THE VILLAGE OF

NAKUSP

WATER OPERATIONS REPORT 2023

Well #1 and #2 Distribution

WTP UV System

7th Ave. hydrant installation

Nakusp Water System, Facility #0211995

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1.0 Introduction:

Under the terms of the Village of Nakusp Operating Permit for the Nakusp Water System, Facility #0211995, as per Section 8 of the *Drinking Water Protection Act*, the Village is required to provide an annual report to the public and users of the water system. This report is to provide a summary of the water system operation, maintenance, upgrades, and testing procedures and is submitted to Interior Health.

Please note that Sections 2, 3, 4 and 10 are taken directly from the Village of Nakusp Emergency Response Plan, as prepared by Austin Engineering, 2016.

Inquiries relating to the water system should be directed to the Public Works Department:

Cavan Gates, Director of Operations
91 1st Street Nakusp, BC, V0G 1R0
Phone: 250-265-35689
Email: operations@nakusp.com

2.0 CUSTOMER DEMOGRAPHICS:

2023 annual invoiced customers are as follows[1]:

Rate Code	Rate Description	Customer Count	Strata Units
01 W01	Water Single Family Dwelling	748	766
01 W02	Water Duplex, Triplex or Apartment - first unit	31	31
01 W03	Water Retail and Other Business	61	80
01 W04	Water Hotel/motel - owner/manager residence	2	2
01 W05	Water Cafe, Restaurant, Drive-in	7	7
01 W08	Water Large Grocer	1	1
01 W09	Church or Church Hall	8	8
01 W10	WATER HALL OR AMUSEMENT PLACE	3	3
01 W11	Water Licenced Lounge	4	4
01 W12	Water Car Wash - per wash unit	2	3
01 W13	Water bottling plant - $0.13464/cubic meter based on 2013 usage	3	3
01 W14	Water Hospital, Intermediate Care Facility - per bed	2	41
01 W17	WATER SPORTS COMPLEX	1	1
01 W18	WATER CONCRETE PLANT	1	1
01 W19	WATER CEMETERY	1	3
01 W20	WATER MOBILE HOME - each pad	4	54
01 W21	WATER Drive In Restaurant (no indoor seating)	2	2
01 W24	WATER LAUNDROMAT PER WASHER	1	4
01 W25	WATER BEACH PARK WASHROOMS	1	2
01 W26	WATER BEACH PARK SPRINKLING	1	5
01 W30	Water Campground - per site	2	39
01 W40	WATER FARM WITH LIVESTOCK	6	6
01 W41	Water Garage, Service Station or Body Shop	13	13
01 W52	Water - Apartment - each additional unit	26	94
01 W84	Water Hotel/motel - per room	7	118
01 W99	WATER Vacant lot with service available	17	17
01 WES	WATER NAKUSP ELEMENTARY SCHOOL	1	1
01 WSS	WATER NAKUSP SECONDARY SCHOOL	1	1
		957	**1,310**

Table 1: 2023 Invoiced Water Consumers

[1] A number of these connections are located outside of the Village of Nakusp's municipal boundary.

3.0 WATER COLLECTION, TREATMENT & DISTRIBUTION SYSTEM:

The Village of Nakusp's water system is supplied by both surface and groundwater sources. Typical system operation can be described as operating in two zones:

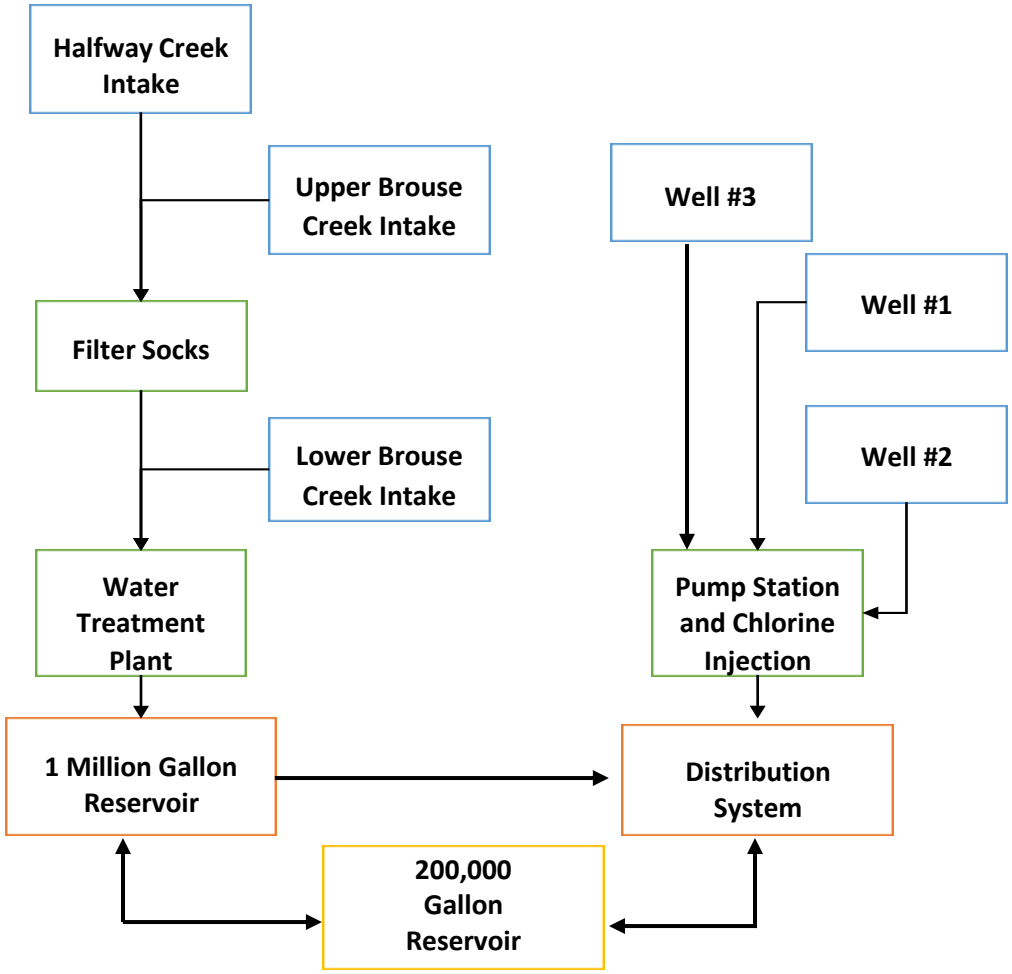


Figure 1: Nakusp Water System Schematic

Upper Distribution Zone

Raw water is supplied by surface water intakes on Halfway Creek, Upper Brouse Creek and Lower Brouse Creek. The surface water then undergoes membrane ultrafiltration, ultraviolet (UV) light, and chlorine injection treatment at the water treatment plant. The water treatment plant directly supplies the 1,000,000 gallons (3,785,000 L) upper reservoir which subsequently services the upper and lower distribution system

Lower Distribution Zone

Raw water is supplied by three groundwater wells located in the same aquifer. Groundwater undergoes chlorine injection prior to suppling the 200,000 gallons (757,000 L) lower reservoir which subsequently services the lower distribution zone.

Together these systems contain one treatment plant, three groundwater wells, three surface water intakes, 26.7 km of water main, two reservoirs, two pressure reducing stations and one booster pump station.

