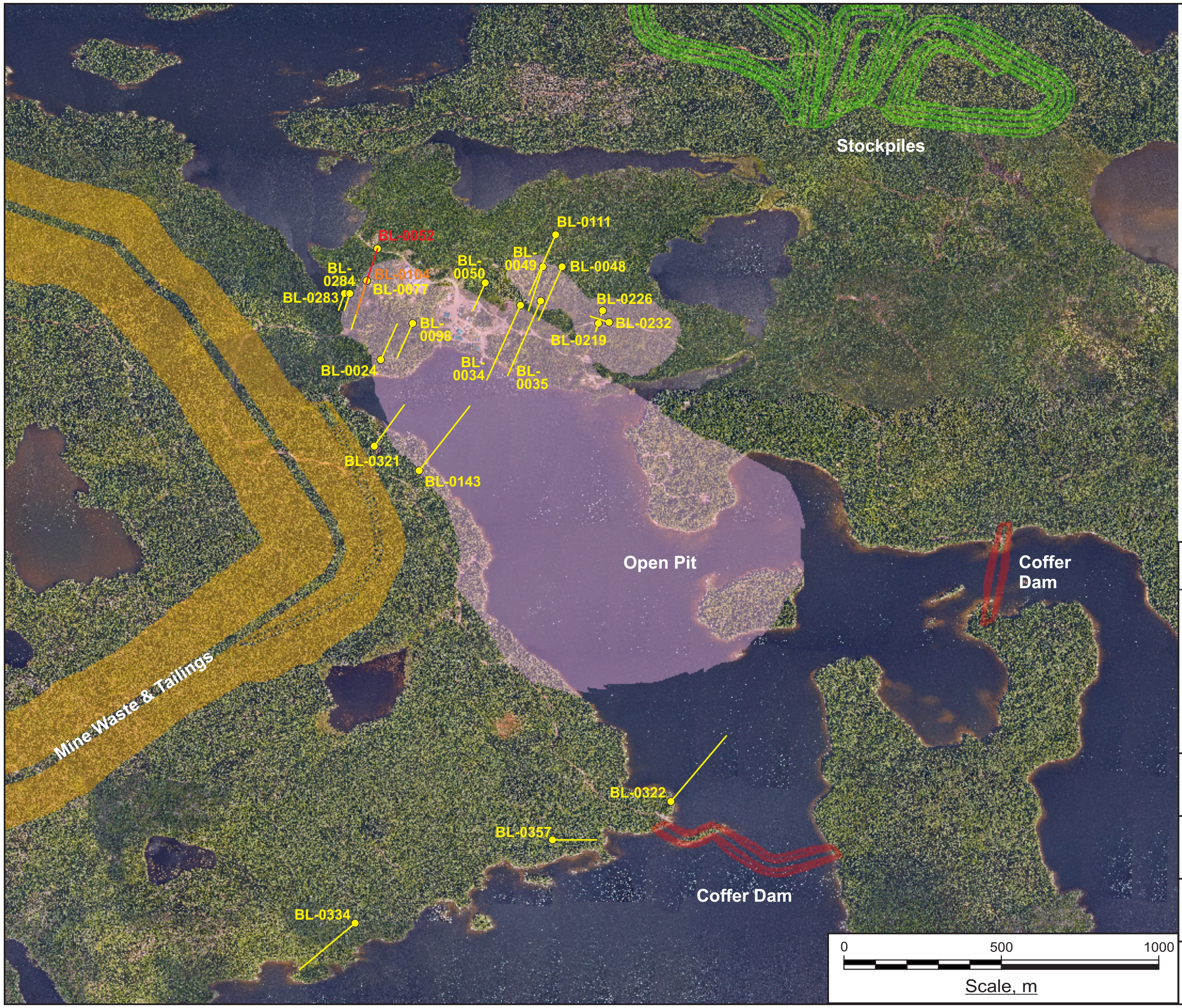


Legend

BL-0226 ●	Location of borehole collar and its trace projected to the surface (note that coloured ID and trace are used for visual clarification)

Note

1. Base orthorectified images provided by First Mining Gold/Gold Canyon Resources, 2020.
2. Trace of each borehole is based on the azimuth and dip (plunge) of the collar and the borehole depth data, that are provided by First Mining Gold/Gold Canyon Resources, 2019.

Figure 3.1

Location of boreholes that were surveyed using acoustic televiewer in 2019.

Project No.
3134

Location
Springpole, ON

Document Reference
FFC-NL-3134-002

Date
March 2021

ACOUSTIC TELEVIEWER LOG

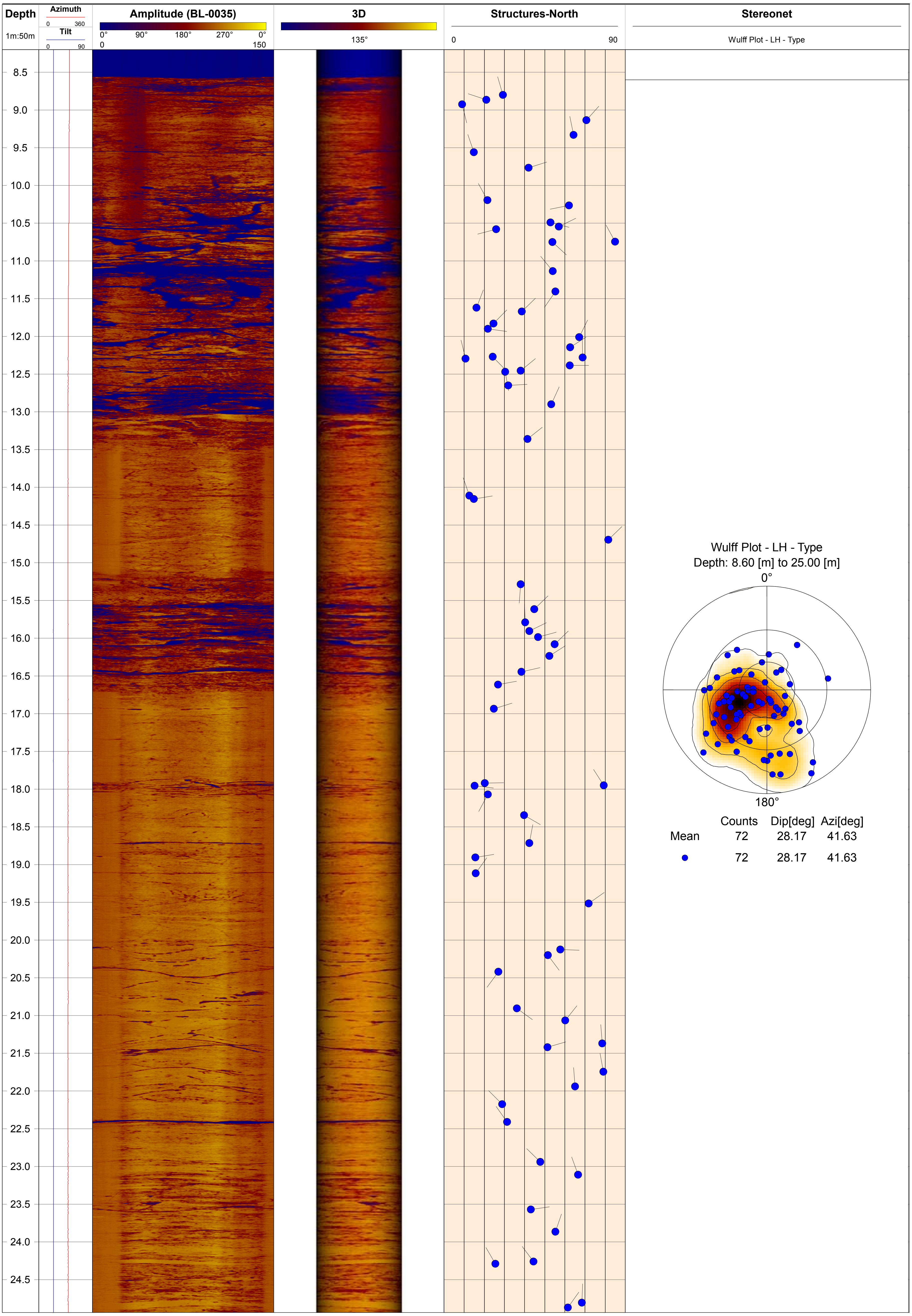
Fracflow Consultant Inc.
Environmental, Hydrogeological and
Geotechnical Engineering Consultants

Project Location:	Springpole, ON	*Easting:*	549436.7
Borehole ID:	BL-0035	*Northing:*	5694166.7
Report Date:	December 2019	*Bearing at the collar:*	204
Logging Date:	August 20, 2019	*Plunge at the collar:*	-65
Logging Depth (m):	495.8	*Borehole Depth (m):*	611.43

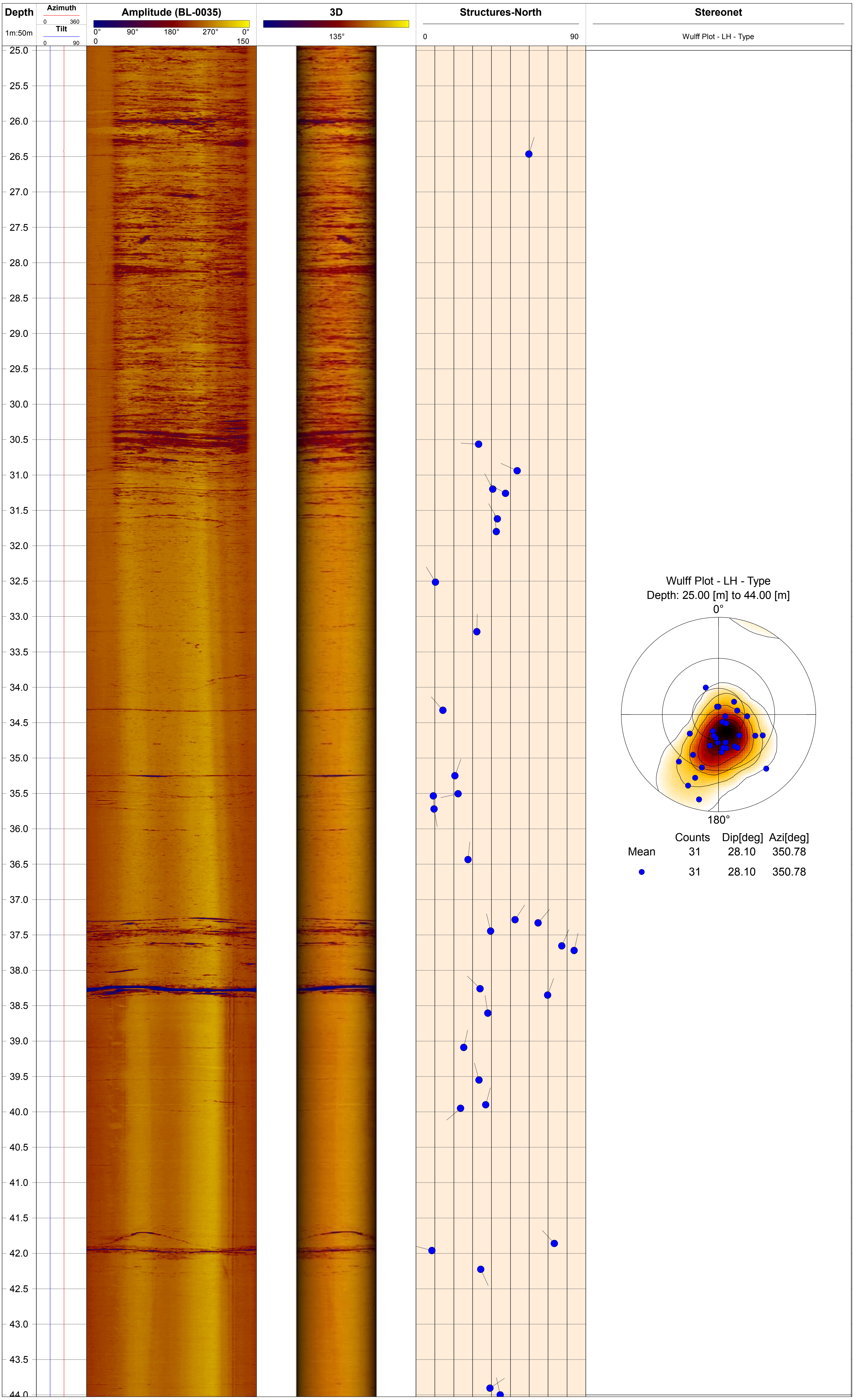
Client: First Mining Gold
/ Gold Canyon Resources

FFC Reference No: FFC-NL-3134-002

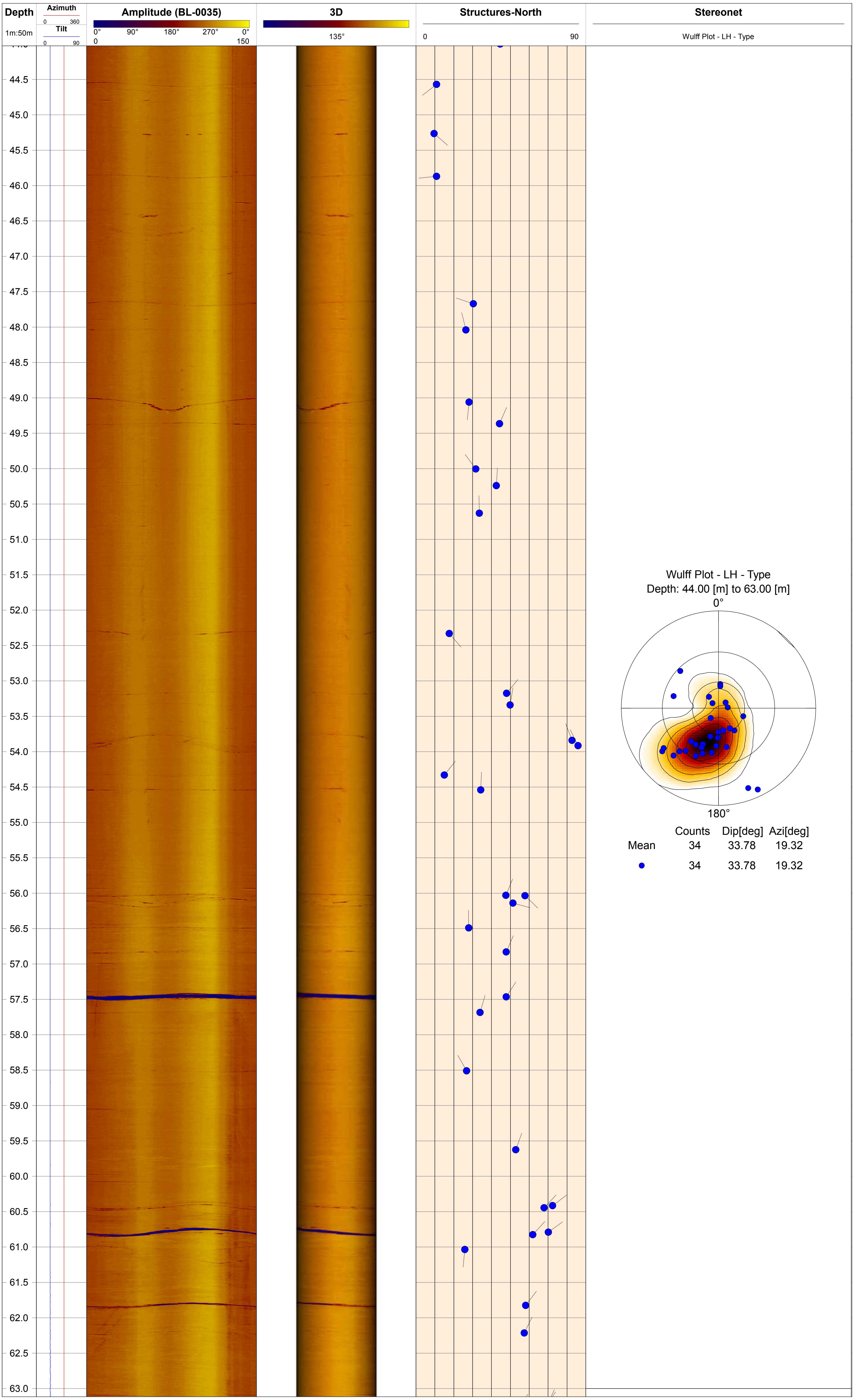
Figure No.: 3.2



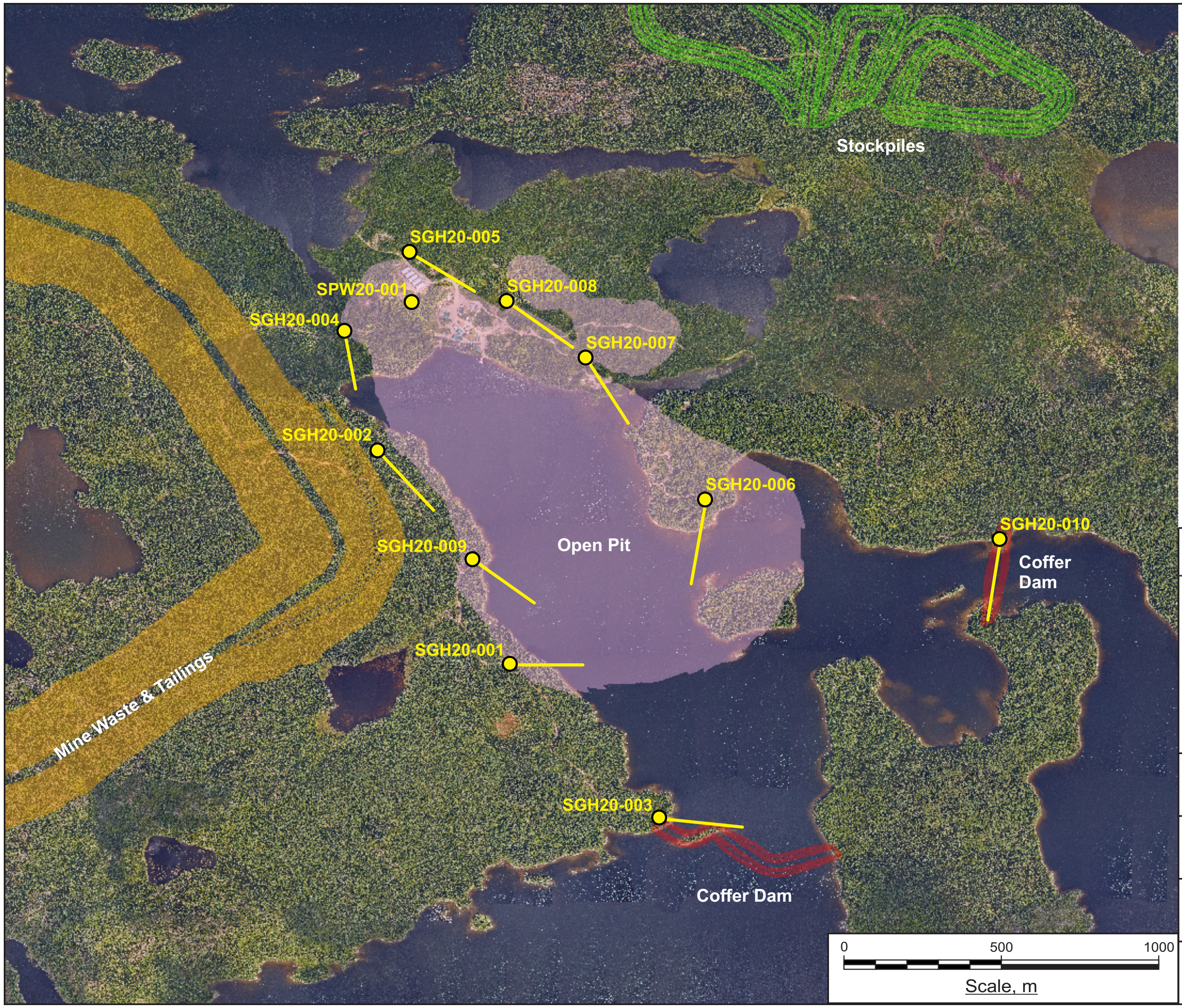
	Counts	Dip[deg]	Azi[deg]
Mean	72	28.17	41.63
●	72	28.17	41.63



	Counts	Dip[deg]	Azi[deg]
Mean	31	28.10	350.78
●	31	28.10	350.78



	Counts	Dip[deg]	Azi[deg]
Mean	34	33.78	19.32
●	34	33.78	19.32



Legend

SGH20-005 ●	Location of borehole collar and its trace projected to the surface

Note

1. Base orthorectified images provided by First Mining Gold/Gold Canyon Resources, 2020.
2. Trace of each borehole is based on the azimuth and dip (plunge) of the collar and the borehole depth data, that are provided by First Mining Gold/Gold Canyon Resources, 2020.

Figure 3.3

Location of boreholes that were surveyed using acoustic televiewer in 2020.

Project No.
3134

Location
Springpole, ON

Document Reference
FFC-NL-3134-002

Date
February 2021

FFC

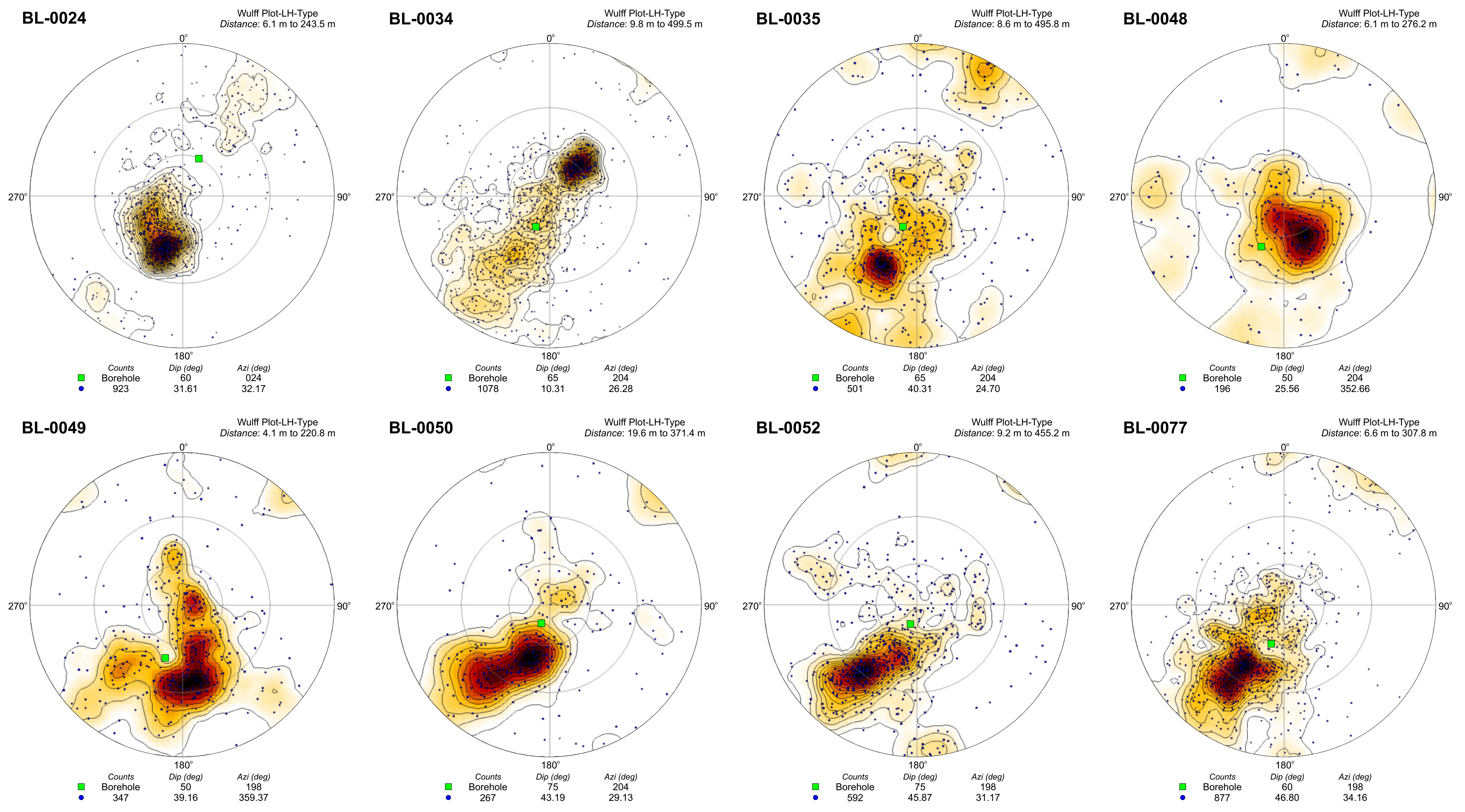


Figure 3.4a Stereonet plot for the fractures that were intersected by each borehole that was logged using acoustic televiewer in 2019 (Page 1 of 3).

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

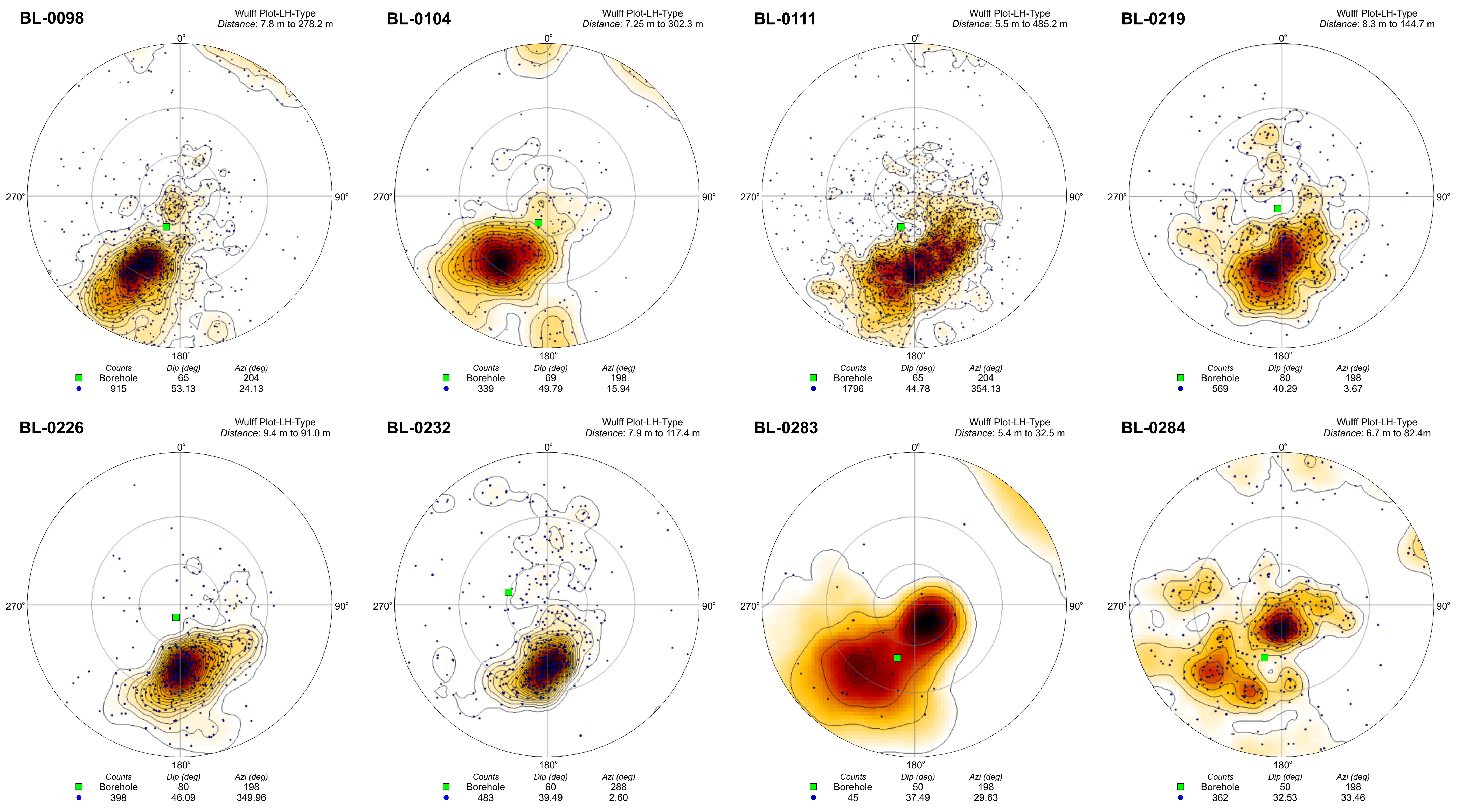
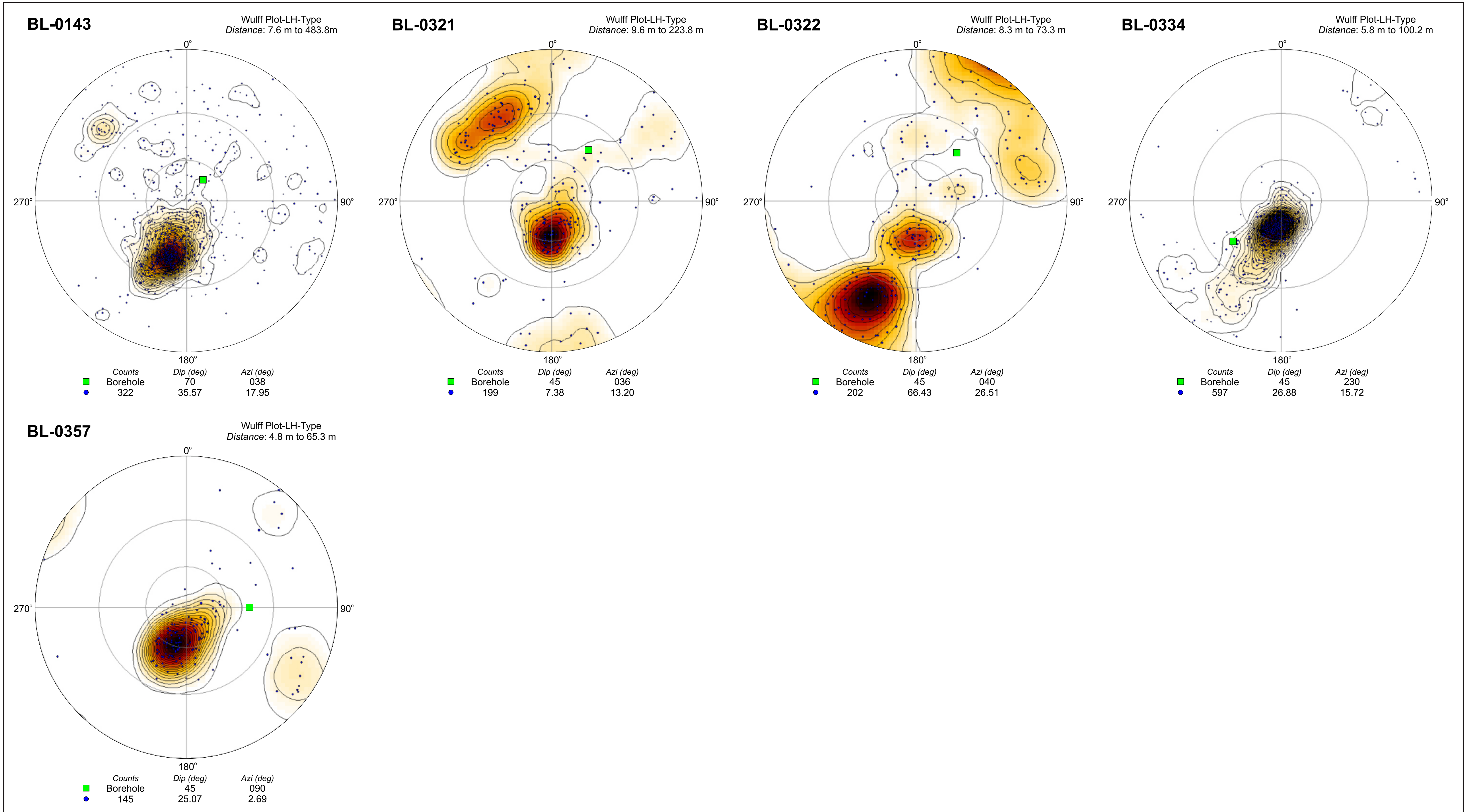


Figure 3.4a Stereonet plot for the fractures that were intersected by each borehole that was logged using acoustic televiewer in 2019 (Page 2 of 3).

