

Wilderness Mountain Water System

2024 Annual Report



Introduction

This report provides a summary of the Wilderness Mountain Water Service for 2024 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, 74 were customers to the water system in 2024.

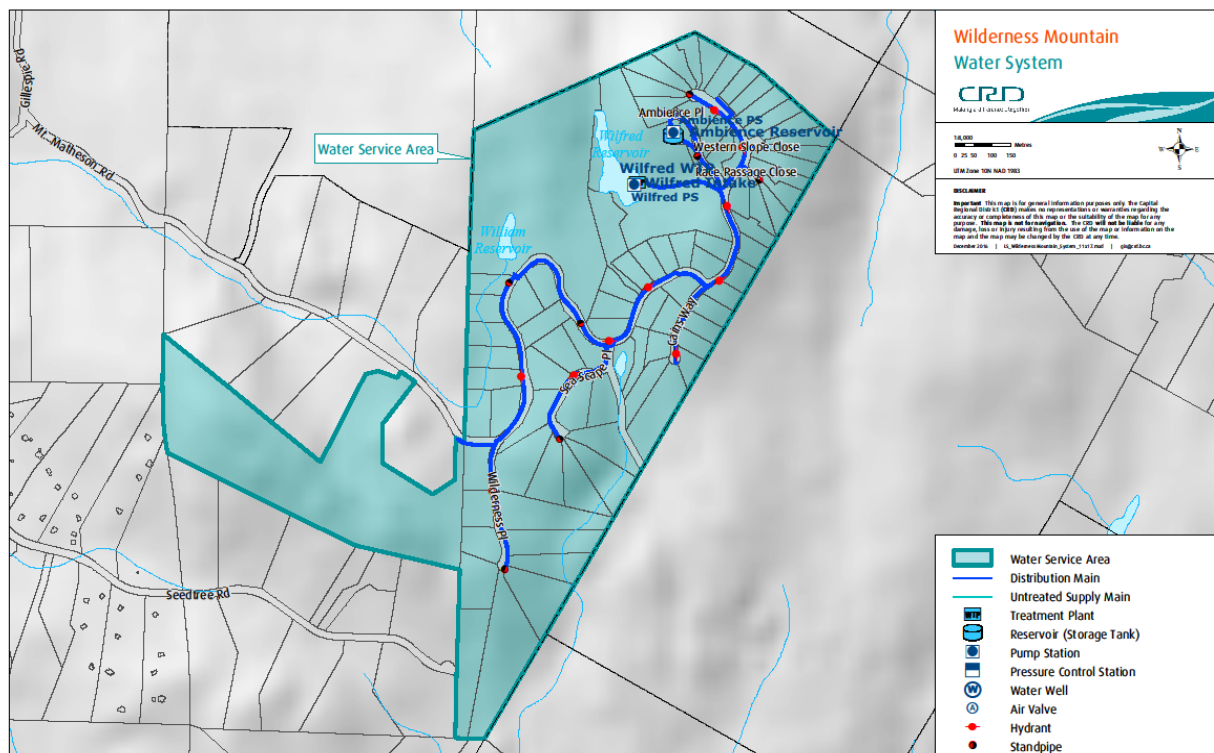


Figure 1: Map of the Wilderness Mountain Water Service Area

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 US gallons) and the distribution system.
- Distribution system. 3,750 meter network of 150 millimeter (6 inch) and 100 mm (4 inch) polyvinyl chloride (PVC) water mains.
- Other water system assets: 74 service connections, 10 hydrants, six standpipes, 21 gate valves and a Supervisory Control and Data Acquisition (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. The reservoir reached full volume in January 2024.

