2021 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 11,615 people based on the 2016 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 extended east up Jones Flat road where the irrigation connections were removed from the Summerland potable water supply and connected to the Garnett Valley Irrigation System.

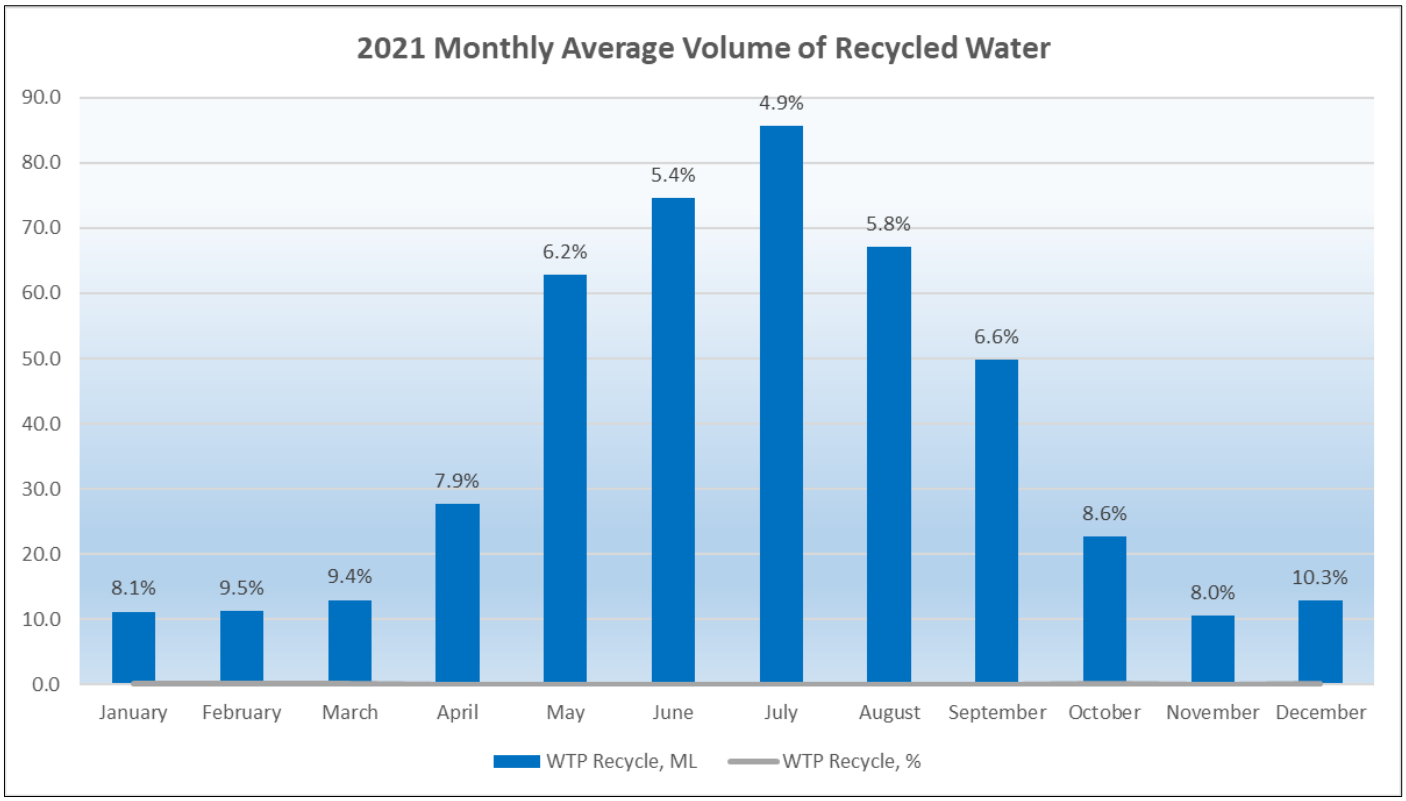
1.12 Water Treatment Plant

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 microsand 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.

