Water Operations

2024 Annual Report

10150 Bottom Wood Lake Road

Lake Country, British Columbia V4V 2M1

Ph: 250-766-6677 Fax: 250-766-0200

Prepared For:
INTERIOR HEALTH AUTHORITY
1440 – 14th Avenue
Vernon, BC V1B 2T1

Prepared By:

District of Lake Country Utility Department

For further details contact Patti Meger, District of Lake County Water Quality Analyst
pmeger@lakecountry.bc.ca

Contents

Water Operations

2024 Overview

The following is intended to inform and summarize 2024 data collections, observations, and work completed by DLC staff with regards to water operations and water quality.

Water operations highlights include:

- Vernon Creek Intake Screens
- Transmission Main Leak Detection
- Mainline Valve Replacement
- Pretty Rd watermain improvements

Dam Maintenance

Inspections of the upland dams (Beaver, Crooked, Oyama, and Damer) are completed by DLC staff weekly when the water levels are normal. Increased inspections occur when water levels increase. In 2024 the District had all dams formally inspected, as well as regular dam maintenance completed on Damer Lake, Crooked Lake, Beaver Lake, Oyama Lake and Vernon creek intake Dam.

Damer Lake Before

Damer Lake After

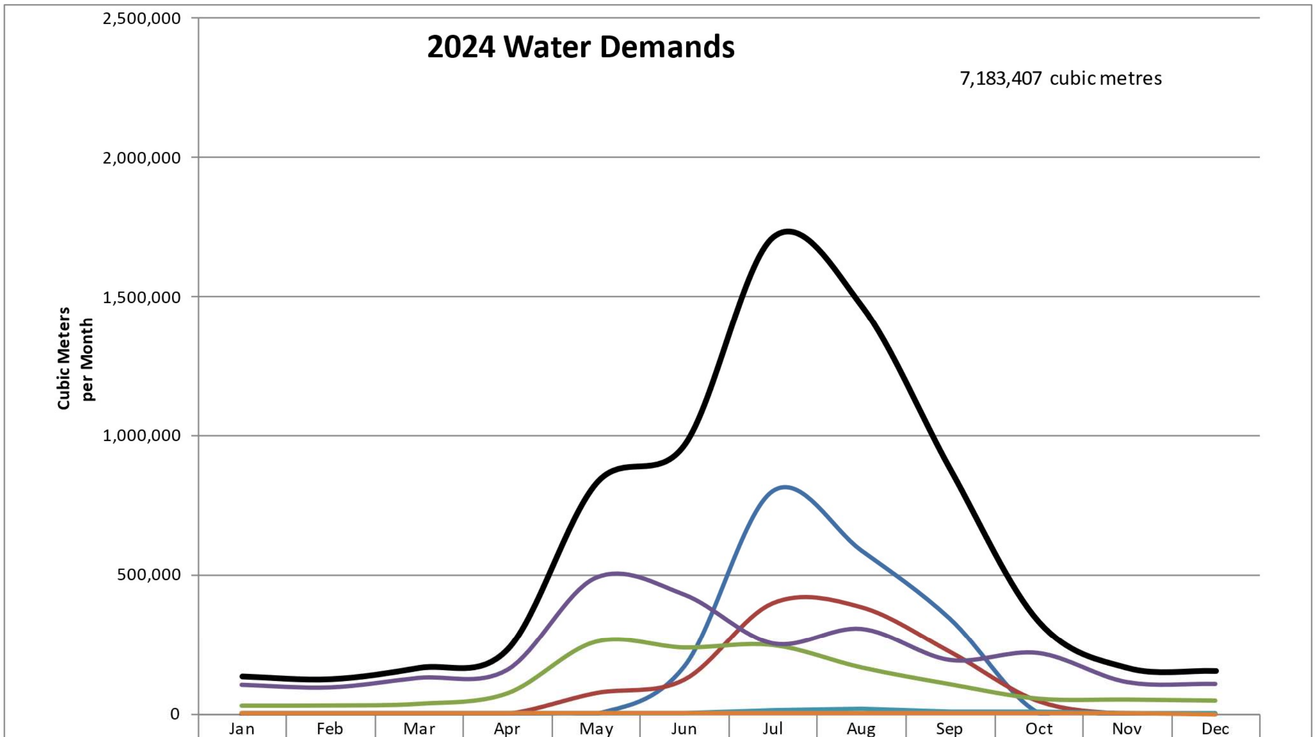
System Descriptions and Classification

The District of Lake Country (DLC) is a growing municipality with an approximate population of 18,000 people. Not all 18,000 residents are connected to the DLC's public water systems. The primary upland sources used by the DLC include Beaver Lake, Crooked Lake, Oyama Lake, and Damer Lake. The lower elevation water sources are Okanagan Lake (3 separate intakes) and Kalamalka Lake.

Infrastructure within the DLC owned water systems include 6 storage dams, 10 reservoirs, 6 chlorine injection systems, 9 pump houses, 2 UV disinfection systems, 6 pressure boosting stations, 41 pressure reducing stations, 85 pressure reducing valves, 519 hydrants, and approximately 200 km of water distribution mains.

Water Demands

The consumption demand of each source within the District varies according to the total number and types of connections serviced by each source. These connection types include residential, commercial, industrial, institutional, seasonal irrigation and agricultural. Total water usage among all District water systems in 2024 was 7,183,407m^3 (see Figure 1 for water consumption by source), which is well below the annual average.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total	136,511	126,757	167,286	235,026	830,789	969,460	1,715,242	1,466,190	879,828	332,886	167,238	156,194
Beaver Lake	0	0	0	0	1,296	171,942	802,281	589,429	344,836	5,710	0	0
Oyama Creek	0	0	0	0	74,402	122,480	398,041	383,848	223,254	45,696	0	0
Kalamalka Lake	30,037	30,727	36,675	73,673	257,512	236,761	245,649	165,909	106,256	55,059	51,883	48,083
Okanagan Lake	103,022	93,752	128,075	157,062	490,142	429,530	252,970	305,557	192,841	217,912	112,968	106,320
Lake Pine	2,227	1,592	1,676	3,170	4,342	5,416	11,861	16,660	9,328	6,862	1,735	1,415
Coral Beach	1,225	686	860	1,121	3,095	3,331	4,440	4,787	3,313	1,647	652	376

Figure 1. *2024 DLC water demands from each source reported as cubic meters per month.*

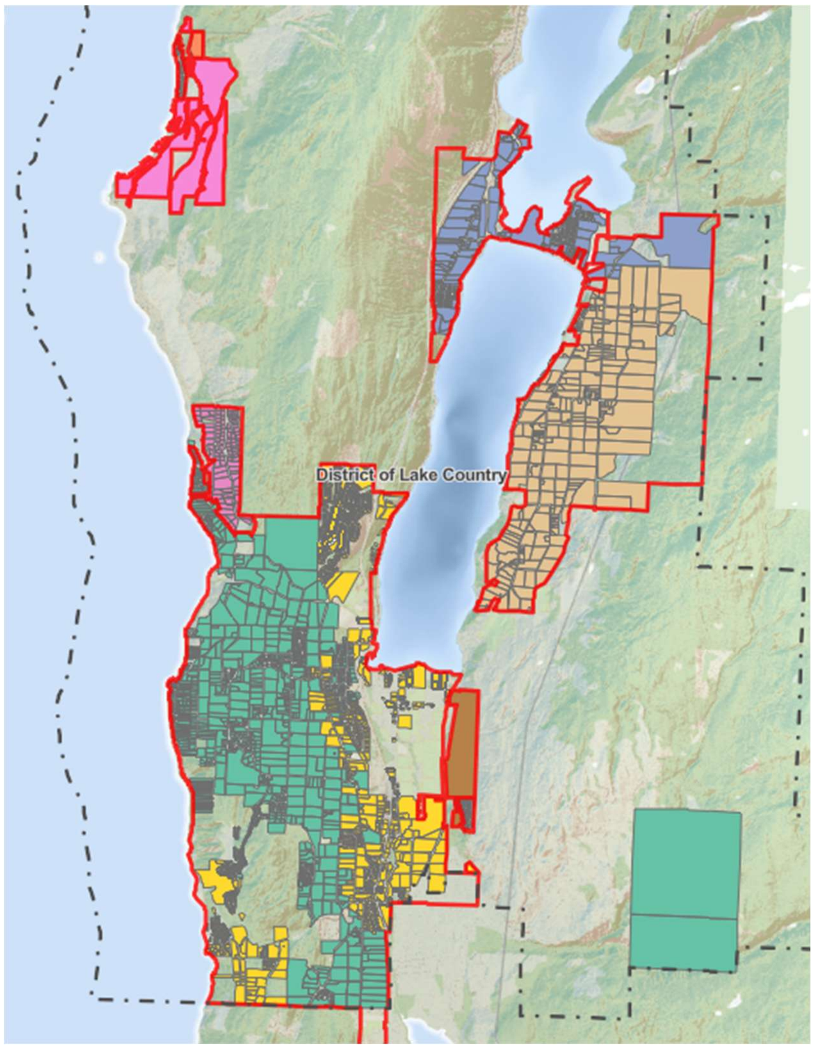
- *Zero demand months on the Oyama Lake source is due to the DLC supplying the Oyama Lake source with the Kalamalka Lake source during periods of low consumption.*
- *Zero demand months on the Beaver Lake source is due to the DLC supplying the Beaver Lake source with the Okanagan Lake source during periods of low consumption.*

Water Sources

The DLC uses and monitors four separate water sources:

1. Beaver Lake (Crooked Lake chain flows into Beaver Lake)
2. Oyama Lake (Damer Lake flows into Oyama Creek)
3. Okanagan Lake
4. Kalamalka Lake

To review a water source area map, go to: [MyWater Map vII (arcgis.com)]



2024 Snowpack

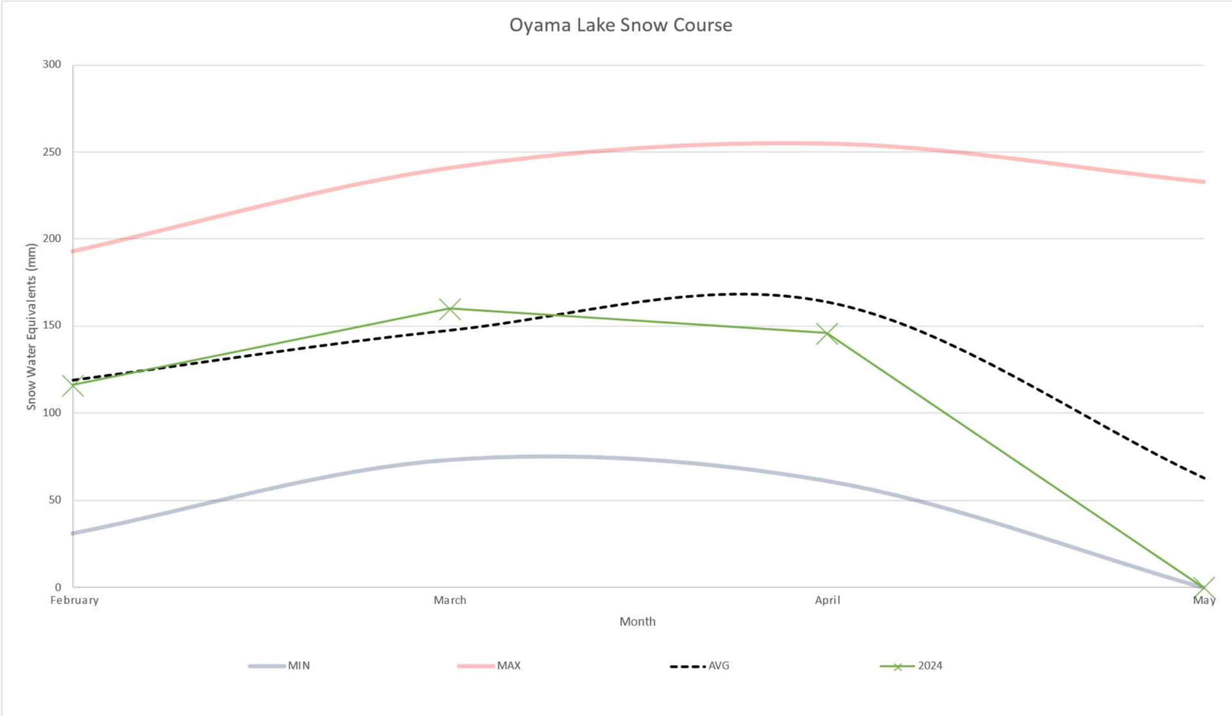


Figure 2. *2024 Oyama Lake Snowpack*

The snow course uses real time data that is collected from an automated weather station. The weather station records humidity, ambient temperature, snow depth, and snow water equivalents required for proper watershed management. To see the historical snow survey data for Oyama Lake please visit the BC River Forecast Centers website, and search for the station ID "*2F19P*".

2024 Freshet & Releases

The March 31, 2024, snowpack results indicated a 14% lower than average snow depth with a water equivalent of 11% lower than average. District staff did not to release water from Beaver or Oyama Lakes, other than the required base flows, as lake levels were at or below average for the time of year.

Cross Connection Control Program (CCCP)

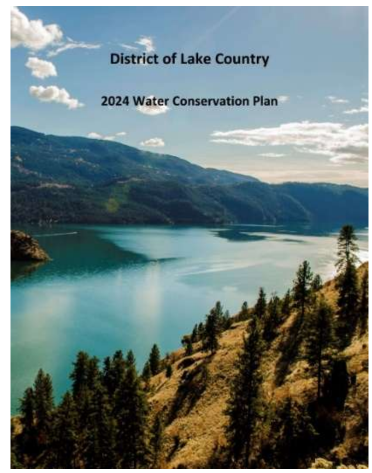
Ensuring the integrity of our water supply system is paramount, and the District upholds this commitment by implementing robust protocols for managing backflow devices and ensuring regulatory compliance standards are met. Testing of known or required backflow prevention devices occurs in compliance with CSA Standard B64.10-11/B64.10.1-11 and amendments thereto. All new construction and businesses are required to meet or exceed DLC regulations related to Cross-Connection Control. Bylaw 984 (Water Rates & Regulations Bylaw) empowers staff to inspect and enforce cross-connection control requirements in the BC Building Code and CSA Group standards. The program has become an integral part of the DLC's multi-barrier approach to protecting our community's drinking water. Existing facility assessments continue to take place on a rotating scheduled basis to ensure that any changes in ownership/usage are captured by the CCC program and protection devices are installed where required. The Cross Connection Control Manager utilizes FAST software to monitor compliance efficiently, ensuring prompt response to any deviations from regulatory requirements.

As of 2024, the District effectively manages backflow devices across 826 properties in accordance with Water Rates & Regulation Bylaw 984. Three water operators obtained qualifications to test backflow devices in 2024 and tested 90 % of the agricultural backflow devices. The following table delineates the distribution of properties by type:

	Properties	Backflow Devices
ICI	145	299
Residential	202	205
Agriculture	440	447
DLC Facilities	39	63
Total	**826**	**1014**

Water Conservation Plan

The 2024 Water Conservation Plan was approved by Council in May 2024. The 2024 Water Conservation Plan is intended to provide strategic direction for water conservation opportunities while securing long-term resilient water supplies for our community. It is important to realize that every drop of water comes at a cost and making good decisions prior to urgent drought situations will lessen the impacts and lead to more desirable outcomes. You can read the 2024 Water Conservation Plan here.



