2026

Greater Vernon Water
Water Quality Monitoring Program

Prepared for: Interior Health

Regional District of North Okanagan
9848 Aberdeen Road, Coldstream, BC

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LIST OF ACRONYMS AND DEFINITIONS

Accredited Lab	A lab with formal recognition by an authoritative body and the Provincial Health Officer of the competence to work to specified standards.
COP	Conditions of Operating Permit
COV	City of Vernon
DAF	Dissolved Air Floatation
DBP	Disinfection By-Products
DCWTP	Duteau Creek Water Treatment Plant
DOC	District of Coldstream
DWPA	*Drinking Water Protection Act*
DWPR	*Drinking Water Protection Regulation*
DWTO	Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies
E.coli	*Escherichia coli* is a gram negative rod of the family Enterobacteriaceae. Most strains of *E.coli* do not produce debilitating toxins, but there are a few strains that do, one being the *E.coli* O157:H7 strain.
GCDWQ	Guidelines for Canadian Drinking Water Quality
GVW	Greater Vernon Water
IH	Interior Health
MHWTP	Mission Hill Water Treatment Plant
QAQC	Quality Assurance / Quality Control
RDNO	Regional District of North Okanagan
SCADA	Supervisory Control and Data Acquisition – is a system for remote monitoring and control that operates with coded signals over communication channels.
Source Water	Untreated water before treatment or disinfection.
UV	Ultraviolet
UVT	Ultraviolet Transmittance
Water Distribution System	RDNO owned and administrated by GVW. The operations and maintenance is contracted to the COV and DOC.

Tables

1 Introduction

The Regional District of North Okanagan (RDNO) owns and operates the Greater Vernon Water Utility (GVW) and as a conditional requirement of the *Permit to Operate* issued by Interior Health (IH) must prepare this Water Quality Monitoring Plan (WQMP) annually.

The multi-barrier approach to supplying safe drinking water is the established best practice for water purveyors and regulators to ensure high-quality drinking water. The key components of the multi-barrier approach include source water protection, treatment, disinfection, proper operation and maintenance of the distribution system, and water quality monitoring to detect any water quality concerns before they affect the public.

The purpose of a source to tap WQMP is to meet regulatory requirements, help prioritize operational improvements, reduce aesthetic concerns to customers, improve consumer confidence, and reduce the risks to public health.

Additional considerations when developing the GVW water quality monitoring program:

- quality of the source water
- number of water sources
- past frequency of unsatisfactory samples
- adequacy of treatment and capacity of the treatment plant
- size and complexity of the distribution system
- practice of disinfection; and
- size of population served.

1.1 Regulatory Framework

The Greater Vernon Water (GVW) Water Quality Monitoring Program is designed to meet the requirements of the *Drinking Water Protection Act* (DWPA), *Drinking Water Protection Regulation* (DWPR), Guidelines for Canadian Drinking Water Quality (GCDWQ), and the Drinking Water Treatment Objectives (Microbiological) for surface water supplies in British Columbia.

Every water system owner in BC must have a valid Permit to Operate under Section 8 of the *Drinking Water Protection Act*. The GVW Permit to Operate is issued by the Interior Health Drinking Water Officer (DWO) and includes terms and conditions. In addition to the Conditions of Operating Permit (COP), GVW must comply with requirements set forth by the DWO, as well as adhere to all applicable legislation and regulations. The permit effectively integrates regulatory expectations with operational practices, including SCADA monitoring, EOCP certification, and public communication protocols.

In addition to the DWPA and DWPR, the GCDWQ and the Drinking Water Treatment Objectives (Microbiological) for surface water supplies in British Columbia requires regular routine monitoring and sampling for a variety of microbiological, chemical, and physical parameters. Sample frequency and parameters are to be determined based on local conditions, population, number and type of water sources, and past water quality results.

Table 1 below summarizes the most recent COP.

Table 1 COP Summary

	Regulatory Requirement	GVW Permit Requirement
1	**Source Protection Plan**	Source Protection Plans required for Duteau Creek and Kalamalka Lake and reviewed annually.
2	**Certified Operators (EOCP)**	Operator certification levels (WD-IV, WT-II, WT-IV) are maintained and reported.
3	**Water Quality Monitoring Program**	Monitoring program that includes at minimum routine sampling and annual comprehensive analysis. Provide annual full comprehensive water quality analysis for each surface source and from the distribution system. • Every three (3) years for supplementary groundwater supplies.
4	**Cross-Connection Control Program (CCCP)**	CCCP established since 2005; updates and compliance stats reported annually.
5	**Turbidity Monitoring (Continuous, Online)**	SCADA-monitored online turbidity meters in place for all surface sources.
6	**Disinfection Monitoring (Continuous, Online)**	Online chlorine meters monitored via SCADA; data included in monthly and annual reports.
7	**Long-Term Planning (Treatment Objectives & Infrastructure Upgrades)**	Master Water Plan
8	**Emergency Response and Contingency Planning**	ERP reviewed annually; includes provisions for emergency groundwater use and public notification.
9	**Monthly and Annual Reporting**	Reports include water quality data, incidents, maintenance updates, and capital works progress.

2 System Description

2.1 Water Source Overview

GVW holds 40 water licences and supplies water to customers via six (6) water intakes from the following surface water sources:

1. Duteau Creek (Duteau Creek intake, Goose Lake intake)
2. Kalamalka Lake
3. Okanagan Lake (Outback and Delcliffe intakes)
4. King Edward Lake (Deer Creek intake).

Duteau Creek supplies the largest water volume to the GVW service area, with both non-potable (untreated) and potable (treated) water. Kalamalka Lake is the second largest water supply and provides only potable water. There are two (2) intakes on Okanagan Lake which service two (2)

small potable water systems, the Outback and Delcliffe (these two (2) water systems have standalone water quality monitoring plans and annual reports provided on the RDNO website). Goose Lake functions as an open reservoir, receiving water from the Duteau Creek Water Treatment Plant (DCWTP), to provide non-potable water to agricultural customers on the western side of Swan Lake and in the Bella Vista Area. Deer Creek (King Edward Lake) provides non-potable water to a limited number of Coldstream agricultural customers combined with some groundwater.

GVW also manages four (4) groundwater wells:

- Coldstream Ranch (CR) Wells 3 and 2 – both are in service all year round to supply agricultural non-potable water. Well 3 is approved as emergency potable / domestic supply.
- Antwerp Springs (Antwerp) Deep and Shallow Wells – are currently not in service. Antwerp Deep Well is approved as emergency supply in the potable / domestic supply. Antwerp Shallow Well is currently not operational and will only be used for irrigation once a non-potable water main is installed close enough to connect the well.

2.2 Drinking water sources and Treatment Process

2.2.1 Duteau Creek

Duteau Creek originates on the Aberdeen Plateau and the watershed is controlled with seven (7) earthen dams forming three (3) reservoirs: Grizzly, Aberdeen, and Haddo. Duteau Creek watershed covers an area of approximately 21,275 hectares (ha) (213 km^2) between Grizzly Hills summit (elevation of 1,800 metres (m)) on the Aberdeen Plateau and the Duteau Creek Intake (point of diversion) at an elevation of 660 m.

Duteau Creek flows out of Haddo Lake and continues downstream for approximately 13 km before entering Harvey Lake, a small reservoir created by the Headgates Dam, which also contains the Duteau Creek intake. Water is diverted into the GVW system at this point through a transmission main pipe to the DCWTP with a bypass for the non-potable system located before the DCWTP. Water is also released through the Headgates Dam low-level outlet into Duteau Creek for Environmental Flow Needs as per an agreement between the RDNO and the Province of British Columbia.

