

Cariboo Regional District

HORSE LAKE WATER SYSTEM 2024 ANNUAL REPORT

Operating Permit # 002914 **CRD Utilities Department**

building communities together

Cariboo Regional District
Suite D, 180 N Third Avenue, Williams Lake, BC V2G 2A4
Tel: 250-392-3351 TF: 1-800-665-1636
Fax: 250-392-2812
mailbox@cariboord.ca

File: 5600-20-06-01

January 14, 2025

Christine Sweezey
Environmental Health Officer
Interior Health
540 Borland Street, 3rd Floor
Williams Lake, BC V2G 2G8

Dear Christine Sweezey:

Re: Transmittal of the 2024 Annual Report for the Horse Lake Water System

---

We are pleased to submit the 2024 Annual Report for the Horse Lake Water System. This report is prepared to provide a comprehensive summary of the key developments, activities, and achievements of 2024, as well as to outline plans for the water system.

The report has been developed with consideration for public engagement and transparency, ensuring it meets the information needs of Interior Health, the Cariboo Regional District Board of Directors, and particularly the Horse Lake community, as represented by Electoral Area L Director Eric de Vries.

We trust this report will serve as a valuable resource in understanding the progress and direction of the Horse Lake Water System.

Sincerely,

Kelly McDonald
Manager of Utilities

KM/cm

Contents

1. Executive Summary 1
1.1. Key Information 1
2. Introduction 2
3. Maintenance 2
3.1. Water Disinfection and Compliance 2
3.2. Boil Water Advisory 3
4. Projects and Planned Activities 3
4.1. Treatment Plant 3
4.2. Asset Management 3
4.3. Supervisory Control and Data Acquisition (SCADA) 3
5. Environmental Operator's Certification Program (EOCP) 3
6. Source to Tap Risks 4
6.1. Cross-Connection Control 4
7. Water Sampling 5
8. Water Quality 5
9. Events 5
9.1. Water Demand 5
10. Emergency Planning 7
10.1. Key Elements of the ERCP 7
11. Conclusion 8
12. References 8
Appendix A: Links 10
Appendix B: Sample Results 12
Appendix C: Emergency Plans 20

Tables and Figures

Table 1: Horse Lake Distribution System Pipe Materials 1
Table 2: Environmental Operator Certification Levels 4
Table 3: Litres per Capita by Month (Horse Lake) 6

Figure 1: Horse Lake total monthly demand in cubic metres. 6
Figure 2: Horse Lake per person daily water use by month (Red) 7

1. Executive Summary

The Horse Lake Water System, managed by the Cariboo Regional District (CRD) since 2009, serves approximately 500 residents, with seasonal fluctuations in usage. Elevated manganese levels have resulted in a longstanding Water Quality Advisory (WQA), which will be addressed by a new treatment plant currently in the final design stages.

In 2024, fire crews depleted the reservoir during an emergency, triggering a Boil Water Advisory. Following this, the reservoir was cleaned using a remotely operated vehicle (ROV) to avoid service disruptions. To prevent future incidents, a communication protocol was established with fire departments to ensure Operators are informed of high water demands. Routine flushing continues to manage manganese buildup and reduce water discoloration.

SCADA system upgrades have improved monitoring and operational efficiency, while ongoing asset management efforts are enhancing budgeting and preventive maintenance practices. Despite staffing shortages, three certified Operators are now with the CRD to maintain system operations.

The Environmental Services Department is also developing an Emergency Response and Contingency Plan (ERCP) and a drought management plan to bolster system resilience. A cross-connection control program is under consideration as part of broader policy updates for smaller systems. The CRD remains dedicated to ensuring safe, reliable water service for the Horse Lake community.

1.1. Key Information

System key facts:

- 3.5 km of distribution main including 2.2 km of ductile iron (DI)
- water supplied by a single source well
- Single 188 cubic metre capacity reservoir
- 242 service connections
- constructed in 1971 by a private contractor

Table 1: Horse Lake Distribution System Pipe Materials

Material	Length (metres)
Ductile Iron (DI)	2,158.7
Galvanized Iron (GI)	11.3
Polyethylene (PE)	62.8
Polyvinyl chloride (PVC)	1,272.4
Total	3,505.2

2. Introduction

The Cariboo Regional District assumed responsibility for the Horse Lake Water System in 2009. The system serves approximately 500 residents, with a significant portion being seasonal users. This seasonal nature is reflected in the extremely low water usage observed during winter months.

The source water contains elevated levels of manganese, which has resulted in a Water Quality Advisory (WQA) for the community. To address this issue, plans are in place for the construction of a treatment plant that will improve water quality and ensure long-term reliability for residents.

3. Maintenance

In 2024, the Horse Lake reservoir was inspected and cleaned by Aquavision Services using a remotely operated vehicle (ROV). This method allowed the reservoir to be cleaned without taking the water system offline, minimizing disruption to residents.

Occasional discoloured water complaints are received by the Environmental Services Department. It is possible that the reservoir cleaning contributed to some of these occurrences. Brown water can result from the interaction between chlorine and manganese over time, causing manganese to form particulates. When water remains stagnant in distribution pipes or household plumbing, this can exacerbate discoloration.

To mitigate this issue, Operators conduct routine flushing of the system to maintain water quality and minimize the risk of brown water along with their general maintenance tasks.

3.1. Water Disinfection and Compliance

The Horse Lake Water System maintains a residual disinfectant in the distribution network by using sodium hypochlorite (liquid chlorine). This practice safeguards against bacterial contamination and helps prevent buildup on pipe walls.

Maintaining a chlorine residual is considered industry standard and is a requirement under the system's Operating Permit issued by Interior Health.

3.2. Boil Water Advisory

In 2024, the Horse Lake Water System was placed under a Boil Water Advisory, temporarily, after the reservoir was emptied by fire crews during emergency response efforts.

To prevent similar incidents in the future, a communication protocol has been established with local fire departments. This ensures that system operators are notified in advance when significant water usage is expected. Operators can increase flow volumes proactively, helping to maintain reservoir levels and reduce the risk of another Boil Water Advisory.

4. Projects and Planned Activities

4.1. Treatment Plant

The design of a small treatment plant for the Horse Lake Water System is nearing completion. The plant will utilize greensand filtration and an oxidizing agent to remove manganese and iron before water enters the distribution system. Final details are being finalized, with a request for construction proposals expected to follow soon.

4.2. Asset Management

Throughout 2024, asset management inventory and implementation have been ongoing across all Cariboo Regional District utilities, including the Horse Lake Water System. This initiative will support more efficient budgeting for system improvements and enhance preventive maintenance practices.

4.3. Supervisory Control and Data Acquisition (SCADA)

The Horse Lake Water System also benefited from the CRD-wide upgrade to our computer monitoring system, which allows the Operators more control as well as improved remote information and alerts.

5. Environmental Operator’s Certification Program (EOCP)

The CRD has been active in 2024, with staff completing numerous training courses and achieving certification levels in the Environmental Operator’s Certification Program (EOCP).

The southern region water systems now have three certified Operators, including one who has achieved their Level 3 (EOCP) certification in water distribution *(table 2).*

The Operators are responsible for operating the Horse Lake Water System, along with six other small water systems and one wastewater system in the South Cariboo.

Table 2: Environmental Operator Certification Levels

Operator	***Region***	***Water Distribution***	***Water Treatment***	***Operator in Training***
Jourdy Ouellette	*South*	3	1	
Larry Perry	*South*	1		
Colin Brusic	*South*			☑
Ken/Chuck	*Central*	Backup		
Manager	*Central*	4	1	

Staffing was a challenge in 2024, with multiple vacant positions. Despite this, Operators have worked diligently to maintain the level of service our residents expect while safeguarding public health. We anticipate improvements in 2025 through additional staff and continued training.

6. Source to Tap Risks

The source well's proximity to the lake classifies it as groundwater under direct influence of surface water (GUDI). As a result, the water supply has been chlorinated for many years.

The small reservoir is prone to sediment buildup, which can potentially harbour bacteria. To mitigate this risk, the reservoir is cleaned regularly.

6.1. Cross-Connection Control

Currently, there is no formal cross-connection control program in place. This issue should be addressed as policies are expanded to cover smaller systems in the future. At present, there are no commercial properties connected to the Horse Lake Water System.

7. Water Sampling

The 2024 sampling schedule consisted of a full chemical analysis as well as twice monthly bacteriological sampling at three locations. In addition, chlorine residuals and turbidity are monitored by the Operators in real time.

** Sample results attached.*

8. Water Quality

Manganese levels in the source well range from 0.188 mg/L to 0.229 mg/L, exceeding the maximum acceptable concentration of 0.12 mg/L established by Health Canada and Interior Health in 2019. As a result, Horse Lake remains under a permanent Water Quality Advisory (WQA), which will be addressed through planned treatment. In 2024, all 74 samples tested for coliforms and E. coli were negative for bacterial contamination.

9. Events

A Water Quality Advisory was issued on December 2, 2021, due to levels of manganese in the water, and remains in effect until further notice.

On September 18, 2024, a Boil Water Notice was issued due to firefighting activities which drained the reservoir to below 35%. Substantial sediment was stirred up and pressure was not maintained. The Boil Water Notice has since been rescinded.

9.1. Water Demand

In 2024, consumers of the Horse Lake Water System used an estimated average of 164 litres per person per day. This estimate is based on service data and highlights a commendable level of water use, particularly given the rural nature of the community and the presence of large properties.

Water consumption varied throughout the year, with the highest demand occurring in July at 318 litres per person per day, while November saw the lowest usage at 58 litres per person per day. These fluctuations align with trends commonly observed in seasonal communities.

