

September 3, 2024

Tahirih Rockafella
Galiano Island BC

Attention: Tahirih Rockafella

Re: Groundwater Assessment of Well WTN 103407, District Lot 14 Galiano Island, Cowichan District.

As requested, Hy-Geo Consulting has completed a review of a recent pumping test conducted on an existing 260 foot (79.25 m) deep bedrock well designated as WTN 103407 on the above property. A copy of the well drilling record for the well is provided in Appendix A. The well was tested to provide evidence of a proven supply of potable water to meet the requirements of *Galiano Island Land Use Bylaw, No. 127, Standards for Potable Water Supply, Sections 13.24 to 13.29* (Galiano Island Local Trust Committee, 2024). The well currently supplies a residence on the property.

Site Location

The property is situated along the northern coast of Galiano Island immediately east of Taylor Cove (Figure 1). District Lot 14 slopes northeasterly along a series of east-west trending ridges from an elevation of close to 100 metres in the southern portion of DL 14 from where elevations also fall towards the south. DL 14 encompasses 5 Strata Lots within Strata Plan VIS4887 and occupies approximately 852212 m² in area. Reported nearby well locations mapped under the *British Columbia Water Resources Atlas* (Province of British Columbia, 2024a), are shown in Figure 2. Ephemeral streams drain the region along the western and eastern boundaries of the property. Well WTN 103407, tested under this assessment is situated at an elevation of approximately 28 m (91.86 feet) above sea level based on 2 m contour topography shown in MapIT (Islands Trust, 2024). The bottom of the well is, therefore, completed about 51.25 m (168.18 feet) below sea level within the underlying fractured sedimentary bedrock aquifer.

Climate

The climate of Galiano Island is characterized by cool dry summers and humid mild winters. Based on records from 1951 to 1980 (Environment Canada, 198_) the normal annual precipitation for a climate station on Galiano Island was 33.7 inches (856 mm). More recent precipitation data for the period 1981-2010, reported by Government of Canada (2024a) for a climate station on nearby Mayne Island showed a normal annual precipitation of 842.0 mm. With the absence of a current climate station on Galiano Island, the Mayne Island climate station may be considered representative of the general longer-term (monthly) precipitation patterns on Galiano (Figure 3).

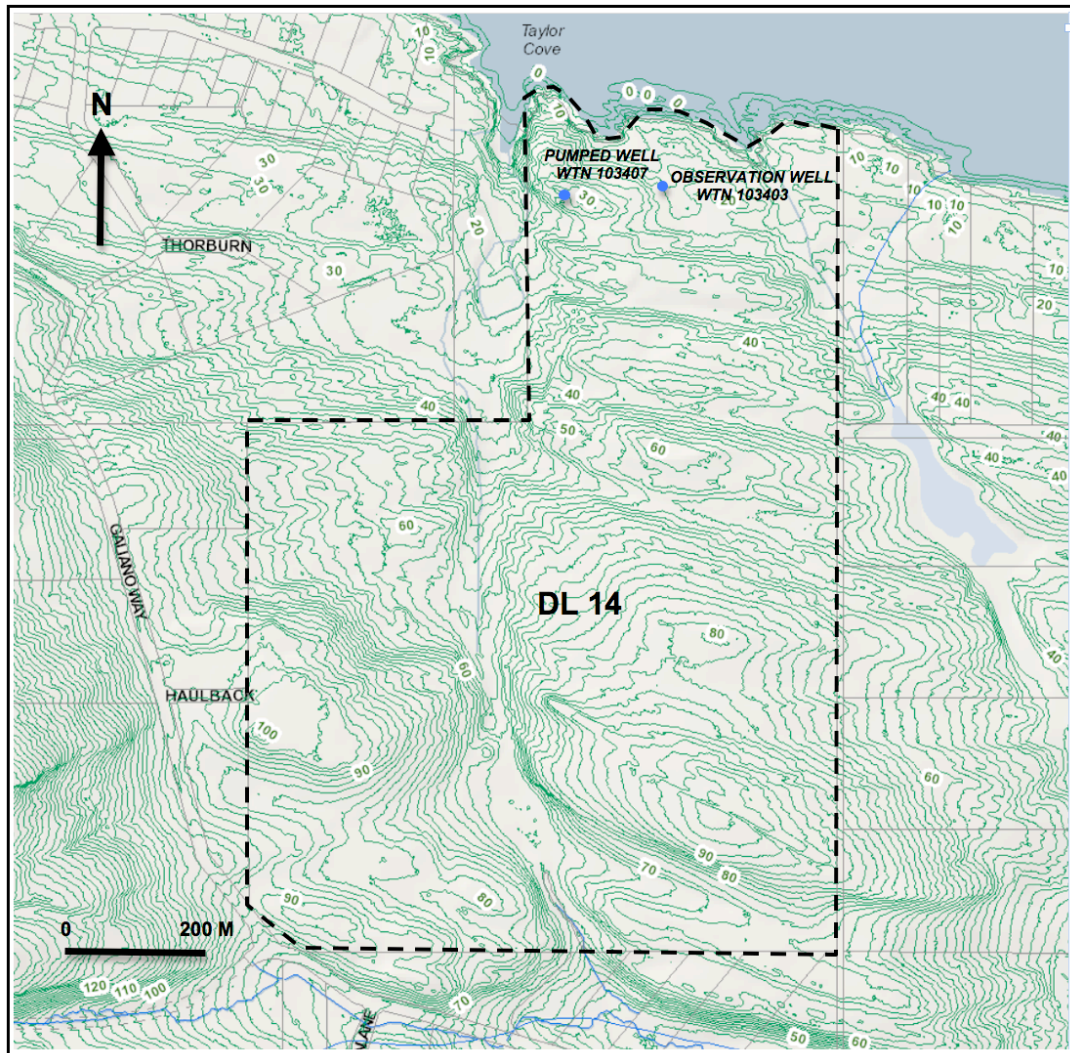


Figure 1. Topography and location of subject property, pumped well and observation well. Contour interval is 2 m. Basemap from Islands Trust (2024).

Over 90% of the total annual amount normally falls as rain with over 60% of the total falling during the period from November to February. Precipitation follows a seasonal cycle, with highest rainfall during the fall, winter and early spring months while the summer months are subject to drought conditions. Global climate models (Allen *et al.*, 2008) suggest precipitation may increase slightly in the future, particularly during the winter months.

The most recent (2024) precipitation data for the region is available for climate station 1015638 on North Pender Island (Government of Canada, 2024b). Table 1 shows that the cumulative precipitation for the North Pender climate station from January 2024 to end of July 2024.

Cumulative precipitation during the first seven months of 2024 was 90.1 percent of normal. For the 12 -day period prior to the pumping test on June 12, 2024, there was 0.0 mm of precipitation recorded. During the days of the pumping test no precipitation was recorded.

