

Wilderness Mountain Water System

2020 Annual Report

CRD | Drinking Water

Introduction

This report provides a summary of the Wilderness Mountain Water Service for 2020 and 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 community of Wilderness Mountain is a rural residential development located on Mount Matheson in the Juan de Fuca Electoral Area. The area was originally serviced by a private water utility from about 1983, and in 2008 the service converted to the Capital Regional District (CRD). The Wilderness Mountain water service is made up of 82 parcels encompassing a total area of approximately 124 hectares. Of the 82 parcels, 73 were customers to the water system in 2020.

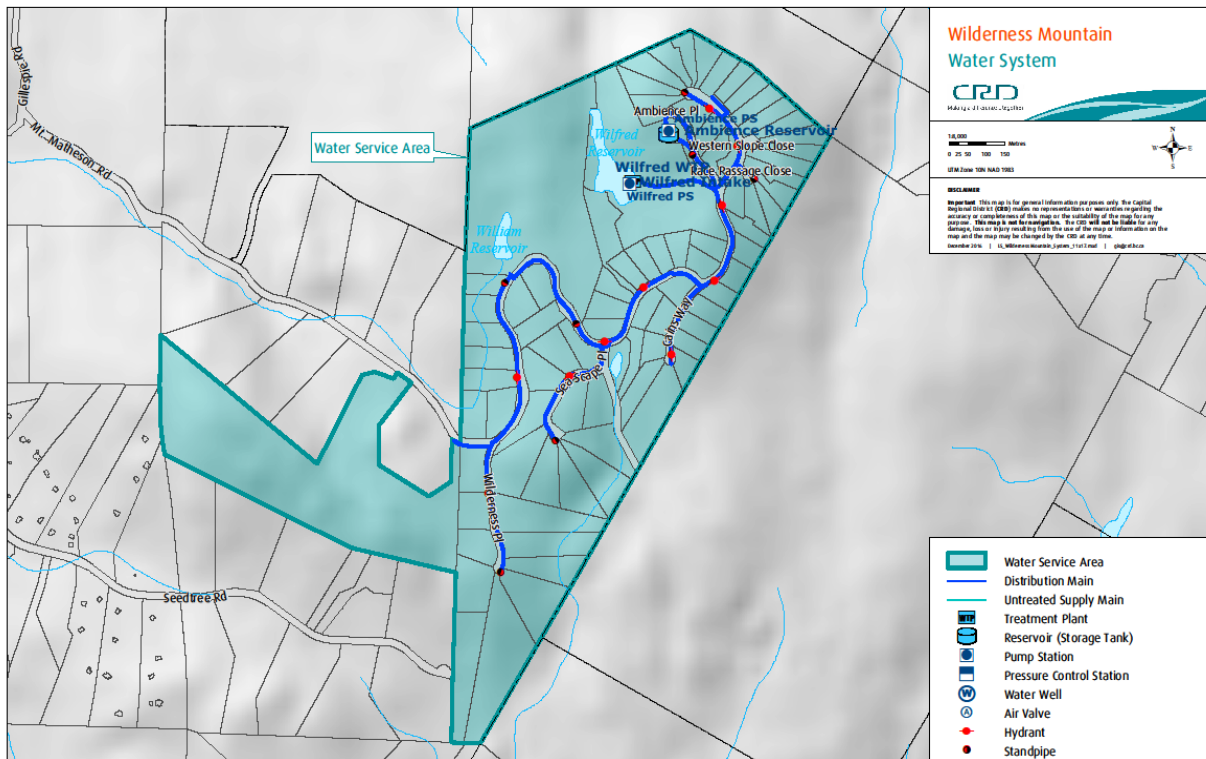


Figure 1: Map of the Wilderness Mountain Water Service Area

The Wilderness Mountain water system is primarily comprised of:

- Raw water obtained from Wilfred Reservoir, a small surface water body which lies within a protected watershed and was created by the construction of two dams.
- Water from Wilfred Reservoir is pumped to the treatment plant which consists of coarse cartridge filtration, ultraviolet disinfection and chloramine disinfection.
- The chloraminated water is then pumped to two distribution system storage tanks (combined capacity of 250 cubic metres or 66,000 USg) and the distribution system.
- Distribution system (3,750 meter network of 150 mm (6") and 100 mm (4") PVC water mains).
- Other water system assets: 73 service connections, 10 hydrants, 6 standpipes, 21 gate valves and a SCADA system.
- Although the water system also includes the William Brook Dam and related water reservoir, this reservoir is no longer utilized for water supply.

