



Annual Report of Monitoring Riondel Water System

Developed in accordance with the
British Columbia Drinking Water Protection Act

BALFOUR WATER SYSTEM	
Period of Monitoring Covered by this Report:	January 1 - December 31, 2022
Interior Health Permit to Operate Facility Number:	12-098-00377
EOCP Classification:	SWS
IHA Permit:	Drinking Water System 15 - 300 Connections
Location of Water Supply System:	Riondel, BC

Contact Information:

Regional District of Central Kootenay
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1. Introduction

Riondel is a community located on the east Shore of Kootenay Lake with access off of Highway 3A. It is within the RDCK Electoral Area A. The Riondel system was first developed in the mid-1900s to service the Bluebell mine site. It was converted to an RDCK service in 1972 and services 198 active connections. The RDCK receives community-specific advice and policy guidance from the Riondel Commission of Management. The commission also coordinates the operation and maintenance of the system, and facilitates communication with the community.

As part of the British Columbia Provincial *Drinking Water Protection Act (2001)* and *Drinking Water Protection Regulation (2003)* an annual water system report to water users is required. This annual report summarizes information collected and recorded throughout the reporting period, and details additional relevant information to the water system.

2. Water Treatment Objectives

The provincial technical document *Drinking Water Treatment objectives (Microbiological) for Surface Water Supplies in British Columbia (2012)* provides performance targets for water suppliers to ensure the provision of biologically safe drinking water. Interior Health supports water suppliers to meet these objectives as risk to human health is substantially reduced. The general treatment objectives are:

- 4-log (99.99%) removal/inactivation of viruses
- 3-log (99.9%) removal/inactivation of Giardia and Cryptosporidium (oocysts)
- Two separate treatment processes (multi-barrier) for surface water supplies
- Turbidity less than 1 NTU (Nephelometric Turbidity Unit)
- Zero total and fecal coliforms (E. coli)

The Riondel water treatment plant provides biologically safe drinking water to its users and achieves the above listed treatment objectives through various system components installed and maintained at the water treatment plant.

3. Water System Overview

The water system derives source water from Indian Creek. A low, concrete weir with diversion inlets has been built on this creek, which delivers the source water to the treatment plant. Water is filtered through a coarse 100 micron self-cleaning screen, then filtered through a semi-permeable membrane, also known as ultra-filtration. The filtered water is then disinfected with chlorine. The treated water is stored in a reservoir and then released into the distribution system.

4. Monitoring

The Riondel water system includes monitoring for bacteriological testing (total/fecal coliforms), turbidity, chlorine residual (free and total), consumption, and chemical constituents.

4.1 Bacteriological

Sampling is done weekly from various locations within the distribution system. Tests for total and fecal coliforms are performed in accordance with the methods outlines in the *Standard Methods for the Examination of Water and Wastewater (2005)*. Colony forming units (cfu) per 100 ml are determined for each sample. There were no adverse sample results in 2022.

4.2 Turbidity

Turbidity is measured on the raw and post ultra-filtration water using both in-line and handheld turbidity meters. The Regional District targets a turbidity level post ultrafiltration treatment below 0.10 NTU. Turbidity levels exceeded this target amount on 4 days within the reporting period. The exceedance remained below 0.105 NTU and recovered to 0.024 NTU within four days. The water quality risk was considered very low, as the treatment process also includes UV and chlorine disinfection which are considered effective at turbidity levels below 1 NTU. Figure 1 outlines raw water turbidity levels, and Figure 2 outlines treated water turbidity levels. Comparing these two figures demonstrates the effectiveness of membrane filtration to reduce turbidity in source water. Drops in turbidity in April, November and December were a result of instrument recalibration.

