

CASTLEGAR

Annual Water Quality Report 2024

Facility Name: City of Castlegar Water System

Facility Number: 0210617

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City of Castlegar

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1.0 Introduction

The City of Castlegar (City) is required under its Operating Permit, issued by the Interior Health Authority (IHA), and mandated by the Drinking Water Protection Act to provide an Annual Water Quality Report. The Annual Water Quality Report also serves to provide water system users with a deeper understanding of their drinking water system.

The City is committed to providing clean, safe drinking water through the responsible management and maintenance of local water infrastructure. This report will provide an overview of the water system including a summary of the existing water distribution system, water treatment and monitoring procedures, system maintenance work, and an overview of recent system improvements.

This report will be submitted to the IHA and posted on the City of Castlegar website.

2.0 Castlegar Water System Overview

A map summarizing the City's water system assets and distribution system is provided in **Appendix A** (courtesy of 2018 Water System Optimization Study).

2.1 Source

The City's primary water source is drawn from Lower Arrow Lake, a 230 km long reservoir that is part of the Columbia River watershed. The intake is situated on the west shore of the reservoir, immediately upstream of the Hugh Keenleyside Dam. The water system intake and pumphouse are owned and operated by the Mercer-Celgar pulp mill. The City is provided water through a long-term supply agreement. The watershed upstream of this point encompasses an area of 36,500 km².

2.2 Water Treatment Centre

The Mercer-Celgar pumphouse located at the intake delivers water to the Water Treatment Centre, where it undergoes treatment, testing, and quality monitoring before being conveyed to the City's distribution system. The disinfection process uses ultraviolet radiation (UV) as a primary disinfectant to inactivate protozoa, as well as chlorine gas as a secondary disinfectant to inactivate viruses. This provides a multi-barrier approach to disinfection by using two different forms of treatment, which is a water quality objective set out by the Drinking Water Treatment Objectives (microbiological) for Surface Water Supplies in British Columbia.

2.3 Reservoirs

The treated water is then directed to and stored within one of eight reservoirs or storage

tanks located throughout the City, as below (From North to South):

- Meadowlark
- Merry Creek
- School 1 & 2
- Park 1 & 2
- Meadowbrook
- Blueberry

The total available reservoir storage capacity is 12.6 megaliters.

2.4 Distribution System

The City's distribution system consists of approximately 106 km of water distribution piping which is comprised of varied materials, diameters, and ages. The breakdown of existing water distribution infrastructure by material type is approximately as follows:

Table 1: Pipe Summary and Material Class

Pipe Material	Sum of Pipe Length (km)	% of System
Cement	61.0	57.8%
Copper	0.4	0.4%
Ferrous	18.4	16.4%
Plastic	26.9	25.4%
Grand Total	105.6	100.0%

2.5 Pump Stations

2.5.1 Meadowlark Pump House

The Meadowlark Pump House consists of eight high-capacity pumps which are split into two stages. Three (Stage I) pumps were used to assist in filling the Meadowlark Reservoir but are no longer in use. Five (Stage II) pumps fill the Park Reservoirs.

2.5.2 Park Pump House

The Park Pump House consists of four high-capacity pumps. The four pumps are referred to as the Stage III pumps. The Stage III pumps fill the Upper Bench reservoirs: Meadowbrook reservoir, Merry Creek reservoir, and Blueberry reservoir.

2.5.3 Grandview Booster Station

The Grandview Booster Pump Station is equipped with two small and two large booster pumps. The pumps provide additional water supply pressure for the Grandview neighbourhood.

2.5.4 Highland Drive Booster Station

The Highland Drive Booster Pump Station is equipped with one pump to increase the water supply pressure to the residents of Highland Drive. This booster pump is needed to increase system pressure during periods of peak water demand.

2.6 Pressure zones

There are ten pressure zones in the City of Castlegar's Distribution System, as outlined below (from North to South):

- North Zone

- Woodland Drive Zone
- School Zone
- Merry Creek Zone
- Park Zone
- Dumont Zone
- Upper Bench Zone
- Twin Rivers Zone
- Trowalex Road Zone
- Blueberry Zone

The system pressure within these zones ranges from 275 kPa to 1034 kPa (40 PSI – 150 PSI).

2.7 Emergency Well Water System (North Well)

The City of Castlegar maintains a groundwater well, referred to as the North Well (well tag #109719), which can be activated in the event of a disruption to the primary water supply. The well and pump are rated to deliver approximately 6 million litres per day (1,100 imperial gallons per minute), offering a significant backup water source for the community.

Although the North Well is not currently approved by Interior Health Authority (IHA) for use as a potable water source, the City has been actively working toward securing this approval. Between 2018 and 2019, significant upgrades were made to the well system in support of this goal. These included the installation of a soft starter, a transfer switch, and a generator plug to ensure reliable operation during power outages; particularly in the event of a failure at the Mercer–Celgar pulp mill or a disruption in the main supply system.

The City's engineering team continues to pursue IHA registration of the North Well as a certified drinking water source. In the interim, staff conduct monthly bacterial testing and an annual comprehensive water quality analysis to monitor the well's condition. Routine maintenance of the pump is carried out on a monthly basis to ensure its readiness for emergency use.

3.0 Castlegar Water Supply and Disinfection Requirements

The City supplies water in accordance with the B.C. Drinking Water Protection Act (DWPA) and Drinking Water Protection Regulation (DWPR), which ultimately outline the disinfection requirements the City must provide. The Province of B.C. has published a series of guideline documents to provide guidance on implementing the DWPA and DWPR, including the Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in British Columbia (Surface Water Treatment Objectives). These objectives are consistent with the Guidelines for Canadian Drinking Water Quality (GCDWQ).

The general Water Treatment Objectives are comprised of the following:

- **4:** 4 log (99.99%) inactivation of viruses
- **3:** 3 log (99.9%) removal or inactivation of protozoa (Giardia Lamblia and Cryptosporidium Parvum)
- **2:** Minimum of two treatment barriers for microbiological protection
- **1:** Less than 1 NTU Turbidity
- **0:** Zero Fecal Coliforms or E. coli Bacteria

Most disinfection processes require sufficiently clear water to treat effectively. To achieve this, the GCDWQ recommends a treatment process consisting of filtration and one form of disinfection. The City of Castlegar is fortunate to have an excellent quality of raw water supply. It is however classified as a surface water source, and to meet the Objective for a minimum of two treatment barriers for microbiological protection the City would either: a) implement filtration followed by disinfection, or b) apply for filtration exemption and implement two forms of disinfection. A water supply system is permitted to operate with no filtration if the filtration exemption requirements outlined in section 4.3 of the Water Treatment Objectives guideline document are met. The City of Castlegar has been meeting the annual filtration exemption criteria since submitting an application to IHA in 2014.

The City's UV system (commissioned on August 12, 2013) allows the City to meet the requirement for two treatment barriers and produces safe drinking water that is in compliance with the DWPA and DWPR.

4.0 Castlegar Water Supply and Disinfection

The City of Castlegar uses UV light as a primary disinfectant and chlorine gas as a secondary disinfectant. The UV system is designed to maintain a minimum dose of 12.2 mJ/cm² to provide the required 3 log (99.9%) protozoan inactivation. The chlorination system operates as the secondary disinfectant, providing the required 4 log (99.99%) inactivation of viruses.

The free chlorine residual is commonly referred to as a Distribution Management Tool, as it leaves a residual disinfectant in the water supply. This residual provides a quantifiable indicator that the water's chlorine concentration is adequate for disinfection and is an important parameter in ensuring that safe potable water is delivered to the residents of the City of Castlegar. The rate of chlorine injection can vary throughout the year depending largely on source water temperature and organic concentrations. The provincial health standard is to maintain a minimum free chlorine residual of 0.20 mg/L at all points of the water distribution system. The chlorine injection rate at the Water Treatment Centre varies from 0.75 mg/L -1.00 mg/L to achieve a free chlorine residual of 0.20 mg/L.

The free chlorine residual is continuously sampled and analyzed by online instrumentation installed throughout the water distribution system. The measured values are transferred to the City of Castlegar's Supervisory Control and Data Acquisition (SCADA) system, which will initiate an alarm to City personnel if the chlorine concentration is measured to be outside the allowable range.

5.0 Testing and Monitoring Program

5.1 Chlorine Residual Testing

In addition to the online chlorine residual analyzing, City of Castlegar staff perform manual chlorine residual testing daily at the Water Treatment Centre and weekly throughout the distribution system at the Airport, Blueberry, Celgar, Fortis, Meadowlark Pump House, and Civic Works Yard sampling locations. Testing is performed weekly at the sampling locations shown in **Figure 1**, this is done to verify the accuracy of the online instrumentation.

Figure 1 provides a summary of the free and total chlorine testing results as annual averages at each sampling point.

The data indicates one sampling date where the chlorine residual measured was under the target 0.2 mg/L. The residual chlorine concentration at the Fortis sampling point was 0.12

mg/L free and 0.21 total on August 6th. This was following a long weekend, over which water usage at that location is minimal. Operators responded and flushed from a nearby hydrant bringing the chlorine levels back above 0.2 mg/l minimum within a few hours.

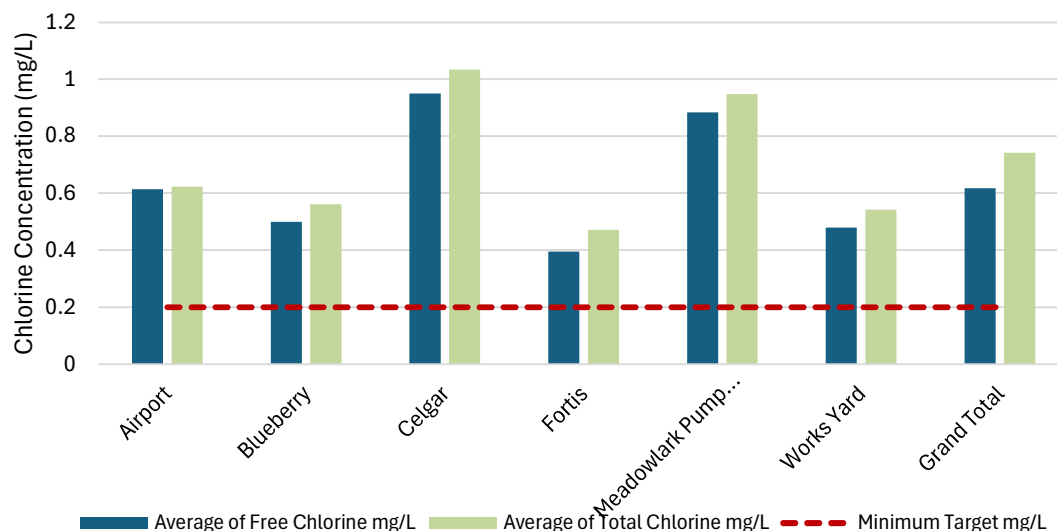


Figure 1: Chlorine Residual Monitoring – Annual Averages in 2024 at Each Sampling Point

5.2 Turbidity Monitoring

The City monitors raw water turbidity levels at the Water Treatment Centre daily. Turbidity is a key parameter in ensuring that the City's water supply follows the filtration exemption conditions outlined in section 4.3 of the Surface Water Treatment Objectives guideline document. The filtration exemption conditions require that average daily raw water turbidity levels be around 1 NTU, but do not exceed 5 NTU for more than two days in a 12-month period.

The filtration exemption conditions for turbidity were met throughout 2024, with no daily averages in excess of 1 NTU. **Figure 2** summarizes the monthly average turbidity readings in 2024.

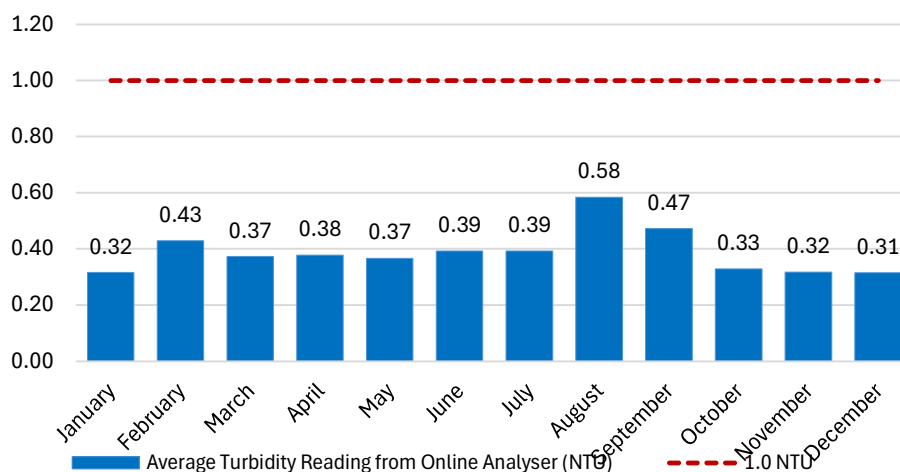


Figure 2: Monthly Average Raw Water Turbidity Levels Measured at Water Treatment Centre in 2024

5.3 UV Light Dose & Transmittance Monitoring

UV dose and UV transmittance (UVT) values are recorded daily at the Water Treatment Centre. UVT is important as it impacts the effectiveness of UV treatment. When UVT is too low, UV light is not able to penetrate the water and overall effectiveness of protozoa inactivation is reduced. The system's low and low-low UVT set-points are 90% and 88%, respectively. There were no recorded UVT measurements below the low set-point of 90% in 2024.

The UV system was designed to maintain a minimum dose of 12.2 mJ/cm² to provide the required 3 log (99.9%) protozoan inactivation. In 2023, there were two days when the minimum UV dose of 12.2 mJ/cm² was not met; a dose of 0 mJ/cm² was measured on March 13 and April 9. It is suspected that these measurements were likely due to an error in the monitoring rather than the UV dose being zero. **Figure 3** below provides a summary of the UV doses and UVT throughout 2024.

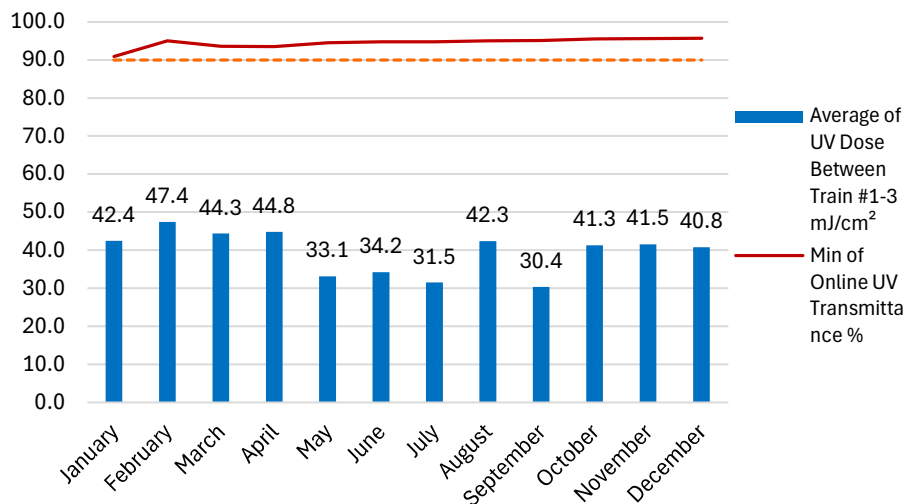


Figure 3: Monthly Average UV Dose and Transmittance in 2024

5.4 pH Monitoring

pH is monitored by operators at the Water Treatment Centre and measurements are recorded each day. The target pH is between 7 and 9, which is within the range recommended by the *Guidelines for Canadian Drinking Water Quality* (pH 7 to 10.5). **Figure 4** provides a summary of pH measurements recorded throughout 2024. All measurements were between the target pH range of 7 to 9.

