ANNUAL WATER REPORT

2025

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INTRODUCTION

The District of Barriere is working to continually improve the water system and public awareness to meet the changing needs of our community.

Water safety is of the utmost importance to the District of Barriere. The supply of good, clean drinking water has been taken for granted by the general public in Canada until events such as the Walkerton E. Coli outbreak brought the safety of the water supply into the public eye.

This report has been submitted to Interior Health and is posted on the District of Barriere website: www.barriere.ca

We are dedicated to providing safe, clean water to the residents of Barriere as indicated in the following report.

WATER UTILITY OBJECTIVES

- To ensure adequate supply of high-quality water to the community.
- To effectively treat the raw water to provide potable water of integrity to the community.
- To ensure the adequate delivery of high-quality potable water to all points within the system for domestic and emergency purposes.
- To ensure effective management of all water system aspects and provide excellent customer service and information to the community.
- To manage water demand by effectively assessing and managing water losses from leakage in the system.
- To develop an effective water conservation program for operations and the wider community.
- To maintain water rates that encourage conservation and resource awareness while providing quality accessible water to consumers.

PROVINCIAL REQUIREMENTS

All drinking water in the water system must meet the Canadian Guidelines for Drinking Water Quality. In British Columbia, the Ministry of Health regulates water suppliers through the Drinking Water Protection Act. This legislation ensures safe drinking water in the Province. It requires that the water supplier monitor the drinking water source and distribution system to ensure compliance with the Drinking Water Protection regulations and report all results to the Health Authority. Water monitoring, inspection and testing, emergency response planning, cross connection control and security standards are all regulated for persons operating a water system.

Changes in water systems must be approved by the Interior Health Authority (IHA), and conform to the District's specifications.

Under the *BC Water Act*, the District must acquire licenses for withdrawal from water bodies.

Under the *Community Charter*, the District may, by bylaw, regulate, prohibit, and impose requirements in relation to municipal service and public health. The District must make reports available to the public on request regarding fees imposed under this section.

SUPPLY SOURCES

Community Water Plant – Spruce Crescent

The District of Barriere's potable water system is supplied by a system of three wells, one being constructed during the 1990s, the second in 2019 and the third most recently in 2022. All three wells are in the northeast quadrant of the community, adjacent to the Barriere River. Two deep wells (DW2 & DW3) are located at the north end of Spruce Crescent, and a third production well (PW1), is located on Bradford Road. The wells are summarized in Table 3.1 below. The location of these wells can be seen on the overall water system plan on the following page.

Table 3.1: Barriere's Supply Wells

Well	Year Built	Pumping Capacity (L/s)	Approximate Depth (m)	Known Issues Or Concerns
PW1 Bradford Park	2019	20	91	High Iron, Manganese
DW2 Spruce Crescent	1997	44	35	Limited lifespan
DW3 Spruce Crescent	2022	32	45	Manganese periodically found over the Aesthetic Objectives.

WATER TREATMENT

The well water is injected with a chlorine solution at the pump stations such that it contains an approximate free residual chlorine concentration of 1.0 mg/L adjacent to the pump stations and has been measured to 0.8 mg/L at the more remote parts of the system.
In terms of the Interior Health Authority requirements, this treatment is satisfactory in a ground water source that is not under the influence of surface water, as these types of supply are given credit for filtration. Referencing the 4-3-2-1-0 requirements, the chlorine addresses the 4 and the 0, while the fact that the Spruce Well supply is a non-GWUDI well appears to be protected by a confining layer and addresses points 3, 2, and 1.

RESERVOIR STORAGE

The North reservoir is a rectangular concrete tank with sloping sides and a capacity of 1,540m^3 (406,560 USG). It is located at the north end of the community adjacent to Barriere Lakes Road and has a free water level of 451 meters. A 350mm diameter supply main connects the reservoir with the rest of the system at the intersection of Lodgepole Road and Barriere Lakes Road.

The South reservoir is a rectangular concrete tank and has a capacity of 1,300m^3 (343,200 USG). It is located at the south end of the community near the top of Mountain Road and has a free water level of 451 meters. A 250mm diameter supply main connects the reservoir with the rest of the system at Mountain Road.

DISTRIBUTION SYSTEM

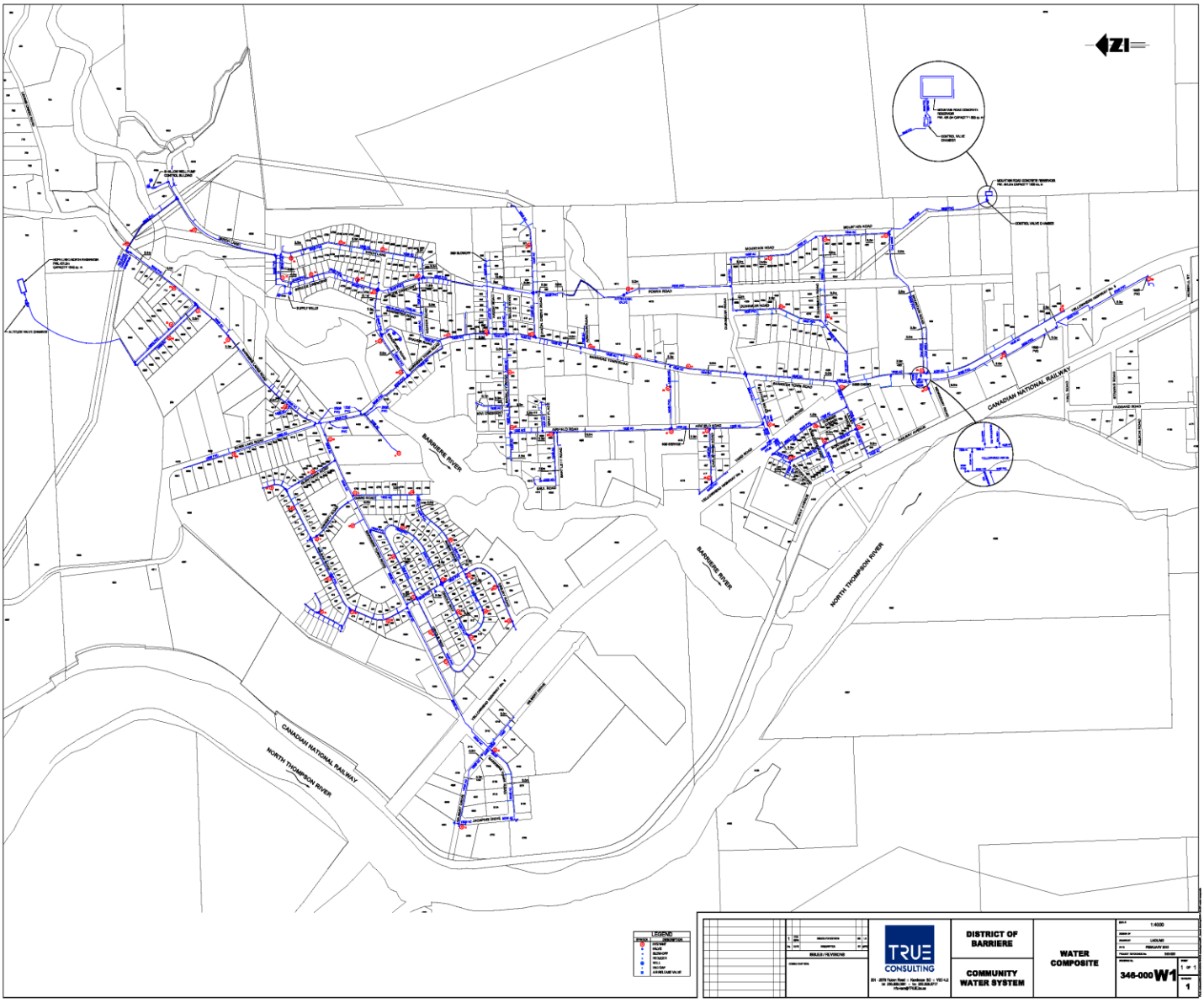
Approximately 25 Kilometers of watermain are connected to create the District of Barriere water system. The water system has been undergoing upgrades to ensure the water quality is safe for consumption. The first upgrades were from 1966 onwards when the pipes were asbestos cement. Beginning in the 1980's the pipes began to be upgraded to PVC due to the potential health risks of leakage from decaying asbestos cement pipe. The PVC pipes range in diameter from 100mm to 350mm and provide potable water to approximately 800 residential and 78 commercial service connections in Barriere.

