

Skana Water System

2023 Annual Report



Introduction

This report provides a summary of the Skana Water Service for 2023 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 2023.

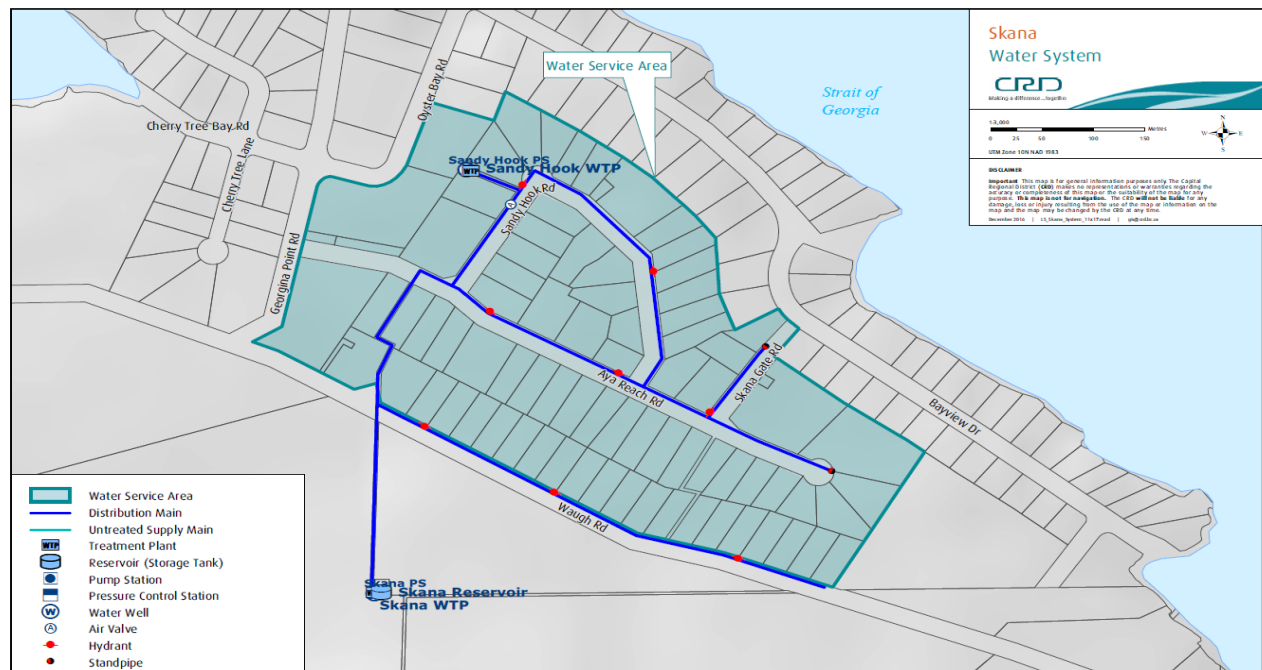


Figure 1: Map of Skana Water System

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 (approx. 1,970 meters of water mains).

- Other water system assets: 50 service connections and meters, eight flushing hydrants, two 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 2023 in Figure 2. Resource water levels in the first quarter of 2023 are about 50% higher than the 4-year average. This is likely the result of lower water demand and a very wet winter season. Aquifer water levels were typical for the remainder of the year.

