

**SUPPLEMENTAL INFORMATION SUBMISSION
FOR WATER SUSTAINABILITY ACT LICENCE
APPLICATION #100315657**

Submitted To:



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Nanaimo, British Columbia
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TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION.....	1
1.1 Background	1
1.2 Scope of Supplemental Work	1
2.0 SITE DESCRIPTION AND REGIONAL HYDROGEOLOGY	2
2.1 Site Description	2
2.2 Regional Hydrogeology	2
2.3 Registered Water Users within a 1-km Radius of the Water Lot	2
3.0 METHODOLOGY	3
3.1 Field Verification Survey	3
3.2 Aquifer Testing Program	3
3.2.1 Step Rate Test	3
3.2.2 Constant Rate Test	3
3.3 Water Quality Sampling	4
3.4 Pumping Test Data Analysis	4
4.0 RESULTS	5
4.1 Field Verification Survey	5
4.2 Water Lot and Neighbouring Well Construction	6
4.3 Step Rate Pumping Test Results	7
4.4 Constant Rate Pumping Test Results	8
4.5 Well and Aquifer Parameter Estimates	8
4.6 Well Yield Calculation for Long-term Sustainable Use (Q_{20})	9
4.7 Well Yield Calculations for Peak Water Demand	10
4.8 Predicted Distance Drawdown Calculations	10
4.9 Groundwater Chemistry	11
5.0 DISCUSSION AND CONCLUSIONS	13
6.0 RECOMMENDATIONS.....	14
7.0 CERTIFICATION	15
8.0 REFERENCES.....	16
9.0 LIMITATIONS AND USE	18

LIST OF TABLES (IN-TEXT)

	PAGE
Table 1: Results of the Field-Verified Survey Within a 250m Radius of Well 13370	5
Table 2: Construction Details for Pumping Well and Observation Well	6
Table 3: Summary of the Step-Rate Drawdown Test for Well 13370	7
Table 4: Summary of the Constant-Rate Drawdown Test for Well 13370	8
Table 5: Well Test – Summary of Well and Aquifer Parameters	8
Table 6: Q ₂₀ Calculation Input Parameters	9
Table 7: Short-Term Sustainable Well Yield Input Parameters	10
Table 8: Distance Drawdown Values for 365-days of Pumping at Well 13370	11
Table 9: Summary of the Key Groundwater Quality Results	12

LIST OF FIGURES (FIGURES SECTION)

- Figure 1: Site Plan
- Figure 2: Bedrock Aquifer Map
- Figure 3: Registered Surface Water and Groundwater Users within 1-Km
- Figure 4: Well 13370 - Step Rate Pump Test Overview Chart (Semi-log Plot)
- Figure 5: Pumping Rate vs Drawdown for SRPT at Well 13370 (September 9, 2020)
- Figure 6: Well 13370 - 72-hour Constant Rate Pump Test Overview Chart
- Figure 7: Piper Plot
- Figure 8: Groundwater Field Parameters Recorded at Well 13370 during Well Testing

LIST OF APPENDICES

- Appendix A New Use and Existing Use License Applications
- Appendix B Field Verification Survey Data
- Appendix C Photo Log
- Appendix D Driller's Logs
- Appendix E Methodology for Pumping Test Analysis
- Appendix F AQTESOLV Analyses and Calculations
- Appendix G Groundwater Chemistry Results

1.0 INTRODUCTION

1.1 Background

Waterline Resources Inc. (Waterline) prepared a Water Sustainability Act (WSA) application behalf of Silva Bay Resort and Marina (the Client) for “new use” groundwater diversion from an existing water supply well (Well Tag Number 25324). The application was submitted to the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) on October 16, 2019 under tracking # 100301323. A technical assessment report was prepared in support of licensing well 25324, with a calculated long-term sustainable yield of 10 cubic meter per day (m^3/d ; Waterline, 2019). The water use is intended for commercial enterprise as part of a future planned development at Lot A, Section 5, Gabriola Island Nanaimo District, Plan 21876 (the Site; Figure 1).

In addition to the new use application, an existing use application (Tracking # 100315657) was submitted to FLNRORD on April 04, 2020 for a daily demand of $25 \text{ m}^3/\text{d}$, also for commercial use at the Resort and Marina. The water is being diverted from an existing water supply well (Well Tag Number 13370), located on Lot 2, Section 5, Gabriola Island Nanaimo District, Plan 23322 (Water Lot). The Water Lot is located approximately 600 m northwest of Silva Bay Resort and Marina, along North Road (Figure 1). An agreement (Permit/File Number 2020-00165) to use the right of way along the provincial public highway, to pipe the water from the Water Lot to the Site was granted by the Ministry of Transportation and Infrastructure (MOTI, 2020). The crossing agreement and the subsequent “works” were have been provided to FLNRORD as part of the existing use application (#100315657).

Waterline has now been re-engaged by the Client to complete a well test at Well 13370 to support the existing use license application and infrastructure planning, for water system upgrades (piping, storage tanks etc.). The new and existing use license applications are included for reference in Appendix A.

1.2 Scope of Supplemental Work

The Client has requested that Waterline complete a well test at Well 13370 to supplement the WSA Licence application #100315657. The test was needed to determine the long-term safe yield of Well 13370 on the Water Lot, and to assist with the design of water infrastructure upgrades planned as part of proposed future development at the Site. In this regard, Waterline completed the following scope of work:

- A 72-hour constant rate pump test (CRPT) at Well 13370 to confirm the sustainable well yield and assess if the Water Lot well could meet the existing and possible future water demand at the Site. Testing was completed in accordance with the *Guidelines for Technical Assessment Requirements in Support of an Application for Groundwater Use in British Columbia* (Todd et.al, 2016);
- Installed data loggers to record water level drawdown/fluctuations in Water Lot well (Well 13370) and one neighboring well (Well 64284) located 30 m north (Figure 1);

- Completed a field verified survey of domestic groundwater users within a 250 m radius of Water Lot Well 13370;
- Used the aquifer test results to calculate the distance drawdown effects from the proposed groundwater extraction rates on nearby users; and
- Compared the groundwater sampling results with the Canadian Drinking Water Guidelines (Health Canada, 2020), commenting on any exceedance and assessed the potential for seawater intrusion.

2.0 SITE DESCRIPTION AND REGIONAL HYDROGEOLOGY

2.1 Site Description

The Water Lot is located 210 m west of the coastline of Silva Bay with a surface elevation ranging between 30 meters above sea level (masl) at the north of the property to 44 masl at the south end of the property (Figure 1). The Water Lot encompasses a land area of 3334 m² with access to the property along North Road (Figure 1). There are three residential land parcels surrounding the property to the east, to the west and to the south (Figure 1). The climate and land cover type at the Water Lot is like the Silva Bay Resort and Marina located 600 m to the southeast; details are summarized in Waterline's previous technical assessment report (Waterline, 2019).

2.2 Regional Hydrogeology

A fractured bedrock aquifer underlies the Water lot (Figure 2) and is referenced as Aquifer #709 (BC MoE, 2020). Gabriola Island and many of the Gulf Islands are formed by Nanaimo Group bedrock which is comprised of interlayered beds of boulder, cobble, and pebble conglomerates, coarse to fine sandstone, siltstone, shale, and coal. The beds are generally flat-lying or slightly tilted and contacts tend to be fractured and form conduits for groundwater flow. Vertical fracturing is also developed between the beds which connects the layers forming productive bedrock aquifers. Vertical fractures may be less pronounced but those that extend to surface serve as conduits for recharging underlying fractured bedrock aquifers.

Aquifer recharge around Silva Bay is mainly from precipitation over the southern part of Gabriola Island where bedrock fractures are exposed closer to ground surface. Long-term monitoring conducted by FLNRORD in Provincial Groundwater Observation Well #197 (OW 197; Figure 2) indicates that water levels in Aquifer #709 fluctuate seasonally with the lowest recorded groundwater levels in the summer months (June to September), and the highest groundwater levels in the winter between November and February (Waterline, 2019).

2.3 Registered Water Users within a 1-km Radius of the Water Lot

Waterline searched the BC MOE - Water Protection and Sustainability Wells database, (BC MoE, 2020) for registered groundwater wells and surface water users within a one-kilometer (1-km) radius of Well 13370. Search results indicate that 151 water wells and 5 surface water licensed users are listed within one kilometre of the Water Lot well (Figure 3). A summary of the results with

relevant well owners is provided in Appendix B. Of the 151 registered water wells, 148 are listed as domestic use or unknown with only three wells (Well Tag # 14878, 16248 and 5449) listed for commercial use. All commercial use wells appear to be unlicensed, however; owners have until March 1st, 2022 to obtain an existing use license under the WSA. Of the 5-surface licenses, only one (C065734) is reported to be active, drawing water from Dick Brook for domestic use (Figure 3). Dick Brook is an ephemeral/intermittent surface water feature that only flows seasonally and is located 460 m west of the Water Lot Well (Figure 3).

3.0 METHODOLOGY

3.1 Field Verification Survey

The provincial water well database is known to be inaccurate since submission of well logs by water well drillers was voluntary prior to enactment of the WSA in 2016. In addition, the original property owners may have sold the property, but the wells database does not get updated with new owner names. Some of the wells listed in the database may have also been replaced and abandoned. For these reasons, field verification of wells is needed.

The guidelines (Todd et. al, 2016) suggest that the field verification survey for domestic users should include well owners within a 1-km radius of the proposed point of diversion (Well 13370). However, considering the nature of the fractured bedrock aquifer and the large number of well owners, Waterline exercised professional judgement and reduced the search area to a 250 m radius (Figure 3). This provided a realistic assessment of wells that could be affected by pumping due to direct hydraulic connection and that should be considered for monitoring during testing.

3.2 Aquifer Testing Program

Waterline completed the aquifer testing program during the month of September, in a period of the year (dry season) that has limited precipitation (historically) and low aquifer recharging conditions.

3.2.1 Step Rate Test

A Step-rate pump test (SRPT) was conducted to assess baseline well specific capacity, well efficiency and to select an appropriate pumping rate for the CRPT. The SRPT was initiated on September 9th, 2020, at 17:09. It involved pumping the well at progressively increasing rate steps of 5.3 m³/d, 23.7 m³/d, 41.2 m³/d and 61.5m³/d for 30-minute intervals.

3.2.2 Constant Rate Test

The CRPT was initiated at 07:27 on September 10, 2020 after the static water level in the well recovered to pre-pumping conditions. The pump was shut down on September 13, 2020 at 10:30 after 72-hours of continuous pumping. Pressure transducers were left in the wells to monitor aquifer recovery for 72-hours after pumping was stopped and until the water level in the pump well reached >90% of pre-pumping conditions. The electrical submersible pump (ESP) installed in the well for daily operation was utilized for the constant rate test. A pitless adaptor from the ESP drop tubing

connected to distribution piping at ground surface (Photo C1; Appendix C). Flow rates during the pumping test were controlled with a ball valve installed inline with the digital flow meter and totalizer (Photo C2; Appendix C). The flow rate and the total volume pumped were recorded as regular frequency during the pumping phase. The pumped water was piped to the Resort and Marina and stored in cisterns for use at the onsite. Any access water was discharged to ground.

To monitor changes in water levels, a Solinst logger capable of recording pressure and temperature were deployed in pumping well and observation well. The data loggers were programmed to record readings at 1-minute intervals and downloaded regularly throughout the test and after the recovery period. Manual water level measurements were recorded in the pumping well and observation well to verify transducer data recorded during the test.

3.3 Water Quality Sampling

A water quality sample was collected from Well 13370 at the end of the constant-rate test to characterize the groundwater type and potential changes that could indicate a connection with seawater. The water sample was submitted to CARO Analytical Services in Richmond on September 15, 2020 for analysis of the following parameters:

- Major Ions and General parameters;
- Total metals; and
- Dissolved Metals.

Microbiological samples were collected during the previous investigation (Waterline, 2019).

3.4 Pumping Test Data Analysis

The Silva Bay Resort and Marina uses water year-round, with peak water demand experienced in the summer when there is an increased number of patrons using the onsite facilities. Conversely, there is a lower water demand in the shoulder season and winter, when there are less people visiting the Resort and Marina. Pumping rates for Well 13370 also vary, with higher flow rates in the summer for shorter sustained periods, and lower flow rates throughout the rest of the year that are more continuous. Given these different well operations, Waterline analyzed the pumping test data for:

1. Assessment of long-term sustainable yield, using the Moell (1975) method, with aquifer parameter inputs calculated from AQTESOLV, Version 4.50 Professional, Aquifer Test Design and Analysis Computer Software (HydroSOLVE, 2007). This method provides a conservative approach for safe well operation over a 20-year period (pumping 24-hours a day and 365-days a year); and
2. Assessment of peak water demand, using the BC Ministry of Environment – Evaluating Long-term Well Capacity for a Certificate of Public Convenience and Necessity (CPCN; BC MoE, 1999), with inputs from the specific capacity calculated for 100 days of pumping.

The CPCN method is less conservative but provides a safe well yield for short-term use (days and months).

Details for both analytical solutions are included in Appendix E.

4.0 RESULTS

4.1 Field Verification Survey

A total of 15 land parcels with 27 registered wells were visited over a 3-day period between September 11 and 13, 2020, as part of the 250 m field verification survey around the Water Lot (Figure 3). A summary of locations visited, and information gathered is included in Table 1.

Table 1: Results of the Field-Verified Survey Within a 250m Radius of Well 13370

PID	Registered Well Tag Number(s)	Date Visited	Well Use Type	Water Supply Issue	General Comments
2228262	64263, 19279 and 30861	11/09/2020 9:20	Domestic	Volume	Once almost ran out of water during dry season, only WTN 64263 in use
3401928	19278, 459979	11/09/2020 9:45	Domestic	-	Property Owner not available, well use unknown
6100457	15618, 5331	11/09/2020 10:15	Domestic	Odour	High Manganese, only WTN 15618 in use
3449700	23403, 26105, 48715	11/09/2020 11:40	Domestic	Odour	Sulphur smell in late summer and mineral crystallization around faucets from hard water, only WTN 23403 in use
3449726	30200	11/09/2020 13:25	Domestic	None	Water contains tannins during freshet
3347311	31803, 39667	11/09/2020 15:40	Domestic	None	In discussion with the local pump contractor, the property is utilizing groundwater, but the location of the wells and use are unknown
5844959	13912, 101436	12/09/2020 10:00	Domestic	-	Property Owner not available, well use unknown
5293316	29486, 54253	12/09/2020 16:30	Domestic	Sediment	Minor staining in appliances, only WTN 29486 in use
308163	64284	13/06/2020 10:55	Domestic	Odour	Sulfur odour in summer
2717786	36300	13/09/2020 11:10	Domestic	-	Property Owner not available, well use unknown
23327243	23122	13/09/2020 11:20	Domestic	None	Well is not in use
5789036	14867, 64379, 106458	13/09/2020 11:30	Domestic	-	No well in use. Owner indicated only one well is present on the property
5789737	14866, 39560	13/09/2020 12:10	Domestic	None	Low Flow, only WTN 14866 in use
5789699	43597	13/09/2020 12:15	Domestic	-	Property Owner not available, well use unknown
5788315	14628	13/09/2020 12:25	Domestic	-	Property Owner not available, well use unknown

Notes: Highlighted cells indicated properties where groundwater use was confirmed

Only 10 of the 15 property owners were home and available to confirm their well use and condition. For properties where multiple wells were registered, Waterline was able to confirm through conversation with the landowners that 13 of the 27 wells listed in the provincial database were not in use and/or were mapped incorrectly (Table 1).

4.2 Water Lot and Neighbouring Well Construction

Waterline reviewed well completion details for the domestic wells adjacent the Water Lot (<150 m; Todd et. al, 2016) and selected a suitable observation well for monitoring drawdown during the 72-hour well test. Table 2 summarizes the drilling and completion details for Well 13370 (pumping well) and two adjacent wells, where access to the well was permitted by the owner (Well 64284 and Well 14866; Figure 1). Driller's logs for all wells are provided in Appendix D.

Table 2: Construction Details for Pumping Well and Observation Well

Well Name	Well 13370	Well 64284	Well 14866
Well Owner	Silva Bay (Water Lot)	Lynn and Simon Reeves	Dave Teichroeb
Land Parcel Identifier (PID)	3081621	3081613	5789737
Location Relative to Water Lot	0	30 m West	97 m Southeast
Well Type	Pumping Well	Observation Well	Well Inaccessible
Latitude	49.15334	49.15346	49.15300
Longitude	-123.70562	-123.70600	-123.70440
Completion Date (dd-mmm-yr)	20-01-1970	20-06-1980	00-10-1956
BC Well Plate ID	13370	-	-
BC Well Tag #	-	64284	14866
Aquifer Formation	Aquifer #709 (Bedrock)	Aquifer #709 (Bedrock)	Aquifer #709 (Bedrock)
Drilling Contractor	Windecker Water Wells	Island Well Drilling	Pacific Water Wells
Drilling Method	Cable Tool Rig	Air Rotary	Air Rotary
Casing Inside Diameter (mm)	167	167	167
Screen Type	Open Hole	Open hole	Open hole
Ground Elevation (masl)	33	34	27
Casing Stick-up (magl)	0.48*	0.30	0.12
Surface Casing Depth (mbgl)	0.43	2.74	2.13
Uppermost Water Bearing Fracture (masl)	-6.63	-29.41	10.54
Borehole TD (masl)	-26.23	-33.07	5.66
NPWL (masl)	15.31	14.72	17.50**
Available Drawdown (m)	21.94	20.35	n/a

Notes: NPWL means non-pumping groundwater level; 'masl' means metres above sea level; 'magl' means metres above ground level; 'mbgl' means metres below ground level; * indicates stick-up including pumphouse floor height; **Available Drawdown** indicates the distance from the non-pumping water level to the top of the uppermost water bearing fracture in Well 13370; n/a means not applicable; ** indicates that the NPWL was measured at the time of well drilling

Well 64284 (Photo C3; Appendix C) was chosen as an appropriate observation well given its proximity to the Water Lot pumping well (30 m west of Well 13370) and the similar open-hole completion interval. The total depth of Well 64284 is deeper and therefore all bedding plane fractures should extend across both wells.

Waterline attempted to instrument Well 14866 to monitor for potential changes in water levels from pumping. However, field staff, with assistance from a registered pump installer (Summer Rain

Water Delivery), were unable to remove the well cap and gain access to the well. The rubber seal under the well cap was stuck on the lip of the casing and would not slide off without causing damage to the well infrastructure. Given the distance of Well 14866 to Well 13370 (97 m southwest), Well 13370 is 31.9 m deeper, the uppermost water bearing fracture elevation in Well 13370 is 12.3 m lower than the total depth of Well 14866, and the static water level measured at the time of drilling Well 14866 was 2.2 m higher than in Well 13370, it is likely that the wells are completed in different fracture systems and are not in direct hydraulic communication.

Well 31803 and Well 39667 on Parcel Identifier 3347311 (the Estate of Dan Urban) were identified as additional suitable observations wells (Figure 1). However, the wells location, and status (in use, decommissioned or other) could not be confirmed during the field verification survey as permission to access the property was not granted by the current Estate Management Group (Wynford Strata Management Group, as per comms, September 4, 2020). As such these wells were not monitored as part of testing.

4.3 Step Rate Pumping Test Results

Groundwater levels measured at Well 13370 for each of the four 30-minute steps, are shown on Figure 4 (Semi-log plot) and are summarized in Table 3. Specific capacity values calculated for each step are provided in Table 3 and displayed graphically in Figure 5. As the pumping rate is increased, drawdown in the well increased and the specific capacity of the well decreases (Figure 5). This suggests that the well becomes inefficient as the fractures are drained or there is some increase in turbulent flow at the higher pumping rate.

Table 3: Summary of the Step-Rate Drawdown Test for Well 13370

Step	Duration (min)	Flow Rate (m ³ /d)	Groundwater Level (mbgl)	Drawdown (m)	Available Drawdown (m)	% of Available Head Used	Specific Capacity (m ³ /d/m)
NPWL	-	-	17.69	-	21.94	-	-
1	30	5.3	17.83	0.14	21.80	<1	38.7
2	30	23.7	18.97	1.28	20.66	6	18.6
3	30	41.2	20.58	2.89	19.05	13	14.3
4	30	61.5	23.05	5.36	16.58	24	11.5

Notes: NPWL means non-pumping water level; **Available Drawdown** indicates the distance from the non-pumping water level to the uppermost water bearing fracture in Well 13370. Drawdown and available head are presented at the end of each successive step; **mbgl** means metres below ground level

4.4 Constant Rate Pumping Test Results

The aquifer response to continuous pumping of Well 13370 is summarized in Table 4. An overview chart is presented graphically on Figure 6.

Table 4: Summary of the Constant-Rate Drawdown Test for Well 13370

Well Name	Flow Rate (m ³ /d)	Groundwater level at the end of Pumping (masl)	NPWL (masl)	Maximum Drawdown (m)	Recovery Time (hours)	% Recovery
Well 13370 (PW)	54.2	-1.84	15.31	17.15	72	92
Well 64284 (OBS)		0.89	14.72	13.83		93

Notes: masl means above sea level; NPWL means non-pumping water level; - means the groundwater level is below sea level

There was no tidal response noted in the raw groundwater level data prior to the data being barometrically compensated (Figure 6). A hydraulic response from pumping Well 13370, was observed at Well 64284 (Figure 6). Given the proximity of Well 64284 to the pumping center (30 m west), a similar amount of drawdown was measured during the testing period (Figure 6). Well 64284 was also in use during the constant rate test and small water level fluctuations can be seen overprinting the constant drawdown curve induced by the test on Well 13370 (Figure 6).

A constant flow rate of 63.8 m³/d was maintained for the first 14-hours (855 minutes) of testing before a power outage caused the pump to shutdown for 3-hours (Figure 6). The test resumed at a lower rate of 54.2 m³/d, which was held constant for the remainder of the testing period and was extended an additional 3-hours to compensate for the power outage. Also, a restriction in the discharge hose caused the pumping rate to reduce to 32.7 m³/d at approximately 52-hours (3097 minutes) into the test, resulting in temporary recovery (<60-minutes) of the water level in both the pumping and observation wells (Figure 6). The obstruction was cleared, and the test rate was reset to 54.2 m³/d.

4.5 Well and Aquifer Parameter Estimates

The test data was used to obtain aquifer transmissivity, storativity and calculate the specific capacity of the well. Results are presented in Table 5 and model plots are provided for reference in Appendix F (F1 to F5).

Table 5: Well Test – Summary of Well and Aquifer Parameters

Well Name	Solution	Pumping or Recovery Cycle	Well Parameter	Aquifer Parameter	
			Specific Capacity (m ³ /d/m)	Transmissivity (m ² /d)	Storativity
Well 13370	100-day Projection	Pumping Data	1.5	-	-
	Cooper-Jacob	Pumping Data	-	0.8	-
	Cooper-Jacob (Agarwal)	Recovery Data	-	0.8	-
Well 64284	Cooper Jacob	Pumping Data	-	0.8	0.0003
	Cooper Jacob (Agarwal)	Recovery Data	-	0.8	0.0005

Notes: m²/d means metres squared per day; m³/d/m indicates flow (Q) rate over drawdown (s)

The specific capacity for Well 13370 was determined by projecting the drawdown slope from the 72-hour constant rate test out to 100 days, assuming the aquifer received no recharge over that period (Appendix F; Figure F1). Based on the constant pumping rate of 54.2 m³/d and a projected 100-day drawdown of 36.1 m, the specific capacity for Well 13370 was determined to be 1.5 m³/d/m (Table 5).

The Cooper-Jacob (1946) Agarwal (1980) solutions for a confined aquifer provided the best-fit with the measured data given our current understanding of the fractured bedrock aquifer system. The solution assumes that the aquifer behaves like an equivalent porous media, therefore the good fit suggests that the fracture network in the vicinity of the site is well developed. The aquifer transmissivity (T) value obtained from the pumping and recovery data (0.8 m²/d) was chosen for the long-term predictive analysis (Appendix F; Figure F2 & F3). The best approximation of aquifer storativity (3.0×10^{-4}) was taken from the pumping and recovery data reported at Well 64284 (Appendix F; Figure F4 & F5). This storativity is an average value for the confined aquifer estimates (0.005 – 0.00005; Freeze and Cherry, 1979) but is in the lower range for values (0.0015 - 0.0001) reported from Aquifer #709 (BC MoE, 2020).

4.6 Well Yield Calculation for Long-term Sustainable Use (Q₂₀)

The Modified Moell method (Q₂₀) developed by van der Kamp and Maathuis (2005) was applied to predict the long-term sustainable yield of the aquifer. Using the forward solution in Aqtesolv (Figure F6, Appendix F) and using the Theis Equation (1935), the theoretical drawdown at the tested rate was predicted for 100-minutes ($s_{100mins \text{ theor}}$) and 20-years ($s_{20yrs \text{ theor}}$). Table 6 summarizes the input parameters, and the calculation indicates that Well 13370 could sustain continuous pumping at a rate of 13.1 m³/d or 4,782 cubic meter per year (m³/y), over a 20-year period (24 hours per day, 365 days per year). It should be noted that the well is not operated constantly and therefore short-term pumping at higher rates is possible.

Table 6: Q₂₀ Calculation Input Parameters

Parameter	Unit	Well 13370
Tested pumping rate (Q)	m ³ /d	54.2
Available drawdown (Ha)	m	21.9
Measured drawdown after 100 minutes ($s_{100mins}$)	m	6.5
Theoretical drawdown after 100 minutes ($s_{100 \text{ mins theor}}$)	m	5.1
Theoretical drawdown after 20 years ($s_{20yrs \text{ theor}}$)	m	62.2
Transmissivity (T)	m ² /d	0.8
Storage coefficient (S)	-	3.0×10^{-4}
Theoretical 20-year sustainable yield (Q₂₀)	m³/d	13.1

Notes: m²/d means metres squared per day; **Available Drawdown** indicates the distance from the non-pumping water level to the uppermost water bearing fracture in Well 13370

4.7 Well Yield Calculations for Peak Water Demand

As the water demand for the Resort and Marina will not be continuous over a 20-year, the 100-day specific capacity method (BC MoE, 1999) was applied to determine a pumping rate for intermittent use over shorter periods of time. The calculation indicates that Well 13370 could sustain a higher rate of 23.1 m³/d to support peak water demand during drier periods in the summer months (Table 7).

Table 7: Short-Term Sustainable Well Yield Input Parameters

Parameter	Unit	Well 13370
Constant Rate Pumping Test Discharge Rate	m ³ /d	54.2
Projected 100-Day Drawdown	m	36.1
Specific Capacity	m³/d/m	1.5
Static Groundwater Level	mbgl	17.7
The uppermost water bearing bedrock fracture	mbgl	39.6
Safety Factor	%	70
Safe Available Drawdown	m	15.4
Short Term Sustainable yield	m³/d	23.1

Notes: mbgl means metres below ground level; m³/d/m indicates flow rate over drawdown

It should be noted that pumping Well 13370 at 23.1 m³/d for shorter periods would be 50% lower than the pumping rate during the 72-hour test. If this pumping rate were sustained over the theoretical 100-day period, the total volume of water extracted would be 2,310 m³ or 48% of the yearly allowable diversion based on the Q₂₀ rate.

4.8 Predicted Distance Drawdown Calculations

A volume of 4,782 m³ can be pumped from Aquifer #709 on a yearly basis, based on the long-term sustainable yield calculation (Section 4.5). However, with varying water use from seasonal water demand, the daily average use (13.1 m³/d) is not a true representation of well operation. Instead, a short-term sustainable well yield (23.1 m³/d; 2,310 m³/y) over a 100-days period was used to assess impact on the aquifer and surrounding wells at peak demand during the summer months (Mid-June to Mid-September). An average demand of 9.3 m³/d (2,472 m³/y) was used to assess impact to the aquifer during the remainder of the year. These two scenarios agree with the existing use application (Tracking # 100315657) and historical records which suggest that a maximum daily demand of 25 m³/d is required to support the highest daily use for the months of June to September, while water use between late September to early June each year is much less.

Using the forward solution in Aqtesolv and running a distance-drawdown calculation using the Theis Equation (1935), drawdown in the aquifer at various distances from the Water Lot Well (13370) were calculated for 100-days at 23.1 m³/d and 265-days at 9.3 m³/d, to simulate one year of pumping for a total volume of 4,782 m³/y (Table 8). These estimates ignore aquifer recharge and therefore provide a conservative estimate of drawdown in the aquifer since aquifer recharge is known to occur each year. The Theis Equation (1935) also ignores well losses from draining of fractures, and therefore represents the predicted drawdown in the aquifer rather than

drawdown in the well which could experience additional drawdown. The drawdown and cone of depression calculations for each of the four drawdown scenarios are presented for reference in Appendix F (Figure F7 to F9).

Table 8: Distance Drawdown Values for 365-days of Pumping at Well 13370

Distance (m)	Drawdown (m)	
	After 100-days of Pumping (Q = 23.1 m ³ /d)	After 265-days of Pumping (Q = 9.3 m ³ /d)
0.1	15.9	8.1
1	3.6	3.1
10	0.0	0.0
30	0.0	0.0

Notes: Q means expected pumping rate

Based on the analysis, pumping at a continuous rate of 23.1 m³/d for 100-days would result in 15.9 m of drawdown in the aquifer at the pumping center (r = 0.1 m). This represents approximately 72% of the available drawdown (distance between static water level and the upper most water bearing fracture; 21.9 m) in Well 13370. For the remaining 265-days of the year, at the pumping rate of 9.3 m³/d, the drawdown at the pumping center would be 8.1 m, equivalent to 37% of the available drawdown. The cone of depression for both pumping scenarios is steep and does not propagate far from the pumping center (<10 m).