Table 3: Litres per Capita by Month (Horse Lake)

Month	***Horse Lake***
January	208
February	133
March	118
April	121
May	145
June	146
July	318
August	350
September	139
October	104
November	58
December	127
Average	**164**

For comparison, the national average residential water consumption in Canada stands at 223 litres per person per day, while the total per capita average water use, including all sectors, is 401 litres per person per day, according to Statistics Canada (2021).

The Horse Lake community's water usage remains within a reasonable range given its unique characteristics, reflecting responsible consumption practices and effective water management efforts. Additionally, the fluctuation between peak and off-peak seasons suggests that system leakage is likely not a concern.

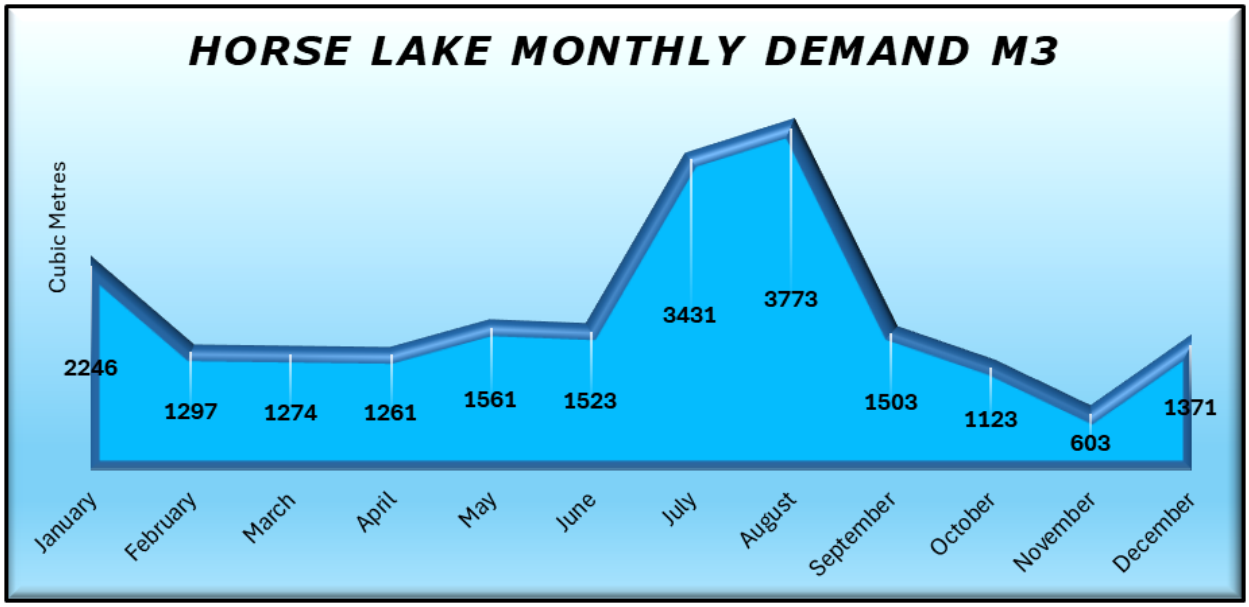


Figure 1: Horse Lake total monthly demand in cubic metres

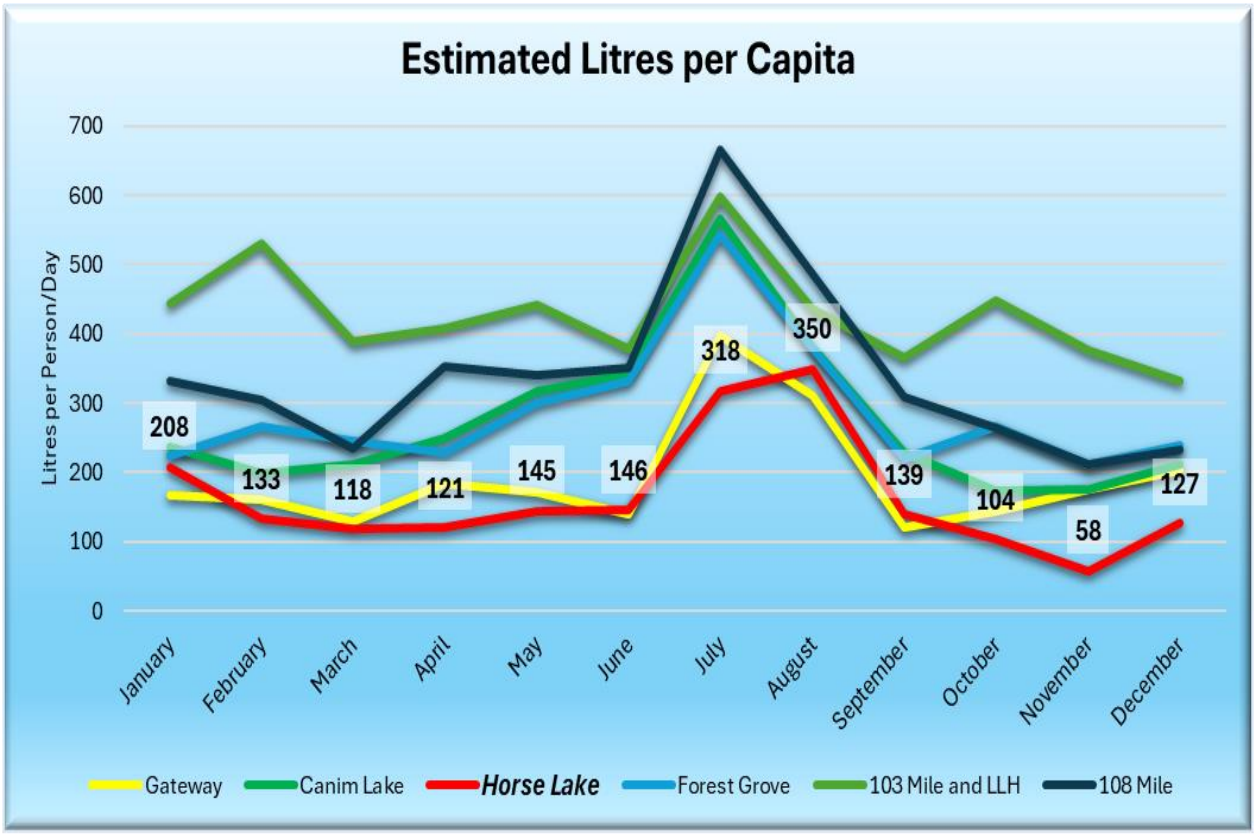


Figure 2: Horse Lake per person daily water use by month (Red)

10. Emergency Planning

A new Emergency Response and Contingency Plan (ERCP) for the Horse Lake water system is currently being developed to enhance preparedness and ensure quick, coordinated responses to potential emergencies affecting the water supply.

The process began with a risk assessment to identify potential hazards, such as equipment failures, natural disasters, contamination events, and power outages. Stakeholder input, including feedback from Operators, community members, and regulatory bodies, helped shape the plan to address specific vulnerabilities and local conditions.

10.1. Key Elements of the ERCP

The key elements of the ERCP include:

- Clear Response Protocols: Step-by-step actions for various emergency scenarios.
- Roles and Responsibilities: Defined roles for Operators, management, and external agencies.

- Communication Strategies: Procedures for notifying residents, government agencies, and media.
- Resource Allocation: Identification of equipment, backup systems, and personnel required during emergencies.
- Training and Drills: Regular exercises to ensure staff are familiar with the plan and can respond efficiently.

The plan will be reviewed and approved by local health authorities to ensure compliance with provincial regulations. Updating the ERCP ensures that emergency procedures align with the current operational capacity.

In addition, a drought management plan is also currently being developed in line with best practice.

** Plans attached.*

11. Conclusion

The Horse Lake Water System made key improvements in 2024, including progress on the treatment plant to address manganese levels and ongoing asset management. Maintenance efforts like reservoir cleaning and the upgrade to SCADA systems helped ensure water quality and system reliability. Staff training and the development of an Emergency Response and Contingency Plan further strengthened preparedness. With these initiatives, the system is set for continued improvements and reliable service for residents in the coming years.

12. References

- *Health Canada (2019, May 21). Guidance on Natural Organic Matter in Drinking Water. Retrieved from https://www.canada.ca/en/health-canada/programs/consultation-organic-matter-drinking-water/document.html#es*
- *Environmental Operators Certification Program (2024). Retrieved from https://eocp.ca/*
- *Sample results, Interior Health. Retrieved from https://services.interiorhealth.ca/publichealthprotection/watersamples.aspx*
- Statistics Canada (2021). *Survey of Drinking Water Plants – The Daily.* https://www150.statcan.gc.ca/n1/daily-quotidien/231114/dq231114d-eng.htm

Thank you to:

- *Cheryl McMullen*
- *Jourdy Ouellette*
- *Colin Brusic*
- *Ken Heidema*
- *Chuck Howes*
- *Phil Wilkins*
- *Tyler Olsen*

for their contribution.