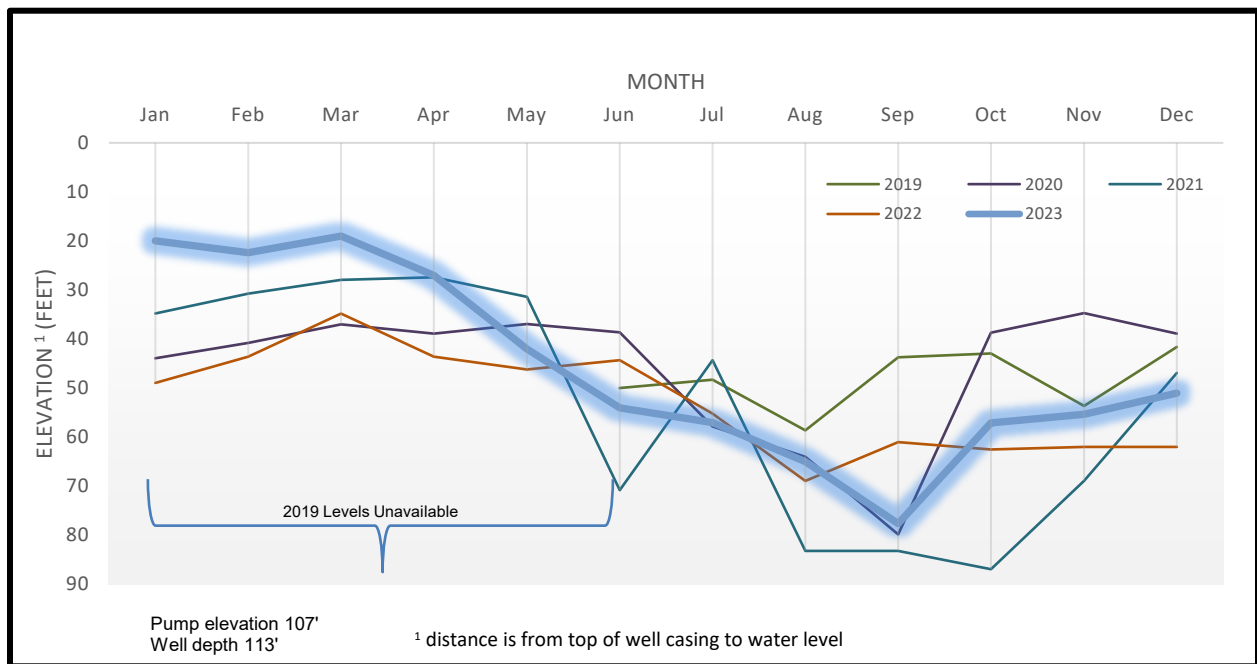


Figure 2: Skana Well #13 Groundwater Supply Monthly Water Level

Water Production and Demand

Referring to Figure 3; 3,746 cubic meters of water was extracted (water production) from the groundwater source (Well #13 and Well #8) in 2023; a 23% decrease from the previous year and a 18% decrease from the five year average. Water demand (customer water billing) for the service totaled 2976 cubic meters of water; a 12% decrease from the previous year and a 13% decrease from the five-year average.