4.9 Groundwater Chemistry

A summary of the key groundwater quality results for Well 13370 are presented in Table 9. The laboratory results are compared with the Guideline for Canadian Drinking Water Quality (GCDWQ; Health Canada, 2020). The GCDWQ sets standards based on aesthetic objectives (AOs) and maximum acceptable concentrations (MACs) for health-related parameters. Laboratory reports for all sampled parameters are included in Appendix G.

For context, the sample collected in June 2019 represent aquifer conditions prior to the dry season under the below average pumping scenario. The sample collected in September 2020 represents aquifer conditions after stressing the aquifer during well testing at a rate that is 50% higher than the peak demand and after a prolonged period of no recharge to the aquifer (at the end of dry season).

Table 9: Summary of the Key Groundwater Quality Results

Sample Location	Units	Guidelines		Well 13370	Well 13370
Sample Date		GCDWQ AO	GCDWQ MAC	2019-06-04 00:00	2020-09-13 00:00
Sample Comment				Collected during Preliminary Site Visit	Collected during the 72-hour CRPT
Lab ID				9060397-02	0091488-01
General Chemistry					
Conductivity (EC)	µS/cm	-	-	359	514
Total Dissolved Solids- Calculated	mg/L	500	-	227	270
Hardness (as CaCO ₃)	mg/L	-	-	12.8	13.3
pH		7-10.5	-	8.17	8.32
Major Ions					
Chloride (Cl)	mg/L	250	-	21.8	50
Nitrate-N	mg/L	-	10	<0.010	<0.010
Nitrite-N	mg/L	-	1	<0.010	<0.010
Organic Nitrogen-Total (as N)	mg/L	-	-	0.056	0.074
Sodium (Na)-Total	mg/L	200	-	81.4	113
Metals					
Iron (Fe)-Total	mg/L	0.3	-	0.103	0.077
Manganese (Mn)-Total	mg/L	0.02	0.12	0.016	0.0142
Microbiological Analysis					
E. Coli	CFU/100 mL	-	0	<1	-
Fecal Coliform	CFU/100 mL	-	0	<1	-
Heterotrophic Plate Count	CFU/100 mL	-	-	<1	-
Total Coliforms	CFU/100 mL	-	0	<1	-

Notes: **Guidelines** - Health Canada, September, 2020, Guidelines for Canadian Drinking Water Quality (GCDWQ), Summary Table; Laboratory results that were less than detection limits and greater than the applied guidelines are not shown as exceedances; **Yellow highlight** – Value exceeds the Maximum Allowable Concentration (MAC); **Italic Values** - Value exceeds the Aesthetic Objectives (AO TCU means true color units; NTU means Nephelometric Turbidity Units; µS/cm means micro siemens per centimeter; mg/L means milligram per liter

Based on the laboratory analysis, groundwater from WSW 13370 is characterized as a sodium bicarbonate type water, with an average total dissolved solids (TDS) concentration of 249 mg/L (Table 9). All chemical parameters sampled in 2020 were below the MAC and AO guideline levels and were comparable with the 2019 results (Table 9). Only chloride and sodium concentration increased after the well test (Table 9). A piper plot of the major ion chemistry also confirms this change in groundwater type, as the anion concentrations reported in September 2020 have shifted towards a chloride end member (Figure 7).

Groundwater field parameters, including temperature, pH and electrical conductivity (EC) were collected during the well test and are graphed on Figure 8. The results indicate:

- All reported field parameters were consistent throughout pumping (Figure 8).
- The TDS had a maximum concentration of 249 mg/L (Figure 8), which is comparable to the average value reported by the lab analysis (Table 9).
- Values for TDS are below the 700 mg/L threshold limit for groundwater under the influence of saltwater (BC MoE, 2016).

5.0 DISCUSSION AND CONCLUSIONS

Silva Bay Resort and Marina is diverting groundwater from Well 13370, located on their Water Lot for use in existing operations. The groundwater is being piped from the Water Lot to the Resort and Marina, located 600 m to the south. The Water Lot is situated 210 m east of the shoreline, on the east side of Gabriola Island. Given the seasonality of the water demand, the highest recorded water use is in the summer over several days to months (peak water demand). A lower water use is recorded over the remainder of the year that is more continuous and is below the average daily demand for the year.

A total of 151 registered groundwater users and 5 surface water licenses were identified within a 1-km radius of Well 13370. Only one surface water license was active and all, but three groundwater wells were registered as domestic users. During a field-verification survey of 15 residential properties within a 250 m radius of Well 13370, Waterline determined 14 of the 27 registered groundwater wells were in use. The remaining 13 wells were not in use or were improperly registered or abandoned.

Well 13370 (pumping well) is completed within the fractured bedrock aquifer (Aquifer #709; Figure 2). The aquifer is considered a confined system, with the top of uppermost water bearing fracture in Well 13370 at 39.6 meters below ground level. Based on the uncertainty of the extent and interconnectivity of the fracture system, the bedrock aquifer was considered as an equivalent porous media for the purpose of the pumping test evaluation. An adjacent well (Well 64284), was selected as a suitable observation given its proximity to Well 13370 (30 m west) and similar well completion depth.

A 72-hour constant rate test was performed at Well 13370 at a final tested rate of 54.2 m³/d. The drawdown recorded in Well 13370 was 17.2 m, while 13.8 m of drawdown was observed in Well 64284. This is equivalent to 78% and 63% of the available drawdown reported for Well 13370, respectively. Considering the two different water use scenarios, a pumping rate of 23.1 m³/d was suggested for operation of Well 13370 over short periods in the summer during peak water demand (100-days from mid-June to mid-September). While a lower pumping rate of 9.3 m³/d was suggested for continuous use during the remainder of the year. These two suggested well yields agree with the historical water use described in the license application (Tracking # 100315657).

Ignoring aquifer recharge and boundary conditions, the theoretical drawdown calculated after 100-days of pumping (from mid-June to mid-September) at a rate of 23.1 m³/d, accounts for 72% of the available drawdown at the pumping center. Over the the next 265-days (from mid-September to mid-June), the theoretical drawdown from pumping at a rate of 9.3 m³/d, accounts for 37% of the available drawdown at the pumping center. In this prediction, the cone of depression is very steep, and drawdown does not propagate far from the pumping center (<10m). However, as was observed at Well 64284 during the 72-hour CRPT, the cone of depression around Well 13370 was more pronounced when the bedrock fractures were directly connected. Therefore, some response to pumping can be expected at greater distance if the bedding fractures are connected.

Groundwater samples collected before (June 2019) and during the CRPT (September 2020) plot as a sodium bicarbonate type water on the piper plot. At the end of the 72-hour CRPT, the sample collected from Well 13370 showed a slight shift away from the bicarbonate end member towards the chloride end member, in comparison to the sample collected in June of 2019. This change in groundwater type could indicate that continuous pumping and stressing of the aquifer near the Water Lot has induced some saltwater intrusion. However continuous monitoring of field parameters during the 72-hour pumping period testing showed no change in TDS. Both chloride and sodium are below their respective MAC and therefore the change in concentrations could be the result of seasonal changes between June (start of the dry season) and September (end of the dry season).

Overall, the groundwater from Well 13370 is considered a fresh source and is not influenced by saltwater intrusion (<700 mg/L; BC MoE, 2016). Also, no tidal affects were noted in the groundwater level data collected during testing, further suggesting no connection to seawater.

6.0 RECOMMENDATIONS

After the well testing program, Waterline instrumented Well 13370 with a dedicated logger to record aquifer pressure and document responses from local pumping. The well was already instrumented with a flow meter, with long-term data logging capabilities to quantify water use. Waterline recommends that Client continue to collect monitoring data, with the data reviewed annually by a qualified hydrogeologist. This will allow for proper assessment of aquifer and well performance, the emergence of any boundary conditions and a continued understanding of seasonal demand. In addition, this data could support changes to the estimated Q_{20} value, if results from the aquifer test overestimated drawdown.

Groundwater stewardship and conservation requires that all users, domestic and commercial alike, participate in proper water management. With the closest provincial groundwater observation well (OW 197) >4-km from the Water Lot, changes to local groundwater conditions may not be captured because of the disconnection between layers forming productive bedrock aquifers. As such, Waterline strongly recommends that dedicated loggers be installed in one or more neighboring groundwater well (Well 14866 or Well 31803 or Well 39667) to confirm potential impacts from pumping at the Water lot and cumulative drawdown affects from the community water use.

7.0 CERTIFICATION

This document was prepared under the direction of a professional geoscientist registered in the Province of British Columbia.

Waterline Resources Inc. trusts that the information provided in this document is sufficient for your requirements. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Respectfully submitted,

Waterline Resources Inc.

Reviewed By:

Original signed and stamped

Original signed

Simon Wing, B.Sc., P.Geo.
Intermediate Hydrogeologist

Darren David, M.Sc., P.Geo.
Principal Hydrogeologist



8.0 REFERENCES

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9.0 LIMITATIONS AND USE

The information presented in this document was compiled exclusively for Silva Bay Resort and Marina (the Client) by Waterline Resources Inc. (Waterline). This work was completed in accordance with the scope of work for this project that was agreed between Waterline and the Client. Waterline exercised reasonable skill, care and diligence to assess the information acquired during the preparation of this document but makes no guarantees or warranties as to the accuracy or completeness of this information. The information contained in this document is based upon, and limited by, the circumstances and conditions acknowledged herein, and upon information available at the time of the preparation of this document. Any information provided by others is believed to be accurate but cannot be guaranteed. No other warranty, expressed or implied, is made as to the professional services provided to the Client.

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FIGURES

Figure 1: Site Plan

Figure 2: Bedrock Aquifer Map

Figure 3: Registered Surface Water and Groundwater Users within 1-Km

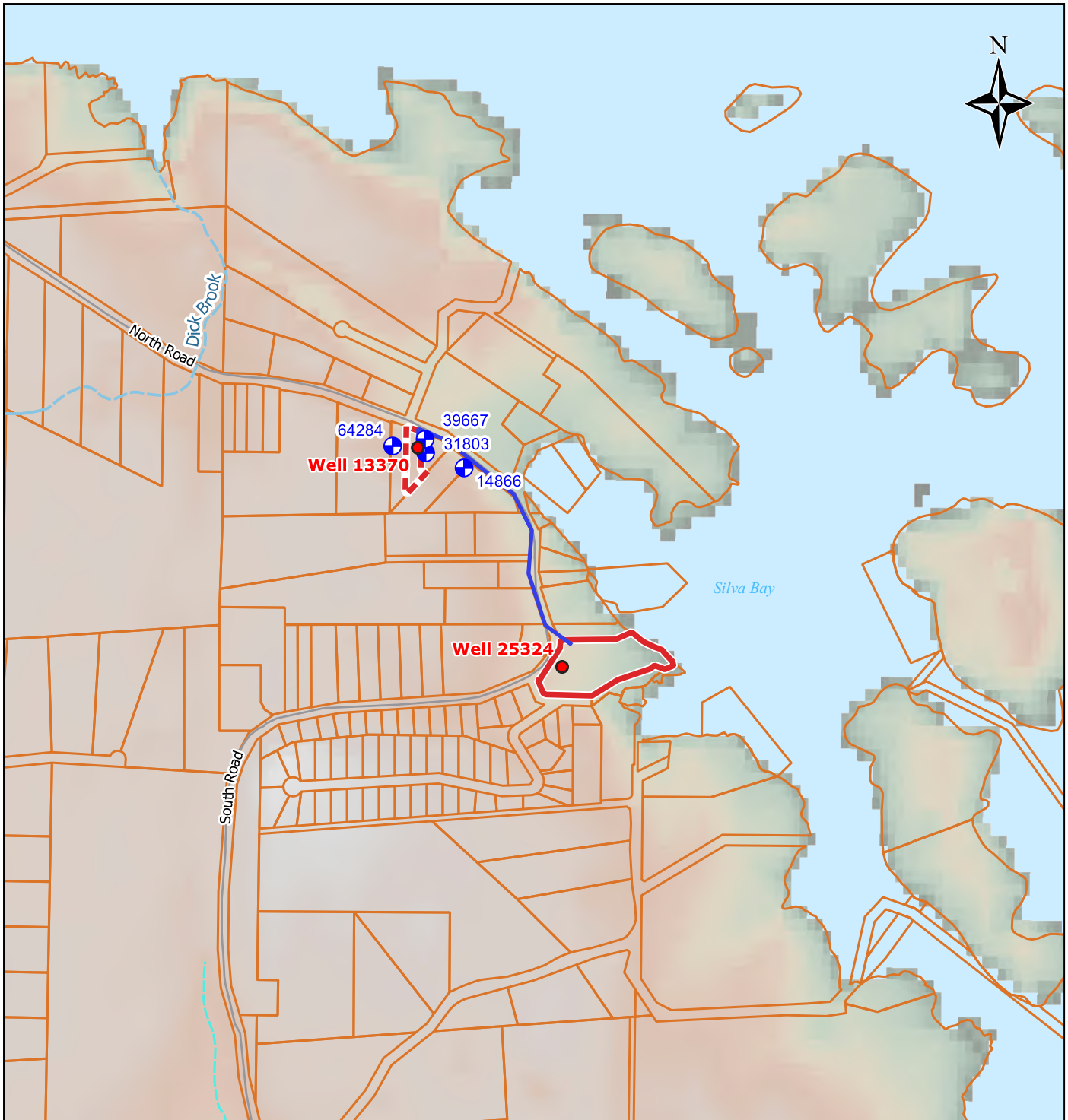
Figure 4: Well 13370 - Step Rate Pump Test Overview Chart (Semi-log Plot)

Figure 5: Pumping Rate vs Drawdown for SRPT at Well 13370 (September 9, 2020)

Figure 6: Well 13370 - 72-hour Constant Rate Pump Test Overview Chart

Figure 7: Piper Plot

Figure 8: Groundwater Field Parameters Recorded at Well 13370 during Well Testing



0 100 200 300 400 metres

Coordinate System: NAD83 / UTM zone 10N

- Project Well
- Neighboring Well
- Pipeline from Water Lot
- Creek - Definite
- Creek - Indefinite
- Creek - Intermittent
- Road - Arterial / Collector
- BC Parcel Fabric
- Site
- Water Lot
- Elevation (m)
 - 4
 - 13
 - 24.3
 - 36.3
 - 47

References:

Canada digital elevation data. [computer file]. Ottawa, ON: Natural Resources Canada, 1997-1999.

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**Silva Bay Resort and Marina - Supplemental Information
Submission Lot 2, Section 5, Gabriola Island Nanaimo District,
Plan 23322, BC Submitted to Silva Bay Resort and Marina**

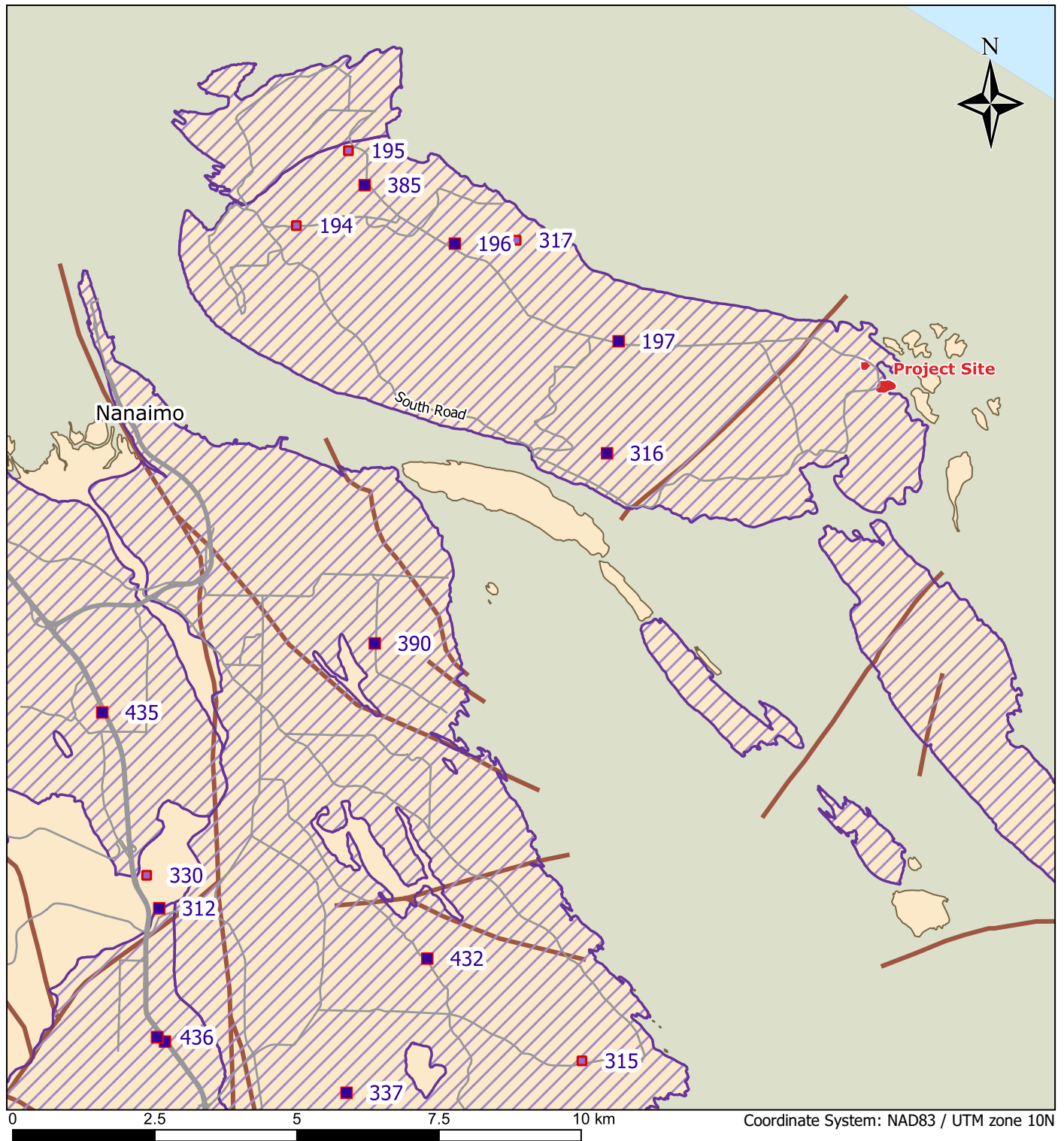
SITE PLAN



Prepared By: Waterline Resources Inc.
Project Number: 3190-20-001
Compiled By: isamson
Date Issued: 2020-Oct-30
Date Revised: --

FIGURE 1

P:\2020 PROJECTS\3190-20-BC 1167433 BC Ltd. Silva Bay Pump Testing\001 Well Testing\Drafting\support\3190_fgsgz



References:

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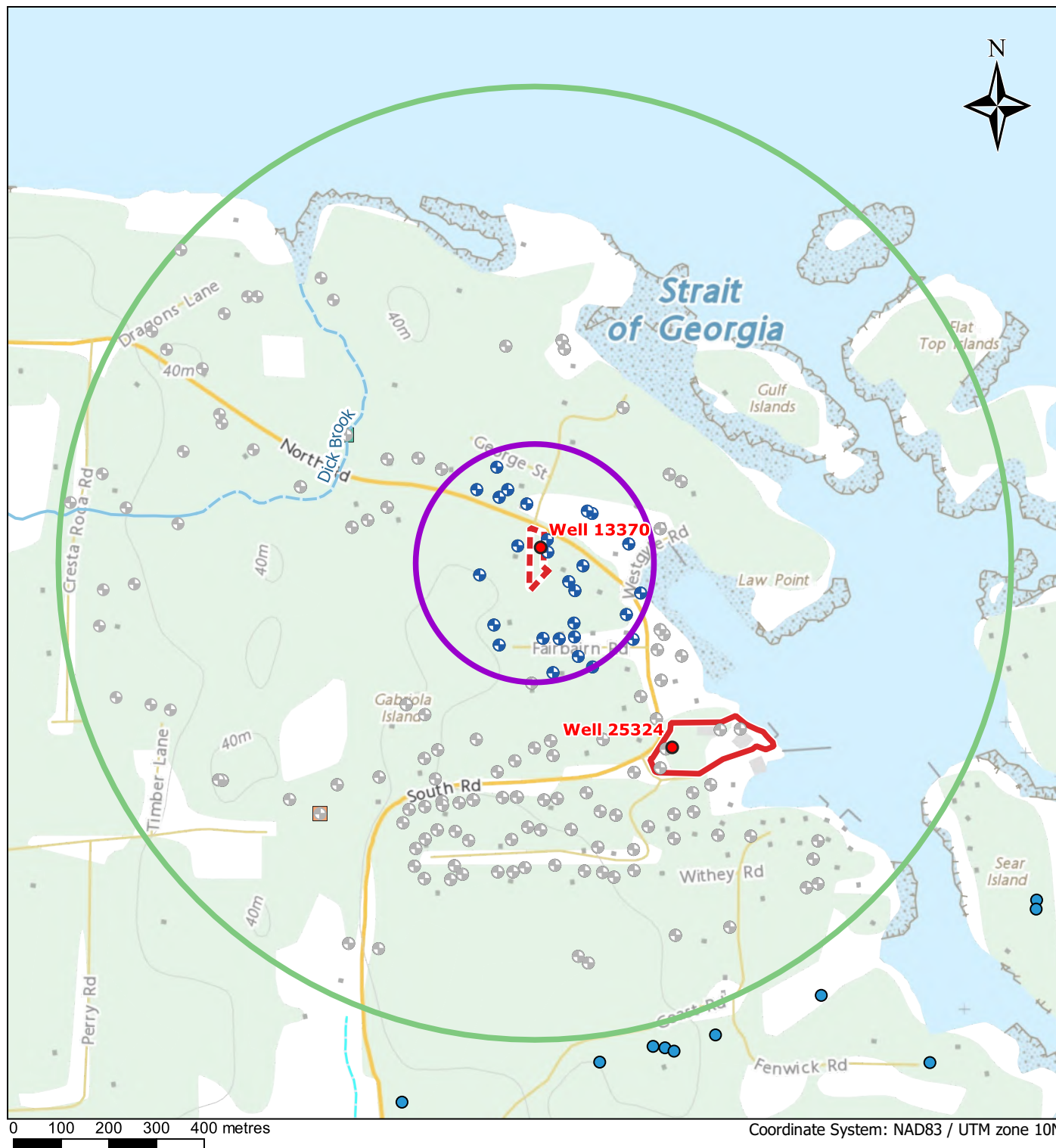
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BEDROCK AQUIFER MAP



Prepared By: Waterline Resources Inc.
Project Number: 3190-20-001
Compiled By: isamson
Date Issued: 2020-Oct-30
Date Revised: --

FIGURE 2



- Project Well
- Wells within 250m
- Wells and Surface Licences within 1km
- Active Surface Water Diversion
- Inactive Surface Water Diversion
- Water Well
- River/Stream - Definite
- - - River/Stream - Indefinite
- · - River/Stream - Intermittent
- Site
- Water Lot

References:

Canada digital elevation data. [computer file]. Ottawa, ON: Natural Resources Canada, 1997-1999.

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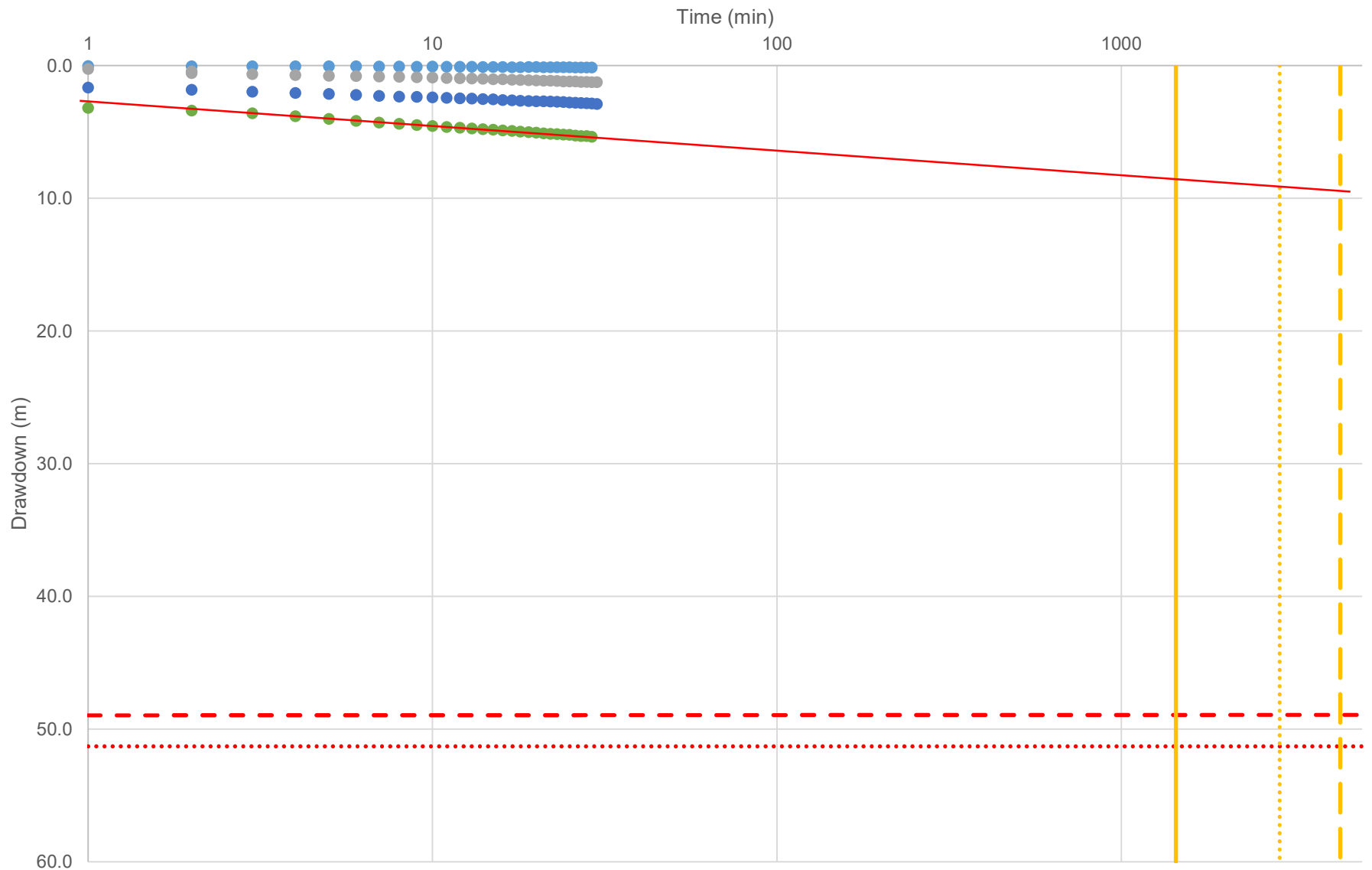
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Submission Lot 2, Section 5, Gabriola Island Nanaimo District,
Plan 23322, BC Submitted to Silva Bay Resort and Marina**

REGISTERED SURFACE WATER AND GROUNDWATER USERS WITHIN 1-KM



Prepared By: Waterline Resources Inc.
Project Number: 3190-20-001
Compiled By: Isamson
Date Issued: 2020-Oct-30
Date Revised: --

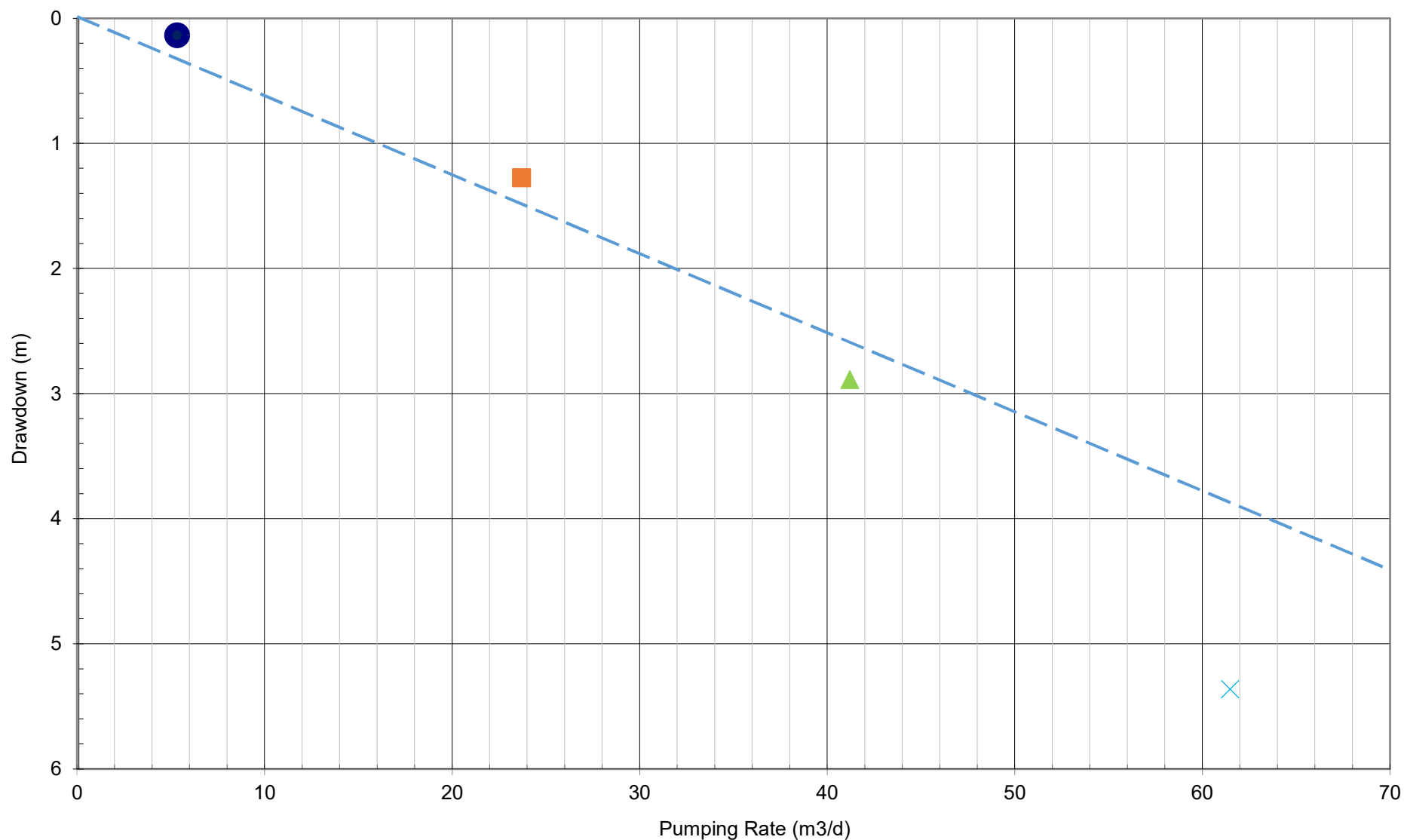
FIGURE 3



LEGEND:

- Step 1 @ 5.3 m³/d
- Step 2 @ 23.7 m³/d
- Step 3 @ 41.2 m³/d
- Step 4 @ 61.5 m³/d
- Pump Intake Depth (mbtoc)
- Transducer Hang Depth (mbtoc)
- 24-hours
- 48-hours
- 72-hours

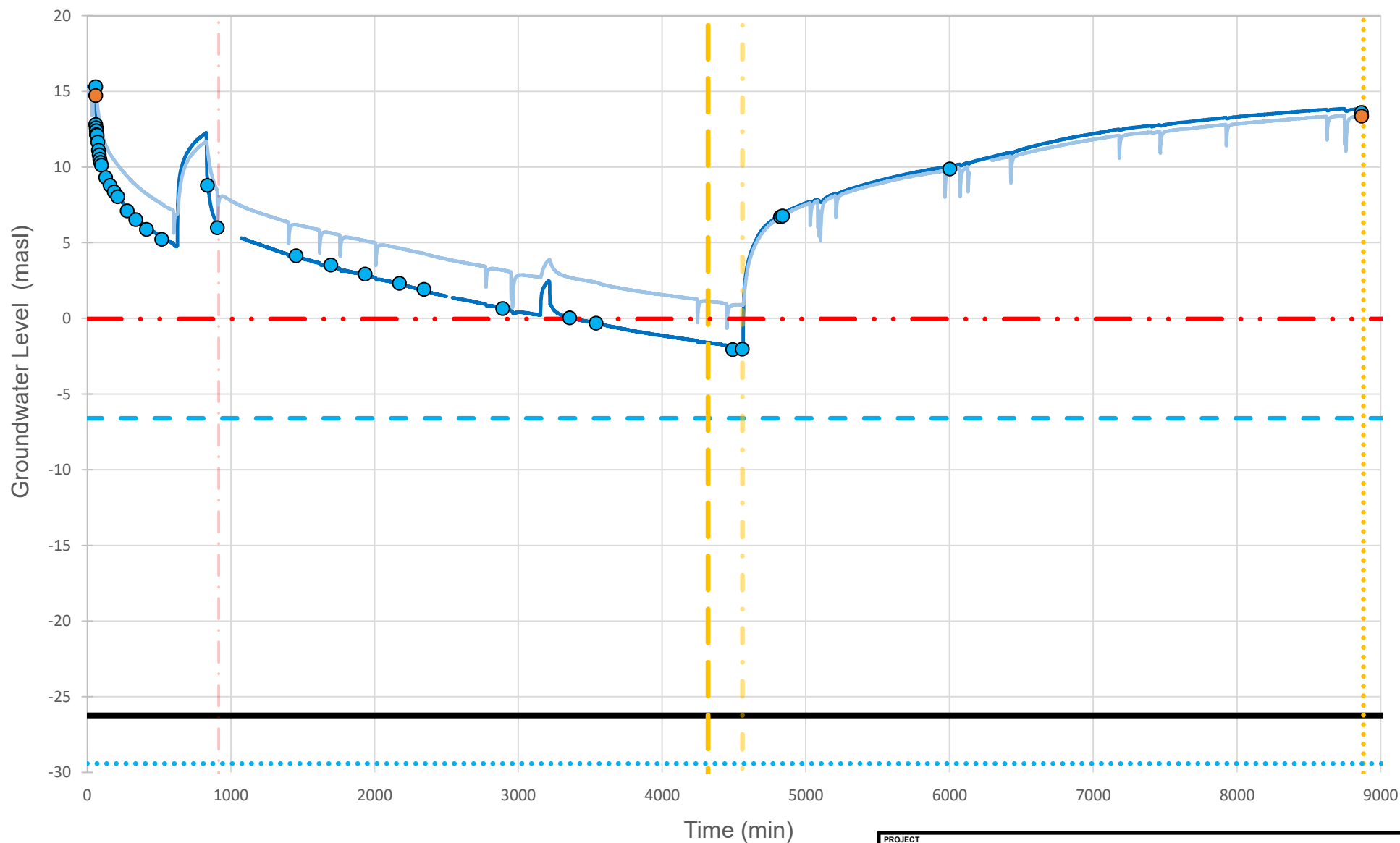
PROJECT		
Silva Bay Resort and Marina - Supplemental Information Submission		
Lot 2, Section 5, Gabriola Island Nanaimo District, Plan 23322, BC		
Submitted to Silva Bay Resort and Marina		
TITLE		
Well 13370 - Step Rate Pump Test Overview Chart		
(Semi-log Plot)		
	PREPARED BY: Waterline Resources Inc.	FIGURE 4
	PROJECT: 3190-20-001	
	COMPILED BY: SW	
	DATE ISSUED: October, 2019	
	REVISED: -	



LEGEND:

● Step 1 @ 5.3 m3/d ■ Step 2 @ 23.7 m3/d ▲ Step 3 @ 41.2 m3/d ✕ Step 4 @ 61.5 m3/d

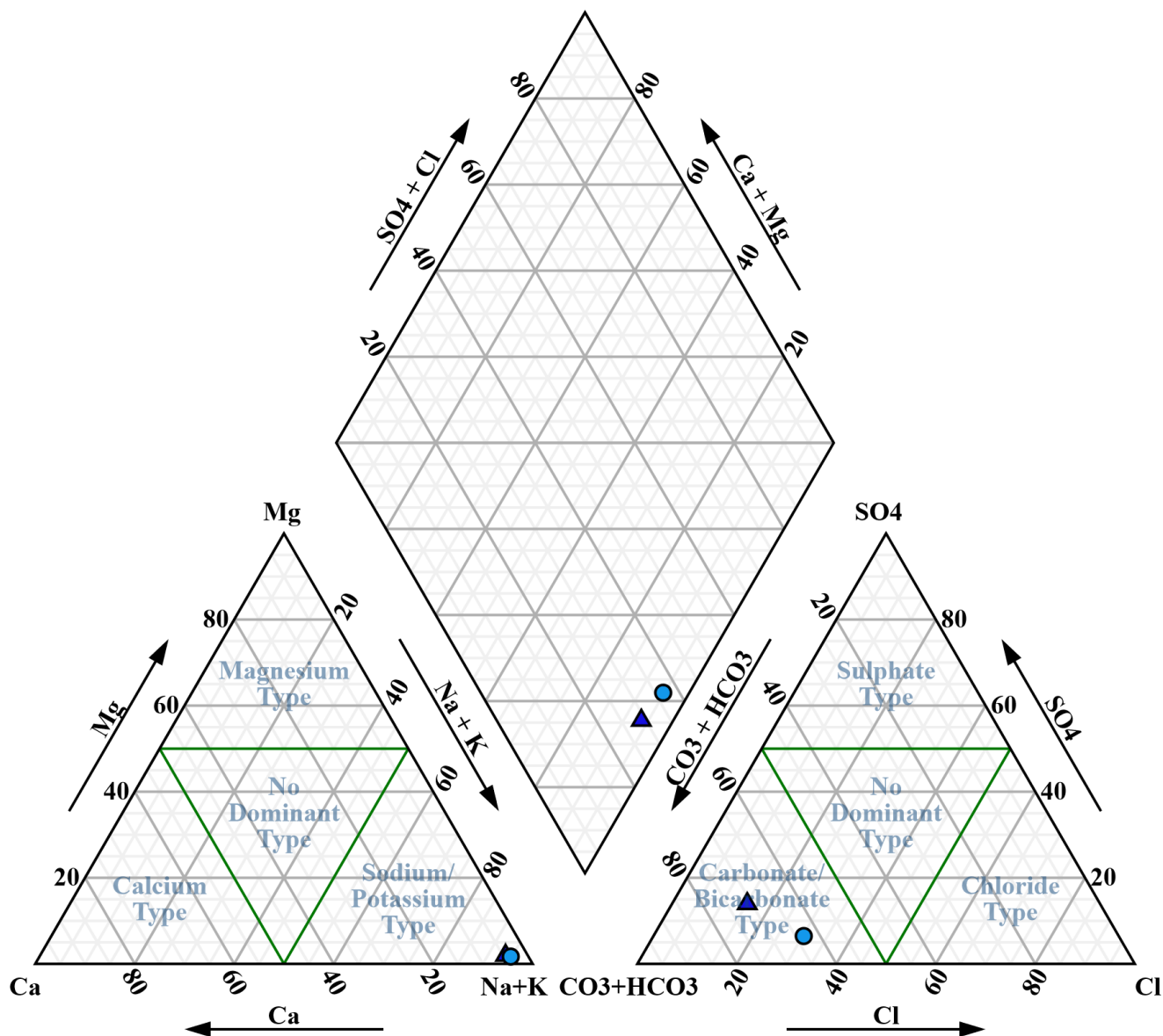
PROJECT Silva Bay Resort and Marina - Supplemental Information Submission Lot 2, Section 5, Gabriola Island Nanaimo District, Plan 23322, BC Submitted to Silva Bay Resort and Marina		
TITLE Pumping Rate vs Drawdown for the SRPT at Well 13370 (September 9, 2020)		
	PREPARED BY: Waterline Resources Inc.	FIGURE 5
	PROJECT: 3190-20-001	
	COMPILED BY: SW	
	DATE ISSUED: October, 2019	
	REVISED: -	



LEGEND:

- Pumping Well 13370 (levellogger)
- Observation Well 64284 (levellogger)
- Total Depth Well 13370 (masl)
- End of Power Outage
- 75-hours
- 3-Days of Recovery
- Pumping Well 13370 (manual)
- Observation Well 64284 (manual)
- Top of Main Water Bearing Fracture Well 13370 (masl)
- 72-hours
- 70% of Available Head in Well 13370 (masl)
- Top of Main Water Bearing Fracture Well 64284 (masl)

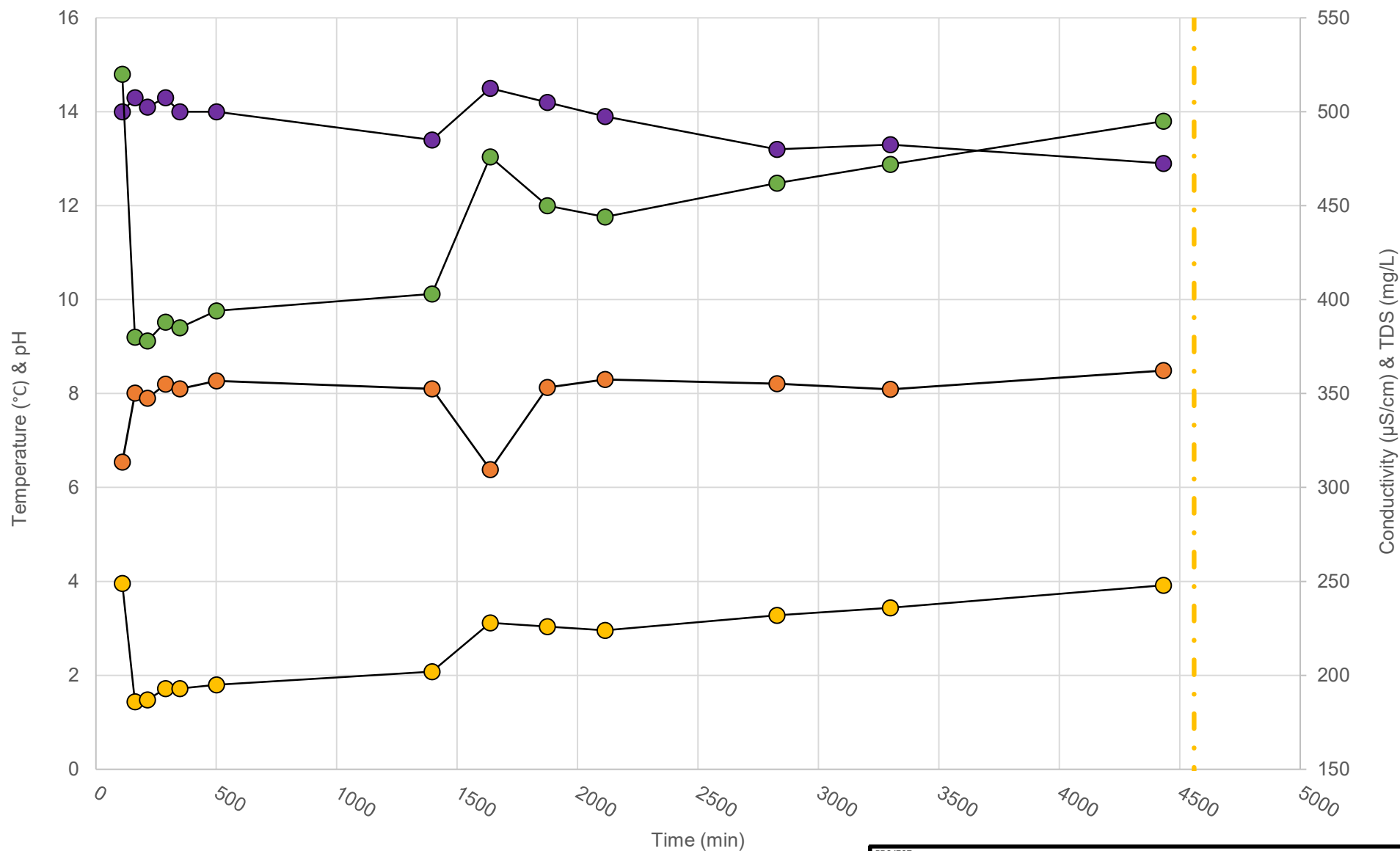
PROJECT Silva Bay Resort and Marina - Supplemental Information Submission Lot 2, Section 5, Gabriola Island Nanaimo District, Plan 23322, BC Submitted to Silva Bay Resort and Marina		
TITLE Well 13370 - 72-hour Constant Rate Pump Test Overview Chart		
	PREPARED BY: Waterline Resources Inc.	FIGURE 7
	PROJECT: 3190-20-001	
	COMPILED BY: SW	
	DATE ISSUED: October, 2019	
	REVISED: -	



Well 13370

- ▲ 2019-Jun-04 13370 - 9060397-02
- 2020-Sep-13 WTN 13370 - 0091488-01

PROJECT		Silva Bay Resort and Marina - Supplemental Information Submission	
TITLE		PIPER PLOT	
	PREPARED BY: Waterline Resources Inc.		FIGURE 7
	PROJECT: 3190-20-001		
	COMPILED BY: Hydrachem		
	DATE ISSUED: 2020-Oct-20		
	REVISED: -		



LEGEND:

—●— Temperature
 —●— pH
 —●— Electrical Conductivity
 —●— TDS
 - - - 75-hours

PROJECT Silva Bay Resort and Marina - Supplemental Information Submission Lot 2, Section 5, Gabriola Island Nanaimo District, Plan 23322, BC Submitted to Silva Bay Resort and Marina		
TITLE Groundwater Field Parameters Recorded at Well 13370 During Well Testing		
	PREPARED BY: Waterline Resources Inc.	
	PROJECT: 3190-20-001	
	COMPILED BY: SW	
	DATE ISSUED: October, 2019	
REVISED: -		FIGURE 8

Appendix A

New Use and Existing Use License Applications





Water Licence Application

Tracking Number: 100301323

Applicant Information

If approved, will the authorization be issued to
an Individual or Company/Organization? Company/Organization

What is your relationship to the
company/organization? Consultant

APPLICANT COMPANY/ORGANIZATION CONTACT INFORMATION

Applicant is an Individual or an Organization to whom this authorization will be issued, if approved

Name: 1167433 BC Ltd
Doing Business As: Silva Bay Resort and Marina
Phone: 778-297-9977
Fax:
Email:
BC Incorporation Number:
Extra Provincial Inc. No:
Society Number:
GST Registration Number:
Contact Name: Dean Chen
Mailing Address: 6055 4000 No. 3 Road
Richmond BC V6X 0J8

CONSULTANT INFORMATION

Please enter the contact information of the Individual/Organization who is acting on behalf of the applicant.

Name: WATERLINE RESOURCES INC.
Doing Business As:
Phone: 250-585-0802
Fax:
Email: mscott@waterlineresources.com
BC Incorporation Number:
Extra Provincial Inc. No: Calgary
Society Number:
GST Registration Number:
Contact Name: Simon Wing
Mailing Address: 2430 Jingle Pot Road
Nanaimo BC V9R 6W2
Letter(s) Attached: Yes (2019-10-09 FrontCounter BC Application Authorization (SIGNED).pdf)

CORRESPONDENCE E-MAIL ADDRESS

It is recommended to provide your correspondence email in this section.

Email: swing@waterlineresources.com
Contact Name: Simon Wing

ELIGIBILITY

If you answer yes to any ONE of the following questions, you are eligible to apply for a water licence.

Question	Answer	Warning
- Are you the owner of land or a mine in British Columbia where the water will be used?	Yes	
- Are you entitled to possession of land or a mine in British Columbia where the water will be used?		
- Do you have a substantial interest in the land, mine, or an undertaking in British Columbia where the water will be used?		
- Are you a holder of a certificate of public convenience and necessity issued under the Public Utilities Act, the Utilities		

Commission Act or the Water Utility Act?

- Are you a municipality, regional district, improvement district, development district or water users' community?
- Are you representing the government of British Columbia or Canada?
- Are you representing a commission, board or person having charge of the administration of Crown land or a mine or an undertaking on Crown land, administered by British Columbia or Canada or controlled by a ministry, department, branch or other subdivision of the government of British Columbia or Canada?
- Are you representing the Greater Vancouver Water District or any other water district incorporated by an Act?
- Are you representing the British Columbia Hydro and Power Authority?
- Are you applying as an agent on behalf of an eligible applicant as described above?

TECHNICAL INFORMATION

GOVERNMENT AND FIRST NATION FEE EXEMPTION REQUEST

Do you belong to, are you applying on behalf of, or are you:

- A provincial government ministry
- The Government of Canada
- A First Nation for water use on reserve land
- A person applying to use water on Treaty Lands
- A Nisga'a citizen
- An entity applying to use water from the Nisga'a Water Reservation?

No

WATER DIVERSION

Do you currently hold a valid Water Licence? No

Select the source of the new water diversion being applied for: Groundwater

PURPOSES OF WATER USE

Please select the purpose for which the diverted water will be used. Please note that the purpose you indicate may be changed during the application review process to better reflect the use of the water, in which case you will be notified of the change. For definitions of Water Use Purpose, click here.

NOTE: A water licence is not required for groundwater that is used for a domestic purpose. Domestic groundwater users have deemed rights for domestic use of up to 2000 litres per day under the Water Sustainability Act and it is therefore not possible to submit an application for a licence.

Purpose	Quantity	Use of Water	Comments	Fee
Commercial Enterprise	10 m3/day	Year Round		\$1,000.00

Total: \$1,000.00

WORKS

Works are the physical equipment used to move the water from its source to where it will be used. For example, works can include a screened intake, pump, pipeline, irrigation system, dugout, storage structure etc. Scroll down the list provided to see all the options available for selection. For a formal definition of "works", refer to Section 1(1) of the Water Sustainability Act.

NOTE: For works not on the list, please describe them in the box below. Hover over the works list to see a quick definition of the work.

Works	Status
Distribution system	Partly Constructed
Flow measuring device	Fully Constructed
Irrigation System	Not Constructed
Pipe	Partly Constructed
Pump	Not Constructed
Pumphouse	Not Constructed
Tank	Fully Constructed
Treatment facility/system	Fully Constructed

Please provide details about the works selected above, and your water system:

Tank size: 2 cisterns totalling 9000 US gallons.
Irrigation will be for landscaping (drought tolerant planting) around the terraced areas (planned/existing outdoor seating areas of the resort). The terraces make up an area of 0.2 acre (6800 sq. Ft). The irrigation system is unplanned at this time, however Waterline and the Client have reviewed the Water estimator for Landscaping (173-day Irrigation Season from April 23 to October 2) and potential water needs for this period. A rainwater capture system will also be implemented to offset irrigation needs

Please Note:

The works associated with the "Water Lot" (WTN 13370) and the location of the pond on the works drawing is for reference only. The inclusion of the "Water Lot" and well 13370 on the works drawing was recommended during the initial review of the application as "they connect everything together," and will be applicable to an anticipated future Existing Use Application. The pond is used as the fire suppression reservoir and is filled by overland flow during the winter months. It is not connected to the groundwater distribution system.

SOURCE OF WATER FOR APPLICATION

WELL WORKS

Is the water you are applying for coming from a well? Yes

If your works are not fully constructed, (e.g. under repair), please provide details in the "Comments" field below.

Works	Common Well Name	Status	Comments
Well	Well 25324	Fully Constructed	Well 25324 was drilled and constructed in August 1969, but never used by the original owner. It has now been tested in September 2019, and looking to be used to supply this tourist commercial business. The well does not currently have a pump installed.
Well Tag Number:	Well ID Plate Number:	25324	

Depth of Well:	61.8 metres
Location of well:	Latitude: 49.14959 Longitude: -123.70178 Decimal Degrees
Method of location measurement:	GPS Device
Is the well a flowing artesian well at any time of the year?	No
Is the well head in a pit or a sump?	No
Are there other wells on the property that are not in use?	Yes

PROXIMITY TO SURFACE WATER

In order to consider all relevant factors concerning your licence application, it is necessary to understand any potential connections between the aquifer from which you propose to withdraw water and connected surface water.

Does any documentation, such as a well construction report, indicate that there is a hydraulic connection between the well and a surface water source? No

JOINT WORKS

Are your works connected to the works of another person or group of persons?

If you share or are connected to another person's works, it is recommended that a Joint Works Agreement-outlining each party's role and responsibilities-be completed and uploaded

Do you share or are you connected to another person's works? No

PERMIT OVER CROWN LAND

For any works that cross or otherwise affect (e.g. flood) Crown land, you will require permission. A Permit Over Crown Land (PCL) means an authority issued under the Water Sustainability Act which allows you to construct, maintain, or operate works on Crown land or to flood Crown land.

Please answer the following questions to determine whether an authorization to occupy Crown Land will be required with your Water application. If a Permit Over Crown land is required, the applicable fee, if any, will be automatically calculated and added to your application.

You should indicate 'Yes' to the following question if any of the following circumstances apply to your application:

- any of your works will be located on or crossing Crown land
 - your well is or will be located on Crown Land
 - you are proposing to flood Crown Land

Do any of the above apply to your application? No

Based on your answer you do not appear to be affecting or flooding Crown land and neither a Permit over Crown land nor a Crown land tenure appears to be required.

ADDITIONAL QUESTIONS

In many cases you might require other authorizations or permits in order to complete your project. In order to make that determination and point you in the right direction, please answer the questions below. More information can also be found on the Government Water website. In addition, your application may be referred to other agencies for comments.

Are you planning to cut timber on Crown Land? No

Are you planning to use an open fire to burn timber or other materials? No

Are you supplying potable water to consumers?

Yes

The Drinking Water Protection Act and the Drinking Water Protection Regulation describe the responsibilities of the water supplier, which include supplying potable water to consumers, disinfecting surface water and preparing an emergency response plan. The Local Health Authorities are responsible. <http://www.health.gov.bc.ca/protect/dwact.html>

Will fish or wildlife habitat be affected?

No

Are you planning to undertake mineral exploration?

No

Do you need to construct a road to the dam (if there are no existing roads)?

No

Do you want to construct works within an existing forest road right-of-way on Crown land?

No

Do you want to transport heavy equipment or materials on an existing forest road?

No

Do you want to use the water for livestock watering on Crown land?

No

Does any work occur within the public road allowance or has to cross a public road?

No

LOCATION INFORMATION**LAND DETAILS**

List all parcels of land where the water will be used. Click "Add Land Information" button to add each parcel of land.

Description

Other

Legal Description:

Lot 2 Plan VIP23322 Section 5 Land District 32 GABRIOLA ISLAND

PID: 003-081-621

Lot 2 Plan VIP22775 Section 5 Land District 32 GABRIOLA ISLAND

PID: 003-166-121

Lot A Plan VIP21876 Section 5 Land District 32 GABRIOLA ISLAND

PID: 003-354-059

Other

Legal Description: District Lot 2049 Land District 32 & DL 2050. COMMERCIAL PURPOSE Lease Licence Num 111583

PID: n/a

Block A District Lot 294 Land District 32 MARINA PURPOSES Lease Licence Num 104001

PID: n/a

District Lot 396 Land District 32 MARINA PURPOSES

PID: n/a

Land District 32 UNSURVEYED CROWN FORESHORE OR LAND COVERED BY WATER BEING PT OF THE BED OF SILVA BAY. ISSUED FOR MARINA PURPOSES Lease Licence Num V898038

PID: n/a

Metes and Bounds: Description obtained from BCAssessment.ca

DRAWINGS

A Drawing to Scale is required that meets the Application Drawing Standards. Choose one of the options below to submit the required map/drawing.

Additionally, it is recommended that you provide a topographical map showing the general location of the property where the water is proposed to be used and the works constructed in relation to nearby communities, highways, railways and other water sources.

(this additional map will not be necessary if your Drawing to Scale is provided using the Geomark Service or a spatial file such as .KML or .KMZ)

☒ I have map(s) saved to my computer and wish to provide these with my application

MAP FILES

Do you have a PDF or image file of a drawn map? You can upload it here.

Description	Filename
As Built drawing	17-171 TOPO_190429.pdf
As built drawing - Marina (New Use)	Silva Bay 1of2.PNG
As built drawing - Water Lot (Existing Use)	Silva Bay 2of2.PNG

ATTACHED DOCUMENTS

Document Type	Description	Filename
Other	Silva Bay's Letter to Authorizations Officer	Letter to Authorization Off...
Other	Technical Assessment	Silva Bay Technical Assessm...

PRIVACY DECLARATION

PRIVACY NOTE FOR THE COLLECTION, USE AND DISCLOSURE OF PERSONAL INFORMATION Personal information is collected by FrontCounter BC under the legal authority of section 26 (c) and 27 (1)(a)(i) of the Freedom of Information and Protection of Privacy Act (the Act). The collection, use, and disclosure of personal information is subject to the provisions of the Act. The personal information collected by FrontCounter BC will be used to process your inquiry or application(s). It may also be shared when strictly necessary with partner agencies that are also subject to the provisions of the Act. The personal information supplied in the application package may be used for referrals or notifications as required. Personal information may be used by FrontCounter BC for survey purposes. For more information regarding the collection, use, and/or disclosure of your personal information by FrontCounter BC, please contact FrontCounter BC at 1-877-855-3222 or at: FrontCounter BC Program Director FrontCounter BC, Provincial Operations 441 Columbia Street Kamloops, BC V2C 2T3

☒ Check here to indicate that you have read and agree to the privacy declaration stated above.

REFERRAL INFORMATION

Some applications may also be passed on to other agencies, ministries or other affected parties for referral or consultation purposes. A referral or notification is necessary when the approval of your application might affect someone else's rights or resources or those of the citizens of BC. An example of someone who could receive your application for referral purposes is a habitat officer who looks after the fish and wildlife in the area of your application. This does not apply to all applications and is done only when required.

Please enter contact information below for the person who would best answer questions about your application that may arise from anyone who received a referral or notification.

Company / Organization: Waterline Resources
Contact Name: Simon Wing
Contact Address: 2430 Jingle Pot Rd.
 Nanaimo, BC, V9R 6W2
Contact Phone: 250-585-9103
Contact Email: swing@waterlineresources.com

☒ I hereby consent to the disclosure of the information contained in this application to other agencies, government ministries or other affected parties for referral or First Nation consultation purposes.

IMPORTANT NOTICES

Please review the "Important Notices" below and then check the declaration at the bottom confirming that everything in this application is complete and accurate.

- I understand that the submission of this water licence application does not provide authority under the Water Sustainability Act to divert, use or store water other than to test the quality or quantity of water or to conduct a flow test in accordance with Section 6(2)(b) of the Water Sustainability Act. I understand that the submission of this water licence does not provide authority under the Water Sustainability Act to divert, use or store water from a well or other ground water sources to construct works. I also understand that my application must first be investigated and a decision made on the application as to whether a water licence may be granted and, as part of that review, additional information may be requested of me.
- The application may be subject to further requirements under the federal Fisheries Act. Please refer to Fisheries and Oceans Canada's "Projects Near Water" webpage (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) for information on how to ensure your project complies with the Fisheries Act.
- Once you click 'Next' the application will be locked down and you will NOT be able to edit it any more.

DECLARATION

☒ By submitting this application form, I, declare that the information contained on this form is complete and accurate.

OTHER INFORMATION

Is there any other information you would like us to know? Please see the attached letter to the authorizations officer for relevant project information.