Appendix A: Links

Interior Health:

- *Interior Health Water Advisories*
- *Drinking Water | Environmental & Seasonal Health | IH*

Cariboo Regional District:

- *Water Notices and Advisories - Cariboo Regional District*
- *Sewer and Water Services - Cariboo Regional District*

Notification App (VoyentAlert!):

- *Emergency Notification System - Cariboo Regional District*

Environmental Operators Certification Program (EOCP):

- *EOCP Homepage | EOCP*
- *Backflow Prevention, Cross Connection Control, and the Environmental Operators Certification Program | EOCP*

Appendix B: Sample Results

Facility and Sample Site: **Horse Lake Waterworks WS** **6343 Mulligan Dr., 100 Mile House, BC**	**Test Type:** **Drinking Water – Bacteriological** **Unit of Measure: CFU per 100 ml**	**Value**	**Date Collected**	**Results**
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	30 Jan 2024	Acceptable
	Sample Parameter: Total Coliform	<1	30 Jan 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	07 Feb 2024	Acceptable
	Sample Parameter: Total Coliform	<1	07 Feb 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	28 Feb 2024	Acceptable
	Sample Parameter: Total Coliform	<1	28 Feb 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	28 Feb 2024	Acceptable
	Sample Parameter: Total Coliform	<1	28 Feb 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	28 Feb 2024	Acceptable
	Sample Parameter: Total Coliform	<1	28 Feb 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	12 Mar 2024	Acceptable
	Sample Parameter: Total Coliform	<1	12 Mar 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	12 Mar 2024	Acceptable
	Sample Parameter: Total Coliform	<1	12 Mar 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	12 Mar 2024	Acceptable
	Sample Parameter: Total Coliform	<1	12 Mar 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	26 Mar 2024	Acceptable
	Sample Parameter: Total Coliform	<1	26 Mar 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	26 Mar 2024	Acceptable
	Sample Parameter: Total Coliform	<1	26 Mar 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	26 Mar 2024	Acceptable
	Sample Parameter: Total Coliform	<1	26 Mar 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	10 Apr 2024	Acceptable
	Sample Parameter: Total Coliform	<1	10 Apr 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	10 Apr 2024	Acceptable
	Sample Parameter: Total Coliform	<1	10 Apr 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	10 Apr 2024	Acceptable
	Sample Parameter: Total Coliform	<1	10 Apr 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	24 Apr 2024	Acceptable
	Sample Parameter: Total Coliform	<1	24 Apr 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	24 Apr 2024	Acceptable
	Sample Parameter: Total Coliform	<1	24 Apr 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	24 Apr 2024	Acceptable
	Sample Parameter: Total Coliform	<1	24 Apr 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	06 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	06 May 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	06 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	06 May 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	06 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	06 May 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	07 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	07 May 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	07 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	07 May 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	07 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	07 May 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	08 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	08 May 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	08 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	08 May 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	08 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	08 May 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	28 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	28 May 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	28 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	28 May 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	28 May 2024	Acceptable
	Sample Parameter: Total Coliform	<1	28 May 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	05 Jun 2024	Acceptable
	Sample Parameter: Total Coliform	<1	05 Jun 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	05 Jun 2024	Acceptable
	Sample Parameter: Total Coliform	<1	05 Jun 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	05 Jun 2024	Acceptable
	Sample Parameter: Total Coliform	<1	05 Jun 2024	Acceptable

Facility and Sample Site: **Horse Lake Waterworks WS** **6343 Mulligan Dr., 100 Mile House, BC**	**Test Type:** **Drinking Water – Bacteriological** **Unit of Measure: CFU per 100 ml**	**Value**	**Date Collected**	**Results**
Malm Sample Station	Sample Parameter: E. coli	<1	18 Jun 2024	Acceptable
	Sample Parameter: Total Coliform	<1	18 Jun 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	18 Jun 2024	Acceptable
	Sample Parameter: Total Coliform	<1	18 Jun 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	18 Jun 2024	Acceptable
	Sample Parameter: Total Coliform	<1	18 Jun 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	03 Jul 2024	Acceptable
	Sample Parameter: Total Coliform	<1	03 Jul 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	03 Jul 2024	Acceptable
	Sample Parameter: Total Coliform	<1	03 Jul 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	03 Jul 2024	Acceptable
	Sample Parameter: Total Coliform	<1	03 Jul 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	16 Jul 2024	Acceptable
	Sample Parameter: Total Coliform	<1	16 Jul 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	16 Jul 2024	Acceptable
	Sample Parameter: Total Coliform	<1	16 Jul 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	16 Jul 2024	Acceptable
	Sample Parameter: Total Coliform	<1	16 Jul 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	06 Aug 2024	Acceptable
	Sample Parameter: Total Coliform	<1	06 Aug 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	06 Aug 2024	Acceptable
	Sample Parameter: Total Coliform	<1	06 Aug 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	06 Aug 2024	Acceptable
	Sample Parameter: Total Coliform	<1	06 Aug 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	13 Aug 2024	Acceptable
	Sample Parameter: Total Coliform	<1	13 Aug 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	13 Aug 2024	Acceptable
	Sample Parameter: Total Coliform	<1	13 Aug 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	13 Aug 2024	Acceptable
	Sample Parameter: Total Coliform	<1	13 Aug 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	17 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	17 Sept 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	17 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	17 Sept 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	17 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	17 Sept 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	23 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	23 Sept 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	23 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	23 Sept 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	23 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	23 Sept 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	24 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	24 Sept 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	24 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	24 Sept 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	24 Sept 2024	Acceptable
	Sample Parameter: Total Coliform	<1	24 Sept 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	08 Oct 2024	Acceptable
	Sample Parameter: Total Coliform	<1	08 Oct 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	08 Oct 2024	Acceptable
	Sample Parameter: Total Coliform	<1	08 Oct 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	08 Oct 2024	Acceptable
	Sample Parameter: Total Coliform	<1	08 Oct 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	22 Oct 2024	Acceptable
	Sample Parameter: Total Coliform	<1	22 Oct 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	22 Oct 2024	Acceptable
	Sample Parameter: Total Coliform	<1	22 Oct 2024	Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli	<1	22 Oct 2024	Acceptable
	Sample Parameter: Total Coliform	<1	22 Oct 2024	Acceptable
Malm Sample Station	Sample Parameter: E. coli	<1	18 Nov 2024	Acceptable
	Sample Parameter: Total Coliform	<1	18 Nov 2024	Acceptable
Pumphouse	Sample Parameter: E. coli	<1	18 Nov 2024	Acceptable
	Sample Parameter: Total Coliform	<1	18 Nov 2024	Acceptable

Facility and Sample Site: **Horse Lake Waterworks WS** **6343 Mulligan Dr., 100 Mile House, BC**	**Test Type:** **Drinking Water – Bacteriological** **Unit of Measure: CFU per 100 ml**	**Value**	**Date Collected**	**Results**
Wolfe Rd Sample Station	Sample Parameter: E. coli Sample Parameter: Total Coliform	<1 <1	18 Nov 2024 18 Nov 2024	Acceptable Acceptable
Malm Sample Station	Sample Parameter: E. coli Sample Parameter: Total Coliform	<1 <1	10 Dec 2024 10 Dec 2024	Acceptable Acceptable
Pumphouse	Sample Parameter: E. coli Sample Parameter: Total Coliform	<1 <1	10 Dec 2024 10 Dec 2024	Acceptable Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli Sample Parameter: Total Coliform	<1 <1	10 Dec 2024 10 Dec 2024	Acceptable Acceptable
Malm Sample Station	Sample Parameter: E. coli Sample Parameter: Total Coliform	<1 <1	17 Dec 2024 17 Dec 2024	Acceptable Acceptable
Pumphouse	Sample Parameter: E. coli Sample Parameter: Total Coliform	<1 <1	17 Dec 2024 17 Dec 2024	Acceptable Acceptable
Wolfe Rd Sample Station	Sample Parameter: E. coli Sample Parameter: Total Coliform	<1 <1	17 Dec 2024 17 Dec 2024	Acceptable Acceptable

Page	:	4 of 7
Work Order	:	KS2400951
Client	:	Cariboo Regional District
Project	:	Drinking Water

Analytical Results Evaluation

Matrix: **Water**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	108 Treated	103 Mile Well #3	103 Mile Well #4	Forest Grove Pumphouse	Gateway Pumphouse	Canim Lake Pumphouse	Horse Lake Pumphouse
				Sampling date/time	19-Mar-2024 08:00	19-Mar-2024 09:00	19-Mar-2024 09:00	19-Mar-2024 10:05	19-Mar-2024 10:25	19-Mar-2024 10:50	19-Mar-2024 11:35
				Sub-Matrix	Water	Water	Water	Water	Water	Water	Water
					KS2400951-001	KS2400951-002	KS2400951-003	KS2400951-004	KS2400951-005	KS2400951-006	KS2400951-007
Physical Tests											
Alkalinity, total (as CaCO3)	----	E290/VA	mg/L		554	676	635	360	460	485	406
Colour, true	----	E329/VA	CU		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Conductivity	----	E100/VA	µS/cm		1330	1520	1300	658	928	932	882
pH	----	E108/VA	pH units		8.21	8.26	8.34	8.09	8.31	8.27	8.19
Solids, total dissolved [TDS]	----	E162/VA	mg/L		944	825	742	395	514	555	527
Turbidity	----	E121/VA	NTU		<0.10	1.70	0.34	<0.10	3.35	<0.10	0.58
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/VA	mg/L		568	628	524	343	464	422	322
Anions and Nutrients											
Chloride	16887-00-6	E235.Cl/VA	mg/L		97.7	138	82.0	13.2	42.1	17.0	57.9
Fluoride	16984-48-8	E235.F/VA	mg/L		0.503	0.145	0.144	0.160	0.248	0.332	0.160
Nitrate (as N)	14797-55-8	E235.NO3-L/VA	mg/L		0.769	<0.0250 DLDS	<0.0250 DLDS	1.10	<0.0250 DLDS	0.296	0.409
Nitrite (as N)	14797-65-0	E235.NO2-L/VA	mg/L		<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	0.0101	0.0061
Sulfate (as SO4)	14808-79-8	E235.SO4/VA	mg/L		81.5	27.8	34.2	4.73	36.3	51.2	7.82
Total Metals											
Aluminum, total	7429-90-5	E420/VA	mg/L		<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Antimony, total	7440-36-0	E420/VA	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic, total	7440-38-2	E420/VA	mg/L		0.00122	0.00554	0.00867	0.00061	0.00324	0.00091	0.00218
Barium, total	7440-39-3	E420/VA	mg/L		<0.0200	0.0541	0.0319	0.0208	0.0301	0.0340	<0.0200
Boron, total	7440-42-8	E420/VA	mg/L		<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Cadmium, total	7440-43-9	E420/VA	mg/L		<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Calcium, total	7440-70-2	E420/VA	mg/L		68.8	50.5	38.4	64.5	46.2	53.3	62.6
Chromium, total	7440-47-3	E420/VA	mg/L		<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Copper, total	7440-50-8	E420/VA	mg/L		1.40	0.00796	0.00345	0.0333	0.00995	0.00900	0.00255
Iron, total	7439-89-6	E420/VA	mg/L		<0.030	0.286	0.184	<0.030	0.777	<0.030	0.219
Lead, total	7439-92-1	E420/VA	mg/L		<0.000500	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500
Magnesium, total	7439-95-4	E420/VA	mg/L		96.1	122	104	44.2	84.6	70.1	40.2
Manganese, total	7439-96-5	E420/VA	mg/L		<0.00200	0.122	0.0561	<0.00200	0.173	0.00448	0.234