Water Supply

The raw water supply level in Wilfred Reservoir is shown in Figure 2. The lake level was at its lowest point in October and November. The reservoir reached full volume in January 2020.

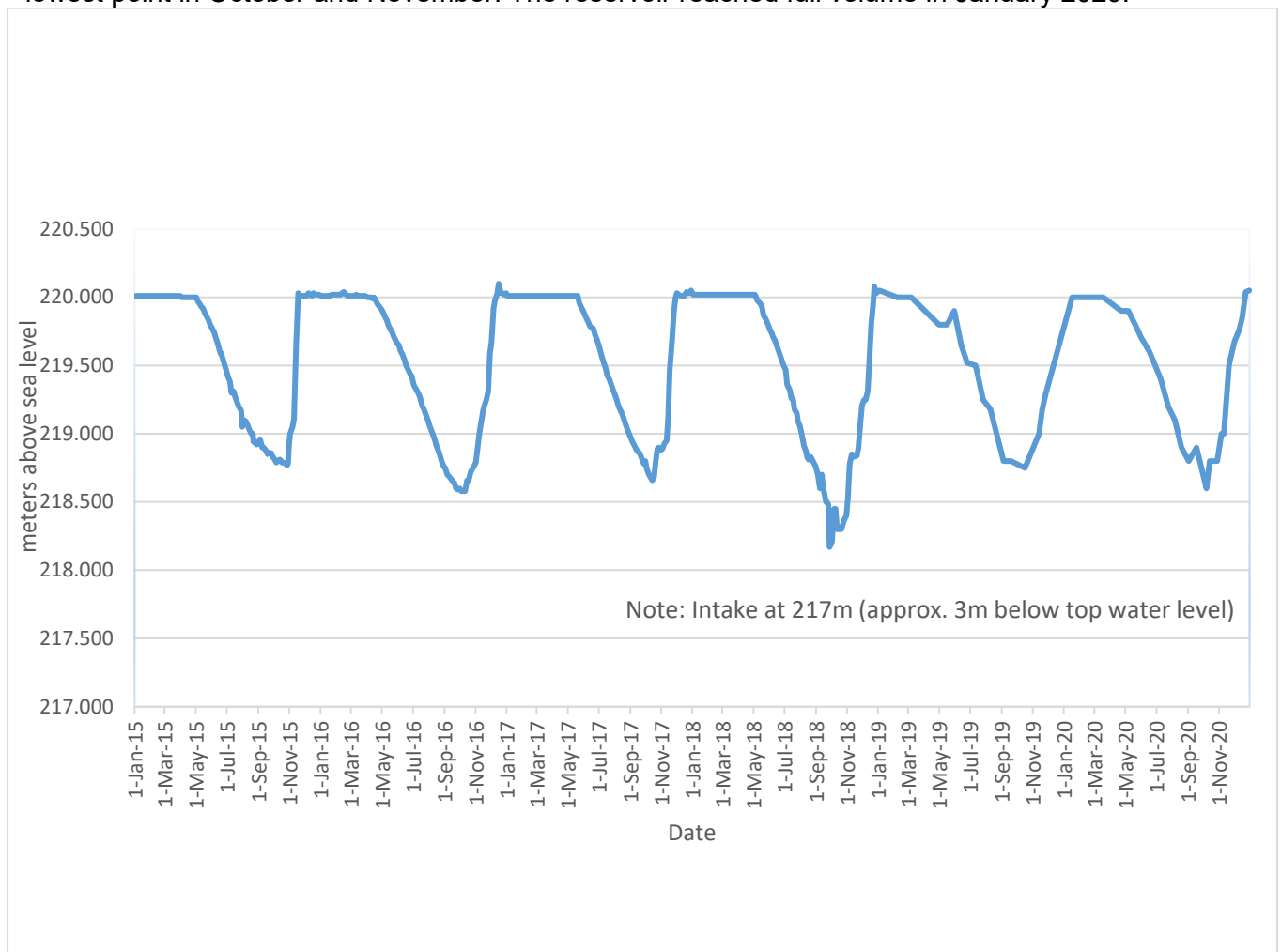


Figure 2: Wilfred Reservoir Water Level 2015-2020

Water Usage

The volume used by the community, or the water demand, is illustrated in Figure 3. The demand in 2020 was 27% higher than in 2019 and 20% higher than the five year average.

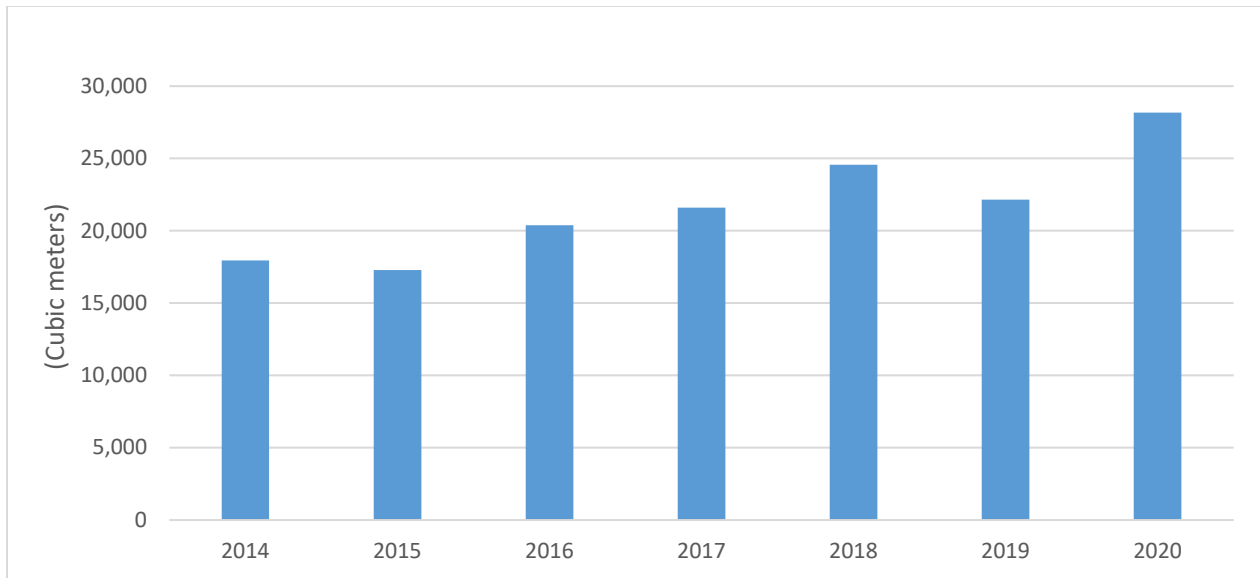


Figure 3: Wilderness Mountain Water Demand 2014-2020

Drinking Water Quality

For the majority of 2020, the Wilderness Mountain Water System supplied safe water to its customers. During the period between January 2, 2020 and January 30, 2020, the water system was under a Boil Water Advisory due to high turbidity in the source water. In late December 2019, the raw water turbidity increased during heavy rainfall and runoff events and eventually led to this Boil Water Advisory (BWA) in January.

Wilfred Reservoir raw water exhibited elevated iron and manganese concentrations throughout the entire year, especially during spring and fall. Without designated treatment to remove metals from the raw water, this led to some exceedances of the aesthetic objective for manganese as per Guidelines for Canadian Drinking Water Quality (GCDWQ). Typically, in combination with free chlorine, elevated manganese concentrations can result in discoloured water. Because the disinfection process in the Wilderness Mountain Water System utilizes chloramination, the effects on customers in terms of discoloured water may be reduced. Manganese concentrations in Wilfred Reservoir in the fall have exceeded periodically the maximum acceptable concentration (MAC) in the GCDWQ. Additional treatment is required to mitigate this issue.

