

TOWN OF QUALICUM BEACH
Annual Water Report 2023



Introduction

As a water purveyor, the Town of Qualicum Beach has a duty to ensure that residents have access to an adequate supply of high-quality water for all uses. Our residents expect to receive clean, potable water from their taps every day. The Town consistently aims to provide the highest possible quality of water to its consumers through the monitoring, testing, and maintenance of its water system. As a supplier under the *British Columbia Drinking Water Protection Act*, the Town of Qualicum Beach is required to provide an annual report on the quality of the water and its distribution.

This annual report is intended to present an overview of the water system and provide a better understanding of the process with which the water is supplied, treated, and monitored.

Operators

It is the responsibility of the Town to ensure that those involved in the management of the water system are properly trained and educated to the required standards. All water operators routinely attend courses and conferences to continually improve their education, knowledge base, and maintain their professional development commitments. The Town of Qualicum Beach ensures that a number of staff are fully certified to operate the system with additional staff currently training in system operations as part of our succession planning process.

Water System Review

The Town draws water from two (2) ground water sources: the River Well field and the Berwick Well field. Both well fields are high quality and quantity deep well sources. The primary supply comes from the River Well field with the Berwick Well field supplying auxiliary support for peak summer demands. During peak demand, the wells can produce up to a combined 188.3 litres per second which would provide a theoretical max production of 16,300 m³/day. Since 2004, the annual water production from the wells has averaged 1.60 million m³. In 2023, the annual production was 1.61 million m³ which is slightly above average and reflects both the dry summer that was experienced in 2023 and a full year of the Town providing bulk water to the Sandpiper subdivision. Refer to **Figure 7** below to view the 20-year historical chart of water production and the general trend in which consumers are reducing their consumption.

The River Well field (**Figure 1** and **Figure 3**), is comprised of five (5) production wells and two (2) monitoring wells located at the northwest corner of the Town’s boundary. The River Well field draws water from the deltaic deposits of the Little Qualicum River.

The Berwick Well field (**Figure 2** and **Figure 4**) is one of the Town’s original water supplies. There are four (4) active production wells which provide approximately 20% of the annual production. The Berwick Well field is considered an auxiliary water source and is only used during periods of

peak consumption during the year. The aquifer is left to rest and recharge during the low demand period of the winter months and brought back online for the summer season.

The distribution system is primarily a looped system made up of over 110 km of water main pipe. The pipes used vary in both size and materials, with most of the piping consisting of polyvinyl chloride (PVC) and some older pipes constructed with either asbestos cement (AC) or cast iron. The system is flushed annually by Town operators to discourage biofilm growth in our water pipes. The flow rates used during the flushing process are monitored to ensure that the proper scouring of the pipes occur and that the process is having the desired effect of keeping the system free of contaminants.

The system is gravity fed but can be assisted by a pump for larger demands, from the reservoirs with the water being pumped from the well fields to one of the three (3) reservoir locations: Jones Street, Berwick Road, or Village Way. There are five (5) reservoirs total in the three (3) locations, with a combined capacity of 9,100 m³ or 9,100,000 liters. The reservoirs feed four (4) different pressure zones. These pressure zones are designed to ensure that there is enough pressure to meet fire flow requirements in all areas of the community, as well as provide adequate pressure to the consumers.

Monitoring

Using a SCADA (Supervisory Control and Data Acquisition) system, the water system is constantly monitored twenty-four (24) hours per day. With the use of laptops and smart phones, operators can remotely monitor and make changes to the system in case an adjustment is needed. **Figure 6** below illustrates the Water System Process Schematic in which the SCADA system is programmed to maintain. In addition to the use of the SCADA system, regular system and security inspections are performed at all booster stations, reservoirs, and wellheads by Town operators.

Treatment

The River Well field supply water is treated initially with ultraviolet (UV) light and then is disinfected with chlorine, as prescribed by the Vancouver Island Health Authority (VIHA). The UV disinfection is dosed at 80 mJ/cm². This ensures a four-log inactivation of *rotavirus*, the target organism of the disinfection process. This is followed by a chlorine injection to provide a distribution system residual and a measurable sentinel throughout the system. Chlorination by-products are not a concern as the chlorine dosage is low and the water chemistry does not identify any complicating components.

Sampling and Testing

Weekly bacteriological testing is performed for total coliforms and e-coli bacteria, as well as

lactose fermenters, total Aeromonas, sulphur reducing and iron reducing bacteria, yeast, fungi, and total plate count. The weekly samples are taken from at least two (2) of the nine (9) sample stations throughout the Town on a rotational basis (**Figure 5**). These station locations were chosen in conjunction with the Provincial Environmental Health Officer to reflect the water quality throughout the distribution system, from its source to the furthest boundaries.

The bacteriological testing is done in triplicate, with one sample forwarded to Vancouver Island Health Authority (VIHA) for testing at the BC Centre for Disease Control (BCCDC) and the two other duplicate samples sent to BV Labs and M.B. Labs. This redundancy in testing is performed to ensure the accuracy of the results for immediate and proper interpretation, to make certain correct sampling and lab work has been done, and for the identification and elimination of false positive results with confidence.

A full chemical analysis is also performed on the raw water. This is completed annually as per *the Guidelines for Canadian Drinking Water Quality* and gives the Town a better understanding of the overall quality of the water and its makeup. See **Figure 8** for the 2023 full parameter test results.

In addition to the required sampling parameters set out by VIHA and *The Guidelines for Canadian Drinking Water Quality*, the wells are tested on a rotational basis for site specific pollutant concerns. The Berwick wells are tested for herbicides, pesticides, and fertilizer related compounds that may be associated with the activities of the adjacent golf course, while the river wells are tested for light and heavy extractable petroleum hydrocarbons (LEPH/HEPH), polycyclic aromatic hydrocarbons (PAH), gasoline constituents (BTEX), and cyanide that are potential contaminants from the adjacent highway. Additionally, three off-site monitoring wells are located north and east of the River Well supply to monitor the potential impacts of a gas station located across the highway and cross gradient from the wells.