Page : 5 of 7
Work Order : KS2400951
Client : Cariboo Regional District
Project : Drinking Water

Analytical Results Evaluation

Matrix: **Water**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	108 Treated	103 Mile Well #3	103 Mile Well #4	Forest Grove Pumphouse	Gateway Pumphouse	Canim Lake Pumphouse	Horse Lake Pumphouse
				Sampling date/time	19-Mar-2024 08:00	19-Mar-2024 09:00	19-Mar-2024 09:00	19-Mar-2024 10:05	19-Mar-2024 10:25	19-Mar-2024 10:50	19-Mar-2024 11:35
				Sub-Matrix	Water	Water	Water	Water	Water	Water	Water
					KS2400951-001	KS2400951-002	KS2400951-003	KS2400951-004	KS2400951-005	KS2400951-006	KS2400951-007
Total Metals											
Mercury, total	7439-97-6	E508/VA	mg/L		0.0000064	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Potassium, total	7440-09-7	E420/VA	mg/L		8.57	9.50	9.57	3.01	6.01	13.5	2.78
Selenium, total	7782-49-2	E420/VA	mg/L		<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Sodium, total	7440-23-5	E420/VA	mg/L		99.3	114	120	15.0	42.2	62.0	88.2
Uranium, total	7440-61-1	E420/VA	mg/L		0.00557	0.00486	0.00433	0.00337	0.0104	0.0144	0.00250
Zinc, total	7440-66-6	E420/VA	mg/L		<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Volatile Organic Compounds [THMs]											
Bromodichloromethane	75-27-4	E611B/VA	µg/L		9.6	----	<1.0	----	<1.0	<1.0	5.8
Bromoform	75-25-2	E611B/VA	µg/L		1.6	----	<1.0	----	<1.0	<1.0	<1.0
Chloroform	67-66-3	E611B/VA	µg/L		10.6	----	1.5	----	<1.0	<1.0	17.8
Dibromochloromethane	124-48-1	E611B/VA	µg/L		8.0	----	<1.0	----	<1.0	<1.0	2.5
Trihalomethanes [THMs], total	----	E611B/VA	µg/L		29.8	----	<2.0	----	<2.0	<2.0	26.1
Volatile Organic Compounds [THMs] Surrogates											
Bromofluorobenzene, 4-	460-00-4	E611B/VA	%		98.2	----	97.0	----	95.7	92.2	95.2
Difluorobenzene, 1,4-	540-36-3	E611B/VA	%		101	----	102	----	101	102	100

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Page	:	6 of 7
Work Order	:	KS2400951
Client	:	Cariboo Regional District
Project	:	Drinking Water

Summary of Guideline Limits

Analyte	*CAS Number*	*Unit*	BCDWQG AO	BCDWQG MAC	BCDWQG OG
Physical Tests					
Alkalinity, total (as CaCO3)	----	mg/L	--	--	--
Colour, true	----	CU	15 CU	--	--
Conductivity	----	µS/cm	--	--	--
Hardness (as CaCO3), from total Ca/Mg	----	mg/L	--	--	--
pH	----	pH units	--	--	7 - 10.5 pH units
Solids, total dissolved [TDS]	----	mg/L	500 mg/L	--	--
Turbidity	----	NTU	--	1 NTU	--
Anions and Nutrients					
Chloride	16887-00-6	mg/L	250 mg/L	--	--
Fluoride	16984-48-8	mg/L	--	1.5 mg/L	--
Nitrate (as N)	14797-55-8	mg/L	--	10 mg/L	--
Nitrite (as N)	14797-65-0	mg/L	--	1 mg/L	--
Sulfate (as SO4)	14808-79-8	mg/L	500 mg/L	--	--
Total Metals					
Aluminum, total	7429-90-5	mg/L	--	2.9 mg/L	--
Antimony, total	7440-36-0	mg/L	--	0.006 mg/L	--
Arsenic, total	7440-38-2	mg/L	--	0.01 mg/L	--
Barium, total	7440-39-3	mg/L	--	2 mg/L	--
Boron, total	7440-42-8	mg/L	--	5 mg/L	--
Cadmium, total	7440-43-9	mg/L	--	0.007 mg/L	--
Calcium, total	7440-70-2	mg/L	--	--	--
Chromium, total	7440-47-3	mg/L	--	0.05 mg/L	--
Copper, total	7440-50-8	mg/L	1 mg/L	2 mg/L	--
Iron, total	7439-89-6	mg/L	0.3 mg/L	--	--
Lead, total	7439-92-1	mg/L	--	0.005 mg/L	--
Magnesium, total	7439-95-4	mg/L	--	--	--
Manganese, total	7439-96-5	mg/L	0.02 mg/L	0.12 mg/L	--
Mercury, total	7439-97-6	mg/L	--	0.001 mg/L	--
Potassium, total	7440-09-7	mg/L	--	--	--
Selenium, total	7782-49-2	mg/L	--	0.05 mg/L	--
Sodium, total	7440-23-5	mg/L	200 mg/L	--	--
Uranium, total	7440-61-1	mg/L	--	0.02 mg/L	--
Zinc, total	7440-66-6	mg/L	5 mg/L	--	--
Volatile Organic Compounds [THMs]					
Bromodichloromethane	75-27-4	µg/L	--	--	--
Bromoform	75-25-2	µg/L	--	--	--

Page	:	7 of 7
Work Order	:	KS2400951
Client	:	Cariboo Regional District
Project	:	Drinking Water

Analyte	*CAS Number*	*Unit*	BCDWQG AO	BCDWQG MAC	BCDWQG OG				
Volatile Organic Compounds [THMs] - Continued									
Chloroform	67-66-3	µg/L	--	--	--				
Dibromochloromethane	124-48-1	µg/L	--	--	--				
Trihalomethanes [THMs], total	----	µg/L	--	**100 µg/L**	--				
Bromofluorobenzene, 4-	460-00-4	%	--	--	--				
Difluorobenzene, 1,4-	540-36-3	%	--	--	--				

Please refer to the General Comments section for an explanation of any qualifiers detected.

Key:

BCDWQG	British Columbia Drinking Water Quality Guidelines (JAN, 2023)
AO	Aesthetic Objective/Other Value
MAC	Maximium Acceptable Concentrations
OG	Operational Guidance

Appendix C: Emergency Plans

2025 Cariboo Regional District

Emergency Response & Contingency Plan

Horse Lake Water System

Utilities, Communications, and Emergency Operations Departments
1-1-2025

By Kelly McDonald, Cheryl McMullen, Gerald Pinchbeck, and Jourdy Ouellette

Contents

SECTION 1: Emergency Plan Goals 1
1.1. Resiliency in Operations 1
1.1.1. Emergency Response Plan 1
1.1.2. Regional Agency Coordination 1
1.1.3. Mutual Aid Agreements 1
1.1.4. Emergency Power 2
1.1.5. Ability to Meet Water Demands 2
1.1.6. Critical Parts Inventory 2
1.1.7. Critical Staff Resiliency 2
SECTION 2: How to Use This Plan 2
SECTION 3: Emergency Planning Definitions 2
SECTION 4: Emergency Scenarios 3
4.1. Introduction 3
4.2. Emergency Scenario Format 3
4.2.1. Description of Emergency 3
4.2.2. Indicators 3
4.2.3. Actions 3
4.2.4. Contacts 3
4.2.5. Event Record 3
SECTION 5: Water Supply Contamination 4
5.1. Potential Causes 4
5.1.1. Chemical Spill 4
5.1.2. Flood Event 4
5.1.3. Confirmed Cross Connection 4
5.1.4. System Breach 4
5.1.5. Positive Sample Result 4
5.1.6. Vandalism 4

SECTION 6: Supply Disruption 5
6.1. Equipment Failure 5
6.2. Supply Main Break 6
6.3. Extended Loss of BC Hydro Power Supply 7
6.4. Operator Transportation Routes Compromised 8
6.4.1. Potential Causes 8
SECTION 7: Cyber Incident 9
SECTION 8: Drought 9
8.1 Introduction 9
Appendix A: Contacts 10
Appendix B: Charts 11
Water Main Break 12
Critical Parts Inventory 12
Appendix C: Drought Management Plan 14
Priority Users 15
Water Restrictions and Conservation Measures 15
Communication Plan 15
Supplemental or Alternate Sources of Potable Water 17
Operational Procedures 18
Appendix D: Templates 19
Damage Assessment Summary (EOC 415) 20
Action Plan (EOC 502) 21
Situation Report (EOC 501) 22
Event Log (EOC 414) 23
Appendix E: Communications Templates 24

SECTION 1: Emergency Plan Goals

The Objective of the Cariboo Regional District (CRD) Emergency Response and Contingency Plan (ERCP) is to provide staff and regulatory agencies with a guideline for potential water utility related emergencies.

This Emergency Response and Contingency Plan (ERCP) serves as a guideline to address various emergency situations, recognizing that no two emergencies are exactly alike. Each emergency is described with a general sequence of steps to follow, providing both a structured approach to response and a consistent method for documenting actions taken. Task lists within each emergency section also function as checklists to remind staff of critical items to consider and complete during an emergency. This ERCP includes specific protocols and considerations for the CRD water supply system.

