DISTRICT OF SUMMERLAND

2023 Drinking Water Quality Annual Report

Facility No. 14-105-00001

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1.0 System Overview and Description

The District of Summerland (DOS), municipal water supply is comprised of two separate drinking water systems that supply potable water to approximately 12,918 people based on the 2022 Census by Statistics Canada. The Summerland water system also referred to as the Trout Creek water system is the largest and currently satisfies greater than 99 percent of the District's potable water demands. The Rodeo Grounds water system is the smallest with only three connections. Construction completed towards the end of 2017 separated the water supply from Garnett Reservoir to an irrigation "only" system. All Garnett Valley residences are now part of the Summerland water system and receive domestic water from the water treatment plant.

1.1 Summerland Water System

1.11 Supply

There are nine District-owned reservoirs throughout the 760 square kilometer Summerland watershed. These reservoirs include Thirsk, Headwaters #1, #2, #3, #4, Crescent, Whitehead, Isintok and Tsuh as shown in Figure 2. The Summerland water system is gravity fed from Trout Creek and utilizes this diversion as the main supply. This water diversion feeds, via an open channel flume, into the Summerland Reservoir that acts as a 68ML (million litre) settling and balancing pond.

Water leaving the Summerland reservoir passes through a coarse intake screen followed by a finer mesh-screening chamber to remove any large debris before entering the water treatment plant and irrigation system.

In 2010, the initial phase of separating the irrigation system from the domestic water system was completed. A 13MLD (million litre per day) capacity line in the upper Prairie Valley area was separated from the combined domestic/irrigation system and now serves as an irrigation-only piping system.

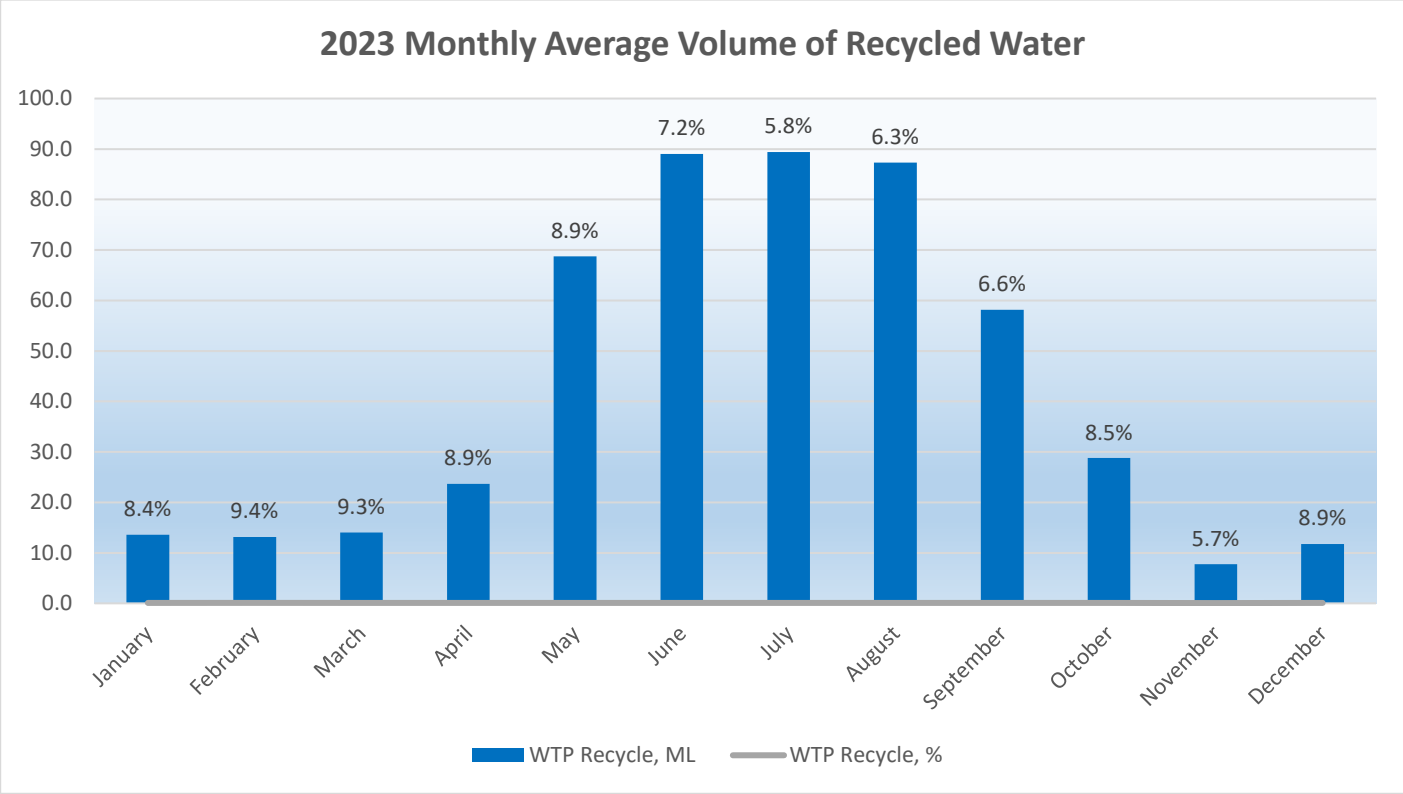
An additional phase of separation occurred during the Garnett Valley upgrade in 2017, section 1.2. The irrigation line from Garnett Dam was converted to an irrigation only system and extended east along Jones Flat road. Domestic connections were switched to a new Summerland potable water line extending to the last house at the North end of Garnett road and boosted by a new pump station along the route.

1.12 Water Treatment Plant

The water treatment process shown in Figure 1 consists of coagulation, flocculation, sedimentation, filtration and chlorine disinfection with a capacity of 76MLD. There are two ballasted floc ACTIFLO clarifiers and six dual media DUSENFLO filters. This was the first water treatment plant in British Columbia to utilize this process. Through the utilization of microsandz, in addition to coagulant and polymer, the weight of the floc and speed of formation is greatly increased. This allows for rapid settling to occur in a much smaller footprint than conventional treatment plants.

A designated waste tank collects wastewater from the treatment process. Submersible pumps lift the wastewater to two on-site settling ponds. Pumps lift the settled sludge to drying beds that are located near the Summerland landfill site.

The recycled supernatant from the settling ponds is gravity fed back to the treatment process. This innovative design involves recycling up to 10% of the supernatant back to the front of the process for re-treatment. This significantly improves the water use efficiency of the process and makes it the first water plant in Canada to utilize this technology. The following graph indicates the monthly average volume of water recycled back to the raw water tank.



Historical sampling results indicate that recycled water contributes very little to the amount of coliforms, colour, turbidity, Cryptosporidium oocysts and Giardia cysts returned to the head of the plant. Lab results for the recycled water indicates better water quality characteristics than that of the raw water from Trout Creek.

The treatment plant design is in accordance with LEED Silver guidelines. This design capitalizes on natural energy sources by use of extensive natural light and the use of heat pumps to transfer energy from raw water. Rainwater is collected and infiltrated back into the ground in dry wells to reflect the predevelopment site condition. The landscaping of the site closely reflects native species and requires no supplementary irrigation.