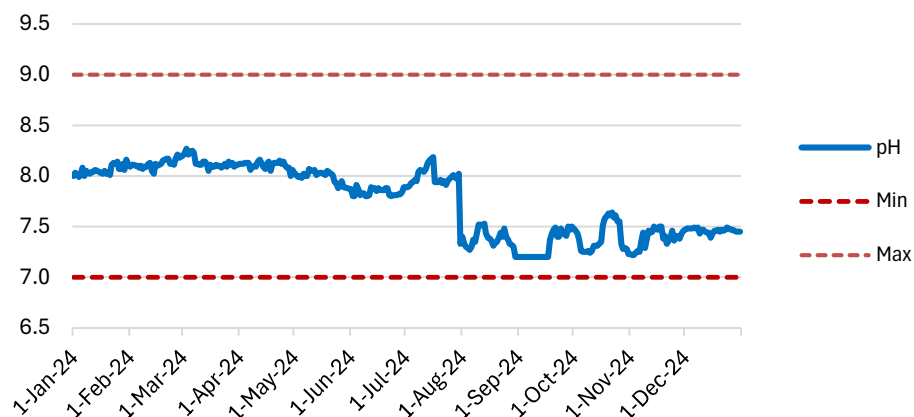


Figure 4: Daily pH Monitoring Data in 2024

5.5 Bacteriological Testing

As required under the City's Operating Permit, City operators perform weekly bacteriological testing for E. coli and Total Coliform Bacteria throughout the distribution system. Sampling locations are as follows:

- Water Treatment Centre (raw water)
- Airport
- Meadowlark Pump House
- Blueberry
- Civic Works Yard

Table 2 summarizes the treatment targets required to meet the BC filtration exemption conditions for E. coli and Total Coliform, as well as the City's level of compliance in 2024.

Table 2: BC Filtration Exemption Conditions & City's Level of Compliance

Parameter	Filtration Exception Condition	Level of Compliance
E. coli	"the number of E. coli in raw water does not exceed 20/100 mL (or if E. coli data are not available less than 100/100 mL of total coliform) in at least 90% of the weekly samples from the previous six months."	Throughout 2024, all E. coli test results (raw water) were below the required 20/100 mL. Only one sample in 2024 tested above 100/100mL for total coliforms, September 9 th had a result of 105/100 mL.
Both E. coli & Total Coliform	"Treatment target for all water systems is to contain no detectable E. coli or fecal coliform per 100 mL." "Total coliform objectives are also zero based on one sample in a 30-day period. For more than one sample in a 30-day period, at least 90% of the samples should have no detectable total coliform bacteria per 100 mL and no sample should have more than 10 total coliform bacteria per 100 mL."	There were no detectable E. coli or total coliform results reported from the distribution system in 2024. There were no detectable E. coli or total coliform results reported from the North Well in 2024.

5.6 Raw Water Full Chemical Analysis Testing

City Staff collect quarterly raw water samples from the raw water tap at the Water Treatment Centre and submit it for a full chemical analysis. Parameters such as alkalinity, hardness, conductivity, pH, fluoride, arsenic, lead, mercury, and turbidity are measured and reported.

Continuous turbidity monitoring, chlorine residual monitoring, and UV dose monitoring is carried out at the Water Treatment Centre. Operators inspect monitoring equipment performance and confirm alarm set points daily. See **Appendix B** for full chemical analysis test results.

5.7 Additional Distribution System Testing

On a quarterly basis, City staff collect water samples from the endpoints of the distribution system (Airport and Blueberry sample locations) for total trihalomethane (THM) testing. City operators also collect samples from the mid-point of the distribution system (Park Pumphouse) for haloacetic acid (HAA) testing. **Figure 5** summarizes the THM and HAA test results from 2024, including the maximum acceptable concentrations (MAC) for each parameter for reference.

See **Appendix B** for THM & HAA laboratory test results.

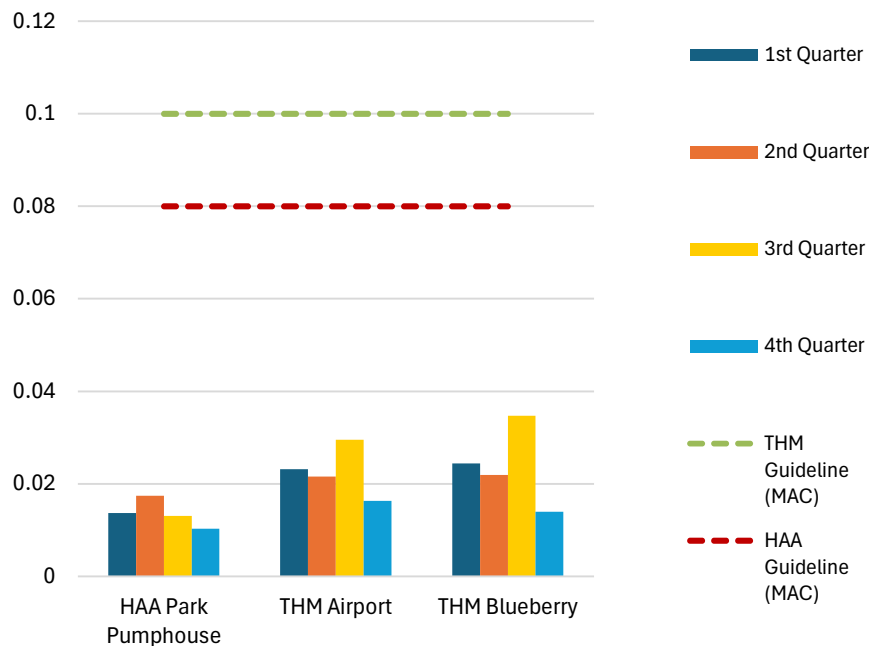


Figure 5: Quarterly THM and HAA Testing Results with Maximum Acceptable Concentration (MAC) of 0.1 mg/L and 0.08 mg/L for THM and HAA, respectively.

5.8 Algae Blooms and Nutrients

Castlegar's water system has seen the impacts from elevated levels of algae in the raw water supply over the past few years. This algae growth is a result of excess nutrient levels in the Arrow Lakes Reservoir and is thought to be a result of fertilizer runoff from agricultural properties and/or the Province's nutrient enrichment program implemented to support recreational fishing.

In recent years, Chlorophyll A levels have remained below the highest levels seen in 2015 and the trend appears to be relatively stable with some peaks. A summary of Chlorophyll A sampling results from 2012 to 2023 is shown in **Figure 6**. Note, no Chlorophyll A sampling was

completed in 2022. The 2023 and 2024 test results were < 1.0 µg/L Chlorophyll A, see **Appendix C** for the certificate of analysis.

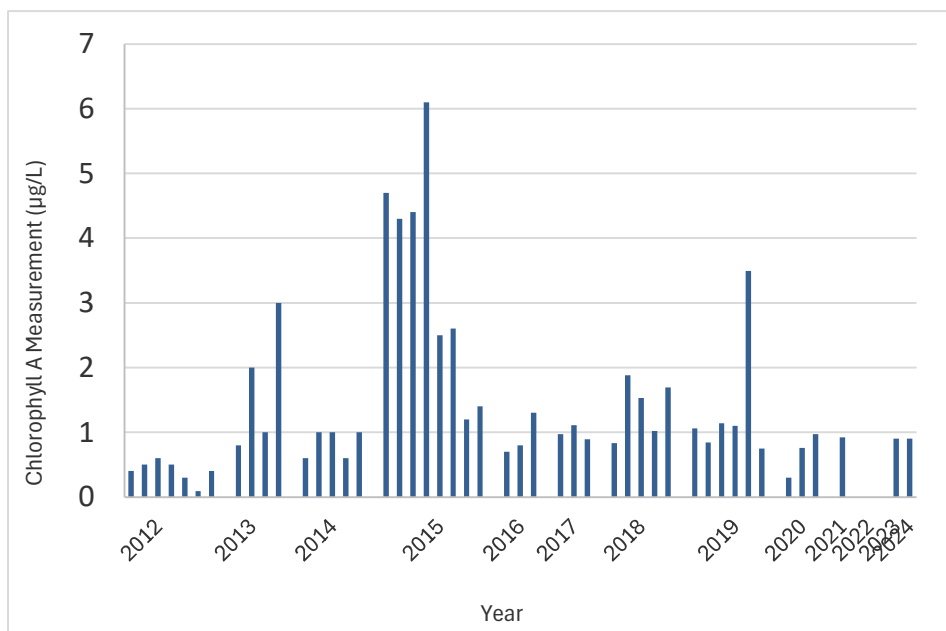


Figure 6: Chlorophyll A Sampling Results (2012–2024)

The City has addressed the algae issue within its distribution system through its annual flushing program, which helps to remove algae that tends to settle near the beginning of the distribution system.

5.9 North Well Analysis Testing

A full chemical analysis of raw water from the well was conducted in January 2024. Refer to **Appendix D** for the North Well water quality results.

5.10 System Control: SCADA

The City's SCADA (Supervisory Control and Data Acquisition) system continuously monitors the Water Treatment Centre and Water Distribution System for the following parameters:

- Turbidity
- UV transmittance
- UV dose
- Chlorine residual
- Flowrate (cumulative daily and instantaneous maximum)
- Temperature
- pH

If a significant change in operating parameters or a component failure is registered by the system, an alarm is issued to the phones of appropriate City personnel and after hours to the City of Castlegar's emergency phone. This provides the City several levels of confidence in addressing alarm conditions.

6.0 System Maintenance

6.1 Fire Hydrants

All fire hydrants are inspected annually. In addition, the City has established three hydrant maintenance zones to carry out a complete tear down and inspection of internal components on a rotational basis. One zone is inspected each year; therefore, all fire hydrants are inspected and flushed every three years.

6.2 Emergency Well Water System (North Well)

The City maintains a groundwater well (North Well) for emergency purposes. The well system is rated at approximately 6 million L/day (1,100 USGPM) and is maintained monthly to ensure it is ready for use in an emergency. See Section 2.7 for further information.

6.3 Pump Stations

The Meadowlark Pump House and the Park Pump House are inspected daily. The Grandview booster station and the Highland Drive booster station are inspected weekly. All pumps and motors are serviced as per the manufacturer's specifications.

6.4 Castlegar Water Treatment Centre

The Water Treatment Centre is inspected daily to ensure that the UV and chlorination disinfection systems are operating correctly. Once a month, the electromagnetic flow meter and UV reference sensors are validated for accuracy. Once a year, the UV reference probes are validated by a third party.

6.5 Reservoirs

Reservoirs are inspected weekly to make sure that operation is normal and that the site is secure. All reservoir levels are monitored in real-time on the City's SCADA system. Automatic alarms are issued to operations personnel if reservoir levels register a high level, low level, or drastic level fluctuation.

6.6 Pressure Reducing Stations

The City of Castlegar operates and maintains 11 pressure reducing valves (PRV) stations. The PRV stations are inspected monthly to verify normal operation and to check for any leaks.

6.7 Security

Castlegar's water distribution system is protected by several security measures. The Water Treatment Centre is equipped with a security system and surveillance cameras. All reservoirs are fenced with locked ladder access. Both the Meadowlark and Park Pump houses are equipped with a security system and surveillance cameras. All PRV sites are securely locked.

6.8 Unidirectional Flushing (UDF) Program

In 2013, the City developed a Unidirectional Flush (UDF) program. This is comprised of approximately 250 UDF routes, which are separated into established "flushing zones". To ensure that all areas are flushed regularly, the City carries out system flushing within the zones on an alternating cycle.

7.0 Water Quality

7.1 Water Quality Issues

A city-wide Boil Water Notice (BWN) was issued from August 9 to 12 after a chlorine vacuum pump failed to start. A power outage on August 9 tripped the chlorine vacuum pump and when the backup failed to start, unchlorinated water entered the main transmission line. This triggered low chlorine level alarms and operators were dispatched. The BWN was issued after consulting with the Interior Health drinking water officer and was in place before the unchlorinated water made it to the first distribution reservoir. This BWN was rescinded on August 12 after two consecutive days of bacterial sampling came back clear of E.coli and total coliforms.

7.2 Source Protection Plan

The *Arrow Reservoir Source Assessment Report* (Urban Systems, 2014) identified key recommendations and priorities for protecting the City's drinking water supply. The City continues to work towards implementing the Assessment Report recommendations; however, due to the size of the Arrow Lakes Reservoir and Columbia River watershed, implementing all the recommendations requires significant coordination between various organizations.

To date, the City has carried out the following recommendations from the report:

1. Collaborate with Mercer-Celgar to construct a security fence around the intake and treatment works at Arrow Lake; and,
2. Ongoing source water monitoring – Develop a water quality sampling schedule, including sampling frequencies, to understand and trend any changes in water quality conditions and to identify possible threats to the source water quality.

8.0 Operator Education and Training

The City of Castlegar has established a training program that follows the 'Environmental Operators Certification Program' (EOCP) guidelines for required training. **Table 3** summarizes the current levels of EOCP certification held by City of Castlegar staff.

Table 3: Operators & EOCP Current Certifications

Employee	Active Levels
Aaron Geck – Assistant Manager – Utilities	WWT 4, WWC 1
Ian Dudley – Head Treatment Plant Operator	WT 3, WD 1
Kurt Thomson – Treatment Plant Operator	WD 2, WWC 2, WT 2, WWT 1
Philip Jago – Treatment Plant Operator	WT 2, WWT 1, WD 1
Miroslav Bazgier – Treatment Plant Operator	WT 1
Daniel Wallenius – Treatment Plant Operator	WWT 4, WT 3, WD 1, SWS
Todd Chahley – Water Sewer Maintenance Foreman	WWT 1, WWC 2, WD 2, WT 1
Graham Lindsey – Water Sewer Maintenance Crew	WD 2, WWC 1
Dana Boone – Water Sewer Maintenance Crew	WD 2, WWC2
Charles Hesketh – Water Sewer Maintenance Crew	WD 1

9.0 Emergency Response Plan

Emergency response planning is an essential part of the governance of a drinking water system. As required under the Operating Permit, the City of Castlegar has prepared an Emergency Response Plan (ERP) for the City's water system (2014). It was reviewed and revised in 2019 and is currently undergoing another revision. The goal of the ERP is to identify potential emergency conditions that could occur and have documented response procedures in place. The Emergency Response Plan has not yet been endorsed by the Castlegar Fire Department or the RCMP.

9.1 Water Source Redundancy

As part of the City's ongoing emergency preparedness planning, the North Well remains a key consideration as an emergency water supply source. While the well is registered with the Province, it does not currently have a groundwater use licence. The City submitted an application for the licence in 2018, and an acknowledgment letter was received from the Province in 2021. As of the date of this report, the application is still under review, and no decision has been issued.

The North Well also requires approval from the Interior Health Authority to be used as a potable water source. To support this process, a comprehensive water quality assessment was initiated in 2024, anticipated to be submitted to IHA for review in 2025.

Integrating the North Well into the City's emergency response capabilities would enhance system resilience in the event of supply disruptions, and aligns with the requirements of the City's Emergency Response Plan.

10.0 Cross-Connection Control Program

The City developed and enforces compliance with a Cross Connection Control Program. This program was established to identify and mitigate high risk service connections that could contaminate the City's water supply and is regulated by Bylaw 1014 (City of Castlegar Elimination and Prevention of Cross-connections Bylaw). In 2023, this bylaw was updated to Bylaw 1404 (City of Castlegar Cross-Connection Control Bylaw, 2023). The Bylaw requires all multi-family, commercial, institutional, and industrial properties to have measures in place to control or eliminate cross-connections. These measures typically include the installation of a back flow prevention assembly, which prevents water from flowing back into the City's distribution system, as well as completing backflow assembly and prevention device testing as required by the City. Starting in 2023 the City began a cross-connection survey program to re-assess the cross-connection potential in all commercial, institutional, and industrial properties in the City.

11.0 System Improvements and Capital Works Projects

The City of Castlegar's Water Management Plan (Urban Systems, 2009) provides a comprehensive assessment of the City's water source, treatment, and distribution systems. This report outlined improvements necessary for maintaining a continuously reliable water supply, as well as timelines for such upgrades. The City of Castlegar has accomplished many of the capital works projects identified in the 2009 Water Management Plan, including:

- SCADA system upgrades and optimization.
- Prepare an Emergency Response Plan.
- Replace sections of undersized water mains (pipe replacement program).

- Complete a comprehensive network pipe material condition and anticipated remaining life investigation to support pipe replacement program.
- Install security measures at major facilities.
- Upgrade of various PRV Stations.
- Construct additional storage at the Park Reservoir Site.
- Update the existing cross connection control program to ensure it meets current requirements.