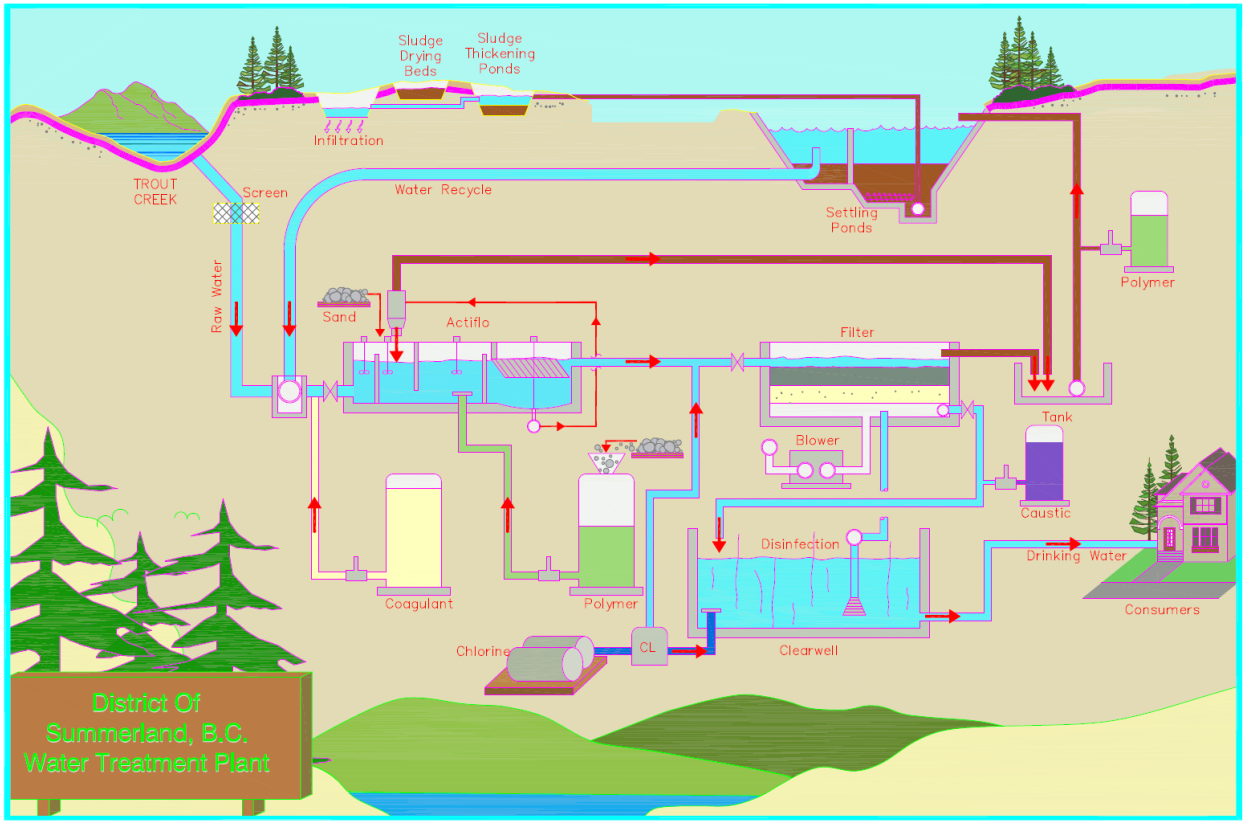


Figure 1 – Water Treatment Plant Schematic

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 four 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 2021.

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
Alistair Wardlaw	1127	WD IV, WT IV	N/A
Matthew Lee	7058	WD I, WT IV	N/A
Sheree Lancaster	4020	WD II, WT IV	WD III
Alex Bellemore	9357	WD II, WT III	WT IV WD III
Evan Sorensen	1439	WT II	WT III WD I

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 every three months, or 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 2021 DOS Landfill Annual Water Quality Report. In summary of this report, the Landfill leachate did not negatively affect water quality in the Summerland Reservoir.

