



Making a difference...together

**FERNWOOD AND HIGHLAND WATER SERVICE COMMISSION  
ANNUAL GENERAL MEETING**

Notice of Meeting on **Thursday, June 8, 2023 at 12:30 pm**

Salt Spring Island Multi Space (SIMS) Boardroom, 124 Rainbow Road, Salt Spring Island, BC

Gary Holman

Laura Travelbea

Brian Travelbea

Carollin Wentworth

**Zoom:**

<https://us06web.zoom.us/j/83355376889?pwd=b05Oa0dwOHFES0Z1UDBrbW1TNGFHdz09>

**AGENDA**

**Purpose of the Annual General Meeting**

The agenda for the Annual General Meeting (AGM) is approved by the members of the Commission. The purposes (and hence the agenda items) of the meeting are:

- To have the last year's AGM minutes approved (by Commission members), and to present reports on the work of the Commission on the past year's operation, maintenance, capital upgrades and financial information of the service to the service residents and owners,
- To nominate members for appointment to the Commission, and
- To enable the public to share comments on subjects which relate to the work of the Commission. The Commission can identify (under "new business") issues on which it wants feedback at the meeting. Motions raised by the public at the AGM will be considered by the commission at a subsequent regular meeting.

The Annual General Meeting is for the 2022 fiscal year.

1. **Territorial Acknowledgment / Call Meeting to Order**
2. **Election of Chair**
3. **Approval of Agenda** **1-2**
4. **Adoption of Minutes of the 2021 Annual General Meeting held on June 3, 2022** **3-4**
  - Adoption of Special Minutes of April 6, 2023 **5-6**
5. **Director and Chair's Report**
6. **Report**
  - 6.1 **Annual Report for the 2022 Fiscal Year** **7-16**

There is no recommendation. This report is for information only.
7. **New Business – None**
8. **Outstanding Business – None**

*To ensure quorum, advise Shayla Burnham 250 537 4448 if you cannot attend.*

EXEC-1295039085-2276

**9. Next Meeting – TBD**

**10. Adjournment**



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**Minutes of the Fiscal Year 2021 Annual General Meeting of the Fernwood and Highland Water Service Commission**  
**Held Thursday, June 3, 2022, Creekside Meeting Room (CRD Office) 108-121 McPhillips Avenue, Salt Spring Island, BC**

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**DRAFT**

**Present:**       **Director:** Gary Holman  
                  **Commission Members:** Laura Travelbea, Brian Travelbea and Carolin Wentworth  
                  **Staff:** Karla Campbell, Senior Manager; Dean Olafson, Manager Engineering; Dan Robson, Manager, Saanich Peninsula and Gulf Islands Operations; Lia Xu, Manager, Finance Services (via Zoom); and Shayla Burnham, Recording Secretary

**1. Territorial Acknowledgement / Call Meeting to Order**

Chair L. Travelbea provided a Territorial Acknowledgement and the meeting was called to order at 10:00 am.

**2. Approval of Agenda**

**MOVED** by Commissioner B. Travelbea, **SECONDED** by Director Holman, that the Fernwood and Highland Water Service Commission agenda for the Fiscal Year 2021 Annual General Meeting be approved as presented.

**CARRIED**

**3. Adoption of Minutes of the 2020 Annual General Meeting held on January 13, 2022**

**MOVED** by Commissioner B. Travelbea, **SECONDED** by Director Holman, that the Fernwood and Highland Water Service Commission meeting minutes from the Fiscal Year 2020 held on January 13, 2022 be approved as presented.

**CARRIED**

- The Commission requested an update regarding item 6.1 Annual Report for 2020 Fiscal Year, bullet number three, "Discussion with the Ministry of Environment (MOE) underway regarding potential residual land application processes" and staff confirmed no update.

**4. Director and Chair's Report**

**Director Holman** briefly reported:

- The Local Community Commission (LCC) Advisory Committee has met two times, with a third meeting scheduled for Monday, June 6, 2022. Broadens representation with the possibility of consolidating island wide services under an elected LCC.

**Chair Travelbea** – No report.

**5. Report**

**5.1 Annual Report for 2021 Fiscal Year**

- Staff provided a brief overview of the Annual Report for 2021 Fiscal Year.
- Staff to update page 6 of the agenda package, under the header “Water Production and Demand” from “689,637 cubic meters (m<sup>3</sup>) of water was extracted” to “68,637 cubic meters (m<sup>3</sup>) of water was extracted.”
- The Commission asked how many water licences the Fernwood and Highland Water Service holds and staff confirmed five.
- Discussion regarding potential future affordable housing within the service area occurred and staff confirmed the Commission’s request for a report. Staffing shortages and capacity issues were also discussed and a timeline for the report could not be confirmed.

There is no recommendation. This report is for information only.

**6. Election of Chair and Commissioners**

- The Notice of Annual General Meeting was advertised as per requirements and staff called for nominations from the floor. After hearing none, L. Travelbea and B. Travelbea both agreed to stand for another two year term beginning on January 1, 2023 and ending on December 31, 2024.
- Director Holman nominated L.Travelbea as Chair. After hearing no other nominations, L. Travelbea was re-elected as Chair.

**7. New Business – None**

**8. Next Meeting – TBD**

**9. Adjournment**

**MOVED** by Commissioner B. Travelbea, **SECONDED** by Commissioner Wentworth, that the meeting be adjourned at 10:50 am.

**CARRIED**

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**CHAIR**

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**SENIOR MANAGER**



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**Minutes of the Special Meeting of the Fernwood and Highland Water Service Commission  
Held April 6, 2023 at the Creekside Meeting Room (CRD Office) #108-121 McPhillips  
Avenue, Salt Spring Island, BC V8K 2T6**

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**DRAFT**

**Present:**       **Director:** Gary Holman  
                  **Commission Members:** Laura Travelbea (via Zoom) and Carolin Wentworth  
                  **Staff:** Dean Olafson, Salt Spring Island Engineering Manager and  
                  Shayla Burnham, Recording Secretary  
                  **Regrets:** Brian Travelbea

These minutes follow the order of the agenda although the sequence may have varied.

**1. Territorial Acknowledgement / Call Meeting to Order**

A Territorial Acknowledgement was provided by Dean Olafson and the meeting was called to order at 12:35pm.

**2. Election of the Chair**

Postponed to the Annual General Meeting scheduled Thursday, June 8, 2023.

**MOVED** by Director Holman, **SECONDED** by Commissioner Travelbea, that the Fernwood and Highland Water Service Commission appoint Commissioner Wentworth as Chair of the meeting.

