

Skana Water System

2022 Annual Report

CRD | Drinking Water

Introduction

This report provides a summary of the Skana Water Service for 2022 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 Skana is a rural residential development located on the north side of Mayne Island in the Southern Gulf Islands Electoral Area, originally serviced by a private water utility. In 2003, the service converted to the Capital Regional District (CRD). The Skana Water Service (Figure 1) is made up of 73 parcels encompassing a total area of approximately 19 hectares. Of the 73 parcels, 50 were customers of the water system in 2022.

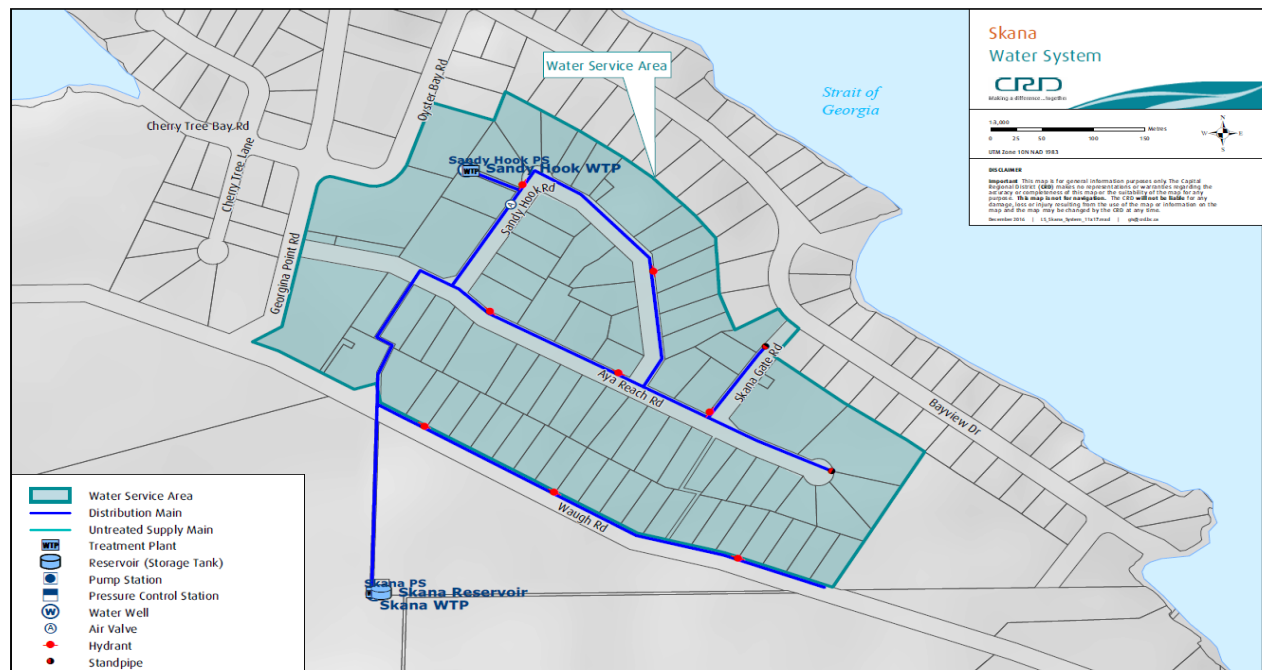


Figure 1: Map of Skana Water System

The Skana water system is primarily comprised of:

- Two groundwater wells, related pumping and control equipment and buildings (Production Wells #8 and Well #13).
- Disinfection process equipment (ultraviolet light and chlorine at each well).
- Two steel storage tanks (total volume is 91 cubic meters).
- Distribution system (1,977 meters of water mains).

- Other water system assets: 50 service connections and meters, eight flushing hydrants, three flushing standpipes, 15 gate valves, one air release valve, Supervisory Control and Data Acquisition (SCADA) system and auxiliary generator.

