REGIONAL DISTRICT OF NANAIMO

Water Service Area Annual Report 2020

French Creek Water Service Area

June 2021

REGIONAL DISTRICT OF NANAIMO
Water & Utility Services Department
6300 Hammond Bay Rd, Nanaimo, BC Canada V9T 6N2 | Ph 250-390-6560

Table of Contents

1.0 Introduction

The following annual report describes the French Creek Water Service Area and summarizes the water quality and production data from 2020. This report also includes a summary of inquiries and complaints, completed and proposed maintenance activities, Operator Certification, the Emergency Response Plan, and the Cross-Connection Control Program.

This report is to be submitted to Island Health by the spring of 2021.

2.0 French Creek Water Service Area

The French Creek Water Service Area was established in 1980 and comprises an area west of Drew Road and south of the Island Highway between the City of Parksville and the Town of Qualicum Beach. The water source for the French Creek Water Service Area comes from a series of groundwater wells located nearby. The water source is chlorinated and stored in one reservoir. There are 289 water service connections in the French Creek Water System. In the event of a power failure or water system emergency, back-up water is immediately supplied by the Town of Qualicum Beach through a pressure-sensing valve located on Ormonde Road. A map of the French Creek Water Service Area is provided in Appendix A for reference.

2.1 Groundwater Wells

Six groundwater production wells are present in the French Creek Water Service Area.

Well / Name	Well Depth	In Use	Wellhead Protection	Treated/Untreated with Chlorine
#1	39.6 m	No	Yes	not in use
#2	40.5 m	Yes	Yes	Treated
#4	40.2 m	Yes	Yes	Treated
#5	50.3 m	No	Yes	not in use
#6	52.4 m	No	Yes	not in use
#7	39.6 m	Yes	Yes	Treated

French Creek Well #1 was converted to a monitoring well in 2013 due to low production and high iron levels. Wells #5 and #6 are temporarily not in use due to elevated levels of iron and manganese.

2.2 Reservoirs

One service reservoir (steel construction) is present at 1225 Sunrise Drive, Parksville, B.C. and has a capacity of 364 m^3 (80,000 imperial gallons).

2.3 Distribution System

The water distribution system in the French Creek Water Service Area is summarized in the table below. Fire hydrants (26) are located throughout the water service area.

Watermain Material	Length of mains in service area	Prevalence in service area
Asbestos-concrete:		
150mm or smaller	3.5 km	52%
200mm or larger	0.8 km	12%
PVC:		
150mm or smaller	0.9 km	14%
200mm or larger	1.5 km	22%

Note: 'PVC' is poly-vinylchloride (plastic)

3.0 Water Sampling and Testing Program

Water sampling and testing is carried out weekly in the distribution system. Notably, the chlorine residual levels are tested weekly to ensure the absence of bacterial regrowth in the watermains. The following table includes a summary of all testing.

Timing	Location	Tests
Weekly	RDN (in-house) Laboratory	Total coliforms, E.Coli, Temperature, pH, Conductivity, Chlorine residual, Salinity, TDS
Semi-Monthly	BC Centre for Disease Control	Total coliforms, E.Coli
Monthly	Bureau Veritas	Iron, Manganese
Annual Source Water Testing (every Fall)	Bureau Veritas	Complete potability testing of raw well water, including T-Ammonia
Annual System Water Testing (every Spring)	Bureau Veritas	Complete potability testing of distribution system, including T-Ammonia

4.0 Water Quality - Source Water and Distribution System

Up-to-date water quality reports and lab data are posted monthly on the RDN website at www.rdn.bc.ca/french-creek. Tables of water quality testing results for both the source water and distribution system are provided at the end of this report under Appendix B.

5.0 Water Quality Inquiries and Complaints

Complaints and inquiries that were received from the French Creek water service area in 2020 were typically related to isolated incidents of iron discolouration in the water. RDN staff respond to these complaints by flushing the owner's water service line at the curb. New federal guidelines put forth for the Maximum Allowable Concentration of manganese in drinking water also

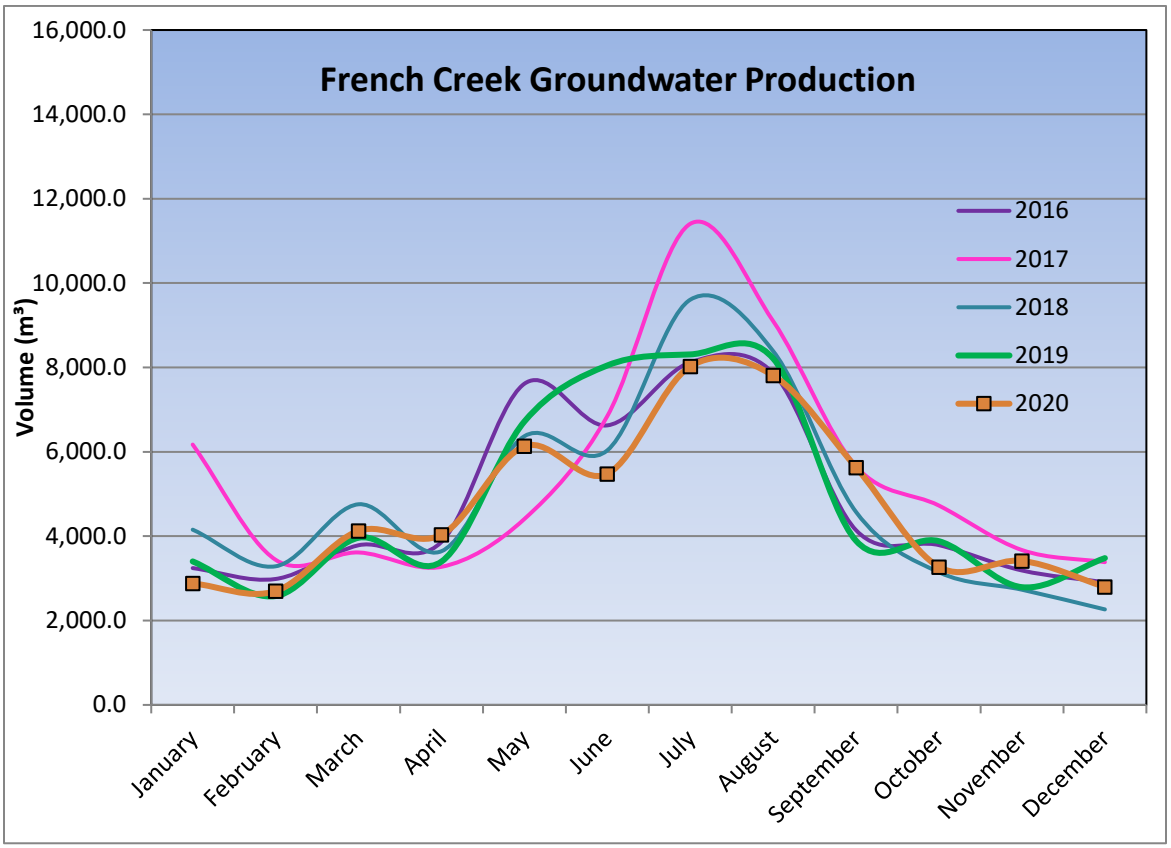
generated several inquiries from the public. The RDN is currently working towards meeting the new Guidelines for Canadian Drinking Water Quality (GCDWQ).