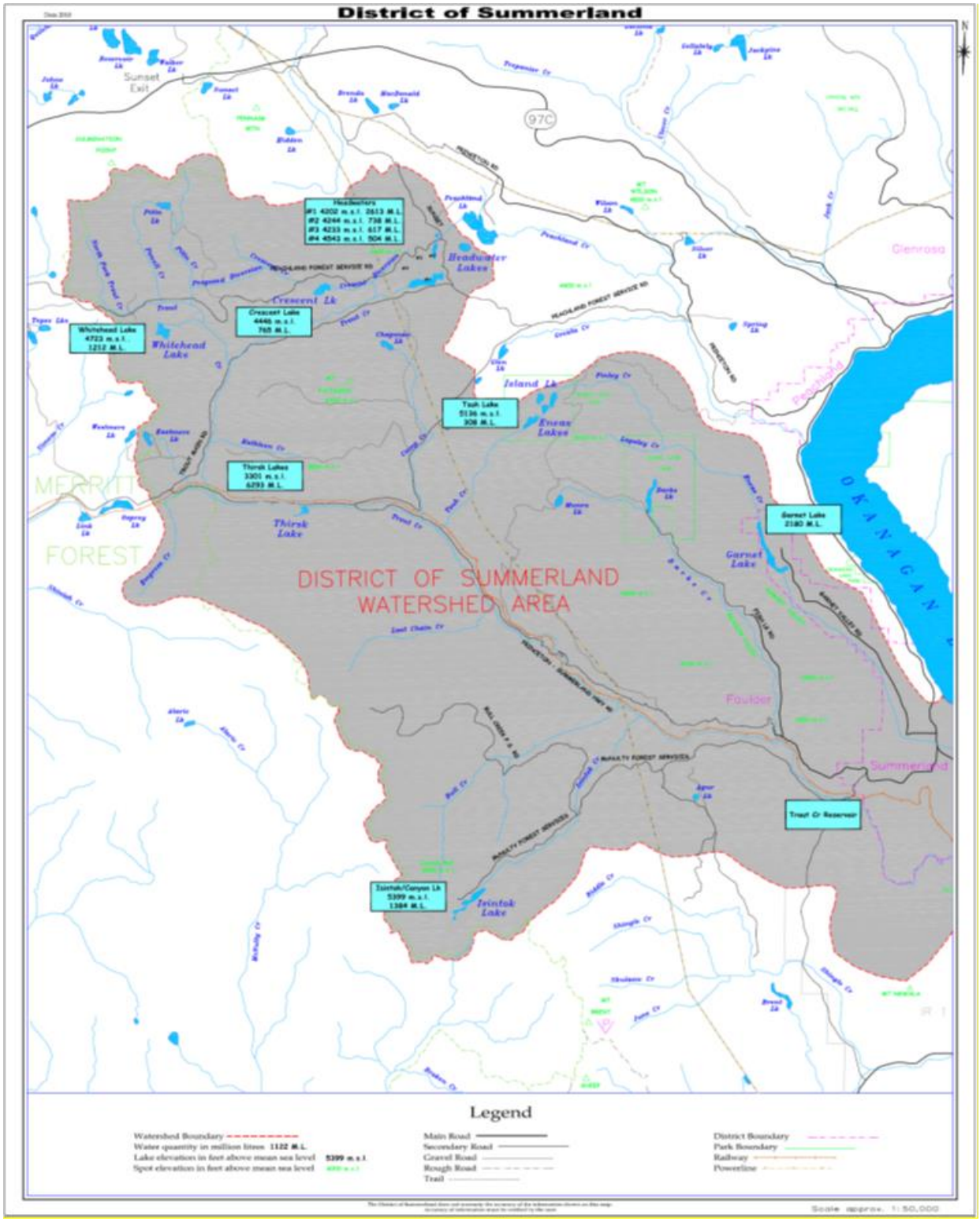


Figure 2 - District of Summerland Watershed Map

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 – 2021 Sample Schedule

Summerland System	LAB	January	February	March	April	May	June	July	August	September	October	November	December
Comprehensive Pump House #6	CARO Kelowna				SA				SA				
Comprehensive TC Raw at Lab sample tap	CARO Kelowna				SA				SA				
Comprehensive HW#1 Outlet, Thirsk Outlet	CARO Kelowna								A				
Algae HW#1, Thirsk, Garnet Valley (Early August)	CARO Kelowna								A				
Lead - First Draw 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						X					X	
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
Gross Alpha & Beta Trout Creek Raw	CARO Kelowna									A			

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

3.12 Summerland Water Treatment Plant – 2021 Sample Schedule

Water Treatment Plant	January	February	March	April	May	June	July	August	September	October	November	December
Turbidity Trout Creek Raw, WTP Recycle, Waste, ActiFlow(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, Actiflow(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, Actiflow(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, Actiflow(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 – 2021 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 eight 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-two samples collected from the Summerland Rodeo Grounds water system in 2021. All Rodeo Lodge water 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 2021 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.