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC



BL-0143

	Counts	*Dip (deg)*	*Azi (deg)*
🟩	Borehole	70	038
●	322	35.57	17.95

BL-0321

	Counts	*Dip (deg)*	*Azi (deg)*
🟩	Borehole	45	036
●	199	7.38	13.20

BL-0322

	Counts	*Dip (deg)*	*Azi (deg)*
🟩	Borehole	45	040
●	202	66.43	26.51

BL-0334

	Counts	*Dip (deg)*	*Azi (deg)*
🟩	Borehole	45	230
●	597	26.88	15.72

BL-0357

	Counts	*Dip (deg)*	*Azi (deg)*
🟩	Borehole	45	090
●	145	25.07	2.69

Figure 3.4a Stereonet plot for the fractures that were intersected by each borehole that was logged using acoustic televiewer in 2019 (Page 3 of 3).

Project No.	Document Reference
3134	FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

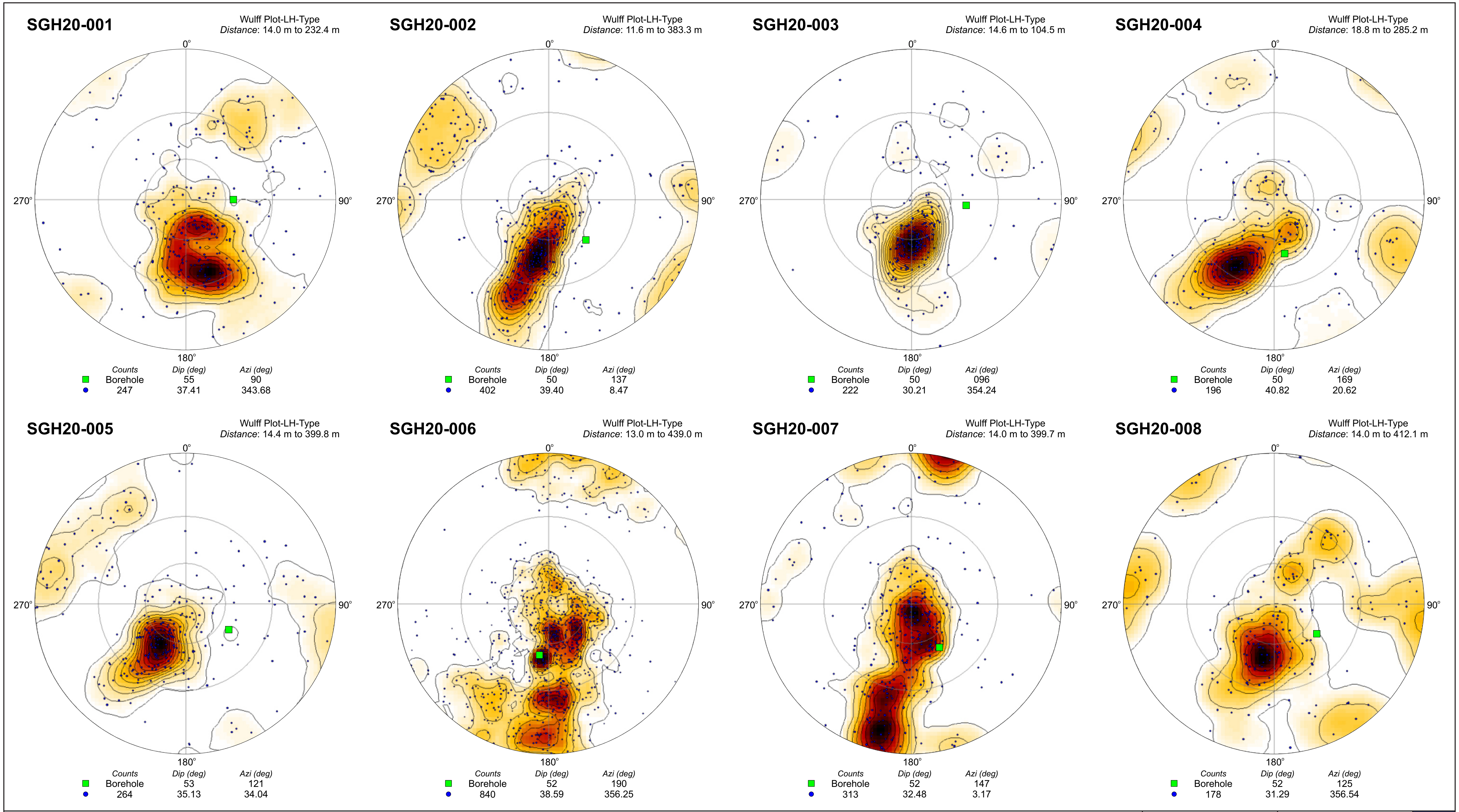


Figure 3.4b Stereonet plot for the fractures that were intersected by each borehole that was logged using acoustic televiewer in 2020 (Page 1 of 2).

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	**Date**
Springpole, ON	February 2021

FFC

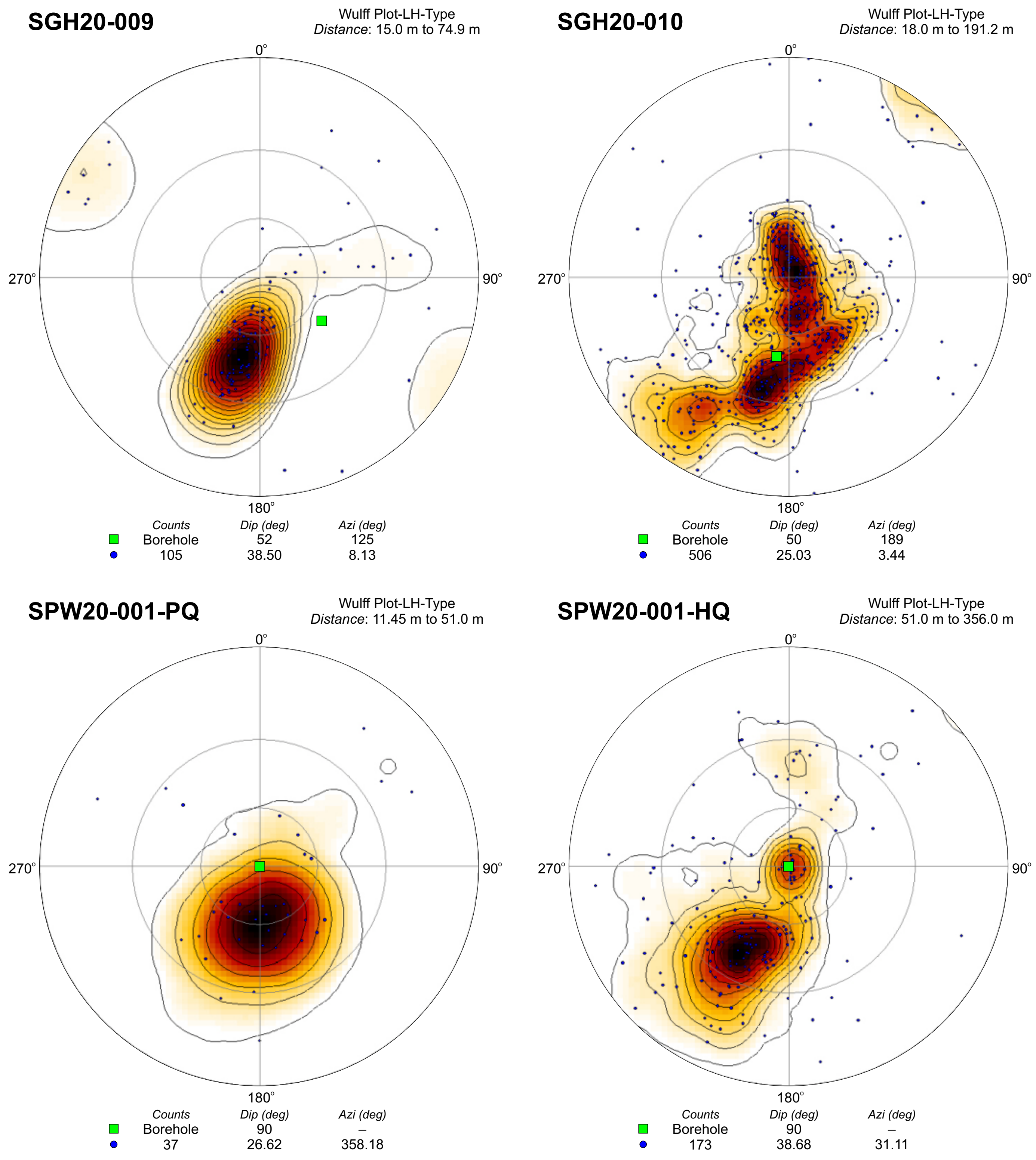


Figure 3.4b Stereonet plot for the fractures that were intersected by each borehole that was logged using acoustic televiewer in 2020 (Page 2 of 2).

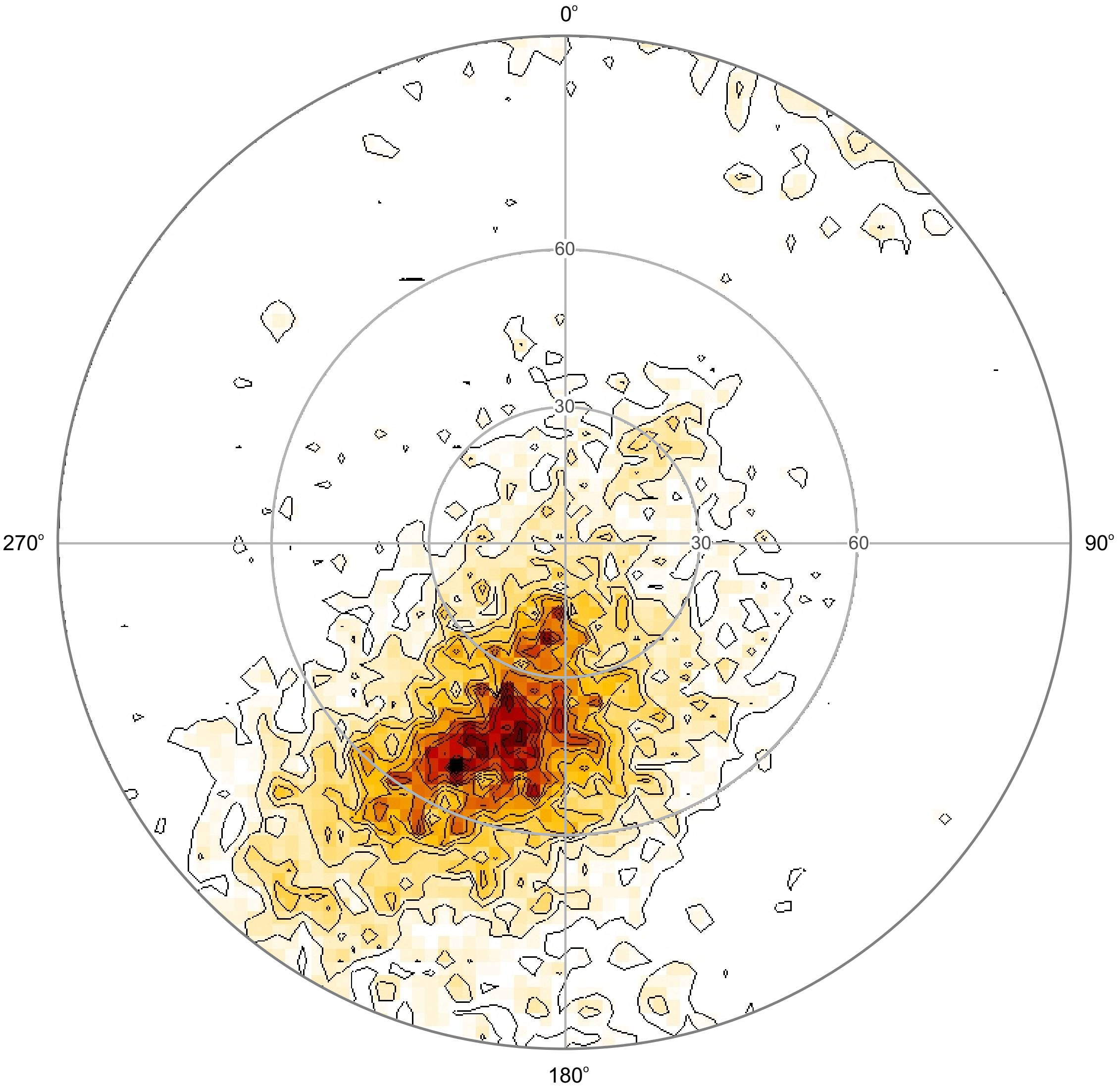
Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

FFC

NQ Boreholes

Wulff Plot-LH-Type

Distance: 4.0 m to 496.0 m



	Counts	*Dip (deg)*	*Azi (deg)*
Mean	11,753	38.24	16.19

Figure 3.5 Composite stereonet plot of fractures that were logged using acoustic televiewer in 2019.

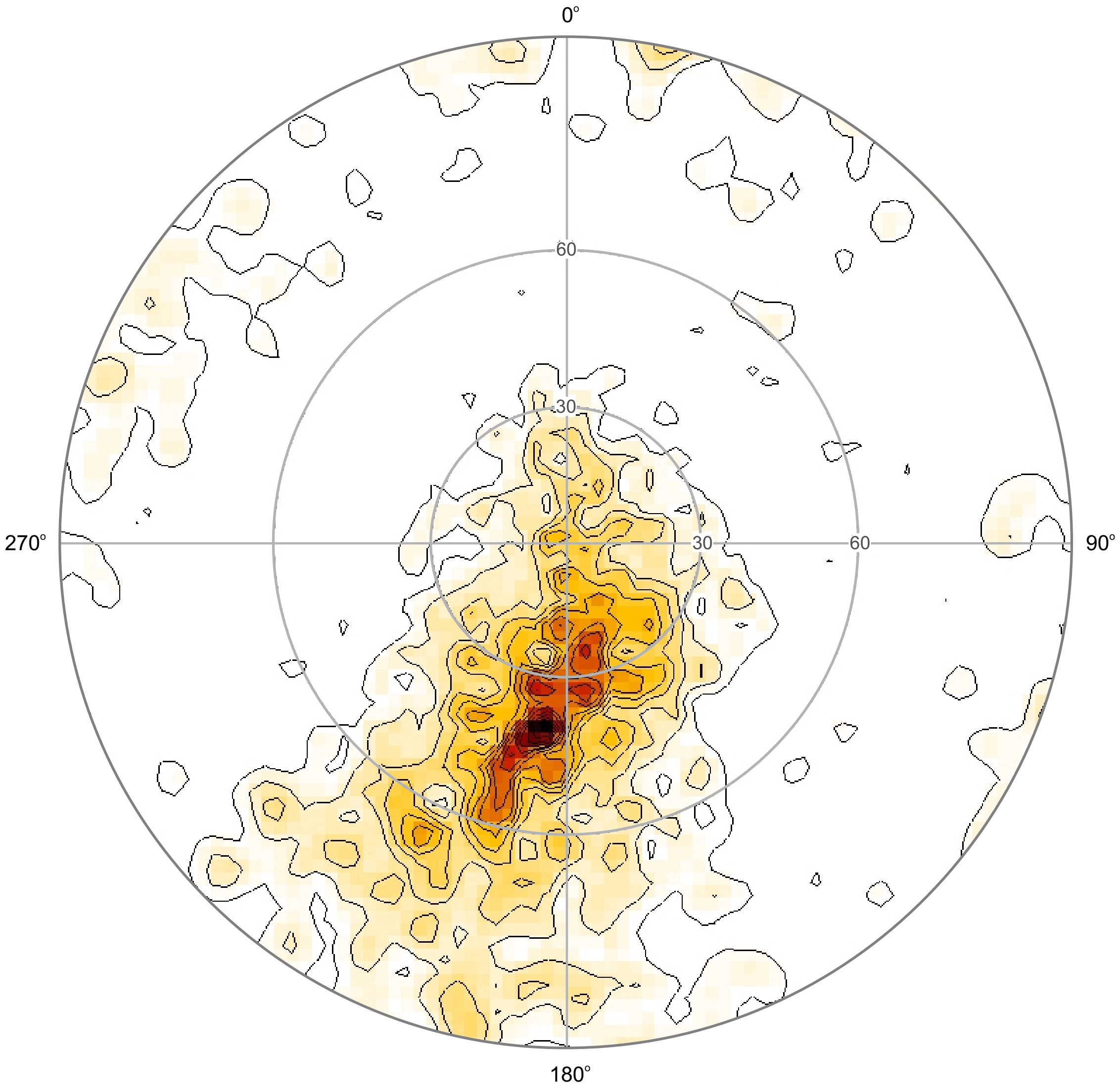
Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

HQ Boreholes

Wulff Plot-LH-Type

Distance: 10.0 m to 440.0 m



	Counts	*Dip (deg)*	*Azi (deg)*
Mean	3446	34.23	4.50

Figure 3.6 Composite stereonet plot of fractures that were logged using acoustic televiewer in 2020.

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

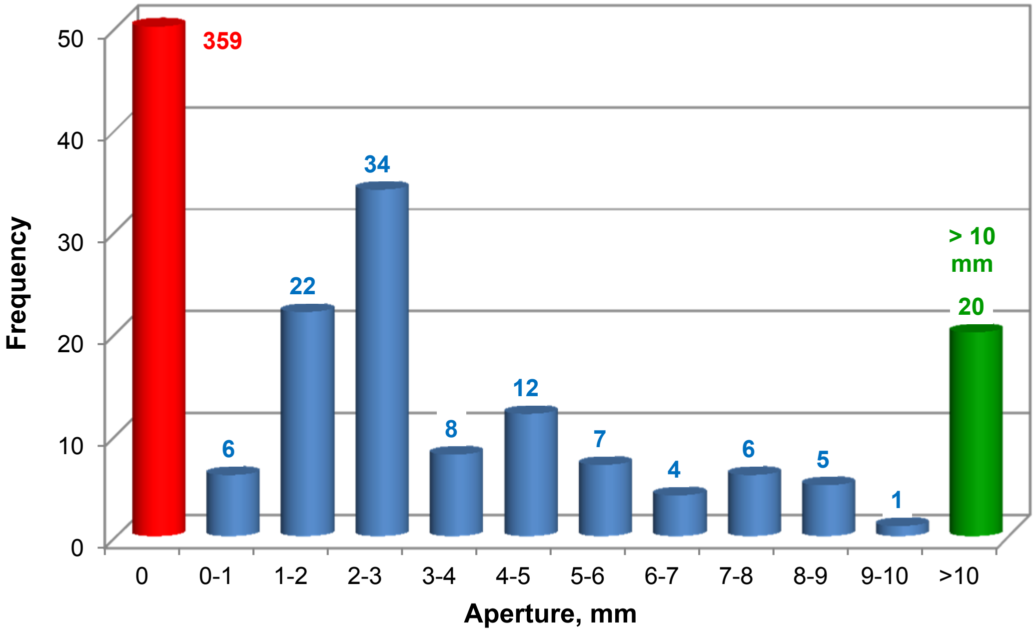


Figure 3.7 Distribution of fracture apertures that intersect the borehole walls from the acoustic televiewer (AT) log for borehole BL-0035.

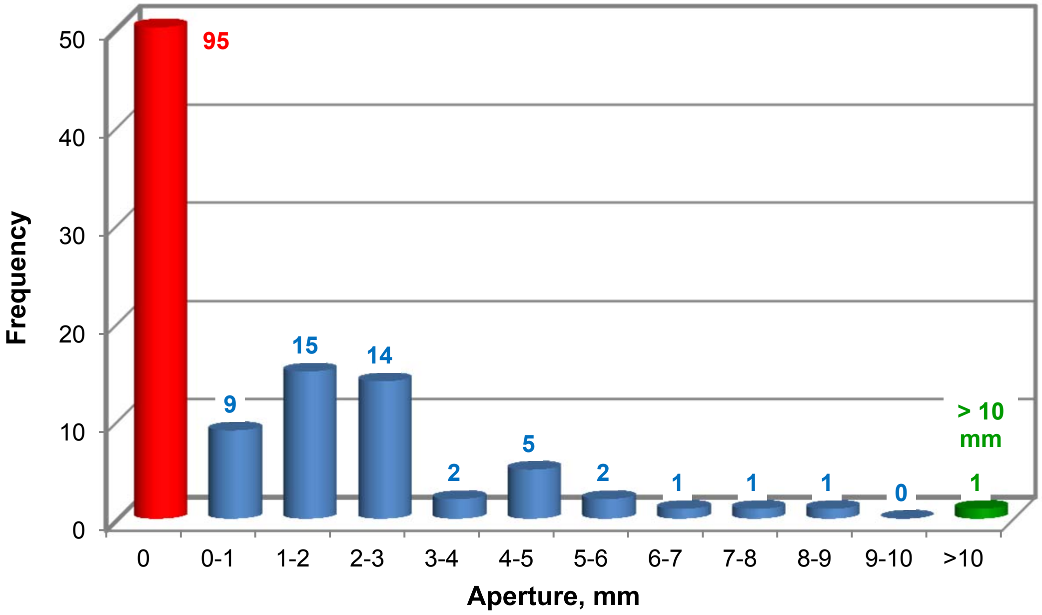


Figure 3.8 Distribution of fracture apertures that intersect the borehole walls from the acoustic televiewer (AT) log for borehole BL-0357.

4.0 HYDRAULIC CONDUCTIVITY OF THE FRACTURED BEDROCK

Deep borehole hydraulic conductivity measurements at the Springpole Lake Project site have been completed using three different procedures. The first set of borehole permeability measurements consisted of reconnaissance type air-lift (withdrawal) tests in 30 open exploration boreholes in 2019 to estimate the overall average rock mass hydraulic conductivity in selected boreholes across the project site. This was followed in 2019 by conducting stand-alone packer tests, using a single packer suspended on pipe since a drill rig was not available, to conduct injection tests at several different depths, up to 100 m below ground surface, using the end-of-borehole approach in 14 exploration boreholes. The third set of tests consisted of conducting standard packer tests using a drill string and the-end-of-the-borehole approach to define the test interval in eleven boreholes, one vertical and ten inclined boreholes, which were drilled around the main open pit perimeter for the combined hydrogeology and pit wall stability (SGH) program in 2020.

4.1 Rock Mass Hydraulic Conductivity Data from Air-Lift Tests

Air-lift tests were completed in the 30 old exploration boreholes that are shown in **Figure 4.1** as part of an initial rock mass permeability screening program in 2019 (**Appendix E**). Air-lift tests provide a quick and cost effective method of obtaining a preliminary indication of the range of the bulk fractured rock mass hydraulic conductivity values since the borehole test interval is equal to the saturated length of the borehole. The air-lift tests were completed using a well-within-a-well procedure. This procedure consists of first placing a pressure and temperature recording instrument, a Levelogger, approximately 20 to 25 m down the borehole and then inserting a 10 to 20 m long, 50 mm or 30 mm diameter, flush joint riser pipe, open at the bottom, into the borehole. The riser pipe is extended to approximately two to three times the distance from the surface to the water level in the borehole and completed using a right angle diverter at the surface. A small diameter airline tube is placed inside the riser pipe with its open end located approximately 1 to 2 m above the open bottom end of the riser pipe. Compressed air from a small air compressor or nitrogen tank is then used to air-lift the water in the borehole at different air pressure levels to generate one to two air lift steps. The flow rate is measured by capturing the discharge water in a calibrated container over a fixed time period. At the end of the air-lift tests on each borehole, the air pressure line is disconnected to quickly vent the air pressure and the recovery of the well is measured, essentially conducting a rising-head hydraulic conductivity test.

The air-lift test data for each borehole are tabulated in **Table 4.1**. The relative permeability of the rock mass through which each borehole was drilled is presented as a ratio of the measured discharge flowrate divided by the drawdown (Q/delta H) that was created during each test, giving a measurement in m^2/day/m. The actual length of the open borehole in which each air-lift test was completed was confirmed by running a dummy probe down each borehole. Based on the length of the borehole that was open, the fractured rock mass transmissivity was calculated and the borehole length was used to compute the average rock mass K or hydraulic conductivity value for each borehole as shown in Equations 4.1 and 4.2.

$$T = \left(\frac{Q}{2\pi(h2-h1)}\right) Ln(r2/r1) \qquad [4.1]$$

$$K = \left(\frac{Q}{2\pi(h2-h1)b}\right) Ln(r2/r1) \qquad [4.2]$$

Where,

T is transmissivity, K is hydraulic conductivity;
*r*1 is the borehole radius;
*r*2 is the radius of influence for the test;
b is the saturated borehole length;
Q is the measured flowrate; and
(*h2-h1*) is the decrease in pressure head for the test, below the static pressure level.

Table 4.1 shows that the hydraulic conductivity values for each entire borehole, in which an air-lift test was completed, varies by approximately three orders of magnitude. Note that radius of influence (r2), for the air-lift tests, was assumed to be 10 m for all of the air-lift tests. **Figure 4.2** provides the hydraulic conductivity values that were computed from the primary set of air-lift test data in the form of a cumulative normal probability plot with a mean of 5.88 E-08 m/s and a standard deviation of 5.0 E-07 m/s for this distribution.