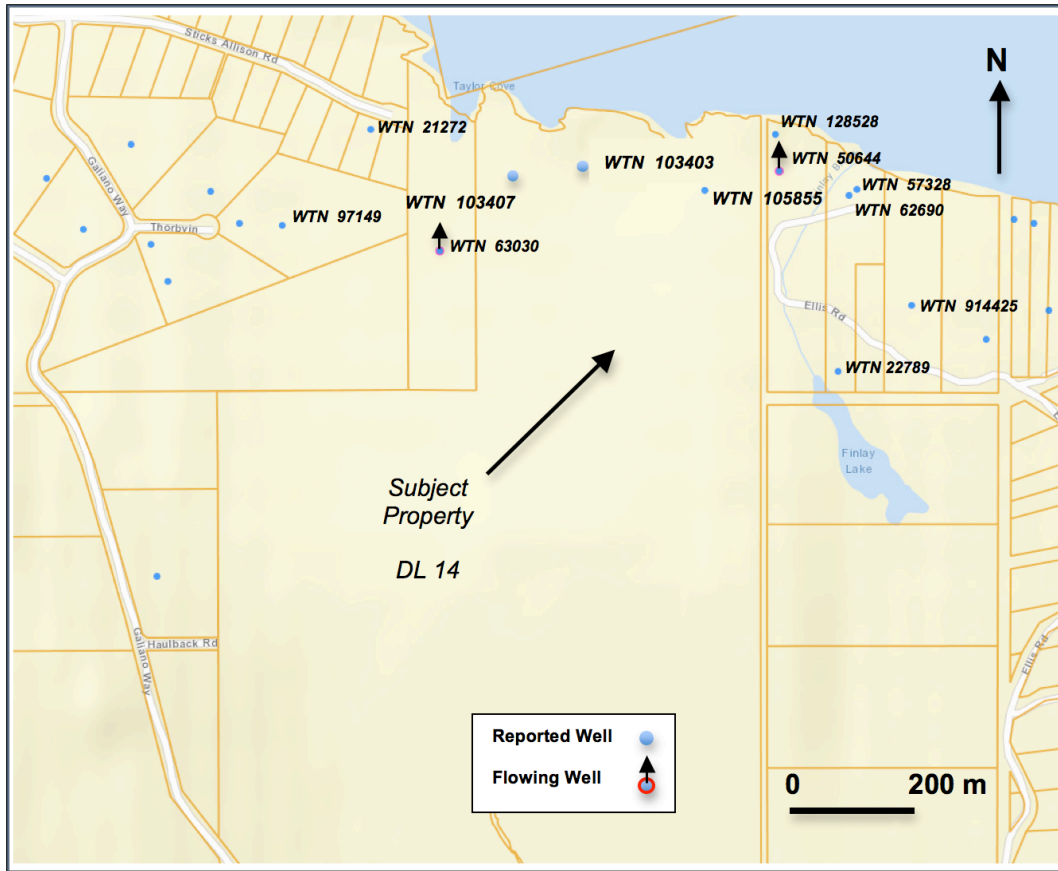


Figure 2. Reported well locations at and in vicinity of DL 14. Well locations are approximate. Basemap from Province of British Columbia (2024a).

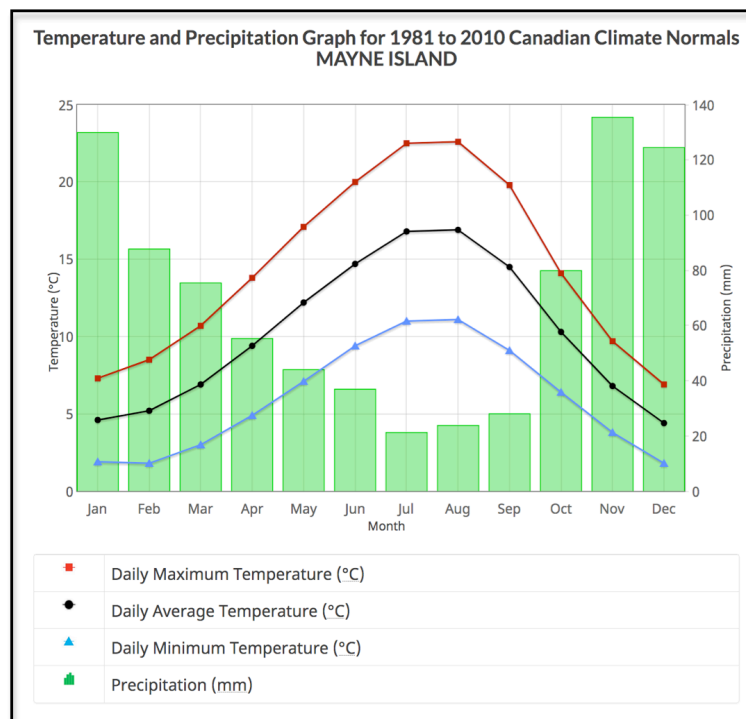


Figure 3. Graph of monthly normal precipitation for Mayne Island Station (Climate ID. 1014931). Graph from Government of Canada (2024a).

Table 1. Monthly precipitation data for North Pender climate station (Climate ID. 1015638) from Jan.1, 2024 to July 31, 2024 compared to Mayne 1981-2010 monthly normals.

Month	Precipitation in 2024 (mm)	Normal Monthly Precipitation (mm)	Percent of Normal	Cumulative Percent of Normal
January	171	129.9	131.6	131.6
February	74.2	87.7	84.6	112.7
March	26.3	75.4	34.9	92.7
April	36.8	55.3	66.5	104.3
May	57.8	44.0	131.4	93.3
June	20.4	36.9	55.3	90.1
July	13.0	21.2	61.3	88.7

Data from Government of Canada (2024a and 2024b).

Hydrogeologic Conditions

The general groundwater conditions of Galiano Island have been reported by Harrison (1994), Kohut and Johanson (1998) and Waterline Resources Inc. (2011). Galiano is comprised of sedimentary clastic rocks belonging to the Nanaimo Group of Late Cretaceous age (Muller and Jeletzky, 1970). The subject property and surrounding region is principally underlain by the Gabriola Formation that is dominantly sandstone with some shale (mudstone) interbeds and conglomerate.

Groundwater on the island is found primarily in open fractures in the bedrock formations. These fractures constitute the major zones for groundwater storage and movement. The subject property lies entirely within the Finlay Lake groundwater region as outlined by Kohut and Johanson (1998). In 1998, Kohut and Johanson estimated the demand to groundwater in storage ratio in this region to be moderate at 0.18. Existing well density at that time was also determined to be low to medium at 0.051 wells/acre. Based on available well records currently in GWELLS (Province of British Columbia, 2024b) there are 43 reported wells in the region. These would have increased the well density to approximately 0.069 wells/acre; still within the low to medium range for this region.

The northern portion of the property is situated in a regional groundwater discharge area along the coast as evidenced by high groundwater levels and flowing artesian conditions in some wells (Kohut and Johanson, 1998).

Regional Water Level Fluctuations

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 groundwater level trend in 2024 for Provincial Observation Well 258,

situated near Sturdies Bay compared to the range of historic maxima and minima levels. The graph indicates that groundwater levels during the pumping test in early August 2024 were declining, close to and slightly below the historic median level trend for this time of year.

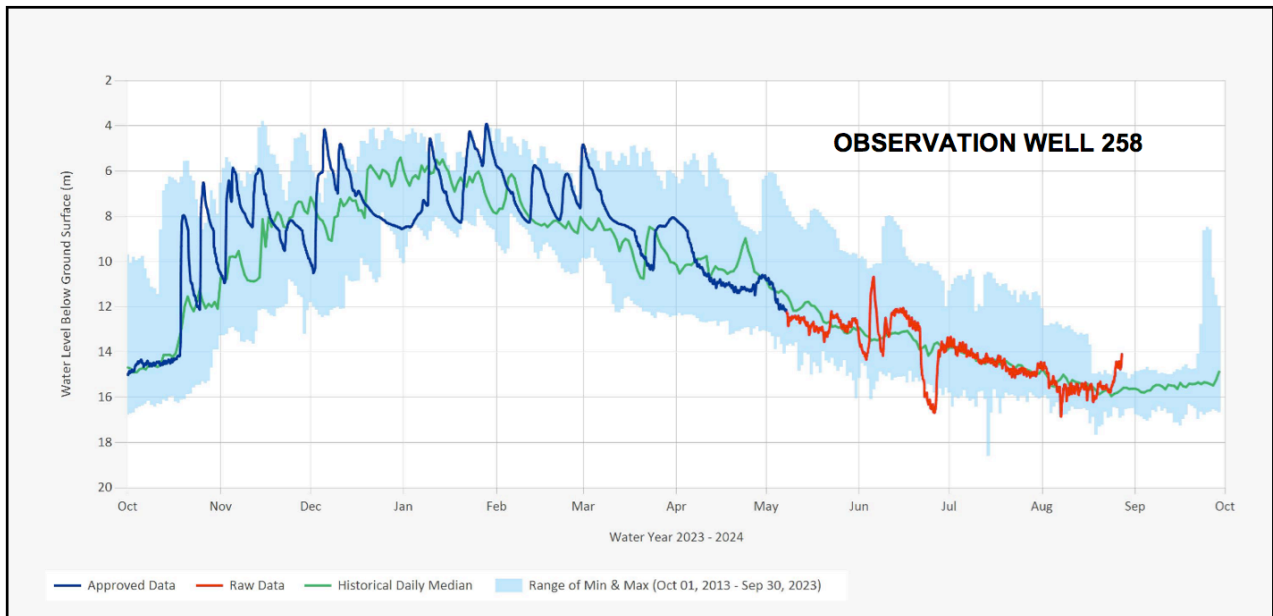


Figure 4. Groundwater level trend in 2023 - 2024 compared to historic maximum, minimum and median data for Observation Well 258. Adapted from Province of British Columbia (2024c).