Water Supply

Groundwater supply monthly water levels are highlighted for 2022 in Figure 2. Resource water levels in 2022 about 10% lower than the 4 year average.

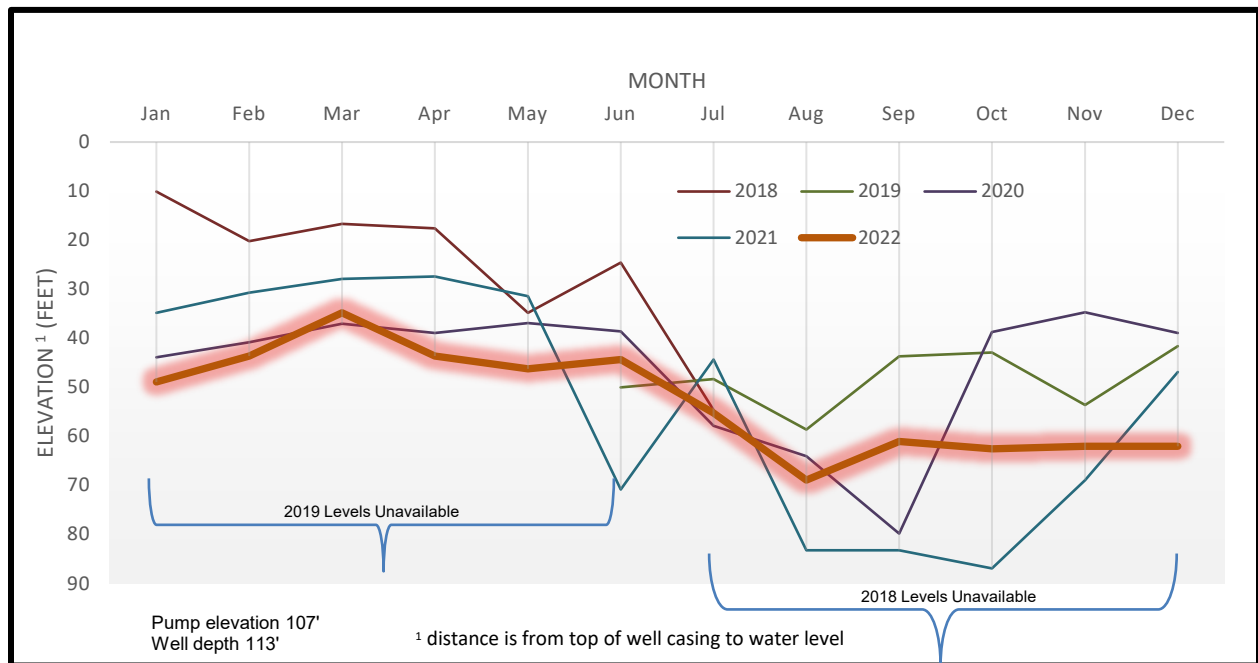


Figure 2: Skana Well #13 Groundwater Supply Monthly Water Level

Water Production and Demand

Referring to Figure 3, 4,889 cubic meters of water was extracted (water production) from the groundwater source (Well #13 and Well #8) in 2022; a 10% increase from the previous year and a 10% increase from the five year average. Water demand (customer water billing) for the service totaled 3,401 cubic meters of water; a 4% decrease from the previous year and a 1% increase from the five year average.