Cross Connection Program

The cross-connection control program is based on premise isolation. The standard water service box and meter setter specified for use in the Town contains a double check valve. Locations that are of greater risk may have alternate devices specified commensurate with the threat of contamination. There are currently two (2) operators certified to perform backflow assembly testing. The backflow prevention devices, of which there are eighty-two (82) double check valve assemblies (DCVA), six (6) reduced pressure backflow assemblies (RPBA), and one (1) pressure vacuum breaker assembly (PVBA), are tested annually. All private commercial and residential backflow devices are tested by independent contractors whose reports are submitted to the Public Works Utility Department.

Well Head Protection

The Town of Qualicum Beach continues to compile data on the areal extent, behaviour, and

recharge of the two (2) aquifers of the well fields to better understand the requirements to manage and evolve a well head protection program. The Town owns significant lands around each well field: thirty (30) hectares (75 acres) recently acquired lands around Berwick and thirty-seven (37) hectares (90 acres) around the River Well Field. Access is restricted to these lands and a network of monitoring and sampling wells are maintained to gather data for determining aquifer conditions and to establish models of aquifer behaviour. Aquifer levels, pumping response, temperature, water chemistry, and lack or presence of potential contaminants are regularly monitored.

Conclusion

The Town of Qualicum Beach continues to provide residents with high quality, rigorously tested water from the Berwick and River Well fields. Town staff are routinely trained on the most up-to-date water management standards, ensuring that staff knowledge base and professional development continues to advance. The Town's water system is constantly monitored using a SCADA monitoring system which allows staff to oversee the system twenty-four (24) hours a day, while technological tools, such as laptops and smartphones, allow staff to make any adjustments that the system requires in real-time. Supplied water from the River Well field, the primary water source for the Town of Qualicum Beach, is treated with UV light and disinfected with chlorine, as per VIHA regulations, and is subjected to weekly bacteriological testing to ensure that there are no biofilm growths within the supplied water. Alongside the weekly bacteriological testing, a full chemical analysis of the raw water supply is performed every year, and rotational tests are done on each wellhead to ensure that there are no site-specific pollutants in the supply. Staff have made, and continues to make, every effort to safeguard the water supplied to the residents of the Town of Qualicum Beach through in-depth testing and monitoring.

