Hy-Geo Consulting
www.hy-geo.com
Tel: (250) 744-7859 Victoria, British Columbia Canada

File: 2306071

August 3, 2023

Judy Hayes
Galiano Island BC

Attention: Judy Hayes

Re: Groundwater Supply for Proposed Subdivision of 490 Gardner Way, Galiano Island

As requested, Hy-Geo Consulting has completed a review of two pumping tests conducted on bedrock wells (WID 69176) and WID 69177) for the above property. An unregistered dug well also located on the property, was not tested. The two pumping tests were conducted on the bedrock wells in order to meet the requirements of *Standards for Potable Water Supply, Sections 13.24 to 13.29* under *Galiano Island Land Use Bylaw, No. 127, 1999* (Galiano Island Local Trust Committee, 2023). The minimum water requirements are 2275 L/day for a single residence. This quantity is equivalent to a pumping rate of 0.42 USgpm (1.58 L/min).

Site Location

The property proposed for subdivision into 2 lots is situated at the southeastern end of Galiano Island approximately 0.6 kilometres southwest of Murcheson Cove (Figures 1 and 2). The property is currently designated as PID 4695844 and comprises 13.43 hectares. The property is situated along a gentle relatively uniform west-facing slope between elevations of 70 to 45 metres above sea level (Figure 3). Surface drainage is towards the west and northwest into a regional lowland area via drainage ditches. A small excavated pond is situated in the western portion of the property (Figure 3). Reported nearby well locations mapped under the *British Columbia Water Resources Atlas* (Province of British Columbia, 2023a), are shown in Figure 1. The wells are all situated within the *Murcheson-Whaler Bay Groundwater Region* delineated by Kohut and Johanson (1998).

Climate

The climate of Galiano Island is characterized by cool dry summers and humid mild winters. With the absence of a current climate station on Galiano Island, the Saturna Campon climate station (ID 1017098) may be considered representative of the general longer-term (monthly) precipitation patterns on Galiano having an annual normal precipitation amount of 812.2 mm based on the 1981-2010 period (Figure 4). The active climate station on Saturna is now the Saturna Campon CS station (ID 1017099). Table 1 indicates that the cumulative precipitation for the Saturna Campon CS station during the nine-month period from October 2022 to end of June 2023 climate station was 96.1 percent of normal. While the overall precipitation was close to normal, there was significant variability among the months, e.g. 51.6% of normal in January 2023 and 251.2 % of normal in December 2022. The months of May and June 2023 were especially dry.

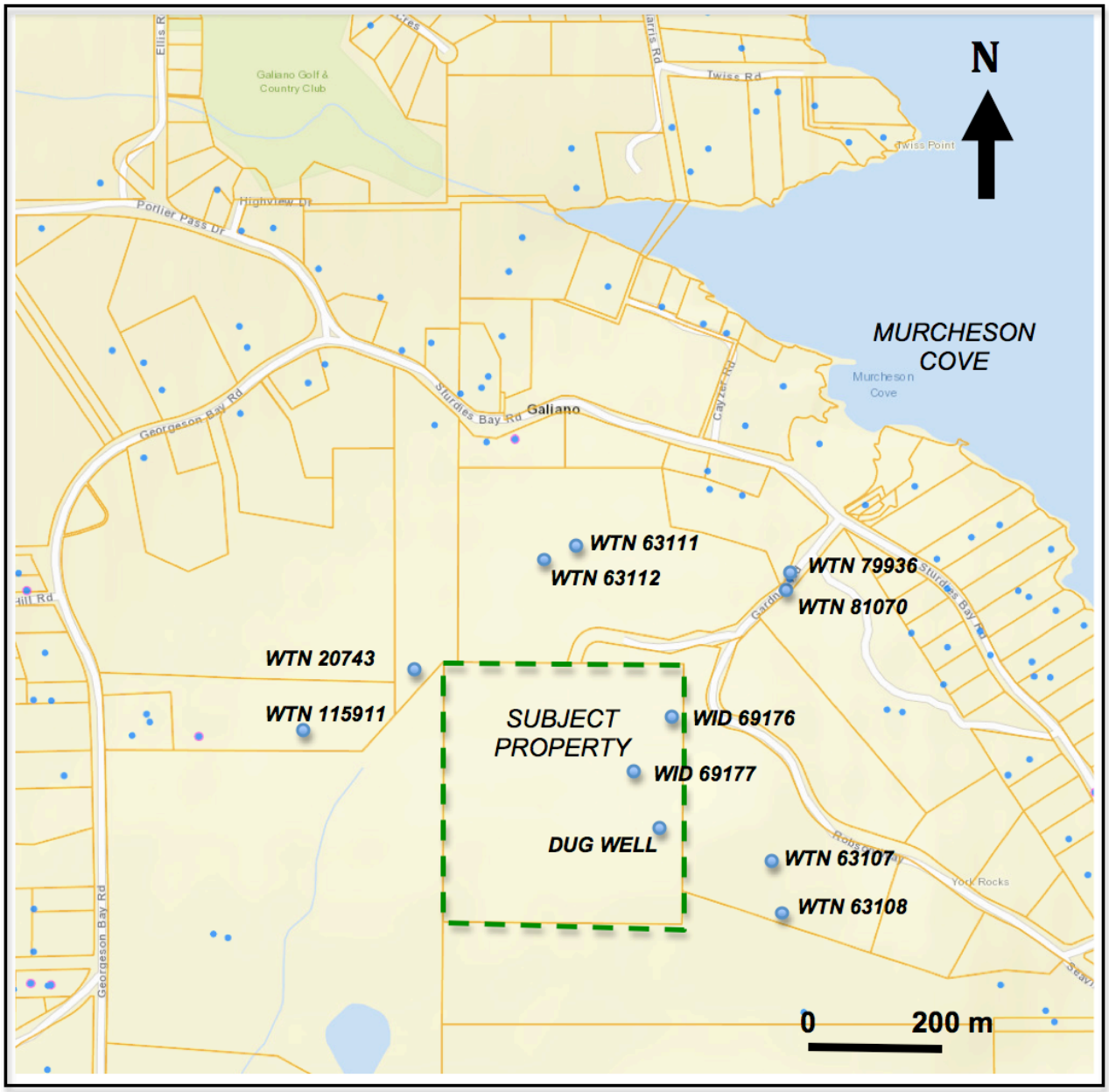


Figure 1. Location of subject property, pump tested wells (WID 69176 and WID 69177) and closest neighbouring wells. Basemap from Province of British Columbia (2023a).

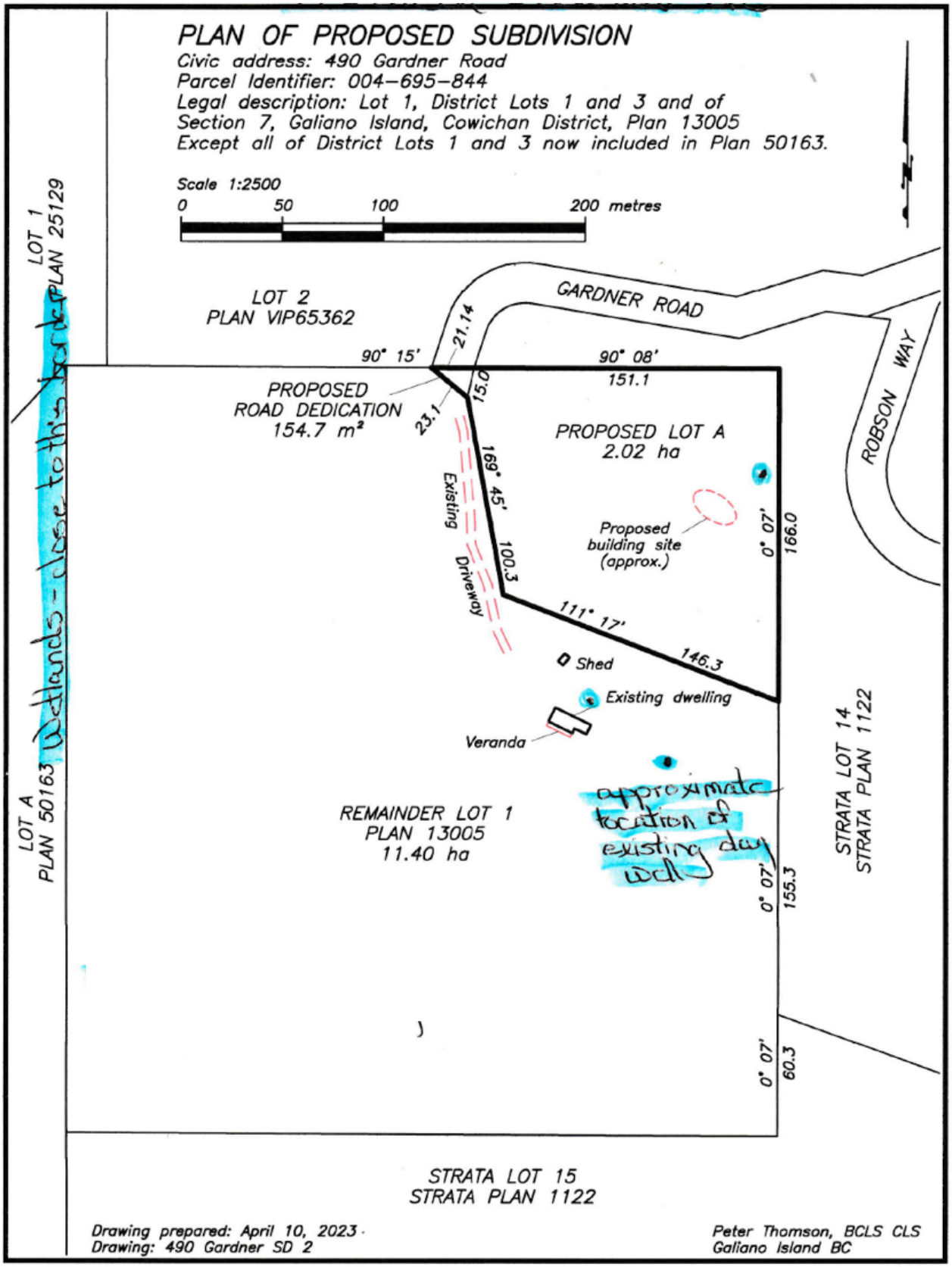


Figure 2. Draft plan of proposed subdivision. Adapted from Thomson (2023).

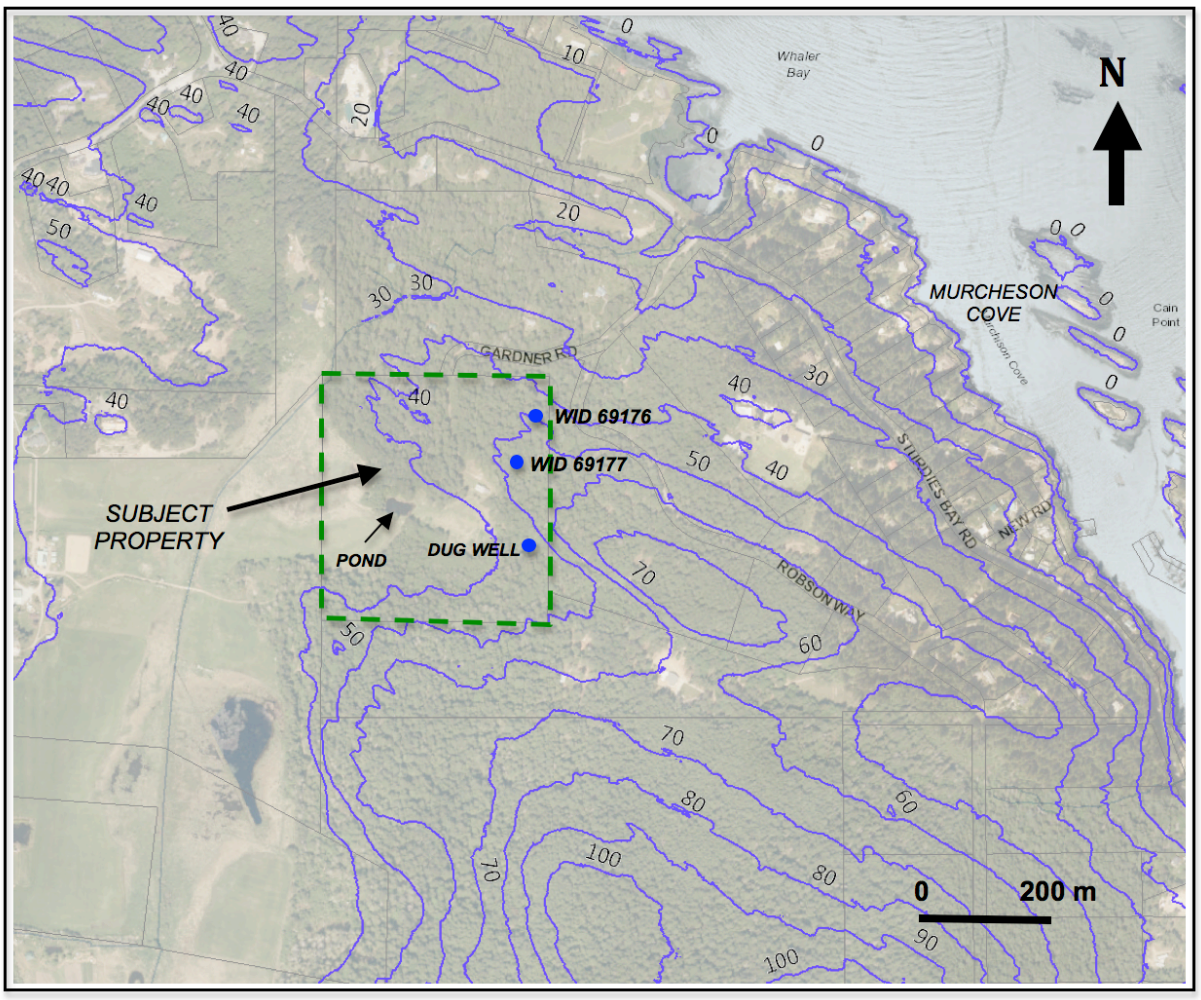


Figure 3. Topographic site conditions. Contour interval = 10 m. Basemap from Islands Trust (2023).