Pumped Well WTN 103407

Well WTN 103407 appears to be plotted incorrectly in the provincial GWELLS database (Province of British Columbia, 2024b) where it is shown in the location of Well WTN 103403. Well WTN 103407 was drilled in May 2009 to a depth of 260 feet (79.25 m) and completed by Ken Smithson in grey sandstone bedrock with water-bearing fractures reported as follows:

- 1/4 USgpm at 45 feet (13.72 m),
- 1/2 USgpm at 120 feet, (36.58 m),
- 1/4 USgpm at 170 feet, (51.82 m) and
- 4 USgpm at 230 feet (70.10 m).

The well was completed with 20 feet (6.1 m) of 6.625 inch (16.83 cm) diameter steel casing set to 18 feet (5.5 m) below ground with a 2 foot (0.6 m) stickup. The driller estimated the well yield at 5 USgpm based on a 3 hour air lift test. Non-pumping water level after drilling was not initially reported. A copy of the well record for Well WTN 103407 is provided in Appendix A.

Observation Well WTN 103403

Well WTN 103403 is situated approximately 150 m northeast of the pumped well as shown in Figure 1. The well was drilled in May 2009 to a depth of 300 feet (91.44 m) and completed by Ken Smithson in grey sandstone with an interbed of shale bedrock and water-bearing fractures reported as follows:

¼ USgpm at 70 feet (21.34 m), and
1¼ USgpm at 265 feet (80.77 m).

The well was completed with 20 feet (6.1 m) of 6.625 inch (16.83 cm) diameter steel casing set to 18 feet (5.5 m) below ground with a 2 foot (0.6 m) stickup. The driller estimated the well yield at 1.5 USgpm based on a 3 hour air lift test. Non-pumping water level after drilling was not initially reported. A copy of the well record for Well WTN 103403 is provided in Appendix A.

2024 Testing Conducted

A pumping test of 12 hours duration is generally considered sufficient for determining the sustainable yield of a domestic residential well where the minimum requirements are 2275 L/day for a single residential use, as set out under *Galiano Island Land Use Bylaw, No. 127, Standards for Potable Water Supply, Sections 13.24 to 13.29* (Galiano Island Local Trust Committee, 2024). This quantity is equivalent to a pumping rate of 0.42 USgpm (1.58 L/min).

A 12 hour constant rate pumping test was subsequently carried out on the subject well on August 12-13, 2024 at a constant rate of 7.6 L/min (1.5 USgpm). The test was undertaken by Red Williams Well Drilling Ltd., utilizing the well owner's submersible pump. Water was discharged 30 m downslope. Manual water level readings were taken in the pumped well during the test at prescribed intervals (Province of British Columbia, 2020). A Heron™ Instruments Inc., *dipperLog* datalogger was set in the pumped well to record water levels at one minute intervals. A second Heron™ Instruments Inc., *dipperLog* datalogger was set in the neighbouring well, WTN 103403, used as an observation well to record water levels at one minute intervals. Upon pump shutdown, recovery in the pumped well was measured at prescribed intervals for 4 hours. A Heron™ Instruments Inc., barologger was also employed at the site to record changes in barometric pressure and adjust the water level data obtained from the observation well.

Water samples were taken from the pumped well discharge after 11.75 hours of pumping and delivered within 24 hours of sampling with ice packs to the Bureau Veritas laboratory in Esquimalt for analysis of chemical and bacteriological parameters. All samples were unadulterated and taken from the pumped well WTN 103407 shown in Figure 1 and delivered to the laboratory by A. Kohut.

Pump Testing Results

Well test data, drawdown and recovery plots for the subject well are provided in Appendix B. Appendix C contains copies of the analytical laboratory report from Bureau Veritas.

Figure 5 shows the drawdown in the subject well during pumping at a rate of 5.65 L/min. At the end of the test, drawdown reached 13.60 m (44.62 feet) below the pre-pumping level of 19.55 m (64.14 feet) below the top of sounding tube, or 32.77 m (107.51 feet) below ground. The drawdown appears to have stabilized during the last 2 hours of the test. During the test, 26.9 % of the available drawdown of 50.43 m to the major water-producing fracture at 70.10 m (230 feet) was utilized. The final water level reached was 4.77 m (15.65 feet) below sea level. Water level recovery was 79% after 4 hours of the pump shutting down and 94 % after 11 hours. Indications from the trend of the recovery graph (Figure 6) is that full recovery would occur.

Extrapolation of the drawdown slope to 100 days without recharge indicates the drawdown would reach 43.8 m (143.70 feet), utilizing 86 % of the available drawdown if the well was continuously pumped at 5.64 L/min. Based on the specific capacity of 0.129 L/min per metre for the well at 100 days and utilizing 70 % of the available drawdown of 50.43 m would indicate a potential long-term yield of 4.55 L/min (6552 L/day) or 1.20 USgpm. Utilizing 70 percent of the available drawdown of 19.17 m to sea level would indicate a potential yield 1.73 L/min (2491 L/day) or 0.45 USgpm. This yield exceeds the bylaw requirements of 2275 L/day. Operation of the well for domestic purposes would maintain groundwater levels above sea level at the well and minimize any potential risk of sea water intrusion.