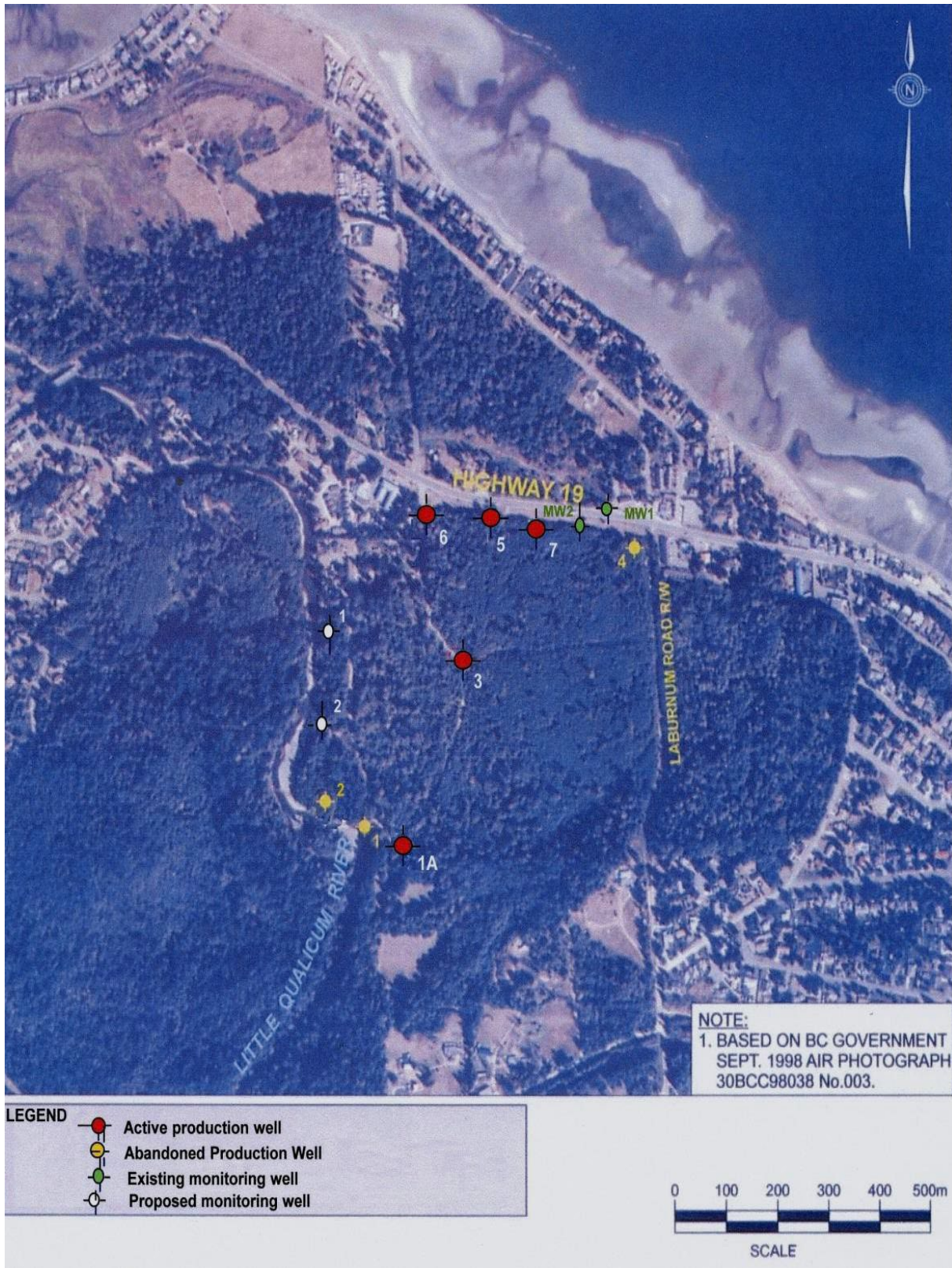


Figure 1. River Well Field

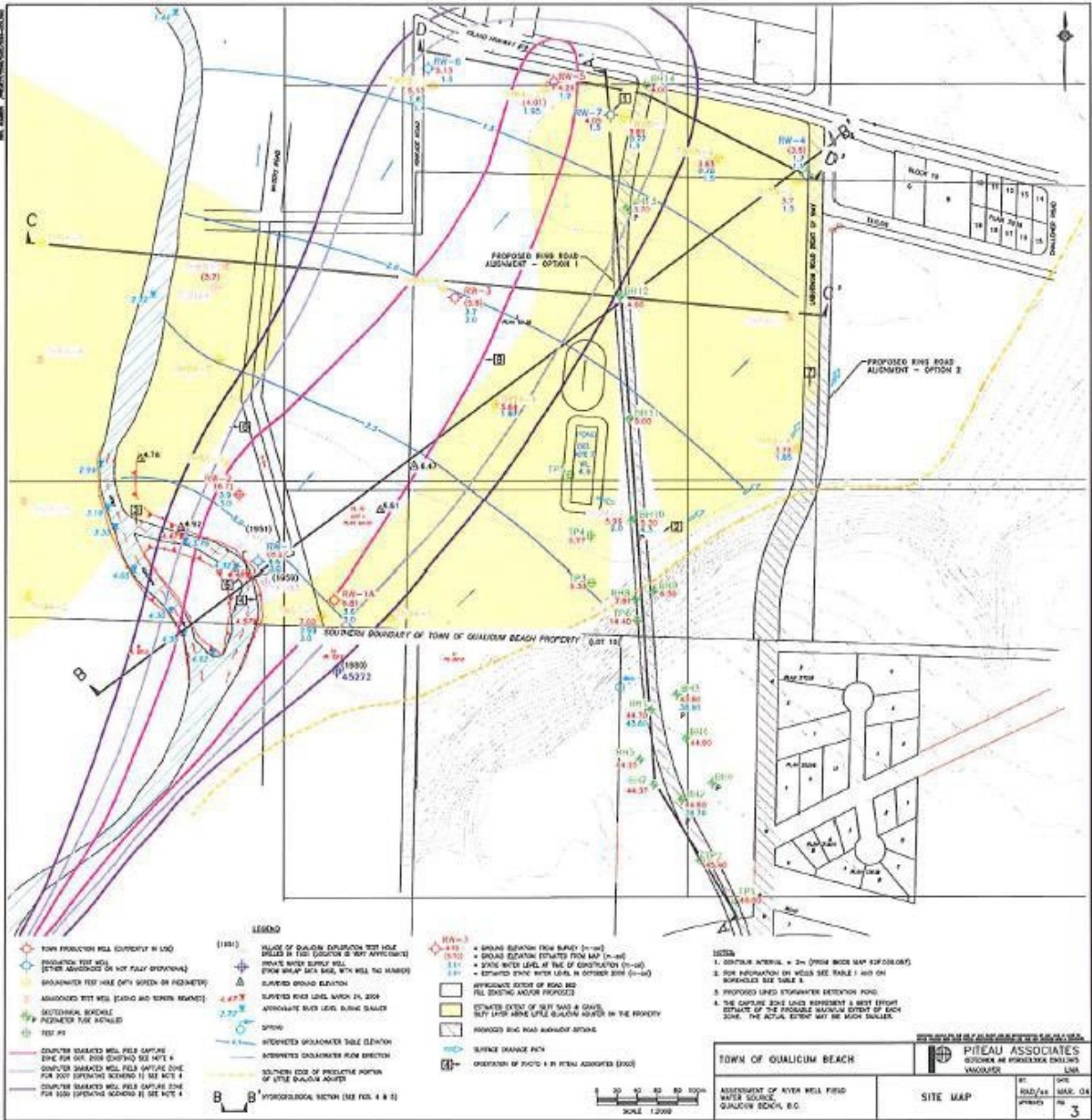


Figure 2. River Well Field Water Source

DWG. NUMBER: /PROJECT/2586/CAUD/2586-002.DWG

