

Beddis Water Service

2021 Annual Report



INTRODUCTION

This report provides a summary of the Beddis Water Service for 2021. 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

The Beddis Water Utility is a rural residential community located on Salt Spring Island. The service was created in 1969 as the Beddis Waterworks District and became a CRD service in 2004. The Beddis Water Utility (Figure 1) is comprised of 137 parcels of land of which 128 are presently connected to the system.

The utility obtains its drinking water from Cusheon Lake, a relatively small lake that lies within an uncontrolled multi-use watershed. The Capital Regional District (CRD) holds two licenses to divert a total of up to 102,850 m³ per year. Cusheon Lake is subject to seasonal water quality changes and is affected by periodic algae blooms.

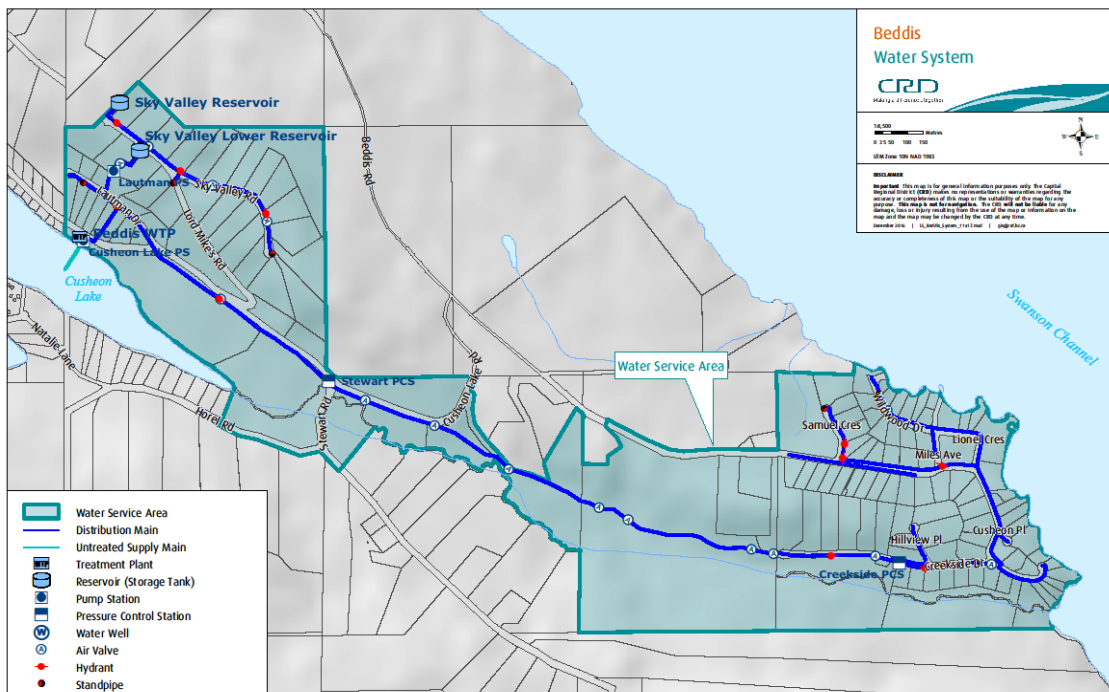


Figure 1: Beddis Water Service

The Beddis water system is primarily comprised of:

- water treatment plant (WTP) that draws water from Cusheon Lake and treats it at a location on Cusheon Road approximately 250m west of Lautman Drive. The water is treated using a rapid mix system, flocculation, dissolved air floatation (DAF) and filters, then chlorination prior to being pumped, via the distribution system to reservoirs. The water treatment plant (WTP) design flow is rate is 16.35 m³/hour (60 l/gpm);
- approximately 7,200 m of water distribution pipe;
- 1 pump station/re-chlorination station;
- 2 water reservoirs – one 45 m³ (10,000 lgal) and one 76 m³ (16,700 lgal);
- fire hydrants, standpipes, and gate valves;
- water service connections complete with water meters;
- 2 pressure regulating stations (PCS) Stewart Road and Creekside Drive.