APPLICATION AND ASSOCIATED FEES

Item	Amount	Taxes	Total	Outstanding Balance
WSA03-APP 3650 m3/y - Commercial Enterprise	\$1,000.00		\$1,000.00	\$0.00

OFFICE

Office to submit application to: Nanaimo

PROJECT INFORMATION

Is this application for an activity or project which requires more than one natural resource authorization from the Province of BC? No

APPLICANT SIGNATURE

Applicant Signature

Date

OFFICE USE ONLY

Office	File Number	Project Number
Nanaimo		

	Disposition ID	Client Number
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Existing Use Groundwater Application

Tracking Number: 100315657

Applicant Information

If approved, will the authorization be issued to an Individual or Company/Organization? Company/Organization
What is your relationship to the company/organization? Consultant

APPLICANT COMPANY/ORGANIZATION CONTACT INFORMATION

Please upload a scan of your Letter of Agency or Agency Agreement. The scan can be either in PDF or image format (jpg, gif or png). Applicant is an Individual or an Organization to whom this authorization will be issued, if approved

Name: 1167433 BC Ltd
Doing Business As: Silva Bay Resort and Marina
Phone: 778-297-9977
Fax:
Email:
BC Incorporation Number:
Extra Provincial Inc. No:
Society Number:
GST Registration Number:
Contact Name: Dean Chen
Mailing Address: 6055-4000 No. 3 Road
Richmond BC V6X 0J8

CONSULTANT INFORMATION

Please enter the contact information of the Individual/Organization who is acting on behalf of the applicant.

Name: WATERLINE RESOURCES INC.
Doing Business As:
Phone: 250-585-0801
Fax:
Email: mscott@waterlineresources.com
BC Incorporation Number:
Extra Provincial Inc. No: Calgary
Society Number:
GST Registration Number:
Contact Name: Steph Righi
Mailing Address: 2430 Jingle Pot Road
Nanaimo BC V9R 6W2
Letter(s) Attached: Yes (2020-04-08 FrontCounter BC Application Authorization_Signed.pdf)

CORRESPONDENCE E-MAIL ADDRESS

It is recommended that you provide your correspondence email address in this section.

Email: srighi@waterlineresources.com
Contact Name: Steph Righi

ELIGIBILITY

If you answer yes to any ONE of the following questions, you are eligible to apply for a water licence.

Question	Answer	Warning
- Are you the owner of land or a mine in British Columbia where the water will be used?	Yes	
- Are you entitled to possession of land or a mine in British Columbia where the water will be used?		
- Do you have a substantial interest in the land, mine, or an undertaking in British Columbia where the water will be used?		
- Are you a holder of a certificate of public convenience and		

necessity issued under the Public Utilities Act, the Utilities Commission Act or the Water Utility Act?

- Are you a municipality, regional district, improvement district, development district or water users' community?
- Are you representing the government of British Columbia or Canada?
- Are you representing a commission, board or person having charge of the administration of Crown land or a mine or an undertaking on Crown land, administered by British Columbia or Canada or controlled by a ministry, department, branch or other subdivision of the government of British Columbia or Canada?
- Are you representing the Greater Vancouver Water District or any other water district incorporated by an Act?
- Are you representing the British Columbia Hydro and Power Authority?
- Are you applying as an agent on behalf of an eligible applicant as described above?

TECHNICAL INFORMATION

GOVERNMENT AND FIRST NATION FEE EXEMPTION REQUEST

Do you belong to, are you applying on behalf of, or are you:

- A provincial government ministry
- The Government of Canada
- A First Nation for water use on reserve land
- A person applying to use water on Treaty Lands
- A Nisga'a citizen
- An entity applying to use water from the Nisga'a Water Reservation?

No

EXISTING USE

Groundwater users that have been using groundwater prior to the date that the Water Sustainability Act came into force may be granted a priority date for their water licence that is equal to the date they first beneficially used the water.

Do you use groundwater for a non-domestic purpose? Yes

Did your groundwater use begin on or before February 29, 2016? Yes

PURPOSE OF WATER USE

Add the purpose(s) your groundwater is being used for. Check the list of Purpose Definitions to determine your correct purpose of water use.

It is possible that the purpose(s) you select may change, be removed, or new ones be added during the review of your application. This may affect the fees due.

Purpose	Quantity	Use of Water	How estimate water use?	Rental Fee	Application Fee
Commercial Enterprise	25 m3/day	Year Round	Estimate based on flow meter readings collected multiple times per week. Estimate based on peak season daily use.	\$967.76	

Total: \$967.76

The one-time application fee has been waived until March 1, 2022. Annual water rentals are still payable and are required when submitting the application.

Note: The rentals payable with this application represent the total that has accrued since February 29, 2016.

HISTORY OF WATER USE

To assign the correct date of precedence (priority date) for your licence it is necessary to gather information about the history of water use.

For each water use purpose you are requesting please indicate to the best of your knowledge when groundwater use began, including the previous owners.

Purpose	Quantity	Date
Industrial - Commercial Enterprise	25 m3/day	Jan 20, 1970

If possible, please describe the history of use for all the purposes back to the date(s) referenced above:

Well drilling began on January 7, 1970 and was completed on January 20, 1970 for BC Coastal Marine Resort/Silva Bay Resort and Marina. The well remains property of and in use of Silva Bay Resort and Marina for commercial purposes.

Upload any documents you have to support the date water use began, e.g. well construction report, pump installation receipt or signed statement.

Description	File Name
Well Log 13370	Well Log WID 13370.pdf

WORKS

Works are the physical equipment used to move the water from its source to where it will be used. For example, works can include a screened intake, pump, pipeline, irrigation system, dugout, storage structure etc. Scroll down the list provided to see all the options available for selection. For a formal definition of "works", refer to Section 1(1) of the Water Sustainability Act.

NOTE: For works not on the list, please describe them in the box below. Hover over the works list to see a quick definition of the work.

Works	Status
Distribution system	Fully Constructed
Flow measuring device	Fully Constructed
Meter	Fully Constructed
Pipe	Fully Constructed
Pressure tank	Fully Constructed
Pump	Fully Constructed
Pumphouse	Fully Constructed
Tank	Fully Constructed
Treatment facility/system	Fully Constructed

Please provide details about the works selected above, and your water system:

Well 13370 with pump, meter and pressure tank inside pump house located on Water Lot 2, Section 5, Gabriola Island Nanaimo District, Plan 23322. Buried pipe runs from Well 13370 alongside the road 500 meters Southeast to the Resort and Marina located at Lot A, Section 5, Gabriola Island Nanaimo District, Plan 21876). A treatment facility/system, cisterns (2 cisterns totaling 9000 US gallons) and flow measuring device are located on the resort property. A distribution system (hose and pipes) delivers water from the cisterns to the marina/restaurant and shipyard.

SOURCE OF WATER FOR APPLICATION

WELL WORKS

Do you access groundwater from a well?

Yes

As an existing user, your works should be fully constructed. If your works are not fully constructed for some reason, (e.g. under repair), please provide details in the "Comments" field below.

Works	Common Well Name	Status	Comments
Well	Well 13370	Fully Constructed	
Well Tag Number:		Well ID Plate Number:	13370
Depth of Well:	59.23 metres		
Method of location measurement:	GPS Device		
Geographic Coordinates of well:	Latitude: 49.533 Longitude: -124.66367 Decimal Degrees		
Is the well a flowing artesian well at any time of the year?	No		
Is the well head in a pit or a sump?	No		
Description		Filename	
Well Log 13370		Well Log WID 13370.pdf	

Are there any other wells on the property that are not in use? No

JOINT WORKS

Are your works connected to the works of another person or group of people?

If you share or are connected to another person's works, it is recommended that a Joint Works Agreement-outlining each party's role and responsibilities-be completed and uploaded

Do you share or are you connected to another person’s works? No

MAPPING

☒ I have map(s) saved to my computer and wish to provide these with my application

MAP FILES

Do you have a PDF or image file of a drawn map? You can upload it here.

Description	Filename
Silva Bay Aerial Images	Silva Bay_Water Works Infra...
Silva Bay and Well 13370 Topo	Silva Bay and Well 13370_To...

LOCATION INFORMATION

LAND DETAILS

List all parcels of land where the water will be used. Click "Add Land Information" button to add each parcel of land.

Description
Private Land
Parcel ID: 003-081-621
Legal Description: Lot 2 Plan VIP23322 Section 5 Land District 32 GABRIOLA ISLAND

Private Land
Parcel ID: 003-166-121
Legal Description: Lot 2 Plan VIP22775 Section 5 Land District 32 GABRIOLA ISLAND

Private Land
Parcel ID: 003-354-059
Legal Description: Lot A Plan VIP21876 Section 5 Land District 32 GABRIOLA ISLAND

PERMIT OVER CROWN LAND

Do any of these circumstances apply to your water use:

- Any of your works cross or are located on Crown land
- Your well is located on Crown Land
- You are flooding Crown Land

Yes

Do you have on of the following that covers the affected Crown Land, including:

- Permit over Crown Land
- Crown Land Tenure
- Mines Lease, or Special Use Permit

Yes

Please identify and list any permit or tenure number(s):

File #: 2020-00165 (granted January 10, 2020) - Ministry of Transportation Permit to Construct, Use and Maintain Works within the Right-Of-Way of a Provincial Public Highway

ATTACHED DOCUMENTS

Document Type	Description	Filename
Other	MOT ROW Permit_2020-00165	22044453078 - MOTI Right of...

PRIVACY DECLARATION

PRIVACY NOTE FOR THE COLLECTION, USE AND DISCLOSURE OF PERSONAL INFORMATIONPersonal information is collected by FrontCounter BC under the legal authority of section 26 (c) and 27 (1)(a)(i) of the Freedom of Information and Protection of Privacy Act (the Act). The collection, use, and disclosure of personal information is subject to the provisions of the Act. The personal information collected by FrontCounter BC will be used to process your inquiry or application(s). It may also be shared when strictly necessary with partner agencies that are also subject to the provisions of the Act. The personal information supplied in the application package may be used for referrals or notifications as required. Personal information may be used by FrontCounter BC for survey purposes.For more information regarding the collection, use, and/or disclosure of your personal information by FrontCounter BC, please contact FrontCounter BC at 1-877-855-3222 or at:FrontCounter BC Program DirectorFrontCounter BC, Provincial Operation441 Columbia StreetKamloops, BC V2C 2T3

☒ Check here to indicate that you have read and agree to the privacy declaration stated above.

REFERRAL INFORMATION

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Please enter contact information below for the person who would best answer questions about your application that may arise from anyone who received a referral or notification.

Company / Organization: Waterline Resources
Contact Name: Steph Righi
Contact Address: 2430 Jingle Pot Rd.
Nanaimo, BC, V9R 6W2

Contact Phone: 250-585-0801
Contact Email: srighi@waterlineresources.com

☒ I hereby consent to the disclosure of the information contained in this application to other agencies, government ministries or other affected parties for referral or First Nation consultation purposes.

IMPORTANT NOTICES

- I understand that once I have submitted my application as a transitioning groundwater user, Section 140(1)(a) of the Water Sustainability Act authorizes me to continue to divert, store and/or use groundwater as I have in the past until such time as a decision is made on my application. I also understand that my application must first be investigated and a decision made on the application as to whether a groundwater licence may be granted, and as part of that review, additional information may be requested of me. I understand that when a decision has been made, I will be required to comply with the decision and any terms and conditions that are included in an eventual water licence.
- The application may be subject to further requirements under the federal Fisheries Act. Please refer to Fisheries and Oceans Canada's "Projects Near Water" webpage (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) for information on how to ensure your project complies with the Fisheries Act.
- Once you click 'Next' the application will be locked down and you will NOT be able to edit it any more.

DECLARATION

☒ By submitting this application form, I, declare that the information contained on this form is complete and accurate.

APPLICATION AND ASSOCIATED FEES

Item	Amount	Taxes	Total	Outstanding Balance
WSA03-REN 2016 9125 m3/y - Commercial Enterprise	\$167.76		\$167.76	\$167.76
WSA03-REN 2017 9125 m3/y - Commercial Enterprise	\$200.00		\$200.00	\$200.00
WSA03-REN 2018 9125 m3/y - Commercial Enterprise	\$200.00		\$200.00	\$200.00
WSA03-REN 2019 9125 m3/y - Commercial Enterprise	\$200.00		\$200.00	\$200.00
WSA03-REN 2020 9125 m3/y - Commercial Enterprise	\$200.00		\$200.00	\$200.00

OFFICE

Office to submit application to: Nanaimo

PROJECT INFORMATION

Is this application for an activity or project which requires more than one natural resource authorization from the Province of BC? No

APPLICANT SIGNATURE

Applicant Signature	Date
----------------------------	-------------

OFFICE USE ONLY		
Office Nanaimo	File Number	Project Number
	Disposition ID	Client Number

Appendix B

Field Verification Survey Data



Well Tag Number	Well Owner	Water Purpose	License Status	Yield Value (m³/day)	Depth Drilled (m)	latitude	longitude
64268	LEAF GEORGE	Private Domestic	UNLICENSED	109	24	49.148737	-123.70118
5450	W KRULL	Private Domestic	UNLICENSED	UNKNOWN YIELD	5	49.154071	-123.710046
13868	R B LORO	Unknown Well Use	UNLICENSED	11	45	49.154608	-123.701592
32426	JAN ANDREASSEN	Unknown Well Use	UNLICENSED	98	34	49.1483	-123.703382
46723	TOM BANNISTER	Unknown Well Use	UNLICENSED	33	46	49.147295	-123.705986
105795	E WEEKS	Private Domestic	UNLICENSED	16	37	49.155135	-123.713915
14286	WHITNEY SHIPYARD	Private Domestic	UNLICENSED	11	37	49.148893	-123.700661
31803	JOHN CARSON	Unknown Well Use	UNLICENSED	27	33	49.153253	-123.705413
36300	GEORGE DETTWEILER	Unknown Well Use	UNLICENSED	27	40	49.154846	-123.706903
45383	TOM GALOZO	Unknown Well Use	UNLICENSED	3	35	49.148531	-123.70839
49750	JAMES DAVIS	Unknown Well Use	UNLICENSED	22	30	49.151718	-123.702045
69298	REINER	Unknown Well Use	UNLICENSED	33	30	49.148625	-123.706252
83384	ADAM & JOSEE VELSEN	Private Domestic	UNLICENSED	44	49	49.148625	-123.706225
106483	BEE MEYER	Private Domestic	UNLICENSED	27	0	49.145631	-123.704427
106520	TED FIDDLER	Private Domestic	UNLICENSED	33	23	49.148459	-123.708375
14287	JOE DAVIS	Unknown Well Use	UNLICENSED	109	18	49.153714	-123.702183
14628	A WATSON	Private Domestic	UNLICENSED	27	12	49.152496	-123.702728
18854	R W KIRKLAND	Unknown Well Use	UNLICENSED	14	18	49.150777	-123.705844
105796	E WEEKS	Private Domestic	UNLICENSED	8	61	49.154442	-123.712548
5435	GABRIOLA WILDWOOD ES	Unknown Well Use	UNLICENSED	136	21	49.149113	-123.702872
15618	A FERRERO	Unknown Well Use	UNLICENSED	44	23	49.151622	-123.702935
64232	SMITH RON	Unknown Well Use	UNLICENSED	22	46	49.147158	-123.707781
51204	EGON & ANN HOLZWORTH	Unknown Well Use	UNLICENSED	33	30	49.147695	-123.703894
21160	SILVA BAY RESORT	Unknown Well Use	UNLICENSED	27	23	49.149199	-123.702119
73206	INGER MARTIN	Unknown Well Use	UNLICENSED	44	30	49.148507	-123.707896
14867	HENRY SILVA	Unknown Well Use	UNLICENSED	16	21	49.153421	-123.703084
39667	DR JOHN GARSON	Private Domestic	UNLICENSED	55	53	49.153487	-123.70543
89857	LINDA DESCHAMBAULT	Private Domestic	UNLICENSED	27	31	49.147131	-123.70342
106548	RUBY CHAPMAN	Private Domestic	UNLICENSED	55	0	49.157132	-123.706675
14865	O NUKKA	Private Domestic	UNLICENSED	13	37	49.150854	-123.702115
23403	D G WRIGHT	Unknown Well Use	UNLICENSED	3	34	49.154158	-123.706029



Well Tag Number	Well Owner	Water Purpose	License Status	Yield Value (m³/day)	Depth Drilled (m)	latitude	longitude
43597	E B COCKRILL	Unknown Well Use	UNLICENSED	44	29	49.15253	-123.704621
73021	GEORGE SHIPLEY	Unknown Well Use	UNLICENSED	44	43	49.149692	-123.70528
51285	JOHN HIGGINS	Private Domestic	UNLICENSED	109	46	49.14854	-123.712778
106421	HOWARD & LORI WANNER	Private Domestic	UNLICENSED	55	0	49.14726	-123.702846
29486	FAIBAIRN	Unknown Well Use	UNLICENSED	UNKNOWN YIELD	5	49.151625	-123.705527
36189	MYERS	Unknown Well Use	UNLICENSED	UNKNOWN YIELD	4	49.146044	-123.701636
13747	MYERS	Private Domestic	UNLICENSED	109	61	49.146207	-123.700075
36188	A BENTZEN	Private Domestic	UNLICENSED	UNKNOWN YIELD	5	49.14794	-123.700442
65135	EMBERSON & CSAPO	Unknown Well Use	UNLICENSED	UNKNOWN YIELD	30	49.149501	-123.708527
36296	R FRAYNE	Unknown Well Use	UNLICENSED	UNKNOWN YIELD	4	49.150165	-123.708907
5372	T MACDONALD	Private Domestic	UNLICENSED	UNKNOWN YIELD	2	49.145834	-123.711039
21159	E A SILVA	Private Domestic	UNLICENSED	22	21	49.151807	-123.702156
47448	RALPH JECK	Unknown Well Use	UNLICENSED	11	24	49.15465	-123.718256
14878	T SHAW GRANDE HOTEL	Business or Other Organization	UNLICENSED	14	17	49.157348	-123.716868
101431	MRS E WEEKS	Private Domestic	UNLICENSED	11	37	49.155624	-123.714827
14543	D PEDERSEN	Unknown Well Use	UNLICENSED	3	34	49.157009	-123.716438
107295	HEIN HAENTJENS DEKKER	Private Domestic	UNLICENSED	273	84	49.148887	-123.714717
69415	TREBELL FRANK	Unknown Well Use	UNLICENSED	55	15	49.158891	-123.716054
28538	GEORGE ATKINSON	Unknown Well Use	UNLICENSED	49	27	49.154104	-123.719167
14866	David Teichroeb	Private Domestic	UNLICENSED	14	21	49.153	-123.7044
48715	WILLIAM A TITLEY	Unknown Well Use	UNLICENSED	33	46	49.154279	-123.706826
68886	PERSIN TONY	Unknown Well Use	UNLICENSED	16	34	49.148429	-123.708882
73064	HAROLD PARDEE	Unknown Well Use	UNLICENSED	55	34	49.149706	-123.707419
101436	ILSE & JOHN GARDNER	Private Domestic	UNLICENSED	14	85	49.151918	-123.70464
64231	MAURO RAY	Unknown Well Use	UNLICENSED	UNKNOWN YIELD	76	49.14787	-123.701702
19279	WALLS	Unknown Well Use	UNLICENSED	8	30	49.151094	-123.704093
64223	SMITH RON	Unknown Well Use	UNLICENSED	16	69	49.147057	-123.708122
91506	SHANYN POIRLER	Private Domestic	UNLICENSED	8	76	49.14707	-123.708877
106577	AL STIENE	Private Domestic	UNLICENSED	14	0	49.147219	-123.70375
91659	IDA & ROBERT F DUFFIN & FRAYNE	Private Domestic	UNLICENSED	3	61	49.149337	-123.708909

Well Tag Number	Well Owner	Water Purpose	License Status	Yield Value (m³/day)	Depth Drilled (m)	latitude	longitude
92052	HANS KLARDIE	Private Domestic	UNLICENSED	218	81	49.148023	-123.704667
5451	C L MUSCLOW	Private Domestic	UNLICENSED	UNKNOWN YIELD	3	49.149414	-123.705207
22523	SILVA BAY RESORT	Unknown Well Use	UNLICENSED	27	34	49.149559	-123.701959
88958	P DALEN	Private Domestic	UNLICENSED	16	107	49.148563	-123.707485
24755	T L MALLINSON	Unknown Well Use	UNLICENSED	11	16	49.148372	-123.709334
49979	N WAYMAN	Unknown Well Use	UNLICENSED	44	29	49.151491	-123.706787
19278	WAYMAN	Unknown Well Use	UNLICENSED	5	18	49.151868	-123.706943
22834	J L HALVERSON	Unknown Well Use	UNLICENSED	30	19	49.148718	-123.704238
32266	H L WALKER	Unknown Well Use	UNLICENSED	22	38	49.150124	-123.702242
64224	CLIFFORD JAMES ATCHISON	Unknown Well Use	UNLICENSED	UNKNOWN YIELD	84	49.149728	-123.703772
64284	WHITE KATHY	Private Domestic	UNLICENSED	22	67	49.153365	-123.706278
106458	RON ABRAMS	Private Domestic	UNLICENSED	27	0	49.15399	-123.704148
24040	FIDDLER	Private Domestic	UNLICENSED	33	23	49.148576	-123.705456
39560	E B COCKRILL	Unknown Well Use	UNLICENSED	65	34	49.1527	-123.7048
106487	BEA MEYER	Private Domestic	UNLICENSED	33	0	49.145507	-123.704137
20849	A R MUSCLOW	Unknown Well Use	UNLICENSED	98	37	49.149098	-123.706807
22876	CALVIN MCKINNON	Unknown Well Use	UNLICENSED	16	20	49.149554	-123.705744
64407	BOB LAUDER	Unknown Well Use	UNLICENSED	49	44	49.147209	-123.706767
64369	DENBOER PETER	Unknown Well Use	UNLICENSED	65	26	49.148827	-123.711411
85022	D FARLEY	Private Domestic	UNLICENSED	8	99	49.148978	-123.710206
20820	A R MUSCLOW	Private Domestic	UNLICENSED	98	37	49.148952	-123.708588
24041	R HOBBS	Private Domestic	UNLICENSED	19	26	49.147656	-123.702865
45680	JOHN CIRCOLO	Private Domestic	UNLICENSED	16	25	49.148605	-123.705073
48475	R K PETERSON	Private Domestic	UNLICENSED	2	62	49.147635	-123.709131
49732	RON SMITH	Unknown Well Use	UNLICENSED	22	46	49.147318	-123.708016
55837	R A MAURO	Private Domestic	UNLICENSED	5	49	49.148119	-123.709509
73240	HENRY SWAGLEY	Unknown Well Use	UNLICENSED	33	46	49.148563	-123.707499
106566	ZOFY ZOENIG	Private Domestic	UNLICENSED	11	0	49.148008	-123.705544
24752	A CLEMENTS	Unknown Well Use	UNLICENSED	14	18	49.148329	-123.701709
55705	KJELL OHLSSON	Unknown Well Use	UNLICENSED	5	26	49.147345	-123.705123

Well Tag Number	Well Owner	Water Purpose	License Status	Yield Value (m³/day)	Depth Drilled (m)	latitude	longitude
69466	SALE FRED	Unknown Well Use	UNLICENSED	44	61	49.14806	-123.705915
13912	G BROWN	Private Domestic	UNLICENSED	7	19	49.151657	-123.704622
64379	CARL NELSON	Unknown Well Use	UNLICENSED	109	27	49.154034	-123.704286
14288	F P GIBSON	Private Domestic	UNLICENSED	19	33	49.15035	-123.709444
91663	WENDY ELLEN HARRISON	Private Domestic	UNLICENSED	164	79	49.147242	-123.704272
5331	JOHN OLSON	Unknown Well Use	UNLICENSED	5	26	49.152089	-123.703133
23122	SILVA BAY MARINA RES	Unknown Well Use	UNLICENSED	55	61	49.15281	-123.707368
30861	R KIRKLAND	Unknown Well Use	UNLICENSED	142	35	49.150979	-123.70523
45043	S.WARK	Private Domestic	UNLICENSED	16	41	49.147817	-123.70886
56122	JAN ANDREASSEN	Private Domestic	UNLICENSED	5	46	49.14837	-123.703835
18855	J DAVIS	Unknown Well Use	UNLICENSED	22	21	49.151429	-123.702233
54253	JOHN PRICE	Unknown Well Use	UNLICENSED	16	38	49.151618	-123.70506
101368	BARBARA WEDLAKE	Private Domestic	UNLICENSED	33	44	49.14574	-123.710174
106580	TOM WHITE	Private Domestic	UNLICENSED	27	34	49.153687	-123.711056
51828	RUSS BUTTERFIELD	Unknown Well Use	UNLICENSED	27	44	49.147823	-123.706378
64263	WALL J B	Private Domestic	UNLICENSED	11	61	49.151289	-123.704507
13864	DR GREEN	Unknown Well Use	UNLICENSED	27	32	49.150544	-123.7027
38657	W BATUTE	Unknown Well Use	UNLICENSED	33	46	49.147798	-123.707612
83408	BRUCE & JEAN MORIN	Private Domestic	UNLICENSED	14	55	49.148613	-123.70665
91669	BONNIE HOLLER	Private Domestic	UNLICENSED	55	62	49.147966	-123.707998
106568	SHARIE & LAURIE KRULL	Private Domestic	UNLICENSED	65	0	49.153824	-123.710605
51381	CARL BARSTEAD	Unknown Well Use	UNLICENSED	55	40	49.149308	-123.706303
89843	R C LAUDER	Private Domestic	UNLICENSED	14	46	49.147212	-123.706328
106526	BILLY & TANYA BAKER	Private Domestic	UNLICENSED	22	0	49.14799	-123.708519
24138	J E DOYLE	Private Domestic	UNLICENSED	8	24	49.14809	-123.702446
28148	DAVE MCKENZIE	Unknown Well Use	UNLICENSED	19	55	49.147302	-123.709168
73074	MAURIKS JOHN	Unknown Well Use	UNLICENSED	27	49	49.158021	-123.714121
90418	FRANK TREBELL	Private Domestic	UNLICENSED	22	30	49.157694	-123.714789
35500	ROBERT ANDEL	Unknown Well Use	UNLICENSED	46	24	49.150305	-123.716794
31607	PAUL GOETZE	Unknown Well Use	UNLICENSED	19	34	49.148896	-123.714827
51867	DEAN LESLIE	Unknown Well Use	UNLICENSED	16	47	49.152464	-123.718197



Well Tag Number	Well Owner	Water Purpose	License Status	Yield Value (m³/day)	Depth Drilled (m)	latitude	longitude
42325	DEAN LESLIE	Unknown Well Use	UNLICENSED	33	21	49.152577	-123.717307
106588	HEINZ THIEL	Private Domestic	UNLICENSED	65	0	49.154015	-123.717561
108729	JULIUS KEREKI	Private Domestic	UNLICENSED	44	30	49.150209	-123.716231
50150	PETER BELLAMY	Private Domestic	UNLICENSED	109	61	49.15178	-123.718297
35508	FRED MOMYER	Unknown Well Use	UNLICENSED	35	26	49.150434	-123.717797
16248	GRANDI HOTEL	Business or Other Organization	UNLICENSED	27	20	49.156655	-123.715405
54165	E WEEKS	Private Domestic	UNLICENSED	33	43	49.155795	-123.714898
22522	SILVA BAY RESORT	Unknown Well Use	UNLICENSED	22	20	49.149929	-123.700401
38530	G DETTWEILER	Unknown Well Use	UNLICENSED	55	29	49.155003	-123.709168
106619	EEVA GIBSON	Private Domestic	UNLICENSED	27	0	49.154979	-123.710059
14855	H HALVERSON	Unknown Well Use	UNLICENSED	27	21	49.151316	-123.701532
29122	T SHAW	Unknown Well Use	UNLICENSED	22	46	49.158385	-123.712014
73078	GREG PETERSON	Unknown Well Use	UNLICENSED	16	40	49.157974	-123.711652
30200	JOE MARSALE	Unknown Well Use	UNLICENSED	82	44	49.154419	-123.707473
5482	GEORGE DETTWEILER	Unknown Well Use	UNLICENSED	33	38	49.1548	-123.708493
13867	FRANK LE POIDEVIN	Private Domestic	UNLICENSED	38	24	49.148377	-123.701147
18829	A REID	Private Domestic	UNLICENSED	22	55	49.15725	-123.705058
44669	A M LAW	Unknown Well Use	UNLICENSED	8	38	49.154741	-123.701937
64261	CHAPMAN ROSS	Private Domestic	UNLICENSED	UNKNOWN YIELD	122	49.157088	-123.704987
98443	MR. L PAGE	Unknown Well Use	UNLICENSED	22	0	49.146966	-123.697878
106498	DICK HARDMAN	Private Domestic	UNLICENSED	65	0	49.14704	-123.69755
73175	MAURIKS JOHN	Unknown Well Use	UNLICENSED	27	49	49.158023	-123.713847
13742	SILVA BAY RESORT	Unknown Well Use	UNLICENSED	22	18	49.14995	-123.699826
26105	RUTH WAGENBLAST	Unknown Well Use	UNLICENSED	11	15	49.154425	-123.706581
64282	REID HENRY	Private Domestic	UNLICENSED	5	66	49.155992	-123.703285
13866	PAGE	Private Domestic	UNLICENSED	5	20	49.14785	-123.697561
105794	E WEEKS	Private Domestic	UNLICENSED	33	43	49.155087	-123.715931
5449	PAGES STORE	Business or Other Organization	UNLICENSED	82	27	49.147507	-123.697693
13865	PAGE	Unknown Well Use	UNLICENSED	27	23	49.147928	-123.699496
Surface Water License Number	License Status	Water Purpose		Water Source	Quantity (m³/year)	latitude	longitude



Well Tag Number	Well Owner	Water Purpose	License Status	Yield Value (m³/day)	Depth Drilled (m)	latitude	longitude
C061944	Abandoned	08A - Stream Storage: Non-Power		Toadeye Swamp	1233.5	49.1482777	-123.711898
C061943	Abandoned	03B - Irrigation: Private		Toadeye Swamp	1233.5	49.1482777	-123.711898
C058460	Cancelled	03B - Irrigation: Private		Dick Brook	3700.4	49.1537229	-123.716064
C058461	Cancelled	08A - Stream Storage: Non-Power		Dick Brook	3700.4	49.1537229	-123.716064
C065734	Current	01A - Domestic		Dick Brook	829.7	49.1554289	-123.711238

Appendix C

Photo Log





Photo C1 & C2: (LEFT) Looking west, inside the pump house of Well 13370 (Pumping Well) at the stick-up, ID plate number and well distribution piping (Photo C1). (RIGHT) Looking west, inside the pump house of Well 13370 at the distribution piping going past the flow control valve and to the flow meter (Photo C2).



