2019 ANNUAL REPORT

VERNON WATER RECLAMATION CENTRE

CITY OF Vernon

2019 Annual Report

VERNON WATER RECLAMATION CENTRE

INTRODUCTION

Regulatory requirements for the operation, monitoring and quality/quantity of effluents from the Vernon Water Reclamation Centre (VWRC) are outlined by the Ministry of Environment in Operational Certificate ME 12215 (issued October 31, 1997 and amended January 14, 2008). Regulations of the Operational Certificate (OC) are in accordance with the Environmental Management Act and the Municipal Wastewater Regulations.

This report is submitted as per Section 9.3.1 of the Ministry of Environment, Lands and Parks Operational Certificate ME 12215 for the City of Vernon Water Reclamation Centre (VWRC).

Under the provisions of the Operational Certificate, the Corporation of the City of Vernon is authorized to discharge reclaimed wastewater from the VWRC located at 2100 43rd Street, Vernon, B.C., to a water storage reservoir (MacKay Reservoir) and then to the ground by irrigation. The discharge of treated reclaimed water to Okanagan Lake via the deep lake outfall is only authorized when:

a) Unforeseen conditions or circumstances beyond the City's control prevent the City from pumping treated reclaimed water from the Vernon Water Reclamation Centre to MacKay Reservoir. Such conditions would include but not be limited to power outages, pump station or pipeline failures,

   Or;

b) The elevation in MacKay Reservoir exceeds 1935 feet above mean sea level and it is projected that the level of MacKay Reservoir will exceed 1939 feet above mean sea level prior to the start of the next irrigation season.

VWRC is further authorized to discharge biosolids sludge. Biosolids from the VWRC are processed by the Regional Compost Facility located at 551 Commonage Road, Vernon, B.C., into a Class A soil compost.

LIST OF ACRONYMS AND MEASUREMENT UNITS

BOD_5	5 day Biochemical Oxygen Demand (mg/L)
FC	Faecal Coliform (MPN/100ml)
L	liters
mg	milligrams
m3	cubic metres
MPN	most probable number
OC	Operating Certificate
OP	Ortho Phosphate (mg/L)
TN	Total Nitrogen (mg/L)
TP	Total Phosphorus (mg/L)
TSS	Total Suspended Solids (mg/L)
VWRC	Vernon Water Reclamation Centre

RECLAIMED WATER QUALITY REQUIREMENTS

Reclaimed water discharged from the VWRC to MacKay Reservoir to be used for irrigation may not exceed the following limits:

- 26 mg/L 5 day Biochemical Oxygen Demand (BOD_5) and
- 25 mg/L Total Suspended Solids (TSS)

Reclaimed water may be discharged from the VWRC to Okanagan Lake via the deep lake outfall if the quality is better than or equivalent to the following parameters:

- 10 mg/L 5 day Biochemical Oxygen Demand (BOD_5)
- 10 mg/L Total Suspended Solids(TSS)
- < 2.0 mg/L and an annual average of 0.25 mg/L (as P) Total Phosphorus (TP)
- 6.0 mg/L (as N) Total Nitrogen (TN)
- 50 MPN /100ml Faecal Coliform (FC)

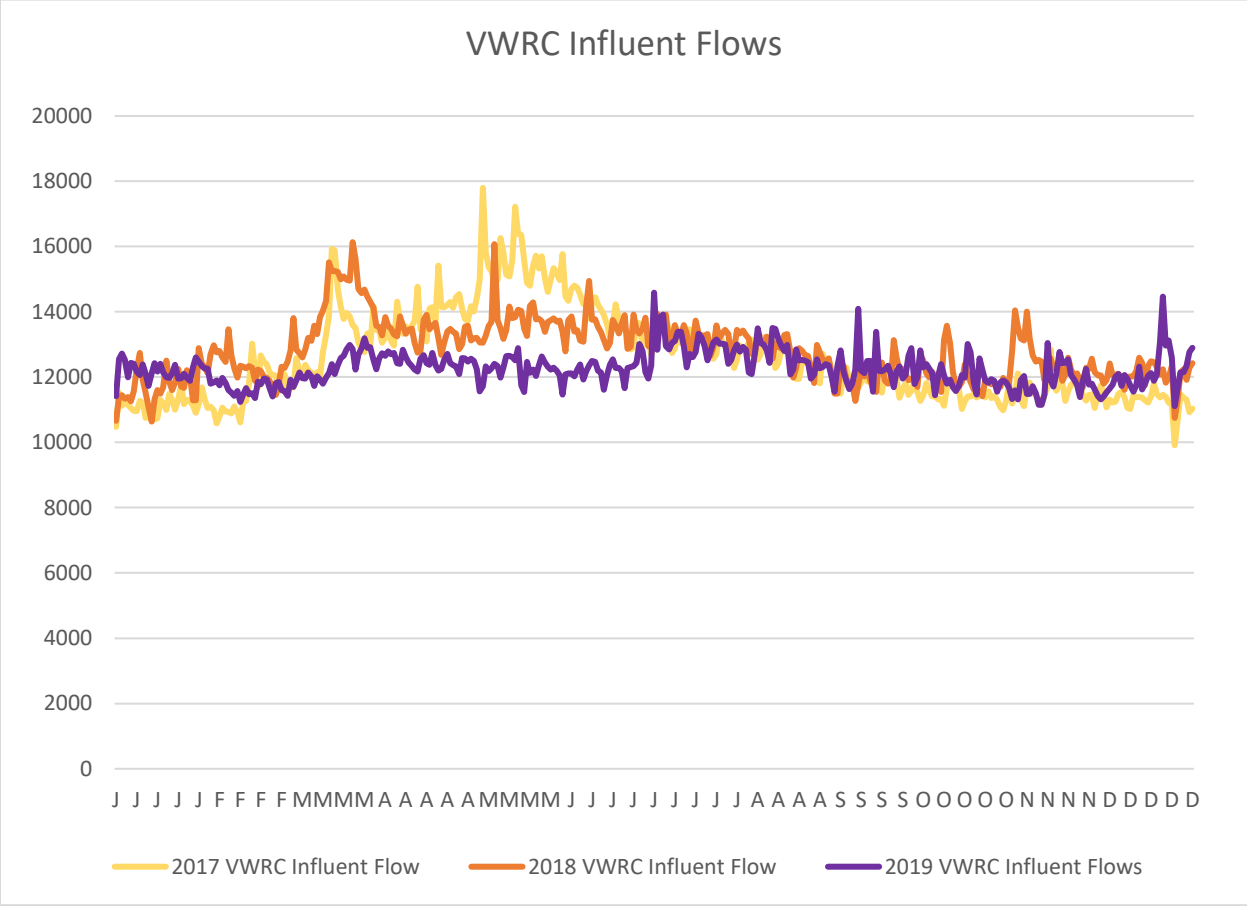
All the analytical requirements stipulated by the OC and reported in this annual report were conducted by Caro Analytical Labs in Kelowna, BC. The lab reports are attached in the appendices. Analysis data stipulated by the OC was downloaded to the MOE EMS site.

RECLAIMED WATER QUANTITY

The maximum authorized volume (according to the OC) of reclaimed water discharged from the VWRC, averaged on a monthly basis, for years after 2016 may be 28,100 cubic meters (m3) per day.

2019 RECLAIMED WATER DAILY FLOWS

The average monthly flow actually discharged from the VWRC in 2019 was 12,259 m3 per day with a maximum daily flow of 14,586 m3 occurring in July.
The total flow through the VWRC for the year was 4,474,358 m3 with a minimum monthly flow of 326,992 m3 occurring in February and the maximum monthly flow of 403,131 m3 occurring in July.
VWRC Influent flows are continuously monitored at the Headworks Parshall Flume.
The VWRC daily flow totals for the last three years are graphed in this figure.



SUMMARY OF 2019 VWRC MONITORING

VWRC Influent quality was monitored by collecting and testing twenty-four hour composite samples from the Headworks Parshall Flume.

VWRC Influent E228537													
2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
BOD_5	597	541	460	506	626	738	545	707	502	555	794	649	602
TSS	320	262	266	322	334	444	280	348	266	356	414	284	325
pH	6.7	6.8	6.8	6.2	6.5	6.3	7.5	6.5	6.6	6.5	6.2	6.1	6.55
Total Phosphorus	9.2	9.6	8.7	9.4	10.1	10.2	7.8	9.9	8.8	9.3	11.5	8.9	9.44
Total Nitrogen	52.2	61.5	55.3	56.5	67.4	62.9	56.0	67.3	51.6	59.5	70.3	64.3	60.4

TREATED EFFLUENT DISCHARGED FROM VWRC TO MACKAY RESERVOIR (EMS SITE E105004)

In 2019, all effluent discharged from VWRC was used as reclaimed water for irrigation.
The quality of VWRC treated effluent was monitored by analysis of twenty-four hour composite samples collected at the discharge of VWRC.
The VWRC Treated Effluent achieved 100% compliance to OC limits for pH, TSS and BOD_5 throughout 2019.

VWRC Treated Effluent to MacKay Reservoir E105004													
2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
BOD_5	6.8	10.2	14.9	11.8	4.3	3.8	4.6	4.7	4.7	3.5	6.0	1.8	6.4
TSS	6.7	7.2	7.0	8.4	2.2	3.8	2.4	5.0	2.9	4.3	< 2.0	< 4.0	5.0
pH	8.0	8.0	7.9	8.1	8.2	8.1	8.1	8.0	8.0	8.1	7.9	7.6	8.00
Total Phosphorus	0.31		0.41	0.47	0.39		0.23	0.26	0.40	0.26	0.26	0.22	0.32
Total Dissolved Phosphorus	0.15		0.35	0.17	0.35		0.17	0.20	0.34	0.19	0.20	0.17	0.23
Ortho Phosphorus	< 0.005		0.014	0.011	0.178		0.017	0.031	0.092	0.025	0.017	0.029	0.05
Total Nitrogen	4.27		6.08	5.95	5.97		6.78	5.90	5.46	4.90	5.03	4.21	5.46
Organic Nitrogen	2.09		2.58	2.56	1.82		1.44	1.63	1.62	1.40	1.45	1.24	1.78
Ammonia Nitrogen	0.07		0.52	0.09	0.18		0.14	0.12	0.08	0.07	0.06	0.08	0.14
Nitrate Nitrogen	2.07		2.74	3.10	3.82		5.18	4.15	3.70	3.42	3.51	2.86	3.46
Nitrite Nitrogen	0.04		0.24	0.19	0.14		0.02	< 0.01	0.05	0.02	0.01	0.03	0.08
Sodium	93.5		96.8	91.2	85.9		91.8	90.0	89.1	86.9	83.5	76.8	88.6
Chloride	84.5		84.2	79.1	73.0		80.5	77.7	79.8	73.8	76.4	87.5	79.7
Specific Conductivity	879		864	855	803		845	803	787	763	792	597	799

RECLAIMED WATER FROM MACKAY RESERVOIR AT CLAY VALVE #4 TO SPRAY IRRIGATION (EMS SITE E228539)

Reclaimed water withdrawn from MacKay Reservoir during the summer irrigation season (from May to September) was sampled and tested from Clay Valve #4 to be monitored for quality during this period. This sample site may be identified in the Caro reports as MacKay Reservoir Effluent (CV4).

Reclaimed Water from MacKay to Spray Irrigation E228539						
2019	May	Jun	Jul	Aug	Sep	Oct
BOD_5	< 8.0	< 6.1	< 7.5	< 8.0	< 6.6	< 6.3
TSS	2.2	2.0	< 2.0	< 2.0	< 2.0	2.2
pH	8.1	8.1	8.1	8.0	7.9	7.9
Total Phosphorus	0.64	0.73	1.03	1.11	1.10	1.12
Total Dissolved Phosphorus	0.60	0.69	0.98	1.07	1.09	1.02
Ortho Phosphorus	0.50	0.48	0.76	0.88	0.61	0.68
Total Nitrogen	2.51	2.58	2.73	2.51	2.09	2.44
Organic Nitrogen	0.98	0.90	0.94	1.01	0.99	1.52
Ammonia	0.61	0.64	0.80	0.88	1.01	0.90
Nitrate Nitrogen	0.91	1.03	0.96	0.42	0.05	0.03
Nitrite Nitrogen	0.01	0.02	0.03	0.20	0.04	< 0.01
Total Coliform Bacteria	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	4.5
Fecal Coliform Bacteria	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8

Reclaimed water pumped from MacKay Reservoir for irrigation is chlorinated (using Chlorine gas from tonners) prior to irrigation use. Weekly chlorine residual tests are conducted at Clay Valve #4 throughout the irrigation season and at all times the chlorine residual was at least 0.5 mg/L.

The water level of MacKay Reservoir is measured weekly during the irrigation season and monthly for the remainder of the year. In 2019, MacKay Reservoir high water level was 1937.01 feet above sea level at the start of the irrigation season and ended at 1928.75 feet at the end of the season.

TREATED EFFLUENT TO DIRECT SPRAY IRRIGATION (EMS SITE E229578)

During irrigation season, the sand filters and Ultra-Violet lights are utilized to ensure disinfection of VWRC reclaimed effluent being used for direct irrigation at the Rise golf course. In addition, this Treated Effluent supplied directly from VWRC is chlorinated with Sodium Hypochlorite before it is used for irrigation by the golf course.
Samples of the Treated Effluent were collected and analyzed during the irrigation season.

VWRC Treated Effluent to Direct Spray Irrigation E229578					
2019	8-May	21-Jun	18-Jul	9-Aug	4-Sep
BOD_5	< 2.0	2.7	2.3	< 1.2	< 1.1
TSS	< 4.0	< 4.0	< 2.0	< 2.0	2.0
pH	6.75	7.86	7.83	7.78	7.71
Turbidity	0.91	1.83	2.18	1.40	0.58
Total Coliform Bacteria	< 1.8	4.5	< 1.8	< 1.8	< 1.8
Fecal Coliform Bacteria	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8

The volume of Treated Effluent discharged from the VWRC for direct irrigation to the Rise golf course was monitored on a weekly basis. The total volume of direct irrigation in 2019 was 70,710 m3.

BAILEY SPRINGS (EMS SITE 0500578)

Bailey Springs (monitoring program) 0500578													
2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
pH	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.4
Total Phosphorus	0.16	0.10	0.31	0.16	0.16	0.16	0.18	0.19	0.21	0.19	0.16	0.13	0.17
Total Dissolved Phosphorus	0.12	0.10	0.13	0.12	0.12	0.12	0.15	0.14	0.17	0.15	0.12	0.12	0.13
Ortho Phosphorus	0.07	0.05	0.08	0.08	0.08	0.06	0.09	0.09	0.08	0.06	0.04	0.06	0.07
Total Nitrogen	0.87	1.00	2.25	1.22	0.89	0.85	1.06	0.99	1.05	0.90	0.71	0.79	1.05
Organic Nitrogen	0.47	0.44	1.09	0.65	0.57	0.65	0.94	0.88	0.91	0.67	0.55	0.46	0.69
Ammonia Nitrogen	0.04	0.04	0.19	0.03	0.07	0.10	0.07	0.09	0.12	0.17	0.07	0.13	0.09
Nitrate Nitrogen	0.36	0.53	0.98	0.54	0.25	0.10	0.05	0.02	0.02	0.06	0.09	0.20	0.27
Nitrite Nitrogen	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Sodium	112	120	123	114	117	116	117	127	128	134	126	335	139
Chloride	123	135	129	122	112	121	123	130	128	124	121	133	125
Specific Conductivity	1220	1270	1260	1180	1140	1150	1210	1180	1230	1200	1220	1230	1208
Total Coliform Bacteria	200	22	65	9	> 1400	> 970	>>	> 5500	16000	3800	1120	1550	
Fecal Coliform Bacteria	8	8	1	< 1	10	29	400	700	360	46	1	3	142

GENERAL REGULATORY REQUIREMENTS

FACILITY CLASSIFICATION AND OPERATOR CERTIFICATION

The VWRC maintained its designation as a Level IV facility with the Environmental Operator's Certification Program (EOCP). The facility continues to operate as a BNR plant, with no changes in process over the 2019 year. Sand filtration followed by UV disinfection and Chlorination at point of use is utilized during irrigation season for direct irrigation as required by the OC.
All of the VWRC operators are certified by the EOCP.

Water Reclamation Centre Staffing

Chief Operator IV	Serge Kozin
Operator III	Mark Hawthorne
Operator III	Kevin Holman
Operator II	Nick Morrison
Operator III	Ryan Powell
Operator II	Rob Morris
Operator I	Amanda Summerfelt
Operator I	Dustan Hoff
Operator I (Reclaimed)	Derek Anderson
Operator I (Reclaimed)	David McGean
Instrument Tech	Darren Roesler
Instrument Tech	Trevor Schikowski
Lab Technician	Hedy Brouwer

SANITARY SEWER USE BYLAW

The City of Vernon Sanitary Sewer Use Bylaw (#4863) can be viewed on the City of Vernon's webpage.

OPERATIONS MANUAL AND MAINTENANCE PROGRAM

An Operations Manual and Maintenance Program continued to be used during 2019 including a software program to track maintenance and streamline operations.

CONTINGENCY PLAN FOR EMERGENCIES

An Emergency Response Manual for the staff of the VWRC to refer to in the case of emergencies.

BIOSOLIDS MANAGEMENT

Bio-solids discharged from the VWRC were processed into a soil conditioner with a Class A classification (in partnership between the City of Kelowna and City of Vernon) at the Regional Compost Facility on Commonage Road in Vernon.

SPRAY IRRIGATION - GROUNDWATER MONITORING STUDY

As mandated by the City of Vernon's operating certificate, the annual groundwater study has been completed by Associated Environmental Consultants Inc. and is attached in the appendices of this report.

IRRIGATION AREA SITE PLAN

The site plans of the spray irrigation areas can be viewed in the appendices.

LIQUID WASTE MANAGEMENT

Reclaimed water discharged by the VWRC continues to be pumped to MacKay reservoir for storage and re-use, but there is potential for discharge to Okanagan Lake in the event of a power or pump system failure. In addition, if levels in the reservoir become un-manageable, then periodic discharges to Okanagan Lake are possible.

APPENDICES

Caro Analytical Lab Test Reports
Site Plan of Spray Irrigation (North areas)
Site Plan of Spray Irrigation (South areas)
Reclaimed Water Irrigation 2019 Groundwater Monitoring Program

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9010721
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-01-17 13:10

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9010721-01) | Matrix: Wastewater | Sampled: 2019-01-09 00:00 To 2019-01-10 00:00					
Anions					
Nitrate (as N)	< 0.010	0.010	mg/L	2019-01-16	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-01-16	HT1
Calculated Parameters					
Nitrate+Nitrite (as N)	< 0.0100	0.0100	mg/L	N/A	
Nitrogen, Total	**52.2**	2.00	mg/L	N/A	
General Parameters					
BOD, 5-day	**597**	2.0	mg/L	2019-01-15	
Nitrogen, Total Kjeldahl	**52.2**	0.050	mg/L	2019-01-11	
pH	**6.72**	0.10	pH units	2019-01-14	HT2
Phosphorus, Total (as P)	**9.21**	0.0020	mg/L	2019-01-12	
Solids, Total Suspended	**320**	2.0	mg/L	2019-01-14	

Sample Qualifiers:

HT1	The sample was prepared and/or analyzed past the recommended holding time.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9021004
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-02-22 15:27

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9021004-02) | Matrix: Wastewater | Sampled: 2019-02-14 00:00 To 2019-02-15 00:00					
Anions					
Nitrate (as N)	< 0.010	0.010	mg/L	2019-02-16	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-02-16	
Calculated Parameters					
Nitrate+Nitrite (as N)	< 0.0100	0.0100	mg/L	N/A	
Nitrogen, Total	**61.5**	2.00	mg/L	N/A	
General Parameters					
BOD, 5-day	**541**	2.0	mg/L	2019-02-20	
Nitrogen, Total Kjeldahl	**61.5**	0.050	mg/L	2019-02-19	
pH	**6.84**	0.10	pH units	2019-02-20	HT2
Phosphorus, Total (as P)	**9.57**	0.0020	mg/L	2019-02-21	
Solids, Total Suspended	**262**	2.0	mg/L	2019-02-20	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9030541
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-03-13 17:16

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9030541-01) | Matrix: Wastewater | Sampled: 2019-03-06 00:00 To 2019-03-07 00:00					
Anions					
Nitrate (as N)	< 0.010	0.010	mg/L	2019-03-08	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-03-08	
Calculated Parameters					
Nitrate+Nitrite (as N)	< 0.0100	0.0100	mg/L	N/A	
Nitrogen, Total	**55.3**	2.00	mg/L	N/A	
General Parameters					
BOD, 5-day	**460**	2.0	mg/L	2019-03-13	
Nitrogen, Total Kjeldahl	**55.3**	0.050	mg/L	2019-03-10	
pH	**6.82**	0.10	pH units	2019-03-08	HT2
Phosphorus, Total (as P)	**8.74**	0.0020	mg/L	2019-03-11	
Solids, Total Suspended	**266**	2.0	mg/L	2019-03-12	

Sample Qualifiers:

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

CARO
ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9040494
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-04-12 16:09

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9040494-01) | Matrix: Wastewater | Sampled: 2019-04-02 00:00 To 2019-04-03 00:00					
Anions					
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-05	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-05	
Calculated Parameters					
Nitrate+Nitrite (as N)	< 0.0100	0.0100	mg/L	N/A	
Nitrogen, Total	**56.5**	2.00	mg/L	N/A	
General Parameters					
BOD, 5-day	**506**	2.0	mg/L	2019-04-10	
Nitrogen, Total Kjeldahl	**56.5**	0.050	mg/L	2019-04-12	
pH	**6.18**	0.10	pH units	2019-04-09	HT2
Phosphorus, Total (as P)	**9.37**	0.0020	mg/L	2019-04-12	
Solids, Total Suspended	**322**	2.0	mg/L	2019-04-08	

Sample Qualifiers:

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

CARO
ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9051012
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-05-17 15:35

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9051012-01) | Matrix: Wastewater | Sampled: 2019-05-08 00:00 To 2019-05-09 00:00					
Anions					
Nitrate (as N)	< 0.010	0.010	mg/L	2019-05-14	HT1
Nitrite (as N)	**0.042**	0.010	mg/L	2019-05-14	HT1
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0418**	0.0100	mg/L	N/A	
Nitrogen, Total	**67.4**	2.00	mg/L	N/A	
General Parameters					
BOD, 5-day	**626**	2.0	mg/L	2019-05-15	
Nitrogen, Total Kjeldahl	**67.4**	0.050	mg/L	2019-05-14	
pH	**6.45**	0.10	pH units	2019-05-16	HT2
Phosphorus, Total (as P)	**10.1**	0.0020	mg/L	2019-05-13	
Solids, Total Suspended	**334**	2.0	mg/L	2019-05-15	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9062973
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-07-07 13:07

Analyte	Result	Uncertainty	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9062973-03) | Matrix: Wastewater | Sampled: 2019-06-27 00:00 To 2019-06-28 00:00						
Anions						
Nitrate (as N)	< 0.010		0.010	mg/L	2019-06-29	
Nitrite (as N)	**0.012**	± 0.002	0.010	mg/L	2019-06-29	
Calculated Parameters						
Nitrate+Nitrite (as N)	**0.0125**		0.0100	mg/L	N/A	
Nitrogen, Total	**62.9**		2.00	mg/L	N/A	
General Parameters						
BOD, 5-day	**738**	± 154	2.0	mg/L	2019-07-03	
Nitrogen, Total Kjeldahl	**62.9**	± 7.9	0.050	mg/L	2019-07-03	
pH	**6.34**	± 0.02	0.10	pH units	2019-07-03	HT2
Phosphorus, Total (as P)	**10.2**	± 1.1	0.0020	mg/L	2019-07-02	
Solids, Total Suspended	**444**	± 35	2.0	mg/L	2019-07-03	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9071239
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-07-17 17:43

Analyte	Result	Uncertainty	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9071239-01) | Matrix: Wastewater | Sampled: 2019-07-10 00:00 To 2019-07-11 00:00						
Anions						
Nitrate (as N)	< 0.010		0.010	mg/L	2019-07-12	
Nitrite (as N)	< 0.010		0.010	mg/L	2019-07-12	
Calculated Parameters						
Nitrate+Nitrite (as N)	< 0.0100		0.0100	mg/L	N/A	
Nitrogen, Total	**56.0**		2.00	mg/L	N/A	
General Parameters						
BOD, 5-day	**545**	± 121	2.0	mg/L	2019-07-17	
Nitrogen, Total Kjeldahl	**56.0**	± 7.1	0.050	mg/L	2019-07-17	
pH	**7.52**	± 0.02	0.10	pH units	2019-07-12	HT2
Phosphorus, Total (as P)	**7.75**	± 0.86	0.0020	mg/L	2019-07-17	
Solids, Total Suspended	**280**	± 28	2.0	mg/L	2019-07-16	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9081394
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-08-22 10:14

Analyte	Result	Uncertainty	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9081394-01) | Matrix: Wastewater | Sampled: 2019-08-13 00:00 To 2019-08-14 00:00						
Anions						
Nitrate (as N)	< 0.010		0.010	mg/L	2019-08-17	
Nitrite (as N)	< 0.010		0.010	mg/L	2019-08-17	
Calculated Parameters						
Nitrate+Nitrite (as N)	< 0.0100		0.0100	mg/L	N/A	
Nitrogen, Total	**67.3**		2.00	mg/L	N/A	
General Parameters						
BOD, 5-day	**707**	± 155	2.0	mg/L	2019-08-21	
Nitrogen, Total Kjeldahl	**67.3**	± 8.5	0.050	mg/L	2019-08-19	
pH	**6.45**	± 0.02	0.10	pH units	2019-08-19	HT2
Phosphorus, Total (as P)	**9.91**	± 1.10	0.0020	mg/L	2019-08-18	
Solids, Total Suspended	**348**	± 28	2.0	mg/L	2019-08-20	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9090395
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-09-11 15:41

Analyte	Result	Uncertainty	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9090395-01) | Matrix: Wastewater | Sampled: 2019-09-02 00:00 To 2019-09-03 00:00						
Anions						
Nitrate (as N)	< 0.010		0.010	mg/L	2019-09-06	
Nitrite (as N)	< 0.010		0.010	mg/L	2019-09-06	
Calculated Parameters						
Nitrate+Nitrite (as N)	< 0.0100		0.0100	mg/L	N/A	
Nitrogen, Total	**51.6**		2.00	mg/L	N/A	
General Parameters						
BOD, 5-day	**502**	± 116	2.0	mg/L	2019-09-11	
Nitrogen, Total Kjeldahl	**51.6**	± 6.6	0.050	mg/L	2019-09-08	
pH	**6.58**	± 0.02	0.10	pH units	2019-09-11	HT2
Phosphorus, Total (as P)	**8.80**	± 0.98	0.0020	mg/L	2019-09-08	
Solids, Total Suspended	**266**	± 22	2.0	mg/L	2019-09-09	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9100434
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-10-10 15:49

Analyte	Result	Uncertainty	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9100434-01) | Matrix: Wastewater | Sampled: 2019-10-02 00:00 To 2019-10-03 00:00						
Anions						
Nitrate (as N)	< 0.010		0.010	mg/L	2019-10-05	
Nitrite (as N)	< 0.010		0.010	mg/L	2019-10-05	
Calculated Parameters						
Nitrate+Nitrite (as N)	< 0.0100		0.0100	mg/L	N/A	
Nitrogen, Total	**59.5**		2.00	mg/L	N/A	
General Parameters						
BOD, 5-day	**555**	± 114	2.0	mg/L	2019-10-09	
Nitrogen, Total Kjeldahl	**59.5**	± 7.5	0.050	mg/L	2019-10-08	
pH	**6.49**	± 0.02	0.10	pH units	2019-10-07	HT2
Phosphorus, Total (as P)	**9.27**	± 1.03	0.0020	mg/L	2019-10-07	
Solids, Total Suspended	**356**	± 33	2.0	mg/L	2019-10-09	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	N001207
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-11-19 16:18

Analyte	Result	Uncertainty	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (N001207-01) | Matrix: Wastewater | Sampled: 2019-11-05 00:00 To 2019-11-06 00:00						
Anions						
Nitrate (as N)	< 0.010		0.010	mg/L	2019-11-07	
Nitrite (as N)	< 0.010		0.010	mg/L	2019-11-07	
Calculated Parameters						
Nitrate+Nitrite (as N)	< 0.0100		0.0100	mg/L	N/A	
Nitrogen, Total	**70.3**		2.00	mg/L	N/A	
General Parameters						
BOD, 5-day	**794**	± 161	2.0	mg/L	2019-11-13	
Nitrogen, Total Kjeldahl	**70.3**	± 8.8	0.050	mg/L	2019-11-13	
pH	**6.21**	± 0.02	0.10	pH units	2019-11-14	HT2
Phosphorus, Total (as P)	**11.5**	± 1.3	0.0020	mg/L	2019-11-11	
Solids, Total Suspended	**414**	± 33	2.0	mg/L	2019-11-14	HT1

Sample Qualifiers:

HT1	The sample was prepared and/or analyzed past the recommended holding time.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9120473
PROJECT	Influent (ME12215) - EMS	**REPORTED**	2019-12-12 19:19

Analyte	Result	Uncertainty	RL	Units	Analyzed	Qualifier
VWRC Influent (24hr Comp.) E228537 (9120473-01) | Matrix: Wastewater | Sampled: 2019-12-03 00:00 To 2019-12-04 00:00						
Anions						
Nitrate (as N)	< 0.010		0.010	mg/L	2019-12-07	
Nitrite (as N)	**0.016**	± 0.003	0.010	mg/L	2019-12-07	
Calculated Parameters						
Nitrate+Nitrite (as N)	**0.0159**		0.0100	mg/L	N/A	
Nitrogen, Total	**64.3**		2.00	mg/L	N/A	
General Parameters						
BOD, 5-day	**649**	± 134	2.0	mg/L	2019-12-11	
Nitrogen, Total Kjeldahl	**64.3**	± 8.1	0.050	mg/L	2019-12-10	
pH	**6.05**	± 0.02	0.10	pH units	2019-12-12	HT2
Phosphorus, Total (as P)	**8.89**	± 0.99	0.0020	mg/L	2019-12-11	
Solids, Total Suspended	**284**	± 23	2.0	mg/L	2019-12-10	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9011356
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-01-24 16:30

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9011356-01) | Matrix: Wastewater | Sampled: 2019-01-16 00:00 To 2019-01-17 00:00					FILT, PRES
Anions					
Chloride	**84.5**	0.10	mg/L	2019-01-20	
Nitrate (as N)	**2.07**	0.010	mg/L	2019-01-20	
Nitrite (as N)	**0.040**	0.010	mg/L	2019-01-20	
Phosphate (as P)	< 0.0050	0.0050	mg/L	2019-01-19	
Calculated Parameters					
Nitrate+Nitrite (as N)	**2.11**	0.0100	mg/L	N/A	
Nitrogen, Total	**4.27**	0.100	mg/L	N/A	
Nitrogen, Organic	**2.09**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.067**	0.020	mg/L	2019-01-21	
BOD, 5-day	**6.8**	2.0	mg/L	2019-01-23	
Conductivity (EC)	**879**	2.0	µS/cm	2019-01-18	
Nitrogen, Total Kjeldahl	**2.16**	0.050	mg/L	2019-01-20	
pH	**7.99**	0.10	pH units	2019-01-18	HT2
Phosphorus, Total (as P)	**0.308**	0.0020	mg/L	2019-01-21	
Phosphorus, Total Dissolved	**0.146**	0.0020	mg/L	2019-01-21	
Solids, Total Suspended	**6.7**	2.0	mg/L	2019-01-22	
Total Metals					
Sodium, total	**93.5**	0.10	mg/L	2019-01-24	

Sample Qualifiers:

FILT	The sample has been filtered for DP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for DP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9021513
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-03-01 10:31

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9021513-01) | Matrix: Wastewater | Sampled: 2019-02-21 00:00 To 2019-02-22 00:00					FILT, PRES
Anions					
Chloride	**93.2**	0.10	mg/L	2019-02-23	
Nitrate (as N)	**3.27**	0.010	mg/L	2019-02-24	
Nitrite (as N)	**0.181**	0.010	mg/L	2019-02-24	
Phosphate (as P)	**0.0091**	0.0050	mg/L	2019-02-24	
Calculated Parameters					
Nitrate+Nitrite (as N)	**3.45**	0.0100	mg/L	N/A	
Nitrogen, Total	**6.41**	0.100	mg/L	N/A	
Nitrogen, Organic	**2.24**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.728**	0.020	mg/L	2019-02-26	
BOD, 5-day	**10.2**	2.0	mg/L	2019-02-27	
Conductivity (EC)	**896**	2.0	µS/cm	2019-02-23	
Nitrogen, Total Kjeldahl	**2.96**	0.050	mg/L	2019-02-27	
pH	**8.02**	0.10	pH units	2019-02-23	HT2
Phosphorus, Total (as P)	**0.394**	0.0020	mg/L	2019-02-27	
Phosphorus, Total Dissolved	**0.189**	0.0020	mg/L	2019-02-27	
Solids, Total Suspended	**7.2**	2.0	mg/L	2019-02-28	
Total Metals					
Sodium, total	**100**	0.10	mg/L	2019-02-27	

Sample Qualifiers:

FILT	The sample has been filtered for DP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for DP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9031745
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-03-28 16:09

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9031745-01) | Matrix: Wastewater | Sampled: 2019-03-19 00:00 To 2019-03-20 00:00					
Anions					
Chloride	**84.2**	0.10	mg/L	2019-03-22	
Nitrate (as N)	**2.74**	0.010	mg/L	2019-03-22	
Nitrite (as N)	**0.242**	0.010	mg/L	2019-03-22	
Phosphate (as P)	**0.0138**	0.0050	mg/L	2019-03-22	
Calculated Parameters					
Nitrate+Nitrite (as N)	**2.98**	0.0100	mg/L	N/A	
Nitrogen, Total	**6.08**	0.200	mg/L	N/A	
Nitrogen, Organic	**2.58**	0.200	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.518**	0.020	mg/L	2019-03-25	
BOD, 5-day	**14.9**	2.0	mg/L	2019-03-27	
Conductivity (EC)	**864**	2.0	µS/cm	2019-03-25	
Nitrogen, Total Kjeldahl	**3.10**	0.050	mg/L	2019-03-25	
pH	**7.93**	0.10	pH units	2019-03-25	HT2
Phosphorus, Total (as P)	**0.406**	0.0020	mg/L	2019-03-24	
Phosphorus, Total Dissolved	**0.347**	0.0020	mg/L	2019-03-24	
Solids, Total Suspended	**7.0**	2.0	mg/L	2019-03-26	
Total Metals					
Sodium, total	**96.8**	0.10	mg/L	2019-03-28	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9040489
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-04-11 13:14

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9040489-02) | Matrix: Wastewater | Sampled: 2019-04-03 00:00 To 2019-04-04 00:00					FILT, PRES
Anions					
Chloride	**79.1**	0.10	mg/L	2019-04-05	
Nitrate (as N)	**3.10**	0.010	mg/L	2019-04-05	
Nitrite (as N)	**0.190**	0.010	mg/L	2019-04-05	
Phosphate (as P)	**0.0112**	0.0050	mg/L	2019-04-05	
Calculated Parameters					
Nitrate+Nitrite (as N)	**3.29**	0.0100	mg/L	N/A	
Nitrogen, Total	**5.95**	0.100	mg/L	N/A	
Nitrogen, Organic	**2.56**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.093**	0.020	mg/L	2019-04-08	
BOD, 5-day	**11.8**	2.0	mg/L	2019-04-10	
Conductivity (EC)	**855**	2.0	µS/cm	2019-04-06	
Nitrogen, Total Kjeldahl	**2.66**	0.050	mg/L	2019-04-06	
pH	**8.07**	0.10	pH units	2019-04-06	HT2
Phosphorus, Total (as P)	**0.472**	0.0020	mg/L	2019-04-09	
Phosphorus, Total Dissolved	**0.174**	0.0020	mg/L	2019-04-09	
Solids, Total Suspended	**8.4**	2.0	mg/L	2019-04-10	
Total Metals					
Sodium, total	**91.2**	0.10	mg/L	2019-04-11	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9051013
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-05-21 10:20

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9051013-01) | Matrix: Wastewater | Sampled: 2019-05-09 00:00 To 2019-05-10 00:00					FILT, PRES
Anions					
Chloride	**73.0**	0.10	mg/L	2019-05-18	
Nitrate (as N)	**3.82**	0.010	mg/L	2019-05-18	HT1
Nitrite (as N)	**0.142**	0.010	mg/L	2019-05-18	HT1
Phosphate (as P)	**0.178**	0.0050	mg/L	2019-05-18	HT1
Calculated Parameters					
Nitrate+Nitrite (as N)	**3.96**	0.0100	mg/L	N/A	
Nitrogen, Total	**5.97**	0.100	mg/L	N/A	
Nitrogen, Organic	**1.82**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.184**	0.020	mg/L	2019-05-16	
BOD, 5-day	**4.3**	2.0	mg/L	2019-05-15	
Conductivity (EC)	**803**	2.0	µS/cm	2019-05-16	
Nitrogen, Total Kjeldahl	**2.01**	0.050	mg/L	2019-05-14	
pH	**8.22**	0.10	pH units	2019-05-16	HT2
Phosphorus, Total (as P)	**0.386**	0.0020	mg/L	2019-05-13	
Phosphorus, Total Dissolved	**0.352**	0.0020	mg/L	2019-05-13	
Solids, Total Suspended	**2.2**	2.0	mg/L	2019-05-15	
Total Metals					
Sodium, total	**85.9**	0.10	mg/L	2019-05-16	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT1	The sample was prepared and/or analyzed past the recommended holding time.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9060727
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-06-17 18:17

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9060727-01) | Matrix: Wastewater | Sampled: 2019-06-06 00:00 To 2019-06-07 00:00					
Anions					
Chloride	**81.4**	0.10	mg/L	2019-06-08	
Nitrate (as N)	**4.78**	0.010	mg/L	2019-06-08	
Nitrite (as N)	**0.092**	0.010	mg/L	2019-06-08	
Phosphate (as P)	**1.12**	0.0050	mg/L	2019-06-08	
Calculated Parameters					
Nitrate+Nitrite (as N)	**4.87**	0.0100	mg/L	N/A	
Nitrogen, Total	**6.87**	0.100	mg/L	N/A	
Nitrogen, Organic	**1.72**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.271**	0.020	mg/L	2019-06-11	
BOD, 5-day	**3.8**	2.0	mg/L	2019-06-12	
Conductivity (EC)	**854**	2.0	µS/cm	2019-06-10	
Nitrogen, Total Kjeldahl	**2.00**	0.050	mg/L	2019-06-13	
pH	**8.06**	0.10	pH units	2019-06-10	HT2
Phosphorus, Total (as P)	**1.70**	0.0020	mg/L	2019-06-14	
Phosphorus, Total Dissolved	**1.58**	0.0020	mg/L	2019-06-14	
Solids, Total Suspended	**3.8**	2.0	mg/L	2019-06-12	
Total Metals					
Sodium, total	**111**	0.10	mg/L	2019-06-15	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9072754
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-08-06 09:11

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9072754-01) | Matrix: Wastewater | Sampled: 2019-07-25 00:00 To 2019-07-26 00:00					FILT, PRES
Anions					
Chloride	**80.5**	0.10	mg/L	2019-07-28	
Nitrate (as N)	**5.18**	0.010	mg/L	2019-07-28	
Nitrite (as N)	**0.023**	0.010	mg/L	2019-07-28	
Phosphate (as P)	**0.0173**	0.0050	mg/L	2019-07-28	
Calculated Parameters					
Nitrate+Nitrite (as N)	**5.20**	0.0100	mg/L	N/A	
Nitrogen, Total	**6.78**	0.100	mg/L	N/A	
Nitrogen, Organic	**1.44**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.138**	0.020	mg/L	2019-07-29	
BOD, 5-day	**4.6**	2.0	mg/L	2019-07-31	
Conductivity (EC)	**845**	2.0	µS/cm	2019-07-30	
Nitrogen, Total Kjeldahl	**1.58**	0.050	mg/L	2019-07-31	
pH	**8.08**	0.10	pH units	2019-07-30	HT2
Phosphorus, Total (as P)	**0.227**	0.0020	mg/L	2019-07-31	
Phosphorus, Total Dissolved	**0.171**	0.0020	mg/L	2019-07-31	
Solids, Total Suspended	**2.4**	2.0	mg/L	2019-07-30	
Total Metals					
Sodium, total	**91.8**	0.10	mg/L	2019-08-03	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9082856
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-09-11 13:54

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9082856-01) | Matrix: Wastewater | Sampled: 2019-08-28 00:00 To 2019-08-29 00:00					FILT, PRES
Anions					
Chloride	**77.7**	0.10	mg/L	2019-08-30	
Nitrate (as N)	**4.15**	0.010	mg/L	2019-08-30	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-08-30	
Phosphate (as P)	**0.0305**	0.0050	mg/L	2019-08-30	
Calculated Parameters					
Nitrate+Nitrite (as N)	**4.15**	0.0100	mg/L	N/A	
Nitrogen, Total	**5.90**	0.0500	mg/L	N/A	
Nitrogen, Organic	**1.63**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.122**	0.020	mg/L	2019-08-30	
BOD, 5-day	**4.7**	2.0	mg/L	2019-09-04	
Conductivity (EC)	**803**	2.0	µS/cm	2019-08-30	
Nitrogen, Total Kjeldahl	**1.75**	0.050	mg/L	2019-08-31	
pH	**7.97**	0.10	pH units	2019-08-30	HT2
Phosphorus, Total (as P)	**0.260**	0.0020	mg/L	2019-09-05	
Phosphorus, Total Dissolved	**0.200**	0.0020	mg/L	2019-09-05	
Solids, Total Suspended	**5.0**	2.0	mg/L	2019-08-30	
Total Metals					
Sodium, total	**90.0**	0.10	mg/L	2019-08-31	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9092071
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-09-30 13:52

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9092071-02) | Matrix: Wastewater | Sampled: 2019-09-19 00:00 To 2019-09-20 00:00					FILT, PRES
Anions					
Chloride	**79.8**	0.10	mg/L	2019-09-22	
Nitrate (as N)	**3.70**	0.010	mg/L	2019-09-22	
Nitrite (as N)	**0.045**	0.010	mg/L	2019-09-22	
Phosphate (as P)	**0.0915**	0.0050	mg/L	2019-09-22	
Calculated Parameters					
Nitrate+Nitrite (as N)	**3.75**	0.0100	mg/L	N/A	
Nitrogen, Total	**5.46**	0.0500	mg/L	N/A	
Nitrogen, Organic	**1.62**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.084**	0.020	mg/L	2019-09-23	
BOD, 5-day	**4.7**	2.0	mg/L	2019-09-26	
Conductivity (EC)	**787**	2.0	µS/cm	2019-09-23	
Nitrogen, Total Kjeldahl	**1.70**	0.050	mg/L	2019-09-25	
pH	**7.98**	0.10	pH units	2019-09-23	HT2
Phosphorus, Total (as P)	**0.399**	0.0020	mg/L	2019-09-22	
Phosphorus, Total Dissolved	**0.341**	0.0020	mg/L	2019-09-22	
Solids, Total Suspended	**2.9**	2.0	mg/L	2019-09-26	
Total Metals					
Sodium, total	**89.1**	0.10	mg/L	2019-09-28	

Sample Qualifiers:

FILT	The sample has been filtered for TdP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TdP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	N000602
PROJECT	Final Filtered Effluent	**REPORTED**	2019-11-25 17:08

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Treated Effluent (FTE) (E105004) (N000602-01) | Matrix: Water | Sampled: 2019-10-30 00:00 To 2019-10-31 00:00					
Anions					
Chloride	**73.8**	0.10	mg/L	2019-11-01	
Nitrate (as N)	**3.42**	0.010	mg/L	2019-11-01	
Nitrite (as N)	**0.017**	0.010	mg/L	2019-11-01	
Phosphate (as P)	**0.0248**	0.0050	mg/L	2019-11-01	
Calculated Parameters					
Nitrate+Nitrite (as N)	**3.44**	0.0100	mg/L	N/A	
Nitrogen, Total	**4.90**	0.0500	mg/L	N/A	
Nitrogen, Organic	**1.40**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.067**	0.020	mg/L	2019-11-01	
BOD, 5-day	**3.5**	2.0	mg/L	2019-11-06	
Conductivity (EC)	**763**	2.0	µS/cm	2019-11-05	
Nitrogen, Total Kjeldahl	**1.46**	0.050	mg/L	2019-11-03	
pH	**8.10**	0.10	pH units	2019-11-05	HT2
Phosphorus, Total (as P)	**0.262**	0.0020	mg/L	2019-11-03	
Phosphorus, Total Dissolved	**0.192**	0.0020	mg/L	2019-11-03	
Solids, Total Suspended	**4.3**	2.0	mg/L	2019-11-05	
Total Metals					
Sodium, total	**86.9**	0.10	mg/L	2019-11-09	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	N001202
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-11-19 16:16

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (N001202-02) | Matrix: Wastewater | Sampled: 2019-11-06 00:00 To 2019-11-07 00:00					
Anions					
Chloride	**76.4**	0.10	mg/L	2019-11-13	
Nitrate (as N)	**3.51**	0.010	mg/L	2019-11-08	
Nitrite (as N)	**0.012**	0.010	mg/L	2019-11-08	
Phosphate (as P)	**0.0174**	0.0050	mg/L	2019-11-08	
Calculated Parameters					
Nitrate+Nitrite (as N)	**3.53**	0.0100	mg/L	N/A	
Nitrogen, Total	**5.03**	0.100	mg/L	N/A	
Nitrogen, Organic	**1.45**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.057**	0.020	mg/L	2019-11-12	
BOD, 5-day	**6.0**	2.0	mg/L	2019-11-13	
Conductivity (EC)	**792**	2.0	µS/cm	2019-11-14	
Nitrogen, Total Kjeldahl	**1.50**	0.050	mg/L	2019-11-13	
pH	**7.94**	0.10	pH units	2019-11-14	HT2
Phosphorus, Total (as P)	**0.261**	0.0020	mg/L	2019-11-11	
Phosphorus, Total Dissolved	**0.204**	0.0020	mg/L	2019-11-11	
Solids, Total Suspended	< 2.0	2.0	mg/L	2019-11-14	
Total Metals					
Sodium, total	**83.5**	0.10	mg/L	2019-11-16	

Sample Qualifiers:

HT1	The sample was prepared and/or analyzed past the recommended holding time.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9121171
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-12-23 15:41

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Final Treated Effluent - 24hr Comp. - E105004 (9121171-02) | Matrix: Wastewater | Sampled: 2019-12-11 00:00 To 2019-12-12 00:00					FILT, PRES
Anions					
Chloride	**87.5**	0.10	mg/L	2019-12-14	
Nitrate (as N)	**2.86**	0.010	mg/L	2019-12-14	
Nitrite (as N)	**0.032**	0.010	mg/L	2019-12-14	
Phosphate (as P)	**0.0289**	0.0050	mg/L	2019-12-14	
Calculated Parameters					
Nitrate+Nitrite (as N)	**2.89**	0.0100	mg/L	N/A	
Nitrogen, Total	**4.21**	0.0500	mg/L	N/A	
Nitrogen, Organic	**1.24**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.079**	0.020	mg/L	2019-12-16	
BOD, 5-day	**1.8**	2.0	mg/L	2019-12-18	
Conductivity (EC)	**597**	2.0	µS/cm	2019-12-17	
Nitrogen, Total Kjeldahl	**1.32**	0.050	mg/L	2019-12-17	
pH	**7.61**	0.10	pH units	2019-12-17	HT2
Phosphorus, Total (as P)	**0.215**	0.0020	mg/L	2019-12-14	
Phosphorus, Total Dissolved	**0.166**	0.0020	mg/L	2019-12-14	
Solids, Total Suspended	**< 4.0**	2.0	mg/L	2019-12-18	
Total Metals					
Sodium, total	**76.8**	0.10	mg/L	2019-12-21	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9050901
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-05-15 12:27

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Treated Effluent (to Direct Irrigation - FFE) Grab - E229578 (9050901-01) | Matrix: Wastewater | Sampled: 2019-05-08 10:30					
General Parameters					
BOD, 5-day	< 2.0	2.0	mg/L	2019-05-14	
pH	**6.75**	0.10	pH units	2019-05-11	HT2
Solids, Total Suspended	< 4.0	2.0	mg/L	2019-05-14	
Turbidity	**0.91**	0.10	NTU	2019-05-10	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	3.0	MPN/100 mL	2019-05-09	
Coliforms, Fecal (MPN)	< 1.8	3.0	MPN/100 mL	2019-05-09	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9062256
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-06-27 11:43

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Treated Effluent (to Direct Irrigation - FFE) Grab - E229578 (9062256-01) | Matrix: Wastewater | Sampled: 2019-06-21					
General Parameters					
BOD, 5-day	**2.7**	2.0	mg/L	2019-06-26	
pH	**7.86**	0.10	pH units	2019-06-25	HT2
Solids, Total Suspended	< 4.0	2.0	mg/L	2019-06-26	
Turbidity	**1.83**	0.10	NTU	2019-06-22	
Microbiological Parameters					
Coliforms, Total (MPN)	**4.5**	3.0	MPN/100 mL	2019-06-21	
Coliforms, Fecal (MPN)	< 1.8	3.0	MPN/100 mL	2019-06-21	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9071907
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-07-24 10:20

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Treated Effluent (to Direct Irrigation - FFE) Grab - E229578 (9071907-01) | Matrix: Wastewater | Sampled: 2019-07-18					
General Parameters					
BOD, 5-day	**2.3**	2.0	mg/L	2019-07-23	
pH	**7.83**	0.10	pH units	2019-07-18	HT2
Solids, Total Suspended	< 2.0	2.0	mg/L	2019-07-22	
Turbidity	**2.18**	0.10	NTU	2019-07-19	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	3.0	MPN/100 mL	2019-07-18	
Coliforms, Fecal (MPN)	< 1.8	3.0	MPN/100 mL	2019-07-18	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9080767
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-08-15 17:16

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Treated Effluent (to Direct Irrigation - FFE) Grab - E229578 (9080767-01) | Matrix: Wastewater | Sampled: 2019-08-09 08:30					FILT, PRES
Anions					
Nitrate (as N)	**4.29**	0.010	mg/L	2019-08-10	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-08-10	
Phosphate (as P)	**0.0459**	0.0050	mg/L	2019-08-10	
Calculated Parameters					
Nitrate+Nitrite (as N)	**4.29**	0.0100	mg/L	N/A	
Nitrogen, Total	**6.07**	0.0500	mg/L	N/A	
Nitrogen, Organic	**1.64**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.139**	0.020	mg/L	2019-08-12	
BOD, 5-day	< 1.2	2.0	mg/L	2019-08-14	
Nitrogen, Total Kjeldahl	**1.78**	0.050	mg/L	2019-08-13	
pH	**7.78**	0.10	pH units	2019-08-12	HT2
Phosphorus, Total (as P)	**0.229**	0.0020	mg/L	2019-08-14	
Phosphorus, Total Dissolved	**0.171**	0.0020	mg/L	2019-08-14	
Solids, Total Suspended	< 2.0	2.0	mg/L	2019-08-14	
Turbidity	**1.40**	0.10	NTU	2019-08-10	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	3.0	MPN/100 mL	2019-08-09	
Coliforms, Fecal (MPN)	< 1.8	3.0	MPN/100 mL	2019-08-09	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**CARO WO#**	9090348
PROJECT	Final Treated Effluent (ME12215) - EMS	**REPORTED**	2019-09-10 15:28

Analyte	Result	RL	Units	Analyzed	Qualifier
VWRC Treated Effluent (to Direct Irrigation - FFE) - E229578 (9090348-01) | Matrix: Wastewater | Sampled: 2019-09-04 09:00					
General Parameters					
BOD, 5-day	< 1.1	2.0	mg/L	2019-09-10	
pH	**7.71**	0.10	pH units	2019-09-06	HT2
Solids, Total Suspended	**2.0**	2.0	mg/L	2019-09-09	
Turbidity	**0.58**	0.10	NTU	2019-09-05	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	3.0	MPN/100 mL	2019-09-05	
Coliforms, Fecal (MPN)	< 1.8	3.0	MPN/100 mL	2019-09-05	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9052138
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-05-30 15:19

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9052138-01) | Matrix: Wastewater | Sampled: 2019-05-22 10:00					FILT, PRES
Anions					
Chloride	**82.3**	0.10	mg/L	2019-05-25	
Nitrate (as N)	**0.913**	0.010	mg/L	2019-05-25	
Nitrite (as N)	**0.013**	0.010	mg/L	2019-05-25	
Phosphate (as P)	**0.497**	0.0050	mg/L	2019-05-25	
Sulfate	**83.3**	1.0	mg/L	2019-05-25	
Calculated Parameters					
Hardness, Total (as CaCO3)	**215**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.926**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.51**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.980**	0.0500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	**0.0102**	0.0050	mg/L	2019-05-28	
Antimony, dissolved	**0.00025**	0.00020	mg/L	2019-05-28	
Arsenic, dissolved	**0.00082**	0.00050	mg/L	2019-05-28	
Barium, dissolved	**0.0295**	0.0050	mg/L	2019-05-28	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-28	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-28	
Boron, dissolved	**0.164**	0.0050	mg/L	2019-05-28	
Cadmium, dissolved	**0.000013**	0.000010	mg/L	2019-05-28	
Calcium, dissolved	**50.7**	0.20	mg/L	2019-05-28	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-05-28	
Cobalt, dissolved	**0.00026**	0.00010	mg/L	2019-05-28	
Copper, dissolved	**0.0178**	0.00040	mg/L	2019-05-28	
Iron, dissolved	**0.017**	0.010	mg/L	2019-05-28	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-05-28	
Lithium, dissolved	**0.0101**	0.00010	mg/L	2019-05-28	
Magnesium, dissolved	**21.5**	0.010	mg/L	2019-05-28	
Manganese, dissolved	**0.0641**	0.00020	mg/L	2019-05-28	
Molybdenum, dissolved	**0.00392**	0.00010	mg/L	2019-05-28	
Nickel, dissolved	**0.00179**	0.00040	mg/L	2019-05-28	
Phosphorus, dissolved	**0.558**	0.050	mg/L	2019-05-28	
Potassium, dissolved	**18.0**	0.10	mg/L	2019-05-28	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-28	
Silicon, dissolved	**3.3**	1.0	mg/L	2019-05-28	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-28	
Sodium, dissolved	**95.0**	0.10	mg/L	2019-05-28	
Strontium, dissolved	**0.571**	0.0010	mg/L	2019-05-28	
Sulfur, dissolved	**33.2**	3.0	mg/L	2019-05-28	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-28	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-28	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9052138
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-05-30 15:19

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9052138-01) | Matrix: Wastewater | Sampled: 2019-05-22 10:00, Continued					FILT, PRES
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-05-28	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-05-28	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-05-28	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-28	
Uranium, dissolved	**0.00213**	0.000020	mg/L	2019-05-28	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-05-28	
Zinc, dissolved	**0.0352**	0.0040	mg/L	2019-05-28	
Zirconium, dissolved	**0.00010**	0.00010	mg/L	2019-05-28	
General Parameters					
Ammonia, Total (as N)	**0.607**	0.020	mg/L	2019-05-28	
BOD, 5-day	< 8.0	2.0	mg/L	2019-05-29	
Nitrogen, Total Kjeldahl	**1.59**	0.050	mg/L	2019-05-29	
pH	**8.13**	0.10	pH units	2019-05-25	HT2
Phosphorus, Total (as P)	**0.642**	0.0020	mg/L	2019-05-30	
Phosphorus, Total Dissolved	**0.596**	0.0020	mg/L	2019-05-30	
Solids, Total Suspended	**2.2**	2.0	mg/L	2019-05-27	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	1.8	MPN/100 mL	2019-05-23	
Coliforms, Fecal (MPN)	< 1.8	1.8	MPN/100 mL	2019-05-23	
Total Metals					
Sodium, total	**102**	0.10	mg/L	2019-05-28	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

Duplicated

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061282
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-06-21 10:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9061282-01) | Matrix: Wastewater | Sampled: 2019-06-12 10:00					F1, FILT, PRES
Anions					
Chloride	**92.8**	0.10	mg/L	2019-06-14	
Nitrate (as N)	**1.03**	0.010	mg/L	2019-06-14	
Nitrite (as N)	**0.016**	0.010	mg/L	2019-06-14	
Phosphate (as P)	**0.479**	0.0050	mg/L	2019-06-14	
Sulfate	**85.4**	1.0	mg/L	2019-06-14	
Calculated Parameters					
Hardness, Total (as CaCO3)	**249**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**1.05**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.58**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.896**	0.0500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Antimony, dissolved	**0.00025**	0.00020	mg/L	2019-06-19	
Arsenic, dissolved	**0.00089**	0.00050	mg/L	2019-06-19	
Barium, dissolved	**0.0305**	0.0050	mg/L	2019-06-19	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Boron, dissolved	**0.192**	0.0050	mg/L	2019-06-19	
Cadmium, dissolved	**0.000029**	0.000010	mg/L	2019-06-19	
Calcium, dissolved	**58.1**	0.20	mg/L	2019-06-19	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Cobalt, dissolved	**0.00031**	0.00010	mg/L	2019-06-19	
Copper, dissolved	**0.00465**	0.00040	mg/L	2019-06-19	
Iron, dissolved	**0.016**	0.010	mg/L	2019-06-19	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Lithium, dissolved	**0.0126**	0.00010	mg/L	2019-06-19	
Magnesium, dissolved	**25.2**	0.010	mg/L	2019-06-19	
Manganese, dissolved	**0.0612**	0.00020	mg/L	2019-06-19	
Molybdenum, dissolved	**0.00446**	0.00010	mg/L	2019-06-19	
Nickel, dissolved	**0.00182**	0.00040	mg/L	2019-06-19	
Phosphorus, dissolved	**0.832**	0.050	mg/L	2019-06-19	
Potassium, dissolved	**19.6**	0.10	mg/L	2019-06-19	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Silicon, dissolved	**3.6**	1.0	mg/L	2019-06-19	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-06-19	
Sodium, dissolved	**110**	0.10	mg/L	2019-06-19	
Strontium, dissolved	**0.593**	0.0010	mg/L	2019-06-19	
Sulfur, dissolved	**35.1**	3.0	mg/L	2019-06-19	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-06-19	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061282
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-06-21 10:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9061282-01) | Matrix: Wastewater | Sampled: 2019-06-12 10:00, Continued					F1, FILT, PRES
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-06-19	
Uranium, dissolved	**0.00243**	0.000020	mg/L	2019-06-19	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-06-19	
Zinc, dissolved	**0.0300**	0.0040	mg/L	2019-06-19	
Zirconium, dissolved	**0.00013**	0.00010	mg/L	2019-06-19	
General Parameters					
Ammonia, Total (as N)	**0.639**	0.020	mg/L	2019-06-17	
BOD, 5-day	< 6.1	2.0	mg/L	2019-06-18	
Nitrogen, Total Kjeldahl	**1.54**	0.050	mg/L	2019-06-16	
pH	**8.12**	0.10	pH units	2019-06-14	HT2
Phosphorus, Total (as P)	**0.728**	0.0020	mg/L	2019-06-17	
Phosphorus, Total Dissolved	**0.685**	0.0020	mg/L	2019-06-17	
Solids, Total Suspended	**2.0**	2.0	mg/L	2019-06-17	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	1.8	MPN/100 mL	2019-06-13	
Coliforms, Fecal (MPN)	< 1.8	1.8	MPN/100 mL	2019-06-13	
Total Metals					
Sodium, total	**99.9**	0.10	mg/L	2019-06-21	
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (Duplicate) (9061282-02) | Matrix: Wastewater | Sampled: 2019-06-12 10:00					F1, FILT, PRES
Anions					
Chloride	**94.2**	0.10	mg/L	2019-06-14	
Nitrate (as N)	**1.01**	0.010	mg/L	2019-06-14	
Nitrite (as N)	**0.017**	0.010	mg/L	2019-06-14	
Phosphate (as P)	**0.509**	0.0050	mg/L	2019-06-14	
Sulfate	**86.3**	1.0	mg/L	2019-06-14	
Calculated Parameters					
Hardness, Total (as CaCO3)	**263**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**1.03**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.62**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.948**	0.0500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Antimony, dissolved	**0.00028**	0.00020	mg/L	2019-06-19	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061282
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-06-21 10:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (Duplicate) (9061282-02) | Matrix: Wastewater | Sampled: 2019-06-12 10:00, Continued					F1, FILT, PRES
Dissolved Metals, Continued					
Arsenic, dissolved	**0.00089**	0.00050	mg/L	2019-06-19	
Barium, dissolved	**0.0315**	0.0050	mg/L	2019-06-19	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Boron, dissolved	**0.211**	0.0050	mg/L	2019-06-19	
Cadmium, dissolved	**0.000019**	0.000010	mg/L	2019-06-19	
Calcium, dissolved	**61.9**	0.20	mg/L	2019-06-19	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Cobalt, dissolved	**0.00031**	0.00010	mg/L	2019-06-19	
Copper, dissolved	**0.00503**	0.00040	mg/L	2019-06-19	
Iron, dissolved	**0.015**	0.010	mg/L	2019-06-19	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Lithium, dissolved	**0.0135**	0.00010	mg/L	2019-06-19	
Magnesium, dissolved	**26.2**	0.010	mg/L	2019-06-19	
Manganese, dissolved	**0.0668**	0.00020	mg/L	2019-06-19	
Molybdenum, dissolved	**0.00461**	0.00010	mg/L	2019-06-19	
Nickel, dissolved	**0.00197**	0.00040	mg/L	2019-06-19	
Phosphorus, dissolved	**0.821**	0.050	mg/L	2019-06-19	
Potassium, dissolved	**20.5**	0.10	mg/L	2019-06-19	
Selenium, dissolved	**0.00060**	0.00050	mg/L	2019-06-19	
Silicon, dissolved	**3.7**	1.0	mg/L	2019-06-19	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-06-19	
Sodium, dissolved	**116**	0.10	mg/L	2019-06-19	
Strontium, dissolved	**0.614**	0.0010	mg/L	2019-06-19	
Sulfur, dissolved	**36.3**	3.0	mg/L	2019-06-19	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-06-19	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-06-19	
Uranium, dissolved	**0.00262**	0.000020	mg/L	2019-06-19	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-06-19	
Zinc, dissolved	**0.0306**	0.0040	mg/L	2019-06-19	
Zirconium, dissolved	**0.00012**	0.00010	mg/L	2019-06-19	
General Parameters					
Ammonia, Total (as N)	**0.644**	0.020	mg/L	2019-06-17	
BOD, 5-day	< 6.1	2.0	mg/L	2019-06-18	
Nitrogen, Total Kjeldahl	**1.59**	0.050	mg/L	2019-06-16	
pH	**8.15**	0.10	pH units	2019-06-14	HT2
Phosphorus, Total (as P)	**0.720**	0.0020	mg/L	2019-06-17	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061282
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-06-21 10:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (Duplicate) (9061282-02) | Matrix: Wastewater | Sampled: 2019-06-12 10:00, Continued					F1, FILT, PRES
General Parameters, Continued					
Phosphorus, Total Dissolved	**0.674**	0.0020	mg/L	2019-06-17	
Solids, Total Suspended	< 2.0	2.0	mg/L	2019-06-17	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	1.8	MPN/100 mL	2019-06-13	
Coliforms, Fecal (MPN)	< 1.8	1.8	MPN/100 mL	2019-06-13	
Total Metals					
Sodium, total	**95.8**	0.10	mg/L	2019-06-21	

