ANNUAL WATER REPORT

FULL SPECTRUM ANALYSIS – **CARO** ***(attached)***

CERTIFICATE OF ANALYSIS

REPORTED TO	Interior Health Authority - Vernon 1440-14th Avenue Vernon, BC V1B 2T1		
ATTENTION	Chris Russell	**WORK ORDER**	9121571
PO NUMBER		**RECEIVED / TEMP**	2019-12-17 09:30 / 7°C
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59
PROJECT INFO	Barriere Water System	**COC NUMBER**	No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at sgulenchyn@caro.ca

Authorized By:

Sara Gulenchyn, B.Sc, P.Chem.
Client Service Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; District of Barriere Water System - 4936 Barriere Town Rd (9121571-01) | Matrix: Water | Sampled: 2019-12-16 10:50						
Anions						
Chloride	**3.74**	AO ≤ 250	0.10	mg/L	2019-12-18	
Fluoride	**0.12**	MAC = 1.5	0.10	mg/L	2019-12-18	
Nitrate (as N)	**0.300**	MAC = 10	0.010	mg/L	2019-12-18	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-12-18	
Sulfate	**20.6**	AO ≤ 500	1.0	mg/L	2019-12-18	
Calculated Parameters						
Hardness, Total (as CaCO3)	**178**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.3**	N/A	-5.0		2019-12-30	
Solids, Total Dissolved	**201**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**175**	N/A	1.0	mg/L	2019-12-19	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-12-19	
Alkalinity, Bicarbonate (as CaCO3)	**175**	N/A	1.0	mg/L	2019-12-19	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-12-19	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-12-19	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2019-12-18	
Conductivity (EC)	**359**	N/A	2.0	µS/cm	2019-12-19	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2019-12-20	
pH	**7.95**	7.0-10.5	0.10	pH units	2019-12-19	HT2
Temperature, at pH	**21.0**	N/A		°C	2019-12-19	HT2
Turbidity	**0.11**	OG < 1	0.10	NTU	2019-12-18	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2019-12-27	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2019-12-27	
Arsenic, total	**0.00123**	MAC = 0.01	0.00050	mg/L	2019-12-27	
Barium, total	**0.0176**	MAC = 1	0.0050	mg/L	2019-12-27	
Boron, total	**0.0139**	MAC = 5	0.0050	mg/L	2019-12-27	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2019-12-27	
Calcium, total	**38.6**	None Required	0.20	mg/L	2019-12-27	
Chromium, total	**0.00129**	MAC = 0.05	0.00050	mg/L	2019-12-27	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2019-12-27	
Copper, total	**0.0377**	MAC = 2	0.00040	mg/L	2019-12-27	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2019-12-27	
Lead, total	**0.00045**	MAC = 0.005	0.00020	mg/L	2019-12-27	
Magnesium, total	**19.8**	None Required	0.010	mg/L	2019-12-27	
Manganese, total	**0.00069**	MAC = 0.12	0.00020	mg/L	2019-12-27	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2019-12-19	
Molybdenum, total	**0.00161**	N/A	0.00010	mg/L	2019-12-27	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2019-12-27	
Potassium, total	**1.68**	N/A	0.10	mg/L	2019-12-27	

TEST RESULTS

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; District of Barriere Water System - 4936 Barriere Town Rd (9121571-01) | Matrix: Water | Sampled: 2019-12-16 10:50, Continued						
Total Metals, Continued						
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2019-12-27	
Sodium, total	**8.63**	AO ≤ 200	0.10	mg/L	2019-12-27	
Strontium, total	**0.266**	7	0.0010	mg/L	2019-12-27	
Uranium, total	**0.00197**	MAC = 0.02	0.000020	mg/L	2019-12-27	
Zinc, total	**0.0061**	AO ≤ 5	0.0040	mg/L	2019-12-27	

Sample Qualifiers:

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

Analysis Description	Method Ref.	Technique	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	Kelowna
Colour, True in Water	SM 2120 C (2017)	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	Kelowna
Hardness in Water	SM 2340 B* (2017)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	N/A
Langelier Index in Water	SM 2330 B (2017)	Calculation	N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
pH in Water	SM 4500-H+ B (2017)	Electrometry	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2017)	SM 1030 E (2011)	N/A
Total Metals in Water	EPA 200.2* / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
Turbidity in Water	SM 2130 B (2017)	Nephelometry	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
AO	Aesthetic Objective
CU	Colour Units (referenced against a platinum cobalt standard)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:sgulenchyn@caro.ca

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9L1509										
Blank (B9L1509-BLK1)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B9L1509-BLK2)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B9L1509-BLK3)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B9L1509-BS1)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Chloride	16.0	0.10	mg/L	16.0		100	90-110			
Fluoride	4.01	0.10	mg/L	4.00		100	88-108			
Nitrate (as N)	4.06	0.010	mg/L	4.00		101	90-110			
Nitrite (as N)	1.99	0.010	mg/L	2.00		99	85-115			
Sulfate	15.9	1.0	mg/L	16.0		99	90-110			
LCS (B9L1509-BS2)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Chloride	16.1	0.10	mg/L	16.0		101	90-110			
Fluoride	4.00	0.10	mg/L	4.00		100	88-108			
Nitrate (as N)	4.00	0.010	mg/L	4.00		100	90-110			
Nitrite (as N)	1.99	0.010	mg/L	2.00		100	85-115			
Sulfate	16.0	1.0	mg/L	16.0		100	90-110			
LCS (B9L1509-BS3)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Chloride	16.0	0.10	mg/L	16.0		100	90-110			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9L1509, Continued										
LCS (B9L1509-BS3), Continued				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Fluoride	4.00	0.10	mg/L	4.00		100	88-108			
Nitrate (as N)	4.01	0.010	mg/L	4.00		100	90-110			
Nitrite (as N)	1.97	0.010	mg/L	2.00		99	85-115			
Sulfate	15.9	1.0	mg/L	16.0		100	90-110			
General Parameters, Batch B9L1483										
Blank (B9L1483-BLK1)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Turbidity	< 0.10	0.10	NTU							
Blank (B9L1483-BLK2)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Turbidity	< 0.10	0.10	NTU							
Blank (B9L1483-BLK3)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Turbidity	< 0.10	0.10	NTU							
LCS (B9L1483-BS1)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Turbidity	39.4	0.10	NTU	40.0		98	90-110			
LCS (B9L1483-BS2)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Turbidity	38.7	0.10	NTU	40.0		97	90-110			
LCS (B9L1483-BS3)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Turbidity	39.2	0.10	NTU	40.0		98	90-110			
General Parameters, Batch B9L1545										
Blank (B9L1545-BLK1)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Colour, True	< 5.0	5.0	CU							
Blank (B9L1545-BLK2)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Colour, True	< 5.0	5.0	CU							
LCS (B9L1545-BS1)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Colour, True	20	5.0	CU	20.0		100	85-115			
LCS (B9L1545-BS2)				Prepared: 2019-12-18, Analyzed: 2019-12-18						
Colour, True	20	5.0	CU	20.0		100	85-115			
General Parameters, Batch B9L1678										
Blank (B9L1678-BLK1)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B9L1678-BLK2)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9L1678, Continued										
Blank (B9L1678-BLK2), Continued				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B9L1678-BLK3)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
LCS (B9L1678-BS1)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Alkalinity, Total (as CaCO3)	93.4	1.0	mg/L	100		93	80-120			
LCS (B9L1678-BS2)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Alkalinity, Total (as CaCO3)	92.9	1.0	mg/L	100		93	80-120			
LCS (B9L1678-BS3)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Alkalinity, Total (as CaCO3)	94.2	1.0	mg/L	100		94	80-120			
LCS (B9L1678-BS4)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Conductivity (EC)	1400	2.0	µS/cm	1410		99	95-104			