The upper reservoir is capable of supplying water to the lower reservoir (gravity) and the lower reservoir to the upper reservoir (by means of the booster station) therefore each source can indirectly supply water to any location within the system providing system redundancy under emergency circumstances.

Village of Nakusp Water Treatment Plant (WTP)

The Village of Nakusp Water Treatment Plant (WTP) is supplied with raw water from the surface water intakes located at Brouse Creek and Halfway Creek. Raw water is gravity fed through a coarse filter sock chamber and a micro hydro facility before reaching the WTP. At the plant water is treated using membrane ultrafiltration, ultraviolet (UV) light, and chlorine disinfection. The maximum capacity of the WTP is 25 L/s. A general process for the water treatment plant can be found below in Figure 2: General WTP Process.

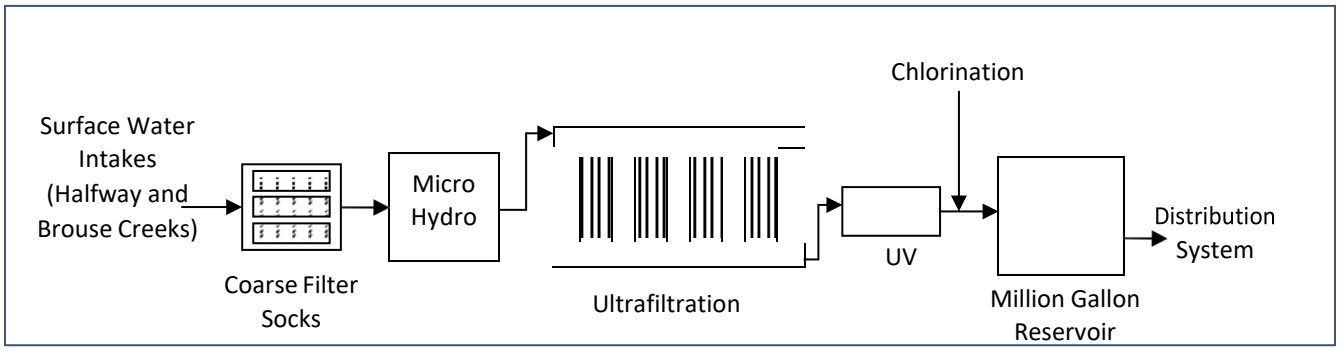


Figure 2: General WTP Process

Groundwater Wells

The Village of Nakusp water system contains three groundwater wells. The wells are located in close proximity to each other, north of the arena in the Nakusp Recreation Park within a "confined to semi-confined aquifer comprised of coarse- grained alluvial fan sediments overlain by silt and clay" with a static water level of approximately 18 m below ground surface (Golder Associates, 2014).

Groundwater sourced from the wells undergoes chlorine injection prior to being routed indirectly into the 200,000 Gallon Reservoir and the rest of the distribution system. Connection between the WTP and the groundwater wells is available however the water typically mixes within the distribution network.

Due to the proximity of the groundwater wells, a groundwater contamination event is likely to impact all wells. The wells can therefore only be considered as redundant to each other for supply related emergency situations. Neither well should be utilized if the other has a contaminant related emergency as both are likely to be impacted.

A summary of well characteristics is outlined below in Table 2.

	Well #1 (Golder Associates, 2014)	Well #2 (Golder Associates, 2014 & Village of Nakusp)	Well #3
BC Ministry of Environment Well Tag Number	88581	104165	123070
Installation Year	2004	2009	2021
Total Depth	84.0 m	83.2 m	83.7 m
Capacity[2] (Limited Based on Current Pump)	42.6 L/s (675 US gpm)	80.1 L/s[3] (1,270 US gpm)	37.9 L/s (600 US gpm)
Current Pump	50 hp	75 hp	75 hp
Typical Pump Flowrate at Maximum Power	23 L/s (364 US gpm)	28 L/s (444 US gpm)	28 L/s (444 US gpm)

Table 2: Well Summary (Golder Associates, 2014 and the Village of Nakusp)

[2] **Capacity is limited due to the current pump installed in the wells**

[3] **Limited to a maximum of 63 L/s (1,000 US gpm) as an environmental assessment has not been completed under the *BC Environmental Assessment Act*.**

4.0 OPERATIONS & MAINTENANCE:

Operations and maintenance procedures are important safeguards for several potential emergency risks and can help to reduce the impact of unavoidable emergency situations. Notable operations and maintenance procedures that the Village of Nakusp employs, related to potential emergencies and their response, are outlined in Table 3 below.

O&M Procedure	Emergency Effects	Potential for Improvement
Locked buildings, fenced reservoir	Protection from tampering	Increased security measures (cameras/security company/better signage/lock gates providing vehicle access to intake locations.
SCADA system connected to all water system entities	Response time is reduced due to on-going/constant surveillance and effective notification system	
Recorded routine O&M checks performed and recorded	Likelihood of unexpected failure reduced	
Documented cross connection control program in place	Reduce likelihood of contamination	
Multiple water supply sources available for whole system (Groundwater wells and WTP)	Redundancy for potential loss/reduction of available water supply	Investigate options to increase supply from the surface water Halfway and Brouse Creeks intakes.
Distribution system flushing program (annually in spring and fall)	Reduce potential of stagnation/ contamination	

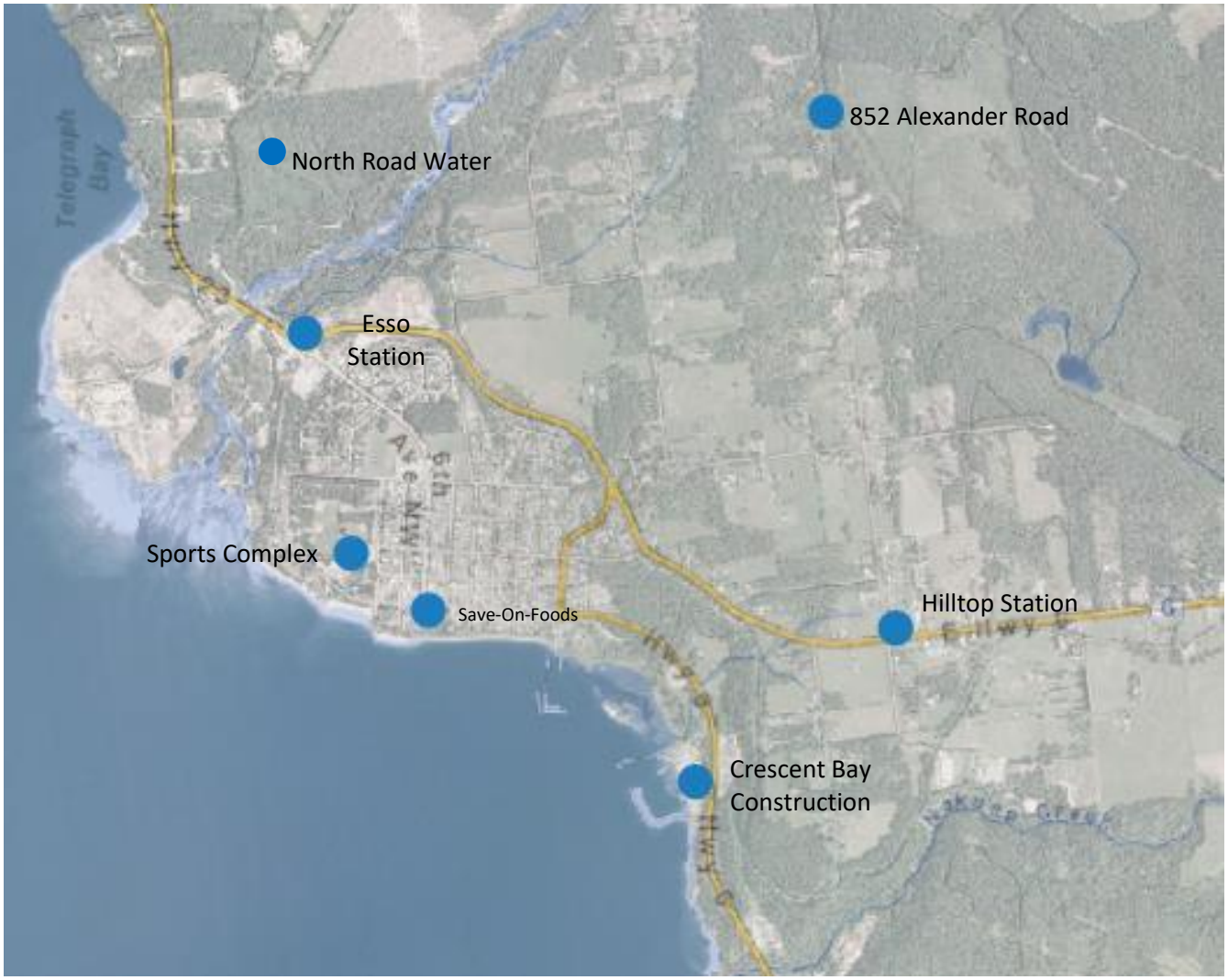
Table 3: Operations and Maintenance Procedures