**CARRIED**

**3. Approval of Agenda**

**MOVED** by Director Holman, **SECONDED** by Commissioner Travelbea, that the Fernwood and Highland Water Service Commission approval the Thursday, April 6, 2023 agenda as presented.

**CARRIED**

**4. Report**

**4.1 Replacement of Upper Reservoir for Highland Fernwood Water System –  
Design Option Update & Funding Source**

- New tanks will be in the same approximate location as the existing tanks.
- It was asked if the existing tanks were the main source of ongoing leaks. Staff to confirm and report back to the Commission at a future date.
- Inflation concerns expressed if the project was postponed.

**MOVED** by Director Holman, **SECONDED** by Commissioner Travelbea, that the Highland Fernwood Water Service Commission recommend the Capital Regional District proceed with detailed design for the Upper Reservoir and pursue a Twin, 45 m<sup>3</sup>, welded, carbon steel tanks with epoxy coating with a total project budget of \$70,000 funded from surplus funds from completed capital projects.

**CARRIED**

**4.2 Request Additional Funds to Complete the Highland Fernwood Water Intake Project**

**MOVED** by Commissioner Travelbea, **SECONDED** by Director Holman, that the Highland Fernwood Water Service Commission recommends to the Capital Regional District Board that the Highland Fernwood 2023 Five-Year Capital Plan be amended to increase the Highland Fernwood Intake Project budget by an additional \$53,000 from \$147,000 to \$200,000, to be funded \$43,000 from Community Works Funds and \$10,000 from Capital Reserves.

**CARRIED**

Commissioner Travelbea left the meeting at 1:12pm.

- 5. Next Meeting – Thursday, June 8, 2023 at 12:30PM in the Creekside Meeting Room (CRD Office) #108-121 McPhillips Avenue, Salt Spring Island, BC V8K 2T6**
- 6. Adjournment**

**MOVED** by Commissioner Wentworth, **SECONDED** by Director Holman, that the Fernwood and Highland Water Service Commission adjourn the meeting at 1:14pm.

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**CHAIR**

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**SENIOR MANAGER**

# Fernwood and Highland Water Service

2022 Annual Report

**CRD** | Drinking Water

## INTRODUCTION

This report provides a summary of the Fernwood and Highland Water Service for 2022. It includes a description of the service, summary of the water supply, demand and production, drinking water quality, operations highlights, capital project updates and financial report.

## SERVICE DESCRIPTION

In 2010 the Highland and Fernwood water services merged to construct new water treatment plant to operate as a single water system. Both former water services hold legacy budgets to repay existing debt and outstanding capital works. The service obtains its drinking water from St. Mary Lake, which lies within an uncontrolled multi-use watershed. The Capital Regional District (CRD) holds five licenses to divert a total of up to 230,000 m<sup>3</sup> per year and store up to 30,800 m<sup>3</sup>. St. Mary Lake is subject to seasonal water quality changes and is affected by periodic algae blooms.

The Highland service was first developed in the 1970's under the name Vesuvius Holdings and was converted to the Highland Water System in 1978. It then became a CRD service in 2004. The Fernwood service was created in the 1970's by a private developer and was converted to the Fernwood Improvement Water District in 1984. It then became a Capital Regional District (CRD) service in 1989. The Fernwood and Highland Water Service (Figure 1) is comprised of 333 parcels of land with 321 of those parcels connected to the service.