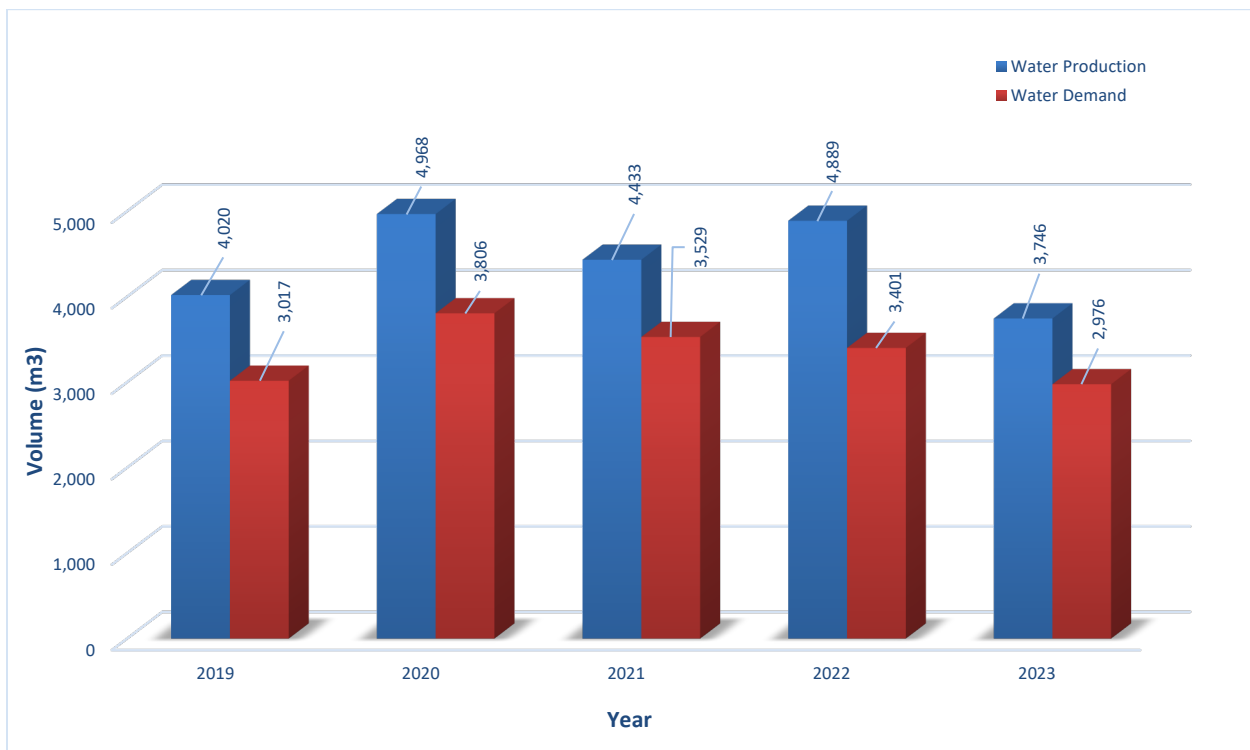


Figure 3: Skana Water Service Annual Water Production and Demand

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 2023 non-revenue water (770 cubic meters) represents approximately 21% 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 170 cubic meters or 4.5%.

Figure 4 below illustrates the monthly water production for 2023 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 early 2023 was abnormally higher because of water system leaks that were identified and repaired.

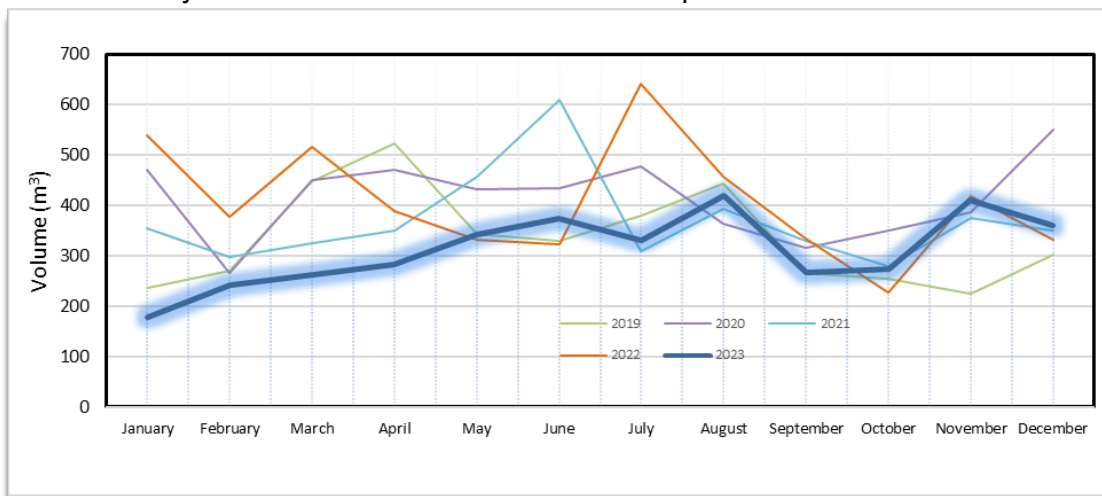


Figure 4: Skana Water Service Monthly Water Production.

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 experienced less water quality challenges in 2023 compared to previous years. The main source Well #13 ran low during the peak of the summer/fall drought and backup Well #8 had to be used more. A positive find was that the water quality supplied by Well #8 improved with higher usage. The raw water still experienced periods with elevated manganese concentrations; in particular during the aquifer recharge season, but no adverse impact was noticed by the customers.