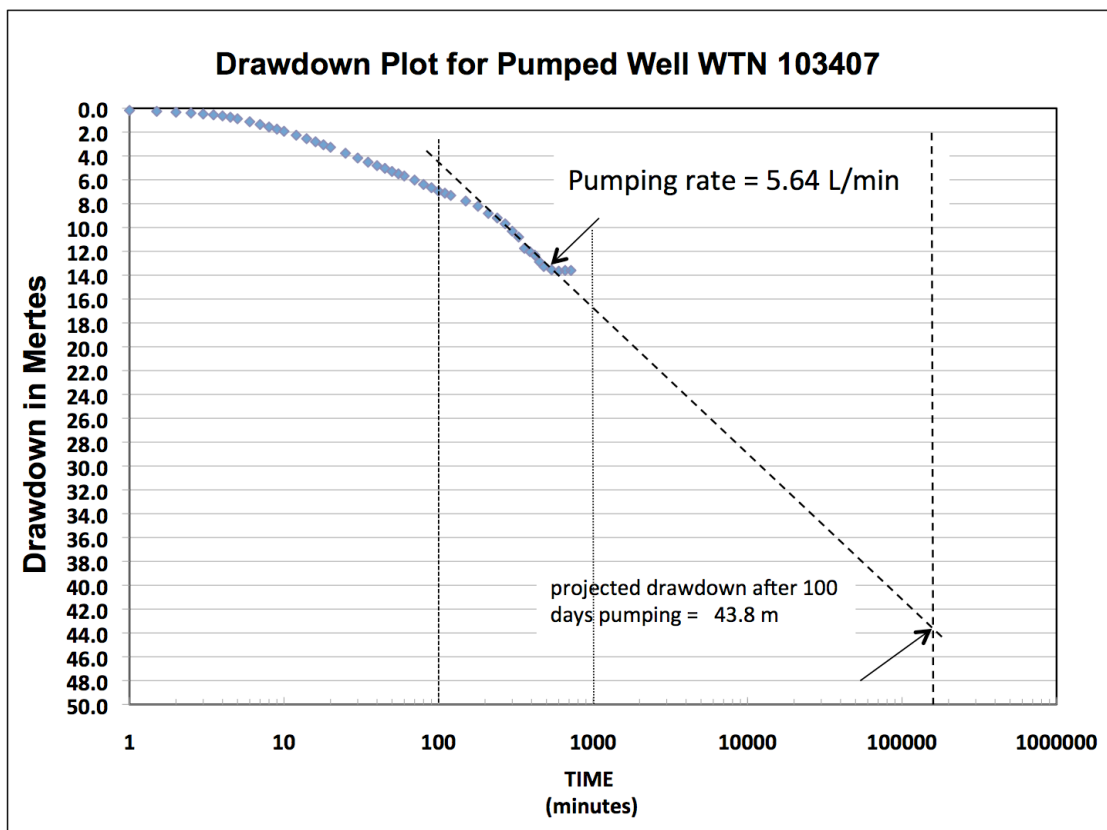


Figure 5. Semi-log drawdown plot for Well WTN 103407 pumping at 5.64 L/min.

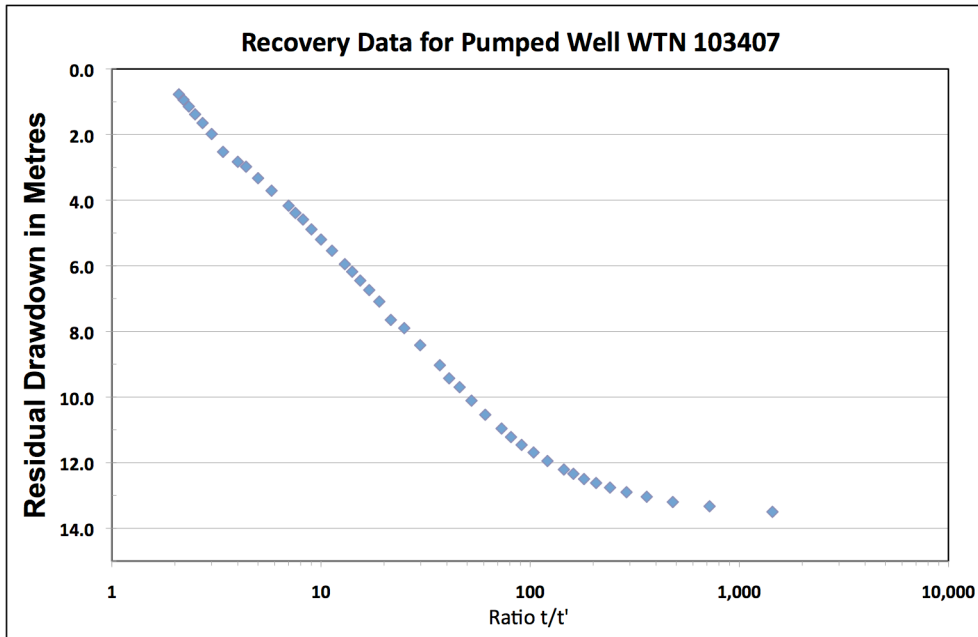


Figure 6. Semi-log recovery plot for Well WTN 103407.

Figure 7 is a plot of the water levels in observation well WTN 103403 prior to, during and after the test pumping of WTN 103407. Prior to the test the water level in the observation well was showing a rising trend. The water level declined about 0.15 metres during part of the test and continued to decline after the pump was stopped. This was followed by further fluctuations of about 0.1 metre indicating that the well may have been responding to tidal effects. Pumping effects from well WTN 103407 were not readily apparent during the test. Based on these observations it is unlikely that pumping of well WTN 103407 for residential purposes would impact any neighbouring wells or streams in the region.

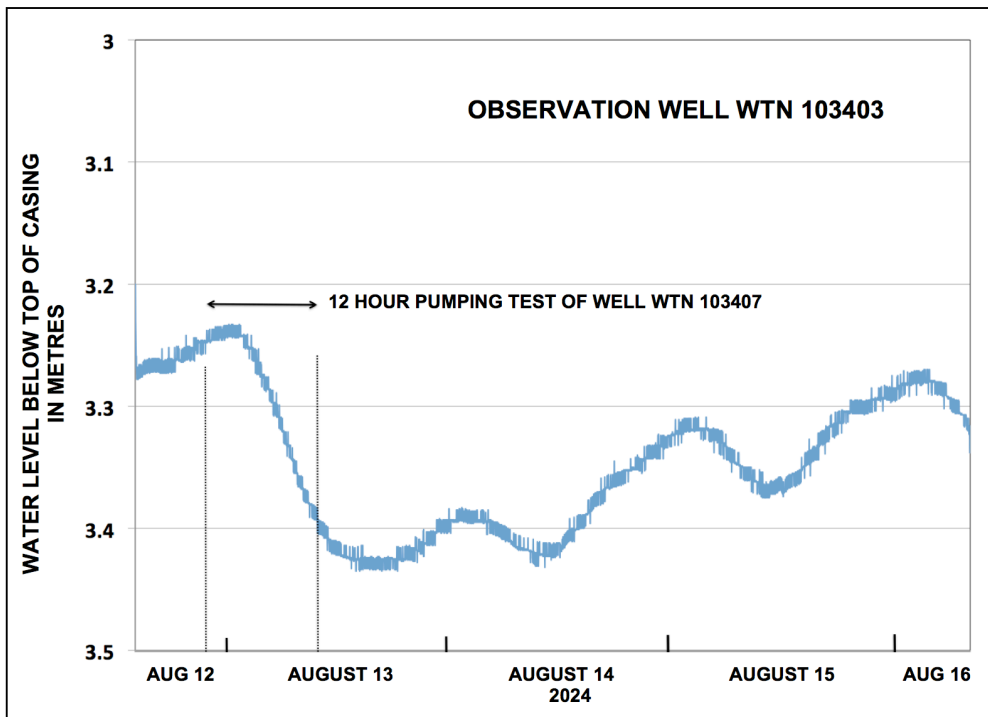


Figure 7. Water level in Observation Well WTN 103403 prior to, during and after pumping of Well WTN 103407.

Water Quality Results

Results of the water quality analyses for Well WTN 103407 are provided in Table 2. Elevated constituents are highlighted in red font. **No Total coliforms or E.Coli bacteria were detected in the sample.** The water quality was excellent with low, total dissolved mineralization (TDS = 250 mg/L).

Based on the laboratory results of the August 13, 2024 sampling, the water quality of the subject well met or exceeded the *Guidelines for Canadian Drinking Water-Summary Table* (Health Canada, 2022) for all parameters analyzed except for elevated levels of: Turbidity at 3.5 NTU, Total Aluminum at 104 µg/L, and Total Manganese at 30.2 µg/L. The elevated levels of these constituents do not pose a health hazard and are only of aesthetic concern. They may be present in particulate form and may be reduced by filtering.

Conclusions

Results of the recent pump testing carried out on Well WTN 103407 indicates that the well has a minimum potential long-term yield of potential yield 1.73 L/min (2491 L/day) or 0.45 USgpm while not drawing groundwater levels below sea level. This yield exceeds the bylaw requirements of 2275 L/day. **Well WTN 103407 therefore, 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, 2024).***

Under normal domestic use of the well up to 2275 L/day the well would not have any detrimental effect on neighbouring wells or nearby surface water sources.

Laboratory results of the August 13, 2024 sampling, indicate the water quality of the subject well met or exceeded the *Guidelines for Canadian Drinking Water-Summary Tables* (Health Canada, 2022) for all parameters analyzed except for elevated levels of: Turbidity at 3.5 NTU, Total Aluminum at 104 µg/L, and Total Manganese at 30.2 µg/L. The elevated levels of these constituents do not pose a health hazard and are only of aesthetic concern. They may be present in particulate form and may be reduced by filtering.