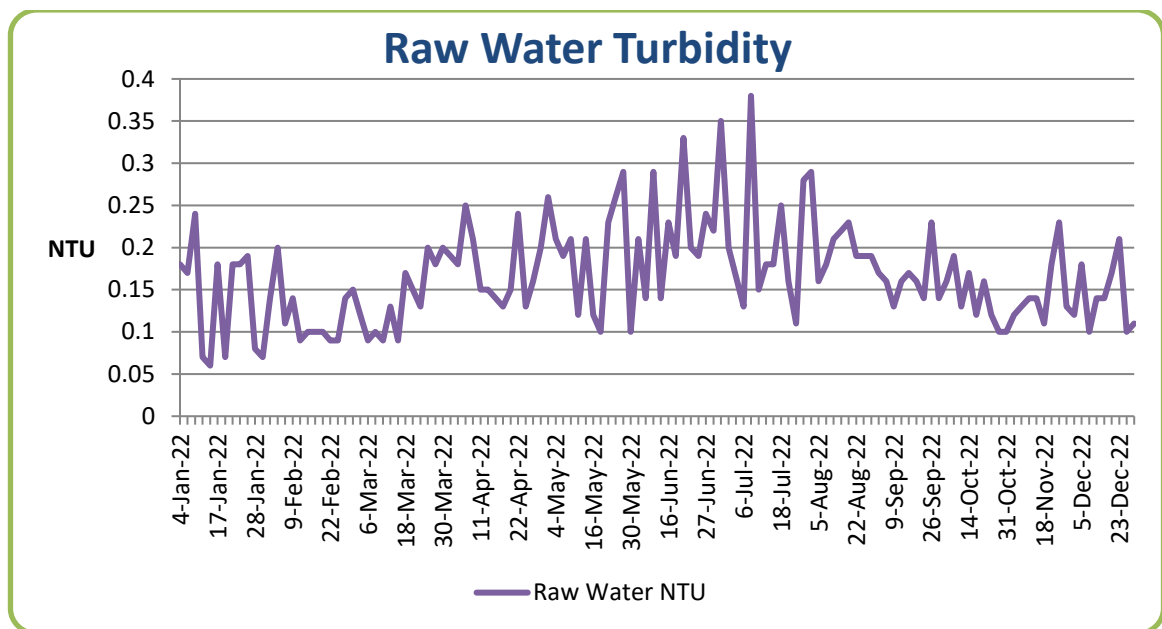


Figure 1 – Raw Water Turbidity Levels for Reporting Period

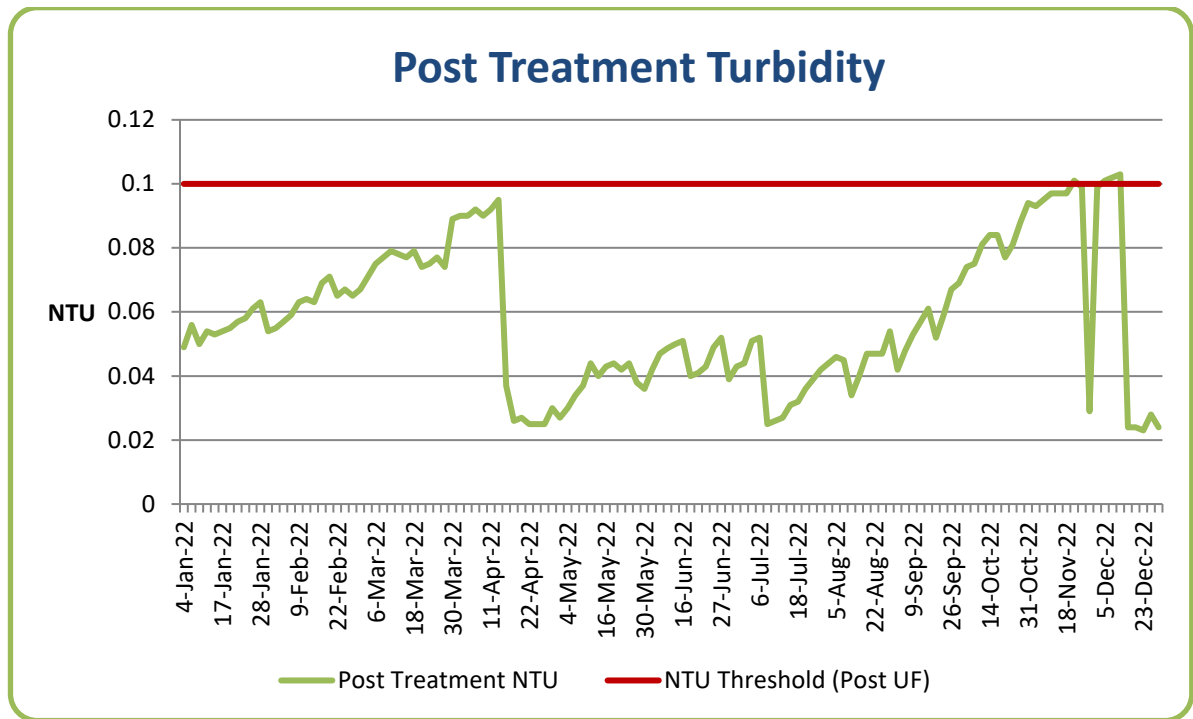


Figure 2 – Post Treatment Turbidity Levels for Reporting Period

4.3 Chlorine Residual

Chlorine residual levels are measured at the water treatment plant and within the distribution system using both in-line and handheld chlorine meters. Figure 3 shows chlorine residual levels at the water treatment plant and within the distribution system. The Regional District targets a minimum chlorine residual (CT) of 0.70 mg/l leaving the reservoir as stated in the operating permit, and 0.2 mg/L in all areas of the distribution system. Chlorine residual levels within the distribution system dropped below the 0.2 mg/L minimum target on 2 occasions during the reporting period. Chlorine residual levels for post reservoir fluctuated throughout the spring likely as a result of higher turbidity levels, with each below-target residual immediately addressed by operators to raise chlorine residual levels. The minimum chlorine residual target of 0.7 mg/l is based upon peak water demands and low reservoir levels. During each below-target residual event, water demand was low and reservoir levels were adequate to provide effective disinfection.

