

# REGIONAL DISTRICT OF NANAIMO

## Water Service Area Annual Report 2020



### Descanso Bay Regional Park Water System



August 2021

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Appendix A - Map of Descanso Bay Regional Park Water System

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## 1. Introduction

The following annual report describes the Descanso Bay Regional Park Water System and 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. Descanso Bay Regional Park Water System

The Regional District acquired the Descanso Bay Regional Park property in 2002 from the Coastal Community Credit Union. The park is accessed from Taylor Bay Road and comprises an area of 16 hectares (40 acres) on the west side of Gabriola Island. The water source comes from one groundwater well located within the park. The water is filtered, disinfected with ultraviolet radiation, and stored in a pressure tank. A portable generator is available for emergency power outages. A map of the Descanso Bay Regional Park Water System is provided in Appendix A for reference.

### 2.1 Groundwater Well

The Descanso Bay Regional Park well is 54.8 metres deep and located approximately 50 metres northwest of the campground office. The well water is filtered with a 5 and 10 micron filter, and then disinfected with UV (ultraviolet) radiation.

### 2.2 Storage Tank

A small pressure tank is present for water storage.

### 2.3 Distribution System

Campground users have access to potable drinking water from an outside tap on the water treatment building, located near the campground office. A small-diameter water service line is present from the pumphouse to the caretaker's residence (and adjoining campground office). The 5 former standpipes that were located throughout the campground were removed due to misuse. In this regard, the water distribution system is no longer in use (675 metres of 3-inch PVC pipe). No fire hydrants are located in this water system.



**Descanso Bay Park  
Water Treatment  
Building**

### 3. Water Sampling and Testing Program

Water sampling and testing is carried out monthly from a standpipe in the water system. The following table includes a summary of all testing:

Timing	Location	Tests
Monthly (from May to Sept)	BC Centre for Disease Control	Total coliforms, E.Coli
Quarterly (from Oct to April)	BC Centre for Disease Control	Total coliforms, E.Coli
Annually (October)	Bureau Veritas Lab	Complete potability testing of raw well water at wellhead, including UV Transmittance
Annually (May)	Bureau Veritas Lab	Complete potability testing of treated water

### 4. Water Quality - Source Water and Distribution System

Water quality testing results for both the source water and distribution system are provided at the end of this report under Appendix B. Bacteriological results are posted on the RDN website at [www.rdn.bc.ca/descanso-bay-regional-park-water-system](http://www.rdn.bc.ca/descanso-bay-regional-park-water-system)

### 5. Water Quality Inquiries and Complaints

No complaints were received from the Descanso Bay Regional Park Water System in 2020. Inquiries were limited to seasonal campground hours.

### 6. Groundwater Production and Consumption

The campground is only used seasonally, but the caretaker lives in the park all year-round. A water meter was installed in 2020 to record the volume of groundwater pumped from the Descanso Bay Regional Park well. The volume of groundwater pumped in 2020 was 62 cubic metres for the entire year.

### 7. Maintenance Program

A daily pump station inspection is carried out to reduce or eliminate the risk of contamination and system failure. Twenty-four hour on-call coverage is in place to respond to water system emergencies and alarms.

## 8. 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 Park Operator has the Small Water Systems Operator certification. The operators receive ongoing training and certification in:

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

## 9. Water System Projects

### 9.1 2020 Completed Studies & Projects

- Removed standpipes within the campground;
- Installed a water meter to measure groundwater production; and
- Calibrated and serviced all Hach spectrophotometer lab equipment.

### 9.2 2021 Proposed Projects & Upgrades

- Review well protection plan; and
- Implement the next 10-year DWWP Water Conservation Plan.

## 10. 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.



**Campground Trail, Descanso Bay Regional Park**

## 11. 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. 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. Closing

An annual report for the year 2021 will be prepared and submitted to Island Health in the Spring of 2022. The Descanso Bay Regional Park Water System Annual Report is also available on our website at: [www.rdn.bc.ca/descanso-bay-regional-park-water-system](http://www.rdn.bc.ca/descanso-bay-regional-park-water-system) .