No Total coliforms or E.Coli bacteria were detected in the recent sampling.

These results indicate that the water meets the prescribed standards for potable water as set out in Schedule A of the *Drinking Water Protection Regulation* (Province of British Columbia, 2024d).

Table 2. Summary of water quality analyses.

Parameters/Site and Sampling Date	WELL WTN 103407 DL 14I August 13/24		Canadian DWGuideline 2022	Units
PHYSICAL TESTS				
True Colour	8.1		< or =15	TCU
Transmittance at 254nm				%T/cm
Conductivity	400			µS/cm
Total Hardness (CaCO ₃)	51.8			mg/L
pH	8.17		7.0-10.5	pH units
Total Dissolved solids (TDS)	250		< or = 500	mg/L
Turbidity	3.5		<1.0	NTU
ANIONS				
Alkalinity (Total as CaCO ₃)	190			mg/L
Alkalinity (PP as CaCO ₃)	<1.0			mg/L
Bicarbonate	230			mg/L
Carbonate	<1.0			mg/L
Hydroxide	<1.0			mg/L
Chloride	8.4		< or = 250	mg/L
Fluoride	0.22		1.5	mg/L
Nitrate (N)	<0.020		10	mg/L
Nitrite (N)	<0.0050		1	mg/L
Total Organic Nitrogen (N)				mg/L
Total Ammonia (N)				mg/L
Nitrate plus Nitrite (N)	<0.020			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 H ₂ S)			0.05	mg/L
Sulphate	6.1		< or =500	mg/L
TOTAL METALS				
Aluminum	104		100 and 2900	µg/L
Antimony	<0.50		6	µg/L
Arsenic	0.39		10	µg/L
Barium	<1.0		2000	µg/L
Beryllium				µg/L
Bismuth				
Boron	174		5000	µg/L
Cadmium	<0.010		7	µg/L
Chromium	1.1		50	µg/L
Cobalt	<0.20			µg/L
Copper	6.27		1000 and 2000	µg/L
Iron	136		< or = 300	µg/L
Lead	0.21		5	µg/L
Manganese	30.2		20 and 120	µg/L
Mercury	<0.0019		1	µg/L
Molybdenum	1.4			µg/L
Nickel	<1.0			µg/L
Selenium	<0.10		50	µg/L
Silicon	7460			µg/L
Silver	<0.020			µg/L
Strontium	27.6		7000	µg/L
Thallium				
Tin				µg/L
Titanium				µg/L
Uranium	<0.10		20	µg/L
Vanadium	<5.0			µg/L
Zinc	<5.0		< or = 5000	µg/L
Zirconium				µg/L
Calcium	18.5			mg/L
Magnesium	1.34			mg/L
Potassium	0.168			mg/L
Sodium	71.8		< or = 200	mg/L
Sulphur	<3.0			mg/L
MICROBIOLOGICAL				
Total coliforms	0		ND	CFU/100mL
Escherichia coli (E. coli)	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.

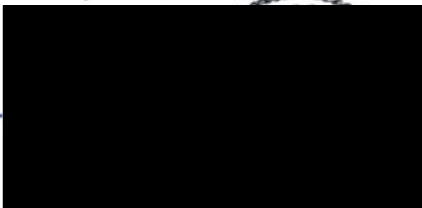
Recommendations

1. As a precautionary measure against any future potential sources of coliform bacteria, water from the well should be treated with an appropriately designed and maintained ultraviolet irradiation (UV) treatment system.
2. Further examination of other potential water treatment options for the well water such as filtering should be considered. Hy-Geo Consulting does not design or install water treatment systems.
3. Generally for low yielding water wells, apart from utilizing a pressure tank for the distribution system, consideration should be given to installing a storage tank e.g. 1000 USgals, on the property to reduce frequent cycling of the well pump during drought and high water use periods.
4. Consideration should be given to equipping the discharge line from the well with a totalizing water flow meter to monitor and record the well use with time and having a water level sounding tube installed for taking periodic water level measurements in the well.

Closure

This report was prepared in accordance with generally accepted engineering, hydrogeological and consulting practices. It is intended for the prime use of Tahirih Rockafella 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
Permit to Practice Number: 1001034

References

- Allen, D.M., Mackie, D.C., Surette, M.J., and E. K. Appaih-Adjei. 2008. *Climate Change: Implications for Groundwater Recharge and Saltwater Intrusion on the Gulf Islands*. Presentation slides for Mayne Island Integrated Water Systems Society (MIWSS) workshop, Mayne Island, Department of Earth Sciences, Simon Fraser University, Burnaby, British Columbia.
- Environment Canada. 198_. *Canadian Climate Normals, 1951-1980, British Columbia*, Atmospheric Environment Service.
- Galiano Island Local Trust Committee. 2024. *Land Use Bylaw 127, 1999*. (with amendments to 2024). Internet <https://islandstrust.bc.ca/document/galiano-island-local-trust-committee-land-use-bylaw-no-127-1999/>
- Government of Canada. 2024a. *Canadian Climate Normals*. 1981-2010 Climate Normals & Averages. Internet website https://climate.weather.gc.ca/climate_normals/
- Government of Canada. 2024b. *Historical Climate Data*. Internet website http://climate.weather.gc.ca/historical_data/search_historic_data_e.html
- Harrison, D. 1994. *Galiano Island Groundwater Study, 1994 – A Review of Well Development and Groundwater Conditions on Galiano Island*. Report prepared for the Galiano Conservancy Association.
- Health Canada. 2022. *Guidelines for Canadian Drinking Water Quality-Summary Tables*. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario. Internet website https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-tables-sept-2022-eng.pdf
- Islands Trust. 2024. *MapIT*. Internet website mapit.islandstrust.bc.ca
- Kohut, A.P., W.S. Hodge, D.A. Johanson, and D. Kalyn. 1984. *Natural Seasonal Response of Groundwater Levels in Fractured Bedrock Aquifers of the Southern Coastal Region of British Columbia*. Proceedings of International Groundwater Symposium on Groundwater Utilization and Contaminant Hydrogeology, Montreal, Quebec. International Association of Hydrogeologists/Canadian National Chapter.
- Kohut, A.P., and D.A. Johanson. 1998. *Assessment of Groundwater Availability and Quality, Galiano Island, British Columbia*. British Columbia Ministry of Environment, Victoria, British Columbia.
- Muller, J. E. and J.A. Jeletzky. 1970. *Geology of the Upper Cretaceous Nanaimo Group, Vancouver Island and Gulf Islands, British Columbia*. Geological Survey of Canada Paper 69-25.

Province of British Columbia. 2020. *Guide to Conducting Well Pumping Tests*. Internet website, https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/guide_to_conducting_pumping_tests.pdf

Province of British Columbia. 2024a. *British Columbia Water Resources Atlas*. Internet website <https://maps.gov.bc.ca/ess/hm/wrbc/>

Province of British Columbia. 2024b. *Groundwater Wells and Aquifers*. Internet website <https://apps.nrs.gov.bc.ca/gwells/>

Province of British Columbia. 2024c. *Groundwater Level Data, Provincial Groundwater Observation Well Network*. Internet website <https://governmentofbc.maps.arcgis.com/apps/webappviewer/index.html?id=b53cb0bf3f6848e79d66ffd09b74f00d>

Province of British Columbia. 2024d. *Drinking Water Protection Regulation, Drinking Water Protection Act*. Consolidated to March 5, 2024. Internet website https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/200_2003#section1

Waterline Resources Inc. 2011. *Galiano Groundwater Study*. Report submitted to Islands Trust, March 31, 2011, File WL11-1755.