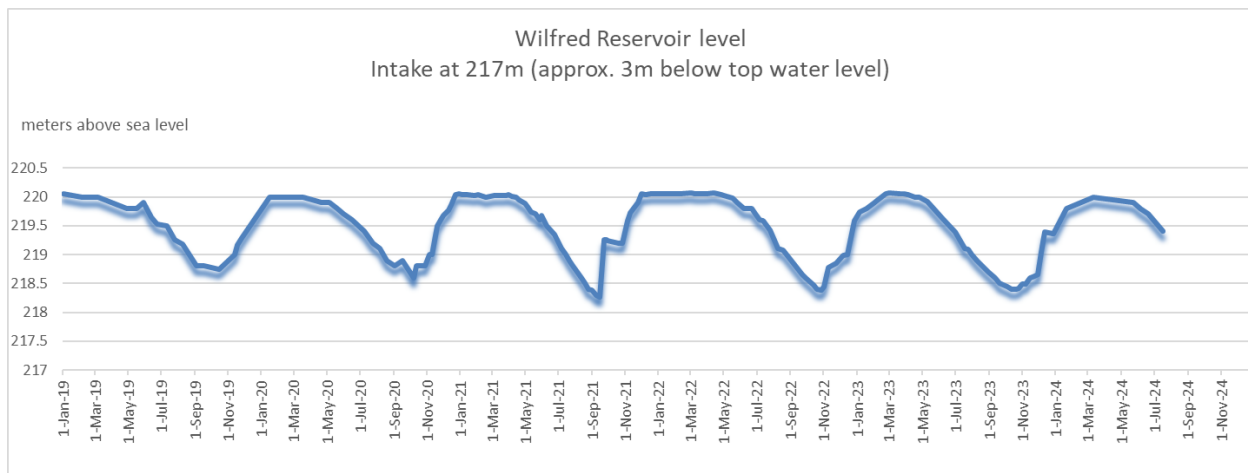


Figure 2: Wilfred Reservoir Water Level 2019-2024

Water Usage

The volume used by the community, or the water demand, is illustrated in Figure 3. The demand in 2024 was 10% lower than in 2023.