Sample Qualifiers:

F1	The sample was not field-filtered and was therefore filtered through a 0.45 µm membrane in the laboratory and preserved with HNO3 prior to analysis for dissolved metals.
FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9071911
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-07-24 10:23

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9071911-01) | Matrix: Wastewater | Sampled: 2019-07-17 13:00					FILT, PRES
Anions					
Chloride	**92.5**	0.10	mg/L	2019-07-18	
Nitrate (as N)	**0.957**	0.010	mg/L	2019-07-18	
Nitrite (as N)	**0.033**	0.010	mg/L	2019-07-18	
Phosphate (as P)	**0.762**	0.0050	mg/L	2019-07-18	
Sulfate	**86.9**	1.0	mg/L	2019-07-18	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.990**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.73**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.941**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.795**	0.020	mg/L	2019-07-18	
BOD, 5-day	< 7.5	2.0	mg/L	2019-07-23	
Nitrogen, Total Kjeldahl	**1.74**	0.050	mg/L	2019-07-20	
pH	**8.06**	0.10	pH units	2019-07-19	HT2
Phosphorus, Total (as P)	**1.03**	0.0020	mg/L	2019-07-23	
Phosphorus, Total Dissolved	**0.976**	0.0020	mg/L	2019-07-23	
Solids, Total Suspended	< 2.0	2.0	mg/L	2019-07-22	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	1.8	MPN/100 mL	2019-07-18	
Coliforms, Fecal (MPN)	< 1.8	1.8	MPN/100 mL	2019-07-18	
Total Metals					
Sodium, total	**88.8**	0.10	mg/L	2019-07-21	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9081370
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-08-22 14:12

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9081370-01) | Matrix: Wastewater | Sampled: 2019-08-14 11:00					
Anions					
Chloride	**89.8**	0.10	mg/L	2019-08-16	
Nitrate (as N)	**0.422**	0.010	mg/L	2019-08-16	
Nitrite (as N)	**0.196**	0.010	mg/L	2019-08-16	
Phosphate (as P)	**0.876**	0.0050	mg/L	2019-08-16	
Sulfate	**86.3**	1.0	mg/L	2019-08-16	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.618**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.51**	0.0500	mg/L	N/A	
Nitrogen, Organic	**1.01**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.877**	0.020	mg/L	2019-08-19	
BOD, 5-day	< 8.0	2.0	mg/L	2019-08-21	
Nitrogen, Total Kjeldahl	**1.89**	0.050	mg/L	2019-08-19	
pH	**7.95**	0.10	pH units	2019-08-16	HT2
Phosphorus, Total (as P)	**1.11**	0.0020	mg/L	2019-08-18	
Phosphorus, Total Dissolved	**1.07**	0.0020	mg/L	2019-08-18	
Solids, Total Suspended	< 2.0	2.0	mg/L	2019-08-20	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	1.8	MPN/100 mL	2019-08-15	
Coliforms, Fecal (MPN)	< 1.8	1.8	MPN/100 mL	2019-08-15	
Total Metals					
Sodium, total	**96.1**	0.10	mg/L	2019-08-21	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9090354
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-09-11 16:42

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9090354-01) | Matrix: Wastewater | Sampled: 2019-09-04 08:30					
Anions					
Chloride	**89.0**	0.10	mg/L	2019-09-07	
Nitrate (as N)	**0.046**	0.010	mg/L	2019-09-07	
Nitrite (as N)	**0.039**	0.010	mg/L	2019-09-07	
Phosphate (as P)	**0.610**	0.0050	mg/L	2019-09-07	
Sulfate	**81.1**	1.0	mg/L	2019-09-07	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0845**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.09**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.991**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**1.01**	0.020	mg/L	2019-09-06	
BOD, 5-day	< 6.6	2.0	mg/L	2019-09-10	
Nitrogen, Total Kjeldahl	**2.00**	0.050	mg/L	2019-09-08	
pH	**7.93**	0.10	pH units	2019-09-06	HT2
Phosphorus, Total (as P)	**1.10**	0.0020	mg/L	2019-09-08	
Phosphorus, Total Dissolved	**1.09**	0.0020	mg/L	2019-09-08	
Solids, Total Suspended	< 2.0	2.0	mg/L	2019-09-09	
Microbiological Parameters					
Coliforms, Total (MPN)	< 1.8	1.8	MPN/100 mL	2019-09-05	
Coliforms, Fecal (MPN)	< 1.8	1.8	MPN/100 mL	2019-09-05	
Total Metals					
Sodium, total	**83.6**	0.10	mg/L	2019-09-08	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9100413
PROJECT	MacKay Reservoir Effluent (ME 12215) - EMS	**REPORTED**	2019-10-10 15:39

Analyte	Result	RL	Units	Analyzed	Qualifier
MacKay Reservoir Effluent to Irr. (CV4) - Reclaimed (E228539) (9100413-01) | Matrix: Wastewater | Sampled: 2019-10-03 09:00					FILT
Anions					
Chloride	**92.1**	0.10	mg/L	2019-10-05	
Nitrate (as N)	**0.029**	0.010	mg/L	2019-10-05	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-10-05	
Phosphate (as P)	**0.680**	0.0050	mg/L	2019-10-05	
Sulfate	**82.0**	1.0	mg/L	2019-10-05	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0286**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.44**	0.100	mg/L	N/A	
Nitrogen, Organic	**1.52**	0.100	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.895**	0.020	mg/L	2019-10-07	
BOD, 5-day	< 6.3	2.0	mg/L	2019-10-09	
Nitrogen, Total Kjeldahl	**2.42**	0.050	mg/L	2019-10-08	
pH	**7.93**	0.10	pH units	2019-10-07	HT2
Phosphorus, Total (as P)	**1.12**	0.0020	mg/L	2019-10-07	
Phosphorus, Total Dissolved	**1.02**	0.0020	mg/L	2019-10-07	
Solids, Total Suspended	**2.2**	2.0	mg/L	2019-10-09	
Microbiological Parameters					
Coliforms, Total (MPN)	**4.5**	1.8	MPN/100 mL	2019-10-03	
Coliforms, Fecal (MPN)	< 1.8	1.8	MPN/100 mL	2019-10-03	
Total Metals					
Sodium, total	**98.6**	0.10	mg/L	2019-10-09	

Sample Qualifiers:

FILT	The sample has been filtered for TP (diss) in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9011840
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-01-31 15:17

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9011840-01) | Matrix: Fresh Water | Sampled: 2019-01-23 14:30					FILT, PRES
Anions					
Chloride	**123**	0.10	mg/L	2019-01-26	
Nitrate (as N)	**0.364**	0.010	mg/L	2019-01-26	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-01-26	
Phosphate (as P)	**0.0694**	0.0050	mg/L	2019-01-26	
Sulfate	**104**	1.0	mg/L	2019-01-26	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.364**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.873**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.474**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.035**	0.020	mg/L	2019-01-28	
Conductivity (EC)	**1220**	2.0	µS/cm	2019-01-28	
Nitrogen, Total Kjeldahl	**0.509**	0.050	mg/L	2019-01-26	
pH	**8.40**	0.10	pH units	2019-01-28	HT2
Phosphorus, Total (as P)	**0.156**	0.0020	mg/L	2019-01-27	
Phosphorus, Total Dissolved	**0.119**	0.0020	mg/L	2019-01-27	
Microbiological Parameters					
Coliforms, Total	**200**	1	CFU/100 mL	2019-01-24	
Background Colonies	**> 200**	200	CFU/100 mL	2019-01-24	
Coliforms, Fecal	**8**	1	CFU/100 mL	2019-01-24	
Total Metals					
Sodium, total	**112**	0.10	mg/L	2019-01-30	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9021510
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-02-28 14:37

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9021510-01) | Matrix: Fresh Water | Sampled: 2019-02-21 11:00					FILT, PRES
Anions					
Chloride	**135**	0.10	mg/L	2019-02-23	
Nitrate (as N)	**0.526**	0.010	mg/L	2019-02-23	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-02-23	
Phosphate (as P)	**0.0508**	0.0050	mg/L	2019-02-23	
Sulfate	**107**	1.0	mg/L	2019-02-23	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.526**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.998**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.435**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.037**	0.020	mg/L	2019-02-26	
Conductivity (EC)	**1270**	2.0	µS/cm	2019-02-23	
Nitrogen, Total Kjeldahl	**0.472**	0.050	mg/L	2019-02-27	
pH	**8.38**	0.10	pH units	2019-02-23	HT2
Phosphorus, Total (as P)	**0.103**	0.0020	mg/L	2019-02-27	
Phosphorus, Total Dissolved	**0.0998**	0.0020	mg/L	2019-02-27	
Microbiological Parameters					
Coliforms, Total	**22**	1	CFU/100 mL	2019-02-22	
Background Colonies	**> 200**	200	CFU/100 mL	2019-02-22	
Coliforms, Fecal	**8**	1	CFU/100 mL	2019-02-22	
Total Metals					
Sodium, total	**120**	0.10	mg/L	2019-02-27	

Sample Qualifiers:

FILT	The sample has been filtered for DP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for DP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9031737
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-03-28 16:07

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9031737-01) | Matrix: Fresh Water | Sampled: 2019-03-20 11:00					F1, FILT, PRES
Anions					
Chloride	**129**	0.10	mg/L	2019-03-22	
Nitrate (as N)	**0.975**	0.010	mg/L	2019-03-22	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-03-22	
Phosphate (as P)	**0.0830**	0.0050	mg/L	2019-03-22	
Sulfate	**105**	1.0	mg/L	2019-03-22	
Calculated Parameters					
Hardness, Total (as CaCO3)	**388**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.975**	0.0100	mg/L	N/A	
Nitrogen, Total	**2.25**	0.0500	mg/L	N/A	
Nitrogen, Organic	**1.09**	0.0500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	**0.0057**	0.0050	mg/L	2019-03-27	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-03-27	
Arsenic, dissolved	**0.00188**	0.00050	mg/L	2019-03-27	
Barium, dissolved	**0.0349**	0.0050	mg/L	2019-03-27	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-03-27	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-03-27	
Boron, dissolved	**0.0964**	0.0050	mg/L	2019-03-27	
Cadmium, dissolved	**0.000033**	0.000010	mg/L	2019-03-27	
Calcium, dissolved	**95.9**	0.20	mg/L	2019-03-27	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-03-27	
Cobalt, dissolved	**0.00021**	0.00010	mg/L	2019-03-27	
Copper, dissolved	**0.00189**	0.00040	mg/L	2019-03-27	
Iron, dissolved	< 0.010	0.010	mg/L	2019-03-27	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-03-27	
Lithium, dissolved	**0.0231**	0.00010	mg/L	2019-03-27	
Magnesium, dissolved	**36.0**	0.010	mg/L	2019-03-27	
Manganese, dissolved	**0.00037**	0.00020	mg/L	2019-03-27	
Molybdenum, dissolved	**0.00723**	0.00010	mg/L	2019-03-27	
Nickel, dissolved	**0.00157**	0.00040	mg/L	2019-03-27	
Phosphorus, dissolved	**0.140**	0.050	mg/L	2019-03-27	
Potassium, dissolved	**13.3**	0.10	mg/L	2019-03-27	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-03-27	
Silicon, dissolved	**9.7**	1.0	mg/L	2019-03-27	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-03-27	
Sodium, dissolved	**129**	0.10	mg/L	2019-03-27	
Strontium, dissolved	**1.19**	0.0010	mg/L	2019-03-27	
Sulfur, dissolved	**42.0**	3.0	mg/L	2019-03-27	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-03-27	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-03-27	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-03-27	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9031737
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-03-28 16:07

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9031737-01) | Matrix: Fresh Water | Sampled: 2019-03-20 11:00, Continued					F1, FILT, PRES
Dissolved Metals, Continued					
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-03-27	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-03-27	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-03-27	
Uranium, dissolved	**0.0143**	0.000020	mg/L	2019-03-27	
Vanadium, dissolved	**0.0017**	0.0010	mg/L	2019-03-27	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-03-27	
Zirconium, dissolved	**0.00012**	0.00010	mg/L	2019-03-27	
General Parameters					
Ammonia, Total (as N)	**0.185**	0.020	mg/L	2019-03-25	
Conductivity (EC)	**1260**	2.0	µS/cm	2019-03-22	
Nitrogen, Total Kjeldahl	**1.28**	0.050	mg/L	2019-03-25	
pH	**8.40**	0.10	pH units	2019-03-22	HT2
Phosphorus, Total (as P)	**0.313**	0.0020	mg/L	2019-03-24	
Phosphorus, Total Dissolved	**0.130**	0.0020	mg/L	2019-03-24	
Microbiological Parameters					
Coliforms, Total	**65**	1	CFU/100 mL	2019-03-21	
Background Colonies	**> 200**	200	CFU/100 mL	2019-03-21	
Coliforms, Fecal	**1**	1	CFU/100 mL	2019-03-21	
Total Metals					
Sodium, total	**123**	0.10	mg/L	2019-03-28	

Sample Qualifiers:

F1	The sample was not field-filtered and was therefore filtered through a 0.45 µm membrane in the laboratory and preserved with HNO3 prior to analysis for dissolved metals.
FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO
ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9040485
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-04-11 13:13

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9040485-01) | Matrix: Fresh Water | Sampled: 2019-04-03 12:30					F1, FILT, PRES
Anions					
Chloride	**122**	0.10	mg/L	2019-04-05	
Nitrate (as N)	**0.542**	0.010	mg/L	2019-04-05	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-05	
Phosphate (as P)	**0.0831**	0.0050	mg/L	2019-04-05	
Sulfate	**104**	1.0	mg/L	2019-04-05	
Calculated Parameters					
Hardness, Total (as CaCO3)	**362**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.542**	0.0100	mg/L	N/A	
Nitrogen, Total	**1.22**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.654**	0.0500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-09	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-09	
Arsenic, dissolved	**0.00158**	0.00050	mg/L	2019-04-09	
Barium, dissolved	**0.0320**	0.0050	mg/L	2019-04-09	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-09	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-09	
Boron, dissolved	**0.103**	0.0050	mg/L	2019-04-09	
Cadmium, dissolved	**0.000027**	0.000010	mg/L	2019-04-09	
Calcium, dissolved	**91.9**	0.20	mg/L	2019-04-09	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-09	
Cobalt, dissolved	**0.00018**	0.00010	mg/L	2019-04-09	
Copper, dissolved	**0.00155**	0.00040	mg/L	2019-04-09	
Iron, dissolved	< 0.010	0.010	mg/L	2019-04-09	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-09	
Lithium, dissolved	**0.0220**	0.00010	mg/L	2019-04-09	
Magnesium, dissolved	**32.1**	0.010	mg/L	2019-04-09	
Manganese, dissolved	**0.00040**	0.00020	mg/L	2019-04-09	
Molybdenum, dissolved	**0.00856**	0.00010	mg/L	2019-04-09	
Nickel, dissolved	**0.00154**	0.00040	mg/L	2019-04-09	
Phosphorus, dissolved	**0.138**	0.050	mg/L	2019-04-09	
Potassium, dissolved	**13.4**	0.10	mg/L	2019-04-09	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-09	
Silicon, dissolved	**8.4**	1.0	mg/L	2019-04-09	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-09	
Sodium, dissolved	**116**	0.10	mg/L	2019-04-09	
Strontium, dissolved	**1.13**	0.0010	mg/L	2019-04-09	
Sulfur, dissolved	**37.8**	3.0	mg/L	2019-04-09	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-09	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-09	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-09	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9040485
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-04-11 13:13

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9040485-01) | Matrix: Fresh Water | Sampled: 2019-04-03 12:30, Continued					F1, FILT, PRES
Dissolved Metals, Continued					
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-09	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-09	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-09	
Uranium, dissolved	**0.0150**	0.000020	mg/L	2019-04-09	
Vanadium, dissolved	**0.0016**	0.0010	mg/L	2019-04-09	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-04-09	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-09	
General Parameters					
Ammonia, Total (as N)	**0.025**	0.020	mg/L	2019-04-08	
Conductivity (EC)	**1180**	2.0	µS/cm	2019-04-06	
Nitrogen, Total Kjeldahl	**0.679**	0.050	mg/L	2019-04-08	
pH	**8.44**	0.10	pH units	2019-04-06	HT2
Phosphorus, Total (as P)	**0.161**	0.0020	mg/L	2019-04-09	
Phosphorus, Total Dissolved	**0.120**	0.0020	mg/L	2019-04-09	
Microbiological Parameters					
Coliforms, Total	**≥ 9**	1	CFU/100 mL	2019-04-04	
Background Colonies	**> 200**	200	CFU/100 mL	2019-04-04	
Coliforms, Fecal	< 1	1	CFU/100 mL	2019-04-04	
Total Metals					
Sodium, total	**114**	0.10	mg/L	2019-04-11	

Sample Qualifiers:

F1	The sample was not field-filtered and was therefore filtered through a 0.45 µm membrane in the laboratory and preserved with HNO3 prior to analysis for dissolved metals.
FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9052135
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-05-30 15:18

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9052135-01) | Matrix: Fresh Water | Sampled: 2019-05-22 10:30					
Anions					
Chloride	**112**	0.10	mg/L	2019-05-25	
Nitrate (as N)	**0.252**	0.010	mg/L	2019-05-25	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-05-25	
Phosphate (as P)	**0.0799**	0.0050	mg/L	2019-05-25	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.252**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.888**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.568**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.068**	0.020	mg/L	2019-05-28	
Conductivity (EC)	**1140**	2.0	µS/cm	2019-05-25	
Nitrogen, Total Kjeldahl	**0.636**	0.050	mg/L	2019-05-29	
pH	**8.49**	0.10	pH units	2019-05-25	HT2
Phosphorus, Total (as P)	**0.162**	0.0020	mg/L	2019-05-30	
Phosphorus, Total Dissolved	**0.116**	0.0020	mg/L	2019-05-30	
Microbiological Parameters					
Coliforms, Total	**≥ 1400**	1	CFU/100 mL	2019-05-23	
Background Colonies	**> 200**	200	CFU/100 mL	2019-05-23	
Coliforms, Fecal	**10**	1	CFU/100 mL	2019-05-23	
Total Metals					
Sodium, total	**117**	0.10	mg/L	2019-05-28	

Sample Qualifiers:

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

Duplicated

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061283
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-06-21 10:16

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9061283-01) | Matrix: Fresh Water | Sampled: 2019-06-12 10:30					F1, FILT, PRES
Anions					
Chloride	**121**	0.10	mg/L	2019-06-14	
Nitrate (as N)	**0.103**	0.010	mg/L	2019-06-14	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-06-14	
Phosphate (as P)	**0.0567**	0.0050	mg/L	2019-06-14	
Sulfate	**104**	1.0	mg/L	2019-06-14	
Calculated Parameters					
Hardness, Total (as CaCO3)	**368**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.103**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.851**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.645**	0.0500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Arsenic, dissolved	**0.00173**	0.00050	mg/L	2019-06-19	
Barium, dissolved	**0.0323**	0.0050	mg/L	2019-06-19	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Boron, dissolved	**0.171**	0.0050	mg/L	2019-06-19	
Cadmium, dissolved	**0.000056**	0.000010	mg/L	2019-06-19	
Calcium, dissolved	**91.9**	0.20	mg/L	2019-06-19	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Cobalt, dissolved	**0.00022**	0.00010	mg/L	2019-06-19	
Copper, dissolved	**0.00198**	0.00040	mg/L	2019-06-19	
Iron, dissolved	< 0.010	0.010	mg/L	2019-06-19	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Lithium, dissolved	**0.0305**	0.00010	mg/L	2019-06-19	
Magnesium, dissolved	**33.6**	0.010	mg/L	2019-06-19	
Manganese, dissolved	**0.00021**	0.00020	mg/L	2019-06-19	
Molybdenum, dissolved	**0.00822**	0.00010	mg/L	2019-06-19	
Nickel, dissolved	**0.00194**	0.00040	mg/L	2019-06-19	
Phosphorus, dissolved	**0.128**	0.050	mg/L	2019-06-19	
Potassium, dissolved	**14.7**	0.10	mg/L	2019-06-19	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Silicon, dissolved	**10.5**	1.0	mg/L	2019-06-19	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-06-19	
Sodium, dissolved	**138**	0.10	mg/L	2019-06-19	
Strontium, dissolved	**1.11**	0.0010	mg/L	2019-06-19	
Sulfur, dissolved	**42.7**	3.0	mg/L	2019-06-19	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-06-19	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061283
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-06-21 10:16

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9061283-01) | Matrix: Fresh Water | Sampled: 2019-06-12 10:30, Continued					F1, FILT, PRES
Dissolved Metals, Continued					
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-06-19	
Uranium, dissolved	**0.0123**	0.000020	mg/L	2019-06-19	
Vanadium, dissolved	**0.0020**	0.0010	mg/L	2019-06-19	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-06-19	
Zirconium, dissolved	**0.00012**	0.00010	mg/L	2019-06-19	
General Parameters					
Ammonia, Total (as N)	**0.103**	0.020	mg/L	2019-06-17	
Conductivity (EC)	**1150**	2.0	µS/cm	2019-06-14	
Nitrogen, Total Kjeldahl	**0.748**	0.050	mg/L	2019-06-16	
pH	**8.46**	0.10	pH units	2019-06-14	HT2
Phosphorus, Total (as P)	**0.158**	0.0020	mg/L	2019-06-17	
Phosphorus, Total Dissolved	**0.118**	0.0020	mg/L	2019-06-17	
Microbiological Parameters					
Coliforms, Total	**≥ 970**	1	CFU/100 mL	2019-06-13	
Background Colonies	**> 200**	200	CFU/100 mL	2019-06-13	
Coliforms, Fecal	**29**	1	CFU/100 mL	2019-06-13	
Total Metals					
Sodium, total	**116**	0.10	mg/L	2019-06-21	
Bailey Springs (0500578) (Duplicate) (9061283-02) | Matrix: Fresh Water | Sampled: 2019-06-12 10:30					F1, FILT, PRES
Anions					
Chloride	**122**	0.10	mg/L	2019-06-14	
Nitrate (as N)	**0.115**	0.010	mg/L	2019-06-14	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-06-14	
Phosphate (as P)	**0.0566**	0.0050	mg/L	2019-06-14	
Sulfate	**107**	1.0	mg/L	2019-06-14	
Calculated Parameters					
Hardness, Total (as CaCO3)	**349**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.115**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.821**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.609**	0.0500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Arsenic, dissolved	**0.00164**	0.00050	mg/L	2019-06-19	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061283
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-06-21 10:16

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (Duplicate) (9061283-02) | Matrix: Fresh Water | Sampled: 2019-06-12 10:30, Continued					F1, FILT, PRES
Dissolved Metals, Continued					
Barium, dissolved	**0.0309**	0.0050	mg/L	2019-06-19	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Boron, dissolved	**0.160**	0.0050	mg/L	2019-06-19	
Cadmium, dissolved	**0.000054**	0.000010	mg/L	2019-06-19	
Calcium, dissolved	**87.0**	0.20	mg/L	2019-06-19	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Cobalt, dissolved	**0.00021**	0.00010	mg/L	2019-06-19	
Copper, dissolved	**0.0217**	0.00040	mg/L	2019-06-19	
Iron, dissolved	< 0.010	0.010	mg/L	2019-06-19	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Lithium, dissolved	**0.0290**	0.00010	mg/L	2019-06-19	
Magnesium, dissolved	**32.1**	0.010	mg/L	2019-06-19	
Manganese, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Molybdenum, dissolved	**0.00783**	0.00010	mg/L	2019-06-19	
Nickel, dissolved	**0.00260**	0.00040	mg/L	2019-06-19	
Phosphorus, dissolved	**0.121**	0.050	mg/L	2019-06-19	
Potassium, dissolved	**14.1**	0.10	mg/L	2019-06-19	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Silicon, dissolved	**10.2**	1.0	mg/L	2019-06-19	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-06-19	
Sodium, dissolved	**132**	0.10	mg/L	2019-06-19	
Strontium, dissolved	**1.07**	0.0010	mg/L	2019-06-19	
Sulfur, dissolved	**40.8**	3.0	mg/L	2019-06-19	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-06-19	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-06-19	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-06-19	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-06-19	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-06-19	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-06-19	
Uranium, dissolved	**0.0116**	0.000020	mg/L	2019-06-19	
Vanadium, dissolved	**0.0019**	0.0010	mg/L	2019-06-19	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-06-19	
Zirconium, dissolved	**0.00011**	0.00010	mg/L	2019-06-19	
General Parameters					
Ammonia, Total (as N)	**0.097**	0.020	mg/L	2019-06-17	
Conductivity (EC)	**1160**	2.0	µS/cm	2019-06-14	
Nitrogen, Total Kjeldahl	**0.706**	0.050	mg/L	2019-06-16	
pH	**8.46**	0.10	pH units	2019-06-14	HT2
Phosphorus, Total (as P)	**0.154**	0.0020	mg/L	2019-06-17	
Phosphorus, Total Dissolved	**0.117**	0.0020	mg/L	2019-06-17	

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9061283
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-06-21 10:16

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (Duplicate) (9061283-02) | Matrix: Fresh Water | Sampled: 2019-06-12 10:30, Continued					F1, FILT, PRES
Microbiological Parameters					
Coliforms, Total	**≥ 2000**	1	CFU/100 mL	2019-06-13	
Background Colonies	**> 200**	200	CFU/100 mL	2019-06-13	
Coliforms, Fecal	**28**	1	CFU/100 mL	2019-06-13	
Total Metals					
Sodium, total	**126**	0.10	mg/L	2019-06-21	

Sample Qualifiers:

F1	The sample was not field-filtered and was therefore filtered through a 0.45 µm membrane in the laboratory and preserved with HNO3 prior to analysis for dissolved metals.
FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9071908
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-07-24 10:21

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9071908-01) | Matrix: Fresh Water | Sampled: 2019-07-17 13:00					FILT, PRES
Anions					
Chloride	**123**	0.10	mg/L	2019-07-18	
Nitrate (as N)	**0.050**	0.010	mg/L	2019-07-18	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-07-18	
Phosphate (as P)	**0.0910**	0.0050	mg/L	2019-07-18	
Sulfate	**105**	1.0	mg/L	2019-07-18	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0502**	0.0100	mg/L	N/A	
Nitrogen, Total	**1.06**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.939**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.069**	0.020	mg/L	2019-07-18	
Conductivity (EC)	**1210**	2.0	µS/cm	2019-07-18	
Nitrogen, Total Kjeldahl	**1.01**	0.050	mg/L	2019-07-20	
pH	**8.49**	0.10	pH units	2019-07-18	HT2
Phosphorus, Total (as P)	**0.177**	0.0020	mg/L	2019-07-23	
Phosphorus, Total Dissolved	**0.150**	0.0020	mg/L	2019-07-23	
Microbiological Parameters					
Coliforms, Total	**Overgrown with**	1	CFU/100 mL	2019-07-18	MIC4
Coliforms, Fecal	**400**	1	CFU/100 mL	2019-07-18	MIC15
Total Metals					
Sodium, total	**117**	0.10	mg/L	2019-07-20	

Sample Qualifiers:

FILT	The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
MIC15	Due to a high bacterial count, the final result is estimated.
MIC4	Overgrown; Total Coliforms were detected.
PRES	Sample has been preserved for TDP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9081368
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-08-22 14:12

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9081368-01) | Matrix: Fresh Water | Sampled: 2019-08-14 13:00					
Anions					
Chloride	**130**	0.10	mg/L	2019-08-16	
Nitrate (as N)	**0.017**	0.010	mg/L	2019-08-16	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-08-16	
Phosphate (as P)	**0.0879**	0.0050	mg/L	2019-08-16	
Sulfate	**108**	1.0	mg/L	2019-08-16	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0171**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.992**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.884**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.091**	0.020	mg/L	2019-08-19	
Conductivity (EC)	**1180**	2.0	µS/cm	2019-08-16	
Nitrogen, Total Kjeldahl	**0.975**	0.050	mg/L	2019-08-17	
pH	**8.47**	0.10	pH units	2019-08-16	HT2
Phosphorus, Total (as P)	**0.186**	0.0020	mg/L	2019-08-18	
Phosphorus, Total Dissolved	**0.140**	0.0020	mg/L	2019-08-18	
Microbiological Parameters					
Coliforms, Total	**≥ 5500**	1	CFU/100 mL	2019-08-15	
Background Colonies	**> 200**	200	CFU/100 mL	2019-08-15	
Coliforms, Fecal	**700**	1	CFU/100 mL	2019-08-15	
Total Metals					
Sodium, total	**127**	0.10	mg/L	2019-08-21	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9090358
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-09-11 16:43

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9090358-01) | Matrix: Fresh Water | Sampled: 2019-09-04 08:45					
Anions					
Chloride	**128**	0.10	mg/L	2019-09-07	
Nitrate (as N)	**0.021**	0.010	mg/L	2019-09-07	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-09-07	
Phosphate (as P)	**0.0754**	0.0050	mg/L	2019-09-07	
Sulfate	**106**	1.0	mg/L	2019-09-07	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0208**	0.0100	mg/L	N/A	
Nitrogen, Total	**1.05**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.909**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.122**	0.020	mg/L	2019-09-06	
Conductivity (EC)	**1230**	2.0	µS/cm	2019-09-06	
Nitrogen, Total Kjeldahl	**1.03**	0.050	mg/L	2019-09-08	
pH	**8.43**	0.10	pH units	2019-09-06	HT2
Phosphorus, Total (as P)	**0.209**	0.0020	mg/L	2019-09-08	
Phosphorus, Total Dissolved	**0.166**	0.0020	mg/L	2019-09-08	
Microbiological Parameters					
Coliforms, Total	**16000**	1	CFU/100 mL	2019-09-05	
Background Colonies	**> 200**	200	CFU/100 mL	2019-09-05	
Coliforms, Fecal	**360**	1	CFU/100 mL	2019-09-05	
Total Metals					
Sodium, total	**128**	0.10	mg/L	2019-09-08	

Sample Qualifiers:

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

CARO ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

REPORTED TO	Vernon Water Reclamation, City of 3400-30th Street VERNON, BC V1T 5E6		
ATTENTION	Hedy Brouwer	**WORK ORDER**	9090358
PO NUMBER		**RECEIVED / TEMP**	2019-09-04 13:45 / 10°C
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-09-11 16:43
PROJECT INFO		**COC NUMBER**	No Number

Introduction:

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

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

Authorized By:

Alana Crump
Junior Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9100415
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-10-10 15:40

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9100415-01) | Matrix: Fresh Water | Sampled: 2019-10-03 09:15					FILT, PRES
Anions					
Chloride	**124**	0.10	mg/L	2019-10-05	
Nitrate (as N)	**0.060**	0.010	mg/L	2019-10-05	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-10-05	
Phosphate (as P)	**0.0611**	0.0050	mg/L	2019-10-05	
Sulfate	**99.4**	1.0	mg/L	2019-10-05	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0596**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.901**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.668**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.173**	0.020	mg/L	2019-10-07	
Conductivity (EC)	**1200**	2.0	µS/cm	2019-10-07	
Nitrogen, Total Kjeldahl	**0.841**	0.050	mg/L	2019-10-08	
pH	**8.39**	0.10	pH units	2019-10-07	HT2
Phosphorus, Total (as P)	**0.188**	0.0020	mg/L	2019-10-07	
Phosphorus, Total Dissolved	**0.147**	0.0020	mg/L	2019-10-07	
Microbiological Parameters					
Coliforms, Total	**3800**	1	CFU/100 mL	2019-10-03	
Background Colonies	**> 200**	200	CFU/100 mL	2019-10-03	
Coliforms, Fecal	**46**	1	CFU/100 mL	2019-10-03	
Total Metals					
Sodium, total	**134**	0.10	mg/L	2019-10-09	

Sample Qualifiers:

FILT	The sample has been filtered for TP (diss) in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for TP (diss) in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	N001198
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-11-19 14:19

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (N001198-01) | Matrix: Fresh Water | Sampled: 2019-11-06 15:00					FILT, PRES
Anions					
Chloride	**121**	0.10	mg/L	2019-11-08	
Nitrate (as N)	**0.094**	0.010	mg/L	2019-11-08	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-11-08	
Phosphate (as P)	**0.0395**	0.0050	mg/L	2019-11-08	
Sulfate	**103**	1.0	mg/L	2019-11-08	
Calculated Parameters					
Nitrate+Nitrite (as N)	**0.0939**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.711**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.550**	0.0500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	**0.067**	0.020	mg/L	2019-11-12	
Conductivity (EC)	**1220**	2.0	µS/cm	2019-11-14	
Nitrogen, Total Kjeldahl	**0.617**	0.050	mg/L	2019-11-13	
pH	**8.37**	0.10	pH units	2019-11-14	HT2
Phosphorus, Total (as P)	**0.156**	0.0020	mg/L	2019-11-11	
Phosphorus, Total Dissolved	**0.123**	0.0020	mg/L	2019-11-11	
Microbiological Parameters					
Coliforms, Total	**1120**	1.0	MPN/100 mL	2019-11-07	
Coliforms, Fecal	**1.0**	1.0	MPN/100 mL	2019-11-07	
Total Metals					
Sodium, total	**126**	0.10	mg/L	2019-11-16	

Sample Qualifiers:

FILT	The sample has been filtered for DP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for DP in the laboratory and the holding time has been extended.

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9120464
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-12-16 12:42

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9120464-01) | Matrix: Fresh Water | Sampled: 2019-12-04 13:30					F1, FILT, PRES
Anions					
Chloride	**133**	0.10	mg/L	2019-12-07	
Nitrate (as N)	**0.201**	0.010	mg/L	2019-12-07	
Nitrite (as N)	< 0.010	0.010	mg/L	2019-12-07	
Phosphate (as P)	**0.0624**	0.0050	mg/L	2019-12-07	
Sulfate	**106**	1.0	mg/L	2019-12-07	
Calculated Parameters					
Hardness, Total (as CaCO3)	**359**	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.201**	0.0100	mg/L	N/A	
Nitrogen, Total	**0.786**	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.457**	0.0500	mg/L	N/A	
Dissolved Metals					
Lithium, dissolved	**0.0226**	0.00010	mg/L	2019-12-13	
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-12-13	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-12-13	
Arsenic, dissolved	**0.00151**	0.00050	mg/L	2019-12-13	
Barium, dissolved	**0.0331**	0.0050	mg/L	2019-12-13	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-12-13	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-12-13	
Boron, dissolved	**0.119**	0.0050	mg/L	2019-12-13	
Cadmium, dissolved	**0.000035**	0.000010	mg/L	2019-12-13	
Calcium, dissolved	**91.6**	0.20	mg/L	2019-12-13	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-12-13	
Cobalt, dissolved	**0.00028**	0.00010	mg/L	2019-12-13	
Copper, dissolved	**0.00159**	0.00040	mg/L	2019-12-13	
Iron, dissolved	< 0.010	0.010	mg/L	2019-12-13	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-12-13	
Magnesium, dissolved	**31.6**	0.010	mg/L	2019-12-13	
Manganese, dissolved	**0.00085**	0.00020	mg/L	2019-12-13	
Molybdenum, dissolved	**0.00789**	0.00010	mg/L	2019-12-13	
Nickel, dissolved	**0.00215**	0.00040	mg/L	2019-12-13	
Phosphorus, dissolved	**0.123**	0.050	mg/L	2019-12-13	
Potassium, dissolved	**13.0**	0.10	mg/L	2019-12-13	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-12-13	
Silicon, dissolved	**9.2**	1.0	mg/L	2019-12-13	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-12-13	
Sodium, dissolved	**120**	0.10	mg/L	2019-12-13	
Strontium, dissolved	**1.17**	0.0010	mg/L	2019-12-13	
Sulfur, dissolved	**35.7**	3.0	mg/L	2019-12-13	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-12-13	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-12-13	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-12-13	

CARO ANALYTICAL SERVICES

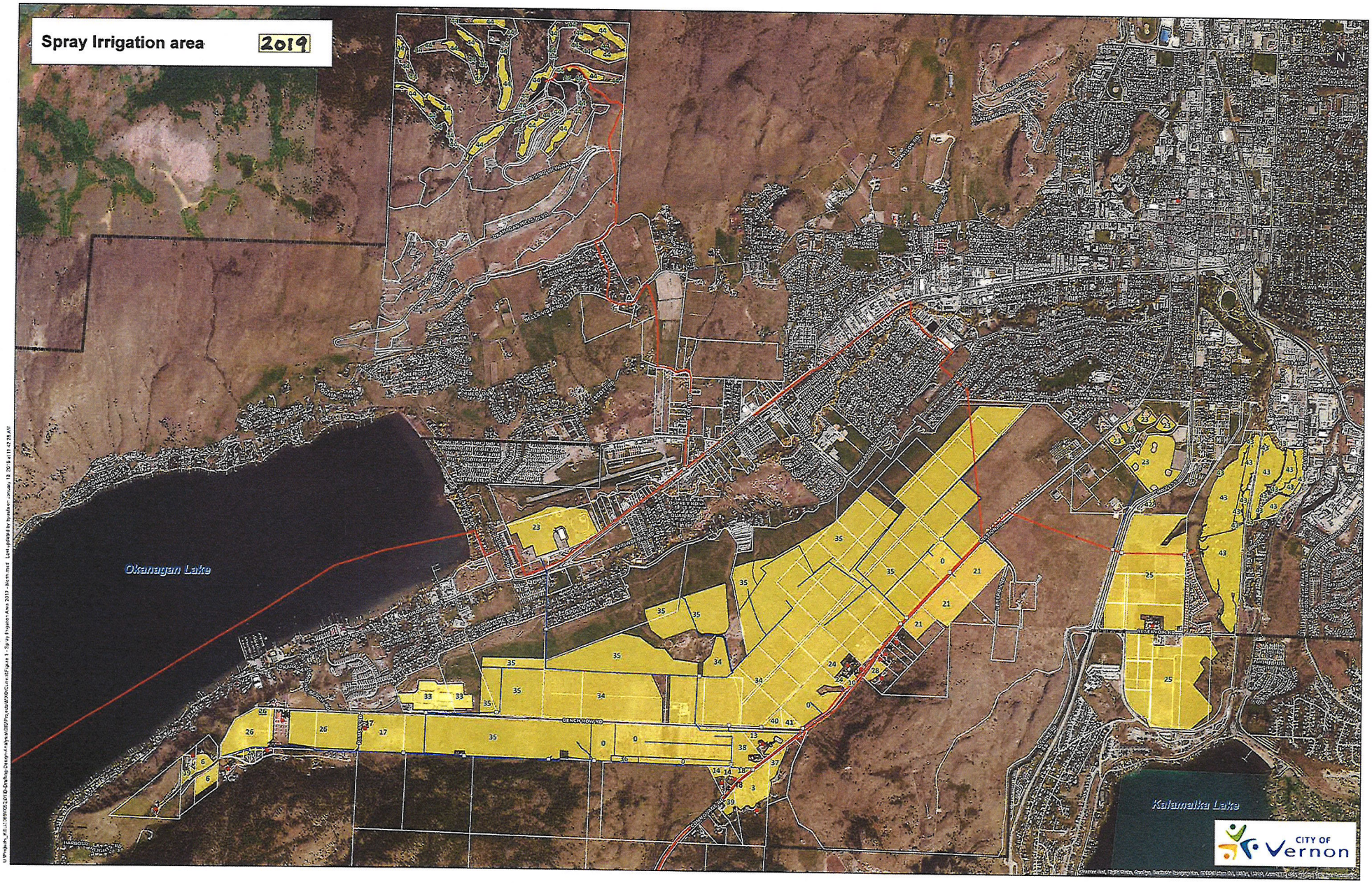
TEST RESULTS

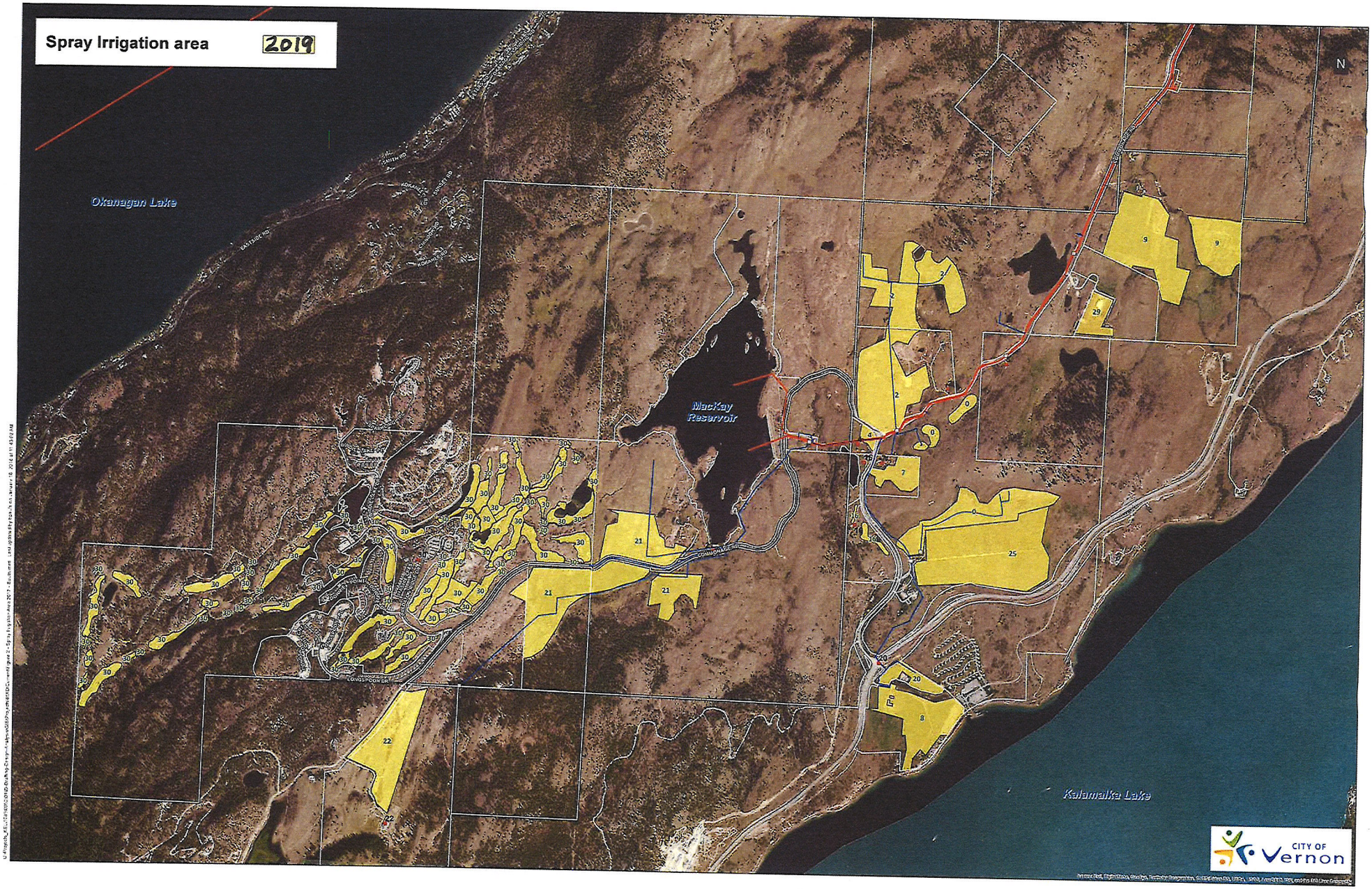
REPORTED TO	Vernon Water Reclamation, City of	**WORK ORDER**	9120464
PROJECT	Bailey Springs (ME12215) - EMS	**REPORTED**	2019-12-16 12:42

Analyte	Result	RL	Units	Analyzed	Qualifier
Bailey Springs (0500578) (9120464-01) | Matrix: Fresh Water | Sampled: 2019-12-04 13:30, Continued					F1, FILT, PRES
Dissolved Metals, Continued					
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-12-13	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-12-13	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-12-13	
Uranium, dissolved	**0.0122**	0.000020	mg/L	2019-12-13	
Vanadium, dissolved	**0.0014**	0.0010	mg/L	2019-12-13	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-12-13	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-12-13	
General Parameters					
Ammonia, Total (as N)	**0.128**	0.020	mg/L	2019-12-06	
Conductivity (EC)	**1230**	2.0	µS/cm	2019-12-10	
Nitrogen, Total Kjeldahl	**0.585**	0.050	mg/L	2019-12-10	
pH	**8.38**	0.10	pH units	2019-12-10	HT2
Phosphorus, Total (as P)	**0.130**	0.0020	mg/L	2019-12-11	
Phosphorus, Total Dissolved	**0.120**	0.0020	mg/L	2019-12-11	
Microbiological Parameters					
Coliforms, Total	**1550**	1.0	MPN/100 mL	2019-12-05	
Coliforms, Fecal	**3.1**	1.0	MPN/100 mL	2019-12-05	
Total Metals					
Sodium, total	**335**	0.10	mg/L	2019-12-14	

Sample Qualifiers:

F1	The sample was not field-filtered and was therefore filtered through a 0.45 µm membrane in the laboratory and preserved with HNO3 prior to analysis for dissolved metals.
FILT	The sample has been filtered for DP in the laboratory. Results may not reflect conditions at the time of sampling.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for DP in the laboratory and the holding time has been extended.


Spray Irrigation area
2019
Okanagan Lake
Kalamalka Lake
BENCH ROAD
CITY OF Vernon


Spray Irrigation area
2019
Okanagan Lake
MacKay Reservoir
Kalamalka Lake
N
CITY OF Vernon

Associated Environmental

REPORT

City of Vernon

Reclaimed Water Irrigation
2019 Groundwater Monitoring Program

MARCH 2020

A Carbon Neutral Company

CANADA BEST MANAGED COMPANIES Platinum member

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1 INTRODUCTION

1.1 Background

The City of Vernon (the City) treats municipal wastewater to an advanced (tertiary) level at the Vernon Water Reclamation Centre (VWRC). The treated wastewater is stored in the MacKay Reservoir, and meets the criteria of "reclaimed water" under the BC *Municipal Wastewater Regulation* (MWR) because it meets the MWR standards for use in irrigation (BC Reg. 87/2012). The reclaimed water is used to irrigate approximately 1,500 ha of agricultural land on the south side of the City. The irrigation program is authorized by the BC Ministry of Environment and Climate Change Strategy (ENV) through Operational Certificate ME 12215 (MOE 2008). Under the Operational Certificate (OC), groundwater monitoring is to be completed each year and an annual report submitted to ENV.

In 2010, Summit Environmental Consultants Inc. (now Associated Environmental Consultants Inc. [Associated]) was retained by the City to implement a groundwater monitoring program to assess potential impacts on groundwater from its reclaimed water irrigation operations. Since then, Associated has conducted the annual groundwater monitoring program on behalf of the City. This report presents the results of the 2019 monitoring program. For more details on the historical program, see Associated's previous reports (Summit 2010, 2012, 2013, 2015a; Associated 2016, 2017, 2018, 2019).

1.2 Objective and Scope

Section 8.6 of the OC requires that a groundwater monitoring program be conducted by a Qualified Professional to "establish if irrigation with reclaimed water is impacting groundwater" (MOE 2008). The objective of the 2019 monitoring program is to monitor for potential effects on groundwater from irrigation operations. To meet this objective, Associated conducted the following scope of work:

1. Conducted the annual groundwater sampling program from a network of monitoring and domestic wells;
2. Compared the water quality data to applicable guidelines and historical data;
3. Provided a summary of the conceptual model of groundwater flow completed by Associated in 2018;
4. Reviewed groundwater level data collected from dataloggers installed in two monitoring wells (DMW-3 and MW-2) to better understand groundwater fluctuations;
5. Developed tri-linear diagrams to assess groundwater types and better understand the age and/or origin of the groundwater; and
6. Prepared an annual report that summarizes the results of the 2019 monitoring program.

In addition, Associated compared water quality data for Bailey Springs[1] (provided by the City) to applicable guidelines and historical data, and included the results in this report.

1.3 Study Area

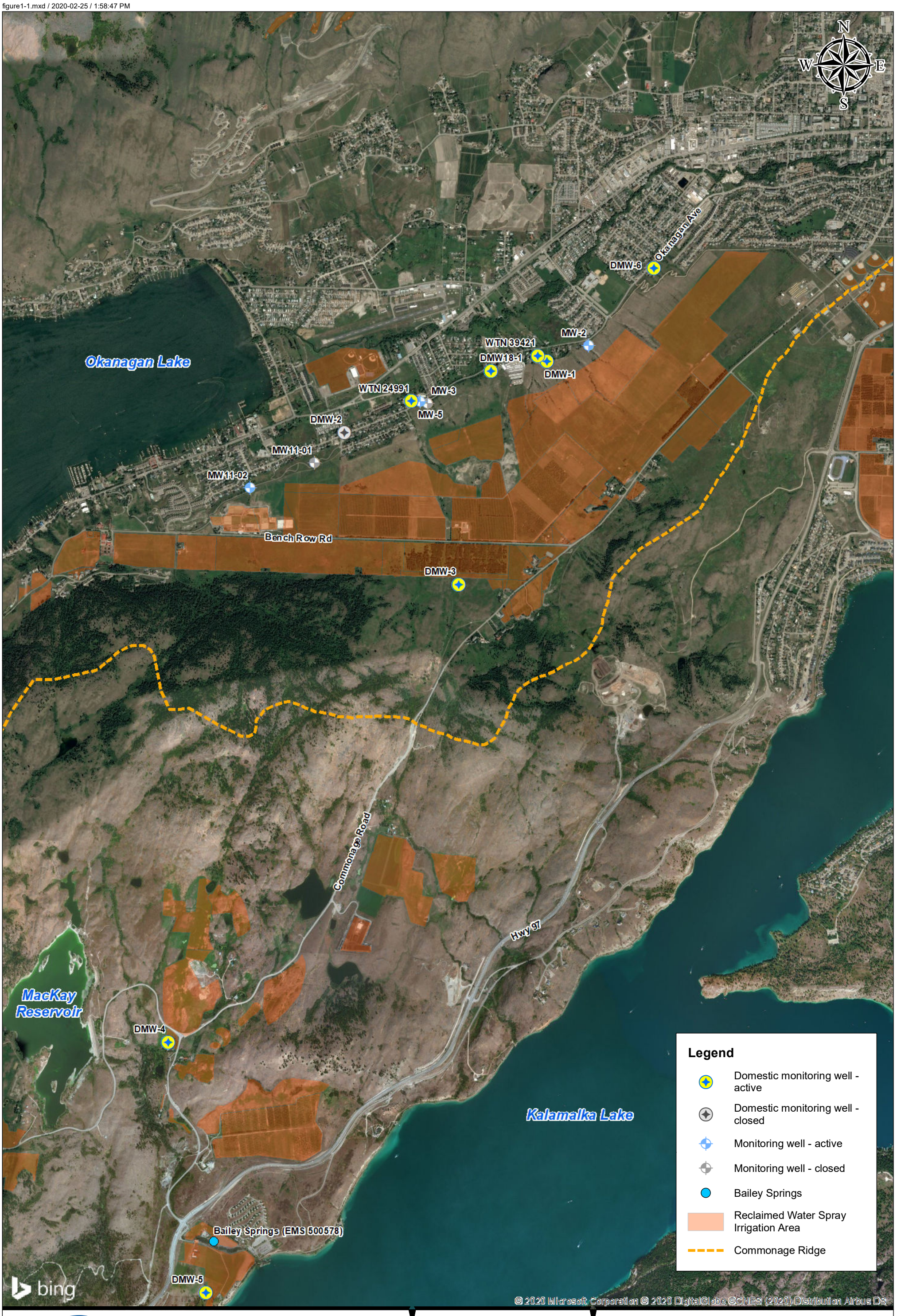
The City's reclaimed water irrigation distribution system is located between Kalamalka and Okanagan Lakes and is indicated by the orange areas in Figure 1-1. The study area includes lands south of the City limits to just beyond the MacKay Reservoir including Townships 9, 10, 13 and 14.

[1] In addition to conducting a groundwater monitoring program, the City is required to collect samples from a stream referred to as Bailey Springs (EMS 500578) under Section 8.9 of the OC (MOE 2008). Bailey Springs is a surface watercourse that originates south of the MacKay Reservoir and discharges to Kalamalka Lake.

The study area includes a northeast to southwest-trending ridge (hereafter referred to as the Commonage Ridge; Figure 1-1), where Commonage Road bisects the top of the ridge that descends to Okanagan Lake (northwest) and Kalamalka Lake (southeast). Several gullies, which have ephemeral water draining towards Okanagan Lake, are located on the bench lands to the west and east of Commonage Road.

Reclaimed wastewater is applied to five major areas: The Rise Golf Course, Vernon Golf and Country Club, Predator Ridge Golf Resort, individual properties in the Commonage area, and the City-managed area on the hillside northwest of Commonage Road (Figure 1-1). The current groundwater monitoring program focuses on the reclaimed water that is applied to the City managed area on the hillside northwest of Commonage Road. Agricultural and horticultural land use in the irrigation area managed by the City includes forage production, livestock grazing, irrigated pasture, and forest tree seedling nursery production.

figure1-1.mxd / 2020-02-25 / 1:58:47 PM



Associated Environmental

PROJECT NO.: 2019-8456
DATE: February 2020
DRAWN BY: BdJ

Meters
0 200 400 600 800 1,000

FIGURE 1-1: RECLAIMED WATER IRRIGATION AREA AND MONITORING WELL NETWORK

City of Vernon

City of Vernon Groundwater Monitoring Program

2 CONCEPTUAL MODEL OF GROUNDWATER FLOW

In 2018, Associated completed an in-depth review of available information to create a conceptual model of groundwater flow. The majority of the review focused on the study area north of the Commonage Ridge as this is where the larger aquifers are located and where the more complex groundwater flow patterns likely occur. The following sections provide a summary of that review, augmented by additional data collected in 2019. Further details on the review completed in 2018 are provided in Associated (2019).

2.1 Lithology

Associated (2019) reviewed numerous borehole lithology data from publicly available data and from monitoring wells drilled by Associated for other City projects in the area. The lithology observed in the boreholes is consistent with the lithology described by Nasmith (1963) and Fulton et al. (1965). The study area north of the Commonage Ridge comprises undivided glacial deposits (i.e., sand, gravel, clay, and till) along the hillside and predominantly fluvial/alluvial deposits in the valley bottom, which is commonly called Priest Valley.

The BC Ministry of Environment and Climate Change (ENV) has updated the aquifer mapping for the North Okanagan since 2019 (ENV 2020). These updates are based on extensive work completed by Hassan et al. (2019). There are now four aquifers mapped in the study area. These aquifers are summarized in Table 2-1.

Table 2-1
Aquifers in the study area

Aquifer No.	Aquifer Name	Year of Mapping	Material	Productivity	Vulnerability	Size (km^2)
346	South Vernon Unconfined	2017	Sand and Gravel	Moderate	Moderate	14.7
347	South Vernon Confined	2017	Sand and Gravel	High	Low	6.8
1227	Okanagan Landing Deep Confined	2019	Sand and Gravel	High	Low	3.7
471	No name given	2012	Bedrock	Low	Moderate	127.6

Cross sections generated by Associated (2019) are provided in Appendix A[2]. Figure A-1 shows the locations of the cross sections. Cross Section A-A' (Figure A-2) has been updated from Associated (2019) given the information provided by Hassan et al. (2019) and shows the distinction between the South Vernon Confined (Aquifer 347), the South Vernon Unconfined (Aquifer 347), and the Okanagan Landing Deep Confined (Aquifer 1227).

Cross Sections B-B' and C-C' (Figures A-3 and A-4, respectively) show that the lithology on the hillside is complex and that lithology units are not laterally extensive east-west. Furthermore, Cross Sections A-A' and C-C' show some

[2] The accuracy of cross sections relies on the lithology information from publicly available well logs and the accuracy of elevation data available. Data from monitoring wells installed for the Hesperia Landfill groundwater monitoring program (MW17-1, MW17-5, MW17-6, MW2018-1, MW2018-2, MW2018-3) have been surveyed to geodetic datum (+/- 1 cm) (Associated 2019). The ground elevations for other wells used were determined based on elevation data available from the City and have an accuracy of +/- 1 m (COV 2016). Borehole logs used to develop the cross sections are provided in Associated (2019).

steeply dipping units towards the clay, sand, and gravel boundaries. This means that groundwater flow could be substantial in some of these aquifers towards Okanagan Lake.

2.2 Groundwater Levels

On October 25, 2017, Associated installed pressure transducer dataloggers in monitoring wells MW-2 (WTN 58804) and DMW-3 (WTN 58803), both of which are included in the long-term monitoring groundwater monitoring program (Section 3), to measure and record groundwater levels every 6 hours. The City retrieved data monthly and recorded a manual reading at that time. The City provided the data to Associated once data were available. Currently, data are available until February 12, 2020, and these data are shown in Figure 2-1.

Monitoring well DMW-3 is located south of Bench Row Road but north of the Commonage Ridge (Figure 1-1). It is the only well in the monitoring program that is not within the area that is irrigated with reclaimed water. The well is 5.79 m deep, and while there is no information regarding the screen interval, the lithology indicates thin surficial sediments (2 m) overlying an unconfined fractured bedrock aquifer. The well is situated near an ephemeral drainage that drains north. Groundwater levels in the well are typically at approximately 2.5 m below top of casing (m btoc) throughout the year, except in spring (March-May) when groundwater levels rise to approximately 0.7 m btoc. During this period of record, groundwater levels rose by as much as 0.76 m in a period of 24 hours (March 17, 2018).

These seasonally fluctuating water levels were observed in 2018 and 2019 and are likely attributable to snowmelt quickly recharging the aquifer. Photograph 2-1 was collected by the City on April 24, 2018 and shows running water passing the monitoring well and saturated ground conditions, suggesting recharge to the underlying material. Fieldwork completed at the well (e.g., water sampling) suggests that the surface seal of the wellhead is competent and that the increased water level is due to an increase in water level of the aquifer, not just an increase of water level in in the well.

Photograph 2-1
DMW-3 looking north (April 24, 2018)

Monitoring well MW-2 is located above Okanagan Avenue in the eastern portion of the study area within the reclaimed water irrigated area (Figure 1-1). It is at a higher elevation than some of the other wells in the valley bottom, but the water level in this well is comparable to the flowing artesian wells located at lower elevations. The well log indicates the well is likely installed across a confined layer of coarse gravel from 12.8 to14.3 metres below ground

surface (mbg) (likely Aquifer 347). The static groundwater level is between 2.6 and 3.6 m btoc throughout the period of record. The response to freshet in this well is less noticeable, which is expected due to the overlying confining layers inhibiting direct recharge of the aquifer. Recharge to this aquifer likely comes from the highlands to the south. Because coarse gravel aquifers typically have large storativity values[3], changes in water levels, which would indicate recharge and discharge of water from the aquifer, are less noticeable.

A 'sawtooth' pattern observed in MW-2 on Figure 2-1 indicates that the well is being influenced by a neighbouring pumping well. The minimal drawdown/recovery observed here suggests that the pumping well is a great distance away, and/or the aquifer has a high transmissivity[4].

[3] Storativity is a measurement of an aquifer's ability to store water
[4] Transmissivity is a measurement of an aquifer's ability to transmit water.

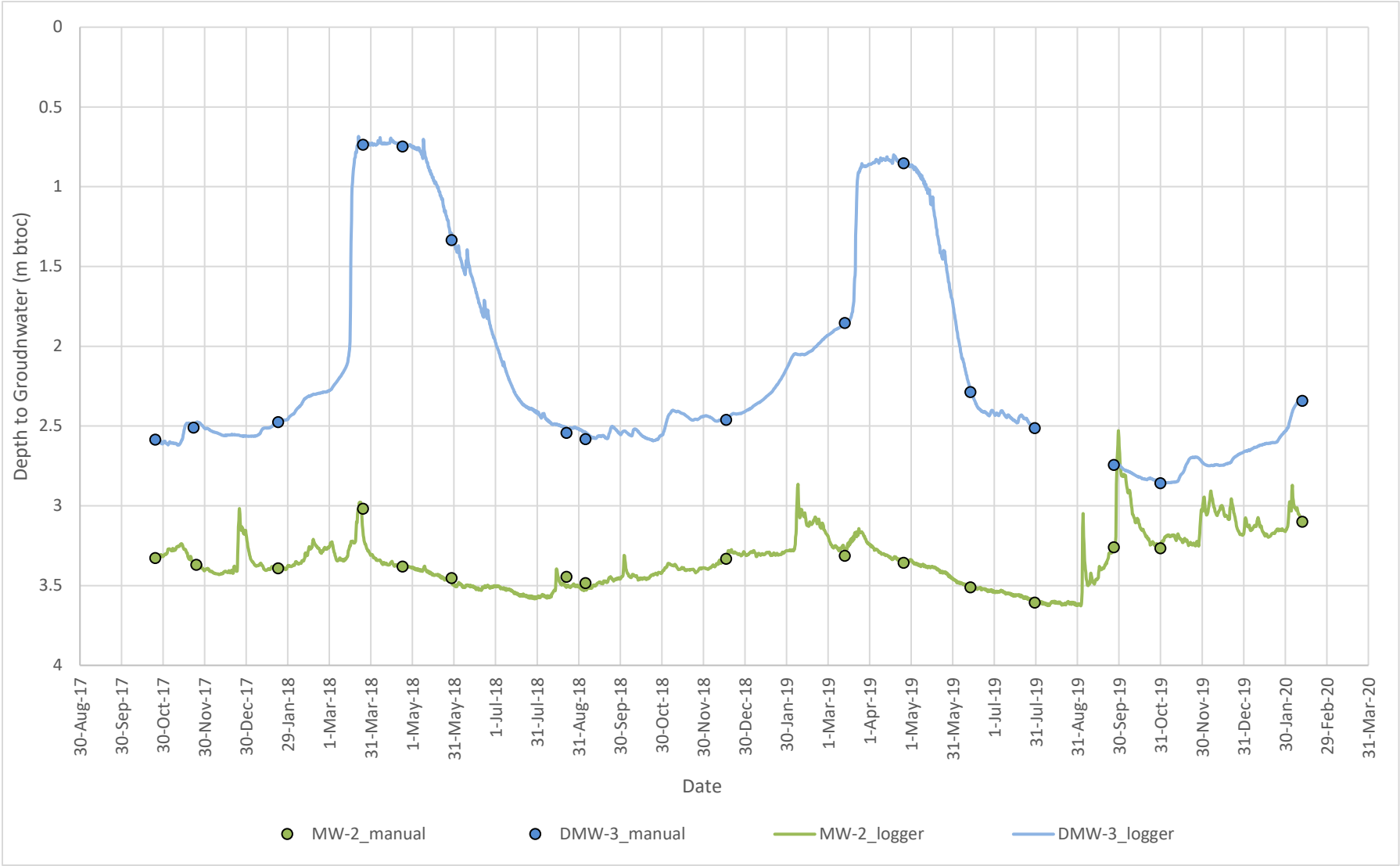


Figure 2-1
Groundwater levels at MW-2 and DMW-2 (October 2017-February 2020)

2.3 Water Chemistry

Associated used the 2019 groundwater chemistry data collected during the field program (described in detail in Section 3) to create tri-linear diagrams (i.e., Piper, Extended Durov, and Stiff Diagrams). These diagrams provide six major ions or combinations of ions plotted onto one diagram to assist with assessment of the types of groundwater in the study area (Hounslow 1995). Groundwater flowing in an aquifer during the natural cycle is influenced by residence time and interaction with the host rock or material along the flow path, and can be generally classified as more freshly recharged (i.e., low mineralization) or having a longer residence time (i.e., higher mineralization).