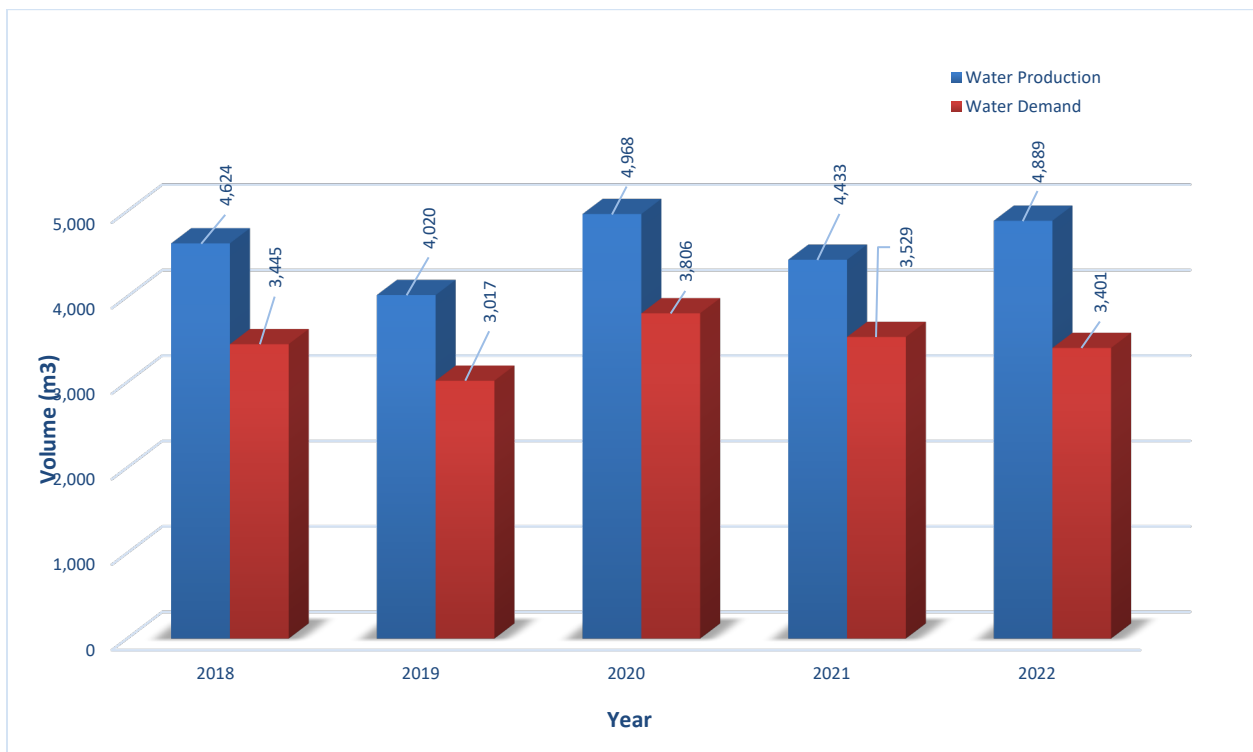


Figure 3: Skana Water Service Annual Water Production and Demand

The difference between annual water production and annual customer water demand is referred to as non-revenue water and can include water system leaks, water system maintenance and operational use (e.g. water main flushing, filter system backwashing), potential unauthorized use and fire-fighting use.

The 2022 non-revenue water (1,488 cubic meters) represents approximately 30% of the total water production for the service area. However, approximately 600 cubic meters is attributed to operational use resulting in a non-revenue water volume of approximately 18%. The non-revenue water is much higher for 2022 than previous years and is attributed to water system leaks that were identified and repaired.

Figure 4 below illustrates the monthly water production for 2022 along with the historical water production information. The monthly water production trends are typical for small water systems such as the Skana water system. However, water production in July 2022 was abnormally higher because of water system leaks that were identified and repaired.