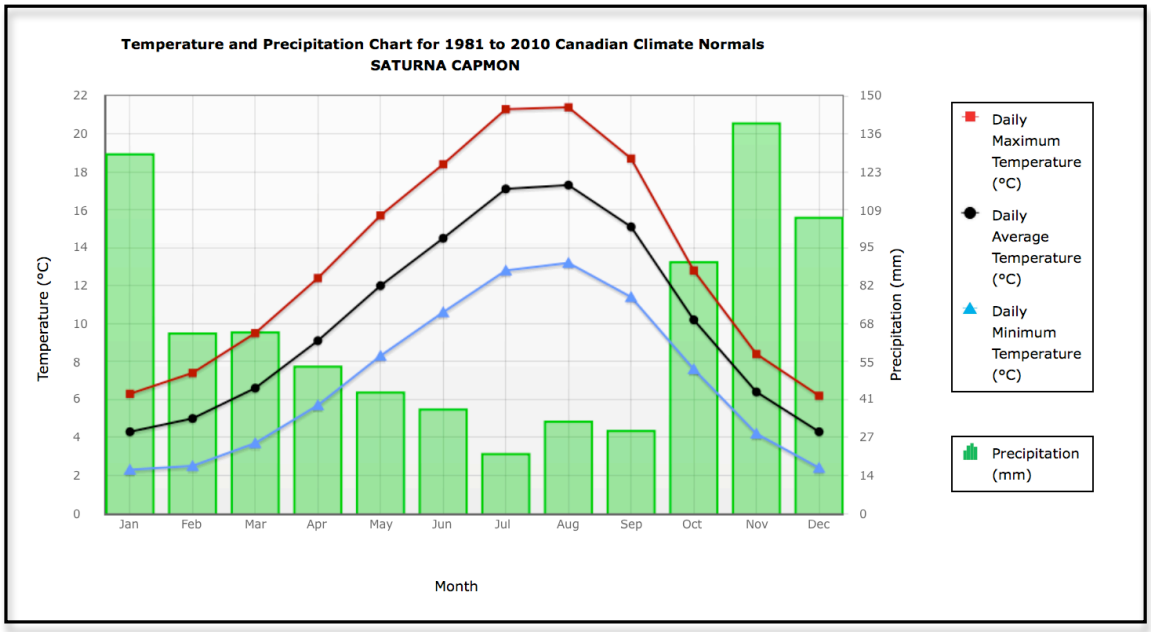


Figure 4. Graph of monthly normal precipitation for Saturna Campon station (Climate ID. 1017098). Graph from Government of Canada (2023a).

Table 1. Monthy precipitation data for Saturna Campon CS climate station (Climate ID. 1017099) in 2022-23 compared to 1981-2010 normals.

Month	Precipitation in 2022-23 (mm)	Monthly Precipitation Normal (mm)	Percent of Normal	Cumulative Percent of Normal
October	100.2	90.2	111.1	111.1
November	84.2	140.1	60.1	80.1
December	266.8	106.2	251.2	134.1
January	66.6	129.0	51.6	111.3
February	62	64.6	95.8	109.4
March	31	65.0	47.7	102.6
April	52.4	52.7	99.4	102.4
May	19.7	43.4	45.4	98.8
June	17.4	37.3	46.6	96.1
Total:	700.3	728.5	96.1	

Data from Government of Canada (2023b).

Hydrogeologic Setting

Galiano is comprised of sedimentary clastic rocks belonging to the Nanaimo Group of Late Cretaceous age (Muller and Jeletzky, 1970). These consist of alternating interbeds of sandstone, mudstone, siltstone, shale and conglomerate. The general groundwater conditions of Galiano Island have been reported by several authors including Harrison (1994), Kohut and Johanson (1998) and Waterline Resources Inc. (2011). Groundwater on the island is found primarily in open fractures in the bedrock formations as they are encountered during drilling of water wells. These fractures constitute the major zones for groundwater storage and movement.

From historic observation well data in the Gulf Islands, groundwater levels in bedrock wells generally rise and fall with the seasons, in response to available precipitation, becoming highest during the late fall and winter months. Water levels then normally decline during the dry summer months reaching seasonal lows in the late fall months (Kohut *et al*.,1984). Figure 4 shows the available reported groundwater level trend data for Provincial Observation Well 258, situated near Sturdies Bay during 2022 - 2023. Data after early March 2023 is currently not available. Historically, water levels during July would be expected to be seasonally low approaching seasonal minimum levels of September-October.

Well WID 69176

Well WID 69176 was drilled on April 27, 2023 by Red Williams Well Drilling Ltd., to a depth of 305 feet (92.96 m) and completed in grey sandstone with fractures reported at 30 to 35 ft (9.14 to 10.67 m), 37 to 38 feet (11.28 to 11.58 m), 73 to 75 feet (22.25 to 22.86 m) and 250 feet (76.20 m). Well WID 69176 is likely completed within interbedded sandstone layers of the Gabriola Formation (Muller and Jeletzky, 1970). The well was airlifted for 2 hours at a rate of 1 USgpm (3.78 L/min). The fracture at 250 feet (76.20 m) likely provides the main source of water in the well.

Elevation of the wellhead is approximately 45 m (147.6 feet) above mean sea level based on topography at the site. A copy of the original well record is provided in Appendix A. The final well depth is approximately 157.4 feet (48 m) below sea level. The non-pumping (static) water level upon well completion was reported at 55 feet (16.8 m) or approximately 92.52 feet (28.2 m) above sea level.

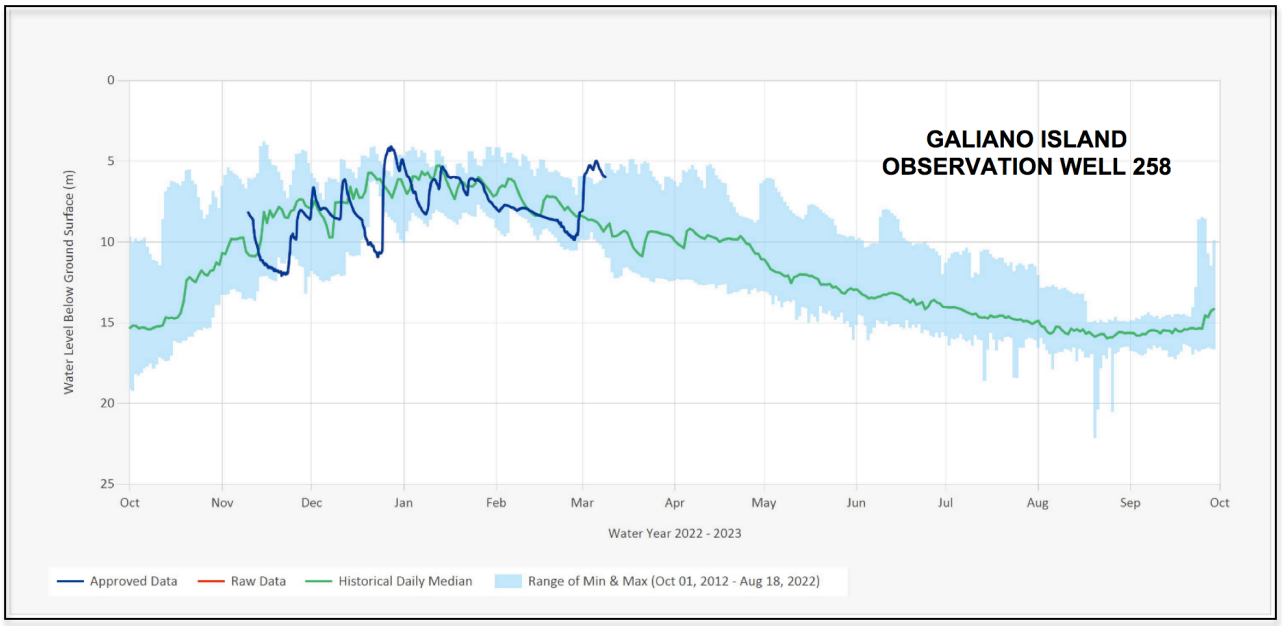


Figure 4. Groundwater level trend in 2022-2023 compared to historic maximum, minimum and median data for Observation Well 258. Adapted from Province of British Columbia Environment (2023b).

Pump Testing Conducted on Well WID 69176

A pumping test of 12 hours duration is generally considered sufficient for determining the sustainable yield of a domestic residential well where the minimum water requirements are 2275 L/day for a single residence, as set out under *Galiano Island Land Use Bylaw No. 127, 1999*, (Galiano Island Local Trust Committee, 2023).

A 12 hour constant rate pumping test was subsequently carried out on Well WID 69176 on July 10-11, 2023 at an average rate of 1.1 USgpm (4.16 L/min) based on flow metre readings. The test was undertaken by Red Williams Well Drilling and Pump Installations Ltd., with a submersible pump set in the well at a depth of 285 to 290 feet (86.87 to 88.39 m). Pumped water was discharged 150 feet (45.72 m) away from the wellhead towards the north. Manual water level readings were taken during the test at prescribed intervals (Province of British Columbia, 2010). A Heron™ Instruments Inc., *dipperLog* datalogger was set in the pumped well to record water levels at one minute intervals. Pumping was followed by manually measuring the recovery water levels at prescribed intervals for 4 hours. A second Heron™ Instruments Inc., was also set in Well WID 69177 which was used as an observation well during the pumping of Well WID 69176.

During the day of the test, no precipitation was recorded at the Saturna Campon climate station (Climate ID. 1017099) and 16.6 mm of precipitation was recorded during the 10 days prior to the start of the test. It is unlikely this amount of precipitation would have significantly affected groundwater levels during this time.

Water samples were taken from the Well WID 69176 on July 11 after 11.8 hours of pumping and delivered within 24 hours of sampling with ice packs to the Bureau Veritas Ltd., laboratory in Esquimalt for analysis of chemical and bacteriological parameters. All samples were unadulterated and taken from Well WID 69176 and delivered to the laboratory by A. Kohut.

Results of Pump Testing Well WID 69176

Pump testing data for Well WID 69176 are provided in Appendix B. Appendix C contains copies of the analytical laboratory reports from Bureau Veritas Ltd. Figure 5 shows the drawdown in Well WID 69176 during pumping. At the end of the test, drawdown reached 6.06 m (19.88 feet) below the pre-pumping level of 16.30 m (53.48 feet) below the top of casing or 5.45 m (17.88 feet) below ground. Water level recovery was 68.5% after 4 hours of the pump shutting down (Figure 6) and 77.6 % after 12 hours. Figure 7 indicates a slowing down of the recovery in Well WID 69176 due to the startup of the pumping test on Well WID 69177. The effects, however, are not considered significant.

Extrapolation of the drawdown curve to 100 days without recharge indicates the drawdown would reach 15 m (49.21 feet), utilizing 25% of the available drawdown of 59.9 m in the well to the top of the major water-bearing fracture at a depth of 76.20 m (250 feet).