Photo C3: Looking down and east at the stick-up and well head configuration for Well 64284 (Observation Well)

Appendix D

Driller's Logs



(51)

D. WINDECKER WATER WELLS

R.R.#1, SITE 3, GABRIOLA, B.C., V0R 1X0

PHONE: 247-9391

WELLS LOGDepthMaterialOwner B.C. Coastal Marine Resorts

Address _____

Location SILVA BAY LOT #1 Plan 22168
Sec 5

19 <u>70</u>	
Date begun <u>Jan 7</u>	completed <u>Jan 20</u>
Yield <u>10</u>	Gallons per minute
Static water level <u>30</u>	feet from surface
Pumping water level <u>180</u>	feet from surface
Casing used <u>2 1/2 ft</u>	
Bottom of casing <u>1 1/2 ft</u>	feet from surface
Stick-up above ground <u>1</u>	feet
Screen used <u>—</u>	
Top of Screen <u>—</u>	feet from surface
Bottom of Screen <u>—</u>	feet from surface
Sources of water: <u>2</u>	gpm at <u>43</u> feet
<u>5</u>	gpm at <u>95</u> feet
<u>10</u>	gpm at <u>130</u> feet
	gpm at _____ feet
Rig No. 1	
Driller: <u>WD 0506 2307</u> <u>Dan Windecker</u>	Tagged <u>13370</u>

MINIMUM CHARGE FOR DRILLING 30 Feet

1/2' overburden

43' Hard Sandstone

90' Sandstone + Blue shale in Layers

100' Hard sandstone

160' Blue shale + Sandstone in Layers

200' Blue clay + Blue shale in Layers

Well Complete

This is Exhibit "A" referred to in the
affidavit of Dan Windecker



WATER WELL RECORD

Date 88 6 20
YR MO DY

NTS MAP

WELL No.

ELEV

Location
AccuracyU
M

Z

E

N

U
M

Date 19

Well
Type

000911

Owners Name & Address KATHY WHITE, NORTH ROAD, SITE 34, GABRIOLA IS, B.C. V0P 1X0

Legal Description & Address

Descriptive Location SILVA BAY, OPPOSITE MARVEN ROAD, GABRIOLA ISLAND B.C.1. TYPE OF WORK ☒ New Well ☐ Reconditioned ☐ Deepened ☐ Abandoned2. WORK METHOD ☒ Cable tool ☐ Bored ☐ Jetted ☒ Rotary ☐ mud ☒ air ☐ reverse ☐ Other3. WATER WELL USE ☒ Domestic ☐ Municipal ☐ Irrigation ☐ Comm. & Ind. ☐ Other

4. DRILLING ADDITIVES

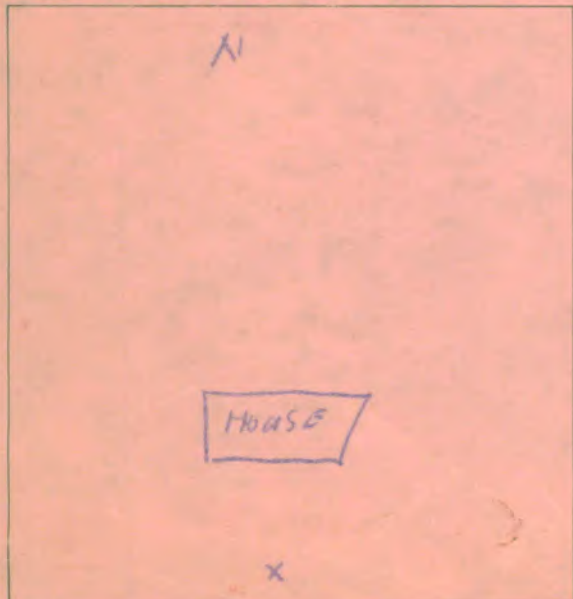
5. MEASUREMENTS from ☐ ground level ☐ top of casing casing height above ground level ft.

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	7	FAULTY SHALEY SANDSTONE	
7	34	SHALEY SANDSTONE	
34	48	GREY SANDSTONE	
48	155	SHALEY SANDSTONE	
155	162	GREY SANDSTONE	
162	220	SHALEY SANDSTONE	
		SOURCE OF WATER:-	
		14 gpm @ 208 ft.	

7. CONSULTANT

Address

8. WELL LOCATION SKETCH

9. CASING: Materials ☒ Steel ☐ Galvanized ☐ Wood ☐ Plastic ☐ Concrete ☐ Other

	units
Hole Diameter	6 ins
Diameter	6 ins
from	+1 ft
to	9 ft
Thickness	1.88 ins
Weight	14 lb/ft

Pitless unit ft ☐ above ☐ below ground level☒ Welded ☐ Cemented ☐ Threaded ☐ New ☐ Used

Perforations:

Shoe(s): NOOpen hole, from 9 to 220 ft Diameter 6 ins

Grout:

10. SCREEN: ☐ Nominal (Telescope) ☐ Pipe Size Type ☐ Continuous Slot ☐ Perforated ☐ Louvre ☐ OtherMaterial ☐ Stainless Steel ☐ Plastic ☐ Other

Set from to ft below ground level

RISER, SCREEN & BLANKS						units
Length						ft
Diam. I.D.						ins
Slot Size						ins
from						ft
to						ft

Fittings, top bottom

Gravel Pack

11. DEVELOPED BY: ☐ Surging ☐ Jetting ☐ Air ☐ Bailing ☐ Pumping ☐ Other12. TEST ☐ Pump ☐ Bail ☐ Air Date YR MO DY

Rate USgpm Temp °C SWL before test ft

Water Level ft after test of hrs

DRAWDOWN in ft				RECOVERY in ft			
mins	WL	mins	WL	mins	WL	mins	WL

13. RECOMMENDED PUMP TYPE RECOMMENDED PUMP SETTING RECOMMENDED PUMPING RATE
ft USgpm14. WATER TYPE: ☒ fresh ☐ salty ☐ clear ☒ cloudy colour smell NIL ; gas ☐ yes ☒ no

15. WATER ANALYSIS: 1 Hardness mg/L 2 Iron mg/L 3 Chloride mg/L 4 pH Field Date Lab Date YR MO DY

SITE I.D. No

16. FINAL WELL COMPLETION DATA

Well Depth 220 ft Well Yield 14 USgpm
Static Water Level 65 ft Artesian Flow USgpm Pressure Head ft
Back filled
Well Head Completion17. DRILLER PLEASE PRINT SURNAME FIRST NAME
WILLIAM DAVIS ALAN

Signature

18. CONTRACTOR Address ISLAND WELL DRILLING LTD.
R.R.1,
GABRIOLA ISLAND B.C.Member, BCWWDA ☐ yes ☒ no

092G.012.3.2.2

RANCH, DEPT. OF LANDS AND FORESTS, VICTORIA, B.C.

LOT 5 PLAN 6986

LOCATION

(COMPLETE LEGAL DESCRIPTION)

OWNER'S NAME

ADDRESS

DRILLER'S NAME

ADDRESS

DATE OF

COMPLETION

DEPTH

ELEVATION
OF COLLAR

CASING DIAM.

LENGTH

TYPE

METHOD OF DIGGING

SCREEN ☐

SIZE

LENGTH

TYPE

PERFORATED CASING ☐

LENGTH

SIZE
OPENINGSDEVELOPED ☐

DESCRIBE

GRAVEL PACK ☐

LENGTH

DIAM.

SIZE GRAVEL, ETC.

PUMP ☐

TYPE

POWER

CAPACITY

OTHER DATA

COSTS WELL

PUMP

PUMP HOUSE, ETC.

MAINTENANCE

DISTANCE TO WATER
FROM TOP OF CASING

32'

☐

ESTIMATED

☒ MEASURED

ELEVATION

FLUCTUATION

HIGH WATER

MONTH

LOW WATER

MONTH

OBSERVATION DATA ☐ FILE No.

WATER USE

☐

ESTIMATED

MAX. RATE WITHDRAWAL

☐

MEASURED

TEMPERATURE

PUMPS SAND ☐CLOGS SCREEN ☐

TYPE DEPOSIT

AQUIFER DATA

LICENSE No.

DATE LICENSE

AMOUNT

DATE APPLICATION

USE



LOCATION SKETCH—INDICATE NORTH

Sampled for
complete chemistry
July 25/78. A.D.H.
(1400042)

Site - I.D.

1400295

SYSTEMS EQUIPMENT LIMITED, VICTORIA-CANADA O 1065-61

SYSTEMSORT

SUPPLY AQUIFER

OTHER AQUIFER PRESENT

OTHER AQUIFER PRESENT

WATER USE

RELIABILITY
OF DATA

UNITS

TENS

UNITS

TENS

UNITS

TENS

SAND

GRAVEL

TILL

HOUSEHOLD

GARDEN

STOCK

COOLING

IRRIGATION

INDUSTRIAL

WATERWORKS

GOOD

FAIR

POOR

Appendix E

Methodology for Pumping Test Analysis



1.0 APPENDIX E: METHODOLOGY FOR ESTIMATING WELL CAPACITY

The available drawdown in Well 13370, completed in fractured bedrock Aquifer #709, is estimated from the lowest known static water level to the the first major water bearing fracture. According to the Ministry of Environment guidance, it is best practice to prevent water level drawdown past 70% of the available water (head) in the wellbore (BC MoE, 1999).

1.1 Calculation for Long-term Sustainable Yield (Q_{20})

For the purposes of this evaluation, the Moell (1975) method, as modified by van der Kamp and Maathuis (2005), was used to determine the theoretical 20-year safe yield (Q_{20}).

$$Q_{20} = \frac{0.7 \times Q \times H_a}{S_{100mins} + (S_{20yrs} - S_{100mins})_{Theor}}$$

Where:

- H_a = Available head (m), calculated as distance from the non-pumping water level (NPWL) to the top of the aquifer;
- Q = Well pumping rate during the aquifer test (m^3/d);
- $S_{100 mins}$ = Measured drawdown at 100 minutes (m);
- $(S_{100mins})_{Theor}$ = Calculated theoretical drawdown after 100 minutes of pumping at Q (m);
- $(S_{20yrs})_{Theor}$ = Calculated theoretical drawdown after 20 years of pumping at Q (m); and
- 0.7 = Arbitrary safety factor to allow for aquifer heterogeneity, boundaries, etc.

The theoretical drawdown after 100 minutes of pumping $(S_{100mins})_{Theor}$ and after 20 years of pumping $(S_{20yrs})_{Theor}$ was calculated based on the following relation (Theis, 1935):

$$\Delta s = \frac{Q}{4\pi T} W(u) \quad (1)$$

$$u = \frac{r^2 S}{4Tt} \quad (2)$$

Where:

- r = radial distance from the pumping well (m);
- S = aquifer storativity (unitless);
- T = estimated transmissivity (mid-time value applied to $(S_{100mins})_{Theor}$ calculation (m^2/day);
- t = elapsed time since pumping began (min);
- s = drawdown (m) at a distance r ;
- Q = constant pumping rate (m^3/d); and

$$W(u) = -0.5772 - \ln(u) + u - \frac{u^2}{(2 \times 2!)} + \frac{u^3}{3 \times 3!} - \dots$$

It should be noted that the Moell (1975) Q_{20} calculation has added safety factors that account for well inefficiencies.

1.2 Estimating Aquifer Parameters for Use in the Q_{20} Calculation

AQTESOLV provides analytical solutions for evaluating hydraulic parameters in the confined, aquifer system. In this analysis, aquifer test data is analyzed by visual curve matching to determine the “best-fit,” and in turn, select the most representative interpretation of aquifer conditions for long-term sustainable use.

The Cooper-Jacob (1946) and Agarwal (1980) solutions for a confined aquifer were used for analysis of the groundwater level data collected at Well 13370 during the aquifer pumping and recovery test phases. These porous media solutions were used rather than fractured bedrock solutions since there is insufficient data available on the nature of the bedrock fractures. Specific assumptions were made with respect to aquifer characteristics using the data evaluation methods. The following assumptions are implicit with the uses of all parametric solutions:

- Aquifer is homogeneous, isotropic, of uniform thickness and of unlimited lateral extent;
- The fractured bedrock aquifer behaves as an equivalent porous media;
- Aquifer potentiometric surface is initially horizontal;
- Flow to pumping well is horizontal;
- Water is released instantaneously from storage with decline of hydraulic head; and
- Diameter of pumping well is very small so that storage in the well can be neglected.

As the above-noted assumptions are typically not realized in nature, there will invariably be some discrepancy between predicted (i.e., theoretical) and measured drawdown. Solutions that ignore all, or a component of recharge, often over-predict drawdown, and are therefore inherently conservative.

1.3 Well Yield Calculations for Peak Water Demand

For the purposes of evaluating the well capacity of Well 13370 for short intermittent use to support peak water demand, the 100-day specific capacity method (BC MoE, 1999) was used.

$$Q = \frac{a}{b} (\text{Projected 100 day Specific Capacity}) \times ((d - c) \times e) (\text{Safe Available Drawdown})$$

Where:

- Q = Well Capacity (m^3/day)
- a = Constant Rate Pumping Test Discharge Rate (m^3/day)
- b = Projected 100-Day Drawdown (meter)
- c = Static Groundwater Level (meter below ground level)
- d = Top of the uppermost water bearing bedrock fracture (meter below ground level)
- e = 70% Safety Factor

It should be noted that a 70% safety factor is applied to account for seasonal changes.

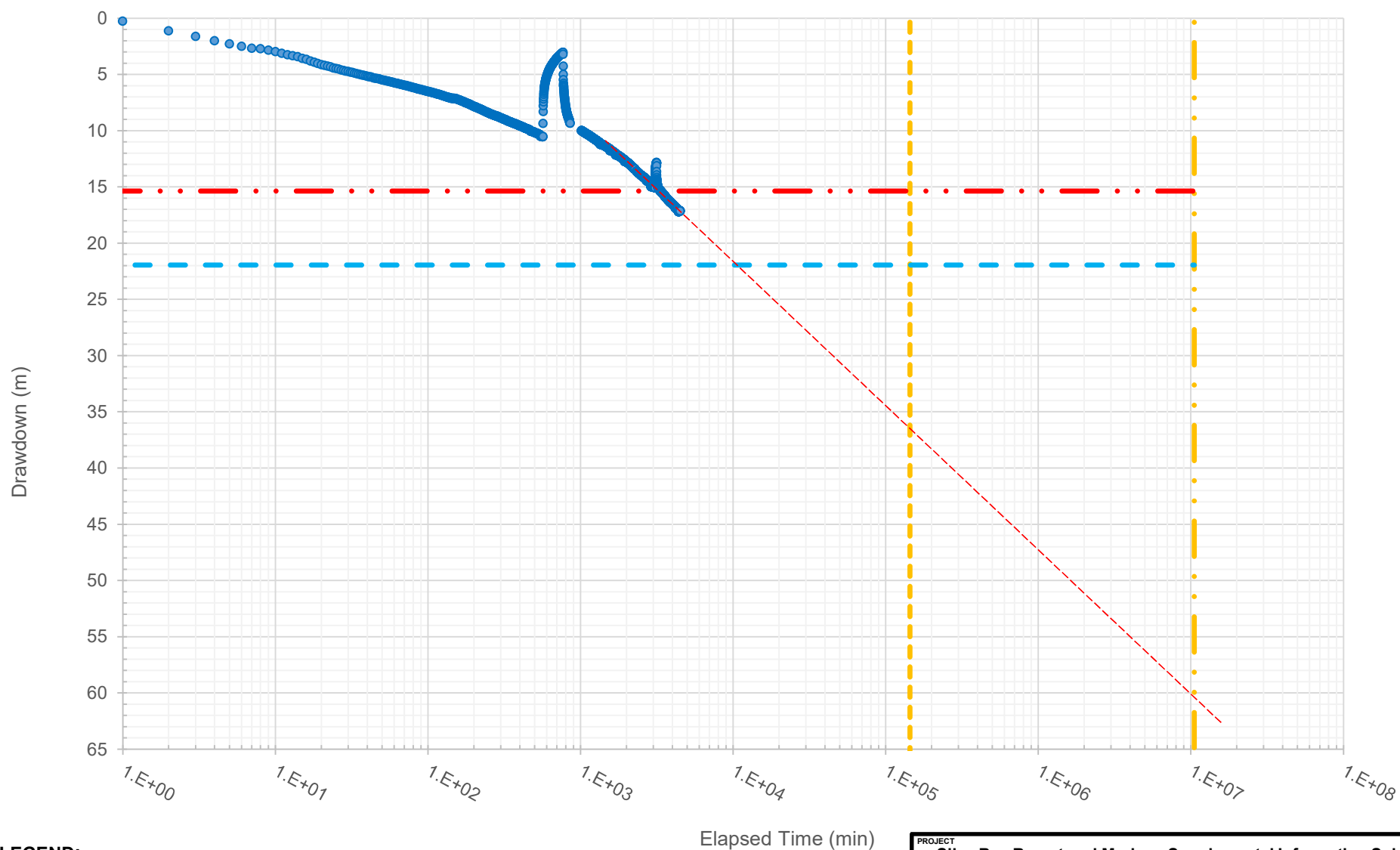
2.0 REFERENCES

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Appendix F

AQTESOLV Analyses and Calculations





LEGEND:

- Drawdown Data for Well 13370
- 100-Days
- ... 20-years
- Top of Main Water Bearing Fracture Well 13370 (m)
- 70% of Available Head in Well 13370 (m)

PROJECT Silva Bay Resort and Marina - Supplemental Information Submission Lot 2, Section 5, Gabriola Island Nanaimo District, Plan 23322, BC Submitted to Silva Bay Resort and Marina	
TITLE Drawdown vs Time for Well 13370 (Semi-log Plot)	
	PREPARED BY: Waterline Resources Inc.
	PROJECT: 3190-20-001
	COMPILED BY: SW
	DATE ISSUED: October, 2019
REVISED: -	
FIGURE F1	

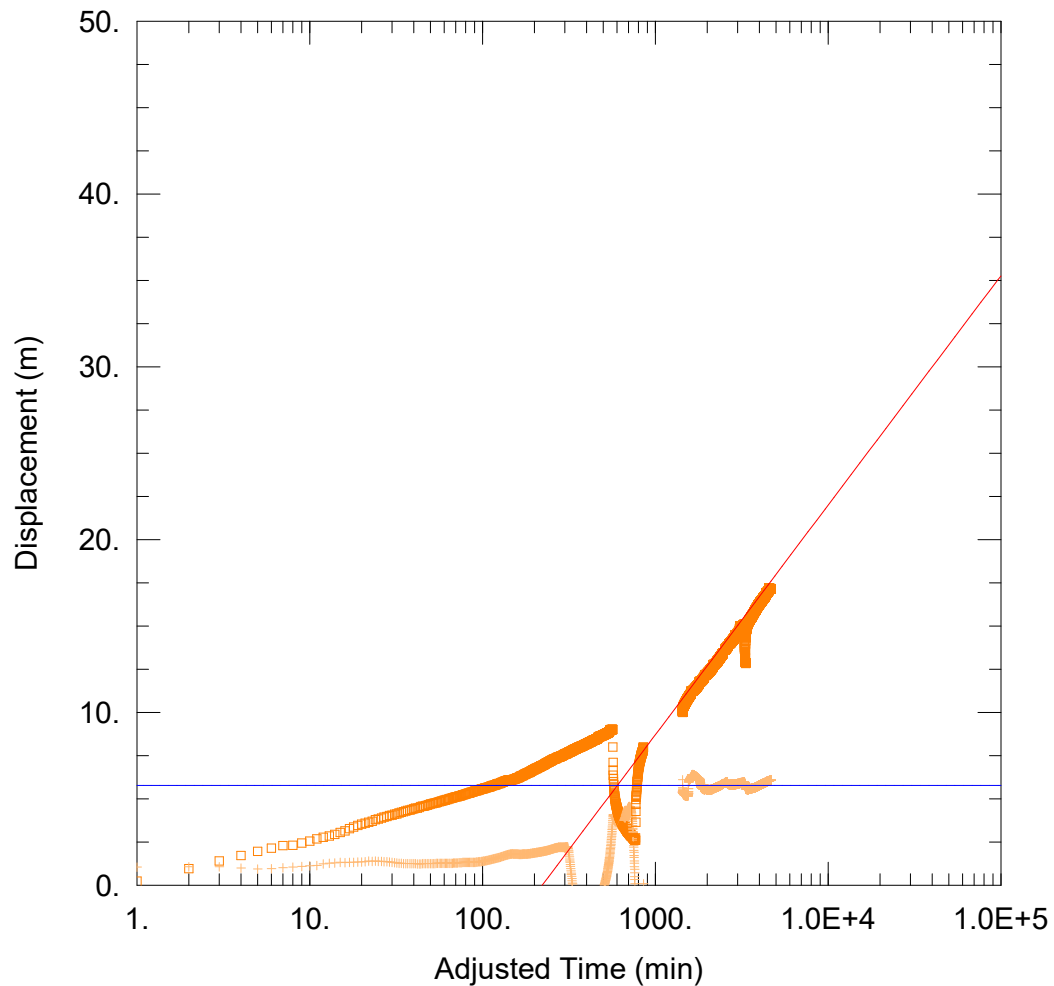
Figure F2 - Well 13370 Drawdown Data_Cooper-Jacob Solution

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F2_PW 13370 CJ.aqt
Date: 10/30/20 Time: 14:13:50

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob
T = 0.7521 m²/day S = 44.99

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW 13370	0	0

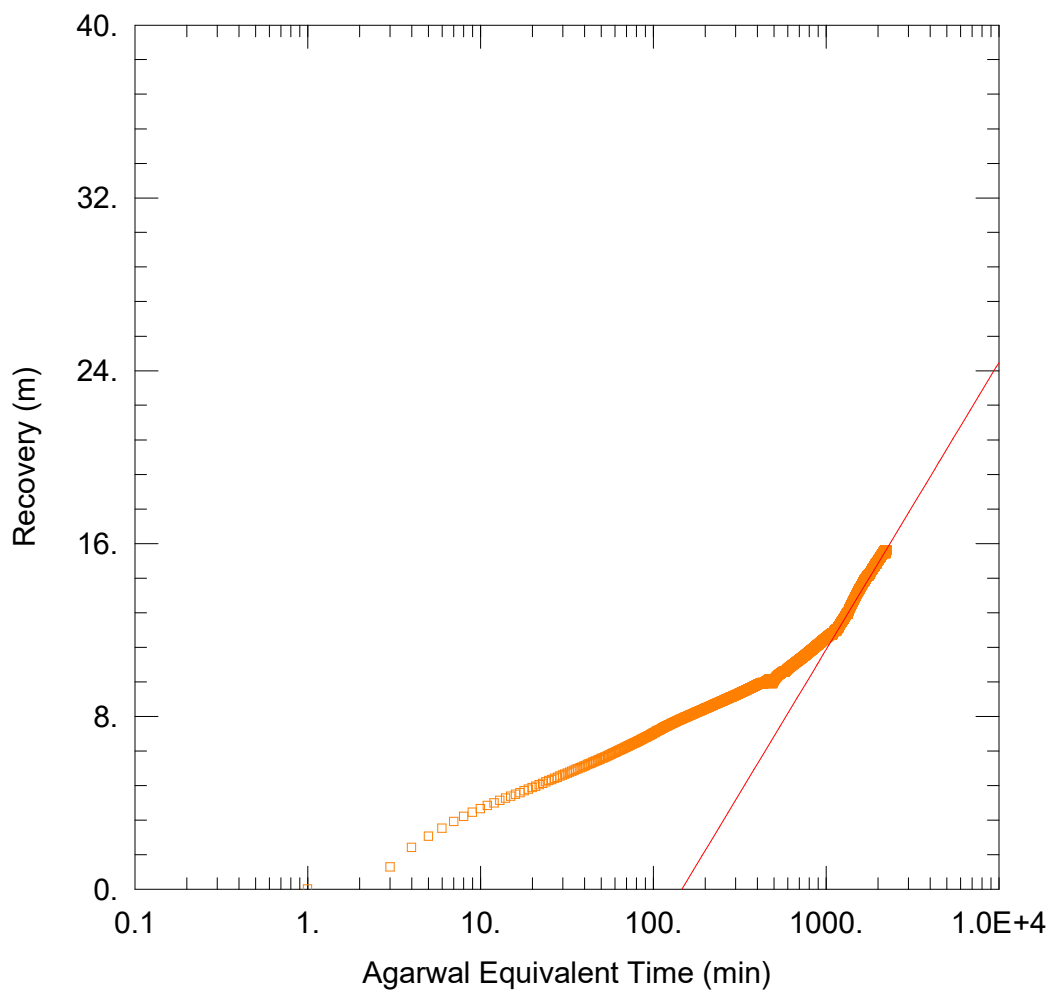
Figure F3 - Well 13370 Recovery Data_Agarwal Solution

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F3_PW 13370 CJ Agarwal.aqt
Date: 10/30/20 Time: 14:35:46

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob
T = 0.752 m²/day S = 29.72

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW 13370	0	0

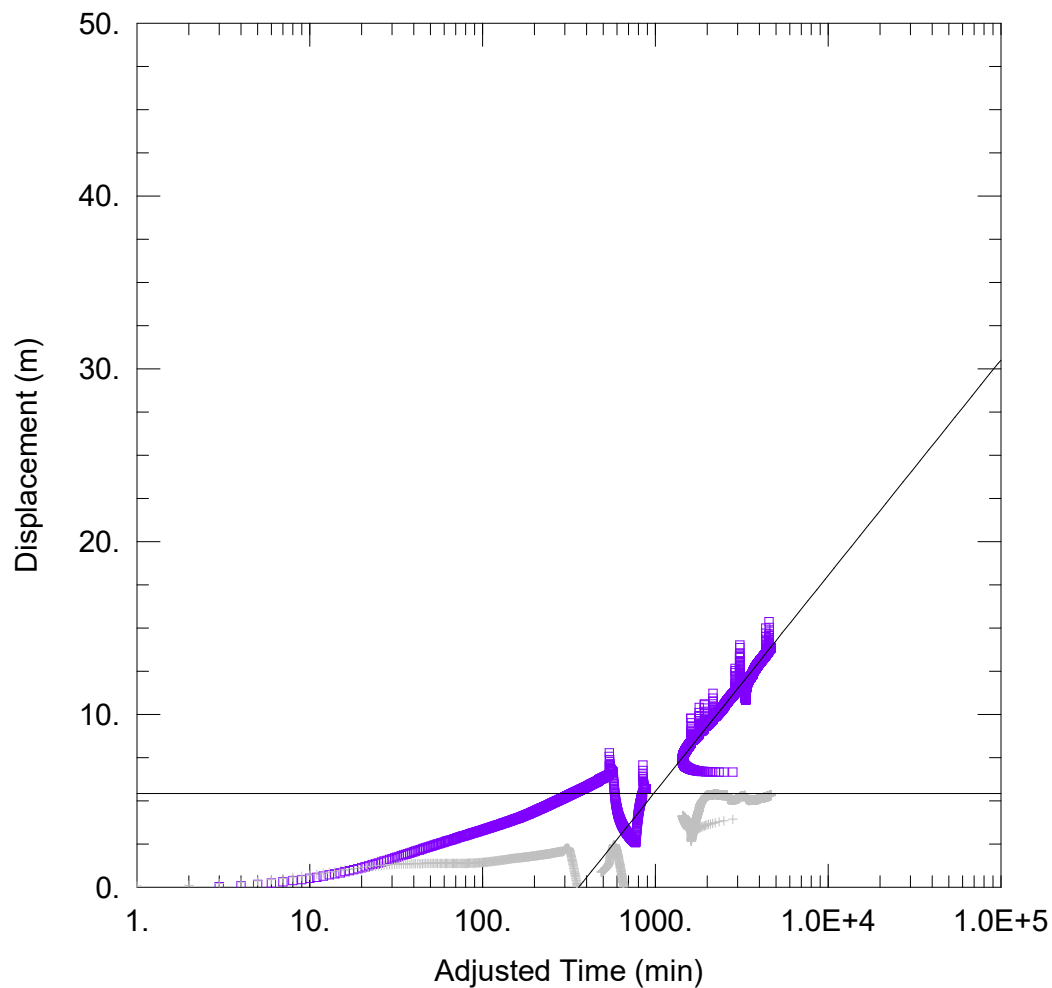
Figure F4 - Well 64284 Drawdown Data_Cooper-Jacob Solution

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F4_OBSW 64284 CJ.aqt
Date: 10/30/20 Time: 14:36:18

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob
T = 0.8 m²/day S = 0.0005