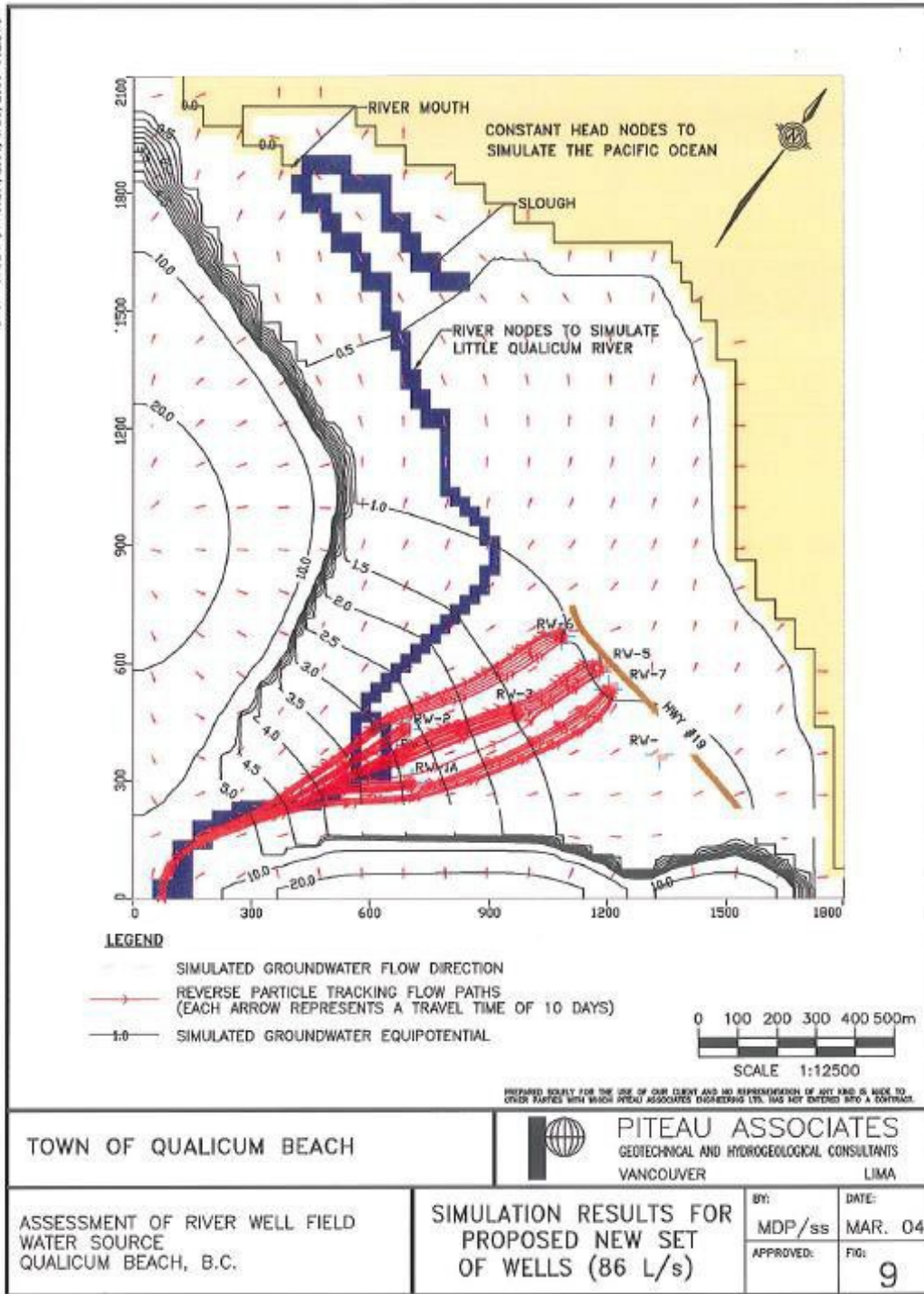
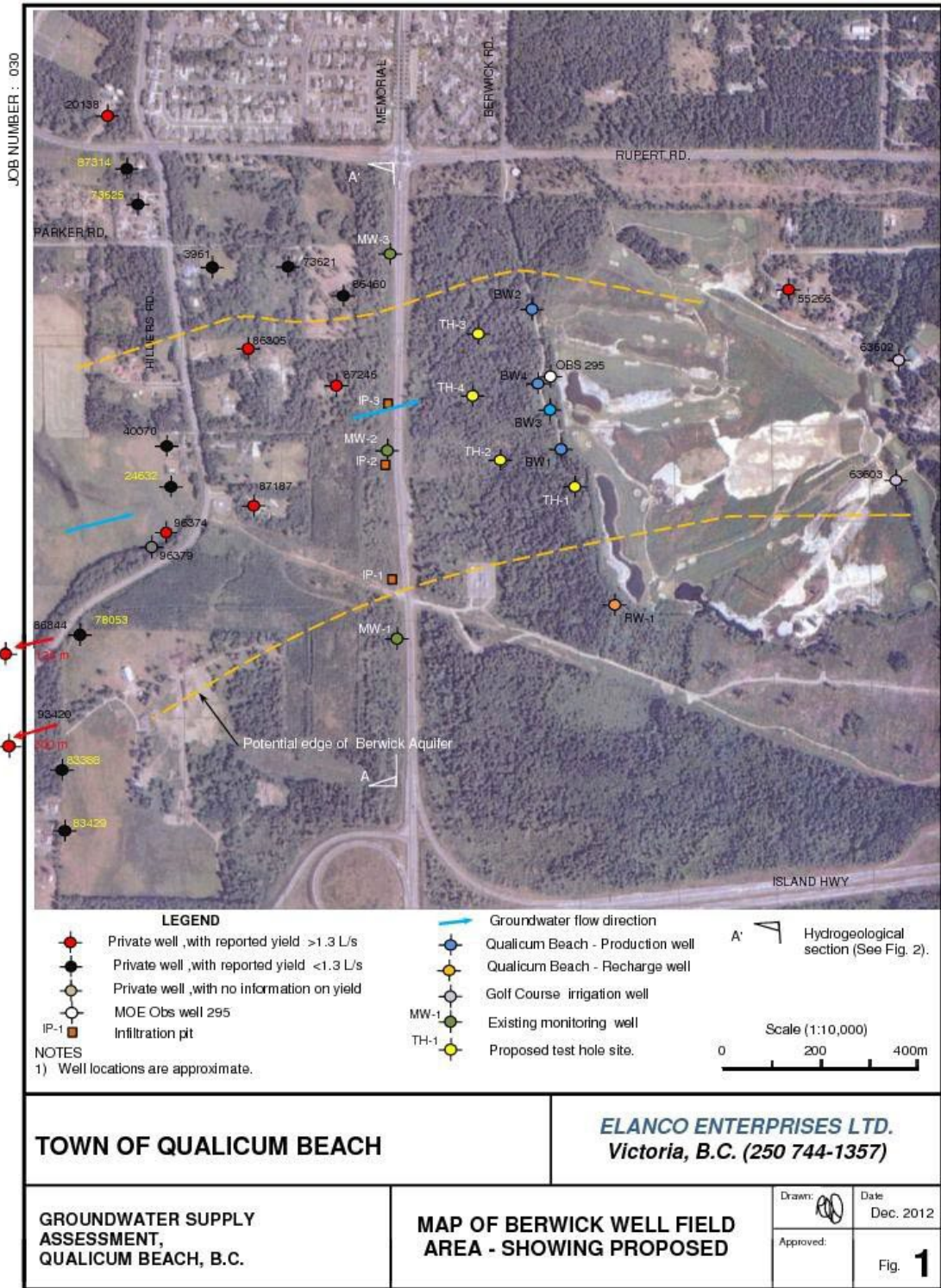


Figure 3. Flow Paths for River Well Field



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Figure 4. Berwick Well Field