The data below provides a summary of the water quality characteristics in 2020:

Raw Water:

- Between August and November, the raw water exhibited medium to high concentrations of total coliform bacteria. Outside this timeframe, total coliform concentrations were low.
- *E. coli* bacteria concentrations were mostly low with higher concentrations in the fall, which included one exceedance of the USEPA 20 CFU/100mL unfiltered surface water treatment criteria.
- *Cryptosporidium* and *Giardia* parasites were tested twice in 2020 and neither were detected.
- The raw water was tested for metals in February, May, August and November and in all samples manganese was above the aesthetic objective in the GCDWQ. Iron concentrations were elevated but not in exceedance of the aesthetic objective. Concentrations of both metals are highest in the fall. No significant water discolouration was reported by customers.
- The mean annual raw water turbidity was 0.52 NTU and therefore lower than in 2019. The maximum turbidity was 1.6 NTU (October). Most raw water turbidity spikes coincided with algal and/or zooplankton blooms in Wilfred Reservoir. There is a historic pattern of significant natural bloom events in June. The January turbidity increase coincided with heavy rainfall and runoff events and led to a month-long BWA.
- The raw water was soft (median hardness 14.55 mg/L CaCO₃).
- The pH was slightly acidic (median pH 6.95).
- The median total organic carbon (TOC) concentration was moderately high at 3.10 mg/L.

Treated Water:

- The treated water was bacteriologically safe to drink outside the Boil Water Advisory period from January 2 – 30. No *E. coli* and no total coliform bacteria were found in the treated water in 89 samples throughout the year.
- The treated water turbidity was usually under the GCDWQ turbidity limit of 1.0 NTU except for a few short term exceedances during winter/spring, and the prolonged exceedance in January which led to the aforementioned Boil Water Advisory. The short-term exceedances lasted only a few minutes and were usually related to pump starts or other operational activities.
- The disinfection by-products THM and HAA were well below the GCDWQ limits.
- The annual median total chlorine residual in the system was 1.99 mg/L.

Table 1 and 2 below provide a summary of the 2020 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 operational issues that were addressed by CRD Integrated Water Services staff:

- Water Main - valve exercising
- Maintenance and calibration of electrical equipment at all sites
- Dam inspections and maintenance

Capital Project Updates - 2020

- Completed remediation of access road to treatment facility.
- Completed mold removal within treatment facility.
- Completed turning a hazardous cedar tree into a wildlife tree.
- Completed the Source Water Vulnerability Study, precursor to the Source Water Protection Plan which will be carried out in 2021.

Financial Report

Please refer to the attached 2020 Statement of Operations. Revenue includes parcel taxes (Transfers from Government), fixed user fees (User Charges), and interest on savings (Interest Earnings), 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 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.

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Attachment: 2020 Financial Summary (Statement of Operations)