APPENDIX A

Well Records

WTN 103407

WTN 103403



Ministry of Environment

- Well Construction Report
- Well Closure Report
- Well Alteration Report

WTN 103407

Ministry Well ID Plate Number: 26544
 Ministry Well Tag Number: 103407
 Confirmation/alternative specs. attached
 Original well construction report attached

INVOICE NO. 000103

Red lettering indicates minimum mandatory information. See reverse for notes & definitions of abbreviations.

Owner name: BILL ELLER

Mailing address: [redacted] Town [redacted] Prov. B.C. Postal Code [redacted]

Well Location: Address: Street no. Street name Town

Legal description: Lot 3 Plan D.L. 14 (VRS 9807) Block Sec. Twp. Rg. Land District GALTIANO
 PID: [redacted] and Description of well location (attach sketch, if nec.):

NAD 83: Zone: 10 UTM Easting: 473772E UTM Northing: 5417031N
 (see note 2) (see note 3):

Method of drilling: air rotary cable tool mud rotary auger driving jetting excavating other (specify):
 Orientation of well: vertical horizontal Ground elevation: 116 ft (asl) Method (see note 4): GPS

Class of well (see note 5): 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):

Lithologic description (see notes 7-14) or closure description (see notes 15 and 16)

From ft (bgl)	To ft (bgl)	Relative Hardness	Colour	Material Description (Use recommended terms on reverse. List in order of decreasing amount, if applicable)	Water-bearing Estimated Flow (USgpm)	Observations (e.g., fractured, weathered, well sorted, silty wash), closure details
0'	10'	S	BLUE	BLUE CLAY; BROWN TILL	0	
10'	23'	H	GREY	GREY SANDSTONE	0	
23'	80'	M	BLK	SHALE	1/4	FRACTURE @ 45'
80'	120'	S	GREY	SANDSTONE	1/2	FRACTURE @ 120'
120'	170'	H	GREY	SANDSTONE	1/4	FRACTURE @ 170'
170'	230'	S	GREY	SANDSTONE	4	FRACTURE @ 230'
230'	260'	S	GREY	SANDSTONE	0	

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material / Open Hole	Wall Thickness in	Drive Shoe
0	18	6 5/8	STEEL	.219	NO

Screen details

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 18)	Slot Size

Surface seal: Type: SODIUM BENTONITE Depth: 17 ft
 Method of installation: Poured Pumped Thickness: 1 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)

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 Surging Jetting Pumping Bailing
 Other (specify): Total duration: 2 hrs
 Notes:

Well yield estimated by:

Pumping Air lifting Bailing Other (specify):
 Rate: 5 USgpm Duration: 3 hrs
 SWL before test: ft (btoc) Pumping water level: ft (btoc)

Obvious water quality characteristics:

Fresh Salty Clear Cloudy Sediment Gas
 Colour/odour: Water sample collected:

Well driller (print clearly):

Name (first, last) (see note 19): KEN SMITHSON
 Registration no. (see note 20): 06022607
 Consultant (if applicable; name and company): D.A. SMITHSON & SONS

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

Signature of Driller Responsible

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction, alteration or closure, 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.

Final well completion data:

Total depth drilled: 260 ft Finished well depth: 260' ft (bgl)
 Final stick up: 24 in Depth to bedrock: 10' ft (bgl)
 SWL: ft (btoc) Estimated well yield: 5 USgpm
 Artesian flow: USgpm, or Artesian pressure: ft
 Type of well cap: SECURED Well disinfected: Yes No
 Where well ID plate is attached: CASING

Well closure information:

Reason for closure:
 Method of closure: Poured Pumped
 Sealant material: Backfill material:
 Details of closure (see note 17):

Date of work (YYYY/MM/DD):

Started: MAY.04/2009 Completed: MAY.05/2009
 Comments:

092B.094112



Ministry of Environment

- Well Construction Report
- Well Closure Report
- Well Alteration Report

DA Smithsons
 WTN 103403
 phone/fax/e-mail here, if desired.

Ministry Well ID Plate Number: 26545
 Ministry Well Tag Number: 103403
 Confirmation/alternative specs. attached
 Original well construction report attached

Red lettering indicates minimum mandatory information.

See reverse for notes & definitions of abbreviations.

Owner name: BILL ELLER

Mailing address: [redacted] Town [redacted] Prov. B.C. Postal Code [redacted]

Well Location: Address: Street no. Street name Town

Legal description: Lot #2 Plan D.L. 114 (V154887) Block Sec. Twp. Rg. Land District GALIANO
 PID: [redacted] (and) Description of well location (attach sketch, if nec.):

NAD 83: Zone: 10 (see note 2) UTM Easting: 473741 E m UTM Northing: 5417062 N m Latitude (see note 3): Longitude:

Method of drilling: air rotary cable tool mud rotary auger driving jetting excavating other (specify):
 Orientation of well: vertical horizontal Ground elevation: 111 ft (asl) Method (see note 4): GPS

Class of well (see note 5): 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):

Lithologic description (see notes 7-14) or closure description (see notes 15 and 16)

From ft (bgl)	To ft (bgl)	Relative Hardness	Colour	Material Description (Use recommended terms on reverse. List in order of decreasing amount, if applicable)	Water-bearing Estimated Flow (USgpm)	Observations (e.g., fractured, weathered, well sorted, silty wash), closure details
0'	3'	S	BRN	BROWN TILL	0	
3'	18'	H	RED	SANDSTONE	0	
18'	70'	H	GREY	SANDSTONE	1/4	FRACTURE @ 70'
70'	200'	M	GREY	SANDSTONE	0	
200'	215'	M	BLK	SHALE	0	
215'	265'	H	GREY	SANDSTONE	1 1/4	FRACTURE @ 265'
265'	300'	H	GREY	SANDSTONE	0	

Casing details

From ft (bgl)	To ft (bgl)	Dia in	Casing Material / Open Hole	Wall Thickness in	Drive Shoe
0'	18'	6 5/8	STEEL	.219	NO

Screen details

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 18)	Slot Size

Surface seal: Type: Depth: ft
 Method of installation: Poured Pumped Thickness: 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)

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 Surging Jetting Pumping Bailing
 Other (specify): Total duration: 2 hrs
 Notes:

Well yield estimated by:

Pumping Air lifting Bailing Other (specify):
 Rate: 1 1/2 USgpm Duration: 3 hrs
 SWL before test: ft (btoc) Pumping water level: ft (btoc)

Obvious water quality characteristics:

Fresh Salty Clear Cloudy Sediment Gas
 Colour/odour: Water sample collected:

Well driller (print clearly):

Name (first, last) (see note 19): KEN SMITHSON
 Registration no. (see note 20): 06 022 607
 Consultant (if applicable; name and company): DA SMITHSON; SONS

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

Signature of Driller Responsible

Final well completion data:

Total depth drilled: 300' ft Finished well depth: 300' ft (bgl)
 Final stick up: 24 in Depth to bedrock: 3' ft (bgl)
 SWL: ft (btoc) Estimated well yield: 1 1/2 USgpm
 Artesian flow: USgpm, or Artesian pressure: ft
 Type of well cap: SECURED Well disinfected: Yes No
 Where well ID plate is attached: CASING

Well closure information:

Reason for closure:
 Method of closure: Poured Pumped
 Sealant material: Backfill material:
 Details of closure (see note 17):

Date of work (YYYY/MM/DD):

Started: 2009/05/06 Completed: 2009/05/07

Comments:

PLEASE NOTE: The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction, alteration or closure, 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 ___ of ___

092B.094 112

APPENDIX B

Pumping Test Data

APPENDIX B

Pumping Test Data for Subject Well WTN 103407

Project: DL 14, Galiano Island
Client: Tahirih Rockafella
Location: Galiano Island
Date of Test: August 12-13, 2024
Test Conducted by: Red Williams Well Drilling