WATER PRODUCTION AND DEMAND

Referring to Figure 2, 31,106 cubic meters (m³) of water was extracted (water production) from Cusheon Lake in 2021; a 28% increase from the previous year and is 22% increase from the five year rolling average. Water demand (customer water billing) for the service totaled 20,889 m³ of water; an 11% increase from the previous year and a 10% increase from the five year rolling average.

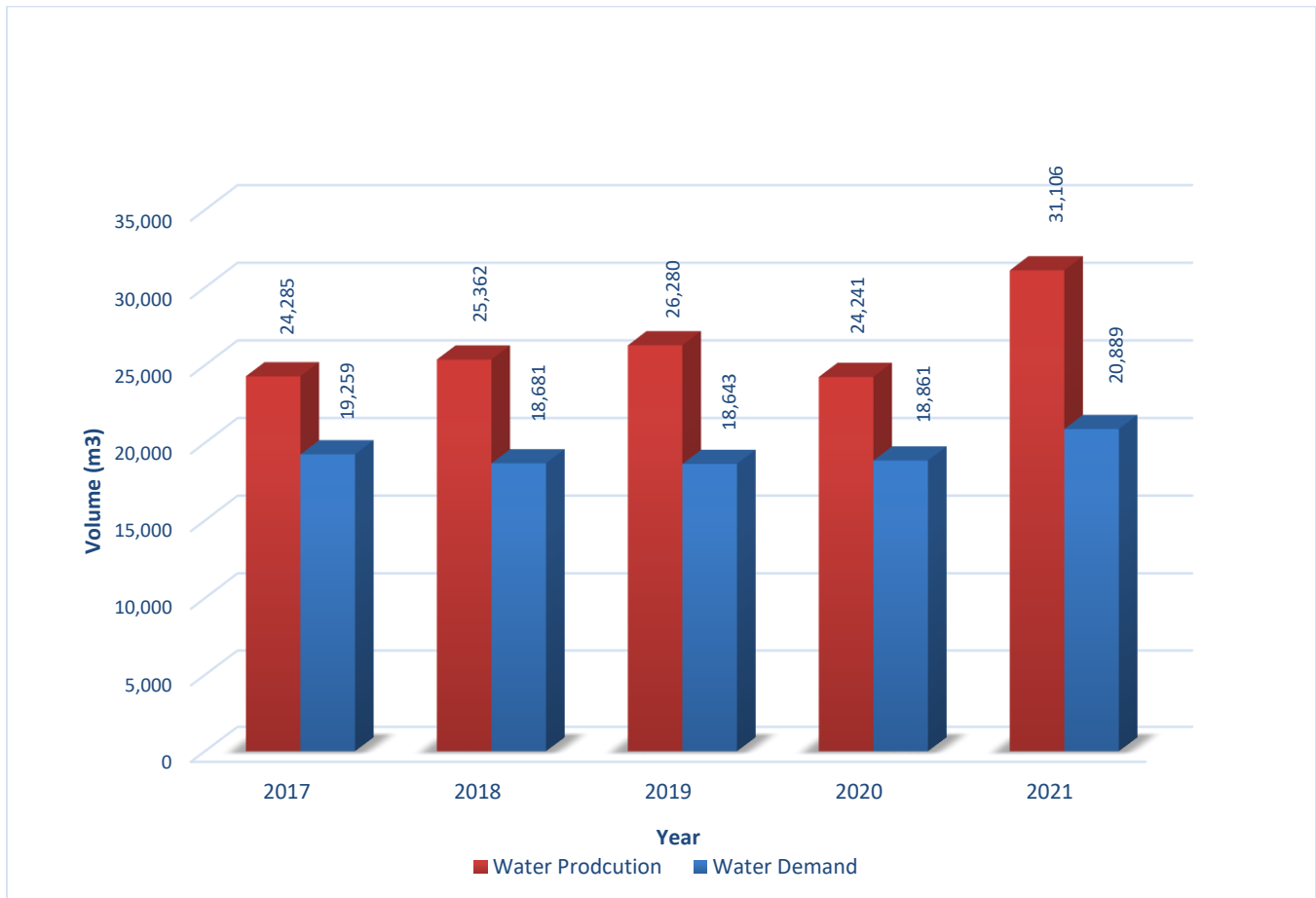


Figure 2: Beddis Water Service Annual Water Production and Demand