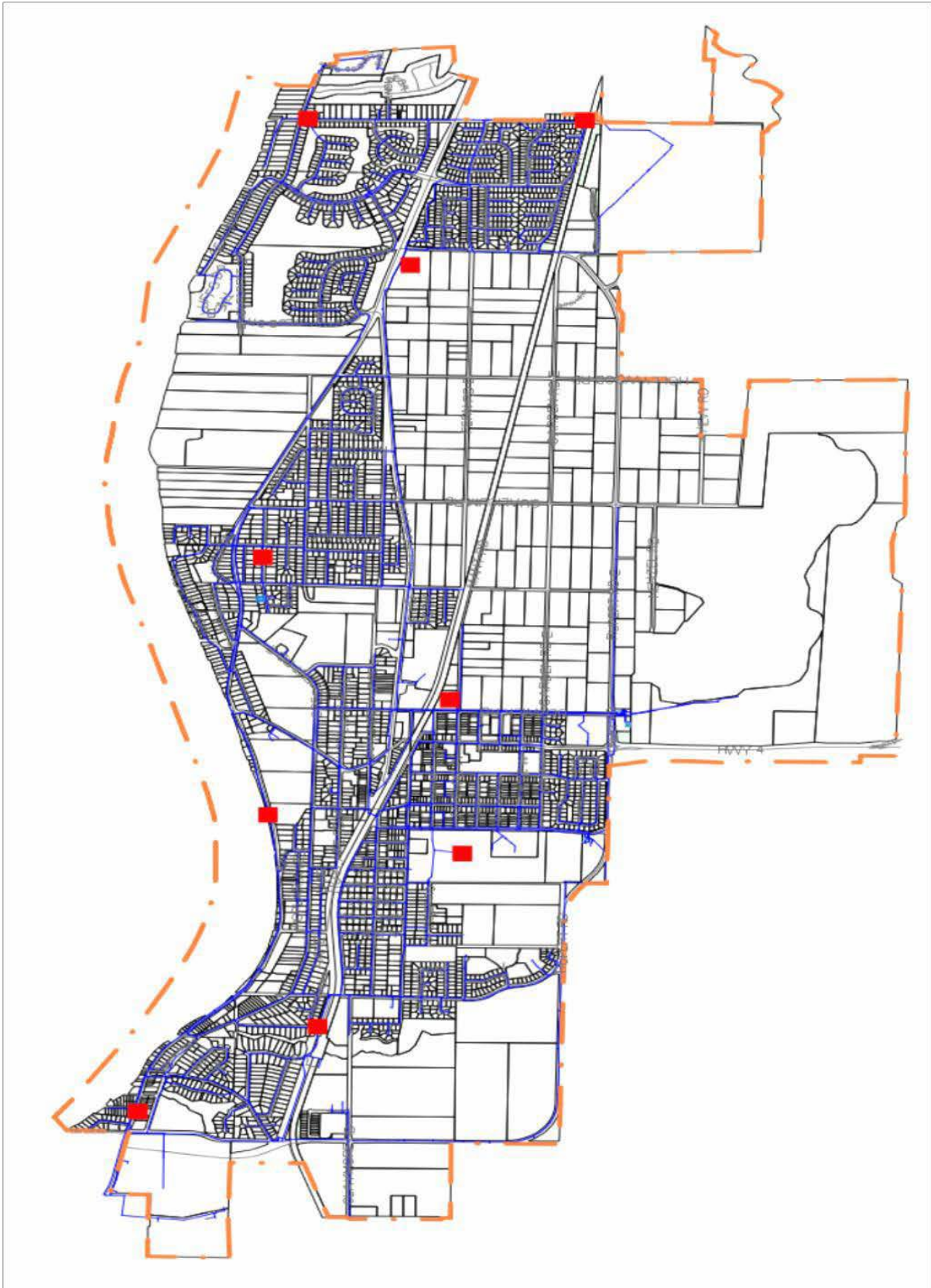
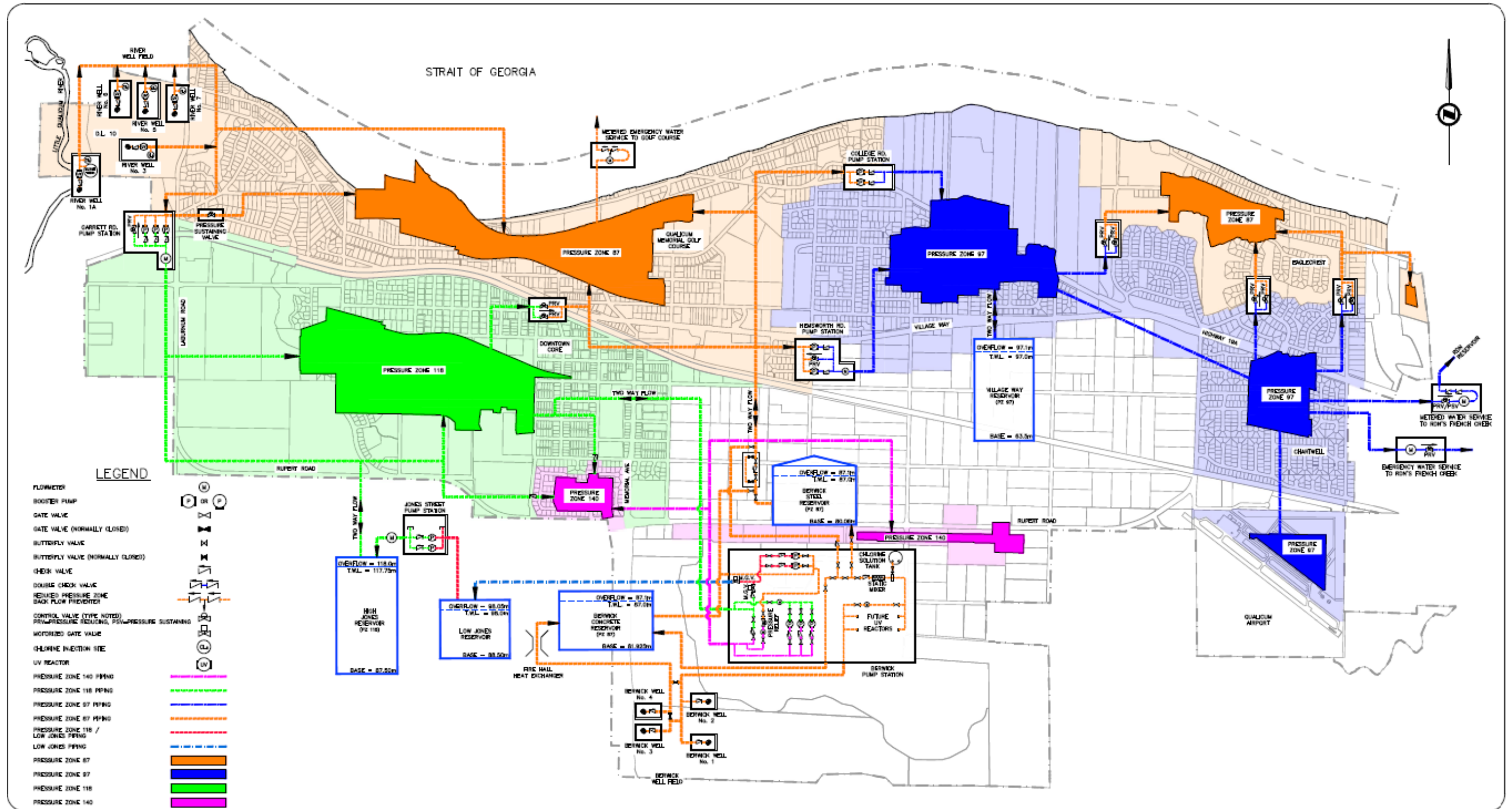