LCS (B9L1678-BS5)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Conductivity (EC)	1380	2.0	µS/cm	1410		98	95-104			
LCS (B9L1678-BS6)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Conductivity (EC)	1390	2.0	µS/cm	1410		99	95-104			
Reference (B9L1678-SRM1)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
pH	6.99	0.10	pH units	7.01		100	98-102			
Reference (B9L1678-SRM2)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
pH	6.99	0.10	pH units	7.01		100	98-102			
Reference (B9L1678-SRM3)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
pH	7.01	0.10	pH units	7.01		100	98-102			
General Parameters, Batch B9L1708										
Blank (B9L1708-BLK1)				Prepared: 2019-12-20, Analyzed: 2019-12-20						
Cyanide, Total	< 0.0020	0.0020	mg/L							
Blank (B9L1708-BLK2)				Prepared: 2019-12-20, Analyzed: 2019-12-20						
Cyanide, Total	< 0.0020	0.0020	mg/L							
LCS (B9L1708-BS1)				Prepared: 2019-12-20, Analyzed: 2019-12-20						
Cyanide, Total	0.0186	0.0020	mg/L	0.0200		93	82-120			
LCS (B9L1708-BS2)				Prepared: 2019-12-20, Analyzed: 2019-12-20						
Cyanide, Total	0.0193	0.0020	mg/L	0.0200		96	82-120			
LCS Dup (B9L1708-BSD1)				Prepared: 2019-12-20, Analyzed: 2019-12-20						
Cyanide, Total	0.0191	0.0020	mg/L	0.0200		96	82-120	3	10	
LCS Dup (B9L1708-BSD2)				Prepared: 2019-12-20, Analyzed: 2019-12-20						
Cyanide, Total	0.0194	0.0020	mg/L	0.0200		97	82-120	< 1	10	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9L1613										
Blank (B9L1613-BLK1)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Mercury, total	< 0.000010	0.000010	mg/L							
Blank (B9L1613-BLK2)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Mercury, total	< 0.000010	0.000010	mg/L							
Reference (B9L1613-SRM1)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Mercury, total	0.00402	0.000010	mg/L	0.00489		82	80-120			
Reference (B9L1613-SRM2)				Prepared: 2019-12-19, Analyzed: 2019-12-19						
Mercury, total	0.00461	0.000010	mg/L	0.00489		94	80-120			
Total Metals, Batch B9L1855										
Blank (B9L1855-BLK1)				Prepared: 2019-12-23, Analyzed: 2019-12-27						
Aluminum, total	< 0.0050	0.0050	mg/L							
Antimony, total	< 0.00020	0.00020	mg/L							
Arsenic, total	< 0.00050	0.00050	mg/L							
Barium, total	< 0.0050	0.0050	mg/L							
Boron, total	< 0.0050	0.0050	mg/L							
Cadmium, total	< 0.000010	0.000010	mg/L							
Calcium, total	< 0.20	0.20	mg/L							
Chromium, total	< 0.00050	0.00050	mg/L							
Cobalt, total	< 0.00010	0.00010	mg/L							
Copper, total	< 0.00040	0.00040	mg/L							
Iron, total	< 0.010	0.010	mg/L							
Lead, total	< 0.00020	0.00020	mg/L							
Magnesium, total	< 0.010	0.010	mg/L							
Manganese, total	< 0.00020	0.00020	mg/L							
Molybdenum, total	< 0.00010	0.00010	mg/L							
Nickel, total	< 0.00040	0.00040	mg/L							
Potassium, total	< 0.10	0.10	mg/L							
Selenium, total	< 0.00050	0.00050	mg/L							
Sodium, total	< 0.10	0.10	mg/L							
Strontium, total	< 0.0010	0.0010	mg/L							
Uranium, total	< 0.000020	0.000020	mg/L							
Zinc, total	< 0.0040	0.0040	mg/L							
LCS (B9L1855-BS1)				Prepared: 2019-12-23, Analyzed: 2019-12-27						
Aluminum, total	0.0221	0.0050	mg/L	0.0199		111	80-120			
Antimony, total	0.0205	0.00020	mg/L	0.0200		103	80-120			
Arsenic, total	0.0211	0.00050	mg/L	0.0200		106	80-120			
Barium, total	0.0204	0.0050	mg/L	0.0198		103	80-120			
Boron, total	0.0184	0.0050	mg/L	0.0200		92	80-120			
Cadmium, total	0.0211	0.000010	mg/L	0.0199		106	80-120			
Calcium, total	1.77	0.20	mg/L	2.02		88	80-120			
Chromium, total	0.0213	0.00050	mg/L	0.0198		108	80-120			
Cobalt, total	0.0212	0.00010	mg/L	0.0199		107	80-120			
Copper, total	0.0220	0.00040	mg/L	0.0200		110	80-120			
Iron, total	2.03	0.010	mg/L	2.02		101	80-120			
Lead, total	0.0213	0.00020	mg/L	0.0199		107	80-120			
Magnesium, total	2.07	0.010	mg/L	2.02		102	80-120			
Manganese, total	0.0207	0.00020	mg/L	0.0199		104	80-120			
Molybdenum, total	0.0205	0.00010	mg/L	0.0200		102	80-120			
Nickel, total	0.0213	0.00040	mg/L	0.0200		106	80-120			
Potassium, total	2.00	0.10	mg/L	2.02		99	80-120			
Selenium, total	0.0213	0.00050	mg/L	0.0200		106	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Interior Health Authority - Vernon	**WORK ORDER**	9121571
PROJECT	Comprehensive Testing 2019 (Chris Russell)	**REPORTED**	2019-12-30 16:59