Since the development of the Water Management Plan, the City has worked to complete an Integrated Infrastructure Capital Plan (IICP). The IICP uses a risk-based approach to integrate the potential impacts of climate change with the fundamentals of asset management in order to identify and rank priority upgrades throughout the City.

In addition to the IICP, a Water System Optimization (WSO) report was prepared for the City in early 2019. The WSO used hydraulic modelling to identify upgrades recommended throughout the City to optimize the water system. The City plans to draw on the IICP and WSO reports for guidance regarding ongoing asset renewal decisions to ensure service delivery within a continuously changing environment.

The following includes the recommended optimization projects by area:

- South System Improvements:
 - Upsize Blueberry supply pipe
 - Upgrade south area hydraulics – new PRVs
 - Storage improvement in Upper Bench Zone
 - Blueberry zone pipe renewal and fire flow improvement
- Park Zone Improvements:
 - Decommission school zone tanks
 - Fire flow looping and upsizing (Hwy-Commercial)
 - Twin Park storage steel tank and decommission concrete tank
- Water Treatment Centre to North End Improvements:
 - Install interconnection from Park zone to North zone for emergency fire flow
 - Fire flow looping and upsizing (downtown area of North zone)
 - Supply control update at Water Treatment Centre
- Various PRV upgrades

The most recent upgrade and maintenance projects, as well as planned projects for 2025 (and near future) are listed below.

2023 Improvements and Capital Projects

- 37th St. PRV upgrade and confined space elimination
- Adoption of Bylaw 1404 – Cross Connection Control – reinitiation of cross connection control program, including new surveys and software for tracking device testing.

2024 Improvements and Capital Projects

- Selkirk College feeder main
- Toba Road – Water main extension.
- Detailed design of Orchard Avenue Phase 3 including water main installation for road extension and site servicing.

- Completed a full hydraulic water model update including calibration/verification.
- Park Pumphouse – Motor Control Center (MCC) Upgrade
- Orchard Ave Phase 2 – Water main extension

Planned Improvements and Capital Projects for Near Future

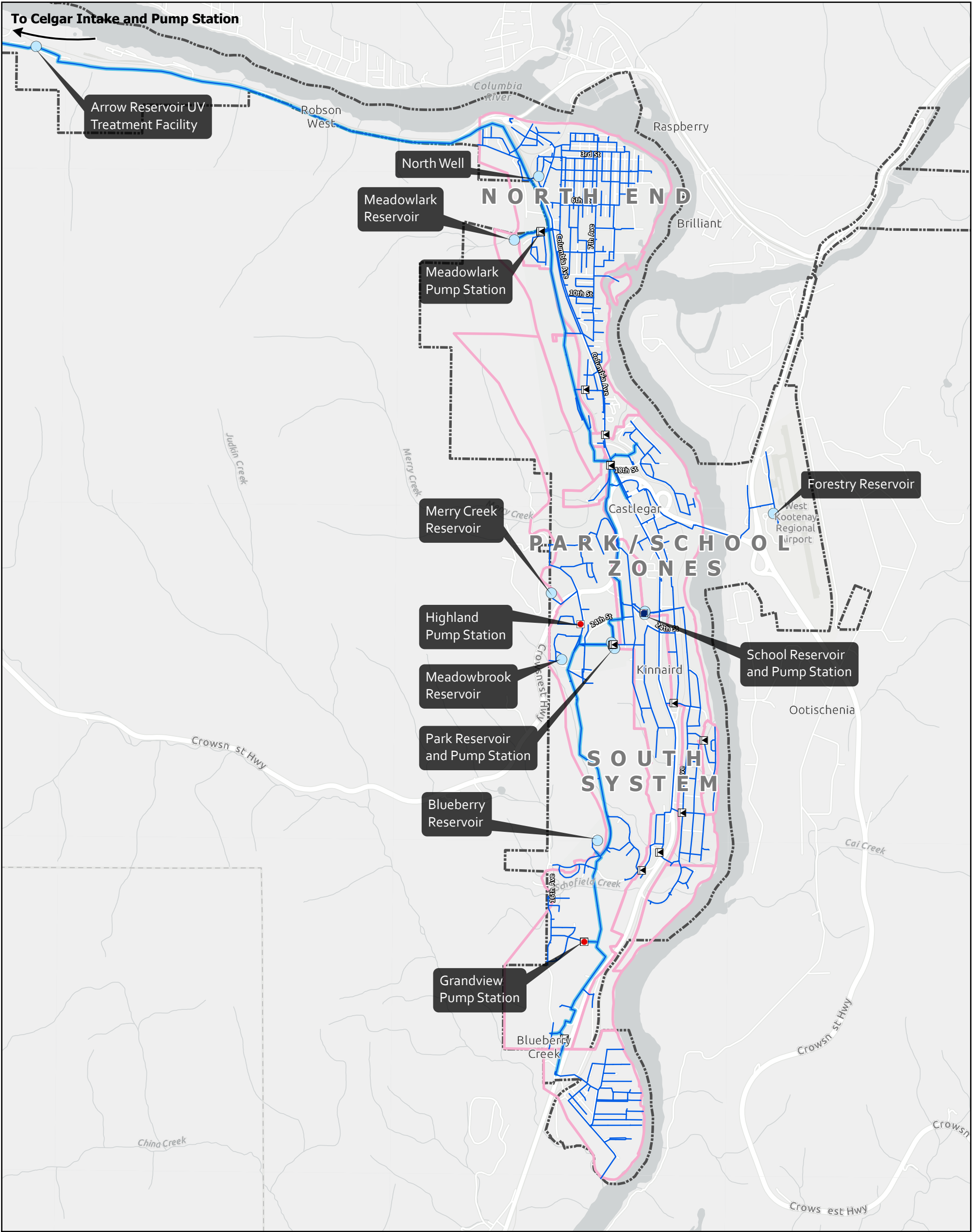
- SCADA Upgrades – improvements and renewals at multiple sites (2025).
- Water Treatment Centre Chlorine Analyzer – purchasing backup unit (2025)
- Water Treatment Centre Valve Upgrades – installation of isolation valves (2026)
- Works & Services Bylaw – Includes engineering design guidelines providing standard specs for servicing, PRV design, metering, modelling, and backflow configuration (2026)
- Water Meter Strategic Plan – assessment of program and strategic plan for future (2026)
- Kinnaird Bridge Utility Pipe Inspections – 3-year cycle for structural reassessment (2027)
- Columbia Ave – Phase 3 – Detailed Design Incl. watermain replacement (2028)

12.0 Conclusion

The City of Castlegar has worked with the local Health Officials to develop a water quality monitoring program that exceeds the Drinking Water Protection Act. The City will continue the monitoring program as part of its commitment to deliver safe potable water to residents in an environmentally and financially sustainable manner.

APPENDIX A

Castlegar Water System





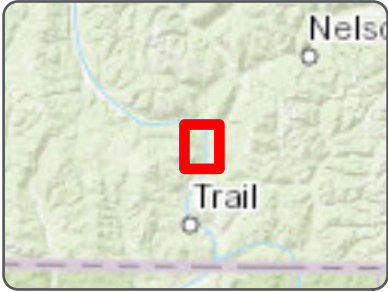
City of Castlegar

Water System Optimization Study
2018 Water System

System Assets and Community Layout

Legend

- Altitude Valve
- Pressure Reducing Valve
- Pump
- Network Structure
- Water Main
- Supply / Trunk Mains
- Pressure Zone Boundary



The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 250 500 1,000 1,500

Metres

Coordinate System:

Scale:
1:35,000

Data Sources:
Data provided by -
City of Castlegar
Urban Systems

Project #:	0841.0104.01
Author:	BP
Checked:	AC
Status:	FINAL
Revision:	A
Date:	2019 / 1 / 9



FIGURE 1

APPENDIX B

Chemical Analysis Lab Test Results

CERTIFICATE OF ANALYSIS

REPORTED TO Castlegar, City of
460 Columbia Avenue
CASTLEGAR, BC V1N 1G7

ATTENTION Matt Clouthier

PO NUMBER 502

PROJECT General Potability

PROJECT INFO

WORK ORDER 24A0430

RECEIVED / TEMP 2024-01-04 08:00 / 8.6°C

REPORTED 2024-01-10 15:20

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/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.

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.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here:
<https://www.caro.ca/terms-conditions>

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

Authorized By:

Brent Whitehead
Account Manager

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#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 |
#108 4475 Wayburne Drive Burnaby, BC V5G 4X4

TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0430
2024-01-10 15:20

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
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481E - Water Treatment Center - Raw Water (24A0430-01) | Matrix: Water | Sampled: 2024-01-02 10:30

Anions

Chloride	0.34	AO ≤ 250	0.10 mg/L	2024-01-05	
Fluoride	< 0.10	MAC = 1.5	0.10 mg/L	2024-01-05	
Nitrate (as N)	0.084	MAC = 10	0.010 mg/L	2024-01-05	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2024-01-05	
Sulfate	11.4	AO ≤ 500	1.0 mg/L	2024-01-05	

Calculated Parameters

Hardness, Total (as CaCO ₃)	66.4	None Required	0.500 mg/L	N/A	
Langelier Index	-1.7	N/A	-5.0	2024-01-09	CT6
Solids, Total Dissolved	70.7	AO ≤ 500	1.00 mg/L	N/A	

General Parameters

Alkalinity, Total (as CaCO ₃)	55.0	N/A	1.0 mg/L	2024-01-06	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	N/A	1.0 mg/L	2024-01-06	
Alkalinity, Bicarbonate (as CaCO ₃)	55.0	N/A	1.0 mg/L	2024-01-06	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	N/A	1.0 mg/L	2024-01-06	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	N/A	1.0 mg/L	2024-01-06	
Colour, True	< 5.0	AO ≤ 15	5.0 CU	2024-01-05	
Conductivity (EC)	140	N/A	2.0 µS/cm	2024-01-06	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	2024-01-05	
pH	6.78	7.0-10.5	0.10 pH units	2024-01-06	HT2
Temperature, at pH	22.8	N/A	°C	2024-01-06	HT2
Turbidity	0.23	OG < 1	0.10 NTU	2024-01-05	

Total Metals

Aluminum, total	0.0130	OG < 0.1	0.0050 mg/L	2024-01-08	
Antimony, total	< 0.00020	MAC = 0.006	0.00020 mg/L	2024-01-08	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050 mg/L	2024-01-08	
Barium, total	0.0167	MAC = 2	0.0050 mg/L	2024-01-08	
Boron, total	< 0.0500	MAC = 5	0.0500 mg/L	2024-01-08	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010 mg/L	2024-01-08	
Calcium, total	18.8	None Required	0.20 mg/L	2024-01-08	
Chromium, total	0.00059	MAC = 0.05	0.00050 mg/L	2024-01-08	
Cobalt, total	< 0.00010	N/A	0.00010 mg/L	2024-01-08	
Copper, total	0.00043	MAC = 2	0.00040 mg/L	2024-01-08	
Iron, total	0.015	AO ≤ 0.3	0.010 mg/L	2024-01-08	
Lead, total	< 0.00020	MAC = 0.005	0.00020 mg/L	2024-01-08	
Magnesium, total	4.74	None Required	0.010 mg/L	2024-01-08	
Manganese, total	0.00174	MAC = 0.12	0.00020 mg/L	2024-01-08	
Mercury, total	< 0.000010	MAC = 0.001	0.000010 mg/L	2024-01-09	
Molybdenum, total	0.00049	N/A	0.00010 mg/L	2024-01-08	
Nickel, total	0.00067	N/A	0.00040 mg/L	2024-01-08	
Potassium, total	0.68	N/A	0.10 mg/L	2024-01-08	
Selenium, total	< 0.00050	MAC = 0.05	0.00050 mg/L	2024-01-08	

TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0430
2024-01-10 15:20

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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481E - Water Treatment Center - Raw Water (24A0430-01) | Matrix: Water | Sampled: 2024-01-02 10:30, Continued

Total Metals, Continued

Sodium, total	0.85	AO ≤ 200	0.10	mg/L	2024-01-08	
Strontium, total	0.126	MAC = 7	0.0010	mg/L	2024-01-08	
Uranium, total	0.000421	MAC = 0.02	0.000020	mg/L	2024-01-08	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-01-08	

Blueberry (24A0430-02) | Matrix: Water | Sampled: 2024-01-02 08:15

Calculated Parameters

Total Trihalomethanes	0.0140	MAC = 0.1	0.00400	mg/L	N/A	
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Volatile Organic Compounds (VOC)

Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-01-09	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-01-09	
Chloroform	0.0140	N/A	0.0010	mg/L	2024-01-09	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-01-09	
Surrogate: Toluene-d8	116		70-130	%	2024-01-09	
Surrogate: 4-Bromofluorobenzene	89		70-130	%	2024-01-09	

Airport (24A0430-03) | Matrix: Water | Sampled: 2024-01-02 11:10

Calculated Parameters

Total Trihalomethanes	0.0163	MAC = 0.1	0.00400	mg/L	N/A	
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Volatile Organic Compounds (VOC)

Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-01-09	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-01-09	
Chloroform	0.0163	N/A	0.0010	mg/L	2024-01-09	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-01-09	
Surrogate: Toluene-d8	123		70-130	%	2024-01-09	
Surrogate: 4-Bromofluorobenzene	96		70-130	%	2024-01-09	

Sample Qualifiers:

CT6 Results were based on lab temperature & lab pH.
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 Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0430
2024-01-10 15:20

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H ₂ SO ₄	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	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* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO ₃ +HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	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

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24A0430 2024-01-10 15:20
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General Comments:

The results in this report apply to the received 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. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed.

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.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0430
2024-01-10 15:20

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 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 B4A1561									
Blank (B4A1561-BLK1)			Prepared: 2024-01-05, Analyzed: 2024-01-05						
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 (B4A1561-BLK2)			Prepared: 2024-01-05, Analyzed: 2024-01-05						
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 (B4A1561-BS1)			Prepared: 2024-01-05, Analyzed: 2024-01-05						
Chloride	15.8	0.10 mg/L	16.0		99	90-110			
Fluoride	3.91	0.10 mg/L	4.00		98	88-108			
Nitrate (as N)	3.93	0.010 mg/L	4.00		98	90-110			
Nitrite (as N)	2.05	0.010 mg/L	2.00		102	85-115			
Sulfate	16.2	1.0 mg/L	16.0		101	90-110			
LCS (B4A1561-BS2)			Prepared: 2024-01-05, Analyzed: 2024-01-05						
Chloride	15.8	0.10 mg/L	16.0		98	90-110			
Fluoride	4.03	0.10 mg/L	4.00		101	88-108			
Nitrate (as N)	3.91	0.010 mg/L	4.00		98	90-110			
Nitrite (as N)	1.99	0.010 mg/L	2.00		100	85-115			
Sulfate	15.6	1.0 mg/L	16.0		97	90-110			
General Parameters, Batch B4A1442									
Blank (B4A1442-BLK1)			Prepared: 2024-01-05, Analyzed: 2024-01-05						
Cyanide, Total	< 0.0020	0.0020 mg/L							
LCS (B4A1442-BS1)			Prepared: 2024-01-05, Analyzed: 2024-01-05						
Cyanide, Total	0.0184	0.0020 mg/L	0.0200		92	82-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0430
2024-01-10 15:20

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B4A1442, Continued									
LCS Dup (B4A1442-BSD1)				Prepared: 2024-01-05, Analyzed: 2024-01-05					
Cyanide, Total	0.0199	0.0020 mg/L	0.0200		100	82-120	8	10	
General Parameters, Batch B4A1453									
Blank (B4A1453-BLK1)				Prepared: 2024-01-05, Analyzed: 2024-01-05					
Turbidity	< 0.10	0.10 NTU							
LCS (B4A1453-BS1)				Prepared: 2024-01-05, Analyzed: 2024-01-05					
Turbidity	147	0.10 NTU	140		105	90-110			
General Parameters, Batch B4A1454									
Blank (B4A1454-BLK1)				Prepared: 2024-01-05, Analyzed: 2024-01-05					
Colour, True	< 5.0	5.0 CU							
LCS (B4A1454-BS1)				Prepared: 2024-01-05, Analyzed: 2024-01-05					
Colour, True	21	5.0 CU	20.0		105	85-115			
Duplicate (B4A1454-DUP1)				Source: 24A0430-01		Prepared: 2024-01-05, Analyzed: 2024-01-05			
Colour, True	< 5.0	5.0 CU	< 5.0					15	
General Parameters, Batch B4A1572									
Blank (B4A1572-BLK1)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
pH	5.61	0.10 pH units							
Temperature, at pH	21.9	°C							
Blank (B4A1572-BLK2)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
pH	5.68	0.10 pH units							
Temperature, at pH	22.9	°C							
LCS (B4A1572-BS1)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
Alkalinity, Total (as CaCO ₃)	97.0	1.0 mg/L	100		97	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	13.0	1.0 mg/L	50.0		26	0-200			
LCS (B4A1572-BS2)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
Alkalinity, Total (as CaCO ₃)	100	1.0 mg/L	100		100	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	12.4	1.0 mg/L	50.0		25	0-200			
LCS (B4A1572-BS3)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-105			
LCS (B4A1572-BS4)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-105			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0430
2024-01-10 15:20