The District irrigates four public parks (Fadear, Bradford, Oriole, Gray Place), four baseball fields, two green spaces, and the cemetery, during off-peak demand times using a total of 77 irrigation zones with an average of 3 sprinkler heads per zone. In addition, the school district operates and maintains irrigation for the three school fields in Barriere.

Several sections of pipe within the District's water supply system are undersized, limiting flows and negatively impacting fire protection and pressures in certain parts of the network. Piping has been upgraded along Barriere Town Road from Bradford Road to the intersection at Dunn Lake/Barriere Lakes Road, and from Barriere Town Road along Bradford Road to Spruce Crescent.

The water distribution system is also shown on the District's webmap at www.barriere.ca

WATER SUPPLY SYSTEM



WATER SAMPLING AND TESTING

Bacteriological:
As required by the Interior Health Authority (IHA), staff takes weekly water samples for bacteriological testing for total coliforms and e-Coli bacteria. There are 3 different sampling sites used throughout Barriere; North, Centre, and South.

Full Spectrum Analysis:
Water samples have been sent from the source water for a full spectrum analysis. Parameters such as alkalinity, metals, pH, turbidity, and hardness are tested. *SEE ATTACHMENT 4*

Summary:
In 2025 the District of Barriere had no positive bacteriological testing results pertaining to Total Coliforms or E.Coli and remained in compliance throughout the entire year of 2025. In 2022, the District began analyzing and tracking manganese levels on a more frequent basis to observe trends during different operating periods and times of the year.

EMERGENCY RESPONSE PLAN

The District of Barriere's Emergency Response Plan for the water system was updated in 2023. It identifies several potential emergencies that could occur and provides a systematic approach to how the District will deal with those emergencies. The plan is available for public viewing at the District Office, 4936 Barriere Town Road.

WATER QUALITY COMPLAINTS

The District of Barriere received few complaints in 2025 in respect to the quality of water being provided. Our community water wells, especially the Bradford wells have elevated iron and manganese levels, which once combined with chlorine create a brownish precipitate that showed up throughout the distribution system, therefore creating an aesthetically unpleasing water quality. Although the water was still safe for human consumption, the District of Barriere along with the Interior Health authority (IHA), continued maintaining the water quality advisory (WQA) that was implemented in 2019. However, with the onboarding of DW3, IHA removed the WQA in December of 2022 and therefore, is no longer in effect.

Most of the complaints received in 2025 were the result of this iron/manganese precipitate getting dislodged from the water mains during our annual hydrant flushing program. This is a temporary issue that clears upon running a household tap for a short period of time. District staff continue to conduct annual watermain flushing as part of our continued commitment to providing safe, clean drinking water.

In September 2025, due to a partial collapse of the well formation DW3 required rehabilitation. A company specializing in well development and rehab services was contracted to perform this work. The well was successfully rehabilitated and put back into service in October 2025. Staff have since observed an increase in flow from DW3 after the rehab was completed.

SYSTEM UPGRADES COMPLETED IN 2025

Barriere Water system

- Five new residential water services installed
- Seven residential water service line leaks were repaired.

POTENTIAL SYSTEM UPGRADES

- Biological manganese removal Water Treatment Plant.
- Complete source assessments for all water sources.
- Additional Production Well (DW4) as the municipalities' population grows.
- Upgrading the asbestos cement water main on Barriere Town Road, installed in 1966, from Bradford Rd. to Mountain Rd. to remove the bottleneck and balance North and South reservoirs.
- Continuing with watermain looping to eliminate dead ends and build resiliency.

CROSS CONNECTION CONTROL PROGRAM

The District of Barriere maintains a Cross Connection Control Program to prevent the potential backflow of non-potable water into the District's water distribution system. The Program is based on premises isolation to ensure there is a reliable barrier between private and public water systems. The program uses a priority approach with higher hazard ICI (Industrial, Commercial, and Institutional) service connections being first in line for inspections and compliance mandates, as well as residential connections with auxiliary water. The District of Barriere Water System Bylaw # 265 gives the District authority to implement this program.

Backflow prevention devices are documented and tracked by the District to ensure they are tested annually and in good working order. This annual testing must be carried out by a certified Backflow Assembly Tester. It is also worth noting that all residential outside hose bibs were confirmed to have vacuum breakers installed (2012) and all new builds are required to have them.

The District also monitors potential backflow situations through its water meter program. All service connections in the District must be metered. Our water meters will detect and flag backflow occurrences and provide additional information on time of occurrence, duration, and volume. If the situation were to occur, it would prompt immediate investigation and may trigger our Water System Emergency Response Plan.

2025 Summary Report

Total ICI Facilities/Premises (inc. District facilities and parks)	102
Total BFP's Tracked	45
Past Due Test Reports	24

Hazard (L/M/S)	Inspected Premises with CCs	Premises in Compliance
Sever	3	3
Moderate	7	7
Low	0	0
Total	10	10

The District will continue to improve and further implement its Cross Connection Control Program through inspections, tracking, program development and public education to eventually have all actual or potential cross connections identified and in compliance with our CCC Program.

OPERATOR CERTIFICATION

The District of Barriere currently employs three licensed operators, all in good standing with the EOCP. One Senior Utilities Specialist, who holds a Class 2 certification in Water Treatment and Water Distribution. One Utility Operator 2, who holds a Class 1 certification in Water Treatment and Water Distribution, and Chlorine Handling Certification. One Utility Operator 1, who holds a Class 2 certification in Water Distribution, and Chlorine Handling Certification. Our Utility Operator 2 is also the District of Barriere's cross connection control inspector and certified backflow assembly tester.

SUMMARY OF SOURCE WATER PROTECTION EFFORTS

The District of Barriere is currently working towards completing a wellhead protection plan to ensure a consistent effort is being made to protect our groundwater production wells. The wellhead protection plan assesses risks and makes recommendations with respect to source water protection. The plan notes that risks to production wells from activities within and outside the capture zone are perceived to be low. Another measure the District of Barriere has implemented is a property covenant on all surrounding residential homes which prohibits the use of fertilizers and pesticides. Further to this the District undertook a GWUDI/GARP study of its deep wells at the Spruce Crescent site to determine potential influences of the adjacent Barriere River. In addition, a Level I GARP Screening was completed for the Bradford PW1 in 2024 (See Attachment 4).