Figure 5. Weekly Sampling Locations



KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers
 P.O. Box 790, 194 Memorial Ave. Parksville, BC V9P 2G8
 Tel: 250-249-1151 Fax: 250-249-5363
 PERMIT TO PRACTICE No. 1001658

CLIENT	TOWN OF QUALICUM BEACH
PROJECT	TOWN OF QUALICUM BEACH WATER SYSTEM

TITLE	WATER SYSTEM PROCESS SCHEMATIC		
PROJECT #	1923	SCALE	1:50,000
DATE	APRIL 2022		REV.
DRAWN BY	JES	DWG No.	1923-01
CHECKED BY	MP	SHEET	1/1

Figure 6. Water System Process Schematic

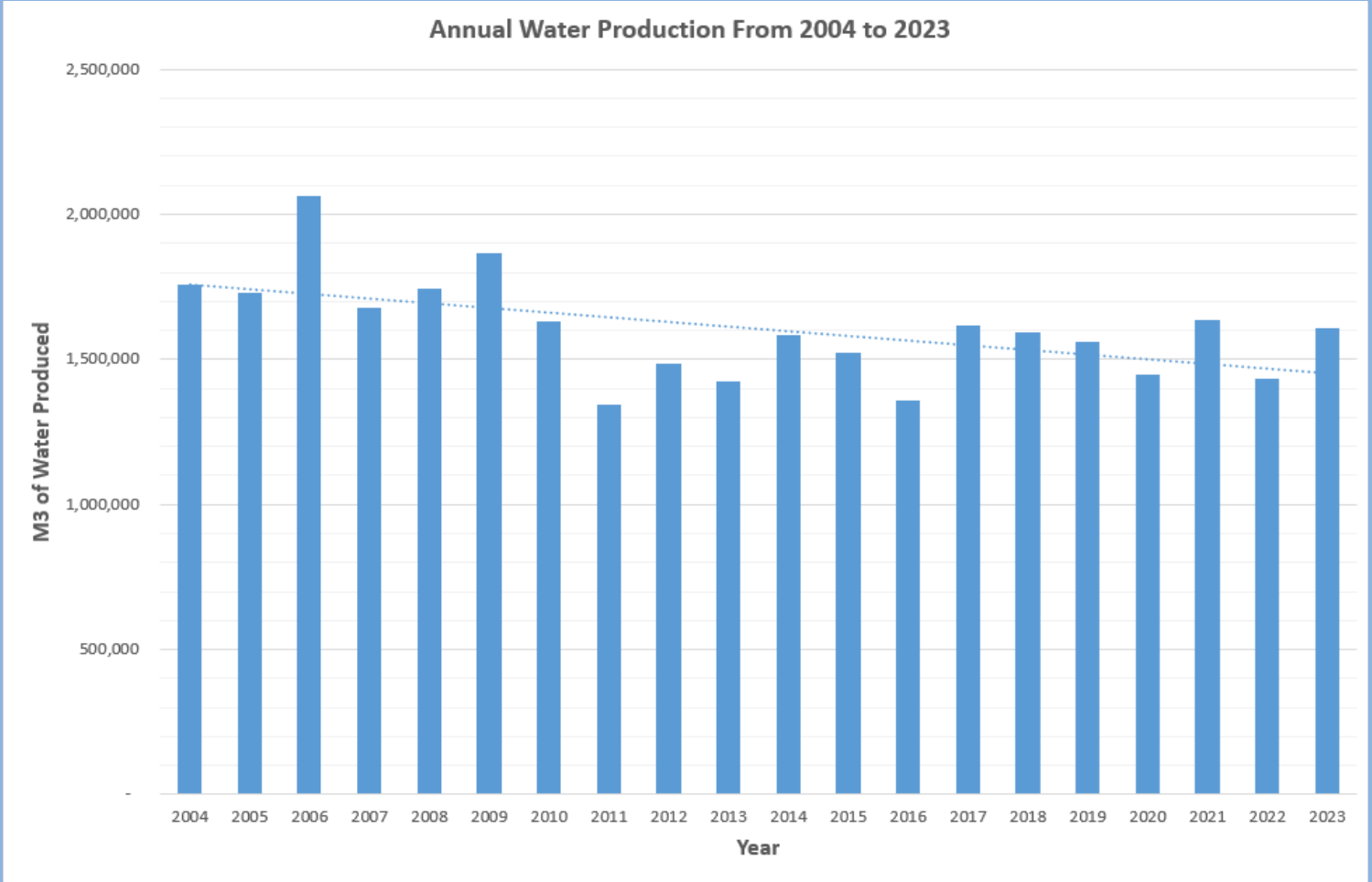


Figure 7. Historical Annual Water Production and Trend

**Figure 8,
Full Spectrum Analysis Results
Below**

Sampler Initials: SM

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID					BZJ893	BZJ894	BZJ895	BZJ898	BZJ899	
Sampling Date					2023-09-18 07:30	2023-09-18 08:00	2023-09-18 08:30	2023-09-18 09:00	2023-09-18 09:30	
COC Number					704557-01-01	704557-01-01	704557-01-01	704557-01-01	704557-01-01	
	UNITS	MAC	AO	OG	RIVER WELL #1A	RIVER WELL #3	RIVER WELL #5	RIVER WELL #6	RIVER WELL #7	RDL
ANIONS										
Nitrite (N)	mg/L	1	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050
Calculated Parameters										
Nitrate (N)	mg/L	10	-	-	0.117	0.117	0.321	0.282	0.131	0.020
Total Total Kjeldahl Nitrogen (Calc)	mg/L	-	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Misc. Inorganics										
pH	pH	-	-	7.0:10.5	6.63	6.68	6.63	6.71	6.63	N/A
Total Organic Carbon (C)	mg/L	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Total Dissolved Solids	mg/L	-	500	-	60	64	82	70	130	10
Anions										
Chloride (Cl)	mg/L	-	250	-	1.8	2.2	7.3	2.4	14	1.0
MISCELLANEOUS										
True Colour	Col. Unit	-	15	-	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
Nutrients										
Total Ammonia (N)	mg/L	-	-	-	<0.015	<0.015	<0.015	<0.015	<0.015	0.015
Total Phosphorus (P)	mg/L	-	-	-	0.0077	<0.0030	<0.0030	<0.0030	<0.0030	0.0030
Nitrate plus Nitrite (N)	mg/L	-	-	-	0.117	0.117	0.321	0.282	0.131	0.020
Total Nitrogen (N)	mg/L	-	-	-	0.137	0.113 (1)	0.326	0.288	0.148	0.020
Physical Properties										
Turbidity	NTU	see remark	see remark	see remark	0.21	<0.10	<0.10	<0.10	0.10	0.10

No Fill
 Grey
 Black

No Exceedance
 Exceeds 1 criteria policy/level
 Exceeds both criteria/levels

RDL = Reportable Detection Limit

N/A = Not Applicable

(1) Nitrogen < Nitrate: Both values fall within the method uncertainty for duplicates and are likely equivalent.

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID					BZJ900	BZJ901	BZJ902	BZJ903	
Sampling Date					2023-09-18 10:00	2023-09-18 10:30	2023-09-18 11:00	2023-09-18 11:30	
COC Number					704557-01-01	704557-01-01	704557-01-01	704557-01-01	
	UNITS	MAC	AO	OG	BERWICK WELL #1	BERWICK WELL #2	BERWICK WELL #3	BERWICK WELL #4	RDL
ANIONS									
Nitrite (N)	mg/L	1	-	-	<0.0050	<0.0050	<0.0050	<0.0050	0.0050
Calculated Parameters									
Nitrate (N)	mg/L	10	-	-	0.628	0.634	0.846	1.05	0.020
Total Total Kjeldahl Nitrogen (Calc)	mg/L	-	-	-	0.048	<0.020	0.022	0.135	0.020
Misc. Inorganics									
pH	pH	-	-	7.0:10.5	7.74	7.50	7.50	7.80	N/A
Total Organic Carbon (C)	mg/L	-	-	-	<0.50	<0.50	<0.50	<0.50	0.50
Total Dissolved Solids	mg/L	-	500	-	180	180	160	160	10
Anions									
Chloride (Cl)	mg/L	-	250	-	21	9.1	23	19	1.0
MISCELLANEOUS									
True Colour	Col. Unit	-	15	-	2.4	<2.0	<2.0	<2.0	2.0
Nutrients									
Total Ammonia (N)	mg/L	-	-	-	<0.015	<0.015	<0.015	0.048	0.015