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B4A1572, Continued									
Reference (B4A1572-SRM1)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
pH	7.03	0.10 pH units	7.01		100	98-102			
Reference (B4A1572-SRM2)				Prepared: 2024-01-06, Analyzed: 2024-01-06					
pH	7.03	0.10 pH units	7.01		100	98-102			
Total Metals, Batch B4A1667									
Blank (B4A1667-BLK1)				Prepared: 2024-01-08, Analyzed: 2024-01-08					
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	< 0.0500	0.0500 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 (B4A1667-BS1)				Prepared: 2024-01-08, Analyzed: 2024-01-08					
Aluminum, total	3.95	0.0050 mg/L	4.00		99	80-120			
Antimony, total	0.0378	0.00020 mg/L	0.0400		95	80-120			
Arsenic, total	0.385	0.00050 mg/L	0.400		96	80-120			
Barium, total	0.0390	0.0050 mg/L	0.0400		98	80-120			
Boron, total	0.380	0.0500 mg/L	0.400		95	80-120			
Cadmium, total	0.0389	0.000010 mg/L	0.0400		97	80-120			
Calcium, total	3.96	0.20 mg/L	4.00		99	80-120			
Chromium, total	0.0388	0.00050 mg/L	0.0400		97	80-120			
Cobalt, total	0.0390	0.00010 mg/L	0.0400		97	80-120			
Copper, total	0.0387	0.00040 mg/L	0.0400		97	80-120			
Iron, total	3.86	0.010 mg/L	4.00		97	80-120			
Lead, total	0.0385	0.00020 mg/L	0.0400		96	80-120			
Magnesium, total	4.00	0.010 mg/L	4.00		100	80-120			
Manganese, total	0.0385	0.00020 mg/L	0.0400		96	80-120			
Molybdenum, total	0.0387	0.00010 mg/L	0.0400		97	80-120			
Nickel, total	0.0383	0.00040 mg/L	0.0400		96	80-120			
Potassium, total	3.97	0.10 mg/L	4.00		99	80-120			
Selenium, total	0.380	0.00050 mg/L	0.400		95	80-120			
Sodium, total	4.17	0.10 mg/L	4.00		104	80-120			
Strontium, total	0.0393	0.0010 mg/L	0.0400		98	80-120			
Uranium, total	0.0385	0.000020 mg/L	0.0400		96	80-120			
Zinc, total	0.382	0.0040 mg/L	0.400		96	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0430
2024-01-10 15:20

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B4A1830									
Blank (B4A1830-BLK1)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK2)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK3)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK4)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK5)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	< 0.000010	0.000010 mg/L							
LCS (B4A1830-BS1)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	0.000281	0.000010 mg/L	0.000250		113	80-120			
LCS (B4A1830-BS2)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	0.000258	0.000010 mg/L	0.000250		103	80-120			
LCS (B4A1830-BS3)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	0.000246	0.000010 mg/L	0.000250		98	80-120			
LCS (B4A1830-BS4)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	0.000265	0.000010 mg/L	0.000250		106	80-120			
LCS (B4A1830-BS5)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Mercury, total	0.000265	0.000010 mg/L	0.000250		106	80-120			
Volatile Organic Compounds (VOC), Batch B4A1750									
Blank (B4A1750-BLK1)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Bromodichloromethane	< 0.0010	0.0010 mg/L							
Bromoform	< 0.0010	0.0010 mg/L							
Chloroform	< 0.0010	0.0010 mg/L							
Dibromochloromethane	< 0.0010	0.0010 mg/L							
Surrogate: Toluene-d8	0.0224	mg/L	0.0250		90	70-130			
Surrogate: 4-Bromofluorobenzene	0.0244	mg/L	0.0249		98	70-130			
LCS (B4A1750-BS1)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Bromodichloromethane	0.0226	0.0010 mg/L	0.0201		113	70-130			
Bromoform	0.0248	0.0010 mg/L	0.0201		123	70-130			
Chloroform	0.0217	0.0010 mg/L	0.0201		108	70-130			
Dibromochloromethane	0.0234	0.0010 mg/L	0.0201		116	70-130			
Surrogate: Toluene-d8	0.0250	mg/L	0.0250		100	70-130			
Surrogate: 4-Bromofluorobenzene	0.0206	mg/L	0.0249		83	70-130			

CERTIFICATE OF ANALYSIS

REPORTED TO Castlegar, City of
460 Columbia Avenue
CASTLEGAR, BC V1N 1G7

ATTENTION Matt Clouthier

PO NUMBER 502

PROJECT THM & HAA

PROJECT INFO

WORK ORDER 24A1602

RECEIVED / TEMP 2024-01-17 10:50 / 8.4°C

REPORTED 2024-01-23 15:22

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/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.

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.

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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.

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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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#108 4475 Wayburne Drive Burnaby, BC V5G 4X4

TEST RESULTS

REPORTED TO PROJECT
Castlegar, City of
THM & HAA

WORK ORDER REPORTED
24A1602
2024-01-23 15:22

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
WT # 4849 - Park Pump House (24A1602-01) Matrix: Water Sampled: 2024-01-15 08:15						
Haloacetic Acids						
Monochloroacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-01-22	
Monobromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-01-22	
Dichloroacetic Acid	0.0059	N/A	0.0020	mg/L	2024-01-22	
Trichloroacetic Acid	0.0078	N/A	0.0020	mg/L	2024-01-22	
Dibromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-01-22	
Total Haloacetic Acids (HAA5)	0.0137	MAC = 0.08	0.00200	mg/L	N/A	
Surrogate: 2-Bromopropionic Acid	111		70-130	%	2024-01-22	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Castlegar, City of
THM & HAA

WORK ORDER REPORTED 24A1602
2024-01-23 15:22

Analysis Description	Method Ref.	Technique	Accredited	Location
Haloacetic Acids in Water	EPA 552.3*	Liquid-Liquid Microextraction, Derivatization and GC-ECD	✓	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 \(Health Canada, September 2022\)](#)

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:

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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 Castlegar, City of
460 Columbia Avenue
CASTLEGAR, BC V1N 1G7

ATTENTION Matt Clouthier

PO NUMBER 502

PROJECT General Potability

PROJECT INFO

WORK ORDER 24D2865

RECEIVED / TEMP REPORTED 2024-04-22 11:31 / 14.2°C
2024-05-01 13:38

COC NUMBER No Number

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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#108 4475 Wayburne Drive Burnaby, BC V5G 4X4

TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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481E - WTC - Raw Water (24D2865-01) | Matrix: Water | Sampled: 2024-04-16 07:47

Anions

Chloride	0.30	AO ≤ 250	0.10	mg/L	2024-04-24	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2024-04-24	
Nitrate (as N)	0.101	MAC = 10	0.010	mg/L	2024-04-24	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-04-24	HT1
Sulfate	12.0	AO ≤ 500	1.0	mg/L	2024-04-24	

Calculated Parameters

Hardness, Total (as CaCO ₃)	66.4	None Required	0.500	mg/L	N/A	
Langelier Index	-1.8	N/A	-5.0		2024-04-29	CT6
Solids, Total Dissolved	72.1	AO ≤ 500	1.00	mg/L	N/A	

General Parameters

Alkalinity, Total (as CaCO ₃)	56.1	N/A	1.0	mg/L	2024-04-25	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-04-25	
Alkalinity, Bicarbonate (as CaCO ₃)	56.1	N/A	1.0	mg/L	2024-04-25	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-04-25	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-04-25	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2024-04-24	HT1
Conductivity (EC)	134	N/A	2.0	µS/cm	2024-04-25	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-04-26	
pH	6.68	7.0-10.5	0.10	pH units	2024-04-25	HT2
Temperature, at pH	21.3	N/A		°C	2024-04-25	HT2
Turbidity	0.47	OG < 1	0.10	NTU	2024-04-25	HT1

Total Metals

Aluminum, total	0.0124	OG < 0.1	0.0050	mg/L	2024-04-27	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-04-27	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2024-04-27	
Barium, total	0.0178	MAC = 2	0.0050	mg/L	2024-04-27	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-04-27	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010	mg/L	2024-04-27	
Calcium, total	19.1	None Required	0.20	mg/L	2024-04-27	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-04-27	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2024-04-27	
Copper, total	0.00042	MAC = 2	0.00040	mg/L	2024-04-27	
Iron, total	0.014	AO ≤ 0.3	0.010	mg/L	2024-04-27	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-04-27	
Magnesium, total	4.52	None Required	0.010	mg/L	2024-04-27	
Manganese, total	0.00146	MAC = 0.12	0.00020	mg/L	2024-04-27	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2024-04-25	
Molybdenum, total	0.00054	N/A	0.00010	mg/L	2024-04-27	
Nickel, total	0.00050	N/A	0.00040	mg/L	2024-04-27	
Potassium, total	0.67	N/A	0.10	mg/L	2024-04-27	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-04-27	

TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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481E - WTC - Raw Water (24D2865-01) | Matrix: Water | Sampled: 2024-04-16 07:47, Continued

Total Metals, Continued

Sodium, total	0.86	AO ≤ 200	0.10	mg/L	2024-04-27	
Strontium, total	0.127	MAC = 7	0.0010	mg/L	2024-04-27	
Uranium, total	0.000452	MAC = 0.02	0.000020	mg/L	2024-04-27	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-04-27	

Blueberry (24D2865-02) | Matrix: Water | Sampled: 2024-04-16 09:30

Calculated Parameters

Total Trihalomethanes	0.0244	MAC = 0.1	0.00400	mg/L	N/A	
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Volatile Organic Compounds (VOC)

Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-04-26	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-04-26	
Chloroform	0.0244	N/A	0.0010	mg/L	2024-04-26	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-04-26	
Surrogate: Toluene-d8	95		70-130	%	2024-04-26	
Surrogate: 4-Bromofluorobenzene	98		70-130	%	2024-04-26	

Airport (24D2865-03) | Matrix: Water | Sampled: 2024-04-16 13:15

Calculated Parameters

Total Trihalomethanes	0.0232	MAC = 0.1	0.00400	mg/L	N/A	
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Volatile Organic Compounds (VOC)

Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-04-26	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-04-26	
Chloroform	0.0232	N/A	0.0010	mg/L	2024-04-26	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-04-26	
Surrogate: Toluene-d8	96		70-130	%	2024-04-26	
Surrogate: 4-Bromofluorobenzene	99		70-130	%	2024-04-26	

Park Pumphouse (24D2865-04) | Matrix: Water | Sampled: 2024-04-16 10:00

Haloacetic Acids

Monochloroacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-04-29	
Monobromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-04-29	
Dichloroacetic Acid	0.0085	N/A	0.0020	mg/L	2024-04-29	
Trichloroacetic Acid	0.0089	N/A	0.0020	mg/L	2024-04-29	
Dibromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-04-29	
Total Haloacetic Acids (HAA5)	0.0174	MAC = 0.08	0.00200	mg/L	N/A	
Surrogate: 2-Bromopropionic Acid	118		70-130	%	2024-04-29	



TEST RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24D2865 2024-05-01 13:38
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Sample Qualifiers:	
CT6	Results were based on lab temperature & lab pH.
HT1	The sample was prepared and/or analyzed past the recommended holding time.
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 Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H ₂ SO ₄	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
Haloacetic Acids in Water	EPA 552.3*	Liquid-Liquid Microextraction, Derivatization and GC-ECD	✓	Richmond
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO ₃ +HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	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



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24D2865 2024-05-01 13:38
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General Comments:
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APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

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 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
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Anions, Batch B4D3665

Blank (B4D3665-BLK1)			Prepared: 2024-04-24, Analyzed: 2024-04-24						
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 (B4D3665-BS1)			Prepared: 2024-04-24, Analyzed: 2024-04-24						
Chloride	16.2	0.10 mg/L	16.0		101	90-110			
Fluoride	4.09	0.10 mg/L	4.00		102	88-108			
Nitrate (as N)	4.01	0.010 mg/L	4.00		100	90-110			
Nitrite (as N)	2.05	0.010 mg/L	2.00		102	85-115			
Sulfate	16.1	1.0 mg/L	16.0		100	90-110			

General Parameters, Batch B4D3713

Blank (B4D3713-BLK1)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Turbidity	< 0.10	0.10 NTU							
Blank (B4D3713-BLK2)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Turbidity	< 0.10	0.10 NTU							
Blank (B4D3713-BLK3)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Turbidity	< 0.10	0.10 NTU							
LCS (B4D3713-BS1)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Turbidity	15.3	0.10 NTU	14.6		105	90-110			
LCS (B4D3713-BS2)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Turbidity	15.2	0.10 NTU	14.6		104	90-110			
LCS (B4D3713-BS3)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Turbidity	15.3	0.10 NTU	14.6		105	90-110			

General Parameters, Batch B4D3775

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B4D3775, Continued									
Blank (B4D3775-BLK1)				Prepared: 2024-04-24, Analyzed: 2024-04-24					
Colour, True	< 5.0	5.0 CU							
LCS (B4D3775-BS1)				Prepared: 2024-04-24, Analyzed: 2024-04-24					
Colour, True	20	5.0 CU	20.0		99	85-115			
General Parameters, Batch B4D3837									
Blank (B4D3837-BLK1)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
pH	6.34	0.10 pH units							HT2
Temperature, at pH	20.9	°C							
Blank (B4D3837-BLK2)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
pH	6.23	0.10 pH units							HT2
Temperature, at pH	21.6	°C							
Blank (B4D3837-BLK3)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
pH	6.18	0.10 pH units							HT1
Temperature, at pH	22.0	°C							
LCS (B4D3837-BS1)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Alkalinity, Total (as CaCO ₃)	97.5	1.0 mg/L	100		98	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	62.0	1.0 mg/L	50.0		124	0-200			
LCS (B4D3837-BS2)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Alkalinity, Total (as CaCO ₃)	94.3	1.0 mg/L	100		94	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	60.5	1.0 mg/L	50.0		121	0-200			
LCS (B4D3837-BS3)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Alkalinity, Total (as CaCO ₃)	95.1	1.0 mg/L	100		95	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	59.4	1.0 mg/L	50.0		119	0-200			
LCS (B4D3837-BS4)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Conductivity (EC)	1400	2.0 µS/cm	1410		99	95-105			
LCS (B4D3837-BS5)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Conductivity (EC)	1400	2.0 µS/cm	1410		100	95-105			
LCS (B4D3837-BS6)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-105			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B4D3837, Continued									
Reference (B4D3837-SRM1)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
pH	7.04	0.10 pH units	7.01		100	98-102			
Reference (B4D3837-SRM2)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
pH	7.03	0.10 pH units	7.01		100	98-102			
Reference (B4D3837-SRM3)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
pH	7.03	0.10 pH units	7.01		100	98-102			
General Parameters, Batch B4D3975									
Blank (B4D3975-BLK1)				Prepared: 2024-04-26, Analyzed: 2024-04-26					
Cyanide, Total	< 0.0020	0.0020 mg/L							
Blank (B4D3975-BLK2)				Prepared: 2024-04-26, Analyzed: 2024-04-26					
Cyanide, Total	< 0.0020	0.0020 mg/L							
LCS (B4D3975-BS1)				Prepared: 2024-04-26, Analyzed: 2024-04-26					
Cyanide, Total	0.0175	0.0020 mg/L	0.0200		88	82-120			
LCS (B4D3975-BS2)				Prepared: 2024-04-26, Analyzed: 2024-04-26					
Cyanide, Total	0.0204	0.0020 mg/L	0.0200		102	82-120			
LCS Dup (B4D3975-BSD1)				Prepared: 2024-04-26, Analyzed: 2024-04-26					
Cyanide, Total	0.0186	0.0020 mg/L	0.0200		93	82-120	6	10	
LCS Dup (B4D3975-BSD2)				Prepared: 2024-04-26, Analyzed: 2024-04-26					
Cyanide, Total	0.0215	0.0020 mg/L	0.0200		108	82-120	5	10	
Haloacetic Acids, Batch B4D4167									
Blank (B4D4167-BLK1)				Prepared: 2024-04-29, Analyzed: 2024-04-29					
Monochloroacetic Acid	< 0.0020	0.0020 mg/L							
Monobromoacetic Acid	< 0.0020	0.0020 mg/L							
Dichloroacetic Acid	< 0.0020	0.0020 mg/L							
Trichloroacetic Acid	< 0.0020	0.0020 mg/L							
Dibromoacetic Acid	< 0.0020	0.0020 mg/L							
Surrogate: 2-Bromopropionic Acid	0.0136	mg/L	0.0116		117	70-130			
LCS (B4D4167-BS1)				Prepared: 2024-04-29, Analyzed: 2024-04-29					
Monochloroacetic Acid	0.0555	0.0020 mg/L	0.0564		99	75-117			
Monobromoacetic Acid	0.0363	0.0020 mg/L	0.0374		97	83-113			
Dichloroacetic Acid	0.0561	0.0020 mg/L	0.0558		101	78-112			
Trichloroacetic Acid	0.0188	0.0020 mg/L	0.0186		101	81-110			
Dibromoacetic Acid	0.0194	0.0020 mg/L	0.0187		104	89-112			
Surrogate: 2-Bromopropionic Acid	0.0114	mg/L	0.0116		98	70-130			
LCS Dup (B4D4167-BSD1)				Prepared: 2024-04-29, Analyzed: 2024-04-29					
Monochloroacetic Acid	0.0570	0.0020 mg/L	0.0564		101	75-117	3	30	
Monobromoacetic Acid	0.0390	0.0020 mg/L	0.0374		104	83-113	7	30	
Dichloroacetic Acid	0.0560	0.0020 mg/L	0.0558		100	78-112	< 1	30	
Trichloroacetic Acid	0.0186	0.0020 mg/L	0.0186		100	81-110	1	30	
Dibromoacetic Acid	0.0182	0.0020 mg/L	0.0187		97	89-112	6	30	
Surrogate: 2-Bromopropionic Acid	0.0118	mg/L	0.0116		102	70-130			