Based on the above results, the long-term well capacity is likely much greater then the rate at which the well was pump tested i.e., 1.1 USgpm (4.164 L/min). It would be prudent, however, to not rate the capacity of the well greater than the rate at which it was pumped. With the limited drawdown observed during the test it is unlikely that pumping the well for a residence would have any significant measureable effects on any neighbouring wells. Use of the well for domestic purposes would not result in drawdown in the well falling below sea level and causing sea water intrusion into the aquifer.

Well WID 69176 is more than capable of meeting the minimum standards of 0.42 USgpm (1.58 L/min) or 2275 L/day for potable water supply under *Galiano Island Land Use Bylaw No. 127, 1999*, (Galiano Island Local Trust Committee, 2023).

Water Quality of Well WID 69176

Results of the July 11, 2023 water quality analyses are provided in Table 2. The water quality is moderately low in dissolved mineralization with TDS of 270 mg/L. Sample results met or exceeded the *Guidelines for Canadian Drinking Water-Summary Table* (Health Canada, 2022) for all parameters analyzed except for elevated levels of total manganese at 53.7 µg/L. No coliform or E. coli bacteria were detected. Manganese above 20 µg/L is of aesthetic concern and may result in staining of laundry and/or toilet fixtures.

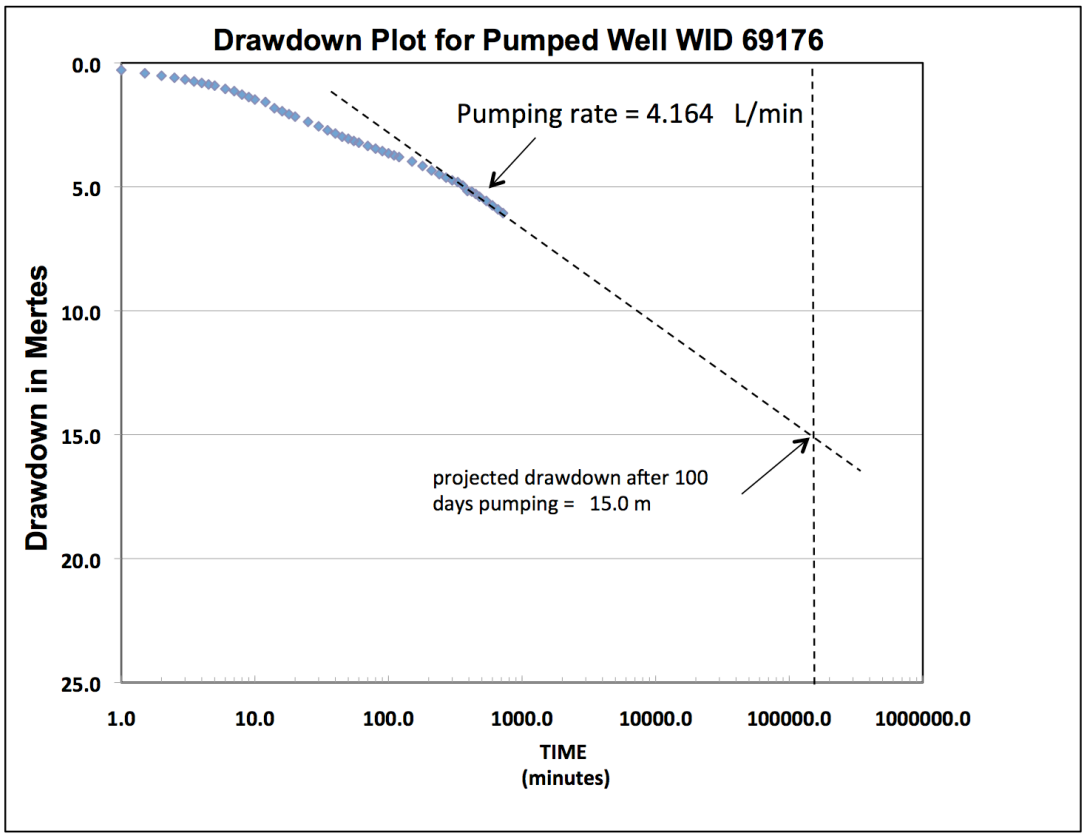


Figure 5. Semi-log drawdown plot for Well WID 69176 pumping at 4.164 L/min.

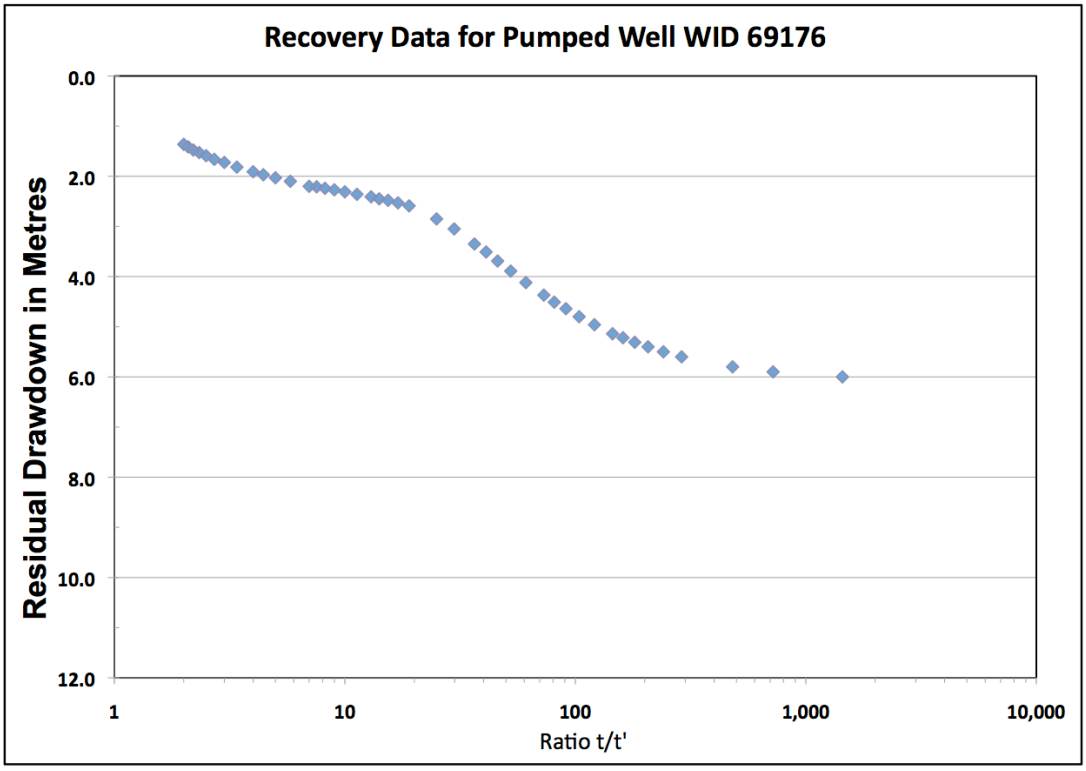


Figure 6. Semi-log recovery plot for Well WID 69176.

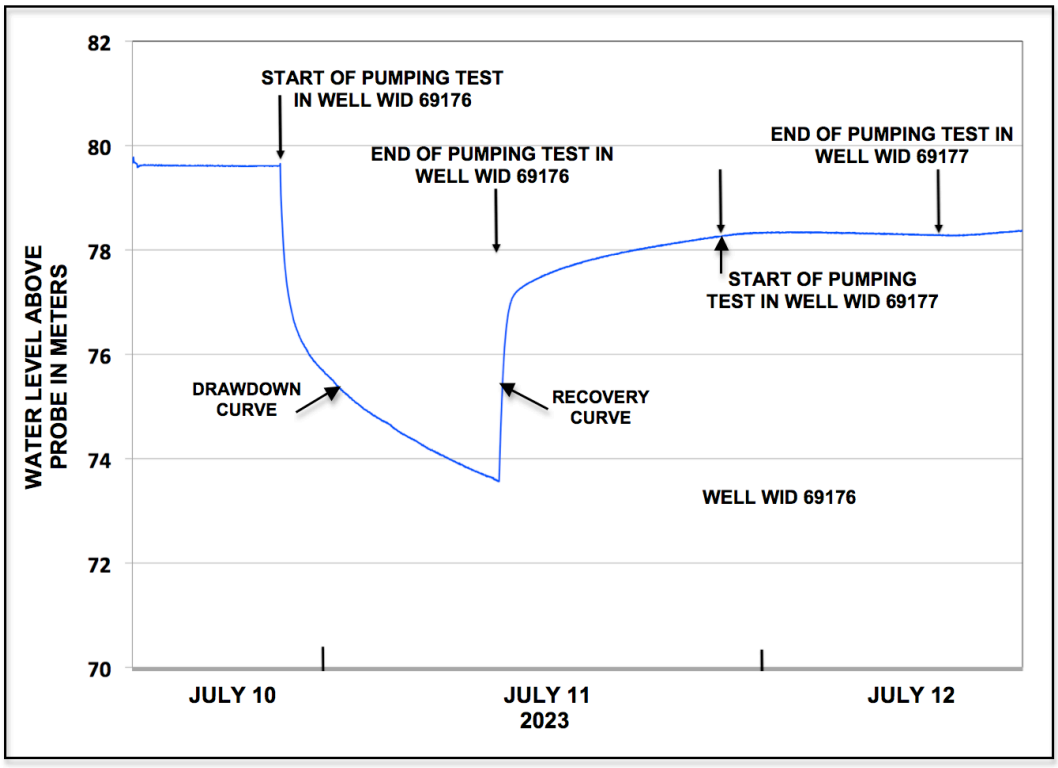


Figure 7. Water level in Well WID 69176 during pumping of Well WID 69176 and Well WID 69177.

Well WID 69177

Well WID 69177 was drilled on April 27, 2023 by Red Williams Well Drilling Ltd., to a depth of 205 feet (62.48 m) and completed in grey sandstone. Well WID 69177 is likely completed within sandstone layers of the Gabriola Formation (Muller and Jeletzky, 1970). Water-bearing fractures were not reported but are likely below a depth of 179 feet (54.60 m). The wellhead is approximately 52 m above sea level with the bottom of the well at 10.48 m below sea level. A copy of the original well record is provided in Appendix A. The non-pumping (static) water level on April 27, 2022 was not reported. The well was airlifted for 2 hours at a rate of 1 USgpm (3.78 L/min) and yield estimated at 1 USgpm (3.78 L/min).

Pump Testing Conducted on WID 69177

A 12 hour constant rate pumping test was carried out on Well WID 69177 on July 11-12, 2023 at an average rate of 1.01 USgpm (3.823 L/min) based on flow metre readings. The test was undertaken by Red Williams Well Drilling and Pump Installations Ltd., with a submersible pump set in the well at a depth of 194 feet (59.13 m). Pumped water was discharged 150 feet (45.72 m) downslope away from the wellhead towards the west. Manual water level readings were taken during the test at prescribed intervals (Province of British Columbia, 2010). A Heron™ Instruments Inc., *dipperLog* datalogger was set in the pumped well to record water levels at one minute intervals. Pumping was followed by manually measuring the recovery water levels at prescribed intervals for 4 hours. A Heron™ Instruments Inc., datalogger was also employed in Well WID 69176 which was used as an observation well during the testing of WID 69177.

During the days of the test, no precipitation was recorded at the Saturna Campon climate station (Climate ID. 1017099) and 16.1 mm of precipitation was recorded during the 10 days prior to the start of the test. It is unlikely this amount of precipitation would have significantly affected water levels in the well.

Water samples were taken from the Well WID 69177 on July 12 after 11.8 hours of pumping and delivered within 24 hours of sampling with ice packs to the Bureau Veritas Ltd., laboratory in Esquimalt for analysis of chemical and bacteriological parameters. All samples were unadulterated and taken from Well WID 69177 and delivered to the laboratory by A. Kohut.

Results of Pump Testing Well WID 69177

Pumping test data for Well WID 69177 are provided in Appendix B. Appendix C contains copies of the analytical laboratory reports from Bureau Veritas Ltd. Figure 8 shows the drawdown in Well WID 69177 during pumping. At the end of the test, drawdown reached 5.78 m (18.96 feet) below the pre-pumping level of 9.40 m (30.84 feet) below the top of casing, or 8.40 m (27.56 feet) below ground. Water level recovery was 98.3 % complete after 4 hours of the pump shutting down (Figure 9). Figure 10 indicates a slight (<0.1 m) lowering of the water level in Well WID 69177 during the pumping test of Well WID 69176. This effect, however, is not considered significant.