Water diverted to the DCWTP for treatment is first clarified by Dissolved Air Flotation (DAF), then injected with chlorine before entering the 10 ML covered reservoir. Water is next disinfected by UV before additional chlorine is added before entering the distribution system. To ensure adequate chlorine Contact Time (CT), chlorine is applied at the front end of the DCWTP reservoir and the final dosage is adjusted post UV to ensure adequate disinfection occurs.

DAF treatment typically removes around 60% of the organic carbon from the raw water and up to 90% of the turbidity. The organic carbon is what causes the yellow colour in Duteau Creek water. DAF, chlorination, and Ultraviolet (UV) disinfection after the reservoir combine to assist GVW in meeting the *4-3-2-1-0 Drinking Water Treatment Objectives* (BC MOH, 2024). The UV inactivates Cryptosporidium and Giardia.

2.2.2 Kalamalka Lake

Water from Kalamalka Lake supplies domestic (potable) water for GVW. The Kalamalka Lake Pump Station (PS) is located on West Kal Road in Coldstream, BC with the intake located 327 m from the shoreline in 20 m of water and 3 m off the lake bottom to improve water quality. Water is

pumped from Kalamalka Lake to the Mission Hill Water Treatment Plant (MHWTP) for disinfection treatment using Ultraviolet (UV) disinfection and chlorine. To ensure adequate chlorine Contact Time (CT), chlorine is applied post-UV and dosage can be adjusted as required to ensure adequate disinfection occurs.

2.3 Service Area and Population Served

GVW is a regional water system that supplies and delivers water to customers in the City of Vernon (COV), the District of Coldstream (DOC), and portions of Electoral Areas “B”, “C” and “D”, and the Township of Spallumcheen. Based on the 2021 census, growth, and service connections, the population served is approximately 67,000.

The GVW distribution system has a service area of 244 km^2 with close to 700 km of pipeline, 39 pump stations, 91 pressure reducing stations, 22 concrete balancing reservoirs, and 88 pressure zones. GVW has approximately 21,000 service connections. There are approximately 800 active farm or agricultural status connections, 1,500 commercial, institutional / park, or industrial connections (ICI) and approximately 20,000 residential connections. All active service connections are metered.

The RDNO owns and manages the GVW water system in addition to operating the supply and treatment facilities, while the COV and DOC are contracted for the operations and maintenance of the distribution system.

3 Monitoring Plan Design

To achieve the WQMP goals, the following have been reviewed and considered:

- Water quality parameters required based on best management practices and regulations
- Locations of sampling
- Utility needs
- Source water and distribution characteristics.

While most of the WQMP is set up on regular schedules, as will be laid out further in this document, trained staff recognize that event-based sampling may be required. Some of these events are considered within the WQ Deviation Response Plan and Emergency Response Plan. Other events that staff prepare for include:

- Customer inquiries relating to changes in their tap water
- Backflow or back pressure events that occur and causes changes to the water
- Extreme weather events affecting source water quality
- Algae presence.

3.1 Monitoring Locations

Sampling is meant to provide early detection of water quality issues. GVW takes samples using two (2) different techniques in the system:

1. Grab samples

   These samples are taken by staff from various locations that may include dedicated sampling stations, a flowing tap, a fire hydrant or blow-off. These samples are discrete

samples taken at a recorded point in time and location. These samples are analyzed in the field or laboratory, depending on the parameter.

2. Online instruments

   Permanently installed in the water system, these instruments analyze water quality parameters at a high frequency. These are often referred to as continuous monitoring devices. All surface sources meet the requirement of having online turbidity meters that are connected to SCADA and are alarmed. All water disinfection processes at the water treatment plants and throughout the distribution system meet the requirement of having continuous online monitoring.

Both grab samples and online instruments are used at the source, treatment, and distribution sites. Online monitoring is used primarily for *real-time and operational monitoring* (continuous turbidity, chlorine, UV), while grab samples are primarily used for *compliance* (lab-certified bacteriological, Disinfection By-Products (DBP), and metals).

3.1.1 Source Water

The following is an overview of the number of samples taken for source water. The schedules are discussed later in this document:

- **Duteau Creek Watershed:** There are four (4) sampling sites that include Duteau Creek mainstem and its tributaries. There is also a sample site at the intake into the treatment plant.
- **Kalamalka Lake Watershed:** There are six (6) sampling sites along Coldstream Creek, as the major tributary to Kalamalka Lake. There is also one (1) sample site at the intake into the treatment plant, as well as a contracted lake monitoring plan in collaboration with the Province and District of Lake Country.
- **Emergency Groundwater Sources:** Coldstream Ranch Well 3 and Antwerp Springs Well 2 are sampled before use or every three (3) years.
- **Irrigation Sources:** Goose Lake (sampled weekly for algae density in irrigation season), Deer Creek, Coldstream Ranch Well 2.

3.1.2 Treatment Facilities

GVW operates two (2) treatment plants: the Duteau Creek Water Treatment Plant (DCWTP) and the Mission Hill Water Treatment Plant (MHWTP).

Duteau Creek Water Treatment Plant (DCWTP):

There is continuous monitoring of turbidity, UV disinfection, pH, conductivity, and chlorine residuals at various locations across the treatment process.

The RDNO operators at the DCWTP complete the following sampling and analysis:

Table 2 DCWTP Samples and Analysis

Raw	Online – Real Time	Grab Sample Frequency
Turbidity	Online	Daily
Temperature	Online	Daily
pH	Online	Daily
Conductivity	Online	Daily

Alkalinity	N/A	Daily
True Color	N/A	Daily
Apparent Color	N/A	Daily
Dissolved Organic Carbon	Online	N/A
Total Aluminum	N/A	Weekly
Mid-Process	**Online – Real Time**	**Grab Sample Frequency**
pH - each train	Online	3x / week
Streaming Current - each train	Online	N/A
Turbidity - each DAF	Online	Daily
DAF Effluent	**Online – Real Time**	**Grab Sample Frequency**
Turbidity	Online	Daily
Alkalinity	N/A	Daily
Dissolved Aluminum	N/A	2x / week
True Colour	N/A	Daily
UVT	N/A	Daily
Front-End Reservoir	**Online – Real Time**	**Grab Sample Frequency**
pH	Online	Daily
Temperature	N/A	Daily
Mid-Reservoir	**Online – Real Time**	**Grab Sample Frequency**
Free Chlorine	Online	Daily
Pre-UV (Reservoir Outlet)	**Online - Real Time**	**Grab Sample Frequency**
Free Chlorine	Online	Daily
UVT (2)	Online	Daily
Post-UV	**Online - Real Time**	**Grab Sample Frequency**
Free Chlorine	Online	Daily
Alkalinity	N/A	3x / week
Reactive phosphate[1]	N/A	3x / week
Temperature	N/A	Daily
pH[1]	N/A	Daily
Turbidity	Online	Daily

[1]Reactive phosphate is analyzed from approximately October through April when the DCWTP is dosing ortho-phosphate.

Bacteria samples are collected by RDNO water quality staff for testing weekly from the effluent domestic pump. Additional testing is done monthly and quarterly as noted in Appendix B.

Mission Hill Water Treatment Plant (MHWTP):

There is continuous monitoring of turbidity, UV disinfection, pH, conductivity, and chlorine residuals at various locations across the treatment process.