During the wet season, disinfection by-product (DBP) concentrations in the distribution system exceeded briefly the maximum acceptable concentration (MAC) listed in the Guidelines for Canadian Drinking Water Quality (GCDWQ), but due to improved results during the prolonged dry season, the rolling annual average concentration of DBP was below the health limit after May and the DBP related water quality advisory (in place since February 2022) was rescinded in late May of 2023.

Well #13 still experienced clear patterns of groundwater influenced by surface water in 2023.

The data below provides a summary of the water quality characteristics in 2023:

Raw Water:

- Well #13, the primary source, had low concentrations of total coliform bacteria in November and December and a low concentration of *E.coli* bacteria also in November. This has been a typical pattern for this well during the aquifer recharge season and is an indication of influence of surface water. CRD has just completed a capital project that properly decommissioned some abandoned wells in the area. It is hoped that this will reduce or even eliminate this surface water connection to the groundwater.
- While Well #13 supplied mostly water with turbidity levels well under 1 Nephelometric Turbidity Unit (NTU), in January, March and October it recorded turbidity levels of up to 2.1 NTU. This again is linked to rainfall and runoff events and therefore evidence of surface water influence.
- During the summer, source supply was supplemented 1 day per week with water from Well #8, the utility's backup water source. This Well #8 usage was increased based on needs later that summer and into the drought-stricken fall. Water from Well #8 did not show the consistently elevated turbidity it had in previous years. Only in early October, the turbidity in this well registered 1.7 NTU. This is a significant improvement of the water quality supplied by this well and may be related to the increased use and the use-associated cleansing of the formation. No *E.coli* bacteria were found in Well #8 in 2023 but in September it contained very low concentrations of total coliform bacteria.
- The median raw water turbidity was 0.65 NTU. This is in line with previous years.
- The raw water was hard (hardness 88.75 mg/L CaCO₃).
- The total organic carbon (TOC) concentration in the raw water ranged from 1.2 to 4.4 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. TOC levels of 4.4 mg/L are also not typical for a true groundwater source and therefore evidence of surface water influence.

Treated Water:

- The treated water was safe to drink with no *E. coli* or total coliform bacteria positive test results.
- The median treated water turbidity was 0.55 NTU. In February, the treated water turbidity leaving the treatment plant slightly exceeded the 1 NTU threshold due to increased raw water turbidity. In August, one distribution system sample also 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 (130 to 140 µg/L). Samples from May, 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 (82 µg/L) while the May, August and November samples exhibited low concentrations. Despite these short-term spikes in the DBP concentrations, the critical measure, the rolling annual average of DBPs, was well below the MAC for both TTHM and HAA.
- During August and November, the manganese concentrations in the treated water from Well #13 and in the distribution system on Skana Gate Road were slightly above the aesthetic limit in the GCDWQ. However, no customer complaints about discolored water were received. Iron concentrations never reached the aesthetic limit in 2023.
- One sample from the treated water leaving the treatment plant in November registered a high concentration of lead; 29 µg/L which is well above the health limit for drinking water in Canada. This is a very unusual result and with no plausible explanation for the sudden presence of lead in the water it is assumed that this result was due to a contaminated sample.
- The free chlorine residual concentrations ranged from 0.04 to 1.6 mg/L with a median of 0.81 mg/L in the distribution system indicating satisfactory secondary disinfection.

Table 1 and 2 below provide a summary of the 2023 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:

- Well #8 (back up supply) rebuild piping due to freeze damage.
- Well #8 UV lamp failure.
- Well #13 pump protection system replaced.
- Well #13 replaced chlorine storage and containment.
- Well #8 replaced interior lights and light switch due to malfunction.
- Well #13 replaced exterior and emergency lights.
- Removed hose bibs at water sample points to improve water sample collection.

Capital Projects Update

The Capital Projects that were in progress or completed in 2023 include:

- Well Decommissioning – The project was for the decommissioning of unused groundwater wells in the water service, both as a means of protecting water quality and to ensure compliance with the groundwater protection regulation. CRD coordinated efforts with Drillwell Enterprises Ltd. to conduct field investigations and ultimately decommission two (2) CRD owned wells and two (2) private wells.