Extrapolation of the latter portion of the drawdown data to 100 days without recharge indicates the drawdown would reach 9.0 m (29.53 feet), utilizing 19.5% of the available drawdown of 46.2 m in the well to the top of the major water-bearing fracture at a depth of 54.6 m (179 feet).

Based on the above results the long-term well capacity is likely much greater then the rate at which the well was pump tested i.e., 1.01 USgpm (3.823 L/min). It would be prudent, however, to not rate the capacity of the well greater than the rate at which it was pumped. With the limited drawdown observed during the test it is unlikely also that pumping the well for a residence would have any significant measureable effects on any neighbouring wells or nearby surface water sources. Use of the well for domestic purposes would not result in drawdown in the well falling below sea level and causing sea water intrusion into the aquifer.

Well WID 69177 is more than capable of meeting the minimum standard of 2275 L/day for potable water supply under *Galiano Island Land Use Bylaw No. 127, 1999*, (Galiano Island Local Trust Committee, 2023).

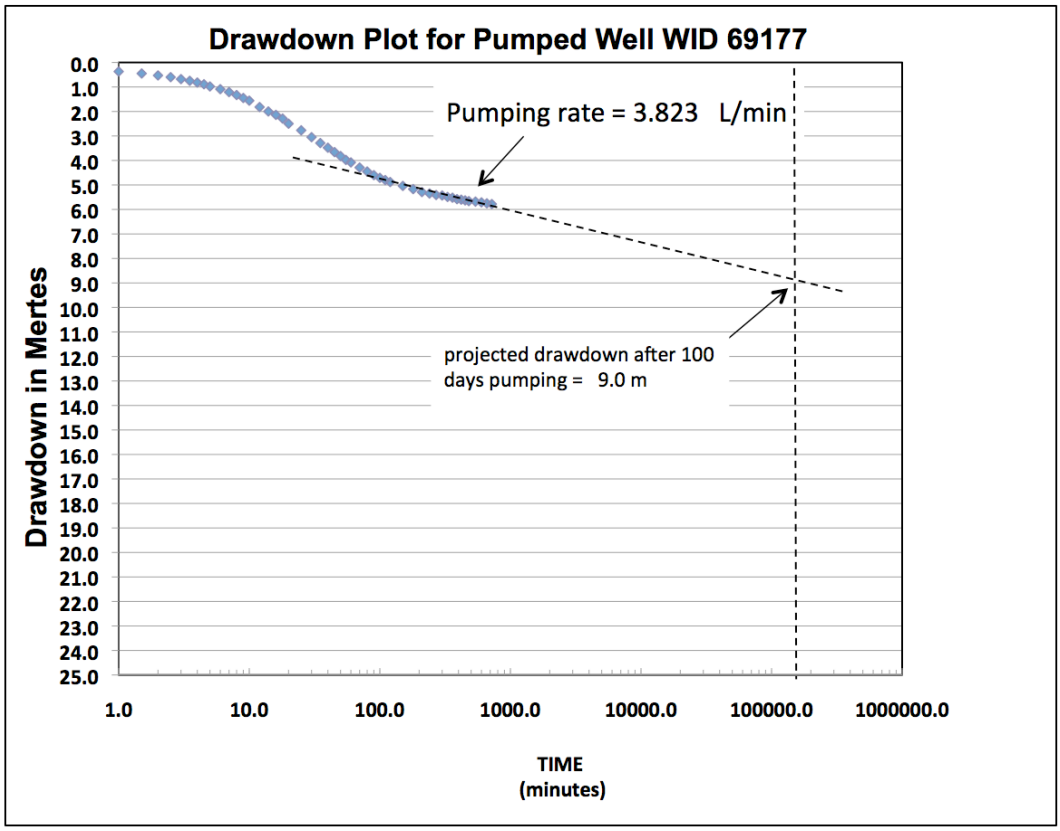


Figure 8. Semi-log drawdown plot for Well WID 69177 pumping at 3.823 L/min.

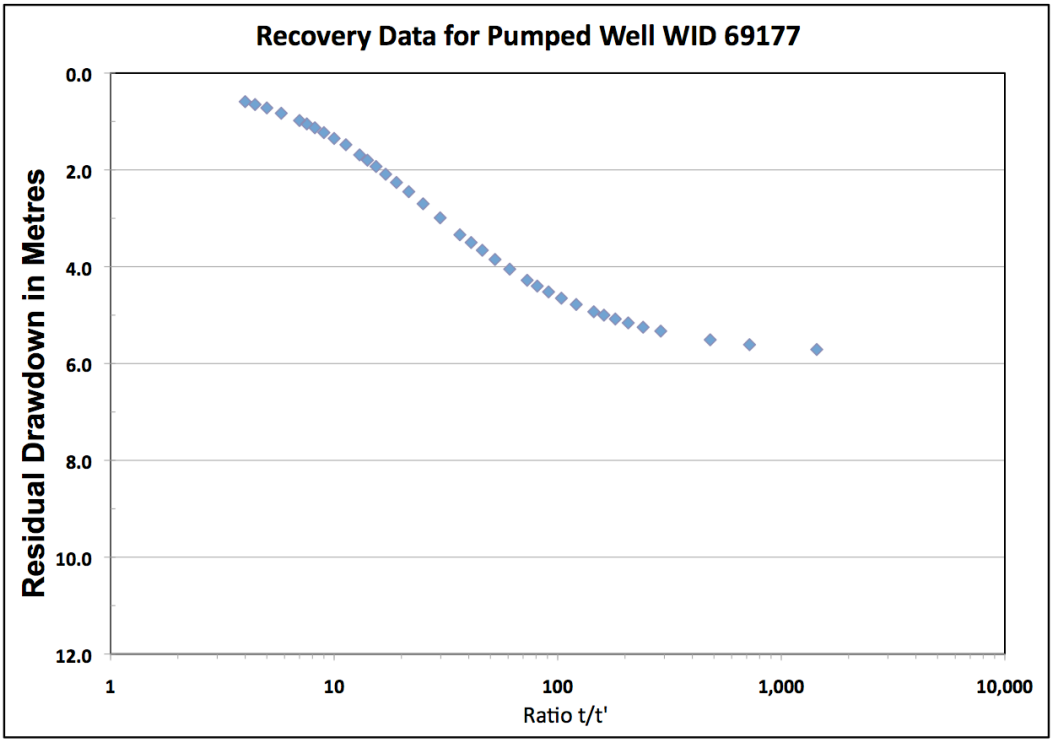


Figure 9. Semi-log recovery plot for Well WID 69177.

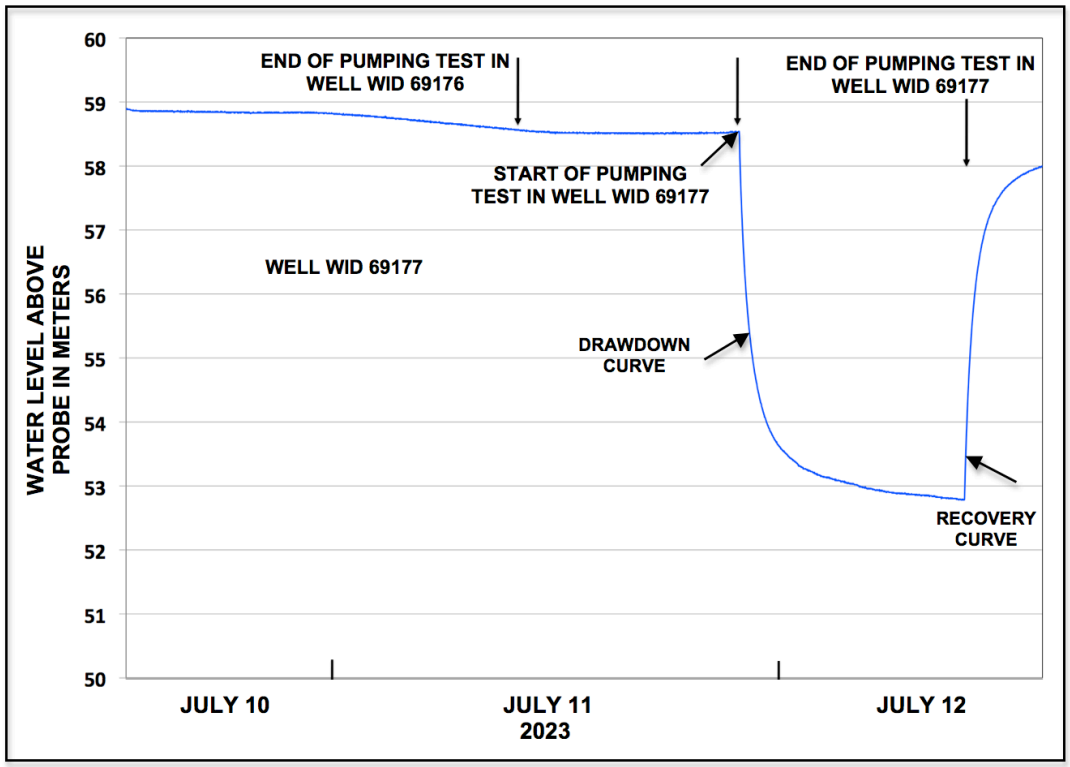


Figure 10. Water level in Well WID 69177 during pumping of Well WID 69176 and Well WID 69177.

Water Quality of Well WID 69177

Results of the July 12, 2023 water quality analyses are provided in Table 2. The water quality is moderately mineralization with total dissolved solids (TDS) of 240 mg/L. Sample results met or exceeded the *Guidelines for Canadian Drinking Water-Summary Table* (Health Canada, 2022) for all parameters analyzed except for elevated levels of total manganese at 185 µg/L and total coliforms at 2.0 CFU/100mL. No E. coli bacteria were detected.

Total manganese levels above 20 µg/L is of aesthetic concern and may result in staining of laundry and/or toilet fixtures. Manganese above 120 µg/L is of a health concern and may cause neurological effects in young children consuming large amounts of water with elevated manganese levels. Further testing for dissolved manganese levels would be warranted before deciding whether water treatment measures may be required. Elevated total coliforms, however, are of a health concern and would require treatment. The levels detected could be natural as a result of decaying organic matter present in the bedrock formations. There are no potential sources of contamination from animal wastes in proximity to the well.

Table 2. Summary of water quality analyses.

Parameters/Site and Sampling Date	WELL WID 69176 Donna Knox Well July 11/23	WELL WID 69177 Judy Hayes Well July 12/23		Canadian DWGuideline 2022	Units
PHYSICAL TESTS					
True Colour	<5.0	<5.0		15	TCU
Conductivity	460	410			µS/cm
Total Hardness ($CaCO_3$)	35.8	125			mg/L
pH	8.27	7.86		7.0-10.5	pH units
Total Dissolved solids (TDS)	270	240		500	mg/L
Turbidity	0.38	0.38		<1.0	NTU
ANIONS					
Alkalinity (Total as $CaCO_3$)	210	180			mg/L
Alkalinity (PP as $CaCO_3$)	<1.0	<1.0			mg/L
Bicarbonate	250	220			mg/L
Carbonate	<1.0	<1.0			mg/L
Hydroxide	<1.0	<1.0			mg/L
Chloride	16	8.5		250	mg/L
Fluoride	0.30	0.11		1.5	mg/L
Nitrate (N)	<0.020	0.560		10	mg/L
Nitrite (N)	<0.0050	0.0		1	mg/L
Total Organic Nitrogen (N)					mg/L
Total Ammonia (N)					mg/L
Nitrate plus Nitrite (N)	<0.020	0.567			mg/L
Total Nitrogen (N)					mg/L
Total Organic Carbon (C)					mg/L
Total Phosphorus (P)					mg/L
Total Sulphide				0.05	mg/L
Sulphide (as H2S)				0.05	mg/L
Sulphate	6.1	6.0		500	mg/L
TOTAL METALS					
Aluminum	23.3	15.7		2900	µg/L
Antimony	<0.50	<0.50		6	µg/L
Arsenic	1.44	0.66		10	µg/L
Barium	2.0	6.2		2000	µg/L
Beryllium					µg/L
Bismuth					
Boron	228	63		5000	µg/L
Cadmium	<0.010	<0.010		7	µg/L
Chromium	<1.0	<1.0		50	µg/L
Cobalt	0.27	<0.20			µg/L
Copper	5.40	6.02		1000 and 2000	µg/L
Iron	30.2	34.1		300	µg/L
Lead	<0.20	0.23		5	µg/L
Manganese	**53.7**	**185**		20 and 120	µg/L
Mercury	<0.0019	<0.0019		1	µg/L
Molybdenum	2.2	1.0			µg/L
Nickel	<1.0	<1.0			µg/L
Selenium	<0.10	<0.10		50	µg/L
Silicon	7250	10400			µg/L
Silver	<0.020	<0.020			µg/L
Strontium	80.2	304		7000	µg/L
Thallium					
Tin					µg/L
Titanium					µg/L
Uranium	0.12	0.32		20	µg/L
Vanadium	<5.0	<5.0			µg/L
Zinc	<5.0	8.7		5000	µg/L
Zirconium					µg/L
Calcium	11.9	41.6			mg/L
Magnesium	1.49	5.11			mg/L
Potassium	0.193	0.303			mg/L
Sodium	89.7	39.7		200	mg/L
Sulphur	<3.0	<3.0			mg/L
MICROBIOLOGICAL					
Total coliforms	0	**2.0**		ND	CFU/100mL
Escherichia coli (E. coli)	0	0		ND	CFU/100mL

* Turbidity guideline applies to a surface water source or a groundwater source under the direct influence of surface water.