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

Table 1

Table 1: 2020 Summary of Raw Water Test Results, Wilderness Mountain Water System									
PARAMETER		2020 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2010 - 2019 RESULTS		
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range Minimum Maximum		≤ = Less than or equal to	Median	Samples Analyzed	Range Minimum-Maximum
mg/L = parts per million ug/L = parts per billion									
Physical Parameters (ND means Not Detected by analytical method used)									
Alkalinity, Total	mg/L	7.30	1	7.30	7.30		8.58	35	7.25 - 13.3
Carbon, Dissolved Organic	mg/L as C	3.30	4	3.00	3.40		3.85	24	1.91 - 5.20
Carbon, Total Organic	mg/L as C	3.10	4	3.00	4.00	Guideline Archived	4.05	24	2.96 - 6.83
Colour, True	TCU	18	4	13	23	≤15 AO	12.0	104	7.1 - 23.0
Conductivity @ 25 C	uS/cm		Not tested in 2020				76.6	40	67.7 - 84.8
Hardness as CaCO ₃	mg/L	14.55	4	13.8	16.4	No Guideline Required	16.6	28	11.1 - 20.6
pH	pH units	6.95	8	6.14	7.10	7.0 - 10.5 AO	6.70	42	6.30 - 7.36
Total Dissolved Solids	mg/L	44.0	1	44.0	44.0	≤500 AO	49.6	24	45.9 - 65.0
Total Suspended Solids	mg/L	1.60	2	1.60	42.0		1.07	24	ND - 4.00
Total Solids	mg/L	42.0	1	42.0	42.0		50.0	24	43.0 - 58.0
Turbidity, lab tests	NTU	0.52	18	0.5	1.60		0.90	250	0.31 - 2.50
Ultraviolet Absorption, 5 cm	Abs.@254 nm		Last tested in 2015				0.44	33	0.28 - 0.66
Ultraviolet Transmittance	%	77.4	3	77.2	79.2		78.8	34	73.7 - 82.8
Water Temperature	degrees C	11.0	19	3.8	19.7	≤15 AO	10.5	283	1.0 - 21.2
Non-Metallic Inorganic Chemicals (ND means Not Detected by analytical method used)									
Ammonia, Total	ug/L as N	ND	2	ND	63.0		8.85	22	ND - 71.0
Bromide	ug/L as Br	16.5	2	0.03	33.0		26.0	20	ND - 319
Chloride	mg/L as Cl	12.0	1	12.0	12.0	≤ 250 AO	11.0	8	11.0 - 13.5
Cyanide	mg/L as Cn	ND	2	ND	0.0	0.2 MAC	ND	7	ND - 0.02
Fluoride	mg/L as F	ND	1	ND	0.0	1.5 MAC	ND	8	ND - 0.02
Nitrogen, Nitrate	ug/L as N	ND	2	ND	0.0		10.0	21	ND - 37.0
Nitrogen, Nitrite	ug/L as N	ND	2	ND	0.0		ND	20	ND - 0.0
Nitrogen, Total	ug/L as N	180.0	2	180.0	210.0		187.3	22	84.0 - 263
Phosphate, Total	ug/L as P	3.90	2	3.90	71.0		6.79	22	ND - 16.6
Silica	mg/L as SiO ₂	4.90	2	4.90	5.00		2.76	17	ND - 5.28
Silicon	mg/L as Si	1.96	4	1.47	2.31		1.39	16	0.38 - 2.36
Sulphate	mg/L as SO ₄	4.90	2	4.90	5.70	≤ 500 AO	8.76	22	5.30 - 19.0
Sulphide	mg/L as H ₂ S	ND	1	ND	0.0	≤ 0.05 AO	ND	7	ND - 0.29
Sulphur	mg/L as S	ND	4	ND	0.0		ND	17	ND - 5.94