APPENDIX I

WATER CONSUMPTION (CUBIC METRES)

Month	2025 PW1	2025 DW2	2025 DW3	2024 PW1	2024 DW2	2024 DW3
January	332	13577	13493	270	12090	13169
February	850	14231	15318	261	15773	15697
March	326	14763	15045	218	22655	10899
April	271	15982	16399	541	12866	13072
May	387	20557	28319	237	19002	23695
June	3154	23939	37210	269	19911	25363
July	733	21009	36042	2016	25981	38358
August	417	21735	32427	3038	24134	30717
September	4865	36539	2934	167	17479	21405
October	2304	18354	4662	370	12725	12454
November	412	10100	9367	268	10770	11114
December	666	11884	11760	292	12178	12371

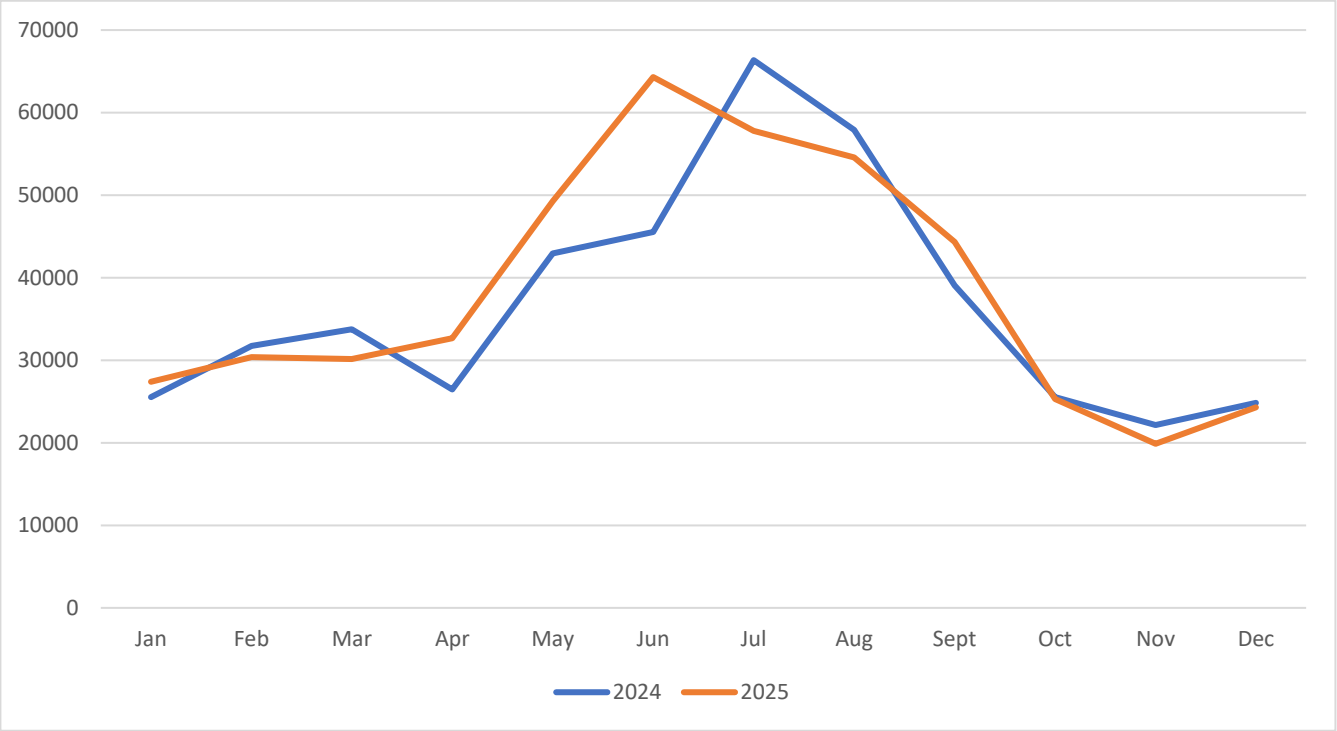
HISTORICAL ANNUAL WATER CONSUMPTION

Total Consumption for 2025: 460,363 cubic metres
Total Consumption for 2024: 441,825 cubic metres
Total Consumption for 2023: 435,260 cubic metres
Total Consumption for 2022: 382,660 cubic metres
Total Consumption for 2021: 386,849 cubic metres
Total Consumption for 2020: 312,417 cubic metres
Total Consumption for 2019: 452,792 cubic metres
Total Consumption for 2018: 552,371 cubic metres
Total Consumption for 2017: 601,764 cubic metres
Total Consumption for 2016: 462,902 cubic metres
Total Consumption for 2015: 538.725 cubic metres
Total Consumption for 2014: 536,108 cubic metres

APPENDIX II

WATER CONSUMPTION

2025 / 2024 Monthly Water Consumption



APPENDIX III

LOUIS CREEK INDUSTRIAL PARK (LCIP)

The District of Barriere has a small water system in the Louis Creek Industrial Park (LCIP) which is located 4 kilometers south of the town of Barriere. This water system serves only the businesses which are in the industrial park, along with 1 residential homeowner. The LCIP water system started production on June 1, 2020. The water main was extended in 2025 to service the remaining industrial lots.

The water system consists of a 50-gpm production well, and a pump house where disinfection occurs. District utility staff attend this site daily where chlorine levels and flows are monitored. Weekly bacteriological samples are collected for analysis from an outside independent laboratory.

LCIP had no positive bacteriological testing results pertaining to Total Coliforms or E. Coli and remained in compliance throughout the entire year of 2025.

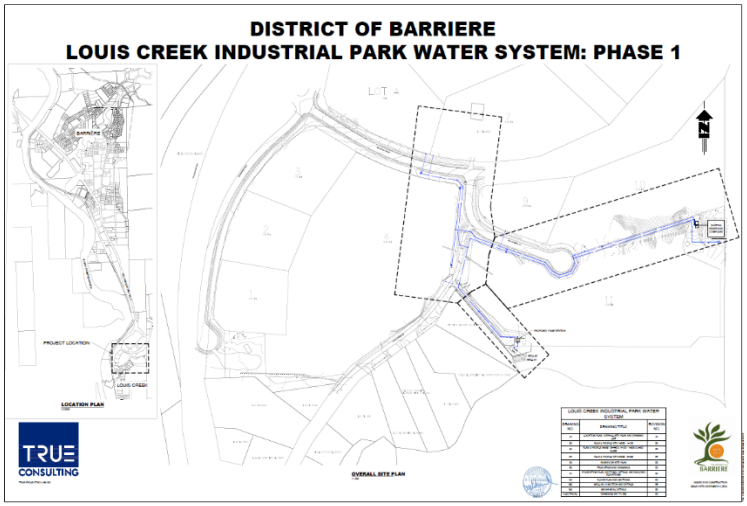
A 1,410 m^3 insulated steel reservoir including all underground piping and valves was installed and commissioned in 2023. The level sensor in the reservoir is powered using a 350-Watt solar panel. In addition, a 31 KVA diesel generator was installed at the pump house to provide backup power in case of an outage.

A full spectrum analysis of the raw water source was conducted in 2025, and is shown in Attachment 1 of this document.