ND means none detectable.

Exceedances shown in red font.

Conclusions

Two bedrock wells, **Well WID 69176** and **Well WID 69177** were recently pump tested for the proposed subdivision in mid July 2023 for periods of 12 hours each. Results of the pump testing indicates that each well is capable of meeting the minimum standards of 0.42 USgpm (1.58 L/min) or 2275 L/day for potable water supply under *Galiano Island Land Use Bylaw No. 127, 1999*, (Galiano Island Local Trust Committee, 2023). Based on the limited drawdowns observed during the pump testing, use of the wells for domestic residential purposes should have no measureable adverse effects on neighbouring water sources or cause sea water intrusion into the bedrock aquifer.

Water quality results for **Well WID 69176** met or exceeded the *Guidelines for Canadian Drinking Water-Summary Table* (Health Canada, 2022) for all parameters analyzed except for elevated levels of total manganese at 53.7 µg/L. No coliform or E. coli bacteria were detected. Manganese levels above 20 µg/L are an aesthetic concern and may result in staining of laundry and/or toilet fixtures.

Water quality results for **Well WID 69177** met or exceeded the *Guidelines for Canadian Drinking Water-Summary Table* (Health Canada, 2022) for all parameters analyzed except for elevated levels of total manganese at 185 µg/L and total coliforms at 2.0 CFU/100mL. No E. coli bacteria were detected. Total manganese levels above 20 µg/L are of aesthetic concern and may result in staining of laundry and/or toilet fixtures. Manganese above 120 µg/L is of a health concern and may cause neurological effects in young children consuming large amounts of water with elevated manganese levels. Further testing for dissolved manganese levels would be warranted before deciding whether water treatment measures may be required. Elevated total coliforms, are of a health concern and would require treatment. The low level detected, however, could be natural as a result of decaying organic matter present in the bedrock formations. There are no potential sources of contamination from animal wastes in proximity to the well.

Recommendations

1. As a precautionary measure against any future potential sources of coliform bacteria, water from each well should be treated with an appropriately designed and maintained ultraviolet irradiation (UV) treatment system.

2. Further sampling for dissolved manganese of water from Well WID 69177 should be considered prior to designing any potential treatment system as the levels of manganese could be due to particulate matter.

3. Generally for low yielding water wells, apart from utilizing a pressure tank for the water distribution system, consideration should be given to installing a storage tank e.g. 1000 USgals, to reduce frequent cycling of the well pump during high water use periods.

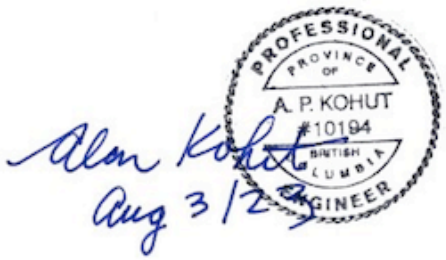
4. For Well WID 69176, the pump should be set a few metres above the major water-producing fracture at 250 feet (78.2 m) to facilitate efficient cooling of the submersible pump motor. Similarly for Well WID 69177, the pump should be set a few metres above the major water-producing fracture at 179 feet (54.6 m)

5. Consideration should be given to equipping the discharge line from each well with a totalizing water flow meter to monitor and record well use with time and having a water level sounding tube installed for taking periodic water level measurements in each well. This information would be valuable in the event any future maintenance of the well or pumping system may be required.

Closure

This report was prepared in accordance with generally accepted engineering, hydrogeological and consulting practices. It is intended for the prime use of Judy Hayes and Donna Knox in connection with its purpose as outlined under the scope of work for this project. This report is based on data and information available to the author from various sources at the time of its preparation and the findings of this report may therefore be subject to revision. Data and information supplied by others has not been independently confirmed or verified to be correct or accurate in all cases. Any errors, omissions or issues requiring clarification should be brought to the attention of the author. The author and Hy-Geo Consulting accepts no responsibility for damages suffered by any third party as a result of any unauthorized use of this report.

Respectfully submitted,



Alan P. Kohut P.Eng
Principal and Senior Hydrogeologist

HY-GEO CONSULTING
EGBC Permit to Practice Number 1001034

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Appendix A

Well Drilling Records

BRITISH COLUMBIA

☒ Well Construction Report
☐ Well Alteration Report

RED WILLIAMS WELL DRILLING LTD
980 PRATT RD QUALICUM BEACH BC V9K 1W5
(250) 248-5552
Stamp: company name/address/ phone/fax/email here, if desired.

Ministry Well ID Plate Number: 69176
Where ID Plate is attached: CASING
Ministry Well Tag Number: _____

See reverse for notes & definitions of abbreviations.

Well Class: Class of well (see note 2): WATER SUPPLY **Sub-class of well:** DOMESTIC

Water supply wells: indicate intended water use: ☒ private domestic ☐ water supply system ☐ irrigation ☐ commercial or industrial ☐ other (specify): _____

Start date of work (YYYY/MM/DD): 2023/04/25 **End date of work** (YYYY/MM/DD): 2023/04/27

Person Responsible for Work (print clearly): **Name (first, last)** (see note 3): THOMAS WILLIAMS

Person who completed the work: THOMAS WILLIAMS **Registration no.** (see note 4): WD 0610270 3

Consultant (if applicable; name and company): _____

DECLARATION: Well construction, well alteration or well decommission, as the case may be, has been done in accordance with the requirements in the Water Sustainability Act and the Ground Water Protection Regulation.

Signature of Person Responsible PER THOMAS WILLIAMS

Owner name: _____

Mailing address: _____ Town _____ Prov. _____ Postal Code _____

Well Location (see note 6): Address: Street no. 490 Street name GARDNER ROAD Town GALIANO ISLAND

(or) **Legal description:** Lot 1 Plan VIP 2005 D.L. 1 and 3 Block _____ Sec. 7 Twp. ___ Rg. ___ Land District 16

(or) **PID** 004-695-844 (and) **Description of well location (attach sketch, if nec.):** WITHIN PROPERTY BOUNDARIES PORT GALIANO ISLAND, EXCEPT PLAN 50163

Well Location:

NAD 83: Zone: 10 (see note 7) (and) **UTM Easting:** 475127 m **UTM Northing:** 5414771 m (or) **Latitude** (see note 8): _____ **Longitude:** _____

Method of drilling: ☒ air rotary ☐ dual rotary ☐ cable tool ☐ mud rotary ☐ auger ☐ driving ☐ jetting ☐ other (specify): _____

Orientation of well: ☒ vertical ☐ horizontal Ground elevation: 110' ft (asl) Method (see note 9) GPS ACCURACY 4'

Lithologic description (see notes 10-15)

From ft (bgl)	To ft (bgl)	Material Description	Moisture: Dry	Damp	Moist	Wet	Colour: Black	Blue	Brown	Green	Grey	Vari-coloured	Red	Tan	White	Hardness: Dense	Hard	Loose	Medium	Soft	Stiff	Very Hard	Very Soft	Observations (e.g. other geological materials (e.g. boulders), est. water bearing flow (USgpm))
0	5	SILT/COBBLE/ORGANICS							✓															FRACTURES @ 30-35
5	12	SANDSTONE							✓															37-38
12	27	SANDSTONE									✓													73-75
27	36	SANDSTONE							✓															250
36	305	SANDSTONE									✓													

Casing Details:

Type: ☐ Surface ☐ Production ☐ Open Hole ☐ Steel Removed

From ft (bgl)	To ft (bgl)	Dia in	Casing Material/Open Hole (see note 16)	Wall Thickness in	Drive Shoe
0	18'	6	STEEL	.219	—

Surface seal: Type: BENTONITE Depth: 18' ft

Method of installation: ☒ poured ☐ Pumped Thickness: 2" in

Backfill: Type: _____ Depth: _____ ft

Liner: ☐ PVC ☐ Other (specify): _____

Diameter: _____ in Thickness: _____ in

From: _____ ft (bgl) To: _____ ft (bgl)

Perforated: From: _____ ft (bgl) To: _____ ft (bgl)

Screen details:

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 17)	Slot Size

Intake: ☐ Screen ☐ Open bottom ☐ Uncased hole

Screen type: ☐ Telescope ☐ Pipe size

Screen material: ☐ Stainless steel ☐ Plastic ☐ Other (specify): _____

Screen opening: ☐ Continuous slot ☐ Slotted ☐ Perforated pipe

Screen bottom: ☐ Bail ☐ Plug ☐ Plate ☐ Other (specify): _____

Filter pack: From: _____ ft To: _____ ft Thickness: _____ in

Type and size of material: _____

Developed by: ☒ Air lifting ☐ Bailing ☐ Jetting ☐ Pumping ☐ Surging ☐ Other (specify): _____ Total duration: 2 hrs

Notes: _____

Well yield estimated by: ☐ Pumping ☒ Air lifting ☐ Bailing ☐ Other (specify): _____

Rate: 1 USgpm Duration: 2 hrs SWL before test: 55' ft (btoc) Drawdown: _____ ft (btoc)

Hydro-fracturing: ☐ Yes ☐ No Increase in Well Yield due to Hydro-fracturing: _____ USgpm

Water Quality: Water sample collected: ☐ Yes ☐ No

Date (YYYY/MM/DD) _____ Water quality odour: _____

Characteristics: ☐ Clear ☐ Cloudy ☒ Fresh ☐ Gas ☐ Salty ☐ Sediment ☐ Other (specify): _____

Colour: ☐ Black ☐ Black flecks ☐ Brown ☒ Clear/none ☐ grey ☐ Slight colour/milky ☐ Orange ☐ Other (specify): _____

Comments: _____

Final well completion data:

Total depth drilled: 305' ft Finished well depth: 305' ft (bgl)

Final casing stick up: 24" in Depth to bedrock: 5' ft (bgl)

SWL: 55' ft (btoc) Estimated well yield: _____ USgpm

Artesian flow: _____ USgpm, or Artesian pressure: 1 ft

Type of well cap: VERMIN PROOF Well disinfected: ☒ Yes ☐ No

☐ **Confirmation/alternative specs. attached**

☐ **Original well construction report attached**

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction or alteration, as the case may be. Well yield, well performance and water quality are not guaranteed as they are influenced by a number of factors, including natural variability, human activities and condition of the works, which may change over time.

white: Customer copy
canary: Driller copy
pink: Ministry copy

BRITISH COLUMBIA

☒ Well Construction Report
☐ Well Alteration Report

RED WILLIAMS WELL DRILLING LTD
Stamp company name/address here
980 PRATT RD QUALICUM BEACH BC V9K 1W5
phone/fax/email here, if desired.
(250) 248-5552

Ministry Well ID Plate Number: 69177
Where ID Plate is attached: CASING
Ministry Well Tag Number: _____

See reverse for notes & definitions of abbreviations.

Well Class: Class of well (see note 2): WATER SUPPLY **Sub-class of well:** DOMESTIC

Water supply wells: indicate intended water use: ☒ private domestic ☐ water supply system ☐ irrigation ☐ commercial or industrial ☐ other (specify): _____

Start date of work (YYYY/MM/DD): 2023/04/27 **End date of work** (YYYY/MM/DD): 2023/04/27

Person Responsible for Work (print clearly): **Name (first, last)** (see note 3): THOMAS WILLIAMS

Person who completed the work: THOMAS WILLIAMS **Registration no.** (see note 4): WD0610270 3

Consultant (if applicable; name and company): _____

DECLARATION: Well construction, well alteration or well decommission, as the case may be, has been done in accordance with the requirements in the Water Sustainability Act and the Ground Water Protection Regulation.