Reference: all readings from top of sounding tube
Stick up: 0.38 m

Observation Wells: WTN 103403 (WID 26545)
Stick up: 0.64 m

Pumped Well: 79.25 m (260 feet) deep
Pumping Rate: 5.64 L/min (1.49 Usgpm)
Static Water Level: 19.55 m

Pump Start Time: 10:00 PM August 12, 2024
Pump End Time: 10:00 AM August 13, 2024
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	19.65	0.10	720.5	0.5	33.05	1441.0	13.5
1	19.73	0.18	721	1	32.88	721.0	13.33
1.5	19.81	0.26	721.5	1.5	32.75	481.0	13.2
2	19.88	0.33	722	2	32.59	361.0	13.04
2.5	19.95	0.40	722.5	2.5	32.45	289.0	12.9
3	20.03	0.48	723	3	32.31	241.0	12.76
3.5	20.10	0.55	723.5	3.5	32.17	206.7	12.62
4	20.19	0.64	724	4	32.05	181.0	12.5
4.5	20.30	0.75	724.5	4.5	31.89	161.0	12.34
5	20.43	0.88	725	5	31.76	145.0	12.21
6	20.68	1.13	726	6	31.50	121.0	11.95
7	20.91	1.36	727	7	31.24	103.9	11.69
8	21.12	1.57	728	8	31.01	91.0	11.46
9	21.30	1.75	729	9	30.77	81.0	11.22
10	21.48	1.93	730	10	30.51	73.0	10.96
12	21.81	2.26	732	12	30.09	61.0	10.54
14	22.10	2.55	734	14	29.66	52.4	10.11
16	22.36	2.81	736	16	29.25	46.0	9.7
18	22.61	3.06	738	18	28.98	41.0	9.43
20	22.82	3.27	740	20	28.58	37.0	9.03
25	23.32	3.77	745	25	27.97	29.8	8.42
30	23.72	4.17	750	30	27.45	25.0	7.9
35	24.07	4.52	755	35	27.20	21.6	7.65
40	24.36	4.81	760	40	26.64	19.0	7.09
45	24.59	5.04	765	45	26.29	17.0	6.74
50	24.85	5.30	770	50	26.00	15.4	6.45
55	25.05	5.50	775	55	25.73	14.1	6.18
60	25.23	5.68	780	60	25.50	13.0	5.95
70	25.57	6.02	790	70	25.09	11.3	5.54
80	25.94	6.39	800	80	24.75	10.0	5.20
90	26.21	6.66	810	90	24.44	9.0	4.89
100	26.50	6.95	820	100	24.14	8.2	4.59
110	26.67	7.12	830	110	23.94	7.5	4.39
120	26.86	7.31	840	120	23.72	7.0	4.17
150	27.33	7.78	870	150	23.26	5.8	3.71
180	27.77	8.22	900	180	22.88	5.0	3.33
210	28.37	8.82	933	213	22.53	4.4	2.98
240	28.75	9.20	960	240	22.38	4.0	2.83
270	29.24	9.69	1020	300	22.08	3.4	2.53
300	29.86	10.31	1080	360	21.53	3.0	1.98
330	30.35	10.80	1140	420	21.20	2.7	1.65
360	31.30	11.75	1200	480	20.93	2.5	1.38
390	31.57	12.02	1260	540	20.70	2.3	1.15
420	31.87	12.32	1320	600	20.49	2.2	0.94
450	32.43	12.88	1380	660	20.32	2.1	0.77
480	32.82	13.27					
540	33.10	13.55					
600	33.21	13.66		Data from datalogger			
660	33.15	13.60					
720	33.15	13.60					

APPENDIX C

Water Quality Analysis



Your C.O.C. #: Wli035250

Attention: AL KOHUT

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

Report Date: 2024/08/20

Report #: R3544084

Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C461889

Received: 2024/08/13, 15:11

Sample Matrix: Drinking Water
Samples Received: 1

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2024/08/14	BBY6SOP-00026	SM 24 2320 B m
Chloride/Sulphate by Auto Colourimetry	1	N/A	2024/08/14	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Color (True) by Automated Analyzer	1	N/A	2024/08/14	BBY6SOP-00057	SM 24 2120 C m
Conductivity @25C	1	N/A	2024/08/14	BBY6SOP-00026	SM 24 2510 B m
Fluoride	1	N/A	2024/08/19	BBY6SOP-00037	SM 24 4500-F C m
Hardness Total (calculated as CaCO3) (1)	1	N/A	2024/08/16	BBY WI-00033	Auto Calc
Mercury (Total) by CV	1	2024/08/15	2024/08/15	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	N/A	2024/08/16	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	1	N/A	2024/08/15	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrate + Nitrite (N)	1	N/A	2024/08/14	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrite (N) Regular Level Water	1	N/A	2024/08/14	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrogen - Nitrate (as N)	1	N/A	2024/08/15	BBY WI-00033	Auto Calc
pH @25°C (2)	1	N/A	2024/08/14	BBY6SOP-00026	SM 24 4500-H+ B m
Total Dissolved Solids (Filt. Residue)	1	2024/08/16	2024/08/19	BBY6SOP-00033	SM 24 2540 C m
Total Coliform & E.Coli by MF-Chromocult	1	N/A	2024/08/14	BBY4SOP-00143	Merck KGaA Version 1
Turbidity	1	N/A	2024/08/14	BBY6SOP-00027	SM 24 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, EPA, APHA or the Quebec Ministry of Environment.

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 C.O.C. #: Wli035250

Attention: AL KOHUT

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

Report Date: 2024/08/20

Report #: R3544084

Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C461889

Received: 2024/08/13, 15:11

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.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

Please direct all questions regarding this Certificate of Analysis to:
Michelle Rivest (Hospedales), B.Sc., Customer Solutions Representative
Email: michelle.rivest@bureauveritas.com
Phone# (604) 734 7276

=====
This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.



DRINKING WATER PACKAGE (NON-REGULATED)

Bureau Veritas ID					CTE761		
Sampling Date					2024/08/13 09:50		
COC Number					Wii035250		
	UNITS	MAC	AO	OG	DL14 WTN 103407	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	1	-	-	<0.0050	0.0050	B477666
Calculated Parameters							
Total Hardness (CaCO3)	mg/L	-	-	-	51.8	0.50	B476793
Nitrate (N)	mg/L	10	-	-	<0.020	0.020	B477123
Misc. Inorganics							
Conductivity	uS/cm	-	-	-	400	2.0	B477522
pH	pH	-	-	7.0:10.5	8.17	N/A	B477527
Total Dissolved Solids	mg/L	-	500	-	250	10	B480738
Anions							
Alkalinity (PP as CaCO3)	mg/L	-	-	-	<1.0	1.0	B477517
Alkalinity (Total as CaCO3)	mg/L	-	-	-	190	1.0	B477517
Bicarbonate (HCO3)	mg/L	-	-	-	230	1.0	B477517
Carbonate (CO3)	mg/L	-	-	-	<1.0	1.0	B477517
Dissolved Fluoride (F)	mg/L	1.5	-	-	0.22	0.050	B483577
Hydroxide (OH)	mg/L	-	-	-	<1.0	1.0	B477517
Chloride (Cl)	mg/L	-	250	-	8.4	1.0	B477544
Sulphate (SO4)	mg/L	-	500	-	6.1	1.0	B477544
MISCELLANEOUS							
True Colour	Col. Unit	-	15	-	8.1	2.0	B477689
Nutrients							
Nitrate plus Nitrite (N)	mg/L	-	-	-	<0.020	0.020	B477664
Physical Properties							
Turbidity	NTU	see remark	see remark	see remark	3.5	0.10	B477907
Elements							
Total Mercury (Hg)	ug/L	1	-	-	<0.0019	0.0019	B479574
Total Metals by ICPMS							
Total Aluminum (Al)	ug/L	2900	-	100	104	3.0	B479587
Total Antimony (Sb)	ug/L	6	-	-	<0.50	0.50	B479587
Total Arsenic (As)	ug/L	10	-	-	0.39	0.10	B479587
Total Barium (Ba)	ug/L	2000	-	-	<1.0	1.0	B479587
Total Boron (B)	ug/L	5000	-	-	174	50	B479587
Total Cadmium (Cd)	ug/L	7	-	-	<0.010	0.010	B479587
No Fill	No Exceedance						
Grey	Exceeds 1 criteria policy/level						
Black	Exceeds both criteria/levels						
RDL = Reportable Detection Limit N/A = Not Applicable							