This plan has been prepared to guide the Cariboo Regional District to respond to an emergency arising in the operation of the Horse Lake Water System. The purpose of the ERCP is to:

- ✓ Ensure staff and the public's safety in carrying out emergency tasks.
- ✓ Provide the earliest and safest response to an emergency condition.
- ✓ Ensure that water quality and public health are not compromised.
- ✓ Ensure that water for firefighting is available.
- ✓ Restore normal water system operation.
- ✓ Protect the natural environment from impacts associated with the system operation in the event of an emergency.
- ✓ Contain property damage.

1.1. Resiliency in Operations

Operational resiliency refers to the capability of an operation to adjust, adapt, and maintain service delivery under emergency conditions. The objective for the CRD Water Utility is to achieve high operational resiliency. Indicators of operational resiliency include the following:

1.1.1. **Emergency Response Plan**: A comprehensive ERP is essential in building resilience within operations, providing structured guidance for handling emergencies effectively. This document is an integral part of that resiliency framework.

1.1.2. **Regional Agency Coordination**: The ERCP must be shared with regional emergency response agencies, ensuring cohesive support. The CRD Emergency Operations Department serves as the local staging agency for the Provincial Emergency Program.

1.1.3. **Mutual Aid Agreements**: In certain emergencies, the CRD may need support from neighboring water utilities. 100 Mile is a nearby utility from which the CRD may seek

assistance in the future. The CRD is working toward a formal mutual aid agreement based on community protection principles.

1.1.4. **Emergency Power**: The Horse Lake Water System can operate on gravity-fed supply. A standard battery pack is on hand to maintain disinfection if the power grid fails.

1.1.5. **Ability to Meet Water Demands**: While the water system meets current demands, the reservoir is small, and there are no fire hydrants in the service area.

1.1.6. **Critical Parts Inventory:** Appendix B provides a list of critical parts and their availability. Appendix A includes contact names for Cariboo support agencies offering specialized parts or services.

1.1.7. **Critical Staff Resiliency:** Staff's ability to respond and remain calm during extreme events is only evident when tested. Training and reinforcement of sound decision-making at all levels will support preparedness for emergency situations.

SECTION 2: How to Use This Plan

The Water System Emergency Response and Contingency Plan (ERCP) is a guide for handling water system emergencies. The “Actions” section outlines various potential emergencies and provides steps to help minimize further damage.

After an emergency, the CRD will complete a Post Incident Report (see Appendix D). Regular review exercises and updates will strengthen our emergency response capabilities. We ask all plan holders to participate and offer recommendations to continually improve the ERCP.

Remember, the ERCP is only effective if everyone reviews, understands, and contributes to its ongoing development.

SECTION 3: Emergency Planning Definitions

This section provides emergency planning definitions used in this document, following *AWWA Manual 19: Emergency Planning for Water Utilities*.

Emergency: An unexpected event that may compromise water quality or reduce the availability of domestic, irrigation, or fire flow water for the community.

Minor Emergency: A localized, routine incident impacting a small number of customers, such as a small pipe break, vehicle collision with a hydrant, brief power outage, or minor service repair. Minor emergencies should be manageable without special resources and, if effectively handled, can be prevented from escalating into major emergencies.

Major Emergency: A significant event affecting a large portion of the water system, posing risks to water quality or quantity and potentially endangering community health and safety. Major emergencies are rare but impactful.

Natural Disaster: Events caused by natural forces beyond human control, including wildfires, earthquakes, floods, tornadoes, heat domes, freezing, and other severe weather-related incidents.

Human-Caused Disaster: Disasters resulting from human actions, whether accidental or intentional. These may include human error, accidents, labor disputes, negligence, vandalism, sabotage, terrorism, biological contamination, or chemical spills.

Hazard: A source of potential harm or danger linked to a disaster, such as unstable slopes from a creek wash-out or ground shaking from an earthquake.

Lifeline Supply: Essential community services that support health, safety, and sustenance. Lifeline utilities include water, wastewater, electricity, and natural gas, as well as critical transportation, communication, healthcare, and emergency operations centres.

SECTION 4: Emergency Scenarios

4.1. Introduction

Sections 5 and 6 list potential water system emergencies related to the physical components of the water supply. Section 7 describes the steps for a cyber threat or vandalism.

4.2. Emergency Scenario Format

Each emergency scenario in this ERCP follows a consistent format:

4.2.1. **Description of Emergency**: Describes each potential emergency for easy reference. Sections 5 and 6 cover physical water service issues, while Section 7 addresses cyber incidents and vandalism.

4.2.2. **Indicators**: Outlines how each emergency can be recognized, either by CRD staff or external contacts.

4.2.3. **Actions**: Lists response steps for CRD staff, generally in recommended order. This list serves as a guideline, and the lead Water Operator can use the provided checklist to verify all necessary actions are taken.

4.2.4. **Contacts**: Lists relevant contact agencies; specific contacts are found in the ERCP's Communications Section.

4.2.5. **Event Record**: A checklist at the page bottom summarizes the event, records whether photos were taken, and tracks emergency reporting.

All events, including minor repairs and leaks, should be documented and sent to the CRD Office for electronic filing. Each event should be recorded by date. Large events should have dedicated folders containing photos and data, following a standardized naming protocol.

SECTION 5: Water Supply Contamination

Description of Emergency: Contamination has been detected or possible contamination is present.

Indicators: Public notification (taste, odour or colour observations), poor water sample results, visible observations made by Water Operators, cross connection with potential contamination.

5.1. Potential Causes

5.1.1. Chemical Spill (e.g. transport truck, industry)
5.1.2. Flood Event
5.1.3. Confirmed Cross Connection
5.1.4. System Breach (e.g. water main break) *see 6.2.
5.1.5. Positive Sample Result (e.g. E. coli or other immediate threat to public health contaminant)
5.1.6. Vandalism

Actions:

1) Notify Water Operator.
2) Notify Drinking Water Officer (DWO).
3) Assess threat level (see Appendix B).
4) Notify Communications Department.
5) Water Operators to investigate site and inform Manager of Utilities of possible situation. Manager to contact Interior Health.
6) Confirm that the source of contaminant is mitigated.
7) If chemical contamination confirmed or highly suspected to be present:
    a) Attempt to isolate.
    b) Discuss with Engineer, Biologist/Chemist (Lab) and DWO to develop a reasonable and representative sampling program.
    c) Contact Lab and arrange bottles if required and collect samples for rush analysis.

8) Report any spills to the Provincial Agency responsible (see Appendix A).

9) In an extreme situation of contamination, consider shutting down all supply pumps.

    a) Pump station would shut off and "Do Not Use" notices would be provided to the public. CRD senior management would make this call.

10) Communication: Begin public notification if required and follow Water Quality Notification Procedures.

11) Continue discussion with appropriate experts for moving forward.

12) Discussions to consider alternate water source if needed. Involve Emergency Operations Department and Notify Fire Department.

13) Continue monitoring until water quality is back to normal and IH gives approval to lift advisory or notice.

14) Complete documentation:

    a) Record of events, include times and dates.
    b) Complete a comprehensive damage assessment.
    c) Investigate potential causes.
    d) After action report.

SECTION 6: Supply Disruption

6.1. Equipment Failure

Description of Emergency: This type of emergency is typically caused by extreme weather events that place a very high demand on the Water Treatment Plant, or any other situation where water demands are high, and equipment or infrastructure reduces the ability to maintain maximum output.

Indicators: Visual observations by Water Operators. Failure of equipment as identified by SCADA and alarms.

Actions:

1) Document Situation: Note date, time, location and means of event recognition.

2) Notify Water Operator.

3) Notify Manager.

4) Notify Communications Department.

5) If cause is identified as a main break, see section 6.2.

6) Well Site Investigation: Generally, this problem is caused by high flows and overheating VFD's.

7) Check in the pumphouse for mechanical issues such as temperatures on variable frequency drive (VFD) displays.

8) Check all SCADA pages and trends to determine what is operational, what has failed, or what is at risk of failure.

9) Check on alarms.

10) Note status of chlorine disinfection, reservoir level, source pump status, chemical dosing status, and raw water flows.

11) Check all necessary equipment to confirm proper functionality.

12) Check inventory for parts that may be available to aid in necessary repairs. If necessary, contact 100 Mile Public Works for assistance.

13) If the issue stems from the VFD's, allow to cool and contract electrician if necessary.

14) If issue is due to drawdown in Supply Well, consult Drought Management Plan (Appendix C) and proceed to next step.

15) If problem persists:

- ✓ Communicate with Interior Health, issue an advisory as recommended (see Section 1).
- ✓ Implement emergency water restrictions (Communications Department).
- ✓ Contact 100 Mile Fire Department and CRD Protective Services Department to inform them of the situation.

16) Complete documentation:

a) Record of events, include times and dates.
b) Complete a comprehensive damage assessment.
c) Investigate potential causes.

6.2. Supply Main Break

Description of Emergency: Failure or damage to a water supply main causing loss of water and/or pressure.

Indicators: SCADA alarms indicating pressure loss, calls from residents or staff observations.