4.2 Hydraulic Conductivities from 2019 Packer Injection Tests

Borehole packer injection tests were completed in 14 old exploration boreholes (**Figure 4.3**) in 2019 (**Appendix F**) using a single packer suspended on 25 mm diameter schedule 80 PVC pipe. All of the boreholes that were packer tested in both 2019 and in 2020 were first AT logged to their open depth. The schedule 80 pipe was connected to the open packer mandrel in the borehole and to a water pump, flow meter, pressure transducer and pressure accumulator (to stabilize the injection pressure) at the ground surface. With the packer inflated using nitrogen gas, this allowed water to be injected into the borehole test interval that extended from the bottom of the packer seal to the end of the borehole or to a zone of borehole blockage.

A typical constant pressure water injection test consisted of placing the packer at the desired location, based on a review of the AT log, and once the packers had been inflated and the borehole interval isolated, three different injection pressures were applied. The pressure and temperature data logger was placed below the bottom packer so that the injection pressures and fluid temperatures were measured in the actual borehole test interval. The packer test injection pressures were also measured on the surface using both an in-line data logger and recorded manually from in-line pressure gauges. **Figure 4.4** shows the typical pattern of pressure steps, above the static pressure conditions, that were used to test the isolated borehole intervals. The expected response was that the flowrate for each pressure step would decrease with time until a stable flow rate was achieved if a constant pressure was applied as shown in **Figure 4.4**. The flow rates for each packer injection tests were measured and manually recorded on the surface using one of three flow meters that covered the range of expected flow rates for the planned packer test interval lengths, based on the expected hydraulic conductivity values for the boreholes that were measured using the air-lift tests. At the end of the third or final pressure step, the water injection line was closed and the rate of decay of the injection pressure was monitored as a form of pressure shut-in test or falling head test. The injection circuit was equipped with filters to remove any particles from the injected water, a standard recirculation loop to control and adjust the injection pressure, and as noted a pressure accumulator to smooth out the pressure surges that were produced by the drill rig water piston pump. Note that the minimum flow rate that was considered reasonable to be measured for the length of the proposed packer test intervals, and for which the low range flowmeter in the flow measuring system in this packer injection assembly could be calibrated, was 0.2 USgpm or 0.76 L/min.

Hydraulic conductivity values were computed using the packer injection test pressure and flow rate data assuming radial flow conditions and the same type of equation as was used to analyze the air-lift test data. The hydraulic conductivity of the packer test borehole interval was calculated using the following equation,

$$K_c = \frac{Q}{2\pi L(h_e)} \ln\left(\frac{r_e}{r_o}\right) \tag{4.3}$$

Where,

K_c is conductivity of the interval;
Q is the final flow rate measured during the water injection at the end of each pressure step;
L is the interval length;
r_e is the radius of influence;
h_e is the excess head; and
r_o is the borehole radius.

Flow out of or into the borehole interval is assumed to be laminar under confined flow conditions. The excess head is the head difference between the head at a specified time and the static water level and can be calculated as,

$$h_e = \frac{P_t}{\gamma_w} - h_o \tag{4.4}$$

Where,

P_t is the borehole interval pressure obtained from the transducer in the test interval;
γ_w is the unit weight of water; and

h_o is the initial static head of water.

In this packer injection test program, where a single packer system suspended on the injection pipe was used, the test interval was the distance from the bottom of the inflated packer to the end of the open section or the bottom of the borehole. Therefore, when the packer string was lowered down the borehole a fixed distance to conduct the next packer test, two consecutive tests shared an overlapped section in the test interval. The conductivity of the overlapped interval can be estimated by subtraction using the following equation

$$k_{c3} = \frac{k_{c1}L_1 - k_{c2}L_2}{L_1 - L_2} \qquad [4.5]$$

Where,

k_{c1} is the hydraulic conductivity of the bottom interval;
k_{c2} is the hydraulic conductivity of the second interval; and
L_1 and L_2 are interval lengths.

Whenever possible the same excess injection head, h_e, was used when testing each borehole interval and the length of the test interval selected such that the ratio $(L_1 - L_2)/L_1$ should exceed 0.2. For most of this packer test program, the second interval was increased by variable distances until the final packer interval had been tested.

For the falling head/rising head tests, the water level response that was monitored during each test was used to compute the hydraulic conductivity using the following equation:

$$\begin{aligned} K &= \left(\frac{(r_{equi})^2}{2L(t_2 - t_1)}\right) \cdot \ln\left(\frac{h_1}{h_2}\right) \cdot \ln\left(\frac{r_e}{r_o}\right) \\ &= \left(\frac{{r_s}^2}{2L \cdot \sin\theta \cdot (t_2 - t_1)}\right) \cdot \ln\left(\frac{h_1}{h_2}\right) \cdot \ln\left(\frac{r_e}{r_o}\right) \end{aligned} \qquad [4.6]$$

Where,

r_{equi} = equivalent radius of standpipe with correction for borehole plunge
r_s = radius of standpipe;
L = length of test interval;
θ = borehole plunge;
h_1 = excess head at time t_1;
h_2 = excess head at time t_2;
r_e = radius of influence; and
r_o = well radius.

For the shut-in pressure tests that were completed at the end of the final injection pressure step, the volume of water in the entire drill string and test cavity was used to compute the volume of water that had to dissipate for the peak shut-in pressure to dissipate to zero. Since the peak injection pressure, measured using the pressure transducer in the test interval, was a direct measure of the excess hydraulic head, this volume of water was then used to compute the diameter of an imaginary standpipe in which the head would drop as the pressure dissipated. The hydraulic conductivity for each shut-in pressure test was calculated using the equation for the falling head test. Since the shut-in test was completed at the end of the pressure injection test sequence, the water pressure in the permeable fractures would be elevated. Therefore, the hydraulic conductivity values computed from the shut-in test data will be conservative or lower than the actual values and were used in this program to show the relative hydraulic conductivity values for the low permeability intervals (Fracflow 2020b).

Table 4.2 and **Table 4.3** provide the 2019 packer test hydraulic conductivity data for boreholes which are located around the proposed open pits and the proposed Mine Rock and Tailings storage area to the west of the main open pit. **Figure 4.5** is a cumulative normal probability plot of the 2019 packer test data showing a mean of 6.19 E-08 m/s and a standard deviation of 1.08 E-06 m/s for the intervals that were tested in 2019.

4.3 Hydraulic Conductivity From 2020 Packer Injection Test Program

Packer tests were completed in 2020 in ten inclined boreholes and one vertical borehole at the Springpole Lake Project site, **Figure 4.6**. **Table 4.4** provides the packer injection test data which were completed in 2020 in boreholes that were drilled around the main open pit perimeter and at the cofferdam locations. This packer test program was completed using an HQ drill string and by conducting the tests using a through-the-bit procedure. Using a drill rig allowed the packer tests to be completed in discrete intervals over the full length or depth of the boreholes. The test procedures, additional test data and QA/QC procedures are provided in Fracflow (2020b).

Figure 4.7 is a cumulative normal probability plot of the 2020 packer injection test data showing a mean of 2.10 E-07 m/s and a standard deviation of 1.84 E-06 m/s for the intervals that were tested in 2020.

4.4 Spatial Variability and Impact on Flow System Development

Each of the three borehole permeability test distributions indicate that the test data are subject to some degree of censoring at the high hydraulic conductivity values, for both the air lift tests and the packer tests that were completed in 2019, and to some degree of truncation in the 2019 packer test data and the 2020 packer test data. Truncation for those tests is produced by the lower limit of the flow meters that were used for the test program and censoring is a result of the flowrate limits that are imposed by the size of the packer mandrel that could be used in the boreholes and drill string at this site. Censoring and truncation in these log-normal type distributions generally indicate that the very low permeability zones and the very high permeability zones are not fully represented. However, by using a cumulative normal probability plot those limits are recognized and partly reflected in the reported means and standard deviations.

The measured hydraulic conductivity values vary both vertically and spatially, reflecting the different structural features, joints, fracture zones and shear zones, which are intersected by the boreholes with different bearing and plunge. The large scale structures or fracture zones that are reported in Fracflow (2020b) as borehole intersections and summarized in Chapter 3 above, generally exhibited high permeability. Other long borehole intersections of broken rock (shear zones) were encountered during the drilling of the boreholes that were drilled in 2020 around the main open pit perimeter and into the orebody to obtain additional mineralization samples.

It is expected that the large structures with the higher permeability will control the overall flow system and have to be included in any subsequent 3D flow and transport modelling of the mine water inflows and when assessing the areas that will be impacted by the drawdown cone that is produce by pit dewatering. This also requires that one include the vertical and horizontal spatial variability and anisotropy in the rock mass permeability characterization.

The hydraulic conductivity data from the air lift tests and the packer tests in the old exploration boreholes, that generally had a northeast to southwest bearing, have similar mean values but different standard deviations, reflecting the different levels of averaging that is produced by the different test procedures. The longer the test interval, the more averaging is produced by the test. The mean hydraulic conductivity value from the 2020 packer test program, which was conducted in shorter test intervals, produced a higher mean hydraulic conductivity value and a higher standard deviation. It is important to note that the boreholes that were tested in 2020 had a range of different orientations than the 2019 boreholes with most of the 2020 boreholes having a northwest to southeast bearing.

Table 4.1 Measured flowrates and computed hydraulic conductivities from the air-lift tests.

Borehole ID	Flowrate (L/s)	Flowrate (m^3/d)	dh (m)	Q/dh ($m^3/d/m$)	Hydraulic Conductivity (K) (m/day)	Hydraulic Conductivity (K) (m/s)
BL-0024	0.08	7.27	4.90	1.40	5.22E-03	6.04E-08
BL-0030	0.00	0.23	4.68	0.05	8.33E-05	9.64E-10
BL-0046	0.16	13.50	3.22	3.87	2.04E-02	2.36E-07
BL-0047	0.05	4.68	5.57	0.86	3.36E-03	3.88E-08
BL-0048	0.14	12.45	2.45	4.47	1.57E-02	1.82E-07
BL-0049	0.14	11.72	6.70	1.85	6.80E-03	7.87E-08
BL-0052	0.02	1.49	2.82	0.36	1.01E-03	1.17E-08
BL-0057	0.35	30.34	2.52	13.71	4.69E-02	5.43E-07
BL-0059	0.05	4.09	5.19	0.80	2.45E-03	2.83E-08
BL-0077	0.05	4.32	4.65	0.93	2.56E-03	2.96E-08
BL-0090	0.00	0.09	3.69	0.02	9.06E-05	1.05E-09
BL-0098	0.00	0.35	4.22	0.11	2.57E-04	2.98E-09
BL-0102	0.01	0.75	2.70	0.28	8.07E-04	9.34E-09
BL-0104	0.12	10.08	4.42	2.28	6.59E-03	7.62E-08
BL-0111	0.04	3.78	7.49	0.59	9.02E-04	1.04E-08
BL-0219	0.02	1.48	3.51	0.53	2.41E-03	2.79E-08
BL-0226	0.36	31.39	7.32	4.10	4.04E-02	4.68E-07
BL-0230	0.08	6.48	2.64	2.77	2.33E-02	2.69E-07
BL-0283	0.25	21.67	3.09	6.10	7.14E-02	8.27E-07
BL-0284	0.25	21.53	2.56	8.51	8.83E-02	1.02E-06
BL-0310	0.03	2.56	1.15	2.13	1.30E-02	1.51E-07
BL-0330	0.00	0.25	2.66	0.10	6.42E-04	7.43E-09
BL-0341	0.00	0.07	0.92	0.08	4.53E-04	5.25E-09
BL-0343	0.03	2.88	3.53	0.83	6.18E-03	7.15E-08
BL-0345	0.02	1.38	2.00	0.65	4.86E-03	5.63E-08
BL-0350	0.03	2.71	1.91	1.42	1.99E-02	2.31E-07
BL-0354	0.01	0.89	1.97	0.45	1.53E-03	1.77E-08
BL-0355	0.01	0.58	4.06	0.16	8.65E-04	1.00E-08
BL-0367	0.12	10.44	1.02	10.92	9.65E-02	1.12E-06
BL-0385	0.66	56.61	3.80	13.64	6.35E-02	7.35E-07

Table 4.2 Packer test data on boreholes around the Open Pit area at the Springpole site.

Hole ID	Test No.	Flowrate (L/m)		Pressure Difference (psi)		Test Interval - Discrete (m)		Conductivity (m/s)
		Step 1	**Step 2**	**Step 1**	**Step 2**	**from**	**to**	
BL-0024	**024-1**	6.23	28.80	6.34	25.43	21.0	32.0	1.00E-10
	024-2	7.17	33.00	6.03	26.82	32.0	61.5	7.16E-07
	024-3	3.40	6.10	13.95	26.19	61.5	91.5	3.69E-08
	024-4	3.00	5.65	16.15	30.45	91.5	252.0	2.43E-08
BL-0034	**034-1**	9.70	35.00	1.63	6.73	11.6	36.2	2.93E-07
	034-2	10.50	32.50	1.81	6.92	36.2	614.5	1.90E-07
BL-0050	**050-3**	11.30	24.45	2.31	4.58	1.3	20.6	2.10E-06
	050-1	10.30	29.25	3.36	8.26	20.6	60.6	1.00E-10
	050-2	10.00	25.74	2.21	6.95	60.6	374.0	2.74E-07
BL-0052	**052-1**	28.30	37.00	10.85	15.13	13.1	33.4	1.00E-10
	052-2	29.10	36.30	8.70	13.88	33.4	462.1	1.45E-07
BL-0098	**098-1**	1.40	4.40	17.49	29.69	14.6	98.6	2.85E-08
	098-2	0.10	1.43	12.66	22.75	98.6	282.2	1.51E-08
BL-0111	**111-1**	7.90	29.10	4.33	17.46	4.1	12.6	1.00E-10
	111-2	10.00	21.00	4.53	12.73	12.6	64.6	3.07E-08
	111-3	10.30	24.00	4.78	15.38	64.6	101.1	1.49E-08
	111-4	10.80	24.00	4.86	16.32	101.1	496.0	9.62E-08
BL-0232	**232-1**	4.52	32.25	6.59	17.54	11.0	35.4	3.89E-07
	232-2	4.55	30.70	1.80	17.93	35.4	66.8	4.93E-07
	232-3	3.60	25.10	3.35	19.34	66.8	96.4	1.00E-10
	232-4	7.26	22.50	4.71	15.69	96.4	124.1	1.13E-06
BL-0283	**283-1**	27.00	NA	7.02	NA	12.0	28.0	1.00E-10
	283-2	23.70	53.80	5.51	11.61	28.0	29.9	5.32E-06
	283-3	28.40	53.85	6.32	12.18	29.9	87.0	1.63E-06
BL-0284	**284-1**	6.20	44.10	2.06	11.58	11.2	25.0	1.00E-10
	284-2	0.25	41.70	1.14	9.90	25.0	45.1	1.43E-07
	284-3	3.65	44.00	0.72	10.46	45.1	64.0	4.09E-06
	284-4	9.03	18.45	7.75	26.03	64.0	84.4	9.22E-07

Table 4.3 Packer test data on boreholes around the Mine Rock & Tailings area.

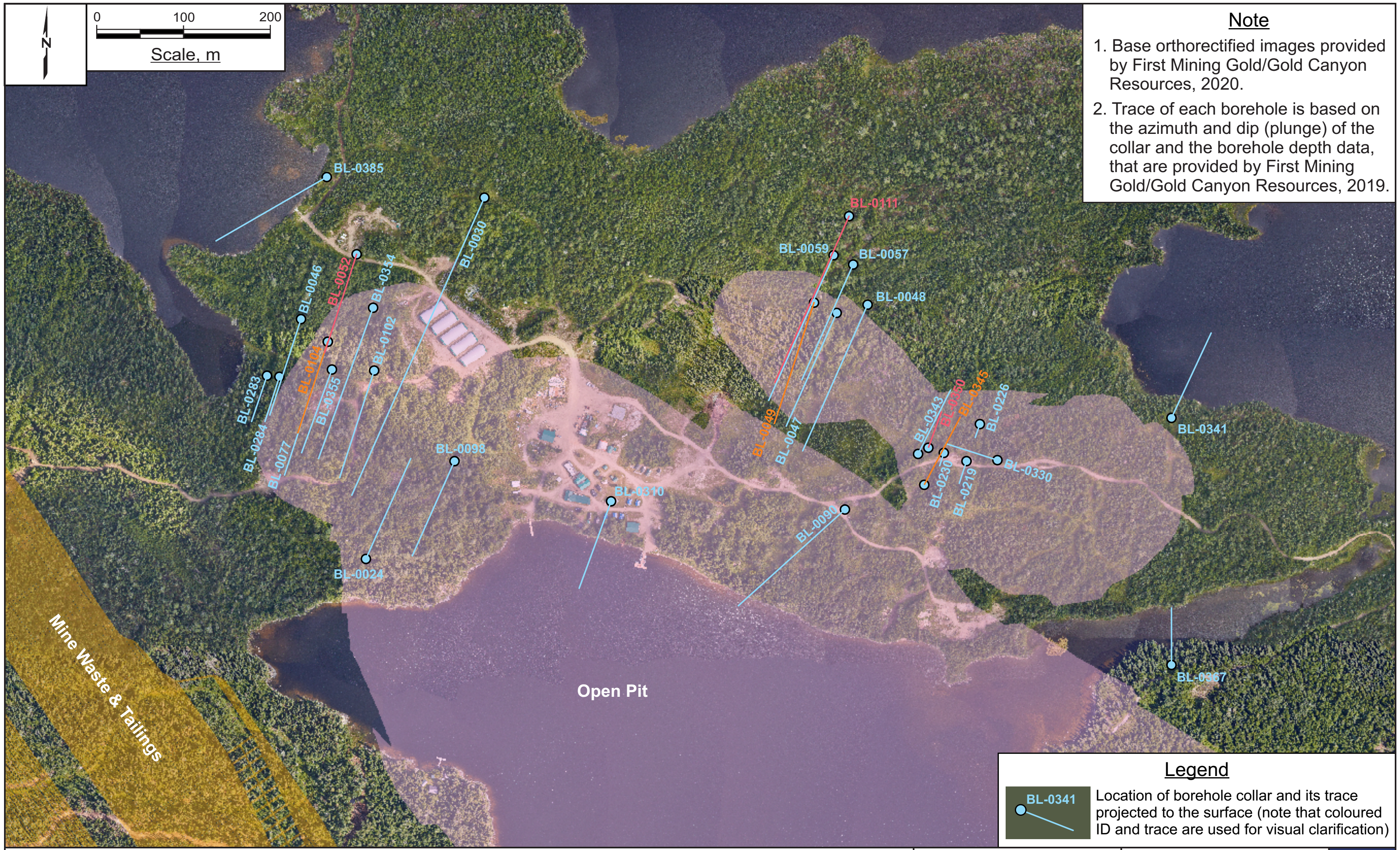
Hole ID	Test No.	Flowrate (L/m)		Pressure Difference (psi)		Test Interval - Discrete (m)		Conductivity (m/s)
		Step 1	Step 2	Step 1	Step 2	from	to	
BL-0143	**143-1**	1.70	7.30	10.56	26.21	9.4	22.6	4.35E-08
	143-2	1.50	6.35	3.71	23.48	22.6	764.1	9.38E-09
BL-0321	**321-1**	1.10	3.90	9.72	21.46	12.1	28.7	9.32E-09
	321-2	1.00	4.25	7.54	21.59	28.7	44.7	1.09E-07
	321-3	0.65	2.55	10.51	23.36	44.7	228.0	1.69E-08
BL-0322	**322-1**	3.60	63.00	0.25	2.57	4.5	12.6	7.02E-06
	322-2	10.00	59.00	0.37	3.06	12.6	44.6	1.00E-10
	322-3	10.00	48.70	0.25	2.16	44.6	386.2	1.84E-06
BL-0334	**334-1**	6.10	22.30	6.07	19.60	13.6	37.6	1.00E-10
	334-2	4.27	19.55	1.30	13.97	37.6	67.6	1.57E-07
	334-3	0.20	NA	26.19	NA	67.6	324.0	6.25E-10
BL-0357	**357-1**	1.70	14.58	5.09	24.76	12.0	22.6	4.30E-07
	357-2	2.00	8.27	3.48	24.78	22.6	59.6	5.68E-08
	357-3	1.62	6.45	3.67	24.94	59.6	200.3	5.04E-08

Table 4.4 Hydraulic conductivity values for discrete intervals that were estimated using the packer test data for the SGH2020 program (Page 1 of 2).

Hole ID	Test No	Discrete Interval (m)		Hyd. Conductivity for Discrete Interval (m/s)
		From	To	
SGH20-001	**001-2**	109.7	142.1	1.08E-07
	001-3	58.7	109.7	4.47E-08
	001-4	7.7	58.7	1.51E-06
	001-6	334.7	400.1	1.13E-06
	001-7	334.7	400.1	1.05E-06
	001-8	226.7	334.7	2.04E-05
	001-9	142.7	226.7	1.00E-10
SGH20-002	**002-11**	109.6	191.0	2.54E-08
	002-12	16.6	109.6	2.79E-06
	002-14	298.6	400.0	3.34E-07
	002-15	193.6	298.6	3.95E-08
SGH20-003	**003-61**	98.6	170.0	2.41E-08
	003-62	17.6	98.6	9.11E-08
	003-64	281.6	395.0	1.98E-08
	003-65	170.6	281.6	6.89E-08
SGH20-004	**004-22**	86.6	164.0	1.34E-09
	004-23	20.6	86.6	7.52E-07
	004-25	230.6	293.0	3.99E-10
	004-26	164.6	230.6	3.59E-07
SGH20-005	**005-28**	92.6	170.0	3.86E-08
	005-29	11.6	92.6	5.80E-07
	005-31	287.0	401.0	1.11E-09
	005-32	170.6	287.0	1.28E-07

Table 4.4 Hydraulic conductivity values for discrete intervals that were estimated using the packer test data for the SGH2020 program (Page 2 of 2).

Hole ID	**Test No**	**Discrete Interval (m)**		**Hyd. Conductivity for Discrete Interval (m/s)**
		From	**To**	
SGH20-006	**006-34-1**	110.6	185.0	3.44E-07
	006-34-2	20.6	110.6	9.03E-07
	006-36	188.6	281.0	1.07E-05
	006-38	338.6	401.0	8.03E-07
	006-39	281.6	338.6	2.44E-07
	006-41	401.6	440.0	2.09E-06
SGH20-007	**007-43**	95.6	170.0	7.81E-07
	007-44	14.6	95.6	1.69E-06
	007-46	290.6	401.0	2.44E-07
	007-47	170.6	290.6	2.96E-07
SGH20-008	**008-49**	116.6	215.0	2.79E-08
	008-50	17.6	116.6	8.92E-08
	008-52	314.6	413.0	2.94E-07
	008-53	218.6	314.6	1.00E-10
SGH20-009	**009-55**	128.6	218.0	1.82E-05
	009-56	20.6	128.6	2.36E-07
	009-58	326.6	392.0	1.83E-05
	009-59	212.6	326.6	4.07E-06
SGH20-010	**010-67**	116.6	224.0	2.69E-08
	010-68	32.6	116.6	9.44E-08
	010-70	302.6	401.0	3.14E-07
	010-71	224.6	302.6	1.00E-10
SPW20-001	**PW1-17**	278.6	356.0	3.43E-07
	PW1-19	203.6	401.0	2.63E-07
	PW1-20	65.6	203.6	2.21E-06



Note

1. Base orthorectified images provided by First Mining Gold/Gold Canyon Resources, 2020.
2. Trace of each borehole is based on the azimuth and dip (plunge) of the collar and the borehole depth data, that are provided by First Mining Gold/Gold Canyon Resources, 2019.

Legend

BL-0341 ●	Location of borehole collar and its trace projected to the surface (note that coloured ID and trace are used for visual clarification)

Figure 4.1 Location of boreholes that air-lift tests were completed in 2019.

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

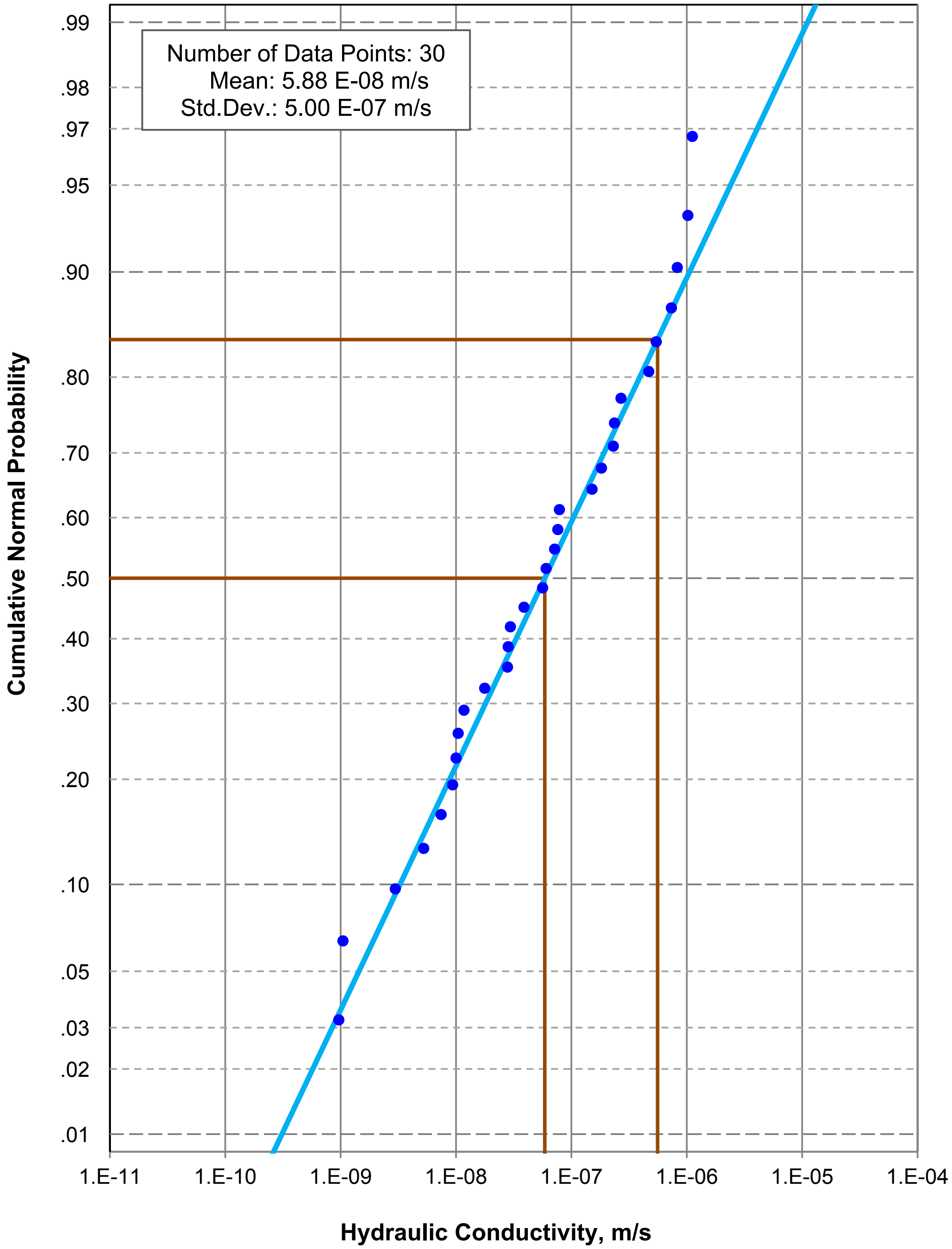


Figure 4.2 Cumulative Normal Probability plot of computed hydraulic conductivity values from air-lift tests.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