LCIP WATER CONSUMPTION (CUBIC METERS)

Month	2025 LCIP	2024 LCIP
January	266	751
February	232	539
March	72	175
April	261	190
May	180	249
June	258	240
July	334	531
August	398	599
September	417	642
October	520	335
November	447	341
December	380	405

Total Consumption for 2025: 4,363 m3
Total Consumption for 2024: 4,997 m3



CERTIFICATE OF ANALYSIS

REPORTED TO	Interior Health Authority - Penticton 3090 Skaha Lake Rd Penticton, BC V2A 7H2		
ATTENTION	Ivor Norlin	**WORK ORDER**	25K0388
PO NUMBER		**RECEIVED / TEMP**	2025-11-04 10:03 / 6.3°C
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 13:06
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: https://www.caro.ca/terms-conditions

If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0388
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 13:06

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
F-2019-37616; Louis Creek Pumphouse (25K0388-01) | Matrix: Drinking Water | Sampled: 2025-11-03 10:40						
Anions						
Chloride	**2.48**	AO ≤ 250	0.10	mg/L	2025-11-06	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2025-11-06	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2025-11-06	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2025-11-06	
Sulfate	**38.2**	AO ≤ 500	1.0	mg/L	2025-11-06	
Calculated Parameters						
Hardness, Total (as CaCO3)	**234**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.5**	N/A	-5.0		2025-11-10	CT6
Solids, Total Dissolved	**272**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**229**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Bicarbonate (as CaCO3)	**229**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2025-11-06	
Conductivity (EC)	**458**	N/A	2.0	µS/cm	2025-11-06	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2025-11-06	
pH	**7.94**	7.0-10.5	0.10	pH units	2025-11-06	HT2
Temperature, at pH	**21.3**	N/A		°C	2025-11-06	HT2
Turbidity	**0.50**	OG < 1	0.10	NTU	2025-11-06	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2025-11-06	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2025-11-06	
Arsenic, total	**0.00116**	MAC = 0.01	0.00050	mg/L	2025-11-06	
Barium, total	**0.0076**	MAC = 2	0.0050	mg/L	2025-11-06	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2025-11-06	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010	mg/L	2025-11-06	
Calcium, total	**67.5**	None Required	0.20	mg/L	2025-11-06	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2025-11-06	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2025-11-06	
Copper, total	< 0.00040	MAC = 2	0.00040	mg/L	2025-11-06	
Iron, total	**0.111**	AO ≤ 0.1	0.010	mg/L	2025-11-06	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2025-11-06	
Magnesium, total	**15.8**	None Required	0.010	mg/L	2025-11-06	
Manganese, total	**0.0667**	MAC = 0.12	0.00020	mg/L	2025-11-06	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2025-11-12	
Molybdenum, total	**0.00256**	N/A	0.00010	mg/L	2025-11-06	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2025-11-06	
Potassium, total	**3.57**	N/A	0.10	mg/L	2025-11-06	

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0388
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 13:06

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
F-2019-37616; Louis Creek Pumphouse (25K0388-01) | Matrix: Drinking Water | Sampled: 2025-11-03 10:40, Continued						
Total Metals, Continued						
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2025-11-06	
Sodium, total	**4.71**	AO ≤ 200	0.10	mg/L	2025-11-06	
Strontium, total	**0.376**	MAC = 7	0.0010	mg/L	2025-11-06	
Uranium, total	< 0.000020	MAC = 0.02	0.000020	mg/L	2025-11-06	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2025-11-06	

Sample Qualifiers:

CT6	Results were based on lab temperature & lab pH.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0388
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 13:06

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	Nephelometry	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
AO	Aesthetic Objective
CU	Colour Units (referenced against a platinum cobalt standard)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0388
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 13:06

General Comments:

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Results in **Bold** indicate values that are above CARO's method reporting limits. Results in **red** indicate values above the regulatory limits where these have been included. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Regulatory limits are added to test reports on request and are as a convenience only. While CARO makes every effort to ensure accuracy of regulatory limits, CARO assumes no liability for the use of this information. It remains the client's responsibility to ensure that regulatory limits are correct for their circumstances.

CERTIFICATE OF ANALYSIS

REPORTED TO	Interior Health Authority - Penticton 3090 Skaha Lake Rd Penticton, BC V2A 7H2		
ATTENTION	Ivor Norlin	**WORK ORDER**	25K0397
PO NUMBER		**RECEIVED / TEMP**	2025-11-04 10:03 / 6.3°C
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:05
PROJECT INFO		**COC NUMBER**	No Number

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We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: https://www.caro.ca/terms-conditions

If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0397
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; Bradford Pumphouse (25K0397-01) | Matrix: Drinking Water | Sampled: 2025-11-03 10:15						
Anions						
Chloride	**0.73**	AO ≤ 250	0.10	mg/L	2025-11-06	
Fluoride	**0.16**	MAC = 1.5	0.10	mg/L	2025-11-06	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2025-11-06	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2025-11-06	
Sulfate	**30.1**	AO ≤ 500	1.0	mg/L	2025-11-06	
Calculated Parameters						
Hardness, Total (as CaCO3)	**226**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.6**	N/A	-5.0		2025-11-12	CT6
Solids, Total Dissolved	**271**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**245**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Bicarbonate (as CaCO3)	**245**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2025-11-06	
Conductivity (EC)	**462**	N/A	2.0	µS/cm	2025-11-06	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2025-11-06	
pH	**8.08**	7.0-10.5	0.10	pH units	2025-11-06	HT2
Temperature, at pH	**21.4**	N/A		°C	2025-11-06	HT2
Turbidity	**0.43**	OG < 1	0.10	NTU	2025-11-06	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2025-11-10	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2025-11-10	
Arsenic, total	**0.00627**	MAC = 0.01	0.00050	mg/L	2025-11-10	
Barium, total	**0.0378**	MAC = 2	0.0050	mg/L	2025-11-10	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2025-11-10	
Cadmium, total	**0.000020**	MAC = 0.007	0.000010	mg/L	2025-11-10	
Calcium, total	**51.1**	None Required	0.20	mg/L	2025-11-10	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2025-11-10	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2025-11-10	
Copper, total	**0.00164**	MAC = 2	0.00040	mg/L	2025-11-10	
Iron, total	**0.120**	AO ≤ 0.1	0.010	mg/L	2025-11-10	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2025-11-10	
Magnesium, total	**23.9**	None Required	0.010	mg/L	2025-11-10	
Manganese, total	**0.108**	MAC = 0.12	0.00020	mg/L	2025-11-10	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2025-11-12	
Molybdenum, total	**0.00342**	N/A	0.00010	mg/L	2025-11-10	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2025-11-10	
Potassium, total	**3.13**	N/A	0.10	mg/L	2025-11-10	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2025-11-10	

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0397
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; Bradford Pumphouse (25K0397-01) | Matrix: Drinking Water | Sampled: 2025-11-03 10:15, Continued						
Total Metals, Continued						
Sodium, total	**12.7**	AO ≤ 200	0.10	mg/L	2025-11-10	
Strontium, total	**0.477**	MAC = 7	0.0010	mg/L	2025-11-10	
Uranium, total	**0.000158**	MAC = 0.02	0.000020	mg/L	2025-11-10	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2025-11-10	

Sample Qualifiers:

CT6	Results were based on lab temperature & lab pH.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0397
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:05

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	Nephelometry	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
AO	Aesthetic Objective
CU	Colour Units (referenced against a platinum cobalt standard)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0397
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:05

General Comments:

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Results in **Bold** indicate values that are above CARO's method reporting limits. Results in **red** indicate values above the regulatory limits where these have been included. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Regulatory limits are added to test reports on request and are as a convenience only. While CARO makes every effort to ensure accuracy of regulatory limits, CARO assumes no liability for the use of this information. It remains the client's responsibility to ensure that regulatory limits are correct for their circumstances.