The RDNO operators at the MHWTP complete the following sampling and analysis:

Table 3 MHWTP Samples and Analysis

MHWTP	Online – Real Time	Grab Sample Frequency (excluding holidays)
Free Chlorine (before contact chamber)	Online	Monday to Friday
Free Chlorine (after contact chamber)	Online	Monday to Friday
Turbidity	Online	Monday to Friday
UVT	Online	Monday to Friday
Conductivity	Online	Monday to Friday
Temperature	Online	Monday to Friday
pH	Online	Monday to Friday
Total Organic Carbon	Online (calculated number using UV254)	N/A
Conductivity	Grab Sample	Monday to Friday
Temperature	Grab Sample	Monday to Friday

Bacteria samples are collected by RDNO water quality staff for testing weekly from the effluent line. Additional testing is done monthly and quarterly as noted in Appendix B.

3.1.3 Distribution System Sites

GVW currently has approximately 84 active sampling sites across the distribution system. Sites are strategically selected to represent the entire system, source to tap, and include variations in pressure zones, water age, flow, and blending of the different water sources. Sampling is meant to provide early detection of water quality issues. See Appendix A for a list of all active GVW sampling sites.

Sites are reviewed annually in collaboration with operators from the COV and DOC, with new stations added to improve coverage as needed.

Most of the active sampling sites used for the routine monitoring are designated sample stations, while a select few end-of-line samples are taken from blow-offs. Best management practices suggest the following:

> "Smooth-nosed sampling tap(s) should be provided to facilitate collection of water samples for both bacteriological and chemical analyses. The sample tap(s) should be easily accessible. Sample lines should be stainless steel from the sampling point to the sampling tap. Sample tap(s) should be located to collect representative samples. Provision for online water quality monitoring should be considered in relation to the overall system

characteristics and monitoring program." Drinking Water Officers' Guide - Consolidated Version - 2025

3.2 Monitoring Parameters

The key water quality parameters that are monitored based on regulations and the Permit to Operate include microbiological parameters (Total Coliforms and E. coli), disinfection (chlorine residual and ultraviolet disinfection), disinfection by-products (trihalomethanes and haloacetic acids), and turbidity.

Additional routine parameters are useful in identifying the source water in the area and whether there is blending of different sources. They also help to indicate if there are any changes in the system that need to be operationally addressed. The field parameters measured include:

- temperature
- pH
- conductivity.

All sampling adheres to best practices for drinking water sources and systems and can be found in Appendix C "Bacteriological Sampling Procedures." The schedule and list of parameters are found in Appendix B. This schedule contains weekly, monthly, annual and multi-year (biennial or greater) sampling events. In 2026, the multi-year sampling event that is planned to be completed is Deer Creek Intake Pond. See the list below of the last comprehensive sampling events for each multi-year site.

Table 4 Multi-year sampling schedule

Sample Site	**Last Sampling Event**
Kalamalka Lake Intake	2025
Coldstream Ranch Well 3	2025
Antwerp Springs	2025
Goose Lake	2025
Deer Creek Intake Pond	2024
Coldstream Ranch well 2	2024

3.2.1 Microbiological Parameters

As per section 8 (2) of the DWPR:

"For the purpose of section 11 (1) of the Act, a water supplier must monitor for total coliform bacteria and, effective April 1, 2006, Escherichia coli, at the frequencies set out in Schedule B of this regulation."

Schedule A of the DWPR specifies the bacteriology water quality standards for potable water and Schedule B defines the minimum frequency of bacterial monitoring standards. The GVW monitoring program is designed to ensure compliance with these regulations.

Schedule A
Water Quality Standards for Potable Water
(BCDWPA, *sections 2, 9*)

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

Schedule B
Frequency of Monitoring Samples for
Prescribed Water Supply Systems
(section 8)

Population Served by the Prescribed Water Supply System:	**Number of 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

Based on a service population of approximately 67,000 (2025), GVW is required to collect 67 samples monthly. Due to the distribution system length and complexity, approximately 108 samples are analyzed per month at the RDNO Laboratory (Table 4). Distribution sampling sites follow a four-week rotating schedule all year, with approximately 30 sites sampled per week.

Table 5 Distribution Bacteria Sampling Frequency

System	Population (approx.)	Sources / Intakes	Sample Sites	Samples per month	Minimum Bacterial Samples per Month
Kalamalka Lake	45,000	1	36	61	45
Duteau Creek	22,000	1	41	47	22
Total 2025	**67,000**	**2**	**77**	**108**	**67**

Additional sampling considerations are outlined in the GCDWQ and included below.

The *Guidelines for Canadian Drinking Water Quality* provide recommendations on monitoring for Total Coliforms and *E.coli* as seen below (section 3.2.1.1 – 3.2.1.4 have been adapted from Health Canada, *Guidelines for Canadian Drink Water Quality: Guideline Technical Document* – Total Coliforms, 2020-06-19):

3.2.1.1 Monitoring total coliforms in water leaving the treatment plant

Total coliforms should be monitored at least weekly in water leaving a treatment plant. If total coliforms are detected, it indicates a serious breach in treatment and is therefore unacceptable. These tests should be used in conjunction with other indicators, such as residual disinfectant and turbidity monitoring as part of a source-to-tap approach to producing drinking water of acceptable quality. While the required frequency for all testing at the treatment plant is prescribed by the responsible authority, best practice commonly involves a testing frequency beyond these minimum recommendations based upon the size of the system, the number of consumers served, the history of the system, and other site-specific considerations.

3.2.1.2 Monitoring total coliforms in water distribution and storage systems

In municipal-scale distribution and storage systems, the number of samples collected for total coliform testing should reflect the size of the population being served, with a minimum of four (4) samples per month. The sampling points and testing frequencies for total coliforms, residual disinfectant, and turbidity in treated water within distribution and storage systems will be specified and / or approved by the responsible authority. As an important part of a source-to-tap approach to ensuring safe drinking water, incorporating total coliforms into a distribution and storage system monitoring strategy can, over time, provide an enhanced knowledge of water quality throughout the system as well as overall system condition. The approach should take into account the particular characteristics of the distribution and storage system and historic knowledge of the overall system such as age, layout, or materials. This strategy allows for the detection of changing conditions, intrusion of contaminants, or areas of declining water quality, which can then be investigated further.

3.2.1.3 Monitoring E. coli in water leaving the treatment plant

E. coli should be monitored at least weekly in water leaving a treatment plant. If *E. coli* is detected, this indicates a serious breach in treatment and is therefore unacceptable. *E. coli* tests should be used in conjunction with other operational indicators (field parameters), such as residual disinfectant and turbidity monitoring as part of a source-to-tap or water safety plan approach.

The required frequency for all testing at the treatment plant is specified by the responsible drinking water authority. Best practice commonly involves a testing frequency beyond these minimum recommendations based upon the size of system, the number of consumers served, the history of the system, and other site-specific considerations, such as the results of source water assessments. Events that lead to changes in source water conditions (e.g., spring runoff, storms or wastewater spills) are associated with an increased risk of fecal contamination. Water utilities should consider additional sampling during these events.

3.2.1.4 Adenosine Triphosphate

Adenosine Triphosphate (ATP) measures the biological activity within the water. It distinguishes between two (2) types of ATP:

- **Intracellular ATP**: Contained within living cells.
- **Extracellular ATP:** Released from dead or stressed microorganisms.