The 2019 tri-linear diagrams (Appendix B) align with the findings of the 2018 monitoring program (Associated 2019). The predominant finding from Associated (2019) was that water quality is variable spatially in the horizontal axis as well as vertical.

The findings are summarized as:

1. The Piper Diagram (Figure B-1; Appendix B) indicates that the wells north of the Commonage Ridge typically plot as Calcium-Bicarbonate, Calcium-Magnesium, and Calcium-Sulphate water types, which suggests younger to moderate residence times. DMW-4 and DMW-5 are both located south of the Commonage Ridge. The groundwater type is mainly a Calcium-Sulphate water, but over time DMW-4 has changed to a Bicarbonate-Sodium water. Both DMW-4 and DMW-5 have shown changes in water chemistry over time, including removal of chloride, sulphate, and calcium.
2. The Stiff Diagrams (Figure B-3; Appendix B) indicate that there are four different chemistry signatures:
    - MW11-02 is at the western extent of the study area and has higher concentrations for all ions.
    - WTN 24991 and MW-5 are located centrally along Okanagan Avenue and have similar construction depths. These wells show younger, more recently recharged groundwater.
    - DMW-1, MW-2, WTN 39421, and DMW18-1 are located at the eastern end of the study area and all, except for DMW-1, are installed to relatively similar depths. MW-2, although similar to the others, has slightly different source(s) influencing its chemistry and may be isolated from the other wells.
    - DMW-3 is the upgradient well and, based on the datalogger, it is closely tied to surface water. It contains high concentrations of ions and is therefore potentially influenced by other upgradient activities (e.g., road salt, animal pasture).
3. Some of the deeper wells (WTN 24991 and MW-5) exhibit water that is typical of freshly recharged (i.e., younger) groundwater. This is counter-intuitive since deeper aquifers typically host older groundwater. The likely cause of this groundwater is due to a pathway of higher transmissivity (e.g., fracture or fault within the bedrock). This freshly recharged water is not likely from the reclaimed water irrigation, since these wells do not exhibit high concentrations of nitrate-N and chloride.
4. Typical parameters associated with reclaimed water (i.e., nitrate-N, chloride, and conductivity) are not necessarily always higher in downgradient wells. The highest concentrations are found in WTN 39421, DMW-1, and DMW-6. MW-2 is located between these wells and has relatively lower concentrations than its neighbouring wells. This indicates the spatial variability in water chemistry.
5. The datalogger information collected from DMW-3 suggests the well is very closely tied to surface water and therefore is not representative of groundwater in deeper aquifers. This suggests surficial sources of anthropogenic inputs. Additionally, DMW-3 may be installed across fractured bedrock, which may create a different chemistry signature than the downgradient wells that are installed in unconsolidated sediments (as evidenced by the Stiff Diagram [Figure B-3; Appendix B]). The findings imply that in order for upgradient monitoring wells to be useful as part of the reclaimed water irrigation monitoring, they would need to be

installed at the bedrock contact, or very deep in the hillside (over 50 m), to intersect similar aquifers in the receiving environment.

6. Although there is no confirmed lithological log for DMW-1, it is likely installed across a different aquifer than WTN 39421. Based on the available lithological data for the study area, DMW-1 and WTN 39421 are likely separated by a 30–40 m thick unit of clay. Both wells have similar water quality but a different signature that is apparent in the Stiff Diagrams (Figure B-3; Appendix B); WTN 39421 has less chloride and alkalinity but higher sulphate values. They have similar concentrations of nitrate-N, dissolved selenium, and conductivity values. There seems to be some similarity in groundwater among aquifers. This may be due to similar material hosting the aquifers. Although these two wells are separated by a thick clay unit, the geological depositional environment could have been similar for the aquifers.
7. Monitoring well MW11-02 has concentrations of certain parameters that are an order of magnitude higher than all other wells, which suggests some additional influence(s) when compared to the other monitoring wells.

Section 3 provides further discussion on water quality, including comparison to applicable guidelines.

3 GROUNDWATER QUALITY

3.1 Methods

3.1.1 Monitoring Network

Groundwater sampling occurred on September 26 and 27, 2019, prior to the end of the irrigation season. This timing aligns with previous sampling programs (Summit 2015b, Associated 2018, 2019). The groundwater monitoring network consists of monitoring wells and domestic water supply wells, as listed in Table 3-1 and shown on Figure 1-1. Table 3-1 also provides a summary of the depth to water and depth to bottom of each well in the monitoring program, and indicates whether a well log is available. All available well logs are provided in Appendix A.

Table 3-1
2019 groundwater monitoring network and well details

Location ID	Well Type	Well Log Available	Depth to Water	Well Depth
MW-2	Monitoring well	Yes (WTN 58804[C])	3.26 mbtoc[A]	14 m[B]
MW-5	Artesian well	No	Artesian	49.8 mbtoc[A]
MW11-02	Monitoring well	Yes	33.07 mbtoc[A]	34.6 mbtoc
DMW-1	Private domestic well (dug well)	Possibly WTN 8414[C]	0.4 mbtoc[A]	2.4 m[B]
DMW-3	Monitoring well	Yes (WTN 58803[C])	2.75 mbtoc[A]	6.3 mbtoc[A]
DMW-4	Private domestic well	No	0.6 mbtoc[A]	Estimated at 4 m[D]
DMW-5	Private domestic well	No	Artesian	Unknown
WTN 39421	Water supply well	Yes (WTN 39421)	Artesian	45 m[B]
WTN 24991	Water supply well	Yes (WTN 24991)	Artesian	113 m[B]
DMW18-1	Private domestic well	Yes (WTN 1950)	6 m[B]	8.5 m[B]

Notes: mbtoc = metre below top of casing; mbg = metre below ground surface; m = metre, taken from registered well log; therefore, unknown if measurement is below top of casing or ground.
[A] Based on field measurements (September 2019).
[B] Based on information in the registered well log.
[C] Assumed WTN based on well's location and field measured depth to bottom, but not confirmed.
[D] Well depth is based on anecdotal information from the property owner. No well log is available and the well head cannot be accessed.

This monitoring network is the same one used in 2018 (Associated 2019), with the exception of DMW-6 which was not sampled in 2019 because Associated could not reach the well owner to approve access. Well DMW18-1 is tested quarterly as part of the City's Hesperia Landfill Monitoring Program (Associated 2020), but data are also included in this report for interpretation as it is a potential domestic receptor in the study area.

3.1.2 Sampling Methodology and Parameters Tested

Groundwater samples were collected following standard BC methods (MOE 2013a). Prior to sampling, monitoring wells were purged to remove at least three times the well volume, until dry, or until field parameters stabilized, using a submersible pump, peristaltic pump, or foot-valve inertial pumping system, depending on well depth. Field parameters (i.e., temperature, conductivity, pH, dissolved oxygen, oxidation-reduction potential, and turbidity) were measured

with field meters during purging. Domestic wells were generally purged using existing pumps until field parameters stabilized. DMW-1, which is a dug well that cannot be purged, was sampled directly using a bailer.

Groundwater samples were collected as grab samples in laboratory-supplied bottles, filtered and preserved in the field (where necessary), and shipped via chain of custody protocol to CARO Analytical Services (an accredited laboratory) in Kelowna BC for analysis of the following parameters[5]:

- alkalinity, bromide, chloride, fluoride, sodium, sulphate, total dissolved solids, and hardness (total as $CaCO_3$);
- ammonia-N, nitrate-N, nitrite-N, total Kjeldahl nitrogen (TKN), organic nitrogen, and total nitrogen;
- orthophosphate, dissolved phosphorus, and total phosphorus; and
- dissolved metals.

3.1.3 Comparison to Guidelines

Given the objective of the groundwater monitoring program (i.e., to establish if irrigating with reclaimed water is impacting groundwater), the groundwater quality results are assessed relative to water quality guidelines. To protect nearby receptors (i.e., domestic wells used for drinking water and irrigation purposes, and groundwater discharging to surface waterbodies), the 2019 groundwater quality results were compared to the following water quality guidelines:

- Guidelines for Canadian Drinking Water Quality (Health Canada DW) (Health Canada 2019);
- British Columbia Source Drinking Water Quality Guidelines (BC DW) (ENV 2017a);
- BC Approved and Working Water[6] Quality Guidelines for aquatic life (BC AL; acute guidelines only), irrigation water (BC IW), and livestock water (LW) (ENV 2017b, 2019); and
- BC *Contaminated Sites Regulation* (CSR) Schedule 3.2, Generic Numerical Water Standards for Drinking Water (DW), Irrigation (IW), Livestock (LW), and Freshwater Aquatic Life (AW) (BC Reg. 253/16).

The Health Canada DW and BC DW guideline levels are designated as either a maximum acceptable concentration (MAC) or an aesthetic objective (AO) (Health Canada 2019, ENV 2017a). The MAC guidelines are health-risk-based and determined based on the known health effects associated with the substance. The AO guidelines apply to those variables that adversely affect taste or intended, typical water uses (e.g., staining of laundry) but do not pose a health hazard. For interpretation purposes, whichever guideline (Health Canada or BC) is more stringent was used and collectively referred to as the DW guideline.

After each sampling event, the results from domestic wells were compared with the Health Canada DW and BC DW guidelines. Associated provided the well owners with a summary of any exceedances and the original laboratory report, as a courtesy for participating in the study and to notify residents of any drinking water guideline exceedances.

As per ENV (2019), exceeding a BC water quality guideline does not imply there are unacceptable risks, but rather the potential for adverse affects may be increased and additional investigation may be required.

[5] DMW18-1, which is sampled quarterly as part of a different monitoring program (Associated 2020), was tested for the same parameters listed here with the exception of organic nitrogen, total nitrogen, and orthophosphate (none of which have a limit under the applicable guidelines).
[6] Some of the BC water quality guidelines are considered "working," but for purposes of discussion in this report, they are given equal weight as approved guidelines.

3.1.4 Comparison to Background, Reclaimed Water Quality, and Historical Data

Water quality data and guideline exceedances are assessed and interpreted by comparing to available background water quality, reclaimed water quality, and historical data.

Background Groundwater Quality

Of the wells included in the standard monitoring program (Table 3-1), only monitoring well DMW-3 is located upgradient of the reclaimed water irrigation area. However, as described in Section 2, it likely does not represent background water quality for most wells because it is closely tied to surface water and may be installed across fractured bedrock, which would have a different chemistry signature than the downgradient wells (which are generally installed in unconsolidated sand and gravel material). Obtaining background water quality for the area is difficult because the irrigation area is extensive. A review of the lithology in the area indicates that any additional monitoring wells intended as representative upgradient samples would also likely need to be installed across fractured bedrock (similar to DMW-3) because the unconsolidated sediments are very thin on the upper valley walls and are typically not water-bearing.

In 2018, Associated reviewed the north side of the valley, where reclaimed water is not used, to determine whether further information on background water quality could be obtained. A preliminary review suggested that the subsurface stratigraphy may be similar on the north side of the valley, where irrigation water is not applied (with the exception of The Rise Golf Course) (Associated 2019). Although this is not a standard approach for determining background, if it were possible to obtain samples from a variety of depths and locations, this information could provide some indication of the range of constituents in a similar geological area that is not irrigated with reclaimed water.

Based on a review of the BC Water Resource Atlas in 2018, over 20 mapped wells were identified for potential testing; however, most of the wells no longer existed or Associated could not gain access (Associated 2019). Many of these wells may have been established as private domestic wells when the area was not supplied by the public water system and may have become inactive once the public water supply was installed. Five background wells were identified and tested in 2018. The results, which were reported in Associated (2019), do not provide a wide range of potential background levels given their depths and locations, but provide some base information. Other general background information includes regional background concentrations developed by ENV.

Reclaimed Water Quality

In addition to the wells listed in Table 3-1, water quality data collected for the program also include Clay Valve #4, which is at the distribution point after Mackay Reservoir (i.e., samples reflect quality of the reclaimed water prior to irrigation). This location is sampled monthly by City staff during the irrigation season, as required by the OC (MOE 2008).

In 2019, City staff collected samples at Clay Valve #4 monthly between May and October, and submitted the samples to CARO Analytical Services for analysis of the following parameters:

- biochemical oxygen demand (BOD);
- pH, total suspended solids, chloride, sodium (total), and sulphate;
- nitrogen (ammonia-N, nitrate-N, nitrite-N, TKN, organic nitrogen, and total nitrogen);
- phosphorus (orthophosphate, dissolved phosphorus, total phosphorus);
- total coliforms and fecal coliforms; and
- dissolved metals (May and June only).

The Clay Valve #4 analytical list includes the parameters required under Section 8.3.4 of the OC, plus chloride, sodium, sulphate, and dissolved metals. These were added to make the list more consistent with groundwater analyses, to aid with interpretation.

Each year, the City provides Associated with the water quality results from this location for inclusion in the water quality database.

Historical Water Quality Data

For most of the groundwater sampling locations, the dataset begins in 2011 when the groundwater monitoring program was initiated. The exceptions are DMW18-1 (first tested in 2018) and DMW-3 and MW-2 (part of a previous monitoring program conducted by ENV between 1979 and 1995). The prior program collected data for DMW-3 from 1989 to 1995 and for MW-2 from 1979 to 1995.

3.1.5 Quality Assurance and Quality Control

The quality assurance / quality control (QA/QC) measures applied as part of the sampling program included calibrating instruments prior to sampling, wearing nitrile gloves, and using either dedicated well equipment or thoroughly decontaminating and rinsing equipment between wells. In addition, a blind duplicate sample was collected. Collection and analysis of duplicate samples provides information on the combined (field and analytical) precision of the sampling and the analytical program. The individual analytical results for each analyte in each sample of the duplicate pair were compared, and the relative percent difference (RPD) value was calculated for each analyte pair as follows:

$$RPD = \left(\frac{(a-b)}{\left(\frac{a+b}{2} \right)} \right) \times 100$$

where *a* and *b* are duplicate pair values in identical units. An RPD value of 20% or less is generally considered acceptable, whereas an RPD value greater than 20% may indicate a problem with either sampling or analysis (MOE 2013a). This limit may vary depending on the analysis involved and the concentration of the analyte. The RPD value also tends to increase as the result approaches the detection limit. Therefore, use of this threshold is restricted to duplicate pair values that are greater than five times their detection limit (MOE 2013a).

In addition to the collection of a duplicate sample, a trip blank and a field blank sample were also collected. Trip blanks are deionized water in sealed containers that are provided by the laboratory. These are taken into the field and remain in sample coolers during sampling; they are not opened. Field blank samples are deionized water provided by the laboratory, but these samples are handled the same way as monitoring well samples. Bottles are filled in the field using the same procedure for the samples being collected. Results for both sample types are then compared to the analytical results expected for deionized water.

3.2 Results and Discussion

3.2.1 Guideline Exceedances

Table 3-2 identifies the parameters that exceeded the applicable drinking water, aquatic life, irrigation water, and/or livestock water guidelines and/or standards in the 2019 groundwater samples. All 2019 results, tabulated and compared with all applicable guidelines, are included in Appendix C. The original laboratory reports for 2019 are in Appendix E.

Table 3-2
Exceedances of the applicable guidelines or standards in groundwater in 2019

	DMW-1	DMW-3	DMW-4	DMW-5	MW-2	MW11-02	MW-5	WTN 24991	WTN 39421	DMW18-1
Conductivity (field-measured)	X	X	X	X	X	X	X			X
pH (field-measured)		X	X	X						
Chloride			X	X		X				
Fluoride				X						
Sulphate						X				
Total dissolved solids	X	X	X	X	X	X			X	X
Phosphorus (total)			X	X	X	X				
Phosphorus (dissolved)			X	X	X	X				
Chromium (dissolved)	X					X			X	X
Iron (dissolved)		X								
Lithium (dissolved)	X	X	X	X		X				X
Manganese (dissolved)		X		X	X		X	X		
Molybdenum (dissolved)			X	X	X			X		X
Selenium (dissolved)	X	X				X			X	X
Sodium (dissolved)				X						
Uranium (dissolved)	X			X	X	X				X
Zinc (dissolved)					X					

Notes: X indicates an exceedance of the applicable guidelines and/or standards, differentiated as follows:
X = exceedance of the applicable drinking water guidelines (Health Canada DW, BC DW, and/or CSR DW).
X = exceedance of the applicable irrigation and/or livestock water guidelines (BC IW, BC LW, CSR IW, and/or CSR LW).
= exceedance of the applicable aquatic life guidelines (BC AL acute and CSR AW).
Although dissolved oxygen was below the BC AL in groundwater, it is not included as an exceedance in the above table as dissolved oxygen in groundwater is not representative of dissolved oxygen in surface water

The DW MAC guideline exceedances are considered to represent the highest risk because much of the study area is not serviced by public water supply, and domestic wells are used for consumption purposes. Exceedances of a DW MAC in 2019 included:

- Fluoride in DMW-5;
- Lithium in DMW-1, DMW-3, DMW-4, DMW-5, DMW18-1, and MW11-02;
- Manganese in DMW-3, DMW-5, and MW-2;
- Selenium in DMW-1, DMW18-1, MW11-02, and WTN 39421; and
- Uranium in DMW-1, DMW-5, and MW11-02.

These parameters are discussed further in Section 3.2.2.

3.2.2 Comparison to Background, Reclaimed Water Quality, and Historical Data

The following sections provide a brief interpretation and historical comparisons for parameters that exceeded guidelines in groundwater 2019 (Table 3-2) and/or are considered key parameters of interest for reclaimed water. Plots showing temporal changes in concentrations for these parameters are included in Appendix D. Historical data can be found in Associated 2018a. As per Section 3.1.4, Clay Valve #4 is the distribution point after Mackay Reservoir (i.e., samples collected at Clay Valve #4 reflect quality of the reclaimed water prior to irrigation).

3.2.2.1 Routine Parameters

pH

Field-measured pH values were slightly below the DW AO range of 7.0–10.5 in DMW-3 (pH of 6.96), DMW-4 (pH of 6.89), and DMW-5 (pH of 6.98) (Figure D-1). The pH of water is not considered to directly affect health; however, pH changes can cause changes in other parameters. The DW AO is set to maximize the effectiveness of treatment and to control corrosion/leaching from pipes (Health Canada 2019). As in previous years, artesian well MW-5 has a higher pH (pH of 9.09) than the other wells, which typically range from 7 to 8. All other pH guidelines were met in 2019. In 2019, laboratory-measured pH in Clay Valve #4 water ranged from 7.91 to 8.15.

Conductivity

There are no DW, AW, or LW guidelines for conductivity. The BC IW guideline for conductivity varies based on crop type (ENV 2017b). The guideline is <700 µs/cm for low tolerance crops, <1,200 µs/cm for slightly tolerant crops, <2,200 µs/cm for moderately tolerant crops, <3,600 µs/cm for tolerant crops, and <5,000 µs/cm for very tolerant crops.[7]

In 2019, conductivity exceeded the BC IW guideline for low tolerance crops in all wells except WTN 24991 and WTN 39421 (Figure D-2). Conductivity also exceeded the BC IW guideline for slightly tolerant crops in DMW-1, DMW-3, DMW-4, DMW-5, MW-2, and MW11-02. DMW-5 and MW11-02 also exceeded the BC IW guideline for moderately tolerant crops. All conductivity results met the guidelines for tolerant crops and very tolerant crops. Conductivity levels have increased in DMW-1 and DMW-5 since 2011. In other wells with historical data, conductivity has remained relatively consistent. Conductivity was not measured in Clay Valve #4 in 2019 (and is not required, according to the OC). DMW-3, the background well, has a range of concentrations over the years that is similar to the other wells.

Chloride

Chloride is a conservative ion, meaning that once it is dissolved in water it tends to stay in solution. As a result, chloride that enters groundwater may reach downgradient surface water (MOE 2003). Examples of anthropogenic sources of chloride to the environment include the application of road salt, industrial activities, municipal wastewater, leachate from refuse disposal sites, and fertilizers (MOE 2003). There are no health-based drinking water guidelines for chloride; however, concentrations above 250 mg/L may cause corrosion in drinking water systems and/or may

[7] Low tolerance crops include strawberry, raspberry, bean, and carrot; slightly tolerant crops include all other fruits and berries, corn, sweet corn, onion, parsnip, radish, pea, pumpkin, lettuce, pepper, muskmelon, sweet potato, potato, celery, cabbage kohlrabi, cauliflower, cowpea, broadbean, flax, sunflower, and clover; moderately tolerant crops include spinach, cantaloupe, cucumber, tomato, squash, Brussel sprout, broccoli, turnip, brome, alfalfa, big trefoil, beardless, wildrye, vetch timothy, and crested wheatgrass (ENV 2017b).

produce an undesirable taste (Health Canada 1987). The DW AO and CSR DW for chloride is 250 mg/L. The BC/CSR IW guideline is 100 mg/L and the BC LW and AW guidelines are 600 mg/L. The CSR AW standard is 1500 mg/L.

In 2019, chloride concentrations (Figure D-3) met the DW AO in all wells except DMW-5 (256 mg/L). The chloride concentrations in DMW-4 and MW11-02 exceeded the IW guideline of 100 mg/L but not the DW guidelines. Chloride concentrations in DMW-5 generally increased between 2011 (i.e., the first sample event, when guidelines were met) and 2016, but have remained relatively consistent since that time. Chloride has increased in DMW-1 since monitoring began, whereas chloride concentrations in DMW-3, DMW-4, MW-2, and DMW18-1 have decreased, and they have remained relatively consistent in MW-5, MW11-02, WTN 24991, and WTN 39421.

DMW-5 is located in a cattle pasture (i.e., near sources of manure and urea) and close to a major roadway (i.e., a source of road salt), which could contribute to the increase in chloride. The well depth is unknown because the well log is not available, but the well is artesian. Chloride in Clay Valve #4, which was tested in 2003, 2015, 2016, 2017, 2018, and 2019, has remained relatively consistent and ranged from 75.9 to 175 mg/L, with an average of 95.3 mg/L. Given that concentrations are lower in the reclaimed water than in DMW-5, and given that an increasing trend is not visually apparent in the other wells in the reclaimed water irrigation area, there are likely other sources of the elevated chloride in DMW-5.

Fluoride

Fluoride is naturally occurring in Canada and can reach the water supply through the degradation and erosion of fluoride-containing rocks. Exposure itself is not necessarily harmful, but at high concentrations fluoride can have adverse effects (Health Canada 2010). The DW MAC, CSR DW, and BC LW guideline is 1.5 mg/L, the CSR IW and CSR LW is 1.0 mg/L, the BC IW is 2.0 mg/L, and the BC AL is calculated based on the water hardness.

Fluoride in DMW-5 (1.52 mg/L) slightly exceeded the DW MAC, CSR DW, and BC LW guidelines, as well as the CSR IW and CSR LW. No guidelines were exceeded by any other well, and the concentration in the remaining wells ranged from 0.13 mg/L to 0.71 mg/L. The trend in fluoride has been stable in all wells, with the exception of DMW-5, where concentrations generally have increased since 2016 (Figure D-4). Concentrations in DMW-4 also increased between 2016 and 2018, but decreased in 2019. Both of these wells are located on the south side of the Commonage Ridge, near MacKay Reservoir. Fluoride was not tested in Clay Valve #4 (because it is not required as per the OC). Only DMW-5 was above the background well DMW-3.

Sodium

Sodium compounds are widely present in nature and can be present in treated municipal wastewater due to human consumption. Sodium is not toxic at normally observed levels; as such, health-based guidelines have not been established (Health Canada 1992). However, sodium concentrations that exceed 200 mg/L may affect taste; therefore, the DW AO for sodium is 200 mg/L. The CSR DW is also 200 mg/L. There is no IW, LW, or AL guideline for sodium.

In 2019, sodium concentrations met the DW AO and CSR DW in all wells except DMW-5 (211 mg/L). The pattern of sodium concentrations in DMW-5 is similar to that of chloride (i.e., increasing from 2011-2016) in the same well (Figure D-5); although similar to chloride, the 2019 concentration was lower than the 2018 concentration and it appears that concentrations may be stabilizing. There are potential sources of sodium near DMW-5, such as road salt or agriculture.

Similar to chloride, sodium has decreased over the past three years in DMW-4 and MW-2. It has also decreased in DMW18-1 since it was first tested in 2018. In other wells, it has remained relatively consistent.

Sodium (total) in Clay Valve #4 in 2019 ranged from 88.8 to 102.0 mg/L, and the concentrations in background well (DMW-3) are mid-range compared to the concentrations in the other wells.

Sulphate

Sulphate enters the water cycle through weathering of parent rocks, atmospheric deposition, and discharges from anthropogenic sources, such as mining operations, agricultural runoff, and municipal wastewater (MOE 2013b). The DW AO and CSR DW is 500 mg/L. The LW (BC and CSR) guideline is 1000 mg/L. The BC AL is calculated based on the water hardness; in this case, the guideline is 429 mg/L. There is no IW guideline.

In 2019, sulphate concentrations met the guidelines in all wells except MW11-02 (Figure D-6), which had a concentration of 729 mg/L and exceeded the DW AO, CSR DW, and BC AL. Historically, sulphate concentrations in MW11-02 have been approximately double the concentrations detected in other monitoring wells in the network, and there is no apparent upward trend in MW11-02; rather, it has fluctuated between 500 and 800 mg/L since 2011. Of all sites, Clay Valve #4 generally continues to have the lowest sulphate concentrations, ranging from 79.2 to 86.9 mg/L in 2019. The lower concentrations of sulphate in Clay Valve #4 suggest that the concentrations in MW11-02 are unrelated to reclaimed water irrigation operations, and are likely caused by local natural or anthropogenic sources.

Well MW11-02 has had issues with fine sands present during well purging and elevated turbidity, which can affect water quality results. In 2017, Associated attempted to redevelop the well.[8] Fine sand was pumped from the well and the turbidity of the water was initially 85.5 NTU; after removing more than 10 well volumes of water, no sand was visible and the turbidity of the water was 3.75 NTU (Associated 2018). In 2018, the turbidity was 10.1 NTU following removal of more than 10 well volumes (Associated 2019). However, when the well was purged in 2019, significant sand was again observed in the water, and turbidity was high (> 100 NTU) despite purging greater than 3 well volumes. The turbidity may be affecting the water quality results from the well, and therefore future efforts should aim to purge greater than 10 well volumes prior to sampling to reduce turbidity. However, the sulphate concentrations in this well are consistent regardless of whether turbidity is low (e.g., in 2017, when turbidity was 3.75 NTU, sulphate was 754 mg/L; in 2019, when turbidity was >100 NTU, sulphate was 729 mg/L).

Sulphate concentrations in the other wells have remained relatively consistent since 2011, with the exception of DMW-4 where they have decreased.

Total Dissolved Solids

Total dissolved solids (TDS) was added to the monitoring program in 2019 to aid with the development of tri-linear diagrams (Section 2.3). The DW AO and BC IW is 500 mg/L, and the BC LW is 1000 mg/L. In 2019, TDS in all wells except artesian wells MW-5 and WTN 24991 exceeded the DW AO and BC IW guidelines. In DMW-5 and MW11-02, TDS also exceeded the BC LW guideline. A time series plot was not generated for TDS, as there is only one year of data.

[8] Well re-development was completed using an inertial pump (foot-valve) and HDPE tubing (Associated 2018). Using a high energy discharge method, fine material is removed from the well and from the formation immediately around the well screen.

3.2.2.2 Nitrogen

The different forms of nitrogen that make up total nitrogen are organic nitrogen, nitrate, nitrite, ammonia, and ammonium. Organic nitrogen in soils and shallow groundwater is converted by microbes to ammonia and ammonium through the process of mineralization. Ammonium is converted to nitrite (NO_2) and then nitrate (NO_3) through the process of microbial nitrification. Because of these processes, nitrogen in groundwater is typically found as nitrate. Of the nitrogen forms, ammonia is most toxic to aquatic life, whereas nitrate is of higher concern for human health (i.e., drinking water). In addition, nitrate is an anion (negatively-charged particle) and tends not to bind with clay and organic matter, both of which are also mostly negatively charged. Therefore, it can travel readily through groundwater.

Clay Valve #4

Because inorganic nitrogen converts readily between forms, it is important to assess all forms of nitrogen in reclaimed water, including total nitrogen. The City is not specifically required to treat for nitrogen under the OC (i.e., no maximum acceptable level is specified), nor is it a requirement for reclaimed water under the MWR. However, in 2005, the treatment system at the VWRC was upgraded to include Biological Nutrient Removal (BNR), which reduces the nitrogen and phosphorus content of wastewater.

Table 3-3 lists the average concentrations of key nitrogen parameters in Clay Valve #4 before BNR (pre-2006) and after BNR (i.e., 2006 – 2019), and the range of concentrations in 2019. The most stringent applicable guidelines are provided in Table 3-3 for context, but it is important to note that these guidelines apply to the receiving environment (i.e., groundwater and surface water) and not Clay Valve #4. However, they show that levels of ammonia-N, nitrate-N, and nitrite-N generally have remained low since the BNR system was brought online.

Table 3-3
Average and 2019 nitrogen concentrations in Clay Valve #4

Nitrogen Form	Average Concentration before BNR[1] (mg/L)	Average Concentration after BNR[2] (mg/L)	Range of Concentrations in 2019	Guideline
Ammonia-N	9.8	0.47	0.607 – 1.17	DW – none AL – 0.681 to 28.7 mg/L[3]
Nitrate-N	2.0	1.2	<0.010 – 1.03	DW – 10 mg/L AL – 32.8 mg/L
Nitrite-N	0.17	0.07	<0.010 – 0.196	DW – 1 mg/L AL – 0.06 to 0.60 mg/L[4]
Total Nitrogen	13.9	2.9	2.14 - 2.73	None

Notes:
BNR = Biological Nutrient Removal
[1] Based on all available pre-2006 data, which include two samples from 1979 and samples from 1996 to 2005.
[2] Based on data from 2006 to 2019.
[3] Guideline varies based on the water pH and temperature; acute maximum guideline range is shown.
[4] Guideline varies based on the chloride concentration; acute maximum guideline range is shown.

Nitrogen (in Groundwater)

In 2019, ammonia-N, nitrite-N, and nitrate-N in groundwater met all applicable guidelines. Nitrite-N was not detected. Ammonia-N was detected in some wells, but concentrations remained below the BC AL acute guideline and CSR AW, both of which are calculated based on the sample pH and temperature. There are no DW, IW, or LW

guidelines for ammonia-N. Ammonia-N concentrations in groundwater in 2019 ranged from <0.020 mg/L (in DMW-1, DMW-4, and WTN 39421) to 0.469 mg/L (in MW-5). The guideline range (based on the pH and temperature) was 0.684 to 21 mg/L (BC AL acute) and 1.31 to 18.5 mg/L (CSR AW).

As described above, nitrogen in groundwater is most readily found as nitrate. Nitrate occurs in groundwater at low levels naturally, and can be generated from anthropogenic sources. The local baseline concentration of nitrate is difficult to determine due to the long history of development and agriculture in the area; however, natural processes typically result in nitrate concentrations of less than 1 mg/L in groundwater in BC, and concentrations above 3 mg/L usually suggest anthropogenic effects (MOE 2007).[9] Key anthropogenic sources of nitrate include agricultural activities (e.g., cattle manure, fertilizers) and human wastewater (e.g., from municipal treatment systems and private septic systems) (Health Canada 2013).

In 2019, nitrate-N concentrations in all wells (Figure D-7) met the applicable guidelines/standards, which range from 10 mg/L (DW MAC) to 400 mg/L (CSR AW). However, similar to previous years, some wells had concentrations that are likely not naturally occurring (i.e., above 3 mg/L): MW11-02 (8.98 mg/L), DMW18-1 (3.05 mg/L), DMW-5 (3.72 mg/L), and DMW-1 (3.04 mg/L). Concentrations in these wells are discussed as follows, relative to historical data:

- **MW11-02:** Prior to 2019, nitrate-N concentrations in MW11-02 had exceeded the DW MAC. Nitrate-N in this well has consistently decreased since early 2012, when the measured concentration was approximately 20 mg/L. In 2019, concentrations decreased to 8.98 mg/L, which is below the DW MAC of 10 mg/L. Although results were below the applicable guidelines in 2019, they are not considered naturally occurring. The well is downgradient from a commercial tree nursery, and elevated nitrate-N concentrations may be an indication of the use of nitrogen-based fertilizers (e.g., ammonium nitrate) in the nursery's operations. The decrease in concentrations is a positive sign, although the reason for the decrease is unknown. It could be reflective of an improvement in nutrient management practices by the nursery. Further monitoring is needed (see recommendations in Section 6) to determine if the decreasing trend continues.
- **DMW18-1**: Nitrate-N in DMW18-1 exceeded DW MAC in 2018 (11.9 mg/L in June 2018 only) (Associated 2019), but concentrations have decreased consistently since that time and did not exceed guidelines in 2019. Although they have decreased, nitrate-N concentrations in 2019 (1.28 mg/L to 3.05 mg/L) are still considered elevated over natural conditions. However, throughout 2018 and 2019, nitrate-N concentrations were notably lower (< 1.5 mg/L) in two nearby monitoring wells (MW17-5 and MW17-6) that are tested as part of the Hesperia Landfill monitoring program (Associated 2020), and are located 35 m and 70 m upgradient of DMW18-1 and within the reclaimed water use area. This highlights the spatial variability of nitrate concentrations. Further monitoring of nitrate-N levels in DMW18-1 in 2020 is needed to determine if concentrations continue to decrease.
- **DMW-5:** Nitrate-N in DMW-5 increased steadily from <1 mg/L in 2011 to >6 mg/L in 2017, as reported in Associated (2019). However, concentrations have decreased over the most recent sampling events (2018 and 2019). To date, nitrate-N in DMW-5 has not exceeded guidelines. As mentioned previously, this well is located in a cattle pasture (i.e., near sources of manure and urea), which is another possible source.
- **DMW-1:** Nitrate-N in DMW-1 has fluctuated from 2.29 (in 2012) mg/L to 3.04 mg/L (in 2019). To date, nitrate-N in DMW-1 has not exceeded guidelines.

[9] This finding is supported by a compilation of 11,660 results for nitrate-N across the Cordillera region (including most of BC, part of Alberta, and part of the Yukon and Northwest Territories), which had a median nitrate-N concentration of 0.05 mg/L. In addition, over 98% of the samples had a nitrate-N concentration of less than 10 mg/L (Rivera 2014). Generally, nitrate-N values greater than 3 mg/L are considered to indicate contribution from human activities (Rivera 2014).

These nitrate-N concentrations are not considered representative of natural conditions, but the source is unclear. The spatial variability of these exceedances across the study area suggests there may be localized sources contributing to elevated levels. DMW18-1 and MW11-02 are both located in the reclaimed water use area, but are over 2 km apart. DMW-1 is located approximately 400 m east of DMW18-1, whereas DMW-5 is over 7 km to the southwest. Testing of additional domestic wells on the other side of the valley (where reclaimed water is not used) in 2018 found one well with a nitrate-N concentration of 21 mg/L (Associated 2019), which suggests localized sources. DMW-3, which is outside the area of reclaimed water use, typically has lower levels of nitrate (0.156 mg/L to 1.01 mg/L), but this well is also located upgradient of the agricultural land found along the valley walls.

As described above, total nitrogen in Clay Valve #4 has decreased since the BNR was brought online, and current total nitrogen levels (2.14 - 2.73 mg/L in 2019) are much lower than the nitrate-N levels in MW11-02, DMW-5, and DMW18-1. However, nitrogen flux (movement) through groundwater can vary depending on the geology and infiltration rate, and in some cases, nitrate can remain in a groundwater system for a long time. Although the reclaimed water may be contributing somewhat to nitrate levels, the majority of the nitrate in these wells is likely sourced from other sources (i.e., commercial tree nursery, cow pastures, local residential septic fields or lawn care products).

3.2.2.3 Phosphorus

The MWR does not set standards for phosphorus for reclaimed water. There is no Health Canada DW or CSR DW for phosphorus, but the BC DW AO is 0.01 mg/L for total phosphorus. According to the supporting documentation for this AO, the guideline for phosphorus applies to lakes that are used as a source of drinking water, to reduce the risk of algal blooms in surface water (MOE 2001a). No guidelines are recommended for streams used for drinking water, and no discussion on groundwater is included (MOE 2001a). Therefore, this guideline is not inferred to apply to groundwater (where algal blooms are not a concern). There are also no LW (BC or CSR), IW (BC or CSR) or CSR AW standards for total or dissolved phosphorus.

The BC AL guideline for phosphorus is 0.015 mg/L (total and dissolved phosphorus). The guideline documents do not specifically state that they apply only to surface water, but phosphorus is generally a concern for surface waterbodies. The BC AL is the only guideline applied to phosphorus in groundwater for this report. However, this is considered a conservative approach. As a comparison, at ground dispersal sites (septic fields), inorganic phosphorus (orthophosphate) readily adsorbs onto soil particle surfaces, reducing the likelihood of transport in groundwater.

In 2019, total and dissolved phosphorus concentrations (Figure D-8 and D-9) exceeded the BC AL of 0.015 mg/L in DMW-4, DMW-5, MW-2, and MW11-02. The highest concentration of total phosphorus was in MW11-02 at 0.392 mg/L, and the highest concentration of dissolved phosphorus was in DMW-4 at 0.275 mg/L. Historically, the highest concentrations of dissolved phosphorus have been in DMW-4, but concentrations have remained relatively consistent over the 2011-2019 monitoring period. With the exception MW11-02, which has shown notable fluctuations in total phosphorus only, concentrations of both total phosphorus and dissolved phosphorus have remained relatively steady in all wells.

Total phosphorus in Clay Valve #4 in 2019 ranged from 0.642 to 1.12 mg/L, and dissolved phosphorus ranged from 0.596 to 1.08 mg/L. Trends were similar to that of previous years.

3.2.2.4 Metals

Exceedances of the guidelines for metals have occurred since groundwater testing began in 2011. Metals are not typical contaminants of concern in municipal wastewater, and the MWR sets no standards for metals in treated

effluent. There are two possible mechanisms by which irrigation with treated effluent could influence metal concentrations in groundwater:

1. Metals can be added to groundwater if they are present at elevated levels in the irrigation water. To assess this condition, the City has been testing metals periodically in Clay Valve #4 samples since 2016.
2. Metals that are naturally present in the soil can be mobilized by the infiltration of irrigation water, and over time may result in elevated concentrations in groundwater. Note, however, that the average pH of the water at Clay Valve #4 has been typically near-neutral, and metal mobilization generally tends to be more significant when the pH of the water is lower (more acidic) than the observed range (USGS 2016).

Exceedances of dissolved metals guidelines are common in BC, and many metals are naturally occurring. Obtaining representative upgradient samples to assess the range of background levels is difficult, as described in Section 2.

In 2019, metals that exceeded the applicable guidelines included chromium, iron, lithium, manganese, molybdenum, selenium, uranium, and zinc. All of these are attributed, at least in part, to background concentrations, as discussed below.

- **Dissolved chromium** (Figure D-10) met the DW (0.05 mg/L) and LW guidelines (0.05 mg/L) in all wells and met the BC and CSR IW (0.0049 mg/L and 0.005 mg/L, respectively for chromium VI) in all wells except DMW-1 (0.00606 mg/L). Concentrations in several wells (DMW-1, MW11-02, WTN 39421, and DMW18-1) exceeded the more stringent BC AL of 0.001 mg/L, but none exceeded the CSR AW standard of 0.01 mg/L. These results are consistent with findings from previous monitoring programs. Historically, the highest chromium concentration has been detected in DMW-1, where concentrations have fluctuated around 0.006 mg/L. In the other wells, concentrations have remained below 0.003 mg/L. Chromium concentrations in groundwater depend on bedrock-groundwater interactions and the IW guideline for chromium is low; therefore, it is relatively common to find naturally occurring concentrations in groundwater near the guideline. Also, chromium in Clay Valve #4 has been consistently below the detection limit of 0.0005 mg/L since it was first tested in 2016.
- **Dissolved iron** (Figure D-11) exceeded the DW AO (0.3 mg/L) and BC AL guideline (0.35 mg/L) in DMW-3 (1.45 mg/L), the background well. None of the results exceeded the CSR DW (6.5 mg/L) or CSR IW (5.0 mg/L) standard. Since testing of iron began in Clay Valve #4 in 2016, dissolved iron has ranged from 0.015 mg/L to 0.039 mg/L. Iron is naturally occurring in BC and is often found above the AO guidelines.
- **Dissolved manganese** (Figure D-12) exceeded the DW MAC (0.12 mg/L), DW AO (0.02 mg/L), and IW (BC and CSR; 0.200 mg/L) in DMW-3 (background well), DMW-5, and MW-2. Concentrations in MW-5 and WTN 24991 exceeded the DW AO guideline, but not the DW MAC or IW guidelines, and none of the wells exceeded the CSR DW (1.5 mg/L). The exceedances may reflect natural conditions, as such exceedances are common for groundwater throughout the BC Interior. Although concentrations of manganese in DMW-5 have fluctuated, they have consistently been above guidelines since testing began in 2011. Since testing of manganese began in Clay Valve #4 in 2016, dissolved manganese has ranged from 0.0114 to 0.142 mg/L.
- **Dissolved molybdenum** (Figure D-13) exceeded the CSR IW[10] (0.01 mg/L) but not the BC IW (0.05 mg/L) or any of the LW, DW, or AL guidelines in DMW18-1, DMW-4, DMW-5, MW-2, and WTN 24991 in 2019. Dissolved molybdenum appears to be trending upward over the past two years at DMW18-1, in contrast to the other wells where it has remained more stable. Dissolved molybdenum is lowest in MW-5 and Clay Valve #4 (0.00392 to 0.0053 mg/L, over the period of record).

[10] The CSR molybdenum standard is 0.010 – 0.030 mg/L, which varies with crop, soil drainage, and molybdenum-copper ratio, and refers to a note to 'consult a director for further advice' (B.C. Reg. 253/16).

- **Dissolved lithium** (Figure D-14) exceeded the CSR DW (0.008 mg/L) in several wells including DMW-1, DMW-3, DMW-4, DMW-5, DMW18-1, and MW11-02. Neither Health Canada nor the BC DW specify a limit for lithium in drinking water; however, the CSR DW limit is 0.008 mg/L. No wells exceeded IW, LW, or AL guidelines, which range from 0.75 mg/L to 5.0 mg/L. Lithium concentrations in all wells have remained relatively consistent over time, with the exception of DMW-5 in which lithium increased between 2011 and 2015. Since 2016, it has remained relatively stable at approximately 0.06 mg/L. In Clay Valve #4, dissolved lithium has ranged from 0.009 to 0.0135 mg/L.

  In September, ENV (2018) released Technical Bulletin 3, which provides regional background concentrations of arsenic, lithium, selenium, uranium, and vanadium for four regions in BC. For the Thompson-Okanagan Region[11], the background concentration for lithium is 0.096 mg/L (compared to the CSR DW of 0.008 mg/L). **Concentrations of dissolved lithium in all wells in 2019 remained below the Thompson-Okanagan Regional background concentration.** This finding, and the presence of lithium above guidelines in four of five wells tested on the north side of the valley in 2018, suggests the dissolved lithium concentrations are likely naturally occurring (Associated 2019).
- **Dissolved selenium** (Figure D-15) exceeded the BC DW MAC, CSR DW, and BC IW (0.01 mg/L) in four wells: DMW-1, DMW18-1, MW11-02, and WTN 39421. DMW-1, MW11-02, and WTN 39421 also exceeded the CSR IW and AW of 0.02 mg/L, and DMW-1 and WTN 39421 exceeded the CSR LW of 0.03 mg/L. All concentrations were below Health Canada's DW MAC of 0.05 mg/L; however, the BC DW MAC of 0.010 mg/L is the recommended drinking guideline for BC (MOH 2017). Concentrations of dissolved selenium in DMW18-1 have decreased since the well was added to the program in 2018. Concentrations have also decreased in DMW-3, which is outside the reclaimed water use area, and MW-2, which is within the reclaimed water use area. In other wells, selenium has remained relatively stable.

  For the Thompson-Okanagan Region[11], the background concentration for selenium is 0.107 mg/L (compared to the CSR DW of 0.010 mg/L). **Concentrations of dissolved selenium in all wells in 2019 remained below the Thompson-Okanagan Regional background concentration.** The highest concentration in 2019 was in WTN 39421, at 0.0347 mg/L. Additionally, selenium concentrations in Clay Valve #4 have remained below guidelines with concentrations ranging from <0.00050 mg/L to 0.00077 mg/L since 2011, and at lower concentrations than in the groundwater samples. This suggests selenium is likely naturally occurring in the Vernon area.
- **Dissolved uranium** (Figure D-16) exceeded the DW MAC and CSR DW (0.02 mg/L), IW (BC and CSR; 0.010 mg/L), and BC AL (0.0085 mg/L) in DMW-1, DMW-5, and MW11-02 in 2019. Concentrations in DMW18-1 and MW-2 exceeded the IW (BC and CSR) and BC AL, but not the DW MAC. Concentrations have been generally consistent since 2011 except in DMW-1 and DMW-5, where they have increased (0.0134 to 0.0216 mg/L in DMW-1 and 0.0203 to 0.0289 mg/L in DMW-5), but concentrations may be stabilizing. Conversely, in MW-2 and DMW18-1, uranium has decreased. Uranium in MW11-02 has fluctuated from below the MAC of 0.02 mg/L to as high as 0.0669 mg/L. In other wells, uranium has remained relatively stable.

  The uranium exceedances may be the result of localized groundwater reacting with the parent rock material in the soil, causing dissolution of uranium. For the Thompson-Okanagan Region, the background concentration for dissolved uranium is 0.084 mg/L (compared to the CSR DW of 0.020 mg/L). **Concentrations of dissolved uranium in all wells in 2019 remained below the Thompson-Okanagan Regional background concentration.** Additionally,

[11] The Thompson-Okanagan Region is defined as 'encompassing the area between Kamloops and Kelowna' (ENV 2018), although it is important to note that the sites used to establish background were in the Kamloops and Kelowna regions, and not in Vernon. These background concentrations suggest that lithium, selenium, and uranium are naturally found in the Thompson-Okanagan region at levels above the applicable guidelines.

uranium concentrations in Clay Valve #4 have remained below guidelines ranging from 0.00172 mg/L to 0.00306 mg/L (since 2011) and at lower concentrations than in the groundwater samples.

- **Dissolved zinc** (Figure D-17) in MW-2 (0.688 mg/L) exceeded the BC AL but not the CSR AW or any other guidelines. The BC AL and CSR AW for zinc are calculated based on the water hardness; for MW-2, these calculated guidelines were 0.323 and 3.150 mg/L, respectively. All other wells met the applicable guidelines for zinc. In Clay Valve #4, dissolved zinc has ranged from 0.0210 to 0.0352 mg/L. Therefore, the exceedance in MW-2 is not attributed to reclaimed water use.

3.2.3 Quality Assurance and Quality Control

RPD values were calculated from duplicate sample set collected at MW-5.[12] Once values less than five times their respective detection limit were removed, the average RPD value was 3% and all RPD values met the 20% threshold.

The results from the field and trip blank samples were consistent with the results expected for deionized water. All parameters were non-detect, with the exception of total mercury in the trip blank, which was detected at 0.000029 mg/L. However, this result is within 5x the detection limit for total mercury (0.00001 mg/L).

Further information about the laboratory's QA/QC is provided in the laboratory reports (Appendix E).

[12] Duplicate samples collected directly by the City from Bailey Springs and Clay Valve #4 are assessed by the City, and not included in this report.

4 BAILEY SPRINGS WATER QUALITY

4.1 Methods

4.1.1 Sampling Location, Frequency, and Methodology

Section 8.9 of the OC requires monthly sampling of Bailey Springs. In 2019, samples from Bailey Springs were collected monthly by City staff, and submitted to CARO Analytical Services for analysis of the following parameters:

- pH, conductivity, chloride, and sodium;
- nitrogen (ammonia-N, nitrate-N, nitrite-N, TKN, organic nitrogen, and total nitrogen);
- phosphorus (orthophosphate, dissolved phosphorus, total phosphorus);
- total coliforms and fecal coliforms;
- sulphate (all months except May); and
- dissolved metals (March, April, June, and December only).

The analytical list includes the parameters required under Section 8.9 of the OC, plus sulphate and dissolved metals, which the City tests periodically to more closely align with the groundwater analytical program.

Each year, the City provides Associated with the water quality results from Bailey Springs for inclusion in the water quality database, and Associated compares the data to applicable guidelines and historical data (Section 4.1.2).

4.1.2 Comparison to Guidelines and Historical Data

To assess risk to aquatic life receptors, results from Bailey Springs were compared with the BC AL (ENV 2017b, 2019). CSR AW standards were not applied to surface water, as they are designed for groundwater that flows to surface water. For this reason, in many cases, the CSR AW standards apply a dilution factor and are therefore less stringent than the BC AL. The BC AL guidelines represent the levels of constituents that are considered safe for aquatic life (e.g., in a stream).

For some parameters, the BC AL guideline includes two maximum levels: chronic (or long-term average) and acute (or short-term maximum). Compliance with chronic guidelines is typically assessed by calculating the average concentration over a specified period (e.g., 5 samples in 30 days). The chronic guidelines are more stringent than the acute guidelines because they are designed to protect aquatic life from repeated exposure. The individual measured concentrations in Bailey Springs were assessed against both the chronic and acute AL guidelines for screening purposes.

Results from Bailey Springs were also compared with the BC Recreational Water Quality Guidelines (BC REC; ENV 2017c), as the outflow to Kalamalka Lake is located next to a commercial campground, beach area, and boat launch (Figure 1-1).

4.2 Results and Discussion

4.2.1 Aquatic Life Guideline Exceedances

Table 4-1 lists the parameters that exceeded the BC AL or REC guidelines in the 2019 surface water samples from Bailey Springs. All results, tabulated and compared with guidelines, are included in Appendix C.

Table 4-1
Exceedances of aquatic life and/or recreation guidelines in Baily Springs in 2019

Parameter	Bailey Springs
Phosphorus (dissolved)	X
Phosphorus (total)	X
Uranium (dissolved)	X

Notes: X indicates an exceedance of the applicable guidelines, differentiated as follows:
X = exceedance of the applicable recreation guidelines (BC REC)
= exceedance of the applicable aquatic life guidelines (BC AL acute and/or chronic)

4.2.2 Comparison to Historical Data

Bailey Springs has been tested since 1976; therefore, there is a significant historical dataset. The following sections provide a brief interpretation and historical comparisons for parameters that exceeded guidelines in Bailey Springs in 2019 and/or are considered key parameters of interest for reclaimed water. Plots showing temporal changes in concentrations for these parameters are included in Appendix D. Historical data are found in Associated 2018a.

4.2.2.1 Chloride

In 2019, all chloride concentrations at Bailey Springs met the BC chronic and acute AL guidelines of 150 mg/L and 600 mg/L, respectively. There are no REC guidelines for chloride. Historically, chloride concentrations at Bailey Springs increased from 1980 (<50 mg/L) to 2013 (239 mg/L) (Figure D-18). However, since 2013, concentrations have decreased (Figure D-19) and in 2019, concentrations ranged from 112 mg/L (in May) to 135 mg/L (in February). Prior to 2019, chloride concentrations had exceeded the BC chronic AL during at least one month each year.

The sample point for Bailey Springs is downstream of where the creek crosses Highway 97 and is within an agricultural area. Seasonal trends in chloride at Bailey Springs in recent years have shown that lower concentrations are typically found during summer when irrigation rates are at their highest levels. In 2019, that trend continued, with the highest chloride concentrations measured in February and December, which corresponds with the timing for the use of road salt.

Chloride in Clay Valve #4, which was tested in 2003 and 2015-2019, has ranged from 75.9 mg/L to 175 mg/L, with an average of 95.3 mg/L. Concentrations appear to have remained consistent over time, but there is limited historical data for comparison, as the OC does not require the City to test chloride at Clay Valve #4.

4.2.2.2 Sodium

There are no BC AL or BC REC guidelines for sodium. Similar to chloride, dissolved sodium concentrations (Figures D-20) have been increasing in Bailey Springs since the early 1980s. Concentrations of dissolved sodium have ranged from approximately 50 mg/L to 335 mg/L since 2011, and have somewhat decreased since around 2014. In 2019,

dissolved sodium was measured in May, April, June, and December and concentrations ranged from 116 mg/L (April) to 138 mg/L (June). Total sodium (Figure D-21) was tested at Bailey Springs monthly in 2019, and ranged from 112 mg/L (January 2019) to 335 mg/L (December 2019). The December result is an increase over historical data. Dissolved sodium, which was also tested in December, was 120 mg/L, indicating that about 70% of the sodium result was in the particulate phase.

4.2.2.3 Nitrogen

In 2019, nitrite-N was not detected in Bailey Springs.

Nitrate-N was detected in all samples and ranged from 0.0170 mg/L (in August) to 0.975 mg/L (in March), but all concentrations remained below the BC chronic and acute AL of 3.0 and 32.8 mg/L, respectively, and the BC REC guideline of 10 mg/L. Nitrate-N has remained consistent in Bailey Springs over time (Figure D-22).

Ammonia-N in Bailey Springs ranged from 0.025 mg/L (in April) to 0.185 mg/L (in March). The BC AL chronic and acute guidelines for ammonia-N vary based on the water pH and temperature. Temperature data were not available, but based on the maximum pH of 8.5 (i.e., most conservative approach), the most stringent BC AL chronic and acute guidelines are 0.261 mg/L and 1.91 mg/L; therefore, all 2019 results met guidelines. There are no BC REC guidelines for ammonia-N. Similar to nitrate, concentrations of ammonia-N have remained relatively stable over the period of record, although concentrations have increased slightly since 2017 (Figure D-23).

4.2.2.4 Phosphorus

Phosphorus is not toxic to aquatic life in the concentrations found in municipal effluent; however, when compared to other macronutrients required by aquatic plants, phosphorus is the least abundant and commonly the first nutrient to limit biological productivity. It is a concern primarily for lakes, where an increase in phosphorus inputs can lead to increased algal growth that can sometimes lead to reduced DO levels in water to levels that are harmful to aquatic life. There are no BC AL or REC guidelines for phosphorus in streams because there are other factors (e.g., flow velocity, light, temperature, and invertebrate grazing pressure) that affect algal growth.

Bailey Springs flows into Kalamalka Lake, and therefore the concern is whether the spring is contributing phosphorus-elevated water to the lake. The BC AL for total and dissolved phosphorus applies to lakes, and the guideline states that it is not possible to specify a single acceptable phosphorus concentration to protect aquatic life, but suggests a range of 0.005 to 0.015 mg/L (ENV 2019). Furthermore, ENV has proposed a Water Quality Objective (WQO) for total phosphorus in Kalamalka Lake of 0.008 mg/L (MOE 2001b). The BC REC guideline for total and dissolved phosphorus in lakes is 0.01 mg/L.

In 2019, total and dissolved phosphorus in Bailey Springs exceeded the Kalamalka Lake WQO, BC AL, and BC REC during all months of the year. Total phosphorus ranged from 0.103 mg/L (in February) to 0.313 mg/L (in March), and dissolved phosphorus ranged from 0.0998 mg/L (in February) to 0.166 mg/L (in September). Total and dissolved phosphorus in Bailey Springs increased between 1976 and 2001; since that time, concentrations have been more stable (Figure D-24 and D-25).

Prior to 2006, when the treatment process was improved to include BNR, the average concentration of total (Figure D-26) and dissolved (Figure D-27) phosphorus in Clay Valve #4 was 3.66 and 3.26 mg/L, respectively. Since 2006, total and dissolved phosphorus have averaged 1.44 and 1.25 mg/L, respectively. In 2019, total phosphorus in Clay Valve #4 ranged from 0.642 to 1.12 mg/L, and dissolved phosphorus ranged from 0.596 to 1.08 mg/L.

The increasing trend noted in total and dissolved phosphorus in Bailey Springs from 1976 to the early 2000s may be related to reclaimed water use, as concentrations in Clay Valve #4 are historically higher, and the improved treatment processes in 2006 may have contributed to the phosphorus concentrations in Bailey Springs levelling off over the past 10 years. However, it is difficult to ascertain the source of the phosphorus in Bailey Springs, as it is in the reclaimed water use area and downstream of MacKay Reservoir, but also within an agricultural area, where cattle are present.

4.2.2.5 Metals

Although not required by the OC, dissolved metals were tested at Bailey Springs in March, April, June, and December 2019. They were also tested periodically in 2016, 2017, and 2018. Similar to previous years, in 2019, the only metal that exceeded the applicable guidelines (BC AL and REC) was dissolved uranium (Figure D-28), which exceeded the BC AL of 0.0085 mg/L during all four times it was tested. Concentrations ranged from 0.0116 mg/L (in June) to 0.0150 mg/L (in April). Dissolved uranium in Clay Valve #4 remains an order of magnitude lower than in Bailey Springs, indicating there may be an alternative source. Uranium occurs naturally in the Okanagan (see Section 3.2.4).

4.2.2.6 Coliform Bacteria

Coliform bacteria are not tested in the wells because they are not considered a likely indicator of irrigation with reclaimed water. When present in the irrigation water, they are generally removed via subsurface filtration before reaching the groundwater table. When coliforms are found in groundwater, they are more likely related to a local source (e.g., a leaking septic system or influence from surface water), or they may have been introduced from the soil bacteria during drilling.

Fecal coliforms and total coliforms are tested by the City at Bailey Springs and Clay Valve #4, as per the requirements in the OC. There is no BC AL for fecal coliforms or total coliforms, unless the water is used for growing and harvesting shellfish (ENV 2019). There is also no BC REC guideline for fecal or total coliforms. The BC REC guideline for *E. coli* is a maximum of $\leq$400 CFU/100 mL and a geometric mean (based on a minimum of 5 samples) of $\leq$200 CFU/100 mL. Testing of *E. coli* at Bailey Springs is not required under the OC.[13]

In 2019, fecal coliforms in Bailey Springs ranged from <1 CFU/100 mL (in April) to 700 CFU/100 mL (in August). Total coliforms ranged from 9 CFU/100 mL (in April) to 16,000 CFU/100 mL (in September). If it is assumed that all the fecal coliforms present are *E. coli*, the August fecal coliform result of 700 CFU/100 mL exceeds the BC REC guideline, but the geometric mean for the year (17 CFU/100 mL) meets the guidelines. Coliforms are commonly found in surface water, especially where agriculture activity and cattle are present, as at Bailey Springs.

In 2019, fecal coliforms were non-detect (<1.8 CFU/100 mL) in all Clay Valve #4 samples, and total coliforms were non-detect except in October (4.5 CFU/100 mL). Given that the water from Clay Valve #4 is disinfected prior to use[14] and that coliforms were generally not detected, the fecal coliforms in Bailey Springs are not attributed to the use of reclaimed water.

[13] Historically, guidelines were based on fecal coliforms, which were considered an indicator of disease risk from pathogenic bacteria; more recently, guidelines have shifted to specify *E. coli* (MOE 2001c).
[14] The OC requires disinfection such that the fecal coliforms are < 2.2 CFU/100 mL for irrigation water in unrestricted public access areas (MOE 2008).

5 SUMMARY

Associated completed the 2019 Groundwater Monitoring Program for the City's reclaimed water irrigation operations to meet Section 8.6 of OC 12215. The monitoring program in 2019 followed the program completed in previous years, and consisted of groundwater sampling once in 2019 (late September) from a network of monitoring wells and domestic wells, comparing the results to applicable water quality guidelines and historical data, and preparing the annual monitoring report (this document).

Under Section 8.9 of the OC, the City is also required to collect monthly samples from a surface watercourse (Bailey Springs). Data from those samples, which were collected directly by the City, were provided to Associated for inclusion in the 2019 Groundwater Monitoring Program report. Data from Clay Valve #4, which represents the quality of the water prior to irrigation, were also provided to Associated to aid in interpretation.

The following provides a summary of the key findings and conclusions based on the results of the 2019 Groundwater Monitoring Program and the Bailey Springs sampling program.

5.1 Conceptual Model of Groundwater Flow

In 2018, Associated completed a thorough review of the conceptual model of groundwater flow, including developing cross sections, reviewing datalogger information, and developing tri-linear diagrams and water quality contour plots. This was completed to better understand groundwater flow pathways to evaluate the current monitoring network and the likelihood of impacts from reclaimed water irrigation. Data from that review were augmented with data from the 2019 monitoring program, and key findings are summarized in this report.