5.11 Summerland Water System – Trout Creek Raw

Caro Analytical Services - Lab Summary

Summerland System - Trout Creek Raw

Month/Year	April 2021	August 2021	MRL	GCDWQ	Units
Anions					
Chloride	2.78	1.08	0.10	AO ≤ 250	mg/L
Fluoride	0.15	0.12	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	7.6	4.2	1.0	AO ≤ 500	mg/L
General Parameters					
Alkalinity, Total (as CaCO3)	85.5	51.8	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	85.5	51.8	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	8.7	28	5.0	AO ≤ 15	CU
Conductivity (EC)	160	102	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	<0.0020	0.0020	MAC = 0.2	mg/L
pH	7.76	7.84	0.10	7-10.5	pH units
Temperature, at pH	25.3	22.9		N/A	°C
Turbidity	0.76	1.21	0.10	OG <0.1	NTU
Calculated Parameters					
Hardness, Total (as CaCO3)	74.6	46.1	0.500	N/A	mg/L
Langlier Index	-0.3	-0.7	-5.0	N/A	-
Solids, Total Dissolved (calc)	74.3	58.8	1.00	N/A	mg/L
Total Metals					
Aluminum, total	0.0143	0.036	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	0.0463	0.0355	0.0050	MAC = 1	mg/L
Boron, total	<0.0050	<0.0050	0.0050	MAC = 5	mg/L
Cadmium, total	<0.000010	<0.000010	0.000010	MAC = 0.005	mg/L
Calcium, total	22.4	13.7	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	0.00196	0.00213	0.00040	MAC = 2	mg/L
Iron, total	0.094	0.148	0.010	AO ≤ 0.3	mg/L
Lead, total	<0.00020	<0.00020	0.00020	MAC = 0.01	mg/L
Magnesium, total	4.54	2.89	0.010	N/A	mg/L
Manganese, total	0.014	0.0192	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000010	<0.000010	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00332	0.00305	0.00010	N/A	mg/L
Nickel, total	<0.00040	<0.00040	0.00040	N/A	mg/L
Potassium, total	1.57	1.36	0.10	N/A	mg/L
Selenium, total	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	5.52	3.97	0.10	AO ≤ 200	mg/L
Strontium, total	0.294	0.192	0.0010	N/A	mg/L
Uranium, total	0.00529	0.00126	0.000020	MAC = 0.02	mg/L
Zinc, total	0.0058	0.0041	0.0040	AO ≤ 5	mg/L
Microbiological Parameters					
Coliforms, Total	19	179	1	MAC = None Detected	CFU/100mL
E.coli	<1.0	44	1	MAC = None Detected	CFU/100mL