CRD is now believed to be in compliance for any CRD owned wells, however, some remaining private wells within the water service could not be located and are ultimately the responsibility of the property owners.

Financial Report

Please refer to the attached 2023 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.

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Attachments: Table 1
 Table 2
 2023 Statement of Operations and Reserve Balances

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

Table 1

Table 1: 2023 Summary of Raw Water Test Results, Skana Water System										
PARAMETER		2023 ANALYTICAL RESULTS				CANADIAN GUIDELINES	2013-2022 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	88.75	4	60.5	93.3	No Guideline Required	87.05	28	27.5	114
Turbidity	NTU	0.65	19	0.1	2.1		0.55	85	0.12	70
Water Temperature	deg C	10.9	38	7.1	14.9		6.8	225	5.1	21.3
pH	pH units	7.05	2	6.6	7.5	AO pH 7.0 -10.5	7.24	22	6.7	8.12
Total Organic Carbon	mg/L	1.75	4	1.2	4.4		2.455	26	1.2	6.09
Metals										
Aluminum	ug/L as Al	11.35	4	< 3	101	2900 MAC / 100 OG	12	29	< 3	110
Antimony	ug/L as Sb	< 0.5	4	< 0.5	< 0.5	6 MAC	< 0.5	29	< 0.5	< 0.5
Arsenic	ug/L as As	0.17	4	0.15	0.19	10 MAC	0.19	29	0.12	0.99
Barium	ug/L as Ba	2.15	4	1.7	2.4	1000 MAC	2.4	29	1.3	< 9
Beryllium	ug/L as Be	< 0.1	4	< 0.1	< 0.1		< 0.1	29	< 0.1	< 3
Bismuth	ug/L as Bi	< 1	4	< 1	< 1		< 1	24	< 1	< 1
Boron	ug/L as B	122	4	108	149	5000 MAC	124	29	< 50	345
Cadmium	ug/L as Cd	< 0.01	4	< 0.01	< 0.01	7 MAC	< 0.01	29	< 0.01	< 0.1
Calcium	mg/L as Ca	28.1	4	18.6	29.9	No Guideline Required	27.6	29	10.1	36
Chromium	ug/L as Cr	< 1	4	< 1	< 1	50 MAC	< 1	29	< 1	< 10
Cobalt	ug/L as Co	< 0.2	4	< 0.2	< 0.2		< 0.2	29	< 0.1	< 20
Copper	ug/L as Cu	13.615	4	4.36	30.2	2000 MAC / ≤ 1000 AO	< 8	29	1.48	32
Iron	ug/L as Fe	27.75	4	6.1	55.1	≤ 300 AO	15.6	29	< 5	464
Lead	ug/L as Pb	1.49	4	0.37	3.7	5 MAC	0.34	29	< 0.2	0.93
Lithium	ug/L as Li	9.8	4	8.1	11.2		10.35	12	7.3	15.9
Magnesium	mg/L as Mg	4.49	4	3.4	4.59	No Guideline Required	4.42	29	0.566	5.96
Manganese	ug/L as Mn	15.15	4	3.1	20.7	120 MAC / ≤ 20 AO	5.9	29	0.077	48.6
Molybdenum	ug/L as Mo	< 1	4	< 1	< 1		< 1	29	< 1	< 20
Nickel	ug/L as Ni	< 1	4	< 1	< 1		< 1	29	< 1	< 50
Potassium	mg/L as K	0.2165	4	0.171	0.221		0.242	29	0.093	0.373
Selenium	ug/L as Se	< 0.1	4	< 0.1	< 0.1	50 MAC	< 0.1	29	< 0.1	1.07
Silicon	ug/L as Si	8515	4	8330	9210		8380	29	6090	12100
Silver	ug/L as Ag	< 0.02	4	< 0.02	< 0.02	No Guideline Required	< 0.02	29	< 0.02	< 10
Sodium	mg/L as Na	40.9	4	23.6	49.8	≤ 200 AO	41.4	29	25.7	86.5
Strontium	ug/L as Sr	76.65	4	56.8	79.1	7000 MAC	75.9	29	53	99.7
Sulfur	mg/L as S	8.5	4	6.6	10.8		8.7	24	3.2	12.6
Thallium	ug/L as Tl	0.0125	4	< 0.01	0.015		< 0.01	24	< 0.01	< 0.05
Tin	ug/L as Sn	< 5	4	< 5	< 5		< 5	29	< 5	< 20
Titanium	ug/L as Ti	< 5	4	< 5	< 5		< 5	29	< 5	< 10
Uranium	ug/L as U	< 0.1	4	< 0.1	< 0.1	20 MAC	< 0.1	24	< 0.1	0.18
Vanadium	ug/L as V	< 5	4	< 5	< 5		< 5	29	< 5	< 10
Zinc	ug/L as Zn	24.15	4	9.4	37.4	≤ 5000 AO	6.4	29	< 1	198
Zirconium	ug/L as Zr	< 0.1	4	< 0.1	0.31		< 0.1	24	< 0.1	< 0.5
Microbial Parameters										
Indicator Bacteria										
Coliform, Total	CFU/100 mL	< 1	20	< 1	1		< 1	153	< 1	200
<i>E. coli</i>	CFU/100 mL	< 1	20	< 1	1		< 1	153	< 1	11
Heterotrophic bacteria, 7 day	CFU/mL	Not analyzed in 2023					10	1	10	10
Parasites										
<i>Cryptosporidium</i> , Total oocysts	oocysts/100 L	Last tested in 2015				Zero detection desirable	< 1	5	< 1	< 1
<i>Giardia</i> , Total cysts	cysts/100 L	Last tested in 2015				Zero detection desirable	< 1	5	< 1	< 1