The conceptual model of groundwater flow in the study area can be divided into two parts: flow south of the Commonage Ridge, and flow north of the Commonage Ridge. Groundwater flow south of this hydraulic divide is towards the south and is predominantly constrained to shallow surficial sediments and fractured bedrock. Groundwater eventually discharges to Kalamalka Lake. Flow north of the Commonage Ridge is more complex. Groundwater recharge occurs around Bench Row Road, as evidenced by the large influx of water at DMW-3 during freshet. Groundwater then flows towards the north where it enters a deeper flow regime (i.e., there is no significant groundwater flow at shallow depths on the hillside, only deeper groundwater observed in MWPRE2018-A/B/C; Associated 2019). Groundwater then recharges the unconfined and confined valley aquifers before finally discharging to Vernon Creek and/or Okanagan Lake. Flow on the hillside is complicated by lithological units that are not laterally extensive, and perched aquifers can exist on top of some units with lower permeability.

The water chemistry of the downgradient wells further suggests variable flow paths; all of the wells along Okanagan Avenue show variable concentrations of constituents and variable water types. Data are inconsistent and, in some cases, counter-intuitive. For example, deeper wells indicate younger groundwater, which suggests a shorter residence time in the aquifer, so it is possible that there is a pathway of high transmissivity (high porosity) at deeper depths. If the younger water was associated with reclaimed water irrigation, we would expect to see higher concentrations of nitrate-N and chloride. However, these constituents are lowest in some of these wells. The trilinear diagrams (Appendix B) show several water types in the study area, which indicates that aquifers and lithological units are not necessarily connected throughout the study area.

5.2 Groundwater Quality

The 2019 Groundwater Monitoring Program included collecting and testing samples from 10 groundwater wells (monitoring wells and domestic water supply wells) in September, and comparing those findings with City data from Clay Valve #4 (reclaimed water prior to irrigation). Results for all locations were compared to applicable guidelines and historical trends.

The complex hydrogeological setting makes it difficult to assess background water quality. Upgradient monitoring wells would need to be installed in the bedrock (like DMW-3; the only current upgradient well), which can show different chemistry than wells installed in unconsolidated aquifers because the unconsolidated sediments are very thin in the areas upgradient of the irrigation areas, and might not have sufficient water for sampling. However, even though background wells are difficult to install outside of the irrigation area and in the unconsolidated deposits, there are several ways in which the results can be interpreted. There is a long dataset from which changes in water quality can be identified, there are water quality data from the reclaimed water prior to irrigation, there are regional background concentrations developed by ENV, and there are limited data from the background water quality study completed in 2018. Given this, the monitoring program is likely sufficient to identify potential widespread impacts on groundwater.

Notable Exceedances

Potential groundwater receptors include downgradient domestic wells and aquatic life in surface waterbodies to which groundwater may discharge. To address potential risks to these receptors, groundwater results were compared with drinking water, aquatic life, irrigation, and livestock guidelines. Parameters that exceeded these guidelines are summarized in Section 3.2. Of highest concern are parameters that exceeded a health-based (MAC) drinking water guideline in groundwater. These included:

- Fluoride in DMW-5;
- Lithium in DMW-1, DMW-3, DMW-4, DMW-5, DMW18-1, and MW11-02;
- Manganese in DMW-3, DMW-5, and MW-2;
- Selenium in DMW-1, DMW18-1, MW11-02, and WTN 39421; and
- Uranium in DMW-1, DMW-5, and MW11-02.

Although it is difficult to assess background groundwater quality, it is unlikely that these exceedances are related to reclaimed water use. Lithium, selenium, and uranium concentrations were all below regional background concentrations established for the Thompson-Okanagan Region, which suggests that these parameters are naturally occurring in the Vernon area. Furthermore, levels are lower in Clay Valve #4 (reclaimed water) than in the groundwater samples. Although regional background concentrations have not been established for manganese, manganese is a common occurrence in BC, and also unlikely related to reclaimed water use. The fluoride exceedance in DMW-5 is also likely naturally occurring, as fluoride is known to occur in the area, but testing of fluoride in Clay Valve #4 should be implemented to help confirm (Section 6).

Unlike 2018, nitrate did not exceed guidelines in any of the groundwater samples in 2019. However, concentrations are generally above what is likely to occur naturally (i.e., > 3 mg/L), particularly in DMW18-1, MW11-02, DMW-1, and DMW-5. Although these nitrate-N concentrations are not considered to represent natural conditions, the source is unclear. A minor component of the elevated concentrations may be sourced from the spray irrigation program; however, the spatial variability of these exceedances across the study area suggests there may be localized sources contributing to the elevated levels. Total nitrogen in Clay Valve #4 is generally low (2.14 - 2.73 mg/L in 2019), but it was higher (average of 13.9 mg/L) prior to 2006, when the City added BNR to the treatment process. It is encouraging

that nitrate-N levels in MW11-02 have decreased and met guidelines in 2019. This well is downslope from a commercial seedling nursery. Factors that could have contributed to the reduction over time include better matching crop water demand with irrigation rates, changes to nutrient management plans, and fixing leaks.

Notable Changes in Groundwater Quality

In previous annual Groundwater Monitoring Programs, including 2018, Associated noted that chloride, fluoride, sodium, and nitrate-N generally increased in well DMW-5 since monitoring began in 2011. With the exception of fluoride, all of these parameters decreased in 2019. Chloride and sodium continued to exceed the DW AO, but only marginally so. As noted previously (Associated 2019), DMW-5 is located in a cattle pasture and downgradient of Highway 97. There is no available well log and the well depth is unknown, but the well is artesian. Due to the numerous potential sources and lack of well information, it is difficult to determine the cause of exceedances in this well.

Other notable differences from the 2018 monitoring program and previous monitoring programs are as follows:

- Total and dissolved phosphorus decreased in DMW-4 in 2019. Previously, these parameters indicated a general increasing trend.
- Nitrate in MW11-02 and DMW18-1 decreased in 2019 and did not exceed DW MAC guidelines.
- Chloride has increased in DMW-1 since monitoring began, whereas chloride has decreased in DMW-3, DMW-4, MW-2, and DMW18-1.
- Selenium has generally decreased in MW-2 since 2011 and in DMW18-1 since 2018 (when it was added to the program). It has also decreased in DMW-3, which is outside the reclaimed water use area.
- Uranium has decreased in MW-2 and DMW18-1.

5.3 Bailey Springs

As required by the OC, the City tests Bailey Springs monthly. Results were compared with aquatic life (BC AL) and recreation (BC REC) guidelines to assess risk to surface water receptors. For the first time since monitoring began, chloride remained below the BC AL guidelines. The only parameters that exceeded guidelines were dissolved and total phosphorus and uranium:

- Dissolved and total phosphorus in Bailey Springs (which discharges to Kalamalka Lake) consistently exceeded the WQO for Kalamalka Lake during all months. Total and dissolved phosphorus in Bailey Springs increased between 1976 and 2001; since that time, concentrations have been more stable. The increasing trend may be related to reclaimed water use, as phosphorus concentrations from Clay Valve #4 are historically higher. The improved treatment processes in 2006 may have contributed to the phosphorus concentrations in Bailey Springs levelling off over the past 10 years. After the treatment system was upgraded to include BNR in 2005, the average concentration of total and dissolved phosphorus in Clay Valve #4 decreased by approximately 50%, and concentrations have continued to decrease since that time. However, it is difficult to ascertain the source of the phosphorus in Bailey Springs, as it is in the reclaimed water use area and downstream of MacKay Reservoir, but also within an agricultural area, where cattle are present.
- Similar to the findings of previous years, uranium in Bailey Springs exceeded the BC AL. However, uranium in Clay Valve #4 remains an order of magnitude lower than in Bailey Springs, indicating there is likely an alternative source. As summarized in Section 3.2.4, uranium occurs naturally in the Okanagan.

6 RECOMMENDATIONS

We recommend the City continue the monitoring program in 2020 to remain compliant with Sections 8.6 and 8.9 of the OC, with the following additions:

- Test Clay Valve #4 for chloride, sodium, sulphate, fluoride, and dissolved metals monthly during the irrigation season, in addition to the parameters required by the OC. The data will be used to compare to guideline exceedances in groundwater results.
- Discontinue metals and sulphate testing at Bailey Springs. Metals are not required by the OC, and based on the results of the monitoring program, do not appear to have any impacts from the reclaimed water program. Sampling of Bailey Springs can include only the parameters required by the OC, plus temperature which should be measured so that the aquatic life guideline for ammonia can be properly calculated.
- Search for a spring (surface expression of groundwater) upgradient of the reclaimed water use area (e.g., along Bench Row Road) during the annual groundwater sampling program. If one can be located, it should be tested at the same time as the monitoring wells and domestic wells, as it may provide additional background water quality data.
- Consider removing DMW-5 from the program. There are too many other sources of nutrients (e.g., cattle grazing, agriculture, highway) to make it an effective monitoring location. Additionally, because no well log is available, well construction details and well depth are unknown.

CLOSURE

This report was prepared for the City of Vernon to document the results of the 2019 Groundwater Monitoring Program for the City's Reclaimed Water Use Program.

The services provided by Associated Environmental Consultants Inc. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Environmental Consultants Inc.

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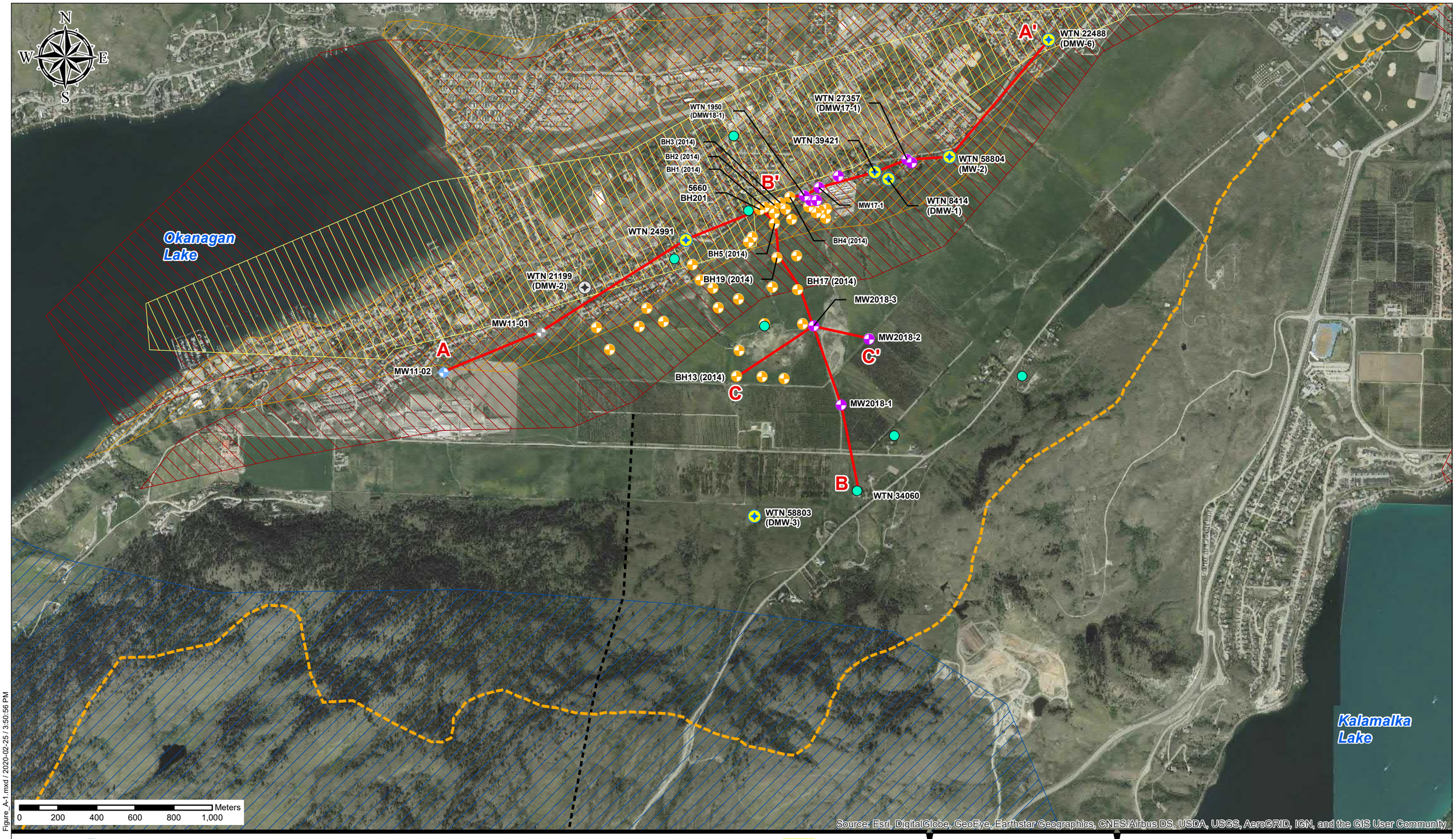
APPENDIX A – CROSS SECTIONS AND WELL LOGS



Figure_A-1.mxd / 2020-02-25 / 3:50:56 PM

Associated Environmental

- Domestic Monitoring Well - Active
- Domestic Monitoring Well - Closed
- Monitoring Well - Active
- Monitoring Well - Closed
- Fletcher Paine Borehole
- Hesperia Monitoring Well
- Other Well
- Cross-section lines
- Commonage Ridge
- Fault (Approximate)

Aquifers

- 346
- 347
- 471
- 1227

PROJECT NO.: 2019-8456
DATE: February 2020
DRAWN BY: BdJ

FIGURE A-1: CROSS-SECTIONS & LITHOLOGICAL INFORMATION USED FOR INTERPRETATION

City of Vernon

City of Vernon Groundwater Monitoring Program

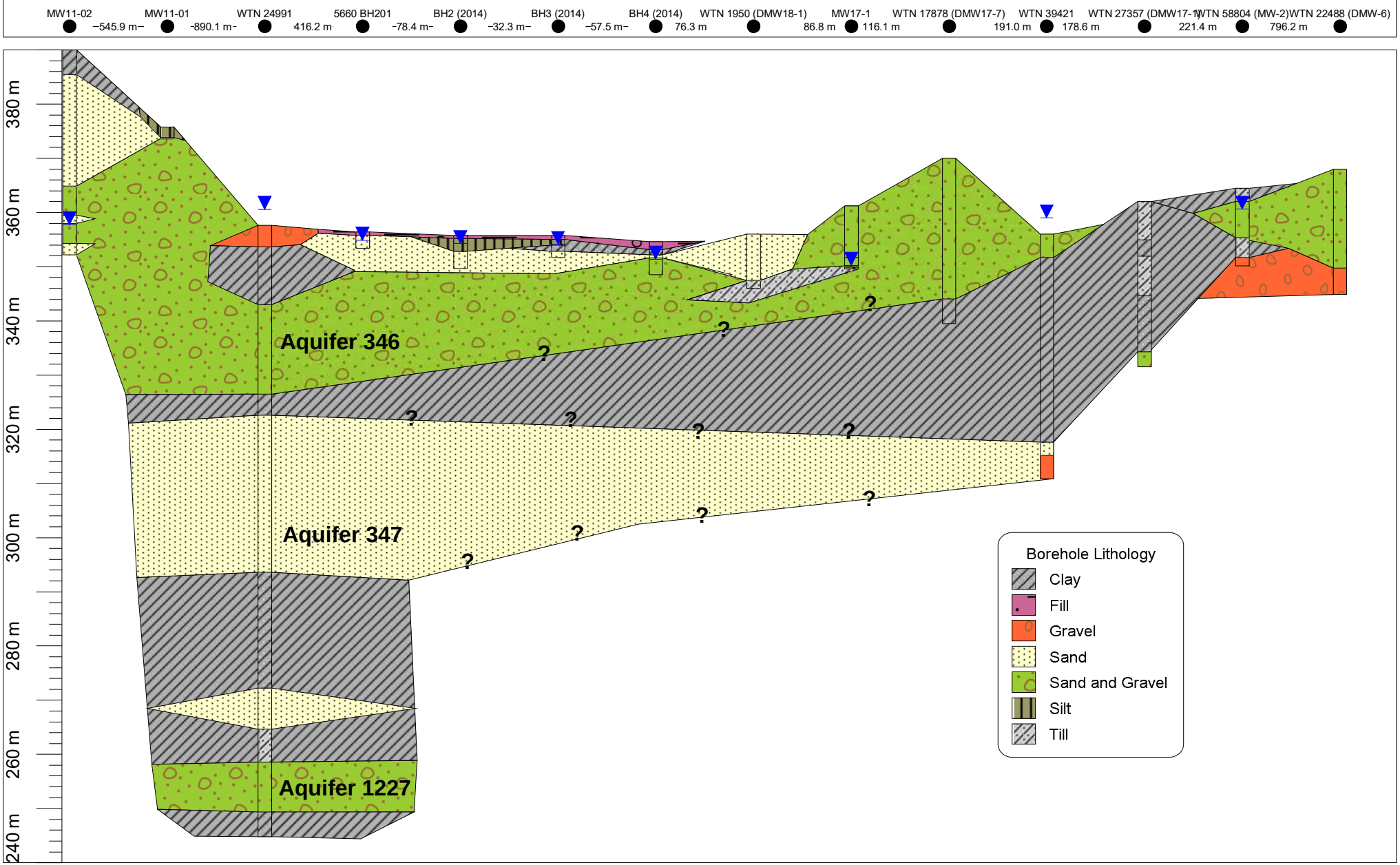
Associated Environmental

PROJECT NO.:	2019-8456
DATE:	February 2020
DRAWN BY:	MW

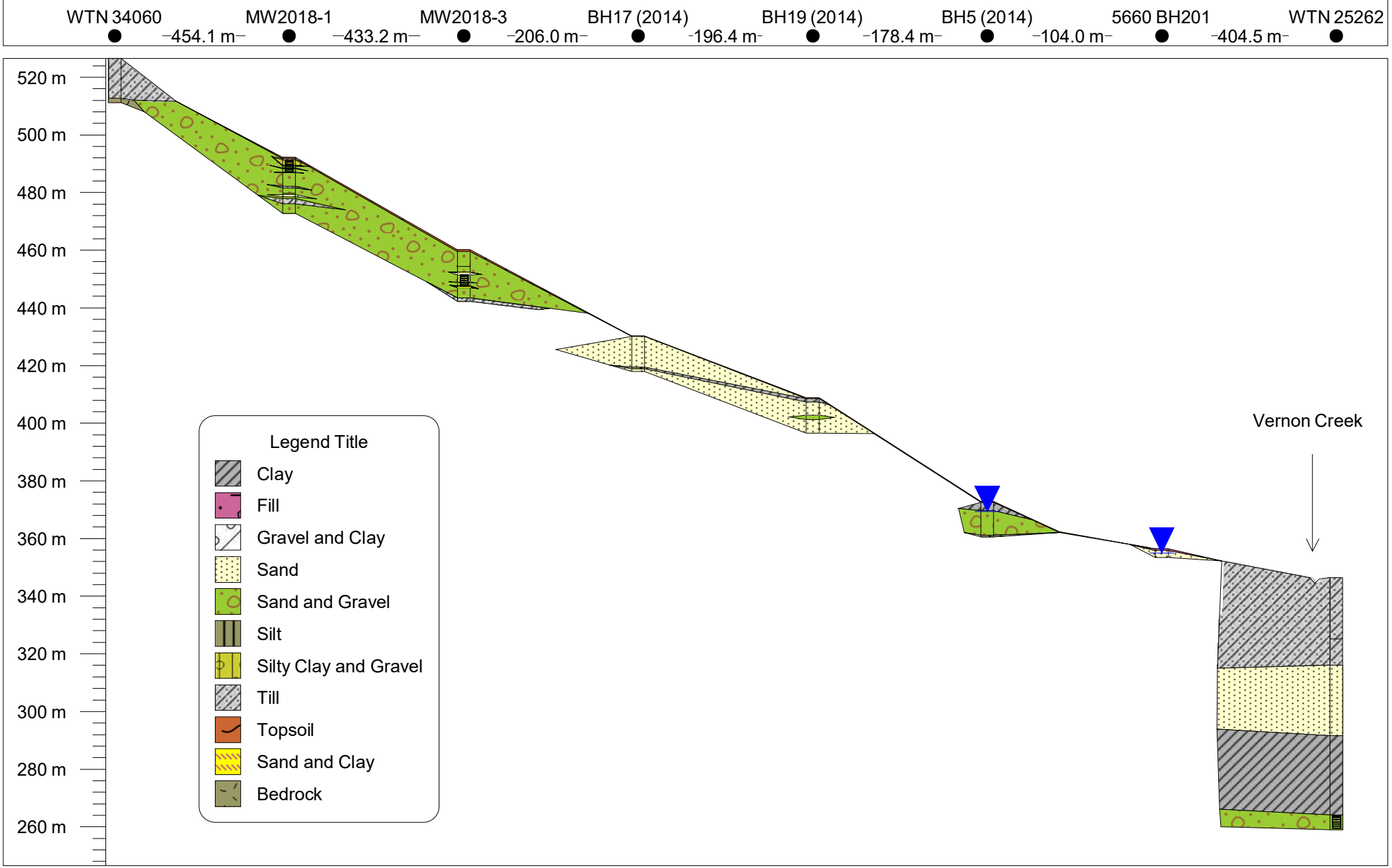
FIGURE A-2: CROSS SECTION A-A'

City of Vernon

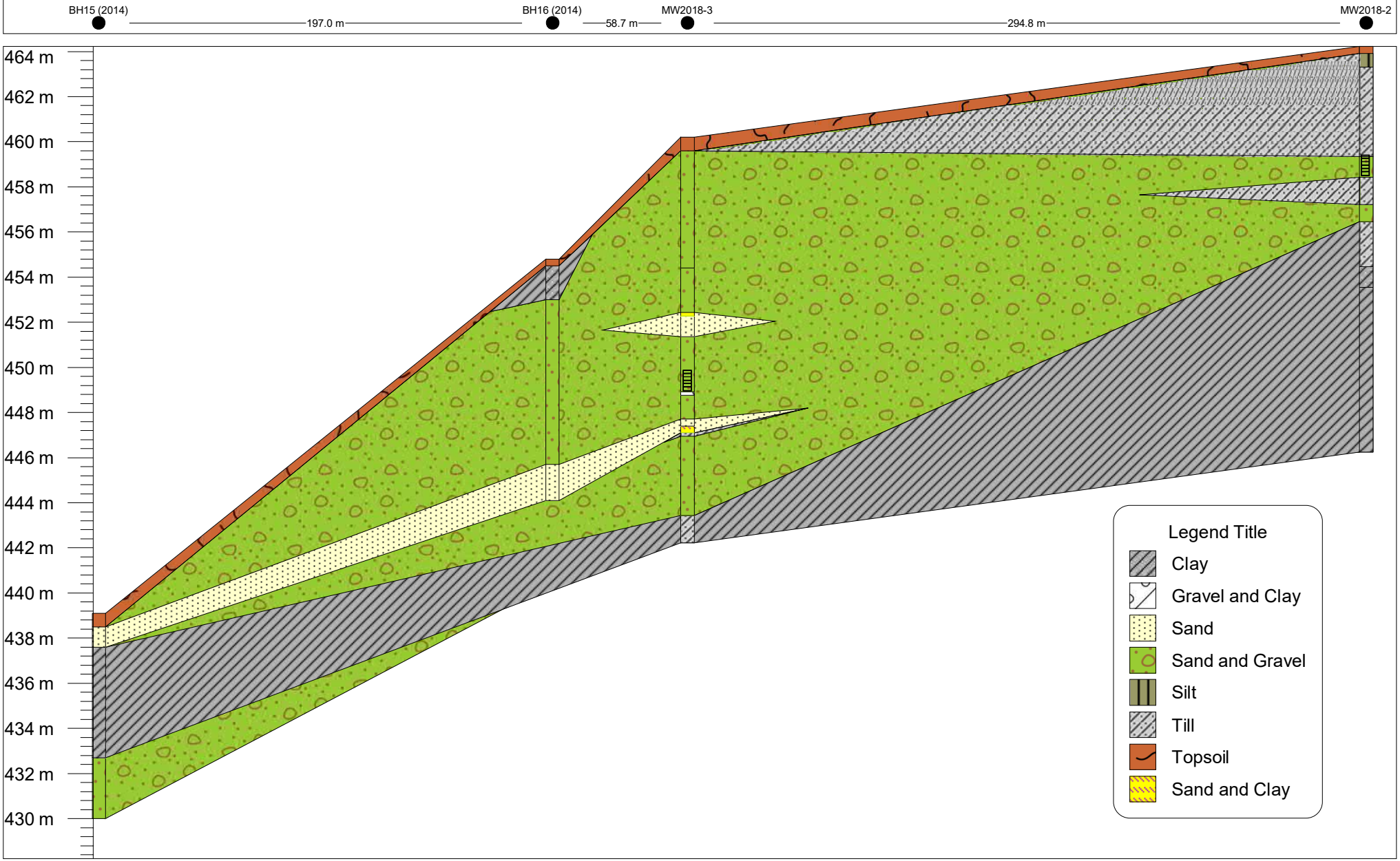
2019 Spray Irrigation Monitoring



Associated Environmental	PROJECT NO.: 2019-8456.000	**FIGURE A-3: CROSS SECTION B-B'**
	DATE: January 2019	City of Vernon
	DRAWN BY: MW	2019 Groundwater Monitoring Program - Reclaimed Water Use



Associated Environmental	PROJECT NO.: 2019-8456.000	**FIGURE A-4: CROSS SECTION C-C'**
	DATE: February 2019	City of Vernon
	DRAWN BY: MW	2019 Groundwater Monitoring Program - Reclaimed Water Use



Project No: **2010-8911.010**

Client: **City of Vernon**

Location: **Okanagan Landing, Vernon, BC**

Logged by/ Checked by: **CDH**

Test Hole / Borehole I.D.: BH11-05

Well I.D.: **MW11-02**

Location on site: **Below PRT site**

Northing/ Easting: **0**

Elevation: **0**

SUBSURFACE PROFILE			SAMPLE			WELL	
Depth (ft / m)	Symbol	Description	Type	I.D.	flag for analysis	Well Details	Well Completion
-5		Ground Surface				Monument stick-up casing protector	
5		**SILTY CLAY** Dk. brown silty clay -some f-m gravel @ 7'					Bentonite Seal 0.3-1.5m
15		**SAND** Brown v.f.-m sand, tr.-some lt. brown silt					Cuttings (clayey) 1.5-9.1m
25		**SAND** Brown- lt. brown+ tan f-c sand, tr. moist, tr. v.f. gravel					
9		-siltier section @ 30'				-slightly more silty 30-32'	Bentonite Seal 9.1-9.8m
35		**SAND** Lt. brown v.f-m sand, tr. silt, tr. v.c. sand, sl. moist					
45		**SAND** Lt. brown v.f-m sand, tr. v.c. sand, tr. silt, dry. -some f. gravel, well rounded, dry.				- f. gravel 52-55'	Bentonite Seal 15.2-15.8m
55		**SAND** Tan-brown f-m sand, tr. c sand, tr. silt, sl. moist					
19		-dry, less silt					
65							

SUMMIT ENVIRONMENTAL CONSULTANTS INC.
A Member of the Associated Engineering Group of Companies

Contractor: Kel Drilling
Operator(s): Kelvin Marte
Drill Method: ODEX
Ground conditions: clay over sand

Date: Oct. 15, 2011
Time:
Temperature:
Sheet: 1 of 2

Project No: **2010-8911.010**

Client: **City of Vernon**

Location: **Okanagan Landing, Vernon, BC**

Logged by/ Checked by: **CDH**

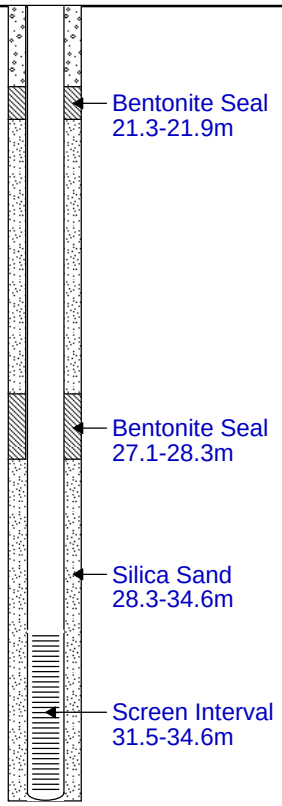
Test Hole / Borehole I.D.: BH11-05

Well I.D.: **MW11-02**

Location on site: **Below PRT site**

Northing/ Easting: **0**

Elevation: **0**

SUBSURFACE PROFILE			SAMPLE			WELL	
Depth	Symbol	Description	Type	I.D.	flag for analysis	Well Details	Well Completion
75		**SAND** Brown-lt. brown v.f-m sand, some silt, moist - some-tr. f-gravel, dry				- moist silt, not wet 68' - granule - v.f. gravel 71-73'	
85		**SAND** Lt. brown -brown v.f-m sand, tr.-some f. gravel					
95	29	**SAND + GRAVEL** Lt. brown f-c sand + f. gravel, coated gravels				- f-c sand + f gravel 83-84'	
105		**SAND** Lt. brown f-v.c. sand, some f. gravel				- moist, coated sands and gravels 98-100'	
115		**SAND + GRAVEL** Brown f-v.c. sand + f. gravel - some gravel moist -wet					
		SILTY SAND Blue-brown silty f-c sand, loss of water in return					
125	39	End of Borehole				Drilled using ODEX 4" casing with NWJ rods, 10' lengths. Rental 175-400 compressor pushing under 400 cfm.	
135							

SUMMIT ENVIRONMENTAL CONSULTANTS INC.
A Member of the Associated Engineering Group of Companies

Contractor: Kel Drilling

Operator(s): Kelvin Marte

Drill Method: ODEX

Ground conditions: clay over sand

Date: Oct. 15, 2011

Time:

Temperature:

Sheet: 2 of 2

DMW18-1

BRITISH COLUMBIA

Report 1 - Detailed Well Record

Well Tag Number: 1950	Construction Date: 1940-01-01 00:00:00
Owner: L FUHR	Driller: Unknown
	Well Identification Plate Number:
Address:	Plate Attached By:
	Where Plate Attached:
Area: VERNON	
	PRODUCTION DATA AT TIME OF DRILLING:
WELL LOCATION:	Well Yield: 0 (Driller's Estimate)
OSOYOOS (ODYD) Land District	Development Method:
District Lot: Plan: Lot:	Pump Test Info Flag: N
Township: Section: Range:	Artesian Flow:
Indian Reserve: Meridian: Block:	Artesian Pressure (ft):
Quarter:	Static Level: 20 feet
Island:	
BCGS Number (NAD 83): 082L024144 Well: 45	WATER QUALITY:
	Character:
Class of Well:	Colour:
Subclass of Well:	Odour:
Orientation of Well:	Well Disinfected: N
Status of Well: New	EMS ID:
Licence General Status: UNLICENSED	Water Chemistry Info Flag:
Well Use: Private Domestic	Field Chemistry Info Flag:
Observation Well Number:	Site Info (SEAM):
Observation Well Status:	
Construction Method: Dug	Water Utility:
Diameter: 0.0 inches	Water Supply System Name:
Casing drive shoe:	Water Supply System Well Name:

Well Depth: 28 feet	
Elevation: 0 feet (ASL)	SURFACE SEAL:
Final Casing Stick Up: inches	Flag: N
Well Cap Type:	Material:
Bedrock Depth: feet	Method:
Lithology Info Flag: N	Depth (ft):
File Info Flag: N	Thickness (in):
Sieve Info Flag: N	
Screen Info Flag: N	WELL CLOSURE INFORMATION:
	Reason For Closure:
Site Info Details:	Method of Closure:
Other Info Flag:	Closure Sealant Material:
Other Info Details:	Closure Backfill Material:
	Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:

LITHOLOGY INFORMATION:

From 0	to 28 Ft.	SANDY CLAY	
From 28	to 0 Ft.	HARDPAN,WATER ON TOP OF HARDPAN	

- Return to Main
- Return to Search Options
- Return to Search Criteria

Information Disclaimer

The Province disclaims all responsibility for the accuracy of information provided. Information provided should not be used as a basis for making financial or any other commitments.

DMW-1

BRITISH COLUMBIA

Report 1 - Detailed Well Record

Well Tag Number: 8414	Construction Date: 1950-01-01 00:00:00
Owner: W E DOUGLAS	Driller: Unknown
	Well Identification Plate Number:
Address:	Plate Attached By:
	Where Plate Attached:
Area:	
	PRODUCTION DATA AT TIME OF DRILLING:
WELL LOCATION:	Well Yield: 0 (Driller's Estimate)
OSOYOOS (ODYD) Land District	Development Method:
District Lot: Plan: Lot:	Pump Test Info Flag:
Township: Section: Range:	Artesian Flow:
Indian Reserve: Meridian: Block:	Artesian Pressure (ft):
Quarter:	Static Level: 3 feet
Island:	
BCGS Number (NAD 83): 082L024144 Well: 5	WATER QUALITY:
	Character:
Class of Well:	Colour:
Subclass of Well:	Odour:
Orientation of Well:	Well Disinfected: N
Status of Well: New	EMS ID:
Licence General Status: UNLICENSED	Water Chemistry Info Flag:
Well Use: Private Domestic	Field Chemistry Info Flag:
Observation Well Number:	Site Info (SEAM):
Observation Well Status:	
Construction Method: Dug	Water Utility:
Diameter: 0.0 inches	Water Supply System Name:
Casing drive shoe:	Water Supply System Well Name:

Well Depth: 8 feet	
Elevation: 0 feet (ASL)	SURFACE SEAL:
Final Casing Stick Up: inches	Flag:
Well Cap Type:	Material:
Bedrock Depth: feet	Method:
Lithology Info Flag:	Depth (ft):
File Info Flag:	Thickness (in):
Sieve Info Flag:	
Screen Info Flag:	WELL CLOSURE INFORMATION:
	Reason For Closure:
Site Info Details:	Method of Closure:
Other Info Flag:	Closure Sealant Material:
Other Info Details:	Closure Backfill Material:
	Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:

LITHOLOGY INFORMATION:

From 0 to 0 Ft. NO LOG- SOIL,CLAY & ROCK

- Return to Main
- Return to Search Options
- Return to Search Criteria

Information Disclaimer

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DMW-3

Report 1 - Detailed Well Record

Well Tag Number: 58803 Owner: CITY OF VERNON Address: BENCH ROW RD Area: VERNON WELL LOCATION: OSOYOOS (ODYD) Land District District Lot: Plan: Lot: Township: 9 Section: 20 Range: Indian Reserve: Meridian: Block: Quarter: SW Island: BCGS Number (NAD 27): 082L024142 Well: 12 Class of Well: Subclass of Well: Orientation of Well: Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Drilled Diameter: 6.0 inches Casing drive shoe: Well Depth: 19 feet Elevation: 0 feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: 6 feet Lithology Info Flag: File Info Flag: Sieve Info Flag: Screen Info Flag: Site Info Details: Other Info Flag: Other Info Details:	Construction Date: 1989-05-12 00:00:00.0 Driller: Dan Gare Drilling Well Identification Plate Number: Plate Attached By: Where Plate Attached: PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 0 (Driller's Estimate) Development Method: Pump Test Info Flag: Artesian Flow: Artesian Pressure (ft): Static Level: 10 feet WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: Field Chemistry Info Flag: Site Info (SEAM): Water Utility: Water Supply System Name: Water Supply System Well Name: SURFACE SEAL: Flag: Material: Method: Depth (ft): Thickness (in): WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
MONITOR WELL

LITHOLOGY INFORMATION:

From	0 to	6 Ft.	SANDY CLAY,RED
From	6 to	10 Ft.	BROKEN BEDROCK
From	10 to	19 Ft.	FRACTURED BEDROCK

- Return to Main
- Return to Search Options
- Return to Search Criteria

DMW-6

BRITISH COLUMBIA

Report 1 - Detailed Well Record

Well Tag Number: 22488	Construction Date: 1969-06-18 00:00:00
Owner: PAUL WARWICK	Driller: Pacific Water Wells
	Well Identification Plate Number:
Address: OK AVENUE	Plate Attached By:
	Where Plate Attached:
Area: VERNON	
	PRODUCTION DATA AT TIME OF DRILLING:
WELL LOCATION:	Well Yield: 30 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
OSOYOOS (ODYD) Land District	Development Method:
District Lot: Plan: B3911 Lot:	Pump Test Info Flag:
Township: 9 Section: 28 Range:	Artesian Flow:
Indian Reserve: Meridian: Block:	Artesian Pressure (ft):
Quarter: NW	Static Level: 32 feet
Island:	
BCGS Number (NAD 83): 082L024322 Well: 38	WATER QUALITY:
	Character:
Class of Well:	Colour:
Subclass of Well:	Odour:
Orientation of Well:	Well Disinfected: N
Status of Well: New	EMS ID:
Licence General Status: UNLICENSED	Water Chemistry Info Flag:
Well Use: Unknown Well Use	Field Chemistry Info Flag:
Observation Well Number:	Site Info (SEAM):
Observation Well Status:	
Construction Method: Drilled	Water Utility:
Diameter: 6.0 inches	Water Supply System Name:
Casing drive shoe:	Water Supply System Well Name:
Well Depth: 76 feet	
Elevation: 0 feet (ASL)	SURFACE SEAL:
Final Casing Stick Up: inches	Flag:
Well Cap Type:	Material:
Bedrock Depth: feet	Method:
Lithology Info Flag:	Depth (ft):
File Info Flag:	Thickness (in):
Sieve Info Flag:	
Screen Info Flag:	WELL CLOSURE INFORMATION:
	Reason For Closure:
Site Info Details:	Method of Closure:
Other Info Flag:	Closure Sealant Material:
Other Info Details:	Closure Backfill Material:

		Details of Closure:		
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:

LITHOLOGY INFORMATION:

From 0 to 60 Ft. SANDY GRAVEL

From 60 to 76 Ft. GRAVEL WATER-BEARING

- Return to Main
- Return to Search Options
- Return to Search Criteria

Report 1 - Detailed Well Record

Well Tag Number: 58804

Owner: CITY OF VERNON

Address: OKANAGAN AVE.

Area: VERNON

WELL LOCATION:

OSOYOOS (ODYD) Land District

District Lot: 64 Plan: 2591 Lot: B

Township: 9 Section: Range:

Indian Reserve: Meridian: Block:

Quarter:

Island:

BCGS Number (NAD 83): 082L024144 Well: 48

Class of Well:

Subclass of Well:

Orientation of Well:

Status of Well: New

Licence General Status: UNLICENSED

Well Use: Private Domestic

Observation Well Number:

Observation Well Status:

Construction Method: Drilled

Diameter: 6.0 inches

Casing drive shoe:

Well Depth: 47 feet

Elevation: 0 feet (ASL)

Construction Date: 1989-05-12 00:00:00

Driller: Dan Gare Drilling

Well Identification Plate Number:

Plate Attached By:

Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:

Well Yield: 0 (Driller's Estimate)

Development Method:

Pump Test Info Flag:

Artesian Flow:

Artesian Pressure (ft):

Static Level: 39 feet

WATER QUALITY:

Character:

Colour:

Odour:

Well Disinfected: N

EMS ID:

Water Chemistry Info Flag:

Field Chemistry Info Flag:

Site Info (SEAM):

Water Utility:

Water Supply System Name:

Water Supply System Well Name:

SURFACE SEAL:

Final Casing Stick Up: inches	Flag:
Well Cap Type:	Material:
Bedrock Depth: feet	Method:
Lithology Info Flag:	Depth (ft):
File Info Flag:	Thickness (in):
Sieve Info Flag:	
Screen Info Flag:	WELL CLOSURE INFORMATION:
	Reason For Closure:
Site Info Details:	Method of Closure:
Other Info Flag:	Closure Sealant Material:
Other Info Details:	Closure Backfill Material:
	Details of Closure:

~~Screen from~~	~~to feet~~	~~Type~~	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:

LITHOLOGY INFORMATION:

From	0 to	8 Ft.	CLAY & ROCKS
From	8 to	30 Ft.	SAND & GRAVEL,RED
From	30 to	42 Ft.	CLAY & ROCKS
From	42 to	47 Ft.	COARSE GRAVEL

- Return to Main
- Return to Search Options
- Return to Search Criteria

BRITISH COLUMBIA

Report 1 - Detailed Well Record

Well Tag Number: 39421	Construction Date: 1978-03-28 00:00:00
Owner: CROWN VILLA MHP - CAROL GOLDSTONE	Driller: Okanagan Rotary Well Drilling
	Well Identification Plate Number: 10073
Address: 6080 OKANAGAN AVE	Plate Attached By: MIKE KAPINIAK
	Where Plate Attached: WELL CASING
Area: VERNON	
	PRODUCTION DATA AT TIME OF DRILLING:
WELL LOCATION:	Well Yield: 80 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
OSOYOOS (ODYD) Land District	Development Method:
District Lot: 62 Plan: 4685 Lot: 1	Pump Test Info Flag: N
Township: Section: Range:	Artesian Flow: 3 Gallons per Minute (U.S./Imperial)
Indian Reserve: Meridian: Block:	Artesian Pressure (ft):
Quarter:	Static Level:
Island:	
BCGS Number (NAD 83): 082L024144 Well: 9	WATER QUALITY:
	Character:
Class of Well: Water supply	Colour:
Subclass of Well: Domestic	Odour:
Orientation of Well:	Well Disinfected: N
Status of Well: New	EMS ID: E262160
Licence General Status: UNLICENSED	Water Chemistry Info Flag: N
Well Use: Water Supply System	Field Chemistry Info Flag:
Observation Well Number:	Site Info (SEAM): N
Observation Well Status:	
Construction Method: Drilled	Water Utility: N
Diameter: inches	Water Supply System Name: CROWN VILLA MHP WATER SYSTEM
Casing drive shoe:	Water Supply System Well Name:
Well Depth: 148 feet	
Elevation: 1171.3 feet (ASL)	SURFACE SEAL:
Final Casing Stick Up: inches	Flag: N
Well Cap Type:	Material:
Bedrock Depth: feet	Method:
Lithology Info Flag: Y	Depth (ft):
File Info Flag: N	Thickness (in):
Sieve Info Flag: N	Liner from To: feet
Screen Info Flag: N	
	WELL CLOSURE INFORMATION:
Site Info Details:	Reason For Closure:
Other Info Flag:	Method of Closure:

Other Info Details:	Closure Sealant Material: Closure Backfill Material: Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe
0	16	null	null	null

GENERAL REMARKS:

LITHOLOGY INFORMATION:

From 0 to 14 Ft. SAND & GRAVEL (DRY) 0 nothing entered

From 14 to 23 Ft. BROWN CLAY

From 23 to 60 Ft. HARD GRAYISH BLUE CLAY

From 60 to 100 Ft. SOFT LIGHT GRAY CLAY

From 100 to 126 Ft. VERY HARD STIFF DARK GRAY CLAY

From 126 to 134 Ft. FINE SAND

From 134 to 148 Ft. CLEAN GRAVEL (WATER) 0 nothing entered

- Return to Main
- Return to Search Options
- Return to Search Criteria

BRITISH COLUMBIA

Report 1 - Detailed Well Record

Well Tag Number: 24991	Construction Date: 1971-06-24 00:00:00
Owner: CLAIRMONT UTILITIES	Driller: Pacific Water Wells
	Well Identification Plate Number: 10033
Address:	Plate Attached By:
	Where Plate Attached:
Area: OKANAGAN LANDING	
	PRODUCTION DATA AT TIME OF DRILLING:
WELL LOCATION:	Well Yield: 30 (Driller's Estimate) U.S. Gallons per Minute
OSOYOOS (ODYD) Land District	Development Method:
District Lot: 62 & 63 Plan: Lot:	Pump Test Info Flag: Y
Township: Section: Range:	Artesian Flow:
Indian Reserve: Meridian: Block:	Artesian Pressure (ft):
Quarter:	Static Level: 8 feet
Island:	
BCGS Number (NAD 83): 082L024143 Well: 44	WATER QUALITY:
	Character:
Class of Well: Water supply	Colour:
Subclass of Well: Domestic	Odour:
Orientation of Well:	Well Disinfected: N
Status of Well: New	EMS ID: E262182
Licence General Status: UNLICENSED	Water Chemistry Info Flag: Y
Well Use: Water Supply System	Field Chemistry Info Flag:
Observation Well Number:	Site Info (SEAM): N
Observation Well Status:	
Construction Method: Drilled	Water Utility: Y
Diameter: 8 inches	Water Supply System Name: CLAREMONT UTILITIES
Casing drive shoe:	Water Supply System Well Name: WELL NO. 2
Well Depth: 370 feet	
Elevation: 1177.8 feet (ASL)	SURFACE SEAL:
Final Casing Stick Up: inches	Flag: N
Well Cap Type:	Material:
Bedrock Depth: feet	Method:
Lithology Info Flag: Y	Depth (ft):
File Info Flag: N	Thickness (in):
Sieve Info Flag: N	

Screen Info Flag: Y	WELL CLOSURE INFORMATION:
	Reason For Closure:
Site Info Details:	Method of Closure:
Other Info Flag:	Closure Sealant Material:
Other Info Details:	Closure Backfill Material:
	Details of Closure:

Screen from	to feet	Type	Slot Size
334	null		20
null	null		30
null	null		50
null	355		80

Casing from	to feet	Diameter	Material	Drive Shoe
0	210	10	null	null
210	335	8	null	null

GENERAL REMARKS:
DRAWDOWN AT 1.6 X 108 TO THE 4TH. SPECIFIC CAPACITY = 2.54 USGM

LITHOLOGY INFORMATION:

From	0	to	13	Ft. COBBLES,GRAVEL
From	13	to	48	Ft. CLAY
From	48	to	102	Ft. TIGHT GRAVEL,WATER-BEARING
From	102	to	115	Ft. CLAY
From	115	to	210	Ft. SAND,FINE SILTY
From	210	to	280	Ft. CLAY
From	280	to	305	Ft. SILTY SAND
From	305	to	325	Ft. STONEY CLAY
From	325	to	355	Ft. SAND GRAVEL
From	355	to	370	Ft. CLAY,BACKFILLED TO 355'

- Return to Main
- Return to Search Options
- Return to Search Criteria

APPENDIX B - TRI-LINEAR DIAGRAMS

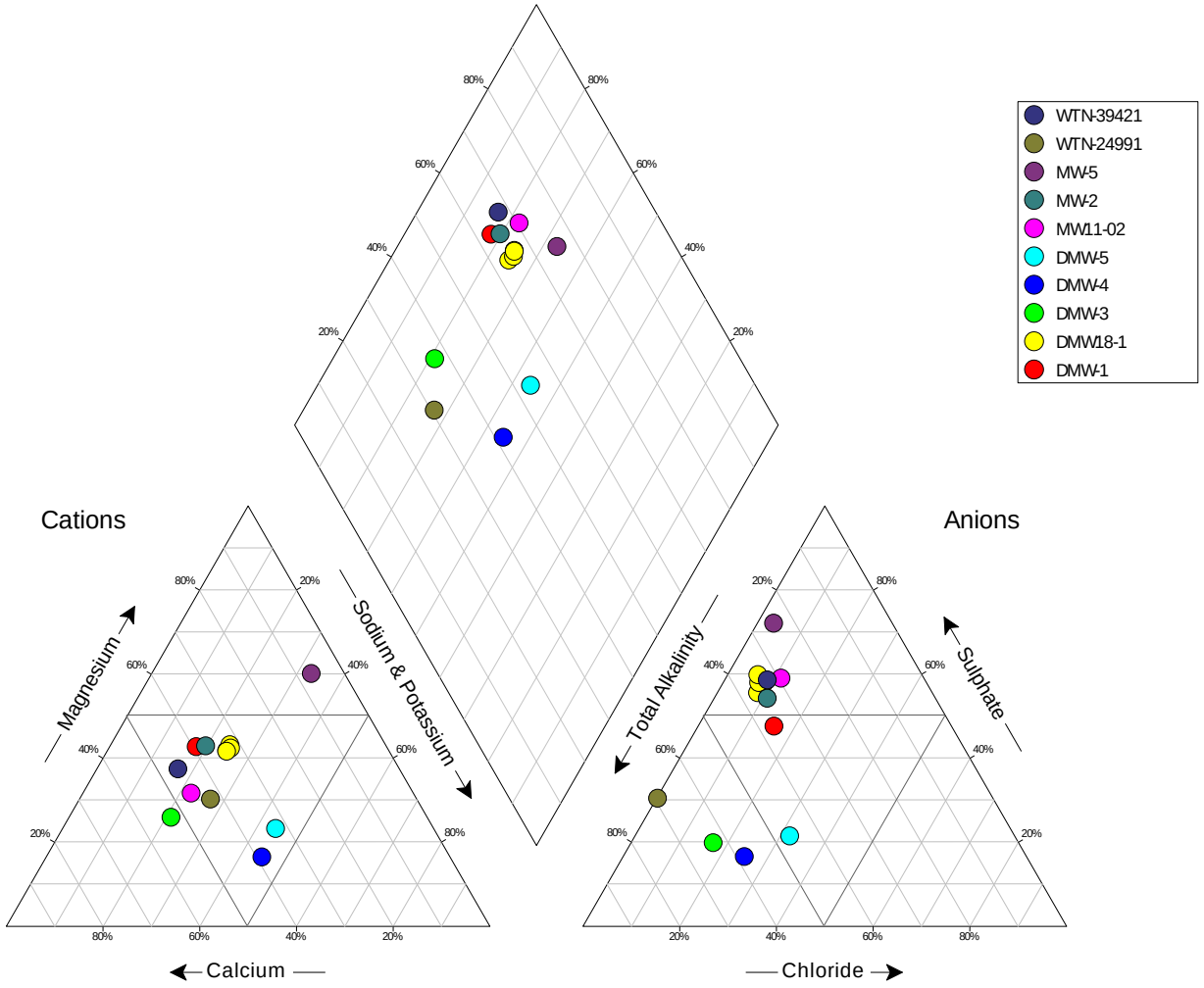

Figure B-1: Piper Diagram (all groundwater samples; 2019 data)

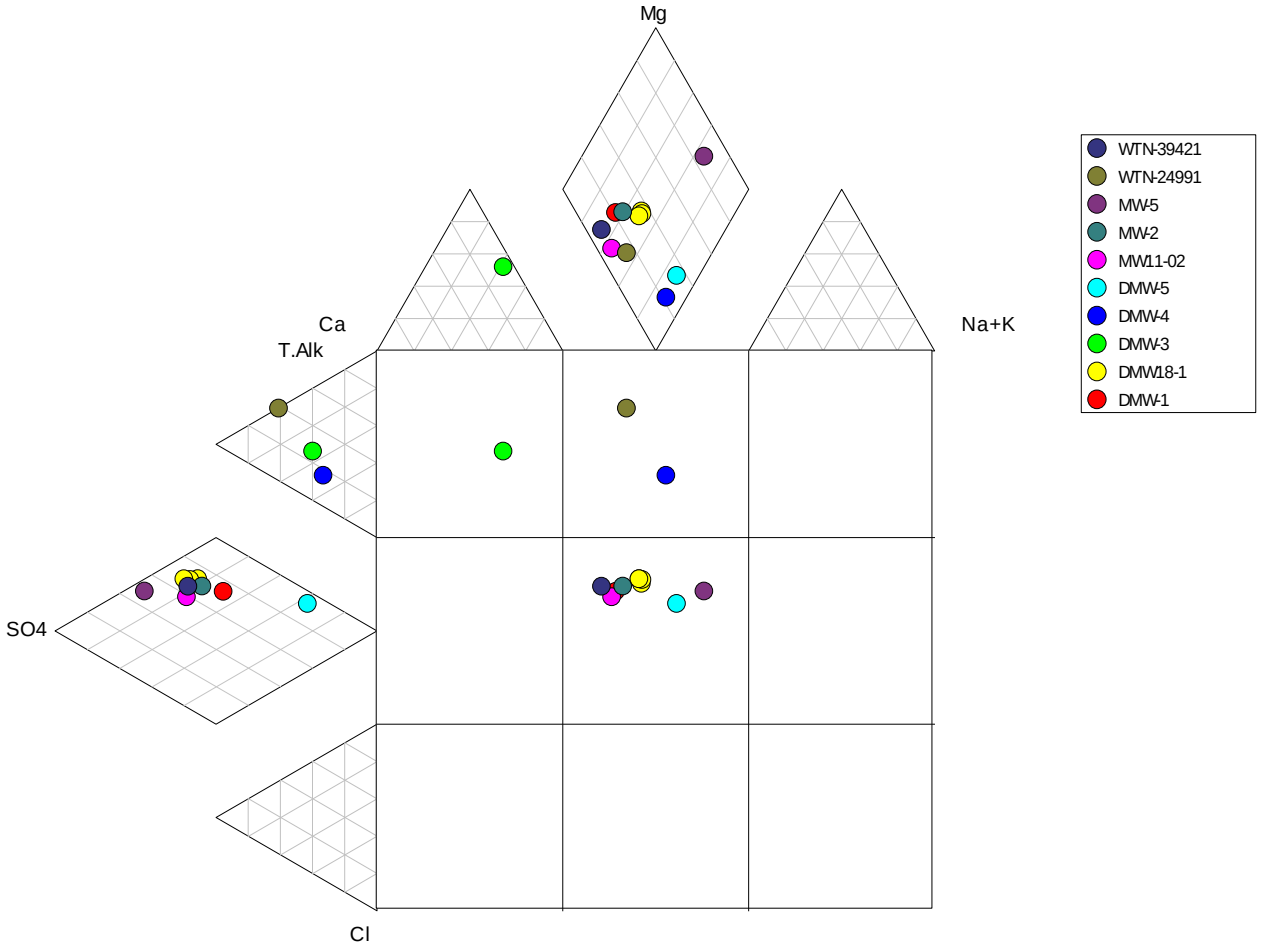

Figure B-2: Expanded Durov Diagram (all groundwater samples; 2019 data)

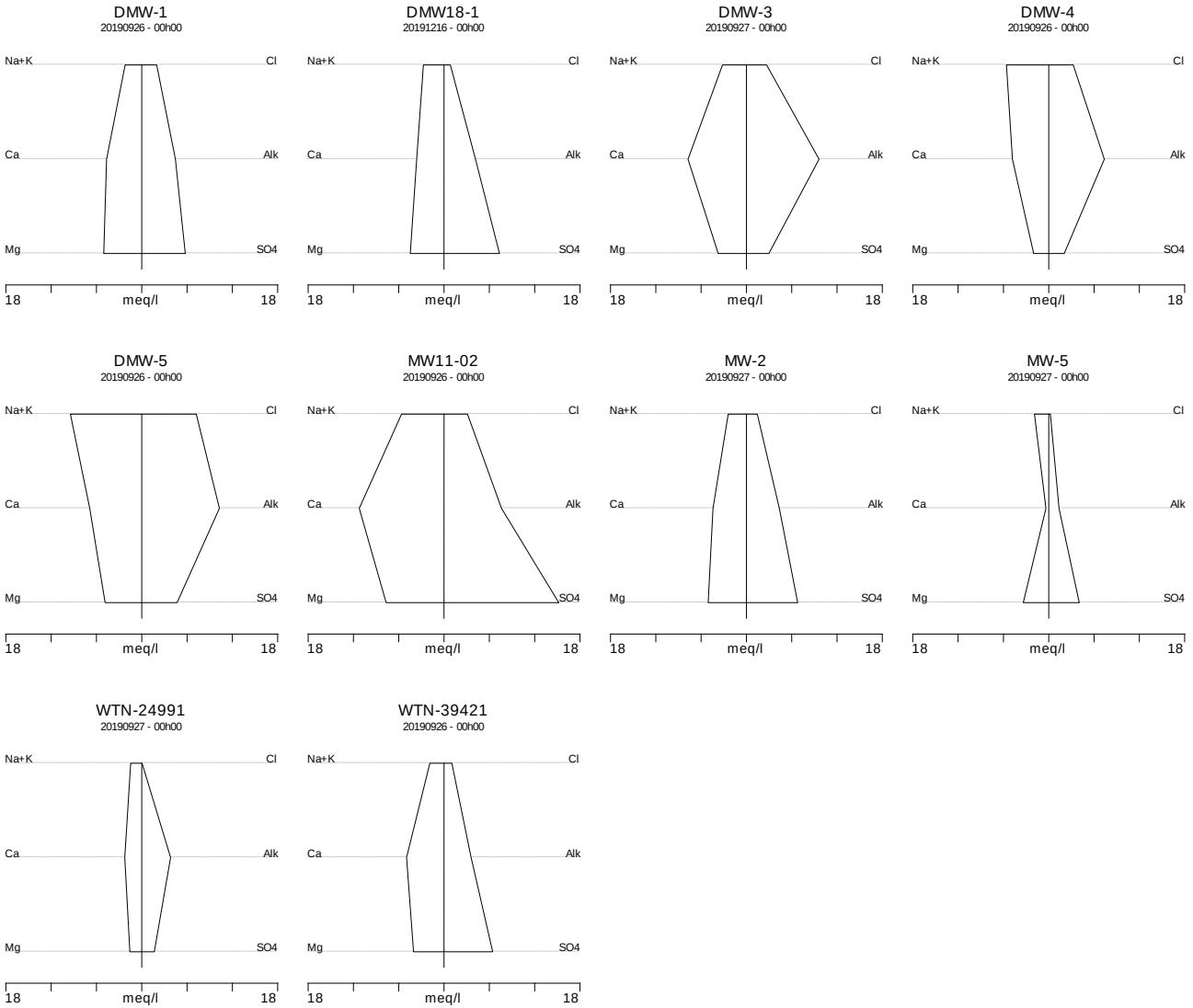

Figure B-3: Stiff Diagrams (all groundwater samples; 2019 data)

APPENDIX C - TABULATED 2019 WATER QUALITY DATA

Table C-1: 2019 Groundwater Quality Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Legend for Table C-1:

<	Less than reported detection limit
GCDWQ MAC	Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations
GCDWQ AO	Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives
BC SDWQG MAC	BC Source Drinking Water Quality Guidelines - Maximum Acceptable Concentrations
BC SDWQG AO	BC Source Drinking Water Quality Guidelines - Aesthetic Objectives
BC CSR DW	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Drinking Water
BCAWQG I	BC Approved Water Quality Guidelines for irrigation
BCWWQG I	BC Working Water Quality Guidelines for British Columbia for irrigation
BC CSR IW	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Irrigation
BCAWQG L	BC Approved Water Quality Guidelines for livestock
BCWWQG L	BC Working Water Quality Guidelines for British Columbia for livestock
BC CSR LW	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Livestock
BCAWQG AL (ST)	BC Approved Water Quality Guidelines for freshwater aquatic life (short-term acute)
BCWWQG AL	BC Working Water Quality Guidelines for British Columbia for freshwater aquatic life
BC CSR AW(F)	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Freshwater Aquatic Life
Calc	Calculated guideline or standard. The guideline or standard is dependent on the value of one or more other analytes, and is calculated from a formula or table.
N	Narrative type of guideline or standard, or Result Note.
NG	No Guideline
NT	Not Tested or Measured
	Highlighted value has a lower detection limit that is greater than the guideline/standard maximum.
GCDWQ MAC	Highlighted value exceeds GCDWQ MAC
GCDWQ AO	Highlighted value exceeds GCDWQ AO
BC SDWQG MAC	Highlighted value exceeds BC SDWQG MAC
BC SDWQG AO	Highlighted value exceeds BC SDWQG AO
BC CSR DW	Highlighted value exceeds BC CSR DW
BCAWQG I	Highlighted value exceeds BCAWQG I
BCWWQG I	Highlighted value exceeds BCWWQG I
BC CSR IW	Highlighted value exceeds BC CSR IW
BCAWQG L	Highlighted value exceeds BCAWQG L
BCWWQG L	Highlighted value exceeds BCWWQG L
BC CSR LW	Highlighted value exceeds BC CSR LW
BCAWQG AL (ST)	Highlighted value exceeds BCAWQG AL (ST)
BCWWQG AL	Highlighted value exceeds BCWWQG AL
BC CSR AW(F)	Highlighted value exceeds BC CSR AW(F)

Table C-1: 2019 Groundwater Quality Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Sampling Location	Date Sampled	Lab Sample ID	Sample Type	Field Results							Lab Results										
											General										
				Conductivity	Depth to Water	Dissolved oxygen	Oxidation reduction potential	pH	Temperature	Turbidity	Alkalinity (bicarbonate, as CaCO3)	Alkalinity (carbonate, as CaCO3)	Alkalinity (hydroxide, as CaCO3)	Alkalinity (phenol-phthalein, as CaCO3)	Alkalinity (total, as CaCO3)	Bromide	Chloride	Fluoride	Hardness, Total (dissolved as CaCO3)	Sulphate	Total dissolved solids
				µS/cm	m	mg/L	mV		°C	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DMW-1	26-Sep-19	9092777-03	Normal	1418	0.4	6.27	109.2	7.40	11.0	2.14	223	<1.0	<1.0	<1.0	223	<0.10	70.2	0.24	486	277	777
DMW18-1	30-Apr-19	9050118-01	Normal	1122	NT	4.31	78	7.91	10.4	0.49	246	<1.0	<1.0	<1.0	246	NT	43.1	NT	426	363	797
DMW18-1	20-Jun-19	9062204-07	Normal	1167	NT	2.47	20	7.67	10.1	0.58	217	<1.0	<1.0	<1.0	217	NT	41.4	NT	486	355	813
DMW18-1	20-Sep-19	9092076-01	Normal	849	NT	45.6	147.9	7.61	11.9	0.48	212	<1.0	<1.0	<1.0	212	<0.10	34.4	0.32	441	340	762
DMW18-1	16-Dec-19	9121554-01	Normal	996	NT	2.80	76.5	7.42	11.1	0.27	208	<1.0	<1.0	<1.0	208	NT	29.6	NT	406	352	760
DMW-3	27-Sep-19	9092859-04	Normal	1666	2.745	2.51	-100.8	6.96	11.6	5.93	481	<1.0	<1.0	<1.0	481	<0.10	95.0	0.71	575	143	877
DMW-4	26-Sep-19	9092777-02	Normal	1511	NT	2.94	99.0	6.89	14.6	0.07	368	<1.0	<1.0	<1.0	368	<0.10	115	0.44	341	98.6	747
DMW-5	26-Sep-19	9092777-01	Normal	2520	NT	4.76	118.9	6.98	14.3	0.01	514	<1.0	<1.0	<1.0	514	0.12	256	1.52	588	225	1240
MW-2	27-Sep-19	9092859-05	Normal	1442	3.260	0.43	-116	7.24	11.3	29.6	218	<1.0	<1.0	<1.0	218	<0.10	51.5	0.33	476	326	796
MW11-02	26-Sep-19	9092777-04	Normal	2614	33.07	9.25	110.4	7.13	10.7	>100	380	<1.0	<1.0	<1.0	380	<0.10	110	0.23	948	729	1600
MW-5	27-Sep-19	9092859-02	Normal	705	0	0.19	-315	9.09	11.2	18.2	58.4	9.1	<1.0	4.6	67.6	<0.10	7.85	0.14	188	194	366
MW-5	27-Sep-19	9092859-03	Duplicate	705	0	0.19	-315	9.09	11.2	18.2	57.9	10.7	<1.0	5.3	68.6	<0.10	7.77	0.13	185	192	359
WTN 24991	27-Sep-19	9092859-01	Normal	658	NT	3.87	-47.1	8.03	14.1	0.16	191	<1.0	<1.0	<1.0	191	<0.10	1.44	0.32	192	79.8	316
WTN 39421	26-Sep-19	9092777-05	Normal	120.2	NT	4.57	8.2	7.91	13.4	0.15	179	<1.0	<1.0	<1.0	179	<0.10	36.7	0.18	451	309	736
GCDWQ MAC				NG	NG	NG	NG	NG	NG	N [1.1]	NG	NG	NG	NG	NG	NG	NG	1.5	NG	NG	NG
GCDWQ AO				NG	NG	NG	NG	7.0 - 10.5 [2.1]	15	NG	NG	NG	NG	NG	NG	NG	250	NG	NG	500 [2.2]	500
BC SDWQG MAC				NG	NG	NG	NG	NG	NG	N [3.1]	NG	NG	NG	NG	NG	NG	NG	1.5	NG	NG	NG
BC SDWQG AO				NG	NG	NG	NG	NG	15	NG	NG	NG	NG	NG	NG	NG	250	NG	NG	500	NG
BC CSR DW				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	250 [5.1]	1.500	NG	500 [5.2]	NG
BCAWQG I				NG	NG	NG	NG	5.0 - 9.5 [6.1]	N [6.2]	N [6.3]	NG	NG	NG	NG	NG	NG	100	2.0 [6.4]	NG	NG	NG
BCWWQG I				700 [7.1]	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	500 [7.2]
BC CSR IW				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	100 [8.1]	1.000	NG	NG	NG
BCAWQG L				NG	NG	NG	NG	5.0 - 9.5 [9.1]	N [9.2]	N [9.3]	NG	NG	NG	NG	NG	NG	600 [9.4]	1.5 [9.5]	NG	1000	NG
BCWWQG L				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	1000 [10.1]	1000 [10.2]
BC CSR LW				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	600	1.000 [11.1]	NG	1000	NG
BCAWQG AL (ST)				NG	NG	min 5 [12.1]	NG	N [12.2]	19 [12.3]	N [12.4]	NG	NG	NG	NG	NG	NG	600 [12.5]	Calc [12.6]	NG	Calc [12.7]	NG
BCWWQG AL				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	N [13.1]	N [13.2]	NG	NG	NG	NG	NG	NG
BC CSR AW(F)				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	1500	Calc [14.1]	NG	Calc [14.2]	NG