A summary of the water system incidents in 2020 is given in the table below.

Activity in 2020	Date(s)	History/Notes
Boil Water Advisories	None	None, ever.
High Turbidity Events	None	None, ever.
Equipment Malfunction	None	None.
Water Main Breaks	None	None.
Pump Failures	None	Temp power outages.

6.0 Groundwater Production and Consumption

The monthly groundwater production in the French Creek Water Service Area for the past 5 years is shown in the chart below. Groundwater production in 2020 was typically below average.



Consumption

In the Fall/Winter of 2020, the average usage per home in French Creek was 0.41 cubic metres per day (90.2 imperial gallons). In the summer, the average water usage was 0.62 cubic metres per day (136.4 imperial gallons). Based on these figures, the annual consumption per capita is estimated to be 178 L/day (based on 2.4 people per household). This consumption is ***36% less*** than the average of all the other RDN water systems of 278 L/day/capita for 2020.

7.0 Maintenance Program

Weekly pump station inspections are carried out to reduce or eliminate the risk of contamination and system failure, and to ensure the consistent application of chlorine for treatment purposes. Watermains are flushed twice annually: once in the spring and once in the fall.

Fire hydrants are serviced once per year (either 'A-level' or 'B-level' maintenance). The water storage reservoir is drained and cleaned once every two years. Twenty-four hour on-call coverage is in place to respond to water system emergencies and alarms.

French Creek
Main Pump House and Reservoir

8.0 Operator Certification

The Regional District Water & Utility Services staff is comprised of one Manager, one Project Engineer, one Engineering Technologist, one Engineering Technician, one Chief Operator, and seven certified operators. The operators receive ongoing training and certification in:

- ✓ Water Treatment
- ✓ Water Distribution
- ✓ Wastewater Collection
- ✓ Cross Connection Control
- ✓ Asbestos Awareness
- ✓ Chlorine Handling
- ✓ WHMIS (Workplace Hazardous Material Information System)
- ✓ TDG (Transportation of Dangerous Goods)
- ✓ Confined Space Awareness
- ✓ Traffic Control
- ✓ Fall Protection
- ✓ First Aid
- ✓ Silica Awareness

9.0 Water Service Area Projects

9.1 2020 Completed Studies & Projects

- Notified residents of the new drinking water guideline for manganese (see attached notice in Appendix B);
- Updated asset database with new assets;
- Calibrated and serviced all Hach spectrophotometer lab equipment;
- Completed a Water System Condition Assessment report and Capital Plan;
- Corresponded with residents regarding water conservation;

- Enforced outdoor sprinkling regulations;
- Completed irrigation checks for high-water users;
- Advised residents regarding water leak repairs;
- Completed the 2020-2030 Water Conservation Plan;
- Implemented a Water Systems SCADA Master Plan;
- Completed regular watermain flushing, and hydrant maintenance;
- Maintained a high level of water quality; and
- Continued quality control through regular testing and monitoring of water system.

9.2 2021 Proposed Projects & Upgrades

- Continue to develop plans for manganese mitigation in the drinking water;
- Continue watermain flushing program and hydrant maintenance;
- Continue implementing the Water Systems SCADA Master Plan;
- Implement the 2020-2030 DWWP Water Conservation Plan; and
- Continue to offer numerous water-saving incentives via rebates.

10.0 Emergency Response Plan

The Regional District Emergency Response Plan (ERP) contains procedures and contact information to efficiently respond to water system emergencies such as contamination of water supply, loss of supply, pump failure, and drought management. The ERP was reviewed and updated in 2020, and copies are available on our website, at each RDN office, in each pumphouse, and in each Water Services vehicle. A copy of the ERP is also attached to this report in Appendix C.

11.0 Cross Connection Control

The RDN's Cross Connection Control Program was put in place to protect the public health by reducing the risk of contaminants flowing back into the public water supply. The RDN Manager of Water Services is the designated Cross Connection Control Manager.

The RDN's Cross Connection Control Program addresses cross connection threats through operating policies and procedures, as well as assisting customers with backflow preventer selection, installation, testing, maintenance and reporting. The program receives its authority from *RDN Cross Connection Control Regulation Bylaw No. 1788*, and the *British Columbia Building Code, Part 7*, which requires that potable water be protected from contamination. Additionally, a webpage has been established at https://rdn.bc.ca/cross-connection-control-program to educate RDN water service customers about cross connection hazards, and lists the relevant links to current standards and resources.

Two of the RDN's water system operators received certification as backflow assembly testers through the British Columbia Water & Waste Association (BCWWA).

12.0 Cyber Security

The RDN uses a multi-level approach to cyber-security. Corporate network security is employed via a universal threat management gateway that implements various methods of data security, which includes daily definition updates to block known cyber threats. In addition, all RDN PC's are protected with anti-virus software. RDN water systems are connected to the corporate network via IP-Sec VPN's for remote management by information technology and equipment operators. Future infrastructure upgrades will see our water systems located on segregated networks to limit the vulnerability from cybersecurity threats.

13.0 Closing

An annual report for the year 2021 will be prepared and submitted to Island Health in the spring of 2022. Annual reports are also available on our website at: www.rdn.bc.ca/french-creek.