Water production by month for the past five years is shown in Figure 3. The monthly water production trends are typical for small water systems such as the Beddis water service. Water production for the

month of April and November are higher than historical due a water system leaks.

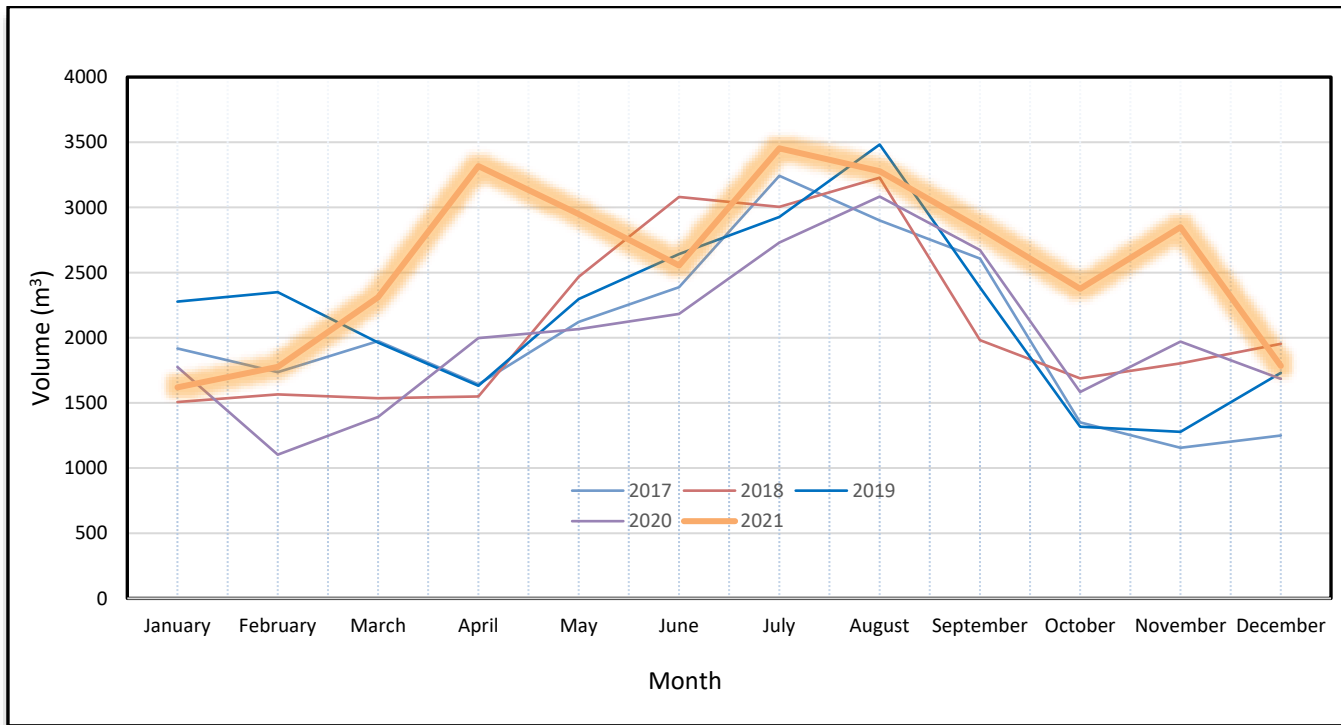


Figure 3: Beddis Water Service Monthly Water Production

The Beddis Water System is fully metered, and water meters are read quarterly. Water meter information 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 33%. Water loss is estimated to be approximately 28% which is higher than the previous year.