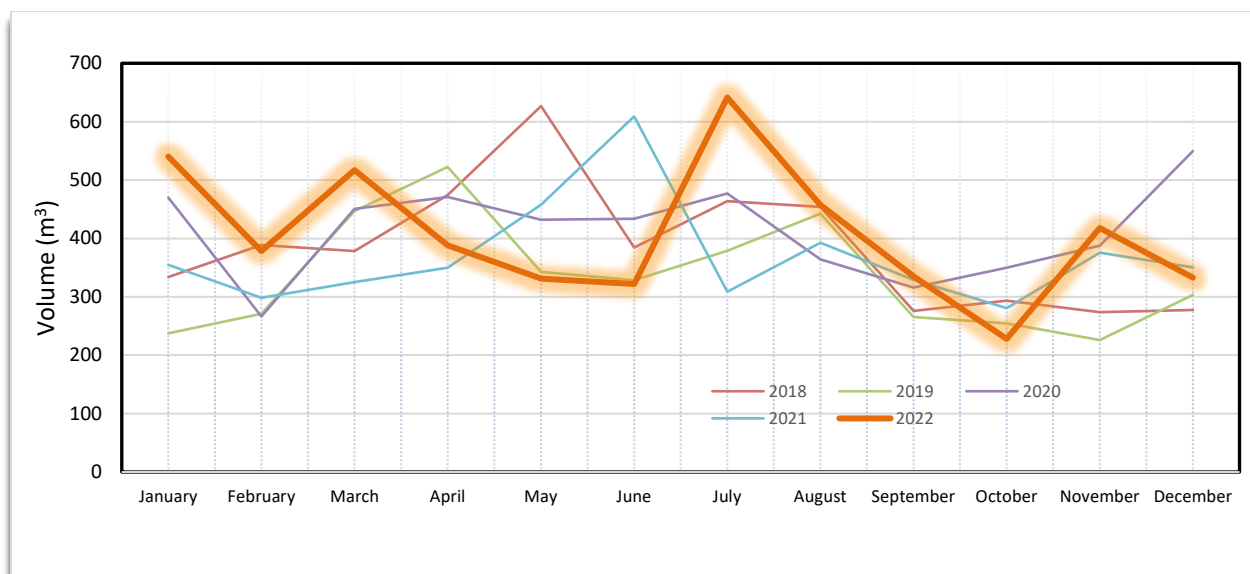


Figure 4: Skana Water Service Monthly Water Production.

Drinking Water Quality

Staff completed the water quality monitoring program at Skana based on regulatory requirements and system specific risks. Samples were collected at regular frequencies from the raw water, at the treatment plant as well as from a number of sampling stations in the distribution system. The samples were shipped for various analyses to the CRD’s Water Quality Lab or to external laboratories for special analyses such as disinfection by-products or metals.

The water system had challenges in 2022 to consistently supply drinking water of good quality to its customers. The main source Well #13 ran low during the peak of the fall drought event and backup Well #8 had to be used with its more turbid raw water. The raw water also experienced periods with elevated iron concentrations; in particular during the aquifer recharge season. Iron then accumulates and concentrates in dead end portions of the distribution system, such as the end of Skana Gate Road, and can lead to water discoloration issues. A cold snap in late December caused multiple pipe breaks which depressurized the system. This resulted in a system-wide Boil Water Advisory from December 25, 2022 to January 4, 2023.

During the wet season, disinfection by-product (DBP) concentrations in the distribution system exceeded the maximum acceptable concentration (MAC) listed in the Guidelines for Canadian Drinking Water Quality (GCDWQ) and caused the continuation of the DBP related water quality advisory that was issued in February 2022.

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

Raw Water:

- Well #13, the primary source, supplied raw water free of indicator bacteria total coliform and *E. coli*. This is improved from previous years.

- During the summer and fall, source supply was supplemented 1 day per week with water from Well #8, the utility's backup water source. In July 2022, the service line for a Bayview property was relocated to achieve proper chlorine disinfection which allowed staff to utilize Well #8 without issuing a BWA to this one property. No total coliform or *E.coli* bacteria were found in Well #8 in 2022. Water from Well #8 had consistently elevated turbidity from 1.5 to 2.9 Nephelometric Turbidity Unit (NTU), which is typical for this well.
- The median raw water turbidity was 0.65 NTU. This is slightly lower than last year but in line with previous years.
- The raw water was hard (hardness 77.65 mg/L CaCO₃).
- The total organic carbon (TOC) concentration in the raw water ranged from 1.2 to 4.0 mg/L with the higher concentrations recorded in the winter during rainy periods. Episodes of high TOC have the potential for high disinfection by-product concentrations.