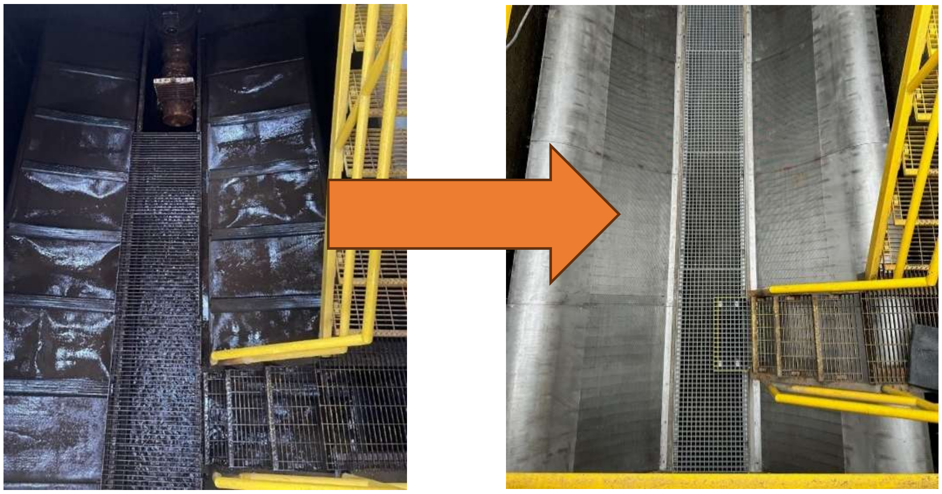
Annual Operations Summary

Annual operational duties that are completed by DLC staff:

- Service installation and repairs
- Collection and analysis of water sampling
- Upland dam inspections and water releases
- Maintenance and cleaning of all reservoirs, chlorination, and pumping facilities.
- Air valve maintenance
- Meter installations, troubleshooting, reads and repairs
- Backflow Assembly Testing
- Pressure reducing valve maintenance
- Hydrant maintenance
- Line valve maintenance
- Main line leak repairs
- Seasonal irrigation turn on and offs
- Responding to customer complaints and inquiries
- Cross connection control assembly testing
- Watermain flushing

Vernon Creek Intake Screens

The Vernon Creek Intake building serves as the headworks for the Beaver Lake Water System. Previously, operators had to manually clean the intake screens, a labor-intensive process that was particularly demanding during freshet when increased turbidity necessitated multiple cleanings daily. In April, self-cleaning screens were installed, significantly reducing the need for manual maintenance and improving operational efficiency.



Vernon Creek Intake Screens

Transmission Main Leak Detection

In August 2024, *SmartBall Technologies* was used to perform a transmission main condition assessment on the Beaver Lake water system. By utilizing sound resonance to detect leaks, the project helps to reduce water wastage and offers valuable insights into the overall condition of the piping network. This initiative is crucial for addressing the significant portion of unaccounted water attributed to leaks within the Districts' distribution systems, contributing to more efficient water management and conservation efforts.

SmartBall Technologies

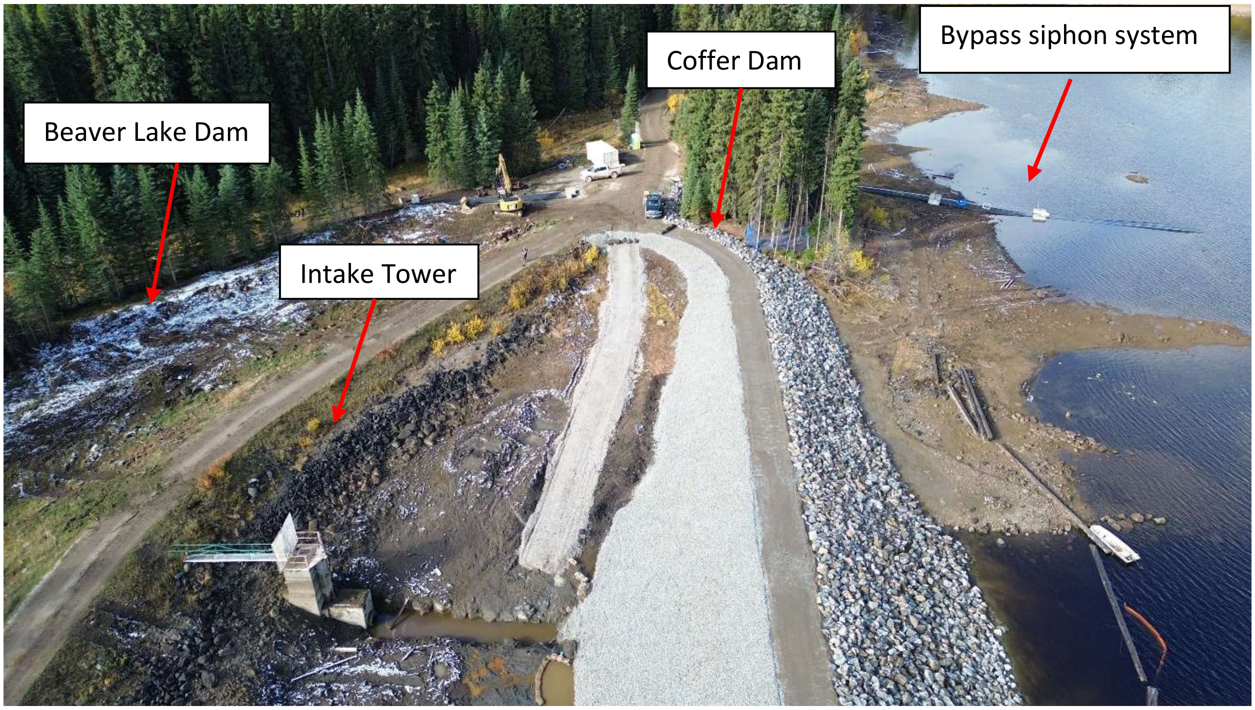
Mainline Valve Replacement

On March 12 2024, a main line valve at the intersection of Camp/Bond Road was replaced, resulting in a water shutdown to 329 properties. Due to the large shutdown area, a precautionary Boil Water Notice was issued for all customers on the distribution system for the Beaver Lake water source until laboratory testing confirmed no risks to public health were present.

Installation of the new main line valve (left) and the shutdown area (right).

Beaver Lake Intake Tower Replacement

The Beaver Lake Intake Tower controls water releases from Beaver Lake to Upper Vernon Creek. A review of the intake tower indicated complete replacement was necessary and 2024 saw the first phase of construction begin. A coffer dam and bypass siphon system were constructed, which will allow for the intake tower and outlet structure to be replaced in 2025.



Pretty Road Improvements

Transportation improvements were made along a section of Pretty Road as part of the Mobility Improvement Program, an initiative by Council to manage safety concerns related to growth and development in the area. This project provided an opportunity to concurrently replace aging infrastructure with 500m of upsized watermain that improved fire flows to the area.

Watermain tie-in at the north end of Pretty Road

Reservoir Cleaning

The DLC uses a diving company to conduct reservoir inspections with an ROV unit as needed. In some instances, the DLC also uses divers to clean the reservoirs. When using a diver is not possible, the DLC operations crew will drain and clean the reservoirs. In 2024 DLC staff cleaned and inspected the Oyama Creek Reservoir and Coral Beach Reservoir.

Pump Servicing and Rebuilds

Okanagan Lake Pumphouse has three 750 HP vertical turbine pumps. In 2024 one of the three pumps was pulled for routine inspections and was found to need its impellers repaired. During the time the pump was out of service, the water jacket for the motor was replaced and tested as well. The pump was removed and sent to a third party for an overhaul with the pump set to be reinstalled in early 2025.

Okanagan Lake Pumphouse, pump installation

In January 2024, Coral Beach 10 horsepower pump was serviced by a local pump maintenance technician. All wearable parts were replaced to ensure reliable pumping throughout the summer.

Within the Lake Pine Water system, one of the two Raven Ridge Distribution Booster Pumps were taken out of service. The motor for the pump was replaced. The pump's impeller stack and bearings were replaced.

Potable Water Emergency Response Plan

The DLC has a Potable Water Emergency Response Plan that is updated annually (or more often as required). The plan outlines operational response and communication procedures that are to be undertaken in an emergency event that may present health threats to people using the water system. Emergency events include, but are not limited to power outages, loss of supply, watermain breaks, and algae blooms. Both the Emergency Response Plan and Annual Water Operations Report are provided to Interior Health Authority (IHA) annually.

Lake Watershed Environmental Releases

In the fall of 2024, the Province once again requested the District to release water from Beaver Lake that exceeded the agreed-upon environmental flow regime. These additional releases were necessary to support the Kokanee spawning in middle-Vernon creek. While the importance of spawning and environmental releases is recognized, this practice is not considered sustainable given the constantly changing climate. The District is actively collaborating with the Province to establish a water management plan aimed at developing a sustainable approach to ensure environmental flows during periods of drought.

Water Quality

Regulatory and Resources

Water purveyors in British Columbia are mandated to supply potable water to their users in accordance with the BC's Drinking Water Protection Act. In 2012, the Province introduced BC Drinking water objectives for surface water supplies in British Columbia. These treatment objectives are designed to ensure the delivery of microbiologically safe drinking water. They establish minimum performance targets for water suppliers, focusing on the treatment of water to eliminate enteric viruses, pathogenic bacteria, Giardia cysts, and Cryptosporidium oocysts. This framework maintains adherence to the 4-3-2-1-0 treatment objectives.

- 4-log (99.99 percent) inactivation and/or removal of viruses,
- 3-log (99.9 percent) inactivation and/or removal of Giardia and *Crypto sporidia*,
- Two treatment processes for surface water
- Less than or equal to one nephelometric turbidity unit (NTU) of turbidity
- No detectable E. coli, fecal coliform and total coliforms

Water suppliers in British Columbia must develop and implement a plan to meet this standard. Meeting this objective significantly reduces risks to human health. Additionally, it is mandatory for water suppliers to transparently identify any risks associated with water supplies that do not meet these standards. This empowers the public to make informed decisions about any necessary additional steps to safeguard themselves, their families, and their guests.

The Oyama and Beaver Lake water treatment facilities solely employ chlorination and do not achieve the required 3-log (99.9 percent) inactivation and/or removal of Cryptosporidium. The health impacts stemming from exposure to certain Protozoa, such as Giardia and Cryptosporidium, vary depending on the individual's immune system. Consequently, the Oyama and Beaver Lake water sources are under a year-round water quality advisory. This advisory recommends that individuals with compromised immune systems boil the water for at least 1 minute before consumption. These concerns and risks have been addressed in our 2023 Water Master Plan (WMP), and ongoing discussions with IHA (Interior Health Authority) regarding the challenges and implementation of meeting these standards persist. Customers who are immune-compromised or may serve water to such individuals are urged to register for the sensitive customer list through the District of Lake Country (DLC) at Engineering@lakecountry.bc.ca. This registration ensures that they receive timely notifications regarding any changes in water quality.

The DLC remains committed to advancing efforts towards achieving compliance with the drinking water treatment objectives.

Water Quality Testing

This section offers an overview of the water quality testing conducted in 2024 for the water sources of the District of Lake Country (DLC). Throughout the year, DLC's distribution sites undergo monitoring for water chemistry parameters such as free and total chlorine, turbidity, temperature, pH, and conductivity. Additionally, tests are conducted to detect the presence of bacteria, including total coliforms and E. coli.

Overall, the majority of water chemistry and bacteriological results indicate compliance with the Guidelines for *Guidelines for Canadian Drinking Water Quality* However, there are instances where certain parameters exceed the maximum acceptable concentrations

Vernon Creek covered in snow.

Instrument Calibration and Quality Control

Before collecting field data or verifying on-line equipment, field instruments undergo regular checks against standards to guarantee accuracy. They are maintained and calibrated as necessary prior to field use. Furthermore, a certified accredited agency (such as Hach) conducts annual inspections and provides certification for all water quality monitoring field equipment.

The online water quality monitoring equipment that uploads directly to Supervisory Control and Data Acquisition (SCADA) undergoes weekly verification using handheld water quality equipment. Additionally, the equipment is regularly maintained and calibrated according to manufacturer guidelines, with additional attention as necessary.

Water Chemistry

Turbidity, a measure of suspended particulate matter in water, occurs naturally in some areas and can be amplified by human activities upstream from our intake locations, such as recreation, cattle ranching, and logging. Elevated turbidity levels can create a favorable environment for microorganisms, shielding them from disinfection and thereby increasing the demand for chlorine. The Canadian Drinking Water Guideline (GCDWQ) establishes a maximum allowable concentration for turbidity in water distribution systems at 1 NTU.

Chlorine serves as the primary disinfectant for all DLC water sources. Both free and total chlorine levels are monitored to verify the effectiveness of the disinfection process and to maintain a residual throughout the distribution systems.

Ultraviolet (UV) water treatment works by inactivating pathogens in surface water (such as cryptosporidium, giardia lamblia and more) with UV radiation. The UV light radiation disrupts their DNA and disables their ability to replicate. UV disinfection provides no residual to prevent system regrowth.

The Kalamalka and Okanagan Lake sources utilize ultraviolet water treatment as a secondary form of disinfection. Ultraviolet operations log sheets are contained in Appendix F

Temperature and pH levels can influence both the odor and taste of water, as well as affect the efficiency of the disinfection process. For optimal palatability and to deter the growth of nuisance organisms, the temperature of potable water should ideally be below 15°C. According to the Guidelines for Canadian Drinking Water Quality (GCDWQ), the pH of water should fall within the range of 7.0 to 10.5. Ensuring proper pH levels is essential for maximizing treatment efficacy, managing corrosion, and reducing leaching from distribution systems and plumbing components.

Conductivity (the ability of an aqueous solution to carry an electrical current) is used as a quick indicator of changes occurring in the natural waters.

Colour creates high disinfectant demands and is an indicator of potential increased dissolved organic matter which, when combined with chlorine, forms disinfectant by-products. The GCDWQ for true colour is <15 TCU.

Water Chemistry Results

For all sources, any water chemistry parameters recorded daily through supervisory control and data acquisition (SCADA) are not included in the data below. SCADA information is reported monthly to IHA. The monitoring of source and distribution water is carried out weekly, with sampling rotated through all sites as outlined in the District of Lake Country Water Quality Monitoring and Reporting Plan.

The chemistry of distribution water can fluctuate for various reasons. Seasonal shifts in water demand, the timing of sampling after system flushing or the use of hydrants, and the mixing of water sources can all contribute to these changes. It's common within a distribution system to detect trace levels of free chlorine in dead ends or low-use areas. Free and total chlorine levels are closely monitored, and if levels are low, or if turbidity and color are elevated, among other potential circumstances, actions are taken in accordance with our Interior Health-approved Potable Water Quality Emergency Response protocols.

The Beaver and Oyama sources frequently fell short of meeting pH range objectives of 7.0-10.5, whereas the lower elevation sources on Okanagan and Kalamalka generally remained within the specified range. Temperature across all systems fluctuates with changes in outdoor ambient temperature and raw water conditions. While annual averages across all systems comfortably remained below the 15 degrees guideline, some systems experienced peak summer temperatures that exceeded this threshold.

Distribution water quality results are in Tables 1 -6 below for DLC Water Systems. The list of sample sites for each distribution system can be found in Appendix B

Low chlorine is commonly detected at end of the line sites for all water sources. When low chlorine or high turbidity occurs our standard deviation response plans are initiated. Follow up procedures, as outlined in the ERP, may include further bacteriological sampling, flushing or other operational practices to improve water quality. At all times bacteriological sampling was good and corrective measures as per our plan were followed.

Beaver Lake Source

Table 1. *2024 Annual Distribution Water Chemistry Results: DLC Water System; Beaver Lake Source (All data reported from weekly water quality monitoring using hand-held equipment). It should be noted that occasionally the distribution water sampled is a mixture of both sources (Okanagan Lake mixed into Beaver distribution) and variation from the norm occurs within the data.*

Beaver Lake Water System	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (NTU)	Temp (°C)	pH (sU)	Conductivity (uS/cm)
MIN	0.20	0.29	0.55	12.3	6.3	58
MAX	3.10	3.00	1.78	23.0	8.0	116
AVG	1.72	1.60	1.13	17.6	7.3	75

Okanagan Lake Source

Table 2. *2024 Annual Distribution Water Chemistry Results: DLC Water System; Okanagan Lake Source (All data reported from weekly water quality monitoring using hand-held equipment).*

Okanagan Lake Water System	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (NTU)	Temp (°C)	pH (sU)	Conductivity (uS/cm)
MIN	0.05	0.16	0.16	3.7	7.0	166
MAX	4.90	5.60	10.9	22.8	9.0	343
AVG	1.00	1.12	0.38	9.2	8.01	287

Oyama Lake Source

Table 3. *2024 Annual Distribution Water Chemistry Results: DLC Water System; Oyama Lake Source (All data reported from weekly water quality monitoring using hand-held equipment). Occasionally the distribution water sampled is a mixture of both sources (Oyama Lake and Kalamalka Lake) resulting in data variations within the data. Oyama water source is typically online mid-May through mid-October (mixing of sources in the Oyama reservoir occurs for a short time following the switch).*

Oyama Lake Water System	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (NTU)	Temp (°C)	pH (sU)	Conductivity (uS/cm)
MIN	0.15	0.33	0.47	10.1	6.0	52
MAX	3.90	4.50	2.22	22.8	7.0	83
AVG	2.37	2.76	1.22	15.2	6.8	60

Kalamalka Lake Source

Table 4. *2024 Annual Distribution Water Chemistry Results: DLC Water System; Kalamalka Lake Source (All data reported from weekly water quality monitoring using hand-held equipment).*

Kalamalka Water System	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (NTU)	Temp (°C)	pH (sU)	Conductivity (uS/cm)
MIN	0.10	0.50	0.13	4.3	6.3	70
MAX	3.50	4.10	6.80	17.3	9.0	435
AVG	1.21	1.50	0.73	9.9	8.2	390

Coral Beach Water System

Table 5. *2024 Annual Distribution Water Chemistry Results: Coral Beach Water System; Okanagan Lake Source (All data reported from weekly water quality monitoring using hand-held equipment).*

Coral Beach (OK Lake) Water System	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (NTU)	Temp (°C)	pH (sU)	Conductivity (uS/cm)
MIN	0.35	0.54	0.17	4.7	7.8	279
MAX	1.45	1.53	0.78	18.3	8.4	326
AVG	0.84	1.02	0.41	11.8	8.1	297

Lake Pine Water System

Table 6. *2024 Annual Distribution Water Chemistry Results: Lake Pine Water System; Okanagan Lake Source (All data reported from weekly water quality monitoring using hand-held equipment).*

Lake Pine (OK Lake) Water System	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (NTU)	Temp (°C)	pH (sU)	Conductivity (uS/cm)
MIN	0.08	0.13	0.16	4.1	7.8	289
MAX	3.80	4.30	0.70	18.2	8.3	353
AVG	1.02	1.21	0.33	10.2	8.1	317

Bacteriological Regulations and Results

DLC adheres to bacteriological water quality monitoring standards outlined in the Guidelines for Canadian Drinking Water Quality (GCDWQ) and the *Drinking Water Protection Act (DWPA) and Regulations (DWPR).* Chlorine, either in gas or hypochlorite form, is employed across all DLC water sources for disinfection against waterborne pathogens, with chlorine residuals monitored in the distribution lines. In addition, ultraviolet (UV) disinfection is implemented on the Kalamalka and Okanagan Lake sources. For UV system deviations from specifications, refer to Appendix F.