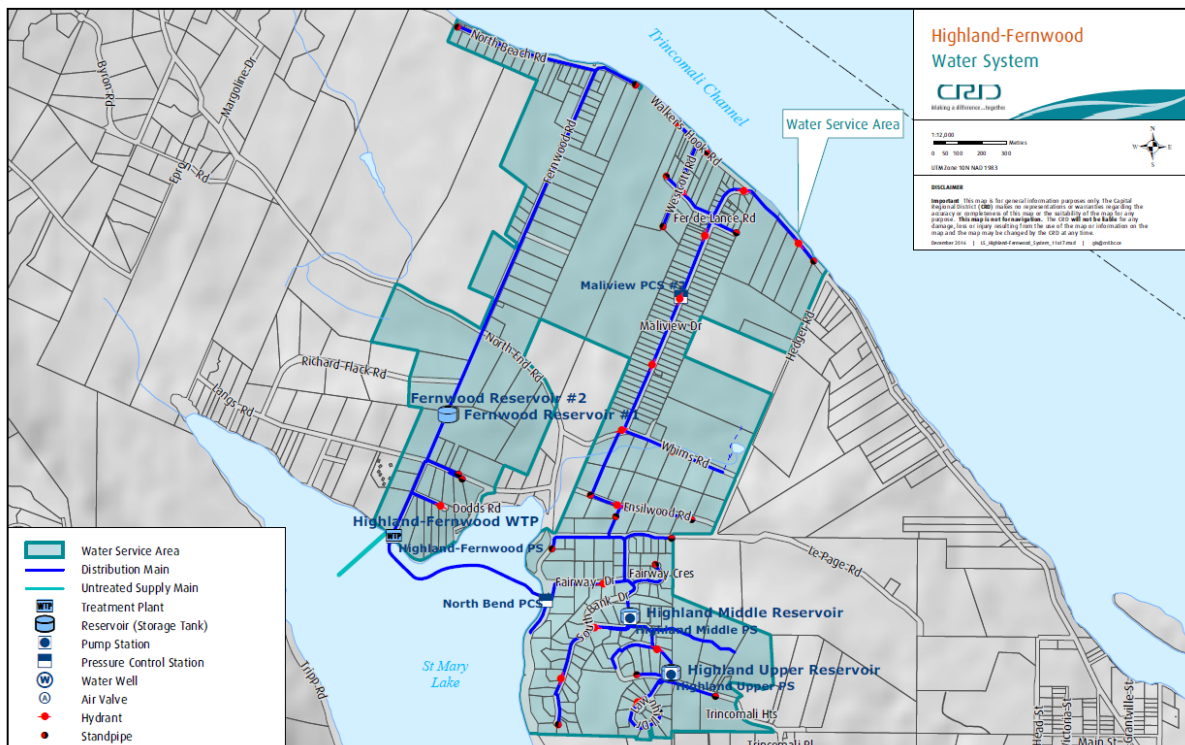


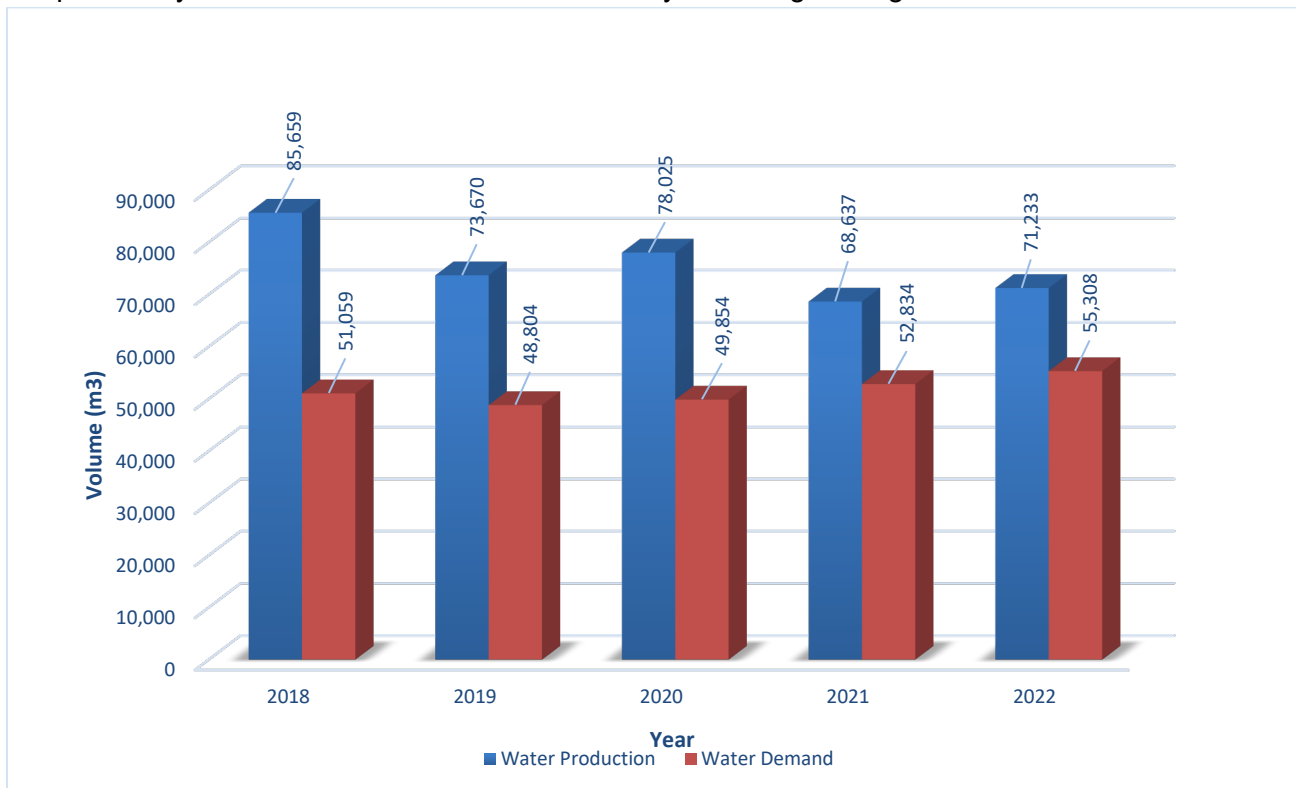
Figure 1: Fernwood and Highland Water Service

The Fernwood and Highland water system is primarily comprised of:

- a water treatment plant (WTP) that draws water from St. Mary Lake and treats it at a location on Maycock Road, adjacent to the lake. The water is treated using a rapid mix system, flocculation, dissolved air floatation (DAF) and filters, ultraviolet disinfection, then chlorination prior to being pumped, via the distribution system to two different reservoirs. The WTP design flow rate is 11.3 l/sec (150 l/gpm);
- one raw water pump station on Maycock Road, adjacent to the lake. (flow rate of two pumps running is 4.6 l/sec (60 l/gpm);
- approximately 12,000 m of water distribution pipe
- 4 water reservoirs – one 180 m<sup>3</sup> (40,000 lg) on the Highland system, one 91 m<sup>3</sup> (20,000 lg) on the Highland system, one 45 m<sup>3</sup> (10,000 lg) on the Fernwood system and, one 91 m<sup>3</sup> (20,000 lg) on the Fernwood system
- 2 water system booster pumps:
  - Highlands Middle Reservoir
  - Highlands Upper Reservoir
- fire hydrants, standpipes, and gate valves
- water service connections complete with water meters
- 2 pressure reducing valve stations - one on North End Road and one on Maliview Drive.

## WATER PRODUCTION AND DEMAND

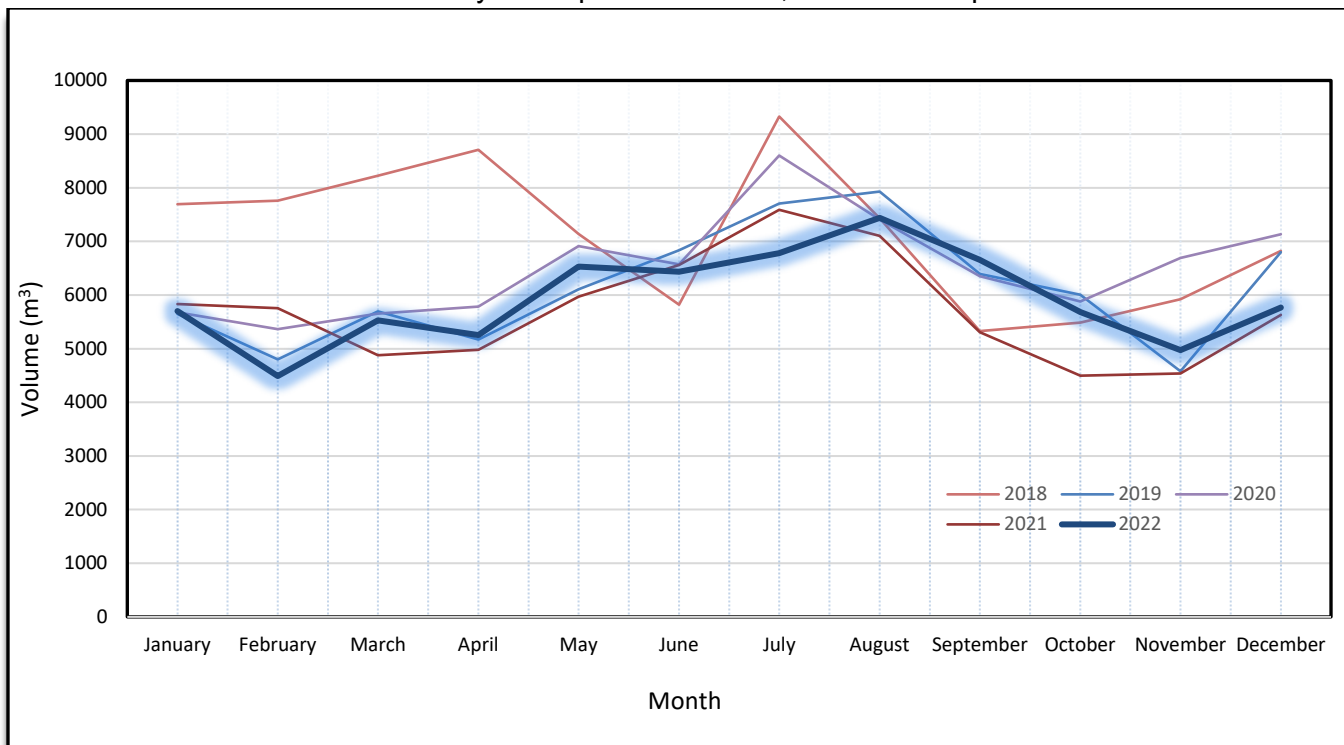
Referring to Figure 2, 71,233 cubic meters (m<sup>3</sup>) of water was extracted (water production) from St. Marys Lake in 2022; a 4% increase from the previous year and a 9% decrease from the five-year rolling average. Water demand (customer water billing) for the service totalled 55,308 m<sup>3</sup> of water; a 5% increase from the previous year and a 9% increase from the five-year rolling average.