Table 2

Table 2: 2023 Summary of Treated Water Test Results, Skana Water System										
PARAMETER	2023 ANALYTICAL RESULTS					CANADIAN GUIDELINES	2013-2022 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	mg/L as CaCO3	77.8	8	53.7	95.9		85.4	49	26.8	107
pH	pH units	6.9	2	6.7	7.1	AO pH 7.0 -10.5	7.05	14	6.9	8.1
Turbidity	NTU	0.55	28	0.2	1.2		0.55	183	0.11	40
Total Organic Carbon	mg/L	1.65	8	1.2	4.1		1.65	44	0.11	5
Water Temperature	deg C	10.85	184	4.8	17.5		7.6	1760	0.6	23.5
Microbial Parameters										
Indicator Bacteria										
Coliform, Total	CFU/100 mL	< 1	58	< 1	< 1	0 MAC	< 1	416	<1	99
<i>E. coli</i>	CFU/100 mL	< 1	58	< 1	< 1	0 MAC	< 1	416	<1	10
Hetero. Plate Count, 7 day	CFU/1 mL	Not tested in 2023				No Guideline Required	< 10	45	< 10	A 15000
Disinfectants										
Disinfectants										
Chlorine, Free Residual	mg/L as Cl2	0.81	188	0.04	1.6		0.71	1781	0.06	4.8
Chlorine, Total Residual	mg/L as Cl2	0.79	12	0.25	1.68		0.71	1281	0.1	5.9
Disinfection By-Products										
Disinfection Byproducts										
Bromodichloromethane	ug/L	18	8	13	23		16	63	6	29
Bromoform	ug/L	< 1	8	< 1	1		< 1	63	< 0.1	1.71
Chloroform	ug/L	39.5	8	24	120		52	63	10.6	170
Chlorodibromomethane	ug/L	5.55	8	1	11		2.8	63	< 0.1	73.8
Total Trihalomethanes	ug/L	64.5	8	49	140	100 MAC	73.8	63	23.1	190
Haloacetic Acids (HAAs)										
HAA5	ug/L	27.5	4	8.1	82	80 MAC	20	11	7.7	140
Metals										
Aluminum	ug/L as Al	18.85	8	< 3	111	2900 MAC / 100 OG	25.6	50	3.1	164
Antimony	ug/L as Sb	< 0.5	8	< 0.5	< 0.5	6 MAC	< 0.5	50	< 0.5	< 0.5
Arsenic	ug/L as As	0.185	8	0.13	0.62	10 MAC	0.18	50	< 0.1	0.97
Barium	ug/L as Ba	2.3	8	1.1	2.4	1000 MAC	2.4	50	1.4	< 9
Beryllium	ug/L as Be	< 0.1	8	< 0.1	< 0.1		< 0.1	50	< 0.1	< 3