"Free" ATP testing is referred to as extracellular ATP and total ATP testing is referred to as the sum of free ATP (extracellular ATP) and intracellular ATP. ATP is monitored weekly at the sources and water treatment plant effluents.

3.2.2 Physical Parameters

Physical parameters are the measurable, non-chemical, non-biological characteristics of water. Physical parameters that are measured in the field by GVW include turbidity, pH, conductivity, temperature, and chlorine.

3.2.2.1 Turbidity

All surface water sources must have continuous online monitoring of the source water turbidity and be alarmed as mandated in the Permit to Operate. The monitoring point is required to be prior to entry into the treatment process (UV and chlorine) if no filtration is present, or prior to entry into the distribution system if filtration is present. GVW has turbidimeters at the Kalamalka Lake and Duteau Creek intakes, which are monitored by the SCADA system.

Turbidity readings within the distribution system are taken via handheld instruments by operators during regularly scheduled grab samples. High-turbidity events are acted on in accordance with the provincial guidance "*Decision Tree for Responding to a Turbidity Event in Unfiltered Drinking Water, April 2013*" and the "*GVW Water Quality Deviation Response and Notification Plan.*"

3.2.2.2 Additional Field Parameters

In addition to turbidity, pH, conductivity, temperature, free chlorine, and total chlorine are taken in the field. These parameters are taken to monitor the water quality and plotted to determine long- or short-term trends that may be present in the water. These parameters are collected during all sampling events. See section 3.2.4 on Disinfection for more information on chlorine monitoring.

3.2.3 Chemical Parameters

The chemical parameters that GVW monitors in water describe the dissolved substances within the water. These chemical parameters are key to water health as they provide nutrient loads within the water. In addition to the microbiological and field parameters, water quality sampling for chemical parameters occurs at the source and within the distribution system.

3.2.3.1 Source Water

There are many additional parameters routinely sampled in source water based on source water quality and regulations. Annually, a comprehensive set of parameters are analyzed for and published on the website. These parameters are determined in conjunction with the DWO. Some of the operational and water quality parameters or groups of parameters are described below. See Appendix B for sample schedule:

- ***Total Organic Carbon (TOC) and Dissolved Organic Carbon* (DOC):** Monitored at the sources as organics relate to THM and HAA production and contribute to UV disinfection effectiveness. Organic loading is also an indicator of pollutants in the water.
- **Aluminum:** The DCWTP uses Poly-Aluminum-Chloride as a flocculant in the DAF process. Therefore, monitoring the Duteau Creek intake for the natural levels of aluminum informs the RDNO of the cumulative aluminum concentration in the water after treatment for operational and drinking water controls.

- **Chlorophyll a, Algae density, Total Phosphorous, Total Nitrogen:** Monitored at source intakes during the algae "growing" season and during lake turnover (fall and spring). Phosphorous and Nitrogen are key nutrients that contribute to eutrophication and algae blooms.
- **Ammonia, Total Phosphorous, Total Nitrogen:** Monitored at the Coldstream Creek locations. Phosphorous and ammonia loading is an indicator of fertilizers and biological degradation.
- **Herbicides, Pesticides and Fuel Scans:** Monitored at the Kalamalka Lake Intake. Indicates leaching of herbicides and pesticides from agricultural activities upstream as well as fuel levels within the lake due to recreation on Kalamalka Lake.
- **Volatile Organic Compounds (VOC):** Monitored at the Kalamalka Lake Intake. VOCs are typically indicators of unwanted chemicals entering the waterway from industrial leaks, spills, or improper disposal.

3.2.3.2 Distribution Water

In addition to the sampling noted above, there are quarterly samples taken with additional water quality parameters in the summer and winter at two (2) designated sampling sites:

- Allenby PS (Kalamalka Lake supply)
- PRV 2 (Duteau Creek supply).

This quarterly sampling schedule helps capture seasonal variations in distribution water quality for both source supplies. See Appendix B for sample schedule. See below for justification for some of the non-routine parameters that are sampled:

- **Orthophosphate:** Monitored weekly at the Aberdeen sample station and monthly at three (3) additional sample sites. Zinc orthophosphate is used in the Duteau Creek water system as a corrosion inhibitor in ductile and cast-iron pipes. Elevated levels of orthophosphate in the water are an indicator of over-application of zinc orthophosphate.
- **Aluminum:** Monitored at the DCWTP. High total aluminum values can reflect Poly Aluminum Chloride carry over, while elevated dissolved aluminum can be an indicator of over-application of the Poly Aluminum Chloride.
- **DBP:** DBP include trihalomethanes (THM) and haloacetic acids (HAA). DBP are formed by the interaction between the nutrients in the water and the chlorine disinfection. DBP are to be maintained as low as possible without compromising the effectiveness of the disinfection process. Quarterly monitoring in line with GCDWQ is required in accordance with the IH *Permit to Operate*. Sample locations were chosen based on the following information:
  - Points of entry (water treatment plant outlets)
  - Locations where DBPs are expected to be highest
  - Location with the longest contact time (the worst-case scenario)

The *Guidelines for Canadian Drinking Water Quality* provide recommendations on monitoring for Haloacetic Acids (HAA) as outlined below.

> **3.1 Monitoring**
> At a minimum, quarterly monitoring of treated water from surface water and groundwater sources is recommended for total HAAs. Increased frequency of monitoring may be required for facilities using surface water sources[2] during periods when water characteristics are more favourable to the formation of by-

products, which will vary according to the specific system. Since total HAA concentrations vary within and between distribution systems, depending on different factors, including water quality characteristics (e.g., HAA precursors, pH, season, temperature) and treatment conditions (e.g., disinfectant type, disinfectant dose, contact time), it is recommended that monitoring samples be taken at the water treatment plant and at points in the distribution system where historical data show the highest HAA concentrations.
Where historical data are not available, program should be put in place to monitor HAA levels in the middle and extremities of the distribution system. Areas with extremely low or no disinfectant residual should be avoided, but areas where disinfectant residuals are significantly lower than the system average because of a long residence time (e.g., dead ends, low flow areas) should be targeted. In systems with booster chlorination stations and water tanks or reservoirs, it is expected that higher HAA concentrations would be found downstream of these components.
Monitoring/reporting may be reduced if drinking water monitoring does not show elevated levels of disinfection by-products within the distribution system.

(Health Canada, *Guidelines for Canadian Drink Water Quality: Guideline Technical Document – Haloacetic Acids*, 2008-07)

The *Guidelines for Canadian Drinking Water Quality* provide recommendations on monitoring for Trihalomethanes (THMs).

3.1 Monitoring
At minimum, quarterly monitoring of treated water from surface water and groundwater sources is recommended for both THMs and BDCM. Increased frequency may be required for facilities using surface water sources [2] during peak by-product formation periods. It is also recommended that monitoring samples be taken at the water treatment plant and at the point in the distribution system with the highest THM formation potential. These points generally represent the areas in the distribution system with the longest disinfectant retention time, which are typically at the far end of the distribution system.
Monitoring/reporting may be reduced if drinking water monitoring does not show elevated levels of CDBPs within the distribution system.

[2] Includes groundwater sources that are under the direct influence of surface water.

(Health Canada, *Guidelines for Canadian Drink Water Quality: Guideline Technical Document – Trihalomethanes*, 2006-05)

3.2.4 Disinfection

Section 5 of the DWPR requires that drinking water from a water supply system must be disinfected if the water originates from surface water, or groundwater that, in the opinion of a DWO, is at risk of containing pathogens. While disinfection is not defined in the DWPA or DWPR, there are different types of disinfection and GVW uses: chlorine and ultraviolet (UV).