Signature of Person Responsible PER THOMAS WILLIAMS

Owner name: _____

Mailing address: 832 CUMBERLAND CRES. Town NORTH VANCOUVER Prov. BC Postal Code V7P 1Y4

Well Location (see note 6): Address: Street no. 490 Street name GARDNER ROAD Town GALIANO ISLAND

(or) **Legal description:** Lot 1 Plan VIP 3005 D.L. Lot 3 Block _____ Sec. 7 Twp. ___ Rg. ___ Land District 16

(or) **PID:** 004-695-844 (and) **Description of well location (attach sketch, if nec.):** WITHIN PROPERTY BOUNDARIES FOR GALIANO ISLAND, EXCEPT PLAN 50163

Well Location:

NAD 83: Zone: 10 (see note 7) (and) **UTM Easting:** 475028 m **UTM Northing:** 5414694 m (or) **Latitude** (see note 8): _____ **Longitude:** _____

Method of drilling: ☒ air rotary ☐ dual rotary ☐ cable tool ☐ mud rotary ☐ auger ☐ driving ☐ jetting ☐ other (specify): _____

Orientation of well: ☒ vertical ☐ horizontal Ground elevation: 110' ft (asl) Method (see note 9) GPS ACCURACY 4'

Lithologic description (see notes 10-15)

From ft (bgl)	To ft (bgl)	Material Description	Moisture: Dry	Damp	Moist	Wet	Colour: Black	Blue	Brown	Green	Grey	Vari-coloured	Red	Tan	White	Hardness: Dense	Hard	Loose	Medium	Soft	Stiff	Very Hard	Very Soft	Observations (e.g. other geological materials (e.g. boulders), est. water bearing flow (USgpm))
0	2	SILT/ORGANICS							✓															
2	35	SANDSTONE							✓															
35	170	SANDSTONE									✓													
170	179	SHALEY SANDSTONE									✓													
179	205	SANDSTONE									✓													

Casing Details:

Type: ☐ Surface ☐ Production ☐ Open Hole ☐ Steel Removed

From ft (bgl)	To ft (bgl)	Dia in	Casing Material/Open Hole (see note 16)	Wall Thickness in	Drive Shoe
0	19'	6	STEEL	.219	—

Surface seal: Type: BENTONITE Depth: 19' ft

Method of installation: ☒ poured ☐ pumped Thickness: 2" in

Backfill: Type: _____ Depth: _____ ft

Liner: ☐ PVC ☐ Other (specify): _____

Diameter: _____ in Thickness: _____ in

From: _____ ft (bgl) To: _____ ft (bgl)

Perforated: From: _____ ft (bgl) To: _____ ft (bgl)

Screen details:

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 17)	Slot Size

Intake: ☐ Screen ☐ Open bottom ☐ Uncased hole

Screen type: ☐ Telescope ☐ Pipe size

Screen material: ☐ Stainless steel ☐ Plastic ☐ Other (specify): _____

Screen opening: ☐ Continuous slot ☐ Slotted ☐ Perforated pipe

Screen bottom: ☐ Bail ☐ Plug ☐ Plate ☐ Other (specify): _____

Filter pack: From: _____ ft To: _____ ft Thickness: ____ in

Type and size of material: _____

Developed by: ☒ Air lifting ☐ Bailing ☐ Jetting ☐ Pumping ☐ Surging ☐ Other (specify): _____ Total duration: 2 hrs

Notes: _____

Well yield estimated by: ☐ Pumping ☒ Air lifting ☐ Bailing ☐ Other (specify): _____

Rate: 1 USgpm Duration: 2 hrs SWL before test: _____ ft (btoc) Drawdown: _____ ft (btoc)

Hydro-fracturing: ☐ Yes ☐ No Increase in Well Yield due to Hydro-fracturing: _____ USgpm

Water Quality: Water sample collected: ☐ Yes ☐ No

Date (YYYY/MM/DD) _____ Water quality odour: _____

Characteristics: ☐ Clear ☐ Cloudy ☒ Fresh ☐ Gas ☐ Salty ☐ Sediment ☐ Other (specify): _____

Colour: ☐ Black ☐ Black flecks ☐ Brown ☒ Clear/none ☐ grey ☐ Slight colour/milky ☐ Orange ☐ Other (specify): _____

Comments: _____

Final well completion data:

Total depth drilled: 205' ft Finished well depth: 205' ft (bgl)

Final casing stick up: 12" in Depth to bedrock: 2 ft (bgl)

SWL: _____ ft (btoc) Estimated well yield: 1 USgpm

Artesian flow: _____ USgpm, or Artesian pressure: _____ ft

Type of well cap: VERMIN Well disinfected: ☒ Yes ☐ No

☐ **Confirmation/alternative specs. attached**

☐ **Original well construction report attached**

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction or alteration, as the case may be. Well yield, well performance and water quality are not guaranteed as they are influenced by a number of factors, including natural variability, human activities and condition of the works, which may change over time.

white: Customer copy
canary: Driller copy
pink: Ministry copy

Sheet 1 of 1

Appendix B

Pumping Test Results

APPENDIX B

Pumping Test Data for Subject Well WID 69176

Project: WID 69176
Client: Donna Knox
Location: 490 Gardner Rd., Galiano Island
Date of Test: July 10 and 11/23
Test Conducted by: Red Williams Well Drilling

Reference: all readings from top of sounding tube

Stick up: 0.61 m
Observation Wells: WID 69177

Pumped Well: 92.96 m deep
Pumping Rate: 4.164 L/min (1.1 USgpm)
Static Water Level: 16.30 m

Pump Start Time: 10:00 PM July 10, 2023
Pump End Time: 10:00 AM July 11, 2023
Analysis by: A. Kohut, P.Eng.

Drawdown Data: **Recovery Data:**

Time (minutes)	Water Level (m)	Drawdown (m)	Time t (minutes)	Time t' (minutes)	Water Level (m)	t/t'	Residual Drawdown (m)
0.5	16.42	0.12	720.5	0.5	22.30	1441.00	6.00
1.0	16.59	0.29	721	1	22.20	721.00	5.90
1.5	16.72	0.42	721.5	1.5	22.10	481.00	5.80
2.0	16.82	0.52	722.5	2.5	21.90	289.00	5.60
2.5	16.90	0.60	723	3	21.80	241.00	5.50
3	16.97	0.67	723.5	3.5	21.70	206.71	5.40
3.5	17.05	0.75	724	4	21.61	181.00	5.31
4	17.11	0.81	724.5	4.5	21.52	161.00	5.22
4.5	17.17	0.87	725	5	21.44	145.00	5.14
5	17.22	0.92	726	6	21.26	121.00	4.96
6	17.35	1.05	727	7	21.10	103.86	4.80
7	17.44	1.14	728	8	20.940	91.00	4.64
8	17.58	1.28	729	9	20.810	81.00	4.51
9	17.68	1.38	730	10	20.67	73.00	4.37
10	17.78	1.48	732	12	20.42	61.00	4.12
12	17.88	1.58	734	14	20.19	52.43	3.89
14	18.13	1.83	736	16	19.99	46.00	3.69
16	18.25	1.95	738	18	19.81	41.00	3.51
18	18.37	2.07	730	20	19.650	36.50	3.35
20	18.47	2.17	745	25	19.35	29.80	3.05
25	18.68	2.38	750	30	19.150	25.00	2.85
30	18.86	2.56	760	40	18.89	19.00	2.59
35	19.02	2.72	765	45	18.83	17.00	2.53
40	19.15	2.85	770	50	18.78	15.40	2.48
45	19.28	2.98	775	55	18.75	14.09	2.45
50	19.36	3.06	780	60	18.71	13.00	2.41
55	19.45	3.15	790	70	18.66	11.29	2.36
60	19.52	3.22	800	80	18.61	10.00	2.31
70	19.65	3.35	810	90	18.57	9.00	2.27
80	19.76	3.46	820	100	18.54	8.20	2.24
90	19.86	3.56	830	110	18.51	7.55	2.21
100	19.95	3.65	840	120	18.50	7.00	2.20
110	20.03	3.73	870	150	18.4	5.80	2.10
120	20.10	3.80	900	180	18.33	5.00	2.03
150	20.28	3.98	930	210	18.27	4.43	1.97
180	20.46	4.16	960	240	18.21	4.00	1.91
210	20.64	4.34	1020	300	18.117	3.40	1.82
240	20.79	4.49	1080	360	18.024	3.00	1.72
270	20.93	4.63	1140	420	17.962	2.71	1.66
300	21.04	4.74	1200	480	17.89	2.50	1.59
330	21.11	4.81	1260	540	17.828	2.33	1.53
360	21.25	4.95	1320	600	17.777	2.20	1.48
390	21.47	5.17	1380	660	17.715	2.09	1.42
420	21.49	5.19	1440	720	17.663	2.00	1.36
450	21.59	5.29					
480	21.70	5.40					

Drawdown Data: **Recovery Data:**

Time (minutes)	Water Level (m)	Drawdown (m)	Time t (minutes)	Time t' (minutes)	Water Level (m)	t/t'	Residual Drawdown (m)
540	21.87	5.57					
600	22.05	5.75					
660	22.21	5.91					
720	22.36	6.06					
	Data from datalogger						

APPENDIX B

Pumping Test Data for Subject Well WID 69177

Project: WID 69177
Client: Judy Hayes
Location: 490 Gardner Rd., Galiano Island
Date of Test: July 11 and 12/23
Test Conducted by: Red Williams Well Drilling

Reference: all readings from top of sounding tube

Stick up: 1.0 m
Observation Wells: WID 69176

Pumped Well: 62.48 m deep
Pumping Rate: 3.823 L/min (1.01 USgpm)
Static Water Level: 9.40 m

Pump Start Time: 10:00 PM July 11, 2023
Pump End Time: 10:00 AM July 12, 2023
Analysis by: A. Kohut, P.Eng.

Drawdown Data: **Recovery Data:**

Time (minutes)	Water Level (m)	Drawdown (m)	Time t (minutes)	Time t' (minutes)	Water Level (m)	t/t'	Residual Drawdown (m)
0.5	9.70	0.30	720.5	0.5	15.11	1441.00	5.71
1.0	9.77	0.37	721	1	15.01	721.00	5.61
1.5	9.85	0.45	721.5	1.5	14.91	481.00	5.51
			722.0	2.0	14.82	361.00	5.42
2.0	9.93	0.53	722.5	2.5	14.73	289.00	5.33
2.5	10.00	0.60	723	3	14.65	241.00	5.25
3	10.08	0.68	723.5	3.5	14.56	206.71	5.16
3.5	10.15	0.75	724	4	14.48	181.00	5.08
4	10.22	0.82	724.5	4.5	14.40	161.00	5.00
4.5	10.29	0.89	725	5	14.33	145.00	4.93
5	10.38	0.98	726	6	14.18	121.00	4.78
6	10.49	1.09	727	7	14.05	103.86	4.65
7	10.61	1.21	728	8	13.920	91.00	4.52
8	10.73	1.33	729	9	13.800	81.00	4.40
9	10.85	1.45	730	10	13.68	73.00	4.28
10	10.96	1.56	732	12	13.45	61.00	4.05
12	11.22	1.82	734	14	13.25	52.43	3.85
14	11.40	2.00	736	16	13.06	46.00	3.66
16	11.54	2.14	738	18	12.90	41.00	3.50
18	11.69	2.29	730	20	12.740	36.50	3.34
20	11.90	2.50	745	25	12.39	29.80	2.99
25	12.17	2.77	750	30	12.100	25.00	2.70
30	12.45	3.05	755	35	11.85	21.57	2.45
35	12.69	3.29	760	40	11.66	19.00	2.26
40	12.88	3.48	765	45	11.49	17.00	2.09
45	13.06	3.66	770	50	11.33	15.40	1.93
50	13.22	3.82	775	55	11.20	14.09	1.80
55	13.38	3.98	780	60	11.09	13.00	1.69
60	13.48	4.08	790	70	10.88	11.29	1.48
70	13.69	4.29	800	80	10.75	10.00	1.35
80	13.85	4.45	810	90	10.63	9.00	1.23
90	14.00	4.60	820	100	10.53	8.20	1.13
100	14.11	4.71	830	110	10.45	7.55	1.05
110	14.20	4.80	840	120	10.38	7.00	0.98
120	14.28	4.88	870	150	10.23	5.80	0.83
150	14.44	5.04	900	180	10.12	5.00	0.72
180	14.57	5.17	930	210	10.05	4.43	0.65
210	14.69	5.29	960	240	9.99	4.00	0.59
240	14.75	5.35					
270	14.81	5.41					
300	14.83	5.43					
330	14.89	5.49					
360	14.92	5.52					
390	14.98	5.58					
420	15.00	5.60					
450	15.03	5.63					