5.0 WATER QUALITY SAMPLING:

Water quality sampling frequency and procedures are important to the realization of a potential emergency event. The *BC Drinking Water Protection Regulation* – *Schedule B* outlines the required frequency of monitoring samples. The Village of Nakusp's Water System falls into the category for populations of less than 5,000 which requires four (4) samples per month. The Village of Nakusp currently meets this sampling requirement by taking samples from seven (7) distinct locations within the system. Approximate sampling locations are outlined in Figure 3.

Samples for external analysis are taken by qualified Water Operators and sent monthly to qualified laboratories (CARO Analytical Services, or BC Centre for Disease Control Laboratory Services). All lab results are documented and kept on file. A summary of water system monitoring is outlined in Table 4.

Figure 3: Sampling Locations



Contamination Events

In the event of suspected or realized contamination in the water system, further water quality sampling is a critical step in resolving the situation. Due to the time required for sampling, laboratory analysis, and results, it should occur as quickly as possible (notification of Interior Health and possible public notification are the priority).

Potential water contaminants that would need to be sampled for in an emergency event can be categorized as:

- Microbial Pathogens
- Chemical and Physical
- Radiological

In the event of a water quality emergency, both the relevance of a test and the turn-around time for result delivery required for decision making, should be considered on a case-by-case basis as required. Once results are available, a comparison should be made to the relevant *BC Water Quality Guideline*. Water sampling Standard Operating Procedures (SOPs) should be followed under all situations.

Table 4: Sampling Overview

Frequency	Test
Weekly	Microbial (E.Coli and Total Coliform)
Monthly	Turbidity monitoring data UV and UV sensor data Chlorine monitoring data
Quarterly	Trihalomethane Haloacetic acids
Semi-Annually	Baseline analysis for potential contaminants of groundwater, including: hydrocarbons (benzene, toluene, ethylbenzene & xylene, light and heavy extractable petroleum hydrocarbons -including polyaromatic hydrocarbons, volatile organic compounds; herbicides and pesticides; metals, nitrates; nitrites and phosphorus; and/or microbiological parameters (coliforms, E. coli); Specific contaminants of concern
Annually	Full comprehensive raw water analysis for each source

6.0 2023 WATER QUALITY ANALYSIS RESULTS

SITE	DATE	Residual Cl2 ppm	TC Count/100 ML	EC Count /100 ML
Crescent Bay				
	Jan 4/23	0.50	L1	L1
	Feb 22/23	0.29	L1	L1
	Apr 12/23	0.25	L1	L1
	May 30/23	0.26	L1	L1
	July 18/23	0.21	L1	L1
	Sept 6/23	0.15	L1	L1
	Oct 25/23	0.45	l1	l1
	Dec 12/23	0.20		
Save-On-Foods				
	Jan 10/23	0.43	L1	L1
	Feb 29/23	0.45	L1	L1
	Apr 18/23	0.48	L1	L1
	June 6/23	0.60	L1	L1
	July 25/23	0.56	L1	L1
	Sept 12/23	0.54	L1	L1
	Oct 31/23	0.40	L1	L1
	Dec 19/23	0.66	l1	l1
Esso				
	Jan 17/23	0.45	L1	L1
	Mar 8/23	0.24	L1	L1
	Apr 25/23	0.40	L1	L1
	Jun 13/23	0.49	L1	L1
	Aug 1/23	0.38	L1	L1
	Sep 20/23	0.44	L1	L1
	Nov 7/23	0.43	L1	L1
	Dec27/23	0.34	L1	L1
Hill Top				
	Jan 24/23	0.62	L1	L1
	Mar 14/23	0.65	L1	L1
	May 2/23	0.34	L1	L1
	June 20/23	0.49	L1	L1
	Sept 26/23	0.35	L1	L1
	Nov 15/23	0.58	L1	L1
North Road (Hot Springs Road)				
	Jan 31/23	0.32	L1	L1
	Mar 21/23	0.24	L1	L1
	May 9/23	0.41	L1	L1
	June 27/23	0.26	L1	L1
	Aug 16/23	0.27	L1	L1
	Oct 4/23	0.47	L1	L1
	Nov 21/23	0.23	L1	L1
852 Alexander Road				
	Feb 7/23	0.30	L1	L1
	Mar 23/23	0.41	L1	L1
	May 16/23	0.31	L1	L1
	July 5/23	0.85	L1	L1
	Aug 23/23		L1	L1
	Oct 11/23	0.38	L1	L1
	Nov 28/23		L1	L1
Arena				
	Feb 14/23	0.43	L1	L1
	Apr 4/23	0.32	L1	L1
	May 24/23	0.25	L1	L1
	July 12/23	0.24	L1	L1
	Aug 30/23	0.51	L1	L1
	Oct 17/23	0.43	L1	L1
	Dec 5/23	0.27	L1	L1

2023 Annual Comprehensive Source Water Analysis (Untreated Water)

Well #1 Raw Water (23J2320-01) Matrix: Water | Sampled: 2023-10-18 13:20

Anions	Results	Guideline	RL Units	Analyzed
Chloride	19.7	AO≤250	0.10 mg/L	2023-10-22
Fluoride	0.16	MAC = 1.5	0.10 mg/L	2023-10-22
Nitrate (as N)	0.628	MAC = 10	0.010mg/L	2023-10-22
Nitrite (as N)	< 0.010	MAC = 1	0.010,g/L	2023-10-22
Sulfate	6.2	AO≤500	1.0 mg/L	2023-10-22

Calculated Parameters	Results	Guideline	RL Units	Analyzed	
Hardness, Total (as CaCO3)	177	None	0.5 mg/L	NIA	
Langelier Index		NIA	-5.0		CT6
Nitrogen, Organic		NIA	0.05 mg/L	NIA	
Solids, Total Dissolved	183	AO≤ 500	1 mg/L	NIA	