FFC

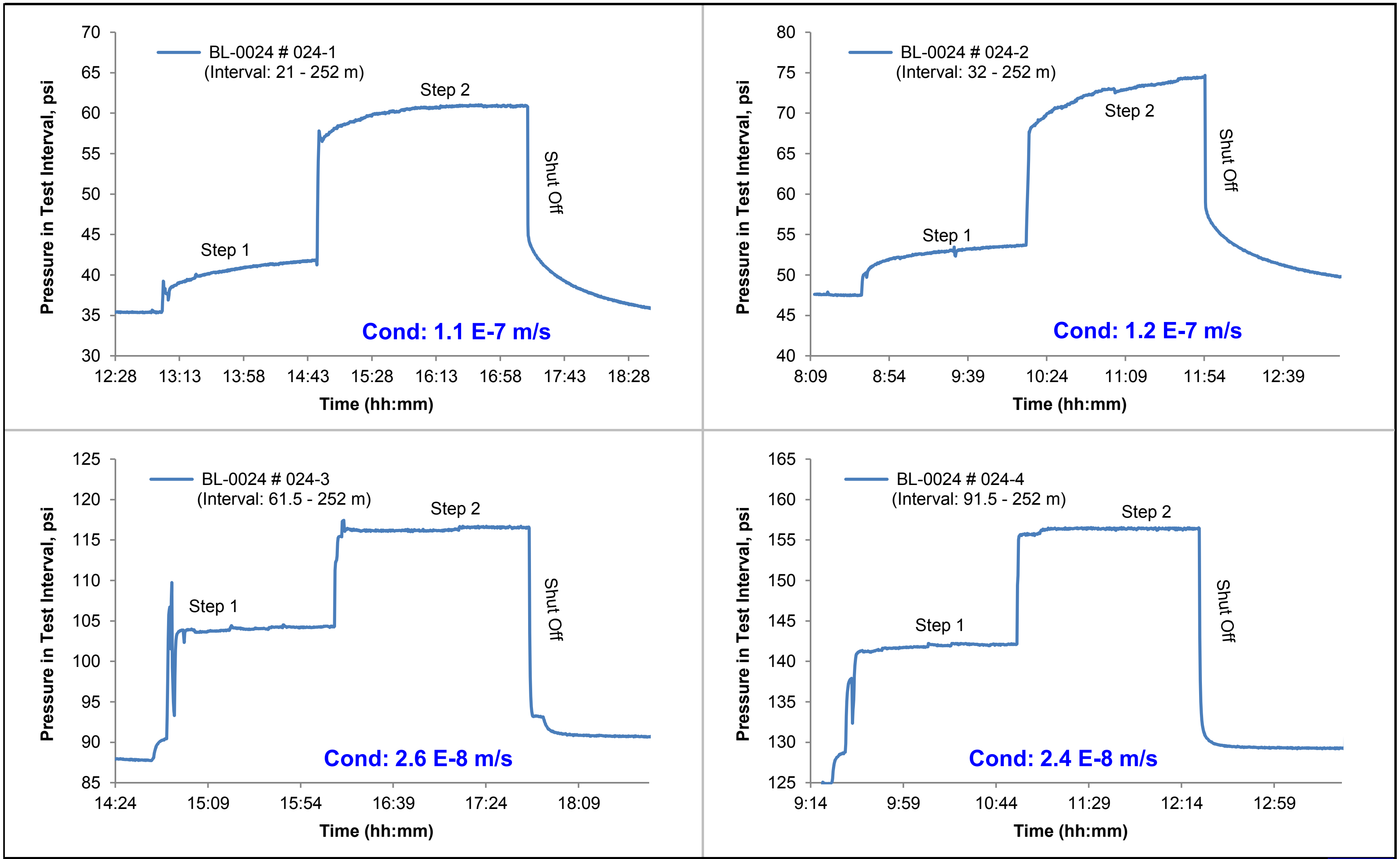
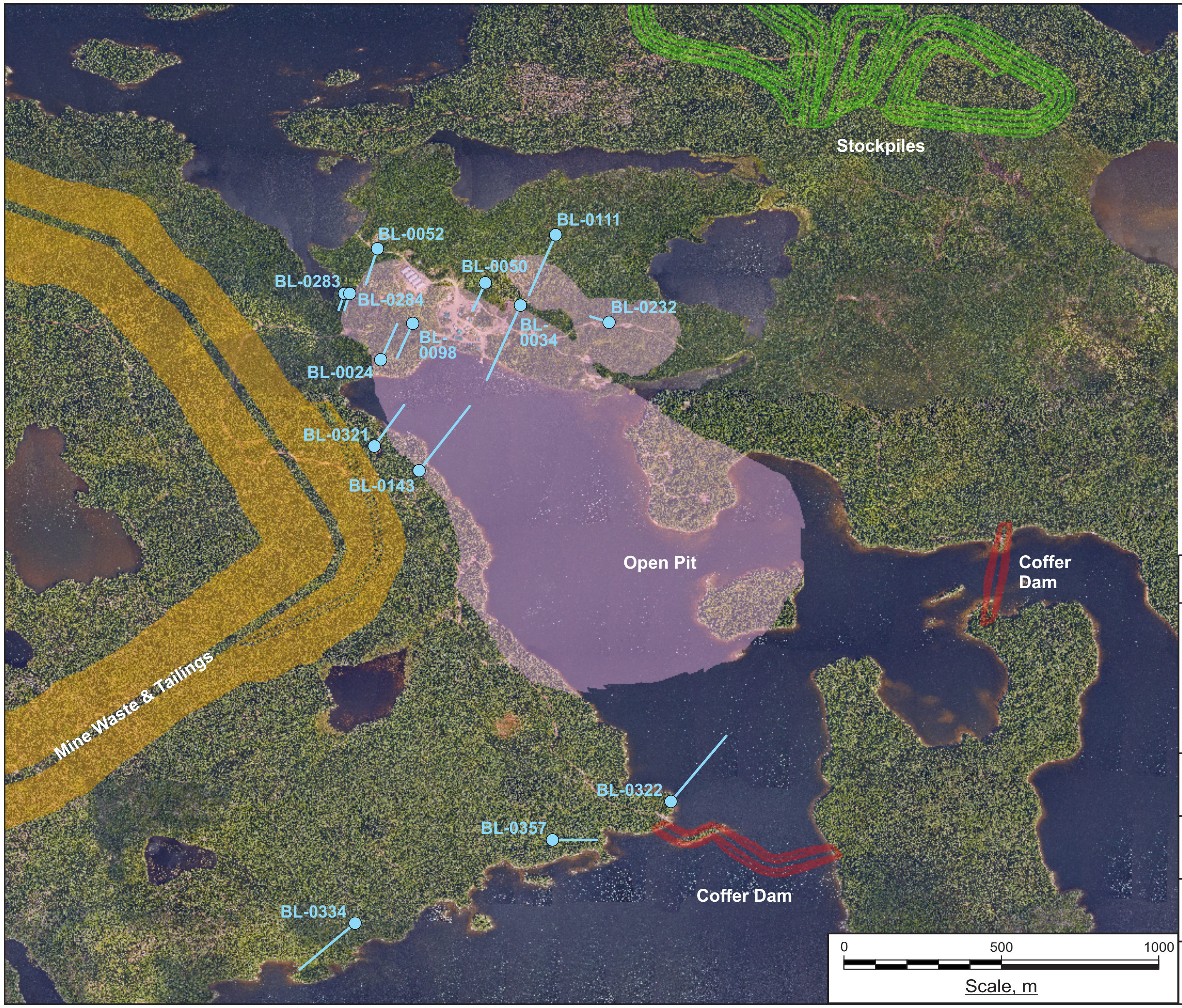


Figure 4.3 Typical pressure curve for a packer test; BL-0024 (borehole depth - 252 m), Tests # 024-1, 024-2, 024-3 and 024-4.

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC



N

Legend

BL-0232 ●	Location of borehole collar and its trace projected to the surface

Note

1. Base orthorectified images provided by First Mining Gold/Gold Canyon Resources, 2020.
2. Trace of each borehole is based on the azimuth and dip (plunge) of the collar and the borehole depth data, that are provided by First Mining Gold/Gold Canyon Resources, 2019.

Figure 4.4

Location of boreholes that packer tests were completed in 2019.

Project No.
3134

Location
Springpole, ON

Document Reference
FFC-NL-3134-002

Date
February 2021

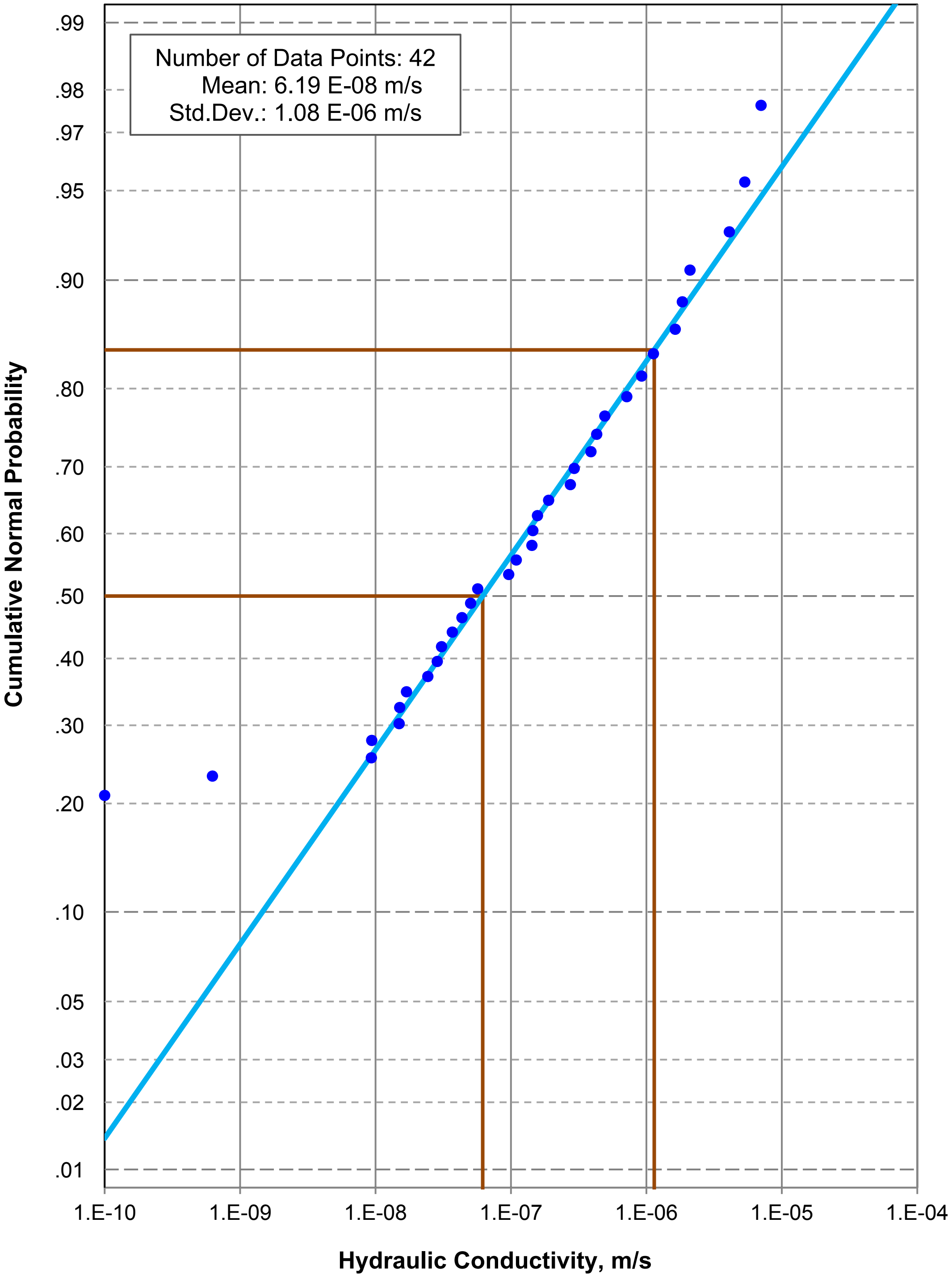
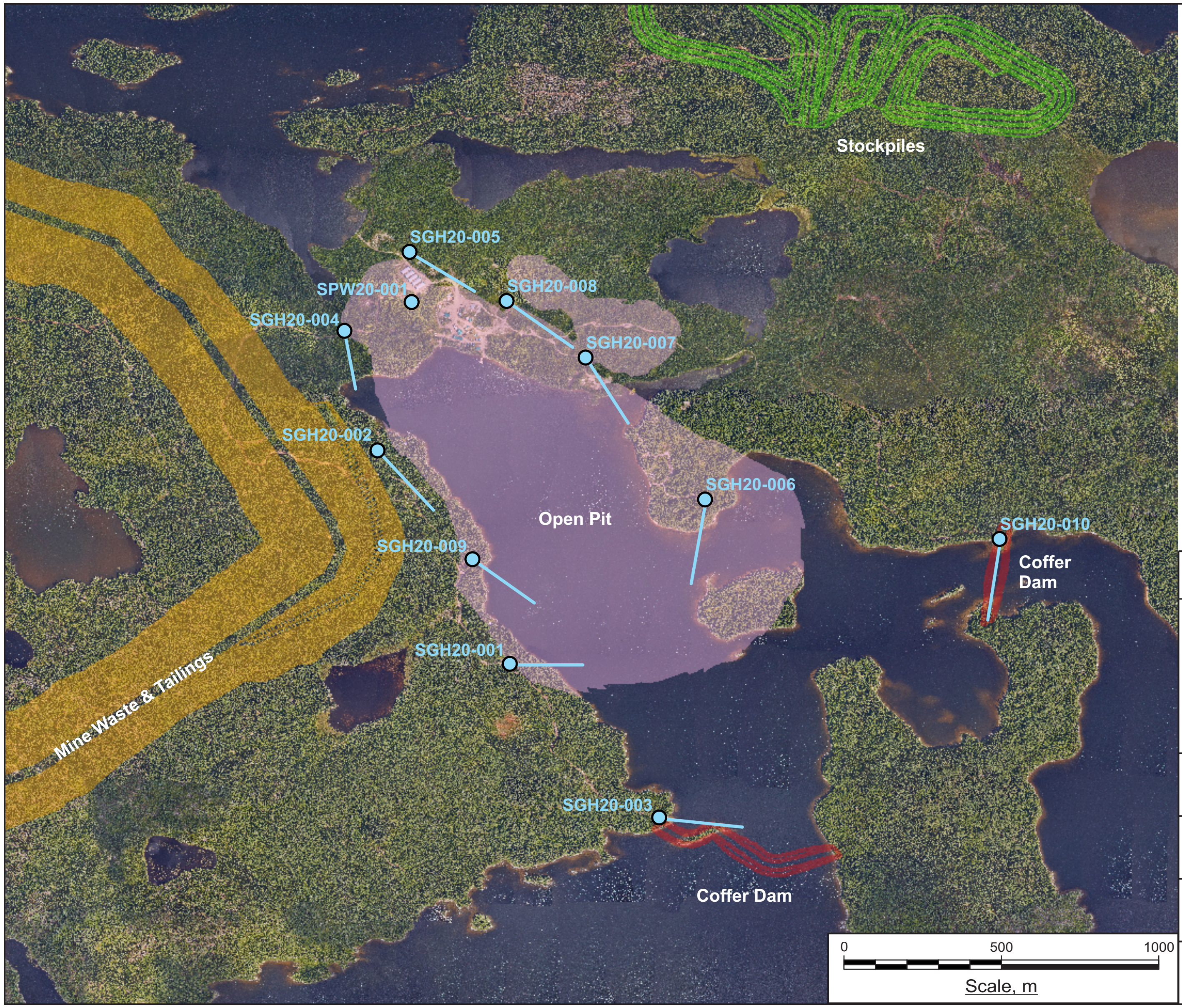


Figure 4.5 Cumulative normal probability plot of the hydraulic conductivities computed from the packer test data in 2019.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

FFC



Legend

SGH20-005 ●	Location of borehole collar and its trace projected to the surface

Note

1. Base orthorectified images provided by First Mining Gold/Gold Canyon Resources, 2020.
2. Trace of each borehole is based on the azimuth and dip (plunge) of the collar and the borehole depth data, that are provided by First Mining Gold/Gold Canyon Resources, 2020.

Figure 4.6

Location of boreholes that packer tests were completed in 2020.

Project No.
3134

Location
Springpole, ON

Document Reference
FFC-NL-3134-002

Date
February 2021

FFC

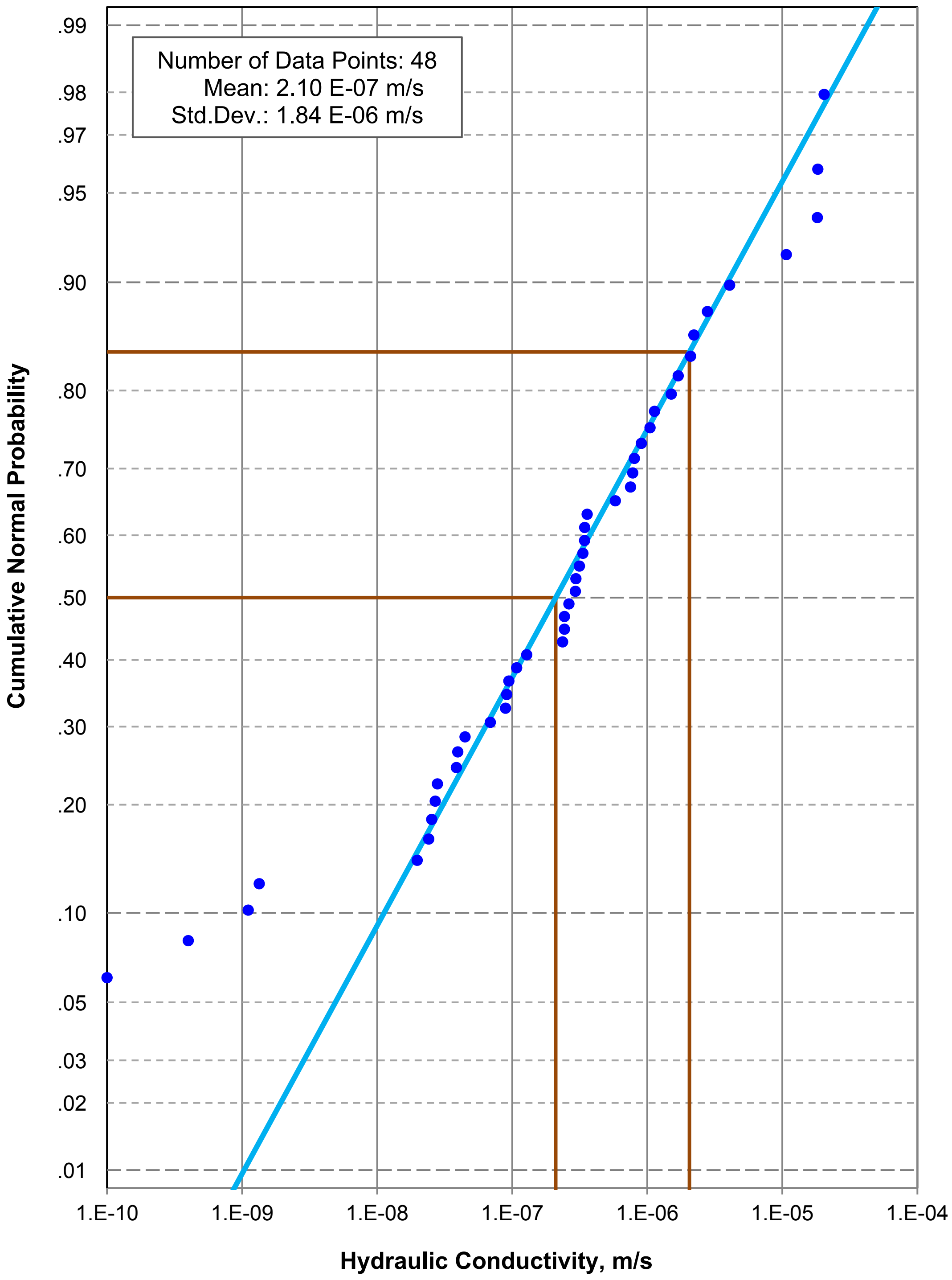


Figure 4.7 Cumulative normal probability plot of the hydraulic conductivities computed from the packer test data in 2020.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

FFC

5.0 AQUEOUS GEOCHEMISTRY OF GROUNDWATER

The aqueous geochemistry of groundwater samples collected from various monitoring wells and boreholes are discussed in this section of the report. Geochemical data collected during the long-term aquifer test at SPW20-001 are largely excluded from this chapter and reserved for presentation and discussion in Chapter 7.

5.1 Ontario Water Quality Guidelines

Groundwater quality was not compared with guideline values as suggested by other members of the project team. Fracflow's effort was focused on using available geochemical data to characterize and understand the nature, interaction and evolution of the various water sources at the Springpole Lake Project site.

5.2 Previous Water Quality Investigations

North Rock (2018) conducted groundwater monitoring and sampling in September 2017. Samples were collected from five monitoring wells in the overburden materials (MW1 to MW5), and from six exploration boreholes (DDH1, DDH2, BL-235, BL08-235, SP11-102, and SP11-064) (**Figure 5.1**). Groundwater samples were collected and analyzed for major anions, major cations and dissolved metals. Sampling depths, volumes purged, and pumping rates were not reported.

North Rock (2019) conducted groundwater monitoring and sampling at the same monitoring wells and boreholes in June and October 2018. Groundwater samples were collected and analyzed for major anions, major cations and dissolved metals. Sampling depths, volumes purged, and pumping rates were not reported.

Groundwater quality at the Springpole Lake Project site was considered by previous workers to represent baseline (background) conditions. Parameter concentrations in groundwater were described as being generally consistent across the site.

5.3 Water Sampling Locations (2019-2020), Field and Analytical Methods

Borehole sampling locations were selected by Fracflow, in 2019 and 2020, to determine if there was any significant degree of spatial and temporal variability in groundwater quality across the Springpole Lake Project site, and to try and relate any such variability to the geology and the characteristics of the flow system.

Borehole Cleaning by Airlifting

Air-lift tests, using a well-within-a-well approach, were carried out by Fracflow for the initial purpose of measuring gross rock mass permeability in old exploration boreholes. That approach was also used for the purpose of removing any residual drilling fluids and cuttings from the upper portion of any exploration borehole that was scheduled for groundwater sampling. The minimum volume of fluid removed from each borehole was equivalent to one borehole volume in low permeability boreholes. The maximum volume of fluid that was removed was equivalent to three borehole volumes, whenever there was sufficient borehole permeability to achieve that goal.

Sampling Locations and Depths (2019)

Groundwater samples collected by Fracflow in 2019 were collected from ten exploration boreholes and four monitoring wells Exploration holes with the following designations were sampled: BL-0024; BL-0034; BL-0049; BL-0052; BL0098; BL-0111; BL-0310; BL-0341; BL-0354; BL-0385.

Boreholes that were sampled were located in and around the Springpole camp site, and within the Northeast Extension of the ore deposit, where good access was available. Deep groundwater samples were collected from vertical depths of between 36 m and 420 m. Note that sample depths used for sample identification in the field refer to distances along the borehole length. The GPS coordinates of the boreholes and true vertical sampling depths, corrected for dip, are summarized in **Table 5.1**. Borehole logs were only available for two of the boreholes sampled. The geology of nearby boreholes was considered where logs for boreholes sampled were not available. **Table 5.2** summarizes the known geology with distances along the borehole length at or near each of the sampled locations.

Shallow groundwater samples were also collected in 2019 from four monitoring wells that were completed in the overburden materials. Those wells were MW2, which is located northwest of the camp site, and MW-B000, MW-E080, and MW-K034. The latter three wells are located southwest of camp in the planned Tailings Management Facility area (TMF), which is also proximal to the Portage zone of the ore deposit. Groundwater samples were collected from depths of between 3 m and 4 m below ground surface. The GPS coordinates and sampling depths for those wells are summarized in **Table 5.1**.

Sampling Locations and Depths (2020)

Groundwater samples collected by Fracflow in 2020 were collected from a total of eighteen monitoring wells and exploration boreholes that have the following designations:

- Monitoring Wells: MW2, MW3, MW4, MW5

- Boreholes: SP11-064, BL-143-D, BL-235, BL-385, BL-321-D, BL-334-D, FBH-01-D, FBH-03-D, FBH-04-D, FBH-07-R1-D, FBH-09-R1-D, FBH-11-D, FBH-14-D, SGH20-001-D.

Sampling locations were spread over a broad area of the Springpole site. The GPS coordinates of the boreholes and true vertical sampling depths, corrected for dip, are summarized in **Table 5.3**.

Sampling Methods (2019)

Groundwater samples from existing exploration boreholes were collected using a Geotech, 42 mm (1.66-inch) diameter, stainless steel bladder pump, equipped with an internal polyethylene bladder. The pump is characterized as a low-flow pump that operates at flow rates of between 0.1 L/min and 0.4 L/min. The pumping rate was controlled using an electronic cycle time powered by a 12-volt battery. The pump was operated using compressed nitrogen gas that was injected through a 3.18 mm (1/8-inch) diameter inflation line. The maximum design operating depth for the pump was 60 m. The bladder would tend to burst when operating at depths of less than 40 m if significant drawdowns developed due to low permeability, increasing the differential pressure between the inside and outside of the bladder.

A 16 mm (5/8-inch) diameter high density polyethylene (HDPE) drop tube was connected to the bottom of the bladder pump to collect samples from greater depths below the pump. The maximum depth for sampling using the drop tube was 448 m. Pumping from that depth required considerable care and careful observation to ensure representative groundwater samples were collected. There were two issues of concern. Firstly, the potential to induce inflow into the borehole at depth would diminish because of the expected decrease in the permeability of the fractured rocks with depth. The effort required to set up and purge the sampling equipment at greater depths would be pointless if pumping was only going to induce a downward flow of standing water from above. Secondly, the volume of water in the drop tube and bladder pump has to be purged before representative samples can be collected for analysis. Increased sampling time and additional compressed nitrogen were required to purge the equipment from greater sampling depths.

Purging continued at any given depth interval for periods of approximately one to three hours in duration. Between 10 L and 60 L of water were removed from each interval. Purging continued until reasonably stable water quality readings were measured.

Sampling Methods (2020)

Groundwater samples in 2020 were collected using one of two methods, depending on the type and depth of each given monitoring well or borehole. Field chemistry measurements were taken every 10 minutes or after one half or one full well volume had been extracted. Volumes were measured using a graduated bucket, and stopwatch to determine total volume removed or flow rate.

Once the purging criteria were met, samples were decanted from a clean high-density polyethylene (HDPE) bottle into laboratory supplied bottles. Fill lines and no-head space requirements were met for each sample. Field filtering was done as required for dissolved analysis through HDPE tubing and a 0.45 µm high capacity (600 cm^2) filter, or through a 60 mL syringe and 0.45 µm syringe filter. Duplicate samples were collected at the approximate rate of one in ten for quality assurance. No identifying names or times were included on the duplicate, only in the field notes. One field blank was collected per sampling event by decanting laboratory supplied distilled water into laboratory labeled and supplied bottles. At the end of each sample program, a trip blank was also shipped in the last cooler. The trip blank was a laboratory filled and sealed set of bottles that were kept cool after arriving at site.

For existing exploration holes that were selected as monitoring wells for routine sampling, a 46 mm (1.82-inch) diameter submersible PVC-12V pump (Waterra Mini-Monsoon model) was used with a dedicated 16 mm (5/8-inch) diameter HDPE tubing acting as the drop pipe. The pump was connected to a 12V battery that had been fully charged overnight. No controller was used, so pumping rates were not adjusted. Pumping was conducted for 60 to 90 minutes, until stable field chemistry was observed prior to sampling. Stable conditions were taken to be a change of less than 2-3% across two samples. Every ten minutes, a field chemistry reading was recorded. Pumping rates were recorded at the beginning and end of each well purging cycle, at a minimum, to calculate the total volume withdrawn.

Shallow monitoring wells, and piezometers constructed within diamond drill holes, were sampled by hand using a dedicated Waterra D-25 inertial foot pump and 5/8" (16 mm) outer diameter HDPE tubing. The inner diameter of most well standpipes was too small to permit an electric pump to be installed. Where necessary, bailers were used to prevent agitation of silt and clay within the screen to obtain a less turbid sample. Each dedicated bailer was stored in a clear plastic bag, between sampling events, to prevent contamination. Three well volumes were removed from each well prior to sampling, and field chemistry measurements were taken after one half or a full well volume was purged. Sampling was done after three well volumes were pumped from each well.

Field-Measured Water Quality Readings

Water quality readings consisted of temperature, pH, specific conductance, redox potential, and/or dissolved oxygen (**Appendix G**). In 2019, calibrated, field-portable instruments were used to record all field measurements. The pH was measured using a HACH SensION1 meter that was calibrated using 4 and 7 buffer solutions. Specific conductivity was measured using a HACH SensION5 meter that was calibrated using a 1,413 µS/cm standard. Temperature was also recorded by each of those meters and averaged to report a single temperature value. Redox potential was measured using a HACH One pH meter connected to a standard HACH ORP electrode. The proper response of the ORP was tested in a quinhydrone solution.

Field-measured quality of groundwater samples in 2020 were made using a YSI multi-meter provided by FMG. Measurements consisted of temperature, pH, specific conductance, and oxidation/redox potential (ORP) and dissolved oxygen. Turbidity was also measured in 2020 using a Lamotte turbidity meter.

In all cases, ORP was measured using Ag/AgCl reference electrodes with a platinum sensor. ORP was converted to Eh by adding 221 mV, which represents the redox potential relative to the standard hydrogen electrode (SHE) for an average temperature of 10°C.