Drinking water samples are collected weekly within each DLC Water System to monitor physical, chemical, and biological parameters. Membrane filtration microbiological samples undergo analysis at an accredited laboratory. Additionally, 'in-house' analysis with Presence-Absence tests (P/A) is conducted to further assess compliance with the GCDWQ and identify trends and emerging issues.

The required number of monthly samples is outlined in the DWPR Schedule B (Table 7) and the DLC Water Quality and Monitoring Plan; Frequency of monthly bacteriological tests (Table 8). Weekly Total coliform and E. coli results from raw water sources and throughout the distribution system, including both membrane filtration and Presence-Absence tests, are compiled and submitted to the assigned Drinking Water Officer.

Any results failing to meet water quality standards outlined in the DWPR, Schedule A (Table 9), are promptly reported to the Drinking Water Officer, triggering implementation of corrective actions according to the DLC's Potable Water Emergency Response Plan.

Table 7: *Schedule B – Frequency of Monitoring Samples for Prescribed Water Supply Systems (section 8).*

Population Served by the Prescribed Water Supply System:	# Samples per month:
less than 5,000	4
5,000 to 90,000	1 per 1,000 of population
more than 90,000	90 plus 1 per 10,000 of population in excess of 90,000

Table 8: *Frequency of monthly bacteriological tests: Membrane Filtration (MF) and Presence-Absence (P/A)*

System/Source	MF Distribution # samples required per mo.	P/A	Total MF Distribution and Raw	Distribution Bacteriological/Chlorine test sites:
DLC Water System: Beaver Lake source : Est. Population 3,000	4	2	8	15*
DLC Water System: Okanagan Lake source : Est. Population: 6,000	6	2	8	14**
DLC Water System: Oyama Lake source: Est. Population 625	4	2	8	5
DLC Water System: Kalamalka Lake source: Est Population 750	4	2	8	5
Coral Beach Water System: Okanagan Lake source Est Population 130	4	2	8	2
Lake Pine Water System: Okanagan Lake source Est Population 198	4	2	8	3**

- * Includes Camp Rd. Reservoir (Offline unless required)
- ** Includes 2 reservoirs

Table 9: *Schedule A - Water Quality Standards for Potable Water (sections 2 and 9) DWPR*

Parameter:	Standard:
Escherichia coli (*E.coli*)	No detectable Escherichia coli (*E.coli*) per 100 ml
Total coliform bacteria:	
(a) 1 sample in a 30 day period	No detectable total coliform bacteria per 100 ml
(b) more than 1 sample in a 30 day period	At least 90% of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml

Coliform bacteria are typically harmless but serve as indicators for potential presence of harmful organisms, signaling issues with water treatment or distribution systems. Escherichia coli (E.coli), found in the intestines of humans and animals, suggests fecal contamination if present in drinking water. While most strains do not affect healthy individuals, certain strains like O157:H7 can cause severe illness. BC's Drinking Water Protection Regulation sets a maximum acceptable concentration (MAC) of none detectable per 100 mL for E.coli in drinking water systems.

Background colony counts estimate the general bacterial population in drinking water systems or raw source water when samples are analyzed. Exceeding acceptable levels of Total coliforms or E. coli triggers the Potable Water Quality Emergency Response Plan. Events are documented and reported to identify problem areas, with follow-up sampling and flushing conducted as necessary to maintain water quality in distribution systems.

In 2024, 282 membrane filtration (MF) bacteriological samples were collected and analyzed at CARO Analytical Services (CARO) in Kelowna for total coliforms and E.coli. Additionally, 166 P/A tests were analyzed in-house. The summary of the bacteriological results is in **Appendix A.** P/A tests determine the presence or absence of total coliforms in the sample but do not quantify coliform counts in case of a positive result. These tests are conducted on alternate weeks from the MF samples. In the event of a positive P/A test, additional bacteriological and water chemistry testing is carried out. E.coli was not detected in any DLC distribution systems throughout this period. There were no positive MF bacteriological results.

Lead

Under the Drinking Water Protection Act (DWPA), drinking water supply systems in BC are responsible for monitoring water they deliver to verify it is within acceptable limits for lead and other metals. The Guidelines for Canadian Drinking Water Quality (GCDWQ) suggest:

> *The GCDWQ maximum acceptable concentration (MAC) for total lead in drinking water is 0.005 mg/L (5 µg/L), based on a sample of water taken at the tap and using the appropriate protocol for the type of building being sampled. These guidelines further state that every effort should be made to maintain lead levels in drinking water as low as reasonably achievable.*

Most drinking water supply systems in BC typically have lead levels well below 5 µg/L. Lead is typically absent in water leaving treatment plants but may leach from pipes and fixtures within buildings, homes, or service lines connecting homes to water mains. Recent advancements in testing now allow laboratories to measure lead levels below 0.001 mg/L (1 part per billion). Although recent testing detected very low lead levels in various systems, these results lack consistency and are measured in parts per billion (ppb), well below guideline thresholds. Testing and assessment will continue in the 2025 sampling program. Since 1989, the BC Plumbing Code has restricted the use of lead in plumbing. The amount of lead released into water depends on plumbing materials used, water corrosiveness, and the duration water sits in the plumbing.

Schools have been advised to conduct water sampling to ensure lead levels are within safe limits. IHA collaborates directly with these facilities on monitoring efforts, and DLC has not received any reports of elevated lead levels in schools or daycares within our communities.

Building owners are responsible for assessing their plumbing systems and taking necessary actions to minimize lead exposure. A plumber can assist in identifying any lead-containing plumbing components in your home, including the service line on your property.

To evaluate corrosion risks within the community, DLC samples water for indicators of corrosivity, including the presence of lead. The results of lead testing can be found in Table 10.

Further information can be found at

BC Health Link: Lead in Drinking Water, the Guidelines for Canadian Drinking Water Quality and Caro Analytical Services for in-home testing

Table 10: 2024 Lead Sampling Results for Raw water intakes and distribution sources.

Lead Results 2024					
WATER SYSTEM	WATER SOURCE	SITE	DATE	RESULT	GCDWQ
Vernon Creek	Beaver Lake	*Vernon Creek RAW*	8/15/2024	<0.00020	0.005
Vernon Creek	Beaver Lake	*Pow Rd PRV*	8/15/2024	<0.00020	0.005
Vernon Creek	Okanagan Lake	*Pow Rd PRV*	1/23/2024	<0.00020	0.005
Vernon Creek	Okanagan Lake	*Pow Rd PRV*	4/8/2024	<0.00020	0.005
Vernon Creek	Okanagan Lake	*Pow Rd PRV*	11/6/2024	<0.00020	0.005
Vernon Creek	Beaver Lake	*Cooney Drain*	8/15/2024	<0.00020	0.005
Vernon Creek	Okanagan Lake	*Cooney Drain*	1/23/2024	<0.00020	0.005
Vernon Creek	Okanagan Lake	*Cooney Drain*	4/8/2024	<0.00020	0.005
Vernon Creek	Okanagan Lake	*Cooney Drain*	11/6/2024	<0.00020	0.005
Vernon Creek	Okanagan Lake	Glenmore	11/6/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Intake RAW*	1/23/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Intake RAW*	11/7/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Intake RAW*	4/8/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Intake RAW*	8/15/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Glenmore Booster*	1/23/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Glenmore Booster*	4/8/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Glenmore Booster*	8/15/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Glenmore Booster*	11/6/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Lake Upper Reservoir*	1/23/2024	0.00038	0.005
Okanagan Lake	Okanagan Lake	*Lake Upper Reservoir*	4/8/2024	<0.00020	0.005
Okanagan Lake	Okanagan Lake	*Lake Upper Reservoir*	8/15/2024	0.0002	0.005
Okanagan Lake	Okanagan Lake	*Lake Upper Reservoir*	11/7/2024	0.00067	0.005
Coral Beach	Okanagan Lake	*Intake RAW*	1/22/2024	<0.00020	0.005
Coral Beach	Okanagan Lake	*Intake RAW*	4/9/2024	<0.00020	0.005
Coral Beach	Okanagan Lake	*Intake RAW*	8/12/2024	<0.00020	0.005
Coral Beach	Okanagan Lake	*Intake RAW*	11/4/2024	<0.00020	0.005
Coral Beach	Okanagan Lake	*South End*	1/22/2024	0.00069	0.005
Coral Beach	Okanagan Lake	*South End*	4/9/2024	<0.00020	0.005
Coral Beach	Okanagan Lake	*South End*	8/12/2024	0.00022	0.005
Coral Beach	Okanagan Lake	*South End*	11/4/2024	<0.00020	0.005
Lake Pine	Okanagan Lake	*Intake RAW*	1/22/2024	0.00023	0.005
Lake Pine	Okanagan Lake	*Intake RAW*	4/9/2024	0.00031	0.005
Lake Pine	Okanagan Lake	*Intake RAW*	8/12/2024	0.00022	0.005
Lake Pine	Okanagan Lake	*Intake RAW*	11/4/2024	<0.00020	0.005
Lake Pine	Okanagan Lake	*LP PR Station*	1/23/2024	<0.00020	0.005
Lake Pine	Okanagan Lake	*LP PR Station*	4/9/2024	<0.00020	0.005
Lake Pine	Okanagan Lake	*LP PR Station*	8/12/2024	0.0014	0.005
Lake Pine	Okanagan Lake	*LP PR Station*	11/4/2024	<0.00020	0.005
Kalamalka Lake	Kalamalka Lake	*Intake RAW*	1/24/2024	<0.00020	0.005
Kalamalka Lake	Kalamalka Lake	*Intake RAW*	4/10/2024	<0.00020	0.005

Kalamalka Lake	Kalamalka Lake	*Intake RAW*	8/13/2024	<0.00020	0.005
Kalamalka Lake	Kalamalka Lake	*Intake RAW*	11/5/2024	<0.00020	0.005
Kalamalka Lake	Kalamalka Lake	*Sheldon/Cornwall*	1/24/2024	<0.00020	0.005
Kalamalka Lake	Kalamalka Lake	*Sheldon/Cornwall*	4/10/2024	<0.00020	0.005
Kalamalka Lake	Kalamalka Lake	*Sheldon/Cornwall*	8/13/2024	0.00025	0.005
Kalamalka Lake	Kalamalka Lake	*Sheldon/Cornwall*	11/5/2024	<0.00020	0.005
Oyama Creek	Oyama Lake	*Intake RAW*	7/30/2024	0.00020	0.005
Oyama Creek	Oyama Lake	*Intake RAW*	8/16/2024	<0.00020	0.005
Oyama Creek	Oyama Lake	*Intake RAW*	11/7/2024	<0.00020	0.005
Oyama Creek	Oyama Lake	*Ribbleworth Drain*	8/16/2024	0.00186	0.005
Oyama Creek	Kalamalka Lake	*Ribbleworth Drain*	1/24/2024	0.00054	0.005
Oyama Creek	Kalamalka Lake	*Ribbleworth Drain*	4/10/2024	0.0003	0.005
Oyama Creek	Kalamalka Lake	*Ribbleworth Drain*	11/5/2024	0.00093	0.005

Water Quality Advisories and Boil Water Notices

IHA mandates water purveyors to issue a Water Quality Advisory when turbidity exceeds 1 NTU and to contact Interior Health when turbidity approaches 5 NTU for potential enhanced notification, such as a Boil Water Notice. Currently, two of the DLC sources are under a Water Quality Advisory (WQA). Quarterly reminder notifications are distributed to customers through water bill inserts, and information is posted on the DLC website, social media channels, and local newspapers as required. Irrespective of Advisory status, regular monitoring of all distribution systems on DLC sources is conducted in accordance with the IHA-approved Water Quality Monitoring and Reporting Plan.

The following sources were on a **Water Quality Advisory (WQA**) in 2024:

- Beaver Lake Water Source (ongoing even if source switched to Okanagan Lake)
- Oyama Lake Water Source (ongoing even if source switched to Kalamalka Lake)

Beaver and Oyama Sources are currently under Water Quality Advisories (WQA) due to fluctuating turbidity and the absence of multibarrier treatment. These advisories will persist until infrastructure upgrades improve water quality and reliability. Despite transitioning customers in these systems to low-turbidity sources of Okanagan and Kalamalka Lakes during the low-flow (non-irrigation) season, the WQA's are regulated to remain in effect.

Municipal Hall
Engineering Department

LAKE COUNTRY

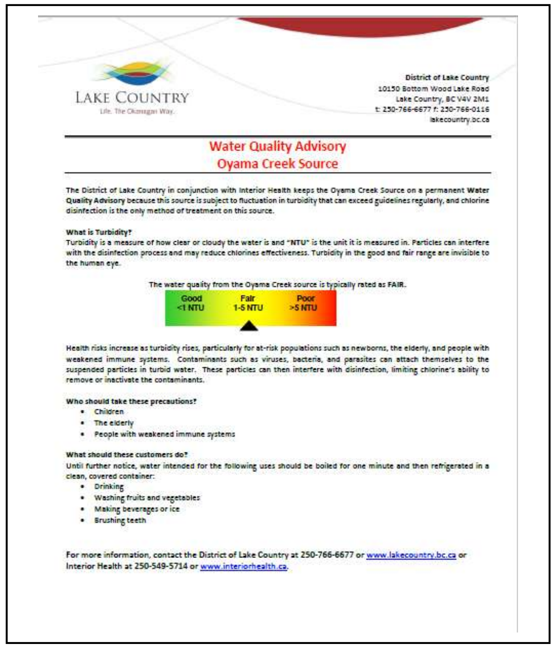
REMINDER
Water Quality Advisory
Sources: Beaver Lake (Vernon Creek)

"Interior Health recommends that children, the elderly, people with weakened immune systems and anyone seeking additional protection drink boiled water or a safe alternative until further notice. For these at-risk populations, water intended for drinking, washing fruits or vegetables, making juice or ice, or brushing teeth should be boiled for one minute."

What is Turbidity?

Until water treatment facilities are constructed, the Water Quality Advisory is expected to remain in effect.

LAKE COUNTRY



LAKE COUNTRY
Life. The Okanagan Way.

District of Lake Country
10150 Bottom Wood Lake Road
Lake Country, BC V4V 2M1
t: 250-766-6677 f: 250-766-0116
lakecountry.bc.ca

Water Quality Advisory
Oyama Creek Source

The District of Lake Country in conjunction with Interior Health keeps the Oyama Creek Source on a permanent Water Quality Advisory because this source is subject to fluctuation in turbidity that can exceed guidelines regularly, and chlorine disinfection is the only method of treatment on this source.

What is Turbidity?
Turbidity is a measure of how clear or cloudy the water is and "NTU" is the unit it is measured in. Particles can interfere with the disinfection process and may reduce chlorines effectiveness. Turbidity in the good and fair range are invisible to the human eye.

The water quality from the Oyama Creek source is typically rated as FAIR.