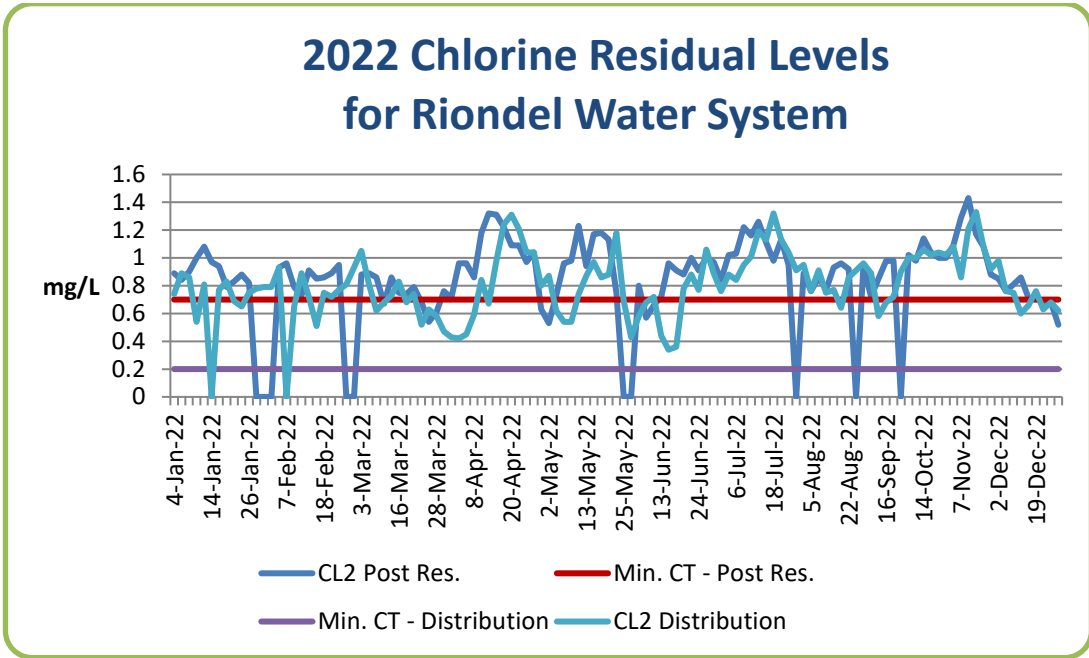


Figure 3 – Free Chlorine Residual Levels for Reporting Period

4.4 Consumption

Flow rates are measured at the ultra-filtration treatment system. The total recorded volume of treated water for the reporting period was 108,905 m3. Figure 4 shows the consumption volume per month for the reporting period.

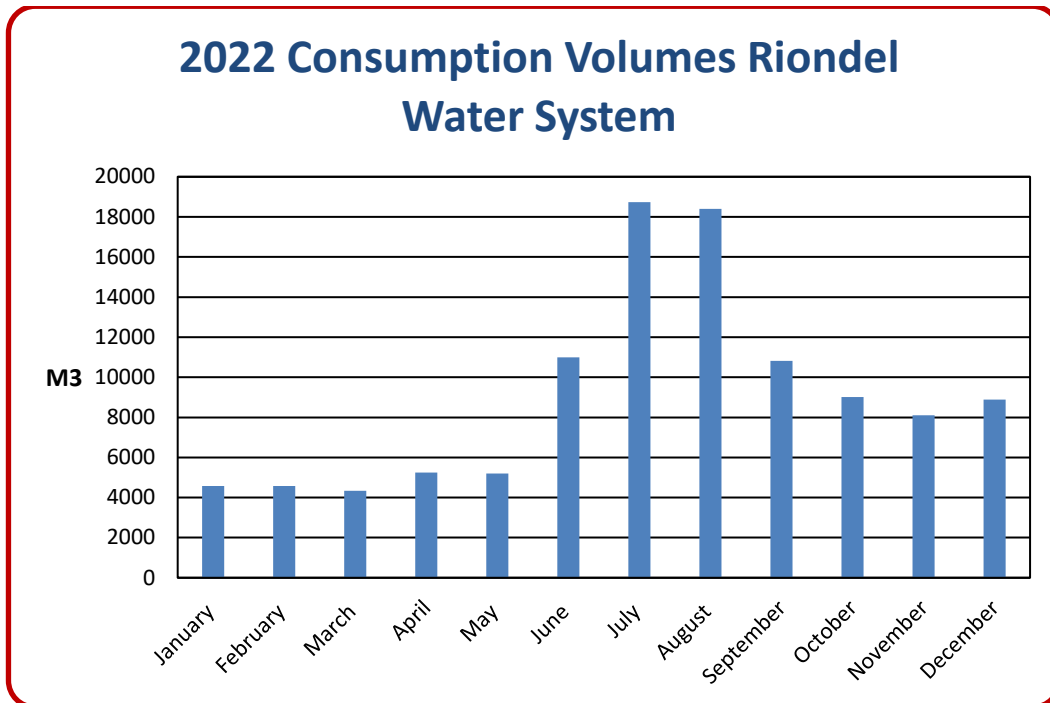


Figure 4 – Treated Water Volumes for Reporting Period

4.5 Chemistry

Comprehensive chemical analysis of water constituents was completed in December 2019. The results in Appendix A show that chemical parameters are below the Maximum Acceptable Concentration (MAC) as detailed in Health Canada’s *Guidelines for Canadian Drinking Water Quality – Summary Table (2017)*.

The RDCK also tested for the chemical disinfection by-products Trihalomethanes/Haloacetic Acids, and Volatile Organic Compounds in June and October. These results are presented in Appendix B. The results show that levels are below the MAC as outlined in the *Guidelines*.

5. Advisories Issued

The following table describes the Notices and Advisories issued for the reporting period.

Table 1 – Notices and Advisories Issued

Notice/Advisory Type	Dates in Effect	Reason
Flushing Notice	Sept 28, 2022	Maintenance and flushing of the distribution system.

Each Notice/Advisory was issued a Rescind Notice to notify the public once action was completed and water quality sampling results demonstrated good water quality.

6. Events and Improvements

In 2022 a fire mitigation project was completed around the Water Treatment Plant and reservoir compound. Water Conservation

Mandatory Stage 1 water conservation measures are in place from June 1 to September 30 every year. In Stage One measures, watering lawns, gardens, trees and shrubs is permitted only from 7pm to 10am daily. Watering using drip irrigation, a watering can or a hand held hose is permitted anytime.

7. Planned Improvements

7.1 Improvements Required by Operating Permit or Drinking Water Officer

The Regional District has not received an updated Operating Permit from Interior Health following construction of the Water Treatment Plant. Interior Health has identified the following Water Treatment Plant deficiencies: cross connection control, and membrane flux monitoring and flow rate automation (flux is allowable flow rate through the filter membranes and varies with changes in water temperature). Membrane flux is currently being

monitored manually, this is a process that should be automated by adjusting for water temperature.