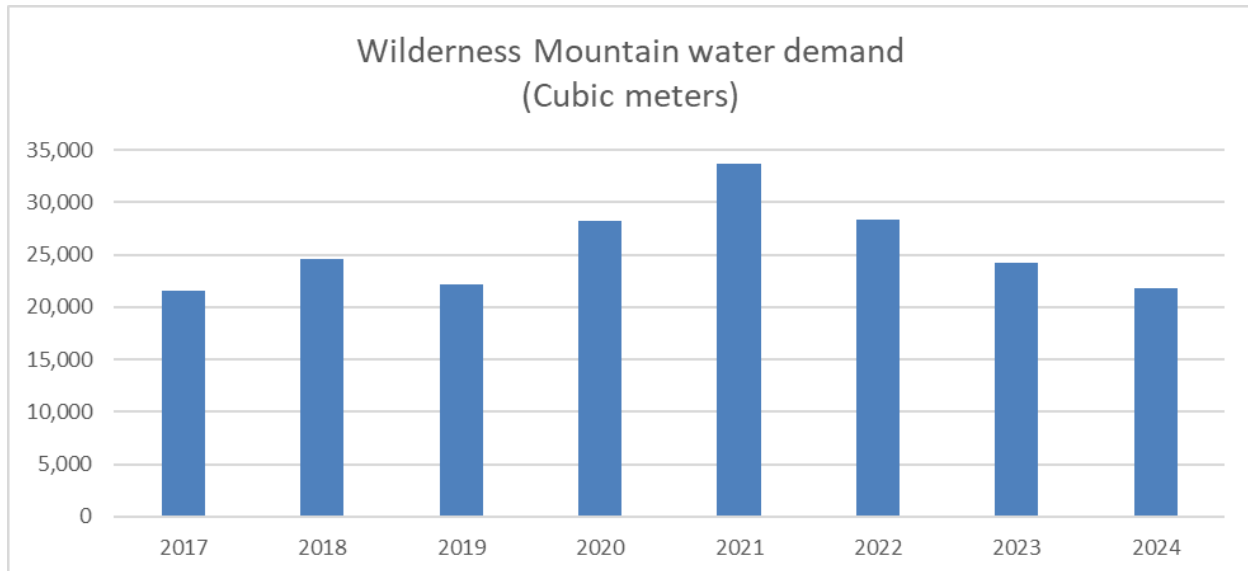


Figure 3: Wilderness Mountain Water Demand (cubic meters) 2017-2024

Drinking Water Quality

The Wilderness Mountain Water System was on two boil water advisories (BWA), in total for 56 days in 2024, due to elevated turbidity in the treated water. High algal activity and the inability of the existing filtration system to filter out very small algae species in bloom were the main factors for these BWAs for this system. Upgrades to the treatment process or a new water source are needed to meet the provincial requirement.

Wilfred Reservoir raw water exhibited elevated iron and manganese concentrations throughout the entire year, but the highest concentrations were recorded during November and December. Lake turnover and rain-driven runoff events were the main causes. Without designated treatment in place to remove these metals from the raw water, the aesthetic objectives for iron and manganese, as per Guidelines for Canadian Drinking Water Quality (GCDWQ), were regularly exceeded in the treated water. In samples from November 13, the manganese concentrations in the treated water even exceeded the maximum acceptable concentration (MAC), the health-related limit stipulated by the GCDWQ. Concentrations beyond the aesthetic limit can lead to water discolourations, while exceedances of the MAC can become a health issue with chronic exposure. Additional treatment is required to mitigate this ongoing issue. The water had a high colour rating throughout the year.

The data below provides a summary of the water quality characteristics in 2024:

Raw Water:

- From May to August, the raw water recorded extremely high total coliform bacteria concentrations. While summer total coliform spikes are common, the magnitude of this event was unprecedented. Outside this period, total coliform concentrations were relatively low.
- *E. coli* bacteria concentrations were mostly low with higher concentrations in the fall following the first post-summer rainfall and runoff event.
- *Cryptosporidium* and *Giardia* parasites were tested twice in 2024, and neither were detected.

- The raw water was tested monthly for metals for a more granular analysis compared to the past. The results indicate that both iron and manganese concentrations are particularly high during November and December. Cause for this is likely a combination of the lake turnover and runoff from rainfall events. However, the source water exhibited also high iron and manganese concentration in June.
- The median annual raw water turbidity was 0.90 Nephelometric Turbidity Unit (NTU) and therefore similar to 2023. The turbidity was typically over 1 NTU during the wet season and during early summer. The maximum turbidity was 2.4 NTU (October 25). Most raw water turbidity spikes coincided with algal and/or zooplankton blooms in Wilfred Reservoir. Runoff and lake turnover events can also have an adverse effect on turbidity.
- The raw water was soft (median hardness 17.75 mg/L CaCO₃).
- The pH was slightly acidic (median pH 6.9).
- The median total organic carbon (TOC) concentration was moderately high at 4.60 mg/L, which is in line with historic results.

Treated Water:

- The treated water was safe to drink outside the 56-day BWAs (January 1-24, and October 25 to November 25, 2024). No *E. coli* or total coliform bacteria were found in the treated water throughout the entire year.
- The treated water turbidity was above the GCDWQ turbidity limit of 1.0 NTU in January, October and November. This led to the two periods with a BWA.
- Manganese concentrations exceeded the aesthetic objective in the treated water during most parts of the year. August and September seem to be two months with lower iron and manganese in the treated water. Treated water samples from November 13 were above the MAC in the GCDWQ. Iron concentrations were in exceedance of the recently lowered aesthetic objective for most parts of the year. The water had a high colour rating for the entire year, likely because of high iron and manganese concentrations.
- The disinfection by-products Trihalomethanes (TTHM) and Haloacetic Acids (HAA) were well below the GCDWQ limits.
- The annual median total chlorine residual in the system was 1.70 mg/L.