Actions: Steps to be taken by CRD staff:

1) Contact Manager of Utilities.
2) Contact Water Operator.
3) Determine location.
4) Stop the flow of water by closing valves and isolating the break, depending on the scale of the break (see chart in Appendix B); attempt to maintain positive pressure.
5) Contact Manager and describe the emergency.
6) Determine what section of the system has been affected by the depressurization.
7) If there is a potential that the system has been contaminated, the Manager of Utilities will contact Interior Health for recommendations on issuing a Water Advisory. See Appendix E (follow Communications procedures).
8) Make the site safe by implementing traffic control: block road, if necessary, contact traffic control contractor (see Appendix A).
9) If possible, mitigate danger to the public and further damage of infrastructure or property. If necessary and feasible, set up sediment control measures and de-chlorinated water released.
10) Assess immediate damage.
11) Coordinate repair plans with appropriate contractors (see contacts).
12) Contact the Provincial Agency responsible (see Appendix) for large discharges of chlorinated water including;
13) If there is significant sediment or unchlorinated water in streams.
14) Call Fire Department to inform them when hydrants are in or out of service.
15) Complete documentation:
    a) Record of events, include times and dates.
    b) Complete a comprehensive damage assessment.
    c) Investigate potential causes.
    d) After action report.

6.3. Extended Loss of BC Hydro Power Supply

Description of Emergency: The loss of power will stop the pumping systems to supply water to the distribution system and from filling the reservoir. With no power, a full reservoir has approximately 48 hours of water available.

Indicators: SCADA alarms

Actions:

1) Source a generator.
2) Change system settings if necessary to keep reservoirs topped up.
3) If sudden phase loss or total power loss causes equipment failure see Section 6.
4) If issues with power supply persist:
   - ✓ Contact BC Hydro for information on the timelines for power restoration.
   - ✓ Communicate with Interior Health, issue an advisory as recommended (see Section 1).
   - ✓ Implement emergency water restrictions (Communications Department).
   - ✓ Potentially throttle down the pressure within the distribution to reduce water loss (always above 20 psi).
   - ✓ Contact 100 Mile Fire Department and CRD Protective Services Department to inform them of the situation.

6.4. Operator Transportation Routes Compromised

6.4.1. Potential Causes

- Forest fire
- Accident
- Mechanical issues with vehicle
- Construction

Description of Emergency: The usual transportation route to the Horse Lake area is blocked (e.g., by a forest fire or accident), and no operator can be onsite to perform duties.

Actions:

1) Contact Manager of Utilities.
2) Manager will inform Interior Health Officer of situation.
3) Continue to monitor system using SCADA.
4) If issue persists:
   - ✓ Contact 100 Mile or other Regional Operators for assistance.

- ✓ Reach out to local contact if physical checks are needed. Preferably local contractor with system experience (see Appendix A).
- ✓ Contact the Communications Department to issue applicable advisories (at the recommendation of Interior Health).

5) Complete documentation:

   a) Record of events, include times and dates.
   b) Complete a comprehensive damage assessment.
   c) Investigate potential causes.

SECTION 7: Cyber Incident

(Omitted for security reasons.)

SECTION 8: Drought

8.1 Introduction

Drought is often caused by a long duration of inadequate rainfall or snowmelt to replenish the level of the water source. It can also be the result of a breakdown in a crucial piece of a water system's infrastructure; or a prolonged issue with water quality that prevents the supply of potable water for an extended period. All of these circumstances can result in a significant depletion in the source capacity or even a complete loss of source. The Cariboo Regional District's Drought Management Plan for the Horse Lake Water System serves as a guide to monitoring, managing and conserving water use in the event of an impending drought. The objectives of this Plan are to:

1) Identify the priority users of the water supply.
2) Provide direction on water conservation before and during the drought period.
3) Establish a guideline for communicating issues and instructions to users and other key contacts.
4) List supplemental or alternate sources of potable water in the event of a prolonged drought.

Appendix C outlines the Cariboo Regional District's Drought Management Plan.

Appendix A: Contacts

(Omitted for security reasons.)

Appendix B: Charts

Water Main Break

Water Main Break Severity Chart				
Class 1	*Class 2*	*Class 3*	*Class 4*	*Class 5*
Routine	*Minor*	*Substantial*	*Major*	*Catastrophic*
Small enough to leave until repairs are convenient	Water Pooling	Isolation Needed	Large area needs to be isolated	Complete Distribution System Shut down
Positive Pressure Maintained	Positive Pressure Maintained	Positive Pressure may not be possible	Loss of Pressure in large area of distribution system	Complete system pressure loss (e.g. drained reservoir)
Consult with DWO if any concerns.	Advisory may be required, consult with DWO.	Advisory Needed, contact Interior Health. Assess damage.	Advisory needed, contact interior health. Assess damage	Advisory needed, contact interior Health. initiate EOC.
Flush line (localized)	sample for bacteriological contamination after flushing lines as per C651-14 (localized)	Sample for bacteriological contamination after flushing lines as per AWWA C651-14	Chemical and bacteriological sampling may be needed. Possible unidirectional flushing and super chlorination needed as per AWWA C651-14	Chemical and bacteriological sampling needed at various points in the system. System wide flushing needed. Super chlorination required as per AWWA C651-14

Critical Parts Inventory

Critical Parts Inventory							
Part	Use	Location Stored	Vendor	Part	Use	Location Stored	Vendor

Appendix C: Drought Management Plan

DROUGHT MANAGEMENT PLAN

Priority Users

The area served by the Horse Lake Water System is comprised of an estimated 500 residents. In a drought situation, the provision of water will be prioritized as follows:

Priority Level	User	Comments
1	Residents	The CRD is obligated to provide water to the residents served by the Horse Lake Water System for basic health and sanitation needs.

Water Restrictions and Conservation Measures

The following restrictions will be imposed and conservation measures recommended to Horse Lake Water System users at various stages prior to and during a drought:

STAGE 1: PREPAREDNESS	
Permitted Uses	**Restrictions**
Drinking water Bathing Handwashing dishes or using dishwasher Washing machine Watering plants with a hose or watering can Bathing pets. Washing vehicles.	May 1 to Oct. 1: Lawn watering on reduced days for reduced hours, per bylaws.
	Conservation Measures
	Install water-saving devices.
STAGE 2: IMPENDING DROUGHT – CONSERVATION	
Permitted Uses	**Restrictions**
Drinking water Bathing Handwashing dishes or using dishwasher Washing machine Watering plants with a hose or watering can	Lawn watering days and hours restricted further. Wash vehicles only if absolutely necessary.
	Conservation Measures
	Bathe pets only as needed. Use washing machine for full loads only. Use dishwasher for full loads only.
STAGE 3: DROUGHT – RESTRICTIONS	
Permitted Uses	**Restrictions**
Drinking water (all users) Bathing Handwashing dishes or using dishwasher Washing machine	No watering of lawns or watering of plants, per bylaws. No bathing of pets unless absolutely necessary. No washing of vehicles. No filling of swimming pools. No power-washing.
	Conservation Measures
	Bathe only as needed and/or reduce time in shower. Use washing machine for full loads only. Use dishwasher for full loads only.

Communication Plan

Communication between the CRD and users of the Horse Lake Water System, as well as with key operational contacts, is imperative during an emergency situation. Providing timely and clear

information and instructions greatly reduces confusion, frustration and anxiety, and enables outside agencies to provide assistance more effectively if needed.

STAGE 1: PREPAREDNESS	
Water use is routinely higher from mid-Spring to the end of Summer each year due to less rainfall, increased lawn and garden maintenance, swimming pools, more frequent car-washing and showers, etc. Water levels are constantly monitored, and watering restrictions are put in place annually from May 1 to October 1 as a preventative measure to minimize depletion of the water supply during these months.	
Procedures (Concurrent)	Target
Finance Dept. mails notice of water restrictions and water conservation recommendations with annual utility bills in April of each year.	Residents
Communications Dept. posts notice of water restrictions and water conservation recommendations on website and social media.	All users of the Horse Lake Water System
Communications Dept. sends notice of water restrictions and water conservation recommendations by email.	Subscribed users.
Water Operators post notice of water restrictions and water conservation recommendations on bulletin boards at 108 Mall, gas station, mailboxes	Users of the Horse Lake Water System who don't have access to a computer.

STAGE 2: POTENTIAL THREAT – DIMINISHED WATER SUPPLY		
If there is little snowmelt in the Spring and rainfall in the Spring/Summer is not enough to bring the source of the water supply to an adequate level, further restrictions on water use may be required. Prolonged water quality issues may result in having to obtain water from an alternate source until rectified. Any significant or ongoing issues would indicate that action is required to prevent the possibility of a water supply crisis.		
Procedures		**Target**
1.	Inform key contacts of possible threat to water source: Water Operators notify Manager of Utilities Manager of Utilities informs other key contacts	Manager of Utilities Drinking Water Officer Electoral Area Director Manager of Fire Administration
2.	At Interior Health's direction, Manager of Utilities and Communications Dept. have public notice mailed to users, posted on website, social media, and on local bulletin boards.	All users of the Horse Lake Water System
	Communications Dept. sends public notice by email.	Subscribed users
3.	Manager of Utilities notifies CRD Managers involved in Emergency Planning as a precautionary measure.	Chief Administrative Officer Manager of Communications Manager of Emergency Programs
4.	Manager of Utilities, Water Operators and Electoral Area Director hold public meeting to discuss potential drought, further restrictions required and recommended conservation measures.	All users of the Horse Lake Water System
5.	Manager of Utilities notifies other agencies as a precautionary measure that assistance may be required if situation can't be rectified.	District of 100 Mile Ministry of Water, Land and Resource Stewardship Ministry of Emergency Management and Climate Readiness

STAGE 3: EMERGENCY – SIGNIFICANT DEPLETION OR LACK OF SOURCE
The following situations are considered critical: • An inability to keep the water supply at a level that will provide enough water to meet the basic health and sanitation needs of the users.

- A prolonged issue with the water system infrastructure that results in the inability to provide water to the users.
- A severe or prolonged water quality issue that cannot be easily rectified.
- The inability to provide an adequate water supply for fire protection.
- An ongoing water supply issue that results in significant losses for businesses in the service area.