Good	Fair	Poor
<1 NTU	1-5 NTU	>5 NTU

Health risks increase as turbidity rises, particularly for at-risk populations such as newborns, the elderly, and people with weakened immune systems. Contaminants such as viruses, bacteria, and parasites can attach themselves to the suspended particles in turbid water. These particles can then interfere with disinfection, limiting chlorine's ability to remove or inactivate the contaminants.

Who should take these precautions?
- Children
- The elderly
- People with weakened immune systems

What should these customers do?
Until further notice, water intended for the following uses should be boiled for one minute and then refrigerated in a clean, covered container:
- Drinking
- Washing fruits and vegetables
- Making beverages or ice
- Brushing teeth

For more information, contact the District of Lake Country at 250-766-6677 or www.lakecountry.bc.ca or Interior Health at 250-549-5714 or www.interiorhealth.ca.

Notable Water Quality Events

Line Valve Replacement

On March 12 2024, the DLC replaced a main line valve at the intersection of Camp/Bond Road, resulting in a water shutdown to 320 properties from approximately 0900 to 2100. A comprehensive plan, including a PowerPoint presentation detailing operations, communications, and sampling, was submitted to IHA. This included a precautionary BWN effective March 12th. Following the repair, flushing then sampling that passed bacteriological tests (<1 total coliforms and <1 E. coli) along with satisfactory water chemistry (adequate chlorine levels and low turbidity), the BWN was rescinded on March 15th.

Clement Road Main Break

On the morning of March 28th 2024, a high flow alarm alerted the operations team of a failure within the distribution system. Crews were quickly on site and isolated the break. Due to loss of pressure and public health concerns a Boil Water Adivsory was put in place for the surrouding properties. The advisory was in place from March 28th – April 03rd.

Temporary Water Service (Rogers Road)

A temporary water service was provide to a modular home park on Rogers Road, when their on site well failed. The District in compliance with IHA, supplied water from a near by hydrant. Precautions were taken to protect the District infrastructure and residence within the park. The water service was provided from July 17-26th.

Disinfectant By-Products:

Under the Guidelines for Guidelines for Canadian Drinking Water Quality: Haloacetic acids (HAAs) Guidelines for Canadian Drinking Water Quality: Haloacetic acids (HAAs) are disinfectant by-products formed when chlorine used in water treatment reacts with natural organic matter. Chlorine's use in treatment has significantly reduced waterborne diseases by killing or inactivating most microorganisms. Most Canadian water treatment plants utilize chlorine for direct treatment and to maintain residual chlorine in distribution systems to prevent bacterial regrowth. Despite by-product risks, disinfection is crucial for public health as it reduces overall health risks compared to consuming untreated water.

Elevated levels of HAA's and THM's are commonly present in chlorinated water sourced from upper elevation drinking water reservoirs. These disinfectant by-products are prevalent in the Okanagan due to high natural organic matter content. In contrast, lower levels of disinfectant by-products, turbidity and organics are found in lakes in our lower elevation sources such as Okanagan and Kalamalka Lakes. Monitoring for deviations in water quality at our deep-water intakes is rigorous following flooding years. It often takes multiple seasons before changes in water chemistry are detected post-flooding event.

Haloacetic Acids (HAAs)

Total haloacetic acids (HAAs) comprise monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid. The maximum acceptable concentration (MAC) for total HAAs in drinking water is 0.08 mg/L (80 µg/L), determined based on a locational running annual average from at least quarterly samples taken in the distribution system.

DLC adheres to GCDWQ standards for HAA testing, conducting minimum quarterly monitoring and sampling at intermediary sites. Additional sample points for HAA testing are established on large water systems (Oyama, Beaver, and Okanagan), particularly in areas with the highest HAA formation potential. These sites are characterized by extended disinfectant retention times and are typically located at re-chlorination sites or at the far end of the distribution system.

Analysis of haloacetic acids in the DLC Water System in 2024 revealed that Oyama and Beaver Lake sources exceeded the annual HAA averages specified in the GCDWQ. Detailed results, including running averages for each site and distribution totals, are presented in Tables 11 - 16

Table 11. **Beaver Lake Source** 2024 Average Total HAA data collected and calculated as per the GCDWQ.

Vernon Creek (Beaver Lake) Source HAA guideline <0.080 mg/L			
Cooney Drain		**Pow Rd PRV**	
	HAA5		HAA5
Date	mg/L	Date	mg/L
8/15/2024	0.1350	8/15/2024	0.1420
Quarterly Site Annual Average	**0.135**	Quarterly Site Annual Average	**0.142**
		Total Quarterly Annual Average	**0.139**

Table 12. **Okanagan Lake Source** 2024 Average Total HAA data collected and calculated as per the GCDWQ.

Okanagan Lake Source HAA guideline <0.080 mg/L			
Glenmore Booster		**Lake Upper Reservoir**	
	HAA5		HAA5
Date	mg/L	Date	mg/L
1/23/2024	0.0484	1/23/2024	0.0725
4/8/2024	0.0389	4/8/2024	0.0598
8/15/2024	0.0280	8/15/2024	0.0478
11/6/2024	0.0278	11/7/2024	0.0559
Quarterly Site Annual Average	**0.036**	Quarterly Site Annual Average	**0.059**
		Total Quarterly Annual Average	**0.047**

Okanagan Lake Source (Vernon Creek System)					
Glenmore Booster		**Cooney Drain**		**Pow Rd PRV**	
	HAA5		HAA5		HAA5
Date	mg/L	Date	mg/L	Date	mg/L
11/6/2024	0.0347	1/23/2024	0.0749	1/23/2024	0.066
		4/8/2024	0.0595	4/8/2024	0.0405
		11/6/2024	0.0635	11/6/2024	0.0600
Quarterly Site Annual Average	**0.035**	Quarterly Site Annual Average	**0.066**	Quarterly Site Annual Average	**0.056**
				Total Quarterly Annual Average*	**0.050**

Table 13. **Kal Lake Source** 2024 Average Total HAA data collected and calculated as per the GCDWQ.

Kalamalka Lake Source HAA guideline <0.080 mg/L	
Sheldon/Cornwall	
	HAA5
Date	mg/L
1/24/2024	0.0564
4/10/2024	0.0271
8/13/2024	0.0319
11/5/2024	0.0275
Quarterly Site Annual Average	**0.036**

Kalamalka Lake Source (Oyama Creek System)	
Ribbleworth Drain	
	HAA5
Date	mg/L
1/24/2024	0.0475
4/10/2024	0.0361
11/5/2024	0.0396
Quarterly Site Annual Average	**0.041**
Total Quarterly Annual Average*	**0.038**

Table 14. **Oyama Lake Source** 2024 Average Total HAA data collected and calculated as per the GCDWQ. Note: Oyama Source only online during irrigation season and quarterly annual samples are not possible

Oyama Lake Source HAA guideline <0.080 mg/L	
Ribbleworth Drain	
	HAA5
Date	mg/L
8/16/2024	0.1470
Quarterly Site Annual Average	**0.147**

Table 15. **Coral Beach Water System** (Okanagan Lake Source) 2024 Average Total HAA data collected and calculated as per the GCDWQ.

Coral Beach Okanagan Lake Source HAA guideline <0.080 mg/L	
DBP - South End	
	HAA5
Date	mg/L
2/22/2024	0.0584
4/9/2024	0.0448
8/12/2024	0.0221
11/4/2024	0.0326
Quarterly Site Annual Average	**0.039**

Table 16. **Lake Pine Water System** (Okanagan Lake Source) 2024 Average Total HAA data collected and calculated as per the GCDWQ.

Lake Pine Okanagan Lake Source HAA guideline <0.080 mg/L	
LP PR Station	
	HAA5
Date	mg/L
2/22/2024	0.1030
4/9/2024	0.1030
8/12/2024	0.0257
11/4/2024	0.0435
Total Quarterly Annual Average	**0.069**

Trihalomethanes (THM's)

The maximum acceptable concentration (MAC) for trihalomethanes (*includes the total of chloroform, bromodichloromethane, dibromochloromethane and bromoform*) in drinking water is 0.100 mg/L (100 µg/L). Compliance is determined based on a locational running annual average, with samples taken at least quarterly at the point in the distribution system with the highest potential THM levels.

In accordance with the Guidelines for Canadian Drinking Water Quality (GCDWQ), the DLC conducts minimum quarterly monitoring and sampling for THMs, with additional sampling points established in areas of highest THM formation potential, such as sites with extended disinfectant retention times or at the farthest reaches of the distribution system.

Analysis conducted in 2024 revealed that the annual THM averages from the Oyama and Beaver Lake sources exceeded the GCDWQ. Beaver Lake source and Oyama Lake source are always on a Water Advisory. Detailed THM results, including running averages for each site and distribution totals are provided in Tables 17-22

Table 17. Beaver Lake Source 2024 Average Total THM values relative to the GCDWQ. Beaver source only online during irrigation season and quarterly annual samples are not possible. Offline distribution samples are reported under Okanagan Lake.

Vernon Creek (Beaver Lake) Source THM guideline <0.100mg/L			
Cooney Drain		Pow Rd PRV	
	TTHM (as CHCL3)		TTHM (as CHCL3)
Date	mg/L	Date	mg/L
8/15/2024	0.217	8/15/2024	0.149
Quarterly Site Annual Average	**0.217**	Quarterly Site Annual Average	**0.149**
		Total Quarterly Annual Average	**0.183**

Table 18. DLC Okanagan Lake source 2024 Average Total THM values relative to the GCDWQ. Includes sites within Beaver distribution lines during switch over (i.e. non-irrigation season approximately October – May).

Okanagan Lake Source THM guideline <0.100 mg/L			
Glenmore Booster		Lake Upper Reservoir	
	TTHM (as CHCL3)		TTHM (as CHCL3)
Date	mg/L	Date	mg/L
1/25/2024	0.0576	1/23/2024	0.0829
4/8/2024	0.0574	4/8/2024	0.0809
8/15/2024	0.051	8/15/2024	0.0758
11/6/2024	0.0325	11/7/2024	0.0814
Quarterly Site Annual Average	**0.050**	Quarterly Site Annual Average	**0.080**
		Total Quarterly Annual Average	**0.065**

Okanagan Lake Source (Vernon Creek System) THM guideline <0.100 mg/L					
Cooney Drain		Pow Rd PRV		Glenmore Booster	
	TTHM (as CHCL3)		TTHM (as CHCL3)		TTHM (as
Date	mg/L	Date	mg/L	Date	mg/L
1/23/2024	0.102	1/23/2024	0.074	11/6/2024	0.035
4/8/2024	0.086	4/8/2024	0.059		
11/6/2024	0.09	11/6/2024	0.061		
Quarterly Site Annual Average	**0.093**	Quarterly Site Annual Average	**0.065**	Quarterly Site Annual Average	**0.035**
				Total Quarterly Annual Average*	**0.064**
*Average of all Okanagan Lake source samples					

Table 19. Oyama Lake Source 2024 Average Total THM data collected and calculated as per the GCDWQ. Note: Oyama Source only online during the irrigation season and quarterly annual samples are not possible. Offline distribution samples are reported under Kalamalka Lake.

Oyama Lake Source THM guideline <0.100 mg/L	
Ribbleworth Drain	
	TTHM (as CHCL3)
Date	mg/L
8/16/2024	0.149
Quarterly Site Annual Average	**0.149**

Table 20. Kalamalka Lake source 2024 Average Total THM values relative to the GCDWQ. Kalamalka sampling includes sites within Oyama distribution lines during switchover (i.e. non-irrigation season approximately October – May).

Kalamalka Lake Source THM guideline <0.100 mg/L	
Sheldon/Cornwall	
	TTHM (as CHCL3)
Date	mg/L
1/24/2024	0.0855
4/10/2024	0.0533
8/13/2024	0.0533
11/5/2024	0.0349
Quarterly Site Annual Average	**0.057**
Kalamalka Lake Source (Oyama Creek System)	
Ribbleworth Drain	
	TTHM (as CHCL3)
Date	mg/L
1/24/2024	0.0625
4/10/2024	0.058
11/5/2024	0.0734
Quarterly Site Annual Average	**0.065**
Total Quarterly Annual Average*	**0.061**
*Average of all Kalamalka Lake source samples	

Table 21. Coral Beach System (Okanagan Lake source) 2024 Average Total THM values relative to the GCDWQ.

Coral Beach Okanagan Lake Source THM guideline <0.100 mg/L	
DBP - South End	
	TTHM (as CHCL3)
Date	mg/L
1/22/2024	0.068
4/9/2024	0.068
8/12/2024	0.045
11/5/2024	0.039
Total Quarterly Annual Average	**0.055**

Table 22. Lake Pine System (Okanagan Lake source) THM data collected in 2024. Average Total THM values relative to the GCDWQ.

Lake Pine Okanagan Lake Source THM guideline <0.100 mg/L	
LP PR Station	
	TTHM (as CHCL3)
Date	mg/L
1/22/2024	0.097
4/9/2024	0.091
8/12/2024	0.052
11/4/2024	0.062
Total Quarterly Annual Average	**0.076**

Source Water Sampling

The DLC draws water from four main primary drinking water reservoirs:

1. Beaver Lake (Crooked Lake chain flows into Beaver Lake) - upland source with a downstream intake on Vernon Creek.
2. Oyama Lake (Damer Lake flows into Oyama Creek) - upland source with a downstream intake on Oyama creek
3. Okanagan Lake (3) deep water intakes
4. Kalamalka Lake (1) deep water intake

Pictures of Oyama Lake

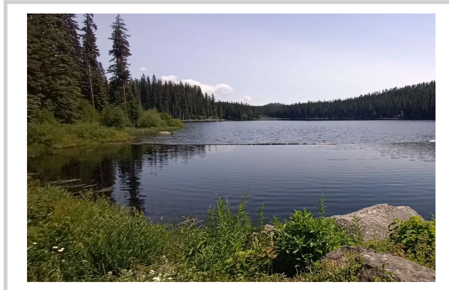
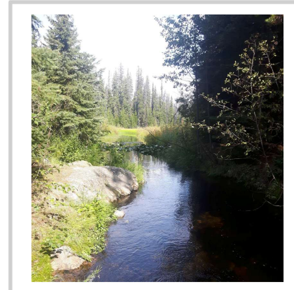
The combined area of the Oyama and Beaver Lake watersheds is approximately 141.1 km² and is located within the traditional and ancestral territory of the Syilx Okanagan People. These two community watersheds collectively provide the DLC with approximately 60-65% of its source water. Both watersheds rely on upland storage reservoirs, which are replenished annually by snowpack, to meet their water regeneration and supply requirements.
The DLC draws water from intakes both on Vernon and Oyama Creeks. In addition to monitoring and sampling at these intakes, the DLC also analyzes raw water from our upland drinking water reservoirs. These reservoirs have samples collected for other water quality parameters that would provide adequate measurement of chemical and physical water quality against the CDWG as per Conditions on Permit and recommendations in 2010 Oyama and Vernon Creek Source Water Assessment. Comprehensive reports (parameters tested at the drinking water intakes) are in Appendix C and the result for nutrient sampling (upland drinking water reservoirs (Beaver and Oyama)) is contained in Appendix D.

Source water from these watersheds have high organic content, leading to coloration problems and increased disinfectant by-products. Turbidity, naturally present in certain areas, can be exacerbated by human activities like recreation, cattle ranching, and logging upstream of our intakes.

Monitoring of reservoir water quality may intensify or diminish based on fluctuating conditions to establish sufficient baseline data for future water treatment needs.

Source Sampling (Raw Water)

Raw Water Sampling occurs at intakes, upland drinking water reservoirs, and at deep water intake pump stations.

Beaver Lake Dam (left) Damer Lake (middle) and Oyama Creek (right)

At raw water intakes, we analyze key water quality parameters to gauge chemical and physical water quality, comparing against GCDWQ and recommendations from Oyama and Vernon Creek Watersheds Source Water Assessment. Comprehensive tests are conducted annually at all intakes, with nutrient testing performed as necessary. The DLC adjusts sampled parameters continuously to establish adequate baseline data for future water treatment.

The DLC's main upland drinking water reservoirs, Beaver and Oyama Lakes (sourced from Vernon and Oyama Creeks), exceeded GCDWQ physical parameters for color. Similar results are common throughout the Okanagan region where water is drawn from upper watersheds.

All results are tabulated in the comprehensive reports in **Appendix D**.