Yambury Road right-of-way near FC Well No.2

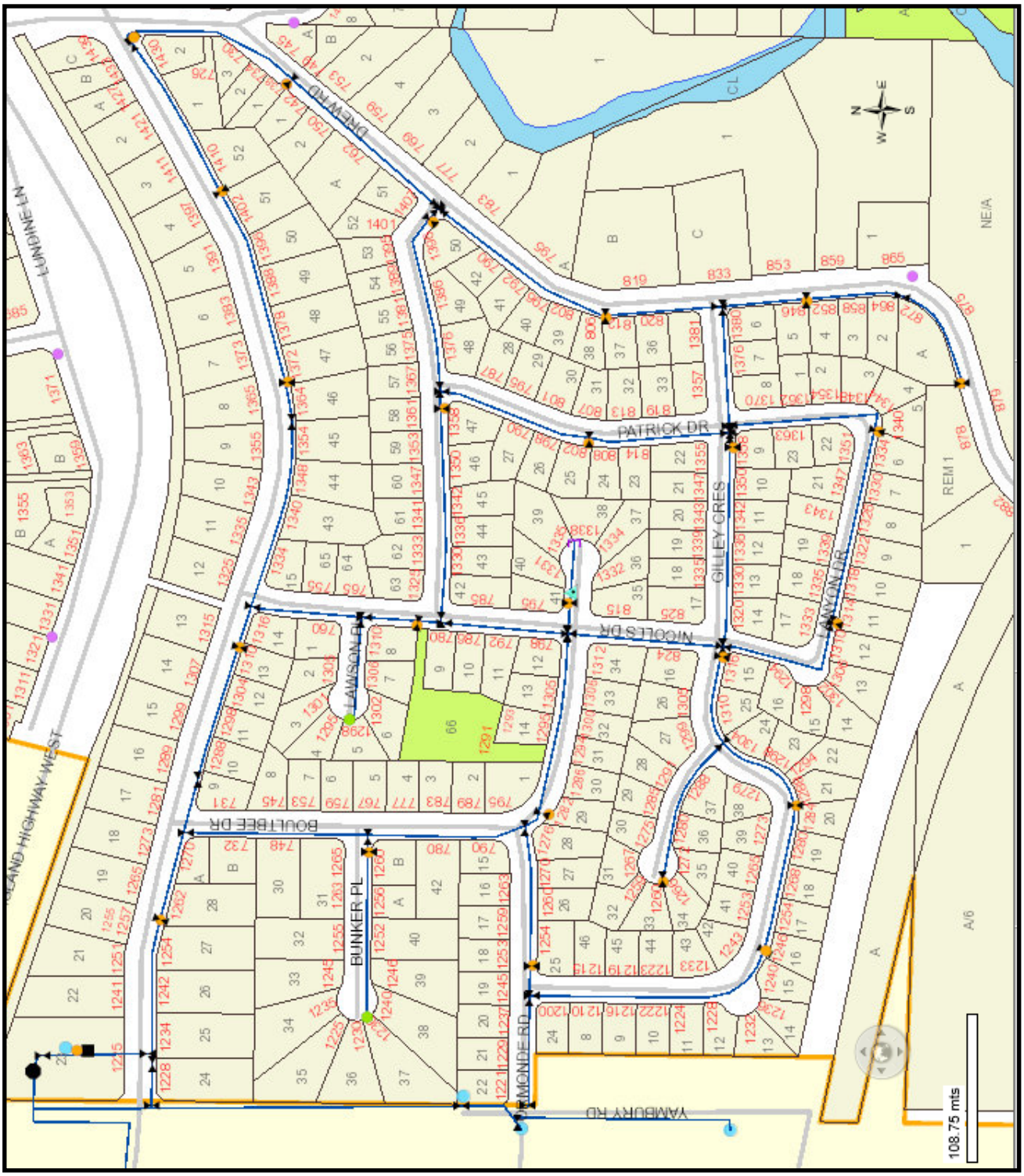
APPENDIX A

MAP OF FRENCH CREEK

WATER SERVICE AREA

FRENCH CREEK

WATER SERVICE AREA



APPENDIX B

WATER QUALITY TESTING RESULTS

REGIONAL DISTRICT OF NANAIMO

PUBLIC NOTICE

July 24, 2020

Recent Changes to Manganese Guidelines for Canadian Drinking Water Quality

Providing safe and healthy drinking water to residents of Water Service Areas is a priority for the Regional District of Nanaimo (RDN). The RDN is actively pursuing a strategy to improve the quality of drinking water in the French Creek Water Service Area (Sandpiper) specifically to address manganese levels.

Federal Guidelines for Canadian Drinking Water Quality

The federal Guidelines for Canadian Drinking Water Quality (GCDWQ) were recently adjusted and new parameters for manganese in drinking water have been set. Under the new guidelines, Health Canada has set a Maximum Acceptable Concentration (MAC) of 0.12 mg/L (120µg/L) for manganese in drinking water. The MAC is intended to protect all Canadians, and is based on the most vulnerable/sensitive population (e.g. infants and young children). Health Canada has also established a new Aesthetic Objective for manganese of 0.02 mg/L. Manganese in water at this concentration is not a health concern, but it may affect the colour or appearance of the water.

Manganese has long been considered a nuisance in drinking water (e.g. causing stains on laundry, plumbing fixtures, etc.), and prior to May 2019, there was no MAC for manganese. However, recent health research suggests that high levels of manganese in drinking water may contribute to adverse health effects on the nervous system. This new information was used to establish the MAC for manganese under the GCDWQ. The new MAC is based on being protective of ongoing consumption of tap water by infants, especially infants consuming formula made with tap water. Health Canada recommends that drinking water that contains levels of manganese above the MAC is not used to prepare infant formula. For adults and older children, short-term exposure to manganese in drinking water slightly above the MAC is unlikely to cause negative health effects. Bathing and showering in water that contains levels of manganese above the guideline value is considered safe.

Testing Results in the French Creek Water Service Area

The groundwater used for drinking water in the French Creek Water Service Area has contained manganese since the water service began in 1980. At times, manganese levels have exceeded the new MAC outlined in the updated GCDWQ. Regular in-house testing by the RDN over the years has provided different results compared to the samples tested yearly in a BC Government-certified lab. This is due to differences in sampling dates and in analytical technique, with the government-certified lab results being considered more accurate. Please see the attached table for reference.

In July 2020 – at the request of Island Health – the RDN began taking monthly samples from two locations in the French Creek Water Service Area and submitting them to the government-certified lab for analysis. To avoid confusion, the RDN will no longer perform in-house testing for Manganese.

Get Involved RDN!

www.rdn.bc.ca

Date	Lab	Sample Location	Total Manganese (mg/L)
May 3/11	RDN Lab[1]	1334 Lanyon Drive	0.110
May 18/11	North Island Labs[2]	1228 Sunrise Drive	0.114
May 1/12	RDN Lab[1]	1334 Lanyon Drive	0.115
May 16/12	North Island Labs[2]	1228 Sunrise Drive	0.145
Jun 3/13	RDN Lab[1]	1381 Gilley Crescent	0.120
Jun 5/13	North Island Labs[2]	1228 Sunrise Drive	0.124
May 6/14	RDN Lab[1]	1381 Gilley Crescent	0.068
May 13/14	North Island Labs[2]	1228 Sunrise Drive	0.139
May 5/15	RDN Lab[1]	1381 Gilley Crescent	0.090
May 19/15	Maxxam Analytics[2]	1228 Sunrise Drive	0.125
May 10/16	RDN Lab[1]	1228 Sunrise Drive	0.162
May 10/16	Maxxam Analytics[2]	1228 Sunrise Drive	0.123
May 8/17	RDN Lab[1]	1228 Sunrise Drive	0.158
May 8/17	Maxxam Analytics[2]	1228 Sunrise Drive	0.142
May 7/18	RDN Lab[1]	1228 Sunrise Drive	0.135
May 7/18	Maxxam Analytics[2]	1228 Sunrise Drive	0.127
May 6/19	RDN Lab[1]	1228 Sunrise Drive	0.177
May 13/19	Bureau Veritas[2]	1228 Sunrise Drive	0.107
MAC for Manganese Introduced in GCDWQ			
May 4/20	RDN Lab[1]	1228 Sunrise Drive	0.141
May 21/20	Bureau Veritas[2]	1228 Sunrise Drive	0.105
July 9/20	Bureau Veritas[2]	1228 Sunrise Drive	0.138
July 9/20	Bureau Veritas[2]	1381 Gilley Crescent	0.115