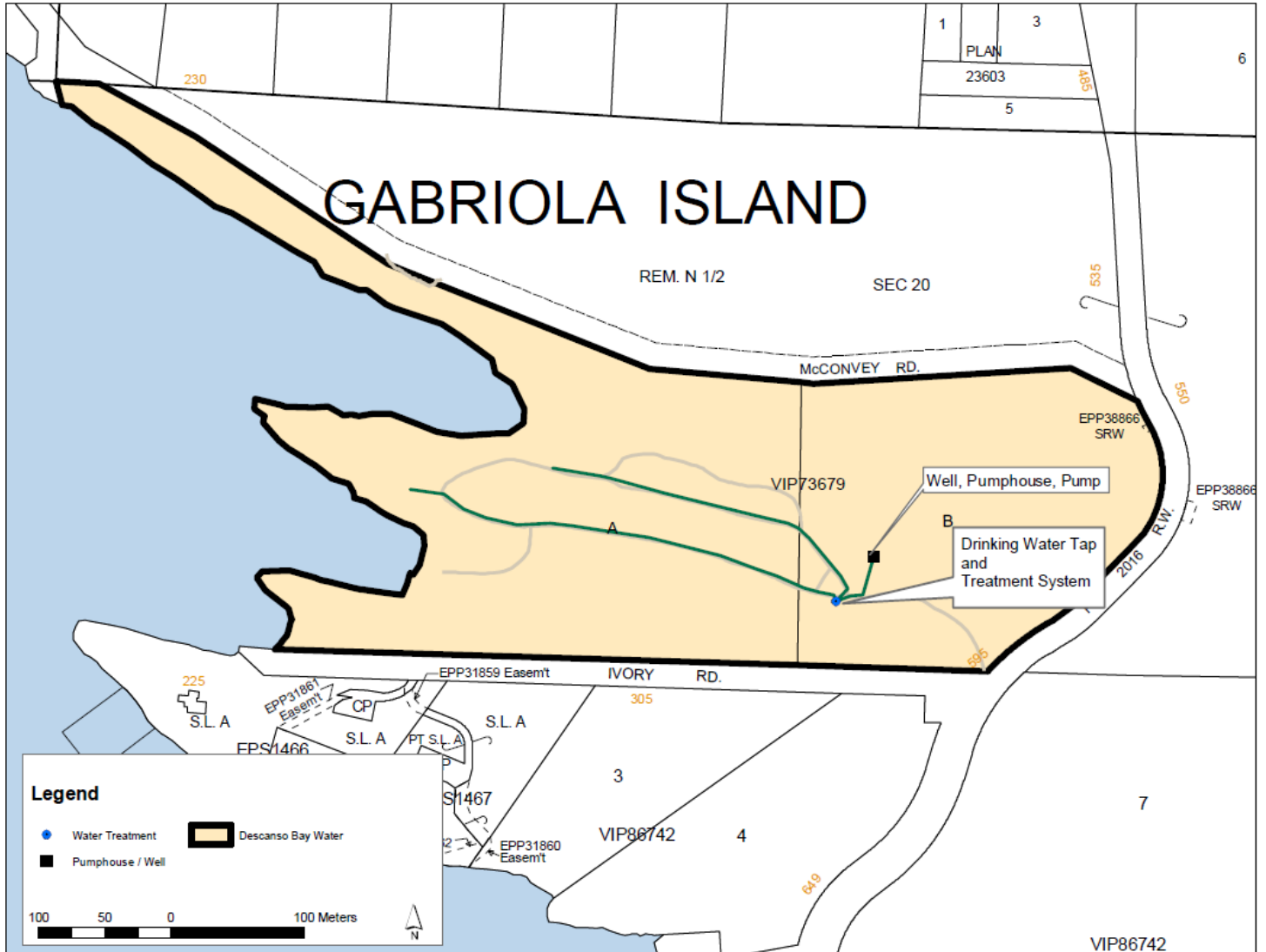


North Cove, Gabriola Island

**APPENDIX A**

**MAP OF DESCANSO BAY REGIONAL PARK  
WATER SYSTEM**

DESCANSO BAY REGIONAL PARK  
WATER SYSTEM





## APPENDIX B

### WATER QUALITY TESTING RESULTS

# DESCANSO BAY PARK WATER SYSTEM



**Facility Location:**

595 Taylor Bay Rd, Gabriola Island

**Facility Information:** Facility Type: 2-14 connections DWS

**Facility Sampling History:**

<u>Location</u>	<u>Date</u>	<u>Total Coliform</u>	<u>E. Coli</u>
Descanso Bay Pumphouse, 595 Taylor Bay Road	2-Dec-2020	LT1	LT1
Descanso Bay Pumphouse, 595 Taylor Bay Road	4-Nov-2020	LT1	LT1
Descanso Bay Pumphouse, 595 Taylor Bay Road	7-Oct-2020	LT1	LT1
Descanso Bay Pumphouse, 595 TAYLOR BAY RD	9-Sep-2020	LT1	LT1
Descanso Bay Pumphouse, 595 TAYLOR BAY RD	5-Aug-2020	LT1	LT1
Descanso Bay Pumphouse, 595 Taylor Bay Road	2-Jul-2020	LT1	LT1
Descanso Bay Pumphouse, 595 TAYLOR BAY RD	3-Jun-2020	LT1	LT1
Standpipe #3 - Descanso Bay , 595 TAYLOR BAY RD	1-Apr-2020	LT1	LT1
AUDIT Descanso Bay Regional Park (Manager's Cabin), 595 Taylor Bay Road	19-Mar-2020	LT1	LT1
Standpipe #4 Descanso Bay Regional Park, 595 Taylor Bay Road	5-Mar-2020	LT1	LT1
Descanso Bay - Stand pipe #5, 595 Taylor Bay Rd	5-Mar-2020	LT1	LT1
Descanso Bay - Stand pipe #5, 595 Taylor Bay Rd	5-Feb-2020	LT1	LT1
Standpipe #4 Descanso Bay Regional Park, 595 Taylor Bay Road	5-Feb-2020	LT1	LT1
Descanso Bay - Stand pipe #5, 595 Taylor Bay Rd	9-Jan-2020	L1	L1
Standpipe #4 Descanso Bay Regional Park, 595 Taylor Bay Road	9-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