Raw Water Data from intakes and pump stations are in Tables 23 through 28 (below). Data is collected from each source from the following sites:

- Beaver Lake source: Vernon Creek Intake (Table 23)
- Okanagan Lake Source: Okanagan Lake Pump Station (Table 24)
- Oyama Lake source: Oyama Creek Intake (Table 25)
- Kalamalka Lake source: Kalamalka Pump Station (Table 26)
- Okanagan Lake Source: Coral Beach Pump House (Table 27)
- Okanagan Lake Source: Lake Pine Pump House (Table 28)

Vernon Creek Intake

Table 23. *2024 Raw Water, Beaver Lake Source: Vernon Creek Intake/Eldorado Reservoir. (Data reported from weekly water quality monitoring using hand-held equipment other than True colour and Bacteriological (CARO)) when source was On-line.*

Beaver Lake Source: Vernon Creek/Eldorado Reservoir									
Weekly sampling & online water quality equipment verification	Hardness mg/L As CaCO3	Turbidity NTU	Temp Deg C	pH	Conductivity uS/cm	True Color TCU	Total Coliforms CFU/100mL	E.Coli CFU/100mL	% of samples Less than 10 E.Coli/100mL (N=21) %
MIN	20	0.29	4	6.9	58	20	172	<1	52
MAX	100	3.62	20	7.9	97	76	4,200	135	
AVG	40	1.67	13	7.6	75	39	21 Samples		
WQ Guidelines			15	7.0-10.5			<1	<1	
Aesthetic Objective (AO) Maximum Allowable Concentration (MAC)	Acceptable	1 (max) ≤5 NTU AO	AO	OG			MAC	MAC	

Table 24. *2024 Raw Water, Okanagan Lake Source: Okanagan Lake Intake. (All data reported from weekly water quality monitoring using hand-held equipment other than True colour and Bacteriological (CARO)).*

Okanagan Lake Source: Okanagan Intake										
Weekly sampling & online water quality equipment verification	Hardness mg/L As CaCO3	Turbidity NTU	Temp Deg C	pH	Conductivity uS/cm	True Color TCU	Total Coliforms CFU/100mL	E.Coli CFU/100mL	% of samples Less than 10 E.Coli/100mL (N=51) %	UV Transmittance @ 254 nm unfiltered %
MIN	120	0.2	4.9	7.8	214	<5	<1	<1	98	85
MAX	180	0.58	11.2	8.4	304	<5	248	11		89
AVG	143	0.35	7.21	8.1	277	5	51 Samples			86
WQ Guidelines			15	7.0-10.5			<1	<1		
Aesthetic Objective (AO) Maximum Allowable Concentration (MAC)	Acceptable	1 (max) ≤5 NTU AO	AO	OG			MAC	MAC		

Table 25. *2024 Raw Water Oyama Creek Intake. (All data reported from weekly water quality monitoring using hand-held equipment other than True colour and Bacteriological (CARO)). Oyama source on-line during irrigation season only.*

Oyama Lake Source: Oyama Creek Intake									
Weekly sampling & online water quality equipment verification	Hardness mg/L As CaCO3	Turbidity NTU	Temp Deg C	pH	Conductivity uS/cm	True Color TCU	Total Coliforms CFU/100mL	E.Coli CFU/100mL	% of samples Less than 10 E.Coli/100mL (N=24) %
MIN	20	0.59	6	7.2	46	32	64	<1	42
MAX	80	2.87	21	8.1	65	92	4,640	1,550	
AVG	38	1.24	12	7.7	55	62	24 Samples		
WQ Guidelines			15	7.0-10.5			<1	<1	
Aesthetic Objective (AO) Maximum Allowable Concentration (MAC)	Acceptable	1 (max) ≤5 NTU AO	AO	OG			MAC	MAC	

Table 26. *2024 Raw Water Kalamalka Lake Intake. (All data reported from weekly water quality monitoring using hand-held equipment other than True colour and Bacteriological (CARO)).*

Kalamalka Lake Source: Kalamalka Intake										
	Hardness	Turbidity	Temp	pH	Conductivity	True Color	Total Coliforms	E.Coli	% of samples Less than 10 E.Coli/100mL (N=50)	UV Transmittance @ 254 nm unfiltered
Weekly sampling & online water quality equipment verification	mg/L As CaCO3	NTU	Deg C		uS/cm	TCU	CFU/100mL	CFU/100mL	%	%
MIN	160	0.31	4	8	289	<5	<1	<1		89
MAX	220	2.42	13	8.6	417	<5	96	<1	100	91
AVG	191	0.77	8	8.3	392	5	50	Samples		90
WQ Guidelines			15	7.0-10.5			<1	<1		
Aesthetic Objective (AO) Maximum Allowable Concentration (MAC)	Acceptable	1 (max) ≤5 NTU AO	AO	OG			MAC	MAC		

Table 27. *Coral Beach Water System, 2024 Raw Water Coral Beach Intake (Okanagan Lake source). (All data reported from weekly water quality monitoring using hand-held equipment other than True colour and Bacteriological (CARO).*

Okanagan Lake Source: Coral Beach Intake										
	Hardness	Turbidity	Temp	pH	Conductivity	True Color	Total Coliforms	E.Coli	% of samples Less than 10 E.Coli/100mL (N=51)	UV Transmittance @ 254 nm unfiltered
Weekly sampling & online water quality equipment verification	mg/L As CaCO3	NTU	Deg C		uS/cm	TCU	CFU/100mL	CFU/100mL	%	%
MIN	140	0.22	5	7.9	266	<5	<1	<1		85
MAX	160	0.82	14	8.4	2,712	<5	26	<1	100	87
AVG	143	0.45	9	8.1	325	5	51	Samples		86
WQ Guidelines			15	7.0-10.5			<1	<1		
Aesthetic Objective (AO) Maximum Allowable Concentration (MAC)	Acceptable	1 (max) ≤5 NTU AO	AO	OG			MAC	MAC		

Table 28. *Lake Pine Water System, 2024 Raw Water Lake Pine Intake (Okanagan Lake source). (All data reported from weekly water quality monitoring using hand-held equipment other than True colour and Bacteriological (CARO).*

Okanagan Lake Source: Lake Pine Intake										
	Hardness	Turbidity	Temp	pH	Conductivity	True Color	Total Coliforms	E.Coli	% of samples Less than 10 E.Coli/100mL (N=47)	UV Transmittance @ 254 nm unfiltered
Weekly sampling & online water quality equipment verification	mg/L As CaCO3	NTU	Deg C		uS/cm	TCU	CFU/100mL	CFU/100mL	%	%
MIN	140	0.16	6	7.8	261	<5	<1	<1		85
MAX	180	0.9	15	8.3	409	6	59	<1	100	87
AVG	148	0.35	11	8	286	5	47	Samples		86
WQ Guidelines			15	7.0-10.5			<1	<1		
Aesthetic Objective (AO) Maximum Allowable Concentration (MAC)	Acceptable	1 (max) ≤5 NTU AO	AO	OG			MAC	MAC		

Below are tables for all DLC water sources containing raw water chemistry data collected throughout the year and analyzed by CARO Analytical. This monthly average data serves as operational guidance and ongoing baseline information for understanding our water sources as we progress towards filtration exclusion and/or filtration.

Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC) measurements gauge natural organic materials in the water, acting as precursors for disinfection by-products and potentially reducing UV disinfection effectiveness. Ultraviolet Transmissivity (UVT), measured as a percentage, indicates the amount of ultraviolet light at 254 nanometers (nm) that can penetrate 10 mm of water. Total Suspended

Solids (TSS) represent unfiltered waterborne particles exceeding 2 microns in size. True color reflects color measurement before filtration, with an Aesthetic Objective in GCDWQ of less than or equal to 15 True color units.

Table 29. *2024 Beaver Lake Water Source - Monthly average water chemistry analysis.*

	PARAMETER	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOCBER	NOVEMBER	DECEMBER
BEAVER LAKE (ELDORADO)	TOC	mg/L												
	DOC	mg/L												
	TURBIDITY	NTU			0.81	2.20	2.22	1.90	3.01	2.17	3.62	0.58		
	TSS	mg/L												
	TRU	Co-Pt												
	TOTAL COLIFORMS	MPN/100mL												
	E. COLI	MPN/100mL												

	PARAMETER	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOCBER	NOVEMBER	DECEMBER
BEAVER LAKE (VC INTAKE)	TOC	mg/L	(Off Line) Okanagan Lake is Primary Source				13.5	11.8	13.6	9.67	7.39	(Off Line) Okanagan Lake is Primary Source		
	DOC	mg/L					12.6	10.8	10.2	8.69	7.35			
	TURBIDITY	NTU					2.12	2.41	3.23	1.70	3.59			
	TSS	mg/L					<4.0	3	<2.0	<2.0	<2.0			
	TRU	Co-Pt					76	50	39	24	20			
	TOTAL COLIFORMS	MPN/100mL					387	687	4200	1990	975			
	E. COLI	MPN/100mL					4	135	46	13	19			

Table 30. *2024 Okanagan Lake Water Source - Monthly average water chemistry analysis*

	PARAMETER	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOCBER	NOVEMBER	DECEMBER
OKANAGAN LAKE	TOC	mg/L	4.7	5.01	4.61	3.74	4.9	4.98	8.2	5.37	5.32	4.58	5.56	6.52
	DOC	mg/L	4.34	4.46	4.67	3.67	4.43	4.76	5.11	4.66	4.47	3.77	4.53	5.46
	UVT	/cm^-1	89.00	86.00	86.50	85.90	86.10	85.90	85.90	85.60	85.30	86.20	86.60	85.80
	TURBIDITY	NTU	0.35	0.32	0.27	0.47	0.44	0.58	0.45	0.42	0.46	0.40	0.39	0.33
	TSS	mg/L	<3.3	<2.0	<2.0	<2.0		<2.0	<2.0	<2.0		<2.0	<2.0	
	TRU	Co-Pt	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	TOTAL COLIFORMS	MPN/100mL	2	3	3	2	2	3	248	68	24	8	17	<1.00
	E. COLI	MPN/100mL	<1	<1	<1	<1	<1	<1	4	<1	1	4	11	<1

Table 31. *2024 Oyama Lake Water Source - Monthly average water chemistry analysis*

	PARAMETER	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOCBER	NOVEMBER	DECEMBER
OYAMA LAKE	TOC	mg/L	(Off Line) Kalamalka Lake is Primary Source				16.90	15.00	14.70	11.70	16.20	11.60	(Off Line) Kalamalka Lake is Primary Source	
	DOC	mg/L					16.90	12.70	11.80	9.79	15.80	10.30		
	TURBIDITY	NTU					1.20	1.24	2.87	1.79	1.22	0.82		
	TSS	mg/L					2.0	3.4	10.0	4.8	2.2	2.0		
	TRU	Co-Pt					90	56	92	32	47	36		
	TOTAL COLIFORMS	MPN/100mL					1	1	1	1	1	1		
	E. COLI	MPN/100mL					22	1,550	29	210	5	1		

Table 32. *2024 Kalamalka Lake Water Source. Monthly average water chemistry analysis*

	PARAMETER	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOCBER	NOVEMBER	DECEMBER
KALAMALKA LAKE	TOC	mg/L	3.97	5.61	4.69	3.96	4.68	8.24	5.07	4.98	4.45	4.55	5.72	5.55
	DOC	mg/L	3.59	5.51	4.46	3.86	4.51	4.54	4.67	4.65	4.25	3.68	5.05	4.63
	UVT	/cm^-1	90.4	90.3	90.5	90.1	89.8	89.3	90.6	89.7	89.8	90.8	89.9	90.0
	TURBIDITY	NTU	0.44	0.40	0.48	0.55	0.95	1.17	0.92	1.09	2.42	1.59	0.42	0.35
	TSS	mg/L	2.0			2.0		2.8	10.0	2.0	5.3		2.0	
	TRU	Co-Pt	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	TOTAL COLIFORMS	MPN/100mL	1	1	1	1	2	1	84	68	96	24	7	2
	E. COLI	MPN/100mL	1	1	1	1	1	1	1	1	1	1	1	1

Table 33. *2024 Coral Beach (Okanagan Lake Water Source) - Monthly average water chemistry analysis*

	PARAMETER	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOCBER	NOVEMBER	DECEMBER
CORAL BEACH (OKANAGAN LAKE)	TOC	mg/L	4.99	4.78	4.44	3.91	5.10	4.82	8.72	5.46	5.25	5.32	4.49	5.93
	DOC	mg/L	4.10	4.82	4.05	3.83	4.44	4.41	5.94	4.82	4.46	4.44	4.10	4.38
	UVT	/cm^-1	85.8	87.0	87.2	86.2	85.4	86.3	85.6	86.2	85.6	86.4	86.0	86.1
	TURBIDITY	NTU	0.45	0.29	0.37	0.65	0.82	0.68	0.65	0.66	0.58	0.55	0.38	0.36
	TSS	mg/L	2.0					2.0	2.0	2.0			2.0	
	TRU	Co-Pt	5	5	5	5	5	5	5	5	5	5	5	5
	TOTAL COLIFORMS	MPN/100mL	1	1	1	1	1	1	1	1	1	1	1	1
	E. COLI	MPN/100mL	1	1	1	1	1	1	1	1	1	1	1	1

Table 34. *2024 Lake Pine (Okanagan Water Source) - Monthly average water chemistry analysis*

	PARAMETER	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOCBER	NOVEMBER	DECEMBER
LAKE PINE (OKANAGAN LAKE)	TOC	mg/L	4.90	4.49	3.81	4.97	5.49	5.01	7.94	6.54	6.36	6.16	5.31	4.67
	DOC	mg/L	4.04	3.98	3.80	4.15	4.64	4.66	6.00	4.54	4.72	4.46	4.45	4.55
	UVT	/cm^-1	86.4	86.1	86.8	85.6	85.5	85.3	86.5	85.8	85.8	86.3	86.0	86.1
	TURBIDITY	NTU	0.90	0.20	0.24	0.42	0.62	0.41	0.51	0.84	0.47	0.41	0.37	0.29
	TSS	mg/L	2.0	2.0				2.0	10.0	2.0			2.0	
	TRU	Co-Pt	5	5	6	5	5	5	5	5	5	5	5	5
	TOTAL COLIFORMS	MPN/100mL	1	1	1	1	1	1	1	1	1	1	1	1
	E. COLI	MPN/100mL	1	1	1	1	1	1	1	1	1	1	1	1

Algae

Visual algae monitoring is conducted year-round at all DLC drinking water intakes. Frequent sampling occurs at the Kalamalka Lake intake, with algae monitoring from spring through November, increasing as needed based on changing conditions. Although the DLC does not have water intakes on Wood Lake, it remains part of our continuous monitoring program alongside Kalamalka Lake. In 2024, algae blooms were observed in Wood Lake; however, there was no apparent impact on the Kalamalka Lake intake. Should an observed or reported condition require further action, the appropriate response would be followed as per the DLC's Potable Water Quality Emergency Response Plan. All samples consistently met acceptable drinking water standards, with results reported to IHA through the monthly reporting process and further discussions as needed.

If any observed or reported condition necessitates further action, we will follow the DLC's Potable Water Quality Emergency Response Plan and share results with IHA as needed. In 2021, the Province launched an algae watch website (https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/algae-watch) . Algae Watch is an educational program for citizen science data gathering. The goal is to help people recognize, identify and report algae blooms in B.C. lakes.

Watershed Management

The DLC provides domestic and irrigation water for Oyama, Winfield, Okanagan Centre, and Carr's Landing communities. Sixty-five percent (65%) of Lake Country's water originates from the Oyama and Beaver Lake watersheds.

British Columbia's drinking water and watershed protection objectives aim to ensure safe, sustainable drinking water sources through a multi-barrier approach, including source protection, effective treatment, and secure distribution systems. This involves regular water quality monitoring, adherence to the Guidelines for Canadian Drinking Water Quality, and risk management measures such as Source Water

Assessment plans and emergency preparedness. The Water Security Strategy (April 2023) aims to guide the province's water policy and watershed planning, integrating land, water, and resource management. The Health Authority, through Drinking Water Officers, aims to ensure compliance and provides public health advisories when needed. While clear directions for implementation on Provincial water security strategies are still being defined, the DLC is making every effort to follow best practices and collaboratively form partnerships. Recognizing that previous approaches may no longer be effective, we are exploring new strategies to improve outcomes. Collaboration with governance structures, including regional districts, municipalities, First Nations, and the Provincial Water Land Resource Sustainability sector, supports watershed stewardship and resilience. These ongoing partnerships also involves working with land tenures, stakeholders, and primary partners to address emerging issues and uphold watershed protection plans and source-to-tap assessments. In 2024, the DLC continued its close cooperation with these groups to ensure effective management and protection of local watersheds

Under the BC Government's Action Plan for Safe Drinking Water, the primary responsibility for protecting drinking water from land-use activities lies with the agency responsible for approving those activities. This can create complex governance that makes addressing source water concerns a significant challenge.