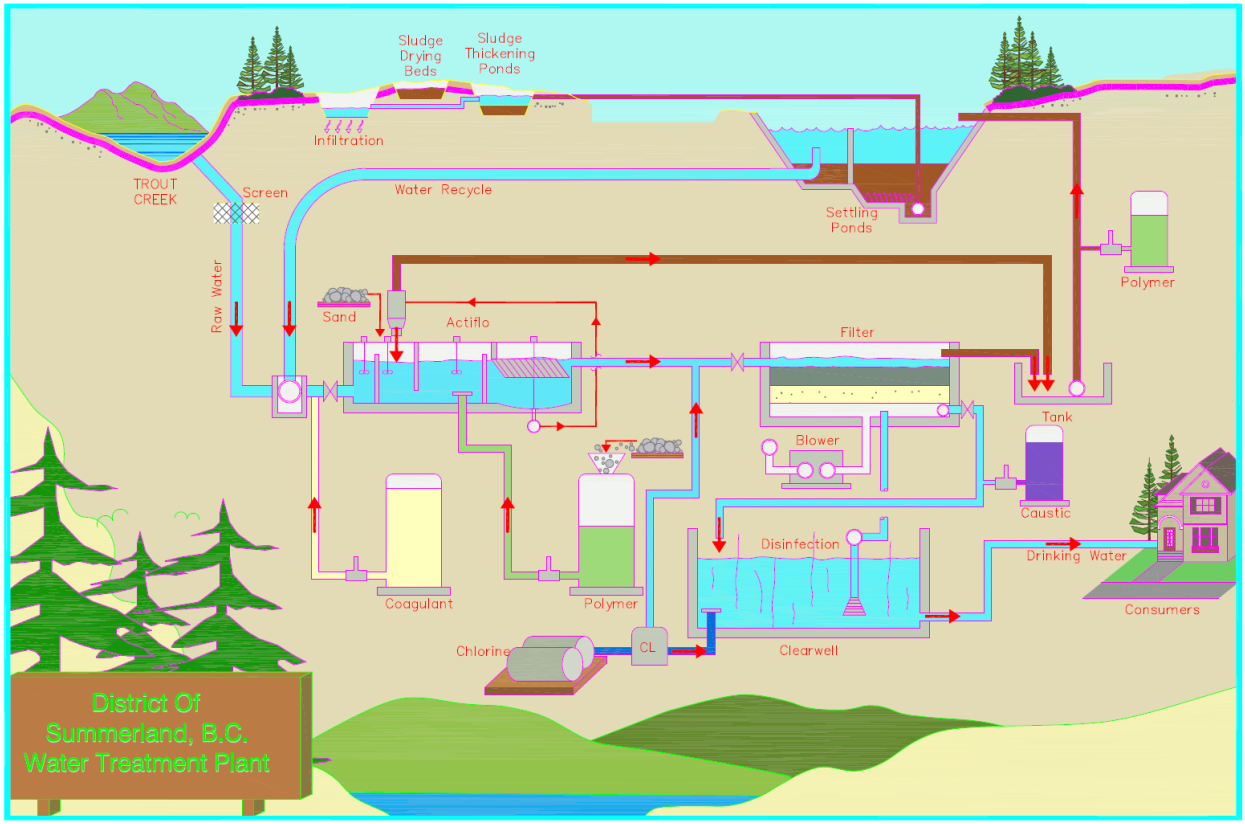


Figure 1 – Water Treatment Plant Schematic

1.13 Water Distribution System

The distribution system in ground piping ranges in size from 50mm to 1.37m in diameter, with a total combined length of approximately 216km.Thirteen pressure-reducing stations, twelve pumping stations and three in-ground storage tanks regulate system pressures ranging from 35 to 175psi at the consumer level.

1.14 Wells

Two wells named TW_3 and TW_5 installed on the Summerland Rodeo Grounds property in 2003 serve as an emergency only supplemental water source when flows from Trout Creek are insufficient to meet system demands. The relatively small combined output of TW_3 and TW_5 was determined to be 66LPS (liters per second). Supplemental well water was not required in 2023.

1.2 Garnett Valley Irrigation "only" System

The Garnett Valley Irrigation system is gravity fed utilizing Garnett Reservoir as the supply. Garnett Reservoir has an upper catchment area of 56 square kilometers, which also encompasses Eneas Reservoir. The reservoir is located on Eneas Creek but receives much of its water from underground springs.

1.3 Summerland Rodeo Grounds Water System

The Summerland Rodeo Grounds is a small water system located on Bathville Road. There are three connections supplying water to the Rodeo Grounds facilities, caretakers' residence and the Kettle Valley Railway station. A 2HP submersible pump supplies water to the system with a maximum pumping rate of 255LPM (liters per minute). The 150mm diameter well is located on the Rodeo Grounds property and is 54m deep.

2.0 System Classification and Operator Certification

The Environmental Operators Certification Program, EOCP, classifies both the District of Summerland's water distribution system and water treatment plant as class IV systems where class I is the least complex and class IV is the most complex.

The District currently employs six full time staff members to operate and maintain the water treatment plant, water distribution system and upper reservoir water supply system. Water Supply Technician's certifications range from levels I to IV in both water distribution and water treatment.

Employee	Certification #	Level	Goals
Shawn Hughes	1510	WD IV, WT I	N/A
Matthew Lee	7058	WD I, WT IV	N/A
Sheree Lancaster	4020	WD III, WT IV	N/A
Alex Bellemore	9357	WD II, WT IV	
Evan Sorensen	1000439	WT II, WD I	WT III & WD III
Kyra Marsden	156247	WT-I	WT III & WD III

Operators maintain EOCP certifications through various accredited training opportunities. Future certification plans include upgrading operators to higher levels.

3.0 Source Sampling

Summerland's watersheds combined encompasses approximately 815 square kilometers. Within this boundary, the DOS owns and operates 12 water storage reservoirs as shown in Figure 2. Various other lakes and tributaries also contribute to the water supply on a seasonal basis. Due to the size and layout of the watershed, source sampling is limited. The Summerland Reservoir is located approximately 300m east, and hydraulically down gradient of the Summerland Landfill. Due to this proximity, additional sampling is a requirement of the Summerland Landfill Operating Certificate MR15275, issued under the provisions of the Environmental Management Act. Sample collection from specified monitoring wells and the Summerland reservoir is scheduled quarterly. Samples are submitted to ALS Environmental Lab in Burnaby for analysis.
In addition to analysis of various parameters, water levels are recorded from 18 monitoring wells and the Summerland Reservoir on a bi-weekly to monthly basis. SNC Lavalin Inc. presented the data in the 2023 DOS

Landfill Annual Water Quality Report. In summary of this report, the Landfill leachate did not negatively affect water quality in the Summerland Reservoir.