WATER QUALITY

In 2021, the analytical results of water samples collected from the Beddis Water System indicated that the drinking water was of good quality. The source water from Cusheon Lake was of good quality throughout the year with low concentrations of algae, most metals and generally low turbidity. Indicator bacteria concentrations (total coliforms) in the raw water were very low between October and April and higher during the warm weather season. No *E.coli* bacteria were detected in the raw water. Manganese concentrations were elevated in Cusheon Lake throughout the year and due to a lack of manganese specific treatment, the aesthetic objective in the Guidelines for Canadian Drinking Water Quality (GCDWQ) was exceeded on several occasions in the treated water (May and November). Manganese concentrations in exceedance of the aesthetic objective can lead to water discoloration and become a nuisance for customers. The maximum acceptable concentration (MAC) in the GCDWQ for manganese was never reached. Besides this, the DAF treatment system functioned very well under these source water conditions. The annual average of the disinfection by-product concentrations was below the limit in the GCDWQ in both sampled locations. While there had been individual results in the past that exceeded the MAC for the disinfection by-product trihalomethanes (THM) indicating the potential for exceedances, in 2021 all individual results were below the MAC. Other than water temperature during the summer months, there have been no exceedances of any monitored water quality parameter in the system. There have been no public water quality advisories in 2021.

The data below provides a summary of the water quality characteristics in 2021:

Raw Water:

- The raw water exhibited typically low concentrations of total coliform and *E. coli* bacteria throughout the year with significantly higher concentrations of total coliform during the summer months. No *E.coli* bacteria were detected in the raw water samples in 2021.
- One sample exhibited a low concentration of parasitic cysts (*Giardia*). No *Cryptosporidium* oocysts were detected.
- The raw water samples indicated fluctuating and elevated concentrations of iron and manganese. Manganese concentrations were elevated and typically above the aesthetic objective year round. Iron concentrations exceeded the aesthetic objective on November 24 after the extreme rainfall and runoff event on November 14/15. Episodes of elevated iron and manganese concentrations can lead to discolouration of the drinking water. Manganese has also a health related MAC which was never reached.
- The raw water was soft (median hardness 34.0 mg/L CaCO₃).
- The raw water turbidity (cloudiness) was often below 1 NTU with some higher peaks in the fall and winter. Highest recorded raw water turbidity was 11 NTU on November 24 in the wake of the extreme rainfall and runoff event on November 14/15.
- The median annual total organic carbon, an indicator of organic compounds and material in the lake water, was a moderate 4.25 mg/L.

Treated Water:

- The treated water was bacteriologically safe to drink. No sample tested positive for total coliform or *E.coli* bacteria.
- The treated water turbidity was consistently well below the turbidity limit of 1.0 NTU with a range from non-detected to 0.25 NTU.
- The annual average levels of the disinfection by-products trihalomethanes (TTHM = 67 µg/L) and haloacetic acids (HAA = 46 µg/L) across the distribution system were well below the limits in the GCDWQ (100 µg/L and 80 µg/L respectively).
- The treated water total organic carbon (TOC) was slightly higher than in 2020 but in line with historical trends, with a median value of 2.05 mg/L. 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.
- All treated water sampled were low in iron concentrations. Manganese concentrations exceeded the aesthetic limits as per GCDWQ in May and November in a few locations. Cusheon Lake is known for the potential of seasonally high iron and manganese concentrations. Such exceedances can lead to water discolouration.
- The aesthetic limit for water temperature (15°C) was exceeded for several weeks during the summer months. The extreme heatwave in early summer exacerbated this situation in 2021.

Table 1 and 2 below provide a summary of the 2021 raw and treated water test results.