Infrastructure in the Oyama and Beaver Lake watershed was initially built for irrigation approximately a century ago and was later upgraded in the 1970s to serve as a major domestic and agricultural water supply. Both watersheds are multi-use and host various ongoing activities such as forestry, range, and recreation. Under the BC Government's Action Plan for Safe Drinking Water, the primary responsibility for protecting drinking water from land-use activities rests with the agency approving those activities, leading to complex governance and significant challenges in addressing source water concerns.

The DLC collaborates with stakeholders, such as forestry and ranching communities, to address issues and maintain partnerships on watershed protection plans and source-to-tap assessments. This ongoing collaboration involves working with multi-level governance, land tenures, stakeholders, and primary partners to address emerging issues and uphold partnerships. Throughout the years, including 2024, the DLC has maintained close cooperation with these stakeholders to ensure the effective management and protection of our local watersheds.

Source to Tap Assessments

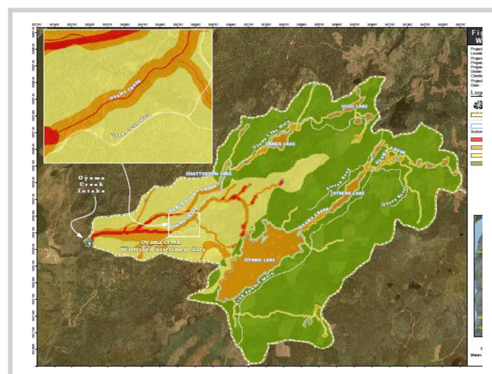
The Source to Tap Assessments of the DLC distribution system's Kalamalka and Okanagan Lake sources identified intake strengths, weaknesses, and strategies for water quality protection. A key recommendation was the establishment of an Intake Protection Zone, ensuring intake use remains a priority and implementing safeguards to prevent contaminants from reaching the lake

Kalamalka & Wood Lake Monitoring

Since 1998, when a taste and odour complaint occurred on Kalamalka Lake, the DLC, Greater Vernon Water/North Okanagan Regional District and the Ministry of Environment have partnered to acquire water quality data on this source. This data is crucial for understanding physical and biological impacts at the existing DLC intake, establishing baseline water chemistry, optimizing the intake depth, monitoring nutrient and algae levels, and anticipating water resource changes. This research is evaluated and re-directed on an annual basis. This ongoing collaboration marks the 25th year of comprehensive study.

Mid 2023 there was a restructuring within the Ministry of Forests and the Ministry of Water, Land and Resource Stewardship. Considering this, in 2024, the DLC focused on fostering more inclusive and collaborative partnerships, particularly in understanding the new responsibilities surrounding water security. During our annual Kalamalka Lake meeting, we invited provincial staff from both ministries, as well as local and regional governance bodies, including the Okanagan Indian Band, to enhance information sharing on key topics such as referrals, past flooding impacts, high-water levels, climate change, and concerns related to wildfires and photosynthetic organisms. While we had strong participation from primary partners, particularly in the Limnology study, full engagement from some provincial ministries proved challenging. We remain committed to improving collaboration moving forward.

Watershed Protection Plans



The Source Water Assessments for the Oyama and Vernon Creek watersheds promotes sustainable ecosystem management through collaboration. The key management tool from this plan is identifying vulnerability zones that indicate potential water quality risks. High-risk areas are evaluated first for potential impacts from activities like forestry, recreation, and mining.

Partnerships and Stakeholder involvement was crucial in considering all aspects of the 2010 Source Water Assessment plan. All involved in land activities must be aware of vulnerability zones and follow recommendations when planning in the watershed.

The Beaver and Oyama community watersheds are part of the North Aberdeen Plateau and extend into the RDNO (Regional District of North Okanagan), where they are also responsible for providing clean, safe, and sustainable water from their water sources of the Haddo, King Edward, and Duteau Community Watersheds. This region holds deep cultural significance for the Syilx People, with the OKIB community playing a vital role in its stewardship.

This area faces increasing threats from climate change, drought, extreme weather events, and wildfire risk, endangering cultural identity, water access, food security, the local economy, and recreational opportunities. To address these challenges, the DLC, OKIB, and RDNO have formed a collaborative partnership focused on long-term watershed protection, safeguarding critical water sources, and preserving cultural heritage. By working together, we strengthen our ability to influence provincial decisions and ensure the resilience of this vital landscape for future generations.

While specific plans are in development, DLC staff maintain year-round communication with key partners and stakeholders, participating in watershed conferences, provincial initiatives, and key organizations such as the Okanagan Basin Water Board and the BC Water Supply Association. Given the multi-purpose, multi-jurisdictional nature of our watersheds, all activities must follow best practices to minimize cumulative environmental impacts and ensure long-term sustainability.

Off Road Vehicle

In 2024, our community watersheds faced ongoing challenges from high motor vehicle traffic and unauthorized activities, leading to environmental damage. Illegal camping, fires, and garbage dumping were widespread, with lease lot resorts reporting increased interest in accessing drinking water reservoirs. Abandoned and burnt vehicles, along with significant debris, were left in the forest and along roadsides.

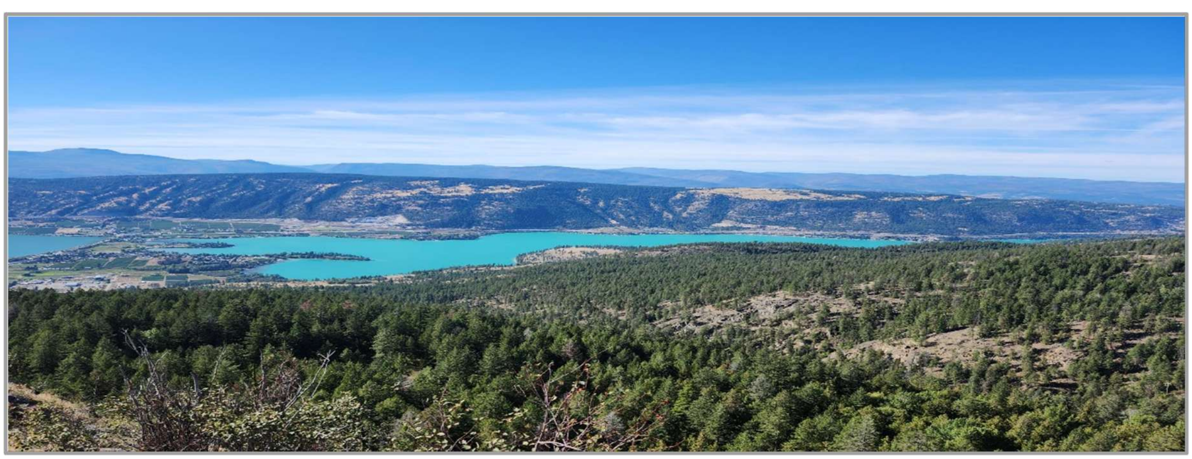
Illegal motorized vehicle use near intake areas poses a risk of soil disturbance and altered drainage patterns, increasing particulates in the water source. Fortunately, despite hot and dry conditions, no forest fires resulted from these activities.

To report concerns in our community watersheds, contact the Conservation Officer Service's 24-hour RAPP hotline at 1-877-952-7277 or #7277 on the TELUS Mobility Network. Complaints can also be submitted online through RAPP.

Range Management

The Okanagan Shuswap District Range Program's annual spring meeting provided a forum for ranchers to engage with local and regional government, IHA, and major licensees. DLC collaborated with range agrologists to facilitate discussions on grazing plans, significant events, and legislative updates. All range use holders, major licensees, and the Small-Scale Salvage Program (SSSP) have agreed to incorporate DLC vulnerability zone mapping into their planning and development processes.

Forestry



Tolko and BC Timber Sales (BCTS) are the two major licensees operating in our watersheds. Both have opted out of the public advisory group and instead pursue certification through the Sustainable Forestry Initiative (SFI), which does not require public input or consultation on targets and indicators. As a result, the DLC must actively monitor and stay informed about their activities.

Major licensees are aware of our Watershed Protection Plan and have committed to using the vulnerability layer as a planning tool for harvest planning. Tolko and BCTS have agreed to annual meetings with the DLC to provide updates on harvesting and other activities. Additionally, DLC staff review harvest and site plans, offering recommendations on access management (including cattle and unauthorized motorized vehicles), wildfire mitigation, drainage concerns, and road rehabilitation to minimize non-status roads.

Both Beaver and Oyama watersheds contain existing and planned Tolko and BCTS harvest blocks, all within high or very high vulnerability zones. These areas lie directly below dam outflows and above drinking water intakes. The DLC remains actively engaged to ensure that licensees manage access while safeguarding both immediate and long-term water quality and supply.

In 2024, BCTS was the only licensee to conduct harvesting in our community watershed. The harvested sites were located below the outflow of Oyama Lake Dams and above our drinking water intakes—areas classified as the highest vulnerability zones. The DLC has informed both major licensees of the risks and potential consequences of activities in these zones.

Post-harvest, DLC staff conducted required block walks with contracted subject matter experts and licensee representatives. Extensive on-site discussions were followed by a formal expectations letter from the DLC, securing confirmation that any outstanding BCTS contractor obligations will be addressed in 2025.

We maintain ongoing engagement with regulatory authorities and the Province, ensuring their input on referrals and sensitive watershed plans from major licensees. This process remains active and continuous.

The Small-Scale Salvage Program (SSSP) is regulated by the Province, allowing private companies to apply for licenses through the Ministry of Forests. These licenses enable harvesting of small volumes of timber for forest health purposes or salvaging timber that would otherwise remain unharvested. SSSP operations are independent of Forest Stewardship Plans (FSP) and certification processes. The DLC has requested referrals from the Province for all SSSP activities in our community watersheds but has not received any referrals for over five years.

Ministry Of Forests Road Rehabilitation for Watershed Protection:

The Ministry of Forests (MOF), funded improvements to drainage and the long-term management of historic roads in high-risk areas above our community's drinking water intakes. These efforts are crucial for safeguarding the most vulnerable zones and ensuring the long-term sustainability of our water resources.

While financial constraints temporarily paused the project before full completion, the progress made in 2023 and 2024 has been exceptional. The collaboration and commitment from the Province, First Nations, contractors, agrologists, ranchers and local government have been integral to this success. The work took place in both the Oyama and Vernon Creek watersheds.

Wildfire Planning

The potential for a catastrophic wildfire in our community watershed is a significant concern. A wildfire in the Beaver or Oyama watersheds could severely degrade water quality. Post-fire floods and landslides often follow the first storm event (or freshet) and continue for decades, jeopardizing both water quality and quantity.

The DLC has acknowledged wildfire as a major risk to our community and has established a communication process with the BC Wildfire Service (BCWS) during the wildfire season.
The DLC recognizes that long-term plans involve collaboration with indigenous neighbors, the Province, and our adjacent watersheds (RDNO) among key stakeholders to safeguard our communities and essential infrastructure from wildfire devastation.

Photos by Frontline Operations in the 2019-2021: Reducing Wildfire Risk to the Okanagan Basin Water Supply – Aberdeen Plateau Report. *A low intensity surface fire typical of discontinuous fuels in an open stand as compared to a crown fire associated with dense, continuous fuels resulting from fire exclusion.*

The DLC, OKIB, and RDNO have formed a collaborative partnership dedicated to long-term watershed protection, safeguarding critical water sources, and preserving cultural heritage. As part of this initiative, we are working together with the Province to develop Wildfire Resiliency Plans. Looking ahead, we aim to implement a multi-year project with several proposals to introduce wildfire resiliency measures that will protect water, infrastructure, and cultural heritage throughout these watersheds.

Appendices:

Appendix A – Summary of Positive Bacteriological Results in Distribution

Lake Country Water System & Source	Total Coliforms CFU/100mL	E. Coli CFU/100mL	Presence Absence (Total Coliforms)	Presence Absence (E. Coli)	Sample Date	Number of TC/E.Coli Samples	Number of P/A Samples
Beaver Lake Source (WQA)	All Total Coliforms and E.coli non-detect					14	10
Okanagan Lake Source	All Total Coliforms and E.coli non-detect					104	55
Kalamalka Lake Source	All Total Coliforms and E.coli non-detect					59	36
Oyama Lake Source (WQA)	All Total Coliforms and E.coli non-detect					15	14
Coral Beach (Okanagan Lake Source)	All Total Coliforms and E.coli non-detect					48	23
Lake Pine (Okanagan Lake Source)	All Total Coliforms and E.coli non-detect					42	28
					Total:	**282**	**166**

Appendix B – District of Lake Country Sampling Sites

District of Lake Country Water System: Beaver Lake Source

MATRIX: Water Quality Sampling Sites, Criteria,Purpose, Type of sample Station	Source	THM	HAA	BacT/Water Chemistry	Free Cl2/NTU when required	Frost Free Yard Hydrant	Online WQ equipment verification	Eclipse #88	Hose bib	Sink	Stainless port	Galvanised pipe	Continuous run	Point of Disinfection	First Customer	Intermediary	End of line	Chronic problem area	Stale water problem area	Seasonal only	Future Online CT monitoing site	Recommend install Eclipse #88	Sample Site Modification Required	Recommend not use
Vernon Creek Intake **RAW**	Beaver Lk			x									x											
Eldorado **RAW**	Beaver Lk			x			x		x															
Eldorado Balancing Reservoir	Beaver Lk			x			x				x													
Eldorado Reservoir chlorination facility (reservoir inlet & outlet)	Beaver Lk						x				x		x	x										
Camp Road Works Yard	Beaver Lk			x												x				x		x		
Camp Rd Reservoir (off line)	Beaver Lk			x	x						x					x			x					
Chase Rd future	Beaver Lk			x	x						x													
Cooney Drain	Beaver Lk	x	x	x								x					x					x		
Glenmore Booster Station	Beaver Lk			x			x				x				x									
Mulbery	Beaver Lk			x				x								x								
Lakestone Beacon Hill PRV	Beaver Lk			x							x													
Hare Road PRV	Beaver Lk			x							x													
Long	Beaver Lk			x				x									x							
McCreight	Beaver Lk			x		x											x	x				x		
Monte Carlo	Beaver Lk			x				x								x								
Nighthawk	Beaver Lk			x		x											x	x	x					
North View/Chase	Beaver Lk			x				x									x	x						
Nygren	Beaver Lk			x				x									x							
Pow Rd PRV Stn	Beaver Lk	x	x	x								x				x								
PR2	Beaver Lk			x	x	x										x								
Shanks Road (Future site)	Beaver Lk			x													x					x		
Williams	Beaver Lk			x		x		x									x	x	x					

Appendix B continued– District of Lake Country Sampling Sites

District of Lake Country Water System: Okanagan Lake Source

MATRIX: Water Quality Sampling Sites, Criteria,Purpose, Type of sample Station	Source	THM	HAA	BacT/Water Chemistry	Free Ci2/NTU when required	Frost Free Yard Hydrant	Online WQ equipment verification	Eclipse #88	Hose bib	Sink	Stainless port	Galvanised pipe	Continuous run	Point of Disinfection	First Customer	Intermediary	End of line	Chronic problem area	Stale water problem area	Seasonal only	Future Online CT monitoing site	Recommend install Eclipse #88	Sample Site Modification Required	Recommend not use
Ok Lk Intake **RAW "OK RAW"**	Ok Lk			x							x		x										x	
Ok Lk Pump Stn/chlorination facility	Ok Lk						x				x		x	x										
UV Treatment Facility	Ok Lk						x																	
Arena	Ok Lk																							
Copper Hill	Ok Lk			x				x									x							
4th Street (future site)																						x		
Glenmore Booster Station	Ok Lk		x	x			x				x				x									
Jardine	Ok Lk			x						x						x								
Lakes Lower Reservoir (cell 1)	Ok Lk			x			x				x					x								
Lakes Upper Reservoir	Ok Lk	x	x	x					x															
Lakes Upper Zone (Shoreline Park)	Ok Lk			x																		x		
Lake Stone Benchlands	Ok Lk			x				x									x							
Future site: Lake Stone original development	Ok Lk			x					x															
McCoubrey	Ok Lk			x				x								x								
McGowan				x				x								x								
Roberts Road PRV	Ok Lk			x												x								
Oceola PRV	Ok Lk			x							x						x							
Ottley Rd (off Stubbs)	Ok Lk			x				x							x									
Ponderosa PRV stn	Ok Lk			x							x					x								
Woodsdale Lift Stn	Ok Lk			x		x											x							