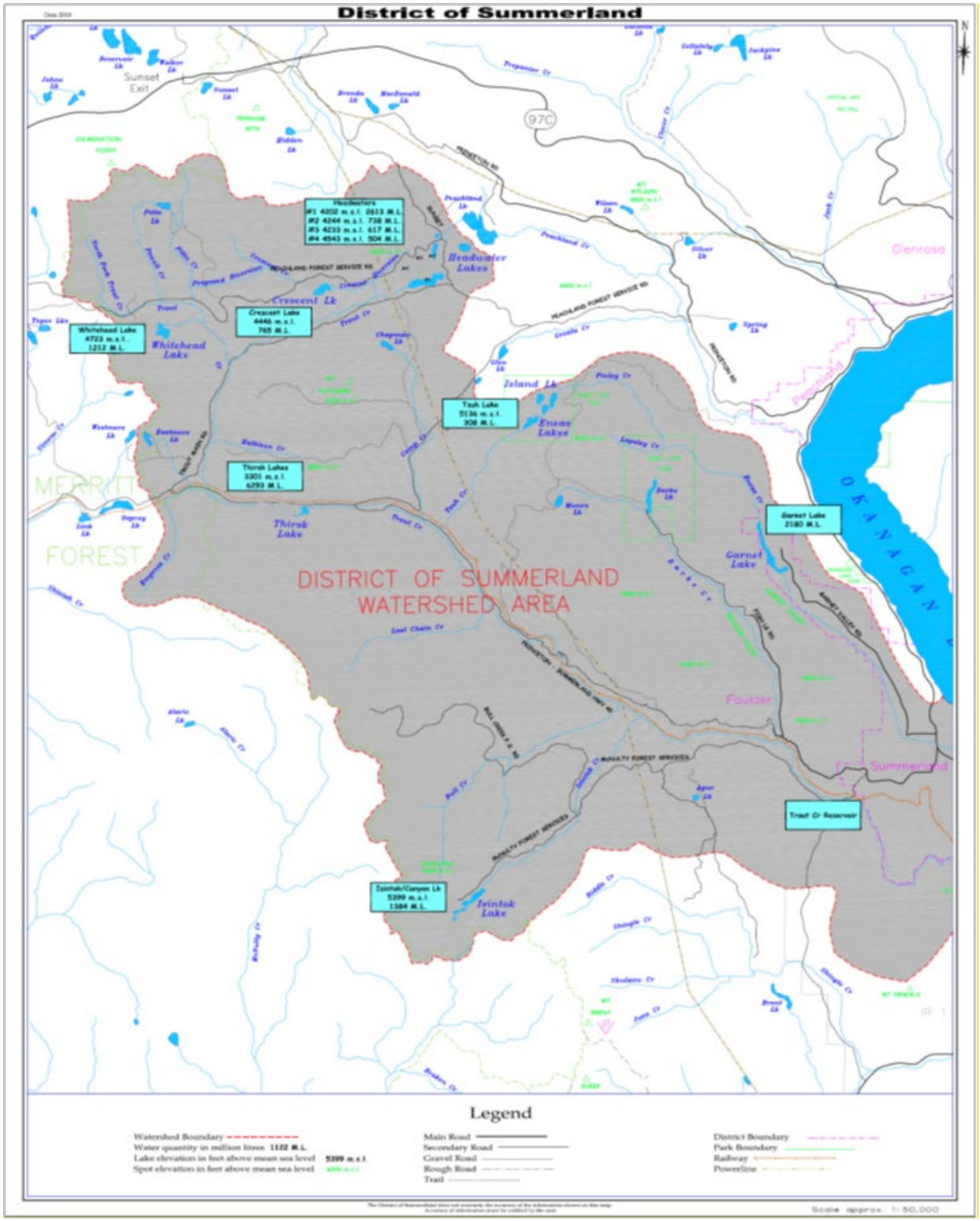


Figure 2 - District of Summerland Watershed Map

3.1 Sample Schedules

A sample schedule is used as a guideline for sampling events throughout the year. The following tables indicate the location and approximate timing for sample collection. Depending on the type of analysis, these locations may vary from source water before treatment to locations ranging from the first consumer to the distribution system ends.

3.11 Summerland Water System – 2023 Sample Schedule

Summerland System	LAB	January	February	March	April	May	June	July	August	September	October	November	December
Comprehensive - Distribution Pump House #6 *IncludesTOC*	CARO Kelowna				SA				SA				
Comprehensive - Pretreatment Summerland Reservoir Raw at WTP Lab tap	CARO Kelowna				SA				SA				
Gross Alpha & Beta Trout Creek Raw	CARO Kelowna									A			
Comprehensive – Watershed Headwaters #1 Outlet, Thirsk Outlet, Trout Creek Raw at Intake, Isintok Outlet. *Includes TOC, Total P, Total dissolved P, TKN, Total Ammonia as N.*	CARO Kelowna								A				
Algae - Watershed Headwaters #1 Outlet, Thirsk Outlet, Summerland Reservoir Raw at WTP Lab tap.	CARO Kelowna								A				
Algae – Pretreatment/Watershed Summerland Reservoir Raw at WTP Lab tap (quarterly through 2023 then adjust accordingly)	CARO Kelowna		Q			Q			Q			Q	
Lead & Copper – Distribution First Draw & Plus 5min Two locations in Distribution	CARO Kelowna			SA				SA					
E.coli Trout Creek, (Up&Dn Stream of Dark Creek inflow) Dark Creek (Above & Below Cattleguard & Mailboxes)	CARO Kelowna						**SA**					**SA**	
THMs Pump House #6	CARO Kelowna	Q			Q			Q			Q		
HAAs Pump House #6	CARO Kelowna	Q			Q			Q			Q		
Crypto/Giardia Trout Creek Raw & WTP Recycle	CARO Richmond	M	M	M	M	M	M	M	M	M	M	M	M
Total coliforms and E. coli Various locations in Distribution	CARO Kelowna	W	W	W	W	W	W	W	W	W	W	W	W
Turbidity Various locations in Distribution	In House	W	W	W	W	W	W	W	W	W	W	W	W
Chlorine Residuals Various locations in Distribution	In House	W	W	W	W	W	W	W	W	W	W	W	W

W – WEEKLY M – MONTHLY Q – QUARTERLY SA – SEMI ANNUALLY A - ANNUALLY

3.12 Summerland Water Treatment Plant – 2023 Sample Schedule

Water Treatment Plant	January	February	March	April	May	June	July	August	September	October	November	December
Turbidity Trout Creek Raw, WTP Recycle, Waste, Actiflo(s), Treated water at PH#2	D	D	D	D	D	D	D	D	D	D	D	D
Hardness and Alkalinity Trout Creek Treated	W	W	W	W	W	W	W	W	W	W	W	W
pH Trout Creek Raw, WTP Recycle, Waste, Actiflo(s), Treated water at PH#2	D	D	D	D	D	D	D	D	D	D	D	D
True Colour Trout Creek Raw, WTP Recycle, Actiflo(s)	D	D	D	D	D	D	D	D	D	D	D	D
True Colour Treated water at PH#2	W	W	W	W	W	W	W	W	W	W	W	W
Apparent Colour Treated water at PH#2	D	D	D	D	D	D	D	D	D	D	D	D
Apparent Colour Trout Creek Raw	W	W	W	W	W	W	W	W	W	W	W	W
UV Transmittance Trout Creek Raw, Actiflo(s), Treated water at PH#2	D	D	D	D	D	D	D	D	D	D	D	D
Aluminum Treated water at PH#2	W	W	W	W	W	W	W	W	W	W	W	W
TSS WTP Recycle & Waste	W	W	W	W	W	W	W	W	W	W	W	W

***W – WEEKLY D – DAILY**

3.13 Rodeo Water System – 2023 Sample Schedule

Rodeo System	LAB	Jan	Febr	Mar	Apr	May	June	Jul	Aug	Sept	Octo	Nov	Dece
Comprehensive Lodge	CARO Kelowna				SA				SA				
Total coliforms and E. coli Lodge	CARO Kelowna	W	W	W	W	W	W	W	W	W	W	W	W
Turbidity Lodge	In House	W	W	W	W	W	W	W	W	W	W	W	W
Gross Alpha & Beta Lodge	CARO Kelowna									A			
Iron Lodge	In House	W	W	W	W	W	W	W	W	W	W	W	W
Manganese Lodge	In House	M	M	M	M	M	M	M	M	M	M	M	M
pH Lodge	In House	W	W	W	W	W	W	W	W	W	W	W	W

W – WEEKLY M – MONTHLY SA – SEMI ANNUALLY A - ANNUALLY

4.0 Bacteriological Summary

The DOS must complete a minimum bacteriological sampling frequency of four samples per week in the water distribution system and a frequency of four samples per month in the Rodeo water system. The collection of water samples are from predetermined locations throughout the town boundaries.

4.1 Summerland Water System

The Summerland water distribution system is classified by Interior Health as a water system with 301-10,000 connections. Sample sites are located from the middle to the end of the distribution system in alternating locations. An average of four samples are collected weekly that are shipped to Caro Analytical. The DOS also has the ability for in-house samples processed by the IDEXX Colilert P/A system for back up capabilities.

Two hundred and four bacteriological samples were collected from the Summerland water system throughout the year and submitted to Caro Analytical for analysis. All treated water samples were absent for Total Coliforms and *E-coli*.

4.2 Rodeo Grounds Water System

The Rodeo Grounds Water System is classified by Interior Health as a water system with 14 or less connections. Sample sites are identified as the Lodge and the Kettle Valley Railway station (KVR). The number of samples collected weekly from the Rodeo Grounds Water System include one that is submitted to Caro Analytical.

There were fifty-six samples collected from the Summerland Rodeo Grounds water system in 2023. A sample collected on May 23rd was positive with 3 total coliform and <1 E-coli. Interior Health was notified and additional samples were submitted to Caro Analytical on May 29th from the Rodeo Lodge as well as the KVR Station. Results from both samples were absent for Total Coliforms and E-coli.

5.0 Additional Water Quality Information

5.1 Comprehensive Summary

Comprehensive water analysis was performed on both water systems in the spring and fall of 2023 to ensure compliance with the Guidelines for Canadian Drinking Water Quality (GCDWQ). Parameters include metals, nutrients, bacteria, anions, and aesthetic objectives including colour, taste and odour. Monitoring of source water included an annual set of samples collected from the low-level outlets of Thirsk Reservoir and Headwaters #1 Reservoir.