Table 1 and 2 below provide a summary of the 2024 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:

- Hypo pump replacement,
- Booster pump replacement,
- Log/Debris removal from Wilfred Reservoir

Capital Project Updates – 2024

The Capital Projects that were in progress or completed in 2024 include:

- Wooden Intake Platform Replacement – Contract executed, and preliminary work progressed on wooden intake platform repairs. A portion of the scope for a floating landing deferred until Q2 of 2025 to align with budget approval timelines.

Financial Report

Please refer to the attached 2024 Statement of Operations and Reserve Balances.

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

Expenses include all costs of providing the service. General Government Services include budget preparation, financial management, utility billing and risk management services. CRD Labour and Operating Costs include 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 include 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 next year's financial plan.

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

Table 1

Table 1: 2024 Summary of Raw Water Test Results, Wilderness Mountain Water System										
PARAMETER		2024 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2014 - 2023 ANALYTICAL RESULTS			
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range		≤ = Less than or equal to	Median	Samples Analyzed	Range	
				Minimum	Maximum				Minimum	Maximum
mg/L = parts per million ug/L = parts per billion										
Physical Parameters (ND means Not Detected by analytical method used)										
Carbon, Dissolved Organic	mg/L as C	4.05	2	3.7	4.4		3.9	21	1.91	5.4
Carbon, Total Organic	mg/L as C	4.6	5	4.1	4.8	Guideline Archived	4	29	2.96	8.8
Colour, True	TCU	22.5	6	18.4	31	≤15 AO	14	53	7	28
Hardness as CaCO ₃	mg/L	17.75	12	15.9	19.1	No Guideline Required	15.7	34	11.1	18.6
pH	pH units	6.91	17	6.32	7.18	7.0 - 10.5 AO	6.9	77	6.14	8.1
Total Suspended Solids	mg/L	1.8	2	1.6	2		<2	13	0.4	7.2
Total Solids	mg/L	64	2	54	74		48.7	13	42	88
Turbidity, lab tests	NTU	0.9	38	0.5	2.4		0.94	382	0.35	5.8
Ultraviolet Transmittance	%	79.3	4	73.2	80.1		76.8	37	69.9	82.1
Water Temperature	degrees C	13.3	29	4.8	21.3	≤15 AO	11.75	310	3.5	21.2
Non-Metallic Inorganic Chemicals (ND means Not Detected by analytical method used)										
Ammonia, Total	ug/L as N	< 15	2	< 15	<15		30	18	<0.61	71
Bromide	ug/L as Br	0.0435	2	0.042	0.045		35	14	< 0.7	50
Chloride	mg/L as Cl	15	2	15	15	≤ 250 AO	11	10	10	14
Cyanide	mg/L as Cn	0.00075	2	0.00057	0.00092	0.2 MAC	< 0.0005	10	< 0.0005	< 0.006
Fluoride	mg/L as F	< 0.05	2	< 0.05	< 0.05	1.5 MAC	< 0.021	5	0.016	0.024
Nitrogen, Nitrate	ug/L as N	67.5	2	< 20	115		< 20	18	< 0.45	37
Nitrogen, Nitrite	ug/L as N	< 5	2	< 5	<5		< 5	18	<0.005	< 5
Nitrogen, Total	ug/L as N	359	2	250	468		211.5	18	84	267
Phosphate, Total	ug/L as P	< 10	3	9	13		6.45	18	< 1	71
Silica	mg/L as SiO ₂	3.4	2	3.3	3.5		4.65	4	2.1	5