**Figure 2: Fernwood and Highland Water Service Annual Water Production and Demand**



Water production by month for the past five years is shown in Figure 3. As with most water systems, water consumption follows a typical diurnal pattern where the monthly total flow peaks during the summer months. The 2022 monthly flow information is indicative of this diurnal pattern. However, for prior years it can be seen that the monthly flow trending does not follow this pattern and is indicative of water system leaks that influence and skew monthly water production data, 2018 case in point.



**Figure 3: Fernwood and Highland Water Service Monthly Water Production**

The Fernwood and Highland Water System is fully metered, and water meters are read quarterly. Water meters are manually read on a quarterly basis and the data enables water production and consumption to be compared in order to estimate leakage losses in the distribution system. The difference between water produced and water demand (total metered consumption) is called non-revenue water and includes distribution leaks, meter error, and unmetered uses such as fire hydrant usage, distribution system maintenance, and process water for the treatment plant. Non-revenue water is approximately 22%. Water loss is estimated to be approximately 19% which is considered low for a small water system such as Fernwood and Highland.

## WATER QUALITY

In 2022, the analytical results (biological, chemical and physical parameters) of water samples collected from the Highland/Fernwood Water Systems indicated that the drinking water supplied to the customers was generally of good quality. The Highland distribution system experienced a water main break that led to a partial Boil Water Advisory (BWA) Sept 20 –23). Also, St. Mary Lake experienced an almost continuous cyanobacteria bloom with particularly high activity from April to June and again from September to October. Various species of potentially toxin producing cyanobacteria were responsible for these blooms but all samples taken from the intake of the Highland/Fernwood Water System tested negative for microcystin, a cyanotoxin frequently associated with such blooms. During these algal events, the Highland/Fernwood water treatment plant was able to produce safe and good quality drinking water.

The data below provides a summary of the water quality characteristics in 2022:

#### Raw Water:

- The raw water exhibited typically low concentrations of total coliform and *E.coli* bacteria throughout the cold weather periods, but much higher spikes during the summer.
- No parasitic *Cryptosporidium* oocysts or *Giardia* cysts were detected in 2022.
- The analyses of raw water samples indicated low concentrations of iron and but elevated concentrations of manganese in the fall (November).
- The raw water was slightly hard (median hardness 36.65 mg/L CaCO<sub>3</sub>).
- The raw water turbidity (cloudiness) was below or near 1 NTU during the winter and summer months, but well over 1 NTU in the spring (April – June; up to 16 NTU) and in the fall (September – October; up to 4.2 NTU). These episodes of high raw water turbidity were the result of strong cyanobacteria blooms.
- A median annual total organic carbon (TOC) concentration of 3.35 mg/L confirms the mesotrophic (semi-productive) to eutrophic (productive) status of St. Mary Lake.
- Cyanobacteria blooms of various species occurred almost all year long in St Mary Lake. Despite the blooms of potentially toxin producing cyanobacteria species, no cyanotoxins (microcystin) were detected in the raw water entering the treatment plant in 2022.

#### Treated Water:

- The treated water was safe to drink outside the period with a BWA; no indicator bacteria were detected in any Fernwood Distribution System or Highland System sample throughout the year.
- The treated water turbidity was typically well below the turbidity limit of 1.0 NTU throughout the year in most parts of the system. However, a few standpipes in the Highland system occasionally registered elevated turbidity. These low flow locations need to be flushed regularly to remove accumulated pipe sediments.
- The levels of regulated disinfection by-products trihalomethanes (THM) were well below the limits in the GCDWQ (100 µg/L) across the Fernwood and the Highland Distribution System. Haloacetic acids (HAA) were not tested for in 2022. As long as THM concentrations are low, HAA tests are only performed every 5 years to verify baseline conditions. The last HAA tests were done in 2021.
- The treated water total organic carbon concentration (TOC) in both distribution systems was similar to 2021, ranging from 1.6 to 1.8 mg/L in the Fernwood Distribution System, and 1.2 to 1.9 mg/L in the Highland Distribution System. There is currently no guideline in the GCDWQ for TOC levels, however the USEPA suggests a treated water TOC concentration of < 2 mg/L as confirmation of effective treatment and disinfection by-product control.
- Iron and/or manganese concentrations, which can lead to water discolouration if present in elevated concentrations, have been below the aesthetic guideline limits throughout both distribution systems.

Table 1, 2 and 3 below provide a summary of the 2022 raw and treated water test results.