3.2.4.1 Chlorine Disinfection

Continuous online monitoring of free chlorine residuals is conducted at a point before the treated water enters the distribution system to ensure adequate chlorine levels are maintained. This is mandated by the IH Permit to Operate as per the respective system's Monitoring Program Detail.

Once the water enters the system, distribution water is monitored for free and total chlorine residuals through operator grab samples, regular scheduled operator site checks, and continuous online monitoring. It is best practice to obtain a minimum free chlorine residual of 0.2mg/L within the distribution system for the control of bacterial regrowth within the distribution system (Guidelines for Canadian Drinking Water Quality). The GVW monitoring program is set up to monitor for representation of the chlorine distribution to keep it below the best practice maximum of 2.0 mg/L (Guidelines for Canadian Drinking Water Quality) and identify areas that may require corrective action of infrastructure upgrades to ensure 0.2 mg/L. While 0.2 mg/L is the goal throughout the distribution system, it can be difficult to achieve in some sections of the system; therefore, microbiological monitoring is used to help determine next steps.

3.2.4.2 Ultraviolet Disinfection

UV disinfection occurs at both the DCWTP and the MHWTP and is used to inactivate Cryptosporidium, Giardia and assorted viruses. The UV disinfection systems are monitored via online instrumentation and the SCADA system to ensure that acceptable disinfection has occurred prior to the water entering the distribution system.

3.3 Sampling Frequency

Sampling frequency is outlined in the *Drinking Water Protection Act* (DWPA), Drinking Water Protection Regulation (DWPR), Guidelines for Canadian Drinking Water Quality (GCDWQ) and is in the IH Permit to Operate. GVW is responsible for meeting the objectives set out in these documents and outlined in section 3.2.1 of this document. Water sampling information can be found in section 3.1. Sampling locations can be found in Appendix A, while sampling frequency can be found in Appendix B. All sampling follows the GVW sampling standard operating procedure, which can be found in Appendix C.

An emergency sampling kit is available in the RDNO lab for use in spill events, potential cross-connections, or other emergency scenarios.

Historical data establishes trends for each source, and deviations from these norms trigger an investigative response. Responses may include a second sample for confirmation and a site inspection to investigate and possibly determine the contamination source. Results that remain high over an extended period will undergo further evaluation.

3.3.1 Event-Based Sampling

Event-based sampling is triggered by, but not limited to, turbidity deviations, algae presence, customer complaints, backflow events, watershed changes, power outages, and breaks and maintenance events. The RDNO deviation response plan and Emergency response plans outline when additional event-based sampling is required. Trained staff also ensure that samples are taken based on unusual events.

4 Data Management and Reporting

4.1 Quality Assurance and Quality Control Program

To confirm data quality, GVW employs the following measures to maintain a reliable Quality Assurance and Quality Control (QAQC) program:

- **PLANNING:** Each year, water quality staff review the water quality data, parameters and sampling sites to update the monitoring program.

- **TRAINING:** GVW provides annual training to their operators for sample collection, handling, and emergency response for consistency and accuracy.
- **SAMPLING:** Field instruments undergo regular maintenance at the RDNO laboratory. Online and handheld instruments undergo routine maintenance and calibration. Duplicate samples are taken throughout the year to assess the precision of field and laboratory activities.
- **VALIDATION:** Duplicate results are compared using Relative Percent Difference (RPD), with values ≤30% generally acceptable, to confirm sampling and analytical precision. Results are reviewed regularly, and additional QAQC measures are implemented if issues are identified. The program is reviewed annually to ensure data quality.

All samples are collected and shipped in accordance with the *Standard Methods for the Examination of Water and Wastewater* (APHA, AWWA, and WEF), ensuring proper documentation, including sample confirmations, requisitions, and chain-of-custody forms for all samples sent to accredited laboratories.

GVW water quality staff have laboratory procedures that are reviewed and updated as necessary.

4.2 Reporting

Data is stored on an internet-based database system. Field parameters and bacterial results are included in weekly reports shared with staff, IH and operations teams. Monthly and annual reports are also prepared in compliance with the conditions outlined in the COP.

Weekly reports are generated by GVW water quality staff for operations and IH by Friday of each week. This includes an overview of chlorine residuals, turbidity and bacterial results within the distribution system and some source water information.

Monthly water quality reports are generated by GVW water quality staff for IH each month. Monthly reports are sent to the DWO by the 15th day of the following month and posted on the RDNO website.

The annual water quality report is due on June 30 for the previous year. The annual report is sent to the DWO and posted on the RDNO website.

At this time, water quality notifications, water updates, and comprehensive results can be found on the RDNO website at www.rdno.ca. Customers can subscribe to receive announcements, media releases, and updates by email at https://www.rdno.ca/subscribe.

5 REFERENCES

Decision Tree for Responding to a Turbidity Event in Unfiltered Drinking Water, Ministry of Health, BC, April 2013.

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Drinking Water Protection Regulation, B.C. Reg. 200/2003 [includes amendments up to B.C. Reg. 87/2011, May 19, 2011].

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Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in British Columbia, Ministry of Health, BC, Version 1.2, *November 2012*

Federation of Canadian Municipalities & National Research Council. (2004). Monitoring water quality in the distribution system (InfraGuide Best Practice). Green Municipal Fund. https://greenmunicipalfund.ca/sites/default/files/DOCuments/resources/guide/infraguide-monitoring-water-quality-distribution-system-mamp.pdf

APPENDICES

APPENDIX A – Water Quality Maps of Sample Sites

Legend

Sampling Stations - Water System

- Duteau Creek
- Goose Lake
- Kalamalka Lake
- King Edward Lake
- Okanagan Lake
- Well
- GVW Boundary
- Watermains
- Parcels

O'Keefe Flushing Station
Golfview SS
Hwy 97 / Old Kamloops Rd SS
Highland Pl PRV 77
Goose Lake
Goose Lake Building
Sun Peaks PS
Rugg Rd SS
Foothills PS
PRV #109
Goose Lake PS
PV Rd SS
Marmot Court SS
6198 Brookside Road B/O
North BX #2 PS
North BX #1 PS
BX Park SS
Anderson Way SS
Haney Road SS
South BX #2
City Yard Fill Station (K)
PRV #2
Kin Race Track SS
4404 25 St SS
McMechan Pump Station
McMechan Reservoir
Boss Creek PS #2
Turtle Mountain PS
Vernon City Hall SS
Allenby Pump Station
Boss Creek PS #1

This map was compiled by RDNO, using data believed to be accurate; however, a margin of error is inherent in all maps. This product is distributed without warranties of any kind, either express or implied, including but not limited to warranties of sustainability or particular purpose or use.