Table C-1: 2019 Groundwater Quality Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Sampling Location	Date Sampled	Lab Sample ID	Sample Type	Lab Results																	
				Nutrients											Dissolved Metals						
				Ammonia (total, as N)	Nitrate (as N)	Nitrate + Nitrite (as N)	Nitrite (as N)	Organic nitrogen	Total nitrogen	Total kjeldahl nitrogen	Ortho-phosphate (dissolved, as P)	Phosphorus (dissolved, by ICPMS/ ICPOES)	Phosphorus (total, APHA 4500-P)	Phosphorus (dissolved, APHA 4500-P)	Potassium (dissolved)	Aluminum (dissolved)	Antimony (dissolved)	Arsenic (dissolved)	Barium (dissolved)	Beryllium (dissolved)	Bismuth (dissolved)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DMW-1	26-Sep-19	9092777-03	Normal	<0.020	3.04	3.04	<0.010	0.119	3.16	0.119	<0.0050	<0.050	0.0149	0.0146	6.10	<0.0050	<0.00020	0.00087	0.0362	<0.00010	<0.00010
DMW18-1	30-Apr-19	9050118-01	Normal	0.020	3.02	3.02	<0.010	NT	NT	NT	NT	<0.050	NT	NT	5.43	<0.0050	<0.00020	0.00224	0.0229	<0.00010	<0.00010
DMW18-1	20-Jun-19	9062204-07	Normal	0.039	3.05	3.05	<0.010	NT	NT	NT	NT	<0.050	0.0102	NT	5.85	0.0157	<0.00020	0.00272	0.0261	<0.00010	<0.00010
DMW18-1	20-Sep-19	9092076-01	Normal	0.040	1.87	1.87	<0.010	NT	NT	NT	NT	<0.050	0.0113	NT	5.55	<0.0050	<0.00020	0.00236	0.0225	<0.00010	<0.00010
DMW18-1	16-Dec-19	9121554-01	Normal	<0.020	1.28	1.28	<0.010	NT	NT	NT	NT	<0.050	0.0126	NT	6.56	<0.0050	<0.00020	0.00280	0.0239	<0.00010	<0.00010
DMW-3	27-Sep-19	9092859-04	Normal	0.028	0.132	0.132	<0.010	0.378	0.538	0.406	<0.0050	<0.050	<0.0020	<0.0020	7.87	<0.0050	0.00047	0.00063	0.0306	<0.00010	<0.00010
DMW-4	26-Sep-19	9092777-02	Normal	<0.020	0.724	0.724	<0.010	0.559	1.28	0.559	0.160	0.284	0.284	0.275	16.6	<0.0050	<0.00020	0.00213	0.0304	<0.00010	<0.00010
DMW-5	26-Sep-19	9092777-01	Normal	0.023	3.72	3.72	<0.010	0.573	4.31	0.596	0.0084	<0.050	0.0226	0.0224	10.5	<0.0050	<0.00020	<0.00050	0.0750	<0.00010	<0.00010
MW-2	27-Sep-19	9092859-05	Normal	0.028	0.121	0.121	<0.010	0.263	0.412	0.291	<0.0050	<0.050	0.0602	0.0263	6.09	<0.0050	<0.00020	0.00068	0.0458	<0.00010	<0.00010
MW11-02	26-Sep-19	9092777-04	Normal	0.048	8.98	8.98	<0.010	0.503	9.53	0.551	<0.0050	<0.050	0.392	0.0323	9.21	0.0107	<0.00020	0.00070	0.0312	<0.00010	<0.00010
MW-5	27-Sep-19	9092859-02	Normal	0.469	<0.010	<0.0100	<0.010	<0.0500	0.474	0.474	<0.0050	<0.050	0.0063	<0.0020	2.95	<0.0050	<0.00020	<0.00050	<0.0050	<0.00010	<0.00010
MW-5	27-Sep-19	9092859-03	Duplicate	0.436	<0.010	<0.0100	<0.010	<0.0500	0.444	0.444	<0.0050	<0.050	0.0056	<0.0020	2.94	<0.0050	<0.00020	<0.00050	<0.0050	<0.00010	<0.00010
WTN 24991	27-Sep-19	9092859-01	Normal	0.136	<0.010	<0.0100	<0.010	<0.0500	0.164	0.164	<0.0050	<0.050	0.0128	0.0097	3.37	<0.0050	<0.00020	0.00135	0.0189	<0.00010	<0.00010
WTN 39421	26-Sep-19	9092777-05	Normal	<0.020	2.35	2.35	<0.010	<0.0500	2.35	<0.050	<0.0050	<0.050	0.0108	0.0037	6.28	<0.0050	<0.00020	0.00070	0.0425	<0.00010	<0.00010
GCDWQ MAC				NG	10	10 [1,2]	1	NG	NG	NG	NG	NG	NG	NG	NG	NG	0.006	0.010 [1.3]	2.0 [1.4]	NG	NG
GCDWQ AO				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	N [2.3]	NG	NG	NG	NG	NG
BC SDWQG MAC				NG	10	NG	1.0	NG	NG	NG	NG	NG	NG	NG	NG	9.5	NG	0.01	NG	NG	NG
BC SDWQG AO				NG	NG	NG	NG	NG	NG	NG	NG	N [4.1]	N [4.2]	N [4.3]	NG	NG	NG	NG	NG	NG	NG
BC CSR DW				NG	10 [5.3]	10 [5.4]	1	NG	NG	NG	NG	NG	NG	NG	NG	9.500 [5.5]	0.006	0.010	1.000	0.008	NG
BCAWQG I				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	5 [6.5]	NG	0.100 [6.6]	NG	NG	NG
BCWWQG I				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	0.100	NG
BC CSR IW				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	5.000	NG	0.100	NG	0.100	NG
BCAWQG L				NG	100 [9.6]	100 [9.7]	10 [9.8]	NG	NG	NG	NG	NG	NG	NG	NG	5 [9.9]	NG	0.025 [9.10]	NG	NG	NG
BCWWQG L				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	0.100	NG
BC CSR LW				NG	100 [11.2]	100 [11.3]	10.000	NG	NG	NG	NG	NG	NG	NG	NG	5.000	NG	0.025	NG	0.100	NG
BCAWQG AL (ST)				Calc [12.8]	32.8 [12.9]	32.8 [12.10]	Calc [12.11]	NG	NG	NG	NG	0.015 [12.12]	0.015 [12.13]	0.015 [12.14]	NG	Calc [12.15]	NG	0.005 [12.16]	NG	NG	NG
BCWWQG AL				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	0.009 [13.3]	NG	1	0.00013	NG
BC CSR AW(F)				Calc [14.3]	400 [14.4]	400 [14.5]	Calc [14.6]	NG	NG	NG	NG	NG	NG	NG	NG	NG	0.090	0.050	10.000	0.0015	NG

Table C-1: 2019 Groundwater Quality Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Sampling Location	Date Sampled	Lab Sample ID	Sample Type	Lab Results																
				Dissolved Metals																
				Boron (dissolved)	Cadmium (dissolved)	Calcium (dissolved)	Chromium (dissolved)	Cobalt (dissolved)	Copper (dissolved)	Iron (dissolved)	Lead (dissolved)	Lithium (dissolved)	Magnesium (dissolved)	Manganese (dissolved)	Mercury (dissolved)	Molybdenum (dissolved)	Nickel (dissolved)	Selenium (dissolved)	Silicon (dissolved, as Si)	Silver (dissolved)	Sodium (dissolved)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DMW-1	26-Sep-19	9092777-03	Normal	0.0319	0.000019	93.4	0.00606	<0.00010	<0.00040	<0.010	<0.00020	0.00875	61.2	0.00182	<0.000010	0.00844	0.00117	0.0316	10.9	<0.000050	46.9
DMW18-1	30-Apr-19	9050118-01	Normal	0.0200	0.000023	75.9	0.00191	<0.00010	0.00145	<0.010	<0.00020	0.00885	57.3	0.00093	<0.000010	0.00993	0.00053	0.0154	8.3	<0.000050	62.7
DMW18-1	20-Jun-19	9062204-07	Normal	0.0183	0.000038	83.2	0.00215	<0.00010	0.00520	0.014	0.00028	0.00998	67.5	0.00109	<0.000010	0.0114	0.00088	0.0170	8.7	<0.000050	71.7
DMW18-1	20-Sep-19	9092076-01	Normal	0.0218	0.000038	76.7	0.00216	<0.00010	0.00328	<0.010	<0.00020	0.00997	60.6	0.00069	<0.000010	0.0110	0.00065	0.0147	9.3	<0.000050	67.0
DMW18-1	16-Dec-19	9121554-01	Normal	0.0119	0.000029	72.7	0.00211	<0.00010	0.00104	<0.010	<0.00020	0.00669	54.4	0.00039	<0.000010	0.0130	0.00048	0.00941	13.1	<0.000050	59.2
DMW-3	27-Sep-19	9092859-04	Normal	<0.0050	0.000080	155	<0.00050	0.00059	0.00315	1.45	0.00208	0.0193	45.5	0.293	<0.000010	0.00862	0.00187	0.00497	15.3	<0.000050	68.2
DMW-4	26-Sep-19	9092777-02	Normal	0.207	0.000294	96.3	<0.00050	0.00069	0.0201	<0.010	0.00032	0.0192	24.3	0.00039	<0.000010	0.0167	0.00183	<0.00050	11.1	<0.000050	119
DMW-5	26-Sep-19	9092777-01	Normal	0.102	0.000021	138	<0.00050	0.00023	0.00177	<0.010	<0.00020	0.0600	58.9	0.320	<0.000010	0.0198	0.00370	0.00052	15.4	<0.000050	211
MW-2	27-Sep-19	9092859-05	Normal	0.0229	0.000056	88.7	<0.00050	0.00064	<0.00040	0.254	<0.00020	0.00770	61.6	0.315	<0.000010	0.0126	0.00189	0.00178	10.0	<0.000050	52.0
MW11-02	26-Sep-19	9092777-04	Normal	0.140	0.000106	225	0.00178	0.00381	0.00220	<0.010	<0.00020	0.0187	93.3	0.00512	<0.000010	0.00703	0.0160	0.0211	14.2	<0.000050	124
MW-5	27-Sep-19	9092859-02	Normal	0.0100	<0.000010	7.59	<0.00050	<0.00010	<0.00040	<0.010	<0.00020	0.00110	41.0	0.0361	<0.000010	0.00339	<0.00040	<0.00050	<1.0	<0.000050	41.8
MW-5	27-Sep-19	9092859-03	Duplicate	0.0097	<0.000010	7.54	<0.00050	<0.00010	<0.00040	0.018	<0.00020	0.00110	40.3	0.0380	<0.000010	0.00329	<0.00040	<0.00050	<1.0	<0.000050	41.7
WTN 24991	27-Sep-19	9092859-01	Normal	0.0135	<0.000010	45.0	<0.00050	<0.00010	<0.00040	0.089	<0.00020	0.00380	19.2	0.0829	<0.000010	0.0109	<0.00040	<0.00050	11.6	<0.000050	31.6
WTN 39421	26-Sep-19	9092777-05	Normal	0.0243	<0.000010	99.6	0.00206	<0.00010	<0.00040	0.023	<0.00020	0.00736	49.1	0.00182	<0.000010	0.00732	0.00086	0.0347	12.3	<0.000050	39.7
GCDWQ MAC				5	0.005	NG	0.05	NG	2 [1.5]	NG	0.005 [1.6]	NG	NG	0.12 [1.7]	0.001	NG	NG	0.05	NG	NG	NG
GCDWQ AO				NG	NG	NG	NG	NG	1 [2.4]	0.3	NG	NG	NG	0.02 [2.5]	NG	NG	NG	NG	NG	NG	200
BC SDWQG MAC				5.0	0.005	NG	NG	NG	NG	NG	0.01	NG	NG	NG	0.001	0.25	NG	0.01	NG	NG	NG
BC SDWQG AO				NG	NG	NG	NG	NG	1.0	0.3	NG	NG	NG	0.05	NG	NG	NG	NG	NG	NG	NG
BC CSR DW				5.000	0.005	NG	0.050 [5.6]	0.020 [5.7]	1.500 [5.8]	6.500 [5.9]	0.010	0.008	NG	1.500 [5.10]	0.001	0.250	0.080	0.010	NG	0.020	200 [5.11]
BCAWQG I				0.5 [6.7]	NG	NG	NG	NG	0.200 [6.8]	NG	0.200 [6.9]	NG	NG	NG	0.0020 [6.10]	0.05 [6.11]	NG	0.010 [6.12]	NG	NG	NG
BCWWQG I				NG	0.0051 [7.3]	NG	0.0049 [7.4]	0.050 [7.5]	NG	NG	NG	0.75 [7.6]	NG	0.200	NG	NG	0.200	NG	NG	NG	NG
BC CSR IW				0.500 [8.2]	0.005	NG	0.005 [8.3]	0.050	0.200	5.000 [8.4]	0.200	2.500 [8.5]	NG	0.200 [8.6]	0.001	0.010 [8.7]	0.200	0.020 [8.8]	NG	NG	NG
BCAWQG L				5 [9.11]	NG	NG	NG	NG	0.300 [9.12]	NG	0.100 [9.13]	NG	NG	NG	0.0030 [9.14]	0.05 [9.15]	NG	0.0300 [9.16]	NG	NG	NG
BCWWQG L				NG	0.080 [10.3]	1000	0.050 [10.4]	1	NG	NG	NG	NG	NG	NG	NG	NG	1	NG	NG	NG	NG
BC CSR LW				5.000	0.080	1000	0.050 [11.4]	1.000	0.300	NG	0.100	5.000	NG	NG	0.002	0.050	1.000	0.030	NG	NG	NG
BCAWQG AL (ST)				1.2 [12.17]	Calc [12.18]	NG	NG	0.110 [12.19]	N [12.20]	0.35	Calc [12.21]	NG	NG	Calc [12.22]	0.000020 [12.23]	2 [12.24]	NG	0.002 [12.25]	NG	Calc [12.26]	NG
BCWWQG AL				NG	NG	N [13.4]	0.001 [13.5]	NG	NG	NG	NG	NG	NG	NG	NG	NG	Calc [13.6]	NG	NG	NG	NG
BC CSR AW(F)				12.000	Calc [14.7]	NG	0.010 [14.8]	0.040	Calc [14.9]	NG	Calc [14.10]	NG	NG	NG	0.00025	10.000	Calc [14.11]	0.020	NG	Calc [14.12]	NG

Table C-1: 2019 Groundwater Quality Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Sampling Location	Date Sampled	Lab Sample ID	Sample Type	Lab Results											
				Dissolved Metals											
				Strontium (dissolved)	Sulphur (dissolved)	Tellurium (dissolved)	Thallium (dissolved)	Thorium (dissolved)	Tin (dissolved)	Titanium (dissolved)	Tungsten (dissolved)	Uranium (dissolved)	Vanadium (dissolved)	Zinc (dissolved)	Zirconium (dissolved)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DMW-1	26-Sep-19	9092777-03	Normal	1.10	98.4	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0216	0.0025	<0.0040	<0.00010
DMW18-1	30-Apr-19	9050118-01	Normal	0.906	111	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0134	<0.0010	0.0048	<0.00010
DMW18-1	20-Jun-19	9062204-07	Normal	1.02	128	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0154	<0.0010	0.0089	<0.00010
DMW18-1	20-Sep-19	9092076-01	Normal	0.889	116	<0.00050	0.000033	<0.00010	<0.00020	<0.0050	<0.0010	0.0127	<0.0010	0.0172	<0.00010
DMW18-1	16-Dec-19	9121554-01	Normal	0.970	115	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0121	<0.0010	<0.0040	<0.00010
DMW-3	27-Sep-19	9092859-04	Normal	1.18	53.6	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.00550	<0.0010	0.0828	<0.00010
DMW-4	26-Sep-19	9092777-02	Normal	0.873	37.4	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.00768	0.0029	0.0331	0.00014
DMW-5	26-Sep-19	9092777-01	Normal	2.09	85.1	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0284	<0.0010	<0.0040	<0.00010
MW-2	27-Sep-19	9092859-05	Normal	0.986	116	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0129	0.0011	0.688	<0.00010
MW11-02	26-Sep-19	9092777-04	Normal	1.47	239	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0304	0.0018	<0.0040	<0.00010
MW-5	27-Sep-19	9092859-02	Normal	0.0561	73.5	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	<0.000020	<0.0010	<0.0040	<0.00010
MW-5	27-Sep-19	9092859-03	Duplicate	0.0555	74.0	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	<0.000020	<0.0010	<0.0040	<0.00010
WTN 24991	27-Sep-19	9092859-01	Normal	0.464	29.4	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.00205	<0.0010	<0.0040	<0.00010
WTN 39421	26-Sep-19	9092777-05	Normal	1.06	113	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.00466	0.0051	0.0192	<0.00010
GCDWQ MAC				7.0 [1.8]	NG	NG	NG	NG	NG	NG	NG	0.02	NG	NG	NG
GCDWQ AO				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	5.0	NG
BC SDWQG MAC				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
BC SDWQG AO				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	5.0	NG
BC CSR DW				2.500	NG	NG	NG	NG	2.500	NG	0.003	0.020	0.020	3.000 [5.12]	NG
BCAWQG I				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	1.000 [6.13]	NG
BCWWQG I				NG	NG	NG	NG	NG	NG	NG	NG	0.010	0.100	NG	NG
BC CSR IW				NG	NG	NG	NG	NG	NG	NG	NG	0.010	0.100	1.000 [8.9]	NG
BCAWQG L				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	2.000 [9.17]	NG
BCWWQG L				NG	NG	NG	NG	NG	NG	NG	NG	0.200	0.100	NG	NG
BC CSR LW				NG	NG	NG	NG	NG	NG	NG	NG	0.200	0.100	2.000	NG
BCAWQG AL (ST)				NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	Calc [12.27]	NG
BCWWQG AL				NG	NG	NG	0.0008 [13.7]	NG	NG	NG	NG	0.0085	NG	NG	NG
BC CSR AW(F)				NG	NG	NG	0.003	NG	NG	1.000	NG	0.085	NG	Calc [14.13]	NG

Table C-1: 2019 Groundwater Quality Results
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1. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)
Note 1.1 for Turbidity:
Waterworks systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet health-based turbidity limits, as defined for specific treatment technologies. Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters should meet the requirements described in GCDWQ. For systems that use groundwater that is not under the direct influence of surface water, which are considered less vulnerable to faecal contamination, turbidity should generally be below 1.0 NTU. For effective operation of the distribution system, it is good practice to ensure that water entering the distribution system has turbidity levels below 1.0 NTU.
Note 1.2 for Nitrate + Nitrite (as N):
The MAC for Nitrate (as N) is 10 mg/L
Note 1.3 for Arsenic (dissolved):
Every effort should be made to maintain arsenic levels in drinking water as low as reasonably achievable.
Note 1.4 for Barium (dissolved):
Update January 24, 2020. The MAC was revised from 1.0 mg/L to 2.0 mg/L.
Note 1.5 for Copper (dissolved):
A maximum acceptable concentration (MAC) of 2 mg/L is established for total copper in drinking water, based on a sample of water taken at the tap. Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on Copper, June 2019.
Note 1.6 for Lead (dissolved):
The maximum acceptable concentration (MAC) for total lead in drinking water is 0.005 mg/L (5 µg/L), based on a sample of water taken at the tap and using the appropriate protocol for the type of building being sampled. Every effort should be made to maintain lead levels in drinking water as low as reasonably achievable (or ALARA). (GCDWQ: Guideline Technical Document; March, 2019)
Note 1.7 for Manganese (dissolved):
Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on manganese, May 2019.
Note 1.8 for Strontium (dissolved):
Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on strontium, May 2019.
2. Notes for Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives (GCDWQ AO)
Note 2.1 for pH:
The operational guideline for pH is a range of 7.0 to 10.5 in finished drinking water.
Note 2.2 for Sulphate:
There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L. Health authorities should be notified of drinking water sources containing above 500 mg/L.
Note 2.3 for Aluminum (dissolved):
This is an operational guidance value, designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance value of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.
Note 2.4 for Copper (dissolved):
Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on Copper, June 2019.
Note 2.5 for Manganese (dissolved):
Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on manganese, May 2019.
3. Notes for BC Source Drinking Water Quality Guidelines - Maximum Acceptable Concentrations (2017 and updates) (BC SDWQG MAC)
General Notes:
The source drinking water quality guidelines presented in this document apply to the ambient water before it is treated and distributed for domestic use. The guidelines apply to drinking water sources from surface water and groundwater. Metal guidelines are based on total concentrations.
Note 3.1 for Turbidity:
For raw drinking water with treatment for particulates, the guideline is: Change from background of 5 NTU at any time when background is ≤ 50 NTU; and change from background of 10% when background is > 50 NTU. For raw drinking water without treatment for particulates, the guideline is: Change from background of 1 NTU at any time when background is ≤ 5 NTU; and change from background of 5 NTU at any time. If natural background turbidity is > 50 NTU, the guideline is: Induced turbidity should not exceed 10% of the background turbidity.

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4. Notes for BC Source Drinking Water Quality Guidelines - Aesthetic Objectives (2017 and updates) (BC SDWQG AO)
General Notes:
The source drinking water quality guidelines presented in this document apply to the ambient water before it is treated and distributed for domestic use. The guidelines apply to drinking water sources from surface water and groundwater. Metal guidelines are based on total concentrations.
Note 4.1 for Phosphorus (dissolved, by ICPMS/ICPOES):
The AO for lakes is 0.01 mg/L. For lakes with residence time > 6 months, measure total P during spring overturn. For lakes with residence time < 6 months, measure mean epilimnetic total P during the growing season (ENV 1985).
Note 4.2 for Phosphorus (total, APHA 4500-P):
The AO for lakes is 0.01 mg/L. For lakes with residence time > 6 months, measure total P during spring overturn. For lakes with residence time < 6 months, measure mean epilimnetic total P during the growing season (ENV 1985).
Note 4.3 for Phosphorus (dissolved, APHA 4500-P):
The AO for lakes is 0.01 mg/L. For lakes with residence time > 6 months, measure total P during spring overturn. For lakes with residence time < 6 months, measure mean epilimnetic total P during the growing season (ENV 1985).
5. Notes for BC CSR, Schedule 3.2, Generic Numerical Water Standards for Drinking Water (2017 and updates) (BC CSR DW)
General Notes:
Drinking water standards are for unfiltered samples obtained at the point of consumption. Heavy metals, metalloids and inorganic ions are expressed as total substance concentrations unless otherwise indicated.
Note 5.1 for Chloride:
Standard to protect against taste and odour concerns.
Note 5.2 for Sulphate:
Standard to protect against taste and odour concerns.
Note 5.3 for Nitrate (as N):
Where nitrate and nitrite are present, total nitrate plus nitrite-nitrogen should not exceed this value.
Note 5.4 for Nitrate + Nitrite (as N):
Where nitrate and nitrite are present, total nitrate plus nitrite-nitrogen should not exceed this value.
Note 5.5 for Aluminum (dissolved):
Standard is specific to protection of human health. Standard is derived with TRV protective of adults. Standard may not adequately protect other age groups. Standard may not address aesthetic (organoleptic) concerns related to drinking water quality. Water treatment may be required.
Note 5.6 for Chromium (dissolved):
Analytical results for chromium (all species) in water may be used to demonstrate compliance with the standards. Where the standards cannot be met based on analytical results for chromium (all species), chromium speciation may be necessary. Standard is 50 µg/L for chromium, hexavalent. Standard is 6000 µg/L for chromium, trivalent. The standard of 50 µg/L was used to identify exceedances for dissolved chromium in order to demonstrate compliance with the standards.
Note 5.7 for Cobalt (dissolved):
The standard in Schedule 3.2 is 1 µg/L. However the BC Ministry of Environment and Climate Change Strategy has set an interim background groundwater concentration estimate of 20 ug/L for Cobalt at sites in the Province. Therefore a standard of 20 ug/L has been used for this criteria set.
Note 5.8 for Copper (dissolved):
Standard is specific to protection of human health. Standard is derived with TRV protective of adults. Standard may not adequately protect other age groups. Standard may not address aesthetic (organoleptic) concerns related to drinking water quality. Water treatment may be required.
Note 5.9 for Iron (dissolved):
Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as (a) item A6, A7, A8 or A11 (b) item C1, C2, C3, C4 or C6, (c) item D2, D3, D5, or D6 (d) item E4, or (e) item H14. Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as item H11 or H20, but only if the site was used for the purpose or activity in conjunction with or as a result of the site also being used for at least one of the purposes or activities set out above. Standard is specific to protection of human health. Standard is derived with TRV protective of adults. Standard may not adequately protect other age groups. Standard may not address aesthetic (organoleptic) concerns related to drinking water quality. Water treatment may be required.
Note 5.10 for Manganese (dissolved):
Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as (a) item B1 (b) item C1, C3 or C4 (c) item D2, D3, D5, or D6 (d) item E4, or

(e) item H3 or H14. Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as item H11 or H20, but only if the site was used for the purpose or activity in conjunction with or as a result of the site also being used for at least one of the purposes or activities set out above. Standard is specific to protection of human health. Standard is derived with TRV protective of adults. Standard may not adequately protect other age groups. Standard may not address aesthetic (organoleptic) concerns related to drinking water quality. Water treatment may be required.
Note 5.11 for Sodium (dissolved):
Standard is specific to protection of human health. Standard is derived with TRV protective of adults. Standard may not adequately protect other age groups.
Note 5.12 for Zinc (dissolved):
Standard is specific to protection of human health. Standard is derived with TRV protective of adults. Standard may not adequately protect other age groups.
6. Notes for BC Approved Water Quality Guidelines for irrigation (BCAWQG I)
General Notes:
The Water Quality Guidelines (Criteria) Reports by BC Ministry of Environment were used as references for the guidelines. (Internet address: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html). Overview Reports (BC MOE) were used as the references for the guidelines unless the note for specific analyte indicates that the Technical Appendix (BC MOE) was used.
Note 6.1 for pH:
Update August 2019 Summary Report.
Note 6.2 for Temperature:
The recommended guideline for temperature is + or - 1 degree Celsius change from natural ambient background.
Note 6.3 for Turbidity:
Induced turbidity should not exceed 10 NTU when background turbidity is less than or equal to 50 NTU, nor should induced turbidity be more than 20 % of background when background is greater than 50 NTU.
Note 6.4 for Fluoride:
Total fluoride in irrigation water should not exceed 1.0 mg/L as a 30-day average or a maximum of 2.0 mg/L.
Note 6.5 for Aluminum (dissolved):
The guideline maximum for total aluminum is 5 mg/L. A separate guideline for dissolved aluminum is not provided.
Note 6.6 for Arsenic (dissolved):
The interim guideline for total arsenic is 100 µg/L.
Note 6.7 for Boron (dissolved):
The guideline for total boron depends on the crop, and varies from 0.5 mg/L to 6 mg/L. The most stringent guideline maximum of 0.5 mg/L, for very sensitive and sensitive crops, was used to identify exceedances for this report.
Note 6.8 for Copper (dissolved):
The guideline maximum for total copper is 200 µg/L.
Note 6.9 for Lead (dissolved):
For neutral and alkaline fine-textured soils the total lead concentration in irrigation water should not exceed 400 µg/L at any time. The concentration of total lead in irrigation water for use on all other soils should not exceed 200 µg/L at any time. / The most stringent guideline maximum was used in this report.
Note 6.10 for Mercury (dissolved):
The guideline maximum for total mercury is 2.0 µg/L.
Note 6.11 for Molybdenum (dissolved):
The guideline maximum for total molybdenum for irrigation of forage crops is 0.05 mg/L. There is no guideline maximum for total molybdenum for irrigation of non-forage crops.
Note 6.12 for Selenium (dissolved):
The guideline for total selenium is 10 µg/L mean. The mean concentrations in the water column are based on at least 5 weekly samples taken over a 30-day period.
Note 6.13 for Zinc (dissolved):
The guideline maximum for total zinc for irrigation is as follows: - Soil pH less than 6: 1000 µg/L. - Soil pH equal to or greater than 6, and less than 7: 2000 µg/L. - Soil pH greater than or equal to 7: 5000 µg/L. / The most stringent guideline maximum was used in this report.

Table C-1: 2019 Groundwater Quality Results
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7. Notes for Working Water Quality Guidelines for British Columbia for irrigation (BCWWQG I)
General Notes:
Reference: Working Water Quality Guidelines for British Columbia (2015). WWQG values are long-term (i.e. average) concentrations unless identified as a short-term maximum in the "Notes" for a specific analyte. Long-term WWQGs represent average substance concentrations calculated from 5 samples in 30 days. WWQG are given for total substance concentrations unless otherwise noted.
Note 7.1 for Conductivity:
The guideline varies from 700 to 5000 µS/cm depending on the type of crop. The most stringent guideline has been used for this report.
Note 7.2 for Total dissolved solids:
The guideline varies from 500 to 3500 mg/L depending on the type of crop. The most stringent guideline has been used for this report.
Note 7.3 for Cadmium (dissolved):
This is a Short-term maximum guideline.
Note 7.4 for Chromium (dissolved):
The guideline for Cr(VI) is 8 µg/L (total). The guideline for Cr(III) is 4.9 µg/L (total). The guideline of 4.9 µg/L for Cr(III) was used, in this report, to identify exceedances for dissolved chromium, and total chromium as a means for determining the potential for exceeding the Cr(VI) and/or Cr(III) guidelines.
Note 7.5 for Cobalt (dissolved):
Continuous or intermittent use on all soils.
Note 7.6 for Lithium (dissolved):
The guideline is 2.5 mg/L for non-citrus crops (May not be protective of barley and other cereal crops; 1.0 mg/L suggested for cereal crops). The guideline is 0.75 mg/L for citrus crops. / The most stringent guideline was used in this report.
8. Notes for BC CSR, Schedule 3.2, Generic Numerical Water Standards for Irrigation (2017 and updates) (BC CSR IW)
General Notes:
Standards for all organic substances are for total substance concentrations. Any water sample to be analyzed for organic substances should not be filtered. Standards for surface water samples to be analyzed for heavy metals, metalloids and inorganic ions are total substance concentrations. In addition, it is recommended that surface water samples being analyzed for heavy metals, metalloids and inorganic ions should also be analyzed for dissolved substance concentrations. Standards for groundwater samples for heavy metals, metalloids and inorganic ions are for dissolved substance concentrations. In addition, it is recommended that groundwater samples being analyzed for heavy metals, metalloids and inorganic ions should also be analyzed for total substance concentrations. Standards apply to irrigation of all soil types, unless otherwise indicated. / There are several different standards for site-specific factors for some analytes. The most stringent standards were used for this criteria set.
Note 8.1 for Chloride:
Standard to protect all types of crops.
Note 8.2 for Boron (dissolved):
Standard varies depending on crop. This standard is for blackberry crop.
Note 8.3 for Chromium (dissolved):
Analytical results for chromium (all species) in water may be used to demonstrate compliance with the standards. Where the standards cannot be met based on analytical results for chromium (all species), chromium speciation may be necessary. Standard is 8 µg/L for chromium, hexavalent. Standard is 5 µg/L for chromium, trivalent. The standard of 5 µg/L was used to identify exceedances for dissolved chromium in order to demonstrate compliance with the standards.
Note 8.4 for Iron (dissolved):
Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as (a) item A6, A7, A8 or A11 (b) item C1, C2, C3, C4 or C6, (c) item D2, D3, D5, or D6 (d) item E4, or (e) item H14. Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as item H11 or H20, but only if the site was used for the purpose or activity in conjunction with or as a result of the site also being used for at least one of the purposes or activities set out above.
Note 8.5 for Lithium (dissolved):
Standard to protect all types of crops.

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Note 8.6 for Manganese (dissolved):
Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as (a) item B1 (b) item C1, C3 or C4 (c) item D2, D3, D5, or D6 (d) item E4, or (e) item H3 or H14. Standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2 as item H11 or H20, but only if the site was used for the purpose or activity in conjunction with or as a result of the site also being used for at least one of the purposes or activities set out above.
Note 8.7 for Molybdenum (dissolved):
Standard varies with crop, soil drainage and Mo:Cu ratio. Standard is 10 – 30 µg/L. Consult a director for further advice. The most stringent standard of 10 µg/L has been used.
Note 8.8 for Selenium (dissolved):
Standard varies with type of application; continuous or intermittent. This standard is for continuous applications on crops.
Note 8.9 for Zinc (dissolved):
The standard varies (from 1000 to 5000 µg/L) with soil pH. This standard (which is the most stringent) is for soil pH less than 6.0
9. Notes for BC Approved Water Quality Guidelines for livestock (BCAWQG L)
General Notes:
The Water Quality Guidelines (Criteria) Reports by BC Ministry of Environment were used as references for the guidelines. (Internet address: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html). Overview Reports (BC MOE) were used as the references for the guidelines unless the note for specific analyte indicates that the Technical Appendix (BC MOE) was used.
Note 9.1 for pH:
Update August 2019 Summary Report.
Note 9.2 for Temperature:
The recommended guideline for temperature is + or - 1 degree Celsius change from natural ambient background.
Note 9.3 for Turbidity:
Induced turbidity should not exceed 5 NTU when background turbidity is less than or equal to 50 NTU, nor should induced turbidity be more than 10 % of background when background is greater than 50 NTU.
Note 9.4 for Chloride:
The water quality guideline for chloride for livestock watering is 600 mg/L.
Note 9.5 for Fluoride:
The total fluoride recommendation for dairy cows, breeding stock and other long-lived animals is 1.0 mg/L as a 30-day mean and 1.5 mg/L as a maximum. Total fluoride should not exceed 2.0 mg/L as a 30-day mean or 4.0 mg/L maximum in the drinking water of all other types of livestock, unless fluoride is provided in the diet by bone meal or mineral additives, in which case 1.0 mg/L as a 30-day mean and 2.0 mg/L maximum is recommended. / The most stringent guideline maximum was used in this report.
Note 9.6 for Nitrate (as N):
Overview Report Update, September 2009.
Note 9.7 for Nitrate + Nitrite (as N):
The guideline maximum for nitrate as nitrogen is 100 mg/l. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed this value. Overview Report Update, September 2009.
Note 9.8 for Nitrite (as N):
Overview Report Update, September 2009.
Note 9.9 for Aluminum (dissolved):
The guideline maximum for total aluminum is 5 mg/L. A separate guideline for dissolved aluminum is not provided.
Note 9.10 for Arsenic (dissolved):
The interim guideline for total arsenic is 25 µg/L.
Note 9.11 for Boron (dissolved):
The guideline maximum for total boron is 5 mg/L.
Note 9.12 for Copper (dissolved):
The guideline maximum for total copper is 300 µg/L.
Note 9.13 for Lead (dissolved):
The guideline maximum for total lead is 100 µg/L.
Note 9.14 for Mercury (dissolved):
The guideline maximum for total mercury is 3.0 µg/L.

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Note 9.15 for Molybdenum (dissolved):
If livestock are consuming forages not irrigated, or if no molybdenum containing fertilizers are applied to grow feed consumed by livestock, then the guideline maximum for total molybdenum is 0.08 mg/L. For all other cases, the guideline maximum for total molybdenum is 0.05 mg/L. / The most stringent guideline maximum was used in this report.
Note 9.16 for Selenium (dissolved):
The guideline for total selenium is 30.0 µg/L mean. The mean concentrations in the water column are based on at least 5 weekly samples taken over a 30-day period.
Note 9.17 for Zinc (dissolved):
The guideline maximum for total zinc is 2000 µg/L.
10. Notes for Working Water Quality Guidelines for British Columbia for livestock (BCWWQG L)
General Notes:
Reference: Working Water Quality Guidelines for British Columbia (2015). WWQG values are long-term (i.e. average) concentrations unless identified as a short-term maximum in the "Notes" for a specific analyte. Long-term WWQGs represent average substance concentrations calculated from 5 samples in 30 days. WWQG are given for total substance concentrations unless otherwise noted.
Note 10.1 for Sulphate:
The guideline is for dissolved sulphate.
Note 10.2 for Total dissolved solids:
The guideline is 1,000-3,000 mg/L, and is species dependent. Maximum of 1000 mg/L is relatively low level of salinity; excellent for all classes of livestock. TDS between 1000 and 3000 mg/L is satisfactory for all classes of livestock and poultry, but some loss in productivity should be anticipated: may cause temporary and mild diarrhoea in livestock not accustomed to them or watery droppings in poultry. / The most stringent guideline was used in this report.
Note 10.3 for Cadmium (dissolved):
This is a Short-term maximum guideline.
Note 10.4 for Chromium (dissolved):
The guideline for Cr(VI) is 50 µg/L (total). The guideline for Cr(III) is 50 µg/L (total). The guideline of 50 µg/L for Cr(VI), and for Cr(III) was used, in this report, to identify exceedances for dissolved chromium, and total chromium as a means for determining the potential for exceeding the Cr(VI) and/or Cr(III) guidelines.
11. Notes for BC CSR, Schedule 3.2, Generic Numerical Water Standards for Livestock (2017 and updates) (BC CSR LW)
General Notes:
Standards for all organic substances are for total substance concentrations. Any water sample to be analyzed for organic substances should not be filtered. Standards for surface water samples to be analyzed for heavy metals, metalloids and inorganic ions are total substance concentrations. In addition, it is recommended that surface water samples being analyzed for heavy metals, metalloids and inorganic ions should also be analyzed for dissolved substance concentrations. Standards for groundwater samples for heavy metals, metalloids and inorganic ions are for dissolved substance concentrations. In addition, it is recommended that groundwater samples being analyzed for heavy metals, metalloids and inorganic ions should also be analyzed for total substance concentrations.
Note 11.1 for Fluoride:
Standard varies with type of livestock. Consult a director for further advice.
Note 11.2 for Nitrate (as N):
Where nitrate and nitrite are present, total nitrate plus nitrite-nitrogen should not exceed this value.
Note 11.3 for Nitrate + Nitrite (as N):
Where nitrate and nitrite are present, total nitrate plus nitrite-nitrogen should not exceed this value.
Note 11.4 for Chromium (dissolved):
Analytical results for chromium (all species) in water may be used to demonstrate compliance with the standards. Where the standards cannot be met based on analytical results for chromium (all species), chromium speciation may be necessary. Standard is 50 µg/L for chromium, hexavalent. Standard is 50 µg/L for chromium, trivalent. The standard of 50 µg/L was used to identify exceedances for dissolved chromium in order to demonstrate compliance with the standards.
12. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (Short-term acute) (BCAWQG AL (ST))
General Notes:
For some parameters, there are two water quality guidelines: the short-term acute guideline (i.e. maximum), and the long-term chronic guideline (i.e. average). The short-term acute guideline was used in this criteria set for parameters that have both guideline values.

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Note 12.1 for Dissolved oxygen:
The instantaneous minimum guideline for dissolved oxygen is 5 mg/L for all life stages other than buried embryo/alevin. The instantaneous minimum guideline for dissolved oxygen in the water column is 9 mg/L for buried embryo/alevin. The instantaneous minimum guideline for dissolved oxygen in interstitial water is 6 mg/L for buried embryo/alevin. The 30-day mean guideline (minimum) for dissolved oxygen is 8 mg/L for all life stages other than buried embryo/alevin. The 30-day mean guideline (minimum) for dissolved oxygen in the water column is 11 mg/L for buried embryo/alevin. The 30-day mean guideline (minimum) for dissolved oxygen in interstitial water is 8 mg/L for buried embryo/alevin.
Note 12.2 for pH:
pH less than 6.5: No statistically significant decrease in pH from background. pH from 6.5 to 9.0: Unrestricted change permitted within this range. pH over 9.0: No statistically significant increase in pH from background. See BC MOE Overview Report for additional details.
Note 12.3 for Temperature:
The maximum daily temperature of 19 degrees Celsius is for streams with unknown fish distribution. See BC MOE Overview Report for additional details for streams with unknown fish distribution, and specific guidelines for streams with known fish distribution, and guideline for lakes and impoundments.
Note 12.4 for Turbidity:
When background is less than or equal to 8 NTU: - Maximum Induced Turbidity of 8 NTU in 24 hours. - For sediment inputs that last between 24 hours and 30 days (daily sampling preferred) the mean turbidity should not exceed background by more than 2 NTU. Maximum Induced Turbidity of 5 NTU when background is between 8 and 50 NTU. Maximum Induced Turbidity of 10% when background is greater than 50 NTU.
Note 12.5 for Chloride:
To protect freshwater aquatic life from acute and lethal effects, the maximum concentration of chloride (mg/L as NaCl) at any time should not exceed 600 mg/L. To protect freshwater aquatic life from chronic effects, the average (arithmetic mean computed from five weekly samples collected over a 30-day period) concentration of chloride (mg/L as NaCl) should not exceed 150 mg/L.
Note 12.6 for Fluoride:
Correction by BC MOE Sept. 2011: The criteria for Fluoride (total) in mg/L is 0.4 as a maximum where the water hardness (as CaCO3) is less than or equal to 10 mg/L. Otherwise use the equation: LC50 fluoride = -51.73 + 92.57 log10 (Hardness) and multiply by 0.01. Hardness is as CaCO3 in units mg/L.
Note 12.7 for Sulphate:
The approved 30-day average (minimum of 5 evenly-spaced samples collected in 30 days) water quality guidelines to protect aquatic life in BC for sulphate are: 128 mg/L at hardness of 0 to 30 mg/L as CaCO3 218 mg/L at hardness of 31 to 75 mg/L as CaCO3 309 mg/L at hardness of 76 to 180mg/L as CaCO3 429 mg/L at hardness 181 to 250 mg/L as CaCO3 Need to determine guideline based on site water for hardness greater than 250 mg/L as CaCO3. For screening purposes in this report, exceedance were flagged for sulphate greater than 429 mg/L at hardness greater than 250 mg/L as CaCO3.
Note 12.8 for Ammonia (total, as N):
The maximum guideline for ammonia varies as a function of pH and temperature. See Table 3 in Overview Report Update September 2009. The 30-day average guideline for ammonia varies as a function of pH and temperature. See Table 4 in Overview Report Update September 2009. / The lab pH and field temperature results were used for determining the maximum ammonia for this report. If a lab pH result was not available then the field pH result was used.
Note 12.9 for Nitrate (as N):
The guideline maximum for nitrate (as N) is 32.8 mg/l. The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.
Note 12.10 for Nitrate + Nitrite (as N):
The guideline maximum for nitrate (as N) is 32.8 mg/l. The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.

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Note 12.11 for Nitrite (as N):
The guideline maximum for nitrite as N is: 0.06 mg/L if chloride less than 2 mg/L 0.12 mg/L if chloride is 2 to 4 mg/L 0.18 mg/L if chloride is 4 to 6 mg/L 0.24 mg/L if chloride is 6 to 8 mg/L 0.30 mg/L if chloride is 8 to 10 mg/L 0.60 mg/L if chloride is greater than 10 mg/L. The guideline 30-day average for nitrite as N is: 0.02 mg/L if chloride less than 2 mg/L 0.04 mg/L if chloride is 2 to 4 mg/L 0.06 mg/L if chloride is 4 to 6 mg/L 0.08 mg/L if chloride is 6 to 8 mg/L 0.10 mg/L if chloride is 8 to 10 mg/L 0.20 mg/L if chloride is greater than 10 mg/L.
Note 12.12 for Phosphorus (dissolved, by ICPMS/ICPOES):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives. (Table 3 and Overview Rept) A maximum of 15 µg/L (0.015 mg/L) was used in this report for screening purposes.
Note 12.13 for Phosphorus (total, APHA 4500-P):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives. (Table 3 and Overview Rept) A maximum of 15 µg/L (0.015 mg/L) was used in this report for screening purposes.
Note 12.14 for Phosphorus (dissolved, APHA 4500-P):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives. (Table 3 and Overview Rept) A maximum of 15 µg/L (0.015 mg/L) was used in this report for screening purposes.
Note 12.15 for Aluminum (dissolved):
The maximum concentration of dissolved aluminum at any time should not exceed: 1. 0.10 mg/L when the pH is greater than or equal to 6.5 2. The value (in mg/L) determined by the following relationship if pH less than 6.5 Dissolved Aluminum = e (1.209-2.426 (pH) + 0.286 $(pH)^2$) The 30-day average concentration of dissolved aluminum (based on a minimum of 5 approximately weekly samples) should not exceed: 1. 0.05 mg/L when the median pH over 30 days is greater than or equal to 6.5 2. the value determined by the following relationship at median pH less than 6.5 Dissolved Aluminum = e (1.6-3.327 (median pH) + 0.402 (median $pH)^2$)
Note 12.16 for Arsenic (dissolved):
The recommended guideline is for total arsenic.
Note 12.17 for Boron (dissolved):
The recommended guideline is for total boron.
Note 12.18 for Cadmium (dissolved):
The guideline for cadmium is determined on a site-specific basis according to the local water hardness. The guideline for cadmium (dissolved) in µg/L is determined by the following equations for short term exposure: 1. If hardness (as CaCO3) is less than 7 mg/L then maximum is 0.0380 µg/L 2. If hardness (as CaCO3) is from 7 to 45 mg/L then maximum is based on equation: e to the power of {1.03[ln(hardness)] - 5.274} 3. If hardness (as CaCO3) is greater than 455 mg/L then maximum is 2.8 µg/L. When water hardness is greater than the upper bound (i.e., highest water hardness tested), a site-specific assessment may be required.
Note 12.19 for Cobalt (dissolved):
The interim maximum concentration for total cobalt is 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt. The interim 30-day average concentration for total cobalt (based on five weekly samples) is 4 µg/L to protect aquatic life from chronic effects of cobalt.
Note 12.20 for Copper (dissolved):
The guideline is for dissolved copper and is dependent on the specific chemistry of the water body and can only be calculated using the British Columbia Biotic Ligand Model (BC BLM) software. (Update August 2019)

Table C-1: 2019 Groundwater Quality Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program
Guideline Notes

Note 12.21 for Lead (dissolved):
The maximum guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is set at 3.0 µg/L. When water hardness exceeds 8.0 mg/L CaCO3 the maximum guideline for lead at any time is given by the following equation: Maximum Criteria (µg/L) = exp (1.273 ln(hardness) - 1.460). The 30-day average guideline for total lead in water, when water hardness exceeds 8 mg/L as CaCO3, is as follows: 30-Day Average (µg/L) is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704). For hardness less than or equal to 8.0 mg/L there is no 30-day average guideline; hence the maximum concentration of 3.0 µg/L is used.
Note 12.22 for Manganese (dissolved):
The maximum concentration of total manganese in mg/L at any time should not exceed the value as determined by the following relationship: 0.01102 hardness + 0.54 where water hardness is reported as mg/L of CaCO3. The 30-day mean concentration of total manganese in mg/L should be less than or equal to the value as determined by the following relationship: 0.0044 hardness + 0.605 where water hardness is reported as mg/L of CaCO3.
Note 12.23 for Mercury (dissolved):
The average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples) should not exceed 0.02 µg/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted as indicated in the Table 1 and Table 4 of the BC MOE Overview Report - First Update, February 2001. There is no guideline maximum for total mercury in water, for freshwater aquatic life.
Note 12.24 for Molybdenum (dissolved):
The maximum concentration for total molybdenum is 2 mg/L. The 30-day average concentration for total molybdenum (based on at least five weekly samples in a period of 30 days) is less than or equal to 1 mg/L.
Note 12.25 for Selenium (dissolved):
The 30-day average water quality guideline for protection of aquatic life is 2 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium. The 30-day average alert concentration for the protection of aquatic life in sensitive ecosystems is 1 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.
Note 12.26 for Silver (dissolved):
The guideline maximum for total silver is: 0.1 µg/L maximum if hardness less than or equal to 100 mg/L 3.0 µg/L maximum if hardness greater than 100 mg/L. The guideline 30-day average for total silver is: 0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L 1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.
Note 12.27 for Zinc (dissolved):
The Short-term Maximum concentration of total zinc (µg/L) at any time should not exceed 33 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3. When water hardness exceeds 90 mg/L CaCO3, the Short-term Maximum guideline in µg/L for total zinc is the value determined by the following relationship: 33 + 0.75 * (hardness - 90) where water hardness is reported as mg/L of CaCO3. Short-term maximum WQG formula applies to water hardness between 90 – 500 mg/L CaCO3. The Long-term Average concentration of total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3. When water hardness exceeds 90 mg/L CaCO3, the Long-term Average guideline in µg/L for total zinc is the value determined by the following relationship: 7.5 + 0.75 * (hardness - 90) where water hardness is reported as mg/L of CaCO3. Long-term average WQG formula applies to water hardness between 90 – 330 mg/L CaCO3.
13. Notes for Working Water Quality Guidelines for British Columbia for freshwater aquatic life (BCWWQG AL)
General Notes:
Reference: Working Water Quality Guidelines for British Columbia (2015). WWQG values are long-term (i.e. average) concentrations unless identified as a short-term maximum in the “Notes” for a specific analyte. Long-term WWQGs represent average substance concentrations calculated from 5 samples in 30 days. WWQG are given for total substance concentrations unless otherwise noted.
Note 13.1 for Alkalinity (phenolphthalein, as CaCO3):
The guideline for alkalinity (total as CaCO3) is as follows: - Less than 10 mg/L, highly sensitive to acid inputs - 10 to 20 mg/L, moderately sensitive to acid inputs - Greater than 20 mg/L, low sensitivity to acid inputs.

Table C-1: 2019 Groundwater Quality Results
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Note 13.2 for Alkalinity (total, as CaCO3):
The guideline for alkalinity (total as CaCO3) is as follows: - Less than 10 mg/L, highly sensitive to acid inputs - 10 to 20 mg/L, moderately sensitive to acid inputs - Greater than 20 mg/L, low sensitivity to acid inputs.
Note 13.3 for Antimony (dissolved):
The guideline is for antimony (III).
Note 13.4 for Calcium (dissolved):
The guideline for dissolved calcium in mg/L is as follows: - Less than 4, highly sensitive to acid inputs - 4 to 8, moderately sensitive - Greater than 8, low sensitivity.
Note 13.5 for Chromium (dissolved):
The guideline for Cr(VI) is 1 µg/L (total). The guideline for Cr(III) is 8.9 µg/L (total). The guideline of 1 µg/L for Cr(VI) was used, in this report, to identify exceedances for dissolved chromium, and total chromium as a means for determining the potential for exceeding the Cr(VI) and/or Cr(III) guidelines.
Note 13.6 for Nickel (dissolved):
The guideline for nickel in µg/L is determined as follows: When the water hardness is 0 to ≤ 60 mg/L, the maximum is 25 µg/L At hardness > 60 to ≤ 180 mg/L the maximum is calculated using the equation: e raised to the power of {0.76[ln(hardness)] + 1.06} At hardness >180 mg/L, the maximum is 150 µg/L Where water hardness is reported as mg/L CaCO3. If the water hardness is unknown, the maximum is 25 µg/L.
Note 13.7 for Thallium (dissolved):
30-day average, site-specific objective for the lower Columbia River, BC
14. Notes for BC CSR, Schedule 3.2, Generic Numerical Water Standards for Freshwater Aquatic Life (2017 and updates) (BC CSR AW(F))
General Notes:
Aquatic life standards assume minimum 1:10 dilution available, and are to protect freshwater life. Standards for all organic substances are for total substance concentrations. Any water sample to be analyzed for organic substances should not be filtered. Standards for surface water samples to be analyzed for heavy metals, metalloids and inorganic ions are total substance concentrations. In addition, it is recommended that surface water samples being analyzed for heavy metals, metalloids and inorganic ions should also be analyzed for dissolved substance concentrations. Standards for groundwater samples for heavy metals, metalloids and inorganic ions are for dissolved substance concentrations. In addition, it is recommended that groundwater samples being analyzed for heavy metals, metalloids and inorganic ions should also be analyzed for total substance concentrations.
Note 14.1 for Fluoride:
The standard for fluoride is: 2000 µg/L @ H < 50 3000 µg/L @ H ≥ 50 Where H means water hardness in mg/L as CaCO3.
Note 14.2 for Sulphate:
The standard for sulfate is: 1280 mg/L @ H ≤ 30 2180 mg/L @ H 31 - 75 3090 mg/L @ H 76 - 180 4290 mg/L @ H > 180 Where H means water hardness in mg/L as CaCO3.
Note 14.3 for Ammonia (total, as N):
Standard varies with pH and temperature. 10 degrees C is assumed. Consult a director for further advice. The standard for ammonia, total (as N) is: 1,310 µg/L @ pH ≥ to 8.5 3,700 µg/L @ pH 8.0 - < 8.5 11,300 µg/L @ pH 7.5 - < 8.0 18,500 µg/L @ pH 7.0 - < 7.5 18,400 µg/L @ pH < 7.0
Note 14.4 for Nitrate (as N):
Standard may not protect all amphibians. Consult director for further advice.
Note 14.5 for Nitrate + Nitrite (as N):
Standard may not protect all amphibians. Consult director for further advice.

Table C-1: 2019 Groundwater Quality Results
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Note 14.6 for Nitrite (as N):
Standard varies with chloride concentration. Consult a director for further advice. The standard for nitrite (as N) is: 200 µg/L (Cl < 2 mg/L) 400 µg/L (Cl 2 - < 4 mg/L) 600 µg/L (Cl 4 - < 6 mg/L) 800 µg/L (Cl 6 - < 8 mg/L) 1,000 µg/L (Cl 8 - < 10 mg/L) 2,000 µg/L (Cl ≥ 10 mg/L)
Note 14.7 for Cadmium (dissolved):
The standard for cadmium is as follows: 0.5 µg/L @ H < 30 1.5 µg/L @ H 30 - < 90 2.5 µg/L @ H 90 - < 150 3.5 µg/L @ H 150 - < 210 4 µg/L @ H ≥ 210 Where H means water hardness in mg/L as CaCO3.
Note 14.8 for Chromium (dissolved):
Analytical results for chromium (all species) in water may be used to demonstrate compliance with the standards. Where the standards cannot be met based on analytical results for chromium (all species), chromium speciation may be necessary. Standard is 10 µg/L for chromium, hexavalent. Standard is 90 µg/L for chromium, trivalent. The standard of 10 µg/L was used to identify exceedances for dissolved chromium in order to demonstrate compliance with the standards.
Note 14.9 for Copper (dissolved):
The standard for copper is as follows: 20 µg/L @ H < 50 30 µg/L @ H 50 - < 75 40 µg/L @ H 75 - < 100 50 µg/L @ H 100 - < 125 60 µg/L @ H 125 - < 150 70 µg/L @ H 150 - < 175 80 µg/L @ H 175 - < 200 90 µg/L @ H ≥ 200 Where H means water hardness in mg/L as CaCO3.
Note 14.10 for Lead (dissolved):
The standard for lead is as follows: 40 µg/L @ H < 50 50 µg/L @ H 50 - < 100 60 µg/L @ H 100 - < 200 110 µg/L @ H 200 - < 300 160 µg/L @ ≥ 300 Where H means water hardness in mg/L as CaCO3.
Note 14.11 for Nickel (dissolved):
The standard for nickel is as follows: 250 µg/L @ H < 60 650 µg/L @ H 60 - < 120 1,100 µg/L @ H 120 - < 180 1,500 µg/L @ H ≥ 180 Where H means water hardness in mg/L as CaCO3.
Note 14.12 for Silver (dissolved):
The standard for silver is: 0.5 µg/L @ H ≤ 100 15 µg/L @ H > 100 Where H means water hardness in mg/L as CaCO3.
Note 14.13 for Zinc (dissolved):
The standard for zinc is as follows: 75 µg/L @ H < 90 150 µg/L @ H = 90 - < 100 900 µg/L @ H = 100 - < 200 1,650 µg/L @ H = 200 - < 300 2,400 µg/L @ H = 300 - < 400 3,150 µg/L @ H = 400 - < 500 If H ≥ 500 then use following formula: Standard (µg/L) = 10 x [7.5 +{(0.75)(H – 90)}] Where H means water hardness in mg/L as CaCO3. There are special ministry approval and data reporting requirements for water hardness values ≥ 500 mg/L as CaCO3. Reference is Schedule 3.2 and Protocol 10.