Appendix B continued – District of Lake Country Sampling Sites

District of Lake Country Water System: Oyama Lake Source

MATRIX: Water Quality Sampling Sites, Criteria,Purpose, Type of sample Station	Source	THM	HAA	BacT/Water Chemistry	Free Cl2/NTU when required	Yard Hydrant	Online WQ equipment verification	Eclipse #88	Hose bib	Sink	Stainless port	Galvanised pipe	Continuous run	Point of Disinfection	First Customer	Intermediary	End of line	Chronic problem area	Stale water problem area	Seasonal only	Future Online CT monitoing site	Recommend install Eclipse #88	Sample Site Modification Required	Recommend not use
Easthill	Oyama Lk	x	x	x		x		x								x								
Oyama Rd S	Oyama Lk	x		x				x									x	x	x					
Oyama Rd N	Oyama Lk			x				x									x	x	x					
Oyama Lk/Hayton Rd	Oyama Lk				x												x	x		x				x
Oyama Creek Intake **RAW**	Oyama Lk			x									x											
Oyama Reservoir	Oyama Lk			x							x			x									x	
Oyama Creek intake/Chlorination Facility - Chlorinator post reservoir	Oyama Lk						x						x	x										
5410 Todd Rd. (Oyama: First customer Fall (Sawmill online: Kal) could be either from Sawmill or from reservoir	Oyama Lk			x							x				x	x	x							

District of Lake Country Water System: Kalamalka Lake Source

MATRIX: Water Quality Sampling Sites, Criteria,Purpose, Type of sample Station	Source	THM	HAA	BacT/Water Chemistry	Free Cl2/NTU when required	Yard Hydrant	Online WQ equipment verification	Eclipse #88	Hose bib	Sink	Stainless port	Galvanised pipe	Continuous run	Point of Disinfection	First Customer	Intermediary	End of line	Chronic problem area	Stale water problem area	Seasonal only	Future Online CT monitoing site	Recommend install Eclipse #88	Sample Site Modification Required	Recommend not use
Irvine B-2 Reservoir	Kal				x				x							x						x		
Cornwall/ Sheldon	Kal	x	x	x				x								x		x						
Evans	Kal			x				x									x							
Kal Lk Intake **RAW**	Kal			x							x		x											
Kal Pump Stn	Kal			x			x				x			x	x						x			
Sawmillpump station	Kal			x							x					x								
Oyama Creek Chlorination Facility (distribtuion water fromKal Source (Sawmill) to Oyama reservoir)	Kal						x						x	x										

Appendix B continued – District of Lake Country Sampling Sites

Coral Beach Water System: Okanagan Lake Source

MATRIX: Water Quality Sampling Sites, Criteria,Purpose, Type of sample Station	Source	THM	HAA	BacT/Water Chemistry	Free Cl2/NTU when required	Yard Hydrant	Online WQ equipment verification	Eclipse #88	Hose bib	Sink	Stainless port	Galvanised pipe	Continuous run	Point of Disinfection	First Customer	Intermediary	End of line	Chronic problem area	Stale water problem area	Seasonal only	Future Online CT monitoing site	Recommend install Eclipse #88	Sample Site Modification Required	Recommend not use
Coral Beach Intake **RAW**	CB Ok Lk			x			x						x										x	
Coral Beach Pump Stn	CB Ok Lk						x				x			x	x						x			
Coral Beach Pump Stn (distrib sample site)	CB Ok Lk			x					x					x	x									
Coral Beach Reservoir (Future)	CB Ok Lk			x												x						x		
Coral Beach North End (Future)	CB Ok Lk				x																	x		
Coral Beach South End	CB Ok Lk	x	x	x		x											x					x		

Lake Pine Water System: Okanagan Lake Source

MATRIX: Water Quality Sampling Sites, Criteria,Purpose, Type of sample Station	Source	THM	HAA	BacT/Water Chemistry	Free Cl2/NTU when required	Yard Hydrant	Online WQ equipment verification	Eclipse #88	Hose bib	sink	Stainless port	Galvanised pipe	Continuous run	Point of Disinfection	First Customer	Intermediary	End of line	Chronic problem area	Stale water problem area	Seasonal only	Future Online CT monitoing site	Recommend install Eclipse #88	Sample Site Modification Required	Recommend not use
Lake Pine Intake RAW	LP Ok Lk			x					x														x	
Lake Pine chlorination facility	LP Ok Lk		x				x				x			x	x									
Lake Pine Booster/Lower Res	LP Ok Lk		x	x			x				x			x	x						x			
Lake Pine PR Stn.	LP Ok Lk	x		x													x					x		
Lake Pine Upper Reservoir	LP Ok Lk			x							x					x								
Lake Pine Road (Future)	LP Ok Lk																					x		
Moberly South (Future Site)	LP Ok Lk																x							

Appendix C – Comprehensive Test Results

2024 Water Potability Test (aka Comprehensive Results)							
Distribution Source		Beaver	Oyama	Kal lake	Coral Beach	Lake Pine	Okanagan Lake
Site		VERNON CREEK Intake	OYAMA CREEK Pump House	KALAMALKA Pump House	CORAL BEACH Pump House	LAKEPINE Pump House	OKANAGAN Lake Pump House
Date		29-Jul-24	17-Sep-24	17-Sep-24	29-Jul-24	18-Sep-24	30-Jul-24
Anions							
Chloride	mg/L	1.28	0.30	10.50	6.04	5.96	5.40
Chloride (AO)	mg/L	250	250	250	250	250	250
Fluoride	mg/L	<0.10	0.15	0.53	0.20	0.30	0.23
Fluoride (MAC)	mg/L	1.5	1.5	1.5	1.5	1.5	1.5
Nitrogen, Nitrate as	mg/L	0.03	0.07	<0.01	0.05	0.10	0.07
Nitrate (MAC)	mg/L	10	10	10	10	10	10
Nitrogen, Nitrite as	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite (MAC)	mg/L	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate	mg/L	3.60	3.30	49.10	30.40	31.80	30.50
Sulphate (AO)	mg/L	500	500	500	500	500	500
General Parameters							
Alkalinity (total)	mg/L	40.30	24.80	145.00	118.00	108.00	120.00
No current guidelines							
Total Organic Carbo	mg/L	8.32			5.17		5.04
No current guidelines							
Dissolved Organic Carbon	mg/L	7.17			4.04		4.15
No current guidelines							
True Colour	CU	28.00	44.00	<5.00	<5.00	<5.00	<5.00
True Colour (AO)	CU	15	15	15	15	15	15
Conductivity	uS/cm	77.10	63.00	430.00	300.00	302.00	300.00
No current guidelines							
Cyanide	mg/L	<0.0020	0.0022	<0.0020	<0.0020	<0.0020	<0.0020
Cyanide (MAC)	mg/L	0.2	0.2	0.2	0.2	0.2	0.2
pH	pH units	6.46	6.92	7.78	6.95	7.74	6.97
pH (OG)	pH units	7 - 10.5	7 - 10.5	7 - 10.5	7 - 10.5	7 - 10.5	7 - 10.5
Turbidity	NTU	1.23	0.74	1.14	0.37	0.36	0.28
Turbidity Guideline	NTU	5.0	5.0	5.0	5.0	5.0	5.0
Trans. 254 nm (unfiltered)	% T				86.30		86.30
No current guidelines. Note the lab did not report for Beaver and Oyama Lake sources							
Trans. 254 nm (unfiltered)	nm				86.30		86.30
No current guidelines. Note the lab did not report for Beaver and Oyama Lake sources							
Calculated Parameters							
Hardness (mg/L as CaCO3)	mg/L	32.20	26.60	177.00	124.00	129.00	135.00
No current guidelines see glossary below							
Total Dissolved Solids/TDS	mg/L	44.40	32.00	229.00	167.00	164.00	172.00
TDS (AO)	mg/L	500	500	500	500	500	500

Appendix C continued – Comprehensive Test Results

2024 Water Potability Test (aka Comprehensive Results)							
Distribution Source		Beaver	Oyama	Kal lake	Coral Beach	Lake Pine	Okanagan Lake
Site		VERNON CREEK Intake	OYAMA CREEK Pump House	KALAMALKA Pump House	CORAL BEACH Pump House	LAKEPINE Pump House	OKANAGAN Lake Pump House
Date		29-Jul-24	17-Sep-24	17-Sep-24	29-Jul-24	18-Sep-24	30-Jul-24
Total Recoverable Metals							
Aluminium (total)	mg/L	0.06	0.06	<0.01	0.01	0.01	<0.01
Aluminium (OG)	mg/L	0.1	0.1	0.1	0.1	0.1	0.1
Antimony (total)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Antimony (MAC)	mg/L	0.00600	0.00600	0.00600	0.00600	0.00600	0.00600
Arsenic (total)	mg/L	<0.0005	<0.0005	0.0009	<0.0005	0.0005	<0.0005
Arsenic (MAC)	mg/L	0.010	0.010	0.010	0.010	0.010	0.010
Barium (total)	mg/L	<0.01	0.01	0.03	0.02	0.02	0.02
Barium (MAC)	mg/L	2.0	2.0	2.0	2.0	2.0	2.0
Boron (total)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron (MAC)	mg/L	5.0	5.0	5.0	5.0	5.0	5.0
Cadmium (total)	mg/L	0.000047	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Cadmium (MAC)	mg/L	0.007	0.007	0.007	0.007	0.007	0.007
Calcium (total)	mg/L	7.82	6.75	39.30	33.50	34.30	34.10
No current guidelines							
Chromium (total)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (MAC)	mg/L	0.050	0.050	0.050	0.050	0.050	0.050
Cobalt (total)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
No current guidelines							
Copper (total)	mg/L	0.0053	0.0014	0.0008	0.0008	0.0057	0.0007
Copper (MAC)	mg/L	2.000	2.000	2.000	2.000	2.000	2.000
Iron (total)	mg/L	0.12	0.10	0.01	<0.01	<0.01	<0.01
Iron (AO)	mg/L	0.3	0.3	0.3	0.3	0.3	0.3
Lead (total)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Lead (MAC)	mg/L	0.005	0.005	0.005	0.005	0.005	0.005
Magnesium (diss.)	mg/L	3.08	2.35	19.10	9.89	10.50	12.10
No current guidelines							
Manganese (total)	mg/L	0.01040	0.00702	0.00288	0.00080	0.00128	0.00091
Manganese (MAC)	mg/L	0.12	0.12	0.12	0.12	0.12	0.12
Mercury (total)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Mercury (MAC)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001
Molybdenum (total)	mg/L	0.00027	0.00020	0.00471	0.00326	0.00347	0.00336
No current guidelines							

2024 Water Potability Test (aka Comprehensive Results)							
Distribution Source		Beaver	Oyama	Kal lake	Coral Beach	Lake Pine	Okanagan Lake
Site		VERNON CREEK Intake	OYAMA CREEK Pump House	KALAMALKA Pump House	CORAL BEACH Pump House	LAKEPINE Pump House	OKANAGAN Lake Pump House
Date		29-Jul-24	17-Sep-24	17-Sep-24	29-Jul-24	18-Sep-24	30-Jul-24
Total Recoverable Metals							
Nickel	mg/L	0.0013	0.0015	<0.0004	<0.0004	0.0006	<0.0004
No current guidelines							
Potassium (total)	mg/L	1.22	1.23	4.76	2.46	2.60	2.64
No current guidelines							
Selenium (total)	mg/L	<0.0005	<0.0005	0.0010	<0.0005	<0.0005	<0.0005
Selenium (MAC)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05
Sodium (total)	mg/L	2.71	2.69	17.90	11.90	12.30	14.20
Sodium (AO)	mg/L	200	200	200	200	200	200
Strontium (total)	mg/L	0.04	0.04	0.43	0.28	0.30	0.28
Strontium (MAC)	mg/L	7	7	7	7	7	7
Uranium (total)	mg/L	0.000034	0.000085	0.003290	0.002440	0.003000	0.002460
Uranium (MAC)	mg/L	0.020	0.020	0.020	0.020	0.020	0.020
Zinc (total)	mg/L	0.009	<0.004	<0.004	<0.004	0.012	<0.004
Zinc (AO)	mg/L	3.000	3.000	3.000	3.000	3.000	3.000

Glossary of Terms, GCDWQ:	
<	Less than. Reported when result is less than the reported detection limit
≤	Less than or equal to. Reported when result is less or equal to the reported detection limit
AO	Aesthetic objective. Refer to GCDWQ
MAC	Maximum acceptable concentration. Refer to GCDWQ
OG	Operational guidance values. Refer to GCDWQ
TCU	True color unit. Color referenced against a platinum cobalt standard
NTU	Nephelometric turbidity unit
uS/cm	Microsiemens per centimeter
Hardness	The degree of hardness of drinking water may be classified in terms of its calcium carbonate concentration as follows: soft, 0 to <60 mg/L; medium hard, 60 to <120 mg/L; hard, 120 to < 180 mg/L; and very hard,

Appendix D – Nutrient Sampling Upland Drinking Water Reservoirs

2024 Nutrients				
Site		OYAMA	DAMER	BEAVER
Date		29-Aug-24	29-Aug-24	01-Sep-24
Anions				
Nitrogen (Nitrate as N)	mg/L	<0.01	<0.01	<0.01
Nitrate (MAC)	mg/L	10	10	10
Nitrogen (Nitrite as N)	mg/L	<0.01	<0.01	<0.01
Nitrite (MAC)	mg/L	1	1	1
Phosphate (as P)	mg/L			
No current guidelines				
Sulfate	mg/L	2.00	3.60	2.90
Sulfate (AO)	mg/L	500	500	500
General Parameters				
Alkalinity, Total (as CaCO3)	mg/L	23.60	23.60	23.00
No current guidlines				
Alkalinity,Phenolphthalein (as CaCO3)	mg/L	<1.00	<1.00	<1.00
No current guidelines				
Alkalinity, Bicarbonate (as CaCO3)	mg/L	24.80	23.60	40.30
No current guidelines				
Alkalinity, Carbonate (as CaCO3)	mg/L	<1.00	<1.00	<1.00
No current guidelines				
Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.00	<1.00	<1.00
No current guidelines				
Ammonia (as N)	mg/L	<0.05	<0.05	<0.05
No current guidelines				
Total Organic Carbon	mg/L	10.70	10.70	10.50
No current guidelines				
Chlorophyll-a	ug/L	1.84	1.84	1.77
No current guidelines				
Colour, True	CU	31.00	31.00	67.00
No current guidelines				
Nitrogen, Total Kjeldahl	mg/L	0.40	0.40	0.48
No current guidelines				
Phosphorus, Total (as P)	mg/L	<0.0050	0.0060	<0.0050
No current guidelines				
Phosphorus, Dissolved Reactive	mg/L	0.02	0.02	0.01
No current guidelines				
TDS	mg/L			
TDS (AO)	mg/L	500	500	500
TSS	mg/L	<2.00	<2.00	<2.00
No current guidelines				
Calculated Parameters				
Hardness, Total (as CaCO3)	mg/L	20.10	18.90	24.40
No current guidelines				
Nitrate+ Nitrite (as N)	mg/L	<0.0100	<0.0100	<0.0100
No current guidelines				
Total Nitrogen	mg/L	0.40	0.40	0.48
No current guidelines				
Organic Nitrogen	mg/L	0.40	0.40	0.48
No current guidelines				