Water Quality data collected from these two distribution systems can be reviewed on the following CRD website: <https://www.crd.bc.ca/about/data/drinking-water-quality-reports>

## OPERATIONAL HIGHLIGHTS

The following is a summary of the major operational issues that were addressed by CRD Integrated Water Services staff:

- Emergency response to water system breaks at:
  - Lawnhill Road (resulted in issuing a boil water advisory for a portion of the service area impacted by the watermain break)
  - 307 Maliview Drive (water service line connection)
  - 308 Maliview Drive (water service line connection)
  - 252 Maliview Drive (water service line connection)
  - 196 Maliview Drive (resulted in issuing a boil water advisory for a portion of the service area impacted by the watermain break)
  - 150 Trincomali Drive (water service line connection)
  - 234 Trincomali Drive (water service line connection)
  - 216 Fairway Crescent (water service line connection)
  - Maliview pressure regulating station valve troubleshooting and rebuild
- Water Treatment Plant:
  - UV system repairs (replace UV sensor) and electronic adjustments
  - Replace faulty hand-off-auto (HOA) electronic control switches
  - Replace rinse tank pressure transducer
  - Troubleshooting and rebuild of backflow prevention equipment
  - Repairs dissolved air floatation (DAF) water turbidity meter
- Distribution System:
  - Maliview pressure regulating station valve troubleshooting and rebuild
  - Highlands Upper Pump Station check valve troubleshooting and replacement

## CAPITAL IMPROVEMENTS

### Fernwood and Highland Water Capital Projects

The following is a summary of the major capital improvements including year ending spending for 2022:

Water Intake and Screen (CE.677.7500): Fernwood water intake has not been performing as it should. Investigation and design of a new intake was commenced by a consultant engaged by the CRD. Detailed design is essentially complete with construction scheduled to take place in 2023.

Project	Spending
Budget	\$147,000
Project Management	(\$9,536)
Designs	(\$31,228)
<b>Balance Remaining</b>	<b>\$106,236</b>

Safe Work Procedures (CE.699.4501): The work scope includes reviewing and developing safe work procedures for operational and maintenance tasks. On-going as capital improvements necessitate.

Project	Spending
Budget	\$17,000
Project Management	(\$444)
Contract	(\$3,386)
<b>Balance Remaining</b>	<b>\$13,170</b>

Waste Pump Design and Construction (CE.707.7500): The control panel and pump for the DAF waste pump at the Fernwood and Highland water treatment plant requires replacement. Investigation and design of a new waste pump will be completed by a consultant engaged by the CRD.

Project	Spending
Budget	\$80,000
Project Management	(\$7,710)
Designs	(\$14,247)
<b>Balance Remaining</b>	<b>\$58,043</b>

Highland Upper Reservoir (CE.360.4655): The Highland Upper Reservoir requires replacement. Investigation and design of a new reservoir is in progress by a consultant engaged by the CRD.

Project	Spending
Budget	\$123,179
Project Management	(\$12,782)
Designs	(\$27,629)
<b>Balance Remaining</b>	<b>\$82,768</b>

Power Generation Equipment - Design (CE.735.4501): Preliminary and detailed design for back-up power generation for the service.

Project	Spending
Budget	\$49,000
Project Management	(\$8,346)
Designs	(\$9,269)
<b>Balance Remaining</b>	<b>\$31,385</b>

## 2022 FINANCIAL REPORT

Please refer to the attached 2022 Statement of Operations and Reserve Balances.

Revenue includes parcel taxes (Transfers from Government), fixed user fees (User Charges), water sales (Sale-Water), interest on savings (Interest earnings), transfers from Operating Reserve Fund, and miscellaneous revenue such as late payment charges (Other revenue).

Expenses includes all costs of providing the service. General Government Services includes budget preparation, financial management, utility billing and risk management services. CRD Labour and Operating Costs includes CRD staff time as well as the costs of equipment, tools, and vehicles. Debt servicing costs are interest and principal payments on long term debt. Other Expenses includes all other costs to administer and operate the water system, including insurance, supplies, water testing and electricity.

The difference between Revenue and Expenses is reported as Net revenue (expenses). Any transfers to or from capital or reserve funds for the service (Transfers to own funds) are deducted from this amount and it is then added to any surplus or deficit carry forward from the prior year, yielding an Accumulated Surplus (or deficit). In alignment with Local Government Act Section 374 (11), any deficit must be carried forward and included in the next year's financial plan.

**WATER SYSTEM PROBLEMS - WHO TO CALL:**

To report any event or to leave a message regarding the Highland/Fernwood Water System, call either:

**CRD water system *emergency* call centre:** **1-855-822-4426 (toll free)**

**1-250-474-9630 (toll)**

**CRD water system *general enquiries* (toll free):** **1-800-663-4425**

When phoning with respect to an emergency, please specify to the operator, the service area in which the emergency has occurred.

Submitted by:	Jason Dales, Senior Manager B.Sc, WD IV, Infrastructure Operations
	Glenn Harris, Ph.D., R.P.Bio., Senior Manager, Environmental Protection
	Karla Campbell, MBA, BPA, Senior Manager, Salt Spring Island Electoral Area
	Rianna Lachance, BCom, CPA, CA, Senior Manager Financial Services
Concurrence:	Ted Robbins, B. Sc., C. Tech., Chief Administrative Officer

Attachment:

2022 Statement of Operations and Reserve Balances

[Highland/Fernwood Water](#)

[Highland Water \(Debt Service\)](#)

[Fernwood Water \(Debt Service\)](#)

For questions related to this Annual Report please email [saltspring@crd.bc.ca](mailto:saltspring@crd.bc.ca)