GVW Sampling Stations - North

Plot Date: Jan 23, 2025

Scale: 1:50,000

0 2 4 8 Kilometers

Plot Size: 17" x 11"

REGIONAL DISTRICT NORTH OKANAGAN

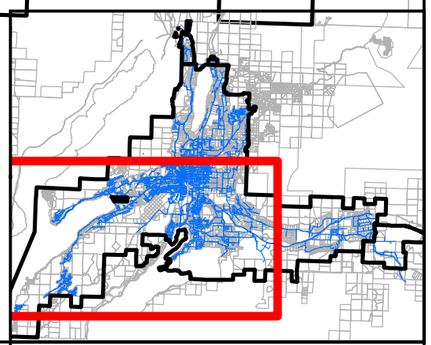
RDNO

Legend

Sampling Stations - Water System

- Duteau Creek
- Goose Lake
- Kalamalka Lake
- King Edward Lake
- Okanagan Lake
- Well
- GVW Boundary
- Watermains
- Parcels

Turtle Mountain PS
McMechan Reservoir
Boss Creek PS #2
Vernon City Hall SS
South BX #1
Boss Creek PS #1
1101 Galiano Road B/O
Balsam Reservoir
Dunsmuir SS
Allenby Pump Station
35th Street SS
2702 15 St SS
2001 43 St SS
Vernon Jubilee Hospital
Amber Dr SS
1802 Pottery Rd
Nordic House SS
Kosmina SS
Tronson Rd SS
Ok. Landing SS
Upland Dr SS
Ravine Pumphouse
Tavistock Reservoir
Kal View Meter SS
Mt Grady Crt SS
Mt. Ida PRV
RDNO Lab
PRV #24
Claremont SS
Mt Grady Rd SS
8844 Oxford Road SS
OK #1
Weeks Rd SS
Husband Rd PS
PRV #1
Mission Hill Water Treatment Plant
Venables / Northcott SS
16506 Kalamalka Road SS
Kal Lake PS
9007 Aberdeen Rd SS
Commonage PS
Braeburn Dr SS
Grey Rd Station
Kirkland Dr
Kidston Rd SS
DOC Public Works Yard
Well 1
West Kal Rd
Pine Dr PRV 16
Well 2
OK #2
Kalamalka Secondary
Coldstream Creek Rd SS
Palfrey SS
Cosens Bay Rd SS
Kokanee PS
Deer Creek
Ponderosa Lift Station
Cunliffe Reservoir
Brassy Place SS
Delcliffe Lake Station
Delcliffe Booster Station
Longspoon Crt SS
Outback Reservoir
Outback PS



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GVW Sampling Stations - West

Plot Date: Jan 23, 2025

Scale: 1:50,000

0 2 4 8 Kilometers

Plot Size: 17" x 11"

REGIONAL DISTRICT NORTH OKANAGAN

RDNO

Turtle Mountain PS
Vernon City Hall SS
South BX #1
Boss Creek PS #2
Boss Creek PS #1
Station
35th Street SS
2702 15 St SS
1101 Galiano Road B/O
43 St SS
Vernon Jubilee Hospital
1802 Pottery Rd
Nordic House SS
Kosmina SS
SS
Upland Dr SS
Ravine Pumphouse
Mt Grady Crt SS
16506 Kalamalka Road SS
Mt. Ida PRV
RDNO Lab
PRV #24
Mt Grady Rd SS
Husband Rd PS
PRV #1
ant
Venables / Northcott SS
Kal Lake PS
9007 Aberdeen Rd SS
Braeburn Dr SS
Grey Rd Station
Kirkland Dr
Kidston Rd SS
DOC Public Works Yard
Well 1
West Kal Rd
Pine Dr PRV 16
Well 2
Kalamalka Secondary
stream Creek Rd SS
Palfrey SS
Cosens Bay Rd SS
Deer Creek
Cunliffe Reservoir
Ponderosa Lift Station
Warren Rd PS
Antwerp PS
Lavington Superette
Springfield Rd SS
Bessette Station
Brewer PH
7446 Hwy 6 SS
Brewer Rd SS
DCWTP
Headgates Bldg

Legend

Sampling Stations - Water System

- Duteau Creek
- Goose Lake
- Kalamalka Lake
- King Edward Lake
- Okanagan Lake
- Well

GVW Boundary
Watermains
Parcels

This map was compiled by RDNO, using data believed to be accurate; however, a margin of error is inherent in all maps. This product is distributed without warranties of any kind, either express or implied, including but not limited to warranties of sustainability or particular purpose or use.

GVW Sampling Stations - East

Plot Date: Jan 23, 2025

Scale: 1:50,000

0 2 4 8 Kilometers

Plot Size: 17" x 11"

REGIONAL DISTRICT NORTH OKANAGAN
RDNO

Table 1 Domestic Potable Water Sources – Raw Water (untreated)

Intake / Source Year Round	Location	Sample Site Comment
Kalamalka Lake Intake	*13204 West Kal Road, Coldstream*	Sample station is located inside the Kalamalka Pump Station (PS)
Duteau Creek Intake	*95 Lewis Road, RDNO, Electoral Area "D"*	Sample site inside building at Duteau Creek Intake
Antwerp Springs PH 2	*6282 Highway 6, Coldstream*	Pre-chlorination (Emergency Well only)
Coldstream Ranch Well 3	Well located on Coldstream Ranch	Pre-chlorination (emergency Well only)

Table 2 Duteau Creek Watershed Sample Sites

Duteau Creek Watershed	Sample Site Comment
Haddo Weir	Sample on south side of weir. Outflow of Haddo Lake
Duteau Creek Bridge	Downstream of bridge at 12km on Haddo main
16 km Aberdeen Road Tributary	Off Aberdeen main – used to monitor impacts of increasing logging in Flyfish subbasin
18 km Aberdeen Road Tributary	Aberdeen main – downstream of culvert – Flyfish Creek

Table 3 Kalamalka Lake Watershed Sample Sites

Kalamalka Lake Watershed★ Coldstream Creek	Sample Site Comment
Coldstream Creek at Howe Drive	Downstream of the bridge
Coldstream Creek at Kirkland Drive	Upstream of the bridge
Coldstream Creek at Brewer Road	Downstream of bridge and the culvert
Coldstream Creek at School Road	Downstream of the bridge
Coldstream Creek at Coldstream Ranch	Downstream Hwy 6, upstream of feed lots
Coldstream Creek at Noble Canyon Bridge	Upstream of the bridge at 1.2km mark

Table 4 Irrigation Water Sources - Watershed and Sample Stations

Intake / Watershed Irrigation	Sample Site Comment
Deer Creek Intake Pond	Intake pond
King Edward Outflow	Dam structure outlet
Coldstream Ranch Well 3	Well located on Coldstream Ranch
Coldstream Ranch Well 2	Well located on Coldstream Ranch
Goose Lake Intake	Raw water copper line at intake building and the lake shore.