Metals (ND means Not Detected by analytical method used)									
Aluminum	ug/L as Al	38.95	4	7.80	81.5	2900 MAC / 100 OG	24.9	16	ND - 60.9
Antimony	ug/L as Sb	ND	4	ND	0.0	6 MAC	ND	16	ND - 0.0
Arsenic	ug/L as As	ND	4	ND	0.11	10 MAC	0.08	16	ND - 0.14
Barium	ug/L as Ba	2.00	4	1.40	2.20	1000 MAC	1.90	16	ND - 2.70
Beryllium	ug/L as Be	ND	4	ND	0.0		ND	16	ND - 0.0
Bismuth	ug/L as Bi	ND	4	ND	0.0		ND	16	ND - 0.0
Boron	ug/L as B	ND	4	ND	0.0	5000 MAC	ND	16	ND - 0.0
Cadmium	ug/L as Cd	ND	4	ND	0.0	5 MAC	ND	16	ND - 0.12
Calcium	mg/L as Ca	3.07	4	2.91	3.55	No Guideline Required	3.48	16	3.02 - 4.56
Chromium	ug/L as Cr	ND	4	ND	0.0	50 MAC	ND	16	ND - 0.0
Cobalt	ug/L as Co	ND	4	ND	0.0		ND	16	ND - 0.0
Copper	ug/L as Cu	3.63	4	3.08	4.32	2000 MAC / ≤ 1000 AO	3.05	16	1.95 - 5.44
Iron	ug/L as Fe	205.0	4	140.0	253.0	≤ 300 AO	158.0	16	115 - 471
Lead	ug/L as Pb	0.26	4	0.23	0.57	5 MAC	0.26	16	ND - 0.62
Lithium	ug/L as Li	ND	3	ND	0.0		ND	8	ND - 5.00
Magnesium	mg/L as Mg	1.68	4	1.56	1.84	No Guideline Required	1.82	16	1.60 - 2.24
Manganese	ug/L as Mn	53.35	4	33.0	81.0	120 MAC / ≤ 20 AO	68.7	16	33.8 - 167
Mercury	ug/L as Hg	ND	4	ND	0.0		ND	14	ND - 0.0
Molybdenum	ug/L as Mo	ND	4	ND	0.0		ND	16	ND - 0.0
Nickel	ug/L as Ni	ND	4	ND	0.0		ND	16	ND - 5.20
Potassium	mg/L as K	0.31	4	0.25	0.34		0.32	16	0.27 - 0.38
Selenium	ug/L as Se	ND	4	ND	0.0	50 MAC	ND	16	ND - 0.12
Silver	ug/L as Ag	ND	4	ND	0.0	No Guideline Required	ND	16	ND - 0.0
Sodium	mg/L as Na	6.53	4	6.25	7.22	≤ 200 AO	7.11	16	6.42 - 9.05
Strontium	ug/L as Sr	14.3	4	12.8	14.8	7000 MAC	14.3	16	ND - 15.7
Thallium	ug/L as Tl	ND	4	ND	0.0		ND	16	ND - 0.0
Tin	ug/L as Sn	ND	4	ND	0.0		ND	16	ND - 0.0
Titanium	ug/L as Ti	ND	4	ND	0.0		ND	16	ND - 0.0
Uranium	ug/L as U	ND	4	ND	0.0	20 MAC	ND	16	ND - 0.0
Vanadium	ug/L as V	ND	4	ND	0.0		ND	16	ND - 0.0
Zinc	ug/L as Zn	ND	4	ND	18.6	≤ 5000 AO	ND	16	ND - 10.8
Zirconium	ug/L as Zr	ND	4	ND	0.0		ND	16	ND - 0.0
Microbial Parameters									
Indicator Bacteria									
Coliform, Total	Coliforms/100 mL	64	16	22	4300		160	249	18 - 2419
<i>E. coli</i>	<i>E.coli</i> /100 mL	2	17	0	40		0	250	0 - 29
Hetero. Plate Count, 28C (7 day)	CFU/1 mL		Last analyzed in 2014			No Guideline Required	850	117	140 - 5800
Chlorophyll									
Chlorophyll a	ug/L	0.60	3	0.48	0.93		2.91	464	0.04 - 18.93
Parasites						No MAC Established			
<i>Cryptosporidium</i> , Total oocysts	oocysts/100 L	0	2	0	0	Zero detection desirable	0	12	0 - 0
<i>Giardia</i> , Total cysts	cysts/100 L	0	2	0	0	Zero detection desirable	0	12	0 - 2