Water that was discharged from each sampling interval was directed into a 500 mL HDPE bottle that was placed inside and at the bottom of the 10 L pail. The probes were immersed in the fluid in the bottle. The bottle was open at the top and allowed to overflow into the pail. As the fluid level in the pail rose above the bottle, the fluid in the bottle was buffered from the effects of degassing and warming in the daytime sun. The sampling bottle, pail, probes, and meters were further protected under a tarpaulin cover.

Sampling Handling, Shipping and Analyses

Water samples were analyzed for a range of physical parameters, cations, anions, nutrients, total metals and dissolved metals. All bottles, acids, sample labels, chain of custody forms, and coolers were supplied by ALS Environmental (Thunder Bay, ON). Fracflow staff handled all equipment and samples with nitrile gloves, and field-filtered the samples for dissolved metals analysis using 0.45 µm disposable Nalgene filters.

All samples were stored in the refrigerator at the Springpole Lake Project site until they could be shipped to Sioux Lookout via Slate Falls Airways. The ideal holding time for samples was three days, but that was dependent on the availability of scheduled flights and suitable weather conditions for flying. Staff from First Mining Gold took custody of the samples when they arrived in Sioux Lookout, and shipped those samples to ALS Environmental for analysis.

Quality Assurance and Control

Fracflow reviewed all of the analytical reports issued by ALS Environmental for proper sample identification, completion of analyses as requested on the Chain of Custody forms, and data quality. ALS experienced technical difficulties in late August 2019, which required some analytical work to be subcontracted to its network laboratories. The pH results for Work Order L2338207 all exceeded the recommended holding times prior to analysis due to that subcontracting. The ten samples affected were 3134-BL0385-108m and its blind duplicate (3134-BLDUP-1), 3134-BL354-104m, 3134-BL52-60, 3134-BL52-138m, 3134-BL52-238m, 3134-BL52-435m, 3134-BL-310-60m, 3134-MW2, and 3134-BL341-60m.

Field blanks and trip blanks were ‘clean’. The results of the duplicate analysis of sample 3134-BL0385-108m compared reasonably well with the primary sample for 58 of the 69 parameters, based on less than a 10% relative percent difference (RPD). Parameters that did not match well, having an RPD in excess of 10%, were total suspended solids (40.8%), total ammonia (19.8%), total phosphorous (13.5%), total copper (17.8%), total lead (13.1%), total lithium (13.3%), total selenium (42.3%), dissolved beryllium (13.3%), dissolved cadmium (16.9%), and dissolved selenium (14.3%).

Analysis of duplicate sample DUP-4 compared reasonably well with the primary sample collected from BL-334-D, based on less than a 10% relative percent difference (RPD) for most chemical parameters. Parameters that did not match well, having an RPD in excess of 10%, were total suspended solids (49.2%), bromide (29.4%), chloride (12.6%), reactive silica (13.8%), total mercury (21.3%), total strontium (12.2%), total sulphur (10.5%), total zinc (22.2%), dissolved calcium (10.7%), dissolved copper (39.3%), and dissolved rubidium (25.6%).

Charge balance error (CBE) is another important quality control parameter, but it is not one that is documented in the analytical reports from ALS. Fracflow calculated the CBE for each sample based on the difference between the sum of the anions and the sum of the cations. Nine of the 27 samples that were analyzed had an ion imbalance in excess of 10%. In cases where the elevated CBE was due to excess anions, that may be due to high organic matter content. For situations where the elevated CBE was due to excess cations, that may be due to a loss of alkalinity or sulphate by reaction during sample storage and transport to the laboratory, or in some cases due to interferences associated with high total suspended solids (TSS) concentrations. TSS concentrations varied between 3.9 mg/L and 55,300 mg/L and created high charge balance errors in some samples with high TSS. For example, the highest calculated CBE values were 38.5% for the sample collected from FBH-14-D, and 60.4% for the sample collected from BL-143-D. The respective TSS concentrations of those samples were 7,220 mg/L and 10,900 mg/L.

Elevated CBE is generally not believed to be the result of analytical error, and is more likely related to the local character of some groundwater samples and possible matrix interference effects. Consider that all four samples from borehole BL-0034 had high CBE, which suggests something unique about the aqueous chemistry of groundwater at that location.

Total dissolved solids (TDS) concentrations were measured and reported as gravimetric values by ALS, but interferences can reduce the accuracy of the measurement and bias the results. Groundwater containing high concentrations of calcium, magnesium and/or chloride can form a hygroscopic residue that will adsorb and retain water during filtration and bias the measurement. Fracflow calculated TDS for all groundwater samples using the standard equation (APHA, 2005):

TDS_{Calc} (mg/L): $(0.6 \text{ x Total Alkalinity as } CaCO_3) + Na^+ + Mg^+ + K^+ + Ca^{2+} + SO4^- + Cl^- + NO^{3-} + F^- + SiO3^{2-}$

Two samples with gross errors in TDS were identified. The sample from MW4 (July 2020) had a measured TDS of 735 mg/L compared with a calculated value of 98 mg/L. The sample from

BL-143-D (November 2020) had a measured TDS of 560 mg/L compared with a calculated value of 951 mg/L. Linear regression for all other samples showed a positive correlation (R^2 0.69), but there is considerable scatter of data points above and below the regression line when measured TDS is in excess of 250 mg/L.

One sample collected from the long-term aquifer test had a concentration of sulphur that did not reconcile with the reported concentration of sulphate. Groundwater sample L2527928-1 (Field no. 3134-AQ-SPW20-001-201109) had a reported sulphate concentration of 116 mg/L. However, total sulphur was reported to be 110 mg/L and the differences in molar mass would suggest that sulphate should be in the order of 330 mg/L. ALS was asked to check the results and found that the low pressures and poor recoveries were experienced during the original analysis. Corrected sulphate, bromide, chloride and fluoride concentrations were reported in a revised analytical report.

5.4 Field and Analytical Data

5.4.1 Field Measurements

Field measurements recorded during sampling in 2019 are presented in **Table 5.4**. Field measurements recorded during sampling in 2020 are presented in **Table 5.5a** (July), **Table 5.5b** (September), and **Table 5.5c** (November). Statistical summaries are provided for each sampling event below.

Statistical summary of field-measured parameters in July 2019

Parameter	Min.	Max.	Avg.	St. Dev.	n
Ph (Std. Units)	6.32	8.82	7.19	0.46	26
Specific Conductance (µS/cm)	214	689	477	90.2	26
ORP (mV)	-187	209	67	102	22
Eh (mV)	34	430	287	102	22
Temperature (°C)	4.00	17.6	7.16	3.72	26
Dissolved Oxygen (mg/L)	---	---	---	---	---
Turbidity (NTU)	---	---	---	---	---

Statistical summary of field-measured parameters in July 2020

Parameter	Min.	Max.	Avg.	St. Dev.	n
Ph (Std. Units)	6.75	7.57	7.11	0.28	9
Specific Conductance (μS/cm)	159	544	404	144	9
ORP (mV)	---	---	---	---	---
Eh (mV)	---	---	---	---	---
Temperature (°C)	4.85	13.5	7.65	3.24	9
Dissolved Oxygen (mg/L)	1.52	8.08	4.95	2.39	9
Turbidity (NTU)	0.65	3,374	833	1,283	9

Statistical summary of field-measured parameters in September 2020

Parameter	Min.	Max.	Avg.	St. Dev.	n
Ph (Std. Units)	6.85	7.89	7.47	0.33	12
Specific Conductance (μS/cm)	238	615	417	110	12
ORP (mV)	-96.0	222	40.9	98.6	12
Eh (mV)	125	443	261	98.6	12
Temperature (°C)	1.80	6.90	3.97	1.34	12
Dissolved Oxygen (mg/L)	2.82	14.2	7.61	3.86	12
Turbidity (NTU)	0.00	3,970	927	1,333	12

Statistical summary of field-measured parameters in November 2020

Parameter	Min.	Max.	Avg.	St. Dev.	n
Ph (Std. Units)	6.85	7.89	7.47	0.33	12
Specific Conductance (μS/cm)	238	615	417	110	12
ORP (mV)	-96.0	222	40.9	98.6	12
Eh (mV)	125	443	261	98.6	12
Temperature (°C)	1.80	6.90	3.97	1.34	12
Dissolved Oxygen (mg/L)	2.82	14.2	7.61	3.86	12
Turbidity (NTU)	0.00	3,970	927	1,333	12

Most intermediate to deep groundwater samples from boreholes that were completed in the fractured-bedrock were alkaline in nature, while samples collected from shallow borehole depths and from overburden wells were slightly acidic to near neutral. The specific conductance of groundwater was indicative of fresh water.

Eh values ranged between 34 mV and 443 mV. Such positive values are indicative of oxidized waters that have generally resided below surface for a relatively short period of time. Deep groundwater that has resided in the subsurface for long periods of time becomes depleted in oxygen and strongly reducing in character. Such groundwater would tend to be characterized by low, negative Eh values.

There was no obvious relationship between sampling depth and field-measured water quality parameters. The calculated correlation coefficients (R^2) for each parameter versus depth were low and signaled weak correlations.

5.4.2 Analytical Data

Analytical chemistry for groundwater samples collected at the Springpole Lake Project site are summarized in **Table 5.6** (July 2019), **Table 5.7** (July 2020), **Table 5.8** (September 2020), and **Table 5.9** (November 2020).

The concentrations of dissolved metals relative to total metals in groundwater were generally lower. It was instructive to compare the dissolved metals results with the total concentrations for the benefit of evaluating any necessary treatment options. The comparison also provides insight into whether or not elevated metals concentrations are associated with particulate matter or if those metals are more likely being influenced by chemical solubility controls. The following list highlights the difference between the average total concentration versus the average dissolved concentration for selected metals where the difference between the two exceeded a factor of ten.

Chromium: total was 0.045 µg/L, dissolved was 0.0022 µg/L (factor 20)
Lead: total was 0.014 µg/L, dissolved was 0.0004 µg/L (factor 35)
Nickel: total was 0.034 µg/L, dissolved was 0.0027 µg/L (factor 13)
Phosphorous: total was 1.51 mg/L, dissolved was 0.106 mg/L (factor 14)
Silver: total was 0.0007 µg/L, dissolved was 0.00001 µg/L (factor 70)
Vanadium: total was 0.046 µg/L, dissolved was 0.0044 µg/L (factor 10)

The above comparison demonstrates the importance of adsorption of some metals onto suspended or particulate matter in groundwater samples. There were generally smaller differences between the total and dissolved concentrations of arsenic, cobalt, iron, manganese and zinc, suggesting that those metals are more affected by chemical reactions and solubility controls. The laboratory analytical reports are provided in **Appendix H**.

5.5 Data Analysis and Interpretation

5.5.1 General Character of Sampled Water

For discussion purposes, the following terminology is used to provide a general classification for groundwater types:

- Fresh water: < 1,000 mg/L total dissolved solids (TDS);
- Brackish water: 1,000 - 10,000 mg/L TDS;
- Saline water: 10,000 - 100,000 mg/L TDS; and
- Brine: > 100,000 mg/L TDS.

As noted previously, samples collected during the long-term aquifer test at SPW20-001 are excluded from this chapter and reserved for presentation and discussion in Chapter 6.

Measured TDS concentrations of the groundwater and surface water samples that were collected in 2019 and 2020 ranged between 157 mg/L and 1,360 mg/L. All waters are recognized as fresh. The measured TDS of 1,360 mg/L at MW4 was likely biased by due the very high concentration of total suspended solids (28,100 mg/L).

There was no chemical evidence to support the presence of brackish or saline water, or brine, in the areas sampled, under current hydrogeological conditions. Groundwater that has experienced an extended period of rock-water interaction, in the subsurface, will often contain detectable concentrations of bromide and relatively high concentrations of chloride. Bromide was below the 0.1 mg/L detection limit in all samples analyzed, except for samples collected from borehole BL-0111 (0.14 mg/L) and BL-385 (0.24 mg/L). The maximum measured chloride concentration was only 22.6 mg/L in a sample from 60 m depth in borehole BL-310.

A representative number of groundwater samples collected by Fracflow were classified using a trilinear diagram (**Figure 5.1**). This diagram consists of two equilateral triangles, positioned at the lower left and right, and a diamond shaped field centered above. The triangle on the left is used to plot the relative proportions of calcium, magnesium, and sodium plus potassium (i.e., cations), the sum total equaling 100 % as chemical equivalents. The triangle on the right is used to plot the relative proportion of total bicarbonate, sulphate and chloride (i.e., anions), the sum total also equaling 100 % as chemical equivalents. A sample plotted on the cation and anion triangles is then projected into the diamond field to plot the point of intersection, from which a chemical classification is obtained. The trilinear diagrams presented in this report were developed using the AquaChem geochemical software (Waterloo Hydrogeologic, 2006).

Major ion concentrations of samples that were used to generate the plot shown in **Figure 5.1** are presented in **Table 5.10** (2019 samples) and **Table 5.11** (July and November 2020 samples), along with the resulting classifications. Groundwater samples were classified as either calcium-bicarbonate (Ca-HCO_3) type or calcium-magnesium-bicarbonate (Ca-Mg-HCO_3) type. Close grouping of data points in **Figure 5.1** is due to the similar major ion chemistry of the samples collected. However, there are sufficient differences in chemistry to suggest that surface water and shallow groundwater evolved from a Ca-HCO_3 type to a Ca-Mg-HCO_3 type during flow into, and increased residence time within, the fractured-bedrock aquifer.

Samples collected from deep boreholes SP11-064 (635.7 m) and BL-143-D (764.1 m) were dominated by calcium and bicarbonate and had relatively low magnesium. The Ca-HCO_3 type of those samples appear more characteristic of shallow groundwater, which may due to higher permeability in the upper portions of each borehole, skewing the sample chemistry to that of shallow groundwater.

5.5.2 Potential Effects of Drilling Fluids on Groundwater Chemistry

The next step in evaluating the groundwater geochemistry at Springpole was to determine if drilling fluids were present and, if so, what effect those fluids may have had on groundwater quality, either by addition of chemical constituents or by chemical reactions that alter the natural quality of the groundwater. Surface water from Springpole Lake was used as the primary water supply for drilling purposes. Chemical additives that included lubricants, flocculants and bleach could have been added to the water as it was pumped downhole. The collective mixture is referred to here as the drilling fluid. The potential effects of those fluids on groundwater chemistry are noted below.

- The chemical additives are designed to rapidly flocculate cuttings from the drilling fluids that return to surface, and for lubrication of the drill string. Those additives often consist of polyacrylimide copolymers that are manufactured using petroleum distillate to form a water-in-oil emulsion. Those fluids create an “oil-wet” condition when in contact with the borehole wall. Some of the hydrocarbon constituents will dissolve in groundwater and measurable concentrations of benzene, toluene, ethylbenzene, xylenes (BTEX), gas-, diesel- and lube-fraction compounds can be detected by chemical analysis. The water-in-oil emulsion can reduce groundwater conductivity when present.

- Polyelectrolytes adhere to sludge particles and cause desorption of the bound water and agglomerization of drill cuttings in the mud pits and boreholes. The effects of those compounds on groundwater chemistry, when left in a borehole to biodegrade, may include changes in redox state (become increasingly reducing in nature), decreased pH and increased metals solubility (especially sulfides), increased total organic carbon (TOC) and elevated chemical oxygen demand (COD).

- Bleach is added to the drilling fluids on a regular basis for disinfection purposes. Bleach can raise the alkalinity and may increase chloride and conductivity (minor effect on brackish and higher conductivity water).

- If grout was used in any of the boreholes, one would observe an elevated pH and very low to negligible bicarbonate.

5.5.3 Assessment of the Presence of Drilling Fluids

Some aspects of the physical quality of the groundwater samples provided direct evidence of the presence and impact of drilling fluid on groundwater in the exploration boreholes. At the start of air-lifting, most of the fluids discharged from the boreholes were brown to dark brown in colour, and probably contained significant residual drilling fluids. In some cases, where drilling fluids may have been undergoing active biodegradation, the discharge fluids were grey, dark green or black colour, were opaque, and had a sulfurous odour of varying strength.

The well-within-a-well set up only operated from a depth of 30 m. Therefore, the possibility of encountering residual drilling fluids increased with increasing sampling depth. The benefit of using a low-flow bladder pump for sampling is that the opportunity exists to draw freshwater into the borehole within the vicinity of the pump, with minimal disturbance of the water column above and below the sampling interval. For most of the boreholes that were sampled, the water quality was much improved relative to that observed during air-lifting. However, oily sheens and hydrocarbon odours were still detected at some borehole locations during sampling, more so during early-time.

The general pattern that was observed with continued purging in most boreholes, was improved colour and clarity, minor changes in specific conductance and pH, and a trend toward decreasing Eh with time. It was only while sampling at a depth of 215.7 m, in borehole BL-0098, that a major shift in water quality was observed. During continuous purging, the pH increased from 4.05 to 8.08 over a period of 144 minutes (**Figure 5.2**) and an oily sheen and hydrocarbon odour were present throughout the purging process. The low pH at the start of purging suggests the presence of actively biodegrading drilling fluids. Respiring bacteria would produce carbon dioxide gas and carbonic acid, which would lower pH. With continued low-flow purging, it appears that fresh groundwater progressively entered the borehole and continued to dilute and replace the drilling fluids. The pH began to stabilize in late-time and approximated the character of the *in situ* groundwater within the fractured-bedrock aquifer.

5.5.4 Rock-Source Deductions

The AquaChem geochemical software (Waterloo Hydrogeologic, 2006) was used to compute a variety of different ion ratios and to infer the potential rock sources and processes, such as ion exchange, that are responsible for the observed major ion chemistry of the water samples that were collected.

The weathering of carbonate-bearing rocks is believed to be the primary source of calcium and bicarbonate, with the weathering of some ferromagnesian minerals being the main sources of magnesium, and ion exchange processes explaining the contributions of sodium in water. Carbonatites and secondary carbonate mineralization on fracture planes and in vesicles of amygdaloidal volcanics, and volcanic breccia would be the most reactive and most probable sources of calcium and bicarbonate.

5.5.5 Solubility Controls

A more advanced assessment of the aqueous geochemical processes that are responsible for the observed groundwater chemistry at the Springpole Lake Project site was completed using the geochemical computer code PHREEQC version 2 (Parkhurst and Appello, 1999). That code is based on the concept of equilibrium chemistry of aqueous solutions that interact with minerals, gases, solid solutions, ion exchange and adsorption surfaces, etc. The degree of saturation with respect to calcite and a variety of other mineral phases were computed by PHREEQC. When the computed saturation index (SI) is negative, the mineral is under-saturated and is likely to be dissolving in groundwater. When the SI value is zero or close to zero, that mineral is in equilibrium and is unlikely to be either dissolving or precipitating. When the SI value is positive, the mineral is supersaturated and is likely to be precipitating.

The saturation indices for calcite are presented in **Table 5.10** and **Table 5.11** for a representative group of groundwater samples that were collected in July 2019, July and November 2020, respectively (samples collected in September 2020 were not speciated). Only 13 of the 48 groundwater samples that were speciated were undersaturated with respect to calcite, which indicates that calcite is likely to be dissolving, thereby adding dissolved calcium and bicarbonate to those waters. The majority of groundwater samples collected were either saturated or supersaturated with respect to calcite, suggesting an equilibrium condition or the active precipitation of calcite, which would remove calcium and bicarbonate from solution.

One sample from borehole BL-0098, collected from a vertical depth of 215.7 m, had an anomalously high pH of 8.82 and the highest saturation index for calcite (1.54). Chemical weathering of alumino-silicate minerals will consume CO_2 and increase pH. Consider the theoretical dissolution of potassium feldspar [Equation 5-1], with formation of kaolinite, and the dissolution of anorthite [Equation 5-2], which releases calcium and dissolved silica:

$$2KAlSi_3O_8 + 2CO_2 + 11H_2O = Al_2Si_2O_5(OH)_4 + 2K+ + 2HCO_3 \qquad [5\text{-}1]$$

$$CaAlSi_2O_8 + 8H^+ = Ca^{2+} + 2Al^{3+} +2H_4SiO_4 \qquad [5\text{-}2]$$

The latter reaction would provide a plausible explanation for the high pH, especially considering that one would expect the host trachyte to contain potassium-rich feldspars.

5.5.6 Chemical Changes with Depth

Total dissolved solids (TDS) concentrations plotted versus sampling depth (**Figure 5.3**) showed a very weak correlation (R^2 0.07) of increased TDS with increased depth, for several possible reasons. First, there is a high degree of spatial variability in rock type, and degree of fracturing and chemical weathering across the Springpole site, which can contribute to variability in TDS. In addition, while groundwater samples were collected from discrete depths within exploration boreholes, those boreholes were open and therefore in communication with the rock mass along the entire length of each borehole. Water in those boreholes have the opportunity to move up or down in response to the forces that drive groundwater flow, whether they be hydraulic gradients, gas pressures, or density differences associated with variations in TDS (i.e., a borehole short-circuits the natural normal flow system and active flow can occur into, or out of, the boreholes through open discontinuities in the rock mass). Finally, TDS data are biased to a larger number of samples collected from shallow sampling depths.

In order to smooth out some of the variability in TDS, average concentrations were calculated for different sample depths and the results were plotted in **Figure 5.4**. If the sample from SP11-064 is excluded from the data set, there is a good correlation between depth and TDS (R^2 0.91), as shown in **Figure 5.4**.

5.5.7 Redox and Trace Metal Chemistry

With increased residence time of groundwater, during flow from recharge areas to discharge areas, oxygen tends to become depleted and anaerobic conditions develop. The initial reactions are driven by the aerobic decay of organic matter and then progress to nitrate reduction, denitrification, iron reduction, and sulfate reduction.

Oxidation/Reduction Potential (ORP) was measured and Eh values were calculated for all groundwater samples from all monitoring wells and boreholes. Eh varied from a high of 807 mV (highly oxidized to condition) to a minimum of 34 mV (a weakly reduced, oxygen limiting condition). Given the depths that groundwater samples were collected in those boreholes (average 109 m), the Eh was unexpectedly high and there was no significant correlation between Eh and sampling depth, or between Eh and dissolved oxygen concentrations. As mentioned previously, the more than 500 boreholes across the site, representing approximately 100,000 m of open hole, may be short-circuiting the natural flow system and allowing oxygen-rich waters at surface to penetrate deep into the rock mass. Despite that possibility, there may still be sufficient variability in redox conditions within the flow system to influence trace metal solubility and mobility.

The orebody at the Springpole Lake Project site consists of zones of disseminated pyrite and arsenopyrite within variably developed stockworks that are surrounded by intensely altered wall rocks. The interaction of those sulphides with groundwater has generated significant concentrations of dissolved arsenic, dissolved iron and other heavy metals in some groundwater samples. The highest concentration of dissolved arsenic was 406 µg/L, or 0.406 mg/L, which was detected in the sample from 163.9 m vertical depth in borehole BL-0049. The associated concentration of dissolved iron was 34,700 µg/L, or 34.7 mg/L. The iron in that sample was anomalously high relative to other samples from the site, and that sample is excluded from the following discussion.

Sulphides are reactive when exposed to oxygenated water. It stands to reason that the higher the Eh of groundwater, the higher will be the concentration of arsenic, iron and other associated metals in and around mineralized zones. That is the pattern observed in **Figure 5.5**, which presents data for a representative set of groundwater samples collected in July 2019, and July and November 2020. One group of samples shows a positive correlation with Eh, and is believed to be associated with sulphide mineralization, while the other group of samples is not correlated with Eh, and is believed to be associated with a relatively barren rock mass.

Concentrations of dissolved zinc were also significant in some groundwater samples, ranging between not detected (< 1 µg/L) and 687 µg/L, averaging 86.8 µg/L. Dissolved zinc in groundwater suggests the presence of sphalerite in association with pyrite and arsenopyrite. Some of the groundwater samples that are believed to have been affected by sulphide decomposition also contained trace, but detectable concentrations of silver. It is further possible that silver is associated with rocks having a more alkalic affinity (i.e., trachyte).

Oxidation of sulphides (e.g., pyrite, chalcopyrite, sphalerite) needs to considered as a major source of sulphate in groundwater at the Springpole site since sulphides are a ubiquitous component of mineralization in and around the ore body. Oxidation of organic matter is another potential source of sulphate. Dissolved organic carbon (DOC) concentrations in groundwater ranged between not detected (< 5 mg/L) and 64.2 mg/L, averaging 17.5 mg/L (St. Dev. 13.1 mg/L). DOC concentrations were highest in shallow groundwater and decreased with depth.

While the groundwater has been shown to be oxidizing in nature, based on the presence of dissolved oxygen and positive values of Eh, sulphide oxidation creates low pH conditions that were not widely observed in Springpole groundwater samples. The alkaline nature of most groundwater samples from Springpole suggests that any acidification generated by sulphide oxidation is neutralized by concomitant dissolution of carbonate mineralogy.

Table 5.1 Groundwater sampling locations in 2019.

Hole ID	UTM Coordinates (NAD83-Zone 15)		Elev	Depth	Azimuth	Dip	Depth of Water Samples									Number of Samples Collected
	Easting (m)	Northing (m)	(m)	(m)	(o)	0	0-50	50-100	100-150	150-200	200-250	250-300	300-350	350-400	400-450	
Groundwater Sampling Locations																
BL-0024	548927.39	5693981.83	400.9	252	24	60	42.4 m				206.1 m					2
BL-0034	549369.89	5694153.42	400.7	614	204	65		54.4 m	125.1 m			261 m			406 m	4
BL-0049	549443.21	5694277.42	400.5	228	198	50	46 m			163.9 m						2
BL-0052	548916.42	5694333.35	404.1	462	198	75		58 m	133.3 m		229.9 m				420 m	4
BL-0098	549028.35	5694095.17	402.1	282	204	65	36.3 m				215.7 m					2
BL-0111	549483.46	5694377.13	402.3	496	204	65		54.4 m	125.1 m		215.1 m		306.3 m			4
BL-0310	549209.32	5694048.25	397.2	151	200	45	42.4 m									1
BL-0341	549853.92	5694144.48	399.3	153	25	45	42.4 m									1
BL-0354	548935.03	5694271.36	406.6	261	200	45		73.5 m								1
BL-0385	548882.12	5694422.7	400	208	240	45		76.4 m								1
MW2	548946	5694468	---	4.0	---	90	4.0 m									1
MW-B000	553930.584	5689607.098	402.09	3.8	---	90	3.8 m									1
MW-E080	554039.906	5689455.692	400.45	3.0	---	90	3.0 m									1
MW-K034	553351.73	5689759.051	401.07	3.7	---	90	3.7 m									1
															Total Samples	**26**

Table 5.2 Lithology at or near boreholes that were sampled in 2019 (Page 1 of 3).

Borehole Number	**Dip (°)**	**Lithology Available**	**Nearest Borehole with Lithology**	**Distance Along Borehole Length**		**Lithology**
				From (m)	**To (m)**	
BL-0098	-65	Yes	n/a	0	1.8	Overburden
				1.8	241.1	Andesite
				241.1	282.2	Tuff
BL-0024	-60	Yes	n/a	0	1.8	Overburden
				1.8	218.6	Andesite
				218.6	221.4	Metasediments
				221.4	251.8	Andesite
BL-0111	-65	No	BL-0152	0	3	Overburden
				3	49.6	Andesite
				49.6	50.3	Volcanic Breccia
				50.3	80.2	Unknown
				80.2	108.4	Porphry Dike
				108.4	132.5	Volcanic Breccia
				132.5	177.7	Andesite
				177.7	178.9	Volcanic Breccia
				178.9	193.1	Andesite
				193.1	207.8	Porphry Dike
				207.8	218.5	Trachyte
				218.5	224.6	Volcanic Breccia
				224.6	238	Trachyte
BL-0049	-50	No	BL-0164	0	1.34	Overburden
				1.34	29.57	Porphyry Dike
				29.57	60.05	Volcanic Breccia
				60.05	82.91	Trachyte
				82.91	96.92	Andesite
				96.92	101.35	Volcanic Breccia
				101.35	114.42	Void
				114.42	125.26	Volcanic Breccia
				125.26	125.27	Carbonatite
				125.27	142.34	Volcanic Breccia
				142.34	157.28	Andesite
				157.28	166.73	Volcanic Breccia
BL-0034	-65	No	BL-0035	0	3.51	Overburden
				3.51	31.33	Volcanic Breccia
				31.33	55.17	Porphyry Dike
				55.17	63.43	Volcanic Breccia
				63.43	84.43	Andesite
				84.43	87.54	Metasediments
				87.54	221.1	Andesite
				221.1	259.33	Metasediments
				259.33	262.55	Andesite
				262.55	282.92	Metasediments
				282.92	444.89	Andesite
				444.89	501.18	Metasediments
				501.18	611.43	Andesite

Table 5.2 Lithology at or near boreholes that were sampled in 2019 (Page 2 of 3).