7.2 Future Improvements

Future planned capital upgrades and actions include the following:

- Reservoir valve replacement (2023)
- Installation of a post reservoir flow meter (2023)
- Condition assessment of storm water drainage system (2023)
- Procurement of back-up generator (2023)
- Water treatment plant ultra-filtration membrane replacement (2024)

8. Training and Certification

Table 2 – Operator Certification

OPERATOR	ACTIVE EOCP LEVELS
Allan K. Richardson	WD-II, WT-II, WWC-II, MWWT-I, CH
Cody Peck	WT-II, WD-II, CH
Evan Bjarnason	WT-II, WD-II, CH

9. Emergency Response Plan

An Emergency Response Plan (ERP) for the Riondel Water System is updated annually. This document includes emergency contact information, a communications plan, and detailed procedures for the following types of incidents:

- broken water main;
- source contamination;
- elevated turbidity levels in treated water;
- fire in a building;
- flood conditions;
- loss of source;
- presence of coliforms or E. coli;
- pump failure;
- power failure; and
- low chlorine residuals.

The *Drinking Water Protection Regulation (2003)*, under Section 13, requires that water suppliers provide an ERP to address any potential emergencies that may impact the delivery of water and health of those being supplied by the water system. The ERP must be made accessible to the staff of the water supplier and a copy submitted to the local Environmental Health Officer. The RDCK has fulfilled these requirements for the Riondel Water System.

Appendix A: Comprehensive Chemistry Analysis Results



CERTIFICATE OF ANALYSIS

REPORTED TO	Interior Health Authority - Vernon 1440-14th Avenue Vernon, BC V1B 2T1	WORK ORDER	9120863
ATTENTION	Chris Russell	RECEIVED / TEMP REPORTED	2019-12-10 09:30 / 6°C 2019-12-18 18:35
PO NUMBER		COC NUMBER	No Number
PROJECT	Comprehensive Testing 2019 (Chris Russell)		
PROJECT INFO	Riondel Water RDCK		

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

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.

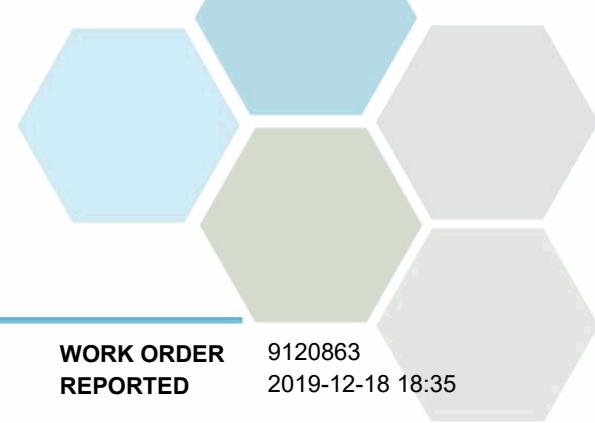
If you have any questions or concerns, please contact me at sgulenchyn@caro.ca

Authorized By:

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

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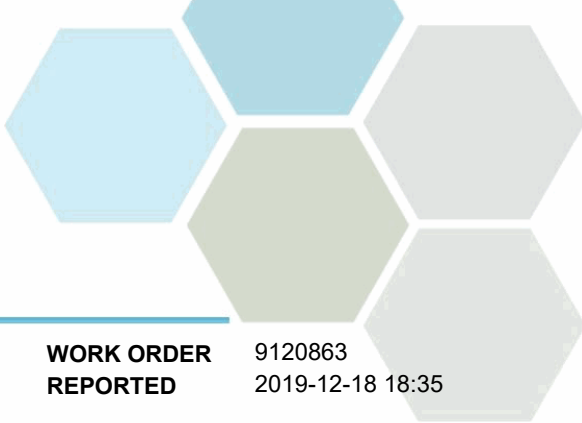


TEST RESULTS

REPORTED TO PROJECT Interior Health Authority - Vernon
Comprehensive Testing 2019 (Chris Russell)

WORK ORDER REPORTED 9120863
2019-12-18 18:35

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
2344; Riondel Water RDCK - Reservoir Tank (9120863-01) Matrix: Water Sampled: 2019-12-09 09:00					
Anions					
Chloride	1.32	AO ≤ 250	0.10 mg/L	2019-12-11	
Fluoride	< 0.10	MAC = 1.5	0.10 mg/L	2019-12-11	
Nitrate (as N)	0.064	MAC = 10	0.010 mg/L	2019-12-11	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2019-12-11	
Sulfate	15.8	AO ≤ 500	1.0 mg/L	2019-12-11	
Calculated Parameters					
Hardness, Total (as CaCO3)	95.1	None Required	0.500 mg/L	N/A	
Langelier Index	-0.07	N/A	-5.0	2019-12-18	
Solids, Total Dissolved	114	AO ≤ 500	1.00 mg/L	N/A	
General Parameters					
Alkalinity, Total (as CaCO3)	91.1	N/A	1.0 mg/L	2019-12-12	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0 mg/L	2019-12-12	
Alkalinity, Bicarbonate (as CaCO3)	91.1	N/A	1.0 mg/L	2019-12-12	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0 mg/L	2019-12-12	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0 mg/L	2019-12-12	
Colour, True	< 5.0	AO ≤ 15	5.0 CU	2019-12-11	
Conductivity (EC)	201	N/A	2.0 µS/cm	2019-12-12	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	2019-12-12	
pH	7.91	7.0-10.5	0.10 pH units	2019-12-12	HT2
Temperature, at pH	22.5	N/A	°C	2019-12-12	HT2
Turbidity	< 0.10	OG < 1	0.10 NTU	2019-12-11	
Total Metals					
Aluminum, total	< 0.0050	OG < 0.1	0.0050 mg/L	2019-12-18	
Antimony, total	< 0.00020	MAC = 0.006	0.00020 mg/L	2019-12-18	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050 mg/L	2019-12-18	
Barium, total	0.0433	MAC = 1	0.0050 mg/L	2019-12-18	
Boron, total	< 0.0050	MAC = 5	0.0050 mg/L	2019-12-18	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010 mg/L	2019-12-18	
Calcium, total	31.2	None Required	0.20 mg/L	2019-12-18	
Chromium, total	< 0.00050	MAC = 0.05	0.00050 mg/L	2019-12-18	
Cobalt, total	< 0.00010	N/A	0.00010 mg/L	2019-12-18	
Copper, total	< 0.00040	MAC = 2	0.00040 mg/L	2019-12-18	
Iron, total	< 0.010	AO ≤ 0.3	0.010 mg/L	2019-12-18	
Lead, total	< 0.00020	MAC = 0.005	0.00020 mg/L	2019-12-18	
Magnesium, total	4.14	None Required	0.010 mg/L	2019-12-18	
Manganese, total	< 0.00020	MAC = 0.12	0.00020 mg/L	2019-12-18	
Mercury, total	< 0.000010	MAC = 0.001	0.000010 mg/L	2019-12-12	
Molybdenum, total	0.00179	N/A	0.00010 mg/L	2019-12-18	
Nickel, total	< 0.00040	N/A	0.00040 mg/L	2019-12-18	
Potassium, total	3.63	N/A	0.10 mg/L	2019-12-18	