Water Quality data collected from this drinking water system can be reviewed on the 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 during the 2021 operating period:

- Water system leak repairs:
 - Lord Mike’s Road (April)
 - 231 Creekside (November)
- Corrective maintenance completed water treatment plant facility skimmer gear box, air saturator pump and flash mixer equipment.
- Replacement of water treatment plant:
 - faulty electronic (HOA) switches
 - PH probe equipment.
 - UPS battery
 - Pressure regulator

CAPITAL IMPROVEMENTS

The following is a summary of the major capital improvements including year ending spending for 2021:

Sky Valley Reservoir Level Control Upgrade (CE.705.5101): Repair work to the level control system of the Upper Sky Valley Reservoir to monitor and control the system automatically. The lack of functional level control system creates risks to the environment as well as significant additional operating costs. The recommended solution to address the problem involved accessing the top of the reservoir and installing a level measuring transducer inside the reservoir which communicates wirelessly with the Lautman pump station and water treatment plant.

Project	Spending
Budget	\$42,500
Project Management	(\$9,658)
Contract	(\$21,046)
Supplies/Materials	(\$9,335)
Project Closed Balance Returned to CRF	\$2,461

Water Intake Assessment/Design (CE.676.7500): The intake pumps have been drawing in air/gas, resulting in reduced flow, and even air-locking of the pump(s). Design engineering services were procured, to provide a detailed analysis, technical memo, and (if necessary) construction/procurement tender package, to facilitate construction/installation of a recommended solution.

Project	Spending
Budget	\$20,000
Project Management	(\$6,172)
Design (Engineering, Drafting, etc.)	(\$14,583)
Balance Remaining	(\$755)

Safe Work Procedures (CE.699.4503): The work scope includes reviewing and developing safe work procedures for operational and maintenance tasks.

Project	Spending
Budget	\$12,000
Project Management	(\$444)
Contract	(\$2,478)
Supplies/Materials	(\$208)
Balance Remaining	\$8,870

Back-up Power Design (CE.735.4502): Complete electrical designs for new onsite back up power.

Project	Spending
Budget	\$10,000
Project Management	(\$49)
Balance Remaining	\$9,951

2021 FINANCIAL REPORT

Please refer to the attached 2021 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), a transfer from the 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) that is carried forward to the following year.

WATER SYSTEM PROBLEMS - WHO TO CALL:

To report any event or to leave a message regarding the Beddis 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:	Matthew McCrank, MSc., P.Eng, Senior Manager, Wastewater Infrastructure Operations
	Glenn Harris, Ph.D., R.P.Bio., Senior Manager, Environmental Protection
	Rianna Lachance, BCom, CPA, CA, Senior Manager Financial Services
	Karla Campbell, BPA, Senior Manager, Salt Spring Island Electoral Area
Concurrence	Robert Lapham, MCIP, RPP, Chief Administrative Officer

Attachment: [2021 Statement of Operations and Reserve Balances](#)