Total Phosphorus (P)	mg/L	-	-	-	0.021	0.018	0.015	0.024	0.0030
Nitrate plus Nitrite (N)	mg/L	-	-	-	0.628	0.634	0.846	1.05	0.020
Total Nitrogen (N)	mg/L	-	-	-	0.676	0.636	0.868	1.18	0.020
Physical Properties									
Turbidity	NTU	see remark	see remark	see remark	0.13	0.13	0.15	0.56	0.10

No Fill

Grey

Black

No Exceedance

Exceeds 1 criteria policy/level

Exceeds both criteria/levels

RDL = Reportable Detection Limit

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(1) Nitrogen < Nitrate: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Bureau Veritas ID					BZJ893	BZJ894	BZJ895	BZJ898	BZJ899	
Sampling Date					2023-09-18 07:30	2023-09-18 08:00	2023-09-18 08:30	2023-09-18 09:00	2023-09-18 09:30	
COC Number					704557-01-01	704557-01-01	704557-01-01	704557-01-01	704557-01-01	
	UNITS	MAC	AO	OG	RIVER WELL #1A	RIVER WELL #3	RIVER WELL #5	RIVER WELL #6	RIVER WELL #7	RDL
Calculated Parameters										
Total Hardness (CaCO3)	mg/L	-	-	-	42.4	42.0	48.9	45.8	78.5	0.50
Elements										
Total Mercury (Hg)	ug/L	1	-	-	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	0.0019
Total Metals by ICPMS										
Total Aluminum (Al)	ug/L	2900	-	100	<3.0	<3.0	<3.0	<3.0	<3.0	3.0
Total Antimony (Sb)	ug/L	6	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	0.50
Total Arsenic (As)	ug/L	10	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Total Barium (Ba)	ug/L	2000	-	-	3.3	3.4	1.5	1.3	2.1	1.0
Total Beryllium (Be)	ug/L	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Total Bismuth (Bi)	ug/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Total Boron (B)	ug/L	5000	-	-	<50	<50	<50	<50	<50	50
Total Cadmium (Cd)	ug/L	7	-	-	0.015	0.016	0.017	0.014	0.015	0.010
Total Chromium (Cr)	ug/L	50	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Total Cobalt (Co)	ug/L	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Total Copper (Cu)	ug/L	2000	1000	-	5.29	8.93	7.37	4.59	7.61	0.20
Total Iron (Fe)	ug/L	-	300	-	<5.0	<5.0	<5.0	<5.0	<5.0	5.0
Total Lead (Pb)	ug/L	5	-	-	0.70	1.05	1.32	0.60	1.17	0.20
Total Manganese (Mn)	ug/L	120	20	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Total Molybdenum (Mo)	ug/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Total Nickel (Ni)	ug/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Total Selenium (Se)	ug/L	50	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Total Silicon (Si)	ug/L	-	-	-	3800	4100	5690	4870	7440	100
Total Silver (Ag)	ug/L	-	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
Total Strontium (Sr)	ug/L	7000	-	-	36.1	32.1	38.3	35.6	58.9	1.0
Total Thallium (Tl)	ug/L	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	0.010
Total Tin (Sn)	ug/L	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	5.0
Total Titanium (Ti)	ug/L	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	5.0
Total Uranium (U)	ug/L	20	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Total Vanadium (V)	ug/L	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	5.0
Total Zinc (Zn)	ug/L	-	5000	-	<5.0	9.6	5.3	<5.0	<5.0	5.0
Total Zirconium (Zr)	ug/L	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10
Total Calcium (Ca)	mg/L	-	-	-	13.6	13.4	14.9	14.5	22.7	0.050
Total Magnesium (Mg)	mg/L	-	-	-	2.04	2.07	2.84	2.33	5.29	0.050
Total Potassium (K)	mg/L	-	-	-	0.180	0.109	0.132	0.164	0.173	0.050
Total Sodium (Na)	mg/L	-	200	-	2.22	2.11	2.92	2.39	3.85	0.050
Total Sulphur (S)	mg/L	-	-	-	<3.0	<3.0	<3.0	<3.0	6.7	3.0