Glossary of Terms:

GCDWQ - Guidelines for Canadian Drinking Water Quality
MRL - Method Reporting Limit
MAC - Maximum Acceptable Concentration
OG - Operational Guideline
AO - Aesthetic Objective
CFU/100mL - Colony Forming Units per 100 millilitres
mg/L - Milligrams per Litre
CU - Colour Units
µS/cm - Microsiemens per Centimeter
NTU - Nephelometric Turbidity Units
pH units - pH <7 = acidic, pH >7 = basic

5.11 Summerland Water System – Trout Creek Raw

Caro Analytical Services - Lab Summary
Summerland System - Trout Creek Raw

Month/Year	August 2023	MRL	GCDWQ	Units
Anions				
Chloride	1.24	0.10	AO ≤ 250	mg/L
Fluoride	<0.10	0.10	MAC = 1.5	mg/L
Nitrate (as N)	<0.010	0.010	MAC = 10	mg/L
Nitrite (as N)	<0.010	0.010	MAC = 1	mg/L
Sulfate	4.6	1.0	AO ≤ 500	mg/L
General Parameters				
Alkalinity, Total (as CaCO3)	54.1	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	54.1	1.0	N/A	mg/L
Alkalinity, Carbonate (as CaCO3)	<1.0	1.0	N/A	mg/L
Alkalinity, Hydroxide (as CaCO3)	<1.0	1.0	N/A	mg/L
Colour, True	30	5.0	AO ≤ 15	CU
Conductivity (EC)	111	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	0.0020	MAC = 0.2	mg/L
pH	7.46	0.10	7-10.5	pH units
Temperature, at pH	23.1		N/A	°C
Turbidity	1.7	0.10	OG <0.1	NTU
Calculated Parameters				
Hardness, Total (as CaCO3)	50.4	0.500	N/A	mg/L
Langlier Index	-1.1	-5.0	N/A	-
Solids, Total Dissolved (calc)	62.4	1.00	N/A	mg/L
Total Metals				
Aluminum, total	0.0342	0.0050	OG <0.1	mg/L
Antimony, total	<0.00020	0.00020	MAC = 0.006	mg/L
Arsenic, total	<0.00050	0.00050	MAC = 0.01	mg/L
Barium, total	0.0334	0.0050	MAC = 1	mg/L
Boron, total	<0.0500	0.0050	MAC = 5	mg/L
Cadmium, total	<0.000010	0.000010	MAC = 0.005	mg/L
Calcium, total	15.6	0.20	N/A	mg/L
Chromium, total	<0.00050	0.00050	MAC = 0.05	mg/L
Cobalt, total	<0.00010	0.00010	N/A	mg/L
Copper, total	0.00118	0.00040	MAC = 2	mg/L
Iron, total	0.156	0.010	AO ≤ 0.3	mg/L
Lead, total	<0.00020	0.00020	MAC = 0.01	mg/L
Magnesium, total	2.75	0.010	N/A	mg/L
Manganese, total	0.0277	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000010	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00277	0.00010	N/A	mg/L
Nickel, total	<0.00040	0.00040	N/A	mg/L
Potassium, total	1.47	0.10	N/A	mg/L
Selenium, total	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	3.68	0.10	AO ≤ 200	mg/L
Strontium, total	0.205	0.0010	N/A	mg/L
Uranium, total	0.00114	0.000020	MAC = 0.02	mg/L
Zinc, total	<0.0040	0.0040	AO ≤ 5	mg/L

5.12 Summerland Water System – Pump House #6

Caro Analytical Services - Lab Summary

Summerland System - Pump House #6

Month/Year	April 14 2023	August 8 2023	MRL	GCDWQ	Units
Anions					
Chloride	10.4	15.3	0.10	AO ≤ 250	mg/L
Fluoride	<0.10	<0.10	0.10	MAC = 1.5	mg/L
Nitrate (as N)	<0.010	<0.010	0.010	MAC = 10	mg/L
Nitrite (as N)	<0.010	<0.010	0.010	MAC = 1	mg/L
Sulfate	8.3	4.2	1.0	AO ≤ 500	mg/L
General Parameters					
Alkalinity, Total (as CaCO3)	71.4	50.1	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	71.4	50.1	1.0	N/A	mg/L
Alkalinity, Carbonate (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Hydroxide (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Colour, True	<5.0	<5.0	5.0	AO ≤ 15	CU
Conductivity (EC)	197	146	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	<0.0020	0.0020	MAC = 0.2	mg/L
pH	7.18	7.44	0.10	7-10.5	pH units
Temperature, at pH	22.7	23.2		N/A	°C
Turbidity	<0.10	0.15	0.10	OG <0.1	NTU
Calculated Parameters					
Total Trihalomethanes	0.0545	N/A	0.00400	MAC = 0.1	mg/L
Hardness, Total (as CaCO3)	86.0	49.1	0.500	N/A	mg/L
Langlier Index	-1.1	-1.2	-5.0	N/A	-
Solids, Total Dissolved (calc)	107	79.6	1.00	N/A	mg/L
Total Metals					
Aluminum, total	0.0276	0.0245	0.0050	OG <0.1	mg/L
Antimony, total	<0.00020	<0.00020	0.00020	MAC = 0.006	mg/L
Arsenic, total	<0.00050	<0.00050	0.00050	MAC = 0.01	mg/L
Barium, total	0.0443	0.0346	0.0050	MAC = 1	mg/L
Boron, total	<0.0500	<0.0500	0.0050	MAC = 5	mg/L
Cadmium, total	<0.000010	<0.000010	0.000010	MAC = 0.005	mg/L
Calcium, total	26.6	15.3	0.20	N/A	mg/L
Chromium, total	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Cobalt, total	<0.00010	<0.00010	0.00010	N/A	mg/L
Copper, total	0.00179	0.00206	0.00040	MAC = 2	mg/L
Iron, total	<0.010	<0.010	0.010	AO ≤ 0.3	mg/L
Lead, total	<0.00020	<0.00020	0.00020	MAC = 0.01	mg/L
Magnesium, total	4.73	2.62	0.010	N/A	mg/L
Manganese, total	0.00125	0.00048	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000010	<0.000010	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00390	0.00272	0.00010	N/A	mg/L
Nickel, total	<0.00040	<0.00040	0.00040	N/A	mg/L
Potassium, total	1.67	1.40	0.10	N/A	mg/L
Selenium, total	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	11.2	10.20	0.10	AO ≤ 200	mg/L
Strontium, total	0.337	0.199	0.0010	N/A	mg/L
Uranium, total	0.00408	0.000110	0.000020	MAC = 0.02	mg/L
Zinc, total	<0.0040	<0.0040	0.0040	AO ≤ 5	mg/L
Volatile Organic Compounds (VOC)					
Bromodichloromethane	0.0111	N/A	0.0010	N/A	mg/L
Bromoform	<0.0010	N/A	0.0010	N/A	mg/L
Chloroform	0.0414	N/A	0.0010	N/A	mg/L
Dibromochloromethane	0.0020	N/A	0.0010	N/A	mg/L
Surrogate: Toluene-d8	70	N/A	70-130%	N/A	%
Surrogate: 4-Bromofluorobenzene	79	N/A	70-130%	N/A	%