Procedures		Target
1.	Inform key contacts of crisis situation. Discuss further steps: Water Operators inform Manager of Utilities. Manager of Utilities notifies other key contacts.	Manager of Utilities Drinking Water Officer Electoral Area Director Chief Administrative Officer Manager of Fire Administration Manager of Communications Manager of Emergency Programs
2.	At Interior Health's direction, Manager of Utilities and Communications Dept. have public notice mailed to users, and posted on website, social media, and local bulletin boards.	All users of the Horse Lake Water System
	Communications Dept. sends notice of emergency situation by email and via Voyent Alert.	Subscribed users
3.	Manager of Utilities and Communications Dept. post notice in local newspaper; make radio announcements.	All users of the Horse Lake Water System
4.	Manager of Utilities, Water Operators and Electoral Area Director hold public meeting to discuss further steps.	All users of the Horse Lake Water System
5.	Manager of Utilities notifies other agencies. Discuss what assistance may be available.	District of 100 Mile Ministry of Water, Land and Resource Stewardship Ministry of Emergency Management and Climate Readiness

Supplemental or Alternate Sources of Potable Water

Supplemental or Alternate Source	Contact Information	Capacity Available	Estimated Time To Deliver	Estimated Cost
Backup Water Source				
Reservoir Rental Company				
Bulk Haul Water	District of 100 Mile 250-395-2434 Bulk Water Station is just off Exeter Truck Route near Co-Op Cardlock Triple P Sanitation (upon verification of IH permit)	Not specified Not specified	Pick up only	$100 upon opening a/c, plus $0.15 per litre.
Other Water Supplier	Triple P Sanitation (upon verification of IH permit)	Not specified		

Bottled Water	Cariboo Water Purification Centre	Not specified		
	Cool Clear Water	Not specified	Tuesdays	$6.50 / 5 Gal $4.00 / 3 Gal
	Williams Lake Water Factory	Not specified		

Operational Procedures

Action		Person Responsible
1	Ensure pump is shut off (to protect pump).	Water Operator
2	Notify all users by social media, email distribution, radio and public bulletins. High risk users to be notified by telephone call. Situationally assessed for best means of communication process.	Manager of Utilities Manager of Communications
3	Contact government agencies (see below) for advice and assistance.	Manager of Utilities
4	Arrange alternate source (e.g. bottled water, bulk hauler and storage tank).	Manager of Utilities

Government Agency Contacts:

- Drinking Water Officer
- Local government's Emergency Program Coordinator
- Ministry of Forests, Lands and Natural Resource Operations
- Others as necessary, depending on severity (ie. Fire Department)

Appendix D: Templates

Damage Assessment Summary (EOC 415)

DAMAGE ASSESSMENT SUMMARY				
	Event:	**Time:**		**Date:**
	Operational Period:	**PEP Task #:**		**Position:**
		Number	**Estimated Value**	**Comments**
Public Property	▪ Municipal Facilities Damaged			
	▪ Municipal Facilities Destroyed			
	▪ Public Facilities Damaged			
	▪ Public Facilities Destroyed			
	▪ Provincial Facilities Damaged			
	▪ Provincial Facilities Destroyed			
	▪ Federal Facilities Damaged			
	▪ Federal Facilities Destroyed			
	▪ Roads Damaged			
	▪ Roads Destroyed			
	▪ Bridges Damaged			
	▪ Bridges Destroyed			
	▪ Railroads Damaged			
	▪ Railroads Destroyed			
	▪ Water Supply Damaged			
	▪ Sewers Damaged			
	Total Public Damage:			
Private Property	▪ Residential Buildings Damaged			
	▪ Residential Buildings Destroyed			
	▪ Businesses Damaged			
	▪ Businesses Destroyed			
	▪ Agriculture Damaged			
	▪ Agriculture Destroyed			
	Total Public Damage:			
Priority Repairs/Restoration:				
Prepared By:			**Date and Time:**	

Action Plan (EOC 502)

EOC Action Plan			
Event:		**Date:**	**Time:**
Operational Period:	**PEP Task #:**	**Prepared By:**	

Objectives: (In priority order, for the designated operational period)

Tasks/Action Items:	**Function Assigned**	**Estimated Completion Time**

Attachments: (Check if attached)

☐	Organization Chart	☐	Public Information Plan	☐	Communication Plan
☐	EOC Floor Plan	☐	Transportation Plan	☐	
☐	Situation Map	☐	Evacuation Plan	☐	

Recommended By (Planning Section Chief):	**Approved By** (EOC Director):

Distribution:

- ☐ EOC Director
- ☐ Risk Management Officer
- ☐ Liaison Officer
- ☐ Information Officer
- ☐ Posted for ALL EOC Personnel
- ☐ Operation Section Chief
- ☐ Planning Section Chief
- ☐ Logistics Section Chief
- ☐ Finance/Administration Section Chief
- ☐ Other _____

Situation Report (EOC 501)

EOC Situation Report

Community / Local Authority: _____

Date and Time: _____

PEP Task Number: _____

Prepared By: ☐ Community / Local Authority
☐ PREOC Operational Area Coordinator

Approved By: _____
(Name and Position)

EOC Contact:	**Report Type:**
Name: _____	☐ Initial
Position: _____	☐ Update #_____
_____	☐ Final
Phone #: _____	**Situation Forecast:**
Fax #: _____	☐ Improving
E-mail: _____	☐ Unchanged
	☐ Deteriorating

Highlights (*Situational Overview – Key Points*):

Current Priority Needs: (*Resources / Information / Support*):

Resource Request Attached: ☐ Yes ☐ No

People Impacted (*Estimated / Confirmed*):

# Evacuated	# Injured	# Homeless*	# Missing	# Dead	# Hospitalized

** As a result of the emergency event*

Event Log (EOC 414)

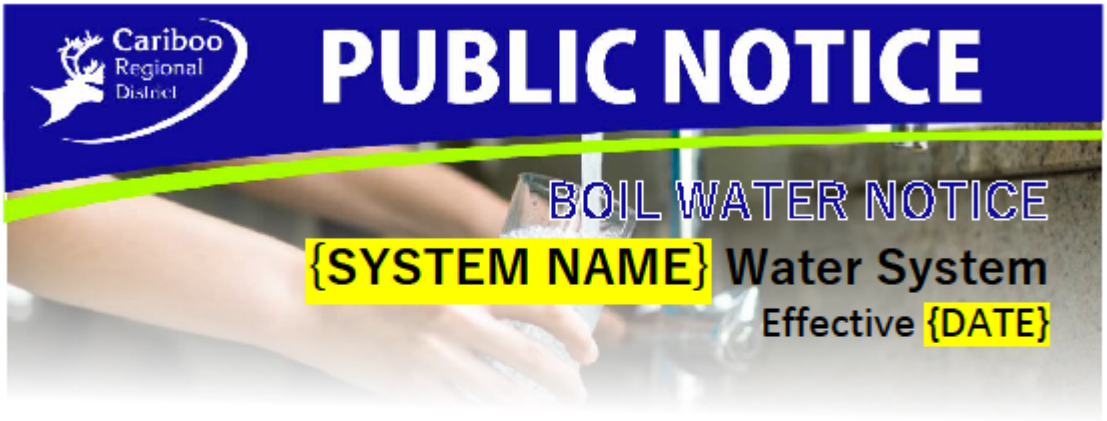
POSITION LOG

Event:	Section:	Position:
Operational Period:	PEP Task #:	Date:

LOG

Time (24 Hr.)	To	From	Action	Follow-Up	Closed

Appendix E: Communications Templates



The Cariboo Regional District has issued a Boil Water Notice to users of the {SYSTEM NAME} Water System, pursuant to a request of a Drinking Water Officer under Section 14 of the *Drinking Water Protection Act*. This Notice remains in effect until further notice.

The Cariboo Regional District's water systems are tested regularly to ensure they meet public health regulations. This boil water notice is being issued because {REASON}. This notice is being issued {CHOOSE: as a precautionary measure to protect public health. OR in order to protect public health and safety from significant health risks presented by pathogens in the water supply.}

All users of the {WATER SYSTEM NAME} Water System are asked to bring water to a rolling boil for a minimum of one minute before using water from the system for:

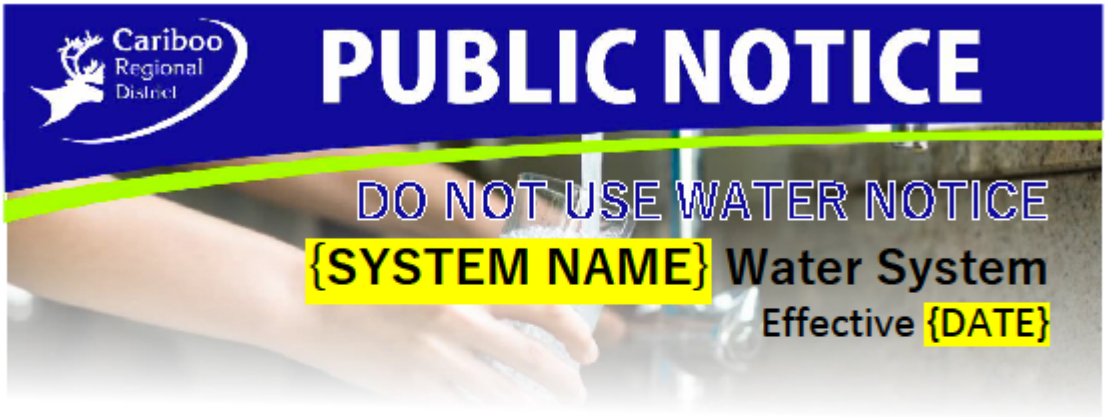
Drinking (or use an alternate, safe source of water)
Cooking (if not boiled)
Brushing teeth
Washing Dishes
Washing fruits or vegetables to be eaten raw
Watering animals

Also, please use hand sanitizer after washing hands.

If you have further questions, please call Environmental Services at 1-800-665-1636 during regular office hours.