TEST RESULTS

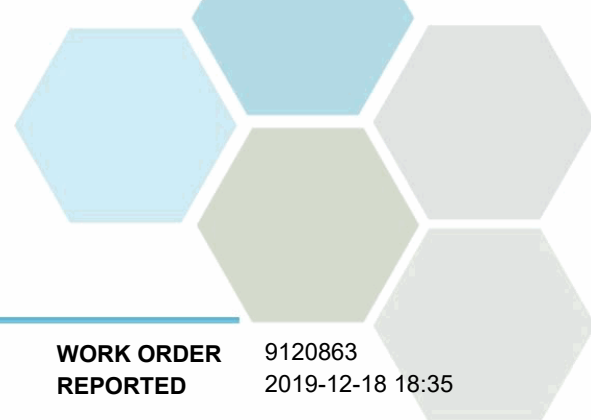
REPORTED TO PROJECT Interior Health Authority - Vernon
Comprehensive Testing 2019 (Chris Russell)

WORK ORDER REPORTED 9120863
2019-12-18 18:35

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
2344; Riondel Water RDCK - Reseevoir Tank (9120863-01) Matrix: Water Sampled: 2019-12-09 09:00, Continued					
<i>Total Metals, Continued</i>					
Selenium, total	< 0.00050	MAC = 0.05	0.00050 mg/L	2019-12-18	
Sodium, total	2.17	AO ≤ 200	0.10 mg/L	2019-12-18	
Strontium, total	0.0966	7	0.0010 mg/L	2019-12-18	
Uranium, total	0.00190	MAC = 0.02	0.000020 mg/L	2019-12-18	
Zinc, total	< 0.0040	AO ≤ 5	0.0040 mg/L	2019-12-18	

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 PROJECT Interior Health Authority - Vernon
Comprehensive Testing 2019 (Chris Russell)

WORK ORDER REPORTED 9120863
2019-12-18 18:35

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

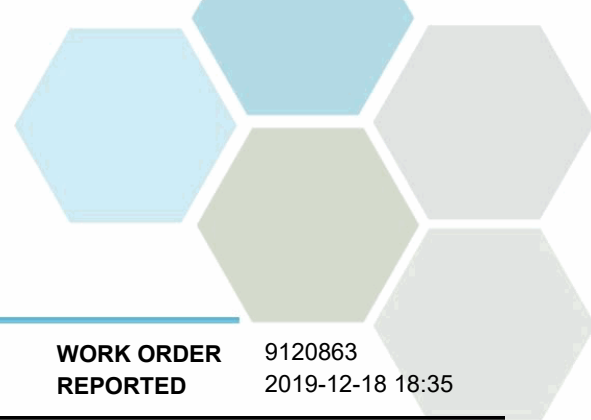
Glossary of Terms:

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 PROJECT Interior Health Authority - Vernon
Comprehensive Testing 2019 (Chris Russell)

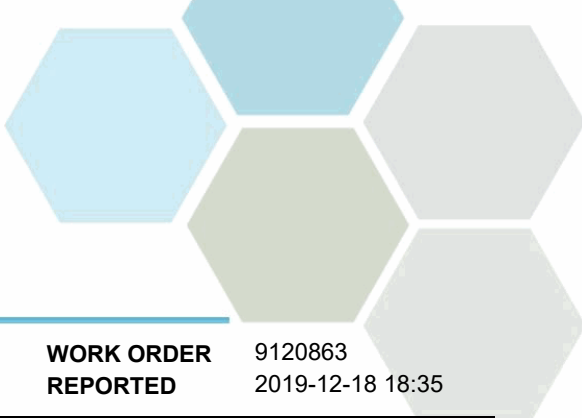
WORK ORDER REPORTED 9120863
2019-12-18 18:35