Table 2

Table 2: 2020 Summary of Treated Water Test Results, Wilderness Mountain Water System									
PARAMETER		2020 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2010-2019 RESULTS		
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range Min. Max.		≤ = Less than or equal to	Median	Samples Analyzed	Range Min.-Max.
mg/L = parts per million ug/L = parts per billion									
Physical Parameters									
Alkalinity, Total	mg/L		Not tested in 2020				11.5	30	7.94 - 15.9
Colour, True	TCU	14	4	11	16	≤ 15 AO	7.00	107	2.10 - 18.0
Conductivity @ 25 C	uS/cm		Not tested in 2020				92.55	38	82.2 - 100.3
Hardness as CaCO3	mg/L	15.0	4	13.9	17.6		16.35	8	15.3 - 18.1
pH	pH units	6.97	16	6.50	7.70	7.0 - 10.5 AO	6.78	41	6.31 - 8.86
Total Organic Carbon	mg/L	3.45	4	2.50	4.30		4.73	1	4.73 - 4.73
Turbidity, lab tests	NTU	0.60	36	0.40	5.80	1 MAC and ≤ 5 AO	0.67	719	0.17 - 3.64
Turbidity, field tests	NTU	1.06	6	1.04	1.40		0.44	8	0.40 - 1.61
Water Temperature	degrees C	7.55	172	1.0	19.9	≤ 15 AO	11.0	2319	1.0 - 20.3
Microbial Parameters									
Indicator Bacteria									
Coliform, Total	CFU/100 mL	0	89	0	0	0 MAC	0	920	0 - 144
E. coli	CFU/100 mL	0	89	0	0	0 MAC	0	920	0 - 0
Hetero. Plate Count, 28C (7 day)	CFU/1 mL	3300	5	70	6000	No Guideline Required	380	234	0 - 32400
Disinfectants									
Disinfectants									
Chlorine, Total Residual	mg/L as Cl ₂	1.99	172	0.04	3.70	No Guideline Required	1.54	2483	0.04 - 5.20
Monochloramine, Field	mg/L	2.65	31	0.17	3.21		2.15	12	0.32 - 3.25
Disinfection By-Products (ND means Not Detected by analytical method used)									
Trihalomethanes (THMs)									
Bromodichloromethane (BDCM)	ug/L	ND	4	ND	0.0		1.50	59	ND - 26.0
Bromoform (BRFM)	ug/L	ND	4	ND	0.0		ND	59	ND - 0.60
Chloroform (CHLF)	ug/L	1.65	4	1.50	3.40		11.9	59	ND - 256
Chlorodibromomethane (DBCM)	ug/L	ND	4	ND	0.0		ND	59	ND - 3.10
Total Trihalomethanes (TTHM)	ug/L	1.65	4	1.50	3.40	100 MAC	13.1	59	ND - 274
Haloacetic Acids (HAAs)									
Haloacetic Acids (*5 Total, HAA5)	ug/L	12.0	4	8.60	22.0	80 MAC	11.1	53	ND - 262
Metals (ND means Not Detected by analytical method used)									
Aluminum	ug/L as Al	48.0	4	4.50	62.1	2900 MAC / 100 OG	17.0	7	6.80 - 33.0
Antimony	ug/L as Sb	ND	4	ND	0.0	6 MAC	ND	7	ND - 0.0
Arsenic	ug/L as As	ND	4	ND	0.10	10 MAC	0.12	7	ND - 0.15
Barium	ug/L as Ba	2.10	4	1.10	2.60	1000 MAC	1.20	7	ND - 2.60
Beryllium	ug/L as Be	ND	4	ND	0.0		ND	7	ND - 0.0
Bismuth	ug/L as Bi	ND	4	ND	0.0		ND	7	ND - 0.0
Boron	ug/L as B	ND	4	ND	0.0	5000 MAC	ND	7	ND - 0.0
Cadmium	ug/L as Cd	ND	4	ND	0.0	5 MAC	ND	7	ND - 0.0
Calcium	mg/L as Ca	3.21	4	2.93	3.85	No Guideline Required	3.49	7	3.31 - 3.83
Chromium	ug/L as Cr	ND	4	ND	0.0	50 MAC	ND	7	ND - 0.0
Cobalt	ug/L as Co	ND	4	ND	0.50		ND	7	ND - 0.0
Copper	ug/L as Cu	14.1	4	10.2	28.5	2000 MAC / ≤ 1000 AO	10.1	7	5.16 - 92.7
Iron	ug/L as Fe	179.5	4	73.2	902.0	≤ 300 AO	111.0	7	52.0 - 244.0
Lead	ug/L as Pb	0.45	4	0.68	0.82	5 MAC	0.57	7	0.38 - 1.01
Lithium	ug/L as Li	ND	3	ND	0.0		ND	4	ND - 0.0
Magnesium	mg/L as Mg	1.70	4	1.60	1.93	No Guideline Required	1.82	7	1.71 - 2.07
Manganese	ug/L as Mn	30.75	4	12.6	364.0	120 MAC / ≤ 20 AO	49.3	7	11.9 - 111.0
Mercury	ug/L as Hg	ND	4	ND	0.0		ND	3	ND - 0.0
Molybdenum	ug/L as Mo	ND	4	ND	0.0		ND	7	ND - 0.0
Nickel	ug/L as Ni	ND	4	ND	0.0		ND	7	ND - 0.0
Potassium	mg/L as K	0.31	4	0.26	0.42		0.34	7	0.28 - 0.36
Selenium	ug/L as Se	ND	4	ND	0.0	50 MAC	ND	7	ND - 0.0
Silicon	mg/L as Si	2.02	4	1.50	2.40		0.525	7	0.408 - 2.33
Silver	ug/L as Ag	ND	4	ND	0.0	No Guideline Required	ND	7	ND - 0.0
Sodium	mg/L as Na	9.45	4	8.73	9.57	≤ 200 AO	10.0	7	8.89 - 11.4
Strontium	ug/L as Sr	14.45	4	13.0	17.2	7000 MAC	14.4	7	14.2 - 16.1
Sulfur	mg/L as S	ND	4	ND	0.0		ND	7	ND - 4.60
Thallium	ug/L as Tl	ND	4	ND	0.0		ND	7	ND - 0.0
Tin	ug/L as Sn	ND	4	ND	0.0		ND	7	ND - 0.0
Titanium	ug/L as Ti	ND	4	ND	0.0		ND	7	ND - 0.0
Uranium	ug/L as U	ND	4	ND	0.0	20 MAC	ND	7	ND - 0.0
Vanadium	ug/L as V	ND	4	ND	0.0		ND	7	ND - 0.0
Zinc	ug/L as Zn	ND	4	ND	21.3	≤ 5000 AO	ND	7	ND - 8.60
Zirconium	ug/L as Zr	ND	4	ND	0.11		ND	7	ND - 0.0