Total Metals, Batch B4D3892

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B4D3892, Continued									
Blank (B4D3892-BLK1)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4D3892-BLK2)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4D3892-BLK3)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4D3892-BLK4)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4D3892-BLK5)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4D3892-BLK6)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	< 0.000010	0.000010 mg/L							
LCS (B4D3892-BS1)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	0.00244	0.000010 mg/L	0.00250		98	80-120			
LCS (B4D3892-BS2)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	0.00240	0.000010 mg/L	0.00250		96	80-120			
LCS (B4D3892-BS3)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	0.00242	0.000010 mg/L	0.00250		97	80-120			
LCS (B4D3892-BS4)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	0.00241	0.000010 mg/L	0.00250		96	80-120			
LCS (B4D3892-BS5)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	0.00242	0.000010 mg/L	0.00250		97	80-120			
LCS (B4D3892-BS6)			Prepared: 2024-04-25, Analyzed: 2024-04-25						
Mercury, total	0.00246	0.000010 mg/L	0.00250		98	80-120			

Total Metals, Batch B4D3985

Blank (B4D3985-BLK1)			Prepared: 2024-04-26, Analyzed: 2024-04-27						
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	< 0.0500	0.0500 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							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24D2865
2024-05-01 13:38

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B4D3985, Continued									
Blank (B4D3985-BLK1), Continued				Prepared: 2024-04-26, Analyzed: 2024-04-27					
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 (B4D3985-BS1)				Prepared: 2024-04-26, Analyzed: 2024-04-27					
Aluminum, total	4.00	0.0050 mg/L	4.00		100	80-120			
Antimony, total	0.0408	0.00020 mg/L	0.0400		102	80-120			
Arsenic, total	0.395	0.00050 mg/L	0.400		99	80-120			
Barium, total	0.0398	0.0050 mg/L	0.0400		99	80-120			
Boron, total	0.411	0.0500 mg/L	0.400		103	80-120			
Cadmium, total	0.0399	0.000010 mg/L	0.0400		100	80-120			
Calcium, total	4.04	0.20 mg/L	4.00		101	80-120			
Chromium, total	0.0397	0.00050 mg/L	0.0400		99	80-120			
Cobalt, total	0.0395	0.00010 mg/L	0.0400		99	80-120			
Copper, total	0.0389	0.00040 mg/L	0.0400		97	80-120			
Iron, total	3.95	0.010 mg/L	4.00		99	80-120			
Lead, total	0.0404	0.00020 mg/L	0.0400		101	80-120			
Magnesium, total	3.93	0.010 mg/L	4.00		98	80-120			
Manganese, total	0.0402	0.00020 mg/L	0.0400		101	80-120			
Molybdenum, total	0.0405	0.00010 mg/L	0.0400		101	80-120			
Nickel, total	0.0395	0.00040 mg/L	0.0400		99	80-120			
Potassium, total	3.94	0.10 mg/L	4.00		99	80-120			
Selenium, total	0.400	0.00050 mg/L	0.400		100	80-120			
Sodium, total	3.86	0.10 mg/L	4.00		97	80-120			
Strontium, total	0.0398	0.0010 mg/L	0.0400		100	80-120			
Uranium, total	0.0408	0.000020 mg/L	0.0400		102	80-120			
Zinc, total	0.387	0.0040 mg/L	0.400		97	80-120			
Volatile Organic Compounds (VOC), Batch B4D3872									
Blank (B4D3872-BLK1)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Bromodichloromethane	< 0.0010	0.0010 mg/L							
Bromoform	< 0.0010	0.0010 mg/L							
Chloroform	< 0.0010	0.0010 mg/L							
Dibromochloromethane	< 0.0010	0.0010 mg/L							
Surrogate: Toluene-d8	0.0222	mg/L	0.0250		89	70-130			
Surrogate: 4-Bromofluorobenzene	0.0214	mg/L	0.0249		86	70-130			
LCS (B4D3872-BS1)				Prepared: 2024-04-25, Analyzed: 2024-04-25					
Bromodichloromethane	0.0216	0.0010 mg/L	0.0201		108	70-130			
Bromoform	0.0195	0.0010 mg/L	0.0201		97	70-130			
Chloroform	0.0231	0.0010 mg/L	0.0201		115	70-130			
Dibromochloromethane	0.0205	0.0010 mg/L	0.0201		102	70-130			
Surrogate: Toluene-d8	0.0280	mg/L	0.0250		112	70-130			
Surrogate: 4-Bromofluorobenzene	0.0285	mg/L	0.0249		115	70-130			
Duplicate (B4D3872-DUP1)				Source: 24D2865-02	Prepared: 2024-04-25, Analyzed: 2024-04-25				
Bromodichloromethane	< 0.0010	0.0010 mg/L		< 0.0010					23
Bromoform	< 0.0010	0.0010 mg/L		< 0.0010					23
Chloroform	0.0268	0.0010 mg/L		0.0244			9		22
Dibromochloromethane	< 0.0010	0.0010 mg/L		< 0.0010					28
Surrogate: Toluene-d8	0.0220	mg/L	0.0250		88	70-130			
Surrogate: 4-Bromofluorobenzene	0.0203	mg/L	0.0249		81	70-130			
Matrix Spike (B4D3872-MS1)				Source: 24D2865-02	Prepared: 2024-04-25, Analyzed: 2024-04-25				
Bromodichloromethane	0.0221	0.0010 mg/L	0.0201	< 0.0010	106	70-130			



APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24D2865 2024-05-01 13:38
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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B4D3872, Continued									
Matrix Spike (B4D3872-MS1), Continued		Source: 24D2865-02		Prepared: 2024-04-25, Analyzed: 2024-04-25					
Bromoform	0.0202	0.0010 mg/L	0.0201	< 0.0010	100	70-130			
Chloroform	0.0460	0.0010 mg/L	0.0201	0.0244	108	70-130			
Dibromochloromethane	0.0210	0.0010 mg/L	0.0201	< 0.0010	105	70-130			
Surrogate: Toluene-d8	0.0202	mg/L	0.0250		81	70-130			
Surrogate: 4-Bromofluorobenzene	0.0230	mg/L	0.0249		92	70-130			

QC Qualifiers:	
HT1	The sample was prepared and/or analyzed past the recommended holding time.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

CERTIFICATE OF ANALYSIS

REPORTED TO Castlegar, City of
460 Columbia Avenue
CASTLEGAR, BC V1N 1G7

ATTENTION Aaron Geck

PO NUMBER 502

PROJECT General Potability

PROJECT INFO

WORK ORDER 24G1219

RECEIVED / TEMP 2024-07-09 08:30 / 18.3°C

REPORTED 2024-07-18 14:32

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/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.

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.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here:
<https://www.caro.ca/terms-conditions>

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

Authorized By:

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Account Manager

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TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24G1219
2024-07-18 14:32

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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481E - WTC - Raw Water (24G1219-01) | Matrix: Water | Sampled: 2024-07-08 09:45

Anions

Chloride	0.33	AO ≤ 250	0.10	mg/L	2024-07-11	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2024-07-11	
Nitrate (as N)	0.106	MAC = 10	0.010	mg/L	2024-07-11	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-07-11	
Sulfate	11.6	AO ≤ 500	1.0	mg/L	2024-07-11	

Calculated Parameters

Hardness, Total (as CaCO ₃)	65.9	None Required	0.500	mg/L	N/A	
Langelier Index	-1.8	N/A	-5.0		2024-07-15	CT6
Solids, Total Dissolved	72.4	AO ≤ 500	1.00	mg/L	N/A	

General Parameters

Alkalinity, Total (as CaCO ₃)	57.3	N/A	1.0	mg/L	2024-07-11	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-07-11	
Alkalinity, Bicarbonate (as CaCO ₃)	57.3	N/A	1.0	mg/L	2024-07-11	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-07-11	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-07-11	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2024-07-11	
Conductivity (EC)	135	N/A	2.0	µS/cm	2024-07-11	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-07-11	
pH	6.69	7.0-10.5	0.10	pH units	2024-07-11	HT2
Temperature, at pH	21.4	N/A		°C	2024-07-11	HT2
Turbidity	0.25	OG < 1	0.10	NTU	2024-07-11	

Total Metals

Aluminum, total	0.0091	OG < 0.1	0.0050	mg/L	2024-07-12	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-07-12	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2024-07-12	
Barium, total	0.0167	MAC = 2	0.0050	mg/L	2024-07-12	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-07-12	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010	mg/L	2024-07-12	
Calcium, total	19.0	None Required	0.20	mg/L	2024-07-12	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-07-12	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2024-07-12	
Copper, total	< 0.00040	MAC = 2	0.00040	mg/L	2024-07-12	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-07-12	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-07-12	
Magnesium, total	4.48	None Required	0.010	mg/L	2024-07-12	
Manganese, total	0.00091	MAC = 0.12	0.00020	mg/L	2024-07-12	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2024-07-11	
Molybdenum, total	0.00049	N/A	0.00010	mg/L	2024-07-12	
Nickel, total	0.00048	N/A	0.00040	mg/L	2024-07-12	
Potassium, total	0.68	N/A	0.10	mg/L	2024-07-12	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-07-12	

TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

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Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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481E - WTC - Raw Water (24G1219-01) | Matrix: Water | Sampled: 2024-07-08 09:45, Continued

Total Metals, Continued

Sodium, total	0.91	AO ≤ 200	0.10	mg/L	2024-07-12	
Strontium, total	0.132	MAC = 7	0.0010	mg/L	2024-07-12	
Uranium, total	0.000427	MAC = 0.02	0.000020	mg/L	2024-07-12	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-07-12	

Blueberry (24G1219-02) | Matrix: Water | Sampled: 2024-07-08 11:25

Calculated Parameters

Total Trihalomethanes	0.0219	MAC = 0.1	0.00400	mg/L	N/A	
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Volatile Organic Compounds (VOC)

Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-07-11	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-07-11	
Chloroform	0.0219	N/A	0.0010	mg/L	2024-07-11	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-07-11	
Surrogate: Toluene-d8	83		70-130	%	2024-07-11	
Surrogate: 4-Bromofluorobenzene	73		70-130	%	2024-07-11	

Airport (24G1219-03) | Matrix: Water | Sampled: 2024-07-08 10:30

Calculated Parameters

Total Trihalomethanes	0.0216	MAC = 0.1	0.00400	mg/L	N/A	
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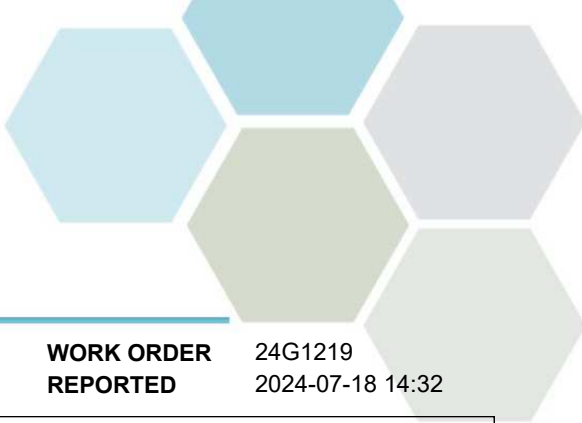
Volatile Organic Compounds (VOC)

Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-07-11	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-07-11	
Chloroform	0.0216	N/A	0.0010	mg/L	2024-07-11	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-07-11	
Surrogate: Toluene-d8	81		70-130	%	2024-07-11	
Surrogate: 4-Bromofluorobenzene	79		70-130	%	2024-07-11	

Park Pumphouse (24G1219-04) | Matrix: Water | Sampled: 2024-07-08 11:05

Haloacetic Acids

Monochloroacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-07-13	
Monobromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-07-13	
Dichloroacetic Acid	0.0067	N/A	0.0020	mg/L	2024-07-13	
Trichloroacetic Acid	0.0065	N/A	0.0020	mg/L	2024-07-13	
Dibromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-07-13	
Total Haloacetic Acids (HAA5)	0.0131	MAC = 0.08	0.00200	mg/L	N/A	
Surrogate: 2-Bromopropionic Acid	93		70-130	%	2024-07-13	



TEST RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24G1219 2024-07-18 14:32
Sample Qualifiers: CT6 Results were based on lab temperature & lab pH. 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 Castlegar, City of
General Potability

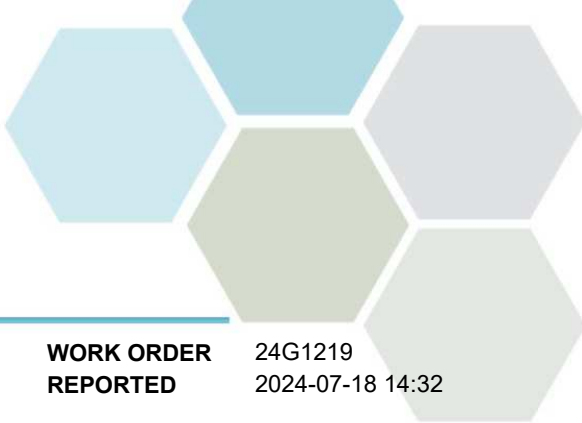
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Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
Haloacetic Acids in Water	EPA 552.3*	Liquid-Liquid Microextraction, Derivatization and GC-ECD	✓	Richmond
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	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 (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	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



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24G1219 2024-07-18 14:32
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General Comments:
The results in this report apply to the received 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. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed.

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.