[1]non-certified lab
[2]certified lab

For information on the Guidelines for Canadian Drinking Water Quality, visit:
www.canada.ca/en/health-canada/services/environmental-workplace-health/water-quality/drinking-water/canadian-drinking-water-guidelines.html

For information regarding BC Drinking Water Regulations visit
www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/drinking-water-quality

For more information, contact:
Regional District of Nanaimo, Regional and Community Utilities
250-390-6560
rcu@rdn.bc.ca

FRENCH CREEK

WATER SERVICE AREA

Facility Location: 1480 Industrial Way

Facility Information: Facility Type: 301-10,000 connections DWT

Facility Sampling History:

Location	Date	Total Coliform	E. Coli
French Creek Sample Port, 1381 Gilley Cresc.	7-Dec-2020	LT1	LT1
1410 Sunrise Road, French Creek, 1410 Sunrise, French Creek BC	1-Dec-2020	LT1	LT1
French Creek Sample Port, 1381 Gilley Cresc.	9-Nov-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	2-Nov-2020	LT1	LT1
French Creek Sample Port, 1381 Gilley Cresc.	13-Oct-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	5-Oct-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	5-Oct-2020	OIE	OIE
French Creek Sample Port, 1381 Gilley Cresc.	8-Sep-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	12-Aug-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	4-Aug-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	13-Jul-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	8-Jul-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	8-Jun-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	1-Jun-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	11-May-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	4-May-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	14-Apr-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	6-Apr-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	9-Mar-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	2-Mar-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	10-Feb-2020	LT1	LT1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	3-Feb-2020	LT1	LT1
1381 Gilley Crescent , 1381 Gilley Crescent, Parksville	13-Jan-2020	L1	L1
French Creek Sample Port - Sunrise Dr, 1228 Sunrise Dr.	6-Jan-2020	L1	L1

Interpreting Sample Reports

In VIHA, the results of drinking water sampling are reported using the following coding system:

LT1 Less than 1 (no detectable bacteria) – Meaning: No bacteria present

L1 Less than 1 (no detectable bacteria) - Meaning: No bacteria present

OIE Ordered in Error

Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory and Spectrophotometer										Bureau Veritas Lab	
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)	Total Iron (mg/L)	Manganese (mg/L)
1-Dec-20	1228 Sunrise	0	0	0	0	9	7.60	0.40	168.3	0.17	351.0	Fe and Mn are no longer tested in-house. Please see test results from Bureau Veritas -->		0.11	0.113
7-Dec-20	1381 Gilley	0	0	0	0	10	7.88	0.30	158.6	0.17	351.0			0.0895	0.0851
14-Dec-20	1381 Gilley			0	0	11	8.20	0.50	169.0	0.17	353.0				
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC	0.3	0.02 AO 0.12 MAC

Legend:

*** Coliforms are measured in colony forming units (CFU) per 100 millilitres of water (CFU/100mL)**

Orange font indicates non-compliance with the Aesthetic Objective (AO) in the Canadian Drinking Water Guidelines (CDWG)

Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

Comments:

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

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2-Nov-20	1228 Sunrise	0	0	0	0	12	7.74	0.51	167.1	0.17	348.0	Fe and Mn are no longer tested in-house. Please see test results from Bureau Veritas -->			
9-Nov-20	1381 Gilley	0	0	0	0	11	8.66	0.27	171.2	0.17	356.0				
16-Nov-20	1228 Sunrise			0	0	10	7.90	0.63	167.5	0.17	349.0			0.102	0.0933
23-Nov-20	1381 Gilley			0	0	11	7.83	0.35	168.0	0.17	350.0			0.0616	0.0665
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	**0.02** AO **0.12** MAC	0.3	**0.02** AO **0.12** MAC

Legend:

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5-Oct-20	1228 Sunrise	0	0	0	0	16	7.95	0.38	169.2	0.17	353.0	Fe and Mn are no longer tested in-house. Please see test results from Bureau Veritas -->			
13-Oct-20	1381 Gilley	0	0	0	0	15	8.15	0.51	169.8	0.17	354.0				
19-Oct-20	1228 Sunrise			0	0	12	7.76	0.73	168.4	0.17	351.0			0.105	0.109
26-Oct-20	1381 Gilley			0	0	13	7.81	0.50	171.3	0.17	357.0				
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC	0.3	0.02 AO 0.12 MAC

Legend:

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2-Sep-20	1228 Sunrise	0	0	0	0	18	8.00	0.45	172.8	0.17	360.0	Fe and Mn are no longer tested in-house. Please see test results from Bureau Veritas -->			
8-Sep-20	1381 Gilley	0	0	0	0	17	8.02	0.50	171.1	0.18	366.0				
14-Sep-20	1228 Sunrise			0	0	17	8.09	0.54	166.6	0.19	372.0			0.107	0.0852
21-Sep-20	1381 Gilley			0	0	17	8.30	0.30	172.7	0.17	359.0				
28-Sep-20	1381 Gilley			0	0	17	8.28	0.33	171.6	0.17	357.0			0.0852	0.0918
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	**0.02** AO **0.12** MAC	0.3	**0.02** AO **0.12** MAC

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French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory and Spectrophotometer										Bureau Veritas Lab	
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)	Total Iron (mg/L)	Manganese (mg/L)
4-Aug-20	1228 Sunrise	0	0	0	0	13	7.40	0.46	177.5	0.18	369.0	Fe and Mn are no longer tested in-house. Please see test results from Bureau Veritas -->			
12-Aug-20	1381 Gilley	0	0	0	0	16.5	8.00	0.35	167.1	0.17	347.0				
17-Aug-20	1228 Sunrise			0	0	16	7.98	0.64	171.1	0.17	356.0			0.106	0.115
24-Aug-20	1381 Gilley			0	0	17	8.19	0.59	170.1	0.17	354.0			0.0986	0.106
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC	0.3	0.02 AO 0.12 MAC

Legend:

*** Coliforms are measured in colony forming units (CFU) per 100 millilitres of water (CFU/100mL)**

Orange font indicates non-compliance with the Aesthetic Objective (AO) in the Canadian Drinking Water Guidelines (CDWG)

Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

Comments:

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory and Spectrophotometer										Bureau Veritas Lab	
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)	Total Iron (mg/L)	Manganese (mg/L)
6-Jul-20	1228 Sunrise	0	0	0	0	14	7.24	0.50	181.1	0.16	359.0	0.11		0.109	**0.138**
13-Jul-20	1381 Gilley	0	0	0	0	15	7.15	0.38	179.9	0.18	373.0			0.0946	**0.115**
20-Jul-20	1228 Sunrise			0	0	13	**6.98**	0.39	176.4	0.18	367.0				
27-Jul-20	1381 Gilley			0	0	17	7.11	0.44	179.4	0.18	373.0				
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	**0.02** AO **0.12** MAC	0.3	**0.02** AO **0.12** MAC

Legend:

*** Coliforms are measured in colony forming units (CFU) per 100 millilitres of water (CFU/100mL)**

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Comments:

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
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Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory and Spectrophotometer										Bureau Veritas Lab	
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)	Total Iron (mg/L)	Manganese (mg/L)
1-Jun-20	1228 Sunrise	0	0	0	0	12	7.24	0.54	175.9	0.18	366.0	0.10	0.173		
8-Jun-20	1381 Gilley	0	0	0	0	13	7.33	0.58	180.1	0.18	360.0				
15-Jun-20	1228 Sunrise			0	0	13	6.99	0.47	179.8	0.18	374.0				
22-Jun-20	1381 Gilley			0	0	15	7.23	0.43	175.7	0.17	366.0				
29-Jun-20	1381 Gilley			0	0	13	7.33	0.44	178.0	0.18	371.0				
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC	0.3	0.02 AO 0.12 MAC

Legend:

*** Coliforms are measured in colony forming units (CFU) per 100 millilitres of water (CFU/100mL)**

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Comments:

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory & Spectrophotometer										Bureau Veritas Lab	
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)	Total Iron (mg/L)	Manganese (mg/L)
4-May-20	1228 Sunrise	0	0	0	0	11	7.52	0.60	175.6	0.18	365.0	0.10	0.141	0.104	0.105
11-May-20	1381 Gilley	0	0	0	0	11	7.30	0.41	176.0	0.18	366.0				
19-May-20	1228 Sunrise			0	0	13	7.24	0.44	176.6	0.18	367.0				
25-May-20	1381 Gilley			0	0	14	7.09	0.36	175.5	0.18	365.0				
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	**0.02** AO **0.12** MAC	0.3	**0.02** AO **0.12** MAC

Legend:

*** Coliforms are measured in colony forming units (CFU) per 100 millilitres of water (CFU/100mL)**

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Comments:

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Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory & Spectrophotometer									
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)
6-Apr-20	1228 Sunrise	0	0	0	0	8	7.00	0.50	181.1	0.19	366.0	0.10	0.158
14-Apr-20	1381 Gilley	0	0	0	0	9	7.70	0.48	175.9	0.18	366.0		
20-Apr-20	1228 Sunrise			0	0	12	7.06	0.41	176.7	0.18	367.0		
28-Apr-20	1381 Gilley			0	0	10	7.22	0.37	175.1	0.17	364.0		
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC

Legend:

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Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory & Spectrophotometer									
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)
2-Mar-20	1228 Sunrise	0	0	0	0	9	7.04	0.52	178.3	0.18	370.0	0.11	0.139
9-Mar-20	1381 Gilley	0	0	0	0	8	7.04	0.35	172.9	0.17	360.0		
16-Mar-20	1228 Sunrise			0	0	9	7.03	0.51	174.9	0.17	364.0		
23-Mar-20	1381 Gilley			0	0	7	7.80	0.52	175.7	0.18	366.0		
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC

Legend:

*** Coliforms are measured in colony forming units (CFU) per 100 millilitres of water (CFU/100mL)**

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Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory & Spectrophotometer									
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)
3-Feb-20	1228 Sunrise	0	0	0	0	9	7.10	0.47	176.7	0.18	368.0	0.09	0.168
10-Feb-20	1381 Gilley	0	0	0	0	8	7.25	0.45	176.9	0.18	368.0		
18-Feb-20	1228 Sunrise			0	0	9	7.30	0.50	177.4	0.18	369.0		
24-Feb-20	1381 Gilley			0	0	8	7.12	0.47	176.1	0.18	366.0		
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC

Legend:

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Regional District of Nanaimo - Water Services Department

French Creek Water Analysis - 2020 Monthly Report

		BC Centre for Disease Control		RDN In-House Laboratory & Spectrophotometer									
Date	Sample Location (Address)	E. coli *	Total Coliform *	E.coli *	Total Coliform *	Temp. (°C)	pH	Free Chlorine Residual (mg/L)	Total Dissolved Solids (mg/L)	Salinity (%)	Conductivity (µS/cm)	Total Iron (mg/L)	Manganese (mg/L)
6-Jan-20	1228 Sunrise	0	0	0	0	9	6.99	1.06	176.1	0.18	367.0	0.08	0.168
13-Jan-20	1381 Gilley	0	0	0	0	8	7.27	0.66	177.5	0.18	369.0		
20-Jan-20	1228 Sunrise			0	0	8	7.29	0.41	180.1	0.17	371.0		
27-Jan-20	1381 Gilley			0	0	8	7.12	0.45	176.0	0.18	366.0		
CDN Drinking Water Guidelines		<1	<1	<1	<1	n/a	7.0-10.5	n/a	500	n/a	n/a	0.3	0.02 AO 0.12 MAC

Legend:

*** Coliforms are measured in colony forming units (CFU) per 100 millilitres of water (CFU/100mL)**

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Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

REGIONAL DISTRICT OF NANAIMO

French Creek #2 Raw Well Water Analysis
Behind 1221 Ormonde Road

CDWG=Canadian Drinking Water Guidelines
MAC=Maximum Acceptable Concentration
OG= Operational Guidance Value
AO=Aesthetic Objective

Orange font indicates non-compliance with the Aesthetic Objective (AO) in the Canadian Drinking Water Guidelines (CDWG)

Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

	Units	CDWG		October 27 2016	October 18 2017	November 8 2018	October 10 2019	October 22 2020
Miscellaneous Inorganics								
Fluoride	mg/L	1.5	MAC	0.11	0.11	0.13	0.11	0.11
Alkalinity (total as $CaCO_3$)	mg/L			133	140	130	130	140
Anions								
Dissolved Sulphate	mg/L	500	AO	35.9	28.9	47.3	38	41
Dissolved Chloride	mg/L	250	AO	6.7	7.2	7.4	8.4	9.9
Nitrite	mg/L	1	MAC	<0.0050	0.0051	<0.0050	<0.005	<0.005
Miscellaneous								
Apparent Colour	Colour Unit			5	15	5	5	15
Nutrients								
Total Ammonia	mg/L			0.3	0.22	0.24	0.36	0.28
Physical Properties								
Conductivity	µS/cm			344	341	354	350	360
pH	pH	7.0:10.5	AO	8.24	8.28	8.21	8.08	8.24
TDS	mg/L	500	AO	190	190	206	200	210
Turbidity	NTU			0.48	0.85	0.32	0.18	0.25
Microbiological Parameters								
E.coli	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Total Coliforms	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Calculated Parameters								
Total Hardness ($CaCO_3$)	mg/L			148	157	161	162	152
Nitrate	mg/L	10	MAC	<0.020	0.095	<0.020	<0.02	<0.02
Elements								
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.00001	<0.000002	<0.000002	<0.0000019
Total Metals								
Total Aluminum	mg/L	0.1	OG	<0.003	<0.003	<0.003	<0.003	<0.003
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Arsenic	mg/L	0.01	MAC	0.00017	0.00011	0.00019	0.00014	0.00013
Total Barium	mg/L	1	MAC	0.0182	0.016	0.0182	0.0189	0.0183
Total Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	<0.050	<0.050	<0.050	<0.05	<0.05
Total Cadmium	mg/L	0.005	MAC	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.001	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L			<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	0.00047	0.0268	<0.0002	<0.0002	<0.0002
Total Iron	mg/L	0.3	AO	0.0585	0.223	0.115	0.139	0.105
Total Lead	mg/L	0.01	MAC	<0.0002	0.00198	<0.0002	<0.0002	<0.0002
Total Manganese	mg/L	0.02 0.12	AO MAC	**0.133**	**0.122**	**0.147**	**0.151**	**0.143**
Total Molybdenum	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Nickel	mg/L			<0.001	0.0027	<0.001	<0.001	<0.001
Total Selenium	mg/L	0.05	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Silicon	mg/L			10.7	12.5	10.1	11.1	10.6
Total Silver	mg/L			<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Total Strontium	mg/L			0.148	0.145	0.165	0.162	0.154
Total Thallium	mg/L			<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Titanium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	0.0068	0.117	<0.005	<0.005	<0.005
Total Zirconium	mg/L			<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium	mg/L			36.5	37.8	39.8	41.2	37.3
Total Magnesium	mg/L			13.8	15.1	14.9	14.4	14.2
Total Potassium	mg/L			2.32	2.53	2.51	2.45	2.39
Total Sodium	mg/L	200	AO	8.58	9.47	9.11	8.99	8.79
Total Sulphur	mg/L			12.4	9.7	14.1	12.2	11.4