Borehole Number	**Dip (°)**	**Lithology Available**	**Nearest Borehole with Lithology**	**Distance Along Borehole Length**		**Lithology**
				From (m)	**To (m)**	
BL-0341	-45	No	BL-0266	0	1	Overburden
				1	6	Volcanic Breccia
				6	9.9	Andesite
				9.9	21.7	Volcanic Breccia
				104.1	107.9	No Recovery
				21.7	103.4	Andesite
				103.4	104.1	Volcanic Breccia
BL-0385	-45	No	BL-214	0	12.5	Overburden
				12.5	16	Metasediments
				16	31.3	Breccia
				31.3	223.9	Andesite
				223.9	227.8	Volcanic Breccia
				227.8	277.2	Andesite
				277.2	289.3	Quartz Porphyry Dike
				289.3	501	Andesite
				501	504.1	Volcanic Breccia
				504.1	521	Andesite
BL-0354	-45	No	SP12-136	0	3.1	Overburden
				154.7	168.7	Quartz Porphyry Dike
				3.1	9.4	Andesite
				9.4	12.3	Volcanic Breccia
				12.3	110.3	Andesite
				110.3	117.3	Volcanic Breccia
				117.3	119	Lamprophyre
				119	132.2	Trachyte
				132.2	147	Quartz Porphyry Dike
				147	154.7	Volcanic Breccia
				168.7	251	Quartz Porphyry Dike
BL-0052	-75	No	BL-0185	0	2.13	Overburden
				2.13	6.25	Andesite
				6.25	10.52	No Recovery
				10.52	21.34	Andesite
				21.34	25.79	Metasediments
				25.79	60.66	Andesite
				60.66	84.58	Volcanic Breccia
				84.58	93.79	Andesite
				93.79	97.84	No Recovery
				97.84	113.39	Andesite
				113.39	113.69	No Recovery
				113.69	150.39	Andesite
				150.39	178.31	Volcanic Breccia
				178.31	181.02	Andesite
				181.02	185.5	No Recovery
				185.5	194.16	Andesite

Table 5.2 Lithology at or near boreholes that were sampled in 2019 (Page 3 of 3).

Borehole Number	Dip (°)	Lithology Available	Nearest Borehole with Lithology	Distance Along Borehole Length		Lithology
				From (m)	To (m)	
BL-0310	-45	No	SP11-072	0	3.9	Overburden
				3.9	18.5	Andesite
				18.5	20.3	Volcanic Breccia
				20.3	74.1	Andesite
				74.1	86.5	Trachyte
				86.5	88.1	Lamprophyre
				88.1	132	Trachyte
				132	142	Metasediments
				142	142.5	Banded Iron Formation
				142.5	163	Metasediments
				163	164	Lamprophyre
				164	178	Trachyte
				178	197	Tuff
				197	210	Trachyte
				210	270	Volcanic Breccia
				270	333.7	Trachyte
				333.7	333.8	Muscovite Seam
				333.8	334	Trachyte
				334	334.1	Muscovite Seam
				334.1	334.3	Trachyte
				334.3	336	Muscovite Seam
				336	343	Trachyte
				343	344	Muscovite Seam
				344	386	Trachyte
				386	397	Volcanic Breccia
				397	492	Trachyte

Table 5.3 Locations of groundwater samples collected in 2020.

Hole ID	**UTM (NAD83-Zone 15)**		**Elevation**	**Depth**	**Azimuth**	**Dip**	**Sample Distance (m)**		**Borehole Distance**	**Monitoring Well Construction**
	Easting (m)	**Northing (m)**	**(m)**	**(m)**	**(Degree)**	**(Degree)**	**Start**	**Stop**	**(m)**	
Groundwater Sampling Locations										
BH-WSF1-01-D	549 772	5 695 076	399.0	8.3	0	90	6.2	8.3	8.3	Multi-level Piezometer
BH-WSF1-03-D	550 726	5 694 431	404.8	11.0	0	90	8.2	11.0	11.0	Multi-level Piezometer
BH-PS-09-R1-D	550 747	5 693 841	400.8	8.2	0	90	6.1	8.2	8.2	Multi-level Piezometer
BH-TMF-04-D	548 122	5 693 471	413.7	14.2	0	90	10.0	14.2	14.2	Multi-level Piezometer
BH-WSF1-11-D	551 085	5 694 725	399.4	8.9	0	90	11.2	8.9	8.9	Multi-level Piezometer
BH-WSF2-12-D	549 785	5 695 494	395.4	8.2	0	90	6.1	8.2	8.2	Multi-level Piezometer
BH-WSF2-13-D	547 290	5 694 515	401.9	9.6	0	90	6.6	9.6	9.6	Multi-level Piezometer
BH-WSF2-14-D	547 152	5 692 980	404.6	9.4	0	90	7.7	9.4	9.4	Multi-level Piezometer
BL-143-D	549 041	5 693 629	397.3	718.0	38	70	21.6	764.1	764.1	Multi-level Piezometer
BL-321-D	548 909	5 693 708	397.3	161.2	36	45	27.5	31.8	228.0	Multi-level Piezometer
BL-334-D	548 847	5 692 197	398.0	229.1	230	45	21.0	32.0	324.0	Multi-level Piezometer
BL-235	549 733	5 694 103	401.3	47.3	198	80	0.0	48.0	48.0	Diamond Drill Hole
BL-0385	548 882	5 694 423	400.0	169.7	240	45	0.0	240.0	240.0	Diamond Drill Hole
SP11-064	549 221	5 693 351	395.9	635.7	40	45	0.0	899.0	899.0	Diamond Drill Hole
MW2	548 946	5 694 468	---	4.0	0	90	0.0	4.0	4.0	Shallow monitoring well
MW3	550 320	5 694 013	---	1.2	0	90	0.0	1.2	1.2	Shallow monitoring well
MW4	552 068	5 691 061	---	1.5	0	90	0.0	1.5	1.5	Shallow monitoring well
MW5	549 556	5 692 429	---	3.7	0	90	0.0	3.7	3.7	Shallow monitoring well
SGH20-001	549 339	5 693 015	403.5	327.7	90	55	23.9	29.0	400.1	Piezometer
SGH20-002-D	548 918	5 693 693	394.9	306.4	137	50.0	21.7	26.2	400.0	Multi-level Piezometer
SGH20-004-D	548 812	5 694 074	408.6	224.5	169	50.0	23.7	28.0	293.0	Multi-level Piezometer
SGH20-008-D	549 328	5 694 167	400.8	325.4	125	52	23.7	30.8	413.0	Multi-level Piezometer
SPW20-001	549 026	5 694 166	408.3	401.0	---	90	0.0	401.0	401.0	Diamond Drill Hole

Table 5.4 Final field-measured water quality values at the end of purging and immediately prior to sampling in 2019.

Borehole Number	Date	Distance Along Borehole Length (m)	Dip (°)	Vertical Depth (m)	Flow Rate (Lpm)	Purging Time (mins)	Volume Purged (L)	pH (Std. Units)	Specific Conductance (uS/cm)	Eh (mV)	Temperature (oC)
BL-0098	18-Aug-19	40	65	36.3	0.33	70	23	7.36	489	247	14.8
	19-Aug-19	238		215.7	0.25	144	36	8.82	485	203	5.8
BL-0024	19-Aug-19	49	60	42.4	0.33	100	33	7.45	444	208	14.0
		238		206.1	0.17	195	33	7.39	478	196	7.1
BL-0111	20-Aug-19	60	65	54.4	0.33	81	27	7.33	389	411	4.7
		138		125.1	0.17	120	20	7.49	398	430	5.4
		238		215.7	0.20	155	31	7.50	399	421	5.7
		338		306.3	0.30	135	41	7.53	455	365	4.8
BL-0049	21-Aug-19	60	50	46.0	0.33	73	24	6.83	480	187	4.1
		214		163.9	0.20	120	24	7.34	689	34	10.5
BL-0034	22-Aug-19	60	65	54.4	0.17	79	13	6.88	491	287	5.0
		138		125.1	0.21	140	30	6.91	491	352	4.0
		288		261.0	0.33	145	48	7.06	564	231	4.4
	23-Aug-19	448		406.0	0.30	130	63	7.10	587	214	4.2
BL-0341	23-Aug-19	60	45	42.4	0.33	85	24	6.74	428	366	6.0
BL-0385	24-Aug-19	108	45	76.4	0.29	110	32	7.34	503	159	11.1
BL-0354	24-Aug-19	104	45	73.5	0.40	120	48	6.68	423	411	17.6
BL-0052	24-Aug-19	60	75	58.0	0.33	105	35	7.26	532	346	6.3
	25-Aug-19	138		133.3	0.33	115	38	7.34	533	340	6.1
	25-Aug-19	238		229.9	0.33	130	43	7.25	568	362	6.7
	25-Aug-19	435		420.2	0.28	215	60	7.31	584	273	6.2
BL-0310	26-Aug-19	60	45	42.4	0.33	125	41	6.99	599	268	6.1
MW2	26-Aug-19	4.0	90	4.0	n/a	90	4.5	7.43	545	---	11.6
MW-B000	29-Sep-19	3.8	90	3.8	n/a	70	5	6.82	496	---	5.6
MW-E080	29-Sep-19	3.0	90	3.0	n/a	---	16	6.32	214	---	4.3
MW-K034	29-Sep-19	3.7	90	3.7	n/a	---	3.5	6.57	510	---	4.1
TMA-RS	29-Sep-19	---	---	---	n/a	---	---	6.21	100	---	7.1

Notes:

1. Field-measured ORP value is corrected to Eh by adding 221 mV, which is the elctrode potential at 10 oC.

2. Flow rates reported above are the average for the pumping period.

3. Duplicate sample collected at BL-0385.

Table 5.5a Final field-measured water quality values at the end of purging and immediately prior to sampling in July 2020 (Page 1 of 2).

		Overburden	**Bedrock**	**Bedrock**	**Bedrock**	**Overburden**
Sample ID		SP-GW-MW5	SP-GW-SP11-064	SP-GW-BL-235	SP-GW-BL-385	SP-GW-MW2
Date	dd-mm-yy	6-Jul-20	6-Jul-20	7-Jul-20	7-Jul-20	14-Jul-20
Time	hh:mm	14:33	16:36	10:19	11:48	10:22
pH		7.43	7.01	7.08	6.93	7.24
Conductivity	us/cm	544.30	301.10	472.30	424.60	541.90
ORP	mV	N/A	N/A	N/A	N/A	N/A
Temp	pH, Cond, D.O	5.75	5.75	6.05	6.55	8.55
DO	mg/L	4.29	8.08	1.52	2.37	7.19
Turbidity	NTU	N/A	0.65	0.83	4.47	3374
Notes		18L purged, smells like weathered plastic, silt at bottom	12V pump, 70m at 12.5L/min, Significant grease build-up on and around casing	12V pump, 15L/min for 75m. Yellow to clear with pumping, strong sulfur odour noted intermittently	12V pump, 15L/min for 30m. Clear to orange-brown, odourless	20L purged. No odour, grey silty

Table 5.5a Final field-measured water quality values at the end of purging and immediately prior to sampling in July 2020 (Page 2 of 2).

Sample ID		**Overburden** SP-GW-MW3	**Overburden** SP-GW-MW4	**Piezometer** SP-GW-BL-334-D	**Piezometer** SP-GW-BL-321-D
Date	dd-mm-yy	14-Jul-20	14-Jul-20	15-Jul-20	15-Jul-20
Time	hh:mm	12:50	16:04	11:12	16:30
pH		6.79	6.75	7.17	7.57
Conductivity	us/cm	217.80	159.00	526.00	453.20
ORP	mV	N/A	N/A	N/A	N/A
Temp	pH, Cond, D.O	12.55	13.55	4.85	5.25
DO	mg/L	6.05	7.64	4.23	3.21
Turbidity	NTU	811	Over range	1641	1.83
Notes		Well cracked, joined at ground level. 15L purged. Brown, silty	7.5L purged. Brown, silty, fine silt at bottom. Odourless.	Purged 90L, grey odourless. Bentonite in sample (?)	60L purged. Sulfur, hydrocarbon odour, slightly orange to clear when pumped.

Table 5.5b Final field-measured water quality values at the end of purging and immediately prior to sampling in September 2020 (Page 1 of 4).

		Groundwater	Groundwater	Groundwater	Piezometer	Piezometer
Sample ID		SP-GW-BL-235	SP-GW-BL-385	SP-GW-SP11-064	SP-GW-BL-143-D	SP-GW-BL-334-D
Date	dd-mm-yy	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	17-Sep-20
Time	hh:mm	9:59	11:39	14:35	16:02	12:13
pH		7.26	7.17	6.87	8.07	7.21
Conductivity	us/cm	494.80	477.80	355.80	292.70	529.00
ORP	mV	-93.9	40	134.8	-165.8	176.8
Temp	pH, Cond, D.O	3.7	5.2	4.7	4.6	4.4
DO	mg/L	1.17	1.54	5.61	2.57	5.32
Turbidity	NTU	0.00	21.30	0.00	0.00	79.23
Notes		12V pump, 63 mins at 11 L/m, Slight sulphur/swampy/organic odour when pumping	orange-ish clear when pumping. Pumped 60m at approx 11L/m	Casing damaged from drilling activities, bend upwards, some debris fell dwn well.	Weathered hydrocarbons odour noted	

Table 5.5b Final field-measured water quality values at the end of purging and immediately prior to sampling in September 2020 (Page 2 of 4).

		Overburden	**Overburden**	**Overburden**	**Piexometer**	**Piezometer**
Sample ID		SP-GW-MW5	SP-GW-MW4	SP-GW-MW3	SP-GW-FBH-07-R1-D	SP-GW-FBH-03-D
Date	dd-mm-yy	17-Sep-20	17-Sep-20	17-Sep-20	19-Sep-20	19-Sep-20
Time	hh:mm	13:39	14:41	17:10	13:05	15:35
pH		7.62	6.92	6.82		7.96
Conductivity	us/cm	579.00	139.90	251.40		36.70
ORP	mV	181.2	177.8	4.3		96
Temp	pH, Cond, D.O	5.7	9.2	8.5	3.5	4.4
DO	mg/L	11.68	8.93	7.21		13.84
Turbidity	NTU	7200	5011	700	2350	988
Notes						AKA BH-WSF1-03-D. 12L purged. Hydrocarbon odour detected

Table 5.5b Final field-measured water quality values at the end of purging and immediately prior to sampling in September 2020 (Page 3 of 4).

		Piezometer	**Overburden**	**Piezometer**	**Piezometer**	**Piezometer**
Sample ID		SP-GW-FBH-11-D	SP-GW-MW2	SP-GW-FBH-02-D	SP-GW-FBH-01-D	SP-GW-FBH-12-D
Date	dd-mm-yy	19-Sep-20	20-Sep-20	20-Sep-20	20-Sep-20	20-Sep-20
Time	hh:mm	16:54	10:00	10:55	11:44	14:45
pH		7.40	7.67	7.76	7.42	7.49
Conductivity	us/cm	586.00	556.00	303.00	409.50	396.10
ORP	mV	-76.1	128.6	-12.9	69.5	-34.2
Temp	pH, Cond, D.O	3.1	9.8	3	3.5	4
DO	mg/L	1.23	11.58	6.76	4.44	9.84
Turbidity	NTU	4054	4480	1260	2070.00	101.66
Notes		AKA BH-WSF1-11-D. 15L purged. Good recharge noted		AKA BH-WSF1-02-D. 15L purged		muddy water, organic material smell.

Table 5.5b Final field-measured water quality values at the end of purging and immediately prior to sampling in September 2020 (Page 4 of 4).

		Piezometer	Piezometer	Piezometer	Piezometer	Piezometer
Sample ID		SP-GW-FBH-04-D	SP-GW-FBH-09-R1-D	SP-GW-FBH-13-D	SP-GW-FBH-06-D	SP-GW-FBH-14-D
Date	dd-mm-yy	20-Sep-20	20-Sep-20	21-Sep-20	22-Sep-20	22-Sep-20
Time	hh:mm	17:10	17:45	14:55	14:19	15:48
pH		7.77	7.83	7.81	8.05	7.79
Conductivity	us/cm	390.70	317.60	354.10	311.90	368.60
ORP	mV	95.6	49	69.1	18.2	-11.9
Temp	pH, Cond, D.O	6.9	6.1	4.9	7.7	5.9
DO	mg/L	10.72	2.99	3.84	11.75	9.74
Turbidity	NTU	132.70	7226.00	1766.00	140.00	3917.00
Notes		18L purged. Brownish colour, hydrocarbon odours noted	Noted slow to recharge. Purged 23L		Recharge too low to reasonably sample	Hydrocarbon odours noted. 15L purged. Unfilitered sample reacted with H2S04

Table 5.5c Final field-measured water quality values at the end of purging and immediately prior to sampling in November 2020 (Page 1 of 3).

		Piezometer	**Piezometer**	**Piezometer**	**Piezometer**	**Piezometer**
Sample ID		SP-GW-FBH-01-D	SP-GW-FBH-11-D	SP-GW-FBH-03-D	SP-GW-FBH-04-D	SP-GW-FBH-14-D
Date	dd-mm-yy	1-Nov-20	1-Nov-20	1-Nov-20	2-Nov-20	2-Nov-20
Time	hh:mm	11:15	14:04	15:15	11:57	14:32
pH		6.85	7.02	7.38	7.53	7.47
Conductivity	us/cm	404.70	615.00	238.00	402.70	397.70
ORP	mV	180.9	-27	90.9	104.3	-48.9
Temp	pH, Cond, D.O	3	2.4	3	4.4	4.2
DO	mg/L	4.65	2.82	14.21	12.10	5.40
Turbidity	NTU	520	605	116	156	3290
Notes		12L purged	18L purged	15L purged	18L purged	15L purged

Table 5.5c Final field-measured water quality values at the end of purging and immediately prior to sampling in November 2020 (Page 2 of 3).

		Piezometer	**Piezometer**	**Piezometer**	**Piezometer**	**Overburden**
Sample ID		SP-GW-FBH-09-R1-D	SP-GW-FBH-07-R1-D	SP-GW-SGH20-001-D	SP-GW-BL-143-D	SP-GW-MW2
Date	dd-mm-yy	3-Nov-20	3-Nov-20	7-Nov-20	7-Nov-20	8-Nov-20
Time	hh:mm	10:02	11:20	10:52	13:44	14:05
pH		7.75	7.86	7.54	7.80	7.89
Conductivity	us/cm	424.00	338.00	337.00	307.90	578.00
ORP	mV	-53.5	72.3	7.3	-96	222.2
Temp	pH, Cond, D.O	1.8	4.7	4.2	4	6.9
DO	mg/L	7.90	10.35	8.34	6.40	12.11
Turbidity	NTU	1365.00	810.00	288.00	0.00	3970.00
Notes		21L purged	21L purged	120L purged	105L purged	9L purged

Table 5.5c Final field-measured water quality values at the end of purging and immediately prior to sampling in November 2020 (Page 3 of 3).

		Bedrock	Bedrock
Sample ID		SP-GW-BL-235	SP-GW-BL-385
Date	dd-mm-yy	15-Nov-20	15-Nov-20
Time	hh:mm	10:08	11:48
pH		7.35	7.17
Conductivity	us/cm	522.00	443.70
ORP	mV	-29	67.9
Temp	pH, Cond, D.O	3.9	5.1
DO	mg/L	3.37	3.69
Turbidity	NTU	0.00	3.94
Notes		Strong sulfur smells noted. Pumped 60 mins. 7.75L/min after used at Cameron.	Brown-grey to clear with sustained pumping. 8.3L/min for 60m

Table 5.6 General chemistry and metals data for groundwater samples collected in 2019 (Page 1 of 4).

Parameter	Units	Client Sample ID	3134-BL98-40M	3134-BL98-238M	3134-BL24-49M	3134-BL24-238M	3134-BL111-60M	3134-BL111-138M	3134-BL111-238M	3134-BL111-338M
		Date Sampled	**18-Aug-2019**	**19-Aug-2019**	**19-Aug-2019**	**19-Aug-2019**	**20-Aug-2019**	**20-Aug-2019**	**20-Aug-2019**	**21-Aug-2019**
		Time Sampled	**15:30**	**10:05**	**13:30**	**18:00**	**11:00**	**13:40**	**16:53**	**10:43**
		Media	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**
		ALS Sample ID	**L2332873-1**	**L2332873-2**	**L2332873-3**	**L2332873-4**	**L2334537-1**	**L2334537-2**	**L2334537-3**	**L2334537-4**
Physical Tests										
Conductivity	uS/cm		486	484	444	494	394	400	399	460
Hardness (as CaCO3)	mg/L		255	242	230	251	207	211	210	233
pH	pH		8.49	8.50	8.43	8.40	8.45	8.46	8.45	8.50
Total Suspended Solids	mg/L		4.0	10.4	44.0	184	21.0	45.4	47.8	18.0
Total Dissolved Solids	mg/L		297	292	275	327	236	246	239	279
Dissolved Organic Carbon	mg/L		---	---	---	---	---	---	---	---
Anions and Nutrients (Water)										
Acidity (as CaCO3)	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L		265	277	227	256	230	227	216	251
Ammonia, Total (as N)	mg/L		0.255	0.254	0.052	0.076	0.257	0.233	0.231	0.346
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14
Chloride (Cl)	mg/L		0.72	1.9	0.7	0.42	0.57	0.55	0.38	6.17
Fluoride (F)	mg/L		0.136	0.1	0.03	0.034	0.205	0.265	0.215	0.237
Nitrate (as N)	mg/L		<0.020	0.03	<0.020	<0.020	0.041	0.059	0.062	<0.020
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		0.0129	0.0239	0.0486	0.237	0.0800	0.124	0.153	0.0534
Silica, Reactive (as SiO2)	mg/L		14	14.5	9.5	9.2	11.8	11.9	12.1	11.7
Sulfate (SO4)	mg/L		21.6	6.97	23.1	28.2	24.8	24.7	25.4	28.6
Total Metals (compared with guideline val										
Aluminum (Al)-Total	mg/L		0.0304	0.0272	1.36	3.34	0.223	0.423	0.703	0.200
Antimony (Sb)-Total	mg/L		0.00017	0.0003	0.0004	0.00063	0.00051	0.00066	0.00100	0.00060
Arsenic (As)-Total	mg/L		0.0063	0.0158	0.0132	0.0304	0.00353	0.00619	0.00845	0.00404
Barium (Ba)-Total	mg/L		0.116	0.134	0.0432	0.0839	0.228	0.263	0.274	0.222
Beryllium (Be)-Total	mg/L		0.00071	0.00151	0.00092	0.00477	0.00123	0.00186	0.00303	0.00133
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L		0.017	0.027	<0.010	0.011	0.017	0.018	0.018	0.022
Cadmium (Cd)-Total	mg/L		0.0000322	0.0000135	0.0000428	0.000173	0.0000782	0.000131	0.000168	0.000107
Calcium (Ca)-Total	mg/L		78.2	76	78.4	89.8	58.5	62.0	63.3	70.6
Cesium (Cs)-Total	mg/L		0.000293	0.000378	0.00105	0.00258	0.000415	0.000581	0.000921	0.000655
Chromium (Cr)-Total	mg/L		0.00173	0.00234	0.0065	0.0125	0.00186	0.00248	0.00349	0.00190
Cobalt (Co)-Total	mg/L		0.00192	0.00223	0.00472	0.0191	0.00330	0.00779	0.0144	0.00867
Copper (Cu)-Total	mg/L		0.0241	0.00758	0.0644	0.322	0.0644	0.0967	0.168	0.0867
Iron (Fe)-Total	mg/L		1.07	2.69	2.34	5.96	3.28	5.72	7.20	2.35
Lead (Pb)-Total	mg/L		0.00266	0.00218	0.00981	0.0472	0.0137	0.0217	0.0418	0.00961
Lithium (Li)-Total	mg/L		0.0024	0.0027	0.0016	0.0037	0.0028	0.0029	0.0034	0.0031
Magnesium (Mg)-Total	mg/L		19.7	18.2	13.1	15.2	12.4	12.8	13.2	12.5
Manganese (Mn)-Total	mg/L		1.43	3.39	0.274	0.603	0.528	0.885	1.17	2.02
Mercury (Hg)	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Total	mg/L		0.00172	0.0015	0.000553	0.00047	0.000716	0.000763	0.00100	0.00343
Nickel (Ni)-Total	mg/L		0.00398	0.00156	0.00411	0.00919	0.00240	0.00516	0.00796	0.00568
Phosphorus (P)-Total	mg/L		<0.050	<0.050	<0.050	0.218	0.092	0.141	0.151	0.059
Potassium (K)-Total	mg/L		2.31	2.21	1	1.29	2.36	2.55	2.80	2.74
Rubidium (Rb)-Total	mg/L		0.00201	0.00187	0.00221	0.00342	0.00380	0.00487	0.00616	0.00588
Selenium (Se)-Total	mg/L		0.000092	0.000075	0.000089	0.000098	0.000121	0.000103	0.000124	0.000053
Silicon (Si)-Total	mg/L		6.6	6.69	6.05	7.02	5.92	6.47	7.21	5.88
Silver (Ag)-Total	mg/L		<0.000010	<0.000010	0.000082	0.000121	0.000168	0.000203	0.000309	0.000069
Sodium (Na)-Total	mg/L		4.5	6.76	2.07	3.05	4.29	4.37	4.51	10.7
Strontium (Sr)-Total	mg/L		1.19	1.12	0.374	0.448	1.40	1.48	1.52	2.62
Sulfur (S)-Total	mg/L		8.06	2.73	9.44	10.8	9.18	9.34	9.69	10.9
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00022	<0.00020	0.00025
Thallium (Tl)-Total	mg/L		0.000021	<0.000010	0.000021	0.000048	0.000063	0.000120	0.000176	0.000090
Thorium (Th)-Total	mg/L		<0.00010	<0.00010	0.0002	0.00061	<0.00010	<0.00010	0.00014	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	0.00017	<0.00010
Titanium (Ti)-Total	mg/L		0.00103	0.00113	0.0401	0.0413	0.0121	0.0242	0.0419	0.0100
Tungsten (W)-Total	mg/L		0.00223	0.00172	0.00214	0.00142	0.00642	0.00822	0.0128	0.00495
Uranium (U)-Total	mg/L		0.000297	0.000374	0.00026	0.000372	0.000481	0.000535	0.000597	0.000723
Vanadium (V)-Total	mg/L		0.00127	0.00209	0.00342	0.008	0.00092	0.00220	0.00337	0.00120
Zinc (Zn)-Total	mg/L		0.17	0.129	0.145	0.456	0.181	0.150	0.190	0.176
Zirconium (Zr)-Total	mg/L		0.00303	0.0054	0.00259	0.00436	0.00195	0.00378	0.00498	0.00278
Dissolved Metals (compared with guidelin										
Aluminum (Al)-Dissolved	mg/L		0.0045	0.0041	0.0196	0.0206	0.0025	0.0028	0.0039	0.0036
Antimony (Sb)-Dissolved	mg/L		0.00014	0.00023	0.00019	0.0003	0.00012	0.00013	0.00014	0.00037
Arsenic (As)-Dissolved	mg/L		0.00263	0.00709	0.00382	0.00514	0.00028	0.00039	0.00040	0.00106
Barium (Ba)-Dissolved	mg/L		0.107	0.12	0.0354	0.0392	0.206	0.206	0.203	0.198
Beryllium (Be)-Dissolved	mg/L		0.00038	0.00069	0.00014	0.00028	0.00039	0.00048	0.00064	0.00056
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		0.016	0.023	<0.010	<0.010	0.025	0.018	0.019	0.023
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	<0.0000050	0.0000214	0.000023	0.0000300	0.0000395	0.0000421	0.0000702
Calcium (Ca)-Dissolved	mg/L		72.5	70.5	73.4	80.9	63.0	64.1	64.0	73.3
Cesium (Cs)-Dissolved	mg/L		0.000279	0.000375	0.000543	0.00063	0.000265	0.000320	0.000376	0.000503
Chromium (Cr)-Dissolved	mg/L		0.00037	0.00308	0.00018	0.00025	0.00052	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	mg/L		0.00166	0.00176	0.00155	0.00463	0.00055	0.00043	0.00038	0.00547
Copper (Cu)-Dissolved	mg/L		0.00115	0.00023	0.00393	0.00265	0.0154	0.0184	0.0269	0.0276
Iron (Fe)-Dissolved	mg/L		0.262	1.1	0.069	0.087	0.058	0.068	0.068	0.016
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050	0.000136	0.000125	<0.000050	0.000056	0.000059	<0.000050
Lithium (Li)-Dissolved	mg/L		0.003	0.0028	<0.0010	0.0011	0.0029	0.0029	0.0028	0.0029
Magnesium (Mg)-Dissolved	mg/L		18	16	11.4	11.8	12.1	12.4	12.1	12.0
Manganese (Mn)-Dissolved	mg/L		1.27	3.27	0.224	0.413	0.114	0.0962	0.0868	1.71
Mercury (Hg)	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Dissolved	mg/L		0.00169	0.00166	0.000535	0.00102	0.000581	0.000620	0.000782	0.00389
Nickel (Ni)-Dissolved	mg/L		0.00354	0.00162	0.00112	0.00149	0.00095	0.00103	0.00148	0.00417
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		2.25	2.11	0.855	0.954	2.25	2.32	2.35	2.53
Rubidium (Rb)-Dissolved	mg/L		0.00186	0.00176	0.0013	0.00165	0.00280	0.00313	0.00330	0.00520
Selenium (Se)-Dissolved	mg/L		0.000065	<0.000050	0.000063	0.000054	0.000068	0.000062	0.000056	<0.000050
Silicon (Si)-Dissolved	mg/L		6.25	6.6	4.29	4.25	5.45	5.56	5.50	5.41
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		4.27	6.36	1.95	2.86	4.23	4.19	4.13	10.3
Strontium (Sr)-Dissolved	mg/L		1.1	1.03	0.354	0.397	1.47	1.48	1.51	2.62
Sulfur (S)-Dissolved	mg/L		8.21	2.53	9.32	10.3	9.30	9.31	9.25	10.5
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		0.000011	<0.000010	<0.000010	<0.000010	0.000013	0.000024	0.000029	0.000049
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.00030	<0.00030	0.00051	0.00041	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L		0.00172	0.00172	0.00033	0.00078	0.00311	0.00224	0.00184	0.00340
Uranium (U)-Dissolved	mg/L		0.0003	0.00037	0.000234	0.000241	0.000388	0.000398	0.000409	0.000649
Vanadium (V)-Dissolved	mg/L		0.0007	0.00108	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.15	0.0354	0.131	0.242	0.160	0.0983	0.113	0.144
Zirconium (Zr)-Dissolved	mg/L		0.00198	0.00269	0.00224	0.00125	0.000592	0.000565	0.000522	0.000816

Table 5.6 General chemistry and metals data for groundwater samples collected in 2019 (Page 2 of 4).