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Legend for Table C-2:

<	Less than reported detection limit
BCAWQG AL (ST)	BC Approved Water Quality Guidelines for freshwater aquatic life (short-term acute)
BCAWQG AL (LT)	BC Approved Water Quality Guidelines for freshwater aquatic life (long-term chronic)
BCWWQG AL	BC Working Water Quality Guidelines for British Columbia for freshwater aquatic life
BC RWQG	BC Recreational Water Quality Guidelines
Calc	Calculated guideline or standard. The guideline or standard is dependent on the value of one or more other analytes, and is calculated from a formula or table.
N	Narrative type of guideline or standard, or Result Note.
NG	No Guideline
NT	Not Tested or Measured
	Highlighted value has a lower detection limit that is greater than the guideline/standard maximum.
BCAWQG AL (ST)	Highlighted value exceeds BCAWQG AL (ST)
BCAWQG AL (LT)	Highlighted value exceeds BCAWQG AL (LT)
BCWWQG AL	Highlighted value exceeds BCWWQG AL
BC RWQG	Highlighted value exceeds BC RWQG

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Sampling Location	Date Sampled	Sample Type	Lab Results																		
			General								Nutrients										
			Biochemical oxygen demand	Chloride	Conductivity	Hardness, Total (dissolved as CaCO3)	pH	Sodium (total)	Sulphate	Total suspended solids	Ammonia (total, as N)	Nitrate (as N)	Nitrate + Nitrite (as N) (calculated)	Nitrite (as N)	Organic nitrogen	Total nitrogen	Total kjeldahl nitrogen	Ortho-phosphate (dissolved, as P)	Phosphorus (dissolved, by ICPMS /ICPOES)	Phosphorus (total, APHA 4500-P)	Phosphorus (dissolved, APHA 4500-P)	Potassium (dissolved)
			mg/L	mg/L	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Bailey Springs	23-Jan-19	Normal	NT	123	1220	NT	8.4	112	104	NT	0.035	0.364	NT	<0.010	0.474	0.873	0.509	0.0694	NT	0.156	0.119	NT
Bailey Springs	21-Feb-19	Normal	NT	135	1270	NT	8.38	120	107	NT	0.037	0.526	NT	<0.010	0.435	0.998	0.472	0.0508	NT	0.103	0.0998	NT
Bailey Springs	20-Mar-19	Normal	NT	129	1260	388	8.4	123	105	NT	0.185	0.975	NT	<0.010	1.09	2.25	1.28	0.083	0.14	0.313	0.13	13.3
Bailey Springs	03-Apr-19	Normal	NT	122	1180	362	8.44	114	104	NT	0.025	0.542	NT	<0.010	0.654	1.22	0.679	0.0831	0.138	0.161	0.12	13.4
Bailey Springs	22-May-19	Normal	NT	112	1140	NT	8.49	117	NT	NT	0.068	0.252	NT	<0.010	0.568	0.888	0.636	0.0799	NT	0.162	0.116	NT
Bailey Springs	12-Jun-19	Normal	NT	121	1150	368	8.46	116	104	NT	0.103	0.103	NT	<0.010	0.645	0.851	0.748	0.0567	0.128	0.158	0.118	14.7
Bailey Springs	12-Jun-19	Duplicate	NT	122	1160	349	8.46	126	107	NT	0.097	0.115	NT	<0.010	0.609	0.821	0.706	0.0566	0.121	0.154	0.117	14.1
Bailey Springs	17-Jul-19	Normal	NT	123	1210	NT	8.49	117	105	NT	0.069	0.05	NT	<0.010	0.939	1.06	1.01	0.091	NT	0.177	0.15	NT
Bailey Springs	14-Aug-19	Normal	NT	130	1180	NT	8.47	127	108	NT	0.091	0.017	NT	<0.010	0.884	0.992	0.975	0.0879	NT	0.186	0.14	NT
Bailey Springs	04-Sep-19	Normal	NT	128	1230	NT	8.43	128	106	NT	0.122	0.021	NT	<0.010	0.909	1.05	1.03	0.0754	NT	0.209	0.166	NT
Bailey Springs	03-Oct-19	Normal	NT	124	1200	NT	8.39	134	99.4	NT	0.173	0.06	NT	<0.010	0.668	0.901	0.841	0.0611	NT	0.188	0.147	NT
Bailey Springs	06-Nov-19	Normal	NT	126	1220	NT	8.37	121	103	NT	0.067	0.094	NT	<0.010	0.55	0.711	0.617	0.0395	NT	0.156	0.123	NT
Bailey Springs	04-Dec-19	Normal	NT	133	1230	NT	8.38	335	106	NT	0.128	0.201	NT	<0.010	0.457	0.786	0.585	0.0624	0.123	0.13	0.12	13
Clay Valve #4	22-May-19	Normal	<8.0	82.3	NT	215	8.13	102	83.3	2.2	0.607	0.913	NT	0.013	0.98	2.51	1.59	0.497	0.558	0.642	0.596	18
Clay Valve #4	12-Jun-19	Normal	<6.1	92.8	NT	249	8.12	99.9	85.4	2	0.639	1.03	NT	0.016	0.896	2.58	1.54	0.479	0.832	0.728	0.685	19.6
Clay Valve #4	12-Jun-19	Duplicate	<6.1	94.2	NT	263	8.15	95.8	86.3	<2.0	0.644	1.01	NT	0.017	0.948	2.62	1.59	0.509	0.821	0.72	0.674	20.5
Clay Valve #4	17-Jul-19	Normal	<7.5	92.5	NT	NT	8.06	88.8	86.9	<2.0	0.795	0.957	NT	0.033	0.941	2.73	1.74	0.762	NT	1.03	0.976	NT
Clay Valve #4	14-Aug-19	Normal	<8.0	89.8	NT	NT	7.95	96.1	86.3	<2.0	0.877	0.422	NT	0.196	1.01	2.51	1.89	0.876	NT	1.11	1.07	NT
Clay Valve #4	26-Sep-19	Normal	<6.5	92.7	NT	NT	7.91	102	79.2	<2.0	1.17	<0.010	<0.014	<0.010	0.968	2.14	2.14	0.798	NT	1.08	1.08	NT
Clay Valve #4	03-Oct-19	Normal	<6.3	92.1	NT	NT	7.93	98.6	82	2.2	0.895	0.029	NT	<0.010	1.52	2.44	2.42	0.68	NT	1.12	1.02	NT
BCAWQG AL (ST)			NG	600 [1.1]	NG	NG	N [1.2]	NG	Calc [1.3]	N [1.4]	Calc [1.5]	32.8 [1.6]	32.8 [1.7]	Calc [1.8]	NG	NG	NG	NG	0.015 [1.9]	0.015 [1.10]	0.015 [1.11]	NG
BCAWQG AL (LT)			NG	150 [2.1]	NG	NG	N [2.2]	NG	Calc [2.3]	N [2.4]	Calc [2.5]	3.0 [2.6]	3.0 [2.7]	Calc [2.8]	NG	NG	NG	NG	N [2.9]	N [2.10]	N [2.11]	NG
BCWWQG AL			NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Sampling Location	Date Sampled	Sample Type	Lab Results																	
			Bacteriological		Dissolved Metals															
			Fecal coliforms (counts)	Total coliforms (counts)	Aluminum (dissolved)	Antimony (dissolved)	Arsenic (dissolved)	Barium (dissolved)	Beryllium (dissolved)	Bismuth (dissolved)	Boron (dissolved)	Cadmium (dissolved)	Calcium (dissolved)	Chromium (dissolved)	Cobalt (dissolved)	Copper (dissolved)	Iron (dissolved)	Lead (dissolved)	Lithium (dissolved)	Magnesium (dissolved)	Manganese (dissolved)
			CFU/100 mL	CFU/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Bailey Springs	23-Jan-19	Normal	8	200	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	21-Feb-19	Normal	8	22	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	20-Mar-19	Normal	1	65	0.0057	<0.00020	0.00188	0.0349	<0.00010	<0.00010	0.0964	0.000033	95.9	<0.00050	0.00021	0.00189	<0.010	<0.00020	0.0231	36	0.00037
Bailey Springs	03-Apr-19	Normal	<1	9	0.0057	<0.00020	0.00158	0.032	<0.00010	<0.00010	0.103	0.000027	91.9	<0.00050	0.00018	0.00155	<0.010	<0.00020	0.022	32.1	0.0004
Bailey Springs	22-May-19	Normal	10	1400	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	12-Jun-19	Normal	29	970	<0.0050	<0.00020	0.00173	0.0323	<0.00010	<0.00010	0.171	0.000056	91.9	<0.00050	0.00022	0.00198	<0.010	<0.00020	0.0305	33.6	0.00021
Bailey Springs	12-Jun-19	Duplicate	28	2000	<0.0050	<0.00020	0.00164	0.0309	<0.00010	<0.00010	0.16	0.000054	87	<0.00050	0.00021	0.0217	<0.010	<0.00020	0.029	32.1	<0.00020
Bailey Springs	17-Jul-19	Normal	400	OG	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	14-Aug-19	Normal	700	5500	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	04-Sep-19	Normal	360	16000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	03-Oct-19	Normal	46	3800	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	06-Nov-19	Normal	1	1120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	04-Dec-19	Normal	3.1	1550	<0.0050	<0.00020	0.00151	0.0331	<0.00010	<0.00010	0.119	0.000035	91.6	<0.00050	0.00028	0.00159	<0.010	<0.00020	0.0226	31.6	0.00085
Clay Valve #4	22-May-19	Normal	<1.8	<1.8	0.0102	0.00025	0.00082	0.0295	<0.00010	<0.00010	0.164	0.000013	50.7	<0.00050	0.00026	0.0178	0.017	<0.00020	0.0101	21.5	0.0641
Clay Valve #4	12-Jun-19	Normal	<1.8	<1.8	<0.0050	0.00025	0.00089	0.0305	<0.00010	<0.00010	0.192	0.000029	58.1	<0.00050	0.00031	0.00465	0.016	<0.00020	0.0126	25.2	0.0612
Clay Valve #4	12-Jun-19	Duplicate	<1.8	<1.8	<0.0050	0.00028	0.00089	0.0315	<0.00010	<0.00010	0.211	0.000019	61.9	<0.00050	0.00031	0.00503	0.015	<0.00020	0.0135	26.2	0.0668
Clay Valve #4	17-Jul-19	Normal	<1.8	<1.8	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Clay Valve #4	14-Aug-19	Normal	<1.8	<1.8	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Clay Valve #4	26-Sep-19	Normal	<1.8	<1.8	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Clay Valve #4	03-Oct-19	Normal	<1.8	4.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
BCAWQG AL (ST)			N [1.12]	NG	Calc [1.13]	NG	0.005 [1.14]	NG	NG	NG	1.2 [1.15]	Calc [1.16]	NG	NG	0.110 [1.17]	N [1.18]	0.35	Calc [1.19]	NG	NG	Calc [1.20]
BCAWQG AL (LT)			N [2.12]	NG	Calc [2.13]	NG	0.005 [2.14]	NG	NG	NG	1.2 [2.15]	Calc [2.16]	NG	NG	0.004 [2.17]	N [2.18]	0.35	Calc [2.19]	NG	NG	Calc [2.20]
BCWWQG AL			NG	NG	NG	0.009 [3.1]	NG	1	0.00013	NG	NG	NG	N [3.2]	0.001 [3.3]	NG	NG	NG	NG	NG	NG	NG

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program

Sampling Location	Date Sampled	Sample Type	Lab Results																
			Dissolved Metals																
			Molybdenum (dissolved)	Nickel (dissolved)	Selenium (dissolved)	Silicon (dissolved, as Si)	Silver (dissolved)	Sodium (dissolved)	Strontium (dissolved)	Sulphur (dissolved)	Tellurium (dissolved)	Thallium (dissolved)	Thorium (dissolved)	Tin (dissolved)	Titanium (dissolved)	Tungsten (dissolved)	Uranium (dissolved)	Vanadium (dissolved)	Zinc (dissolved)	Zirconium (dissolved)
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Bailey Springs	23-Jan-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	21-Feb-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	20-Mar-19	Normal	0.00723	0.00157	<0.00050	9.7	<0.000050	129	1.19	42	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0143	0.0017	<0.0040	0.00012
Bailey Springs	03-Apr-19	Normal	0.00856	0.00154	<0.00050	8.4	<0.000050	116	1.13	37.8	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.015	0.0016	<0.0040	<0.00010
Bailey Springs	22-May-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	12-Jun-19	Normal	0.00822	0.00194	<0.00050	10.5	<0.000050	138	1.11	42.7	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0123	0.002	<0.0040	0.00012
Bailey Springs	12-Jun-19	Duplicate	0.00723	0.0026	<0.00050	10.2	<0.000050	132	1.07	40.8	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0116	0.0019	<0.0040	0.00011
Bailey Springs	17-Jul-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	14-Aug-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	04-Sep-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	03-Oct-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	06-Nov-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bailey Springs	04-Dec-19	Normal	0.00789	0.00215	<0.00050	9.2	<0.000050	120	1.17	35.7	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.0122	0.0014	<0.0040	<0.00010
Clay Valve #4	22-May-19	Normal	0.00392	0.00179	<0.00050	3.3	<0.000050	95	0.571	33.2	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.00213	<0.0010	0.0352	0.0001
Clay Valve #4	12-Jun-19	Normal	0.00446	0.00182	<0.00050	3.6	<0.000050	110	0.593	35.1	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.00243	<0.0010	0.03	0.00013
Clay Valve #4	12-Jun-19	Duplicate	0.00461	0.00197	0.0006	3.7	<0.000050	116	0.614	36.3	<0.00050	<0.000020	<0.00010	<0.00020	<0.0050	<0.0010	0.00262	<0.0010	0.0306	0.00012
Clay Valve #4	17-Jul-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Clay Valve #4	14-Aug-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Clay Valve #4	26-Sep-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Clay Valve #4	03-Oct-19	Normal	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
BCAWQG AL (ST)			2 [1.21]	NG	0.002 [1.22]	NG	Calc [1.23]	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	Calc [1.24]	NG
BCAWQG AL (LT)			1 [2.21]	NG	0.002 [2.22]	NG	Calc [2.23]	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	Calc [2.24]	NG
BCWWQG AL			NG	Calc [3.4]	NG	NG	NG	NG	NG	NG	NG	0.0008 [3.5]	NG	NG	NG	NG	0.0085	NG	NG	NG

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program
Guideline Notes

1. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (Short-term acute) (BCAWQG AL (ST))
General Notes:
For some parameters, there are two water quality guidelines: the short-term acute guideline (i.e. maximum), and the long-term chronic guideline (i.e. average). The short-term acute guideline was used in this criteria set for parameters that have both guideline values.
Note 1.1 for Chloride:
To protect freshwater aquatic life from acute and lethal effects, the maximum concentration of chloride (mg/L as NaCl) at any time should not exceed 600 mg/L. To protect freshwater aquatic life from chronic effects, the average (arithmetic mean computed from five weekly samples collected over a 30-day period) concentration of chloride (mg/L as NaCl) should not exceed 150 mg/L.
Note 1.2 for pH:
pH less than 6.5: No statistically significant decrease in pH from background. pH from 6.5 to 9.0: Unrestricted change permitted within this range. pH over 9.0: No statistically significant increase in pH from background. See BC MOE Overview Report for additional details.
Note 1.3 for Sulphate:
The approved 30-day average (minimum of 5 evenly-spaced samples collected in 30 days) water quality guidelines to protect aquatic life in BC for sulphate are: 128 mg/L at hardness of 0 to 30 mg/L as CaCO3 218 mg/L at hardness of 31 to 75 mg/L as CaCO3 309 mg/L at hardness of 76 to 180mg/L as CaCO3 429 mg/L at hardness 181 to 250 mg/L as CaCO3 Need to determine guideline based on site water for hardness greater than 250 mg/L as CaCO3. For screening purposes in this report, exceedance were flagged for sulphate greater than 429 mg/L at hardness greater than 250 mg/L as CaCO3.
Note 1.4 for Total suspended solids:
Maximum Induced Suspended Sediments - mg/L or % of background: - 25 mg/L in 24 hours when background is less than or equal to 25; - Mean of 5 mg/L in 30 days when background is less than or equal to 25; - 25 mg/L when background is between 25 and 250; - 10% when background is greater than or equal to 250.
Note 1.5 for Ammonia (total, as N):
The maximum guideline for ammonia varies as a function of pH and temperature. See Table 3 in Overview Report Update September 2009. The 30-day average guideline for ammonia varies as a function of pH and temperature. See Table 4 in Overview Report Update September 2009. / The lab pH and field temperature results were used for determining the maximum ammonia for this report. If a lab pH result was not available then the field pH result was used.
Note 1.6 for Nitrate (as N):
The guideline maximum for nitrate (as N) is 32.8 mg/l. The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.
Note 1.7 for Nitrate + Nitrite (as N) (calculated):
The guideline maximum for nitrate (as N) is 32.8 mg/l. The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.
Note 1.8 for Nitrite (as N):
The guideline maximum for nitrite as N is: 0.06 mg/L if chloride less than 2 mg/L 0.12 mg/L if chloride is 2 to 4 mg/L 0.18 mg/L if chloride is 4 to 6 mg/L 0.24 mg/L if chloride is 6 to 8 mg/L 0.30 mg/L if chloride is 8 to 10 mg/L 0.60 mg/L if chloride is greater than 10 mg/L. The guideline 30-day average for nitrite as N is: 0.02 mg/L if chloride less than 2 mg/L 0.04 mg/L if chloride is 2 to 4 mg/L 0.06 mg/L if chloride is 4 to 6 mg/L 0.08 mg/L if chloride is 6 to 8 mg/L 0.10 mg/L if chloride is 8 to 10 mg/L 0.20 mg/L if chloride is greater than 10 mg/L.

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program
Guideline Notes

Note 1.9 for Phosphorus (dissolved, by ICPMS/ICPOES):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives. (Table 3 and Overview Rept) A maximum of 15 µg/L (0.015 mg/L) was used in this report for screening purposes.
Note 1.10 for Phosphorus (total, APHA 4500-P):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives. (Table 3 and Overview Rept) A maximum of 15 µg/L (0.015 mg/L) was used in this report for screening purposes.
Note 1.11 for Phosphorus (dissolved, APHA 4500-P):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives. (Table 3 and Overview Rept) A maximum of 15 µg/L (0.015 mg/L) was used in this report for screening purposes.
Note 1.12 for Fecal coliforms (counts):
The guideline for fecal coliforms is as follows: “The fecal coliform density in fresh and marine waters used for the growing and harvesting of shellfish for human consumption should not exceed a median MPN of 14/100 mL over 30 days, and at least 90% of the samples in a 30-day period should not exceed 43/100 mL.”
Note 1.13 for Aluminum (dissolved):
The maximum concentration of dissolved aluminum at any time should not exceed: 1. 0.10 mg/L when the pH is greater than or equal to 6.5 2. The value (in mg/L) determined by the following relationship if pH less than 6.5 Dissolved Aluminum = e (1.209-2.426 (pH) + 0.286 (pH)^2) The 30-day average concentration of dissolved aluminum (based on a minimum of 5 approximately weekly samples) should not exceed: 1. 0.05 mg/L when the median pH over 30 days is greater than or equal to 6.5 2. the value determined by the following relationship at median pH less than 6.5 Dissolved Aluminum = e (1.6-3.327 (median pH) + 0.402 (median pH)^2)
Note 1.14 for Arsenic (dissolved):
The recommended guideline is for total arsenic.
Note 1.15 for Boron (dissolved):
The recommended guideline is for total boron.
Note 1.16 for Cadmium (dissolved):
The guideline for cadmium is determined on a site-specific basis according to the local water hardness. The guideline for cadmium (dissolved) in µg/L is determined by the following equations for short term exposure: 1. If hardness (as CaCO3) is less than 7 mg/L then maximum is 0.0380 µg/L 2. If hardness (as CaCO3) is from 7 to 45 mg/L then maximum is based on equation: e to the power of {1.03[ln(hardness)] - 5.274} 3. If hardness (as CaCO3) is greater than 455 mg/L then maximum is 2.8 µg/L. When water hardness is greater than the upper bound (i.e., highest water hardness tested), a site-specific assessment may be required.
Note 1.17 for Cobalt (dissolved):
The interim maximum concentration for total cobalt is 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt. The interim 30-day average concentration for total cobalt (based on five weekly samples) is 4 µg/L to protect aquatic life from chronic effects of cobalt.
Note 1.18 for Copper (dissolved):
The guideline is for dissolved copper and is dependent on the specific chemistry of the water body and can only be calculated using the British Columbia Biotic Ligand Model (BC BLM) software. (Update August 2019)
Note 1.19 for Lead (dissolved):
The maximum guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is set at 3.0 µg/L. When water hardness exceeds 8.0 mg/L CaCO3 the maximum guideline for lead at any time is given by the following equation: Maximum Criteria (µg/L) = exp (1.273 ln(hardness) - 1.460). The 30-day average guideline for total lead in water, when water hardness exceeds 8 mg/L as CaCO3, is as follows: 30-Day Average (µg/L) is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704). For hardness less than or equal to 8.0 mg/L there is no 30-day average guideline; hence the maximum concentration of 3.0 µg/L is used.

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program
Guideline Notes

Note 1.20 for Manganese (dissolved):
The maximum concentration of total manganese in mg/L at any time should not exceed the value as determined by the following relationship: 0.01102 hardness + 0.54 where water hardness is reported as mg/L of CaCO3. The 30-day mean concentration of total manganese in mg/L should be less than or equal to the value as determined by the following relationship: 0.0044 hardness + 0.605 where water hardness is reported as mg/L of CaCO3.
Note 1.21 for Molybdenum (dissolved):
The maximum concentration for total molybdenum is 2 mg/L. The 30-day average concentration for total molybdenum (based on at least five weekly samples in a period of 30 days) is less than or equal to 1 mg/L.
Note 1.22 for Selenium (dissolved):
The 30-day average water quality guideline for protection of aquatic life is 2 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium. The 30-day average alert concentration for the protection of aquatic life in sensitive ecosystems is 1 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.
Note 1.23 for Silver (dissolved):
The guideline maximum for total silver is: 0.1 µg/L maximum if hardness less than or equal to 100 mg/L 3.0 µg/L maximum if hardness greater than 100 mg/L. The guideline 30-day average for total silver is: 0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L 1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.
Note 1.24 for Zinc (dissolved):
The Short-term Maximum concentration of total zinc (µg/L) at any time should not exceed 33 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3. When water hardness exceeds 90 mg/L CaCO3, the Short-term Maximum guideline in µg/L for total zinc is the value determined by the following relationship: 33 + 0.75 * (hardness - 90) where water hardness is reported as mg/L of CaCO3. Short-term maximum WQG formula applies to water hardness between 90 – 500 mg/L CaCO3. The Long-term Average concentration of total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3. When water hardness exceeds 90 mg/L CaCO3, the Long-term Average guideline in µg/L for total zinc is the value determined by the following relationship: 7.5 + 0.75 * (hardness - 90) where water hardness is reported as mg/L of CaCO3. Long-term average WQG formula applies to water hardness between 90 – 330 mg/L CaCO3.
2. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (Long-term chronic) (BCAWQG AL (LT))
General Notes:
For some parameters, there are two water quality guidelines: the short-term acute guideline (i.e. maximum), and the long-term chronic guideline (i.e. average). The long-term chronic guideline was used in this criteria set for parameters that have both guideline values.
Note 2.1 for Chloride:
To protect freshwater aquatic life from acute and lethal effects, the maximum concentration of chloride (mg/L as NaCl) at any time should not exceed 600 mg/L. To protect freshwater aquatic life from chronic effects, the average (arithmetic mean computed from five weekly samples collected over a 30-day period) concentration of chloride (mg/L as NaCl) should not exceed 150 mg/L.
Note 2.2 for pH:
pH less than 6.5: No statistically significant decrease in pH from background. pH from 6.5 to 9.0: Unrestricted change permitted within this range. pH over 9.0: No statistically significant increase in pH from background. See BC MOE Overview Report for additional details.

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program
Guideline Notes

Note 2.3 for Sulphate:
The approved 30-day average (minimum of 5 evenly-spaced samples collected in 30 days) water quality guidelines to protect aquatic life in BC for sulphate are: 128 mg/L at hardness of 0 to 30 mg/L as CaCO3 218 mg/L at hardness of 31 to 75 mg/L as CaCO3 309 mg/L at hardness of 76 to 180mg/L as CaCO3 429 mg/L at hardness 181 to 250 mg/L as CaCO3 Need to determine guideline based on site water for hardness greater than 250 mg/L as CaCO3. For screening purposes in this report, exceedance were flagged for sulphate greater than 429 mg/L at hardness greater than 250 mg/L as CaCO3.
Note 2.4 for Total suspended solids:
Maximum Induced Suspended Sediments - mg/L or % of background: - 25 mg/L in 24 hours when background is less than or equal to 25; - Mean of 5 mg/L in 30 days when background is less than or equal to 25; - 25 mg/L when background is between 25 and 250; - 10% when background is greater than or equal to 250.
Note 2.5 for Ammonia (total, as N):
The maximum guideline for ammonia varies as a function of pH and temperature. See Table 3 in Overview Report Update September 2009. The 30-day average guideline for ammonia varies as a function of pH and temperature. See Table 4 in Overview Report Update September 2009. / The lab pH and field temperature results were used for determining the maximum ammonia concentration for this report. If a lab pH result was not available then the field pH result was used.
Note 2.6 for Nitrate (as N):
The guideline maximum for nitrate (as N) is 32.8 mg/l. The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.
Note 2.7 for Nitrate + Nitrite (as N) (calculated):
The guideline maximum for nitrate (as N) is 32.8 mg/l. The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.
Note 2.8 for Nitrite (as N):
The guideline maximum for nitrite as N is: 0.06 mg/L if chloride less than 2 mg/L 0.12 mg/L if chloride is 2 to 4 mg/L 0.18 mg/L if chloride is 4 to 6 mg/L 0.24 mg/L if chloride is 6 to 8 mg/L 0.30 mg/L if chloride is 8 to 10 mg/L 0.60 mg/L if chloride is greater than 10 mg/L. The guideline 30-day average for nitrite as N is: 0.02 mg/L if chloride less than 2 mg/L 0.04 mg/L if chloride is 2 to 4 mg/L 0.06 mg/L if chloride is 4 to 6 mg/L 0.08 mg/L if chloride is 6 to 8 mg/L 0.10 mg/L if chloride is 8 to 10 mg/L 0.20 mg/L if chloride is greater than 10 mg/L.
Note 2.9 for Phosphorus (dissolved, by ICPMS/ICPOES):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.
Note 2.10 for Phosphorus (total, APHA 4500-P):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.
Note 2.11 for Phosphorus (dissolved, APHA 4500-P):
Streams: None proposed for streams. Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.
Note 2.12 for Fecal coliforms (counts):
The guideline for fecal coliforms is as follows: “The fecal coliform density in fresh and marine waters used for the growing and harvesting of shellfish for human consumption should not exceed a median MPN of 14/100 mL over 30 days, and at least 90% of the samples in a 30-day period should not exceed 43/100 mL.”

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
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Guideline Notes

Note 2.13 for Aluminum (dissolved):
The maximum concentration of dissolved aluminum at any time should not exceed: 1. 0.10 mg/L when the pH is greater than or equal to 6.5 2. The value (in mg/L) determined by the following relationship if pH less than 6.5 Dissolved Aluminum = e (1.209-2.426 (pH) + 0.286 $(pH)^2$) The 30-day average concentration of dissolved aluminum (based on a minimum of 5 approximately weekly samples) should not exceed: 1. 0.05 mg/L when the median pH over 30 days is greater than or equal to 6.5 2. the value determined by the following relationship at median pH less than 6.5 Dissolved Aluminum = e (1.6-3.327 (median pH) + 0.402 (median $pH)^2$) / The lab pH results were used for determining the maximum aluminum (dissolved) concentration for this report. If a lab pH result was not available then the field pH result was used.
Note 2.14 for Arsenic (dissolved):
The recommended guideline is for total arsenic.
Note 2.15 for Boron (dissolved):
The recommended guideline is for total boron.
Note 2.16 for Cadmium (dissolved):
The guideline for cadmium is determined on a site-specific basis according to the local water hardness. The guideline for cadmium (dissolved) in µg/L is determined by the following equations for long term exposure: 1. If hardness (as CaCO3) is less than 3.4 mg/L then maximum is 0.0176 µg/L 2. If hardness (as CaCO3) is from 3.4 to 285 mg/L then maximum is based on equation: e raised to the power of {0.736[ln(hardness)] - 4.943} 3. If hardness (as CaCO3) is greater than 285 mg/L then maximum is 0.457 µg/L. When water hardness is greater than the upper bound (i.e., highest water hardness tested), a site-specific assessment may be required.
Note 2.17 for Cobalt (dissolved):
The interim maximum concentration for total cobalt is 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt. The interim 30-day average concentration for total cobalt (based on five weekly samples) is 4 µg/L to protect aquatic life from chronic effects of cobalt.
Note 2.18 for Copper (dissolved):
The guideline is for dissolved copper and is dependent on the specific chemistry of the water body and can only be calculated using the British Columbia Biotic Ligand Model (BC BLM) software.
Note 2.19 for Lead (dissolved):
The maximum guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is set at 3.0 µg/L. When water hardness exceeds 8.0 mg/L CaCO3 the maximum guideline for lead at any time is given by the following equation: Maximum Criteria (µg/L) = exp (1.273 ln(hardness) - 1.460). The 30-day average guideline for total lead in water, when water hardness exceeds 8 mg/L as CaCO3, is as follows: 30-Day Average (µg/L) is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704). For hardness less than or equal to 8.0 mg/L there is no 30-day average guideline; hence the maximum concentration of 3.0 µg/L is used.
Note 2.20 for Manganese (dissolved):
The maximum concentration of total manganese in mg/L at any time should not exceed the value as determined by the following relationship: 0.01102 hardness + 0.54 where water hardness is reported as mg/L of CaCO3. The 30-day mean concentration of total manganese in mg/L should be less than or equal to the value as determined by the following relationship: 0.0044 hardness + 0.605 where water hardness is reported as mg/L of CaCO3.
Note 2.21 for Molybdenum (dissolved):
The maximum concentration for total molybdenum is 2 mg/L. The 30-day average concentration for total molybdenum (based on at least five weekly samples in a period of 30 days) is less than or equal to 1 mg/L.
Note 2.22 for Selenium (dissolved):
The 30-day average water quality guideline for protection of aquatic life is 2 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium. The 30-day average alert concentration for the protection of aquatic life in sensitive ecosystems is 1 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.
Note 2.23 for Silver (dissolved):
The guideline maximum for total silver is: 0.1 µg/L maximum if hardness less than or equal to 100 mg/L 3.0 µg/L maximum if hardness greater than 100 mg/L. The guideline 30-day average for total silver is: 0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L 1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.

Table C-2: 2019 Bailey Springs and Clay Valve #4 Results
City of Vernon Reclaimed Water Irrigation Groundwater Monitoring Program
Guideline Notes

Note 2.24 for Zinc (dissolved):
The Short-term Maximum concentration of total zinc (µg/L) at any time should not exceed 33 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3. When water hardness exceeds 90 mg/L CaCO3, the Short-term Maximum guideline in µg/L for total zinc is the value determined by the following relationship: 33 + 0.75 * (hardness - 90) where water hardness is reported as mg/L of CaCO3. Short-term maximum WQG formula applies to water hardness between 90 – 500 mg/L CaCO3. The Long-term Average concentration of total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3. When water hardness exceeds 90 mg/L CaCO3, the Long-term Average guideline in µg/L for total zinc is the value determined by the following relationship: 7.5 + 0.75 * (hardness - 90) where water hardness is reported as mg/L of CaCO3. Long-term average WQG formula applies to water hardness between 90 – 330 mg/L CaCO3.
3. Notes for Working Water Quality Guidelines for British Columbia for freshwater aquatic life (BCWWQG AL)
General Notes:
Reference: Working Water Quality Guidelines for British Columbia (2015). WWQG values are long-term (i.e. average) concentrations unless identified as a short-term maximum in the “Notes” for a specific analyte. Long-term WWQGs represent average substance concentrations calculated from 5 samples in 30 days. WWQG are given for total substance concentrations unless otherwise noted.
Note 3.1 for Antimony (dissolved):
The guideline is for antimony (III).
Note 3.2 for Calcium (dissolved):
The guideline for dissolved calcium in mg/L is as follows: - Less than 4, highly sensitive to acid inputs - 4 to 8, moderately sensitive - Greater than 8, low sensitivity.
Note 3.3 for Chromium (dissolved):
The guideline for Cr(VI) is 1 µg/L (total). The guideline for Cr(III) is 8.9 µg/L (total). The guideline of 1 µg/L for Cr(VI) was used, in this report, to identify exceedances for dissolved chromium, and total chromium as a means for determining the potential for exceeding the Cr(VI) and/or Cr(III) guidelines.
Note 3.4 for Nickel (dissolved):
The guideline for nickel in µg/L is determined as follows: When the water hardness is 0 to ≤ 60 mg/L, the maximum is 25 µg/L At hardness > 60 to ≤ 180 mg/L the maximum is calculated using the equation: e raised to the power of {0.76[ln(hardness)] + 1.06} At hardness >180 mg/L, the maximum is 150 µg/L Where water hardness is reported as mg/L CaCO3. If the water hardness is unknown, the maximum is 25 µg/L.
Note 3.5 for Thallium (dissolved):
30-day average, site-specific objective for the lower Columbia River, BC

APPENDIX D - TIME SERIES PLOTS

List of Acronyms:

GCDWQ MAC	Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations
GCDWQ AO	Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives
BC SDWQG MAC	BC Source Drinking Water Quality Guidelines - Maximum Acceptable Concentrations
BC SDWQG AO	BC Source Drinking Water Quality Guidelines - Aesthetic Objectives
BC CSR DW	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Drinking Water
BCAWQG I	BC Approved Water Quality Guidelines for irrigation
BCWWQG I	Working Water Quality Guidelines for British Columbia for irrigation
BC CSR IW	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Irrigation
BCAWQG L	BC Approved Water Quality Guidelines for livestock
BCWWQG L	Working Water Quality Guidelines for British Columbia for livestock
BC CSR LW	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Livestock
BCAWQG AL	BC Approved Water Quality Guidelines for freshwater aquatic life
BCWWQG AL	Working Water Quality Guidelines for British Columbia for freshwater aquatic life
BC CSR AW(F)	BC CSR, Schedule 3.2, Generic Numerical Water Standards for Freshwater Aquatic Life (2017 and updates)
BCAWQG AL (ST)	BC Approved Water Quality Guidelines for freshwater aquatic life (short-term; acute)
BCAWQG AL (LT)	BC Approved Water Quality Guidelines for freshwater aquatic life (long-term; chronic)
Calc	Calculated guideline: the guideline is dependent on the value of one or more other analytes, and is calculated from a formula or table. Therefore, it is not shown on the plot. Refer to guideline notes in Appendix C for further details.
N	Narrative type of guideline; therefore, it is not shown on the plot. Refer to guideline notes in Appendix C for further details.

Note: On all plots, results that were below detection are plotted at one-half the detection limit and circled to indicate it is an inferred data point.

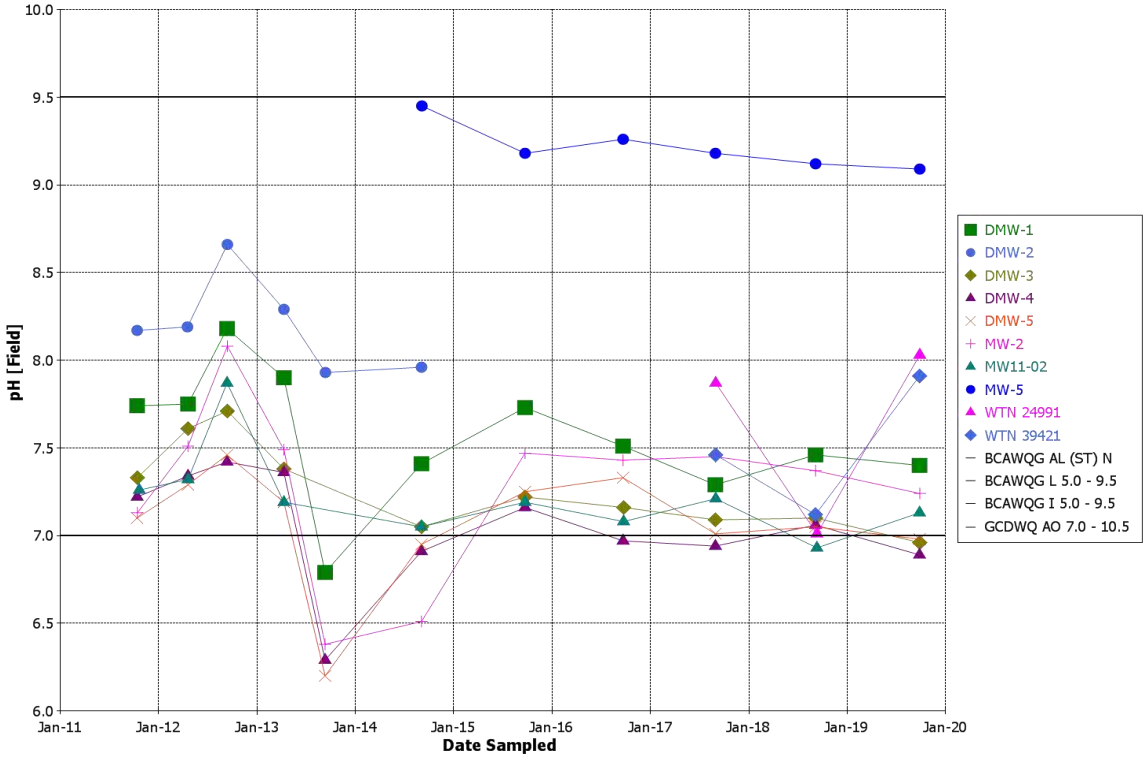

Figure D-1: Plot of field-measured pH in groundwater (all data since 2011) [1]

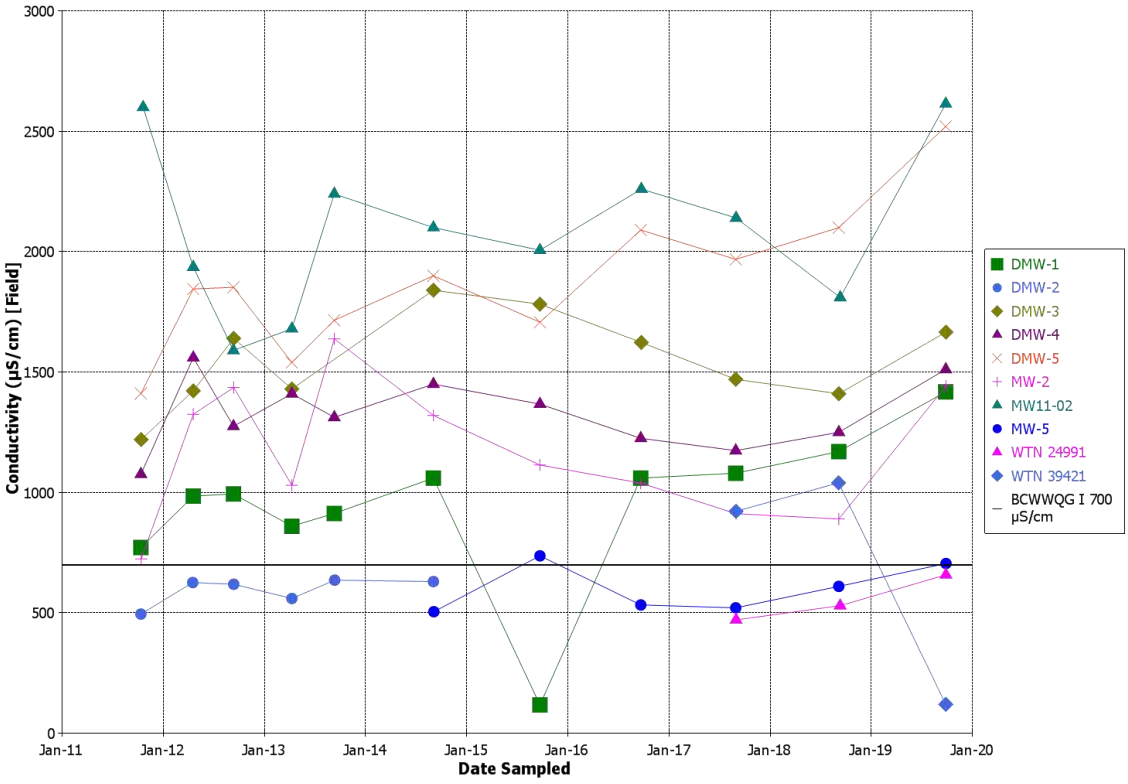

Figure D-2: Plot of field-measured conductivity in groundwater (all data since 2011)[1]

[1] pH and conductivity for Clay Valve #4 are not shown on the above figures because they have been measured in the laboratory. Figures D-1 and D-2 show field-measured data only.

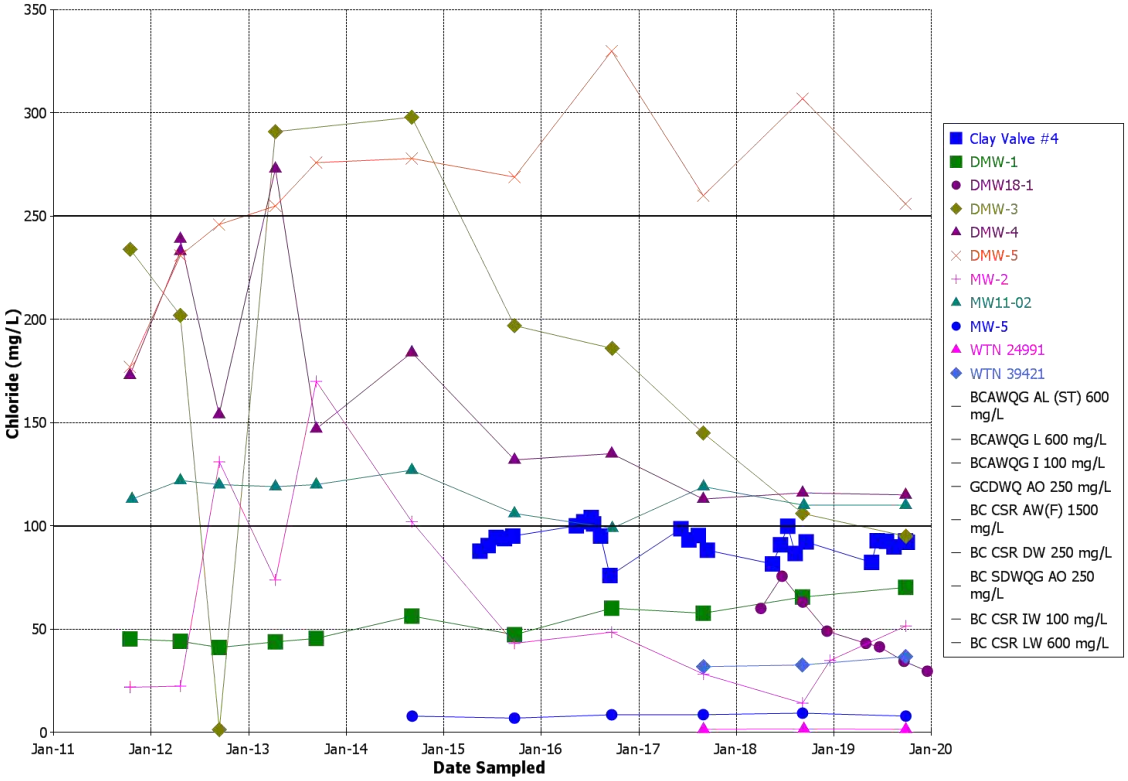

Figure D-3: Plot of chloride in groundwater and Clay Valve #4 (all data since 2011)

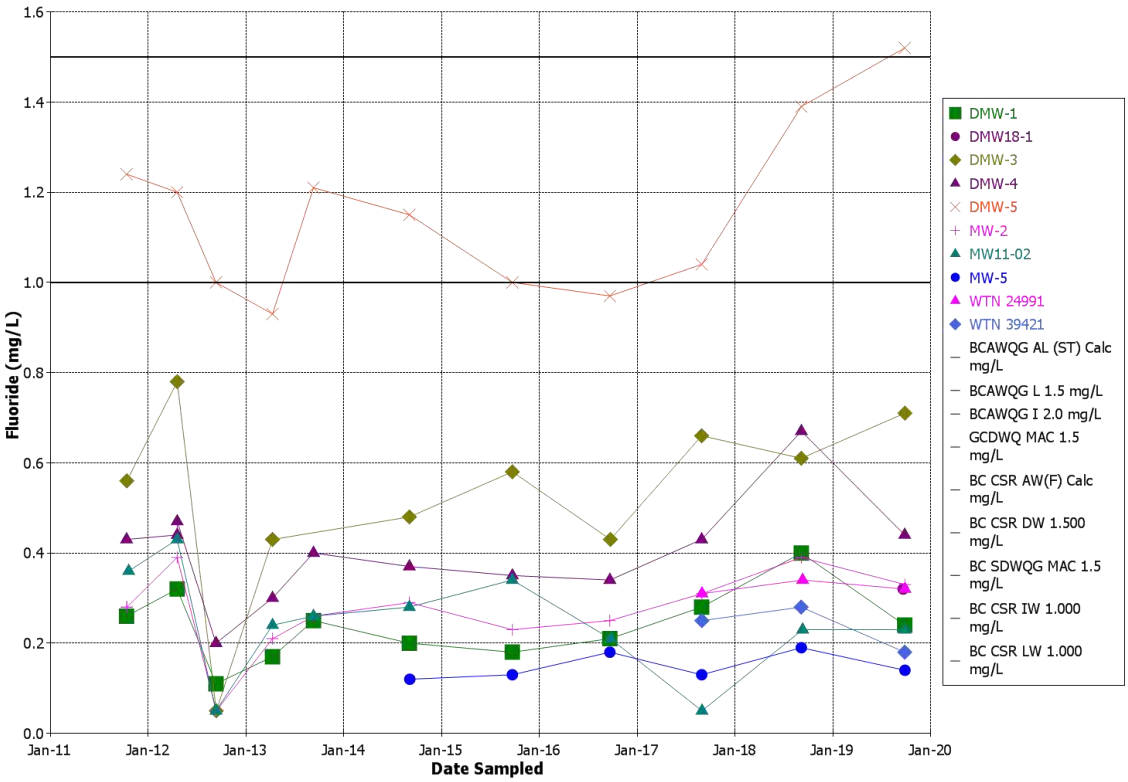

Figure D-4: Plot of fluoride in groundwater and Clay Valve #4 (all data since 2011)

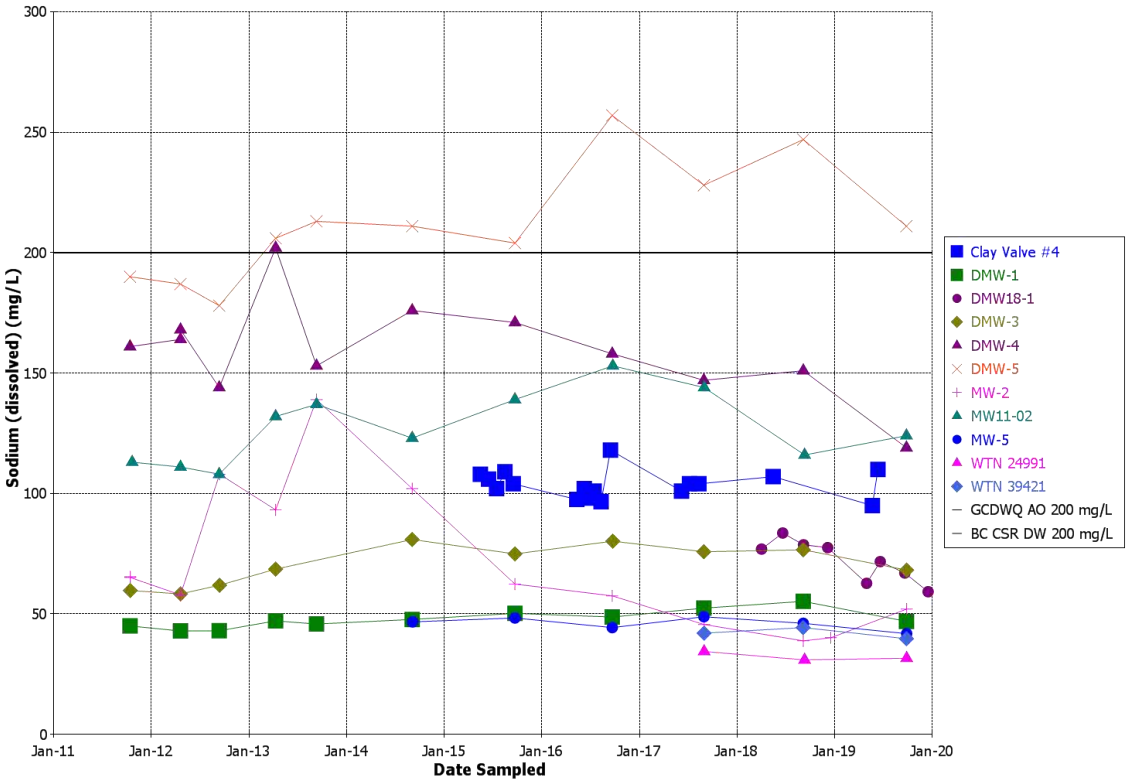

Figure D-5: Plot of dissolved sodium in groundwater and Clay Valve #4 (all data since 2011)

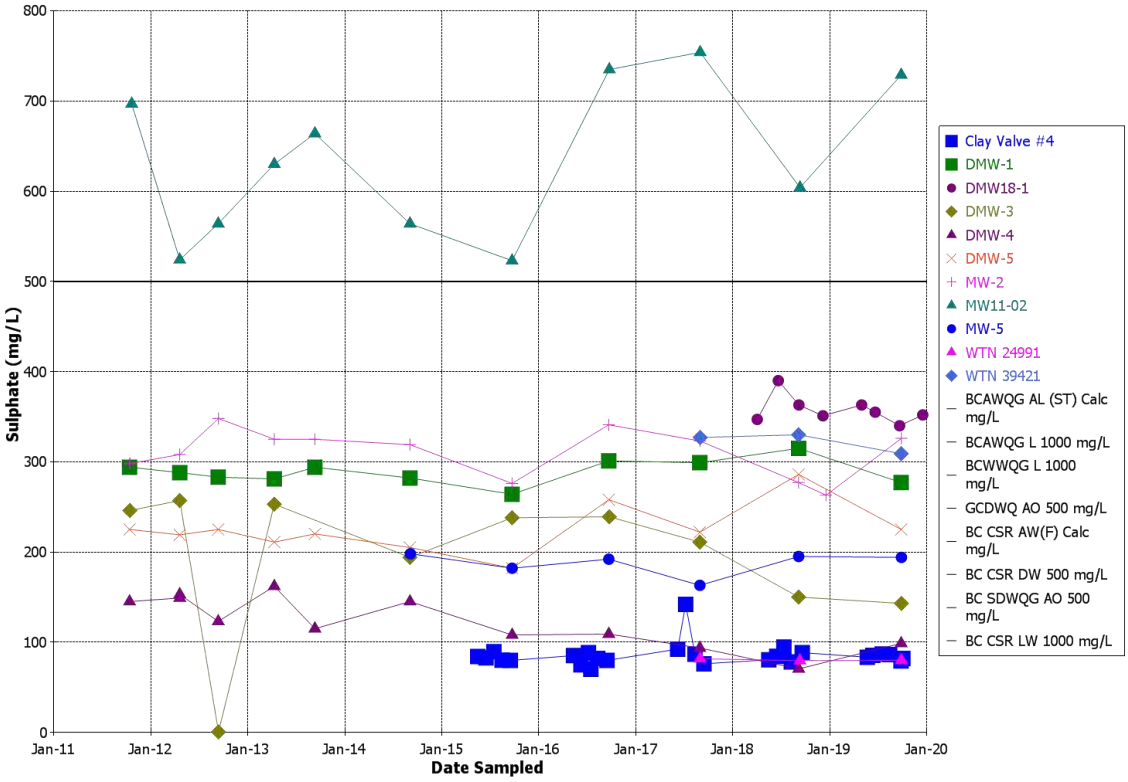

Figure D-6: Plot of sulphate in groundwater and Clay Valve #4 (all data since 2011)

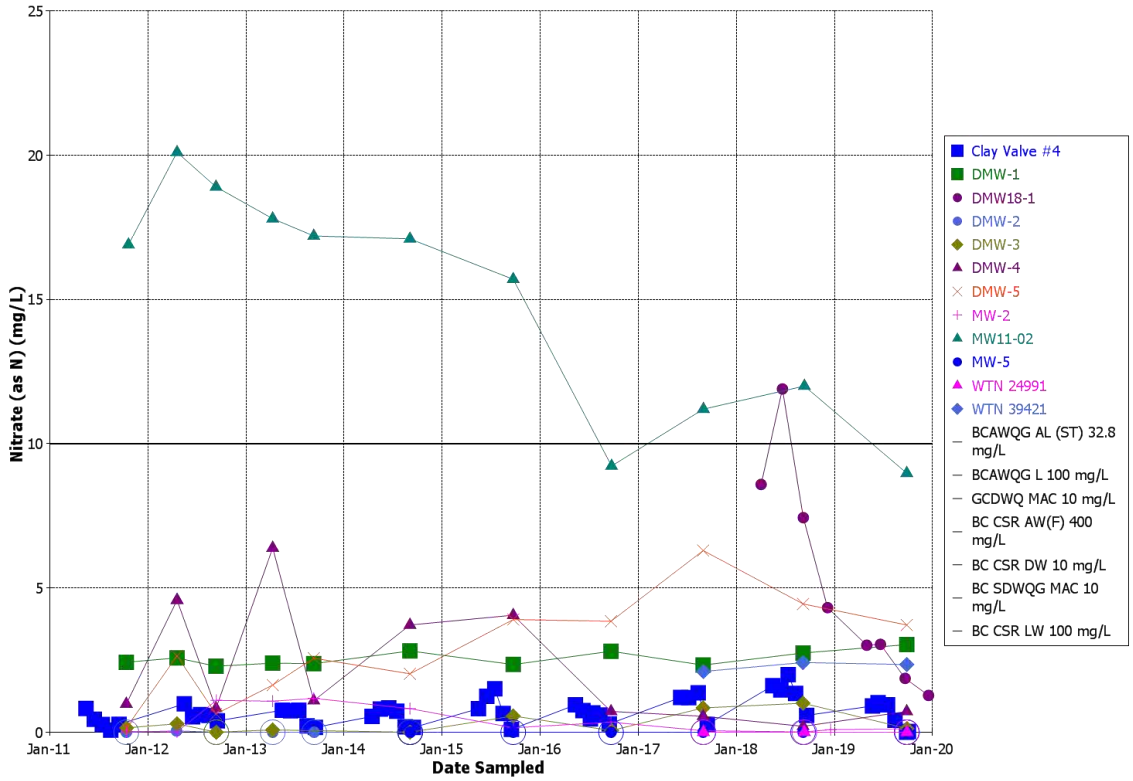

Figure D-7: Plot of nitrate-N in groundwater and Clay Valve #4 (all data since 2011)

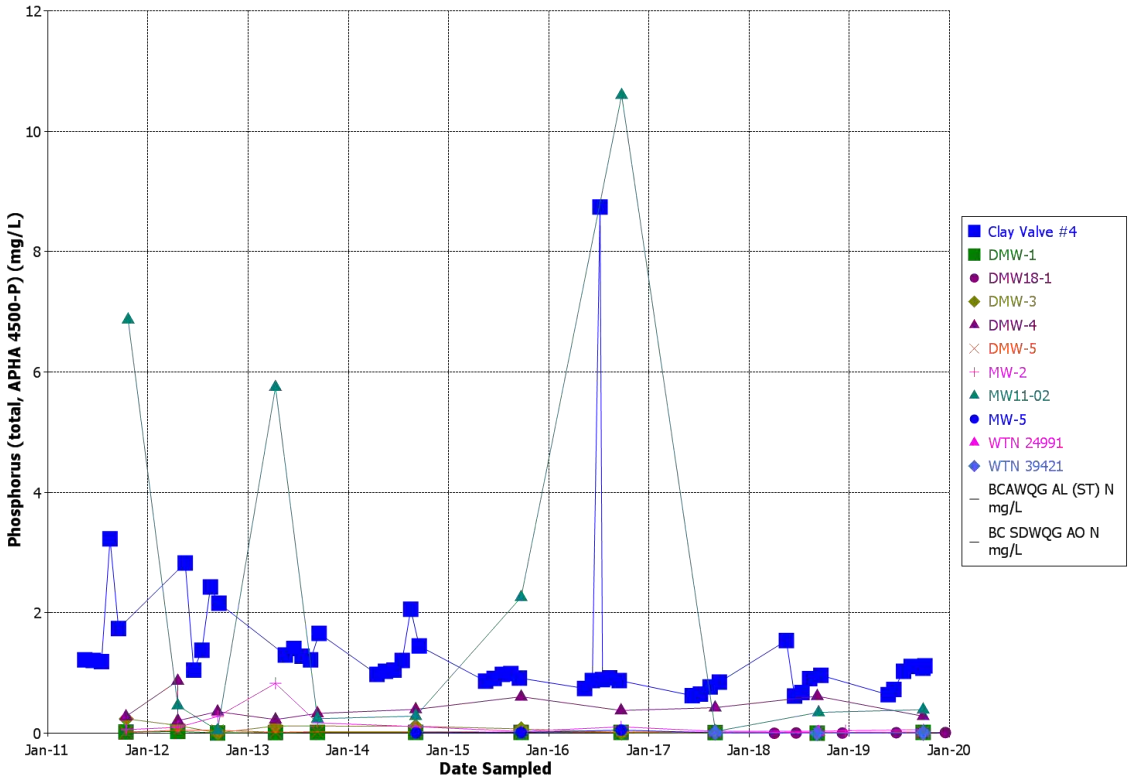

Figure D-8: Plot of total phosphorus in groundwater and Clay Valve #4 (all data since 2011)

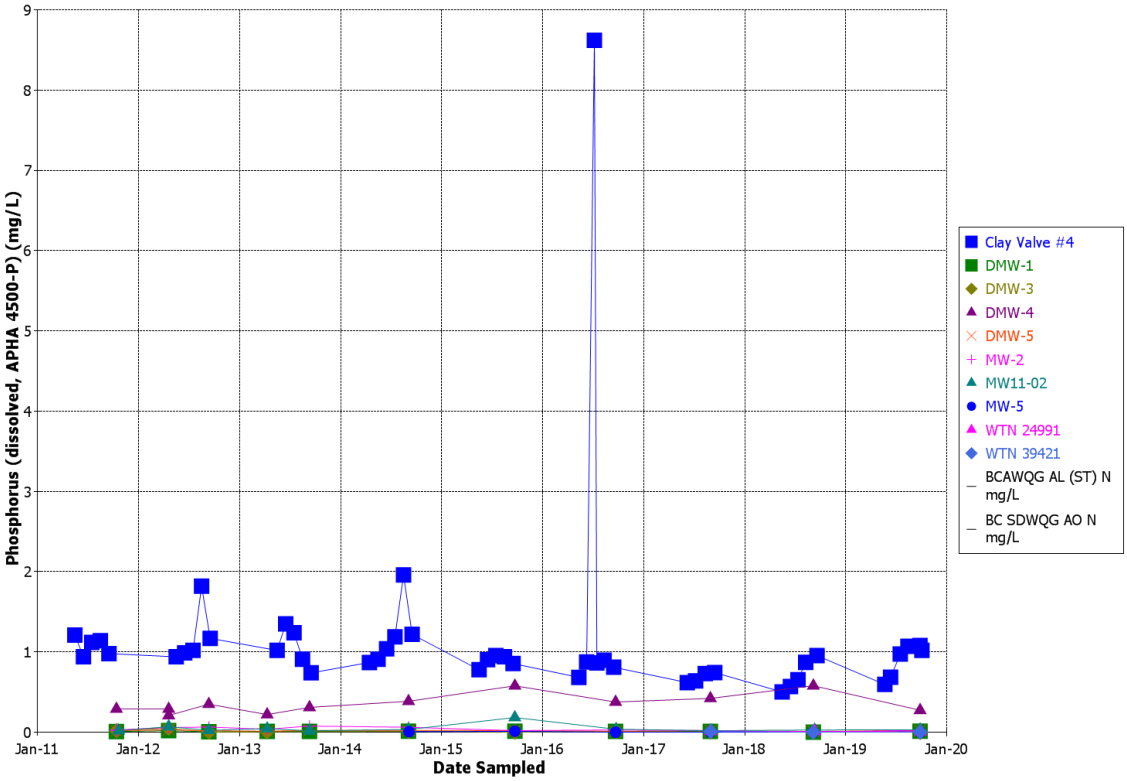

Figure D-9: Plot of dissolved phosphorus in groundwater and Clay Valve #4 (all data since 2011)

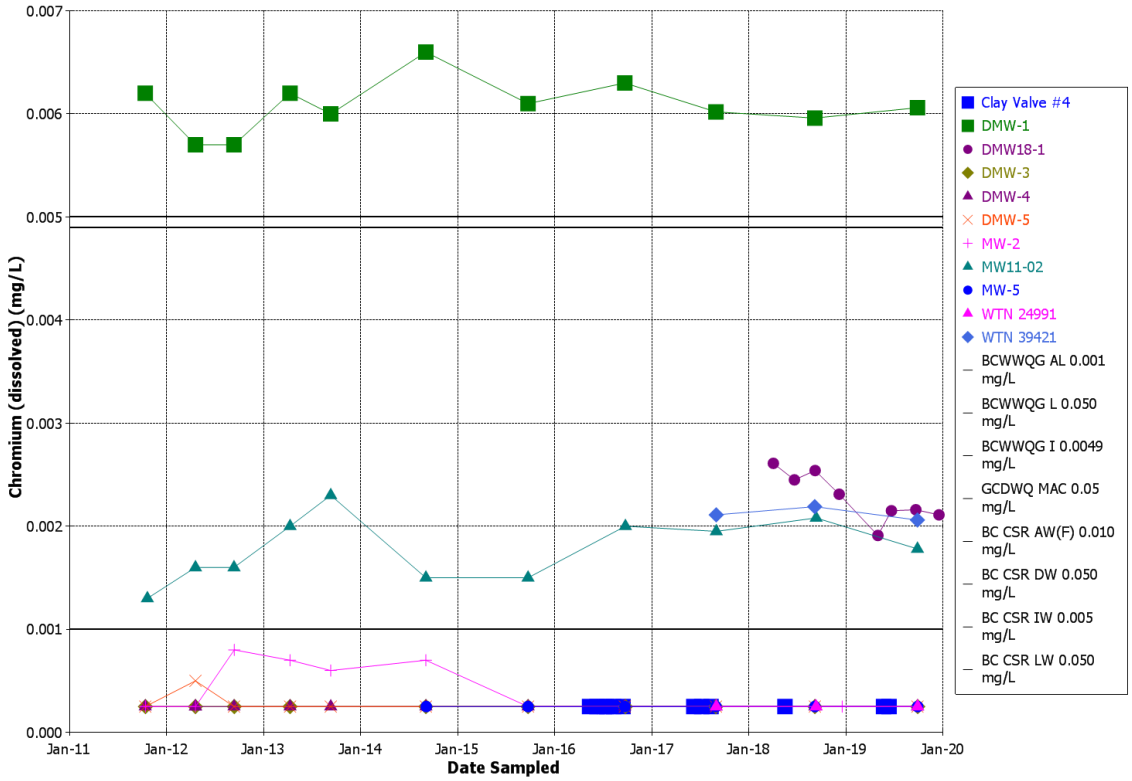

Figure D-10: Plot of dissolved chromium in groundwater and Clay Valve #4 (all data since 2011)

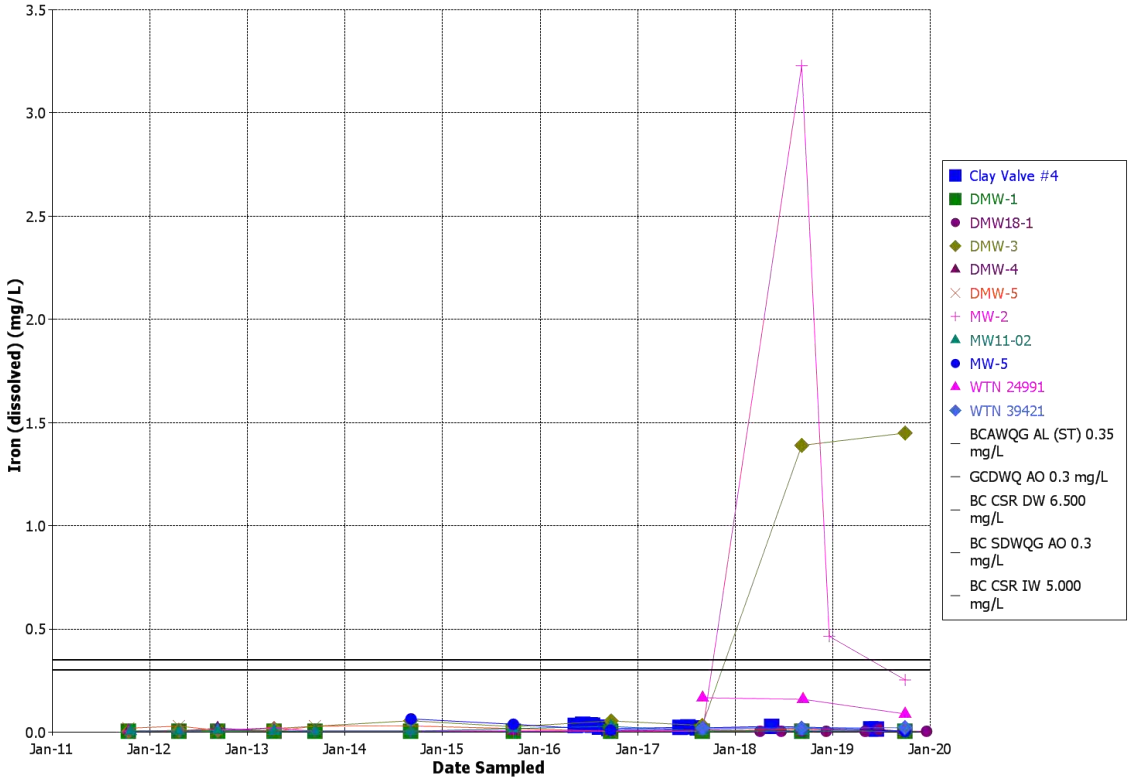

Figure D-11: Plot of dissolved iron in groundwater and Clay Valve #4 (all data since 2011)