Silicon	mg/L as Si	1110	12	675	1990		1540	31	380	2920
Sulphate	mg/L as SO ₄	3.6	4	3.4	4.2	≤ 500 AO	5.8	21	4	19
Sulphide	mg/L as H ₂ S	< 0.0018	2	< 0.0018	<0.0018	≤ 0.05 AO	< 0.0018	3	< 0.0018	0.0037
Sulphur	mg/L as S	< 3	12	< 3	<3		< 3	32	< 3	5.94
Metals (ND means Not Detected by analytical method used)										
Aluminum	ug/L as Al	20	12	5.9	36.6	2900 MAC / 100 OG	25.4	31	7.8	81.5
Antimony	ug/L as Sb	< 0.5	12	< 0.5	< 0.5	6 MAC	< 0.5	31	< 0.5	< 0.5
Arsenic	ug/L as As	0.11	12	< 0.1	0.14	10 MAC	< 0.1	31	< 0.1	0.15
Barium	ug/L as Ba	2.5	12	1.8	2.8	1000 MAC	2.1	31	< 1	2.7
Beryllium	ug/L as Be	< 0.1	12	< 0.1	< 0.1		< 0.1	31	< 0.1	< 0.1
Bismuth	ug/L as Bi	< 1	12	< 1	< 1		< 1	31	< 1	< 1
Boron	ug/L as B	< 50	12	< 50	< 50	5000 MAC	< 50	31	< 50	< 50
Cadmium	ug/L as Cd	< 0.01	12	< 0.01	0.046	7 MAC	< 0.01	31	< 0.01	0.013
Calcium	mg/L as Ca	3.785	12	3.4	4.06	No Guideline Required	3.36	31	2.9	4.14
Chromium	ug/L as Cr	< 1	12	< 1	12.4	50 MAC	< 1	31	< 1	< 1
Cobalt	ug/L as Co	< 0.2	12	< 0.2	0.26		< 0.2	31	< 0.2	0.5
Copper	ug/L as Cu	7.17	12	1.86	28.5	2000 MAC / ≤ 1000 AO	3.18	31	1.95	28.5
Iron	ug/L as Fe	173.5	12	89	489	≤ 100 AO	182	31	90.5	902
Lead	ug/L as Pb	0.6	12	< 0.2	2.68	5 MAC	0.27	31	< 0.2	1.01
Lithium	ug/L as Li	< 2	12	< 2	<2		< 2	22	< 2	5
Magnesium	mg/L as Mg	1.99	12	1.8	2.21	No Guideline Required	1.76	31	1.48	2.03
Manganese	ug/L as Mn	59.2	12	23.9	182	120 MAC / ≤ 20 AO	54.7	31	19.7	364
Mercury	ug/L as Hg	< 0.0019	5	< 0.0019	<0.03		< 0.0019	28	< 0.0019	< 0.05
Molybdenum	ug/L as Mo	< 1	12	< 1	<1		< 1	31	< 1	< 1
Nickel	ug/L as Ni	< 1	12	< 1	<1		< 1	31	< 1	5.2
Potassium	mg/L as K	0.398	12	0.312	0.454		0.325	31	0.249	0.423
Selenium	ug/L as Se	< 0.1	12	< 0.1	<0.1	50 MAC	< 0.1	31	< 0.1	< 0.1
Silver	ug/L as Ag	< 0.02	12	< 0.02	<0.02	No Guideline Required	< 0.02	31	< 0.02	< 0.02
Sodium	mg/L as Na	7.25	12	6.46	7.85	≤ 200 AO	6.79	31	6.18	10.9
Strontium	ug/L as Sr	15.55	12	14.3	17.8	7000 MAC	14.3	31	12.2	17.2
Thallium	ug/L as Tl	< 0.01	12	< 0.01	<0.01		< 0.01	31	< 0.01	< 0.05
Tin	ug/L as Sn	< 5	12	< 5	<5		< 5	31	< 5	< 5
Titanium	ug/L as Ti	< 5	12	< 5	<5		< 5	31	< 5	< 5
Uranium	ug/L as U	< 0.1	12	< 0.1	<0.1	20 MAC	< 0.1	31	< 0.1	< 0.1
Vanadium	ug/L as V	< 5	12	< 5	<5		< 5	31	< 5	< 5
Zinc	ug/L as Zn	9	12	< 5	42.3	≤ 5000 AO	< 5	31	< 5	21.3
Zirconium	ug/L as Zr	< 0.1	12	< 0.1	< 0.1		< 0.1	31	< 0.1	< 0.5
Microbial Parameters										
Indicator Bacteria										
Coliform, Total	Coliforms/100 mL	165	20	< 1	190000		150	199	<1	53000
<i>E. coli</i>	E.coli/100 mL	< 1	20	< 1	15		< 1	208	<1	29
Hetero. Plate Count, 28C (7 day)	CFU/1 mL	Last analyzed in 2014				No Guideline Required	780	9	470	1340
Chlorophyll										
Chlorophyll A	ug/L	3.74	16	1.24	13.2		3.68	135	0.295	10.7
Parasites						No MAC Established				
<i>Cryptosporidium</i> , Total oocysts	oocysts/100 L	< 0.1	2	< 0.1	<0.1	Zero detection desirable	0.55	13	< 0.1	< 1
<i>Giardia</i> , Total cysts	cysts/100 L	< 0.1	2	< 0.1	< 0.1	Zero detection desirable	< 1	9	< 0.1	< 1