Treated Water:

- The treated water was bacteriologically safe to drink with no confirmed *E. coli* or total coliform bacteria. Two samples in March and one sample in July tested positive for total coliform bacteria. Immediate resamples confirmed that no actual drinking water contamination occurred.
- Several pipe breaks during a cold snap in late December led to a Boil Water Advisory from December 25, 2022 to January 4, 2023.
- The median treated water turbidity was 0.7 NTU. On one occasion in March, the turbidity in a distribution system sample exceeded slightly 1 NTU.
- The disinfection by-product total trihalomethanes (TTHM) exceeded the maximum acceptable concentration of 100 µg/L at the Skana Gate Road and the Waugh Road sampling location in February and May (100 to 150 µg/L). Samples from August and November recorded much lower TTHM concentrations. Haloacetic acids (HAA) concentrations, another regulated disinfection by-product, also exceeded the MAC of 80 µg/L at Skana Gate Road in February and May (93 to 140 µg/L) while the August and November samples exhibited low concentrations. This is an improvement over 2021 DBP concentrations and is in part due to the efforts by staff to optimize chlorine concentrations, but also due to an unusually dry fall which resulted in lower than usual DBP formation during the fall months. However, due to the stark seasonal differences, there were long periods throughout the year when the rolling annual average of DBPs was above the MAC and therefore the water system remained under a DBP related water quality advisory.
- During the wet season, particularly February, the iron concentrations in the treated water from Well #13 and in the distribution system on Skana Gate Road were above the aesthetic limit in the GCDWQ. However no customer complaints about discolored water were received. During the dry season, iron concentrations in the raw and treated water are low.
- The free chlorine residual concentrations ranged from 0.24 to 1.46 mg/L with a median of 0.67 mg/L in the distribution system indicating satisfactory secondary disinfection.

Table 1 and 2 below provide a summary of the 2022 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 by CRD Integrated Water Services staff:

- Water system leak repair on Sandy Hook Road and Aya Reach standpipe connection.
- Well #8 (back up supply) water pump electrical protection system repair.
- Well #13 SCADA communications modem failure replacement.
- Emergency response to water system leaks during cold weather event late December 2022 that resulted in the water system depressurizing and a Boil Water Advisory to be issued for the service in consultation with Island Health.

Capital Projects Update

The Capital Projects that were in progress or completed in 2022 include:

- Well Decommissioning – The project which is related to unused groundwater wells in the area started in 2021. Due to inaccurate well records staff continued in the review and confirmation of ownership of wells and coordinated access agreements with some residents. A contract was entered into with Drillwell Enterprises Ltd. with the anticipation of conducting further field investigations and decommissioning of wells during drier weather in 2023.

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), interest on savings (Interest earnings), a transfer from the Operating Reserve Fund, 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 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.

Submitted by:	Jason Dales, B.Sc., WD IV, Senior Manager, Wastewater Infrastructure Operations
	Joseph Marr, P.Eng., Acting Senior Manager, Infrastructure Engineering
	Glenn Harris, Ph.D., R.P.Bio., Senior Manager, Environmental Protection
	Rianna Lachance, BCom, CPA, CA, Senior Manager, Financial Services
Concurrence:	Ian Jesney, P.Eng., Acting General Manager, Integrated Water Services
	Larisa Hutcheson, P.Eng., General Manager, Parks & Environmental Services