Parameter	Units	Client Sample ID	3134-BL49-60M	3134-BL49-214M	3134-BL0034-60M	3134-BL0034-138M	3134-BL0034-288M	3134-BL0034-448M	3134-BL0385-108M	3134-BLDUP-1
		Date Sampled	21-Aug-2019	21-Aug-2019	22-Aug-2019	22-Aug-2019	22-Aug-2019	22-Aug-2019	24-Aug-2019	24-Aug-2019
		Time Sampled	13:11	16:00	10:40	13:40	16:45	11:10	10:15	0:01
		Media	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2334537-5	L2334537-6	L2336229-1	L2336229-2	L2336229-3	L2336229-4	L2338207-1	L2338207-2
Physical Tests										
Conductivity	uS/cm		467	578	519	521	606	648	509	502
Hardness (as CaCO3)	mg/L		258	344	271	271	296	308	265	266
pH	pH		8.45	8.25	7.92	7.93	7.92	8.01	7.55	7.49
Total Suspended Solids	mg/L		50.9	264	7.9	8.4	93.7	9.7	3.9	5.9
Total Dissolved Solids	mg/L		303	422	362	368	385	380	300	317
Dissolved Organic Carbon	mg/L		---	---	---	---	---	---	---	---
Anions and Nutrients (Water)										
Acidity (as CaCO3)	mg/L		<1.0	<1.0	3.6	<1.0	2.9	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L		264	348	379	398	388	432	281	258
Ammonia, Total (as N)	mg/L		0.522	1.65	0.382	0.364	0.543	0.591	0.144	0.118
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		2.36	0.72	1.09	0.56	1.42	2.97	8.58	8.65
Fluoride (F)	mg/L		0.179	0.114	0.184	0.147	0.102	0.114	0.059	0.059
Nitrate (as N)	mg/L		<0.020	<0.020	<0.020	0.030	0.024	6.26	<0.020	<0.020
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		0.0732	0.546	0.0724	0.0838	0.121	0.0439	0.0069	0.0079
Silica, Reactive (as SiO2)	mg/L		14.7	11.4	19.4	19.4	15.6	14.7	12.9	12.4
Sulfate (SO4)	mg/L		27.7	11.6	13.8	13.6	20.8	26.8	25.1	25.5
Total Metals (compared with guideline val										
Aluminum (Al)-Total	mg/L		0.576	1.58	0.0590	0.0792	0.271	0.196	0.0448	0.0476
Antimony (Sb)-Total	mg/L		0.00336	0.00690	0.00060	0.00129	0.00159	0.00091	0.00120	0.00127
Arsenic (As)-Total	mg/L		0.0267	0.486	0.0535	0.0615	0.0435	0.0162	0.00379	0.00399
Barium (Ba)-Total	mg/L		0.284	0.455	0.205	0.207	0.356	0.351	0.136	0.140
Beryllium (Be)-Total	mg/L		0.00161	0.0112	0.00256	0.00441	0.00528	0.00329	0.00019	0.00023
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L		0.014	0.014	0.012	0.012	0.015	0.016	0.019	0.020
Cadmium (Cd)-Total	mg/L		0.000317	0.00153	0.0000140	0.0000178	0.0000430	0.0000237	0.0000165	0.0000175
Calcium (Ca)-Total	mg/L		78.0	107	90.4	92.1	97.6	102	88.5	91.0
Cesium (Cs)-Total	mg/L		0.000612	0.00121	0.000364	0.000475	0.000770	0.000666	0.000331	0.000342
Chromium (Cr)-Total	mg/L		0.00340	0.00630	0.00296	0.00361	0.00426	0.00374	0.00161	0.00159
Cobalt (Co)-Total	mg/L		0.00190	0.00660	0.00472	0.00655	0.00558	0.00217	0.00121	0.00125
Copper (Cu)-Total	mg/L		0.100	0.564	0.0570	0.0754	0.177	0.0542	0.00154	0.00184
Iron (Fe)-Total	mg/L		6.26	44.8	8.27	9.03	6.04	2.70	1.56	1.58
Lead (Pb)-Total	mg/L		0.0224	0.0591	0.00142	0.00275	0.00654	0.00243	0.000227	0.000199
Lithium (Li)-Total	mg/L		0.0054	0.0076	0.0037	0.0036	0.0036	0.0034	0.0014	0.0016
Magnesium (Mg)-Total	mg/L		16.8	19.9	14.4	13.7	18.0	19.5	16.2	16.3
Manganese (Mn)-Total	mg/L		0.774	1.22	1.05	1.05	0.799	0.594	0.316	0.312
Mercury (Hg)	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Total	mg/L		0.00375	0.00676	0.00533	0.00686	0.00709	0.00306	0.00448	0.00468
Nickel (Ni)-Total	mg/L		0.00371	0.00936	0.00528	0.00772	0.00640	0.00214	0.00207	0.00210
Phosphorus (P)-Total	mg/L		0.065	0.572	0.067	0.086	0.116	0.058	<0.050	<0.050
Potassium (K)-Total	mg/L		2.19	2.38	1.72	1.72	2.15	2.31	1.16	1.18
Rubidium (Rb)-Total	mg/L		0.00325	0.00439	0.00182	0.00192	0.00307	0.00315	0.00202	0.00203
Selenium (Se)-Total	mg/L		0.000193	0.000317	0.000102	0.000066	0.000084	<0.000050	0.000083	0.000054
Silicon (Si)-Total	mg/L		7.96	8.20	9.00	8.97	7.63	7.02	5.71	5.81
Silver (Ag)-Total	mg/L		0.000058	0.000058	0.000016	0.000016	0.000018	0.000024	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		2.71	2.86	2.18	2.05	4.20	4.82	3.95	4.13
Strontium (Sr)-Total	mg/L		0.865	0.889	0.448	0.503	2.69	3.27	1.43	1.51
Sulfur (S)-Total	mg/L		10.9	5.41	5.13	5.15	8.16	9.59	9.18	9.26
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00028	0.00040	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		0.000092	0.000307	<0.000010	<0.000010	0.000019	0.000013	<0.000010	<0.000010
Thorium (Th)-Total	mg/L		0.00034	0.00053	0.00041	0.00043	0.00027	0.00015	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		0.0237	0.0383	0.0128	0.0143	0.0185	0.0114	<0.0015	0.00110
Tungsten (W)-Total	mg/L		0.00582	0.0136	0.00071	0.00075	0.00287	0.00294	0.00106	0.00108
Uranium (U)-Total	mg/L		0.00292	0.00702	0.000407	0.000440	0.000425	0.000389	0.000290	0.000300
Vanadium (V)-Total	mg/L		0.00332	0.0175	0.00757	0.00807	0.00638	0.00427	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L		0.198	0.692	0.382	0.379	0.345	0.169	0.0527	0.0545
Zirconium (Zr)-Total	mg/L		0.00940	0.0172	0.0115	0.0119	0.0103	0.00883	0.000840	0.000905
Dissolved Metals (compared with guidelin										
Aluminum (Al)-Dissolved	mg/L		0.0453	0.0545	0.0365	0.0365	0.0280	0.0280	0.0049	0.0054
Antimony (Sb)-Dissolved	mg/L		0.00075	0.00198	0.00036	0.00083	0.00113	0.00048	0.00086	0.00083
Arsenic (As)-Dissolved	mg/L		0.0203	0.406	0.0385	0.0418	0.0189	0.0106	0.00223	0.00223
Barium (Ba)-Dissolved	mg/L		0.253	0.330	0.174	0.175	0.301	0.319	0.132	0.133
Beryllium (Be)-Dissolved	mg/L		0.00055	0.00167	0.00202	0.00364	0.00263	0.00256	0.00016	0.00014
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		0.013	0.013	0.011	0.011	0.013	0.015	0.016	0.015
Cadmium (Cd)-Dissolved	mg/L		0.0000143	0.0000055	0.0000084	0.0000103	0.0000064	<0.0000050	0.0000128	0.0000108
Calcium (Ca)-Dissolved	mg/L		77.5	108	86.8	87.1	90.5	92.9	82.2	81.9
Cesium (Cs)-Dissolved	mg/L		0.000224	0.000477	0.000323	0.000419	0.000528	0.000515	0.000316	0.000317
Chromium (Cr)-Dissolved	mg/L		0.00029	0.00075	0.00147	0.00142	0.00127	0.00119	<0.00010	0.00014
Cobalt (Co)-Dissolved	mg/L		0.00065	0.00179	0.00438	0.00598	0.00322	0.00118	0.00114	0.00114
Copper (Cu)-Dissolved	mg/L		0.00179	0.00576	0.0219	0.0290	0.00391	0.00198	<0.00020	<0.00020
Iron (Fe)-Dissolved	mg/L		4.83	34.7	5.31	5.72	2.47	1.71	0.951	0.944
Lead (Pb)-Dissolved	mg/L		0.000649	0.000315	0.000535	0.00115	0.000427	0.000257	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		0.0046	0.0065	0.0033	0.0032	0.0027	0.0028	0.0019	0.0019
Magnesium (Mg)-Dissolved	mg/L		15.8	18.2	13.1	13.1	17.0	18.5	14.6	14.9
Manganese (Mn)-Dissolved	mg/L		0.742	0.919	0.996	0.999	0.643	0.521	0.272	0.267
Mercury (Hg)	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Dissolved	mg/L		0.00269	0.00574	0.00478	0.00607	0.00644	0.00246	0.00488	0.00464
Nickel (Ni)-Dissolved	mg/L		0.00148	0.00185	0.00482	0.00692	0.00418	0.00125	0.00170	0.00170
Phosphorus (P)-Dissolved	mg/L		<0.050	0.209	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		1.99	2.18	1.74	1.71	2.12	2.23	1.14	1.15
Rubidium (Rb)-Dissolved	mg/L		0.00198	0.00314	0.00177	0.00194	0.00267	0.00285	0.00194	0.00200
Selenium (Se)-Dissolved	mg/L		0.000084	0.000132	0.000071	0.000086	0.000089	0.000125	0.000105	0.000091
Silicon (Si)-Dissolved	mg/L		7.05	6.50	8.96	8.99	7.15	6.67	5.55	5.64
Silver (Ag)-Dissolved	mg/L		0.000013	0.000014	0.000016	0.000013	0.000011	0.000012	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		2.63	2.70	2.00	1.92	3.83	4.51	3.65	3.59
Strontium (Sr)-Dissolved	mg/L		0.816	0.878	0.415	0.487	2.52	3.14	1.29	1.27
Sulfur (S)-Dissolved	mg/L		9.97	5.31	5.06	5.12	8.19	9.60	9.56	9.46
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	0.00030	0.00033	0.00012	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	0.00111	<0.00010	<0.00010	0.00094	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		0.00176	0.00353	0.00917	0.00903	0.00362	0.00243	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L		0.00077	0.00719	0.00055	0.00052	0.00189	0.00234	0.00130	0.00122
Uranium (U)-Dissolved	mg/L		0.00208	0.00283	0.000349	0.000371	0.000279	0.000238	0.000279	0.000257
Vanadium (V)-Dissolved	mg/L		0.00105	0.00705	0.00538	0.00555	0.00345	0.00302	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.113	0.161	0.372	0.362	0.194	0.0997	0.0498	0.0493
Zirconium (Zr)-Dissolved	mg/L		0.00601	0.00806	0.00948	0.00975	0.00767	0.00775	0.000652	0.000665

Table 5.6 General chemistry and metals data for groundwater samples collected in 2019 (Page 3 of 4).

Parameter	Units	Client Sample ID	3134-BL354-104M	3134-BL52-60M	3134-BL52-138M	3134-BL52-238M	3134-BL52-435M	3134-BL-310-60M	3134-MW2	3134-BL341-60M
		Date Sampled	24-Aug-2019	24-Aug-2019	25-Aug-2019	25-Aug-2019	25-Aug-2019	25-Aug-2019	26-Aug-2019	26-Aug-2019
		Time Sampled	14:35	18:20	10:45	14:15	18:35	12:15	15:30	0:01
		Media	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2338207-3	L2338207-4	L2338207-5	L2338207-6	L2338207-7	L2338207-8	L2338207-9	L2338207-10
Physical Tests										
Conductivity	uS/cm		430	551	543	575	589	614	479	440
Hardness (as CaCO3)	mg/L		226	279	282	296	302	324	290	228
pH	pH		7.02	7.51	7.55	7.46	7.52	7.28	7.68	7.30
Total Suspended Solids	mg/L		115	15.2	14.1	31.7	27.1	9.1	2680	45.2
Total Dissolved Solids	mg/L		274	336	334	355	371	386	442	277
Dissolved Organic Carbon	mg/L		---	---	---	---	---	---	---	---
Anions and Nutrients (Water)										
Acidity (as CaCO3)	mg/L		3.4	1.6	<1.0	<1.0	<1.0	6.7	<1.0	1.8
Alkalinity, Total (as CaCO3)	mg/L		247	289	268	235	143	318	277	294
Ammonia, Total (as N)	mg/L		<0.020	0.246	0.247	<0.020	<0.020	0.154	<0.020	0.037
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10
Chloride (Cl)	mg/L		0.69	1.49	1.33	2.50	4.02	9.54	1.10	0.15
Fluoride (F)	mg/L		0.038	0.100	0.129	0.068	0.062	0.061	0.057	0.047
Nitrate (as N)	mg/L		0.373	0.107	0.117	0.262	0.083	0.128	0.034	<0.020
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.020	<0.010
Phosphorus (P)-Total	mg/L		0.091	0.0162	0.0193	0.0318	0.0270	0.0270	0.81	0.0633
Silica, Reactive (as SiO2)	mg/L		12.0	13.1	12.7	12.9	13.1	13.0	17.3	9.3
Sulfate (SO4)	mg/L		19.0	36.4	35.8	45.0	41.0	31.8	5.36	28.5
Total Metals (compared with guideline val										
Aluminum (Al)-Total	mg/L		1.03	0.127	0.0215	0.0409	0.0399	0.0334	4.69	0.628
Antimony (Sb)-Total	mg/L		0.00099	0.00045	0.00024	0.00062	0.00093	0.00066	0.0167	0.00046
Arsenic (As)-Total	mg/L		0.0536	0.00471	0.00098	0.00167	0.00145	0.00605	0.00173	0.00910
Barium (Ba)-Total	mg/L		0.0193	0.108	0.0793	0.0495	0.0535	0.153	0.109	0.0291
Beryllium (Be)-Total	mg/L		0.00018	0.00055	0.00050	0.00181	0.00203	0.00021	0.00025	0.00021
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L		<0.010	0.036	0.039	0.036	0.045	0.027	0.017	<0.010
Cadmium (Cd)-Total	mg/L		0.0000424	0.0000350	0.0000220	0.0000607	0.0000601	0.0000177	0.000164	0.000396
Calcium (Ca)-Total	mg/L		76.7	90.6	72.0	80.1	75.3	81.6	176	74.1
Cesium (Cs)-Total	mg/L		0.000578	0.00105	0.000829	0.000535	0.000699	0.000200	0.000388	0.000452
Chromium (Cr)-Total	mg/L		0.00626	0.00162	0.00011	0.00017	0.00017	0.00055	0.0105	0.00286
Cobalt (Co)-Total	mg/L		0.00392	0.00253	0.00041	0.00077	0.00204	0.00263	0.00333	0.00254
Copper (Cu)-Total	mg/L		0.0190	0.0278	0.0284	0.0870	0.106	0.00706	0.0167	0.0129
Iron (Fe)-Total	mg/L		11.1	2.32	0.236	0.454	0.255	0.898	5.53	3.25
Lead (Pb)-Total	mg/L		0.00268	0.00137	0.000133	0.000510	0.000888	0.000130	0.0193	0.0131
Lithium (Li)-Total	mg/L		0.0025	0.0024	<0.0010	0.0018	0.0016	0.0016	0.0114	0.0013
Magnesium (Mg)-Total	mg/L		12.6	20.6	17.6	17.5	16.8	16.9	40.2	16.4
Manganese (Mn)-Total	mg/L		0.445	0.467	0.115	0.221	0.380	0.782	0.241	0.597
Mercury (Hg)	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Total	mg/L		0.000302	0.000705	0.00119	0.00102	0.00125	0.00183	0.000476	0.00169
Nickel (Ni)-Total	mg/L		0.00678	0.00343	0.00126	0.00295	0.00405	0.00313	0.00879	0.00437
Phosphorus (P)-Total	mg/L		0.096	<0.050	<0.050	<0.050	<0.050	<0.050	0.680	<0.050
Potassium (K)-Total	mg/L		0.764	1.63	1.23	0.868	0.921	1.35	2.39	2.49
Rubidium (Rb)-Total	mg/L		0.00210	0.00240	0.00176	0.00146	0.00167	0.00198	0.00963	0.00703
Selenium (Se)-Total	mg/L		0.000255	0.000100	0.000091	0.000155	0.000132	0.000094	<0.000050	0.000112
Silicon (Si)-Total	mg/L		6.67	6.05	5.48	5.53	5.51	5.63	14.2	4.64
Silver (Ag)-Total	mg/L		0.000276	0.000014	<0.000010	0.000011	<0.000010	0.000017	0.000023	0.000149
Sodium (Na)-Total	mg/L		1.45	8.59	8.15	7.88	9.33	7.26	3.50	1.29
Strontium (Sr)-Total	mg/L		0.203	3.98	3.48	1.38	1.46	0.865	0.172	0.316
Sulfur (S)-Total	mg/L		6.86	13.2	14.8	16.6	19.4	13.8	1.96	12.1
Tellurium (Te)-Total	mg/L		<0.00020	0.00034	0.00035	<0.00020	0.00021	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		0.000067	0.000029	0.000014	0.000019	0.000017	0.000013	0.000062	0.000160
Thorium (Th)-Total	mg/L		0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00204	0.00012
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00066	<0.00010
Titanium (Ti)-Total	mg/L		0.0275	0.00634	0.00066	0.00149	0.00136	<0.0015	0.220	0.0309
Tungsten (W)-Total	mg/L		0.00275	0.00232	0.00263	0.00113	0.00126	0.00241	0.00028	0.00358
Uranium (U)-Total	mg/L		0.000107	0.000249	0.000220	0.000259	0.000300	0.000483	0.000760	0.000845
Vanadium (V)-Total	mg/L		0.00383	0.00093	<0.00050	<0.00050	<0.00050	0.00102	0.0152	0.00243
Zinc (Zn)-Total	mg/L		0.159	0.113	0.142	0.551	0.338	0.0663	0.101	0.0967
Zirconium (Zr)-Total	mg/L		0.000988	0.00216	0.00147	0.000654	0.000663	0.00534	0.00328	0.00278
Dissolved Metals (compared with guidelin										
Aluminum (Al)-Dissolved	mg/L		0.0112	0.0032	0.0039	0.0023	0.0027	0.0140	0.0122	0.0430
Antimony (Sb)-Dissolved	mg/L		0.00022	0.00022	0.00026	0.00056	0.00074	0.00069	0.00340	0.00023
Arsenic (As)-Dissolved	mg/L		0.00072	0.00055	0.00048	0.00077	0.00077	0.00541	0.00024	0.00086
Barium (Ba)-Dissolved	mg/L		0.00957	0.0930	0.101	0.0576	0.0654	0.193	0.0286	0.0214
Beryllium (Be)-Dissolved	mg/L		<0.00010	0.00019	0.00039	0.00137	0.00151	0.00018	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		<0.010	0.030	0.034	0.031	0.035	0.022	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L		0.0000115	0.0000124	0.0000175	0.0000575	0.0000637	0.0000156	0.0000127	0.000190
Calcium (Ca)-Dissolved	mg/L		70.8	80.8	81.0	86.6	88.9	98.6	83.4	66.4
Cesium (Cs)-Dissolved	mg/L		0.000116	0.000993	0.00109	0.000615	0.000764	0.000231	<0.000010	0.000072
Chromium (Cr)-Dissolved	mg/L		0.00011	0.00044	0.00099	0.00134	0.00098	0.00180	0.00466	0.00021
Cobalt (Co)-Dissolved	mg/L		0.00016	0.00040	0.00052	0.00096	0.00258	0.00408	0.00019	0.00135
Copper (Cu)-Dissolved	mg/L		0.00502	0.00721	0.0189	0.0700	0.0637	0.00436	0.00189	0.00334
Iron (Fe)-Dissolved	mg/L		0.070	0.048	0.035	0.012	0.012	0.773	0.027	0.127
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000303
Lithium (Li)-Dissolved	mg/L		0.0020	0.0022	0.0023	0.0021	0.0025	0.0025	0.0047	0.0012
Magnesium (Mg)-Dissolved	mg/L		11.8	18.7	19.3	19.4	19.3	19.0	19.7	15.1
Manganese (Mn)-Dissolved	mg/L		0.0197	0.0844	0.104	0.204	0.423	0.904	0.0317	0.402
Mercury (Hg)	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Dissolved	mg/L		0.000205	0.00111	0.00115	0.00108	0.00127	0.00161	0.000692	0.00209
Nickel (Ni)-Dissolved	mg/L		0.00200	0.00098	0.00124	0.00294	0.00371	0.00381	0.00291	0.00244
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		0.609	1.56	1.62	1.09	1.23	1.82	1.26	2.04
Rubidium (Rb)-Dissolved	mg/L		0.00117	0.00219	0.00235	0.00188	0.00222	0.00267	0.00119	0.00380
Selenium (Se)-Dissolved	mg/L		0.000180	0.000082	0.000090	0.000206	0.000136	0.000126	<0.000050	0.000090
Silicon (Si)-Dissolved	mg/L		5.47	5.62	5.75	5.78	5.86	5.83	7.73	4.05
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000015	0.000012
Sodium (Na)-Dissolved	mg/L		1.33	7.68	8.63	8.44	10.3	8.52	5.23	1.13
Strontium (Sr)-Dissolved	mg/L		0.170	3.50	3.71	1.41	1.62	0.932	0.0956	0.270
Sulfur (S)-Dissolved	mg/L		7.16	13.3	13.6	16.1	17.8	12.3	2.40	12.1
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	0.000012	0.000012	0.000014	<0.000010	<0.000010	0.000042
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00022	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00066	0.00059	0.00087
Tungsten (W)-Dissolved	mg/L		0.00011	0.00225	0.00272	0.00094	0.00107	0.00207	<0.00010	0.00094
Uranium (U)-Dissolved	mg/L		0.000058	0.000239	0.000215	0.000284	0.000307	0.000463	0.000443	0.000738
Vanadium (V)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00088	0.00176	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.136	0.0891	0.179	0.687	0.438	0.0950	0.0214	0.0751
Zirconium (Zr)-Dissolved	mg/L		0.000089	0.00117	0.00131	0.000324	0.000333	0.00467	0.000139	0.00186

Table 5.6 General chemistry and metals data for groundwater samples collected in 2019 (Page 4 of 4).

Parameter	Units	Client Sample ID	3134 - MW - B000 - WS1	3134 - MW - E080 - WS1	3134 - MW - K034 - WS1
		Date Sampled	**29-Sep-2019**	**29-Sep-2019**	**29-Sep-2019**
		Time Sampled	**14:45**	**13:50**	**16:20**
		Media	**Groundwater**	**Groundwater**	**Groundwater**
		ALS Sample ID	**L2358839-1**	**L2358839-2**	**L2358839-3**
Physical Tests					
Conductivity	uS/cm		484	177	431
Hardness (as CaCO3)	mg/L		317	272	249
pH	pH		7.80	7.14	6.83
Total Suspended Solids	mg/L		385	4850	1760
Total Dissolved Solids	mg/L		320	159	298
Dissolved Organic Carbon	mg/L		23.1	19.5	29.8
Anions and Nutrients (Water)					
Acidity (as CaCO3)	mg/L		13.4	18.8	87.7
Alkalinity, Total (as CaCO3)	mg/L		298	105	258
Ammonia, Total (as N)	mg/L		1.09	0.846	2.48
Bromide (Br)	mg/L		<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		0.54	0.39	0.14
Fluoride (F)	mg/L		0.029	0.024	<0.020
Nitrate (as N)	mg/L		0.132	<0.020	<0.020
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		0.221	0.411	0.204
Silica, Reactive (as SiO2)	mg/L		---	---	---
Sulfate (SO4)	mg/L		0.43	0.37	<0.30
Total Metals (compared with guideline val					
Aluminum (Al)-Total	mg/L		1.76	2.18	2.23
Antimony (Sb)-Total	mg/L		<0.00050	<0.00050	<0.00050
Arsenic (As)-Total	mg/L		0.00066	0.00076	0.00067
Barium (Ba)-Total	mg/L		0.0888	0.105	0.103
Beryllium (Be)-Total	mg/L		<0.00050	<0.00050	<0.00050
Bismuth (Bi)-Total	mg/L		<0.00025	<0.00025	<0.00025
Boron (B)-Total	mg/L		<0.050	<0.050	<0.050
Cadmium (Cd)-Total	mg/L		0.000029	0.000028	0.000029
Calcium (Ca)-Total	mg/L		111	98.9	96.1
Cesium (Cs)-Total	mg/L		0.000238	0.000269	0.000250
Chromium (Cr)-Total	mg/L		0.00629	0.0148	0.0147
Cobalt (Co)-Total	mg/L		0.00152	0.00181	0.00177
Copper (Cu)-Total	mg/L		0.0048	0.0071	0.0082
Iron (Fe)-Total	mg/L		4.64	20.4	19.9
Lead (Pb)-Total	mg/L		0.00100	0.00117	0.00118
Lithium (Li)-Total	mg/L		0.0060	0.0078	<0.0050
Magnesium (Mg)-Total	mg/L		10.0	6.01	5.88
Manganese (Mn)-Total	mg/L		0.569	0.449	0.431
Mercury (Hg)	mg/L)		<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L		0.00040	0.00072	0.00064
Nickel (Ni)-Total	mg/L		0.0044	0.0056	0.0056
Phosphorus (P)-Total	mg/L		<0.25	<0.25	<0.25
Potassium (K)-Total	mg/L		3.35	2.46	2.37
Rubidium (Rb)-Total	mg/L		0.0062	0.0050	0.0051
Selenium (Se)-Total	mg/L		<0.00025	<0.00025	<0.00025
Silicon (Si)-Total	mg/L		11.6	13.6	13.8
Silver (Ag)-Total	mg/L		<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L		3.74	2.76	2.79
Strontium (Sr)-Total	mg/L		0.149	0.117	0.111
Sulfur (S)-Total	mg/L		<2.5	<2.5	<2.5
Tellurium (Te)-Total	mg/L		<0.0010	<0.0010	<0.0010
Thallium (Tl)-Total	mg/L		<0.000050	<0.000050	<0.000050
Thorium (Th)-Total	mg/L		<0.00050	0.00113	0.00102
Tin (Sn)-Total	mg/L		0.00226	0.00052	0.00050
Titanium (Ti)-Total	mg/L		0.117	0.170	0.165
Tungsten (W)-Total	mg/L		<0.00050	0.00065	0.00060
Uranium (U)-Total	mg/L		0.000246	0.000278	0.000284
Vanadium (V)-Total	mg/L		0.0063	0.0196	0.0186
Zinc (Zn)-Total	mg/L		<0.015	<0.015	<0.015
Zirconium (Zr)-Total	mg/L		<0.0010	0.0039	0.0047
Dissolved Metals (compared with guidelin					
Aluminum (Al)-Dissolved	mg/L		---	---	0.0660
Antimony (Sb)-Dissolved	mg/L		---	---	<0.00010
Arsenic (As)-Dissolved	mg/L		---	---	0.00032
Barium (Ba)-Dissolved	mg/L		---	---	0.0945
Beryllium (Be)-Dissolved	mg/L		---	---	<0.00010
Bismuth (Bi)-Dissolved	mg/L		---	---	<0.000050
Boron (B)-Dissolved	mg/L		---	---	<0.010
Cadmium (Cd)-Dissolved	mg/L		---	---	<0.0000050
Calcium (Ca)-Dissolved	mg/L		---	---	93.0
Cesium (Cs)-Dissolved	mg/L		---	---	<0.000010
Chromium (Cr)-Dissolved	mg/L		---	---	0.00651
Cobalt (Co)-Dissolved	mg/L		---	---	0.00042
Copper (Cu)-Dissolved	mg/L		---	---	0.00026
Iron (Fe)-Dissolved	mg/L		---	---	16.6
Lead (Pb)-Dissolved	mg/L		---	---	0.000122
Lithium (Li)-Dissolved	mg/L		---	---	0.0036
Magnesium (Mg)-Dissolved	mg/L		---	---	3.99
Manganese (Mn)-Dissolved	mg/L		---	---	0.398
Mercury (Hg)	mg/L)		---	---	---
Molybdenum (Mo)-Dissolved	mg/L		---	---	0.000717
Nickel (Ni)-Dissolved	mg/L		---	---	0.00142
Phosphorus (P)-Dissolved	mg/L		---	---	0.113
Potassium (K)-Dissolved	mg/L		---	---	2.06
Rubidium (Rb)-Dissolved	mg/L		---	---	0.00106
Selenium (Se)-Dissolved	mg/L		---	---	0.000156
Silicon (Si)-Dissolved	mg/L		---	---	10.2
Silver (Ag)-Dissolved	mg/L		---	---	<0.000010
Sodium (Na)-Dissolved	mg/L		---	---	2.79
Strontium (Sr)-Dissolved	mg/L		---	---	0.107
Sulfur (S)-Dissolved	mg/L		---	---	<0.50
Tellurium (Te)-Dissolved	mg/L		---	---	<0.00020
Thallium (Tl)-Dissolved	mg/L		---	---	<0.000010
Thorium (Th)-Dissolved	mg/L		---	---	0.00029
Tin (Sn)-Dissolved	mg/L		---	---	0.00021
Titanium (Ti)-Dissolved	mg/L		---	---	0.0177
Tungsten (W)-Dissolved	mg/L		---	---	0.00060
Uranium (U)-Dissolved	mg/L		---	---	0.000056
Vanadium (V)-Dissolved	mg/L		---	---	0.0120
Zinc (Zn)-Dissolved	mg/L		---	---	0.0014
Zirconium (Zr)-Dissolved	mg/L				0.00715

Table 5.7 General chemistry and metals data for groundwater samples collected in July 2020 (Page 1 of 2).