5.13 Rodeo Water System

Caro Analytical Services - Lab Summary

Rodeo System - Lodge

Month/Year	April 17 2023	August 8 2023	MRL	GCDWQ	Units
Anions					
Chloride	2.43	2.29	0.10	AO ≤ 250	mg/L
Fluoride	0.14	0.13	0.10	MAC = 1.5	mg/L
Nitrate (as N)	0.240	0.202	0.010	MAC = 10	mg/L
Nitrite (as N)	<0.010	<0.010	0.010	MAC = 1	mg/L
Sulfate	11.5	10.7	1.0	AO ≤ 500	mg/L
General Parameters					
Alkalinity, Total (as CaCO3)	153	168	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	153	168	1.0	N/A	mg/L
Alkalinity, Carbonate (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Hydroxide (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Colour, True	<5.0	<5.0	5.0	AO ≤ 15	CU
Conductivity (EC)	323	314	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	<0.0020	0.0020	MAC = 0.2	mg/L
pH	7.76	8.08	0.10	7-10.5	pH units
Temperature, at pH	22.9	22.7		N/A	°C
Turbidity	0.62	0.20	0.10	OG <0.1	NTU
Calculated Parameters					
Hardness, Total (as CaCO3)	160	158	0.500	N/A	mg/L
Langlier Index	0.09	0.4	-5.0	N/A	-
Solids, Total Dissolved (calc)	181	187	1.00	N/A	mg/L
Total Metals					
Aluminum, total	<0.0050	<0.0050	0.0050	OG <0.1	mg/L
Antimony, total	<0.00020	<0.00020	0.00020	MAC = 0.006	mg/L
Arsenic, total	<0.00050	<0.00050	0.00050	MAC = 0.01	mg/L
Barium, total	0.0646	0.0671	0.0050	MAC = 1	mg/L
Boron, total	<0.0500	<0.0500	0.0050	MAC = 5	mg/L
Cadmium, total	<0.000010	<0.000010	0.000010	MAC = 0.005	mg/L
Calcium, total	49.5	49.3	0.20	N/A	mg/L
Chromium, total	0.00075	0.00068	0.00050	MAC = 0.05	mg/L
Cobalt, total	<0.00010	<0.00010	0.00010	N/A	mg/L
Copper, total	0.0131	0.0369	0.00040	MAC = 2	mg/L
Iron, total	0.042	<0.010	0.010	AO ≤ 0.3	mg/L
Lead, total	<0.00020	<0.00020	0.00020	MAC = 0.01	mg/L
Magnesium, total	8.88	8.35	0.010	N/A	mg/L
Manganese, total	0.00035	<0.00020	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000010	<0.000010	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00712	0.00678	0.00010	N/A	mg/L
Nickel, total	<0.00040	<0.00040	0.00040	N/A	mg/L
Potassium, total	3.08	3.00	0.10	N/A	mg/L
Selenium, total	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	10.8	10.6	0.10	AO ≤ 200	mg/L
Strontium, total	0.435	0.455	0.0010	N/A	mg/L
Uranium, total	0.00884	0.00786	0.000020	MAC = 0.02	mg/L
Zinc, total	<0.0040	<0.0040	0.0040	AO ≤ 5	mg/L

5.14 Source Water

Summerland System Source Water	Caro Analytical Services - Lab Summary Headwaters #1 Reservoir Low Level Outlet	Thirsk Reservoir Low Level Outlet	Isintok Reservoir Low Level Outlet			
Month/Year	**August 24 2023**	**August 24 2023**	**August 24 2023**	**MRL**	**GCDWQ**	**Units**
Anions						
Chloride	0.34	0.74	0.19	0.10	AO ≤ 250	mg/L
Fluoride	<0.10	<0.10	<0.10	0.10	MAC = 1.5	mg/L
Nitrate (as N)	<0.010	<0.010	<0.010	0.010	MAC = 10	mg/L
Nitrite (as N)	0.011	0.011	<0.010	0.010	MAC = 1	mg/L
Sulfate	3.5	3.9	<1.0	1.0	AO ≤ 500	mg/L
General Parameters						
Alkalinity, Total (as CaCO3)	53.4	45.5	12.4	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	53.4	45.5	12.4	1.0	N/A	mg/L
Alkalinity, Carbonate (as CaCO3)	<1.0	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Hydroxide (as CaCO3)	<1.0	<1.0	<1.0	1.0	N/A	mg/L
Ammonia, Total (as N)	N/A	N/A	N/A	0.050	N/A	mg/L
Carbon, Total Organic	N/A	N/A	N/A	0.5	N/A	mg/L
Colour, True	19	37	84	5.0	AO ≤ 15	CU
Conductivity (EC)	96.4	89.3	29.9	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	<0.0020	0.0028	0.0020	MAC = 0.2	mg/L
pH	7.31	7.22	6.7	0.10	7-10.5	pH units
Phosphorus, Total (as P)	N/A	N/A	N/A	0.050	N/A	mg/L
Phosphorus, Total Dissolved	N/A	N/A	N/a	0.050	N/A	mg/L
Temperature, at pH	23.1	22.9	23.5		N/A	°C
Turbidity	1.97	3.16	3.71	0.10	OG <0.1	NTU
Calculated Parameters						
Hardness, Total (as CaCO3)	45.9	40.9	11	0.500	N/A	mg/L
Langlier Index	-1.3	-1.5	-3.1	-5.0	N/A	-
Solids, Total Dissolved (calc)	57.4	51.6	14.2	1.00	N/A	mg/L
Total Metals						
Aluminum, total	0.011	0.0640	0.1790	0.0050	OG <0.1	mg/L
Antimony, total	<0.00020	<0.00020	<0.00020	0.00020	MAC = 0.006	mg/L
Arsenic, total	<0.00050	<0.00050	<0.00050	0.00050	MAC = 0.01	mg/L
Barium, total	0.0157	0.0319	0.0097	0.0050	MAC = 1	mg/L
Boron, total	<0.0500	<0.0500	<0.0500	0.0050	MAC = 5	mg/L
Cadmium, total	<0.000010	<0.000010	<0.000010	0.000010	MAC = 0.005	mg/L
Calcium, total	15.5	12.8	3.31	0.20	N/A	mg/L
Chromium, total	<0.00050	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Cobalt, total	<0.00010	<0.00010	0.00053	0.00010	N/A	mg/L
Copper, total	0.00047	0.00139	0.00172	0.00040	MAC = 2	mg/L
Iron, total	0.150	0.220	2.170	0.010	AO ≤ 0.3	mg/L
Lead, total	<0.00020	<0.00020	<0.00020	0.00020	MAC = 0.01	mg/L
Magnesium, total	1.72	2.16	0.65	0.010	N/A	mg/L
Manganese, total	0.02980	0.0459	0.1320	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000010	<0.000010	<0.000010	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00133	0.00219	0.00116	0.00010	N/A	mg/L
Nickel, total	<0.00040	<0.00040	<0.00040	0.00040	N/A	mg/L
Potassium, total	1.34	1.27	0.82	0.10	N/A	mg/L
Selenium, total	<0.00050	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	2.37	2.96	1.65	0.10	AO ≤ 200	mg/L
Strontium, total	0.0897	0.155	0.0269	0.0010	N/A	mg/L
Uranium, total	0.000045	0.000768	0.000230	0.000020	MAC = 0.02	mg/L
Zinc, total	<0.0040	<0.0040	<0.0040	0.0040	AO ≤ 5	mg/L

5.2 Chlorine Residual

Treated water is monitored continuously for free chlorine residual by on-line HACH/ProMinent analyzers at the water treatment plant and within the distribution system. Cellular and radio alarms alert operators if levels deviate from desired set points. To ensure output accuracy, chlorine analyzers are routinely calibrated and maintained.

As set out in the annual sample schedule, various sample points are tested for free chlorine residual weekly throughout the water distribution system. The HACH Pocket Colorimeter II is used to test chlorine residual, as it is both rugged and portable. The colorimeters are serviced and calibrated annually by a certified HACH technician for quality assurance.

There are eight routine sampling locations throughout the distribution system with pump house #2 located at the beginning of the system and monitored daily. The rest of the sample sites are located between the middle and the ends of the distribution system.

5.3 Turbidity

5.31 Summerland Water System

Raw water is monitored continuously with a Hach Surface Scatter 7sc Turbidimeter and trended on a 24-hour basis. A grab sample is also collected daily and analyzed in house with the Hach 2100Q for comparison. The meter is calibrated monthly or as required based on the readings. In 2023, daily raw water grab samples for turbidity ranged from a low of 0.43 NTU on January 28th to a high of 9.9 NTU on May 15th.

Recycled water is monitored continuously for turbidity with a Solitax sc turbidimeter and trended on SCADA. The turbidity for recycled water ranged from a low of 0.12 NTU during the month of February to a high of 8.55 NTU during the month of August.

Treated water is monitored continuously with Hach 5300sc turbidimeters at the six filter outlets prior to the clearwell and trended on SCADA. The annual average turbidity of treated water leaving the water treatment plant to distribution was 0.020 NTU.