**Table 1: 2022 Summary of Raw Water Test Results, Highland / Fernwood Water System**

PARAMETER		2022 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2012 - 2021 ANALYTICAL RESULTS			
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range Minimum Maximum		≤ Less than or equal to	Median	Samples Analyzed	Range Minimum Maximum	
ND means Not Detected by analytical method used										
<b>Physical/Biological Parameters</b>										
Carbon, Total Organic	mg/L as C	3.35	4	3.10	3.50		3.84	24	2.80	5.67
Chlorophyll	ug/L	1.52	2	0.84	2.20		5.55	26	1.29	17.50
Colour, True	TCU	6.00	19	3.00	8.00		6.00	94	3.00	25.00
Hardness as CaCO <sub>3</sub>	mg/L	36.65	4	36.40	38.50	No Guideline Required	38.90	31	28.10	46.10
pH	pH units	Not tested in 2022				7.0 - 10.5 AO	7.83	25	7.18	8.90
Turbidity	NTU	1.15	18	0.50	16.00		1.10	274	0.33	27.10
Water Temperature	°C	14.00	36	5.00	25.00	15°C AO	16.00	117	5.00	25.00
<b>Microbial Parameters</b>										
<b>Indicator Bacteria</b>										
Coliform, Total	CFU/100 mL	31	18	< 1	302		60	187	< 1	6000
<i>E. coli</i>	CFU/100 mL	< 1	18	< 1	4		< 1	188	< 1	180
Hetero. Plate Count, 7 day	CFU/1 mL	Last analyzed in 2013								
<b>Algal Toxins</b>										
Microcystin (Abraxis)	ug/L	< 1	37	< 1	< 1	1.5	< 1	101	< 1	< 1
<i>Cryptosporidium</i> , Total oocysts	oocysts/100 L	< 1	2	< 1	< 1	Zero detection desirable	< 1	20	< 1	1.92
<i>Giardia</i> , Total cysts	cysts/100 L	< 1	2	< 1	< 1	Zero detection desirable	< 1	20	< 1	1.2
<b>Metals</b>										
Aluminum	ug/L as Al	9	4	< 3	17.3	2900 MAC / 100 OG	< 10	32	< 3	108
Antimony	ug/L as Sb	< 0.5	4	< 0.5	< 0.5	6 MAC	< 0.5	32	0.05	< 10
Arsenic	ug/L as As	0.49	4	0.42	0.73	10 MAC	< 0.5	32	0.32	0.85
Barium	ug/L as Ba	13.15	4	12.4	14.4	100 MAC	12	32	< 1	15.1
Beryllium	ug/L as Be	< 0.1	4	< 0.1	< 0.1		< 0.1	32	< 0.01	< 3
Bismuth	ug/L as Bi	< 1	4	< 1	< 1		< 1	26	< 0.005	< 1
Boron	ug/L as B	< 50	4	< 50	51	5000 MAC	< 50	32	43	343
Cadmium	ug/L as Cd	< 0.01	4	< 0.01	< 0.01	5 MAC	< 0.01	32	< 0.005	0.1
Calcium	mg/L as Ca	9.455	4	9.32	10	No Guideline Required	10	32	7.85	12.3
Chromium	ug/L as Cr	< 1	4	< 1	< 1	50 MAC	< 1	32	< 0.1	< 10
Cobalt	ug/L as Co	< 0.2	4	< 0.2	1.23		< 0.2	32	0.0264	< 20
Copper	ug/L as Cu	1.365	4	0.93	2.75	2000 MAC / ≤ 1000 AO	1	32	< 0.5	< 8
Iron	ug/L as Fe	33.65	4	20.1	98.1	≤ 300 AO	24	32	0.1	176
Lead	ug/L as Pb	< 0.2	4	< 0.2	< 0.2	5 MAC	< 0.2	32	0.0954	1.2
Lithium	ug/L as Li	7	4	6.4	7.6		8	14	7.2	11.5
Magnesium	mg/L as Mg	3.23	4	3.07	3.28	No Guideline Required	3	32	1.09	4.47
Manganese	ug/L as Mn	25.7	4	8.5	110	120 MAC / ≤ 20 AO	16	32	< 4	85.8
Molybdenum	ug/L as Mo	< 1	4	< 1	< 1		< 1	32	0.059	< 20
Nickel	ug/L as Ni	< 1	4	< 1	< 1		< 1	32	0.298	< 50
Potassium	mg/L as K	0.847	4	0.776	0.877		1	32	0.145	1.62
Selenium	ug/L as Se	< 0.1	4	< 0.1	< 0.1	50 MAC	< 0.1	32	< 0.04	0.775
Silicon	ug/L as Si	2675	4	2270	3900		1470	32	345	9530
Silver	ug/L as Ag	< 0.02	4	< 0.02	< 0.02	No Guideline Required	< 0.02	32	< 0.005	< 10
Sodium	mg/L as Na	18.35	4	17.9	18.8	≤ 200 AO	20	32	< 0.05	87.3
Strontium	ug/L as Sr	92.9	4	86.9	96	7000 MAC	95	32	36.7	116
Sulphur	mg/L as S	4.1	4	3.6	4.3		5	26	< 3	8.7
Tin	ug/L as Sn	< 5	4	< 5	< 5		< 5	32	< 0.2	< 20
Titanium	ug/L as Ti	< 5	4	< 5	< 5		< 5	32	0.82	10
Thallium	ug/L as Tl	< 0.01	4	< 0.01	< 0.01		< 0.01	26	< 0.002	< 0.05
Uranium	ug/L as U	< 0.1	4	< 0.1	< 0.1	20 MAC	< 0.1	26	0.0026	< 0.1
Vanadium	ug/L as V	< 5	4	< 5	< 5		< 5	32	< 0.2	16
Zinc	ug/L as Zn	5.55	4	< 5	14.4	≤ 5000 AO	< 5	31	< 1	136
Zirconium	ug/L as Zr	< 0.1	4	< 0.1	< 0.1		< 0.1	26	< 0.1	< 0.5