Attachments: Table 1
Table 2
2022 Statement of Operations and Reserve Balances

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

Table 1

Table 1: 2022 Summary of Raw Water Test Results, Skana 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										
Physical Parameters										
Hardness as CaCO ₃	mg/L	77.65	4	64.8	100	No Guideline Required	84.65	26	27.5	114
Turbidity	NTU	0.65	17	0.15	2.9		0.275	68	< 0.14	70
Water Temperature	deg C	6.45	16	5.5	13.9		6.5	194	5.1	21.3
pH	pH units	Not analyzed in 2022				AO pH 7.0 -10.5	7.24	24	6.7	8.12
Total Organic Carbon	mg/L	2.95	4	1.2	4		2.35	22	1.2	6.09
Metals										
Aluminum	ug/L as Al	51.95	4	4.6	105	2900 MAC / 100 OG	13.9	27	< 3	110
Antimony	ug/L as Sb	< 0.5	4	< 0.5	< 0.5	6 MAC	< 0.5	27	< 0.5	< 0.5
Arsenic	ug/L as As	0.18	4	0.18	0.19	10 MAC	0.2	27	0.12	0.99
Barium	ug/L as Ba	1.9	4	1.7	2.4	1000 MAC	2.4	27	1.3	< 9
Beryllium	ug/L as Be	< 0.1	4	< 0.1	< 0.1		< 0.1	27	< 0.1	< 3
Bismuth	ug/L as Bi	< 1	4	< 1	< 1		< 1	20	< 1	< 1
Boron	ug/L as B	115	4	89	146	5000 MAC	123	27	< 50	345
Cadmium	ug/L as Cd	< 0.01	4	< 0.01	< 0.01	5 MAC	< 0.01	27	< 0.01	< 0.1
Calcium	mg/L as Ca	24.4	4	20	32	No Guideline Required	26.8	27	10.1	36
Chromium	ug/L as Cr	< 1	4	< 1	< 1	50 MAC	< 1	27	< 1	< 10
Cobalt	ug/L as Co	< 0.2	4	< 0.2	< 0.2		< 0.2	27	< 0.1	< 20
Copper	ug/L as Cu	5.955	4	4.34	10.9	2000 MAC / ≤ 1000 AO	< 8	27	1.48	39
Iron	ug/L as Fe	105.45	4	5.2	336	≤ 300 AO	15.6	27	< 5	464
Lead	ug/L as Pb	0.365	4	< 0.2	0.56	5 MAC	0.48	27	< 0.2	0.93
Lithium	ug/L as Li	9.05	4	7.5	10.7		10.6	8	7.3	15.9
Magnesium	mg/L as Mg	4.075	4	3.62	4.97	No Guideline Required	4.42	27	0.566	5.96
Manganese	ug/L as Mn	11.15	4	4.1	26.7	120 MAC / ≤ 20 AO	4.4	27	0.077	48.6
Molybdenum	ug/L as Mo	< 1	4	< 1	< 1		< 1	27	< 1	< 20
Nickel	ug/L as Ni	< 1	4	< 1	< 1		< 1	27	< 1	< 50
Potassium	mg/L as K	0.2115	4	0.203	0.235		0.251	27	0.093	0.606
Selenium	ug/L as Se	< 0.1	4	< 0.1	< 0.1	50 MAC	< 0.1	27	< 0.1	1.07
Silicon	ug/L as Si	8605	4	8190	9040		8220	27	3170	12100
Silver	ug/L as Ag	< 0.02	4	< 0.02	< 0.02	No Guideline Required	< 0.02	27	< 0.02	< 10
Sodium	mg/L as Na	39.95	4	31.2	47.7	≤ 200 AO	41.4	27	25.7	86.5
Strontium	ug/L as Sr	64.05	4	57.8	87.2	7000 MAC	75.9	27	53	99.7
Sulfur	mg/L as S	7.75	4	6.2	10.5		8.75	20	3.2	12.6
Thallium	ug/L as Tl	< 0.01	4	< 0.01	0.016		< 0.01	20	< 0.01	< 0.05
Tin	ug/L as Sn	< 5	4	< 5	< 5		< 5	27	< 5	< 20
Titanium	ug/L as Ti	< 5	4	< 5	< 5		< 5	27	< 5	< 10
Uranium	ug/L as U	< 0.1	4	< 0.1	0.13	20 MAC	0.105	20	< 0.1	0.18
Vanadium	ug/L as V	< 5	4	< 5	< 5		< 5	27	< 5	< 10
Zinc	ug/L as Zn	6.8	4	< 5	9.2	≤ 5000 AO	6.2	27	< 1	198
Zirconium	ug/L as Zn	0.175	4	< 0.1	0.31		< 0.1	20	< 0.1	< 0.5
Microbial Parameters										
Indicator Bacteria										
Coliform, Total	CFU/100 mL	< 1	15	< 1	< 1		< 1	149	< 1	200
<i>E. coli</i>	CFU/100 mL	< 1	15	< 1	< 1		< 1	149	< 1	11
Heterotrophic bacteria, 7 day	CFU/mL	Not analyzed in 2022					10	1	10	10
Parasites										
<i>Cryptosporidium</i> , Total oocysts	oocysts/100 L	Last tested in 2015				Zero detection desirable	< 1	7	< 1	< 1
<i>Giardia</i> , Total cysts	cysts/100 L	Last tested in 2015				Zero detection desirable	< 1	7	< 1	< 1