General Parameters	**Results**	Guideline	RL Units	Analyzed	Qualifier
Alkalinity, Total (as CaCO3)	136	NIA	1 mg/L	2023-10-24	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	NIA	1 mg/L	2023-10-24	
Alkalinity, Bicarbonate (as CaCO3)	136	NIA	1 mg/L	2023-10-24	
Alkalinity, Carbonate (as CaCO3)	< 1.0	NIA	1 mg/L	2023-10-24	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	NIA	1 mg/L	2023-10-24	
Ammonia, Total (as N)		Not Required	0.05 mg/L		
Carbon, Total Organic		NIA	0.5 mg/L		RA1
Colour, True		AO ≤ 15	5 CU		
Conductivity (EC)	363	NIA	2 µS/cm	2023-10-24	
Cyanide, Total	< 0.0020	MAC = 0.2	0.002 mg/L	2023-10-24	
Nitrogen, Total Kjeldahl		NIA	0.05 mg/L		
pH	7.67	7.0-10.5	0.1 pH	2023-10-24	HT2
Phosphorus, Total (as P)		NIA	0.005 mg/L		
Sulfide, Total		AO ≤0.05	0.02 mg/L		
Temperature, at pH		NIA			HT2
Turbidity	0.11	OG < 1	0.1 NTU	2023-10-24	
UV Transmittance @ 254nm- Unfiltered		NIA	0.10 % T		
UV Transmittance @ 254nm		N/A	0.10% T		

Microbiological Parameters	**Results**	**Guidelines**	**RL Units**	**Analyzed**
Coliforms, Total	< 1	MAC=0	1 CFU/100mL	2023-10-19
Background Colonies		N/A	1 CFU/100mL	
E. coli	< 1	MAC=0	1 CFU/100mL	2023-10-19

Total Metals	**Results**	**Guideline**	**RL Unit**	**Analyzed**
Aluminum, total	< 0.0050	OG < 0.1	0.005 mg/L	2023-10-24
Antimony, total	< 0.00020	MAC = 0.006	0.0002 mg/L	2023-10-24
Arsenic, total	< 0.00050	MAC = 0.01	0.0005 mg/L	2023-10-24
Barium, total	0.469	MAC = 2	0.005 mg/L	2023-10-24
Boron, total	< 0.0500	MAC = 5	0.05 mg/L	2023-10-24
Cadmium, total	< 0.000010	MAC = 0.005	0.00001	2023-10-24
Calcium, total	55.9	None Required	0.2 mg/L	2023-10-24
Chromium, total	0.00237	MAC = 0.05	0.0005	2023-10-24
Cobalt, total		NIA	0.0001	
Copper, total	0.000199	MAC = 2	0.0004	2023-10-24
Iron, total	< 0.010	AO ≤ 0.3	0.01 mg/L	2023-10-24
Lead, total	<0.00020	MAC = 0.005	0.0002	2023-10-24
Magnesium, total	8.19	None Required	0.01 mg/L	2023-10-24
Manganese, total	0.00020	MAC = 0.12	0.0002	2023-10-24
Mercury, total		MAC = 0.001	0.00001	

Well #1 Raw Water (23J2320-01) l Matrix: Water l Sampled: 2023-10-18 13:20 (continued)

Molybdenum		N/A	0.00010 mg/L	
Nickel, total		NIA	0.0004	
Potassium, total	1.57	NIA	0.1 mg/L	2023-10-24
Selenium, total	< 0.00050	MAC = 0.05	0.0005	2023-10-24
Sodium, total	5.55	AO ≤ 200	0.1 mg/L	2023-10-24
Strontium, total	1.08	7	0.001 mg/L	2023-10-24
Uranium, total	0.00179	MAC = 0.02	0.00002	2023-10-24
Zinc, total	0.0045	AO≤ 5	0.004 mg/L	2023-10-24

Well #2 Raw Water (23J2320-02) | Matrix: Water | Sampled: 2023-10-18 13:20

Anions	Results	Guideline	RL Unit	Analyzed
Chloride	9.34	AO≤250	0.10 mg/L	2023-10-22
Fluoride	0.18	MAC = 1.5	0.10 mg/L	2023-10-22
Nitrate (as N)	0.653	MAC = 10	0.010 mg/L	2023-10-22
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-10-22
Sulfate	4.7	AO≤500	1.0 mg/L	2023-10-22

Calculated Parameters	Results	Guideline	RL Units	Analyzed	Qualifier
Hardness, Total (as CaCO3)	109	None required	0.500 mg/L	NIA	
Langelier Index		N/A	-5.0		CT6
Nitrogen, Organic		N/A	0.0500 mg/L	NIA	
Solids, Total Dissolved	121	AO≤250	1.00 mg/L	NIA	

General Parameters	Results	Guideline	RL Units	Analyzed	Qualifier
Alkalinity, Total (as CaCO3)	97	N/A	1.0 mg/L	2023-10-23	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0 mg/L	2023-10-23	
Alkalinity, Bicarbonate (as CaCO3)	97.0	N/A	1.0 mg/L	2023-10-23	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0 mg/L	2023-10-23	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0 mg/L	2023-10-23	
Ammonia, Total (as N)		None	0.020 mg/L		
Carbon, Total Organic		N/A	0.50 mg/L		
Colour, True		AO≤15	5.0 CU		
Conductivity (EC)	221	N/A	2.0 µS/cm	2023-10-23	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	2023-10-23	RA1
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050 mg/L	2023-10-23	
pH	7.28	7.0-10.5	0.10 pH units	2023-10-23	HT2
Phosphorus, Total (as P)		N/A	0.0020 mg/L		
Sulfide, Total		AO≤ 0.05	0.020 mg/L		
Temperature, at pH		N/A	°C		HT2
Turbidity	0.43	OG < 1	0.10 NTU	2023-10-23	
UV Transmittance @ 254nm- Unfiltered		N/A	0.10 % T		
UV Transmittance @ 254nm		N/A	0.10 % T		

Microbiological Parameters	Results	Guidelines	RL Units	Analyzed
Coliforms, Total	< 1	MAC = 0	1 CFU/100 mL	2023-10-19
Background Colonies		N/A	1 CFU/100 mL	
E. coli	< 1	MAC = 0	1 CFU/100 mL	2023-10-19

Total Metals	Results	Guideline	RL Unit	Analyzed
Aluminum, total	< 0.0050	OG < 0.1	0.0050	2023-10-24
Antimony, total	< 0.00020	MAC = 0.006	0.00020	2023-10-24
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	2023-10-24
Barium, total	0.248	MAC = 1	0.0050	2023-10-24
Boron, total	< 0.0500	MAC = 5	0.0050	2023-10-24
Cadmium, total	0.000010	MAC = 0.005	0.000010	2023-10-24
Calcium, total	34.8	None Required	0.20 mg/L	2023-10-24
Chromium, total	0.00273	MAC = 0.05	0.00050	2023-10-24
Cobalt, total		N/A	0.00010	
Copper, total	0.00153	AO≤1	0.00040	2023-10-24
Iron, total	0.014	AO≤ 0.3	0.010 mg/L	2023-10-24
Lead, total	<0.00020	MAC = 0.01	0.00020	2023-10-24
Magnesium, total	4.95	None	0.010 mg/L	2023-10-24
Manganese, total	0.0103	AO≤0.05	0.00020	2023-10-24
Mercury, total		MAC = 0.001	0.000010	
Molybdenum, total		N/A	0.00010	
Nickel, total		N/A	0.00040	
Potassium, total	1.35	N/A	0.10 mg/L	2023-10-24
Selenium, total	< 0.00050	MAC = 0.05	0.00050	2023-10-24
Sodium, total	4.28	AO≤200	0.10 mg/L	2023-10-24
Strontium, total	0.528	N/A	0.0010 mg/L	2023-10-24
Uranium, total	0.000543	MAC = 0.02	0.000020	2023-10-24
Zinc, total	<0.0040	AO≤5	0.0040 mg/L	2023-10-24