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9L1855, Continued										
LCS (B9L1855-BS1), Continued				Prepared: 2019-12-23, Analyzed: 2019-12-27						
Sodium, total	2.18	0.10	mg/L	2.02		108	80-120			
Strontium, total	0.0205	0.0010	mg/L	0.0200		102	80-120			
Uranium, total	0.0208	0.000020	mg/L	0.0200		104	80-120			
Zinc, total	0.0216	0.0040	mg/L	0.0200		108	80-120			
Reference (B9L1855-SRM1)				Prepared: 2019-12-23, Analyzed: 2019-12-27						
Aluminum, total	0.306	0.0050	mg/L	0.303		101	82-114			
Antimony, total	0.0525	0.00020	mg/L	0.0511		103	88-115			
Arsenic, total	0.125	0.00050	mg/L	0.118		106	88-111			
Barium, total	0.818	0.0050	mg/L	0.823		99	83-110			
Boron, total	3.27	0.0050	mg/L	3.45		95	80-118			
Cadmium, total	0.0516	0.000010	mg/L	0.0495		104	90-110			
Calcium, total	10.2	0.20	mg/L	11.6		88	85-113			
Chromium, total	0.262	0.00050	mg/L	0.250		105	88-111			
Cobalt, total	0.0411	0.00010	mg/L	0.0377		109	90-114			
Copper, total	0.537	0.00040	mg/L	0.486		110	90-117			
Iron, total	0.514	0.010	mg/L	0.488		105	90-116			
Lead, total	0.218	0.00020	mg/L	0.204		107	90-110			
Magnesium, total	4.03	0.010	mg/L	3.79		106	88-116			
Manganese, total	0.111	0.00020	mg/L	0.109		102	88-108			
Molybdenum, total	0.203	0.00010	mg/L	0.198		102	88-110			
Nickel, total	0.260	0.00040	mg/L	0.249		105	90-112			
Potassium, total	7.36	0.10	mg/L	7.21		102	87-116			
Selenium, total	0.134	0.00050	mg/L	0.121		111	90-122			
Sodium, total	8.10	0.10	mg/L	7.54		107	86-118			
Strontium, total	0.385	0.0010	mg/L	0.375		103	86-110			
Uranium, total	0.0315	0.000020	mg/L	0.0306		103	88-112			
Zinc, total	2.68	0.0040	mg/L	2.49		108	90-113			