Drawdown Data: **Recovery Data:**

Time (minutes)	Water Level (m)	Drawdown (m)	Time t (minutes)	Time t' (minutes)	Water Level (m)	t/t'	Residual Drawdown (m)
480	15.06	5.66					
540	15.08	5.68					
600	15.11	5.71					
660	15.15	5.75					
720	15.18	5.78					

Appendix C

Laboratory Water Quality Sampling Results

Your Project #: 490 GARDNER
Your C.O.C. #: WI034252

Attention: AL KOHUT

HY-GEO CONSULTING
4470 Arsens Place
VICTORIA, BC
Canada V8Z 2M9

Report Date: 2023/07/18
Report #: R3366518
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C351946
Received: 2023/07/11, 14:40

Sample Matrix: Drinking Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2023/07/13	BBY6SOP-00026	SM 24 2320 B m
Chloride/Sulphate by Auto Colourimetry	1	N/A	2023/07/13	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Colour (True) by Kone Lab	1	N/A	2023/07/12	BBY6SOP-00057	SM 23 2120 C m
Conductivity @25C	1	N/A	2023/07/13	BBY6SOP-00026	SM 24 2510 B m
Fluoride	1	N/A	2023/07/17	BBY6SOP-00048	SM 24 4500-F C m
Hardness Total (calculated as CaCO3) (1)	1	N/A	2023/07/15	BBY WI-00033	Auto Calc
Mercury (Total) by CV	1	2023/07/13	2023/07/13	AB SOP-00084	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	N/A	2023/07/15	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	1	N/A	2023/07/14	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrate + Nitrite (N)	1	N/A	2023/07/12	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA	1	N/A	2023/07/12	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	1	N/A	2023/07/13	BBY WI-00033	Auto Calc
pH @25°C (2)	1	N/A	2023/07/13	BBY6SOP-00026	SM 24 4500-H+ B m
Total Dissolved Solids (Filt. Residue)	1	2023/07/14	2023/07/17	BBY6SOP-00033	SM 24 2540 C m
Total Coliform & E.Coli by MF-Chromocult	1	N/A	2023/07/12	BBY4SOP-00143	Merck KGaA Version 1
Turbidity	1	N/A	2023/07/12	BBY6SOP-00027	SM 23 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Your Project #: 490 GARDNER
Your C.O.C. #: WI034252

Attention: AL KOHUT

HY-GEO CONSULTING
4470 Arsens Place
VICTORIA, BC
Canada V8Z 2M9

Report Date: 2023/07/18
Report #: R3366518
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C351946
Received: 2023/07/11, 14:40

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.

Encryption Key

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Email: customersolutionswest@bureauveritas.com
Phone# (604) 734 7276
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DRINKING WATER PACKAGE (NON-REGULATED)

Bureau Veritas ID					BUI440		
Sampling Date							
COC Number					WI034252		
	UNITS	MAC	AO	OG	WID 69176	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	1	-	-	<0.0050	0.0050	B031618
Calculated Parameters							
Total Hardness (CaCO3)	mg/L	-	-	-	35.8	0.50	B029061
Nitrate (N)	mg/L	10	-	-	<0.020	0.020	B029303
Misc. Inorganics							
Conductivity	uS/cm	-	-	-	460	2.0	B031571
pH	pH	-	-	7.0:10.5	8.27	N/A	B031567
Total Dissolved Solids	mg/L	-	500	-	270	10	B034173
Anions							
Alkalinity (PP as CaCO3)	mg/L	-	-	-	<1.0	1.0	B031568
Alkalinity (Total as CaCO3)	mg/L	-	-	-	210	1.0	B031568
Bicarbonate (HCO3)	mg/L	-	-	-	250	1.0	B031568
Carbonate (CO3)	mg/L	-	-	-	<1.0	1.0	B031568
Dissolved Fluoride (F)	mg/L	1.5	-	-	0.30	0.050	B036370
Hydroxide (OH)	mg/L	-	-	-	<1.0	1.0	B031568
Chloride (Cl)	mg/L	-	250	-	16	1.0	B032704
Sulphate (SO4)	mg/L	-	500	-	6.1	1.0	B032704
MISCELLANEOUS							
True Colour	Col. Unit	-	15	-	<5.0	5.0	B030877
Nutrients							
Nitrate plus Nitrite (N)	mg/L	-	-	-	<0.020	0.020	B031612
Physical Properties							
Turbidity	NTU	see remark	see remark	see remark	0.38	0.10	B030966
Elements							
Total Mercury (Hg)	ug/L	1	-	-	<0.0019	0.0019	B032486
Total Metals by ICPMS							
Total Aluminum (Al)	ug/L	2900	-	100	23.3	3.0	B034118
Total Antimony (Sb)	ug/L	6	-	-	<0.50	0.50	B034118
Total Arsenic (As)	ug/L	10	-	-	1.44	0.10	B034118
Total Barium (Ba)	ug/L	2000	-	-	2.0	1.0	B034118
Total Boron (B)	ug/L	5000	-	-	228	50	B034118
Total Cadmium (Cd)	ug/L	7	-	-	<0.010	0.010	B034118
Total Chromium (Cr)	ug/L	50	-	-	<1.0	1.0	B034118

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
N/A = Not Applicable

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DRINKING WATER PACKAGE (NON-REGULATED)

Bureau Veritas ID					BUI440		
Sampling Date							
COC Number					WI034252		
	UNITS	**MAC**	**AO**	**OG**	**WID 69176**	**RDL**	**QC Batch**
Total Cobalt (Co)	ug/L	-	-	-	0.27	0.20	B034118
Total Copper (Cu)	ug/L	2000	1000	-	5.40	0.20	B034118
Total Iron (Fe)	ug/L	-	300	-	30.2	5.0	B034118
Total Lead (Pb)	ug/L	5	-	-	<0.20	0.20	B034118
Total Manganese (Mn)	ug/L	120	20	-	**53.7**	1.0	B034118
Total Molybdenum (Mo)	ug/L	-	-	-	2.2	1.0	B034118
Total Nickel (Ni)	ug/L	-	-	-	<1.0	1.0	B034118
Total Selenium (Se)	ug/L	50	-	-	<0.10	0.10	B034118
Total Silicon (Si)	ug/L	-	-	-	7250	100	B034118
Total Silver (Ag)	ug/L	-	-	-	<0.020	0.020	B034118
Total Strontium (Sr)	ug/L	7000	-	-	80.2	1.0	B034118
Total Uranium (U)	ug/L	20	-	-	0.12	0.10	B034118
Total Vanadium (V)	ug/L	-	-	-	<5.0	5.0	B034118
Total Zinc (Zn)	ug/L	-	5000	-	<5.0	5.0	B034118
Total Calcium (Ca)	mg/L	-	-	-	11.9	0.050	B029300
Total Magnesium (Mg)	mg/L	-	-	-	1.49	0.050	B029300
Total Potassium (K)	mg/L	-	-	-	0.193	0.050	B029300
Total Sodium (Na)	mg/L	-	200	-	89.7	0.050	B029300
Total Sulphur (S)	mg/L	-	-	-	<3.0	3.0	B029300
Microbiological Param.							
Total Coliforms	CFU/100mL	0	-	-	0	N/A	B031605
E. coli	CFU/100mL	0	-	-	0	N/A	B031605

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

Sample BUI440 [WID 69176] : Sampling Date not provided for Total Coliform & E.Coli by MF-Chromocult; therefore, hold time status cannot be assessed.
MAC,AO,OG: The guidelines that have been included in this report have been taken from the Canadian Drinking Water Quality Summary Table, September 2022.

Criteria A = Maximum Acceptable Concentration (MAC) / Criteria B = Aesthetic Objectives (AO) / Criteria C = Operational Guidance Values (OG)
It is recommended to consult these guidelines when interpreting your data since there are non-numerical guidelines that are not included on this report.

Turbidity Guidelines:
1. Chemically assisted filtration: less than or equal to 0.3 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 1.0 NTU at any time.
2. Slow sand / diatomaceous earth filtration: less than or equal to 1.0 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 3.0 NTU at any time.
3. Membrane filtration: less than or equal to 0.1 NTU in 99% of the measurements made or at least 99% of the time each calendar month. Shall not exceed 0.3 NTU at any time.
4. To ensure effectiveness of disinfection and for good operation of the distribution system, it is recommended that water entering the distribution system have turbidity levels of 1.0 NTU or less.
Measurement of Uncertainty has not been accounted for when stating conformity to the selected criteria, where applicable.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B030877	True Colour	2023/07/12			101	80 - 120	<5.0	Col. Unit	NC	20
B030966	Turbidity	2023/07/12			97	80 - 120	<0.10	NTU	18	20
B031567	pH	2023/07/13			100	97 - 103			1.4	N/A
B031568	Alkalinity (PP as CaCO3)	2023/07/13					<1.0	mg/L		
B031568	Alkalinity (Total as CaCO3)	2023/07/13			100	80 - 120	<1.0	mg/L		
B031568	Bicarbonate (HCO3)	2023/07/13					<1.0	mg/L		
B031568	Carbonate (CO3)	2023/07/13					<1.0	mg/L		
B031568	Hydroxide (OH)	2023/07/13					<1.0	mg/L		
B031571	Conductivity	2023/07/13			100	90 - 110	<2.0	uS/cm		
B031612	Nitrate plus Nitrite (N)	2023/07/12	104	80 - 120	108	80 - 120	<0.020	mg/L	NC	25
B031618	Nitrite (N)	2023/07/12	99	80 - 120	104	80 - 120	<0.0050	mg/L	NC	20
B032486	Total Mercury (Hg)	2023/07/13	85	80 - 120	95	80 - 120	<0.0019	ug/L	NC	20
B032704	Chloride (Cl)	2023/07/13	NC	80 - 120	98	80 - 120	<1.0	mg/L		
B032704	Sulphate (SO4)	2023/07/13	NC	80 - 120	99	80 - 120	<1.0	mg/L	1.6	20
B034118	Total Aluminum (Al)	2023/07/14	99	80 - 120	99	80 - 120	<3.0	ug/L	0.47	20
B034118	Total Antimony (Sb)	2023/07/14	102	80 - 120	102	80 - 120	<0.50	ug/L	NC	20
B034118	Total Arsenic (As)	2023/07/14	102	80 - 120	101	80 - 120	<0.10	ug/L	6.6	20
B034118	Total Barium (Ba)	2023/07/14	100	80 - 120	99	80 - 120	<1.0	ug/L	0.49	20
B034118	Total Boron (B)	2023/07/14	98	80 - 120	95	80 - 120	<50	ug/L	NC	20
B034118	Total Cadmium (Cd)	2023/07/14	97	80 - 120	98	80 - 120	<0.010	ug/L	NC	20
B034118	Total Chromium (Cr)	2023/07/14	98	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B034118	Total Cobalt (Co)	2023/07/14	94	80 - 120	95	80 - 120	<0.20	ug/L	NC	20
B034118	Total Copper (Cu)	2023/07/14	NC	80 - 120	94	80 - 120	<0.20	ug/L	0.17	20
B034118	Total Iron (Fe)	2023/07/14	100	80 - 120	97	80 - 120	<5.0	ug/L	2.2	20
B034118	Total Lead (Pb)	2023/07/14	99	80 - 120	100	80 - 120	<0.20	ug/L	0.88	20
B034118	Total Manganese (Mn)	2023/07/14	97	80 - 120	96	80 - 120	<1.0	ug/L	NC	20
B034118	Total Molybdenum (Mo)	2023/07/14	104	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B034118	Total Nickel (Ni)	2023/07/14	96	80 - 120	98	80 - 120	<1.0	ug/L	0.65	20
B034118	Total Selenium (Se)	2023/07/14	105	80 - 120	105	80 - 120	<0.10	ug/L	NC	20
B034118	Total Silicon (Si)	2023/07/14	NC	80 - 120	102	80 - 120	<100	ug/L	1.9	20
B034118	Total Silver (Ag)	2023/07/14	100	80 - 120	99	80 - 120	<0.020	ug/L	NC	20
B034118	Total Strontium (Sr)	2023/07/14	NC	80 - 120	98	80 - 120	<1.0	ug/L	1.6	20
B034118	Total Uranium (U)	2023/07/14	92	80 - 120	84	80 - 120	<0.10	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
B034118	Total Vanadium (V)	2023/07/14	100	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
B034118	Total Zinc (Zn)	2023/07/14	NC	80 - 120	100	80 - 120	<5.0	ug/L	1.4	20
B034173	Total Dissolved Solids	2023/07/17	100	80 - 120	97	80 - 120	<10	mg/L	0.83	20
B036370	Dissolved Fluoride (F)	2023/07/17	104	80 - 120	102	80 - 120	<0.050	mg/L	NC	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Mauro Oselin, Scientific Specialist