CAPITAL REGIONAL DISTRICT

WILDERNESS MOUNTAIN WATER Statement of Operations (Unaudited) For the Year Ended December 31, 2020

	2020	2019
Revenue		
Transfers from government	63,859	62,090
User Charges	65,659	65,125
Water Sales	17,520	17,520
Fees and Charges	200	258
Other revenue from own sources:		
Interest earnings	33	37
Other revenue	72	702
Grant revenue	3,255	-
Total Revenue	150,598	145,732
Expenses		
General government services	5,487	4,908
Contract for services	3,575	3,620
CRD Labour and Operating costs	71,204	79,542
Debt Servicing Costs	23,659	23,667
Other expenses	36,461	39,634
Total Expenses	140,387	151,370
Net revenue (expenses)	10,211	(5,639)
Transfers to own funds:		
Capital Reserve Fund	-	-
Operating Reserve Fund	1,640	-
Annual surplus/(deficit)	8,571	(5,639)
Accumulated surplus/(deficit), beginning of year	(5,639)	-
Accumulated surplus/(deficit), end of year	\$ 2,932	(5,639)

CAPITAL REGIONAL DISTRICT

WILDERNESS MOUNTAIN WATER Statement of Reserve Balances (Unaudited) For the Year Ended December 31, 2020

	Capital Reserve	
	2020	2019
Beginning Balance	40,732	39,617
Transfer from Operating Budget	-	-
Transfers from Completed Capital Projects	8,620	-
Interest Income	778	1,115
Ending Balance	50,130	40,732

	Operating Reserve	
	2020	2019
Beginning Balance	-	-
Transfer from Operating Budget	1,640	-
Interest Income	17	-
Ending Balance	1,657	-