**Table 2: 2022 Summary of Treated Water Test Results, Fernwood Distribution System**

PARAMETER		2022 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2012 - 2021 ANALYTICAL RESULTS			
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range Minimum Maximum		≤ = Less than or equal to	Median	Samples Analyzed	Range Minimum Maximum	
ND means Not Detected by analytical method used										
<b>Physical Parameters</b>										
Hardness as CaCO <sub>3</sub>	mg/L	38.50	8	36.6	41.6		40.5	40.5	35	35.1
Carbon, Total Organic	mg/L as C	1.70	4	1.6	1.8		2.0	1.95	32	< 0.3
Colour, True	TCU	< 2	1	< 2	< 2		2.3	2.29	18	1.5
pH	pH units	Not tested in 2022					7.5	7.455	4	7.3
Turbidity	NTU	1.30	18	0.1	1.3	1 MAC and ≤ 5 AO	0.2	0.2	274	< 0.14
Water Temperature	°C	14.00	51	6.0	20.0	15°C AO	13.0	13	304	4.0
<b>Microbial Parameters</b>										
<b>Indicator Bacteria</b>										
Coliform, Total	CFU/100 mL	< 1	53	< 1	< 1	0 MAC	< 1	< 1	328	< 1
<i>E. coli</i>	CFU/100 mL	< 1	53	< 1	< 1	0 MAC	< 1	< 1	328	< 1
Hetero. Plate Count, 7 day	CFU/1 mL	Not tested in 2022				No Guideline Required	< 10	< 10	73	0
<b>Algal Toxins</b>										
Microcystin (Abraxis)	ug/L	Not tested in 2022				1.5				
Anatoxin A	ug/L	Last analyzed in 2013					< 0.16	< 0.16	51	< 0.16
Cylindrospermopsin	ug/L	Last analyzed in 2013					< 0.1	< 0.1	51	< 0.1
Microcystin-RR	ug/L	Last analyzed in 2013					< 0.16	< 0.16	51	< 0.16
Microcystin-YR	ug/L	Last analyzed in 2013					< 0.16	< 0.16	51	< 0.16
Microcystin-LR	ug/L	Last analyzed in 2013				1.5 MAC	< 0.16	< 0.16	33	< 0.16
Microcystin-LA	ug/L	Last analyzed in 2013					< 0.16	< 0.16	26	< 0.16
Nodularin	ug/L	Last analyzed in 2013					< 0.1	< 0.1	51	< 0.1
<b>Disinfectants</b>										
<b>Disinfectants</b>										
Chlorine, Free Residual	mg/L as Cl <sub>2</sub>	0.84	50	0.27	1.47	No Guideline Required	1.06	1.06	1303	0.07
Chlorine, Total Residual	mg/L as Cl <sub>2</sub>	Not tested in 2022				No Guideline Required	1.32	1.32	1164	0.29
<b>Disinfection By-Products</b>										
<b>Trihalomethanes (THMs)</b>										
Bromodichloromethane	ug/L	10.5	4	10.0	14		13	36	2.01	25.4
Bromoform	ug/L	< 1	4	< 1	< 1		< 1	36	< 0.1	< 1
Chloroform	ug/L	23	4	16.0	34		22.4	37	9.76	116
Chlorodibromomethane	ug/L	4	4	3.6	4.4		4.85	36	< 0.1	32.1
Total Trihalomethanes	ug/L	39	4	31.0	49	100 MAC	41	35	11.8	146
<b>Haloacetic Acids (HAAs)</b>										
HAA5	ug/L	Not tested in 2022				80 MAC	15.8	10	< 0.1	26
<b>Metals</b>										
Aluminum	ug/L as Al	5.45	8	3.3	11.6	2900 MAC / 100 OG	10	35	3.9	389
Antimony	ug/L as Sb	< 0.5	8	< 0.5	< 0.5	6 MAC	< 0.5	35	< 0.5	< 0.5
Arsenic	ug/L as As	0.345	8	0.2	0.4	10 MAC	0.31	35	0.2	0.76
Barium	ug/L as Ba	12.25	8	10.2	13.9	100 MAC	12	35	9.9	16.4
Beryllium	ug/L as Be	< 0.1	8	< 0.1	< 0.1		< 0.1	35	< 0.1	< 0.1
Bismuth	ug/L as Bi	< 1	8	< 1	< 1		< 1	35	< 1	< 1
Boron	ug/L as B	< 50	8	< 50	< 50	5000 MAC	< 50	35	< 50	53
Cadmium	ug/L as Cd	< 0.01	8	< 0.01	< 0.01	5 MAC	< 0.01	35	< 0.01	0.016
Calcium	mg/L as Ca	10.35	8	9.6	11.5	No Guideline Required	10.9	35	8.9	15.3
Chromium	ug/L as Cr	< 1	8	< 1	< 1	50 MAC	< 1	35	< 1	< 1
Cobalt	ug/L as Co	< 0.2	8	< 0.2	0.7		< 0.2	35	< 0.2	0.23
Copper	ug/L as Cu	4.92	8	2.2	10.4	2000 MAC / ≤ 1000 AO	5.26	35	1.5	83.2
Iron	ug/L as Fe	31.55	8	23.3	73.4	≤ 300 AO	48.5	35	19.6	770
Lead	ug/L as Pb	0.345	8	< 0.2	2.5	5 MAC	0.56	39	< 0.2	78.1
Lithium	ug/L as Li	7	8	6.5	7.2		7.9	11	7.2	11.7
Magnesium	mg/L as Mg	3.035	8	2.7	3.3	No Guideline Required	3.08	35	2.52	3.57
Manganese	ug/L as Mn	2.35	8	< 1	7.0	120 MAC / ≤ 20 AO	2.2	35	< 1	150
Molybdenum	ug/L as Mo	< 1	8	< 1	< 1		< 1	35	< 1	< 1
Nickel	ug/L as Ni	< 1	8	< 1	< 1		< 1	35	< 1	< 1
Potassium	mg/L as K	0.812	8	0.8	0.8		0.789	35	0.702	0.872
Selenium	ug/L as Se	< 0.1	8	< 0.1	< 0.1	50 MAC	< 0.1	35	< 0.1	< 0.1
Silicon	ug/L as Si	2535	8	2210.0	3560.0		1310	35	405	3700
Silver	ug/L as Ag	< 0.02	8	< 0.02	< 0.02	No Guideline Required	< 0.02	35	< 0.02	0.02
Sodium	mg/L as Na	20.3	8	19.8	24.6	≤ 200 AO	22.1	35	19.8	25.2
Strontium	ug/L as Sr	93.7	8	85.9	98.1	7000 MAC	96.2	35	87.1	106
Sulphur	mg/L as S	3.95	8	3.5	4.1		4.7	35	3.7	5.4
Tin	ug/L as Sn	< 5	8	< 5	< 5		< 5	35	< 5	< 5
Titanium	ug/L as Ti	< 5	8	< 5	< 5		< 5	35	< 5	< 5
Thallium	ug/L as Th	< 0.01	8	< 0.01	< 0.01		< 0.01	35	< 0.01	0.042
Uranium	ug/L as U	< 0.1	8	< 0.1	< 0.1	20 MAC	< 0.1	35	< 0.1	< 0.1
Vanadium	ug/L as V	< 5	8	< 5	< 5		< 5	35	< 5	< 5
Zinc	ug/L as Zn	21.55	8	8.4	27.6	≤ 5000 AO	18.5	35	5.6	76.2
Zirconium	ug/L as Zr	< 0.1	8	< 0.1	< 0.1		< 0.1	35	< 0.1	< 0.5