Table 2

Table 2: 2024 Summary of Treated Water Test Results, Wilderness Mountain Water System										
PARAMETER		2024 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2014-2023 ANALYTICAL RESULTS			
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range		≤ = Less than or equal to	Median	Samples Analyzed	Range	
				Minimum	Maximum				Minimum	Maximum
mg/L = parts per million ug/L = parts per billion										
Physical Parameters										
Colour, True	TCU	18	4	12	23	≤ 15 AO	11	49	5	24
Hardness as CaCO ₃	mg/L	18.1	39	15.8	20		16.1	25	13.6	18.1
pH	pH units	7.14	17	6.5	7.92	7.0 - 10.5 AO	7	79	6.45	9.1
Total Organic Carbon	mg/L	4.55	6	3.8	5.8		3.95	16	2.5	8.7
Turbidity, lab tests	NTU	0.7	27	0.5	1.4	1 MAC and ≤ 5 AO	0.69	304	0.17	3.3
Water Temperature	degrees C	10.7	215	3	21.5	≤ 15 AO	11.1	1971	1.8	21.1
Microbial Parameters										
Indicator Bacteria										
Coliform, Total	CFU/100 mL	< 1	98	< 1	< 1	0 MAC	< 1	846	< 1	330
<i>E. coli</i>	CFU/100 mL	< 1	98	< 1	< 1	0 MAC	< 1	846	< 1	40
Hetero. Plate Count, 28C (7 day)	CFU/1 mL	21000	1	21000	21000	No Guideline Required	4600	76	60	22000
Disinfectants										
Disinfectants										
Chlorine, Total Residual	mg/L as Cl ₂	1.7	140	0.05	3.29	No Guideline Required	1.4	1188	0	5.2
Monochloramine, Field - 1 Station	mg/L	2.475	18	0.98	3.1		2.3	85	0.17	3.45
Disinfection By-Products (ND means Not Detected by analytical method used)										
Trihalomethanes (THMs)										
Bromodichloromethane (BDCM)	ug/L	< 1	5	< 1	< 1		< 1	52	< 0.2	26
Bromoform (BRFM)	ug/L	< 1	5	< 1	< 1		< 1	52	< 0.1	< 2
Chloroform (CHLF)	ug/L	2.8	5	2.3	3.8		2.45	52	< 1	130
Chlorodibromomethane (DBCM)	ug/L	< 1	5	< 1	< 1		< 1	52	< 0.1	3.1
Total Trihalomethanes (TTHM)	ug/L	2.8	5	2.3	3.8	100 MAC	2.4	52	< 1	160
Haloacetic Acids (HAAs)										
Haloacetic Acids (*5 Total, HAA5)	ug/L	8	1	8	8	80 MAC	11.5	44	0.75	88
Metals (ND means Not Detected by analytical method used)										
Aluminum	ug/L as Al	14.3	39	3.7	36.2	2900 MAC / 100 OG	19.3	25	4.5	62.1