Table 5 Duteau Water Distribution Sites

Sample Site Name	**Site Description / Location**
6015 Highway 6	6015 Highway 6
7900 McClounie Road	7900 McClounie Road – Kalamalka Secondary School
Aberdeen Road SS	9007 Aberdeen Road
Boss Creek 1 PS Return	Boss Creek PH 1 (Lower) Return/Inlet
Boss Creek 2 PS Return	Boss Creek PH 2 (Upper) Return/Inlet
Braeburn Drive SS	8835 Braeburn Drive (PRV 270)
Brewer Road SS	6815 Brewer Road
Coldstream Creek Road SS	12408 Coldstream Creek Road
Cosens Bay Road SS	Cosens Bay Road and Grieves Drive
Cunliffe Reservoir SS	6910 Cunliffe Road
DCWTP Post Treatment	1014 Whitevale Road
East Dedecker Road SS	East Dedecker Road at the park
Foothills Booster	6805 Foothills Drive
Glenhayes Road SS	7899 Glenhayes Road
Golfview Place SS	466 Golfview Place
Goose Lake Road PS	6604 Goose Lake Road
Haney Road SS	located near SPCA
Highway 6 SS	7446 Highway 6

Sample Site Name	Site Description / Location
Husband Road PS	11701 Husband Road
Kosmina Road SS	1701 Kosmina Road
Marmot Court SS	364 Marmot Court
McMechan Booster	901 39 Avenue
Mt Grady Road SS	corner of Mt. Grady Court and Mt. Grady Road
Noble Canyon Road Hydrant	Noble Canyon
North BX 2 PS	6302 Apple Lane
Old Kamloops Road SS	Highway 97 and Old Kamloops Road
Palfrey Drive SS	Cunliffe Road and Palfrey Drive
Pine Road SS	Pine Road and Coldstream Creek Road SS
Pleasant Valley Road SS	6522 PV Road
Ponderosa Way SS	13900 Ponderosa Way
PRV 076	8101 Highland Place
PRV 1	8798 Buchanan Road
PRV 2	4714 Pleasant Valley Road
Ravine Drive PS	35 Ravine Drive
Redrock Road SS	7532 Redrock Road
Rugg Road SS	6926 Rugg Road
South BX 1 PS	3600 East Vernon Road
South BX 2 PS	5121 Dixon Dam
Springfield Road SS	5608 Petworth/Springfield
Sunpeaks Reservoir SS	7444 Sun Peaks Drive
Upland Drive SS	488 Upland Drive
Total Duteau Sites	**41**

Table 6 Kalamalka Lake Distribution Sites

Sample Site Name	Site Description / Location
15th Street SS	2702 15 Street
21st Avenue SS	2101 32 Street
25 Street SS	4404 25 St SS
30th Street SS	3402 - 30 Street
35 Street SS	2806 35 Street
3710 21st Avenue SS	3710 21 Avenue
43rd Street SS	2001 43rd Street SS
43rd Avenue SS	South End of Old Kamloops Road near 43rd Avenue on East side of Road
4714 Pleasant Valley SS	City Yard fill station at 4714 Pleasant Valley Road
58th Avenue SS	58 Avenue and 20 Street by Rona
Allenby PS	5715 Bella Vista Road
Amber Drive SS	7095 Amber Drive
Anderson Way SS	5100 Anderson Way
Balsam Reservoir SS	558 Balsam Court
Brassy Place SS	803 Brassy Place
College Way SS	Highway 97 and College Way
Dunsmuir Road SS	3025 Dunsmuir SS
Kidston Road SS	12101 Kidston Road
Kirkland Drive SS	7906 Kirkland Drive
Kokanee Booster	9320 Kokanee Road
Longacre Drive SS	6532 Longacre Drive
Longspoon Court SS	595 Longspoon Court
McMechan Reservoir SS	39 Avenue
MHWTP Post Treatment	3350 Reservoir Road
Mission Road SS	1400 Mission Road

Sample Site Name	Site Description / Location
Mt Grady Court SS	Mt Grady Court and Mt Grady Road
Okanagan Landing 1 PS	7864 Okanagan Landing Road
Okanagan Landing 2 PS	8979 Okanagan Landing Road
Okanagan Landing Road SS	5871 Okanagan Landing Road
Pottery Road SS	1802 Pottery Road
Tavistock Reservoir SS	9033 Tavistock Road
Tronson Road SS	Beachcomber Bay Road & Tronson Road
Turtle Mountain PS	3600 Turtle Mountain Blvd
Upper Commonage Booster	461 Commonage Road
Weeks Road SS	7540 Weeks Road
Total Kalamalka Sites	**36**

APPENDIX B - Parameters and Schedule

Sampling Schedule

Kalamalka Lake Intake

Parameter	Frequency
E. coli	Weekly
Total Coliform	Weekly
Total Nitrogen	Weekly (Feb–Jun & Oct–Nov); Quarterly
Total Phosphorous	Weekly (Feb–Jun & Oct–Nov); Quarterly
Dissolved Organic Carbon	Twice-Monthly
Total Organic Carbon	Twice-Monthly
Algae Density (RDNO Lab)	Monthly (May–Nov)
Chlorophyll A	Monthly (May–Nov)
Alkalinity (RDNO Lab)	Quarterly
Anions	Quarterly
Color Apparent (RDNO Lab)	Quarterly
Color True (RDNO Lab)	Quarterly
Hardness (RDNO Lab)	Quarterly
Hardness	Twice-Annually
Cyanide	Annually
Metals	Annually
Mercury	Annually
pH	Annually
Specific Conductance	Annually
Total Dissolved Phosphorous	Annually
Total Dissolved Solids	Annually
Total Kjeldahl Nitrogen	Annually
Turbidity	Annually
UV Apparent	Annually
UV True	Annually
Volatile Organic Carbon	Annually
Fuel Scan	Bi-Annual
Herbicides	Bi-Annual
Pesticides	Bi-Annual

Duteau Creek Intake

Parameter	Frequency
E. coli	Weekly
Total Coliform	Weekly
Total Nitrogen	Weekly (Feb–Jun & Oct–Nov); Quarterly
Total Phosphorous	Weekly (Feb–Jun & Oct–Nov); Quarterly
Total Organic Carbon	Monthly
Iron (RDNO Lab)	Monthly
Algae Density (RDNO Lab)	Monthly (May–Nov)
Chlorophyll A	Monthly (May–Nov)
Dissolved Organic Carbon	Quarterly
Anions	Quarterly
Total Kjeldahl Nitrogen	Twice-Annually
Alkalinity	Annually
Cyanide	Annually
Hardness	Annually
Metals	Annually
Mercury	Annually
pH	Annually
Specific Conductance	Annually
Total Dissolved Phosphorous	Annually
Total Dissolved Solids	Annually
Turbidity	Annually
UV Apparent	Annually
UV True	Annually

Mission Hill WTP Effluent

Parameter	Frequency
E. coli	Weekly
Total Coliform	Weekly
Dissolved Organic Carbon	Monthly
Total Organic Carbon	Monthly
Colour (apparent)	Quarterly
Sulfate	Quarterly

Duteau Creek WTP Effluent

Parameter	Frequency
E. coli	Weekly
Total Coliform	Weekly
Aluminum	Monthly
Total Organic Carbon	Monthly
Iron (RDNO Lab)	Monthly
Dissolved Organic Carbon	Quarterly

Kalamalka Distribution (Allenby PS) & Duteau Distribution (PRV 2)

Parameter	Frequency
E. coli	Quarterly
Total Coliform	Quarterly
Alkalinity (RDNO Lab)	Quarterly
Color Apparent (RDNO Lab)	Quarterly
Hardness (RDNO Lab)	Quarterly
Sulfate (RDNO Lab)	Quarterly
Cyanide	Twice-Annually
Dissolved Organic Carbon	Twice-Annually
Total Organic Carbon	Twice-Annually
Mercury	Twice-Annually
Molybdenum	Twice-Annually
Nitrite	Twice-Annually
Nitrate	Twice-Annually
pH	Twice-Annually
Potassium	Twice-Annually
Selenium	Twice-Annually
Sodium	Twice-Annually
Specific Conductance	Twice-Annually
Sulfate	Twice-Annually
Total Dissolved Phosphorous	Twice-Annually
Total Kjeldahl Nitrogen	Twice-Annually
Total Phosphorous	Twice-Annually
Turbidity	Twice-Annually
Uranium	Twice-Annually
UV Apparent	Twice-Annually
UV True	Twice-Annually
Zinc	Twice-Annually
Color True (RDNO Lab)	Twice-Annually