CERTIFICATE OF ANALYSIS

REPORTED TO	Interior Health Authority - Penticton 3090 Skaha Lake Rd Penticton, BC V2A 7H2		
ATTENTION	Ivor Norlin	**WORK ORDER**	25K0401
PO NUMBER		**RECEIVED / TEMP**	2025-11-04 10:03 / 6.3°C
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:12
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

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If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0401
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:12

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; Spruce DW 2 Pumphouse (25K0401-01) | Matrix: Drinking Water | Sampled: 2025-11-03 09:45						
Anions						
Chloride	**2.61**	AO ≤ 250	0.10	mg/L	2025-11-06	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2025-11-06	
Nitrate (as N)	**0.052**	MAC = 10	0.010	mg/L	2025-11-06	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2025-11-06	
Sulfate	**17.0**	AO ≤ 500	1.0	mg/L	2025-11-06	
Calculated Parameters						
Hardness, Total (as CaCO3)	**185**	None Required	0.500	mg/L	N/A	
Langelier Index	**-0.1**	N/A	-5.0		2025-11-10	CT6
Solids, Total Dissolved	**208**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**193**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Bicarbonate (as CaCO3)	**193**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2025-11-06	
Conductivity (EC)	**377**	N/A	2.0	µS/cm	2025-11-06	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2025-11-06	
pH	**7.56**	7.0-10.5	0.10	pH units	2025-11-06	HT2
Temperature, at pH	**21.4**	N/A		°C	2025-11-06	HT2
Turbidity	**0.17**	OG < 1	0.10	NTU	2025-11-06	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2025-11-08	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2025-11-08	
Arsenic, total	**0.00106**	MAC = 0.01	0.00050	mg/L	2025-11-08	
Barium, total	**0.0196**	MAC = 2	0.0050	mg/L	2025-11-08	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2025-11-08	
Cadmium, total	**0.000010**	MAC = 0.007	0.000010	mg/L	2025-11-08	
Calcium, total	**41.0**	None Required	0.20	mg/L	2025-11-08	
Chromium, total	**0.00088**	MAC = 0.05	0.00050	mg/L	2025-11-08	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2025-11-08	
Copper, total	**0.00474**	MAC = 2	0.00040	mg/L	2025-11-08	
Iron, total	< 0.010	AO ≤ 0.1	0.010	mg/L	2025-11-08	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2025-11-08	
Magnesium, total	**20.0**	None Required	0.010	mg/L	2025-11-08	
Manganese, total	**0.00266**	MAC = 0.12	0.00020	mg/L	2025-11-08	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2025-11-12	
Molybdenum, total	**0.00160**	N/A	0.00010	mg/L	2025-11-08	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2025-11-08	
Potassium, total	**1.70**	N/A	0.10	mg/L	2025-11-08	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2025-11-08	

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0401
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:12

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; Spruce DW 2 Pumphouse (25K0401-01) | Matrix: Drinking Water | Sampled: 2025-11-03 09:45, Continued						
Total Metals, Continued						
Sodium, total	**7.72**	AO ≤ 200	0.10	mg/L	2025-11-08	
Strontium, total	**0.259**	MAC = 7	0.0010	mg/L	2025-11-08	
Uranium, total	**0.00193**	MAC = 0.02	0.000020	mg/L	2025-11-08	
Zinc, total	**0.0103**	AO ≤ 5	0.0040	mg/L	2025-11-08	

Sample Qualifiers:

CT6	Results were based on lab temperature & lab pH.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0401
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:12

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	Nephelometry	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
AO	Aesthetic Objective
CU	Colour Units (referenced against a platinum cobalt standard)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0401
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:12

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CERTIFICATE OF ANALYSIS

REPORTED TO	Interior Health Authority - Penticton 3090 Skaha Lake Rd Penticton, BC V2A 7H2		
ATTENTION	Ivor Norlin	**WORK ORDER**	25K0409
PO NUMBER		**RECEIVED / TEMP**	2025-11-04 10:03 / 6.3°C
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:21
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

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If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0409
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:21

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; Spruce D.W 3 Pumphouse (25K0409-01) | Matrix: Drinking Water | Sampled: 2025-11-03 09:25						
Anions						
Chloride	**1.81**	AO ≤ 250	0.10	mg/L	2025-11-06	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2025-11-06	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2025-11-06	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2025-11-06	
Sulfate	**29.5**	AO ≤ 500	1.0	mg/L	2025-11-06	
Calculated Parameters						
Hardness, Total (as CaCO3)	**217**	None Required	0.500	mg/L	N/A	
Langelier Index	**0.4**	N/A	-5.0		2025-11-10	CT6
Solids, Total Dissolved	**254**	AO ≤ 500	1.00	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	**230**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Bicarbonate (as CaCO3)	**230**	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2025-11-06	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	2025-11-06	
Conductivity (EC)	**439**	N/A	2.0	µS/cm	2025-11-06	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	2025-11-06	
pH	**7.94**	7.0-10.5	0.10	pH units	2025-11-06	HT2
Temperature, at pH	**21.4**	N/A		°C	2025-11-06	HT2
Turbidity	**0.56**	OG < 1	0.10	NTU	2025-11-06	
Total Metals						
Aluminum, total	**0.0187**	OG < 0.1	0.0050	mg/L	2025-11-06	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2025-11-06	
Arsenic, total	**0.00167**	MAC = 0.01	0.00050	mg/L	2025-11-06	
Barium, total	**0.0234**	MAC = 2	0.0050	mg/L	2025-11-06	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2025-11-06	
Cadmium, total	**0.000015**	MAC = 0.007	0.000010	mg/L	2025-11-06	
Calcium, total	**48.6**	None Required	0.20	mg/L	2025-11-06	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2025-11-06	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2025-11-06	
Copper, total	**0.00489**	MAC = 2	0.00040	mg/L	2025-11-06	
Iron, total	**0.049**	AO ≤ 0.1	0.010	mg/L	2025-11-06	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2025-11-06	
Magnesium, total	**23.1**	None Required	0.010	mg/L	2025-11-06	
Manganese, total	**0.0341**	MAC = 0.12	0.00020	mg/L	2025-11-06	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2025-11-12	
Molybdenum, total	**0.00201**	N/A	0.00010	mg/L	2025-11-06	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2025-11-06	
Potassium, total	**1.98**	N/A	0.10	mg/L	2025-11-06	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2025-11-06	

TEST RESULTS

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0409
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:21

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
0660203; Spruce D.W 3 Pumphouse (25K0409-01) | Matrix: Drinking Water | Sampled: 2025-11-03 09:25, Continued						
Total Metals, Continued						
Sodium, total	**8.33**	AO ≤ 200	0.10	mg/L	2025-11-06	
Strontium, total	**0.386**	MAC = 7	0.0010	mg/L	2025-11-06	
Uranium, total	**0.00140**	MAC = 0.02	0.000020	mg/L	2025-11-06	
Zinc, total	**0.0119**	AO ≤ 5	0.0040	mg/L	2025-11-06	

Sample Qualifiers:

CT6	Results were based on lab temperature & lab pH.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0409
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:21

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Colour, True in Water	SM 2120 C (2021)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2021)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	Nephelometry	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
AO	Aesthetic Objective
CU	Colour Units (referenced against a platinum cobalt standard)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Interior Health Authority - Penticton	**WORK ORDER**	25K0409
PROJECT	Comprehensive 2025 for Ivor Norlin	**REPORTED**	2025-11-12 15:21

General Comments:

The results in this report apply to samples received by CARO and analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety and must not be modified. CARO is not responsible for losses or damages resulting directly or indirectly from errors or omissions in the conduct of the testing. Any liability is limited to the cost of analysis. CARO will dispose of all samples within 30 days of sample receipt, unless otherwise agreed. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Results in **red** indicate values above the regulatory limits where these have been included. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Regulatory limits are added to test reports on request and are as a convenience only. While CARO makes every effort to ensure accuracy of regulatory limits, CARO assumes no liability for the use of this information. It remains the client's responsibility to ensure that regulatory limits are correct for their circumstances.