For questions related to this Annual Report please email: saltspring@crd.bc.ca

Table 1: 2021 Summary of Raw Water Test Results, Beddis Water System

PARAMETER		2021 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2011 - 2020 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										
Physical Parameters/Biological										
Chlorophyll a	ug/L	0.98	10	ND	4.42		2.14	68	ND - 51.6	
Colour, True	TCU	12	16	6	35	≤ 15 AO	18	99	11 - 32	
Conductivity @ 25C	uS/cm			Last analyzed in 2011			102.4	1	102.4-102.4	
Hardness as CaCO ₃	mg/L	34.0	4	30.1	37.0	No Guideline Required	35.8	34	17.9-42.0	
pH	pH Units	7.2	4	6.5	7.6	7.0-10.5 AO	7.21	28	6.91 - 7.70	
Carbon, Total Organic	mg/L	4.25	12	3.3	5.1		4.5	44	3.48 - 6.57	
Turbidity	NTU	0.85	17	0.44	11.0		1.26	176	ND - 25.1	
Water Temperature	Degrees C	17.9	17	5.5	26.4	≤ 15 AO	12.5	651	3.0 - 26.1	
Microbial Parameters										
Indicator Bacteria										
Coliform, Total	CFU/100 mL	57	15	5	950		38.5	172	ND - 7200	
<i>E. coli</i>	CFU/100 mL	ND	16	ND	ND		ND	173	0 - 13	
Hetero. Plate Count, 7 day	CFU/1 mL		Not tested in 2021					1200	66	170 - 1312
Parasites										
						No MAC Established				
<i>Cryptosporidium</i> , Total oocysts	oocysts/100 L	ND	2	ND	ND	Zero detection desirable	ND	19	ND - 4.40	
<i>Giardia</i> , Total cysts	cysts/100 L	ND	2	ND	0.04	Zero detection desirable	ND	16	ND	
Algal Toxins										
Microcystin (Abraxis)	ug/L		Not tested in 2021				1.5 MAC	ND	18	ND
Anatoxin A	ug/L		Last analyzed in 2014					ND	10	ND
Cylindrospermopsin	ug/L		Last analyzed in 2014					ND	10	ND
Microcystin-RR	ug/L		Last analyzed in 2014					ND	10	ND
Microcystin-YR	ug/L		Last analyzed in 2014					ND	10	ND - 9.18
Microcystin-LR	ug/L		Last analyzed in 2014					ND	10	ND
Total Microcystins	ug/L		Last analyzed in 2016				1.5 MAC	ND	13	ND - 9.18
Nodularin	ug/L		Last analyzed in 2014					ND	10	ND
Metals										
Aluminum	ug/L as Al	49.75	4	4.3	267	2900 MAC / 100 OG	21.9	34	ND - 184	
Antimony	ug/L as Sb	ND	4	ND	ND	6 MAC	ND	34	ND - 1.80	
Arsenic	ug/L as As	0.27	4	0.	0.34	10 MAC	0.3	34	ND - 0.76	
Barium	ug/L as Ba	6.3	4	4.3	9.2	100 MAC	6.5	34	4.1 - 13.0	
Beryllium	ug/L as Be	ND	4	ND	ND		ND	34	ND	
Bismuth	ug/L as Bi	ND	4	ND	ND		ND	27	ND	
Boron	ug/L as B	ND	4	ND	ND	5000 MAC	ND	34	ND - 586	
Cadmium	ug/L as Cd	ND	4	ND	0.017	5 MAC	ND	34	ND	
Calcium	mg/L as Ca	9.28	4	8.07	10.1	No Guideline Required	9.92	34	5.34 - 11.6	
Chromium	ug/L as Cr	ND	4	ND	ND	50 MAC	ND	34	ND	
Cobalt	ug/L as Co	ND	4	ND	0.33		ND	34	ND	
Copper	ug/L as Cu	9.69	4	4.72	19.2	2000 MAC / ≤ 1000 AO	ND	34	4.21-32.5	
Iron	ug/L as Fe	124.0	4	51.6	389	≤ 300 AO	133.0	34	ND - 310	
Lead	ug/L as Pb	0.79	4	0.30	2.61	5 MAC	ND	34	0.28 - 3.17	
Lithium	ug/L as Li	ND	4	ND	ND		ND	16	ND	
Magnesium	mg/L as Mg	2.63	4	2.41	2.83	No Guideline Required	2.67	34	1.10 - 3.14	
Manganese	ug/L as Mn	36.75	4	23.5	37.5	120 MAC / ≤ 20 AO	38.3	34	8.00 - 220	
Molybdenum	ug/L as Mo	ND	4	ND	ND		ND	34	ND - 27.0	
Nickel	ug/L as Ni	ND	4	ND	ND		ND	34	ND	
Potassium	mg/L as K	0.51	4	0.47	0.75		0.53	34	0.15 - 0.64	
Selenium	ug/L as Se	ND	4	ND	ND	50 MAC	ND	34	ND - 0.62	
Silicon	mg/L as Si	3.94	4	3.3	4.52		3.86	34	0.43 - 5.88	
Silver	ug/L as Ag	ND	4	ND	ND	No Guideline Required	ND	34	ND	
Sodium	mg/L as Na	5.89	4	5.35	6.71	≤ 200 AO	6.13	33	1.71 - 11.1	
Strontium	ug/L as Sr	67.5	4	65.3	72.6	7000 MAC	68.8	34	18.1-86.0	
Sulfur	mg/L as S	3.15	4	3.0	3.4		ND	27	ND - 5.70	
Tin	ug/L as Sn	ND	4	ND	ND		ND	34	ND	
Titanium	ug/L as Ti	ND	4	ND	10.5		ND	34	ND	
Thallium	ug/L as Tl	ND	4	ND	ND		ND	27	ND	
Uranium	ug/L as U	ND	4	ND	ND	20 MAC	ND	27	ND	
Vanadium	ug/L as V	ND	4	ND	ND		ND	34	ND	
Zinc	ug/L as Zn	12.0	4	8.9	35.6	≤ 5000 AO	8.05	34	3.0 - 200.0	
Zirconium	ug/L as Zr	ND	4	ND	0.18		ND	27	ND	