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

5.12 Summerland Water System – Pump House #6

Caro Analytical Services - Lab Summary

Summerland System - Pump House #6

Month/Year	April 2021	August 2021	MRL	GCDWQ	Units
Anions					
Chloride	10.1	12.2	0.10	AO ≤ 250	mg/L
Fluoride	0.12	0.11	0.10	MAC = 1.5	mg/L
Nitrate (as N)	0.014	<0.010	0.010	MAC = 10	mg/L
Nitrite (as N)	<0.010	<0.010	0.010	MAC = 1	mg/L
Sulfate	7.6	4.1	1.0	AO ≤ 500	mg/L
General Parameters					
Alkalinity, Total (as CaCO3)	86.5	42.4	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	86.5	42.4	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)	190	121	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	<0.0020	0.0020	MAC = 0.2	mg/L
pH	7.96	7.62	0.10	7-10.5	pH units
Temperature, at pH	25.3	23		N/A	°C
Turbidity	0.14	<0.10	0.10	OG <0.1	NTU
Calculated Parameters					
Total Trihalomethanes	0.0722	0.0552	0.00400	MAC = 0.1	mg/L
Hardness, Total (as CaCO3)	74.2	41.4	0.500	N/A	mg/L
Langlier Index	-0.1	-1.1	-5.0	N/A	-
Solids, Total Dissolved (calc)	109	65.8	1.00	N/A	mg/L
Total Metals					
Aluminum, total	0.0248	0.0231	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	0.0422	0.0306	0.0050	MAC = 1	mg/L
Boron, total	<0.0500	0.0954	0.0050	MAC = 5	mg/L
Cadmium, total	<0.000010	<0.000010	0.000010	MAC = 0.005	mg/L
Calcium, total	22.5	12.4	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	0.00066	0.00506	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	4.33	2.55	0.010	N/A	mg/L
Manganese, total	0.00766	0.00044	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000040	<0.000010	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00337	0.00299	0.00010	N/A	mg/L
Nickel, total	<0.00040	<0.00040	0.00040	N/A	mg/L
Potassium, total	1.52	1.22	0.10	N/A	mg/L
Selenium, total	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	10.6	7.5	0.10	AO ≤ 200	mg/L
Strontium, total	0.285	0.17	0.0010	N/A	mg/L
Uranium, total	0.003070	0.000123	0.000020	MAC = 0.02	mg/L
Zinc, total	<0.0040	0.0058	0.0040	AO ≤ 5	mg/L
Volatile Organic Compounds (VOC)					
Bromodichloromethane	0.0103	0.0028	0.0010	N/A	mg/L
Bromoform	<0.0010	<0.0010	0.0010	N/A	mg/L
Chloroform	0.0517	0.0524	0.0010	N/A	mg/L
Dibromochloromethane	0.0102	<0.0010	0.0010	N/A	mg/L
Surrogate: Toluene-d8	94	104	70-130%		%
Surrogate: 4-Bromofluorobenzene	81	105	70-130%		%
Microbiological Parameters					
Coliforms, Total	<1	<1	1	MAC = None Detected	CFU/100mL
E.coli	<1	<1	1	MAC = None Detected	CFU/100mL

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

5.13 Rodeo Water System

Caro Analytical Services - Lab Summary

Rodeo System - Lodge

Month/Year	April 2021	August 2021	MRL	GCDWQ	Units
Anions					
Chloride	1.92	1.85	0.10	AO ≤ 250	mg/L
Fluoride	0.2	0.18	0.10	MAC = 1.5	mg/L
Nitrate (as N)	0.211	0.236	0.010	MAC = 10	mg/L
Nitrite (as N)	<0.010	<0.010	0.010	MAC = 1	mg/L
Sulfate	13.1	12.8	1.0	AO ≤ 500	mg/L
General Parameters					
Alkalinity, Total (as CaCO3)	174	169	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	174	169	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)	281	293	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	<0.0020	0.0020	MAC = 0.2	mg/L
pH	7.97	8.15	0.10	7-10.5	pH units
Temperature, at pH	25.3	22.7		N/A	°C
Turbidity	0.36	0.34	0.10	OG <0.1	NTU
Calculated Parameters					
Hardness, Total (as CaCO3)	147	146	0.500	N/A	mg/L
Langlier Index	0.5	0.6	-5.0	N/A	-
Solids, Total Dissolved (calc)	188	186	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	0.00054	<0.00050	0.00050	MAC = 0.01	mg/L
Barium, total	0.0627	0.0648	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	44.8	43	0.20	N/A	mg/L
Chromium, total	0.00069	0.0009	0.00050	MAC = 0.05	mg/L
Cobalt, total	<0.00010	<0.00010	0.00010	N/A	mg/L
Copper, total	0.0307	0.0176	0.00040	MAC = 2	mg/L
Iron, total	0.043	0.020	0.010	AO ≤ 0.3	mg/L
Lead, total	<0.00020	<0.00020	0.00020	MAC = 0.01	mg/L
Magnesium, total	8.5	9.25	0.010	N/A	mg/L
Manganese, total	0.00093	0.00072	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000040	<0.000040	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00746	0.00727	0.00010	N/A	mg/L
Nickel, total	<0.00040	<0.00040	0.00040	N/A	mg/L
Potassium, total	2.88	3.19	0.10	N/A	mg/L
Selenium, total	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	10.5	11.7	0.10	AO ≤ 200	mg/L
Strontium, total	0.390	0.394	0.0010	N/A	mg/L
Uranium, total	0.00884	0.0084	0.000020	MAC = 0.02	mg/L
Zinc, total	0.0059	0.0062	0.0040	AO ≤ 5	mg/L
Microbiological Parameters					
Coliforms, Total	<1	<1	1	MAC = None Detected	CFU/100mL
Ecoli	<1	<1	1	MAC = None Detected	CFU/100mL