Well #3 Raw Water

Not used in 2023

Surface Raw (24A3051-01) | Matrix: Water | Sampled: 2024-01-30 11:00

Anions	Results	Guideline	RL Unit	Analyzed
Chloride	0.12	AO≤250	0.10 mg/L	2024-02-01
Fluoride	0.72	MAC = 1.5	0.10 mg/L	2024-02-01
Nitrate (as N)	<0.010	MAC = 10	0.010 mg/L	2024-02-01
Nitrite (as N)	<0.010	MAC = 1	0.010 mg/L	2024-02-01
Sulfate	25.1	AO≤500	1.0 mg/L	2024-02-01

Calculated Parameters	Results	Guideline	RL Units	Analyzed	Qualifier
Hardness, Total (as CaCO3)	96.4	None required	0.500 mg/L	NIA	
Langelier Index	-0.8	N/A	-5.0	2024-02-05	CT 6
Nitrogen, Organic		N/A	0.0500 mg/L	NIA	
Solids, Total Dissolved	128	AO≤250	1.00 mg/L	NIA	

General Parameters	Results	Guidelines	RL Units	Analyzed	Qualifier
Alkalinity, Total (as CaCO3)	96.9	N/A	1.0 mg/L	2024-00-01	
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	N/A	1.0 mg/L	2024-02-01	
Alkalinity, Bicarbonate (as CaCO3)	96.9	N/A	1.0 mg/L	2024-02-01	
Alkalinity, Carbonate (as CaCO3)	<1.0	N/A	1.0 mg/L	2024-02-01	
Alkalinity, Hydroxide (as CaCO3)	<1.0	N/A	1.0 mg/L	2024-02-01	
Ammonia, Total (as N)		None	0.020 mg/L		
Carbon, Total Organic	2.75	N/A	0.50 mg/L	2024-02-05	
Colour, True	<5.0	AO≤15	5.0 CU	2024-02-01	
Conductivity (EC)	203	N/A	2.0 µS/cm	2024-02-01	
Cyanide, Total	<0.0020	MAC = 0.2	0.0020 mg/L	2024-02-01	RA1
Nitrogen, Total Kjeldahl		N/A	0.050 mg/L		
pH	7.28	7.0-10.5	0.10 pH units	2024-02-01	HT2
Phosphorus, Total (as P)		N/A	0.0020 mg/L	2024-02-06	
Sulfide, Total	<0.020	AO≤ 0.05	0.020 mg/L	2024-02-01	
Temperature, at pH	22.2	N/A	°C	2024-02-01	HT2

Turbidity	0.68	OG < 1	0.10	2024-02-01	
UV Transmittance @ 254nm- Unfiltered		N/A	0.10 % T	2024-02-02	
UV Transmittance @ 254nm		N/A	0.10 % T		

Surface Raw (24A3051-01) | Matrix: Water | Sampled: 2024-01-30 11:00, Continued

Microbiological Parameters	**Results**	**Guidelines**	**RL Units**	**Analyzed**
Coliforms, Total		MAC = 0	1 CFU/100 mL	HT3
Background Colonies		N/A	1 CFU/100mL	HT1
E. coli		MAC=0	1 CFU/100mL	HT3

Total Metals	**Results**	**Guidelines**	**RL Units**	**Analyzed**
Aluminum, total	0.0196	OG < 0.1	0.0050	2024-02-03
Antimony, total	<0.00020	MAC = 0.006	0.00020	2024-02-03
Arsenic, total	<0.0050	MAC = 0.01	0.00050	2024-02-03
Barium, total	0.0422	MAC = 1	0.0050	2024-02-03
Boron, total	<0.0500	MAC = 5	0.0050	2024-02-03
Cadmium, total	0.000012	MAC = 0.005	0.000010 mg/L	2024-02-03
Calcium, total	36.7	None Required	0.20 mg/L	2024-02-03
Chromium, total	<0.00050	MAC = 0.05	0.00050 mg/L	2024-02-03
Cobalt, total	<0.00010	N/A	0.00010 mg/L	2024-02-03
Copper, total	0.00075	AO≤1	0.00040 mg/L	2024-02-03
Iron, total	0.030	AO≤ 0.3	0.010 mg/L	2024-02-03
Lead, total	<0.00020	MAC = 0.01	0.00020 mg/L	2024-02-03
Magnesium, total	2.76	None Required	0.010 mg/L	2024-02-03
Manganese, total	0.00156	AO≤0.05	0.00020 mg/L	2024-02-03
Mercury, total	<0.000010	MAC = 0.001	0.000010 mg/L	2024-02-03
Molybdenum, total	0.00303	N/A	0.00010 mg/L	2024-02-03
Nickel, total	<0.00040	N/A	0.00040 mg/L	2024-02-03
Potassium, total	1.65	N/A	0.10 mg/L	2024-02-03
Selenium, total	0.00053	MAC = 0.05	0.00050 mg/L	2024-02-03
Sodium, total	2.35	AO≤200	0.10 mg/L	2024-02-03
Strontium, total	0.508	N/A	0.0010 mg/L	2024-02-03
Uranium, total		MAC = 0.02	0.000020 mg/L	2024-02-03
Zinc, total		AO≤5	0.0040 mg/L	2024-02-03

2023 Trihalomethane (THM) Results

Each water sample is tested for: Bromodichloromethane; Bromoform; Chloroform; and Dibromochloromethane. Results are reported in mg/L. The method reporting limit for each compound is less than 0.001 mg/L. Only results exceeding 0.001 mg/L are shown below:

DATE	SITE	BROMODICHLOROMETHANE	BROMOFORM	CHLOROFORM	DIBROMO-CHLOROMETHANE	TOTAL THM
Mar 8/23	Esso	<0.0010	0.0010	0.0014	<0.0010	<0.00400
June 14/23	Esso	<0.0010	<0.0010	<0.0010	<0.0010	<0.00400
Sept 6/23	Crescent Bay	0.0017	<0.0010	0.034	0.001	0.00612
Dec 6/23	Arena	0.001	<0.0010	0.0019	<0.0010	<0.0040

2023 Haloacetic Acid (HAA) Results

Another major group of chlorinated disinfection by-products found in drinking water, besides Trihalomethanes, are Haloacetic Acids. Together they can be used as indicators for the presence of all chlorinated disinfection by-products. The Maximum Allowable Concentration of HAAs is 80 micrograms/Litre.