For more information about boil water advisories and service interruptions in the CRD and what to expect, visit cariboord.ca/water-notices-and-advisories. To receive updates on CRD water systems and other relevant information within the CRD, residents are reminded to subscribe to the latest news on our website at cariboord.ca/subscribe. Residents can also sign up the Cariboo Chilcotin Emergency Notification System to be notified directly of emergency orders and alerts or utility service interruptions at cariboord.ca/EmergencyNotifications.

@CaribooRD cariboord.ca facebook.com/caribooregion facebook.com/CRDEmergencyOperations



The Cariboo Regional District has issued a Do Not Use Notice to users of the {SYSTEM NAME} Water System, pursuant to a request of a Drinking Water Officer under Section 14 of the *Drinking Water Protection Act*. This Notice remains in effect until further notice.

The Cariboo Regional District's water systems are tested regularly to ensure they meet public health regulations. Due to the presence of {if known, be specific, or if unknown say "contaminants in the water supply posing an immediate threat to resident's safety}, the Cariboo Regional District is implementing this until further notice. Follow all instructions below:

All users of the {WATER SYSTEM NAME} Water System are asked to immediately stop using water from the system for any purpose. This includes: drinking, making beverages or ice, brushing teeth, preparing or washing food, bathing, water for animals, washing anything (including vehicles), and watering plants.

Do not turn your taps on for any reason. Boiling water will NOT make it safe! Water from your hot water tank may also be unsafe, and you are advised to consult a qualified plumber before draining the tank.

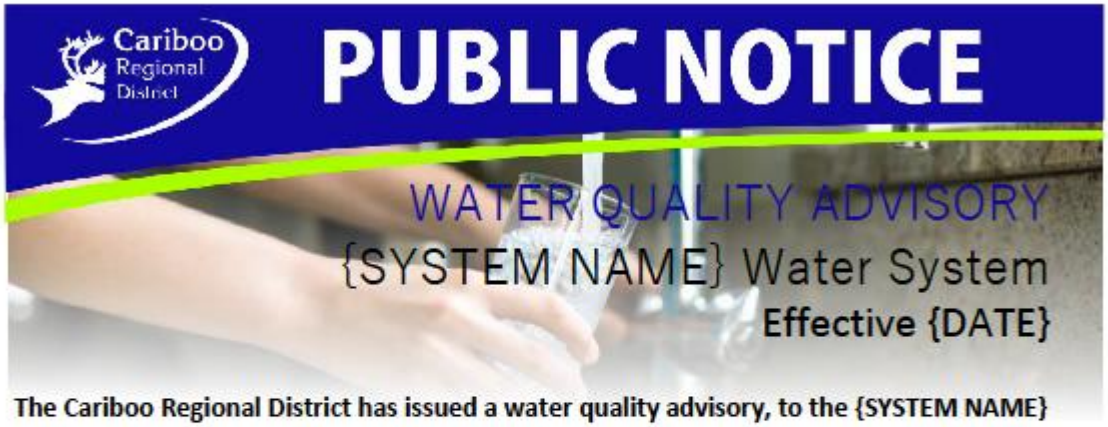
The Cariboo Regional District has contacted Interior Health and the Ministry of Environment to request their cooperation in investigating this matter. In addition, the Cariboo Regional District is taking immediate acton to find another source of water supply for residents of {WATER SYSTEM NAME}.

During this time, an alternate water source will be available at {ADDRESS AND OPERATING HOURS}.

If you have further questions, please call Environmental Services at 1-800-665-1636 during regular office hours.

For more information about boil water advisories and service interruptions in the CRD and what to expect, visit cariboord.ca/water-notices-and-advisories. To receive updates on CRD water systems and other relevant information within the CRD, residents are reminded to subscribe to the latest news on our website at cariboord.ca/subscribe. Residents can also sign up the Cariboo Chilcotin Emergency Notification System to be notified directly of emergency orders and alerts or utility service interruptions at cariboord.ca/EmergencyNotifications.

@CaribooRD cariboord.ca facebook.com/caribooregion facebook.com/CRDEmergencyOperations



The Cariboo Regional District has issued a water quality advisory, to the {SYSTEM NAME} Water System users because of {issue} levels exceeding the *Guidelines for Canadian Drinking Water Quality*. This Advisory remains in effect until further notice.

The Cariboo Regional District's water systems are tested regularly to ensure they meet public health regulations. Health Canada's Guidelines for Drinking Water has established a maximum acceptable concentration (MAC) for {issue} in drinking water of {standard}. Recent water samples submitted show {issue} concentrations that exceed the MAC.

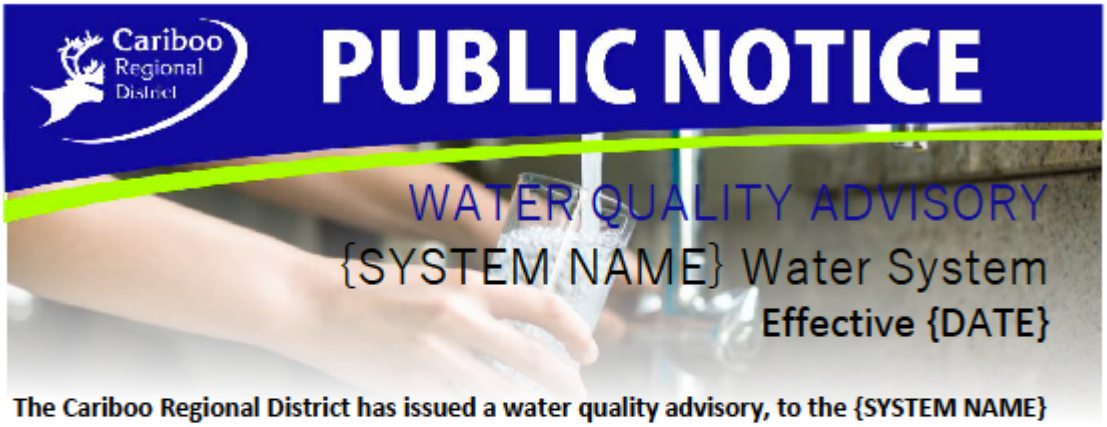
Add information provided by Health Canada or Interior Health about the nature of the water quality advisory. This section requires approval from a Drinking Water Officer.

{Other safety instructions or advisories. I.e. is the water safe for other non-consumption purposes, how does boiling water impact it, etc.}

If you have further questions, please call the Environmental Services department at 1-800-665-1636 during regular office hours.

*For more information about boil water advisories and service interruptions in the CRD and what to expect, visit **cariboord.ca/water-notices-and-advisories**. To receive updates on CRD water systems and other relevant*

@CaribooRD cariboord.ca facebook.com/caribooregion facebook.com/CRDEmergencyOperations



The Cariboo Regional District has issued a water quality advisory, to the {SYSTEM NAME} Water System users because of manganese (Mn) levels exceeding the *Guidelines for Canadian Drinking Water Quality*. This Advisory remains in effect until further notice.

The Cariboo Regional District's water systems are tested regularly to ensure they meet public health regulations. Health Canada has established a maximum acceptable concentration (MAC) for manganese in drinking water of 0.12 mg/L. Recent water samples submitted show manganese concentrations that exceed the MAC.

Manganese (Mn) is an element found in air, food, soil and drinking water. While a small amount of Mn is essential for human health, new Health Canada research has shown drinking water with too much Mn can be a risk to health for infants and young children.

Infants and young children are the most sensitive and vulnerable population, as their bodies absorb more manganese and cannot regulate or remove the chemical as readily as adults and older children. As a result, the **drinking water from this system must not be used to prepare formula for bottle-fed infants**. An alternate source of safe drinking water, such as bottled water, must be used when preparing formula for infants and young children. **Boiling the water will not lower the manganese level.**

Breastfed infants are generally considered at lower risk to manganese exposure as the transfer of manganese to breast milk is limited. Pregnant or breastfeeding women who have concerns may wish to use a safe, alternate source of drinking water or consult with a healthcare professional.

Water exceeding the MAC for manganese can be used for cooking and drinking by non-vulnerable groups and is still considered safe for hand washing, bathing and showering. If you have further questions, please call the Environmental Services department at 1-800-665-1636 during regular office hours.

*For more information about boil water advisories and service interruptions in the CRD and what to expect, visit **cariboord.ca/water-notices-and-advisories**. To receive updates on CRD water systems and other relevant information within the CRD, residents are reminded to subscribe to the latest news on our website at **cariboord.ca/subscribe**.*

@CaribooRD cariboord.ca facebook.com/caribooregion facebook.com/CRDEmergencyOperations



The Cariboo Regional District has issued a water quality advisory for users of the Forest Grove Water System because of a positive test result for low coliform found in the system.

For this reason, as precautionary measure, any high-risk users, including those with weakened immune systems, young children and those on dialysis are advised to:

- **use purchased bottled water or boiled water for drinking, brushing teeth, dishwashing, preparing food, and making ice, or**
- **bring water to a roiling boil for one minute, then cool to an appropriate temperature before using.**

The CRD regularly tests the water system as part of its Water Quality Monitoring Program. The advisory will remain in effect until further notice. We apologize in advance for any inconvenience this may cause.

When satisfactory results are reported from the required testing, customers will be notified that the advisory has been lifted. If you have questions, please call the Environmental Services department at 1-800-665-1636. If calling outside of regular business hours (8:30 a.m. to 4:30 p.m. Monday to Friday), please dial "5" when prompted to reach our emergency after hours contact.

For more information about boil water advisories and service interruptions in the CRD and what to expect, visit cariboord.ca/water-notices-and-advisories.

To receive updates on CRD water systems and other relevant information within the CRD, residents are reminded to subscribe to the latest news on our website at cariboord.ca/subscribe.

@CaribooRD cariboord.ca facebook.com/caribooregion facebook.com/CRDEmergencyOperations