Table 2

Table 2: 2022 Summary of Treated Water Test Results, Skana Water System										
PARAMETER		2022 ANALYTICAL RESULTS				CANADIAN GUIDELINES ≤ Less than or equal to	2012-2021 ANALYTICAL RESULTS			
Parameter Name	Units of Measure	Annual Median	Samples Analyzed	Range Minimum Maximum			Median	Samples Analyzed	Range Minimum Maximum	
ND means Not Detected by analytical method used										
Physical Parameters										
Hardness	mg/L as CaCO3	77.5	8	64.8	95.9		85.4	41	27	107
pH	pH units	Not tested in 2022				AO pH 7.0 - 10.5	7.05	14	7	8.1
Turbidity	NTU	0.7	27	0.25	1.02		0.41	158	< 0.14	40
Total Organic Carbon	mg/L	2.4	8	0.78	4.5		1.5	38	0	5
Water Temperature	deg C	6.7	69	5.4	18.2		6.6	1907	1	23.5
Microbial Parameters										
Indicator Bacteria										
Coliform, Total	CFU/100 mL	< 1	57	< 1	2	0 MAC	< 1	405	< 1	99
<i>E. coli</i>	CFU/100 mL	< 1	57	< 1	< 1	0 MAC	< 1	405	< 1	10
Hetero. Plate Count, 7 day	CFU/1 mL	Not tested in 2022				No Guideline Required	< 10	45	< 10	15000
Disinfectants										
Disinfectants										
Chlorine, Free Residual	mg/L as Cl2	0.67	69	0.24	1.46		0.88	1928	0.06	>2.2
Chlorine, Total Residual	mg/L as Cl2	1.03	1	1.03	1.03		0.67	1584	0.1	5.9
Disinfection By-Products										
Disinfection Byproducts										
Bromodichloromethane	ug/L	15.5	8	< 1	18.0		20	57	9.15	29
Bromoform	ug/L	< 1	8	< 1	< 1		< 1	57	< 0.1	1.71
Chloroform	ug/L	56.0	8	15.0	130.0		61.5	57	10.6	170
Chlorodibromomethane	ug/L	2.4	8	< 1	7.0		5.1	57	< 0.1	73.8
Total Trihalomethanes	ug/L	73.0	8	24.0	150.0	100 MAC	73.8	57	23.1	190
Haloacetic Acids (HAAs)										
HAA5	ug/L	55.5	4	18	140	80 MAC	20	7	7.7	140
Metals										
Aluminum	ug/L as Al	48.45	8	3.1	110	2900 MAC / 100 OG	25.6	42	3.1	164
Antimony	ug/L as Sb	< 0.5	8	< 0.5	< 0.5	6 MAC	< 0.5	42	< 0.5	< 0.5
Arsenic	ug/L as As	0.17	8	0.14	0.2	10 MAC	0.19	42	< 0.1	0.97