APPENDIX 2: QUALITY CONTROL RESULTS

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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 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 B4G2545									
Blank (B4G2545-BLK1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
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 (B4G2545-BLK2)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
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 (B4G2545-BS1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Fluoride	3.96	0.10 mg/L	4.00		99	88-108			
Nitrate (as N)	4.02	0.010 mg/L	4.00		101	90-110			
Nitrite (as N)	2.03	0.010 mg/L	2.00		102	85-115			
Sulfate	16.3	1.0 mg/L	16.0		102	90-110			
LCS (B4G2545-BS2)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Chloride	16.2	0.10 mg/L	16.0		101	90-110			
Fluoride	3.90	0.10 mg/L	4.00		98	88-108			
Nitrate (as N)	4.06	0.010 mg/L	4.00		102	90-110			
Nitrite (as N)	2.08	0.010 mg/L	2.00		104	85-115			
Sulfate	16.1	1.0 mg/L	16.0		100	90-110			
General Parameters, Batch B4G2542									
Blank (B4G2542-BLK1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Turbidity	< 0.10	0.10 NTU							
LCS (B4G2542-BS1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Turbidity	1520	0.10 NTU	1500		101	90-110			

APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B4G2553									
Blank (B4G2553-BLK1)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Temperature, at pH	22.0	°C							
Blank (B4G2553-BLK2)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Temperature, at pH	22.2	°C							
LCS (B4G2553-BS1)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Alkalinity, Total (as CaCO ₃)	96.5	1.0 mg/L	100		96	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	71.5	1.0 mg/L	50.0		143	0-200			
LCS (B4G2553-BS2)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Conductivity (EC)	1420	2.0 µS/cm	1410		100	95-105			
LCS (B4G2553-BS3)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Alkalinity, Total (as CaCO ₃)	96.6	1.0 mg/L	100		97	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	69.4	1.0 mg/L	50.0		139	0-200			
LCS (B4G2553-BS4)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Conductivity (EC)	1420	2.0 µS/cm	1410		101	95-105			
Duplicate (B4G2553-DUP1)				Source: 24G1219-01		Prepared: 2024-07-11, Analyzed: 2024-07-11			
Alkalinity, Total (as CaCO ₃)	56.0	1.0 mg/L		57.3			2	10	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO ₃)	56.0	1.0 mg/L		57.3			2	10	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Conductivity (EC)	135	2.0 µS/cm		135			< 1	5	
pH	6.62	0.10 pH units		6.69			1	4	HT2
Reference (B4G2553-SRM1)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
pH	7.02	0.10 pH units		7.01			100	98-102	
Reference (B4G2553-SRM2)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
pH	7.02	0.10 pH units		7.01			100	98-102	
General Parameters, Batch B4G2584									
Blank (B4G2584-BLK1)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Cyanide, Total	< 0.0020	0.0020 mg/L							
LCS (B4G2584-BS1)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Cyanide, Total	0.0220	0.0020 mg/L		0.0200			110	82-120	
LCS Dup (B4G2584-BSD1)				Prepared: 2024-07-11, Analyzed: 2024-07-11					
Cyanide, Total	0.0219	0.0020 mg/L		0.0200			110	82-120	< 1

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24G1219
2024-07-18 14:32

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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General Parameters, Batch B4G2657

Blank (B4G2657-BLK1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Colour, True	< 5.0	5.0 CU							
LCS (B4G2657-BS1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Colour, True	17	5.0 CU	20.0		86	85-115			

Haloacetic Acids, Batch B4G2746

Blank (B4G2746-BLK1)			Prepared: 2024-07-12, Analyzed: 2024-07-13						
Monochloroacetic Acid	< 0.0020	0.0020 mg/L							
Monobromoacetic Acid	< 0.0020	0.0020 mg/L							
Dichloroacetic Acid	< 0.0020	0.0020 mg/L							
Trichloroacetic Acid	< 0.0020	0.0020 mg/L							
Dibromoacetic Acid	< 0.0020	0.0020 mg/L							
Surrogate: 2-Bromopropionic Acid	0.0104	mg/L	0.0116		89	70-130			
LCS (B4G2746-BS1)			Prepared: 2024-07-12, Analyzed: 2024-07-12						
Monochloroacetic Acid	0.0571	0.0020 mg/L	0.0564		101	75-117			
Monobromoacetic Acid	0.0380	0.0020 mg/L	0.0374		102	83-113			
Dichloroacetic Acid	0.0574	0.0020 mg/L	0.0558		103	78-112			
Trichloroacetic Acid	0.0189	0.0020 mg/L	0.0186		102	81-110			
Dibromoacetic Acid	0.0199	0.0020 mg/L	0.0187		106	89-112			
Surrogate: 2-Bromopropionic Acid	0.0120	mg/L	0.0116		103	70-130			
LCS Dup (B4G2746-BSD1)			Prepared: 2024-07-12, Analyzed: 2024-07-12						
Monochloroacetic Acid	0.0555	0.0020 mg/L	0.0564		98	75-117	3	30	
Monobromoacetic Acid	0.0372	0.0020 mg/L	0.0374		100	83-113	2	30	
Dichloroacetic Acid	0.0549	0.0020 mg/L	0.0558		98	78-112	4	30	
Trichloroacetic Acid	0.0185	0.0020 mg/L	0.0186		99	81-110	2	30	
Dibromoacetic Acid	0.0177	0.0020 mg/L	0.0187		95	89-112	11	30	
Surrogate: 2-Bromopropionic Acid	0.0113	mg/L	0.0116		97	70-130			

Total Metals, Batch B4G2664

Blank (B4G2664-BLK1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4G2664-BLK2)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4G2664-BLK3)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Mercury, total	< 0.000010	0.000010 mg/L							
LCS (B4G2664-BS1)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Mercury, total	0.00286	0.000010 mg/L	0.00250		114	80-120			
LCS (B4G2664-BS2)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Mercury, total	0.00283	0.000010 mg/L	0.00250		113	80-120			
LCS (B4G2664-BS3)			Prepared: 2024-07-11, Analyzed: 2024-07-11						
Mercury, total	0.00268	0.000010 mg/L	0.00250		107	80-120			

Total Metals, Batch B4G2674

Blank (B4G2674-BLK1)			Prepared: 2024-07-11, Analyzed: 2024-07-12						
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
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WORK ORDER REPORTED 24G1219
2024-07-18 14:32

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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Total Metals, Batch B4G2674, Continued

Blank (B4G2674-BLK1), Continued

Prepared: 2024-07-11, Analyzed: 2024-07-12

Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0500	0.0500 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 (B4G2674-BS1)

Prepared: 2024-07-11, Analyzed: 2024-07-12

Aluminum, total	3.96	0.0050 mg/L	4.00		99	80-120			
Antimony, total	0.0380	0.00020 mg/L	0.0400		95	80-120			
Arsenic, total	0.393	0.00050 mg/L	0.400		98	80-120			
Barium, total	0.0389	0.0050 mg/L	0.0400		97	80-120			
Boron, total	0.406	0.0500 mg/L	0.400		101	80-120			
Cadmium, total	0.0384	0.000010 mg/L	0.0400		96	80-120			
Calcium, total	4.07	0.20 mg/L	4.00		102	80-120			
Chromium, total	0.0407	0.00050 mg/L	0.0400		102	80-120			
Cobalt, total	0.0401	0.00010 mg/L	0.0400		100	80-120			
Copper, total	0.0400	0.00040 mg/L	0.0400		100	80-120			
Iron, total	3.99	0.010 mg/L	4.00		100	80-120			
Lead, total	0.0384	0.00020 mg/L	0.0400		96	80-120			
Magnesium, total	4.00	0.010 mg/L	4.00		100	80-120			
Manganese, total	0.0396	0.00020 mg/L	0.0400		99	80-120			
Molybdenum, total	0.0391	0.00010 mg/L	0.0400		98	80-120			
Nickel, total	0.0398	0.00040 mg/L	0.0400		99	80-120			
Potassium, total	3.92	0.10 mg/L	4.00		98	80-120			
Selenium, total	0.400	0.00050 mg/L	0.400		100	80-120			
Sodium, total	4.06	0.10 mg/L	4.00		101	80-120			
Strontium, total	0.0394	0.0010 mg/L	0.0400		99	80-120			
Uranium, total	0.0400	0.000020 mg/L	0.0400		100	80-120			
Zinc, total	0.390	0.0040 mg/L	0.400		98	80-120			

Volatile Organic Compounds (VOC), Batch B4G2677

Blank (B4G2677-BLK1)

Prepared: 2024-07-11, Analyzed: 2024-07-11

Bromodichloromethane	< 0.0010	0.0010 mg/L							
Bromoform	< 0.0010	0.0010 mg/L							
Chloroform	< 0.0010	0.0010 mg/L							
Dibromochloromethane	< 0.0010	0.0010 mg/L							
Surrogate: Toluene-d8	0.0180	mg/L	0.0250		72	70-130			
Surrogate: 4-Bromofluorobenzene	0.0186	mg/L	0.0249		75	70-130			



APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24G1219 2024-07-18 14:32
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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B4G2677, Continued									
LCS (B4G2677-BS1)					Prepared: 2024-07-11, Analyzed: 2024-07-11				
Bromodichloromethane	0.0188	0.0010 mg/L	0.0201		93	70-130			
Bromoform	0.0191	0.0010 mg/L	0.0201		95	70-130			
Chloroform	0.0203	0.0010 mg/L	0.0201		101	70-130			
Dibromochloromethane	0.0179	0.0010 mg/L	0.0201		89	70-130			
Surrogate: Toluene-d8	0.0200	mg/L	0.0250		80	70-130			
Surrogate: 4-Bromofluorobenzene	0.0233	mg/L	0.0249		94	70-130			

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

CERTIFICATE OF ANALYSIS

REPORTED TO Castlegar, City of
460 Columbia Avenue
CASTLEGAR, BC V1N 1G7

ATTENTION Aaron Geck

PO NUMBER 502

PROJECT General Potability

PROJECT INFO

WORK ORDER 24J3029

RECEIVED / TEMP 2024-10-23 09:26 / 3.8°C

REPORTED 2024-10-31 14:52

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/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.

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.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here:
<https://www.caro.ca/terms-conditions>

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 Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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481E - WTC - Raw Water (24J3029-01) | Matrix: Water | Sampled: 2024-10-22 09:45

Anions

Chloride	0.24	AO ≤ 250	0.10	mg/L	2024-10-24	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2024-10-24	
Nitrate (as N)	0.118	MAC = 10	0.010	mg/L	2024-10-24	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2024-10-24	
Sulfate	11.0	AO ≤ 500	1.0	mg/L	2024-10-24	

Calculated Parameters

Hardness, Total (as CaCO ₃)	64.7	None Required	0.500	mg/L	N/A	
Langelier Index	-1.6	N/A	-5.0		2024-10-28	CT6
Solids, Total Dissolved	68.1	AO ≤ 500	1.00	mg/L	N/A	

General Parameters

Alkalinity, Total (as CaCO ₃)	52.0	N/A	1.0	mg/L	2024-10-25	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-10-25	
Alkalinity, Bicarbonate (as CaCO ₃)	52.0	N/A	1.0	mg/L	2024-10-25	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-10-25	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	2024-10-25	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2024-10-24	
Conductivity (EC)	133	N/A	2.0	µS/cm	2024-10-25	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2024-10-26	
pH	7.01	7.0-10.5	0.10	pH units	2024-10-25	HT2
Temperature, at pH	20.4	N/A		°C	2024-10-25	HT2
Turbidity	0.27	OG < 1	0.10	NTU	2024-10-24	

Microbiological Parameters

Coliforms, Total	13	MAC = 0	1	CFU/100 mL	2024-10-23	
E. coli	< 1	MAC = 0	1	CFU/100 mL	2024-10-23	

Total Metals

Aluminum, total	0.0092	OG < 0.1	0.0050	mg/L	2024-10-24	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2024-10-24	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2024-10-24	
Barium, total	0.0167	MAC = 2	0.0050	mg/L	2024-10-24	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2024-10-24	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010	mg/L	2024-10-24	
Calcium, total	18.9	None Required	0.20	mg/L	2024-10-24	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-10-24	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2024-10-24	
Copper, total	0.00041	MAC = 2	0.00040	mg/L	2024-10-24	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2024-10-24	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2024-10-24	
Magnesium, total	4.27	None Required	0.010	mg/L	2024-10-24	
Manganese, total	0.00078	MAC = 0.12	0.00020	mg/L	2024-10-24	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2024-10-24	

TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
481E - WTC - Raw Water (24J3029-01) Matrix: Water Sampled: 2024-10-22 09:45, Continued						
Total Metals, Continued						
Molybdenum, total	0.00051	N/A	0.00010	mg/L	2024-10-24	
Nickel, total	0.00043	N/A	0.00040	mg/L	2024-10-24	
Potassium, total	0.63	N/A	0.10	mg/L	2024-10-24	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2024-10-24	
Sodium, total	0.80	AO ≤ 200	0.10	mg/L	2024-10-24	
Strontium, total	0.119	MAC = 7	0.0010	mg/L	2024-10-24	
Uranium, total	0.000424	MAC = 0.02	0.000020	mg/L	2024-10-24	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2024-10-24	

Blueberry (24J3029-02) | Matrix: Water | Sampled: 2024-10-22 09:00

Calculated Parameters						
Total Trihalomethanes	0.0347	MAC = 0.1	0.00400	mg/L	N/A	
Volatile Organic Compounds (VOC)						
Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-10-26	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-10-26	
Chloroform	0.0347	N/A	0.0010	mg/L	2024-10-26	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-10-26	
Surrogate: Toluene-d8	87		70-130	%	2024-10-26	
Surrogate: 4-Bromofluorobenzene	77		70-130	%	2024-10-26	

Airport (24J3029-03) | Matrix: Water | Sampled: 2024-10-22 09:25

Calculated Parameters						
Total Trihalomethanes	0.0295	MAC = 0.1	0.00400	mg/L	N/A	
Volatile Organic Compounds (VOC)						
Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2024-10-26	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2024-10-26	
Chloroform	0.0295	N/A	0.0010	mg/L	2024-10-26	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2024-10-26	
Surrogate: Toluene-d8	81		70-130	%	2024-10-26	
Surrogate: 4-Bromofluorobenzene	75		70-130	%	2024-10-26	

Park Pumphouse (24J3029-04) | Matrix: Water | Sampled: 2024-10-22 09:15

Haloacetic Acids						
Monochloroacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-10-31	
Monobromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-10-31	
Dichloroacetic Acid	0.0091	N/A	0.0020	mg/L	2024-10-31	
Trichloroacetic Acid	0.0103	N/A	0.0020	mg/L	2024-10-31	
Dibromoacetic Acid	< 0.0020	N/A	0.0020	mg/L	2024-10-31	

TEST RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24J3029 2024-10-31 14:52
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Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Park Pumphouse (24J3029-04) Matrix: Water Sampled: 2024-10-22 09:15, Continued						
Haloacetic Acids, Continued						
Total Haloacetic Acids (HAA5)	0.0194	MAC = 0.08	0.00200	mg/L	N/A	
Surrogate: 2-Bromopropionic Acid	113		70-130	%	2024-10-31	

Sample Qualifiers:

CT6 Results were based on lab temperature & lab pH.

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 Castlegar, City of
General Potability

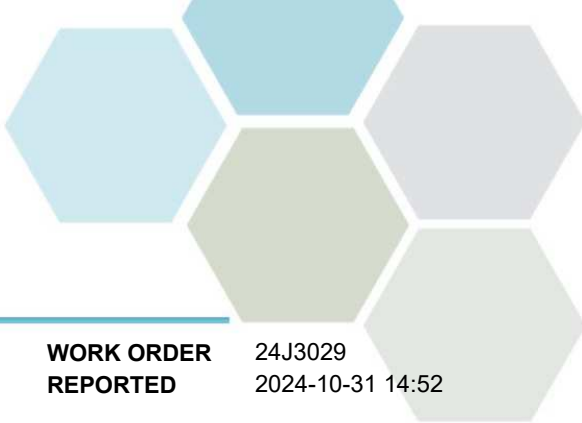
WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H ₂ SO ₄	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Coliforms, Total in Water	SM 9222* (2015)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
E. coli in Water	SM 9222* (2015)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Haloacetic Acids in Water	EPA 552.3*	Liquid-Liquid Microextraction, Derivatization and GC-ECD	✓	Richmond
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO ₃ +HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)	✓	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	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
CFU/100 mL	Colony Forming Units per 100 millilitres
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



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24J3029 2024-10-31 14:52
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General Comments:
The results in this report apply to the received 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. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed.