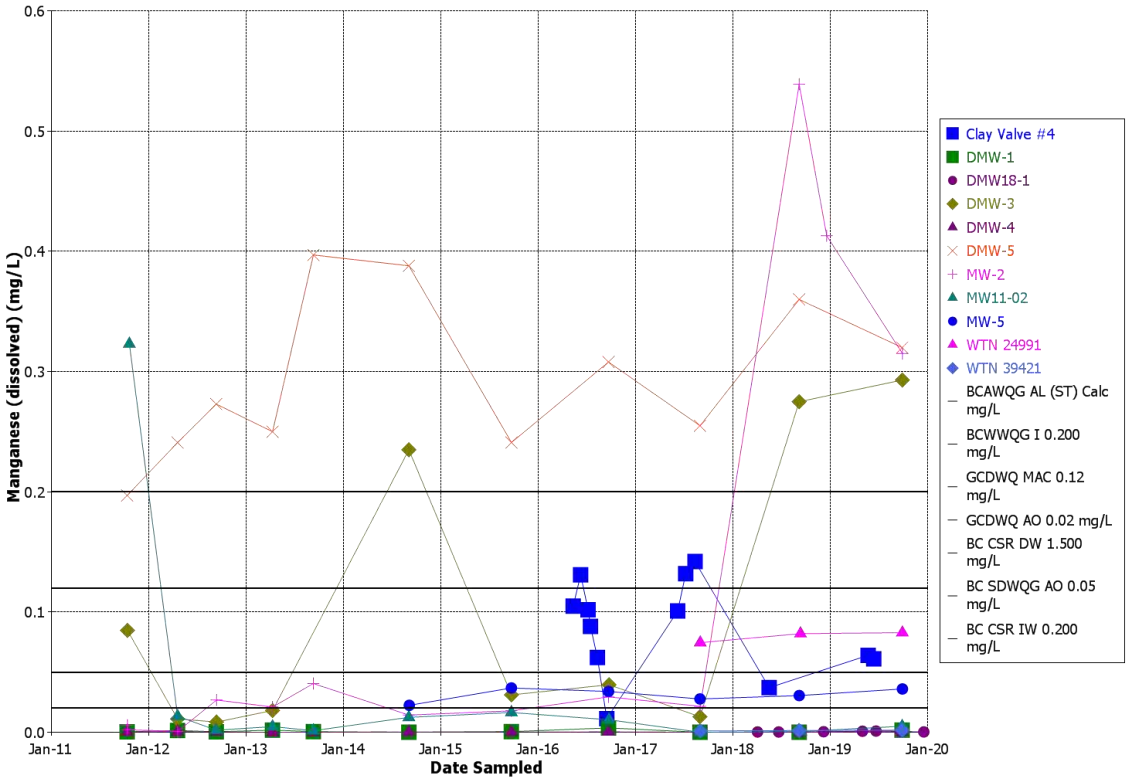

Figure D-12: Plot of dissolved manganese in groundwater and Clay Valve #4 (all data since 2011)

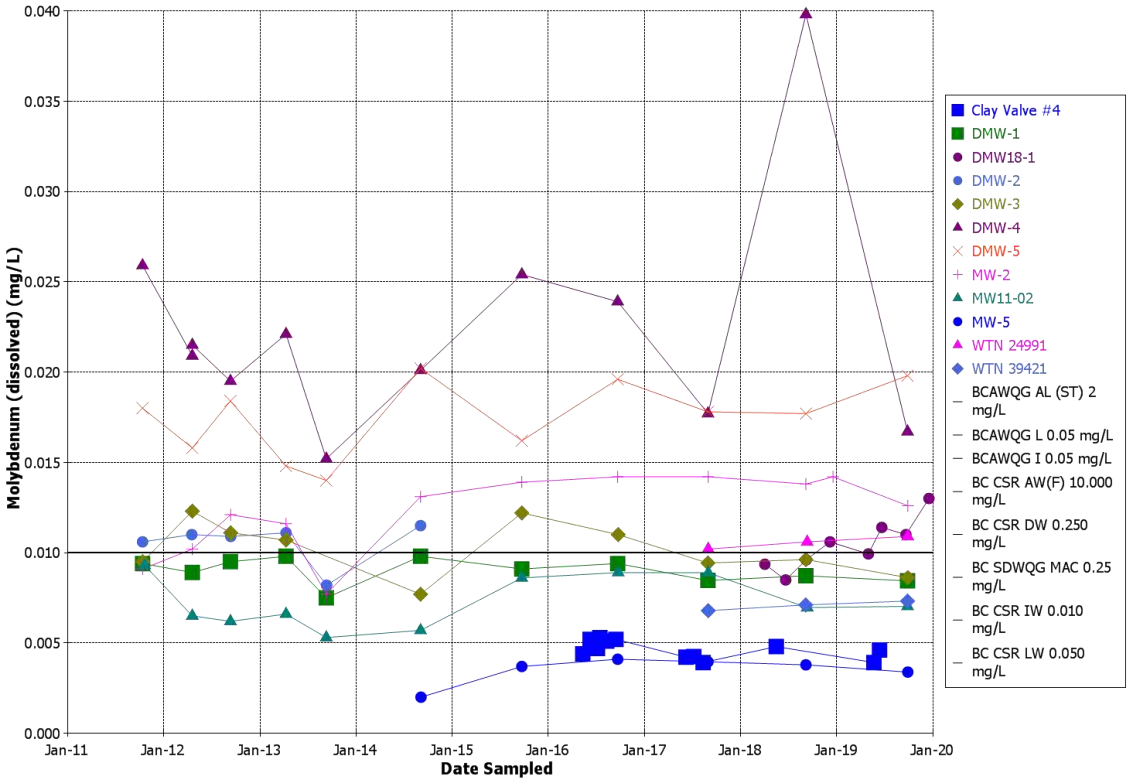

Figure D-13: Plot of dissolved molybdenum in groundwater and Clay Valve #4 (all data since 2011)

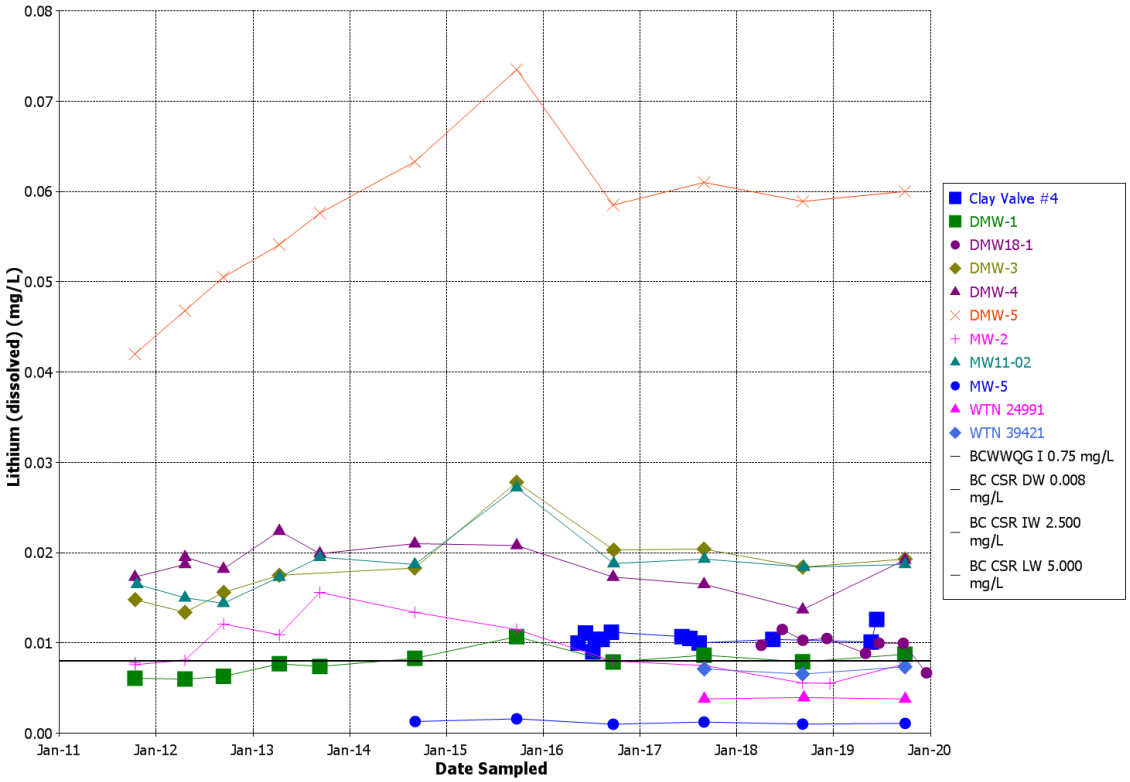

Figure D-14: Plot of dissolved lithium in groundwater and Clay Valve #4 (all data since 2011)

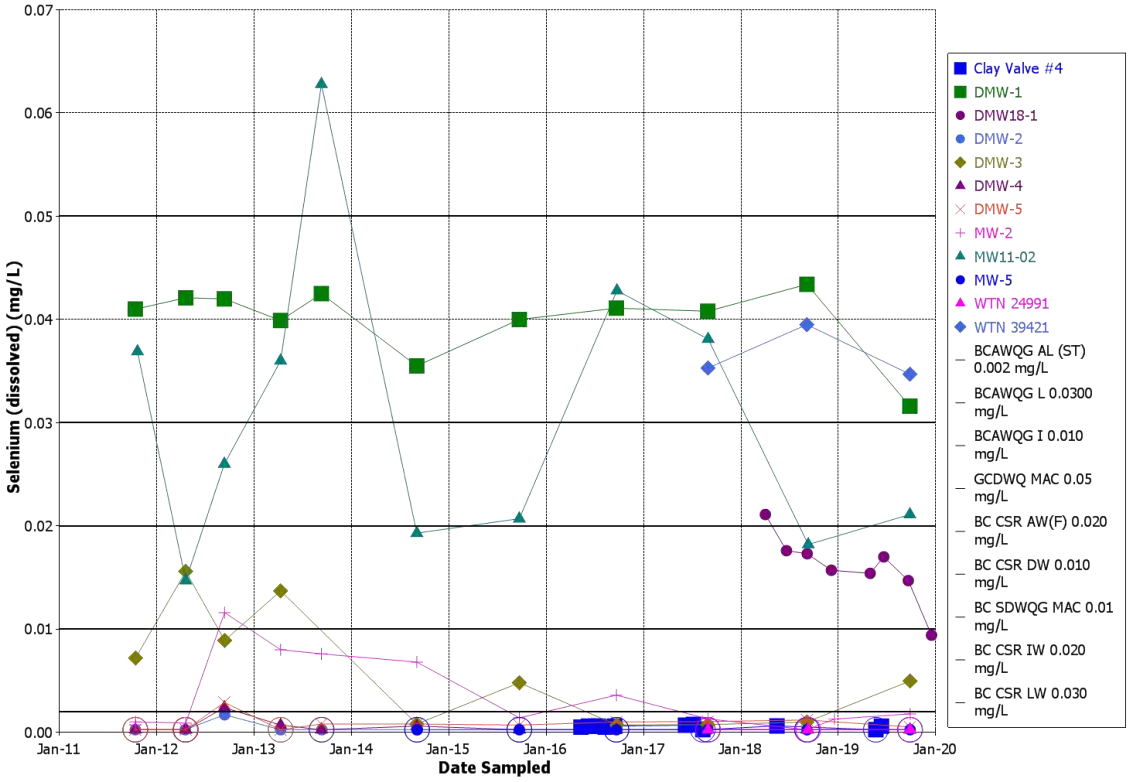

Figure D-15: Plot of dissolved selenium in groundwater and Clay Valve #4 (all data since 2011)

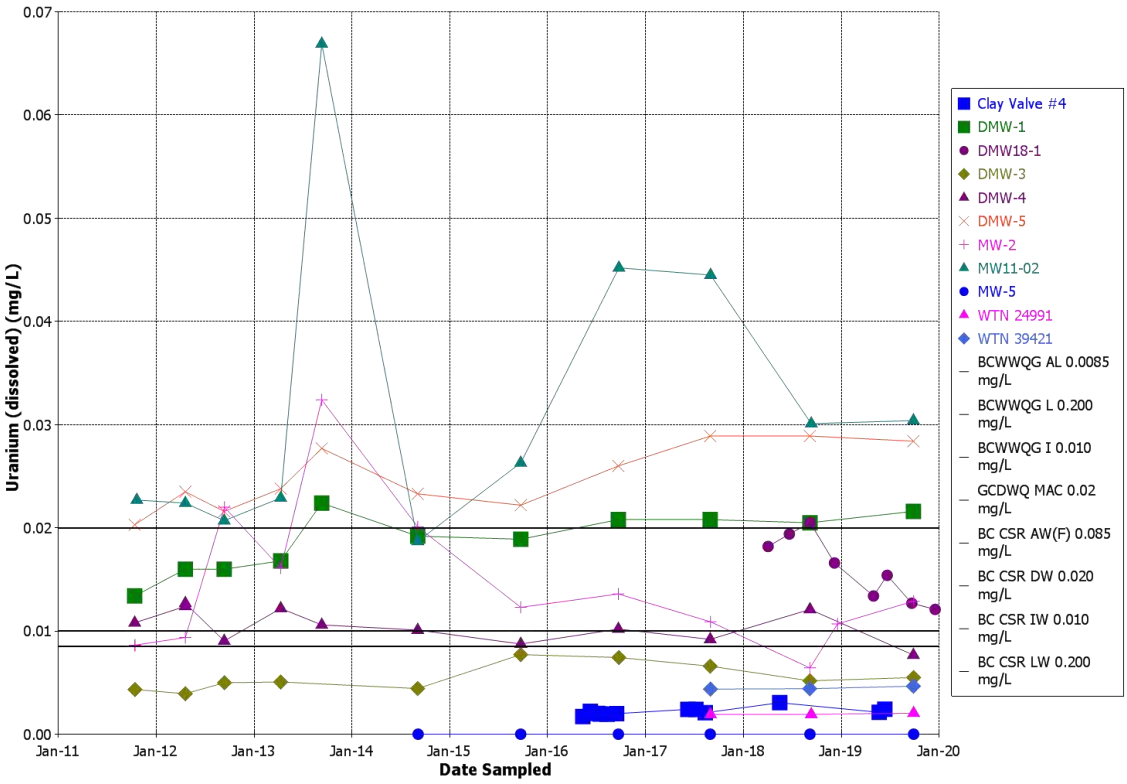

Figure D-16: Plot of dissolved uranium in groundwater and Clay Valve #4 (all data since 2011)

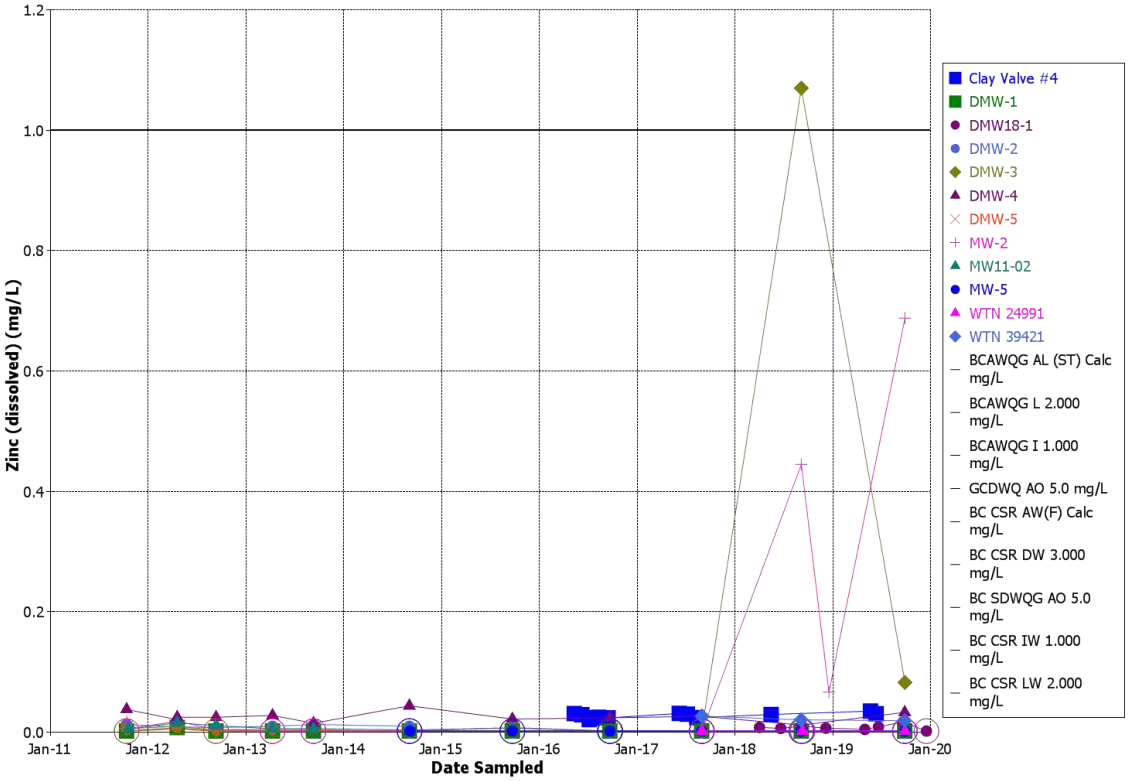

Figure D-17: Plot of dissolved zinc in groundwater and Clay Valve #4 (all data since 2011)

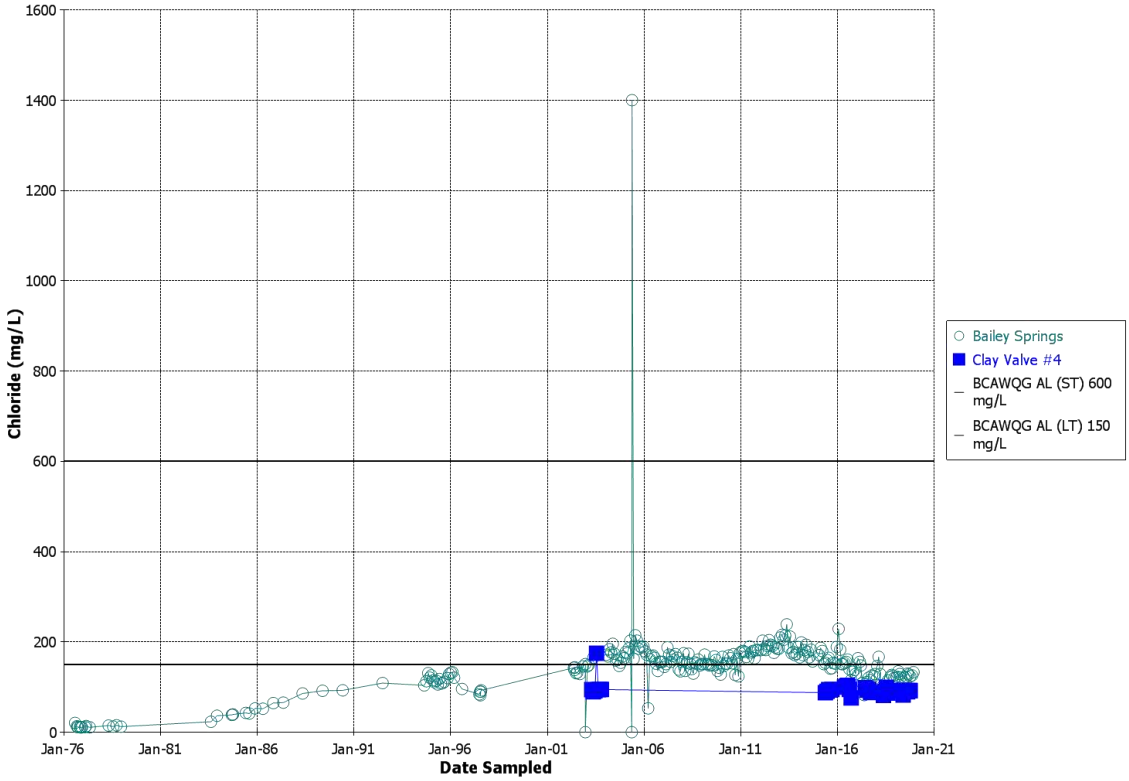

Figure D-18: Plot of chloride in Bailey Springs and Clay Valve #4 (all data)

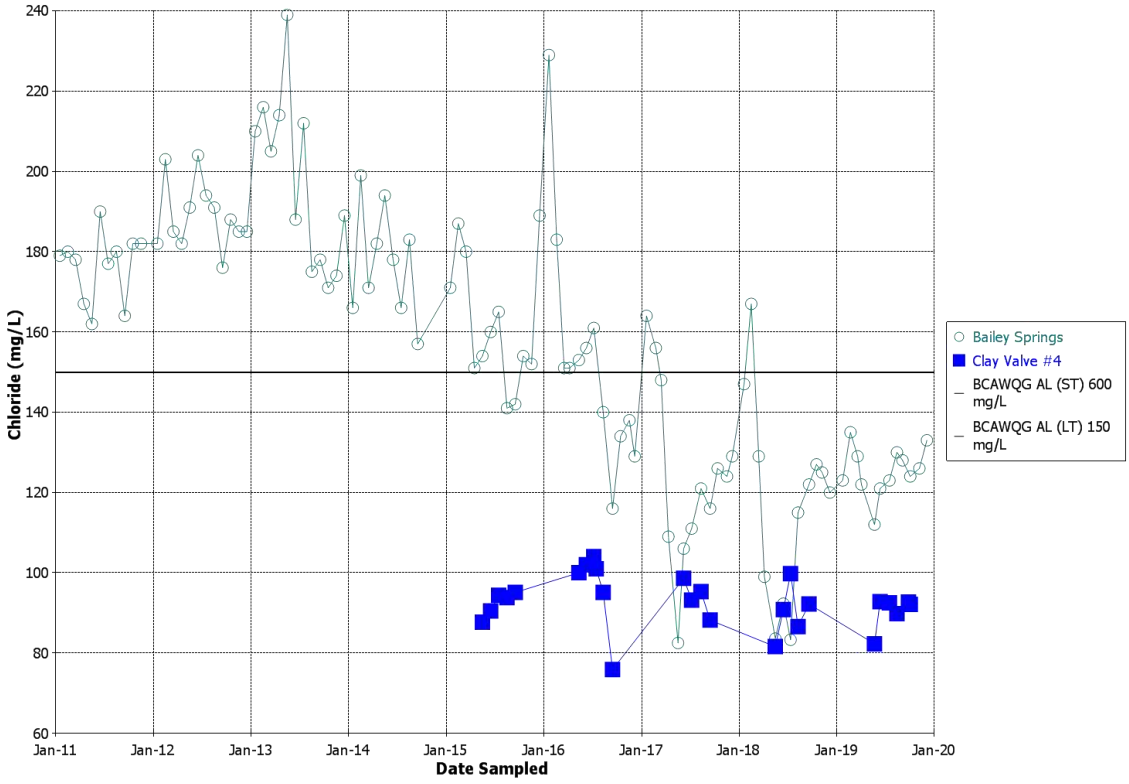

Figure D-19: Plot of chloride in Bailey Springs and Clay Valve #4 (data since 2011)

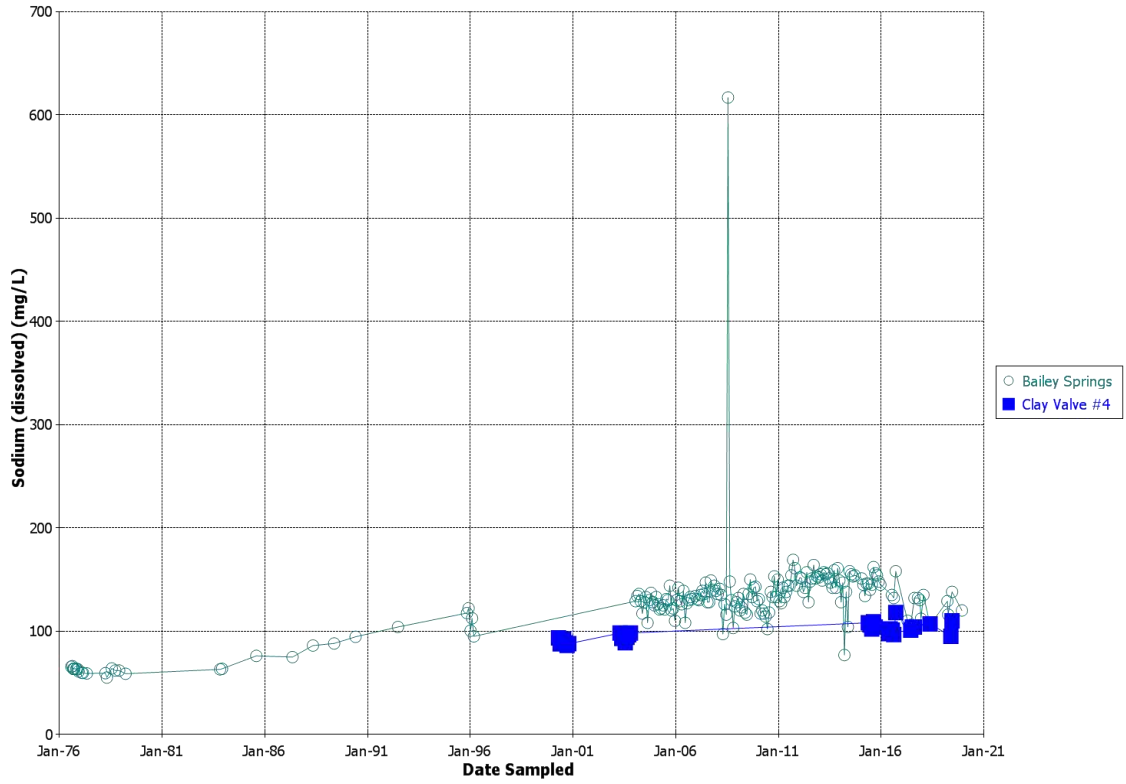

Figure D-20: Plot of dissolved sodium in Bailey Springs and Clay Valve #4 (all data)

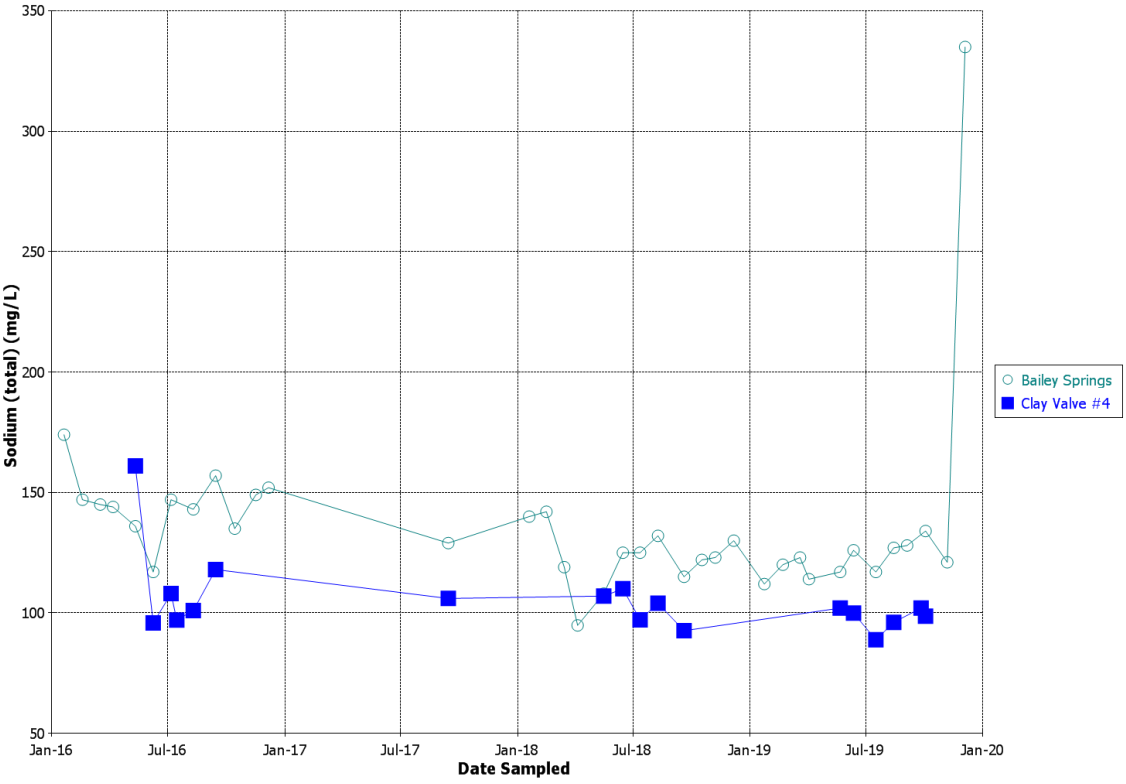

Figure D-21: Plot of total sodium in Bailey Springs and Clay Valve #4 (data since 2016)

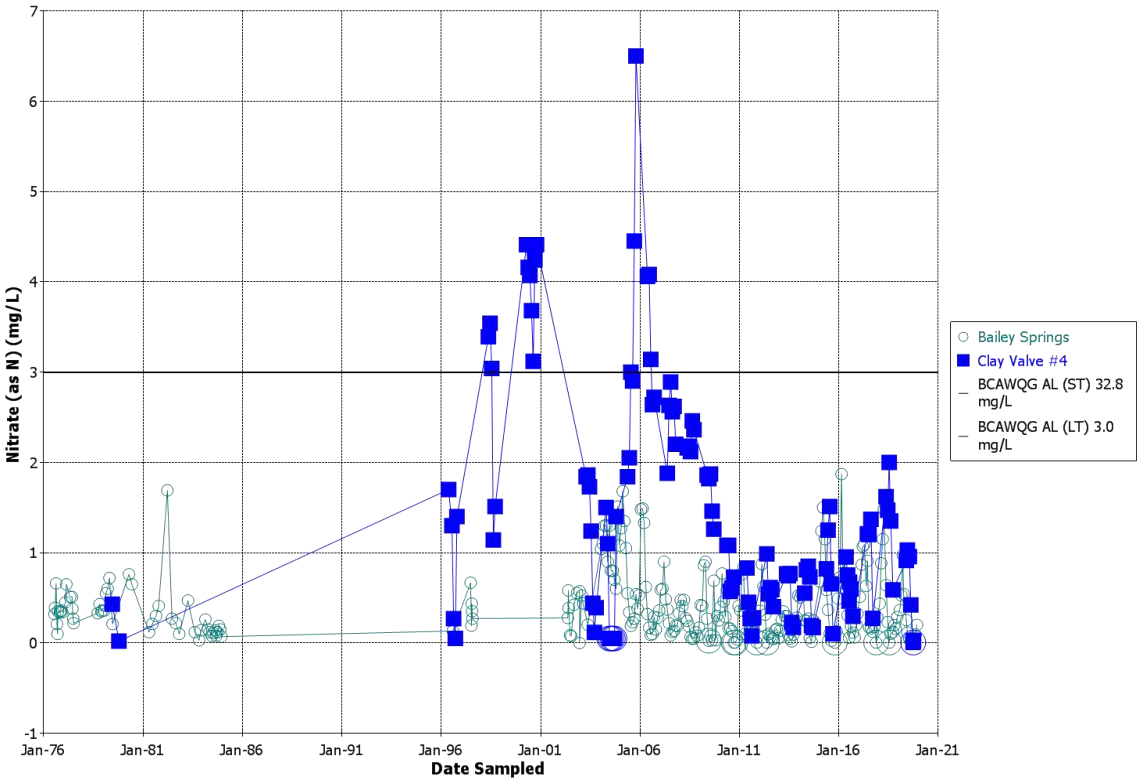

Figure D-22: Plot of nitrate-N in Bailey Springs and Clay Valve #4 (all data)

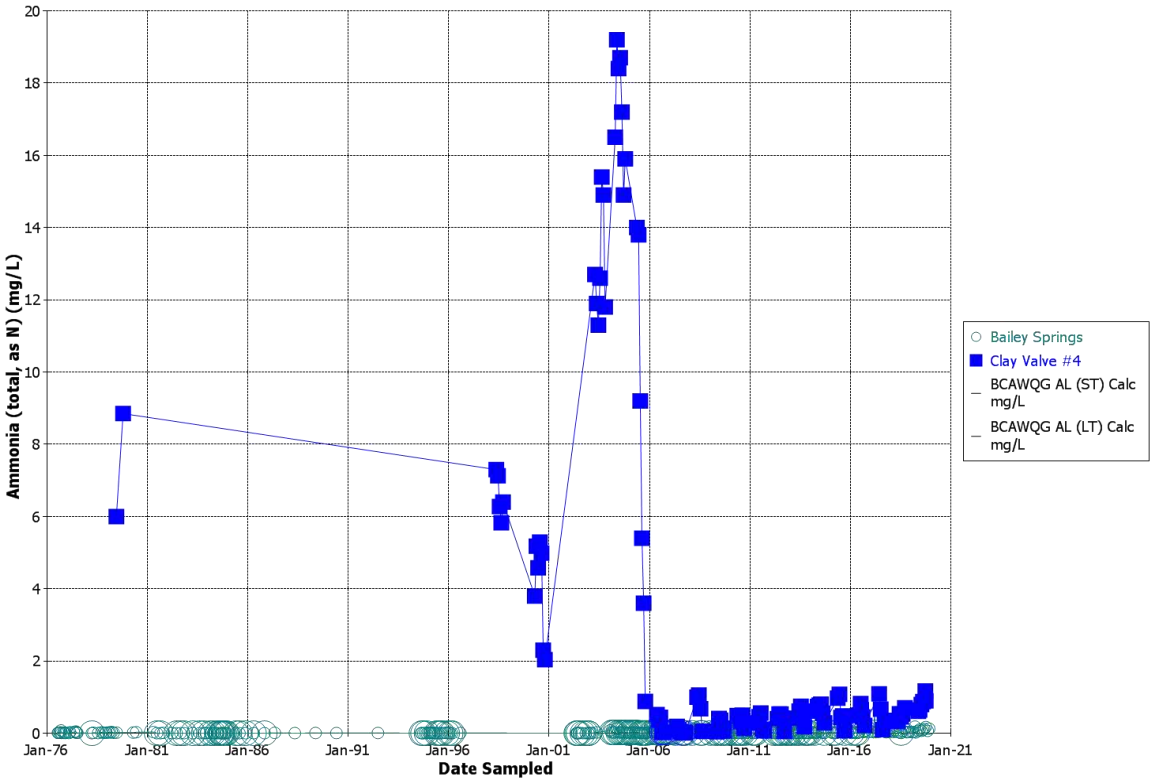

Figure D-23: Plot of ammonia-N in Bailey Springs and Clay Valve #4 (all data)

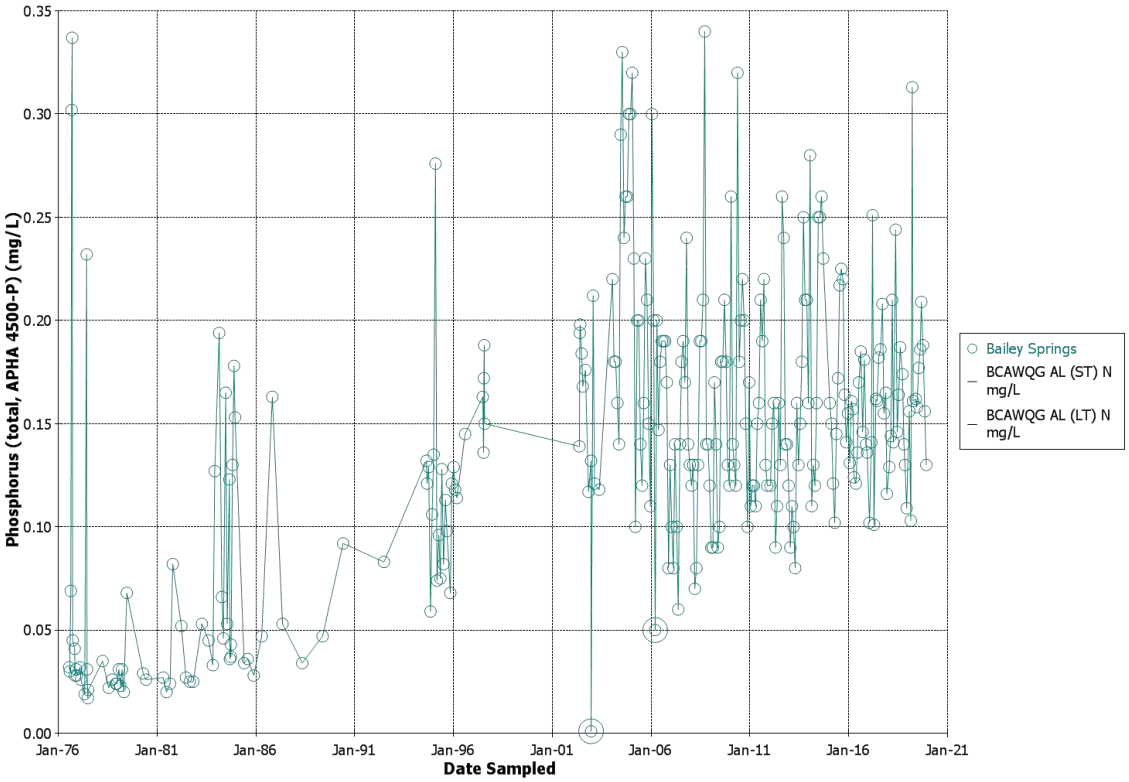

Figure D-24: Plot of total phosphorus in Bailey Springs (all data)

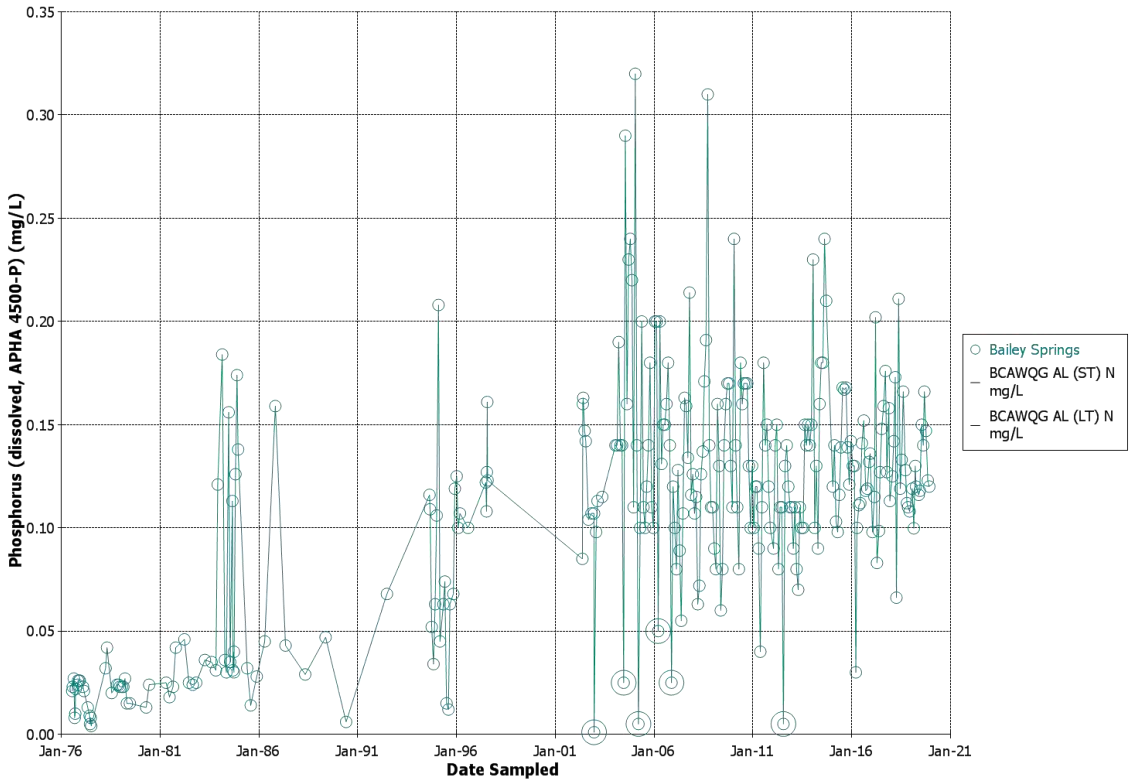

Figure D-25: Plot of dissolved phosphorus in Bailey Springs (all data)

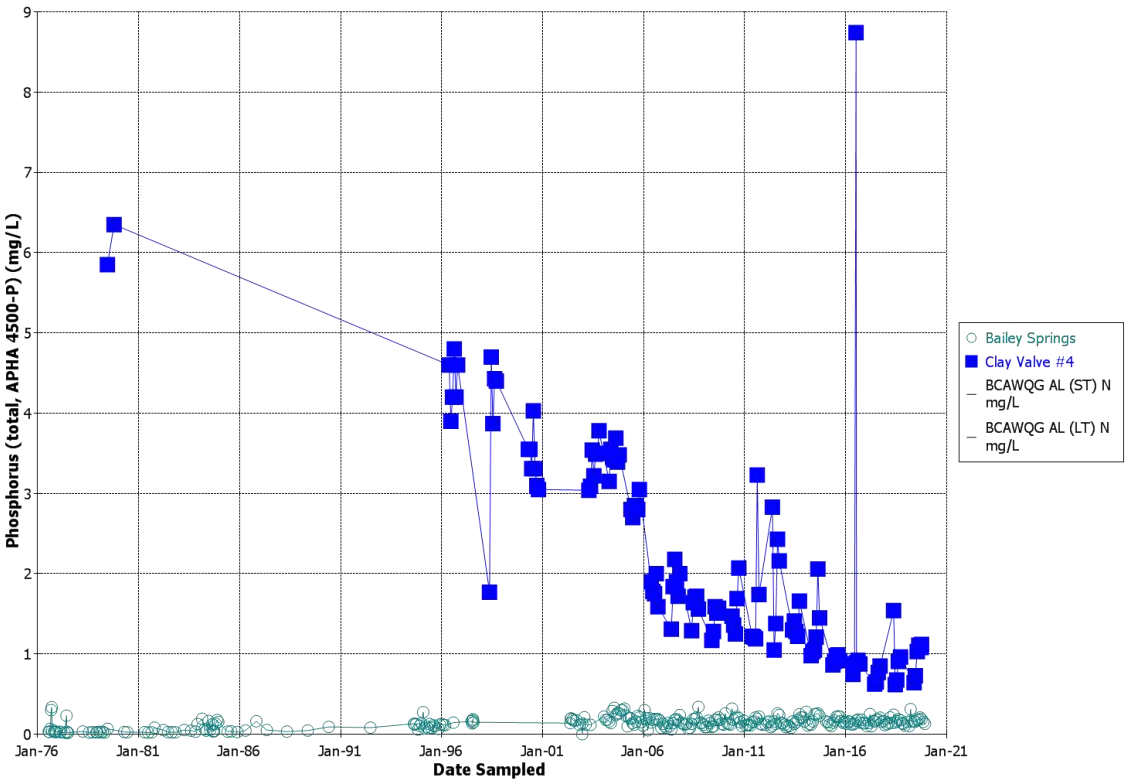

Figure D-26: Plot of total phosphorus in Bailey Springs and Clay Valve #4 (all data)

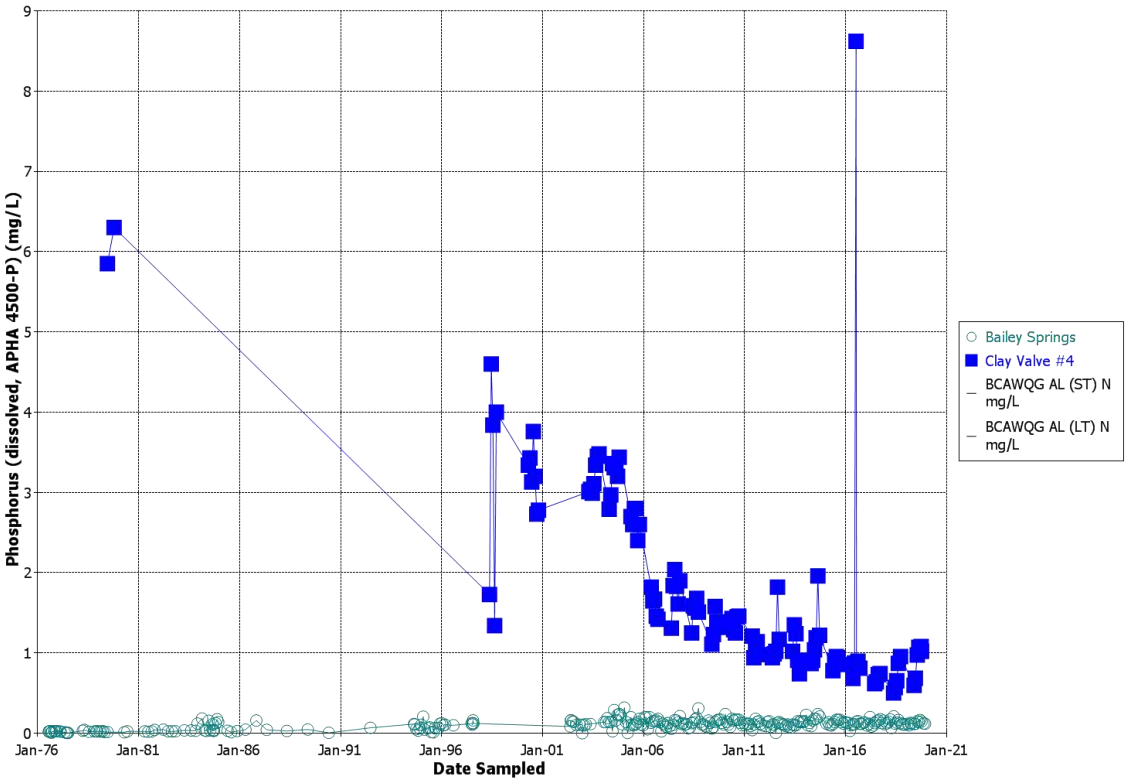

Figure D-27: Plot of dissolved phosphorus in Bailey Springs and Clay Valve #4 (all data)

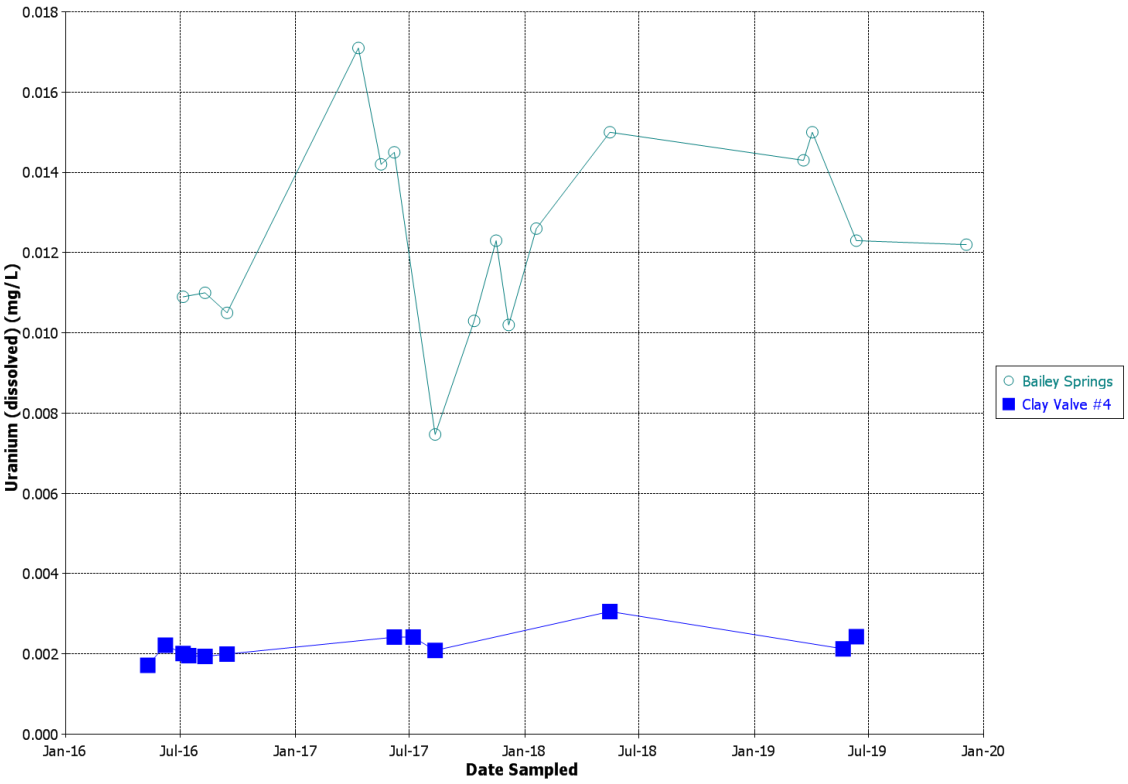

Figure D-28: Plot of dissolved uranium in Bailey Springs and Clay Valve #4 (all data)

APPENDIX E - LABORATORY REPORTS

CERTIFICATE OF ANALYSIS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon) #200 - 2800 29th Street Vernon, BC V1T 9P9		
ATTENTION	Nicole Penner	**WORK ORDER**	9092777
PO NUMBER		**RECEIVED / TEMP**	2019-09-27 09:50 / 2°C
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00
PROJECT INFO	2019-8456.000.000	**COC NUMBER**	No Number

Introduction:

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

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

Authorized By:

Alana Crump
Junior Account Manager

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
DMW-5 (9092777-01) | Matrix: Water | Sampled: 2019-09-26 12:34						
Anions						
Bromide	**0.12**	N/A	0.10	mg/L	2019-10-01	
Chloride	**256**	AO ≤ 250	0.10	mg/L	2019-09-28	
Fluoride	**1.52**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	**3.72**	MAC = 10	0.010	mg/L	2019-09-28	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-28	
Phosphate (as P)	**0.0084**	N/A	0.0050	mg/L	2019-09-28	
Sulfate	**225**	AO ≤ 500	1.0	mg/L	2019-09-28	
Calculated Parameters						
Hardness, Total (as CaCO3)	**588**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**3.72**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**4.31**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.573**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.0600**	N/A	0.00010	mg/L	2019-10-05	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Barium, dissolved	**0.0750**	N/A	0.0050	mg/L	2019-10-05	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Boron, dissolved	**0.102**	N/A	0.0050	mg/L	2019-10-05	
Cadmium, dissolved	**0.000021**	N/A	0.000010	mg/L	2019-10-05	
Calcium, dissolved	**138**	N/A	0.20	mg/L	2019-10-05	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Cobalt, dissolved	**0.00023**	N/A	0.00010	mg/L	2019-10-05	
Copper, dissolved	**0.00177**	N/A	0.00040	mg/L	2019-10-05	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2019-10-05	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Magnesium, dissolved	**58.9**	N/A	0.010	mg/L	2019-10-05	
Manganese, dissolved	**0.320**	N/A	0.00020	mg/L	2019-10-05	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-01	
Molybdenum, dissolved	**0.0198**	N/A	0.00010	mg/L	2019-10-05	
Nickel, dissolved	**0.00370**	N/A	0.00040	mg/L	2019-10-05	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-05	
Potassium, dissolved	**10.5**	N/A	0.10	mg/L	2019-10-05	
Selenium, dissolved	**0.00052**	N/A	0.00050	mg/L	2019-10-05	
Silicon, dissolved	**15.4**	N/A	1.0	mg/L	2019-10-05	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-05	
Sodium, dissolved	**211**	N/A	0.10	mg/L	2019-10-05	
Strontium, dissolved	**2.09**	N/A	0.0010	mg/L	2019-10-05	
Sulfur, dissolved	**85.1**	N/A	3.0	mg/L	2019-10-05	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
DMW-5 (9092777-01) | Matrix: Water | Sampled: 2019-09-26 12:34, Continued						
Dissolved Metals, Continued						
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-05	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-05	
Uranium, dissolved	**0.0284**	N/A	0.000020	mg/L	2019-10-05	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-05	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2019-10-05	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
General Parameters						
Alkalinity, Total (as CaCO3)	**514**	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Bicarbonate (as CaCO3)	**514**	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Ammonia, Total (as N)	**0.023**	None Required	0.020	mg/L	2019-09-30	
Nitrogen, Total Kjeldahl	**0.596**	N/A	0.050	mg/L	2019-09-29	
Phosphorus, Total (as P)	**0.0226**	N/A	0.0020	mg/L	2019-10-03	
Phosphorus, Total Dissolved	**0.0224**	N/A	0.0020	mg/L	2019-10-03	
Solids, Total Dissolved	**1240**	AO ≤ 500	15	mg/L	2019-10-02	
DMW-4 (9092777-02) | Matrix: Water | Sampled: 2019-09-26 13:35						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**115**	AO ≤ 250	0.10	mg/L	2019-09-28	
Fluoride	**0.44**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	**0.724**	MAC = 10	0.010	mg/L	2019-09-28	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-28	
Phosphate (as P)	**0.160**	N/A	0.0050	mg/L	2019-09-28	
Sulfate	**98.6**	AO ≤ 500	1.0	mg/L	2019-09-28	
Calculated Parameters						
Hardness, Total (as CaCO3)	**341**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.724**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**1.28**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.559**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.0192**	N/A	0.00010	mg/L	2019-10-05	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
DMW-4 (9092777-02) | Matrix: Water | Sampled: 2019-09-26 13:35, Continued						
Dissolved Metals, Continued						
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Arsenic, dissolved	**0.00213**	N/A	0.00050	mg/L	2019-10-05	
Barium, dissolved	**0.0304**	N/A	0.0050	mg/L	2019-10-05	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Boron, dissolved	**0.207**	N/A	0.0050	mg/L	2019-10-05	
Cadmium, dissolved	**0.000294**	N/A	0.000010	mg/L	2019-10-05	
Calcium, dissolved	**96.3**	N/A	0.20	mg/L	2019-10-05	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Cobalt, dissolved	**0.00069**	N/A	0.00010	mg/L	2019-10-05	
Copper, dissolved	**0.0201**	N/A	0.00040	mg/L	2019-10-05	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2019-10-05	
Lead, dissolved	**0.00032**	N/A	0.00020	mg/L	2019-10-05	
Magnesium, dissolved	**24.3**	N/A	0.010	mg/L	2019-10-05	
Manganese, dissolved	**0.00039**	N/A	0.00020	mg/L	2019-10-05	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-01	
Molybdenum, dissolved	**0.0167**	N/A	0.00010	mg/L	2019-10-05	
Nickel, dissolved	**0.00183**	N/A	0.00040	mg/L	2019-10-05	
Phosphorus, dissolved	**0.284**	N/A	0.050	mg/L	2019-10-05	
Potassium, dissolved	**16.6**	N/A	0.10	mg/L	2019-10-05	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Silicon, dissolved	**11.1**	N/A	1.0	mg/L	2019-10-05	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-05	
Sodium, dissolved	**119**	N/A	0.10	mg/L	2019-10-05	
Strontium, dissolved	**0.873**	N/A	0.0010	mg/L	2019-10-05	
Sulfur, dissolved	**37.4**	N/A	3.0	mg/L	2019-10-05	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-05	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-05	
Uranium, dissolved	**0.00768**	N/A	0.000020	mg/L	2019-10-05	
Vanadium, dissolved	**0.0029**	N/A	0.0010	mg/L	2019-10-05	
Zinc, dissolved	**0.0331**	N/A	0.0040	mg/L	2019-10-05	
Zirconium, dissolved	**0.00014**	N/A	0.00010	mg/L	2019-10-05	
General Parameters						
Alkalinity, Total (as CaCO3)	**368**	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Bicarbonate (as CaCO3)	**368**	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
DMW-4 (9092777-02) | Matrix: Water | Sampled: 2019-09-26 13:35, Continued						
General Parameters, Continued						
Ammonia, Total (as N)	< 0.020	None Required	0.020	mg/L	2019-09-30	
Nitrogen, Total Kjeldahl	**0.559**	N/A	0.050	mg/L	2019-09-29	
Phosphorus, Total (as P)	**0.284**	N/A	0.0020	mg/L	2019-10-03	
Phosphorus, Total Dissolved	**0.275**	N/A	0.0020	mg/L	2019-10-03	
Solids, Total Dissolved	**747**	AO ≤ 500	15	mg/L	2019-10-02	
DMW-1 (9092777-03) | Matrix: Water | Sampled: 2019-09-26 14:45						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**70.2**	AO ≤ 250	0.10	mg/L	2019-09-28	
Fluoride	**0.24**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	**3.04**	MAC = 10	0.010	mg/L	2019-09-28	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-28	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-28	
Sulfate	**277**	AO ≤ 500	1.0	mg/L	2019-09-28	
Calculated Parameters						
Hardness, Total (as CaCO3)	**486**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**3.04**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**3.16**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.119**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.00875**	N/A	0.00010	mg/L	2019-10-05	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Arsenic, dissolved	**0.00087**	N/A	0.00050	mg/L	2019-10-05	
Barium, dissolved	**0.0362**	N/A	0.0050	mg/L	2019-10-05	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Boron, dissolved	**0.0319**	N/A	0.0050	mg/L	2019-10-05	
Cadmium, dissolved	**0.000019**	N/A	0.000010	mg/L	2019-10-05	
Calcium, dissolved	**93.4**	N/A	0.20	mg/L	2019-10-05	
Chromium, dissolved	**0.00606**	N/A	0.00050	mg/L	2019-10-05	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-05	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2019-10-05	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Magnesium, dissolved	**61.2**	N/A	0.010	mg/L	2019-10-05	
Manganese, dissolved	**0.00182**	N/A	0.00020	mg/L	2019-10-05	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-01	
Molybdenum, dissolved	**0.00844**	N/A	0.00010	mg/L	2019-10-05	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
DMW-1 (9092777-03) | Matrix: Water | Sampled: 2019-09-26 14:45, Continued						
Dissolved Metals, Continued						
Nickel, dissolved	**0.00117**	N/A	0.00040	mg/L	2019-10-05	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-05	
Potassium, dissolved	**6.10**	N/A	0.10	mg/L	2019-10-05	
Selenium, dissolved	**0.0316**	N/A	0.00050	mg/L	2019-10-05	
Silicon, dissolved	**10.9**	N/A	1.0	mg/L	2019-10-05	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-05	
Sodium, dissolved	**46.9**	N/A	0.10	mg/L	2019-10-05	
Strontium, dissolved	**1.10**	N/A	0.0010	mg/L	2019-10-05	
Sulfur, dissolved	**98.4**	N/A	3.0	mg/L	2019-10-05	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-05	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-05	
Uranium, dissolved	**0.0216**	N/A	0.000020	mg/L	2019-10-05	
Vanadium, dissolved	**0.0025**	N/A	0.0010	mg/L	2019-10-05	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2019-10-05	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
General Parameters						
Alkalinity, Total (as CaCO3)	**223**	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Bicarbonate (as CaCO3)	**223**	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-27	
Ammonia, Total (as N)	< 0.020	None Required	0.020	mg/L	2019-09-30	
Nitrogen, Total Kjeldahl	**0.119**	N/A	0.050	mg/L	2019-09-29	
Phosphorus, Total (as P)	**0.0149**	N/A	0.0020	mg/L	2019-10-03	
Phosphorus, Total Dissolved	**0.0146**	N/A	0.0020	mg/L	2019-10-03	
Solids, Total Dissolved	**777**	AO ≤ 500	15	mg/L	2019-10-02	
MW11-02 (9092777-04) | Matrix: Water | Sampled: 2019-09-26 16:30						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**110**	AO ≤ 250	0.10	mg/L	2019-09-28	
Fluoride	**0.23**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	**8.98**	MAC = 10	0.010	mg/L	2019-09-28	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-28	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-28	
Sulfate	**729**	AO ≤ 500	1.0	mg/L	2019-09-28	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW11-02 (9092777-04) | Matrix: Water | Sampled: 2019-09-26 16:30, Continued						
Calculated Parameters						
Hardness, Total (as CaCO3)	**948**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**8.98**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**9.53**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.503**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.0187**	N/A	0.00010	mg/L	2019-10-05	
Aluminum, dissolved	**0.0107**	N/A	0.0050	mg/L	2019-10-05	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Arsenic, dissolved	**0.00070**	N/A	0.00050	mg/L	2019-10-05	
Barium, dissolved	**0.0312**	N/A	0.0050	mg/L	2019-10-05	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Boron, dissolved	**0.140**	N/A	0.0050	mg/L	2019-10-05	
Cadmium, dissolved	**0.000106**	N/A	0.000010	mg/L	2019-10-05	
Calcium, dissolved	**225**	N/A	0.20	mg/L	2019-10-05	
Chromium, dissolved	**0.00178**	N/A	0.00050	mg/L	2019-10-05	
Cobalt, dissolved	**0.00381**	N/A	0.00010	mg/L	2019-10-05	
Copper, dissolved	**0.00220**	N/A	0.00040	mg/L	2019-10-05	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2019-10-05	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Magnesium, dissolved	**93.3**	N/A	0.010	mg/L	2019-10-05	
Manganese, dissolved	**0.00512**	N/A	0.00020	mg/L	2019-10-05	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-01	
Molybdenum, dissolved	**0.00703**	N/A	0.00010	mg/L	2019-10-05	
Nickel, dissolved	**0.0160**	N/A	0.00040	mg/L	2019-10-05	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-05	
Potassium, dissolved	**9.21**	N/A	0.10	mg/L	2019-10-05	
Selenium, dissolved	**0.0211**	N/A	0.00050	mg/L	2019-10-05	
Silicon, dissolved	**14.2**	N/A	1.0	mg/L	2019-10-05	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-05	
Sodium, dissolved	**124**	N/A	0.10	mg/L	2019-10-05	
Strontium, dissolved	**1.47**	N/A	0.0010	mg/L	2019-10-05	
Sulfur, dissolved	**239**	N/A	3.0	mg/L	2019-10-05	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-05	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-05	
Uranium, dissolved	**0.0304**	N/A	0.000020	mg/L	2019-10-05	
Vanadium, dissolved	**0.0018**	N/A	0.0010	mg/L	2019-10-05	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2019-10-05	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW11-02 (9092777-04) | Matrix: Water | Sampled: 2019-09-26 16:30, Continued						
Dissolved Metals, Continued						
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
General Parameters						
Alkalinity, Total (as CaCO3)	**380**	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Bicarbonate (as CaCO3)	**380**	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-30	
Ammonia, Total (as N)	**0.048**	None Required	0.020	mg/L	2019-09-30	
Nitrogen, Total Kjeldahl	**0.551**	N/A	0.050	mg/L	2019-09-29	
Phosphorus, Total (as P)	**0.392**	N/A	0.0020	mg/L	2019-10-03	
Phosphorus, Total Dissolved	**0.0323**	N/A	0.0020	mg/L	2019-10-03	
Solids, Total Dissolved	**1600**	AO ≤ 500	15	mg/L	2019-10-02	
WTN 39421 (9092777-05) | Matrix: Water | Sampled: 2019-09-26 17:40						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**36.7**	AO ≤ 250	0.10	mg/L	2019-09-28	
Fluoride	**0.18**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	**2.35**	MAC = 10	0.010	mg/L	2019-09-28	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-28	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-28	
Sulfate	**309**	AO ≤ 500	1.0	mg/L	2019-09-28	
Calculated Parameters						
Hardness, Total (as CaCO3)	**451**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**2.35**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**2.35**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.00736**	N/A	0.00010	mg/L	2019-10-05	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Arsenic, dissolved	**0.00070**	N/A	0.00050	mg/L	2019-10-05	
Barium, dissolved	**0.0425**	N/A	0.0050	mg/L	2019-10-05	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Boron, dissolved	**0.0243**	N/A	0.0050	mg/L	2019-10-05	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-05	
Calcium, dissolved	**99.6**	N/A	0.20	mg/L	2019-10-05	
Chromium, dissolved	**0.00206**	N/A	0.00050	mg/L	2019-10-05	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
WTN 39421 (9092777-05) | Matrix: Water | Sampled: 2019-09-26 17:40, Continued						
Dissolved Metals, Continued						
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-05	
Iron, dissolved	**0.023**	N/A	0.010	mg/L	2019-10-05	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Magnesium, dissolved	**49.1**	N/A	0.010	mg/L	2019-10-05	
Manganese, dissolved	**0.00182**	N/A	0.00020	mg/L	2019-10-05	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-01	
Molybdenum, dissolved	**0.00732**	N/A	0.00010	mg/L	2019-10-05	
Nickel, dissolved	**0.00086**	N/A	0.00040	mg/L	2019-10-05	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-05	
Potassium, dissolved	**6.28**	N/A	0.10	mg/L	2019-10-05	
Selenium, dissolved	**0.0347**	N/A	0.00050	mg/L	2019-10-05	
Silicon, dissolved	**12.3**	N/A	1.0	mg/L	2019-10-05	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-05	
Sodium, dissolved	**39.7**	N/A	0.10	mg/L	2019-10-05	
Strontium, dissolved	**1.06**	N/A	0.0010	mg/L	2019-10-05	
Sulfur, dissolved	**113**	N/A	3.0	mg/L	2019-10-05	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-05	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-05	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-05	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-05	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-05	
Uranium, dissolved	**0.00466**	N/A	0.000020	mg/L	2019-10-05	
Vanadium, dissolved	**0.0051**	N/A	0.0010	mg/L	2019-10-05	
Zinc, dissolved	**0.0192**	N/A	0.0040	mg/L	2019-10-05	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-05	
General Parameters						
Alkalinity, Total (as CaCO3)	**179**	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Bicarbonate (as CaCO3)	**179**	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-30	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-09-30	
Ammonia, Total (as N)	< 0.020	None Required	0.020	mg/L	2019-09-30	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	mg/L	2019-09-29	
Phosphorus, Total (as P)	**0.0108**	N/A	0.0020	mg/L	2019-10-03	
Phosphorus, Total Dissolved	**0.0037**	N/A	0.0020	mg/L	2019-10-03	
Solids, Total Dissolved	**736**	AO ≤ 500	15	mg/L	2019-10-02	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