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ OBSW 64284	30	0

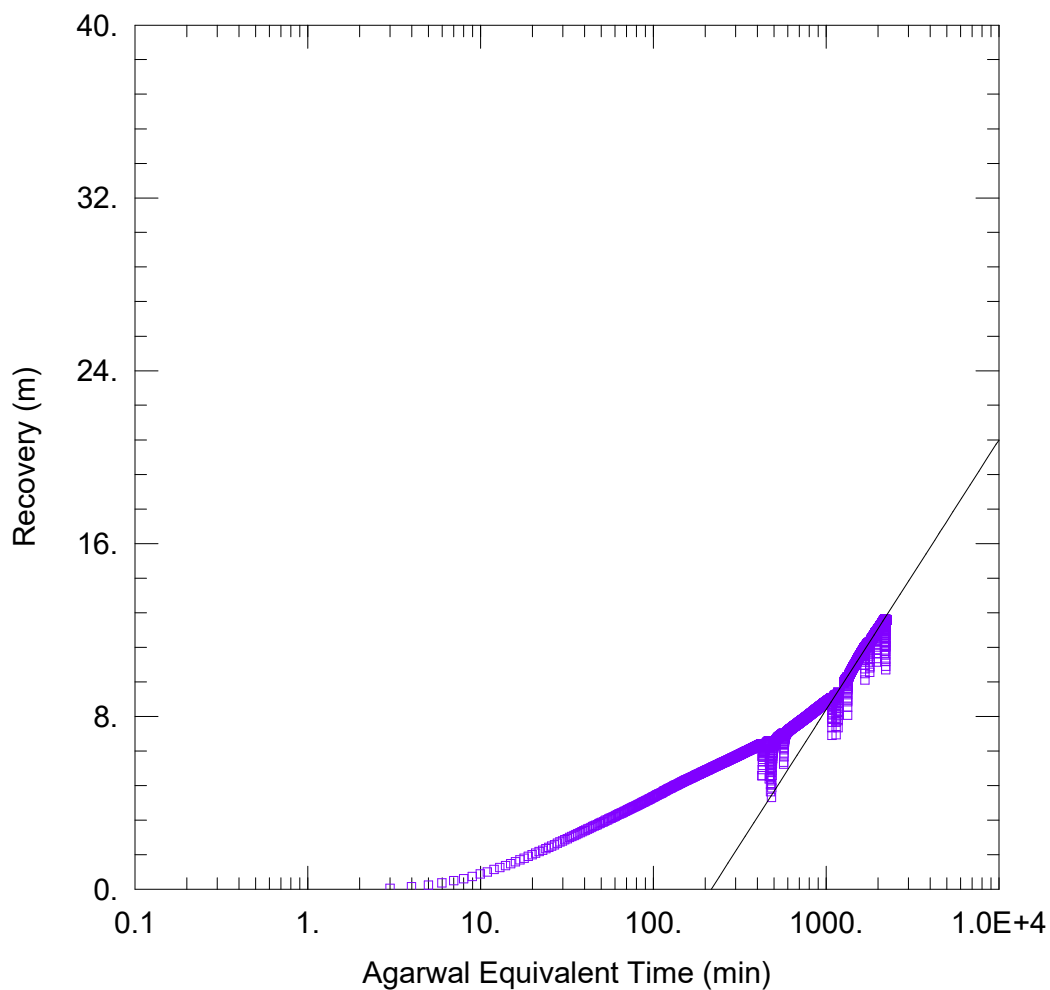
Figure F5 - Well 64284 Recovery Data_Agarwal Solution

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F5_OBSW 64284 CJ Agarwal.aqt
Date: 10/30/20 Time: 14:37:07

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob
T = 0.8 m²/day S = 0.0003

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ OBSW 64284	30	0

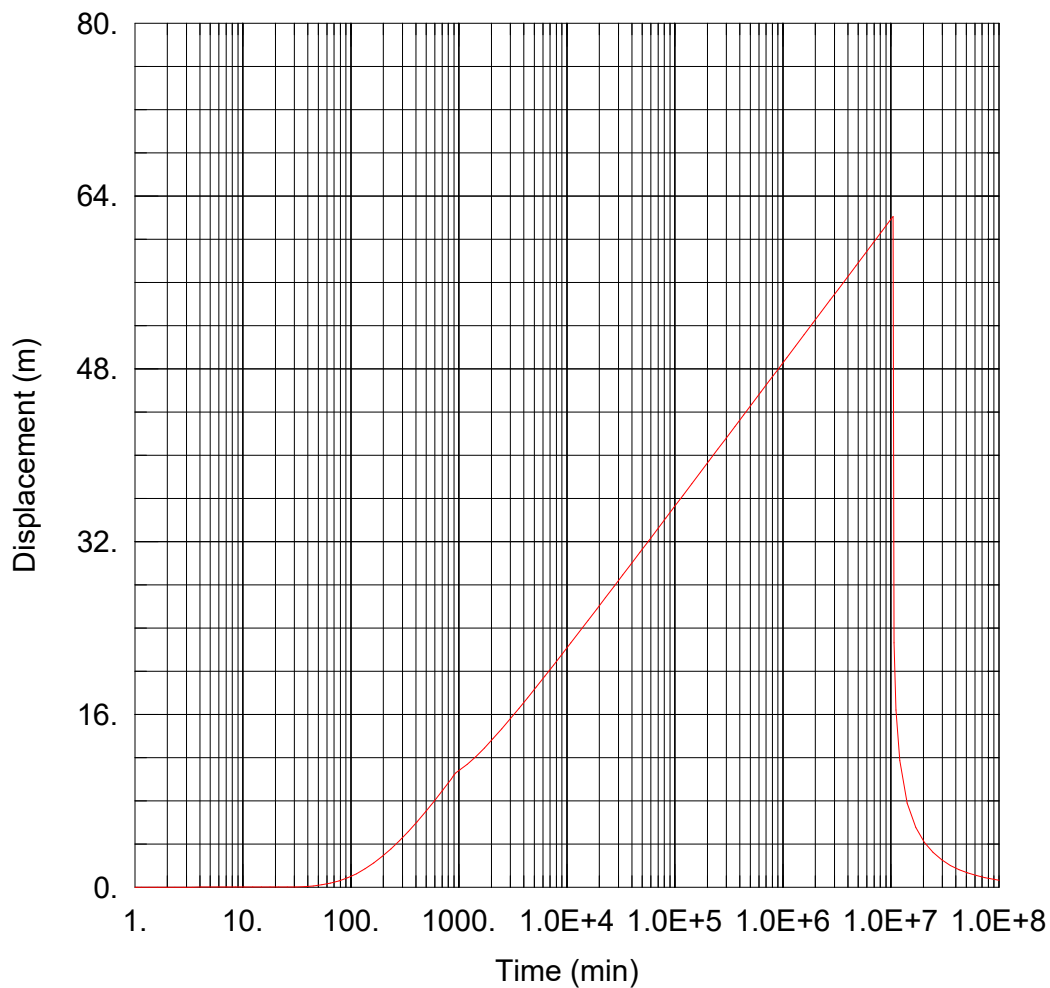
Figure F6 - Forward Solution for Q20 Calculation

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F6_PW 13370 CJ 20YRS.aqt
Date: 11/13/20 Time: 11:44:11

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.7521 m²/day S = 44.99
Kz/Kr = 1. b = 19.6 m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW 13370	0	0

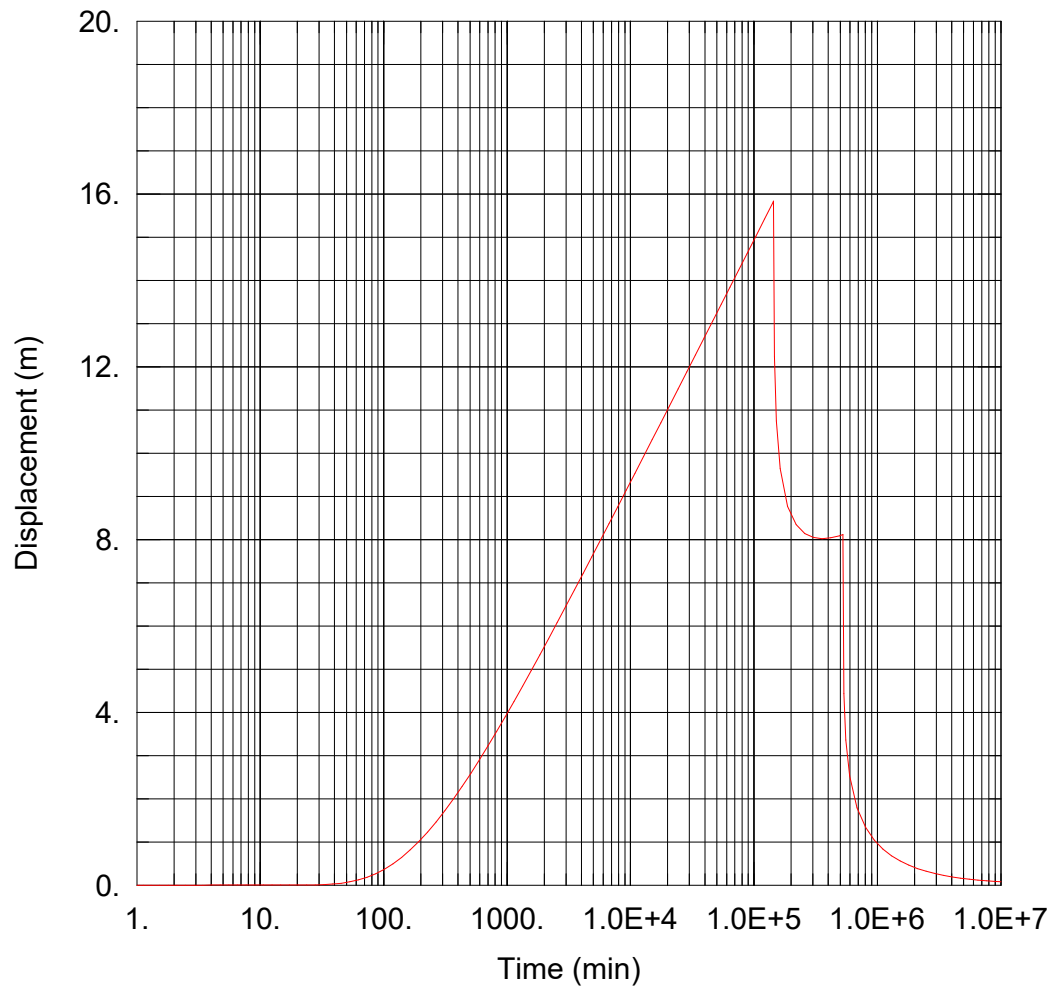
Figure F7 - Forward Solution for 365-days of Pumping at Q20 Rates

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F7_Distance Drawdown.aqt
Date: 11/13/20 Time: 11:44:33

SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 0.7521 m²/day S = 44.99
Kz/Kr = 1. b = 19.6 m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW 13370	0	0

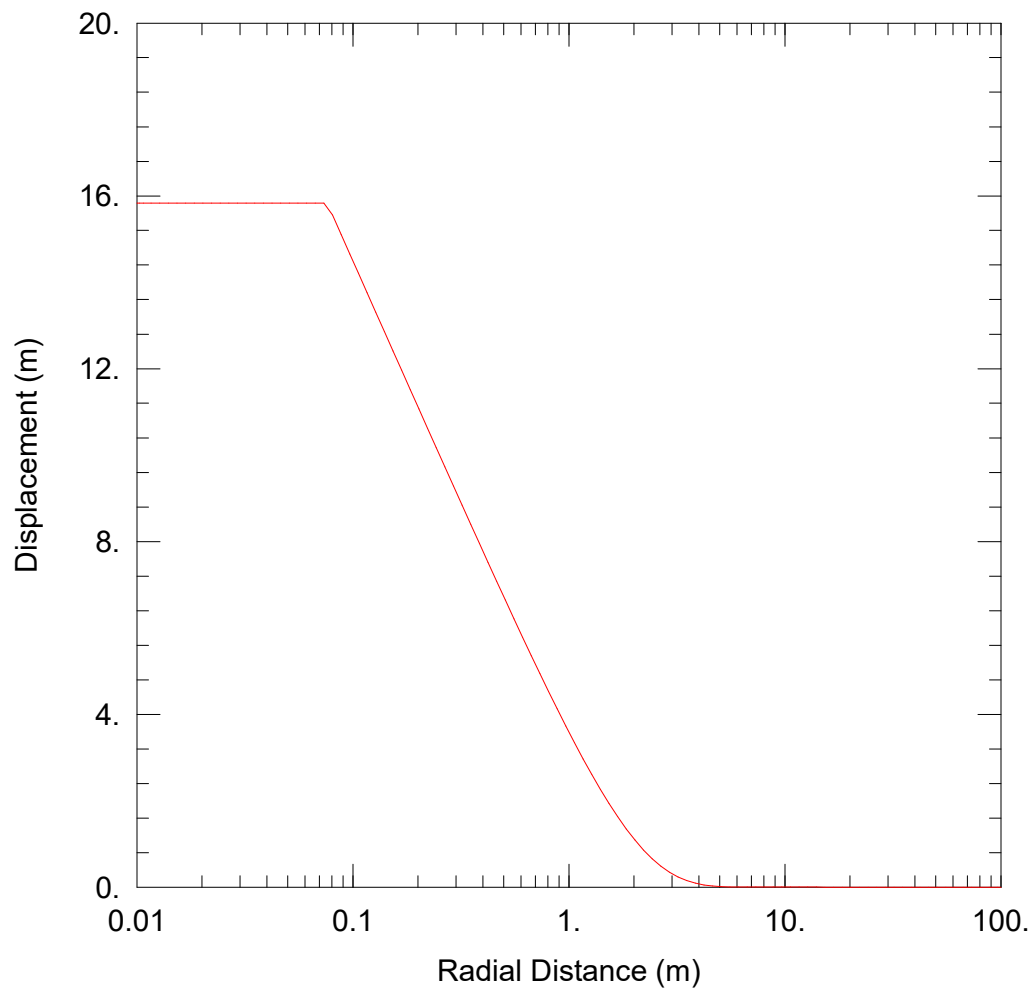
Figure F8 - Forward Solution for 100-days of Pumping at 23.1 m3/d

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F8_Distance Drawdown.aqt
Date: 11/13/20 Time: 11:44:54

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.7521 m²/day S = 44.99
Kz/Kr = 1. b = 19.6 m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW 13370	0	0

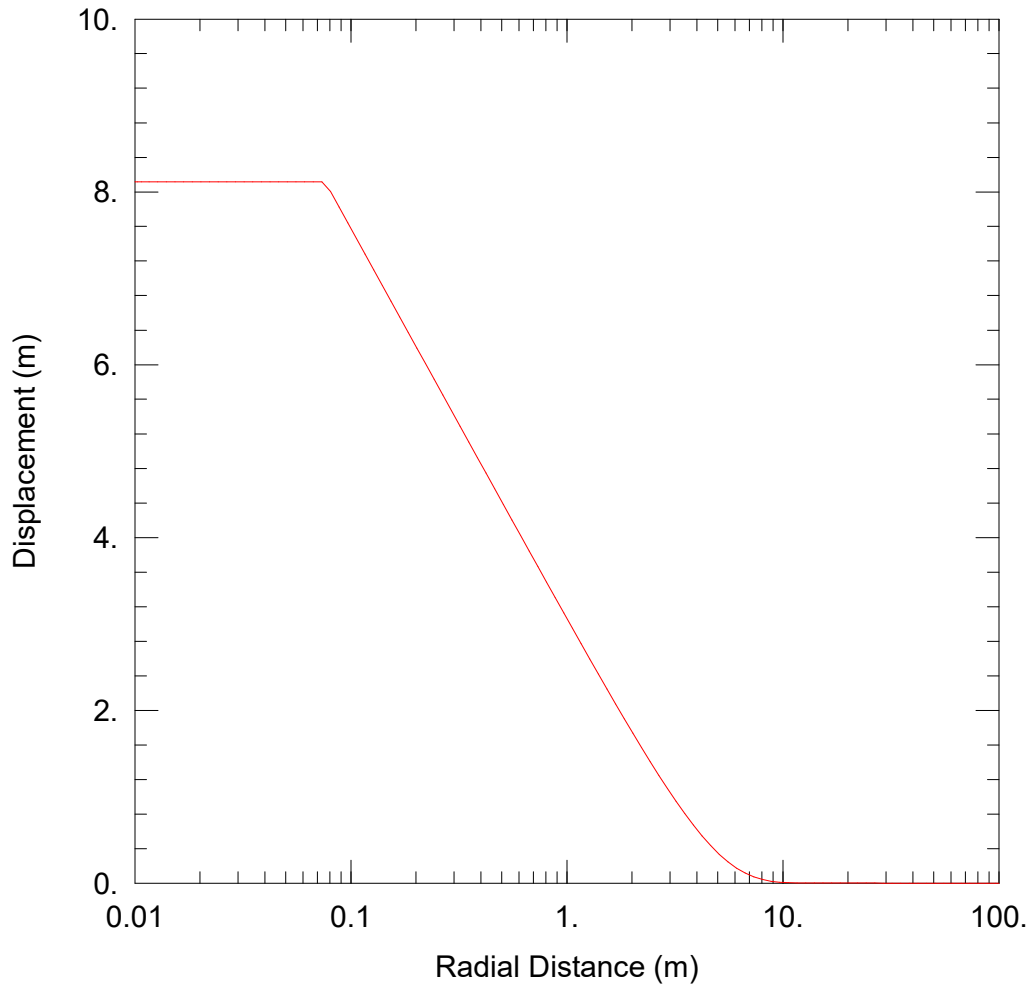
Figure F8 - Forward Solution for 265-days of Pumping at 9.3 m³/d

Prepared By:
Waterline Resource

Prepared For:
1167433 BC Ltd

Project:
3190-20-001

Location:
Silva Bay Resort and Marina



Data Set: P:\...\F9_Distance Drawdown.aqt
Date: 11/13/20 Time: 11:45:14

SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 0.7521 m²/day S = 44.99
Kz/Kr = 1. b = 19.6 m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW 13370	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW 13370	0	0

Appendix G

Groundwater Chemistry Results



CERTIFICATE OF ANALYSIS

REPORTED TO Waterline Resources Inc. - Nanaimo
2430 Jingle Pot Road
Nanaimo, BC V9R 6W2

ATTENTION Gage Nordstrom

PO NUMBER

PROJECT 3190-20-001

PROJECT INFO Silva Bay Resort + Marina

WORK ORDER 0091488

RECEIVED / TEMP 2020-09-15 09:00 / 10°C

REPORTED 2020-09-22 17:04

COC NUMBER B88655

Introduction:

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

Big Picture Sidekicks



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

We've Got Chemistry



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

Ahead of the Curve



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

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

Authorized By:

Taylor Maxwell
Junior Account Manager

1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL	Units	Analyzed	Qualifier
WTN 13370 (0091488-01) Matrix: Water Sampled: 2020-09-13 10:00					
Anions					
Chloride	50.0	0.10	mg/L	2020-09-17	
Fluoride	0.39	0.10	mg/L	2020-09-16	
Nitrate (as N)	< 0.010	0.010	mg/L	2020-09-16	
Nitrite (as N)	< 0.010	0.010	mg/L	2020-09-16	
Sulfate	14.5	1.0	mg/L	2020-09-16	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	13.3	0.500	mg/L	N/A	
Ion Balance	108		mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	0.0100	mg/L	N/A	
Nitrogen, Organic	0.0740	0.0500	mg/L	N/A	
Solids, Total Dissolved	270	1.00	mg/L	N/A	
Dissolved Metals					
Lithium, dissolved	0.00711	0.00010	mg/L	2020-09-21	
Aluminum, dissolved	0.0116	0.0050	mg/L	2020-09-21	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2020-09-21	
Arsenic, dissolved	0.00070	0.00050	mg/L	2020-09-21	
Barium, dissolved	< 0.0050	0.0050	mg/L	2020-09-21	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2020-09-21	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2020-09-21	
Boron, dissolved	0.403	0.0500	mg/L	2020-09-21	
Cadmium, dissolved	0.000023	0.000010	mg/L	2020-09-21	
Calcium, dissolved	3.61	0.20	mg/L	2020-09-21	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2020-09-21	
Cobalt, dissolved	< 0.00010	0.00010	mg/L	2020-09-21	
Copper, dissolved	0.00400	0.00040	mg/L	2020-09-21	
Iron, dissolved	0.028	0.010	mg/L	2020-09-21	
Lead, dissolved	< 0.00020	0.00020	mg/L	2020-09-21	
Magnesium, dissolved	1.04	0.010	mg/L	2020-09-21	
Manganese, dissolved	0.0123	0.00020	mg/L	2020-09-21	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2020-09-19	
Molybdenum, dissolved	0.00298	0.00010	mg/L	2020-09-21	
Nickel, dissolved	< 0.00040	0.00040	mg/L	2020-09-21	
Phosphorus, dissolved	0.085	0.050	mg/L	2020-09-21	
Potassium, dissolved	0.38	0.10	mg/L	2020-09-21	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2020-09-21	
Silicon, dissolved	7.6	1.0	mg/L	2020-09-21	
Silver, dissolved	< 0.000050	0.000050	mg/L	2020-09-21	
Sodium, dissolved	110	0.10	mg/L	2020-09-21	
Strontium, dissolved	0.0518	0.0010	mg/L	2020-09-21	
Sulfur, dissolved	6.3	3.0	mg/L	2020-09-21	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2020-09-21	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2020-09-21	

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL	Units	Analyzed	Qualifier
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WTN 13370 (0091488-01) | Matrix: Water | Sampled: 2020-09-13 10:00, Continued

Dissolved Metals, Continued

Thorium, dissolved	< 0.00010	0.00010	mg/L	2020-09-21	
Tin, dissolved	< 0.00020	0.00020	mg/L	2020-09-21	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2020-09-21	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2020-09-21	
Uranium, dissolved	0.000066	0.000020	mg/L	2020-09-21	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2020-09-21	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2020-09-21	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2020-09-21	

General Parameters

Alkalinity, Total (as CaCO ₃)	148	1.0	mg/L	2020-09-17	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2020-09-17	
Alkalinity, Bicarbonate (as CaCO ₃)	147	1.0	mg/L	2020-09-17	
Alkalinity, Carbonate (as CaCO ₃)	1.0	1.0	mg/L	2020-09-17	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2020-09-17	
Bicarbonate (HCO ₃)	179	1.22	mg/L	N/A	
Carbonate (CO ₃)	0.626	0.600	mg/L	N/A	
Hydroxide (OH)	< 0.340	0.340	mg/L	N/A	
Ammonia, Total (as N)	0.054	0.050	mg/L	2020-09-17	
Carbon, Total Organic	2.13	0.50	mg/L	2020-09-16	
Conductivity (EC)	514	2.0	µS/cm	2020-09-17	
Nitrogen, Total Kjeldahl	0.128	0.050	mg/L	2020-09-18	
pH	8.32	0.10	pH units	2020-09-17	HT2
Solids, Total Dissolved	291	15	mg/L	2020-09-17	

Total Metals

Aluminum, total	0.0593	0.0050	mg/L	2020-09-20	
Antimony, total	< 0.00020	0.00020	mg/L	2020-09-20	
Arsenic, total	0.00070	0.00050	mg/L	2020-09-20	
Barium, total	< 0.0050	0.0050	mg/L	2020-09-20	
Beryllium, total	< 0.00010	0.00010	mg/L	2020-09-20	
Bismuth, total	< 0.00010	0.00010	mg/L	2020-09-20	
Boron, total	0.399	0.0500	mg/L	2020-09-20	
Cadmium, total	< 0.000010	0.000010	mg/L	2020-09-20	
Calcium, total	3.65	0.20	mg/L	2020-09-20	
Chromium, total	< 0.00050	0.00050	mg/L	2020-09-20	
Cobalt, total	< 0.00010	0.00010	mg/L	2020-09-20	
Copper, total	0.00053	0.00040	mg/L	2020-09-20	
Iron, total	0.077	0.010	mg/L	2020-09-20	
Lead, total	< 0.00020	0.00020	mg/L	2020-09-20	
Lithium, total	0.00696	0.00010	mg/L	2020-09-20	
Magnesium, total	1.10	0.010	mg/L	2020-09-20	
Manganese, total	0.0142	0.00020	mg/L	2020-09-20	
Mercury, total	< 0.000010	0.000010	mg/L	2020-09-18	

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL	Units	Analyzed	Qualifier
WTN 13370 (0091488-01) Matrix: Water Sampled: 2020-09-13 10:00, Continued					
<i>Total Metals, Continued</i>					
Molybdenum, total	0.00310	0.00010	mg/L	2020-09-20	
Nickel, total	< 0.00040	0.00040	mg/L	2020-09-20	
Phosphorus, total	0.070	0.050	mg/L	2020-09-20	
Potassium, total	0.40	0.10	mg/L	2020-09-20	
Selenium, total	< 0.00050	0.00050	mg/L	2020-09-20	
Silicon, total	8.1	1.0	mg/L	2020-09-20	
Silver, total	< 0.000050	0.000050	mg/L	2020-09-20	
Sodium, total	113	0.10	mg/L	2020-09-20	
Strontium, total	0.0540	0.0010	mg/L	2020-09-20	
Sulfur, total	6.5	3.0	mg/L	2020-09-20	
Tellurium, total	< 0.00050	0.00050	mg/L	2020-09-20	
Thallium, total	< 0.000020	0.000020	mg/L	2020-09-20	
Thorium, total	< 0.00010	0.00010	mg/L	2020-09-20	
Tin, total	< 0.00020	0.00020	mg/L	2020-09-20	
Titanium, total	< 0.0050	0.0050	mg/L	2020-09-20	
Tungsten, total	< 0.0010	0.0010	mg/L	2020-09-20	
Uranium, total	0.000069	0.000020	mg/L	2020-09-20	
Vanadium, total	< 0.0010	0.0010	mg/L	2020-09-20	
Zinc, total	< 0.0040	0.0040	mg/L	2020-09-20	
Zirconium, total	< 0.00010	0.00010	mg/L	2020-09-20	

Sample Qualifiers:

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

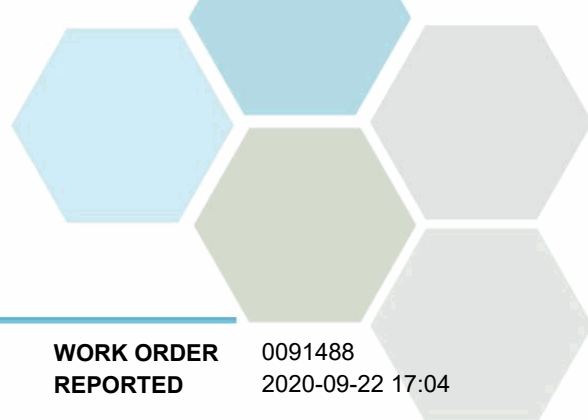
WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H ₂ SO ₄	✓	Kelowna
Ammonia, Total in Water	SM 4500-NH ₃ G* (2017)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Bicarbonate in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]		N/A
Carbon, Total Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO ₂ Detection	✓	Kelowna
Carbonate in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]		N/A
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	✓	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	✓	N/A
Hydroxide in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]		N/A
Ion Balance in Water	SM 1030 E (2017)	SM 1030 E (2011)		N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
Mercury, total in Water	EPA 245.7*	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	✓	Kelowna
pH in Water	SM 4500-H+ B (2017)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 2540 C* (2017)	Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO ₃ +HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

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

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, pH > 7 = basic
µS/cm	Microsiemens per centimetre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

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

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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Anions, Batch B011335

Blank (B011335-BLK1)			Prepared: 2020-09-16, Analyzed: 2020-09-16						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
LCS (B011335-BS1)			Prepared: 2020-09-16, Analyzed: 2020-09-16						
Chloride	15.9	0.10 mg/L	16.0		100	90-110			
Fluoride	4.08	0.10 mg/L	4.00		102	88-108			
Nitrate (as N)	4.04	0.010 mg/L	4.00		101	90-110			
Nitrite (as N)	2.00	0.010 mg/L	2.00		100	85-115			
Sulfate	16.1	1.0 mg/L	16.0		101	90-110			

Dissolved Metals, Batch B011764

Blank (B011764-BLK1)			Prepared: 2020-09-19, Analyzed: 2020-09-19						
Mercury, dissolved	< 0.000010	0.000010 mg/L							
Blank (B011764-BLK2)			Prepared: 2020-09-19, Analyzed: 2020-09-19						
Mercury, dissolved	< 0.000010	0.000010 mg/L							
Matrix Spike (B011764-MS1)			Source: 0091488-01		Prepared: 2020-09-19, Analyzed: 2020-09-19				
Mercury, dissolved	0.000229	0.000010 mg/L	0.000250	< 0.000010	91	70-130			
Reference (B011764-SRM1)			Prepared: 2020-09-19, Analyzed: 2020-09-19						
Mercury, dissolved	0.00515	0.000010 mg/L	0.00581		89	70-130			
Reference (B011764-SRM2)			Prepared: 2020-09-19, Analyzed: 2020-09-19						
Mercury, dissolved	0.00571	0.000010 mg/L	0.00581		98	70-130			