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

REGIONAL DISTRICT OF NANAIMO

French Creek #4 Raw Well Water Analysis
SE of 785 York Place

CDWG=Canadian Drinking Water Guidelines
MAC=Maximum Acceptable Concentration
OG= Operational Guidance Value
AO=Aesthetic Objective

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Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

	Units	CDWG		October 27 2016	October 18 2017	November 8 2018	October 10 2019	October 22 2020
Miscellaneous Inorganics								
Fluoride	mg/L	1.5	MAC	0.11	0.11	0.13	0.11	0.11
Alkalinity (total as $CaCO_3$)	mg/L			134	135	130	130	140
Anions								
Dissolved Sulphate	mg/L	500	AO	19.8	26.7	20.1	21	20
Dissolved Chloride	mg/L	250	AO	7.2	8.6	8.4	9.2	10
Nitrite	mg/L	1	MAC	<0.0050	<0.0050	<0.0050	<0.0050	<0.005
Miscellaneous								
Apparent Colour	Colour Unit			10	10	5	10	15
Nutrients								
Total Ammonia	mg/L			0.47	0.37	0.4	0.49	0.4
Physical Properties								
Conductivity	µS/cm			319	326	312	320	320
pH	pH	7.0:10.5	AO	8.27	8.28	8.19	8.1	8.23
TDS	mg/L	500	AO	162	174	196	190	180
Turbidity	NTU			0.27	0.48	0.2	0.22	0.3
Microbiological Parameters								
E.coli	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Total Coliforms	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Calculated Parameters								
Total Hardness ($CaCO_3$)	mg/L			133	152	138	141	139
Nitrate	mg/L	10	MAC	<0.020	<0.020	<0.020	<0.02	<0.02
Elements								
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.00001	<0.000002	<0.000002	<0.0000019
Total Metals								
Total Aluminum	mg/L	0.1	OG	<0.003	<0.003	<0.003	<0.003	<0.003
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0005	<0.0005	<0.0005	<0.00052
Total Arsenic	mg/L	0.01	MAC	<0.0001	0.0001	<0.0001	0.00011	0.00014
Total Barium	mg/L	1	MAC	0.0137	0.0147	0.0134	0.0142	0.0143
Total Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	<0.050	<0.050	<0.050	<0.05	<0.05
Total Cadmium	mg/L	0.005	MAC	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.001	<0.001	<0.001	0.001	<0.001
Total Cobalt	mg/L			<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	<0.0002	0.00024	0.00081	0.00059	0.00065
Total Iron	mg/L	0.3	AO	0.124	0.149	0.13	0.138	0.13
Total Lead	mg/L	0.01	MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Manganese	mg/L	0.02 0.12	AO MAC	**0.141**	**0.149**	**0.145**	**0.146**	**0.143**
Total Molybdenum	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Nickel	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Selenium	mg/L	0.05	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Silicon	mg/L			11.9	13	11.5	12.3	12.2
Total Silver	mg/L			<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Total Strontium	mg/L			0.133	0.14	0.134	0.139	0.139
Total Thallium	mg/L			<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Titanium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	<0.005	<0.005	0.0065	<0.005	<0.005
Total Zirconium	mg/L			<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium	mg/L			31.8	37.1	32.5	34.7	33.1
Total Magnesium	mg/L			12.9	14.4	13.8	13.2	13.6
Total Potassium	mg/L			2.39	2.54	2.56	2.41	2.53
Total Sodium	mg/L	200	AO	9.45	10	9.79	9.72	9.78
Total Sulphur	mg/L			7.2	8.5	6.8	7	6.1

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

REGIONAL DISTRICT OF NANAIMO

French Creek #5 Raw Well Water Analysis
1140 Sunrise Drive
Well is offline.

CDWG=Canadian Drinking Water Guidelines
OG= Operational Guidance Value
MAC=Maximum Acceptable Concentration
AO=Aesthetic Objective

Orange font indicates non-compliance with the Aesthetic Objective (AO) in the Canadian Drinking Water Guidelines (CDWG)

Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

	Units	CDWG		October 18 2017	November 8 2018	October 10 2019	October 22 2020
Miscellaneous Inorganics							
Fluoride	mg/L	1.5	MAC	0.16	0.18	0.15	0.16
Alkalinity (total as $CaCO_3$)	mg/L			127	118	120	130
Anions							
Dissolved Sulphate	mg/L	500	AO	<1.0	<1.0	<1.0	<1
Dissolved Chloride	mg/L	250	AO	7.4	7	6.9	6.1
Nitrite	mg/L	1	MAC	<0.0050	<0.0050	<0.005	<0.005
Miscellaneous							
Apparent Colour	Colour Unit			30	30	80	20
Nutrients							
Total Ammonia	mg/L			1.5	1.5	1.3	1.6
Physical Properties							
Conductivity	µS/cm			259	245	260	250
pH	pH	7.0:10.5	AO	8.16	8.04	7.92	8.17
TDS	mg/L	500	AO	146	140	140	150
Turbidity	NTU			0.73	4.01	8.3	2.8
Microbiological Parameters							
E.coli	MPN/100mL	<1	MAC	<1.0	<1.0	0	0
Total Coliforms	MPN/100mL	<1	MAC	<1.0	<1.0	0	0
Calculated Parameters							
Total Hardness ($CaCO_3$)	mg/L			81.2	75.4	77.9	77.6
Nitrate	mg/L	10	MAC	<0.020	<0.020	<0.02	<0.02
Elements							
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.000002	77.9	<0.0000019
Total Metals							
Total Aluminum	mg/L	0.1	OG	0.0045	0.0041	0.0068	0.0359
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0005	0.00058	<0.0005
Total Arsenic	mg/L	0.01	MAC	0.00039	0.00027	0.00043	0.00038
Total Barium	mg/L	1	MAC	0.0059	0.0076	0.0153	0.0057
Total Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	0.062	0.057	0.061	0.06
Total Cadmium	mg/L	0.005	MAC	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.001	<0.001	0.0012	0.0016
Total Cobalt	mg/L			<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	0.00142	0.00744	0.0999	0.00101
Total Iron	mg/L	0.3	AO	**0.725**	**1.74**	**2.87**	**1.01**
Total Lead	mg/L	0.01	MAC	<0.0002	**0.0122**	**0.238**	0.00105
Total Manganese	mg/L	0.02 0.12	AO MAC	**0.181**	**0.206**	**0.246**	**0.176**
Total Molybdenum	mg/L			<0.001	0.001	0.0012	<0.001
Total Nickel	mg/L			<0.001	<0.001	0.0021	<0.001
Total Selenium	mg/L	0.05	MAC	<0.0001	<0.0001	<0.0001	<0.0001
Total Silicon	mg/L			19.1	12.3	11.1	19
Total Silver	mg/L			<0.00002	<0.00002	0.00003	<0.00002
Total Strontium	mg/L			0.0700	0.0723	0.0703	0.0672
Total Thallium	mg/L			<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.005	<0.005	0.0062	<0.005
Total Titanium	mg/L			<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	0.0265	0.766	2.91	0.105
Total Zirconium	mg/L			<0.0001	<0.0001	<0.0001	0.00012
Total Calcium	mg/L			19	18	18.4	18.2
Total Magnesium	mg/L			8.17	7.41	7.75	7.78
Total Potassium	mg/L			2.67	2.52	2.52	2.59
Total Sodium	mg/L	200	AO	22.5	20.1	21	20.4
Total Sulphur	mg/L			<3.0	<3.0	<3	<3

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

REGIONAL DISTRICT OF NANAIMO

French Creek #6 Raw Well Water Analysis
1108 Wellington Drive
Well is offline.

CDWG=Canadian Drinking Water Guidelines
MAC=Maximum Acceptable Concentration
OG= Operational Guidance Value
AO=Aesthetic Objective

Orange font indicates non-compliance with the Aesthetic Objective (AO) in the Canadian Drinking Water Guidelines (CDWG)

Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

	Units	CDWG		October 27 2016	October 18 2017	November 8 2018	October 10 2019	October 22 2020
Miscellaneous Inorganics								
Fluoride	mg/L	1.5	MAC	0.14	0.14	0.17	0.14	0.15
Alkalinity (total as $CaCO_3$)	mg/L			105	105	105	100	110
Anions								
Dissolved Sulphate	mg/L	500	AO	<0.50	<1.0	<1.0	<1.0	<1
Dissolved Chloride	mg/L	250	AO	4.1	4.5	4.4	4.8	4.2
Nitrite	mg/L	1	MAC	<0.0050	<0.0050	<0.0050	<0.005	<0.005
Miscellaneous								
Apparent Colour	Colour Unit			30	30	15	20	20
Nutrients								
Total Ammonia	mg/L			1.4	1	1.1	1.2	1.1
Physical Properties								
Conductivity	µS/cm			217	213	209	210	210
pH	pH	7.0:10.5	AO	8.1	8.08	8.09	7.91	8.13
TDS	mg/L	500	AO	140	122	124	140	110
Turbidity	NTU			0.83	0.55	0.54	0.67	0.63
Microbiological Parameters								
E.coli	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Total Coliforms	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Calculated Parameters								
Total Hardness ($CaCO_3$)	mg/L			72.3	75.8	75.1	70.7	71.1
Nitrate	mg/L	10	MAC	<0.020	<0.020	<0.020	<0.02	<0.02
Elements								
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.00001	<0.000002	<0.000002	<0.0000019
Total Metals								
Total Aluminum	mg/L	0.1	OG	<0.003	<0.003	0.0138	<0.003	<0.003
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Arsenic	mg/L	0.01	MAC	0.00118	0.0014	0.00116	0.00113	0.00109
Total Barium	mg/L	1	MAC	0.0044	0.0046	0.0041	0.0041	0.0041
Total Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	<0.050	<0.050	<0.050	<0.05	<0.05
Total Cadmium	mg/L	0.005	MAC	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.001	<0.001	<0.001	0.0012	<0.001
Total Cobalt	mg/L			<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	0.00117	0.00073	0.00206	0.00099	0.00112
Total Iron	mg/L	0.3	AO	**0.817**	**0.814**	**0.842**	**0.806**	**0.808**
Total Lead	mg/L	0.01	MAC	0.00044	0.00055	0.00058	<0.0002	0.00023
Total Manganese	mg/L	0.02 0.12	AO MAC	**0.157**	**0.161**	**0.161**	**0.167**	**0.151**
Total Molybdenum	mg/L			<0.001	<0.001	0.001	<0.001	<0.001
Total Nickel	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Selenium	mg/L	0.05	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Silicon	mg/L			16.7	16.9	16.7	16.1	16.6
Total Silver	mg/L			<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Total Strontium	mg/L			0.0553	0.0576	0.0547	0.0514	0.0495
Total Thallium	mg/L			<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Titanium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	0.0387	0.0169	0.0242	0.0179	0.0232
Total Zirconium	mg/L			<0.0005	0.00012	0.00015	0.00012	0.00012
Total Calcium	mg/L			16.8	16.9	17.3	16.4	16.4
Total Magnesium	mg/L			7.35	8.14	7.74	7.19	7.31
Total Potassium	mg/L			1.86	2.06	2.01	1.91	1.93
Total Sodium	mg/L	200	AO	13.7	15.6	15.2	14.3	14.4
Total Sulphur	mg/L			<3.0	<3.0	<3.0	<3.0	<3

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

REGIONAL DISTRICT OF NANAIMO

French Creek #7 Raw Well Water Analysis
846 Yambury Road

CDWG=Canadian Drinking Water Guidelines
MAC=Maximum Acceptable Concentration
OG= Operational Guidance Value
AO=Aesthetic Objective

Orange font indicates non-compliance with the Aesthetic Objective (AO) in the Canadian Drinking Water Guidelines (CDWG)

Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

	Units	CDWG		October 27 2016	October 18 2017	November 8 2018	October 10 2019	October 22 2020
Miscellaneous Inorganics								
Fluoride	mg/L	1.5	MAC	0.1	0.1	0.11	0.094	0.099
Alkalinity (total as $CaCO_3$)	mg/L			150	149	149	150	150
Anions								
Dissolved Sulphate	mg/L	500	AO	26.7	30.3	31.2	23	28
Dissolved Chloride	mg/L	250	AO	5.4	6.4	7.1	9.4	8.6
Nitrite	mg/L	1	MAC	<0.0050	<0.0050	<0.0050	<0.005	<0.005
Miscellaneous								
Apparent Colour	Colour Unit			10	10	<5.0	5	15
Nutrients								
Total Ammonia	mg/L			0.36	0.28	0.28	0.34	0.27
Physical Properties								
Conductivity	µS/cm			348	351	349	350	360
pH	pH	7.0:10.5	AO	8.33	8.24	8.25	8.11	8.3
TDS	mg/L	500	AO	214	196	194	210	210
Turbidity	NTU			0.23	0.25	0.28	0.34	0.36
Microbiological Parameters								
E.coli	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Total Coliforms	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	0	0
Calculated Parameters								
Total Hardness ($CaCO_3$)	mg/L			154	165	170	164	162
Nitrate	mg/L	10	MAC	<0.020	<0.020	<0.020	<0.02	<0.02
Elements								
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.00001	<0.000002	<0.000002	<0.0000019
Total Metals								
Total Aluminum	mg/L	0.1	OG	<0.003	<0.003	<0.003	<0.003	<0.003
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Arsenic	mg/L	0.01	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Barium	mg/L	1	MAC	0.016	0.0152	0.0165	0.165	0.0162
Total Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	<0.050	<0.050	<0.050	<0.05	<0.05
Total Cadmium	mg/L	0.005	MAC	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.001	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L			<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	0.00025	<0.0002	<0.0002	<0.0002	<0.0002
Total Iron	mg/L	0.3	AO	0.123	0.127	0.13	0.149	0.123
Total Lead	mg/L	0.01	MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Manganese	mg/L	0.02 0.12	AO MAC	**0.139**	**0.144**	**0.152**	**0.147**	**0.135**
Total Molybdenum	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Nickel	mg/L			<0.001	<0.001	<0.001	<0.001	<0.001
Total Selenium	mg/L	0.05	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Silicon	mg/L			11.7	12	11.4	11.8	11.6
Total Silver	mg/L			<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Total Strontium	mg/L			0.147	0.131	0.162	0.152	0.152
Total Thallium	mg/L			<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Titanium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.005	<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	<0.005	<0.005	0.0224	0.0309	0.0393
Total Zirconium	mg/L			<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium	mg/L			37.5	39.3	40.6	40.4	38.9
Total Magnesium	mg/L			14.7	16.2	16.7	15.3	15.7
Total Potassium	mg/L			2.34	2.59	2.6	2.37	2.41
Total Sodium	mg/L	200	AO	8.89	9.59	9.57	8.5	8.7
Total Sulphur	mg/L			8.7	10.2	10.5	8.1	8.6

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.

REGIONAL DISTRICT OF NANAIMO

French Creek Distribution (Tap Water) Analysis
1228 Sunrise Drive

CDWG=Canadian Drinking Water Guidelines
MAC=Maximum Acceptable Concentration
OG= Operational Guidance Value
AO= Asthetic Objective.

Orange font indicates non-compliance with the Aesthetic Objective in the Canadian Drinking Water Guidelines (CDWG)
Red font indicates non-compliance with the Maximum Acceptable Concentration (MAC) in the CDWG

	Units	CDWG		May 13 2014	May 19 2015	May 10 2016	May 8 2017	May 7 2018	May 13 2019	May 21 2020
Miscellaneous Inorganics										
Fluoride	mg/L	1.5	MAC	0.1	0.11	0.11	0.12	0.11	0.11	0.11
Alkalinity (total as CaCO)	mg/L			140	128	141	144	127	137	130
Anions										
Dissolved Sulphate	mg/L	500	AO	25.8	22	29.5	26.4	27.6	28.4	36
Dissolved Chloride	mg/L	250	AO	9.4	11	12	12	11	12	13
Nitrite	mg/L	1	MAC	<0.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.005	<0.005
Miscellaneous										
Apparent Colour	Colour Unit			36	10	30	10	20	<2	20
Nutrients										
Total Ammonia	mg/L			<0.02	0.0099	0.016	0.11	0.028	<0.015	0.061
Physical Properties										
Conductivity	µS/cm			337	331	350	344	336	354	350
pH	pH	7.0:10.5	AO	8.2	8.17	8.29	8.27	8.12	8.14	8.09
TDS	mg/L	500	AO	222	194	188	204	198	210	210
Turbidity	NTU			1.1	1.3	1.29	1.85	1.37	1.33	1.5
Microbiological Parameters										
E.coli	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	<1.0	<1.0	0	0
Total Coliforms	MPN/100mL	<1	MAC	<1.0	<1.0	<1.0	<1.0	<1..0	0	0
Calculated Parameters										
Total Hardness (CaCO)	mg/L			160	135	145	181	144	154	154
Nitrate	mg/L	10	MAC	<0.05	<0.020	<0.020	<0.020	<0.020	<0.02	<0.02
Elements										
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.00001	<0.00001	<0.00001	<0.000002	<0.000002	<0.0000019
Total Metals										
Total Aluminum	mg/L	0.1	OG	<0.025	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Arsenic	mg/L	0.01	MAC	<0.00025	<0.00012	<0.0001	0.00012	<0.0001	<0.00012	<0.0001
Total Barium	mg/L	1	MAC	0.0169	0.0151	0.016	0.0191	0.015	0.0156	0.0163
Total Beryllium	mg/L			<0.00025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	0.027	<0.050	<0.050	<0.050	<0.050	<0.05	<0.05
Total Cadmium	mg/L	0.005	MAC	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.0025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L			<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	0.0025	0.00148	0.00069	0.0009	0.00102	0.00119	0.00096
Total Iron	mg/L	0.3	AO	0.143	0.113	0.117	0.125	0.123	0.11	0.104
Total Lead	mg/L	0.01	MAC	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Manganese	mg/L	0.02 0.12	AO MAC	**0.139**	**0.125**	**0.123**	**0.142**	**0.127**	**0.107**	**0.105**
Total Molybdenum	mg/L			0.00056	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Nickel	mg/L			<0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Selenium	mg/L	0.05	MAC	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Silicon	mg/L			12.5	11.5	12.4	15.6	12.5	11.4	11.7
Total Silver	mg/L			<0.00025	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Total Strontium	mg/L			0.146	0.136	0.146	0.163	0.146	0.137	0.15
Total Thallium	mg/L			<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Titanium	mg/L			<0.0025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	0.0188	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Zirconium	mg/L				<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium	mg/L			39	34	34.6	44.7	34.9	37.3	37.5
Total Magnesium	mg/L			15.1	12.2	14.2	16.9	13.7	14.7	14.5
Total Potassium	mg/L			2.6	2.29	2.48	3.05	2.32	2.49	2.5
Total Sodium	mg/L	200	AO	15.4	11.3	12.5	14.1	11.7	12.2	12
Total Sulphur	mg/L				8.8	8.8	10.9	8.8	9.4	9.7

Notes below about Manganese (2019) from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

Type	Parameter (published, reaffirmed)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I = Inorganic chemical parameter	Manganese (2019)	0.12	AO: <0.02	Dissolution of naturally-occurring minerals commonly found in soil and rock. Other sources include industrial discharge, mining activities and leaching from landfills.	**Health Basis of MAC:** Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. **Other:** Formula-fed infants (where water containing manganese at levels above the MAC is used to prepare formula) may be especially at risk.	AO based on minimizing the occurrence of discoloured water, consumer complaints and staining of laundry.