Bureau Veritas ID					BZJ900	BZJ901	BZJ902	BZJ903	
Sampling Date					2023-09-18 10:00	2023-09-18 10:30	2023-09-18 11:00	2023-09-18 11:30	
COC Number					704557-01-01	704557-01-01	704557-01-01	704557-01-01	
	UNITS	MAC	AO	OG	BERWICK WELL #1	BERWICK WELL #2	BERWICK WELL #3	BERWICK WELL #4	RDL
Calculated Parameters									
Total Hardness (CaCO3)	mg/L	-	-	-	133	67.9	114	115	0.50
Elements									
Total Mercury (Hg)	ug/L	1	-	-	<0.0019	<0.0019	<0.0019	<0.0019	0.0019
Total Metals by ICPMS									
Total Aluminum (Al)	ug/L	2900	-	100	<3.0	<3.0	<3.0	<3.0	3.0
Total Antimony (Sb)	ug/L	6	-	-	<0.50	<0.50	<0.50	<0.50	0.50
Total Arsenic (As)	ug/L	10	-	-	0.26	<0.10	0.27	0.34	0.10
Total Barium (Ba)	ug/L	2000	-	-	3.8	4.4	3.6	4.2	1.0
Total Beryllium (Be)	ug/L	-	-	-	<0.10	<0.10	<0.10	<0.10	0.10
Total Bismuth (Bi)	ug/L	-	-	-	<1.0	<1.0	<1.0	<1.0	1.0
Total Boron (B)	ug/L	5000	-	-	<50	<50	<50	<50	50
Total Cadmium (Cd)	ug/L	7	-	-	0.014	<0.010	0.014	0.018	0.010
Total Chromium (Cr)	ug/L	50	-	-	<1.0	<1.0	<1.0	<1.0	1.0
Total Cobalt (Co)	ug/L	-	-	-	<0.20	<0.20	<0.20	<0.20	0.20
Total Copper (Cu)	ug/L	2000	1000	-	3.49	0.33	2.64	1.45	0.20
Total Iron (Fe)	ug/L	-	300	-	15.5	<5.0	<5.0	194	5.0
Total Lead (Pb)	ug/L	5	-	-	0.51	<0.20	0.35	0.39	0.20
Total Manganese (Mn)	ug/L	120	20	-	<1.0	<1.0	<1.0	136	1.0
Total Molybdenum (Mo)	ug/L	-	-	-	<1.0	<1.0	<1.0	<1.0	1.0
Total Nickel (Ni)	ug/L	-	-	-	<1.0	<1.0	<1.0	<1.0	1.0
Total Selenium (Se)	ug/L	50	-	-	<0.10	<0.10	<0.10	<0.10	0.10
Total Silicon (Si)	ug/L	-	-	-	9390	11800	9450	8160	100
Total Silver (Ag)	ug/L	-	-	-	<0.020	<0.020	<0.020	<0.020	0.020
Total Strontium (Sr)	ug/L	7000	-	-	70.6	78.2	58.3	60.5	1.0
Total Thallium (Tl)	ug/L	-	-	-	<0.010	<0.010	<0.010	<0.010	0.010
Total Tin (Sn)	ug/L	-	-	-	<5.0	<5.0	<5.0	<5.0	5.0
Total Titanium (Ti)	ug/L	-	-	-	<5.0	<5.0	<5.0	<5.0	5.0
Total Uranium (U)	ug/L	20	-	-	<0.10	<0.10	<0.10	<0.10	0.10
Total Vanadium (V)	ug/L	-	-	-	<5.0	<5.0	<5.0	<5.0	5.0
Total Zinc (Zn)	ug/L	-	5000	-	21.7	<5.0	<5.0	<5.0	5.0
Total Zirconium (Zr)	ug/L	-	-	-	<0.10	<0.10	<0.10	<0.10	0.10
Total Calcium (Ca)	mg/L	-	-	-	31.5	18.1	24.7	24.7	0.050
Total Magnesium (Mg)	mg/L	-	-	-	13.2	5.51	12.6	12.9	0.050
Total Potassium (K)	mg/L	-	-	-	0.448	0.698	0.424	0.496	0.050
Total Sodium (Na)	mg/L	-	200	-	5.65	8.07	5.87	5.74	0.050
Total Sulphur (S)	mg/L	-	-	-	<3.0	<3.0	<3.0	<3.0	3.0

Grey Exceeds 1 criteria policy/level
Black Exceeds both criteria/levels RDL = Reportable Detection Limit