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

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9L0892									
Blank (B9L0892-BLK1)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
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 (B9L0892-BLK2)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
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 (B9L0892-BS1)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Fluoride	4.10	0.10 mg/L	4.00		102	88-108			
Nitrate (as N)	4.11	0.010 mg/L	4.00		103	90-110			
Nitrite (as N)	2.02	0.010 mg/L	2.00		101	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
LCS (B9L0892-BS2)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Chloride	16.2	0.10 mg/L	16.0		101	90-110			
Fluoride	3.95	0.10 mg/L	4.00		99	88-108			
Nitrate (as N)	4.11	0.010 mg/L	4.00		103	90-110			
Nitrite (as N)	2.01	0.010 mg/L	2.00		101	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
General Parameters, Batch B9L0873									
Blank (B9L0873-BLK1)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Turbidity	< 0.10	0.10 NTU							
LCS (B9L0873-BS1)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Turbidity	38.8	0.10 NTU	40.0		97	90-110			

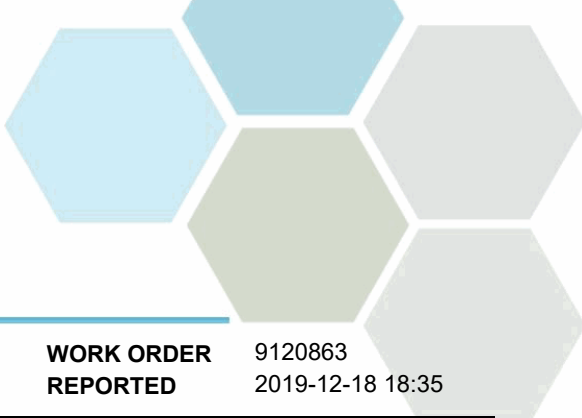


APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Interior Health Authority - Vernon
Comprehensive Testing 2019 (Chris Russell)

WORK ORDER REPORTED 9120863
2019-12-18 18:35

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9L0873, Continued									
General Parameters, Batch B9L0876									
Blank (B9L0876-BLK1)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Colour, True	< 5.0	5.0 CU							
Blank (B9L0876-BLK2)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Colour, True	< 5.0	5.0 CU							
LCS (B9L0876-BS1)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Colour, True	21	5.0 CU	20.0		103	85-115			
LCS (B9L0876-BS2)			Prepared: 2019-12-11, Analyzed: 2019-12-11						
Colour, True	21	5.0 CU	20.0		105	85-115			
General Parameters, Batch B9L0919									
Blank (B9L0919-BLK1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Cyanide, Total	< 0.0020	0.0020 mg/L							
Blank (B9L0919-BLK2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Cyanide, Total	< 0.0020	0.0020 mg/L							
LCS (B9L0919-BS1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Cyanide, Total	0.0196	0.0020 mg/L	0.0200		98	82-120			
LCS (B9L0919-BS2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Cyanide, Total	0.0189	0.0020 mg/L	0.0200		95	82-120			
LCS Dup (B9L0919-BSD1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Cyanide, Total	0.0202	0.0020 mg/L	0.0200		101	82-120	3	10	
LCS Dup (B9L0919-BSD2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Cyanide, Total	0.0183	0.0020 mg/L	0.0200		92	82-120	3	10	
General Parameters, Batch B9L0980									
Blank (B9L0980-BLK1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
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 (B9L0980-BLK2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
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 (B9L0980-BS1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Alkalinity, Total (as CaCO3)	95.8	1.0 mg/L	100		96	80-120			



APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Interior Health Authority - Vernon
Comprehensive Testing 2019 (Chris Russell)

WORK ORDER REPORTED 9120863
2019-12-18 18:35

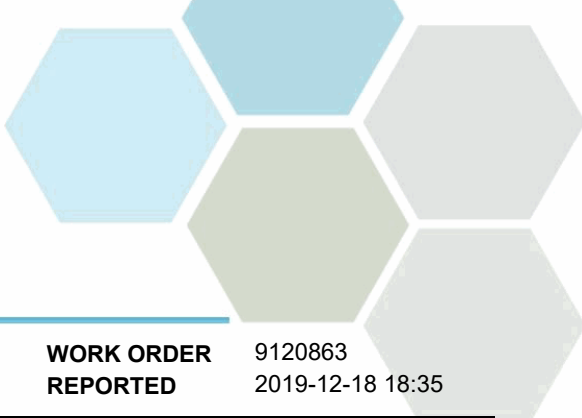
Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9L0980, Continued									
LCS (B9L0980-BS2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Alkalinity, Total (as CaCO ₃)	95.4	1.0 mg/L	100		95	80-120			
LCS (B9L0980-BS3)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Conductivity (EC)	1370	2.0 µS/cm	1410		97	95-104			
LCS (B9L0980-BS4)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Conductivity (EC)	1360	2.0 µS/cm	1410		97	95-104			
Reference (B9L0980-SRM1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
pH	6.99	0.10 pH units	7.01		100	98-102			
Reference (B9L0980-SRM2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
pH	7.02	0.10 pH units	7.01		100	98-102			

Total Metals, Batch B9L1006

Blank (B9L1006-BLK1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B9L1006-BLK2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Mercury, total	< 0.000010	0.000010 mg/L							
Reference (B9L1006-SRM1)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Mercury, total	0.00480	0.000010 mg/L	0.00489		98	80-120			
Reference (B9L1006-SRM2)			Prepared: 2019-12-12, Analyzed: 2019-12-12						
Mercury, total	0.00463	0.000010 mg/L	0.00489		95	80-120			

Total Metals, Batch B9L1125

Blank (B9L1125-BLK1)			Prepared: 2019-12-13, Analyzed: 2019-12-18						
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							



APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Interior Health Authority - Vernon
Comprehensive Testing 2019 (Chris Russell)