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

5.14 Source Water

Caro Analytical Services - Lab Summary

Summerland System Source Water	Headwaters #1 Reservoir Low Level Outlet	Thirsk Reservoir Low Level Outlet			
Month/Year	**August 2021**	**August 2021**	**MRL**	**GCDWQ**	**Units**
Anions					
Chloride	0.32	0.56	0.10	AO ≤ 250	mg/L
Fluoride	<0.10	0.11	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	3.1	3.4	1.0	AO ≤ 500	mg/L
General Parameters					
Alkalinity, Total (as CaCO3)	52.8	40.2	1.0	N/A	mg/L
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0	1.0	N/A	mg/L
Alkalinity, Bicarbonate (as CaCO3)	52.8	40.2	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	18	40	5.0	AO ≤ 15	CU
Conductivity (EC)	97.4	79.1	2.0	N/A	µS/cm
Cyanide, Total	<0.0020	<0.0020	0.0020	MAC = 0.2	mg/L
pH	7.91	7.72	0.10	7-10.5	pH units
Temperature, at pH	22.9	22.9		N/A	°C
Turbidity	2.59	3.75	0.10	OG <0.1	NTU
Calculated Parameters					
Hardness, Total (as CaCO3)	46.2	36.6	0.500	N/A	mg/L
Langlier Index	-0.6	-1.1	-5.0	N/A	-
Solids, Total Dissolved (calc)	56.7	45.9	1.00	N/A	mg/L
Total Metals					
Aluminum, total	0.0282	0.140	0.0050	OG <0.1	mg/L
Antimony, total	<0.00020	<0.00020	0.00020	MAC = 0.006	mg/L
Arsenic, total	0.00056	<0.00050	0.00050	MAC = 0.01	mg/L
Barium, total	0.0173	0.0350	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	15	11.0	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	0.0059	0.00185	0.00040	MAC = 2	mg/L
Iron, total	0.182	0.400	0.010	AO ≤ 0.3	mg/L
Lead, total	<0.00020	0.00025	0.00020	MAC = 0.01	mg/L
Magnesium, total	2.07	2.20	0.010	N/A	mg/L
Manganese, total	0.03600	0.0860	0.00020	AO ≤ 0.05	mg/L
Mercury, total	<0.000010	<0.000010	0.000010	MAC = 0.001	mg/L
Molybdenum, total	0.00160	0.00227	0.00010	N/A	mg/L
Nickel, total	<0.00040	0.00046	0.00040	N/A	mg/L
Potassium, total	1.27	1.10	0.10	N/A	mg/L
Selenium, total	<0.00050	<0.00050	0.00050	MAC = 0.05	mg/L
Sodium, total	2.72	3.09	0.10	AO ≤ 200	mg/L
Strontium, total	0.0925	0.135	0.0010	N/A	mg/L
Uranium, total	0.000046	0.000750	0.000020	MAC = 0.02	mg/L
Zinc, total	<0.0040	0.0044	0.0040	AO ≤ 5	mg/L
Microbiological Parameters					
Coliforms, Total	76	2420	1	MAC = None Detected	CFU/100mL
E.coli	2	8	1	MAC = None Detected	CFU/100mL
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					

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. Telephone 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 thirteen 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. Due to the COVID-19 pandemic, three of the sites including an Elementary school, RV Park and Fish Hatchery closed down or had restricted access that limited the sampling locations to ten for most of the year.