DATE	SITE	MONOCHLOROACETIC ACID (MCA)	DICHLOROACETIC ACID (DCA)	TRICHLOROACETIC ACID (TCA)	MONOBROMOACETIC ACID (MBA)	DIBROMOACETIC ACID (DBA)	TOTAL HAA5
Mar 8/23	Esso	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00200
June 14/23	Esso	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00200
Sept 6/23	Crescent Bay	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00200
Dec 6/23	Arena	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00200

7.0 OPERATOR CERTIFICATION:

Utilities and Utility Operators are certified through the Environmental Operators Certification Program (EOCP). Following an EOCP re-evaluation the Village WTP remains classified as a Water Treatment Level II and Water Distribution Level II Facility, which requires Level II Operators to run it.

At this time, our staff is certified to the following levels:

Employee	Water Treatment	Water Distribution
Terry Flamond	WT-I	WD - I
Taylor Cooke	-	Multi-Utility
Cory Jackson	-	Multi-Utility
Zac Wethal		

8.0 CHALLENGES & DIFFICULTIES:

Perhaps the biggest challenge is addressing aging water infrastructure and securing funding for improvement initiatives. Water utility projects are notoriously difficult to fund compared to other infrastructure initiatives. One major reason is that these systems are much less visible compared to roads and bridges, which makes it harder to generate public support for improvement and maintenance. As the old saying goes, out of sight, out of mind.

Another challenge is water consumption. Our water use can increase up to 150% in summer and early fall, largely due to lawn watering.

The expansion of the service area for future growth is another challenge facing the Village of Nakusp.

9.0 WATER CONSUMPTION DATA:

Water Supplied:

Surface Water: 148,864 m3
Well #1: 128,110 m3
Well #2: 226,337m3
Well #3: 0 m3
Total: 503,311 m3

The average 2023 per capita consumption based on the number of Village strata units (1,288 total) equals 390 m3 per unit. This number includes industrial, commercial and institutional usage. In comparison to the 2022 average per capita consumption of 384 m3 by 1,281 strata units, this accounts for a slight increase. The total 2023 consumption of 503,311 m3 was up 10,153 m3 from 2022's annual consumption of 493,158 m3. The most likely cause of the increase was irrigation during the heat dome in June 2023.

Figure 4: 2016 - 2023 Historic Monthly Water Usage (m3)