Appendix D continued– Nutrient Sampling Upland Drinking Water Reservoirs

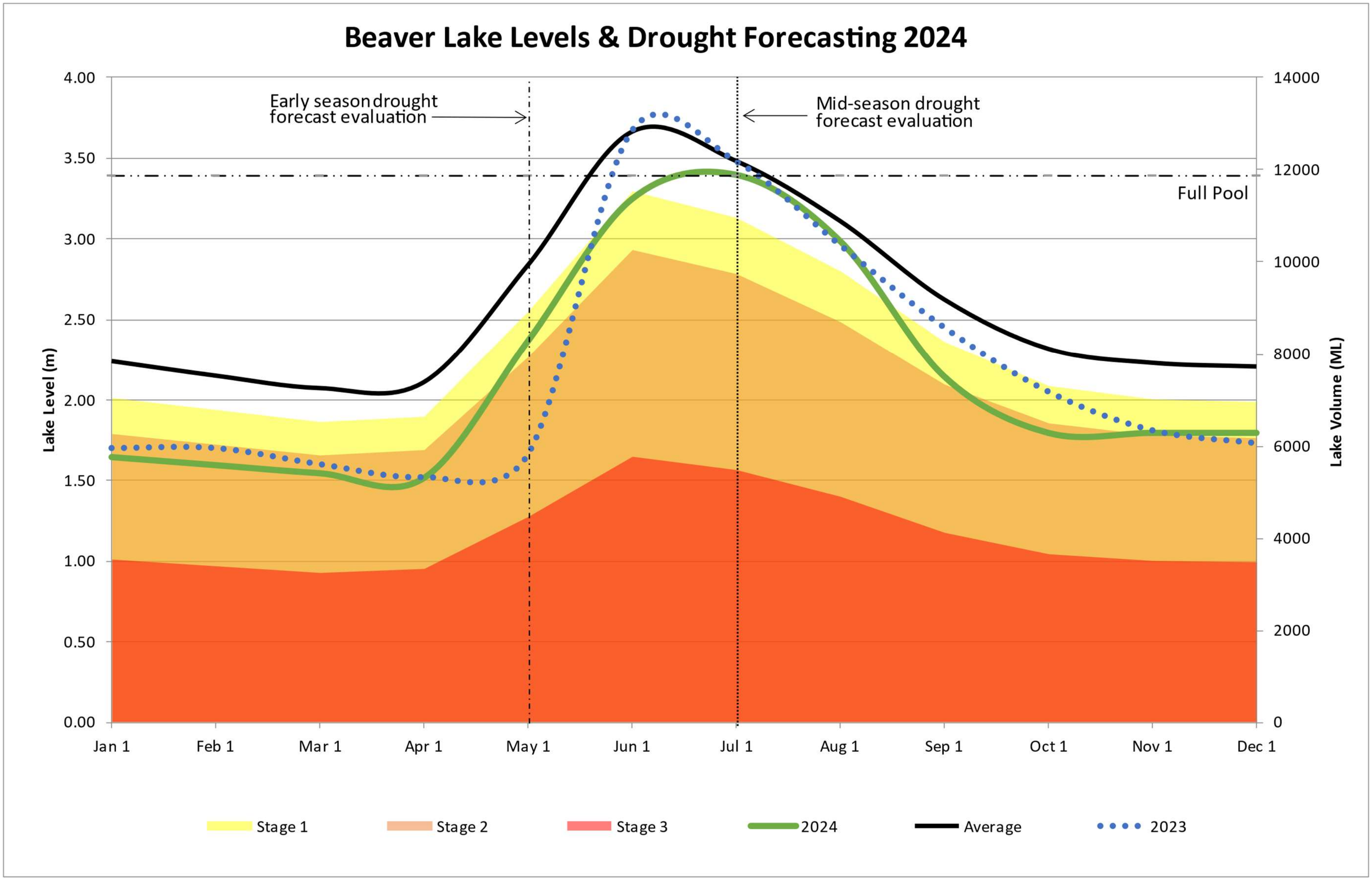
2024 Nutrients				
Site		OYAMA	DAMER	BEAVER
Date		29-Aug-24	29-Aug-24	01-Sep-24
Metals				
Total Dissolved Aluminium	mg/L	0.02	0.02	0.02
Total Recoverable Aluminium	mg/L	0.02	0.02	0.02
Aluminium (OG)	mg/L	0.1	0.1	0.1
Total Dissolved Antimony	mg/L	<0.0002	<0.0000	<0.0002
Total Recoverable Antimony	mg/L	<0.0002	<0.0000	<0.0002
Antimony (MAC)	mg/L	0.006	0.006	0.006
Total Dissolved Arsenic	mg/L	<0.0005	<0.0010	<0.0005
Total Recoverable Arsenic	mg/L	<0.0005	<0.0010	<0.0005
Arsenic (MAC)	mg/L	0.01	0.01	0.01
Total Dissolved Barium	mg/L	0.0066	0.0070	0.0053
Total Recoverable Barium	mg/L	0.0062	0.0060	0.0055
Barium (MAC)	mg/L	2	2	2
Total Dissolved Beryllium	mg/L	<0.00010	<0.00000	<0.00010
Total Recoverable Beryllium	mg/L	<0.00010	<0.00000	<0.00010
No current guidelines				
Total Dissolved Bismuth	mg/L	<0.00010	<0.00000	<0.00010
Total Recoverable Bismuth	mg/L	<0.00010	<0.00000	<0.00010
No current guidelines				
Total Dissolved Boron	mg/L	<0.05	<0.05	<0.05
Total Recoverable Boron	mg/L	<0.05	<0.05	<0.05
Boron (MAC)	mg/L	5	5	5
Total Dissolved Cadmium	mg/L	<0.000010	<0.000000	<0.000010
Total Recoverable Cadmium	mg/L	<0.000010	<0.000000	<0.000010
Cadmium (MAC)	mg/L	0.005	0.005	0.005
Total Dissolved Calcium	mg/L	4.89	4.89	6.78
Total Recoverable Calcium	mg/L	4.90	4.90	6.55
No current guidelines				
Total Dissolved Chromium	mg/L	<0.00050	<0.00100	<0.00050
Total Recoverable Chromium	mg/L	<0.00050	<0.00100	<0.00050
Chromium (MAC)	mg/L	0.05	0.05	0.05
Total Dissolved Cobalt	mg/L	<0.00010	<0.00000	<0.00010
Total Recoverable Cobalt	mg/L	<0.00010	<0.00000	<0.00010
No current guidelines				
Total Dissolved Copper	mg/L	0.00086	0.00100	0.00077
Total Recoverable Copper	mg/L	0.00165	0.00200	0.00090
Copper (AO)	mg/L	2	2	2
Total Dissolved Iron	mg/L	0.06	0.06	0.07
Total Recoverable Iron	mg/L	0.08	0.08	0.09
Iron (AO)	mg/L	0.3	0.3	0.3
Total Dissolved Lead	mg/L	<0.00020	<0.00000	<0.00020
Total Recoverable Lead	mg/L	<0.00020	<0.00000	<0.00020
Lead (MAC)	mg/L	0.005	0.005	0.005
Total Dissolved Lithium	mg/L	0.00078	0.00100	0.00057
Total Recoverable Lithium	mg/L	0.00071	0.00100	0.00047
No current guidelines				
Total Dissolved Magnesium	mg/L	1.92	1.92	2.08
Total Recoverable Magnesium	mg/L	1.62	1.62	1.94
No current guidelines				

2024 Nutrients				
Site		OYAMA	DAMER	BEAVER
Date		29-Aug-24	29-Aug-24	01-Sep-24
Metals Continued				
Total Dissolved Manganese	mg/L	0.00	0.00	0.00
Total Recoverable Manganese	mg/L	0.01	0.01	0.01
Manganese (MAC)	mg/L	0.12	0.12	0.12
Total Dissolved Mercury	mg/L	<0.000010	<0.000000	<0.000010
Total Recoverable Mercury	mg/L	<0.000010	<0.000000	<0.000010
Mercury (MAC)	mg/L	0.001	0.001	0.001
Total Dissolved Molybdenum	mg/L	<0.00010	<0.00000	0.00012
Total Recoverable Molybdenum	mg/L	0.00018	0.00000	0.00017
No current guidelines				
Total Dissolved Nickel	mg/L	0.00092	0.00100	0.00056
Total Recoverable Nickel	mg/L	0.00103	0.00100	0.00043
No current guidelines				
Total Dissolved Phosphorus	mg/L	<0.05	<0.05	<0.05
Total Recoverable Phosphorus	mg/L	<0.05	<0.05	<0.05
No current guidelines				
Total Dissolved Potassium	mg/L	1.08	1.08	1.00
Total Recoverable Potassium	mg/L	0.91	0.91	0.87
No current guidelines				
Total Dissolved Selenium	mg/L	<0.00050	<0.00000	<0.00050
Total Recoverable Selenium	mg/L	<0.00050	<0.00000	<0.00050
Selenium (MAC)	mg/L	0.05	0.05	0.05
Total Dissolved Silicon	mg/L	2.60	2.60	2.90
Total Recoverable Silicon	mg/L	2.40	2.40	2.70
No current guidelines				
Total Dissolved Silver	mg/L	<0.000050	<0.000000	<0.000050
Total Recoverable Silver	mg/L	<0.000050	<0.000000	<0.000050
No current guidelines				
Total Dissolved Sodium	mg/L	2.38	2.38	2.17
Total Reocoverable Sodium	mg/L	2.13	2.13	2.15
Sodium (AO)	mg/L	200	200	200
Total Dissolved Strontium	mg/L	0.03	0.00	0.04
Total Recoverable Strontium	mg/L	0.03	0.00	0.04
No current guidelines				
Total Dissolved Sulfur	mg/L	<3.00	<3.00	<3.00
Total Recoverable Sulfur	mg/L	<3.00	<3.00	<3.00
No current guidelines				
Total Dissolved Tellurium	mg/L	<0.00050	<0.00100	<0.00050
Total Recoverable Tellerium	mg/L	<0.00050	<0.00100	<0.00050
No current guidelines				
Total Dissolved Thallium	mg/L	<0.000020	<0.000000	<0.000020
Total Recoverable Thallium	mg/L	<0.000020	<0.000000	<0.000020
No current guidelines				

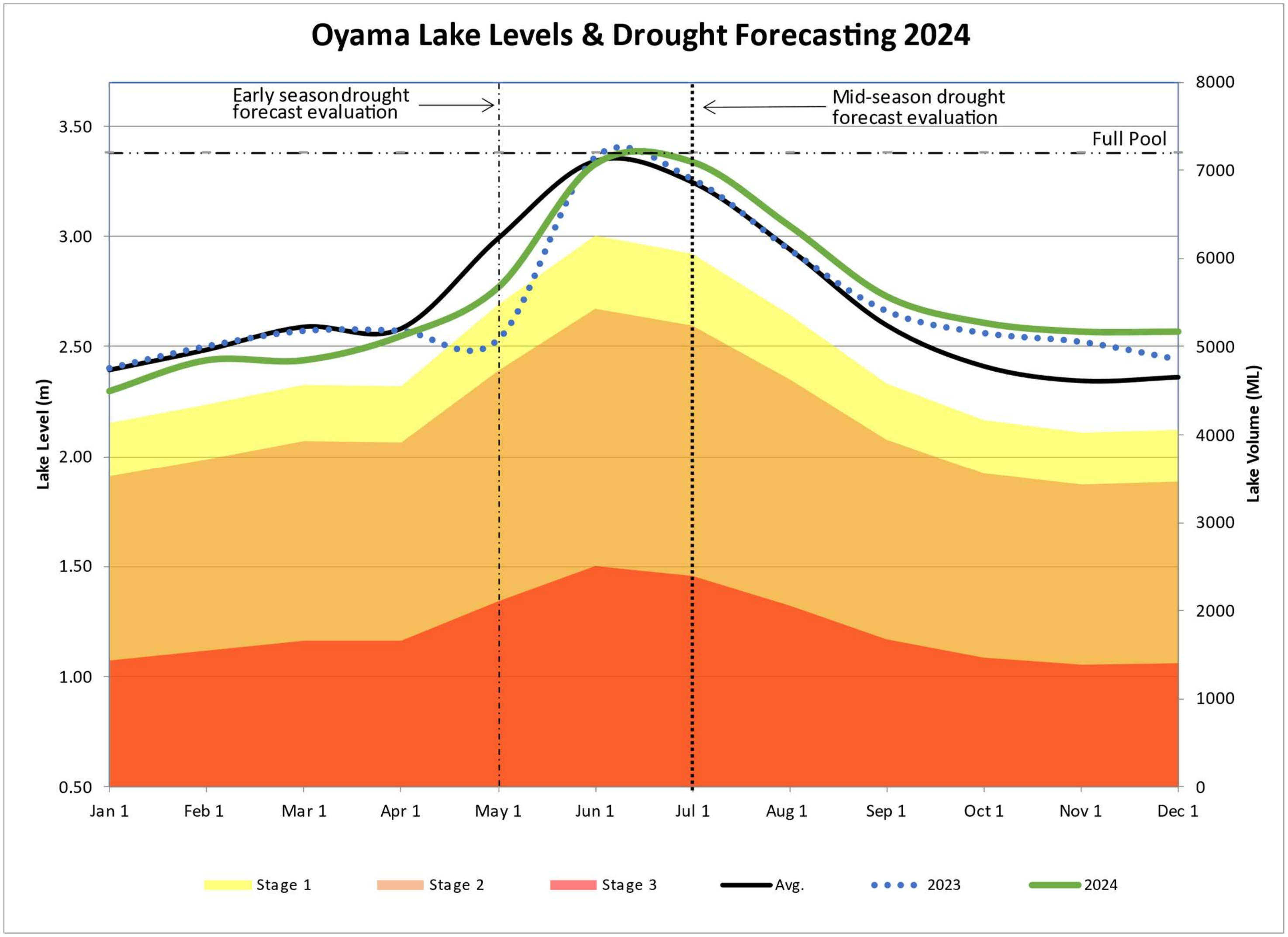
2024 Nutrients				
Site		OYAMA	DAMER	BEAVER
Date		29-Aug-24	29-Aug-24	01-Sep-24
Metals Continued				
Total Dissolved Thorium	mg/L	<0.00010	<0.00000	<0.00010
Total Recoverable Thorium	mg/L	<0.00010	<0.00000	<0.00010
No current guidelines				
Total Dissolved Tin	mg/L	<0.00020	<0.00000	<0.00020
Total Recoverable Tin	mg/L	<0.00020	<0.00000	<0.00020
No current guidelines				
Total Dissolved Titanium	mg/L	<0.01	<0.01	<0.01
Total Recoverable Titanium	mg/L	<0.01	<0.01	<0.01
No current guidelines				
Total Dissolved Uranium	mg/L	0.000023	0.000000	0.000021
Total Recoverable Uranium	mg/L	0.000030	0.000000	0.000027
Uranium (MAC)	mg/L	0.02	0.02	0.02
Total Dissolved Vanadium	mg/L	<0.00500	<0.00500	<0.00500
Total Recoverable Vanadium	mg/L	<0.00500	<0.00500	<0.00500
No current guidelines				
Total Dissolved Zinc	mg/L	<0.0040	<0.0040	<0.0040
Total Recoverable Zinc	mg/L	<0.0040	<0.0040	<0.0040
Zinc (AO)	mg/L	5	5	5
Total Dissolved Zirconium	mg/L	0.00035	0.00000	0.00038
Total Recoverable Zirconium	mg/L	0.00043	0.00000	0.00037
Zirconium (MAC)	mg/L			

Glossary of Terms, GCDWQ:	
<	Less than. Reported when result is less than the reported detection limit
≤	Less than or equal to. Reported when result is less or equal to the reported detection limit
AO	Aesthetic objective. Refer to GCDWQ
MAC	Maximum acceptable concentration. Refer to GCDWQ
OG	Operational guidance values. Refer to GCDWQ
TCU	True color unit. Color referenced against a platinum cobalt standard
NTU	Nephelometric turbidity unit
uS/cm	Microsiemens per centimeter
Hardness	The degree of hardness of drinking water may be classified in terms of its calcium carbonate concentration as follows: soft, 0 to <60 mg/L; medium hard, 60 to <120 mg/L; hard, 120 to < 180 mg/L; and very hard, 180 mg/L and

Appendix E – Drought Forecast for Beaver Lake & Oyama Lake



Appendix E continued – Drought Forecast for Beaver Lake & Oyama Lake



Appendix F – UV system off spec water

The configuration and design of the UV system at Kalamalka Lake does not automatically permit off spec water to pass into the distribution system. For this facility to operate outside of validated conditions (i.e., 5% off spec) the system would need to be manually adjusted to bypass the UV reactor setting to operate outside of the spec conditions. This did not occur.

Appendix G – Environmental Operators Certification Program (EOCP)

The EOCP Board of Directors, with the approval of the Ministry of Health, recently changed the water treatment facility definition. As such, since our chlorination facilities are method of *primary disinfection*, to produce potable water, they are now classified as water treatment facilities.

According to the EOCP, primary disinfection can include chlorination and ultraviolet of which we utilize alone or combined in our facilities. With this new definition, Operators are now required to update their certification to include water treatment. With the EOCP and Ministry of Health changing our facility classifications to Water Treatment facilities, Section 12 of the BC Drinking Water Protection Regulation requires that our operators now must now also obtain Water Treatment Certification through the EOCP. All operators now are also required to accumulate operator experience toward Water Distribution and Water Treatment certification.

Name	Certification No.	Level
Mike Mitchell	1839	WD-IV, CH, WT-II
Patti Meger	4838	WT-I, CH, WD-II
Kiel Wilkie	6503	WD-III, CH
Tyler Friedrich	7697	WD-III, WT-I
Mike Kristensen	8344	WD-II, WT-I, CH
Krista Winram	1001349	WD-II, CH
Evan Kemp	8114	WWT-III, WWC-I, CH, WT-II
Kyle Barker	1002179	WD-II
Eddie Maher	1001145	WD-II