Interior Health Authority

Printed on: July 25, 2025
1:41 PM

Kamloops Health Centre
519 Columbia Street
Kamloops BC V2C 2T8
Canada

(250) 851-7340

Interior Health Authority

Facility Inspected:		**Inspection #:**	I-2025-211518-211518
District of Barriere Water System		**Inspection Date:**	03-Jul-2025 10:30
Attention:	District of Barriere	**Completed Date:**	03-Jul-2025 13:00
		Inspected By:	Diana Tesic-Nagalingam
Site Address:	Hwy 5 N Barriere BC V0E 1E0	**Facility Type:**	District Municipality - Community LW
		Risk Rating:	Invalid
Site Phone:	(250) 672-9751	**Inspection Type:**	Monitoring
Site Fax:	(250) 672-9708	**Inspection Reasons:**	Monitoring
Site Email:	cmatthews@barriere.ca	**Infractions:**	1
		Delivery Method:	Email

Opening Comments and Observations:
Routine inspection.

N/A = Not Applicable No = No Yes = Yes

District Municipality - Community LW

LW1 - Core

LW1.1 - Are the water system details up to date? Yes

District Municipality - Community LW - LW - Distribution & Storage

LWD1 - Water - Distribution & Storage

LWD1.1 - Is the water system preparing or following a Cross Connection Control Program? Yes

Response: All new ICI developments are required to be inspected for Cross-connections.
Existing backflow prevention devices are documented and tracked by the District to ensure they are tested annually and in good working order.
As per the Annual Water Quality Monitoring Report, the District tracks all the backflow events noted by the reverse flow of water meters. Any backflow event will trigger Emergency Response.

LWD1.2 - Does the water system follow a distribution system maintenance and protection plan or otherwise conduct routine maintenance of the distribution system? Yes

Hydrants are flushed annually. Leak detection/subsequent repairs of the distribution are completed.

District Municipality - Community LW - LW - Emergency Response

LWE1 - Emergency Response

LWE1.1 - Does the Water Supplier have a written emergency response plan and contingency plan? [DWPA Section 10 & 15(a), DWPR Section 13] Yes

Response: Emergency response plan was updated in 2023. Contact list should be reviewed and updated annually or as needed.

LWE1.2 - Does the water system have a system that will notify operators of a process failure or breach of the system? Yes

SCADA system is completed.

District Municipality - Community LW - LW - Monitoring & Reporting

LWM1 - Monitoring & Reporting

LWM1.1 - Is the Water Supplier monitoring its source water and the drinking water it provides for the parameters, and at the frequency, established by the regulations and by its operating permit? [DWPA Section 11] Yes

Response: Include, to your Water Quality Monitoring Program, periodic sampling for manganese and pathogen indicators for Spruce Crescent wells currently in use.

LWM1.2 - Does the Water Supplier prepare and make public an Annual report? [DWPA Section 15(b), DWPR Section 11] Yes

Response: Annual Water Quality Monitoring Report for 2024 is posted on the public website.

LWM1.3 - Is the distribution system manually monitored for chlorine? Yes

LWM1.4 - Is the distribution system manually monitored for turbidity? Yes

LWM1.5 - Are the Point of Entry / Point of Use devices being maintained and monitored? N/A

District Municipality - Community LW - LW - Operations & Management

LWO1 - Operations & Management

LWO1.1 - Does the Water Supplier hold a valid Operating Permit? Yes

LWO1.2 - Does the water system have a Water Master Plan, or acceptable planning process, to achieve compliance with Provincial Treatment Objectives? Yes

LWO1.3 - Does the water system have an Asset Management Plan? **No**

There was a discussion to initiate the Asset Management process for the utility infrastructure.

Follow up by: 24-Jul-2026

- *LWO1.3A - An Asset Management Plan is beneficial to a water system to plan for capital costs associated with infrastructure improvements and replacement*

LWO1.4 - Does the water system have an Operator certified to the Treatment Classification of the system? [DWPA Section 9, DWPR Section12] Yes

The facility is classified as a WT Level 2

Response: Currently (operator certification level may change in the near future) there is one operator certified as a Level 2 WT, one with Level 1 WT, and one OIT.

LWO1.5 - Does the water system have an Operator certified to the Distribution Classification of the system? [DWPA Section 9, DWPR Section12] Yes

The facility is classified as a WD Level 2.

Response: Currently there are two operators with Level 2 WD certification and one operator with Level 1 WD.

LWO1.6 - Does the Water Supplier have a succession plan to train, recruit and retain staff at the required certification levels? Yes

District Municipality - Community LW - LW - Source

LWS1 - Source

LWS1.1 - Has a source assessment been prepared for each source? Yes

Preliminary Stage 1 GARP study of the PW1 and DW2 and DW3 by a hydrogeologist indicates that the water sources are at low risk of being GARP due to confining layer in the aquifer. However, the wells are located within 300 m of a source of probable enteric viral contamination (river, force mains, OWWT, etc.) and existence of a barrier to viral transport is at question. As per the Assessment, the existing practice of primary disinfection with (sufficient) contact time (for virus reduction) and maintaining a chlorine residual in the distribution system should remain in place.

Response: Source assessment is intended to help water suppliers develop a better understanding of the risks to drinking water safety and availability. It also can help suppliers operate more effectively in working to ensure the best possible water quality and assured quantity.

LWS1.2 - Has a source assessment response plan been prepared for each source? Yes

Source response plan is available for Spruce Crescent deep wells.

LWS1.3 - Is the system following their assessment response plan?

LWS1.4 - Has a Ground water At Risk of containing Pathogens (GARP) assessment been completed? Yes

Stage 1 assessment has been completed for both well fields.
Stage 2 assessment is underway for the Spruce Crescent wells.

Response: Consider also including risks (and response to risks) to 200-Year floods for the Spruce Crescent well fields if not already included as part of the assessment.

District Municipality - Community LW - LW - Treatment

LWT1 - Treatment

LWT1.1 - Does the water treatment plant(s) (WTP) meet the Drinking Water Treatment Objectives (Microbial) for Surface Water? N/A

LWT1.2 - Do the conditions for filtration exemption of the Drinking Water Treatment Objectives (Microbial) for Surface Water continue to be met? N/A

LWT1.3 - Does the water treatment plant (WTP) meet the Provincial Treatment Objectives (Microbial) for Ground Water Supplies? Yes

Provided that sufficient CT is achieved for 4 log virus reduction.

LWT1.4 - Do the conditions for filtration exemption of the Drinking Water Treatment Objectives (Microbial) for Ground Water continue to be met? Yes

Conditions for filtration exemption are supported by continuous assessment of water supply conditions, specifically with respect to bacteriological water sampling, average daily turbidity levels (around 1 NTU), and watershed control program maintained that minimizes the potential for fecal contamination in the source water.