Table 3: 2022 Summary of Treated Water Test Results, Highland Distribution System										
PARAMETER		2022 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2012 - 2021 ANALYTICAL RESULTS			
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range		≤ Less than or equal to	Median	Samples Analyzed	Range	
ND means Not Detected by analytical method used				Minimum	Maximum				Minimum	Maximum
<b>Physical Parameters</b>										
Hardness as CaCO <sub>3</sub>	mg/L	45.5	4	44.2	49.8		46.5	23	40.8	54.9
Carbon, Total Organic	mg/L as C	1.7	8	1.2	1.9		1.885	58	< 0.3	19.7
Colour, True	TCU	< 2	36	< 2	< 2		< 2	34	< 2	2.1
pH	pH units	Not tested in 2022					7.35	4	7.2	8.1
Turbidity	NTU	0.2	44	< 0.14	5.2	1 MAC and ≤ 5 AO	0.3	378	0.1	37.8
Water Temperature	°C	14.0	145	4	22	15°C AO	12	712	4	23.5
<b>Microbial Parameters</b>										
<b>Indicator Bacteria</b>										
Coliform, Total	CFU/100 mL	< 1	154	< 1	< 1	0 MAC	< 1	1067	< 1	209
<i>E. coli</i>	CFU/100 mL	< 1	154	< 1	< 1	0 MAC	< 1	1067	< 1	< 1
Hetero. Plate Count 7 day	CFU/1 mL	Not tested in 2022				No Guideline Required	30	58	< 10	310
<b>Algal Toxins</b>										
Microcystin (Abraxis)	ug/L	Not tested in 2022				1.5				
Anatoxin A	ug/L	Last analyzed in 2013					< 0.16	50	< 0.16	< 0.16
Cylindrospermopsin	ug/L	Last analyzed in 2013					< 0.1	50	< 0.1	< 0.1
Microcystin-RR	ug/L	Last analyzed in 2013					< 0.16	49	< 0.16	< 0.16
Microcystin-YR	ug/L	Last analyzed in 2013					< 0.16	50	< 0.16	< 0.16
Microcystin-LR	ug/L	Last analyzed in 2013				1.5 MAC	< 0.16	32	< 0.16	< 0.16
Microcystin-LA	ug/L	Last analyzed in 2013					0	0	0	0
Nodularin	ug/L	Last analyzed in 2013					< 0.1	50	< 0.1	< 0.1
<b>Disinfectants</b>										
<b>Disinfectants</b>										
Chlorine, Free Residual	mg/L as Cl <sub>2</sub>	0.91	155	0.2	1.89	No Guideline Required	1.05	3357	0.06	4.7
Chlorine, Total Residual	mg/L as Cl <sub>2</sub>	Not tested in 2022				No Guideline Required	1.23	2995	0.08	5.6
<b>Disinfection By-Products</b>										
<b>Trihalomethanes (THMs)</b>										
Bromodichloromethane	ug/L	14.5	8	12	21		16	67	< 0.1	31.9
Bromoform	ug/L	< 1	8	< 1	< 1		< 1	66	< 0.1	4.2
Chloroform	ug/L	29.5	8	22	58		29	69	9.22	127
Chlorodibromomethane	ug/L	5	8	3.8	6.7		5.7	67	< 0.1	15.5
Total Trihalomethanes	ug/L	48.5	8	38	85	100 MAC	52.5	64	21.4	161
<b>Haloacetic Acids (HAAs)</b>										
HAA5	ug/L	Not tested in 2022				80 MAC	19.5	20	9.21	37.7
<b>Metals</b>										
Aluminum	ug/L as Al	9.85	4	7.6	19.1	2900 MAC / 100 OG	16.5	23	4.5	58.8
Antimony	ug/L as Sb	< 0.5	4	< 0.5	< 0.5	6 MAC	< 0.5	23	< 0.5	< 0.5
Arsenic	ug/L as As	0.35	4	0.2	0.5	10 MAC	0.28	23	0.22	0.45
Barium	ug/L as Ba	10.25	4	9.8	12.9	100 MAC	11.2	23	6.7	14.3
Beryllium	ug/L as Be	< 0.1	4	< 0.1	< 0.1		< 0.1	23	< 0.1	< 0.1
Bismuth	ug/L as Bi	< 1	4	< 1	< 1		< 1	23	< 1	< 1
Boron	ug/L as B	< 50	4	< 50	< 50	5000 MAC	< 50	23	< 50	51
Cadmium	ug/L as Cd	< 0.01	4	< 0.01	< 0.01	5 MAC	< 0.01	23	< 0.01	< 0.01
Calcium	mg/L as Ca	15.2	4	14.5	17.8	No Guideline Required	16	23	11.1	19.1
Chromium	ug/L as Cr	< 1	4	< 1	< 1	50 MAC	< 1	23	< 1	< 1
Cobalt	ug/L as Co	< 0.2	4	< 0.2	< 0.2		< 0.2	23	< 0.2	< 0.2
Copper	ug/L as Cu	2.405	4	2.3	2.8	2000 MAC / ≤ 1000 AO	3.65	23	2.02	8.38
Iron	ug/L as Fe	91.45	4	87.0	96.0	≤ 300 AO	123	23	40.9	591
Lead	ug/L as Pb	< 0.2	4	< 0.2	0.2	5 MAC	0.27	23	< 0.2	1.35
Lithium	ug/L as Li	6.85	4	6.6	6.9		7.4	7	7	8.2
Magnesium	mg/L as Mg	1.825	4	1.3	2.0	No Guideline Required	1.9	23	0.95	3.16
Manganese	ug/L as Mn	1.95	4	1.3	5.5	120 MAC / ≤ 20 AO	3	23	< 1	57.9
Molybdenum	ug/L as Mo	< 1	4	< 1	< 1		< 1	23	< 1	< 1
Nickel	ug/L as Ni	< 1	4	< 1	< 1		< 1	23	< 1	< 1
Potassium	mg/L as K	0.8285	4	0.8	0.8		0.779	23	0.721	0.902
Selenium	ug/L as Se	< 0.1	4	< 0.1	< 0.1	50 MAC	< 0.1	23	< 0.1	< 0.1
Silicon	ug/L as Si	2775	4	2320.0	3150.0		1770	23	1190	3490
Silver	ug/L as Ag	< 0.02	4	< 0.02	< 0.02	No Guideline Required	< 0.02	23	< 0.02	< 0.02
Sodium	mg/L as Na	20.4	4	20.3	21.6	≤ 200 AO	22.3	23	19.9	24.1
Strontium	ug/L as Sr	97.45	4	92.9	105.0	7000 MAC	102	23	93	115
Sulphur	mg/L as S	4.1	4	3.6	4.1		4.8	23	3.4	5.7
Tin	ug/L as Sn	< 5	4	< 5	< 5		< 5	23	< 5	< 5
Titanium	ug/L as Ti	< 5	4	< 5	< 5		< 5	23	< 5	< 5
Thallium	ug/L as Th	< 0.01	4	< 0.01	< 0.01		< 0.01	23	< 0.01	< 0.01
Uranium	ug/L as U	< 0.1	4	< 0.1	< 0.1	20 MAC	< 0.1	23	< 0.1	< 0.1
Vanadium	ug/L as V	< 5	4	< 5	< 5		< 5	23	< 5	< 5
Zinc	ug/L as Zn	7.55	4	< 5	10.1	≤ 5000 AO	8.4	23	< 5	17
Zirconium	ug/L as Zn	< 0.1	4	< 0.1	< 0.1		< 0.1	23	< 0.1	< 0.5