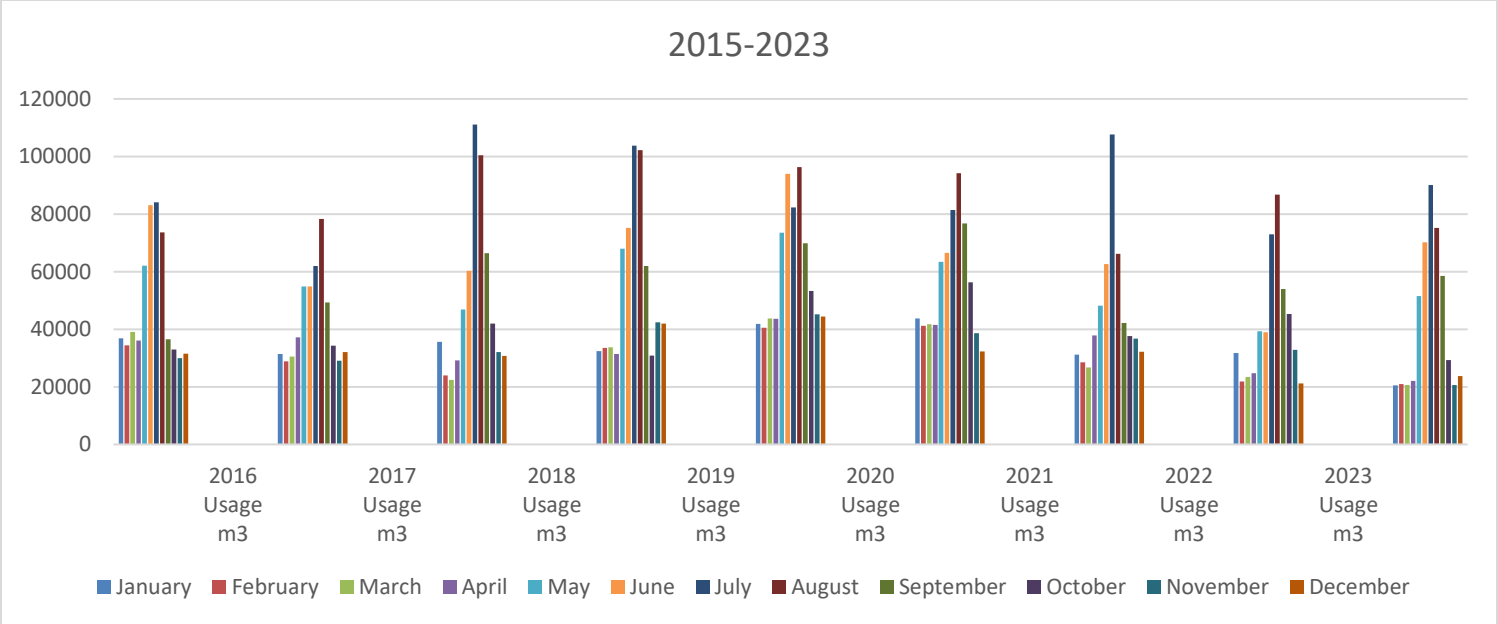


Figure 5 Monthly Water Dema d Comparison 2022 and 2023

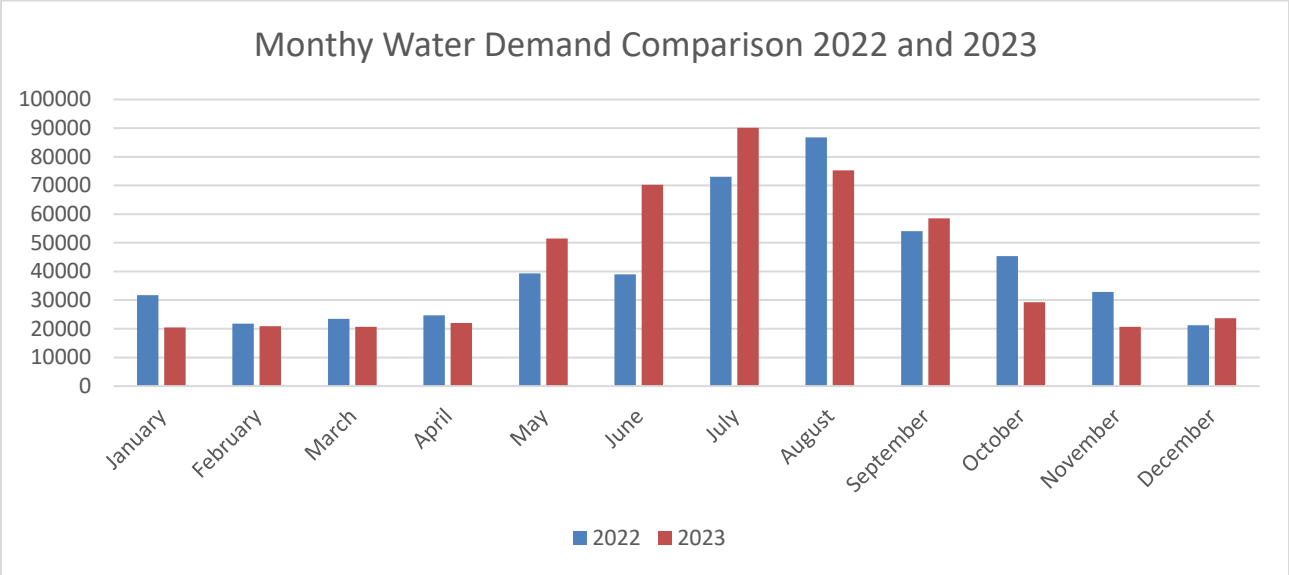


Figure 6: 2013 – 2020 Annual Historical Water Usage

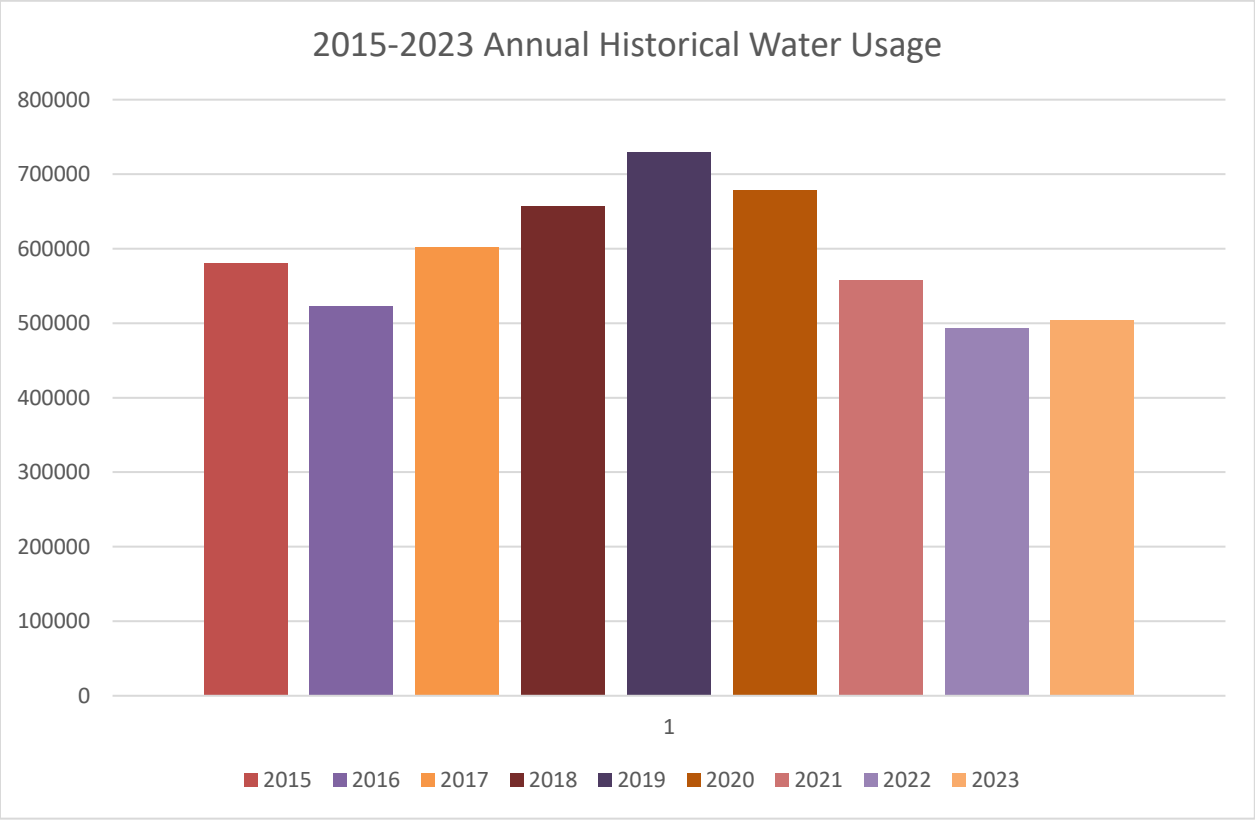


Figure 7: 2023 Monthly Water Use Data

2023 GRAVITY SYSTEM									
MONTH	DAYS RUNNING	MAX. DAY WATER USED	DAY OF MONTH MAX.	MIN. DAY WATER USED	DAY OF MONTH MIN.	READING @ START OF MONTH	READING @ END OF MONTH	READING FOR MONTH M3	DAILY AVG
January	31	317	22	1	13	4641	7031	2390	77
February	28	291	21	37	8	7031	10298	3267	117
March	31	277	22	1	28	10298	14902	4604	149
April	30	489	26	25	11	14902	20522	5620	187
May	31	858	16	66	24	20522	31651	11129	359
June	30	910	7	296	19	31651	50332	18681	623
July	31	1,041	8	15	18	50332	65280	14948	482
August	31	1,380	5	132	10	65280	85532	20252	653
September	30	593	10	95	24	85532	98289	12757	425
October	31	914	21	261	10	98289	113707	15418	497
November	30	987	11	462	19	113707	133475	19768	659
December	31	939	16	313	6	133475	153505	20030	646

2023 WELL #1 SYSTEM									
MONTH	DAYS RUNNING	MAX. DAY WATER USED	DAY OF MONTH MAX.	MIN. DAY WATER USED	DAY OF MONTH MIN.	READING @ START OF MONTH	READING @ START OF NEXT MONTH	READING FOR MONTH M3	DAILY AVG
January	28	1195	6	2	29	1649770	1665806	16036	573
February	0	N/A	N/A	N/A	N/A	1665806	1665806	0	0
March	20	675	12	2	9	1665806	1676652	10846	542
April	20	653	5	4	18	1676652	1685901	9249	462
May	7	226	24	6	24	1685901	1687032	1131	162
June	25	1764	7	132	2	1687032	1704377	17345	694
July	31	2941	24	0	14	1704377	1720085	15708	507
August	31	1112	10	0	21	1720085	1731368	11283	364
September	29	1829	19	7	28	1720085	1752858	32773	1130
October	18	923	8	199	19	1752858	1766575	13717	762
November	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
December	2	17	12	5	18	1766575	1766597	22	11

2023 WELL #2 SYSTEM									
MONTH	DAYS RUNNING	MAX. DAY WATER USED	DAY OF MONTH MAX.	MIN. DAY WATER USED	DAY OF MONTH MIN.	READING @ START OF MONTH	READING @ START OF NEXT MONTH	READING FOR MONTH M3	DAILY AVG.
January	3	763	30	622	289	2664292	2666366	2074	691
February	25	1459	25	456	20	2666366	2684034	17668	707
March	7	652	2	422	1	2684024	2689207	5183	740
April	12	813	26	290	27	2689207	2696358	7151	596
May	26	1716	16	469	1	2696358	2735595	39237	1509
June	27	1953	29	216	14	2735595	2769788	34193	1266
July	31	3886	24	7	28	2769788	2829222	59434	1917
August	31	2270	6	583	29	2829222	2872927	43705	1410
September	24	1287	10	7	28	2872927	2885887	12960	540
October	4	91	14	10	19	2885887	2886048	161	40
November	1	889	30	N/A	N/A	2886048	2886937	889	889
December	8	898	12	7	13	2886937	2890619	3682	460

2023 WELL #3 SYSTEM									
MONTH	DAYS RUNNING	MAX. DAY WATER USED	DAY OF MONTH MAX.	MIN. DAY WATER USED	DAY OF MONTH MIN.	READING @ START OF MONTH	READING @ START OF NEXT MONTH	READING FOR MONTH M3	DAILY AVG.
January	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0	0	0

9.0 CROSS CONNECTION CONTROL PROGRAM:

The Village of Nakusp has developed a Cross Connection Control Program, as required by the Drinking Water Protection Act. The purpose of this program is to protect public health, by preventing potential non-potable water sources from cross contaminating the domestic water supply. This is achieved through the installation, maintenance, and inspection of back-flow prevention devices. Utilities Operator Terry Flamond received Backflow training and certification in 2020.