Table 2: 2021 Summary of Treated Water Test Results, Beddis Water System

PARAMETER		2021 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2011 - 2020 RESULTS		
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range Min. Max.		≤ = Less than or equal to	Median	Samples Analyzed	Range Min.-Max.
ND means Not Detected by analytical method used									
Physical Parameters									
Carbon, Total Organic Colour, True	mg/L as C TCU	2.05 ND	12 16	1.50 ND	5.3 ND	≤ 15 AO	2.1 ND	72 95	0.27-6 ND - 4.0
Hardness as CaCO ₃	mg/L	36.3	16	30.9	47.7	No Guideline Required	37.8	73	29.8 - 53.1
pH	pH units	6.6	5	6.5	7.2	7.0-10.5 AO	6.90	21	6.57 - 9.03
Turbidity	NTU	ND	17	ND	0.25	1 MAC and ≤ 5 AO	0.22	188	0.07 - 2.93
Water Temperature	Degress C	13.4	98	4.0	26.0	≤ 15 AO	12.0	3307	0 - 26.0
Microbial Parameters									
Indicator Bacteria									
Coliform, Total	CFU/100 mL	ND	82	ND	ND	0 MAC	ND	743	ND - 4
<i>E. coli</i>	CFU/100 mL	ND	82	ND	ND	0 MAC	ND	742	ND
Hetero. Plate Count, 7 day	CFU/1 mL		Not tested in 2021			No Guideline Required	ND	126	ND - 280
Algal Toxins									
Anatoxin A	ug/L		Last analyzed in 2014				ND	2	ND
Cylindrospermopsin	ug/L		Last analyzed in 2014				ND	2	ND
Microcystin-RR	ug/L		Last analyzed in 2014				ND	2	ND
Microcystin-YR	ug/L		Last analyzed in 2014				ND	2	ND
Microcystin-LR	ug/L		Last analyzed in 2014				ND	1	ND
Total Microcystins	ug/L		Last analyzed in 2015			1.5 MAC	ND	5	ND
Nodularin	ug/L		Last analyzed in 2014				ND	2	ND
Disinfectants									
Disinfectants									
Chlorine, Free Residual	mg/L as Cl ₂	1.01	99	0.31	2.07	No Guideline Required	0.88	3641	ND - 2.50
Chlorine, Total Residual	mg/L as Cl ₂	1.17	98	0.39	2.2	No Guideline Required	1.02	3430	0.1 - 4.52
Disinfection By-Products									
Trihalomethanes (THMs)									
Bromodichloromethane	ug/L	9.9	24	6.7	14		11.9	71	ND - 20.0
Bromoform	ug/L	ND	24	ND	ND		ND	71	ND
Chloroform	ug/L	48.5	24	28.0	74.0		62.0	71	6.91 - 234
Chlorodibromomethane	ug/L	1.15	24	ND	2.4		1.06	71	ND - 6.88