In addition to the continuous on-line monitoring of treated water leaving the plant, daily grab samples from Pump House #2, the first point of distribution, ranged from a low of 0.05 NTU to a high of 0.28 NTU throughout the year. Turbidity is monitored daily in the distribution system with a portable HACH 2100Q and continuously with a Hach 5300 sc. Gelex standards are used to verify the accuracy of the meter on a daily basis. A certified HACH technician services and calibrates the meter annually for quality assurance.

5.32 Rodeo Water System

Rodeo Grounds turbidity is monitored weekly from the Lodge and/or the Kettle Valley Railway Station. Grab samples ranged from 0.13 NTU on December 25th to 0.95 NTU on April 17th.
Occasional system flushing is required during periods of very low demand in order to regenerate the well with fresh water.

5.4 Trihalomethanes & Haloacetic Acids

The DOS must complete a minimum sampling frequency of four samples per year in the water distribution system for total Trihalomethanes (THMs) and for Haloacetic acids (HAAs).

Based on the Canadian Drinking Water Guideline for THMs, the maximum acceptable concentration (MAC) is 0.10mg/L, expressed as a running annual average of quarterly samples and the MAC for HAAs is 0.08mg/L. The sample location for the Summerland water system is Pump House #6 located on Simpson Road and samples were submitted to Caro Analytical for analysis.

The average annual concentration of THMs was 0.0682mg/L.

The average annual concentration of HAAs was 0.0429mg/L.

Trihalomethane (THMs) Lab Results
Caro Analytical Services, Kelowna BC

Pump House #6

2023	Total Trihalomethanes, mg/L
January 16	0.0869
April 11	0.0545
July 17	0.0781
October 3	0.0533
Minimum	0.0533
Maximum	0.0869
Average	0.0682

Haloacetic Acids (HAAs) Lab Results
Caro Analytical Services, Kelowna BC

Pump House #6

2023	Total Haloacetic Acids, mg/L
January 16	0.0546
April 11	0.0429
July 17	0.0357
October 3	0.0385
Minimum	0.0357
Maximum	0.0546
Average	0.0429

5.5 Cryptosporidium and Giardia

Cryptosporidium and Giardia performance monitoring locations include raw water and recycled wastewater supernatant. Raw water is collected directly from the piping to the raw water tank and is thoroughly flushed prior to sample collection. Recycled supernatant is collected from the piping from the settling ponds and also thoroughly flushed prior to sample collection.

The following data includes the reported count per 100L volume of water.

Cryptosporidium and Giardia Lab Results
Caro Analytical Services, Kelowna BC

	Trout Creek Raw		WTP Recycle	
Date	**Cryptosporidium species Oocysts/100L**	**Giardia species Cysts/100L**	**Cryptosporidium species Oocysts/100L**	**Giardia species Cysts/100L**
4-Jan-23	9	32	0	0
6-Feb-23	16	58	0	0
6-Mar-23	50	125	0	0
3-Apr-23	68	192	0	0
1-May-23	158	61	1	0
5-Jun-23	0	0	0	0
4-Jul-23	110	70	9	17
8-Aug-23	104	145	19	31
5-Sept-23	23	50	0	0
4-Oct-23	24	51	0	0
7-Nov-23	29	25	0	0
4-Dec-23	13	16	0	0
Average	50	69	2	4

5.6 Gross Alpha & Beta

To assess the level of radionuclides in drinking water, raw water samples are submitted annually to Caro Analytical Services for analysis of gross alpha and beta. The tests are cost-effective screening tools used to determine whether further isotope-specific analysis for radium or uranium is necessary.
Samples from both drinking water systems were collected at the source.

5.61 Summerland Water System

Trout Creek Raw (23I3083-05) | Matrix: Water | Sampled: 2023-09-25

Radioactivity Parameters

Gross Alpha Activity	< 0.04	MAC = 0.5	0.04 Bq/L	2023-10-12
Gross Beta Activity	**0.08**	MAC = 1	0.03 Bq/L	2023-10-12

5.62 Rodeo Water System

CARO ANALYTICAL SERVICES

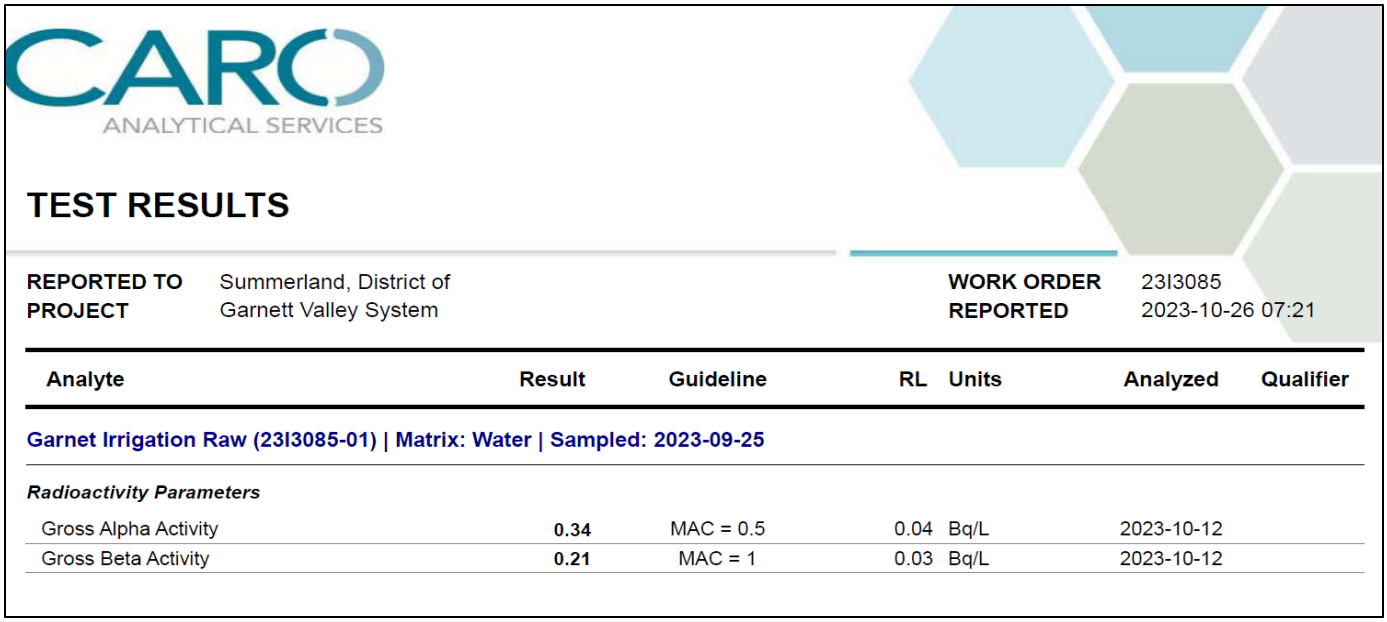
TEST RESULTS

REPORTED TO Summerland, District of
PROJECT Rodeo System

WORK ORDER 23I3084
REPORTED 2023-10-26 07:20

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Rodeo Lodge (23I3084-01) | Matrix: water | Sampled: 2023-09-25 14:50						
Microbiological Parameters						
Coliforms, Total	< 1	MAC = 0	1	CFU/100 mL	2023-09-26	
E. coli	< 1	MAC = 0	1	CFU/100 mL	2023-09-26	
Radioactivity Parameters						
Gross Alpha Activity	**0.29**	MAC = 0.5	0.04	Bq/L	2023-10-12	
Gross Beta Activity	**0.18**	MAC = 1	0.03	Bq/L	2023-10-12	

5.63 Garnet Water System



CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Summerland, District of	**WORK ORDER**	23I3085
PROJECT	Garnett Valley System	**REPORTED**	2023-10-26 07:21

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Garnet Irrigation Raw (23I3085-01) | Matrix: Water | Sampled: 2023-09-25						
Radioactivity Parameters						
Gross Alpha Activity	**0.34**	MAC = 0.5	0.04	Bq/L	2023-10-12	
Gross Beta Activity	**0.21**	MAC = 1	0.03	Bq/L	2023-10-12	

5.7 Algae

Algae can be an indicator of water quality issues that could have an impact on water treatment processes such as filter clogging. Aesthetically, algae blooms can cause water discolouration, taste and odour. As a pre-emptive measure, samples were collected throughout the summer from five reservoirs including Thirsk, Headwaters #1, Isintok, Garnett Valley, Summerland and one sample from Trout Creek. These samples were submitted to Larratt Aquatic Consulting Ltd for analysis. There were no imminent water quality issues identified from the reservoirs in 2023.