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		April 8 2014	Nov. 12 2014	May 16 2016	October 4 2016	June 20 2017	Nov. 29 2018	Dec 4 2019	Feb 25 2021
<b>Miscellaneous Inorganics</b>											
Fluoride	mg/L	1.5	MAC	0.26	0.58	0.032	0.28	0.64	0.26	0.31	0.24
Alkalinity (total as CaCO <sub>3</sub> )	mg/L			140	150	148	144	146	138	140	180
<b>Anions</b>											
Dissolved Sulphate	mg/L	500	AO	5.5	6.8	6.13	5.9	6.2	6.4	5.8	5.7
Dissolved Chloride	mg/L	250	AO	14	13.6	14	14	15	15	16	16
Nitrite	mg/L	1	MAC	<0.05	<0.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.005	<0.005
<b>Miscellaneous</b>											
Apparent Colour	Colour Unit			5	6	10	5	5	5	5	10
<b>Nutrients</b>											
Total Ammonia	mg/L			<0.02	<0.02	0.0067	0.015	0.031	<0.020	0.53	0.14
<b>Physical Properties</b>											
Conductivity	µS/cm			312	338	322	323	333	315	320	320
pH	pH	7.0:10.5	AO	8	8.1	8.34	8.25	8.36	8.21	8.11	6.95
TDS	mg/L	500	AO	190	196	184	190	178	160	190	190
Turbidity	NTU			0.5	<0.5	0.4	0.18	0.44	0.15	0.16	0.23
<b>Microbiological Parameters</b>											
E.coli	MPN/100mL	1	MAC	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0	0
Total Coliforms	MPN/100mL	1	MAC	<1.0	<1.0	53.1	1	43	<1.0	0	0
<b>Calculated Parameters</b>											
Total Hardness (CaCO <sub>3</sub> )	mg/L			60	46	55.2	52.4	48.9	53.8	51.5	49
Nitrate	mg/L	10	MAC	<0.05	<0.05	<0.020	<0.020	<0.020	<0.020	<0.02	<0.02
<b>Elements</b>											
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000002	<0.000002	<0.000019
<b>Total Metals</b>											
Total Aluminum	mg/L	0.1	OG	0.028	0.013	0.0036	0.0073	0.0158	0.0032	0.0094	<0.003
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Arsenic	mg/L	0.01	MAC	0.00151	0.00113	0.00139	0.00123	0.00102	0.00128	0.00126	0.00136
Total Barium	mg/L	1	MAC	0.00042	0.00079	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Beryllium	mg/L			<0.00025	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.0005	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	0.159	0.282	0.21	0.161	0.414	0.132	0.151	0.127
Total Cadmium	mg/L	0.005	MAC	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.0025	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L			<0.0005	<0.0001	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	0.0011	0.0017	0.00627	0.00448	0.00308	0.00185	0.00072	0.0012
Total Iron	mg/L	0.3	AO	0.028	0.013	0.0313	0.0145	0.0208	0.0062	0.0207	0.0057
Total Lead	mg/L	0.01	MAC	0.0005	0.0002	0.00044	0.00045	0.00024	0.00083	0.00027	0.00036
Total Manganese	mg/L	0.02 0.12	AO MAC	0.034	0.0022	0.0033	0.0059	0.0048	0.0287	0.0198	0.025
Total Molybdenum	mg/L			0.00161	0.00486	0.002	0.0019	0.0049	0.0015	0.0022	0.0014
Total Nickel	mg/L			<0.0010	<0.0002	<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	<0.001	<0.0001	<0.0001	<0.0001
Total Silicon	mg/L			10.3	8.28	10.8	10.1	10.3	9.53	8.74	8.92
Total Silver	mg/L			<0.00025	<0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Total Strontium	mg/L			0.0638	0.0507	0.0591	0.0575	0.0486	0.059	0.054	0.0557
Total Thallium	mg/L			<0.00005	<0.00001	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.0005	0.0008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Titanium	mg/L			<0.0025	0.0006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.00005	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.0005	0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	0.0113	0.0054	0.0092	0.006	<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			19	15	17.4	16.4	16.1	16.9	16.1	14.8
Total Magnesium	mg/L			3.11	2.04	2.85	2.76	2.11	2.82	2.75	2.96
Total Potassium	mg/L			<0.5	<0.1	0.14	0.133	0.174	0.128	0.132	0.127
Total Sodium	mg/L	200	AO	59.6	63.9	57.3	53.4	67.3	51.1	54.2	48.8
Total Sulphur	mg/L					<3.0	<3.0	<3.0	<3.0	<3	<3
UV Transmittance	%/cm			95.4	95.8	94.9		93.4	96	96	96.4

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.	<b>Health Basis of MAC:</b> Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. <b>Other:</b> 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.

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 in the Canadian Drinking Water Guidelines (CDWG)