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.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

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 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 B4J4104									
Blank (B4J4104-BLK1)					Prepared: 2024-10-24, Analyzed: 2024-10-24				
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 (B4J4104-BLK2)					Prepared: 2024-10-25, Analyzed: 2024-10-25				
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 (B4J4104-BLK3)					Prepared: 2024-10-25, Analyzed: 2024-10-25				
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 (B4J4104-BS1)					Prepared: 2024-10-24, Analyzed: 2024-10-24				
Chloride	16.3	0.10 mg/L	16.0		102	90-110			
Fluoride	4.06	0.10 mg/L	4.00		101	88-108			
Nitrate (as N)	3.86	0.010 mg/L	4.00		96	90-110			
Nitrite (as N)	1.97	0.010 mg/L	2.00		98	85-115			
Sulfate	15.9	1.0 mg/L	16.0		99	90-110			
LCS (B4J4104-BS2)					Prepared: 2024-10-25, Analyzed: 2024-10-25				
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Fluoride	4.08	0.10 mg/L	4.00		102	88-108			
Nitrate (as N)	3.88	0.010 mg/L	4.00		97	90-110			
Nitrite (as N)	2.14	0.010 mg/L	2.00		107	85-115			
Sulfate	16.2	1.0 mg/L	16.0		101	90-110			
LCS (B4J4104-BS3)					Prepared: 2024-10-25, Analyzed: 2024-10-25				
Chloride	16.2	0.10 mg/L	16.0		101	90-110			
Fluoride	3.92	0.10 mg/L	4.00		98	88-108			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B4J4104, Continued									
LCS (B4J4104-BS3), Continued				Prepared: 2024-10-25, Analyzed: 2024-10-25					
Nitrate (as N)	3.86	0.010 mg/L	4.00		96	90-110			
Nitrite (as N)	2.22	0.010 mg/L	2.00		111	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
Duplicate (B4J4104-DUP1)				Source: 24J3029-01		Prepared: 2024-10-24, Analyzed: 2024-10-24			
Chloride	0.25	0.10 mg/L		0.24				10	
Fluoride	< 0.10	0.10 mg/L		< 0.10				10	
Nitrate (as N)	0.128	0.010 mg/L		0.118			8	10	
Nitrite (as N)	< 0.010	0.010 mg/L		< 0.010				15	
Sulfate	11.0	1.0 mg/L		11.0			< 1	10	
Matrix Spike (B4J4104-MS1)				Source: 24J3029-01		Prepared: 2024-10-24, Analyzed: 2024-10-24			
Chloride	16.4	0.10 mg/L	16.0	0.24	101	75-125			
Fluoride	4.13	0.10 mg/L	4.00	< 0.10	102	75-125			
Nitrate (as N)	3.82	0.010 mg/L	4.00	0.118	93	75-125			
Nitrite (as N)	2.02	0.010 mg/L	2.00	< 0.010	101	75-115			
Sulfate	27.0	1.0 mg/L	16.0	11.0	100	75-125			
General Parameters, Batch B4J4181									
Blank (B4J4181-BLK1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Colour, True	< 5.0	5.0 CU							
LCS (B4J4181-BS1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Colour, True	18	5.0 CU	20.0		92	85-115			
General Parameters, Batch B4J4248									
Blank (B4J4248-BLK1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Turbidity	< 0.10	0.10 NTU							
LCS (B4J4248-BS1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Turbidity	1.81	0.10 NTU	1.69		107	90-110			
General Parameters, Batch B4J4327									
Blank (B4J4327-BLK1)				Prepared: 2024-10-25, Analyzed: 2024-10-25					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Temperature, at pH	19.8	°C							
Blank (B4J4327-BLK2)				Prepared: 2024-10-25, Analyzed: 2024-10-25					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Temperature, at pH	20.5	°C							
LCS (B4J4327-BS1)				Prepared: 2024-10-28, Analyzed: 2024-10-28					
Alkalinity, Total (as CaCO ₃)	91.6	1.0 mg/L	100		92	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B4J4327, Continued									
LCS (B4J4327-BS2)				Prepared: 2024-10-28, Analyzed: 2024-10-28					
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-105			
LCS (B4J4327-BS3)				Prepared: 2024-10-28, Analyzed: 2024-10-28					
Alkalinity, Total (as CaCO ₃)	92.3	1.0 mg/L	100		92	80-120			
LCS (B4J4327-BS4)				Prepared: 2024-10-28, Analyzed: 2024-10-28					
Conductivity (EC)	1420	2.0 µS/cm	1410		100	95-105			
Duplicate (B4J4327-DUP2)		Source: 24J3029-01		Prepared: 2024-10-25, Analyzed: 2024-10-25					
Alkalinity, Total (as CaCO ₃)	53.8	1.0 mg/L		52.0			3	10	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO ₃)	53.8	1.0 mg/L		52.0			3	10	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Conductivity (EC)	133	2.0 µS/cm		133			< 1	5	
pH	7.11	0.10 pH units		7.01			1	4	
Reference (B4J4327-SRM1)				Prepared: 2024-10-28, Analyzed: 2024-10-28					
pH	7.00	0.10 pH units		7.01			100	98-102	
Reference (B4J4327-SRM2)				Prepared: 2024-10-28, Analyzed: 2024-10-28					
pH	7.00	0.10 pH units		7.01			100	98-102	

General Parameters, Batch B4J4415

Blank (B4J4415-BLK1)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	< 0.0020	0.0020 mg/L							
Blank (B4J4415-BLK2)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	< 0.0020	0.0020 mg/L							
Blank (B4J4415-BLK3)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	< 0.0020	0.0020 mg/L							
LCS (B4J4415-BS1)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	0.0211	0.0020 mg/L		0.0200			106	82-120	
LCS (B4J4415-BS2)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	0.0207	0.0020 mg/L		0.0200			104	82-120	
LCS (B4J4415-BS3)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	0.0214	0.0020 mg/L		0.0200			107	82-120	
LCS Dup (B4J4415-BSD1)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	0.0227	0.0020 mg/L		0.0200			113	82-120	7 10
LCS Dup (B4J4415-BSD2)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	0.0224	0.0020 mg/L		0.0200			112	82-120	8 10
LCS Dup (B4J4415-BSD3)				Prepared: 2024-10-26, Analyzed: 2024-10-26					
Cyanide, Total	0.0216	0.0020 mg/L		0.0200			108	82-120	< 1 10

Haloacetic Acids, Batch B4J4944

Blank (B4J4944-BLK1)				Prepared: 2024-10-30, Analyzed: 2024-10-30					
Monochloroacetic Acid	< 0.0020	0.0020 mg/L							
Monobromoacetic Acid	< 0.0020	0.0020 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Haloacetic Acids, Batch B4J4944, Continued									
Blank (B4J4944-BLK1), Continued				Prepared: 2024-10-30, Analyzed: 2024-10-30					
Dichloroacetic Acid	< 0.0020	0.0020 mg/L							
Trichloroacetic Acid	< 0.0020	0.0020 mg/L							
Dibromoacetic Acid	< 0.0020	0.0020 mg/L							
Surrogate: 2-Bromopropionic Acid	0.0129	mg/L	0.0116		111	70-130			
LCS (B4J4944-BS1)				Prepared: 2024-10-30, Analyzed: 2024-10-30					
Monochloroacetic Acid	0.0578	0.0020 mg/L	0.0558		104	75-117			
Monobromoacetic Acid	0.0388	0.0020 mg/L	0.0375		103	83-113			
Dichloroacetic Acid	0.0589	0.0020 mg/L	0.0559		105	78-112			
Trichloroacetic Acid	0.0204	0.0020 mg/L	0.0186		110	81-110			
Dibromoacetic Acid	0.0193	0.0020 mg/L	0.0186		104	89-112			
Surrogate: 2-Bromopropionic Acid	0.0118	mg/L	0.0116		101	70-130			
LCS Dup (B4J4944-BSD1)				Prepared: 2024-10-30, Analyzed: 2024-10-30					
Monochloroacetic Acid	0.0547	0.0020 mg/L	0.0558		98	75-117	5	30	
Monobromoacetic Acid	0.0364	0.0020 mg/L	0.0375		97	83-113	6	30	
Dichloroacetic Acid	0.0532	0.0020 mg/L	0.0559		95	78-112	10	30	
Trichloroacetic Acid	0.0169	0.0020 mg/L	0.0186		91	81-110	19	30	
Dibromoacetic Acid	0.0182	0.0020 mg/L	0.0186		98	89-112	6	30	
Surrogate: 2-Bromopropionic Acid	0.0115	mg/L	0.0116		99	70-130			
Microbiological Parameters, Batch B4J4037									
Blank (B4J4037-BLK1)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK2)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK3)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK4)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK5)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK6)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK7)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK8)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLK9)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Microbiological Parameters, Batch B4J4037, Continued									
Blank (B4J4037-BLK9), Continued				Prepared: 2024-10-23, Analyzed: 2024-10-23					
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLKA)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLKB)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B4J4037-BLKC)				Prepared: 2024-10-23, Analyzed: 2024-10-23					
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							

Total Metals, Batch B4J4260

Blank (B4J4260-BLK1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
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	< 0.0500	0.0500 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							

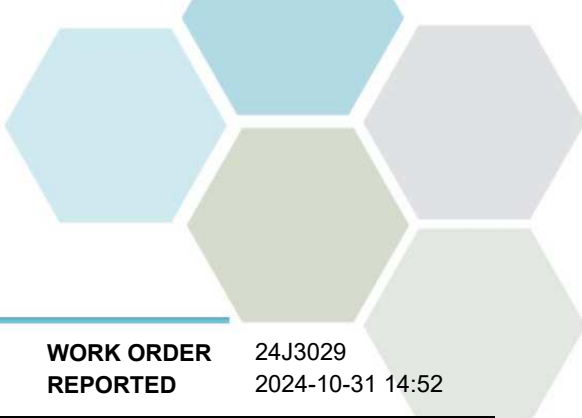
LCS (B4J4260-BS1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Aluminum, total	3.93	0.0050 mg/L	4.00	98	80-120				
Antimony, total	0.0394	0.00020 mg/L	0.0400	99	80-120				
Arsenic, total	0.382	0.00050 mg/L	0.400	96	80-120				
Barium, total	0.0393	0.0050 mg/L	0.0400	98	80-120				
Boron, total	0.421	0.0500 mg/L	0.400	105	80-120				
Cadmium, total	0.0399	0.000010 mg/L	0.0400	100	80-120				
Calcium, total	4.05	0.20 mg/L	4.00	101	80-120				
Chromium, total	0.0381	0.00050 mg/L	0.0400	95	80-120				
Cobalt, total	0.0392	0.00010 mg/L	0.0400	98	80-120				
Copper, total	0.0390	0.00040 mg/L	0.0400	97	80-120				
Iron, total	3.93	0.010 mg/L	4.00	98	80-120				
Lead, total	0.0398	0.00020 mg/L	0.0400	100	80-120				
Magnesium, total	3.95	0.010 mg/L	4.00	99	80-120				
Manganese, total	0.0388	0.00020 mg/L	0.0400	97	80-120				
Molybdenum, total	0.0399	0.00010 mg/L	0.0400	100	80-120				

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24J3029
2024-10-31 14:52

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B4J4260, Continued									
LCS (B4J4260-BS1), Continued				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Nickel, total	0.0397	0.00040 mg/L	0.0400		99	80-120			
Potassium, total	3.89	0.10 mg/L	4.00		97	80-120			
Selenium, total	0.393	0.00050 mg/L	0.400		98	80-120			
Sodium, total	3.92	0.10 mg/L	4.00		98	80-120			
Strontium, total	0.0389	0.0010 mg/L	0.0400		97	80-120			
Uranium, total	0.0405	0.000020 mg/L	0.0400		101	80-120			
Zinc, total	0.374	0.0040 mg/L	0.400		94	80-120			
Total Metals, Batch B4J4301									
Blank (B4J4301-BLK1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4J4301-BLK2)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4J4301-BLK3)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4J4301-BLK4)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	< 0.000010	0.000010 mg/L							
LCS (B4J4301-BS1)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	0.00240	0.000010 mg/L	0.00250		96	80-120			
LCS (B4J4301-BS2)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	0.00208	0.000010 mg/L	0.00250		83	80-120			
LCS (B4J4301-BS3)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	0.00300	0.000010 mg/L	0.00250		120	80-120			
LCS (B4J4301-BS4)				Prepared: 2024-10-24, Analyzed: 2024-10-24					
Mercury, total	0.00268	0.000010 mg/L	0.00250		107	80-120			
Volatile Organic Compounds (VOC), Batch B4J4331									
Blank (B4J4331-BLK1)				Prepared: 2024-10-25, Analyzed: 2024-10-25					
Bromodichloromethane	< 0.0010	0.0010 mg/L							
Bromoform	< 0.0010	0.0010 mg/L							
Chloroform	< 0.0010	0.0010 mg/L							
Dibromochloromethane	< 0.0010	0.0010 mg/L							
Surrogate: Toluene-d8	0.0234	mg/L	0.0250		94	70-130			
Surrogate: 4-Bromofluorobenzene	0.0188	mg/L	0.0249		75	70-130			
Blank (B4J4331-BLK2)				Prepared: 2024-10-25, Analyzed: 2024-10-25					
Bromodichloromethane	< 0.0010	0.0010 mg/L							
Bromoform	< 0.0010	0.0010 mg/L							
Chloroform	< 0.0010	0.0010 mg/L							
Dibromochloromethane	< 0.0010	0.0010 mg/L							
Surrogate: Toluene-d8	0.0213	mg/L	0.0250		85	70-130			
Surrogate: 4-Bromofluorobenzene	0.0182	mg/L	0.0249		73	70-130			
LCS (B4J4331-BS1)				Prepared: 2024-10-25, Analyzed: 2024-10-25					
Bromodichloromethane	0.0232	0.0010 mg/L	0.0201		116	70-130			
Bromoform	0.0198	0.0010 mg/L	0.0201		98	70-130			
Chloroform	0.0225	0.0010 mg/L	0.0201		112	70-130			



APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24J3029 2024-10-31 14:52
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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B4J4331, Continued									
LCS (B4J4331-BS1), Continued					Prepared: 2024-10-25, Analyzed: 2024-10-25				
Dibromochloromethane	0.0196	0.0010 mg/L	0.0201		97	70-130			
Surrogate: Toluene-d8	0.0236	mg/L	0.0250		95	70-130			
Surrogate: 4-Bromofluorobenzene	0.0233	mg/L	0.0249		94	70-130			
LCS (B4J4331-BS3)					Prepared: 2024-10-25, Analyzed: 2024-10-25				
Bromodichloromethane	0.0215	0.0010 mg/L	0.0201		107	70-130			
Bromoform	0.0192	0.0010 mg/L	0.0201		95	70-130			
Chloroform	0.0215	0.0010 mg/L	0.0201		107	70-130			
Dibromochloromethane	0.0185	0.0010 mg/L	0.0201		92	70-130			
Surrogate: Toluene-d8	0.0229	mg/L	0.0250		92	70-130			
Surrogate: 4-Bromofluorobenzene	0.0229	mg/L	0.0249		92	70-130			

APPENDIX C

Chlorophyll A Certificate of Analysis

CERTIFICATE OF ANALYSIS

REPORTED TO Castlegar, City of
460 Columbia Avenue
CASTLEGAR, BC V1N 1G7

ATTENTION Aaron Geck

PO NUMBER 502

PROJECT General Potability

PROJECT INFO

WORK ORDER 2411263

RECEIVED / TEMP 2024-09-10 10:30 / 15.1°C

REPORTED 2024-09-17 13:38

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/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.