Samples were collected by District of Summerland on May 29, July 10, and August 23, 2023. The Garnet Valley Reservoir sample from July 10 contained abundant algae with a total density of 9660 cells/mL; counts declined to only 2130 cells/mL in August (Figure 1). The other sites were sampled only on August 23 and, with the exception of Summerland Reservoir, had very high algae densities. Each of the upper elevation lakes had very different algae communities with Headwaters #1 being the only one with a large cyanobacteria population. The Summerland Reservoir sample contained a mixture of different algae types, but with diatoms dominating the community. The cyanobacteria present in the upper watershed do not appear to be affecting the Summerland Reservoir based on the 2023 samples. No health risks are expected from the algae densities observed in the Summerland Reservoir sample.

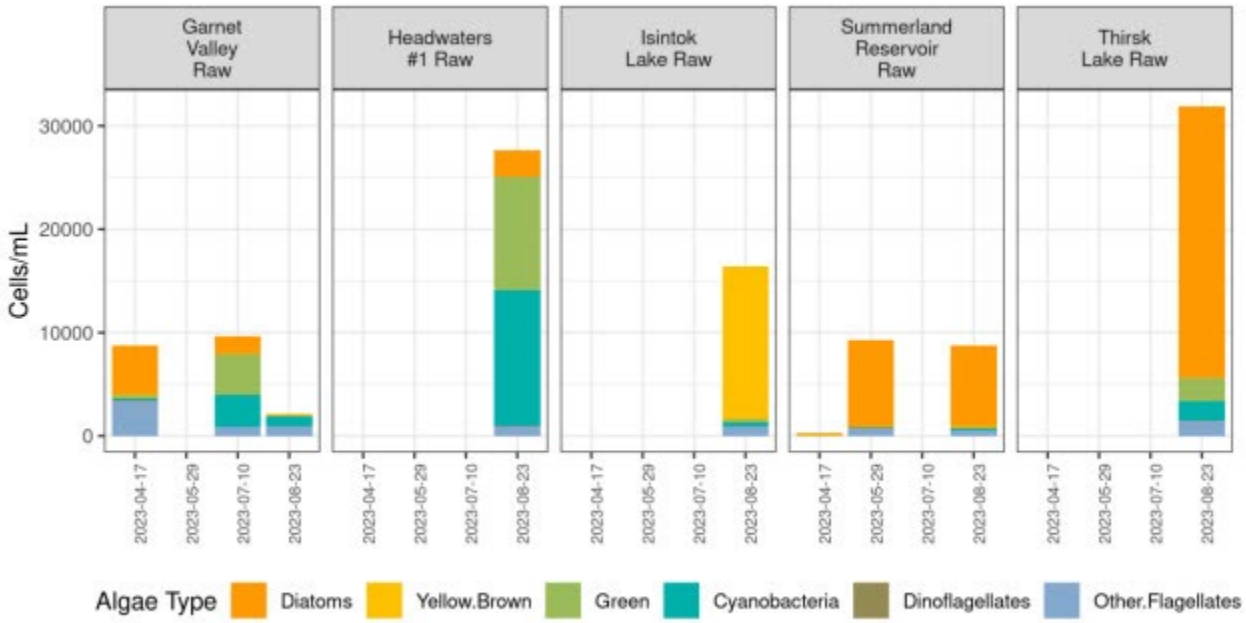


Figure 1: Algae results from 2023

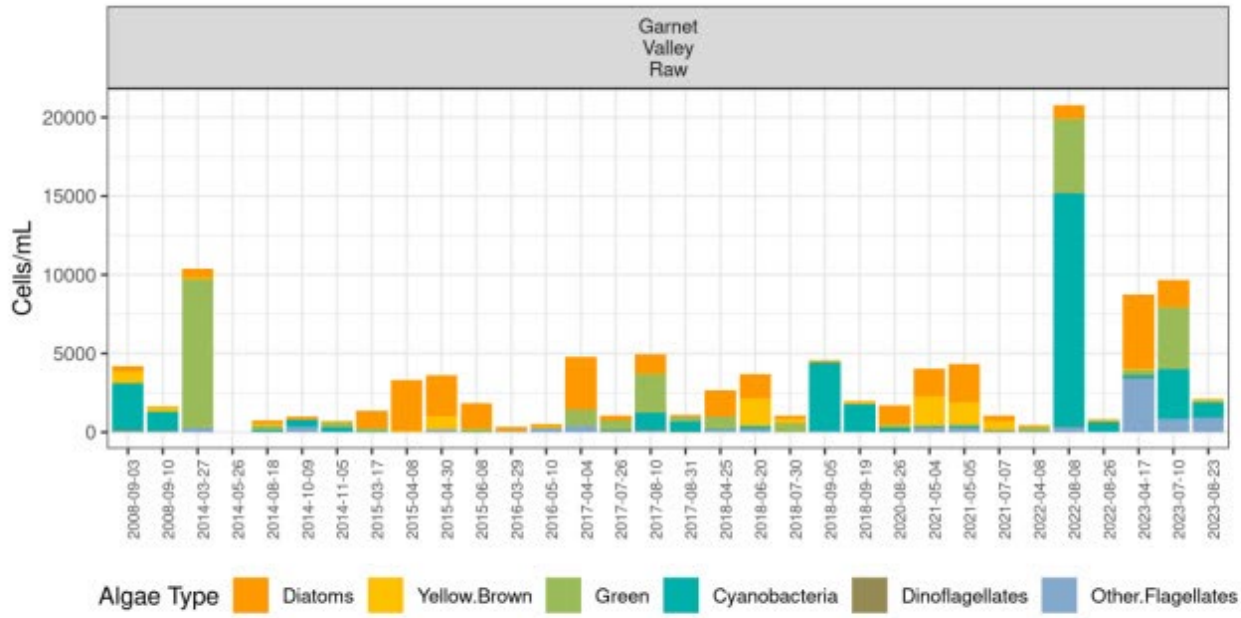


Figure 2: Garnet Valley Reservoir samples, 2008-2023

6.0 Annual Water Consumption

Gravity fed water from the Summerland reservoir supplies both the water treatment plant and the non-potable irrigation system. Two water meters located inside the building below the reservoir register daily consumption. The combined volume was approximately 9.799ML in 2023 with the minimum day demand on December 11th at 2.47MLD and the maximum day demand on August 14th at 84.579MLD.

7.0 Water Quality Events

The DOS responded to three emergency water main breaks in 2023. The protocol for water main break response involves maintaining positive pressure in order to protect the water system from potential contamination. Challenges for maintaining water quality in the distribution system involved managing the preventative maintenance program while achieving target levels for infrastructure repair and replacement. Annual budget is allocated for the replacement of aging infrastructure.

7.1 Summerland Water System

A water main break occurred January 6th on Taylor Place. It was determined positive pressure was lost and a boil water notice (BWN) was called for the area affecting 23 properties. A section of the mainline was replaced as per AWWA protocol. Samples were taken on January 9th and January 10th. Due to measured background colonies, another round of samples were taken on January 12th. With approval from IHA, the BWN was lifted on January 13th, 2023.