DRINKING WATER PACKAGE (NON-REGULATED)

Bureau Veritas ID					CTE761		
Sampling Date					2024/08/13 09:50		
COC Number					Wii035250		
	UNITS	MAC	AO	OG	DL14 WTN 103407	RDL	QC Batch
Total Chromium (Cr)	ug/L	50	-	-	1.1	1.0	B479587
Total Cobalt (Co)	ug/L	-	-	-	<0.20	0.20	B479587
Total Copper (Cu)	ug/L	2000	1000	-	6.27	0.20	B479587
Total Iron (Fe)	ug/L	-	300	-	136	5.0	B479587
Total Lead (Pb)	ug/L	5	-	-	0.21	0.20	B479587
Total Manganese (Mn)	ug/L	120	20	-	30.2	1.0	B479587
Total Molybdenum (Mo)	ug/L	-	-	-	1.4	1.0	B479587
Total Nickel (Ni)	ug/L	-	-	-	<1.0	1.0	B479587
Total Selenium (Se)	ug/L	50	-	-	<0.10	0.10	B479587
Total Silicon (Si)	ug/L	-	-	-	7460	100	B479587
Total Silver (Ag)	ug/L	-	-	-	<0.020	0.020	B479587
Total Strontium (Sr)	ug/L	7000	-	-	27.6	1.0	B479587
Total Uranium (U)	ug/L	20	-	-	<0.10	0.10	B479587
Total Vanadium (V)	ug/L	-	-	-	<5.0	5.0	B479587
Total Zinc (Zn)	ug/L	-	5000	-	<5.0	5.0	B479587
Total Calcium (Ca)	mg/L	-	-	-	18.5	0.050	B477121
Total Magnesium (Mg)	mg/L	-	-	-	1.34	0.050	B477121
Total Potassium (K)	mg/L	-	-	-	0.168	0.050	B477121
Total Sodium (Na)	mg/L	-	200	-	71.8	0.050	B477121
Total Sulphur (S)	mg/L	-	-	-	<3.0	3.0	B477121
Microbiological Param.							
Total Coliforms	CFU/100mL	0	-	-	0	N/A	B477371
E. coli	CFU/100mL	0	-	-	0	N/A	B477371
No Fill	No Exceedance						
Grey	Exceeds 1 criteria policy/level						
Black	Exceeds both criteria/levels						
RDL = Reportable Detection Limit							
N/A = Not Applicable							



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.



BUREAU
VERITAS

Bureau Veritas Job #: C461889

Report Date: 2024/08/20

QUALITY ASSURANCE REPORT

HY-GEO CONSULTING

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B477517	Alkalinity (PP as CaCO3)	2024/08/14					<1.0	mg/L	NC	20
B477517	Alkalinity (Total as CaCO3)	2024/08/14			95	80 - 120	<1.0	mg/L	0.17	20
B477517	Bicarbonate (HCO3)	2024/08/14					<1.0	mg/L		
B477517	Carbonate (CO3)	2024/08/14					<1.0	mg/L		
B477517	Hydroxide (OH)	2024/08/14					<1.0	mg/L		
B477522	Conductivity	2024/08/14			101	90 - 110	<2.0	uS/cm	0	10
B477527	pH	2024/08/14			100	97 - 103			0.42	N/A
B477544	Chloride (Cl)	2024/08/14	109	80 - 120	105	80 - 120	<1.0	mg/L	10	20
B477544	Sulphate (SO4)	2024/08/14	NC	80 - 120	98	80 - 120	<1.0	mg/L	0.20	20
B477664	Nitrate plus Nitrite (N)	2024/08/14	114	80 - 120	108	80 - 120	<0.020	mg/L	NC	25
B477666	Nitrite (N)	2024/08/14	111	80 - 120	104	80 - 120	<0.0050	mg/L	NC	20
B477689	True Colour	2024/08/14			100	80 - 120	<2.0	Col. Unit	NC	20
B477907	Turbidity	2024/08/14			103	80 - 120	<0.10	NTU	3.7	20
B479574	Total Mercury (Hg)	2024/08/15	96	80 - 120	98	80 - 120	<0.0019	ug/L	NC	20
B479587	Total Aluminum (Al)	2024/08/15	101	80 - 120	104	80 - 120	<3.0	ug/L	NC	20
B479587	Total Antimony (Sb)	2024/08/15	100	80 - 120	106	80 - 120	<0.50	ug/L	NC	20
B479587	Total Arsenic (As)	2024/08/15	102	80 - 120	106	80 - 120	<0.10	ug/L	5.8	20
B479587	Total Barium (Ba)	2024/08/15	97	80 - 120	102	80 - 120	<1.0	ug/L	1.2	20
B479587	Total Boron (B)	2024/08/15	114	80 - 120	109	80 - 120	<50	ug/L	NC	20
B479587	Total Cadmium (Cd)	2024/08/15	101	80 - 120	107	80 - 120	<0.010	ug/L	15	20
B479587	Total Chromium (Cr)	2024/08/15	92	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
B479587	Total Cobalt (Co)	2024/08/15	97	80 - 120	101	80 - 120	<0.20	ug/L	NC	20
B479587	Total Copper (Cu)	2024/08/15	NC	80 - 120	99	80 - 120	<0.20	ug/L	2.1	20
B479587	Total Iron (Fe)	2024/08/15	102	80 - 120	103	80 - 120	<5.0	ug/L	3.9	20
B479587	Total Lead (Pb)	2024/08/15	97	80 - 120	99	80 - 120	<0.20	ug/L	1.7	20
B479587	Total Manganese (Mn)	2024/08/15	99	80 - 120	106	80 - 120	<1.0	ug/L	0.56	20
B479587	Total Molybdenum (Mo)	2024/08/15	106	80 - 120	111	80 - 120	<1.0	ug/L	NC	20
B479587	Total Nickel (Ni)	2024/08/15	97	80 - 120	105	80 - 120	<1.0	ug/L	NC	20
B479587	Total Selenium (Se)	2024/08/15	100	80 - 120	102	80 - 120	<0.10	ug/L	5.7	20
B479587	Total Silicon (Si)	2024/08/15	NC	80 - 120	106	80 - 120	<100	ug/L	1.8	20
B479587	Total Silver (Ag)	2024/08/15	101	80 - 120	106	80 - 120	<0.020	ug/L	0.71	20
B479587	Total Strontium (Sr)	2024/08/15	112	80 - 120	99	80 - 120	<1.0	ug/L	1.1	20
B479587	Total Uranium (U)	2024/08/15	103	80 - 120	108	80 - 120	<0.10	ug/L	NC	20
B479587	Total Vanadium (V)	2024/08/15	94	80 - 120	99	80 - 120	<5.0	ug/L	NC	20



BUREAU
VERITAS

Bureau Veritas Job #: C461889

Report Date: 2024/08/20

QUALITY ASSURANCE REPORT(CONT'D)

HY-GEO CONSULTING

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B479587	Total Zinc (Zn)	2024/08/15	NC	80 - 120	108	80 - 120	<5.0	ug/L	2.2	20
B480738	Total Dissolved Solids	2024/08/19	101	80 - 120	104	80 - 120	<10	mg/L	6.3	20
B483577	Dissolved Fluoride (F)	2024/08/19	97	80 - 120	99	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).



VALIDATION SIGNATURE PAGE

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



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager



Bureau Veritas Proprietary Software
Logiciel Propriétaire de Bureau Veritas

Automated Statchk

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.