Bureau Veritas Proprietary Software
Logiciel Propriétaire de Bureau Veritas

Automated Statchk

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Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 490 GARDNER
Your C.O.C. #: WI034479

Attention: AL KOHUT

HY-GEO CONSULTING
4470 Arsens Place
VICTORIA, BC
Canada V8Z 2M9

Report Date: 2023/07/19
Report #: R3367441
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C352397
Received: 2023/07/12, 14:46

Sample Matrix: Drinking Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2023/07/14	BBY6SOP-00026	SM 24 2320 B m
Chloride/Sulphate by Auto Colourimetry	1	N/A	2023/07/14	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Colour (True) by Kone Lab	1	N/A	2023/07/14	BBY6SOP-00057	SM 23 2120 C m
Conductivity @25C	1	N/A	2023/07/14	BBY6SOP-00026	SM 24 2510 B m
Fluoride	1	N/A	2023/07/17	BBY6SOP-00048	SM 24 4500-F C m
Hardness Total (calculated as CaCO3) (1)	1	N/A	2023/07/15	BBY WI-00033	Auto Calc
Mercury (Total) by CV	1	2023/07/14	2023/07/14	AB SOP-00084	BCMOE BCLM Oct2013 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	N/A	2023/07/15	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	1	N/A	2023/07/14	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrate + Nitrite (N)	1	N/A	2023/07/14	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA	1	N/A	2023/07/14	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrogen - Nitrate (as N)	1	N/A	2023/07/15	BBY WI-00033	Auto Calc
pH @25°C (2)	1	N/A	2023/07/14	BBY6SOP-00026	SM 24 4500-H+ B m
Total Dissolved Solids (Filt. Residue)	1	2023/07/14	2023/07/17	BBY6SOP-00033	SM 24 2540 C m
Total Coliform & E.Coli by MF-Chromocult	1	N/A	2023/07/13	BBY4SOP-00143	Merck KGaA Version 1
Turbidity	1	N/A	2023/07/13	BBY6SOP-00027	SM 23 2130 B m

Remarks:

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Your Project #: 490 GARDNER
Your C.O.C. #: WI034479

Attention: AL KOHUT

HY-GEO CONSULTING
4470 Arsens Place
VICTORIA, BC
Canada V8Z 2M9

Report Date: 2023/07/19
Report #: R3367441
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C352397
Received: 2023/07/12, 14:46

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* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.

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Email: customersolutionswest@bureauveritas.com
Phone# (604) 734 7276
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DRINKING WATER PACKAGE (NON-REGULATED)

Bureau Veritas ID					BUL010		
Sampling Date					2023/07/12 09:50		
COC Number					WI034479		
	UNITS	MAC	AO	OG	WID 69177	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	1	-	-	0.0069	0.0050	B034898
Calculated Parameters							
Total Hardness (CaCO3)	mg/L	-	-	-	125	0.50	B030744
Nitrate (N)	mg/L	10	-	-	0.560	0.020	B030823
Misc. Inorganics							
Conductivity	uS/cm	-	-	-	410	2.0	B033528
pH	pH	-	-	7.0:10.5	7.86	N/A	B033527
Total Dissolved Solids	mg/L	-	500	-	240	10	B034173
Anions							
Alkalinity (PP as CaCO3)	mg/L	-	-	-	<1.0	1.0	B033526
Alkalinity (Total as CaCO3)	mg/L	-	-	-	180	1.0	B033526
Bicarbonate (HCO3)	mg/L	-	-	-	220	1.0	B033526
Carbonate (CO3)	mg/L	-	-	-	<1.0	1.0	B033526
Dissolved Fluoride (F)	mg/L	1.5	-	-	0.11	0.050	B036749
Hydroxide (OH)	mg/L	-	-	-	<1.0	1.0	B033526
Chloride (Cl)	mg/L	-	250	-	8.5	1.0	B034435
Sulphate (SO4)	mg/L	-	500	-	6.0	1.0	B034435
MISCELLANEOUS							
True Colour	Col. Unit	-	15	-	<5.0	5.0	B034238
Nutrients							
Nitrate plus Nitrite (N)	mg/L	-	-	-	0.567	0.020	B034897
Physical Properties							
Turbidity	NTU	see remark	see remark	see remark	0.38	0.10	B033464
Elements							
Total Mercury (Hg)	ug/L	1	-	-	<0.0019	0.0019	B034230
Total Metals by ICPMS							
Total Aluminum (Al)	ug/L	2900	-	100	15.7	3.0	B034118
Total Antimony (Sb)	ug/L	6	-	-	<0.50	0.50	B034118
Total Arsenic (As)	ug/L	10	-	-	0.66	0.10	B034118
Total Barium (Ba)	ug/L	2000	-	-	6.2	1.0	B034118
Total Boron (B)	ug/L	5000	-	-	63	50	B034118
Total Cadmium (Cd)	ug/L	7	-	-	<0.010	0.010	B034118

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
N/A = Not Applicable

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DRINKING WATER PACKAGE (NON-REGULATED)

Bureau Veritas ID					BUL010		
Sampling Date					2023/07/12 09:50		
COC Number					WI034479		
	UNITS	MAC	AO	OG	WID 69177	RDL	QC Batch
Total Chromium (Cr)	ug/L	50	-	-	<1.0	1.0	B034118
Total Cobalt (Co)	ug/L	-	-	-	<0.20	0.20	B034118
Total Copper (Cu)	ug/L	2000	1000	-	6.02	0.20	B034118
Total Iron (Fe)	ug/L	-	300	-	34.1	5.0	B034118
Total Lead (Pb)	ug/L	5	-	-	0.23	0.20	B034118
Total Manganese (Mn)	ug/L	120	20	-	**185**	1.0	B034118
Total Molybdenum (Mo)	ug/L	-	-	-	1.0	1.0	B034118
Total Nickel (Ni)	ug/L	-	-	-	<1.0	1.0	B034118
Total Selenium (Se)	ug/L	50	-	-	<0.10	0.10	B034118
Total Silicon (Si)	ug/L	-	-	-	10400	100	B034118
Total Silver (Ag)	ug/L	-	-	-	<0.020	0.020	B034118
Total Strontium (Sr)	ug/L	7000	-	-	304	1.0	B034118
Total Uranium (U)	ug/L	20	-	-	0.32	0.10	B034118
Total Vanadium (V)	ug/L	-	-	-	<5.0	5.0	B034118
Total Zinc (Zn)	ug/L	-	5000	-	8.7	5.0	B034118
Total Calcium (Ca)	mg/L	-	-	-	41.6	0.050	B030822
Total Magnesium (Mg)	mg/L	-	-	-	5.11	0.050	B030822
Total Potassium (K)	mg/L	-	-	-	0.303	0.050	B030822
Total Sodium (Na)	mg/L	-	200	-	39.7	0.050	B030822
Total Sulphur (S)	mg/L	-	-	-	<3.0	3.0	B030822
Microbiological Param.							
Total Coliforms	CFU/100mL	0	-	-	**2.0**	N/A	B033178
E. coli	CFU/100mL	0	-	-	0	N/A	B033178

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

MAC,AO,OG: The guidelines that have been included in this report have been taken from the Canadian Drinking Water Quality Summary Table, September 2022.

Criteria A = Maximum Acceptable Concentration (MAC) / Criteria B = Aesthetic Objectives (AO) / Criteria C = Operational Guidance Values (OG)
It is recommended to consult these guidelines when interpreting your data since there are non-numerical guidelines that are not included on this report.

Turbidity Guidelines:
1. Chemically assisted filtration: less than or equal to 0.3 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 1.0 NTU at any time.
2. Slow sand / diatomaceous earth filtration: less than or equal to 1.0 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 3.0 NTU at any time.
3. Membrane filtration: less than or equal to 0.1 NTU in 99% of the measurements made or at least 99% of the time each calendar month. Shall not exceed 0.3 NTU at any time.
4. To ensure effectiveness of disinfection and for good operation of the distribution system, it is recommended that water entering the distribution system have turbidity levels of 1.0 NTU or less.
Measurement of Uncertainty has not been accounted for when stating conformity to the selected criteria, where applicable.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B033464	Turbidity	2023/07/13			101	80 - 120	<0.10	NTU	0.71	20
B033526	Alkalinity (PP as CaCO3)	2023/07/14					<1.0	mg/L		
B033526	Alkalinity (Total as CaCO3)	2023/07/14			97	80 - 120	<1.0	mg/L		
B033526	Bicarbonate (HCO3)	2023/07/14					<1.0	mg/L		
B033526	Carbonate (CO3)	2023/07/14					<1.0	mg/L		
B033526	Hydroxide (OH)	2023/07/14					<1.0	mg/L		
B033527	pH	2023/07/14			100	97 - 103				
B033528	Conductivity	2023/07/14			99	90 - 110	<2.0	uS/cm		
B034118	Total Aluminum (Al)	2023/07/14	99	80 - 120	99	80 - 120	<3.0	ug/L	0.47	20
B034118	Total Antimony (Sb)	2023/07/14	102	80 - 120	102	80 - 120	<0.50	ug/L	NC	20
B034118	Total Arsenic (As)	2023/07/14	102	80 - 120	101	80 - 120	<0.10	ug/L	6.6	20
B034118	Total Barium (Ba)	2023/07/14	100	80 - 120	99	80 - 120	<1.0	ug/L	0.49	20
B034118	Total Boron (B)	2023/07/14	98	80 - 120	95	80 - 120	<50	ug/L	NC	20
B034118	Total Cadmium (Cd)	2023/07/14	97	80 - 120	98	80 - 120	<0.010	ug/L	NC	20
B034118	Total Chromium (Cr)	2023/07/14	98	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B034118	Total Cobalt (Co)	2023/07/14	94	80 - 120	95	80 - 120	<0.20	ug/L	NC	20
B034118	Total Copper (Cu)	2023/07/14	NC	80 - 120	94	80 - 120	<0.20	ug/L	0.17	20
B034118	Total Iron (Fe)	2023/07/14	100	80 - 120	97	80 - 120	<5.0	ug/L	2.2	20
B034118	Total Lead (Pb)	2023/07/14	99	80 - 120	100	80 - 120	<0.20	ug/L	0.88	20
B034118	Total Manganese (Mn)	2023/07/14	97	80 - 120	96	80 - 120	<1.0	ug/L	NC	20
B034118	Total Molybdenum (Mo)	2023/07/14	104	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B034118	Total Nickel (Ni)	2023/07/14	96	80 - 120	98	80 - 120	<1.0	ug/L	0.65	20
B034118	Total Selenium (Se)	2023/07/14	105	80 - 120	105	80 - 120	<0.10	ug/L	NC	20
B034118	Total Silicon (Si)	2023/07/14	NC	80 - 120	102	80 - 120	<100	ug/L	1.9	20
B034118	Total Silver (Ag)	2023/07/14	100	80 - 120	99	80 - 120	<0.020	ug/L	NC	20
B034118	Total Strontium (Sr)	2023/07/14	NC	80 - 120	98	80 - 120	<1.0	ug/L	1.6	20
B034118	Total Uranium (U)	2023/07/14	92	80 - 120	84	80 - 120	<0.10	ug/L	NC	20
B034118	Total Vanadium (V)	2023/07/14	100	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
B034118	Total Zinc (Zn)	2023/07/14	NC	80 - 120	100	80 - 120	<5.0	ug/L	1.4	20
B034173	Total Dissolved Solids	2023/07/17	100	80 - 120	97	80 - 120	<10	mg/L	0.83	20
B034230	Total Mercury (Hg)	2023/07/14	104	80 - 120	99	80 - 120	<0.0019	ug/L	NC	20
B034238	True Colour	2023/07/14			106	80 - 120	<5.0	Col. Unit	NC	20
B034435	Chloride (Cl)	2023/07/14	NC	80 - 120	100	80 - 120	<1.0	mg/L	0.074	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B034435	Sulphate (SO4)	2023/07/14	NC	80 - 120	101	80 - 120	<1.0	mg/L	0.94	20
B034897	Nitrate plus Nitrite (N)	2023/07/14	102	80 - 120	107	80 - 120	<0.020	mg/L	NC	25
B034898	Nitrite (N)	2023/07/14	99	80 - 120	106	80 - 120	<0.0050	mg/L	NC	20
B036749	Dissolved Fluoride (F)	2023/07/17	110	80 - 120	106	80 - 120	<0.050	mg/L	0	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Mauro Oselin, Scientific Specialist

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