Barium	ug/L as Ba	2.1	8	1.6	2.5	1000 MAC	2.4	42	1.4	< 9
Beryllium	ug/L as Be	< 0.1	8	< 0.1	< 0.1		< 0.1	42	< 0.1	< 3
Bismuth	ug/L as Bi	< 1	8	< 1	< 1		< 1	39	< 1	< 1
Boron	ug/L as B	114	8	84	150	5000 MAC	119.5	42	53	507
Cadmium	ug/L as Cd	< 0.01	8	< 0.01	< 0.01	5 MAC	< 0.01	42	< 0.01	< 0.1
Calcium	mg/L as Ca	24.35	8	20	30.8	No Guideline Required	26.75	42	9.8	34.3
Chromium	ug/L as Cr	< 1	8	< 1	< 1	50 MAC	< 1	42	< 1	< 10
Cobalt	ug/L as Co	< 0.2	8	< 0.2	< 0.2		< 0.2	42	< 0.2	< 20
Copper	ug/L as Cu	7.575	8	4.26	11.6	2000 MAC / ≤ 1000 AO	7.33	42	3.48	66
Iron	ug/L as Fe	137.95	8	27.7	346	≤ 300 AO	49.9	42	< 10	607
Lead	ug/L as Pb	0.315	8	< 0.2	0.67	5 MAC	0.35	42	< 0.2	10
Lithium	ug/L as Li	9.1	8	7.6	10.9		9.95	16	7.4	15.9
Magnesium	mg/L as Mg	4.07	8	3.55	4.63	No Guideline Required	4.32	42	0.55	5.15
Manganese	ug/L as Mn	3.85	8	2.5	7.2	120 MAC / ≤ 20 AO	2.85	42	< 0.004	42.9
Molybdenum	ug/L as Mo	< 1	8	< 1	< 1		< 1	42	< 1	< 20
Nickel	ug/L as Ni	< 1	8	< 1	< 1		< 1	42	< 1	< 50
Potassium	mg/L as K	0.2125	8	0.193	0.253		0.2505	42	0.162	0.409
Selenium	ug/L as Se	< 0.1	8	< 0.1	< 0.1	50 MAC	< 0.1	42	< 0.1	0.564
Silicon	ug/L as Si	8640	8	8000	9160		8380	42	939	11800
Silver	ug/L as Ag	< 0.02	8	< 0.02	< 0.02	No Guideline Required	< 0.02	42	< 0.02	< 10
Sodium	mg/L as Na	40.05	8	30.6	54.7	≤ 200 AO	42.45	42	28.2	87.4
Strontium	ug/L as Sr	63.35	8	57	79.1	7000 MAC	74.55	42	53.5	89.7
Sulphur	mg/L as S	7.6	8	6.1	9.2		8.7	39	3.1	12.8
Thallium	ug/L as Tl	< 0.01	8	< 0.01	< 0.01		< 0.01	39	< 0.01	< 0.05
Tin	ug/L as Sn	< 5	8	< 5	< 5		< 5	42	< 5	< 20
Titanium	ug/L as Ti	< 5	8	< 5	< 5		< 5	42	< 5	31
Uranium	ug/L as U	< 0.1	8	< 0.1	0.13	20 MAC	< 0.1	39	< 0.1	0.18
Vanadium	ug/L as V	< 5	8	< 5	< 5		< 5	42	< 5	< 10
Zinc	ug/L as Zn	13.75	8	< 5	30.9	≤ 5000 AO	9	42	< 5	201
Zirconium	ug/L	0.17	8	< 0.1	0.33		< 0.1	39	< 0.1	< 0.5