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 2021, daily raw water grab samples for turbidity ranged from a low of 0.50 NTU on March 6th to a high of 4.12 NTU on April 24th.

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 0.19 NTU during the month of November to a high of 2.19 NTU during the month of May.

Treated water is monitored continuously with Hach 5300sc turbidimeters at the six filter outlets prior to the clearwell and also trended on SCADA. The annual average turbidity of treated water leaving the water treatment plant to distribution was 0.022 NTU.

In addition to the continuous on-line monitoring of treated water leaving the plant, daily grab samples from PH #2, the first point of distribution, ranged from a low of 0.06 NTU to a high of 0.34 NTU throughout the year. Turbidity is monitored in the distribution system with a portable HACH 2100Q turbidimeter. 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 0.18 NTU on November 12th to 2.70 NTU on December 20th.
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 0.0744mg/L.

The average annual concentration of HAAs was 0.0483mg/L.

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

Pump House #6

2021	Total Trihalomethanes, mg/L
February 9	0.0765
April 13	0.0722
July 8	0.0552
October 21	0.0935
Minimum	0.0552
Maximum	0.0935
Average	0.0744

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

Pump House #6

2021	Total Haloacetic Acids, mg/L
February 9	N/A
April 13	0.0329
July 8	0.0449
October 21	0.0671
Minimum	0.0329
Maximum	0.0671
Average	0.0483

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**
20-Jan-21	0	31	0	0
18-Feb-21	0	33	0	0
Mar-21	N/A	N/A	N/A	N/A
8-Apr-21	0	36	0	0
18-May-21	4	75	0	0
25-Jun-21	0	5	0	0
14-Jul-21	2	14	0	0
11-Aug-21	0	0	1	128
10-Sept-21	0	0	0	0
21-Oct-21	0	178	0	2
21-Nov-21	0	38	0	0
15-Dec-21	0	19	0	0
Average	1	39	0	12

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Summerland, District of	**WORK ORDER**	21I2642
PROJECT	Summerland System	**REPORTED**	2021-10-12 12:58

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Trout Creek Raw (21I2642-01) | Matrix: Water | Sampled: 2021-09-20 09:35						
Radioactivity Parameters						
Gross Alpha Activity	**0.40**	MAC = 0.5	0.04	Bq/L	2021-10-12	
Gross Beta Activity	**0.15**	MAC = 1	0.03	Bq/L	2021-10-12	

5.62 Rodeo Water System

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Summerland, District of	**WORK ORDER**	21I2643
PROJECT	Rodeo System	**REPORTED**	2021-10-12 12:59

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Lodge (21I2643-01) | Matrix: Water | Sampled: 2021-09-20 08:20						
Radioactivity Parameters						
Gross Alpha Activity	**0.19**	MAC = 0.5	0.04	Bq/L	2021-10-12	
Gross Beta Activity	**0.12**	MAC = 1	0.03	Bq/L	2021-10-12	

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 three reservoirs including Thirsk, Headwaters #1 and Garnett Valley and submitted to Larratt Aquatic Consulting Ltd. There were no imminent water quality issues identified from the reservoirs in 2021.

A sample submitted from Thirsk identified a diverse population of non-problem diatoms (1700 cells /mL), cyanobacteria (1090 cells/mL) and dominated by green algae (3520 cells/mL).

Headwaters #1 sample had high algae densities (12,230 total cells/mL) dominated by cyanobacteria. Cyanobacteria densities were above WHO Alert Level 1 threshold (Above 2000 cells/mL) but should not pose a risk for acute cyanotoxicity.

The Garnett sample was dominated by a mix of diatoms and flagellated yellow-brown algae. Total algae densities were low at 1064 cells/mL.

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 8,985ML in 2021 with the minimum day demand on November 29th at 2.530MLD and the maximum day demand on June 25th at 106.292MLD.

7.0 Water Quality Events

The DOS responded to two emergency water main breaks in 2021. 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 on South Victoria road on May 28th at approximately 6:45am.Works crews excavated the site to find a large hole in the 750mm PCCP pipe. It was determined that positive pressure was lost and a BWN was issued to all residents in southern Summerland including Trout Creek (1005 Affected Properties). Water staff began placing sandwich boards at all access points to the affected areas throughout Summerland and updating social media. Contractor on site welded a plate on the PCCP liner and added more than 24” of reinforced hot concreate cover around the break. After disinfection of the new section of pipe and line flushing, there were two consecutive sets of bacteriological samples submitted to Caro Analytical. With approval from the IHA Drinking Water Officer, the Boil Water Notice was rescinded on June 1st.