WORK ORDER REPORTED 9120863
2019-12-18 18:35

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9L1125, Continued									
LCS (B9L1125-BS1)					Prepared: 2019-12-13, Analyzed: 2019-12-18				
Aluminum, total	0.0199	0.0050 mg/L	0.0199		100	80-120			
Antimony, total	0.0189	0.00020 mg/L	0.0200		94	80-120			
Arsenic, total	0.0197	0.00050 mg/L	0.0200		98	80-120			
Barium, total	0.0180	0.0050 mg/L	0.0198		91	80-120			
Boron, total	0.0184	0.0050 mg/L	0.0200		92	80-120			
Cadmium, total	0.0193	0.000010 mg/L	0.0199		97	80-120			
Calcium, total	1.84	0.20 mg/L	2.02		91	80-120			
Chromium, total	0.0196	0.00050 mg/L	0.0198		99	80-120			
Cobalt, total	0.0201	0.00010 mg/L	0.0199		101	80-120			
Copper, total	0.0201	0.00040 mg/L	0.0200		100	80-120			
Iron, total	1.85	0.010 mg/L	2.02		91	80-120			
Lead, total	0.0196	0.00020 mg/L	0.0199		99	80-120			
Magnesium, total	1.86	0.010 mg/L	2.02		92	80-120			
Manganese, total	0.0187	0.00020 mg/L	0.0199		94	80-120			
Molybdenum, total	0.0186	0.00010 mg/L	0.0200		93	80-120			
Nickel, total	0.0200	0.00040 mg/L	0.0200		100	80-120			
Potassium, total	1.80	0.10 mg/L	2.02		89	80-120			
Selenium, total	0.0202	0.00050 mg/L	0.0200		101	80-120			
Sodium, total	1.90	0.10 mg/L	2.02		94	80-120			
Strontium, total	0.0181	0.0010 mg/L	0.0200		90	80-120			
Uranium, total	0.0200	0.000020 mg/L	0.0200		100	80-120			
Zinc, total	0.0233	0.0040 mg/L	0.0200		117	80-120			
Reference (B9L1125-SRM1)					Prepared: 2019-12-13, Analyzed: 2019-12-18				
Aluminum, total	0.113	0.0050 mg/L	0.118		96	82-114			
Antimony, total	0.0220	0.00020 mg/L	0.0216		102	88-115			
Arsenic, total	0.227	0.00050 mg/L	0.212		107	88-111			
Barium, total	1.53	0.0050 mg/L	1.65		93	83-110			
Boron, total	0.781	0.0050 mg/L	0.825		95	79-117			
Cadmium, total	0.111	0.000010 mg/L	0.110		100	90-110			
Calcium, total	3.82	0.20 mg/L	3.86		99	85-120			
Chromium, total	0.224	0.00050 mg/L	0.217		103	88-111			
Cobalt, total	0.0663	0.00010 mg/L	0.0620		107	90-114			
Copper, total	0.438	0.00040 mg/L	0.408		107	90-117			
Iron, total	0.633	0.010 mg/L	0.635		100	90-116			
Lead, total	0.0561	0.00020 mg/L	0.0550		102	90-110			
Magnesium, total	3.33	0.010 mg/L	3.30		101	88-116			
Manganese, total	0.169	0.00020 mg/L	0.171		99	88-108			
Molybdenum, total	0.204	0.00010 mg/L	0.202		101	88-110			
Nickel, total	0.437	0.00040 mg/L	0.418		105	90-112			
Potassium, total	1.38	0.10 mg/L	1.44		96	87-116			
Selenium, total	0.0180	0.00050 mg/L	0.0162		111	90-122			
Sodium, total	8.93	0.10 mg/L	9.00		99	81-117			
Strontium, total	0.459	0.0010 mg/L	0.468		98	86-110			
Uranium, total	0.128	0.000020 mg/L	0.129		99	88-112			
Zinc, total	0.461	0.0040 mg/L	0.424		109	90-113			

Appendix B: Trihalomethanes/Haloacetic Acid and Volatile Organic Compounds Monitoring Results



CERTIFICATE OF ANALYSIS

REPORTED TO	Regional District of Central Kootenay - Nelson Box 590 - 202 Lakeside Drive Nelson, BC V1L 5R4	WORK ORDER	22F3612
ATTENTION	Steve Ethier	RECEIVED / TEMP REPORTED	2022-06-23 09:30 / 12.5°C
PO NUMBER	RDCK- Riondel	COC NUMBER	No Number
PROJECT	Riondel		
PROJECT INFO			

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/IEC 17025:2017 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.

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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.

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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.

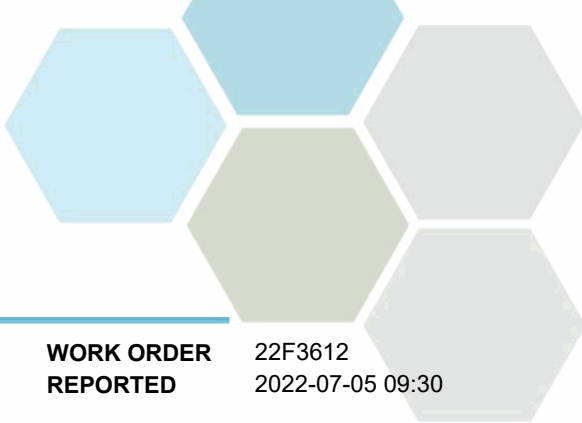
If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

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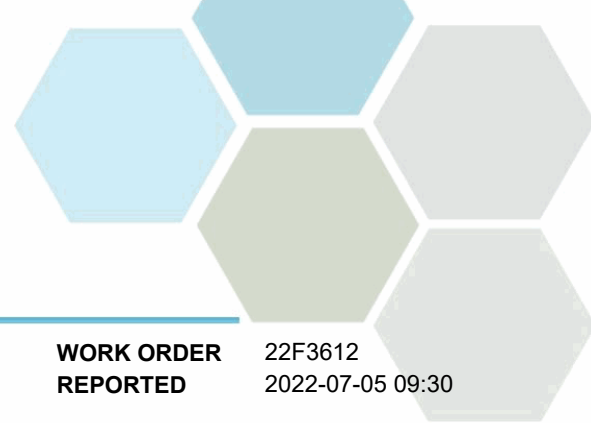