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
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
Mercury, dissolved 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
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	Kelowna
Solids, Total Dissolved in Water	SM 2540 C* (2017)	Gravimetry (Dried at 103-105C)	Kelowna

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

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, Feb 2017)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

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:acrump@caro.ca

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

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 B9I2451										
Blank (B9I2451-BLK1)				Prepared: 2019-09-28, Analyzed: 2019-09-28						
Chloride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Phosphate (as P)	< 0.0050	0.0050	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B9I2451-BLK2)				Prepared: 2019-09-28, Analyzed: 2019-09-28						
Chloride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Phosphate (as P)	< 0.0050	0.0050	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B9I2451-BS1)				Prepared: 2019-09-28, Analyzed: 2019-09-28						
Chloride	16.1	0.10	mg/L	16.0		101	90-110			
Nitrate (as N)	3.94	0.010	mg/L	4.00		99	90-110			
Nitrite (as N)	2.10	0.010	mg/L	2.00		105	85-115			
Phosphate (as P)	1.03	0.0050	mg/L	1.00		103	80-120			
Sulfate	15.8	1.0	mg/L	16.0		99	90-110			
LCS (B9I2451-BS2)				Prepared: 2019-09-28, Analyzed: 2019-09-28						
Chloride	15.8	0.10	mg/L	16.0		99	90-110			
Nitrate (as N)	3.94	0.010	mg/L	4.00		99	90-110			
Nitrite (as N)	2.11	0.010	mg/L	2.00		106	85-115			
Phosphate (as P)	1.03	0.0050	mg/L	1.00		103	80-120			
Sulfate	15.7	1.0	mg/L	16.0		98	90-110			
Anions, Batch B9I2586										
Blank (B9I2586-BLK1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Bromide	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Blank (B9I2586-BLK2)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Bromide	< 0.10	0.10	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9I2586, Continued										
Blank (B9I2586-BLK2), Continued				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Fluoride	< 0.10	0.10	mg/L							
LCS (B9I2586-BS1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Bromide	3.90	0.10	mg/L	4.00		97	85-115			
Fluoride	3.97	0.10	mg/L	4.00		99	88-108			
LCS (B9I2586-BS2)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Bromide	4.05	0.10	mg/L	4.00		101	85-115			
Fluoride	4.06	0.10	mg/L	4.00		101	88-108			
Dissolved Metals, Batch B9J0144										
Blank (B9J0144-BLK1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Blank (B9J0144-BLK2)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Reference (B9J0144-SRM1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Mercury, dissolved	0.00525	0.000010	mg/L	0.00489		107	80-120			
Reference (B9J0144-SRM2)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Mercury, dissolved	0.00459	0.000010	mg/L	0.00489		94	80-120			
Dissolved Metals, Batch B9J0332										
Blank (B9J0332-BLK1)				Prepared: 2019-10-05, Analyzed: 2019-10-05						
Lithium, dissolved	< 0.00010	0.00010	mg/L							
Aluminum, dissolved	< 0.0050	0.0050	mg/L							
Antimony, dissolved	< 0.00020	0.00020	mg/L							
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	< 0.0050	0.0050	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							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9J0332, Continued										
Blank (B9J0332-BLK1), Continued				Prepared: 2019-10-05, Analyzed: 2019-10-05						
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 (B9J0332-BS1)				Prepared: 2019-10-05, Analyzed: 2019-10-05						
Lithium, dissolved	0.0208	0.00010	mg/L	0.0200		104	80-120			
Aluminum, dissolved	0.0206	0.0050	mg/L	0.0199		103	80-120			
Antimony, dissolved	0.0215	0.00020	mg/L	0.0200		107	80-120			
Arsenic, dissolved	0.0201	0.00050	mg/L	0.0200		100	80-120			
Barium, dissolved	0.0196	0.0050	mg/L	0.0198		99	80-120			
Beryllium, dissolved	0.0198	0.00010	mg/L	0.0198		100	80-120			
Bismuth, dissolved	0.0206	0.00010	mg/L	0.0200		103	80-120			
Boron, dissolved	0.0177	0.0050	mg/L	0.0200		89	80-120			
Cadmium, dissolved	0.0195	0.000010	mg/L	0.0199		98	80-120			
Calcium, dissolved	1.97	0.20	mg/L	2.02		97	80-120			
Chromium, dissolved	0.0201	0.00050	mg/L	0.0198		102	80-120			
Cobalt, dissolved	0.0206	0.00010	mg/L	0.0199		103	80-120			
Copper, dissolved	0.0208	0.00040	mg/L	0.0200		104	80-120			
Iron, dissolved	1.90	0.010	mg/L	2.02		94	80-120			
Lead, dissolved	0.0205	0.00020	mg/L	0.0199		103	80-120			
Magnesium, dissolved	1.92	0.010	mg/L	2.02		95	80-120			
Manganese, dissolved	0.0200	0.00020	mg/L	0.0199		101	80-120			
Molybdenum, dissolved	0.0198	0.00010	mg/L	0.0200		99	80-120			
Nickel, dissolved	0.0205	0.00040	mg/L	0.0200		103	80-120			
Phosphorus, dissolved	1.95	0.050	mg/L	2.00		98	80-120			
Potassium, dissolved	1.87	0.10	mg/L	2.02		92	80-120			
Selenium, dissolved	0.0195	0.00050	mg/L	0.0200		97	80-120			
Silicon, dissolved	1.9	1.0	mg/L	2.00		94	80-120			
Silver, dissolved	0.0194	0.000050	mg/L	0.0200		97	80-120			
Sodium, dissolved	1.93	0.10	mg/L	2.02		96	80-120			
Strontium, dissolved	0.0200	0.0010	mg/L	0.0200		100	80-120			
Sulfur, dissolved	4.5	3.0	mg/L	5.00		90	80-120			
Tellurium, dissolved	0.0203	0.00050	mg/L	0.0200		102	80-120			
Thallium, dissolved	0.0204	0.000020	mg/L	0.0199		102	80-120			
Thorium, dissolved	0.0200	0.00010	mg/L	0.0200		100	80-120			
Tin, dissolved	0.0201	0.00020	mg/L	0.0200		101	80-120			
Titanium, dissolved	0.0208	0.0050	mg/L	0.0200		104	80-120			
Tungsten, dissolved	0.0202	0.0010	mg/L	0.0200		101	80-120			
Uranium, dissolved	0.0197	0.000020	mg/L	0.0200		99	80-120			
Vanadium, dissolved	0.0202	0.0010	mg/L	0.0200		101	80-120			
Zinc, dissolved	0.0211	0.0040	mg/L	0.0200		106	80-120			
Zirconium, dissolved	0.0199	0.00010	mg/L	0.0200		100	80-120			
Reference (B9J0332-SRM1)				Prepared: 2019-10-05, Analyzed: 2019-10-05						
Lithium, dissolved	0.104	0.00010	mg/L	0.100		104	77-127			
Aluminum, dissolved	0.224	0.0050	mg/L	0.235		95	79-114			
Antimony, dissolved	0.0445	0.00020	mg/L	0.0431		103	89-123			
Arsenic, dissolved	0.443	0.00050	mg/L	0.423		105	87-113			
Barium, dissolved	3.00	0.0050	mg/L	3.30		91	85-114			
Beryllium, dissolved	0.210	0.00010	mg/L	0.209		100	79-122			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9J0332, Continued										
Reference (B9J0332-SRM1), Continued				Prepared: 2019-10-05, Analyzed: 2019-10-05						
Boron, dissolved	1.49	0.0050	mg/L	1.65		90	79-117			
Cadmium, dissolved	0.215	0.000010	mg/L	0.221		97	89-112			
Calcium, dissolved	7.46	0.20	mg/L	7.72		97	85-120			
Chromium, dissolved	0.441	0.00050	mg/L	0.434		102	87-113			
Cobalt, dissolved	0.129	0.00010	mg/L	0.124		104	90-117			
Copper, dissolved	0.842	0.00040	mg/L	0.815		103	90-115			
Iron, dissolved	1.24	0.010	mg/L	1.27		98	86-112			
Lead, dissolved	0.111	0.00020	mg/L	0.110		101	90-113			
Magnesium, dissolved	6.59	0.010	mg/L	6.59		100	84-116			
Manganese, dissolved	0.341	0.00020	mg/L	0.342		100	85-113			
Molybdenum, dissolved	0.417	0.00010	mg/L	0.404		103	87-112			
Nickel, dissolved	0.852	0.00040	mg/L	0.835		102	90-114			
Phosphorus, dissolved	0.497	0.050	mg/L	0.499		100	74-119			
Potassium, dissolved	2.85	0.10	mg/L	2.88		99	78-119			
Selenium, dissolved	0.0339	0.00050	mg/L	0.0324		105	89-123			
Sodium, dissolved	17.7	0.10	mg/L	18.0		98	81-117			
Strontium, dissolved	0.913	0.0010	mg/L	0.935		98	82-111			
Thallium, dissolved	0.0397	0.000020	mg/L	0.0385		103	90-113			
Uranium, dissolved	0.250	0.000020	mg/L	0.258		97	87-113			
Vanadium, dissolved	0.868	0.0010	mg/L	0.873		99	85-110			
Zinc, dissolved	0.879	0.0040	mg/L	0.848		104	88-114			
General Parameters, Batch B9I2455										
Blank (B9I2455-BLK1)				Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Blank (B9I2455-BLK2)				Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Blank (B9I2455-BLK3)				Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
LCS (B9I2455-BS1)				Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Total (as CaCO3)	96.9	1.0	mg/L	100		97	80-120			
LCS (B9I2455-BS2)				Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Total (as CaCO3)	96.0	1.0	mg/L	100		96	80-120			
LCS (B9I2455-BS3)				Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Total (as CaCO3)	94.1	1.0	mg/L	100		94	80-120			
Duplicate (B9I2455-DUP3)		**Source: 9092777-03**		Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Total (as CaCO3)	224	1.0	mg/L		223			< 1	10	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9I2455, Continued										
Duplicate (B9I2455-DUP3), Continued		**Source: 9092777-03**		Prepared: 2019-09-27, Analyzed: 2019-09-27						
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO3)	224	1.0	mg/L		223			< 1	10	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
General Parameters, Batch B9I2539										
Blank (B9I2539-BLK1)				Prepared: 2019-09-28, Analyzed: 2019-09-29						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
Blank (B9I2539-BLK2)				Prepared: 2019-09-28, Analyzed: 2019-09-29						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
LCS (B9I2539-BS1)				Prepared: 2019-09-28, Analyzed: 2019-09-29						
Nitrogen, Total Kjeldahl	1.01	0.050	mg/L	1.00		101	85-115			
LCS (B9I2539-BS2)				Prepared: 2019-09-28, Analyzed: 2019-09-29						
Nitrogen, Total Kjeldahl	1.01	0.050	mg/L	1.00		101	85-115			
General Parameters, Batch B9I2576										
Blank (B9I2576-BLK1)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Blank (B9I2576-BLK2)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Blank (B9I2576-BLK3)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
LCS (B9I2576-BS1)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Alkalinity, Total (as CaCO3)	103	1.0	mg/L	100		103	80-120			
LCS (B9I2576-BS2)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Alkalinity, Total (as CaCO3)	96.4	1.0	mg/L	100		96	80-120			
LCS (B9I2576-BS3)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Alkalinity, Total (as CaCO3)	99.0	1.0	mg/L	100		99	80-120			
General Parameters, Batch B9I2579										
Blank (B9I2579-BLK1)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9I2579, Continued										
Blank (B9I2579-BLK2)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9I2579-BLK3)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9I2579-BLK4)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9I2579-BLK5)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
LCS (B9I2579-BS1)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	1.01	0.020	mg/L	1.00		101	90-115			
LCS (B9I2579-BS2)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	0.986	0.020	mg/L	1.00		99	90-115			
LCS (B9I2579-BS3)				Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	0.999	0.020	mg/L	1.00		100	90-115			
Duplicate (B9I2579-DUP3)		**Source: 9092777-05**		Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	< 0.020	0.020	mg/L		< 0.020				15	
Matrix Spike (B9I2579-MS3)		**Source: 9092777-05**		Prepared: 2019-09-30, Analyzed: 2019-09-30						
Ammonia, Total (as N)	0.256	0.020	mg/L	0.250	< 0.020	97	75-125			
General Parameters, Batch B9J0221										
Blank (B9J0221-BLK1)				Prepared: 2019-10-02, Analyzed: 2019-10-03						
Phosphorus, Total (as P)	< 0.0020	0.0020	mg/L							
Blank (B9J0221-BLK2)				Prepared: 2019-10-02, Analyzed: 2019-10-03						
Phosphorus, Total (as P)	< 0.0020	0.0020	mg/L							
Blank (B9J0221-BLK3)				Prepared: 2019-10-02, Analyzed: 2019-10-03						
Phosphorus, Total Dissolved	< 0.0020	0.0020	mg/L							
LCS (B9J0221-BS1)				Prepared: 2019-10-02, Analyzed: 2019-10-03						
Phosphorus, Total (as P)	0.109	0.0020	mg/L	0.100		109	85-115			
LCS (B9J0221-BS2)				Prepared: 2019-10-02, Analyzed: 2019-10-03						
Phosphorus, Total (as P)	0.108	0.0020	mg/L	0.100		108	85-115			
LCS (B9J0221-BS3)				Prepared: 2019-10-02, Analyzed: 2019-10-03						
Phosphorus, Total Dissolved	0.108	0.0020	mg/L	0.100		108	85-115			
General Parameters, Batch B9J0230										
Blank (B9J0230-BLK1)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Solids, Total Dissolved	< 15	15	mg/L							
Blank (B9J0230-BLK2)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Solids, Total Dissolved	< 15	15	mg/L							
LCS (B9J0230-BS1)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Solids, Total Dissolved	232	15	mg/L	240		97	85-115			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092777
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:00

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9J0230, Continued										
LCS (B9J0230-BS2)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Solids, Total Dissolved	238	15	mg/L	240		99	85-115			
Duplicate (B9J0230-DUP1)			**Source: 9092777-01**	Prepared: 2019-10-02, Analyzed: 2019-10-02						
Solids, Total Dissolved	1260	15	mg/L		1240			2	15	
Duplicate (B9J0230-DUP2)			**Source: 9092777-04**	Prepared: 2019-10-02, Analyzed: 2019-10-02						
Solids, Total Dissolved	1700	15	mg/L		1600			6	15	

CERTIFICATE OF ANALYSIS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon) #200 - 2800 29th Street Vernon, BC V1T 9P9		
ATTENTION	Nicole Penner	**WORK ORDER**	9092859
PO NUMBER		**RECEIVED / TEMP**	2019-09-27 16:18 / 5°C
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40
PROJECT INFO	2019-8456.000.000	**COC NUMBER**	No Number

Introduction:

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

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

Authorized By:

Alana Crump
Junior Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
WTN 24991 (9092859-01) | Matrix: Water | Sampled: 2019-09-27 09:45						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**1.44**	AO ≤ 250	0.10	mg/L	2019-09-29	
Fluoride	**0.32**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2019-09-29	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-29	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-29	
Sulfate	**79.8**	AO ≤ 500	1.0	mg/L	2019-10-03	
Calculated Parameters						
Hardness, Total (as CaCO3)	**192**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.164**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.00380**	N/A	0.00010	mg/L	2019-10-06	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Arsenic, dissolved	**0.00135**	N/A	0.00050	mg/L	2019-10-06	
Barium, dissolved	**0.0189**	N/A	0.0050	mg/L	2019-10-06	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Boron, dissolved	**0.0135**	N/A	0.0050	mg/L	2019-10-06	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Calcium, dissolved	**45.0**	N/A	0.20	mg/L	2019-10-06	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Iron, dissolved	**0.089**	N/A	0.010	mg/L	2019-10-06	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Magnesium, dissolved	**19.2**	N/A	0.010	mg/L	2019-10-06	
Manganese, dissolved	**0.0829**	N/A	0.00020	mg/L	2019-10-06	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Molybdenum, dissolved	**0.0109**	N/A	0.00010	mg/L	2019-10-06	
Nickel, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-06	
Potassium, dissolved	**3.37**	N/A	0.10	mg/L	2019-10-06	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Silicon, dissolved	**11.6**	N/A	1.0	mg/L	2019-10-06	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-06	
Sodium, dissolved	**31.6**	N/A	0.10	mg/L	2019-10-06	
Strontium, dissolved	**0.464**	N/A	0.0010	mg/L	2019-10-06	
Sulfur, dissolved	**29.4**	N/A	3.0	mg/L	2019-10-06	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
WTN 24991 (9092859-01) | Matrix: Water | Sampled: 2019-09-27 09:45, Continued						
Dissolved Metals, Continued						
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Uranium, dissolved	**0.00205**	N/A	0.000020	mg/L	2019-10-06	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2019-10-06	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
General Parameters						
Alkalinity, Total (as CaCO3)	**191**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Bicarbonate (as CaCO3)	**191**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Ammonia, Total (as N)	**0.136**	None Required	0.020	mg/L	2019-10-01	
Nitrogen, Total Kjeldahl	**0.164**	N/A	0.050	mg/L	2019-10-02	
Phosphorus, Total (as P)	**0.0128**	N/A	0.0020	mg/L	2019-10-05	
Phosphorus, Total Dissolved	**0.0097**	N/A	0.0020	mg/L	2019-10-05	
Solids, Total Dissolved	**316**	AO ≤ 500	15	mg/L	2019-10-03	
MW-5 (9092859-02) | Matrix: Water | Sampled: 2019-09-27 10:45						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**7.85**	AO ≤ 250	0.10	mg/L	2019-09-29	
Fluoride	**0.14**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2019-09-29	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-29	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-29	
Sulfate	**194**	AO ≤ 500	1.0	mg/L	2019-10-03	
Calculated Parameters						
Hardness, Total (as CaCO3)	**188**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.474**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.00110**	N/A	0.00010	mg/L	2019-10-06	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-5 (9092859-02) | Matrix: Water | Sampled: 2019-09-27 10:45, Continued						
Dissolved Metals, Continued						
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Barium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Boron, dissolved	**0.0100**	N/A	0.0050	mg/L	2019-10-06	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Calcium, dissolved	**7.59**	N/A	0.20	mg/L	2019-10-06	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2019-10-06	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Magnesium, dissolved	**41.0**	N/A	0.010	mg/L	2019-10-06	
Manganese, dissolved	**0.0361**	N/A	0.00020	mg/L	2019-10-06	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Molybdenum, dissolved	**0.00339**	N/A	0.00010	mg/L	2019-10-06	
Nickel, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-06	
Potassium, dissolved	**2.95**	N/A	0.10	mg/L	2019-10-06	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Silicon, dissolved	< 1.0	N/A	1.0	mg/L	2019-10-06	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-06	
Sodium, dissolved	**41.8**	N/A	0.10	mg/L	2019-10-06	
Strontium, dissolved	**0.0561**	N/A	0.0010	mg/L	2019-10-06	
Sulfur, dissolved	**73.5**	N/A	3.0	mg/L	2019-10-06	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Uranium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2019-10-06	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
General Parameters						
Alkalinity, Total (as CaCO3)	**67.6**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Phenolphthalein (as CaCO3)	**4.6**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Bicarbonate (as CaCO3)	**58.4**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Carbonate (as CaCO3)	**9.1**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-5 (9092859-02) | Matrix: Water | Sampled: 2019-09-27 10:45, Continued						
General Parameters, Continued						
Ammonia, Total (as N)	**0.469**	None Required	0.020	mg/L	2019-10-01	
Nitrogen, Total Kjeldahl	**0.474**	N/A	0.050	mg/L	2019-10-02	
Phosphorus, Total (as P)	**0.0063**	N/A	0.0020	mg/L	2019-10-05	
Phosphorus, Total Dissolved	< 0.0020	N/A	0.0020	mg/L	2019-10-05	
Solids, Total Dissolved	**366**	AO ≤ 500	15	mg/L	2019-10-03	
MW-5a (9092859-03) | Matrix: Water | Sampled: 2019-09-27 11:00						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**7.77**	AO ≤ 250	0.10	mg/L	2019-09-29	
Fluoride	**0.13**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2019-09-29	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-29	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-29	
Sulfate	**192**	AO ≤ 500	1.0	mg/L	2019-10-03	
Calculated Parameters						
Hardness, Total (as CaCO3)	**185**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.444**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.00110**	N/A	0.00010	mg/L	2019-10-06	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Barium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Boron, dissolved	**0.0097**	N/A	0.0050	mg/L	2019-10-06	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Calcium, dissolved	**7.54**	N/A	0.20	mg/L	2019-10-06	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Iron, dissolved	**0.018**	N/A	0.010	mg/L	2019-10-06	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Magnesium, dissolved	**40.3**	N/A	0.010	mg/L	2019-10-06	
Manganese, dissolved	**0.0380**	N/A	0.00020	mg/L	2019-10-06	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Molybdenum, dissolved	**0.00329**	N/A	0.00010	mg/L	2019-10-06	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-5a (9092859-03) | Matrix: Water | Sampled: 2019-09-27 11:00, Continued						
Dissolved Metals, Continued						
Nickel, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-06	
Potassium, dissolved	**2.94**	N/A	0.10	mg/L	2019-10-06	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Silicon, dissolved	< 1.0	N/A	1.0	mg/L	2019-10-06	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-06	
Sodium, dissolved	**41.7**	N/A	0.10	mg/L	2019-10-06	
Strontium, dissolved	**0.0555**	N/A	0.0010	mg/L	2019-10-06	
Sulfur, dissolved	**74.0**	N/A	3.0	mg/L	2019-10-06	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Uranium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2019-10-06	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
General Parameters						
Alkalinity, Total (as CaCO3)	**68.6**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Phenolphthalein (as CaCO3)	**5.3**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Bicarbonate (as CaCO3)	**57.9**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Carbonate (as CaCO3)	**10.7**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Ammonia, Total (as N)	**0.436**	None Required	0.020	mg/L	2019-10-01	
Nitrogen, Total Kjeldahl	**0.444**	N/A	0.050	mg/L	2019-10-02	
Phosphorus, Total (as P)	**0.0056**	N/A	0.0020	mg/L	2019-10-05	
Phosphorus, Total Dissolved	< 0.0020	N/A	0.0020	mg/L	2019-10-05	
Solids, Total Dissolved	**359**	AO ≤ 500	15	mg/L	2019-10-03	
DMW-3 (9092859-04) | Matrix: Water | Sampled: 2019-09-27 12:45						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**95.0**	AO ≤ 250	0.10	mg/L	2019-09-29	
Fluoride	**0.71**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	**0.132**	MAC = 10	0.010	mg/L	2019-09-29	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-29	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-29	
Sulfate	**143**	AO ≤ 500	1.0	mg/L	2019-10-03	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
DMW-3 (9092859-04) | Matrix: Water | Sampled: 2019-09-27 12:45, Continued						
Calculated Parameters						
Hardness, Total (as CaCO3)	**575**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.132**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.538**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.378**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.0193**	N/A	0.00010	mg/L	2019-10-06	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Antimony, dissolved	**0.00047**	N/A	0.00020	mg/L	2019-10-06	
Arsenic, dissolved	**0.00063**	N/A	0.00050	mg/L	2019-10-06	
Barium, dissolved	**0.0306**	N/A	0.0050	mg/L	2019-10-06	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Boron, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Cadmium, dissolved	**0.000080**	N/A	0.000010	mg/L	2019-10-06	
Calcium, dissolved	**155**	N/A	0.20	mg/L	2019-10-06	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Cobalt, dissolved	**0.00059**	N/A	0.00010	mg/L	2019-10-06	
Copper, dissolved	**0.00315**	N/A	0.00040	mg/L	2019-10-06	
Iron, dissolved	**1.45**	N/A	0.010	mg/L	2019-10-06	
Lead, dissolved	**0.00208**	N/A	0.00020	mg/L	2019-10-06	
Magnesium, dissolved	**45.5**	N/A	0.010	mg/L	2019-10-06	
Manganese, dissolved	**0.293**	N/A	0.00020	mg/L	2019-10-06	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Molybdenum, dissolved	**0.00862**	N/A	0.00010	mg/L	2019-10-06	
Nickel, dissolved	**0.00187**	N/A	0.00040	mg/L	2019-10-06	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-06	
Potassium, dissolved	**7.87**	N/A	0.10	mg/L	2019-10-06	
Selenium, dissolved	**0.00497**	N/A	0.00050	mg/L	2019-10-06	
Silicon, dissolved	**15.3**	N/A	1.0	mg/L	2019-10-06	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-06	
Sodium, dissolved	**68.2**	N/A	0.10	mg/L	2019-10-06	
Strontium, dissolved	**1.18**	N/A	0.0010	mg/L	2019-10-06	
Sulfur, dissolved	**53.6**	N/A	3.0	mg/L	2019-10-06	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Uranium, dissolved	**0.00550**	N/A	0.000020	mg/L	2019-10-06	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Zinc, dissolved	**0.0828**	N/A	0.0040	mg/L	2019-10-06	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
DMW-3 (9092859-04) | Matrix: Water | Sampled: 2019-09-27 12:45, Continued						
Dissolved Metals, Continued						
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
General Parameters						
Alkalinity, Total (as CaCO3)	**481**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Bicarbonate (as CaCO3)	**481**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Ammonia, Total (as N)	**0.028**	None Required	0.020	mg/L	2019-10-01	
Nitrogen, Total Kjeldahl	**0.406**	N/A	0.050	mg/L	2019-10-02	
Phosphorus, Total (as P)	< 0.0020	N/A	0.0020	mg/L	2019-10-05	
Phosphorus, Total Dissolved	< 0.0020	N/A	0.0020	mg/L	2019-10-05	
Solids, Total Dissolved	**877**	AO ≤ 500	15	mg/L	2019-10-03	
MW-2 (9092859-05) | Matrix: Water | Sampled: 2019-09-27 14:35						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	**51.5**	AO ≤ 250	0.10	mg/L	2019-09-29	
Fluoride	**0.33**	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	**0.121**	MAC = 10	0.010	mg/L	2019-09-29	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-29	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-29	
Sulfate	**326**	AO ≤ 500	1.0	mg/L	2019-10-03	
Calculated Parameters						
Hardness, Total (as CaCO3)	**476**	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	**0.121**	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	**0.412**	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	**0.263**	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	**0.00770**	N/A	0.00010	mg/L	2019-10-06	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Arsenic, dissolved	**0.00068**	N/A	0.00050	mg/L	2019-10-06	
Barium, dissolved	**0.0458**	N/A	0.0050	mg/L	2019-10-06	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Boron, dissolved	**0.0229**	N/A	0.0050	mg/L	2019-10-06	
Cadmium, dissolved	**0.000056**	N/A	0.000010	mg/L	2019-10-06	
Calcium, dissolved	**88.7**	N/A	0.20	mg/L	2019-10-06	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-2 (9092859-05) | Matrix: Water | Sampled: 2019-09-27 14:35, Continued						
Dissolved Metals, Continued						
Cobalt, dissolved	**0.00064**	N/A	0.00010	mg/L	2019-10-06	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Iron, dissolved	**0.254**	N/A	0.010	mg/L	2019-10-06	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Magnesium, dissolved	**61.6**	N/A	0.010	mg/L	2019-10-06	
Manganese, dissolved	**0.315**	N/A	0.00020	mg/L	2019-10-06	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Molybdenum, dissolved	**0.0126**	N/A	0.00010	mg/L	2019-10-06	
Nickel, dissolved	**0.00189**	N/A	0.00040	mg/L	2019-10-06	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-06	
Potassium, dissolved	**6.09**	N/A	0.10	mg/L	2019-10-06	
Selenium, dissolved	**0.00178**	N/A	0.00050	mg/L	2019-10-06	
Silicon, dissolved	**10.0**	N/A	1.0	mg/L	2019-10-06	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-06	
Sodium, dissolved	**52.0**	N/A	0.10	mg/L	2019-10-06	
Strontium, dissolved	**0.986**	N/A	0.0010	mg/L	2019-10-06	
Sulfur, dissolved	**116**	N/A	3.0	mg/L	2019-10-06	
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Uranium, dissolved	**0.0129**	N/A	0.000020	mg/L	2019-10-06	
Vanadium, dissolved	**0.0011**	N/A	0.0010	mg/L	2019-10-06	
Zinc, dissolved	**0.688**	N/A	0.0040	mg/L	2019-10-06	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
General Parameters						
Alkalinity, Total (as CaCO3)	**218**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Bicarbonate (as CaCO3)	**218**	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Ammonia, Total (as N)	**0.028**	None Required	0.020	mg/L	2019-10-01	
Nitrogen, Total Kjeldahl	**0.291**	N/A	0.050	mg/L	2019-10-02	
Phosphorus, Total (as P)	**0.0602**	N/A	0.0020	mg/L	2019-10-05	
Phosphorus, Total Dissolved	**0.0263**	N/A	0.0020	mg/L	2019-10-05	
Solids, Total Dissolved	**796**	AO ≤ 500	15	mg/L	2019-10-03	
Field Blank (9092859-06) | Matrix: Water | Sampled: 2019-09-27 14:20						

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Field Blank (9092859-06) | Matrix: Water | Sampled: 2019-09-27 14:20, Continued						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	< 0.10	AO ≤ 250	0.10	mg/L	2019-09-29	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2019-09-29	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-29	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-29	
Sulfate	< 1.0	AO ≤ 500	1.0	mg/L	2019-09-29	
Calculated Parameters						
Hardness, Total (as CaCO3)	< 0.500	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	< 0.0500	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	< 0.0500	N/A	0.0500	mg/L	N/A	
Dissolved Metals						
Lithium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Aluminum, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Antimony, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Arsenic, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Barium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Beryllium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Bismuth, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Boron, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Cadmium, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Calcium, dissolved	< 0.20	N/A	0.20	mg/L	2019-10-06	
Chromium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Cobalt, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Copper, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Iron, dissolved	< 0.010	N/A	0.010	mg/L	2019-10-06	
Lead, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Magnesium, dissolved	< 0.010	N/A	0.010	mg/L	2019-10-06	
Manganese, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Mercury, dissolved	< 0.000010	N/A	0.000010	mg/L	2019-10-06	
Molybdenum, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Nickel, dissolved	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Phosphorus, dissolved	< 0.050	N/A	0.050	mg/L	2019-10-06	
Potassium, dissolved	< 0.10	N/A	0.10	mg/L	2019-10-06	
Selenium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Silicon, dissolved	< 1.0	N/A	1.0	mg/L	2019-10-06	
Silver, dissolved	< 0.000050	N/A	0.000050	mg/L	2019-10-06	
Sodium, dissolved	< 0.10	N/A	0.10	mg/L	2019-10-06	
Strontium, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Sulfur, dissolved	< 3.0	N/A	3.0	mg/L	2019-10-06	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Field Blank (9092859-06) | Matrix: Water | Sampled: 2019-09-27 14:20, Continued						
Dissolved Metals, Continued						
Tellurium, dissolved	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Thallium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Thorium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Tin, dissolved	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Titanium, dissolved	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Tungsten, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Uranium, dissolved	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Vanadium, dissolved	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Zinc, dissolved	< 0.0040	N/A	0.0040	mg/L	2019-10-06	
Zirconium, dissolved	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
General Parameters						
Alkalinity, Total (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Ammonia, Total (as N)	< 0.020	None Required	0.020	mg/L	2019-10-01	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	mg/L	2019-10-02	
Phosphorus, Total (as P)	< 0.0020	N/A	0.0020	mg/L	2019-10-05	
Phosphorus, Total Dissolved	< 0.0020	N/A	0.0020	mg/L	2019-10-05	
Solids, Total Dissolved	< 15	AO ≤ 500	15	mg/L	2019-10-03	
Trip Blank (9092859-07) | Matrix: Water | Sampled: 2019-09-27						
Anions						
Bromide	< 0.10	N/A	0.10	mg/L	2019-10-01	
Chloride	< 0.10	AO ≤ 250	0.10	mg/L	2019-09-29	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	2019-10-01	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2019-09-29	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2019-09-29	
Phosphate (as P)	< 0.0050	N/A	0.0050	mg/L	2019-09-29	
Sulfate	< 1.0	AO ≤ 500	1.0	mg/L	2019-09-29	
Calculated Parameters						
Hardness, Total (as CaCO3)	< 0.500	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	
Nitrogen, Total	< 0.0500	N/A	0.0500	mg/L	N/A	
Nitrogen, Organic	< 0.0500	N/A	0.0500	mg/L	N/A	
General Parameters						
Alkalinity, Total (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	

TEST RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
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Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Trip Blank (9092859-07) | Matrix: Water | Sampled: 2019-09-27, Continued						
General Parameters, Continued						
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	2019-10-03	
Ammonia, Total (as N)	< 0.020	None Required	0.020	mg/L	2019-10-01	
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	mg/L	2019-10-02	
Phosphorus, Total (as P)	< 0.0020	N/A	0.0020	mg/L	2019-10-05	
Solids, Total Dissolved	< 15	AO ≤ 500	15	mg/L	2019-10-03	
Total Metals						
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2019-10-06	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2019-10-06	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2019-10-06	
Barium, total	< 0.0050	MAC = 1	0.0050	mg/L	2019-10-06	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Boron, total	< 0.0050	MAC = 5	0.0050	mg/L	2019-10-06	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2019-10-06	
Calcium, total	< 0.20	None Required	0.20	mg/L	2019-10-06	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2019-10-06	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Copper, total	< 0.00040	MAC = 2	0.00040	mg/L	2019-10-06	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2019-10-06	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2019-10-06	
Lithium, total	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Magnesium, total	< 0.010	None Required	0.010	mg/L	2019-10-06	
Manganese, total	< 0.00020	MAC = 0.12	0.00020	mg/L	2019-10-06	
Mercury, total	**0.000029**	MAC = 0.001	0.000010	mg/L	2019-10-06	
Molybdenum, total	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Nickel, total	< 0.00040	N/A	0.00040	mg/L	2019-10-06	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2019-10-06	
Potassium, total	< 0.10	N/A	0.10	mg/L	2019-10-06	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2019-10-06	
Silicon, total	< 1.0	N/A	1.0	mg/L	2019-10-06	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2019-10-06	
Sodium, total	< 0.10	AO ≤ 200	0.10	mg/L	2019-10-06	
Strontium, total	< 0.0010	7	0.0010	mg/L	2019-10-06	
Sulfur, total	< 3.0	N/A	3.0	mg/L	2019-10-06	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2019-10-06	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2019-10-06	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2019-10-06	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2019-10-06	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2019-10-06	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2019-10-06	

TEST RESULTS

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Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Trip Blank (9092859-07) | Matrix: Water | Sampled: 2019-09-27, Continued						
Total Metals, Continued						
Uranium, total	< 0.000020	MAC = 0.02	0.000020	mg/L	2019-10-06	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2019-10-06	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2019-10-06	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2019-10-06	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
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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
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
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
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
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	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	HNO3+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)
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Health Canada, Feb 2017)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

APPENDIX 1: SUPPORTING INFORMATION

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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:acrump@caro.ca

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
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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 B9I2505										
Blank (B9I2505-BLK1)				Prepared: 2019-09-29, Analyzed: 2019-09-29						
Chloride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Phosphate (as P)	< 0.0050	0.0050	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B9I2505-BLK2)				Prepared: 2019-09-29, Analyzed: 2019-09-29						
Chloride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Nitrite (as N)	< 0.010	0.010	mg/L							
Phosphate (as P)	< 0.0050	0.0050	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B9I2505-BS1)				Prepared: 2019-09-29, Analyzed: 2019-09-29						
Chloride	16.1	0.10	mg/L	16.0		100	90-110			
Nitrate (as N)	3.86	0.010	mg/L	4.00		96	90-110			
Nitrite (as N)	2.02	0.010	mg/L	2.00		101	85-115			
Phosphate (as P)	0.991	0.0050	mg/L	1.00		99	80-120			
Sulfate	16.1	1.0	mg/L	16.0		101	90-110			
LCS (B9I2505-BS2)				Prepared: 2019-09-29, Analyzed: 2019-09-29						
Chloride	16.2	0.10	mg/L	16.0		101	90-110			
Nitrate (as N)	4.03	0.010	mg/L	4.00		101	90-110			
Nitrite (as N)	1.93	0.010	mg/L	2.00		96	85-115			
Phosphate (as P)	0.951	0.0050	mg/L	1.00		95	80-120			
Sulfate	16.0	1.0	mg/L	16.0		100	90-110			
Anions, Batch B9I2586										
Blank (B9I2586-BLK1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Bromide	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Blank (B9I2586-BLK2)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Bromide	< 0.10	0.10	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9I2586, Continued										
Blank (B9I2586-BLK2), Continued				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Fluoride	< 0.10	0.10	mg/L							
LCS (B9I2586-BS1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Bromide	3.90	0.10	mg/L	4.00		97	85-115			
Fluoride	3.97	0.10	mg/L	4.00		99	88-108			
LCS (B9I2586-BS2)				Prepared: 2019-10-02, Analyzed: 2019-10-02						
Bromide	4.05	0.10	mg/L	4.00		101	85-115			
Fluoride	4.06	0.10	mg/L	4.00		101	88-108			
Dissolved Metals, Batch B9J0462										
Blank (B9J0462-BLK1)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Lithium, dissolved	< 0.00010	0.00010	mg/L							
Aluminum, dissolved	< 0.0050	0.0050	mg/L							
Antimony, dissolved	< 0.00020	0.00020	mg/L							
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	< 0.0050	0.0050	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 (B9J0462-BS1)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Lithium, dissolved	0.0212	0.00010	mg/L	0.0199		107	80-120			
Aluminum, dissolved	0.0224	0.0050	mg/L	0.0200		112	80-120			
Antimony, dissolved	0.0207	0.00020	mg/L	0.0200		104	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9J0462, Continued										
LCS (B9J0462-BS1), Continued				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Arsenic, dissolved	0.0205	0.00050	mg/L	0.0200		103	80-120			
Barium, dissolved	0.0201	0.0050	mg/L	0.0200		100	80-120			
Beryllium, dissolved	0.0227	0.00010	mg/L	0.0200		113	80-120			
Bismuth, dissolved	0.0220	0.00010	mg/L	0.0200		110	80-120			
Boron, dissolved	0.0176	0.0050	mg/L	0.0200		88	80-120			
Cadmium, dissolved	0.0200	0.000010	mg/L	0.0200		100	80-120			
Calcium, dissolved	2.33	0.20	mg/L	2.02		115	80-120			
Chromium, dissolved	0.0194	0.00050	mg/L	0.0200		97	80-120			
Cobalt, dissolved	0.0200	0.00010	mg/L	0.0200		100	80-120			
Copper, dissolved	0.0203	0.00040	mg/L	0.0200		102	80-120			
Iron, dissolved	1.91	0.010	mg/L	2.02		95	80-120			
Lead, dissolved	0.0217	0.00020	mg/L	0.0200		108	80-120			
Magnesium, dissolved	1.96	0.010	mg/L	2.02		97	80-120			
Manganese, dissolved	0.0201	0.00020	mg/L	0.0200		100	80-120			
Molybdenum, dissolved	0.0196	0.00010	mg/L	0.0200		98	80-120			
Nickel, dissolved	0.0203	0.00040	mg/L	0.0200		102	80-120			
Phosphorus, dissolved	1.97	0.050	mg/L	2.00		98	80-120			
Potassium, dissolved	1.86	0.10	mg/L	2.02		92	80-120			
Selenium, dissolved	0.0194	0.00050	mg/L	0.0200		97	80-120			
Silicon, dissolved	2.1	1.0	mg/L	2.00		103	80-120			
Silver, dissolved	0.0205	0.000050	mg/L	0.0200		102	80-120			
Sodium, dissolved	1.81	0.10	mg/L	2.02		90	80-120			
Strontium, dissolved	0.0198	0.0010	mg/L	0.0200		99	80-120			
Sulfur, dissolved	4.4	3.0	mg/L	5.00		88	80-120			
Tellurium, dissolved	0.0233	0.00050	mg/L	0.0200		116	80-120			
Thallium, dissolved	0.0218	0.000020	mg/L	0.0200		109	80-120			
Thorium, dissolved	0.0211	0.00010	mg/L	0.0200		106	80-120			
Tin, dissolved	0.0213	0.00020	mg/L	0.0200		106	80-120			
Titanium, dissolved	0.0207	0.0050	mg/L	0.0200		103	80-120			
Tungsten, dissolved	0.0213	0.0010	mg/L	0.0200		106	80-120			
Uranium, dissolved	0.0213	0.000020	mg/L	0.0200		107	80-120			
Vanadium, dissolved	0.0191	0.0010	mg/L	0.0200		96	80-120			
Zinc, dissolved	0.0213	0.0040	mg/L	0.0200		107	80-120			
Zirconium, dissolved	0.0204	0.00010	mg/L	0.0200		102	80-120			
LCS (B9J0462-BS2)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Lithium, dissolved	0.0211	0.00010	mg/L	0.0199		106	80-120			
Aluminum, dissolved	0.0227	0.0050	mg/L	0.0200		113	80-120			
Antimony, dissolved	0.0209	0.00020	mg/L	0.0200		104	80-120			
Arsenic, dissolved	0.0209	0.00050	mg/L	0.0200		104	80-120			
Barium, dissolved	0.0199	0.0050	mg/L	0.0200		100	80-120			
Beryllium, dissolved	0.0220	0.00010	mg/L	0.0200		110	80-120			
Bismuth, dissolved	0.0213	0.00010	mg/L	0.0200		107	80-120			
Boron, dissolved	0.0174	0.0050	mg/L	0.0200		87	80-120			
Cadmium, dissolved	0.0204	0.000010	mg/L	0.0200		102	80-120			
Calcium, dissolved	2.01	0.20	mg/L	2.02		99	80-120			
Chromium, dissolved	0.0200	0.00050	mg/L	0.0200		100	80-120			
Cobalt, dissolved	0.0205	0.00010	mg/L	0.0200		102	80-120			
Copper, dissolved	0.0208	0.00040	mg/L	0.0200		104	80-120			
Iron, dissolved	1.96	0.010	mg/L	2.02		97	80-120			
Lead, dissolved	0.0210	0.00020	mg/L	0.0200		105	80-120			
Magnesium, dissolved	2.04	0.010	mg/L	2.02		101	80-120			
Manganese, dissolved	0.0209	0.00020	mg/L	0.0200		105	80-120			
Molybdenum, dissolved	0.0197	0.00010	mg/L	0.0200		99	80-120			
Nickel, dissolved	0.0207	0.00040	mg/L	0.0200		103	80-120			
Phosphorus, dissolved	2.07	0.050	mg/L	2.00		104	80-120			

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REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9J0462, Continued										
LCS (B9J0462-BS2), Continued				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Potassium, dissolved	1.93	0.10	mg/L	2.02		96	80-120			
Selenium, dissolved	0.0195	0.00050	mg/L	0.0200		98	80-120			
Silicon, dissolved	2.2	1.0	mg/L	2.00		111	80-120			
Silver, dissolved	0.0207	0.000050	mg/L	0.0200		104	80-120			
Sodium, dissolved	1.88	0.10	mg/L	2.02		93	80-120			
Strontium, dissolved	0.0199	0.0010	mg/L	0.0200		100	80-120			
Sulfur, dissolved	5.0	3.0	mg/L	5.00		100	80-120			
Tellurium, dissolved	0.0237	0.00050	mg/L	0.0200		118	80-120			
Thallium, dissolved	0.0210	0.000020	mg/L	0.0200		105	80-120			
Thorium, dissolved	0.0204	0.00010	mg/L	0.0200		102	80-120			
Tin, dissolved	0.0213	0.00020	mg/L	0.0200		107	80-120			
Titanium, dissolved	0.0212	0.0050	mg/L	0.0200		106	80-120			
Tungsten, dissolved	0.0215	0.0010	mg/L	0.0200		107	80-120			
Uranium, dissolved	0.0206	0.000020	mg/L	0.0200		103	80-120			
Vanadium, dissolved	0.0196	0.0010	mg/L	0.0200		98	80-120			
Zinc, dissolved	0.0201	0.0040	mg/L	0.0200		100	80-120			
Zirconium, dissolved	0.0208	0.00010	mg/L	0.0200		104	80-120			
Reference (B9J0462-SRM1)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Lithium, dissolved	0.103	0.00010	mg/L	0.100		103	77-127			
Aluminum, dissolved	0.232	0.0050	mg/L	0.235		99	79-114			
Antimony, dissolved	0.0432	0.00020	mg/L	0.0431		100	89-123			
Arsenic, dissolved	0.455	0.00050	mg/L	0.423		108	87-113			
Barium, dissolved	3.10	0.0050	mg/L	3.30		94	85-114			
Beryllium, dissolved	0.230	0.00010	mg/L	0.209		110	79-122			
Boron, dissolved	1.50	0.0050	mg/L	1.65		91	79-117			
Cadmium, dissolved	0.223	0.000010	mg/L	0.221		101	89-112			
Calcium, dissolved	7.78	0.20	mg/L	7.72		101	85-120			
Chromium, dissolved	0.431	0.00050	mg/L	0.434		99	87-113			
Cobalt, dissolved	0.126	0.00010	mg/L	0.124		102	90-117			
Copper, dissolved	0.840	0.00040	mg/L	0.815		103	90-115			
Iron, dissolved	1.27	0.010	mg/L	1.27		100	86-112			
Lead, dissolved	0.114	0.00020	mg/L	0.110		104	90-113			
Magnesium, dissolved	6.60	0.010	mg/L	6.59		100	84-116			
Manganese, dissolved	0.343	0.00020	mg/L	0.342		100	85-113			
Molybdenum, dissolved	0.416	0.00010	mg/L	0.404		103	87-112			
Nickel, dissolved	0.851	0.00040	mg/L	0.835		102	90-114			
Phosphorus, dissolved	0.529	0.050	mg/L	0.499		106	74-119			
Potassium, dissolved	2.81	0.10	mg/L	2.88		98	78-119			
Selenium, dissolved	0.0336	0.00050	mg/L	0.0324		104	89-123			
Sodium, dissolved	17.4	0.10	mg/L	18.0		96	81-117			
Strontium, dissolved	0.913	0.0010	mg/L	0.935		98	82-111			
Thallium, dissolved	0.0409	0.000020	mg/L	0.0385		106	90-113			
Uranium, dissolved	0.257	0.000020	mg/L	0.258		100	87-113			
Vanadium, dissolved	0.834	0.0010	mg/L	0.873		96	85-110			
Zinc, dissolved	0.843	0.0040	mg/L	0.848		99	88-114			
Reference (B9J0462-SRM2)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Lithium, dissolved	0.105	0.00010	mg/L	0.100		105	77-127			
Aluminum, dissolved	0.235	0.0050	mg/L	0.235		100	79-114			
Antimony, dissolved	0.0420	0.00020	mg/L	0.0431		97	89-123			
Arsenic, dissolved	0.447	0.00050	mg/L	0.423		106	87-113			
Barium, dissolved	3.04	0.0050	mg/L	3.30		92	85-114			
Beryllium, dissolved	0.232	0.00010	mg/L	0.209		111	79-122			
Boron, dissolved	1.58	0.0050	mg/L	1.65		96	79-117			
Cadmium, dissolved	0.218	0.000010	mg/L	0.221		99	89-112			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9J0462, Continued										
Reference (B9J0462-SRM2), Continued				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Calcium, dissolved	7.80	0.20	mg/L	7.72		101	85-120			
Chromium, dissolved	0.430	0.00050	mg/L	0.434		99	87-113			
Cobalt, dissolved	0.126	0.00010	mg/L	0.124		101	90-117			
Copper, dissolved	0.828	0.00040	mg/L	0.815		102	90-115			
Iron, dissolved	1.25	0.010	mg/L	1.27		98	86-112			
Lead, dissolved	0.114	0.00020	mg/L	0.110		103	90-113			
Magnesium, dissolved	6.71	0.010	mg/L	6.59		102	84-116			
Manganese, dissolved	0.347	0.00020	mg/L	0.342		101	85-113			
Molybdenum, dissolved	0.409	0.00010	mg/L	0.404		101	87-112			
Nickel, dissolved	0.845	0.00040	mg/L	0.835		101	90-114			
Phosphorus, dissolved	0.522	0.050	mg/L	0.499		105	74-119			
Potassium, dissolved	2.87	0.10	mg/L	2.88		100	78-119			
Selenium, dissolved	0.0326	0.00050	mg/L	0.0324		101	89-123			
Sodium, dissolved	17.8	0.10	mg/L	18.0		99	81-117			
Strontium, dissolved	0.893	0.0010	mg/L	0.935		95	82-111			
Thallium, dissolved	0.0406	0.000020	mg/L	0.0385		106	90-113			
Uranium, dissolved	0.256	0.000020	mg/L	0.258		99	87-113			
Vanadium, dissolved	0.827	0.0010	mg/L	0.873		95	85-110			
Zinc, dissolved	0.829	0.0040	mg/L	0.848		98	88-114			
Dissolved Metals, Batch B9J0619										
Blank (B9J0619-BLK1)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Blank (B9J0619-BLK2)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Reference (B9J0619-SRM1)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, dissolved	0.00449	0.000010	mg/L	0.00489		92	80-120			
Reference (B9J0619-SRM2)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, dissolved	0.00430	0.000010	mg/L	0.00489		88	80-120			
General Parameters, Batch B9J0012										
Blank (B9J0012-BLK1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9J0012-BLK2)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9J0012-BLK3)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9J0012-BLK4)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
LCS (B9J0012-BS1)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	1.07	0.020	mg/L	1.00		107	90-115			
LCS (B9J0012-BS2)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	1.04	0.020	mg/L	1.00		104	90-115			
LCS (B9J0012-BS3)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	1.04	0.020	mg/L	1.00		104	90-115			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9J0012, Continued										
LCS (B9J0012-BS4)				Prepared: 2019-10-01, Analyzed: 2019-10-01						
Ammonia, Total (as N)	1.03	0.020	mg/L	1.00		103	90-115			
General Parameters, Batch B9J0116										
Blank (B9J0116-BLK1)				Prepared: 2019-10-01, Analyzed: 2019-10-02						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
Blank (B9J0116-BLK2)				Prepared: 2019-10-01, Analyzed: 2019-10-02						
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L							
LCS (B9J0116-BS1)				Prepared: 2019-10-01, Analyzed: 2019-10-02						
Nitrogen, Total Kjeldahl	1.06	0.050	mg/L	1.00		106	85-115			
LCS (B9J0116-BS2)				Prepared: 2019-10-01, Analyzed: 2019-10-02						
Nitrogen, Total Kjeldahl	1.07	0.050	mg/L	1.00		107	85-115			
General Parameters, Batch B9J0307										
Blank (B9J0307-BLK1)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Blank (B9J0307-BLK2)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Blank (B9J0307-BLK3)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
LCS (B9J0307-BS1)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Alkalinity, Total (as CaCO3)	99.3	1.0	mg/L	100		99	80-120			
LCS (B9J0307-BS2)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Alkalinity, Total (as CaCO3)	100	1.0	mg/L	100		100	80-120			
LCS (B9J0307-BS3)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Alkalinity, Total (as CaCO3)	102	1.0	mg/L	100		102	80-120			
Duplicate (B9J0307-DUP1)		**Source: 9092859-01**		Prepared: 2019-10-03, Analyzed: 2019-10-03						
Alkalinity, Total (as CaCO3)	189	1.0	mg/L		191			< 1	10	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO3)	189	1.0	mg/L		191			< 1	10	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9J0381										
Blank (B9J0381-BLK1)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Solids, Total Dissolved	< 15	15	mg/L							
LCS (B9J0381-BS1)				Prepared: 2019-10-03, Analyzed: 2019-10-03						
Solids, Total Dissolved	233	15	mg/L	240		97	85-115			
General Parameters, Batch B9J0469										
Blank (B9J0469-BLK1)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total Dissolved	< 0.0020	0.0020	mg/L							
Blank (B9J0469-BLK2)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total (as P)	< 0.0020	0.0020	mg/L							
Blank (B9J0469-BLK3)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total (as P)	< 0.0020	0.0020	mg/L							
Blank (B9J0469-BLK4)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total (as P)	< 0.0020	0.0020	mg/L							
LCS (B9J0469-BS1)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total Dissolved	0.102	0.0020	mg/L	0.100		102	85-115			
LCS (B9J0469-BS2)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total (as P)	0.100	0.0020	mg/L	0.100		100	85-115			
LCS (B9J0469-BS3)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total (as P)	0.102	0.0020	mg/L	0.100		102	85-115			
LCS (B9J0469-BS4)				Prepared: 2019-10-04, Analyzed: 2019-10-05						
Phosphorus, Total (as P)	0.101	0.0020	mg/L	0.100		101	85-115			
Total Metals, Batch B9J0466										
Blank (B9J0466-BLK1)				Prepared: 2019-10-04, Analyzed: 2019-10-06						
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	< 0.0050	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							
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							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9J0466, Continued										
Blank (B9J0466-BLK1), Continued				Prepared: 2019-10-04, Analyzed: 2019-10-06						
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 (B9J0466-BS1)				Prepared: 2019-10-04, Analyzed: 2019-10-06						
Aluminum, total	0.0231	0.0050	mg/L	0.0199		116	80-120			
Antimony, total	0.0232	0.00020	mg/L	0.0200		116	80-120			
Arsenic, total	0.0210	0.00050	mg/L	0.0200		105	80-120			
Barium, total	0.0200	0.0050	mg/L	0.0198		101	80-120			
Beryllium, total	0.0220	0.00010	mg/L	0.0198		111	80-120			
Bismuth, total	0.0220	0.00010	mg/L	0.0200		110	80-120			
Boron, total	0.0192	0.0050	mg/L	0.0200		96	80-120			
Cadmium, total	0.0209	0.000010	mg/L	0.0199		105	80-120			
Calcium, total	2.12	0.20	mg/L	2.02		105	80-120			
Chromium, total	0.0210	0.00050	mg/L	0.0198		106	80-120			
Cobalt, total	0.0216	0.00010	mg/L	0.0199		108	80-120			
Copper, total	0.0219	0.00040	mg/L	0.0200		110	80-120			
Iron, total	2.04	0.010	mg/L	2.02		101	80-120			
Lead, total	0.0215	0.00020	mg/L	0.0199		108	80-120			
Lithium, total	0.0221	0.00010	mg/L	0.0200		110	80-120			
Magnesium, total	2.12	0.010	mg/L	2.02		105	80-120			
Manganese, total	0.0213	0.00020	mg/L	0.0199		107	80-120			
Molybdenum, total	0.0213	0.00010	mg/L	0.0200		107	80-120			
Nickel, total	0.0217	0.00040	mg/L	0.0200		108	80-120			
Phosphorus, total	2.08	0.050	mg/L	2.00		104	80-120			
Potassium, total	2.01	0.10	mg/L	2.02		100	80-120			
Selenium, total	0.0206	0.00050	mg/L	0.0200		103	80-120			
Silicon, total	2.3	1.0	mg/L	2.00		114	80-120			
Silver, total	0.0208	0.000050	mg/L	0.0200		104	80-120			
Sodium, total	1.97	0.10	mg/L	2.02		98	80-120			
Strontium, total	0.0205	0.0010	mg/L	0.0200		103	80-120			
Sulfur, total	4.6	3.0	mg/L	5.00		93	80-120			
Tellurium, total	0.0213	0.00050	mg/L	0.0200		106	80-120			
Thallium, total	0.0216	0.000020	mg/L	0.0199		108	80-120			
Thorium, total	0.0206	0.00010	mg/L	0.0200		103	80-120			
Tin, total	0.0212	0.00020	mg/L	0.0200		106	80-120			
Titanium, total	0.0222	0.0050	mg/L	0.0200		111	80-120			
Tungsten, total	0.0217	0.0010	mg/L	0.0200		108	80-120			
Uranium, total	0.0207	0.000020	mg/L	0.0200		104	80-120			
Vanadium, total	0.0211	0.0010	mg/L	0.0200		106	80-120			
Zinc, total	0.0219	0.0040	mg/L	0.0200		109	80-120			
Zirconium, total	0.0211	0.00010	mg/L	0.0200		106	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Associated Environmental Consultants Inc. (Vernon)	**WORK ORDER**	9092859
PROJECT	COV Additional Well Testing (2019)	**REPORTED**	2019-10-08 17:40

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9J0466, Continued										
Reference (B9J0466-SRM1)				Prepared: 2019-10-04, Analyzed: 2019-10-06						
Aluminum, total	0.319	0.0050	mg/L	0.303		105	82-114			
Antimony, total	0.0535	0.00020	mg/L	0.0511		105	88-115			
Arsenic, total	0.125	0.00050	mg/L	0.118		106	88-111			
Barium, total	0.806	0.0050	mg/L	0.823		98	83-110			
Beryllium, total	0.0550	0.00010	mg/L	0.0496		111	80-119			
Boron, total	3.65	0.0050	mg/L	3.45		106	80-118			
Cadmium, total	0.0512	0.000010	mg/L	0.0495		103	90-110			
Calcium, total	11.8	0.20	mg/L	11.6		101	85-113			
Chromium, total	0.263	0.00050	mg/L	0.250		105	88-111			
Cobalt, total	0.0417	0.00010	mg/L	0.0377		111	90-114			
Copper, total	0.547	0.00040	mg/L	0.486		113	90-117			
Iron, total	0.530	0.010	mg/L	0.488		109	90-116			
Lead, total	0.214	0.00020	mg/L	0.204		105	90-110			
Lithium, total	0.433	0.00010	mg/L	0.403		108	79-118			
Magnesium, total	4.13	0.010	mg/L	3.79		109	88-116			
Manganese, total	0.115	0.00020	mg/L	0.109		106	88-108			
Molybdenum, total	0.215	0.00010	mg/L	0.198		109	88-110			
Nickel, total	0.270	0.00040	mg/L	0.249		108	90-112			
Phosphorus, total	0.257	0.050	mg/L	0.227		113	72-118			
Potassium, total	7.65	0.10	mg/L	7.21		106	87-116			
Selenium, total	0.128	0.00050	mg/L	0.121		106	90-122			
Sodium, total	7.78	0.10	mg/L	7.54		103	86-118			
Strontium, total	0.385	0.0010	mg/L	0.375		103	86-110			
Thallium, total	0.0869	0.000020	mg/L	0.0805		108	90-113			
Uranium, total	0.0320	0.000020	mg/L	0.0306		104	88-112			
Vanadium, total	0.401	0.0010	mg/L	0.386		104	87-110			
Zinc, total	2.59	0.0040	mg/L	2.49		104	90-113			
Total Metals, Batch B9J0629										
Blank (B9J0629-BLK1)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, total	< 0.000010	0.000010	mg/L							
Blank (B9J0629-BLK2)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, total	< 0.000010	0.000010	mg/L							
Reference (B9J0629-SRM1)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, total	0.00484	0.000010	mg/L	0.00489		99	80-120			
Reference (B9J0629-SRM2)				Prepared: 2019-10-06, Analyzed: 2019-10-06						
Mercury, total	0.00456	0.000010	mg/L	0.00489		93	80-120			