Dissolved Metals, Batch B011806

Blank (B011806-BLK1)			Prepared: 2020-09-21, Analyzed: 2020-09-21						
Lithium, dissolved	< 0.00010	0.00010 mg/L							
Aluminum, dissolved	< 0.0050	0.0050 mg/L							
Antimony, dissolved	< 0.00020	0.00020 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B011806, Continued									
Blank (B011806-BLK1), Continued				Prepared: 2020-09-21, Analyzed: 2020-09-21					
Arsenic, dissolved	< 0.00050	0.00050 mg/L							
Barium, dissolved	< 0.0050	0.0050 mg/L							
Beryllium, dissolved	< 0.00010	0.00010 mg/L							
Bismuth, dissolved	< 0.00010	0.00010 mg/L							
Boron, dissolved	< 0.0500	0.0500 mg/L							
Cadmium, dissolved	< 0.000010	0.000010 mg/L							
Calcium, dissolved	< 0.20	0.20 mg/L							
Chromium, dissolved	< 0.00050	0.00050 mg/L							
Cobalt, dissolved	< 0.00010	0.00010 mg/L							
Copper, dissolved	< 0.00040	0.00040 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.00020	0.00020 mg/L							
Magnesium, dissolved	< 0.010	0.010 mg/L							
Manganese, dissolved	< 0.00020	0.00020 mg/L							
Molybdenum, dissolved	< 0.00010	0.00010 mg/L							
Nickel, dissolved	< 0.00040	0.00040 mg/L							
Phosphorus, dissolved	< 0.050	0.050 mg/L							
Potassium, dissolved	< 0.10	0.10 mg/L							
Selenium, dissolved	< 0.00050	0.00050 mg/L							
Silicon, dissolved	< 1.0	1.0 mg/L							
Silver, dissolved	< 0.000050	0.000050 mg/L							
Sodium, dissolved	< 0.10	0.10 mg/L							
Strontium, dissolved	< 0.0010	0.0010 mg/L							
Sulfur, dissolved	< 3.0	3.0 mg/L							
Tellurium, dissolved	< 0.00050	0.00050 mg/L							
Thallium, dissolved	< 0.000020	0.000020 mg/L							
Thorium, dissolved	< 0.00010	0.00010 mg/L							
Tin, dissolved	< 0.00020	0.00020 mg/L							
Titanium, dissolved	< 0.0050	0.0050 mg/L							
Tungsten, dissolved	< 0.0010	0.0010 mg/L							
Uranium, dissolved	< 0.000020	0.000020 mg/L							
Vanadium, dissolved	< 0.0010	0.0010 mg/L							
Zinc, dissolved	< 0.0040	0.0040 mg/L							
Zirconium, dissolved	< 0.00010	0.00010 mg/L							
LCS (B011806-BS1)				Prepared: 2020-09-21, Analyzed: 2020-09-21					
Lithium, dissolved	0.0214	0.00010 mg/L	0.0200		107	80-120			
Aluminum, dissolved	0.0215	0.0050 mg/L	0.0199		108	80-120			
Antimony, dissolved	0.0201	0.00020 mg/L	0.0200		101	80-120			
Arsenic, dissolved	0.0202	0.00050 mg/L	0.0200		101	80-120			
Barium, dissolved	0.0200	0.0050 mg/L	0.0198		101	80-120			
Beryllium, dissolved	0.0217	0.00010 mg/L	0.0198		110	80-120			
Bismuth, dissolved	0.0207	0.00010 mg/L	0.0200		104	80-120			
Boron, dissolved	< 0.0500	0.0500 mg/L	0.0200		106	80-120			
Cadmium, dissolved	0.0212	0.000010 mg/L	0.0199		106	80-120			
Calcium, dissolved	2.17	0.20 mg/L	2.02		108	80-120			
Chromium, dissolved	0.0202	0.00050 mg/L	0.0198		102	80-120			
Cobalt, dissolved	0.0206	0.00010 mg/L	0.0199		103	80-120			
Copper, dissolved	0.0212	0.00040 mg/L	0.0200		106	80-120			
Iron, dissolved	2.11	0.010 mg/L	2.02		105	80-120			
Lead, dissolved	0.0205	0.00020 mg/L	0.0199		103	80-120			
Magnesium, dissolved	2.03	0.010 mg/L	2.02		100	80-120			
Manganese, dissolved	0.0206	0.00020 mg/L	0.0199		104	80-120			
Molybdenum, dissolved	0.0197	0.00010 mg/L	0.0200		98	80-120			
Nickel, dissolved	0.0206	0.00040 mg/L	0.0200		103	80-120			
Phosphorus, dissolved	2.07	0.050 mg/L	2.00		104	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B01806, Continued									
LCS (B01806-BS1), Continued				Prepared: 2020-09-21, Analyzed: 2020-09-21					
Potassium, dissolved	2.09	0.10 mg/L	2.02		103	80-120			
Selenium, dissolved	0.0194	0.00050 mg/L	0.0200		97	80-120			
Silicon, dissolved	1.9	1.0 mg/L	2.00		96	80-120			
Silver, dissolved	0.0202	0.000050 mg/L	0.0200		101	80-120			
Sodium, dissolved	2.04	0.10 mg/L	2.02		101	80-120			
Strontium, dissolved	0.0201	0.0010 mg/L	0.0200		101	80-120			
Sulfur, dissolved	4.9	3.0 mg/L	5.00		98	80-120			
Tellurium, dissolved	0.0198	0.00050 mg/L	0.0200		99	80-120			
Thallium, dissolved	0.0208	0.000020 mg/L	0.0199		104	80-120			
Thorium, dissolved	0.0203	0.00010 mg/L	0.0200		101	80-120			
Tin, dissolved	0.0207	0.00020 mg/L	0.0200		104	80-120			
Titanium, dissolved	0.0213	0.0050 mg/L	0.0200		106	80-120			
Tungsten, dissolved	0.0202	0.0010 mg/L	0.0200		101	80-120			
Uranium, dissolved	0.0205	0.000020 mg/L	0.0200		102	80-120			
Vanadium, dissolved	0.0197	0.0010 mg/L	0.0200		99	80-120			
Zinc, dissolved	0.0234	0.0040 mg/L	0.0200		117	80-120			
Zirconium, dissolved	0.0186	0.00010 mg/L	0.0200		93	80-120			
Duplicate (B01806-DUP1)				Source: 0091488-01		Prepared: 2020-09-21, Analyzed: 2020-09-21			
Lithium, dissolved	0.00718	0.00010 mg/L	0.00711				< 1	20	
Aluminum, dissolved	0.0117	0.0050 mg/L	0.0116					20	
Antimony, dissolved	< 0.00020	0.00020 mg/L	< 0.00020					20	
Arsenic, dissolved	0.00071	0.00050 mg/L	0.00070					20	
Barium, dissolved	< 0.0050	0.0050 mg/L	< 0.0050					20	
Beryllium, dissolved	< 0.00010	0.00010 mg/L	< 0.00010					20	
Bismuth, dissolved	< 0.00010	0.00010 mg/L	< 0.00010					20	
Boron, dissolved	0.402	0.0500 mg/L	0.403				< 1	20	
Cadmium, dissolved	0.000014	0.000010 mg/L	0.000023					20	
Calcium, dissolved	3.58	0.20 mg/L	3.61				< 1	20	
Chromium, dissolved	< 0.00050	0.00050 mg/L	< 0.00050					20	
Cobalt, dissolved	< 0.00010	0.00010 mg/L	< 0.00010					20	
Copper, dissolved	0.00410	0.00040 mg/L	0.00400				3	20	
Iron, dissolved	0.029	0.010 mg/L	0.028					20	
Lead, dissolved	< 0.00020	0.00020 mg/L	< 0.00020					20	
Magnesium, dissolved	1.07	0.010 mg/L	1.04				3	20	
Manganese, dissolved	0.0126	0.00020 mg/L	0.0123				2	20	
Molybdenum, dissolved	0.00298	0.00010 mg/L	0.00298				< 1	20	
Nickel, dissolved	< 0.00040	0.00040 mg/L	< 0.00040					20	
Phosphorus, dissolved	0.064	0.050 mg/L	0.085					20	
Potassium, dissolved	0.40	0.10 mg/L	0.38					20	
Selenium, dissolved	< 0.00050	0.00050 mg/L	< 0.00050					20	
Silicon, dissolved	7.8	1.0 mg/L	7.6				2	20	
Silver, dissolved	< 0.000050	0.000050 mg/L	< 0.000050					20	
Sodium, dissolved	112	0.10 mg/L	110				2	20	
Strontium, dissolved	0.0523	0.0010 mg/L	0.0518				1	20	
Sulfur, dissolved	5.5	3.0 mg/L	6.3					20	
Tellurium, dissolved	< 0.00050	0.00050 mg/L	< 0.00050					20	
Thallium, dissolved	< 0.000020	0.000020 mg/L	< 0.000020					20	
Thorium, dissolved	< 0.00010	0.00010 mg/L	< 0.00010					20	
Tin, dissolved	< 0.00020	0.00020 mg/L	< 0.00020					20	
Titanium, dissolved	< 0.0050	0.0050 mg/L	< 0.0050					20	
Tungsten, dissolved	0.0010	0.0010 mg/L	0.0010					20	
Uranium, dissolved	0.000064	0.000020 mg/L	0.000066					20	
Vanadium, dissolved	< 0.0010	0.0010 mg/L	< 0.0010					20	
Zinc, dissolved	< 0.0040	0.0040 mg/L	< 0.0040					20	
Zirconium, dissolved	< 0.00010	0.00010 mg/L	< 0.00010					20	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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Dissolved Metals, Batch B011806, Continued

Reference (B011806-SRM1)			Prepared: 2020-09-21, Analyzed: 2020-09-21						
Lithium, dissolved	0.109	0.00010 mg/L	0.100		109	70-130			
Aluminum, dissolved	0.245	0.0050 mg/L	0.235		104	70-130			
Antimony, dissolved	0.0450	0.00020 mg/L	0.0431		104	70-130			
Arsenic, dissolved	0.435	0.00050 mg/L	0.423		103	70-130			
Barium, dissolved	3.03	0.0050 mg/L	3.30		92	70-130			
Beryllium, dissolved	0.228	0.00010 mg/L	0.209		109	70-130			
Boron, dissolved	1.83	0.0500 mg/L	1.65		111	70-130			
Cadmium, dissolved	0.230	0.000010 mg/L	0.221		104	70-130			
Calcium, dissolved	7.95	0.20 mg/L	7.72		103	70-130			
Chromium, dissolved	0.446	0.00050 mg/L	0.434		103	70-130			
Cobalt, dissolved	0.127	0.00010 mg/L	0.124		102	70-130			
Copper, dissolved	0.846	0.00040 mg/L	0.815		104	70-130			
Iron, dissolved	1.34	0.010 mg/L	1.27		106	70-130			
Lead, dissolved	0.113	0.00020 mg/L	0.110		103	70-130			
Magnesium, dissolved	6.82	0.010 mg/L	6.59		104	70-130			
Manganese, dissolved	0.342	0.00020 mg/L	0.342		100	70-130			
Molybdenum, dissolved	0.401	0.00010 mg/L	0.404		99	70-130			
Nickel, dissolved	0.865	0.00040 mg/L	0.835		104	70-130			
Phosphorus, dissolved	0.524	0.050 mg/L	0.499		105	70-130			
Potassium, dissolved	3.07	0.10 mg/L	2.88		107	70-130			
Selenium, dissolved	0.0326	0.00050 mg/L	0.0324		101	70-130			
Sodium, dissolved	18.3	0.10 mg/L	18.0		101	70-130			
Strontium, dissolved	0.932	0.0010 mg/L	0.935		100	70-130			
Thallium, dissolved	0.0403	0.000020 mg/L	0.0385		105	70-130			
Uranium, dissolved	0.248	0.000020 mg/L	0.258		96	70-130			
Vanadium, dissolved	0.879	0.0010 mg/L	0.873		101	70-130			
Zinc, dissolved	0.914	0.0040 mg/L	0.848		108	70-130			

General Parameters, Batch B011279

Blank (B011279-BLK1)			Prepared: 2020-09-16, Analyzed: 2020-09-16						
Carbon, Total Organic	< 0.50	0.50 mg/L							
Blank (B011279-BLK2)			Prepared: 2020-09-16, Analyzed: 2020-09-16						
Carbon, Total Organic	< 0.50	0.50 mg/L							
LCS (B011279-BS1)			Prepared: 2020-09-16, Analyzed: 2020-09-16						
Carbon, Total Organic	10.9	0.50 mg/L	10.0		109	78-116			
LCS (B011279-BS2)			Prepared: 2020-09-16, Analyzed: 2020-09-16						
Carbon, Total Organic	10.8	0.50 mg/L	10.0		108	78-116			

General Parameters, Batch B011475

Blank (B011475-BLK1)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Solids, Total Dissolved	< 15	15 mg/L							
LCS (B011475-BS1)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Solids, Total Dissolved	232	15 mg/L	240		97	85-115			

General Parameters, Batch B011481

Blank (B011481-BLK1)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Ammonia, Total (as N)	< 0.050	0.050 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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General Parameters, Batch B011481, Continued

LCS (B011481-BS1)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Ammonia, Total (as N)	1.04	0.050 mg/L	1.00		104	90-115			

General Parameters, Batch B011499

Blank (B011499-BLK1)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							

Blank (B011499-BLK2)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							

LCS (B011499-BS1)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Alkalinity, Total (as CaCO ₃)	88.8	1.0 mg/L	100		89	80-120			

LCS (B011499-BS2)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Alkalinity, Total (as CaCO ₃)	89.7	1.0 mg/L	100		90	80-120			

LCS (B011499-BS3)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-104			

LCS (B011499-BS4)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
Conductivity (EC)	1440	2.0 µS/cm	1410		102	95-104			

Reference (B011499-SRM1)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
pH	6.95	0.10 pH units	7.01		99	98-102			

Reference (B011499-SRM2)			Prepared: 2020-09-17, Analyzed: 2020-09-17						
pH	6.95	0.10 pH units	7.01		99	98-102			

General Parameters, Batch B011565

Blank (B011565-BLK1)			Prepared: 2020-09-17, Analyzed: 2020-09-18						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							

Blank (B011565-BLK2)			Prepared: 2020-09-17, Analyzed: 2020-09-18						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							

LCS (B011565-BS1)			Prepared: 2020-09-17, Analyzed: 2020-09-18						
Nitrogen, Total Kjeldahl	1.07	0.050 mg/L	1.00		107	85-115			

LCS (B011565-BS2)			Prepared: 2020-09-17, Analyzed: 2020-09-18						
Nitrogen, Total Kjeldahl	1.10	0.050 mg/L	1.00		110	85-115			

Total Metals, Batch B011747

Blank (B011747-BLK1)			Prepared: 2020-09-18, Analyzed: 2020-09-18						
Mercury, total	< 0.000010	0.000010 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B01747, Continued									
Matrix Spike (B01747-MS1)		Source: 0091488-01		Prepared: 2020-09-18, Analyzed: 2020-09-18					
Mercury, total	0.000238	0.000010 mg/L	0.000250	< 0.000010	95	70-130			
Reference (B01747-SRM1)				Prepared: 2020-09-18, Analyzed: 2020-09-18					
Mercury, total	0.00595	0.000010 mg/L	0.00581		102	70-130			
Total Metals, Batch B01803									
Blank (B01803-BLK1)		Prepared: 2020-09-20, Analyzed: 2020-09-20							
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Beryllium, total	< 0.00010	0.00010 mg/L							
Bismuth, total	< 0.00010	0.00010 mg/L							
Boron, total	< 0.0500	0.0500 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Lithium, total	< 0.00010	0.00010 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Phosphorus, total	< 0.050	0.050 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Silicon, total	< 1.0	1.0 mg/L							
Silver, total	< 0.000050	0.000050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Sulfur, total	< 3.0	3.0 mg/L							
Tellurium, total	< 0.00050	0.00050 mg/L							
Thallium, total	< 0.000020	0.000020 mg/L							
Thorium, total	< 0.00010	0.00010 mg/L							
Tin, total	< 0.00020	0.00020 mg/L							
Titanium, total	< 0.0050	0.0050 mg/L							
Tungsten, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Vanadium, total	< 0.0010	0.0010 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
Zirconium, total	< 0.00010	0.00010 mg/L							
LCS (B01803-BS1)		Prepared: 2020-09-20, Analyzed: 2020-09-20							
Aluminum, total	0.0236	0.0050 mg/L	0.0199		119	80-120			
Antimony, total	0.0212	0.00020 mg/L	0.0200		106	80-120			
Arsenic, total	0.0204	0.00050 mg/L	0.0200		102	80-120			
Barium, total	0.0210	0.0050 mg/L	0.0198		106	80-120			
Beryllium, total	0.0203	0.00010 mg/L	0.0198		102	80-120			
Bismuth, total	0.0215	0.00010 mg/L	0.0200		107	80-120			
Boron, total	< 0.0500	0.0500 mg/L	0.0200		103	80-120			
Cadmium, total	0.0206	0.000010 mg/L	0.0199		103	80-120			
Calcium, total	2.09	0.20 mg/L	2.02		103	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B01803, Continued									
LCS (B01803-BS1), Continued					Prepared: 2020-09-20, Analyzed: 2020-09-20				
Chromium, total	0.0205	0.00050 mg/L	0.0198		103	80-120			
Cobalt, total	0.0210	0.00010 mg/L	0.0199		105	80-120			
Copper, total	0.0214	0.00040 mg/L	0.0200		107	80-120			
Iron, total	2.10	0.010 mg/L	2.02		104	80-120			
Lead, total	0.0212	0.00020 mg/L	0.0199		107	80-120			
Lithium, total	0.0194	0.00010 mg/L	0.0200		97	80-120			
Magnesium, total	2.03	0.010 mg/L	2.02		100	80-120			
Manganese, total	0.0210	0.00020 mg/L	0.0199		106	80-120			
Molybdenum, total	0.0201	0.00010 mg/L	0.0200		101	80-120			
Nickel, total	0.0211	0.00040 mg/L	0.0200		105	80-120			
Phosphorus, total	2.11	0.050 mg/L	2.00		106	80-120			
Potassium, total	2.09	0.10 mg/L	2.02		103	80-120			
Selenium, total	0.0203	0.00050 mg/L	0.0200		102	80-120			
Silicon, total	2.0	1.0 mg/L	2.00		102	80-120			
Silver, total	0.0208	0.000050 mg/L	0.0200		104	80-120			
Sodium, total	2.00	0.10 mg/L	2.02		99	80-120			
Strontium, total	0.0201	0.0010 mg/L	0.0200		101	80-120			
Sulfur, total	5.6	3.0 mg/L	5.00		112	80-120			
Tellurium, total	0.0208	0.00050 mg/L	0.0200		104	80-120			
Thallium, total	0.0214	0.000020 mg/L	0.0199		108	80-120			
Thorium, total	0.0208	0.00010 mg/L	0.0200		104	80-120			
Tin, total	0.0209	0.00020 mg/L	0.0200		105	80-120			
Titanium, total	0.0212	0.0050 mg/L	0.0200		106	80-120			
Tungsten, total	0.0208	0.0010 mg/L	0.0200		104	80-120			
Uranium, total	0.0211	0.000020 mg/L	0.0200		105	80-120			
Vanadium, total	0.0202	0.0010 mg/L	0.0200		101	80-120			
Zinc, total	0.0225	0.0040 mg/L	0.0200		113	80-120			
Zirconium, total	0.0191	0.00010 mg/L	0.0200		95	80-120			
Reference (B01803-SRM1)					Prepared: 2020-09-20, Analyzed: 2020-09-20				
Aluminum, total	0.331	0.0050 mg/L	0.299		111	70-130			
Antimony, total	0.0544	0.00020 mg/L	0.0517		105	70-130			
Arsenic, total	0.129	0.00050 mg/L	0.119		108	70-130			
Barium, total	0.834	0.0050 mg/L	0.801		104	70-130			
Beryllium, total	0.0600	0.00010 mg/L	0.0501		120	70-130			
Boron, total	4.74	0.0500 mg/L	4.11		115	70-130			
Cadmium, total	0.0530	0.000010 mg/L	0.0503		105	70-130			
Calcium, total	12.7	0.20 mg/L	10.7		118	70-130			
Chromium, total	0.264	0.00050 mg/L	0.250		105	70-130			
Cobalt, total	0.0419	0.00010 mg/L	0.0384		109	70-130			
Copper, total	0.534	0.00040 mg/L	0.487		110	70-130			
Iron, total	0.560	0.010 mg/L	0.504		111	70-130			
Lead, total	0.350	0.00020 mg/L	0.278		126	70-130			
Lithium, total	0.467	0.00010 mg/L	0.398		117	70-130			
Magnesium, total	3.80	0.010 mg/L	3.59		106	70-130			
Manganese, total	0.117	0.00020 mg/L	0.111		106	70-130			
Molybdenum, total	0.209	0.00010 mg/L	0.196		107	70-130			
Nickel, total	0.264	0.00040 mg/L	0.248		107	70-130			
Phosphorus, total	0.250	0.050 mg/L	0.213		117	70-130			
Potassium, total	6.57	0.10 mg/L	5.89		112	70-130			
Selenium, total	0.127	0.00050 mg/L	0.120		106	70-130			
Sodium, total	9.15	0.10 mg/L	8.71		105	70-130			
Strontium, total	0.411	0.0010 mg/L	0.393		105	70-130			
Thallium, total	0.0999	0.000020 mg/L	0.0787		127	70-130			
Uranium, total	0.0430	0.000020 mg/L	0.0344		125	70-130			
Vanadium, total	0.406	0.0010 mg/L	0.391		104	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3190-20-001

WORK ORDER REPORTED 0091488
2020-09-22 17:04

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<i>Total Metals, Batch B011803, Continued</i>									
Reference (B011803-SRM1), Continued				Prepared: 2020-09-20, Analyzed: 2020-09-20					
Zinc, total	2.65	0.0040 mg/L	2.50		106	70-130			

CERTIFICATE OF ANALYSIS

REPORTED TO Waterline Resources Inc. - Nanaimo
2430 Jingle Pot Road
Nanaimo, BC V9R 6W2

ATTENTION Gage Nordstrom

PO NUMBER
PROJECT 3157-19-001
PROJECT INFO

WORK ORDER 9060397

RECEIVED / TEMP 2019-06-05 09:12 / NA
REPORTED 2019-06-14 11:13
COC NUMBER B80595

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



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

We've Got Chemistry



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

Ahead of the Curve



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

Work Order Comments:

This is a revised report; please refer to Appendix 3 for details.

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

Authorized By:

Bryan Shaw, Ph.D., P.Chem.
Client Service Coordinator



1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL	Units	Analyzed	Qualifier
Reservoir (9060397-01) Matrix: Water Sampled: 2019-06-04 14:05					
Anions					
Chloride	18.5	0.10	mg/L	2019-06-06	
Fluoride	0.44	0.10	mg/L	2019-06-06	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-06-06	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-06-06	
Sulfate	31.8	1.0	mg/L	2019-06-06	
Calculated Parameters					
Hydrogen Sulfide, total	< 0.01	0.01	mg/L	2019-06-12	
Hardness, Total (as CaCO ₃)	12.9	0.500	mg/L	N/A	
Langelier Index	-0.5	-5.0		2019-06-12	
Nitrogen, Organic	< 0.0500	0.0500	mg/L	N/A	
Solids, Total Dissolved	224	1.00	mg/L	N/A	
Solids, Total Dissolved	224	10	mg/L	2019-06-12	
General Parameters					
Alkalinity, Total (as CaCO ₃)	146	1.0	mg/L	2019-06-06	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-06	
Alkalinity, Bicarbonate (as CaCO ₃)	146	1.0	mg/L	2019-06-06	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-06	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-06	
Bicarbonate (HCO ₃)	179	1.22	mg/L	N/A	
Carbonate (CO ₃)	< 0.600	0.600	mg/L	N/A	
Hydroxide (OH)	< 0.340	0.340	mg/L	N/A	
Ammonia, Total (as N)	0.032	0.020	mg/L	2019-06-07	
BOD, 5-day	< 2.2	2.0	mg/L	2019-06-11	BOD2
Carbon, Total Organic	1.59	0.50	mg/L	2019-06-10	
Chemical Oxygen Demand	< 20	20	mg/L	2019-06-07	
Colour, True	< 5.0	5.0	CU	2019-06-06	
Conductivity (EC)	377	2.0	µS/cm	2019-06-07	
Cyanide, Total	< 0.0050	0.0020	mg/L	2019-06-07	
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L	2019-06-10	
pH	8.28	0.10	pH units	2019-06-06	HT2
Sulfide, Total	< 0.020	0.020	mg/L	2019-06-06	
Temperature, at pH	23.1		°C	2019-06-06	HT2
Turbidity	0.83	0.10	NTU	2019-06-06	
UV Transmittance @ 254nm	91.3	0.10	% T	2019-06-07	
Total Metals					
Aluminum, total	0.0340	0.0050	mg/L	2019-06-11	
Antimony, total	< 0.00020	0.00020	mg/L	2019-06-11	
Arsenic, total	0.00097	0.00050	mg/L	2019-06-11	
Barium, total	< 0.0050	0.0050	mg/L	2019-06-11	
Boron, total	0.339	0.0050	mg/L	2019-06-11	

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL	Units	Analyzed	Qualifier
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Reservoir (9060397-01) | Matrix: Water | Sampled: 2019-06-04 14:05, Continued

Total Metals, Continued

Cadmium, total	< 0.000010	0.000010	mg/L	2019-06-11	
Calcium, total	3.19	0.20	mg/L	2019-06-11	
Chromium, total	0.00102	0.00050	mg/L	2019-06-11	
Cobalt, total	< 0.00010	0.00010	mg/L	2019-06-11	
Copper, total	0.00297	0.00040	mg/L	2019-06-11	
Iron, total	0.054	0.010	mg/L	2019-06-11	
Lead, total	0.00027	0.00020	mg/L	2019-06-11	
Magnesium, total	1.19	0.010	mg/L	2019-06-11	
Manganese, total	0.00596	0.00020	mg/L	2019-06-11	
Mercury, total	< 0.000010	0.000010	mg/L	2019-06-07	
Molybdenum, total	0.00397	0.00010	mg/L	2019-06-11	
Nickel, total	0.00056	0.00040	mg/L	2019-06-11	
Potassium, total	0.33	0.10	mg/L	2019-06-11	
Selenium, total	< 0.00050	0.00050	mg/L	2019-06-11	
Sodium, total	79.8	0.10	mg/L	2019-06-11	
Strontium, total	0.0455	0.0010	mg/L	2019-06-11	
Uranium, total	0.000123	0.000020	mg/L	2019-06-11	
Zinc, total	0.0072	0.0040	mg/L	2019-06-11	

Microbiological Parameters

Coliforms, Total	<1	1	CFU/100 mL	2009-06-05	
Coliforms, Fecal	<1	1	CFU/100 mL	2009-06-05	
E. coli	<1	1	CFU/100 mL	2009-06-05	
Heterotrophic Plate Count	<1	1	CFU/mL	2009-06-05	

13370 (9060397-02) | Matrix: Water | Sampled: 2019-06-04 14:20

Anions

Chloride	21.8	0.10	mg/L	2019-06-06	
Fluoride	0.43	0.10	mg/L	2019-06-06	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-06-06	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-06-06	
Sulfate	29.1	1.0	mg/L	2019-06-06	

Calculated Parameters

Hydrogen Sulfide, total	< 0.01	0.01	mg/L	2019-06-12	
Hardness, Total (as CaCO3)	12.8	0.500	mg/L	N/A	
Langelier Index	-0.6	-5.0		2019-06-12	
Nitrogen, Organic	0.0560	0.0500	mg/L	N/A	
Solids, Total Dissolved	227	1.00	mg/L	N/A	
Solids, Total Dissolved	227	10	mg/L	2019-06-12	

General Parameters

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL	Units	Analyzed	Qualifier
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13370 (9060397-02) | Matrix: Water | Sampled: 2019-06-04 14:20, Continued

General Parameters, Continued

Alkalinity, Total (as CaCO ₃)	147	1.0	mg/L	2019-06-06	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-06	
Alkalinity, Bicarbonate (as CaCO ₃)	147	1.0	mg/L	2019-06-06	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-06	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-06	
Bicarbonate (HCO ₃)	179	1.22	mg/L	N/A	
Carbonate (CO ₃)	< 0.600	0.600	mg/L	N/A	
Hydroxide (OH)	< 0.340	0.340	mg/L	N/A	
Ammonia, Total (as N)	0.048	0.020	mg/L	2019-06-07	
BOD, 5-day	< 2.2	2.0	mg/L	2019-06-11	BOD2
Carbon, Total Organic	1.61	0.50	mg/L	2019-06-10	
Chemical Oxygen Demand	< 20	20	mg/L	2019-06-07	
Colour, True	5.0	5.0	CU	2019-06-06	
Conductivity (EC)	359	2.0	µS/cm	2019-06-07	
Cyanide, Total	< 0.0050	0.0020	mg/L	2019-06-07	
Nitrogen, Total Kjeldahl	0.104	0.050	mg/L	2019-06-10	
pH	8.17	0.10	pH units	2019-06-06	HT2
Sulfide, Total	< 0.020	0.020	mg/L	2019-06-06	
Temperature, at pH	22.9		°C	2019-06-06	HT2
Turbidity	1.65	0.10	NTU	2019-06-06	
UV Transmittance @ 254nm	91.5	0.10	% T	2019-06-07	

Total Metals

Aluminum, total	0.0641	0.0050	mg/L	2019-06-11	
Antimony, total	< 0.00020	0.00020	mg/L	2019-06-11	
Arsenic, total	0.00101	0.00050	mg/L	2019-06-11	
Barium, total	< 0.0050	0.0050	mg/L	2019-06-11	
Boron, total	0.354	0.0050	mg/L	2019-06-11	
Cadmium, total	< 0.000010	0.000010	mg/L	2019-06-11	
Calcium, total	3.18	0.20	mg/L	2019-06-11	
Chromium, total	0.00121	0.00050	mg/L	2019-06-11	
Cobalt, total	< 0.00010	0.00010	mg/L	2019-06-11	
Copper, total	0.0396	0.00040	mg/L	2019-06-11	
Iron, total	0.103	0.010	mg/L	2019-06-11	
Lead, total	0.00319	0.00020	mg/L	2019-06-11	
Magnesium, total	1.19	0.010	mg/L	2019-06-11	
Manganese, total	0.0160	0.00020	mg/L	2019-06-11	
Mercury, total	< 0.000010	0.000010	mg/L	2019-06-11	
Molybdenum, total	0.00370	0.00010	mg/L	2019-06-11	
Nickel, total	< 0.00040	0.00040	mg/L	2019-06-11	
Potassium, total	0.33	0.10	mg/L	2019-06-11	
Selenium, total	< 0.00050	0.00050	mg/L	2019-06-11	
Sodium, total	81.4	0.10	mg/L	2019-06-11	

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL	Units	Analyzed	Qualifier
13370 (9060397-02) Matrix: Water Sampled: 2019-06-04 14:20, Continued					
Total Metals, Continued					
Strontium, total	0.0456	0.0010	mg/L	2019-06-11	
Uranium, total	0.000132	0.000020	mg/L	2019-06-11	
Zinc, total	0.0056	0.0040	mg/L	2019-06-11	
Microbiological Parameters					
Coliforms, Total	<1	1	CFU/100 mL	2009-06-05	
Coliforms, Fecal	<1	1	CFU/100 mL	2009-06-05	
E. coli	<1	1	CFU/100 mL	2009-06-05	
Heterotrophic Plate Count	<1	1	CFU/mL	2009-06-05	
25324 (9060397-03) Matrix: Water Sampled: 2019-06-04 16:00					
Anions					
Chloride	21.4	0.10	mg/L	2019-06-07	
Fluoride	< 0.10	0.10	mg/L	2019-06-07	
Nitrate (as N)	0.013	0.010	mg/L	2019-06-07	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-06-07	
Sulfate	7.5	1.0	mg/L	2019-06-07	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	27.6	0.500	mg/L	N/A	
Langelier Index	-2.0	-5.0		2019-06-12	
Nitrogen, Organic	0.309	0.100	mg/L	N/A	
Solids, Total Dissolved	87.9	1.00	mg/L	N/A	
Solids, Total Dissolved	88	10	mg/L	2019-06-12	
General Parameters					
Alkalinity, Total (as CaCO ₃)	43.6	1.0	mg/L	2019-06-07	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-07	
Alkalinity, Bicarbonate (as CaCO ₃)	43.6	1.0	mg/L	2019-06-07	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-07	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-06-07	
Bicarbonate (HCO ₃)	53.2	1.22	mg/L	N/A	
Carbonate (CO ₃)	< 0.600	0.600	mg/L	N/A	
Hydroxide (OH)	< 0.340	0.340	mg/L	N/A	
Ammonia, Total (as N)	0.035	0.020	mg/L	2019-06-07	
Colour, True	16	5.0	CU	2019-06-06	
Conductivity (EC)	158	2.0	µS/cm	2019-06-07	
Cyanide, Total	< 0.0050	0.0020	mg/L	2019-06-07	
Nitrogen, Total Kjeldahl	0.344	0.050	mg/L	2019-06-11	
pH	7.00	0.10	pH units	2019-06-07	HT2
Solids, Total Suspended	94.4	2.0	mg/L	2019-06-10	
Temperature, at pH	23.5	°C		2019-06-07	HT2

TEST RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL	Units	Analyzed	Qualifier
25324 (9060397-03) Matrix: Water Sampled: 2019-06-04 16:00, Continued					
<i>General Parameters, Continued</i>					
Turbidity	289	0.10	NTU	2019-06-07	
<i>Total Metals</i>					
Aluminum, total	1.10	0.0050	mg/L	2019-06-11	
Antimony, total	< 0.00020	0.00020	mg/L	2019-06-11	
Arsenic, total	0.00223	0.00050	mg/L	2019-06-11	
Barium, total	0.0316	0.0050	mg/L	2019-06-11	
Boron, total	0.0617	0.0050	mg/L	2019-06-11	
Cadmium, total	0.000012	0.000010	mg/L	2019-06-11	
Calcium, total	5.89	0.20	mg/L	2019-06-11	
Chromium, total	0.00246	0.00050	mg/L	2019-06-11	
Cobalt, total	0.00077	0.00010	mg/L	2019-06-11	
Copper, total	0.00728	0.00040	mg/L	2019-06-11	
Iron, total	47.3	0.010	mg/L	2019-06-11	
Lead, total	0.00076	0.00020	mg/L	2019-06-11	
Magnesium, total	3.13	0.010	mg/L	2019-06-11	
Manganese, total	0.125	0.00020	mg/L	2019-06-11	
Mercury, total	< 0.000040	0.000040	mg/L	2019-06-11	CT5
Molybdenum, total	0.00092	0.00010	mg/L	2019-06-11	
Nickel, total	0.00175	0.00040	mg/L	2019-06-11	
Potassium, total	0.32	0.10	mg/L	2019-06-11	
Selenium, total	< 0.00050	0.00050	mg/L	2019-06-11	
Sodium, total	23.0	0.10	mg/L	2019-06-11	
Strontium, total	0.0856	0.0010	mg/L	2019-06-11	
Uranium, total	0.000175	0.000020	mg/L	2019-06-11	
Zinc, total	0.0078	0.0040	mg/L	2019-06-11	

Sample Qualifiers:

BOD2 The sample dilutions set-up for the BOD analysis did not meet the oxygen depletion criterion of at least 2 mg/L.