SAMPLE DATE	LOCATION	CL2 RESIDUAL (ppm)	TURBIDITY (ntu)	TOTAL COLIFORMS	E-COLI	BACKGROUND COLONIES (CFU/100mL)
Jan 9/23	12568 Taylor Place	0.72	0.68	<1	<1	
Jan 9/23	12588 Taylor Place	1.19	0.20	<1	<1	
Jan 10/23	12572 Taylor Place	0.94	0.31	<1	<1	
Jan 10/23	12558 Taylor Place	1.00	0.46	<1	<1	>200
Jan 12/23	12568 Taylor Place	0.62	0.29	<1	<1	

A water main break occurred July 24th on Dale Meadows Road. It was determined positive pressure was lost and a boil water notice (BWN) was called for the area affecting 28 properties. A section of the mainline was replaced as per AWWA protocol. Samples were taken on July 25th and July 26th. A positive coliform result came back from the first set of samples therefore another sample was collected on July 28th. With approval from IHA, the BWN was lifted on July 31st, 2023.

SAMPLE DATE	LOCATION	CL2 RESIDUAL (ppm)	TURBIDITY (ntu)	TOTAL COLIFORMS	E-COLI
July 25/23	10316 Dale Meadows Place	0.87	0.18	<1	<1
July 25/23	112-10903 Meadow View Estates	0.40	0.58	1	<1
July 26/23	10316 Dale Meadows Place	0.35	0.31	<1	<1

July 26/23	112-10903 Meadow View Estates	0.34	0.24	<1	<1
July 28/23	113-10903 Meadow View Estates	0.46	0.27	<1	<1

A water main break occurred August 15th on Dale Meadows Road. It was determined positive pressure was lost and a boil water notice (BWN) was called for the area affecting 6 properties. A section of the mainline was replaced as per AWWA protocol. Samples were taken on August 16th and August 17th. Positive coliforms were found from the first set of samples therefore another sample was collected on August 18th. With approval from IHA, the BWN was lifted on August 18th, 2023.

SAMPLE DATE	LOCATION	CL2 RESIDUAL (ppm)	TURBIDITY (ntu)	TOTAL COLIFORMS (Caro A)	E-COLI (Caro A)	IDEXX In-House
Aug 16/23	12304 Dale Meadows Rd	0.16	0.24	<1	<1	<1
Aug 16/23	9801 Gould Ave	0.30	0.59	10	<1	P
Aug 17/23	12304 Dale Meadows Rd	0.17	0.30	<1	<1	<1
Aug 17/23	10019 Gould Ave	0.40	0.19	<1	<1	<1
Aug 17/23	10216 Gould Ave	0.40	0.24	<1	<1	<1
Aug 18/23	10019 Gould Ave	0.37	0.16	<1	<1	

8.0 System Shortfalls and Problems

8.1 Summerland Water System

The large unprotected watershed is home to cattle farming, forestry practices and numerous recreational activities. The District will be working with the appropriate groups such as the Ministry of Forests, Lands, Natural Resource Operations and Rural Development towards production of a Source Protection Plan. The watershed is also subject to flooding, wildfires and drought conditions. An ongoing Water Treatment Plant system shortfall is having *limited* treated water storage. This puts an added stress on operators and severely increases the likelihood of a District wide BWN should something at the WTP fail. At peak summer flow the WTP clearwell is critically depleted after only 45 minutes. Along with this, high flow demands can exceed the capacity of the water treatment plant resulting in the supplemental line opening and allowing partially treated water into the system. This has occurred seldom since the first phases of system separation were completed. To ensure that this risk is reduced, the District is continuing with plans to separate more sections of potable water distribution mains from irrigation only mains.

8.2 Rodeo Water System

The Rodeo well is subject to low demand from late fall through early spring when the facility is at its lowest annual occupation rate. During this time, there is an increase in turbidity as well as iron concentration resulting in the potential for iron-forming bacteria. A continuously flowing flush line on the Lodge water connection continues to keep the well water turning over during the off-season low demand. A new water source is being investigated to eliminate the use of the Rodeo System.

9.0 Capital Works Plan

9.1 Completed Projects in 2023

Water Treatment Plant

- Rotork Actuators installation on both Raw Water Valves, filter to waste valves and filter backwash valves
- Emergency Coagulant Storage tanks
- Text capable WTP Auto-dialer

Watershed

- Log removal at Isintok Dam
- Isintok Dam Spillway - Design
- Dam Safety Review – Crescent and Whitehead 90%
- Thirsk Dam structural investigation continues
- Installation of Intake online turbidity meter with alarm setpoints

Water Distribution System

- PRV #4 Above ground upgrade – Installation
- PRV #7 Above ground upgrade – Design
- Trout Creek Flume & Water Intake Structure Upgrade – Design
- Giants Head Water Separation Infrastructure Project– Construction

9.2 Anticipated Capital Projects for 2024

Water Treatment Plant

- WTP Controls Upgrade & PLC Upgrade – Design
- Start of Hypo Conversion
- Lamella Replacements

Watershed

- Source Water Protection Plan
- Isintok Dam Spillway – Construction

Water Distribution System

- PRV #7 above ground upgrade – Construction
- Auxiliary Power to Pump Station #5 – Design
- System Separation Study
- Jubilee Road water main (Rosedale and Victoria)

- Prairie Valley Road watermain replacement (Morrow to Cartwright)
- Catholic Protection Upgrades
- Dale Meadows water main replacement Design and Construction
- PRV #8 above ground upgrade - Design

9.3 Future Capital Projects

The following is a projection of future capital projects over the next five years:

Project	2024	2025	2026	2027	2028
WTP Controls Upgrade - Construction	X				
Actiflo #1 and Actiflo #2 Lamella Block Replacements	X	X			
Chlorine gas to sodium hypochlorite conversion - delayed					2029
Cathodic Protection Upgrades	X	X	X	X	X
Crescent Dam Outlet & Spillway – Design & Construction				X	X
Auxiliary Power to Select Pump Stations - delayed					
Trout Creek Flume & Water Intake Structure upgrade – Construction (Grant Dependent)		X	X	X	
Garnet Dam spillway widening, slope protection & apron extension - Design		X	X		
Annual Water Main Replacements		X	X		
Thirsk Dam Improvements		X	X		
PRV & Trout Creek Tank above ground upgrades		X	X	X	X
Source Water Protection Plan		X			

10.0 Emergency Response Plan

The DOS Water division has produced a new Emergency Response Plan in 2022 that will be updated annually or as required. This document is available for viewing at the Public Works office and the Water Treatment Plant. An electronic copy is available on the District of Summerland website.

11.0 Cross Connection Control (CCC)

The DOS has a certified CCC inspector on staff who tests all municipally owned backflow assemblies. The town currently tests and tracks approximately 65 backflow assemblies located on District owned and/or operated facilities as well as tracking over 400 backflow assemblies in our backflow management program.

11.1 CCC Bylaw 2358

A bylaw is in place to ensure the installation of proper backflow devices in all new construction. The District of Summerland retained MTS Inc. in 2023 to work in conjunction with the District's Certified CCC Tester to ensure appropriate CCC services. All new houses and construction projects in the DOS must now have at minimum double check installed.

12.0 Supervisory Control and Data Acquisition (SCADA)

The Summerland water system utilizes a SCADA system for gathering and analyzing real time data. The data collected is used to monitor and control the plant processes, detect and correct problems, and measure trends over time. Trending is then utilized to maintain efficiency, process data and communicate system issues in order to prevent unnecessary operational downtime.

The components of the SCADA system include sensors and control relays, Remote Telemetry Units referred to as RTUs, a SCADA master unit, and the communication network. The system includes input and output signal hardware, networks, a Human-Machine Interface or HMI, controllers, communication, a database, and software.

Most of the control functions performed by the SCADA system are done automatically by two types of devices, either RTUs or Programmable Logic Controllers also called PLCs. Data such as equipment status, meter readings and alarm status are collected at the RTU or PLC level.

The HMI serves as the master station that communicates the process status and alarm information collected along the SCADA system to the human operator. The pieces of data from the system are gathered into this one place, saving operators from manually combining polled data from individual points.

Operators are able to view any system alarms and information through the HMI, and make educated decisions based on the readings. The system is equipped with control functions so signals can be sent back to the RTUs to execute certain actions.

12.1 SCADA Updates

The following updates occurred in 2023:

- Improved filter turbidity trending
- PRV telemetry EWON for above ground station trending
- Pumphouse 6,7 and Garnet valley
- Intake Turbidity monitoring

12.2 Future SCADA Updates

- Design for PLC & SCADA upgrade in mid 2023 with construction to start in late 2024