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

	Units	CDWG		April 8 2014	Nov 12 2014	May 16 2016	Oct 4 2016	June 20 2017	Nov 29 2018	June 6 2019	May 28 2020
<b>Miscellaneous Inorganics</b>											
Fluoride	mg/L	1.5	MAC	0.21	0.39	0.29	0.29	0.64	0.26	0.39	0.5
Alkalinity (total as CaCO <sub>3</sub> )	mg/L			140	150	147	141	145	136	140	140
<b>Anions</b>											
Dissolved Sulphate	mg/L	500	AO	5.6	6.4	5.79	6.1	6.44	6.2	6.2	5.8
Dissolved Chloride	mg/L	250	AO	14.5	14.2	14	14	15	15	15	17
Nitrite	mg/L	1	MAC	<0.05	<0.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.005	<0.005
<b>Miscellaneous</b>											
Apparent Colour	Colour Unit			5	5	10	5	5	<5.0	15	5
<b>Nutrients</b>											
Total Ammonia	mg/L			<0.02	<0.02	0.0055	0.01	0.018	<0.020	<0.015	0.11
<b>Physical Properties</b>											
Conductivity	µS/cm			312	335	322	323	333	309	323	320
pH	pH	6.5-8.5	AO	8	8.1	8.34	8.24	8.37	8.15	8.01	7.95
TDS	mg/L	500	AO	186	196	170	200	198	156	176	200
Turbidity	NTU			<0.5	<0.5	<0.10	0.16	0.28	0.22	0.14	0.31
<b>Microbiological Parameters</b>											
E.coli	MPN/100mL	1	MAC	<1.0	<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	<1.0	0	0
<b>Calculated Parameters</b>											
Total Hardness (CaCO <sub>3</sub> )	mg/L			57	51	56	52.2	47.4	54.2	47.8	42.2
Nitrate	mg/L	10	MAC	<0.05	<0.05	<0.020	<0.020	<0.020	<0.020	<0.02	<0.02
<b>Elements</b>											
Total Mercury	mg/L	0.001	MAC	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000002	<0.000002	<0.0000019
<b>Total Metals</b>											
Total Aluminum	mg/L	0.1	OG	<0.025	0.009	0.0037	0.0048	0.0133	<0.003	0.0047	0.0076
Total Antimony	mg/L	0.006	MAC	<0.0005	<0.0001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Arsenic	mg/L	0.01	MAC	0.00125	0.00116	0.00144	0.00119	0.001	0.00124	0.0011	0.00142
Total Barium	mg/L	1	MAC	<0.00025	0.00065	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Beryllium	mg/L			<0.00025	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth	mg/L			<0.0005	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Boron	mg/L	5	MAC	0.142	0.226	0.208	0.151	0.417	0.131	0.191	0.239
Total Cadmium	mg/L	0.005	MAC	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Total Chromium	mg/L	0.05	MAC	<0.0025	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L			<0.0005	<0.0001	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Total Copper	mg/L	1	AO	0.0023	0.003	0.0105	0.00445	0.00442	0.00788	0.00113	0.00293
Total Iron	mg/L	0.3	AO	<0.010	0.019	0.0121	0.0071	0.0119	<0.005	0.0089	0.0126
Total Lead	mg/L	0.01	MAC	<0.0005	<0.0001	0.00025	<0.0002	0.00023	0.00053	0.00042	0.00037
Total Manganese	mg/L	0.02 0.12	AO MAC	0.025	<0.0010	<0.001	0.0045	0.0015	0.013	0.0085	0.0023
Total Molybdenum	mg/L			0.00135	0.00363	<0.002	0.0018	0.005	0.0015	0.003	0.0029
Total Nickel	mg/L			<0.0010	<0.0002	<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	<0.0001
Total Silicon	mg/L			9.52	8.97	11.1	9.82	9.74	9.55	8.8	8.24
Total Silver	mg/L			<0.00025	<0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Total Strontium	mg/L			0.0589	0.0555	0.0588	0.0576	0.0473	0.0588	0.0516	0.047
Total Thallium	mg/L			<0.00005	<0.00001	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Total Tin	mg/L			<0.0005	0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Titanium	mg/L			<0.0025	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Uranium	mg/L	0.02	MAC	<0.00005	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium	mg/L			<0.0005	0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Zinc	mg/L	5	AO	0.0137	0.0071	0.0114	0.0072	0.0067	0.0136	<0.005	0.0118
Total Zirconium	mg/L					<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Total Calcium	mg/L			17.9	16.4	17.7	16.4	15.5	17	15.1	13.5
Total Magnesium	mg/L			2.87	2.4	2.86	2.71	2.1	2.87	2.44	2.09
Total Potassium	mg/L			<0.5	<0.1	0.146	0.13	0.17	0.129	0.124	0.124
Total Sodium	mg/L	200	AO	54.5	62.1	58.2	52.2	65.8	50.9	52.8	54.8
Total Sulphur	mg/L					<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

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.	<b>Health Basis of MAC:</b> Effects on neurological development and behaviour; deficits in memory, attention, and motor skills. <b>Other:</b> 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.