CT5 This sample has been incorrectly preserved for Mercury analysis

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

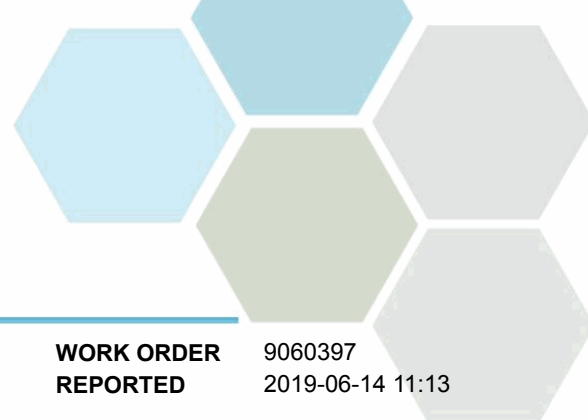
APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analysis Description	Method Ref.	Technique	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	Kelowna
Biochemical Oxygen Demand in Water	SM 5210 B (2017)	Dissolved Oxygen Meter	Richmond
Carbon, Total Organic in Water	SM 5310 B (2017)	Combustion, Infrared CO2 Detection	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2017)	Closed Reflux, Colorimetry	Kelowna
Coliforms, Fecal in Water	SM 9222 (2017)	Membrane Filtration	Sublet
Coliforms, Total in Water	SM 9222 (2017)	Membrane Filtration	Sublet
Colour, True in Water	SM 2120 C (2017)	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	Kelowna
E. coli in Water	SM 9223 B (2017)	Enzyme Substrate Endo Agar	Sublet
Hardness in Water	SM 2340 B* (2017)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	N/A
Heterotrophic Plate Count in Water	SM 9215 B (2017)	Pour Plate	Sublet
Hydrogen Sulfide, total in Water	SM 4500-S2 H (2017)	Calculation	N/A
Langelier Index in Water	SM 2330 B (2017)	Calculation	N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	Kelowna
pH in Water	SM 4500-H+ B (2017)	Electrometry	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2017)	SM 1030 E (2011)	N/A
Solids, Total Suspended in Water	SM 2540 D* (2017)	Gravimetry (Dried at 103-105C)	Kelowna
Sulfide, Total in Water	SM 4500-S2 D* (2017)	Colorimetry (Methylene Blue)	Edmonton
Total Metals in Water	EPA 200.2* / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
Transmittance at 254 nm in Water	SM 5910 B* (2017)	Ultraviolet Absorption	Kelowna
Turbidity in Water	SM 2130 B (2017)	Nephelometry	Kelowna

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



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Glossary of Terms:

RL	Reporting Limit (default)
% T	Percent Transmittance
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
<1	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
CFU/100 mL	Colony Forming Units per 100 millilitres
CFU/mL	Colony Forming Units per millilitre
CU	Colour Units (referenced against a platinum cobalt standard)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
pH units	pH < 7 = acidic, pH > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

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

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9F0414									
Blank (B9F0414-BLK1)			Prepared: 2019-06-06, Analyzed: 2019-06-06						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
Blank (B9F0414-BLK2)			Prepared: 2019-06-06, Analyzed: 2019-06-06						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
Blank (B9F0414-BLK3)			Prepared: 2019-06-06, Analyzed: 2019-06-06						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
LCS (B9F0414-BS1)			Prepared: 2019-06-06, Analyzed: 2019-06-06						
Chloride	15.9	0.10 mg/L	16.0		99	90-110			
Fluoride	3.92	0.10 mg/L	4.00		98	88-108			
Nitrate (as N)	4.00	0.010 mg/L	4.00		100	90-110			
Nitrite (as N)	1.96	0.010 mg/L	2.00		98	85-115			
Sulfate	15.8	1.0 mg/L	16.0		99	90-110			
LCS (B9F0414-BS2)			Prepared: 2019-06-06, Analyzed: 2019-06-06						
Chloride	15.8	0.10 mg/L	16.0		99	90-110			
Fluoride	3.59	0.10 mg/L	4.00		90	88-108			
Nitrate (as N)	4.00	0.010 mg/L	4.00		100	90-110			
Nitrite (as N)	1.94	0.010 mg/L	2.00		97	85-115			
Sulfate	16.1	1.0 mg/L	16.0		100	90-110			
LCS (B9F0414-BS3)			Prepared: 2019-06-06, Analyzed: 2019-06-06						
Chloride	16.1	0.10 mg/L	16.0		101	90-110			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9F0414, Continued									
LCS (B9F0414-BS3), Continued				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Fluoride	4.06	0.10 mg/L	4.00		101	88-108			
Nitrate (as N)	3.99	0.010 mg/L	4.00		100	90-110			
Nitrite (as N)	2.00	0.010 mg/L	2.00		100	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
Anions, Batch B9F0576									
Blank (B9F0576-BLK1)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
Blank (B9F0576-BLK2)				Prepared: 2019-06-11, Analyzed: 2019-06-11					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
Blank (B9F0576-BLK3)				Prepared: 2019-06-11, Analyzed: 2019-06-11					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
LCS (B9F0576-BS1)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Chloride	15.8	0.10 mg/L	16.0		99	90-110			
Fluoride	3.93	0.10 mg/L	4.00		98	88-108			
Nitrate (as N)	3.92	0.010 mg/L	4.00		98	90-110			
Nitrite (as N)	1.95	0.010 mg/L	2.00		98	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
LCS (B9F0576-BS2)				Prepared: 2019-06-11, Analyzed: 2019-06-11					
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Fluoride	4.10	0.10 mg/L	4.00		102	88-108			
Nitrate (as N)	4.02	0.010 mg/L	4.00		100	90-110			
Nitrite (as N)	1.98	0.010 mg/L	2.00		99	85-115			
Sulfate	15.9	1.0 mg/L	16.0		100	90-110			
LCS (B9F0576-BS3)				Prepared: 2019-06-11, Analyzed: 2019-06-11					
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Fluoride	3.95	0.10 mg/L	4.00		99	88-108			
Nitrate (as N)	3.99	0.010 mg/L	4.00		100	90-110			
Nitrite (as N)	1.99	0.010 mg/L	2.00		100	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	90-110			
Duplicate (B9F0576-DUP1)				Source: 9060397-03		Prepared: 2019-06-10, Analyzed: 2019-06-10			
Chloride	21.4	0.10 mg/L		21.4			< 1	10	
Fluoride	< 0.10	0.10 mg/L		< 0.10				10	
Nitrate (as N)	0.014	0.010 mg/L		0.013				10	
Nitrite (as N)	< 0.010	0.010 mg/L		< 0.010				15	
Sulfate	7.5	1.0 mg/L		7.5			< 1	10	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9F0576, Continued									
Matrix Spike (B9F0576-MS1)		Source: 9060397-03		Prepared: 2019-06-10, Analyzed: 2019-06-10					
Chloride	37.2	0.10 mg/L	16.0	21.4	99	75-125			
Fluoride	4.02	0.10 mg/L	4.00	< 0.10	99	75-125			
Nitrate (as N)	3.89	0.010 mg/L	4.00	0.013	97	75-125			
Nitrite (as N)	1.95	0.010 mg/L	2.00	< 0.010	97	80-120			
Sulfate	23.5	1.0 mg/L	16.0	7.5	100	75-125			

General Parameters, Batch B9F0333

Blank (B9F0333-BLK1)		Prepared: 2019-06-06, Analyzed: 2019-06-06							
Sulfide, Total	< 0.020	0.020 mg/L							
LCS (B9F0333-BS1)		Prepared: 2019-06-06, Analyzed: 2019-06-06							
Sulfide, Total	0.568	0.020 mg/L	0.500		114	82-116			
Matrix Spike (B9F0333-MS1)		Source: 9060397-02		Prepared: 2019-06-06, Analyzed: 2019-06-06					
Sulfide, Total	0.542	0.020 mg/L	0.500	< 0.020	108	70-120			

General Parameters, Batch B9F0382

Blank (B9F0382-BLK1)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	< 0.50	0.50 mg/L							
Blank (B9F0382-BLK2)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	< 0.50	0.50 mg/L							
Blank (B9F0382-BLK3)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	< 0.50	0.50 mg/L							
Blank (B9F0382-BLK4)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	< 0.50	0.50 mg/L							
LCS (B9F0382-BS1)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	9.50	0.50 mg/L	10.0		95	78-116			
LCS (B9F0382-BS2)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	9.83	0.50 mg/L	10.0		98	78-116			
LCS (B9F0382-BS3)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	9.81	0.50 mg/L	10.0		98	78-116			
LCS (B9F0382-BS4)		Prepared: 2019-06-10, Analyzed: 2019-06-10							
Carbon, Total Organic	9.87	0.50 mg/L	10.0		99	78-116			

General Parameters, Batch B9F0395

Blank (B9F0395-BLK1)		Prepared: 2019-06-07, Analyzed: 2019-06-07							
Colour, True	< 5.0	5.0 CU							
Blank (B9F0395-BLK2)		Prepared: 2019-06-07, Analyzed: 2019-06-07							
Colour, True	< 5.0	5.0 CU							
LCS (B9F0395-BS1)		Prepared: 2019-06-07, Analyzed: 2019-06-07							
Colour, True	20	5.0 CU	20.0		99	85-115			
LCS (B9F0395-BS2)		Prepared: 2019-06-07, Analyzed: 2019-06-07							
Colour, True	20	5.0 CU	20.0		102	85-115			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<i>General Parameters, Batch B9F0395, Continued</i>									
<i>General Parameters, Batch B9F0398</i>									
Blank (B9F0398-BLK1)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Turbidity	< 0.10	0.10 NTU							
Blank (B9F0398-BLK2)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Turbidity	< 0.10	0.10 NTU							
Blank (B9F0398-BLK3)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Turbidity	< 0.10	0.10 NTU							
LCS (B9F0398-BS1)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Turbidity	39.4	0.10 NTU	40.0		98	90-110			
LCS (B9F0398-BS2)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Turbidity	39.6	0.10 NTU	40.0		99	90-110			
LCS (B9F0398-BS3)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Turbidity	39.3	0.10 NTU	40.0		98	90-110			
<i>General Parameters, Batch B9F0427</i>									
Blank (B9F0427-BLK1)				Prepared: 2019-06-06, Analyzed: 2019-06-11					
BOD, 5-day	< 2.0	2.0 mg/L							
LCS (B9F0427-BS1)				Prepared: 2019-06-06, Analyzed: 2019-06-11					
BOD, 5-day	190	55.3 mg/L	198		96	85-115			
<i>General Parameters, Batch B9F0443</i>									
Blank (B9F0443-BLK1)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Chemical Oxygen Demand	< 20	20 mg/L							
LCS (B9F0443-BS1)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Chemical Oxygen Demand	509	20 mg/L	500		102	89-115			
<i>General Parameters, Batch B9F0465</i>									
Blank (B9F0465-BLK1)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
Blank (B9F0465-BLK2)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
Blank (B9F0465-BLK3)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
LCS (B9F0465-BS1)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Ammonia, Total (as N)	1.02	0.020 mg/L	1.00		102	90-115			
LCS (B9F0465-BS2)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Ammonia, Total (as N)	1.02	0.020 mg/L	1.00		102	90-115			
LCS (B9F0465-BS3)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Ammonia, Total (as N)	1.02	0.020 mg/L	1.00		102	90-115			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9F0475									
Blank (B9F0475-BLK1)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Blank (B9F0475-BLK2)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Blank (B9F0475-BLK3)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
LCS (B9F0475-BS1)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Alkalinity, Total (as CaCO ₃)	104	1.0 mg/L	100		104	80-120			
LCS (B9F0475-BS2)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Alkalinity, Total (as CaCO ₃)	104	1.0 mg/L	100		104	80-120			
LCS (B9F0475-BS3)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
Alkalinity, Total (as CaCO ₃)	105	1.0 mg/L	100		105	80-120			
LCS (B9F0475-BS4)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-104			
LCS (B9F0475-BS5)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-104			
LCS (B9F0475-BS6)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Conductivity (EC)	1400	2.0 µS/cm	1410		99	95-104			
Duplicate (B9F0475-DUP2)				Source: 9060397-01		Prepared: 2019-06-06, Analyzed: 2019-06-06			
Alkalinity, Total (as CaCO ₃)	145	1.0 mg/L		146			1	10	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO ₃)	145	1.0 mg/L		146			1	10	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Conductivity (EC)	365	2.0 µS/cm		377			3	5	
pH	8.19	0.10 pH units		8.28			1	4	
Reference (B9F0475-SRM1)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
pH	7.04	0.10 pH units	7.01		100	98-102			
Reference (B9F0475-SRM2)				Prepared: 2019-06-06, Analyzed: 2019-06-06					
pH	7.02	0.10 pH units	7.01		100	98-102			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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General Parameters, Batch B9F0475, Continued

Reference (B9F0475-SRM3)			Prepared: 2019-06-06, Analyzed: 2019-06-06						
pH	7.02	0.10 pH units	7.01		100	98-102			

General Parameters, Batch B9F0501

Blank (B9F0501-BLK1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Cyanide, Total	< 0.0020	0.0020 mg/L							
Blank (B9F0501-BLK2)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Cyanide, Total	< 0.0020	0.0020 mg/L							
LCS (B9F0501-BS1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Cyanide, Total	0.0217	0.0020 mg/L	0.0200		108	82-120			
LCS (B9F0501-BS2)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Cyanide, Total	0.0198	0.0020 mg/L	0.0200		99	82-120			
LCS Dup (B9F0501-BSD1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Cyanide, Total	0.0210	0.0020 mg/L	0.0200		105	82-120	3	10	
LCS Dup (B9F0501-BSD2)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Cyanide, Total	0.0198	0.0020 mg/L	0.0200		99	82-120	< 1	10	

General Parameters, Batch B9F0518

Blank (B9F0518-BLK1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Turbidity	< 0.10	0.10 NTU							
Blank (B9F0518-BLK2)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Turbidity	< 0.10	0.10 NTU							
LCS (B9F0518-BS1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Turbidity	38.0	0.10 NTU	40.0		95	90-110			
LCS (B9F0518-BS2)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Turbidity	38.0	0.10 NTU	40.0		95	90-110			
Duplicate (B9F0518-DUP1)			Source: 9060397-03		Prepared: 2019-06-07, Analyzed: 2019-06-07				
Turbidity	291	0.10 NTU	289				< 1	15	

General Parameters, Batch B9F0519

Blank (B9F0519-BLK1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
UV Transmittance @ 254nm	< 0.10	0.10 % T							
LCS (B9F0519-BS1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
UV Transmittance @ 254nm	41.6	0.10 % T	41.4		100	95-105			

General Parameters, Batch B9F0524

Blank (B9F0524-BLK1)			Prepared: 2019-06-07, Analyzed: 2019-06-10						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
Blank (B9F0524-BLK2)			Prepared: 2019-06-07, Analyzed: 2019-06-10						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9F0524, Continued									
LCS (B9F0524-BS1)				Prepared: 2019-06-07, Analyzed: 2019-06-10					
Nitrogen, Total Kjeldahl	1.10	0.050 mg/L	1.00		110	85-115			
LCS (B9F0524-BS2)				Prepared: 2019-06-07, Analyzed: 2019-06-10					
Nitrogen, Total Kjeldahl	1.10	0.050 mg/L	1.00		110	85-115			
General Parameters, Batch B9F0604									
Blank (B9F0604-BLK1)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Blank (B9F0604-BLK2)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Blank (B9F0604-BLK3)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
LCS (B9F0604-BS1)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Alkalinity, Total (as CaCO ₃)	103	1.0 mg/L	100		103	80-120			
LCS (B9F0604-BS2)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Alkalinity, Total (as CaCO ₃)	104	1.0 mg/L	100		104	80-120			
LCS (B9F0604-BS3)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Alkalinity, Total (as CaCO ₃)	115	1.0 mg/L	100		115	80-120			
LCS (B9F0604-BS4)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Conductivity (EC)	1390	2.0 µS/cm	1410		99	95-104			
LCS (B9F0604-BS5)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-104			
LCS (B9F0604-BS6)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
Conductivity (EC)	1390	2.0 µS/cm	1410		99	95-104			
Reference (B9F0604-SRM1)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
pH	7.02	0.10 pH units	7.01		100	98-102			
Reference (B9F0604-SRM2)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
pH	6.99	0.10 pH units	7.01		100	98-102			
Reference (B9F0604-SRM3)				Prepared: 2019-06-07, Analyzed: 2019-06-07					
pH	6.99	0.10 pH units	7.01		100	98-102			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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General Parameters, Batch B9F0604, Continued

General Parameters, Batch B9F0670

Blank (B9F0670-BLK1)			Prepared: 2019-06-10, Analyzed: 2019-06-11						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
Blank (B9F0670-BLK2)			Prepared: 2019-06-10, Analyzed: 2019-06-11						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
Blank (B9F0670-BLK3)			Prepared: 2019-06-10, Analyzed: 2019-06-11						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
LCS (B9F0670-BS1)			Prepared: 2019-06-10, Analyzed: 2019-06-11						
Nitrogen, Total Kjeldahl	1.04	0.050 mg/L	1.00		104	85-115			
LCS (B9F0670-BS2)			Prepared: 2019-06-10, Analyzed: 2019-06-11						
Nitrogen, Total Kjeldahl	1.04	0.050 mg/L	1.00		104	85-115			
LCS (B9F0670-BS3)			Prepared: 2019-06-10, Analyzed: 2019-06-11						
Nitrogen, Total Kjeldahl	1.04	0.050 mg/L	1.00		104	85-115			
Duplicate (B9F0670-DUP2)			Source: 9060397-03		Prepared: 2019-06-10, Analyzed: 2019-06-11				
Nitrogen, Total Kjeldahl	0.316	0.050 mg/L		0.344				15	
Matrix Spike (B9F0670-MS2)			Source: 9060397-03		Prepared: 2019-06-10, Analyzed: 2019-06-11				
Nitrogen, Total Kjeldahl	4.62	0.200 mg/L	4.00	0.344	107	65-135			

General Parameters, Batch B9F0676

Blank (B9F0676-BLK1)			Prepared: 2019-06-10, Analyzed: 2019-06-10						
Solids, Total Suspended	< 1.0	1.0 mg/L							
Blank (B9F0676-BLK2)			Prepared: 2019-06-10, Analyzed: 2019-06-10						
Solids, Total Suspended	< 1.0	1.0 mg/L							
LCS (B9F0676-BS1)			Prepared: 2019-06-10, Analyzed: 2019-06-10						
Solids, Total Suspended	95.0	10.0 mg/L	100		95	85-115			
LCS (B9F0676-BS2)			Prepared: 2019-06-10, Analyzed: 2019-06-10						
Solids, Total Suspended	100	10.0 mg/L	100		100	85-115			
Duplicate (B9F0676-DUP1)			Source: 9060397-03		Prepared: 2019-06-10, Analyzed: 2019-06-10				
Solids, Total Suspended	99.2	2.0 mg/L		94.4			5	20	

Total Metals, Batch B9F0550

Blank (B9F0550-BLK1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B9F0550-BLK2)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Mercury, total	< 0.000010	0.000010 mg/L							
Reference (B9F0550-SRM1)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Mercury, total	0.00434	0.000010 mg/L	0.00489		89	80-120			
Reference (B9F0550-SRM2)			Prepared: 2019-06-07, Analyzed: 2019-06-07						
Mercury, total	0.00423	0.000010 mg/L	0.00489		86	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9F0692									
Blank (B9F0692-BLK1)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B9F0692-BLK2)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Mercury, total	< 0.000010	0.000010 mg/L							
Reference (B9F0692-SRM1)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Mercury, total	0.00461	0.000010 mg/L	0.00489		94	80-120			
Reference (B9F0692-SRM2)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Mercury, total	0.00417	0.000010 mg/L	0.00489		85	80-120			
Total Metals, Batch B9F0712									
Blank (B9F0712-BLK1)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Mercury, total	< 0.000040	0.000040 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
Blank (B9F0712-BLK2)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Mercury, total	< 0.000040	0.000040 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

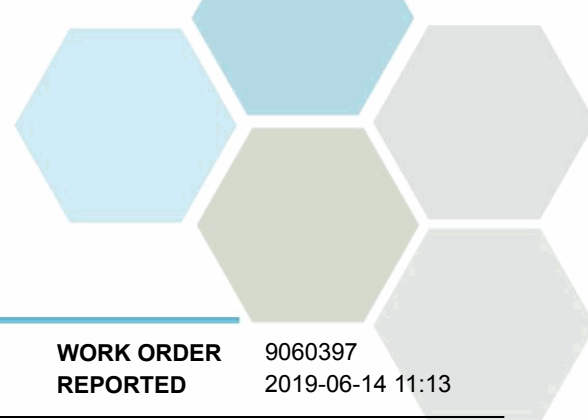
Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9F0712, Continued									
Blank (B9F0712-BLK2), Continued					Prepared: 2019-06-10, Analyzed: 2019-06-11				
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
Blank (B9F0712-BLK3)					Prepared: 2019-06-10, Analyzed: 2019-06-11				
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Mercury, total	< 0.000040	0.000040 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
LCS (B9F0712-BS1)					Prepared: 2019-06-10, Analyzed: 2019-06-11				
Aluminum, total	0.0230	0.0050 mg/L	0.0200		115	80-120			
Antimony, total	0.0229	0.00020 mg/L	0.0200		115	80-120			
Arsenic, total	0.0204	0.00050 mg/L	0.0200		102	80-120			
Barium, total	0.0219	0.0050 mg/L	0.0200		109	80-120			
Boron, total	0.0212	0.0050 mg/L	0.0200		106	80-120			
Cadmium, total	0.0213	0.000010 mg/L	0.0200		107	80-120			
Calcium, total	2.01	0.20 mg/L	2.00		100	80-120			
Chromium, total	0.0191	0.00050 mg/L	0.0200		95	80-120			
Cobalt, total	0.0196	0.00010 mg/L	0.0200		98	80-120			
Copper, total	0.0200	0.00040 mg/L	0.0200		100	80-120			
Iron, total	1.86	0.010 mg/L	2.00		93	80-120			
Lead, total	0.0215	0.00020 mg/L	0.0200		108	80-120			
Magnesium, total	2.03	0.010 mg/L	2.00		101	80-120			
Manganese, total	0.0198	0.00020 mg/L	0.0200		99	80-120			
Mercury, total	0.000845	0.000040 mg/L	0.00100		84	80-120			
Molybdenum, total	0.0195	0.00010 mg/L	0.0200		98	80-120			
Nickel, total	0.0199	0.00040 mg/L	0.0200		100	80-120			
Potassium, total	1.87	0.10 mg/L	2.00		94	80-120			
Selenium, total	0.0195	0.00050 mg/L	0.0200		98	80-120			
Sodium, total	1.88	0.10 mg/L	2.00		94	80-120			
Strontium, total	0.0212	0.0010 mg/L	0.0200		106	80-120			
Uranium, total	0.0221	0.000020 mg/L	0.0200		111	80-120			
Zinc, total	0.0213	0.0040 mg/L	0.0200		106	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9F0712, Continued									
Reference (B9F0712-SRM1)				Prepared: 2019-06-10, Analyzed: 2019-06-11					
Aluminum, total	0.285	0.0050 mg/L	0.303		94	82-114			
Antimony, total	0.0564	0.00020 mg/L	0.0511		110	88-115			
Arsenic, total	0.120	0.00050 mg/L	0.118		102	88-111			
Barium, total	0.851	0.0050 mg/L	0.823		103	83-110			
Boron, total	3.27	0.0050 mg/L	3.45		95	80-118			
Cadmium, total	0.0514	0.000010 mg/L	0.0495		104	90-110			
Calcium, total	11.1	0.20 mg/L	11.6		95	85-113			
Chromium, total	0.241	0.00050 mg/L	0.250		96	88-111			
Cobalt, total	0.0374	0.00010 mg/L	0.0377		99	90-114			
Copper, total	0.487	0.00040 mg/L	0.486		100	90-117			
Iron, total	0.464	0.010 mg/L	0.488		95	90-116			
Lead, total	0.208	0.00020 mg/L	0.204		102	90-110			
Magnesium, total	3.73	0.010 mg/L	3.79		98	88-116			
Manganese, total	0.104	0.00020 mg/L	0.109		95	88-108			
Mercury, total	0.00405	0.000040 mg/L	0.00489		83	80-120			
Molybdenum, total	0.197	0.00010 mg/L	0.198		99	88-110			
Nickel, total	0.239	0.00040 mg/L	0.249		96	90-112			
Potassium, total	6.75	0.10 mg/L	7.21		94	87-116			
Selenium, total	0.116	0.00050 mg/L	0.121		96	90-122			
Sodium, total	7.16	0.10 mg/L	7.54		95	86-118			
Strontium, total	0.393	0.0010 mg/L	0.375		105	86-110			
Uranium, total	0.0306	0.000020 mg/L	0.0306		100	88-112			
Zinc, total	2.48	0.0040 mg/L	2.49		100	90-113			



APPENDIX 3: REVISION HISTORY

REPORTED TO PROJECT Waterline Resources Inc. - Nanaimo
3157-19-001

WORK ORDER REPORTED 9060397
2019-06-14 11:13

Sample ID	Changed	Change	Analysis	Analyte(s)
9060397-01	2019-06-14	Added	Alkalinity w/ Calc Pkg	
9060397-02	2019-06-14	Added	Alkalinity w/ Calc Pkg	
9060397-03	2019-06-14	Added	Alkalinity w/ Calc Pkg	