On December 26th, Works crews responded to a report of a water leak North of Peach Orchard Road and began closing select valves to isolate the problem. In the late afternoon of December 27th, crews located the broken 4" cast iron line but due to possible contamination, a BWN for about 300 properties was called at approximately 5:30 pm. After disinfection of the new section of pipe and line flushing, there were two consecutive sets of bacteriological samples submitted to Caro Analytical. With approval from the IHA Drinking Water Officer, the Boil Water Notice was rescinded on December 31st.

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. 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 occurs rarely 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.

9.0 Capital Works Plan

9.1 Completed Projects in 2021

Water Treatment Plant

- Conversion from chlorine gas to sodium hypochlorite - Design
- Waste Tank isolation valves
- Rotork installation on Filters #1-6 inlet valves

Watershed

- Isintok Dam outlet pipe replacement & slope protection – Design & Construction
- Thirsk Dam structure analysis
- Dam Safety reviews including:
  Completion of consequence classification for Headwaters #1 - #4, Crescent, Whitehead, Isintok and Summerland Reservoir

Water Distribution System

- PRV# 14 above ground upgrade – Construction
- Pump House 2B upgrade
- Screening Works Slide Gate Replacement

9.2 Anticipated Capital Projects for 2022

Water Treatment Plant

- Conversion from chlorine gas to sodium hypochlorite – Construction
- PLC Upgrade – Design
- Rotork Actuators installation on both Raw Water Valves, filter to waste valves and filter backwash valves

Watershed

- Garnet Dam & Thirsk Dam – Dam Safety Review completion
- Source Water Assessment
- Isintok Dam Driftwood/Tree Removal
- Isintok Dam Spillway - Design
- Trout Creek Flume & Water Intake Structure Upgrade – Design
- Decommissioning of Eneas &Tsuh Dam – Study/Design
- Crescent & Whitehead Dam Spillway – Design

Water Distribution System

- Canyon View road water main replacement
- PRV #4 Above ground upgrade – Design & Construction
- Auxiliary Power to Pump Station #5 – Design
- Giants Head Road Water System Separation – phase 1 construction

9.3 Future Capital Projects

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

Project	2023	2024	2025	2026
Okanagan Lake Pump Station – Design	X	X		
Isintok Dam Spillway – Design & Construction	X	X		
Whitehead Dam Spillway – Design & Construction	X			X
Crescent Dam Outlet & Spillway – Design & Construction	X		X	
Auxiliary Power to Pump Station #5 - Construction	X	X		
Auxiliary Power to Pump houses #1, #2, #4, and #6		X	X	X
Trout Creek Flume & Water Intake Structure upgrade – Construction (Grant Dependent)	X			
Source Water Protection Plan		X		
Garnet Dam spillway widening, slope protection & apron extension - Design		X		
Annual Water Main Replacements		X	X	X
Dale Meadows water main replacement	X	X		
Thirsk Slide Gates Replacement			X	X
Pressure Reducing Station #1, #7 , #8 & Trout Creek Tank above ground upgrades	X	X	X	X

10.0 Emergency Response Plan

The DOS Water division has produced a new Emergency Response Plan 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 DOS 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 60 backflow assembly devices located on District owned and/or operated facilities. The District also currently tracks 389 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 2021 to work in conjunction with the District's Certified CCC Tester to ensure appropriate CCC services.

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 also 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 2021:

- Emergency Disinfection System HMI installed
- Completed Hunters Hill HMI

12.2 Future SCADA Updates

- The DOS continues to move from the free wave radio system to a cellular based system for reliability. The DOS is continuing to work with the consultant in 2022.
- Raw Water Pumps temperature trending
- Turbidity & Filter level trend update
- Supplemental Line activation switch
- Design for PLC & SCADA upgrade in mid 2022 with construction to start in 2023.