Bismuth	ug/L as Bi	< 1	8	< 1	< 1		< 1	47	< 1	< 1
Boron	ug/L as B	131	8	102	280	5000 MAC	119.5	50	53	507
Cadmium	ug/L as Cd	< 0.01	8	< 0.01	0.023	7 MAC	< 0.01	50	< 0.01	< 0.1
Calcium	mg/L as Ca	24.25	8	18	30.8	No Guideline Required	26.75	50	9.8	34.3
Chromium	ug/L as Cr	< 1	8	< 1	< 1	50 MAC	< 1	50	< 1	< 10
Cobalt	ug/L as Co	< 0.2	8	< 0.2	< 0.2		< 0.2	50	< 0.2	< 20
Copper	ug/L as Cu	7.925	8	4.34	118	2000 MAC / ≤ 1000 AO	7.33	50	3.48	66
Iron	ug/L as Fe	92.05	8	18.6	271	≤ 300 AO	49.9	50	< 10	607
Lead	ug/L as Pb	0.545	8	0.21	29	5 MAC	0.335	50	< 0.2	10
Lithium	ug/L as Li	10.25	8	8.4	13.5		9.95	24	7.4	15.9
Magnesium	mg/L as Mg	4.17	8	2.14	4.7	No Guideline Required	4.255	50	0.55	5.15
Manganese	ug/L as Mn	7	8	2.2	35.4	120 MAC / ≤ 20 AO	3.3	50	< 0.004	42.9
Molybdenum	ug/L as Mo	< 1	8	< 1	< 1		< 1	50	< 1	< 20
Nickel	ug/L as Ni	< 1	8	< 1	2		< 1	50	< 1	< 50
Potassium	mg/L as K	0.2125	8	0.193	0.253		0.24	50	0.162	0.409
Selenium	ug/L as Se	< 0.1	8	< 0.1	< 0.1	50 MAC	< 0.1	50	< 0.1	0.564
Silicon	ug/L as Si	8485	8	8110	9240		8395	50	939	11800
Silver	ug/L as Ag	< 0.02	8	< 0.02	< 0.02	No Guideline Required	< 0.02	50	< 0.02	< 10
Sodium	mg/L as Na	43.95	8	28.6	82.1	≤ 200 AO	42.45	50	28.2	87.4
Strontium	ug/L as Sr	72.85	8	57.9	80.6	7000 MAC	72.35	50	53.5	89.7
Sulphur	mg/L as S	7.5	8	6.3	9.1		8.6	47	3.1	12.8
Thallium	ug/L as Tl	< 0.01	8	< 0.01	0.011		< 0.01	47	< 0.01	< 0.05
Tin	ug/L as Sn	< 5	8	< 5	< 5		< 5	50	< 5	< 20
Titanium	ug/L as Ti	< 5	8	< 5	5.3		< 5	50	< 5	31
Uranium	ug/L as U	< 0.1	8	< 0.1	0.12	20 MAC	< 0.1	47	< 0.1	0.18
Vanadium	ug/L as V	< 5	8	< 5	< 5		< 5	50	< 5	< 10
Zinc	ug/L as Zn	26.35	8	7.7	521	≤ 5000 AO	9	50	< 5	201
Zirconium	ug/L	< 0.1	8	< 0.1	0.35		< 0.1	47	< 0.1	< 0.5