Antimony	ug/L as Sb	< 0.5	39	< 0.5	< 0.5	6 MAC	< 0.5	25	< 0.5	< 0.5
Arsenic	ug/L as As	< 0.1	39	< 0.1	0.13	10 MAC	< 0.1	25	< 0.1	0.14
Barium	ug/L as Ba	2.5	39	1.3	3.3	1000 MAC	2	25	< 1	2.6
Beryllium	ug/L as Be	< 0.1	39	< 0.1	< 0.1		< 0.1	25	< 0.1	< 0.1
Bismuth	ug/L as Bi	< 1	39	< 1	< 1		< 1	25	< 1	< 1
Boron	ug/L as B	< 50	39	< 50	< 50	5000 MAC	< 50	25	< 50	< 50
Cadmium	ug/L as Cd	< 0.01	39	< 0.01	0.057	5 MAC	< 0.01	25	< 0.01	< 0.01
Calcium	mg/L as Ca	4.02	39	3.45	4.48	No Guideline Required	3.49	25	2.93	3.93
Chromium	ug/L as Cr	< 1	39	< 1	< 1	50 MAC	< 1	25	< 1	< 1
Cobalt	ug/L as Co	< 0.2	39	< 0.2	0.34		< 0.2	25	< 0.2	< 0.5
Copper	ug/L as Cu	14	39	6.18	136	2000 MAC / ≤ 1000 AO	10.2	25	3.57	92.7
Iron	ug/L as Fe	161	39	60.7	371	≤ 100 AO	176	25	49.7	573
Lead	ug/L as Pb	0.37	39	< 0.2	2.2	5 MAC	0.4	25	0.2	0.99
Lithium	ug/L as Li	< 2	39	< 2	< 2		< 2	21	< 2	< 5
Magnesium	mg/L as Mg	1.98	39	1.73	2.17	No Guideline Required	1.79	25	1.52	2.07
Manganese	ug/L as Mn	51.9	39	9.2	159	120 MAC / ≤ 20 AO	37.7	25	8	208
Mercury	ug/L as Hg	< 0.0019	5	< 0.0019	< 0.03		< 0.0019	19	< 0.0019	0.0032
Molybdenum	ug/L as Mo	< 1	39	< 1	< 1		< 1	25	< 1	< 1
Nickel	ug/L as Ni	< 1	39	< 1	< 1		< 1	25	< 1	< 1
Potassium	mg/L as K	0.394	39	0.303	0.459		0.342	25	0.241	0.397
Selenium	ug/L as Se	< 0.1	39	< 0.1	< 0.1	50 MAC	< 0.1	25	< 0.1	< 0.1
Silicon	mg/L as Si	1170	39	695	1930		1540	25	408	2860
Silver	ug/L as Ag	< 0.02	39	< 0.02	< 0.02	No Guideline Required	< 0.02	25	< 0.02	< 0.02
Sodium	mg/L as Na	10.2	39	8.61	12.1	≤ 200 AO	9.57	25	7.22	11.4
Strontium	ug/L as Sr	16.4	39	14.6	18.5	7000 MAC	14.4	25	12.3	16.4
Sulfur	mg/L as S	< 3	39	< 3	< 3		< 3	25	< 3	4.6
Thallium	ug/L as Tl	< 0.01	39	< 0.01	< 0.01		< 0.01	25	< 0.01	< 0.05
Tin	ug/L as Sn	< 5	39	< 5	< 5		< 5	25	< 5	< 5
Titanium	ug/L as Ti	< 5	39	< 5	< 5		< 5	25	< 5	< 5
Uranium	ug/L as U	< 0.1	39	< 0.1	< 0.1	20 MAC	< 0.1	25	< 0.1	< 0.1
Vanadium	ug/L as V	< 5	39	< 5	< 5		< 5	25	< 5	< 5
Zinc	ug/L as Zn	< 5	39	< 5	101	≤ 5000 AO	< 5	25	< 5	18.6
Zirconium	ug/L as Zr	< 0.1	39	< 0.1	< 0.1		< 0.1	25	< 0.1	< 0.5