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.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here:
<https://www.caro.ca/terms-conditions>

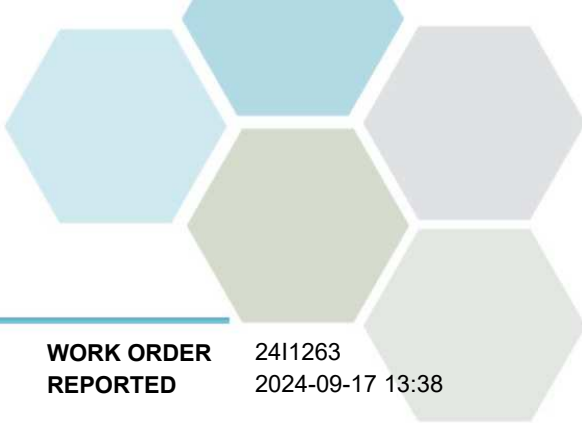
If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

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#108 4475 Wayburne Drive Burnaby, BC V5G 4X4



TEST RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	2411263 2024-09-17 13:38
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Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
481E - WTC - Raw Water (2411263-01) Matrix: Water Sampled: 2024-09-09 09:45						
General Parameters						
Chlorophyll a	< 1.00	N/A	1.00	µg/L	2024-09-17	HT1

Sample Qualifiers:						
HT1	The sample was prepared and/or analyzed past the recommended holding time.					

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 2411263
2024-09-17 13:38

Analysis Description	Method Ref.	Technique	Accredited	Location
Chlorophyll-A in Water	SM 10200 H (2022)	Spectrophotometry		Kelowna

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
µg/L	Micrograms per litre
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

[Guidelines for Canadian Drinking Water Quality \(Health Canada, September 2022\)](#)

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 received 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. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed.

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APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 2411263
2024-09-17 13:38

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 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
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General Parameters, Batch B4I2502

Blank (B4I2502-BLK1)			Prepared: 2024-09-11, Analyzed: 2024-09-17						
Chlorophyll a	< 1.00	1.00 µg/L							

APPENDIX D

North Well Chemical Analysis

CERTIFICATE OF ANALYSIS

REPORTED TO Castlegar, City of
460 Columbia Avenue
CASTLEGAR, BC V1N 1G7

ATTENTION Matt Clouthier

PO NUMBER 502

PROJECT General Potability

PROJECT INFO

WORK ORDER 24A0423

RECEIVED / TEMP 2024-01-04 08:51 / 2.8°C

REPORTED 2024-01-11 16:23

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/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.

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.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here:
<https://www.caro.ca/terms-conditions>

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

Authorized By:

Brent Whitehead
Account Manager

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#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 |
#108 4475 Wayburne Drive Burnaby, BC V5G 4X4

TEST RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0423
2024-01-11 16:23

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
1D214 - North Well (24A0423-01) Matrix: Water Sampled: 2024-01-02 09:00					
Anions					
Chloride	20.8	AO ≤ 250	0.10 mg/L	2024-01-09	
Fluoride	0.19	MAC = 1.5	0.10 mg/L	2024-01-09	
Nitrate (as N)	1.45	MAC = 10	0.010 mg/L	2024-01-09	HT1
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2024-01-09	HT1
Sulfate	51.4	AO ≤ 500	1.0 mg/L	2024-01-09	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	215	None Required	0.500 mg/L	N/A	
Langelier Index	0.4	N/A	-5.0	2024-01-11	CT6
Solids, Total Dissolved	285	AO ≤ 500	1.00 mg/L	N/A	
General Parameters					
Alkalinity, Total (as CaCO ₃)	176	N/A	1.0 mg/L	2024-01-09	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	N/A	1.0 mg/L	2024-01-09	
Alkalinity, Bicarbonate (as CaCO ₃)	176	N/A	1.0 mg/L	2024-01-09	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	N/A	1.0 mg/L	2024-01-09	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	N/A	1.0 mg/L	2024-01-09	
Colour, True	< 5.0	AO ≤ 15	5.0 CU	2024-01-09	HT1
Conductivity (EC)	476	N/A	2.0 µS/cm	2024-01-09	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	2024-01-11	
pH	7.96	7.0-10.5	0.10 pH units	2024-01-09	HT2
Temperature, at pH	21.5	N/A	°C	2024-01-09	HT2
Turbidity	0.96	OG < 1	0.10 NTU	2024-01-08	HT1
Total Metals					
Aluminum, total	0.121	OG < 0.1	0.0050 mg/L	2024-01-09	
Antimony, total	< 0.00020	MAC = 0.006	0.00020 mg/L	2024-01-09	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050 mg/L	2024-01-09	
Barium, total	0.101	MAC = 2	0.0050 mg/L	2024-01-09	
Boron, total	< 0.0500	MAC = 5	0.0500 mg/L	2024-01-09	
Cadmium, total	0.000023	MAC = 0.007	0.000010 mg/L	2024-01-09	
Calcium, total	67.7	None Required	0.20 mg/L	2024-01-09	
Chromium, total	0.00100	MAC = 0.05	0.00050 mg/L	2024-01-09	
Cobalt, total	0.00011	N/A	0.00010 mg/L	2024-01-09	
Copper, total	0.0172	MAC = 2	0.00040 mg/L	2024-01-09	
Iron, total	0.204	AO ≤ 0.3	0.010 mg/L	2024-01-09	
Lead, total	0.00107	MAC = 0.005	0.00020 mg/L	2024-01-09	
Magnesium, total	11.1	None Required	0.010 mg/L	2024-01-09	
Manganese, total	0.00686	MAC = 0.12	0.00020 mg/L	2024-01-09	
Mercury, total	< 0.000010	MAC = 0.001	0.000010 mg/L	2024-01-09	
Molybdenum, total	0.00311	N/A	0.00010 mg/L	2024-01-09	
Nickel, total	0.00127	N/A	0.00040 mg/L	2024-01-09	
Potassium, total	3.75	N/A	0.10 mg/L	2024-01-09	
Selenium, total	0.00188	MAC = 0.05	0.00050 mg/L	2024-01-09	

TEST RESULTS

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24A0423 2024-01-11 16:23
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Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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1D214 - North Well (24A0423-01) | Matrix: Water | Sampled: 2024-01-02 09:00, Continued

Total Metals, Continued

Sodium, total	16.0	AO ≤ 200	0.10	mg/L	2024-01-09	
Strontium, total	0.423	MAC = 7	0.0010	mg/L	2024-01-09	
Uranium, total	0.00631	MAC = 0.02	0.000020	mg/L	2024-01-09	
Zinc, total	0.0257	AO ≤ 5	0.0040	mg/L	2024-01-09	

Sample Qualifiers:

CT6	Results were based on lab temperature & lab pH.
HT1	The sample was prepared and/or analyzed past the recommended holding time.
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 Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0423
2024-01-11 16:23

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H ₂ SO ₄	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	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* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO ₃ +HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	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



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT	Castlegar, City of General Potability	WORK ORDER REPORTED	24A0423 2024-01-11 16:23
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APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0423
2024-01-11 16:23

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B4A1629									
Blank (B4A1629-BLK1)			Prepared: 2024-01-09, Analyzed: 2024-01-09						
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 (B4A1629-BLK2)			Prepared: 2024-01-09, Analyzed: 2024-01-09						
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 (B4A1629-BS1)			Prepared: 2024-01-09, Analyzed: 2024-01-09						
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Fluoride	4.02	0.10 mg/L	4.00		101	88-108			
Nitrate (as N)	4.03	0.010 mg/L	4.00		101	90-110			
Nitrite (as N)	1.95	0.010 mg/L	2.00		97	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
LCS (B4A1629-BS2)			Prepared: 2024-01-09, Analyzed: 2024-01-09						
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Fluoride	4.16	0.10 mg/L	4.00		104	88-108			
Nitrate (as N)	4.03	0.010 mg/L	4.00		101	90-110			
Nitrite (as N)	1.93	0.010 mg/L	2.00		97	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
General Parameters, Batch B4A1691									
Blank (B4A1691-BLK1)			Prepared: 2024-01-08, Analyzed: 2024-01-08						
Turbidity	< 0.10	0.10 NTU							
LCS (B4A1691-BS1)			Prepared: 2024-01-08, Analyzed: 2024-01-08						
Turbidity	15.9	0.10 NTU	14.6		109	90-110			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0423
2024-01-11 16:23

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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General Parameters, Batch B4A1691, Continued

Duplicate (B4A1691-DUP1)		Source: 24A0423-01		Prepared: 2024-01-08, Analyzed: 2024-01-08					
Turbidity	1.01	0.10 NTU		0.96			6	15	

General Parameters, Batch B4A1712

Blank (B4A1712-BLK1)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Temperature, at pH	22.4	°C							

LCS (B4A1712-BS1)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Alkalinity, Total (as CaCO ₃)	106	1.0 mg/L	100		106	80-120			
Alkalinity, Phenolphthalein (as CaCO ₃)	14.9	1.0 mg/L	50.0		30	0-200			

LCS (B4A1712-BS2)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Conductivity (EC)	1420	2.0 µS/cm	1410		101	95-105			

Reference (B4A1712-SRM1)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
pH	7.04	0.10 pH units	7.01		100	98-102			

General Parameters, Batch B4A1802

Blank (B4A1802-BLK1)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Colour, True	< 5.0	5.0 CU							

LCS (B4A1802-BS1)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Colour, True	18	5.0 CU	20.0		90	85-115			

Duplicate (B4A1802-DUP1)		Source: 24A0423-01		Prepared: 2024-01-09, Analyzed: 2024-01-09					
Colour, True	< 5.0	5.0 CU		< 5.0				15	

General Parameters, Batch B4A1983

Blank (B4A1983-BLK1)		Prepared: 2024-01-11, Analyzed: 2024-01-11							
Cyanide, Total	< 0.0020	0.0020 mg/L							

Blank (B4A1983-BLK2)		Prepared: 2024-01-11, Analyzed: 2024-01-11							
Cyanide, Total	< 0.0020	0.0020 mg/L							

LCS (B4A1983-BS1)		Prepared: 2024-01-11, Analyzed: 2024-01-11							
Cyanide, Total	0.0185	0.0020 mg/L	0.0200		92	82-120			

LCS (B4A1983-BS2)		Prepared: 2024-01-11, Analyzed: 2024-01-11							
Cyanide, Total	0.0202	0.0020 mg/L	0.0200		101	82-120			

LCS Dup (B4A1983-BSD1)		Prepared: 2024-01-11, Analyzed: 2024-01-11							
Cyanide, Total	0.0175	0.0020 mg/L	0.0200		88	82-120	5	10	

LCS Dup (B4A1983-BSD2)		Prepared: 2024-01-11, Analyzed: 2024-01-11							
Cyanide, Total	0.0198	0.0020 mg/L	0.0200		99	82-120	2	10	

Matrix Spike (B4A1983-MS1)		Source: 24A0423-01		Prepared: 2024-01-11, Analyzed: 2024-01-11					
Cyanide, Total	0.0382	0.0020 mg/L	0.0400	< 0.0020	96	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0423
2024-01-11 16:23

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B4A1759									
Blank (B4A1759-BLK1)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
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	< 0.0500	0.0500 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 (B4A1759-BS1)				Prepared: 2024-01-09, Analyzed: 2024-01-09					
Aluminum, total	4.00	0.0050 mg/L	4.00		100	80-120			
Antimony, total	0.0394	0.00020 mg/L	0.0400		99	80-120			
Arsenic, total	0.389	0.00050 mg/L	0.400		97	80-120			
Barium, total	0.0387	0.0050 mg/L	0.0400		97	80-120			
Boron, total	0.398	0.0500 mg/L	0.400		99	80-120			
Cadmium, total	0.0397	0.000010 mg/L	0.0400		99	80-120			
Calcium, total	4.06	0.20 mg/L	4.00		101	80-120			
Chromium, total	0.0393	0.00050 mg/L	0.0400		98	80-120			
Cobalt, total	0.0395	0.00010 mg/L	0.0400		99	80-120			
Copper, total	0.0382	0.00040 mg/L	0.0400		96	80-120			
Iron, total	3.97	0.010 mg/L	4.00		99	80-120			
Lead, total	0.0402	0.00020 mg/L	0.0400		101	80-120			
Magnesium, total	4.10	0.010 mg/L	4.00		102	80-120			
Manganese, total	0.0397	0.00020 mg/L	0.0400		99	80-120			
Molybdenum, total	0.0391	0.00010 mg/L	0.0400		98	80-120			
Nickel, total	0.0385	0.00040 mg/L	0.0400		96	80-120			
Potassium, total	4.06	0.10 mg/L	4.00		102	80-120			
Selenium, total	0.393	0.00050 mg/L	0.400		98	80-120			
Sodium, total	4.19	0.10 mg/L	4.00		105	80-120			
Strontium, total	0.0395	0.0010 mg/L	0.0400		99	80-120			
Uranium, total	0.0404	0.000020 mg/L	0.0400		101	80-120			
Zinc, total	0.385	0.0040 mg/L	0.400		96	80-120			
Matrix Spike (B4A1759-MS1)				Source: 24A0423-01	Prepared: 2024-01-09, Analyzed: 2024-01-09				
Aluminum, total	4.38	0.0050 mg/L	4.00	0.121	106	70-130			
Antimony, total	0.0388	0.00020 mg/L	0.0400	< 0.00020	97	70-130			
Arsenic, total	0.434	0.00050 mg/L	0.400	< 0.00050	108	70-130			
Barium, total	0.139	0.0050 mg/L	0.0400	0.101	96	70-130			
Boron, total	0.431	0.0500 mg/L	0.400	< 0.0500	103	70-130			
Cadmium, total	0.0427	0.000010 mg/L	0.0400	0.000023	107	70-130			
Calcium, total	68.3	0.20 mg/L	4.00	67.7	16	70-130			MS2
Chromium, total	0.0432	0.00050 mg/L	0.0400	0.00100	105	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Castlegar, City of
General Potability

WORK ORDER REPORTED 24A0423
2024-01-11 16:23

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B4A1759, Continued									
Matrix Spike (B4A1759-MS1), Continued		Source: 24A0423-01		Prepared: 2024-01-09, Analyzed: 2024-01-09					
Cobalt, total	0.0417	0.00010 mg/L	0.0400	0.00011	104	70-130			
Copper, total	0.0570	0.00040 mg/L	0.0400	0.0172	99	70-130			
Iron, total	4.39	0.010 mg/L	4.00	0.204	105	70-130			
Lead, total	0.0436	0.00020 mg/L	0.0400	0.00107	106	70-130			
Magnesium, total	15.6	0.010 mg/L	4.00	11.1	110	70-130			
Manganese, total	0.0488	0.00020 mg/L	0.0400	0.00686	105	70-130			
Molybdenum, total	0.0458	0.00010 mg/L	0.0400	0.00311	107	70-130			
Nickel, total	0.0412	0.00040 mg/L	0.0400	0.00127	100	70-130			
Potassium, total	7.83	0.10 mg/L	4.00	3.75	102	70-130			
Selenium, total	0.436	0.00050 mg/L	0.400	0.00188	108	70-130			
Sodium, total	20.2	0.10 mg/L	4.00	16.0	107	70-130			
Strontium, total	0.455	0.0010 mg/L	0.0400	0.423	80	70-130			
Uranium, total	0.0502	0.000020 mg/L	0.0400	0.00631	110	70-130			
Zinc, total	0.436	0.0040 mg/L	0.400	0.0257	102	70-130			

Total Metals, Batch B4A1830

Blank (B4A1830-BLK1)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK2)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK3)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK4)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B4A1830-BLK5)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	< 0.000010	0.000010 mg/L							
LCS (B4A1830-BS1)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	0.000281	0.000010 mg/L	0.000250		113	80-120			
LCS (B4A1830-BS2)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	0.000258	0.000010 mg/L	0.000250		103	80-120			
LCS (B4A1830-BS3)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	0.000246	0.000010 mg/L	0.000250		98	80-120			
LCS (B4A1830-BS4)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	0.000265	0.000010 mg/L	0.000250		106	80-120			
LCS (B4A1830-BS5)		Prepared: 2024-01-09, Analyzed: 2024-01-09							
Mercury, total	0.000265	0.000010 mg/L	0.000250		106	80-120			

QC Qualifiers:

MS2 The native sample concentration is greater than the spike concentration hence the matrix spike limits do not apply.

APPENDIX E

Interior Health Operating Permit



Interior Health

Health Protection

Permit To Operate

Drinking Water System 301 - 10,000 Connection - Annual

Facility Number: 0210617
Name of Facility: City of Castlegar Water System
Address: 460 Columbia Avenue
Castlegar, BC V1N 1G7
Owner: City of Castlegar
Conditions:

April 1, 2004

Effective Date

Public Health Inspector

*This permit is nontransferable and must be displayed in a
conspicuous place*