Response: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/how-drinking-water-is-protected-in-bc/dwog_part_b_-_5_surface_water_treatment_objectives.pdf

Actions Taken

Actions Taken:

Facility Contact: District of Barriere
Facility Address: Hwy 5 N, Barriere BC V0E 1E0 Canada

- Site visit

Closing Comments:

- During the annual hydrant flushing program please notify affected population during the short maintenance period of the increased turbidity and to flush the cold water lines until the turbidity is acceptable following the maintenance works
- One of the recommendations from the Stage 1 GARP assessment is to install a water level transducer to monitor continuous pumping and static water levels on an ongoing basis, as a means for measuring the long-term effect of operating a production well in the aquifer.
- Consider funding applications for the connection of the two MHP to the District's distribution system and treatment for manganese (DW1, DW2, DW3, and PW1). More discussion on both issues will be included in the Conditions of Permit

Received By:

Chris Matthews

Inspector:

Diana Tesic-Nagalingam, Specialist EHO

Interior Health Authority

Printed on: July 25, 2025
1:57 PM

Kamloops Health Centre
519 Columbia Street
Kamloops BC V2C 2T8
Canada

(250) 851-7340

Interior Health Authority

Facility Inspected:
Louis Creek Industrial Park

Attention: District of Barriere

Site Address: Louis Creek Rd
Louis Creek BC V0E 2E0

Site Phone: (250) 672-9751
Site Fax: (250) 672-9708
Site Email: pamos@barriere.ca

Inspection #: I-2025-212338-212338
Inspection Date: 03-Jul-2025 13:00
Completed Date: 03-Jul-2025 14:00
Inspected By: Diana Tesic-Nagalingam
Facility Type: District Municipality - Community SW
Risk Rating: Invalid
Inspection Type: Monitoring
Inspection Reasons: Monitoring
Infractions: 2

Delivery Method: Email

Opening Comments and Observations:
Routine inspection.

Yes = Yes N/A = Not Applicable No = No

District Municipality - Community SW

SW1 - Core

SW1.1 - Are the water system details up to date? Yes

District Municipality - Community SW - SW - Distribution & Storage

SWD1 - Distribution & Storage

SWD1.1 - Is the water system preparing or following a Cross Connection Control Program? Yes

Response: All, but one connection, is of industrial type. Cross-connection control is necessary.

SWD1.2 - Does the water system follow a distribution system maintenance and protection plan or otherwise conduct routine maintenance of the distribution system? Yes

District Municipality - Community SW - SW - Emergency Response

SWE1 - Emergency Response

SWE1.1 - Does the Water Supplier have a written emergency response plan and contingency plan? [DWPA Section 10 & 15(a), DWPR Section 13] Yes

SWE1.2 - Does the water system have a system that will notify operators of a process failure or breach of the system? Yes

Response: SCADA system is in place.

Facility Contact: District of Barriere
Facility Address: Louis Creek Rd, Louis Creek BC V0E 2E0 Canada

District Municipality - Community SW - SW - Monitoring & Reporting

SWM1 - Monitoring & Reporting

SWM1.1 - Is the Water Supplier monitoring its source water and the drinking water it provides for the parameters, and at the frequency, established by the regulations and by its operating permit? [DWPA Section 11] — Yes

SWM1.2 - Does the Water Supplier prepare and make public an Annual report? [DWPA Section 15(b), DWPR Section 11] — Yes

Information on the District's owned small water system is included in the Annual Water Quality Monitoring Report for the District of Barriere community water system.

SWM1.3 - Is the distribution system manually monitored for chlorine? — Yes

SWM1.4 - Is the distribution system manually monitored for turbidity? — Yes

SWM1.5 - Are the Point of Entry / Point of Use devices being maintained and monitored? — N/A

District Municipality - Community SW - SW - Operations & Management

SWO1 - Operations & Management

SWO1.1 - Does the Water Supplier hold a valid Operating Permit? — Yes

SWO1.2 - Does the water system have a Water Master Plan, or acceptable planning process, to achieve compliance with Provincial Treatment Objectives?

SWO1.3 - Does the water system have an Asset Management Plan?

Response: Infrastructure assets should be added to the master Asset Management Plan

SWO1.4 - Does the water system have an Operator certified to the Treatment Classification of the system? [DWPA Section 9, DWPR Section12] — Yes

System is classified as a SWS.

SWO1.5 - Does the water system have an Operator certified to the Distribution Classification of the system? [DWPA Section 9, DWPR Section12]

SWO1.6 - Does the Water Supplier have a succession plan to train, recruit and retain staff at the required certification levels? — Yes

District Municipality - Community SW - SW - Source

SWS1 - Source

SWS1.1 - Has a source assessment been prepared for each source? — **No**

Follow up by: 25-Jul-2026

SWS1.2 - Has a source assessment response plan been prepared for each source?

SWS1.3 - Is the system following their assessment response plan?

SWS1.4 - Has a Ground water At Risk of containing Pathogens (GARP) assessment been completed? **No**

Follow up by: 25-Jul-2026

District Municipality - Community SW - SW - Treatment

SWT1 - Treatment

SWT1.1 - Does the water treatment plant(s) (WTP) meet the Drinking Water Treatment Objectives (Microbial) for Surface Water? N/A

SWT1.2 - Do the conditions for filtration exemption of the Drinking Water Treatment Objectives (Microbial) for Surface Water continue to be met? N/A

SWT1.3 - Does the water treatment plant (WTP) meet the Provincial Treatment Objectives (Microbial) for Ground Water Supplies? Yes

Water treatment is chlorination with contact time (reservoir).

SWT1.4 - Do the conditions for filtration exemption of the Drinking Water Treatment Objectives (Microbial) for Ground Water continue to be met? Yes

Conditions for filtration exemption are supported by continuous assessment of water supply conditions, specifically with respect to bacteriological water sampling, average daily turbidity levels (around 1 NTU), and watershed control program maintained that minimizes the potential for fecal contamination in the source water.

Response: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/how-drinking-water-is-protected-in-bc/dwog_part_b_-_5_surface_water_treatment_objectives.pdf

Actions Taken

Actions Taken:

- Site visit

Closing Comments:

- Plan is to complete the extension of the distribution line to supply remainder of lots within the Industrial park.
- Water users should have the access to the water quality data (bacteriological and chemical)

Received By:

Paul Amos

Inspector:

Diana Tesic-Nagalingam, Specialist EHO

western water ASSOCIATES LTD

TECHNICAL MEMORANDUM

TO: Chris Matthews, AScT
District of Barriere
PO Box 219 - 4936 Barriere Town Road
Barriere, BC V0E 1E0

DATE: November 12, 2025

WWAL REFERENCE: 20-105-05VR

FR: Paul Williamson, M.Sc., P.Geo. (Western Water Associates Ltd.)

RE: **District of Barriere DW3 Well Assessment**

The District of Barriere operates the Spruce Crescent wellfield that sources groundwater from two production wells: DW2, installed in 1997, and DW3, completed in 2021. Western Water Associates Ltd. (WWAL) was the hydrogeological consultant during the installation and testing of DW3 and has assisted the District with several other groundwater related projects including the Spruce Crescent wellfield GARP assessment, licencing of the Bradford wellfield, and annual monitoring of the Spruce Crescent wells.

In September 2025, turbidity issues in DW3 forced operators to take the production well offline. A review of the results from specific capacity testing (a measure of a well's efficiency) conducted in June 2025 indicated a decline of more than 60% from when the well was first tested in April 2021. As a result, WWAL recommended that the District move forward with a rehabilitation/redevelopment program for DW3 using the "surge and bail" method with a cable-tool drill rig.