Total Trihalomethanes	ug/L	58.5	24	35.0	91.0	100 MAC	73.1	71	6.91 - 251
Haloacetic Acids (HAAs)									
HAA5	ug/L	46	4	40	51	80 MAC	29.4	17	13.0 - 232
Metals									
Aluminum	ug/L as Al	11.5	16	ND	26.1	2900 MAC / 100 OG	10.2	74	ND - 346
Antimony	ug/L as Sb	ND	16	ND	ND	6 MAC	ND	73	ND - 1.33
Arsenic	ug/L as As	0.17	16	ND	0.22	10 MAC	0.31	73	ND - 0.99
Barium	ug/L as Ba	5.5	16	4.0	7.1	100 MAC	5.8	73	4.1 - 18.0
Beryllium	ug/L as Be	ND	16	ND	ND		ND	73	ND
Bismuth	ug/L as Bi	ND	16	ND	ND		ND	68	ND
Boron	ug/L as B	ND	16	ND	ND	5000 MAC	ND	73	ND - 505
Cadmium	ug/L as Cd	ND	16	ND	ND	5 MAC	ND	73	ND
Calcium	mg/L as Ca	10.3	16	8.43	16.9	No Guideline Required	10.8	73	8.06 - 19.3
Chromium	ug/L as Cr	ND	16	ND	ND	50 MAC	ND	73	ND
Cobalt	ug/L as Co	ND	16	ND	ND		ND	73	ND
Copper	ug/L as Cu	8.37	16	0.74	48.6	2000 MAC / ≤ 1000 AO	9.91	73	0.66 - 127
Iron	ug/L as Fe	18.1	16	ND	86.6	≤ 300 AO	19.5	73	ND - 2650
Lead	ug/L as Pb	0.28	16	ND	1.14	5 MAC	0.30	73	ND - 2.23
Lithium	ug/L as Li	ND	8	ND	ND		ND	20	ND
Magnesium	mg/L as Mg	2.44	16	0.98	2.86	No Guideline Required	2.52	73	0.92 - 3.07
Manganese	ug/L as Mn	3.85	16	ND	49.2	120 MAC / ≤ 20 AO	9.0	73	ND - 61.3
Molybdenum	ug/L as Mo	ND	16	ND	ND		ND	73	ND
Nickel	ug/L as Ni	ND	16	ND	ND		ND	73	ND
Potassium	mg/L as K	0.53	16	0.46	0.74		0.55	73	ND - 0.67
Selenium	ug/L as Se	ND	16	ND	ND	50 MAC	ND	73	ND
Silicon	mg/L as Si	3.94	16	3.06	4.40		3.68	73	0.52 - 6.07
Silver	ug/L as Ag	ND	16	ND	ND	No Guideline Required	ND	73	ND
Sodium	mg/L as Na	8.61	16	7.3	9.02	≤ 200 AO	8.73	73	6.89 - 13.5
Strontium	ug/L as Sr	71.6	16	64.9	64.9	7000 MAC	73.8	73	58.3 - 92.3
Sulfur	mg/L as S	3.05	16	ND	3.5		ND	68	ND - 4.20
Tin	ug/L as Sn	ND	16	ND	ND		ND	73	ND
Titanium	ug/L as Ti	ND	16	ND	ND		ND	73	ND
Thallium	ug/L as Tl	ND	16	ND	ND		ND	67	ND
Uranium	ug/L as U	ND	16	ND	ND	20 MAC	ND	68	ND
Vanadium	ug/L as V	ND	16	ND	ND		ND	73	ND
Zinc	ug/L as Zn	7.0	16	ND	60.4	≤ 5000 AO	7.9	73	ND - 1160
Zirconium	ug/L as Zr	ND	16	ND	ND		ND	52	ND