Distribution Sample Stations (4-week rotation)

Parameter	Frequency
E. coli	Weekly
Total Coliform	Weekly

Disinfection Bi-Product Monitoring

Parameter	Frequency
E. coli	Quarterly
Total Coliform	Quarterly
Trihalomethanes	Quarterly
Halo Acetic Acids	Quarterly

Coldstream Creek

Parameter	Frequency
E. coli	Weekly (Feb 15–Jun 30); Monthly
Total Coliform	Weekly (Feb 15–Jun 30); Monthly
Ammonia	Monthly
Chloride	Monthly
Sulphate	Monthly
Total Nitrogen	Monthly
Total Organic Carbon	Monthly
Total Phosphorous	Monthly

Duteau Watershed (Sampled Spring to Fall)

Parameter	Frequency
E. coli	Weekly
Total Coliform	Weekly
Chlorophyll A	Monthly (Haddo Weir Only)
Color Apparent (RDNO Lab)	Monthly (Haddo Weir Only)
Color True (RDNO Lab)	Monthly (Haddo Weir Only)
Total Organic Carbon	Monthly (Haddo Weir Only)
Total Nitrogen	Monthly (Haddo Weir Only)
Total Phosphorous	Monthly (Haddo Weir Only)
Alkalinity	Annual (Haddo Weir Only)
Anions	Annual (Haddo Weir Only)
Colour	Annual (Haddo Weir Only)
Cyanide	Annual (Haddo Weir Only)
Dissolved Organic Carbon	Annual (Haddo Weir Only)
Hardness	Annual (Haddo Weir Only)
Metals	Annual (Haddo Weir Only)
Mercury	Annual (Haddo Weir Only)
pH	Annual (Haddo Weir Only)
Specific Conductance	Annual (Haddo Weir Only)
Total Dissolved Phosphorous	Annual (Haddo Weir Only)
Total Dissolved Solids	Annual (Haddo Weir Only)
Total Kjeldal Nitrogen	Annual (Haddo Weir Only)
Turbidity	Annual (Haddo Weir Only)
UV254	Annual (Haddo Weir Only)

Coldstream Ranch Well 3

Parameter	Frequency
Alkalinity	Upon Start or Three Years
Anions	Upon Start or Three Years
Colour	Upon Start or Three Years
Cyanide	Upon Start or Three Years
E. coli	Upon Start or Three Years
Fuel Scan (HEPL/LEPL)	Upon Start or Three Years
Iron Reducing Bacteria/Sulfate Reducing Bacteria	Upon Start or Three Years
Hardness	Upon Start or Three Years
Herbicides	Upon Start or Three Years
Heterotrophic Plate Count	Upon Start or Three Years
Mercury	Upon Start or Three Years
Metals	Upon Start or Three Years
Pesticides	Upon Start or Three Years
pH	Upon Start or Three Years
Specific Conductance	Upon Start or Three Years
Total Coliforms	Upon Start or Three Years
Total Dissolved Phosphorous	Upon Start or Three Years
Total Dissolved Solids	Upon Start or Three Years
Total Kjeldahl Nitrogen	Upon Start or Three Years
Total Nitrogen	Upon Start or Three Years
Total Phosphorous	Upon Start or Three Years
Turbidity	Upon Start or Three Years
UV 254	Upon Start or Three Years
Volatile Organic Carbon	Upon Start or Three Years

Antwerp Springs

Parameter	Frequency
Alkalinity	Upon Start or Three Years
Anions	Upon Start or Three Years
Colour	Upon Start or Three Years
Cyanide	Upon Start or Three Years
E. coli	Upon Start or Three Years
Fuel Scan (HEPL/LEPL)	Upon Start or Three Years
Iron Reducing Bacteria/Sulfate Reducing Bacteria	Upon Start or Three Years
Hardness	Upon Start or Three Years
Herbicides	Upon Start or Three Years
Heterotrophic Plate Count	Upon Start or Three Years
Mercury	Upon Start or Three Years
Metals	Upon Start or Three Years
Pesticides	Upon Start or Three Years
pH	Upon Start or Three Years
Specific Conductance	Upon Start or Three Years
Total Coliforms	Upon Start or Three Years
Total Dissolved Phosphorous	Upon Start or Three Years
Total Dissolved Solids	Upon Start or Three Years
Total Kjeldahl Nitrogen	Upon Start or Three Years
Total Nitrogen	Upon Start or Three Years
Total Phosphorous	Upon Start or Three Years
Turbidity	Upon Start or Three Years
UV 254	Upon Start or Three Years
Volatile Organic Carbon	Upon Start or Three Years

Goose Lake

Parameter	Frequency
Algae Density (RDNO Lab)	Weekly (Apr 15–Sep 30)
Alkalinity	Bi-Annual
Anions	Bi-Annual
Chlorophyll A	Bi-Annual
Colour	Bi-Annual
Cyanide	Bi-Annual
Dissolved Organic Carbon	Bi-Annual
E.coli	Bi-Annual
Hardness	Bi-Annual
Mercury	Bi-Annual
Metals	Bi-Annual
pH	Bi-Annual
Specific Conductance	Bi-Annual
Total Coliform	Bi-Annual
Total Dissolved Phosphorous	Bi-Annual
Total Dissolved Solids	Bi-Annual
Total Kjeldahl Nitrogen	Bi-Annual
Total Nitrogen	Bi-Annual
Total Organic Carbon	Bi-Annual
Total Phosphorous	Bi-Annual
Turbidity	Bi-Annual
UV254	Bi-Annual

Deer Creek Intake Pond

Parameter	Frequency
Algae Density (RDNO Lab)	Bi-Annual
Alkalinity	Bi-Annual
Anions	Bi-Annual
Chlorophyll A	Bi-Annual
Colour	Bi-Annual
Cyanide	Bi-Annual
Dissolved Organic Carbon	Bi-Annual
E. coli	Bi-Annual
Hardness	Bi-Annual
Mercury	Bi-Annual
Metals	Bi-Annual
pH	Bi-Annual
Specific Conductance	Bi-Annual
Total Coliforms	Bi-Annual
Total Dissolved Phosphorous	Bi-Annual
Total Dissolved Solids	Bi-Annual
Total Kjeldahl Nitrogen	Bi-Annual
Total Nitrogen	Bi-Annual
Total Organic Carbon	Bi-Annual
Total Phosphorous	Bi-Annual
Turbidity	Bi-Annual
UV 254	Bi-Annual

Coldstream Ranch Well 2

Parameter	Frequency
Alkalinity	Five Years
Anions	Five Years
Colour	Five Years
Cyanide	Five Years
E. coli	Five Years
Fuel Scan (HEPL/LEPL)	Five Years
Iron Reducing Bacteria/Sulfate Reducing Bacteria	Five Years
Hardness	Five Years
Heterotrophic Plate Count	Five Years
Mercury	Five Years
Metals	Five Years
pH	Five Years
Specific Conductance	Five Years
Total Coliforms	Five Years
Total Dissolved Phosphorous	Five Years
Total Dissolved Solids	Five Years
Total Kjeldahl Nitrogen	Five Years
Total Nitrogen	Five Years
Total Phosphorous	Five Years
Turbidity	Five Years
UV 254	Five Years
Volatile Organic Carbon	Five Years

APPENDIX C: Sampling and Testing Procedures

Note: Appendix C to be added at a future date