Precision Service & Pumps was retained by the District to complete the rehabilitation program, which was carried out from September 26 to October 4, 2025. Precision reported heavy inflow of fine-grained sediments over the first several days of redevelopment but noted a marked improvement in the well's specific capacity after each day. Based on the day sheets provided by Precision, a total of 54 hours was spent redeveloping the well (not including travel, set up, or test pumping). At the conclusion of the redevelopment work, Precision also completed a series of brief pumping tests, which demonstrated the well was capable of operating without producing elevated spikes of turbidity.

On October 24, 2025, District operators conducted a follow-up specific capacity test on the production well after the the water system had been operational for several days. The test was conducted in the same fashion as the one in June, thereby providing a means for quantifying the post-rehabilitation improvement in the well. Table 1 below provides a summary of the initial and most recent specific capacity tests, while attached Figure 1 provide water level drawdown data from each of the three testing events. Although the 2025 pumping tests were conducted at the same pumping rate (31.9 L/s), the well was tested at a higher pumping rate in 2021. As a result, the 2021 results are not a perfect match for those generated in 2025.

Table 1 – Summary of Specific Capacity Testing Results

Well ID	Date	Duration (minutes)	Flow Rate	Drawdown (at end of test)	Specific Capacity
DW3	April 2021	60	37.9 L/s (600 US gpm)	6.32 m (20.7 ft)	6.0 L/s/m (28.9 US gpm/ft)
	June 2025	60	31.9 L/s (506 US gpm)	14.69 m (48.2 ft)	2.2 L/s/m (10.5 US gpm/ft)
	Sept 2025	60	31.9 L/s (506 US gpm)	4.39 m (14.4 ft)	7.3 L/s/m (35.1 US gpm/ft)

The results from the two 2025 specific capacity tests indicate the rehabilitation program produced a significant improvement in the well's efficiency. For the post redevelopment test, the amount of water level drawdown induced by pumping over the 60 minute duration was reduced by more than 10 m when compared to the predevelopment test. Additionally, the well's specific capacity increased by more than 200% in comparison to the predevelopment test and reached a level that exceeded the value measured in initial 2021 assessment.

Overall, the rehabilitation program was successful, to the point where the well can now likely be pumped at rate similar to the original design flow of 44.2 L/s (700 US gpm). If increasing the flow rate is desired, WWAL recommends taking an incremental approach, as follows:

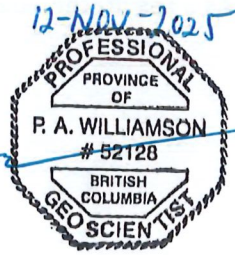
- Operate the well for one to two weeks at its current pumping rate (31.9 L/s, 506 US gpm), while monitoring turbidity and sand production at the wellhead.
- Assuming no issues arise, incrementally increase the flow rate to 33.1 L/s (525 US gpm) and monitor turbidity and sand production at the wellhead over the period of at least one week.
- If the well continues to perform without issue, the flow rate can be adjusted upward on a weekly basis by increments of 1.6 L/s (25 US gpm) followed by turbidity and sand production monitoring.

If any issues arise during the flow adjustment program, please reach out to WWAL to discuss next steps. Ongoing performance testing of the well should be maintained on an annual basis to identify any future reduction in the well's specific capacity.

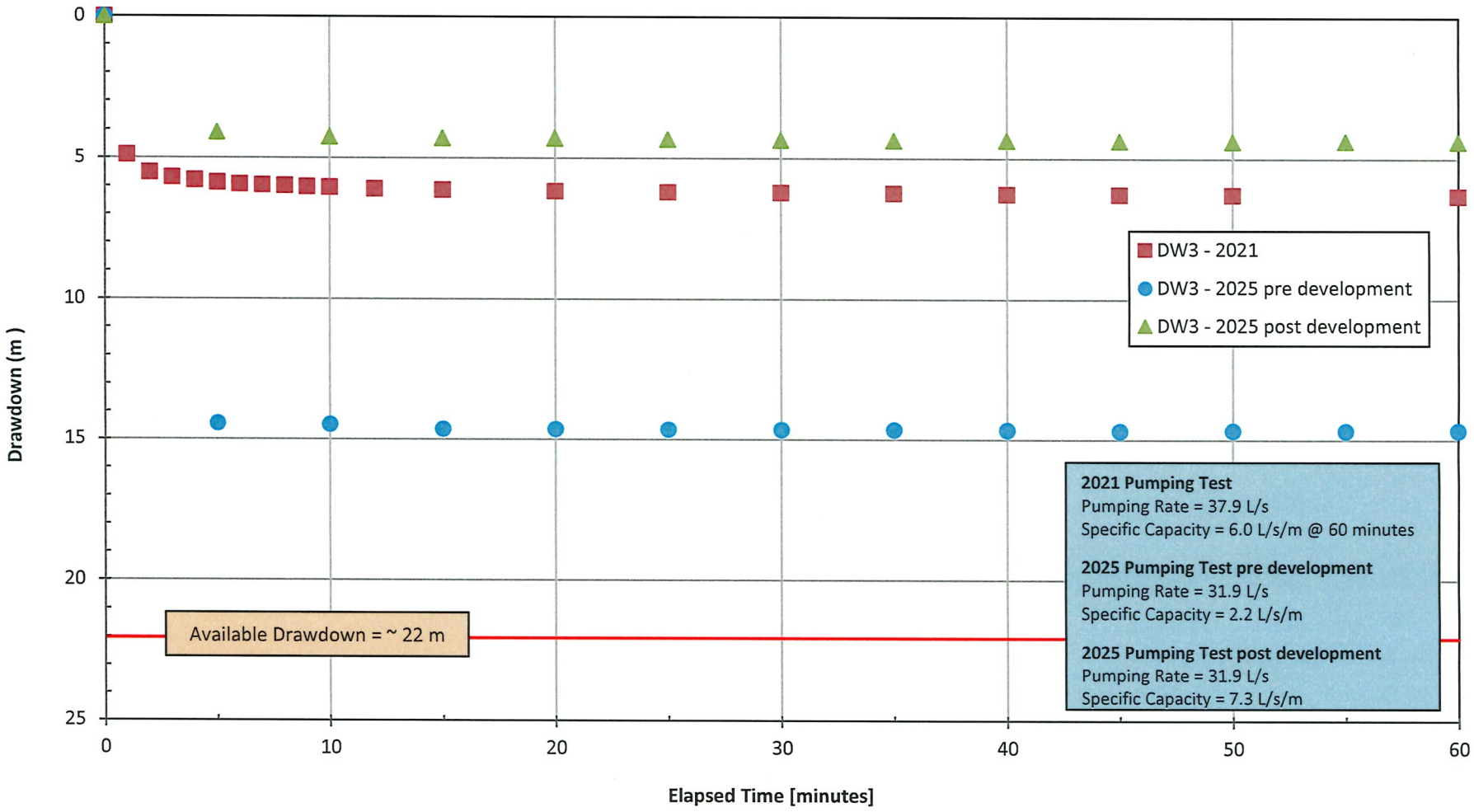
We trust that the professional opinions and advice presented in this document are sufficient for your current requirements.

Western Water Associates Ltd.
(EGBC Permit to Practice No. 1001419)

12-NOV-2025



Paul Williamson, M.Sc., P.Geo.
Hydrogeologist



District of Barriere
DW3 Rehabilitation

TITLE

Figure 1 - Specific Capacity Testing for DW3

western water ASSOCIATES LTD
Consultants in Hydrogeology and Water Resources Management

DRAWN	PW	DATE	October 27, 2025	JOB NO.	20-105-05VR
CHECKED	RR	SCALE	n/a	DWG. NO.	n/a
REVIEWED		FILE NO.		FIGURE NO.	