10.0 EMERGENCY RESPONSE:

Notifications

Clear and timely communication to all stakeholders in an emergency situation is critical to the effective management and resolution for any situation. Internal, government and public notifications should be made in a timely manner as each situation necessitates.

In the event of water quality exceedances, the first point of contact is the local public health officer at Interior Health. Any laboratory drinking water sample with positive E. coli or fecal coliform bacteria results, or threat of unsafe drinking water must be reported to Interior Health as per the *BC Drinking Water Protection Act*:

- During regular Interior Health office hours (weekdays, 08:00 to 16:30) the local public health officer should be the first point of contact.
- Should the local public health officer be unavailable during office hours the Nelson Health Unit, Health Protection Office can be contacted as an alternate.
- The Medical Health Officer Emergency Contact Number should only be used for emergency situations that occur outside of

regular office hours.

In the event that public notice is required, multiple methods should be utilized to ensure all effected parties are adequately informed. This may include the use of notices, public meetings, radio advertisements, newspaper advertisements, television advertisements or direct individual notice.

Public notices regarding water quality issues have been developed for distribution in the following scenarios:

- **Water Quality Advisory:** Addresses situations where “at risk populations” (such as the elderly, infants, and people with weakened immune systems) may be at risk due to increased turbidity and potentially higher bacterial, virus, and parasite risks.
- **Boil Water Notice:** Addresses situations with high turbidity and potential bacterial, virus and parasite contamination of the water.
- **Do Not Consume Notice:** Addresses situations where water is not safe and should not be consumed due to untreated chemical contaminants, or other extreme cases in which contaminants cannot be inactivated by boiling water.

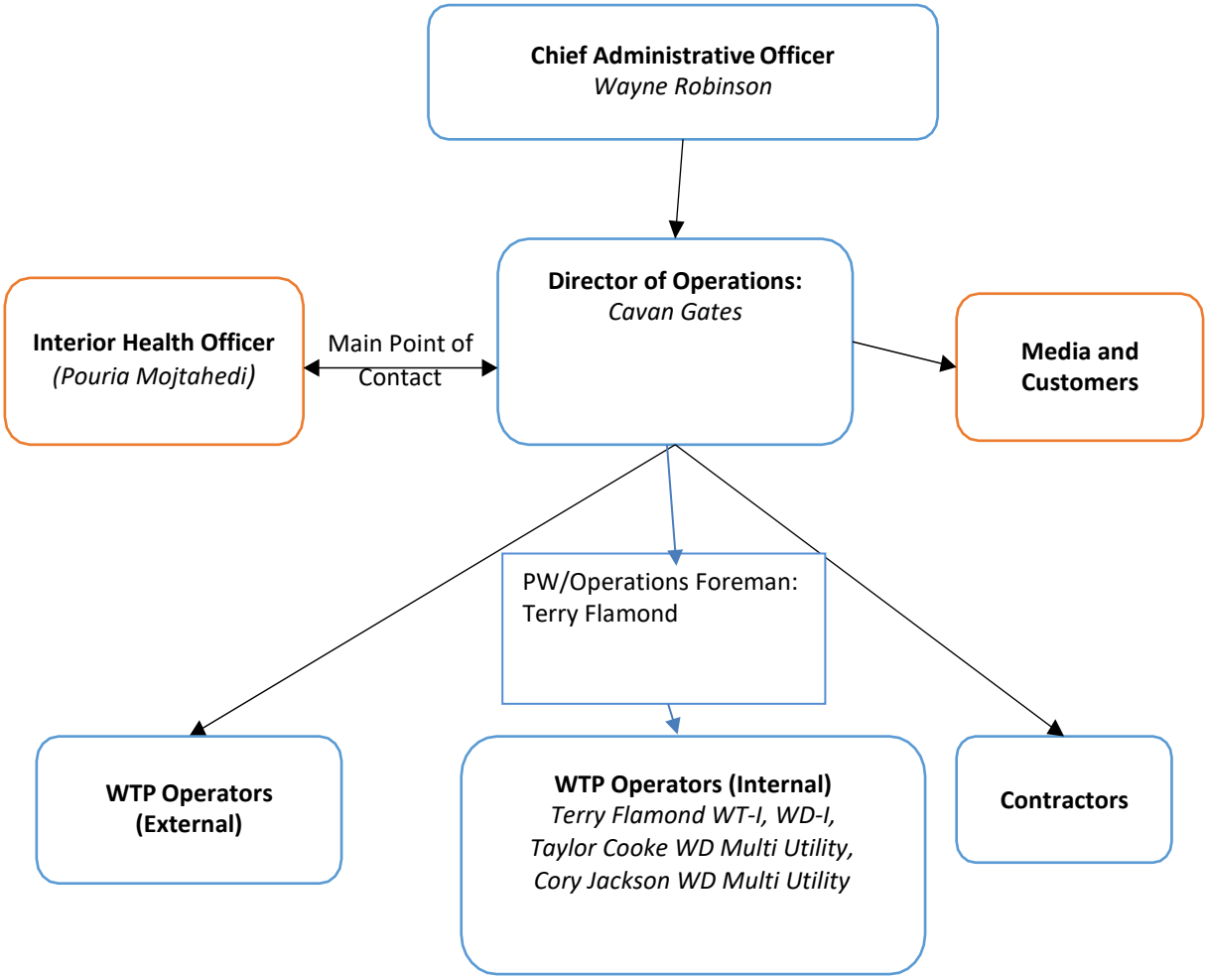
These notices should be tailored to each specific situation to provide the public with accurate and relevant information. Once the issues have been resolved, the public will also need to be informed that it is safe to resume with normal use of water. Notices for these situations can be found in Appendix A.

In the event that water use restrictions need to be implemented, it should be in accordance with the *Village of Nakusp Water Rates and Regulations Bylaw 656-2015.*

It is effective to designate a spokesperson to focus on communicating all relevant information to impacted parties. A summary of the ERP should be distributed and made available to all customers to alleviate questions and concerns in an emergency event.

Internal communication is also important in an emergency event, and a chain of command should be developed to ensure efficiency and that no information is lost.

The following is an example of a chain of command system for implementation.



NOTE:
**WT=Water Treatment Operator Certification*
**WD=Water Distribution Operator Certification*
**Village of Nakusp Requires Level II Distribution and Level II Treatment Operators*

11.0 PROJECTS & IMPROVEMENTS:

Project Summary & Timeline

Capital Improvements	
Project Title	**Estimated Completion Date**
Well 3 design, build, install and tie-in	Completed late 2023
New reservoir cover	2025

Engineering Studies/Plans &Technical Reports	
Implement leak detection program	2025
Operations & Maintenance	
Ground Water (Well 1 and 2) Licensing Application	Completed
1 Mil Reservoir Inspection	Completed 2023
200K Reservoir Inspection (camera)	Completed 2023
Ground Water Licence Amendment to include Well 3 capacity	2025