TEST RESULTS

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Riondel

WORK ORDER REPORTED 22F3612
2022-07-05 09:30

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Riondel (22F3612-01) Matrix: Water Sampled: 2022-06-21 14:00						
Calculated Parameters						
Total Trihalomethanes	0.0313	MAC = 0.1	0.00400	mg/L		N/A
Haloacetic Acids						
Monochloroacetic Acid	< 0.0020	N/A	0.0020	mg/L		2022-06-30
Monobromoacetic Acid	< 0.0020	N/A	0.0020	mg/L		2022-06-30
Dichloroacetic Acid	0.0175	N/A	0.0020	mg/L		2022-06-30
Trichloroacetic Acid	0.0194	N/A	0.0020	mg/L		2022-06-30
Dibromoacetic Acid	< 0.0020	N/A	0.0020	mg/L		2022-06-30
Total Haloacetic Acids (HAA5)	0.0368	MAC = 0.08	0.00200	mg/L		N/A
Surrogate: 2-Bromopropionic Acid	98		70-130	%		2022-06-30
Volatile Organic Compounds (VOC)						
Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L		2022-06-28
Bromoform	< 0.0010	N/A	0.0010	mg/L		2022-06-28
Chloroform	0.0313	N/A	0.0010	mg/L		2022-06-28
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L		2022-06-28
Surrogate: Toluene-d8	103		70-130	%		2022-06-28
Surrogate: 4-Bromofluorobenzene	98		70-130	%		2022-06-28



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Riondel

WORK ORDER REPORTED 22F3612
2022-07-05 09:30

Analysis Description	Method Ref.	Technique	Accredited	Location
Haloacetic Acids in Water	EPA 552.3*	Liquid-Liquid Microextraction, Derivatization and GC-ECD	✓	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond

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
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods

Guidelines Referenced in this Report:

[Guidelines for Canadian Drinking Water Quality \(Health Canada, June 2019\)](#)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

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 or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing. The quality control (QC) data is available upon request

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: bwhitehead@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



CERTIFICATE OF ANALYSIS

REPORTED TO	Regional District of Central Kootenay - Nelson Box 590 - 202 Lakeside Drive Nelson, BC V1L 5R4	WORK ORDER	22J1984
ATTENTION	RDCK- Nelson	RECEIVED / TEMP REPORTED	2022-10-14 09:30 / 13.1°C
PO NUMBER	RDCK- Nelson	COC NUMBER	No Number
PROJECT	Analytical Testing		
PROJECT INFO	RIO		

Introduction:

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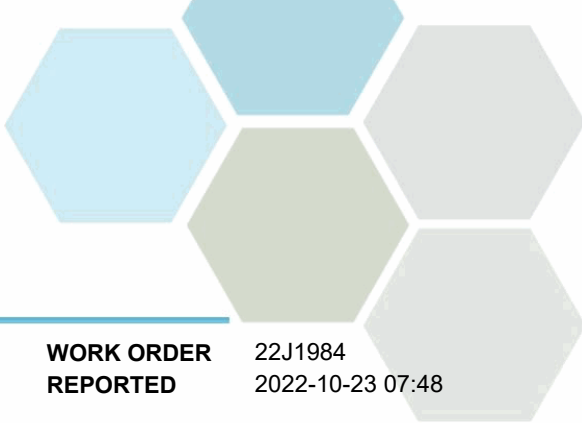
If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

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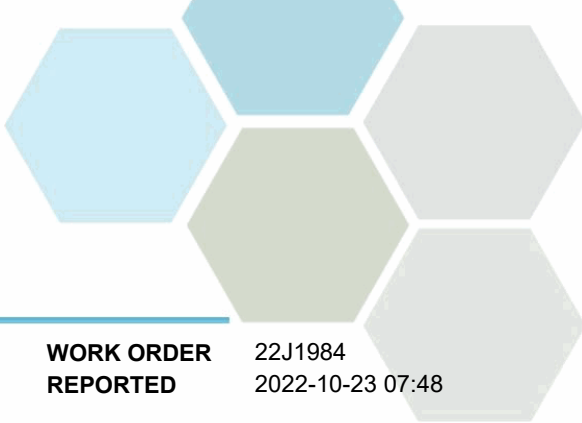


TEST RESULTS

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Analytical Testing

WORK ORDER REPORTED 22J1984
2022-10-23 07:48

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
RIO - Community Center (22J1984-01) Matrix: Water Sampled: 2022-10-11 09:40						
Calculated Parameters						
Total Trihalomethanes	0.0142	MAC = 0.1	0.00400	mg/L		N/A
Volatile Organic Compounds (VOC)						
Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L		2022-10-22
Bromoform	< 0.0010	N/A	0.0010	mg/L		2022-10-22
Chloroform	0.0142	N/A	0.0010	mg/L		2022-10-22
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L		2022-10-22
Surrogate: Toluene-d8	75		70-130	%		2022-10-22
Surrogate: 4-Bromofluorobenzene	103		70-130	%		2022-10-22



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Analytical Testing

WORK ORDER REPORTED 22J1984
2022-10-23 07:48

Analysis Description	Method Ref.	Technique	Accredited	Location
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond

Glossary of Terms:

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mg/L	Milligrams per litre
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