Parameter	Units	Client Sample ID	SP-GW-MW5	SP-GW-SP11-064	SP-GW-BL-235	SP-GW-BL-385	GW TRIP BLANK	SP-GW-MW2	SP-GW-MW3	SP-GW-MW4
		Date Sampled	6-Jul-2020	6-Jul-2020	7-Jul-2020	7-Jul-2020	6-Jul-2020	14-Jul-2020	14-Jul-2020	14-Jul-2020
		Time Sampled	14:30	16:36	10:07	11:48	0:01	10:22	13:33	16:04
		Media	Groundwater	Groundwater	Groundwater	Groundwater	Blank	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2471783-1	L2471783-2	L2471783-3	L2471783-4	L2471783-5	L2475724-1	L2475724-2	L2475724-3
Physical Tests										
Conductivity	uS/cm		525	284	450	427	1	543	174	142
Hardness (as CaCO3)	mg/L		277	138	233	201	<0.50	292	89.8	71.6
pH	pH		7.62	7.24	7.66	7.74	5.75	7.74	7.00	6.82
Total Suspended Solids	mg/L		33900	4.6	<3.0	62.0	<3.0	9690	2070	32200
Total Dissolved Solids	mg/L		397	167	292	276	<10	454	195	735
Dissolved Organic Carbon	mg/L		8.7	12.3	21.6	14.1	<0.50	5	41	22
Anions and Nutrients										
Acidity (as CaCO3)	mg/L		19.9	15	11	8	<2.0	10	15.6	16.7
Alkalinity, Total (as CaCO3)	mg/L		366	141	230	193	<2.0	452	104	78
Ammonia, Total (as N)	mg/L		0.012	<0.010	0.38	<0.010	<0.010	0.027	0.172	0.075
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	0.21	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		0.29	0.17	0.21	22.6	<0.10	0.15	0.20	0.12
Fluoride (F)	mg/L		0.199	0.047	0.124	0.036	<0.020	0.071	0.050	0.051
Nitrate (as N)	mg/L		0.224	0.08	<0.020	0.092	<0.020	<0.020	<0.020	0.057
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		3.53	<0.0030	0.0259	<0.0030	<0.0030	10.100	3.190	16.7000
Silica, Reactive (as SiO2)	mg/L		12.3	10.8	12.9	10.8	<0.010	16.1	10.7	14.0
Sulfate (SO4)	mg/L		22.6	17.8	37.2	13.9	<0.30	5.9	0.5	4.1
Total Metals (compared with guideline val										
Aluminum (Al)-Total	mg/L		68.7	0.0312	0.0326	0.126	<0.0050	58.1	32.0	174.0
Antimony (Sb)-Total	mg/L		<0.0010	<0.00010	<0.00010	0.00183	<0.00010	<0.00050	<0.00050	<0.00050
Arsenic (As)-Total	mg/L		0.0237	0.00019	0.00446	0.0055	<0.00010	0.01250	0.01630	0.01410
Barium (Ba)-Total	mg/L		0.585	0.0112	0.115	0.057	<0.00010	0.436	0.255	1.910
Beryllium (Be)-Total	mg/L		0.0029	<0.00010	0.00019	<0.00010	<0.00010	0.00219	0.00085	0.00539
Bismuth (Bi)-Total	mg/L		0.00114	<0.000050	<0.000050	<0.000050	<0.000050	0.00047	0.00033	0.00158
Boron (B)-Total	mg/L		<0.10	<0.010	<0.010	0.012	<0.010	0.057	<0.050	<0.050
Cadmium (Cd)-Total	mg/L		0.00105	0.0000337	<0.0000050	<0.0000050	<0.0000050	0.000646	0.000186	0.001250
Calcium (Ca)-Total	mg/L		406	54.8	75.2	63.1	<0.050	621.0	48.3	101.0
Cesium (Cs)-Total	mg/L		0.0132	0.000058	0.000332	0.000139	<0.000010	0.006530	0.004250	0.020100
Chromium (Cr)-Total	mg/L		0.165	<0.00050	0.00058	0.00085	<0.00050	0.12200	0.09710	0.41400
Cobalt (Co)-Total	mg/L		0.0926	0.00015	0.00073	0.00043	<0.00010	0.03580	0.0279	0.10900
Copper (Cu)-Total	mg/L		0.357	0.00777	<0.00050	0.00206	<0.00050	0.1120	0.032	0.8790
Iron (Fe)-Total	mg/L		117	0.07	2.17	1.51	<0.010	78.40	54.60	206.00
Lead (Pb)-Total	mg/L		0.0454	0.000131	0.000088	0.000091	<0.000050	0.0340	0.0283	0.06230
Lithium (Li)-Total	mg/L		0.11	<0.0010	0.0029	0.0011	<0.0010	0.0980	0.0633	0.2040
Magnesium (Mg)-Total	mg/L		105	1.47	14.2	12.4	<0.0050	184.0	18.5	87.4
Manganese (Mn)-Total	mg/L		2.73	0.00641	0.633	0.0476	<0.00050	1.960	2.60	6.56
Mercury (Hg)-Total	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Total	mg/L		0.00195	0.000341	0.00126	0.000435	<0.000050	0.00073	0.00055	0.00552
Nickel (Ni)-Total	mg/L		0.145	0.00075	0.0008	0.00171	<0.00050	0.096500	0.04550	0.31100
Phosphorus (P)-Total	mg/L		3.87	<0.050	<0.050	<0.050	<0.050	6.41000	1.31000	6.72000
Potassium (K)-Total	mg/L		14.8	0.24	1.93	0.757	<0.050	13.700	3.130	33.000
Rubidium (Rb)-Total	mg/L		0.159	0.00086	0.00264	0.00145	<0.00020	0.14	0.04	0.52
Selenium (Se)-Total	mg/L		0.00159	0.000136	0.000068	0.000276	<0.000050	0.00025	0.00041	0.00105
Silicon (Si)-Total	mg/L		83.9	4.87	6.07	5.33	<0.10	73.800000	38.100000	119.000000
Silver (Ag)-Total	mg/L		0.0009	<0.000050	<0.000050	<0.000050	<0.000050	0.00	0.00	0.00
Sodium (Na)-Total	mg/L		6.16	1.24	1.92	3.46	<0.050	5.98	1.67	3.76
Strontium (Sr)-Total	mg/L		0.367	0.09	0.533	0.205	<0.0010	0.51	0.30	0.3
Sulfur (S)-Total	mg/L		7.3	5.95	13.6	5.13	<0.50	<2.5	<2.5	<2.5
Tellurium (Te)-Total	mg/L		<0.0020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010
Thallium (Tl)-Total	mg/L		0.00196	<0.000010	<0.000010	0.000013	<0.000010	0.00118	0.000352	0.00348
Thorium (Th)-Total	mg/L		0.0271	<0.00010	0.00013	<0.00010	<0.00010	0.037800	0.004240	0.032700
Tin (Sn)-Total	mg/L		<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	0.00075	0.00107	0.00095
Titanium (Ti)-Total	mg/L		1.77	0.00063	<0.0020	0.00208	<0.00030	2.96	1.28000	2.92
Tungsten (W)-Total	mg/L		<0.0010	0.00072	0.00188	0.00037	<0.00010	<0.00050	<0.00050	<0.00050
Uranium (U)-Total	mg/L		0.00435	0.000098	0.00077	0.000161	<0.000010	0.00385	0.0033	0.01050
Vanadium (V)-Total	mg/L		0.142	<0.00050	0.00205	<0.00050	<0.00050	0.134000	0.074800	0.307000
Zinc (Zn)-Total	mg/L		0.356	0.0034	<0.0030	<0.0030	<0.0030	0.21200	0.11400	0.52600
Zirconium (Zr)-Total	mg/L		0.003	<0.00020	0.0075	0.00066	<0.00020	0.003	0.002	0.005
Dissolved Metals (for modelling purposes)										
Aluminum (Al)-Dissolved	mg/L		0.0148	0.0157	0.0277	0.0284	<0.0050	0.0012	0.1200	0.0489
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	0.00111	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		0.0002	0.00017	0.0021	0.001	<0.00010	0.00017	0.00696	0.00030
Barium (Ba)-Dissolved	mg/L		0.0365	0.0104	0.114	0.0552	<0.00010	0.023	0.041	0.025
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010	0.00018	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		<0.010	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L		0.0000079	0.0000322	<0.0000050	<0.0000050	<0.0000050	0.0000060	0.0000080	0.0000220
Calcium (Ca)-Dissolved	mg/L		90.8	53	71.4	62.5	<0.050	84.2	28.2	24.7
Cesium (Cs)-Dissolved	mg/L		<0.000010	0.000057	0.000298	0.000109	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	0.00059	0.00026
Cobalt (Co)-Dissolved	mg/L		<0.00010	0.0001	0.00047	0.00023	<0.00010	0.00010	0.00103	0.00011
Copper (Cu)-Dissolved	mg/L		0.00156	0.00686	0.00033	0.00143	<0.00020	0.0008	0.0003	0.0083
Iron (Fe)-Dissolved	mg/L		0.015	0.023	1.84	0.133	<0.010	<0.010	4.790	0.058
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000166	0.000099
Lithium (Li)-Dissolved	mg/L		0.0076	<0.0010	0.0023	<0.0010	<0.0010	0.0052	0.0012	0.0010
Magnesium (Mg)-Dissolved	mg/L		12.3	1.38	13.2	10.9	<0.0050	19.8	4.7	2.4
Manganese (Mn)-Dissolved	mg/L		0.00142	0.00504	0.571	0.0358	<0.00050	0.0233	1.1400	0.13
Mercury (Hg) - Dissolved	mg/L		<0.0000050	0.0000078	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.00298	0.000341	0.00107	0.000259	<0.000050	0.000459	0.000328	0.00089
Nickel (Ni)-Dissolved	mg/L		<0.00050	0.00064	<0.00050	0.00103	<0.00050	0.00074	0.00067	0.00199
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		1.18	0.224	1.83	0.696	<0.050	0.96	0.51	0.99
Rubidium (Rb)-Dissolved	mg/L		0.00097	0.00069	0.00232	0.00128	<0.00020	0.00070	0.00161	0.00119
Selenium (Se)-Dissolved	mg/L		0.00164	0.000135	0.00057	0.000257	<0.000050	<0.000050	0.000083	0.000091
Silicon (Si)-Dissolved	mg/L		6.34	4.85	5.77	5.09	<0.050	7.85	4.80	4.77
Silver (Ag)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		3.35	1.12	1.94	3.04	<0.050	2.80	0.88	1.4
Strontium (Sr)-Dissolved	mg/L		0.126	0.09	0.505	0.191	<0.0010	0.10	0.18	0.05
Sulfur (S)-Dissolved	mg/L		7.3	5.83	12.4	4.78	<0.50	1.73	<0.50	1.5
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00019	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		0.00082	<0.00030	0.00185	<0.00030	<0.00030	<0.00030	0.00486	0.00358
Tungsten (W)-Dissolved	mg/L		<0.00010	0.00063	0.00171	0.00018	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L		0.000774	0.000094	0.00068	0.000138	<0.000010	0.000410	0.000030	0.000041
Vanadium (V)-Dissolved	mg/L		<0.00050	<0.00050	0.00176	<0.00050	<0.00050	0.00096	0.00321	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.001	0.0039	0.0045	<0.0010	<0.0010	<0.0010	0.003	0.003
Zirconium (Zr)-Dissolved	mg/L		<0.00020	<0.00020	0.00628	0.00032	<0.00020	<0.00020	0.001070	0.000340
Charge Balance Error (CBE)	%		15.34	6.33	5.87	6.90	---	21.01	6.32	4.14

Note: CBE is calculated as (sum of cations - sum of anions) / (sum of cations + sum of anions) x 100

Table 5.7 General chemistry and metals data for groundwater samples collected in July 2020 (Page 2 of 2).

Parameter	Units	Client Sample ID	SP-GW-BL-334-D	SP-GW-BL-321-D	SP-GW-DUP-4	FIELD BLANK
		Date Sampled	15-Jul-2020	15-Jul-2020	15-Jul-2020	15-Jul-2020
		Time Sampled	12:00	16:30	0:01	0:01
		Media	Groundwater	Groundwater	Duplicate	Blank
		ALS Sample ID	L2475724-4	L2475724-5	L2475724-6	L2475724-7
Physical Tests						
Conductivity	uS/cm		507	431	505	2
Hardness (as CaCO3)	mg/L		245	186	244	<0.50
pH	pH		7.57	8.05	7.52	5.64
Total Suspended Solids	mg/L		787	9	1300	<3.0
Total Dissolved Solids	mg/L		381	255	346	<10
Dissolved Organic Carbon	mg/L		14	9	15	<0.50
Anions and Nutrients						
Acidity (as CaCO3)	mg/L		4.2	<2.0	5.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		345	247	381	<2.0
Ammonia, Total (as N)	mg/L		0.370	0.75	0.373	0.206
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		0.40	0.91	0.31	<0.10
Fluoride (F)	mg/L		0.118	0.158	0.104	<0.020
Nitrate (as N)	mg/L		<0.020	<0.020	<0.020	0.024
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		0.5270	0.023	0.5270	<0.0030
Silica, Reactive (as SiO2)	mg/L		13.9	14.7	12.9	0.0
Sulfate (SO4)	mg/L		21.7	6.3	18.9	<0.30
Total Metals (compared with guideline val						
Aluminum (Al)-Total	mg/L		31.0	0.056	28.4	<0.0030
Antimony (Sb)-Total	mg/L		<0.00050	0.00014	<0.00050	<0.00010
Arsenic (As)-Total	mg/L		0.0041	0.002	0.0038	<0.00010
Barium (Ba)-Total	mg/L		0.350	0.125	0.348	<0.00010
Beryllium (Be)-Total	mg/L		0.00272	<0.00010	0.00269	<0.00010
Bismuth (Bi)-Total	mg/L		0.00065	<0.000050	0.00063	<0.000050
Boron (B)-Total	mg/L		<0.050	0.045	<0.050	<0.010
Cadmium (Cd)-Total	mg/L		0.000311	0.00001	0.0003420	<0.0000050
Calcium (Ca)-Total	mg/L		183.0	57	179.0	<0.050
Cesium (Cs)-Total	mg/L		0.007920	0.00023	0.007630	<0.000010
Chromium (Cr)-Total	mg/L		0.05880	0.00021	0.05480	<0.00010
Cobalt (Co)-Total	mg/L		0.02710	0.00016	0.02600	<0.00010
Copper (Cu)-Total	mg/L		0.161	<0.00050	0.1580	<0.00050
Iron (Fe)-Total	mg/L		32.90	1.4	30.60	<0.010
Lead (Pb)-Total	mg/L		0.0274	0.0001	0.02630	<0.000050
Lithium (Li)-Total	mg/L		0.0285	0.0034	0.0274	<0.0010
Magnesium (Mg)-Total	mg/L		33.1	14.0	31.8	<0.0050
Manganese (Mn)-Total	mg/L		1.260	0.18	1.23	<0.00010
Mercury (Hg)-Total	mg/L)		---	---	---	---
Molybdenum (Mo)-Total	mg/L		0.00177	0.00293	0.00143	<0.000050
Nickel (Ni)-Total	mg/L		0.05220	<0.00050	0.04970	<0.00050
Phosphorus (P)-Total	mg/L		<0.25	<0.050	<0.25	<0.050
Potassium (K)-Total	mg/L		12.100	4.440	11.600	<0.050
Rubidium (Rb)-Total	mg/L		0.06	0.00	0.06	<0.00020
Selenium (Se)-Total	mg/L		0.00064	0.00005	0.00067	<0.000050
Silicon (Si)-Total	mg/L		47.800000	7.400000	43.600000	<0.10
Silver (Ag)-Total	mg/L		0.01	0.00	0.00	<0.000010
Sodium (Na)-Total	mg/L		14.10	19.50	14.10	<0.050
Strontium (Sr)-Total	mg/L		1.39	0.68	1.39	<0.00020
Sulfur (S)-Total	mg/L		6.100	3.600	5.400	<0.50
Tellurium (Te)-Total	mg/L		0.0	<0.00020	0.00	<0.00020
Thallium (Tl)-Total	mg/L		0.000854	<0.000010	0.000819	<0.000010
Thorium (Th)-Total	mg/L		0.026000	<0.00010	0.0244	<0.00010
Tin (Sn)-Total	mg/L		<0.00050	<0.00010	<0.00050	<0.00010
Titanium (Ti)-Total	mg/L		0.212	0.00107	0.19	<0.00030
Tungsten (W)-Total	mg/L		0.0037	0.0085	0.0033	<0.00010
Uranium (U)-Total	mg/L		0.00855	0.0013	0.00810	<0.000010
Vanadium (V)-Total	mg/L		0.07670	0.00076	0.071600	<0.00050
Zinc (Zn)-Total	mg/L		0.14100	0.0035	0.12800	<0.0030
Zirconium (Zr)-Total	mg/L		0.001	0.001	0.002	<0.00020
Dissolved Metals (for modelling purposes)						
Aluminum (Al)-Dissolved	mg/L		0.0067	0.0042	0.0080	<0.0010
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		0.0004	0.002	0.0004	<0.00010
Barium (Ba)-Dissolved	mg/L		0.087	0.119	0.086	<0.00010
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		0.026	0.047	0.028	<0.010
Cadmium (Cd)-Dissolved	mg/L		0.0000110	<0.0000050	0.0000100	<0.0000050
Calcium (Ca)-Dissolved	mg/L		77.4	53	77.0	<0.050
Cesium (Cs)-Dissolved	mg/L		0.000079	0.000204	0.000071	<0.000010
Chromium (Cr)-Dissolved	mg/L		0.00028	0.00015	0.00029	<0.00010
Cobalt (Co)-Dissolved	mg/L		0.00188	0.00012	0.00195	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00208	<0.00020	0.0021	<0.00020
Iron (Fe)-Dissolved	mg/L		0.27	0.9	0.40	<0.010
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		0.0032	0.0035	0.0032	<0.0010
Magnesium (Mg)-Dissolved	mg/L		12.5	13.2	12.6	<0.0050
Manganese (Mn)-Dissolved	mg/L		0.172	0.170	0.173	<0.00010
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.00178	0.00279	0.00184	<0.000050
Nickel (Ni)-Dissolved	mg/L		0.00077	<0.00050	0.00078	<0.00050
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		4.33	4.31	4.15	<0.050
Rubidium (Rb)-Dissolved	mg/L		0.00515	0.00345	0.00495	<0.00020
Selenium (Se)-Dissolved	mg/L		0.000176	<0.000050	0.000136	<0.000050
Silicon (Si)-Dissolved	mg/L		6.18	7.05	6.29	<0.050
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		11.30	18.60	11.20	<0.050
Strontium (Sr)-Dissolved	mg/L		1.000	0.646	0.981	<0.00020
Sulfur (S)-Dissolved	mg/L		6.72	3.23	7.01	<0.50
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.00030	<0.00030	0.00034	<0.00030
Tungsten (W)-Dissolved	mg/L		0.00276	0.00781	0.00262	<0.00010
Uranium (U)-Dissolved	mg/L		0.00169	0.00121	0.001650	<0.000010
Vanadium (V)-Dissolved	mg/L		0.00165	0.00050	0.00162	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.006	0.004	0.007	<0.0010
Zirconium (Zr)-Dissolved	mg/L		0.00048	0.00096	0.00050	<0.00020
Charge Balance Error (CBE)	%		14.5	4.55	---	---

Note: CBE is calculated as (sum of cations - sum of anions) /

Table 5.8 General chemistry and metals data for groundwater samples collected in September 2020 (Page 1 of 3).

Parameter	Units	Client Sample ID	SP-GW-BL-143-D	SP-GW-SP11-064	SP-GW-BL-385	SP-GW-BL-235	SP-GW-BL-334-D	SP-GW-MW5	SP-GW-MW4	SP-GW-W3
		Date Sampled	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020
		Time Sampled	11:14	14:35	11:39	10:00	12:13	13:39	14:41	17:10
		Media	L2507837-1	L2507837-2	L2507837-3	L2507837-4	L2507954-1	L2507954-2	L2507954-3	L2507954-4
		ALS Sample ID	Water	Water	Water	Water	Water	Water	Water	Water
Physical Tests										
Conductivity	uS/cm		290	364	495	497	537	581	101	222
Hardness (as CaCO3)	mg/L		119	175	242	251	265	306	54.5	138
pH	pH		8.01	7.50	7.72	7.69	7.65	7.61	6.79	6.72
Total Suspended Solids	mg/L		<3.0	<3.0	5.8	<3.0	54	14500	28100	12800
Total Dissolved Solids	mg/L		177	223	299	319	345	645	1360	510
Dissolved Organic Carbon	mg/L		8.5	7.9	6.0	12.6	11	6	24	64
Anions and Nutrients										
Acidity (as CaCO3)	mg/L		2	9.5	5.7	5.7	11.9	12.5	13.8	19.8
Alkalinity, Total (as CaCO3)	mg/L		147	193	264	283	325	464	76	143
Ammonia, Total (as N)	mg/L		0.371	<0.0050	0.0192	0.33	0.201	0.028	0.077	0.280
Bromide (Br)	mg/L		<0.10	<0.10	0.28	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		0.85	0.29	17	0.2	0.18	0.20	<0.10	0.55
Fluoride (F)	mg/L		0.099	0.032	0.033	0.093	0.071	0.166	0.048	0.038
Nitrate (as N)	mg/L		0.031	0.373	0.051	<0.020	<0.020	0.230	0.106	<0.020
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		0.006	<0.0030	0.016	0.036	0.052	6.350	41.200	6.450
Silica, Reactive (as SiO2)	mg/L		7.8	12.2	11.5	12.2	13.3	14.8	9.3	11.9
Sulfate (SO4)	mg/L		24.7	19.3	18.4	39.4	17.7	23.8	2.8	<0.30
Total Metals (compared with guideline val										
Aluminum (Al)-Total	mg/L		0.0093	0.0163	0.165	0.0966	3.820	180.0	357.0	160.0
Antimony (Sb)-Total	mg/L		0.00051	<0.00010	0.00337	0.00048	0.00011	0.00160	<0.0010	0.00120
Arsenic (As)-Total	mg/L		0.00157	0.00026	0.013	0.0693	0.00065	0.07960	0.02850	0.07190
Barium (Ba)-Total	mg/L		0.124	0.0154	0.102	0.142	0.089	1.390	3.810	1.140
Beryllium (Be)-Total	mg/L		0.00053	<0.00010	<0.00010	0.00014	0.00014	0.00580	0.01070	0.00340
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.002	0.00356	0.00151
Boron (B)-Total	mg/L		0.022	<0.010	0.01	<0.010	0.017	0.110	<0.10	<0.10
Cadmium (Cd)-Total	mg/L		0.0000072	0.0000422	0.0000051	0.0000256	0.0000318	0.002760	0.002400	0.000898
Calcium (Ca)-Total	mg/L		34.8	68.1	76.9	80	96.2	807.0	179.0	137.0
Cesium (Cs)-Total	mg/L		0.000412	0.000081	0.000159	0.000355	0.000796	0.028300	0.034800	0.023200
Chromium (Cr)-Total	mg/L		0.00017	0.00023	0.0014	0.00083	0.00897	0.38500	0.81300	0.41300
Cobalt (Co)-Total	mg/L		<0.00010	0.00011	0.0008	0.00853	0.00423	0.17700	0.2230	0.13200
Copper (Cu)-Total	mg/L		0.00942	0.00612	0.00186	0.00151	0.0230	0.7220	1.810	0.1520
Iron (Fe)-Total	mg/L		2.27	0.157	3.92	5.99	4.26	270	382	276
Lead (Pb)-Total	mg/L		0.000137	0.000168	0.000176	0.00138	0.0013	0.0870	0.1290	0.10900
Lithium (Li)-Total	mg/L		0.0029	0.001	0.0018	0.0032	0.0057	0.2190	0.4250	0.3290
Magnesium (Mg)-Total	mg/L		7.58	1.96	14.3	14.7	13.3	223.0	168.0	71.8
Manganese (Mn)-Total	mg/L		0.159	0.0104	0.124	1.91	0.180	6.500	12.80	6.43
Mercury (Hg)-Total	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Total	mg/L		0.00467	0.000455	0.00337	0.00147	0.00148	0.0144	0.0109	0.0037
Nickel (Ni)-Total	mg/L		<0.00050	0.00058	0.00249	0.00491	0.008090	0.347000	0.62000	0.22500
Phosphorus (P)-Total	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	9.30000	12.70000	8.87000
Potassium (K)-Total	mg/L		1.9	0.293	0.85	1.89	3.800	40.400	55.300	15.300
Rubidium (Rb)-Total	mg/L		0.002	0.00089	0.00151	0.00241	0.01	0.33	0.91	0.20
Selenium (Se)-Total	mg/L		0.000057	0.000153	0.000237	0.000091	0.00043	0.00216	0.00217	0.00163
Silicon (Si)-Total	mg/L		3.94	5.43	5.93	6.03	11.70	314.00	226.00	198.00
Silver (Ag)-Total	mg/L		<0.000010	<0.000010	0.000013	0.000033	0.00061	0.00221	0.00283	0.00129
Sodium (Na)-Total	mg/L		12.8	1.53	4.04	1.81	5.380000	20.90	5.81	7.68
Strontium (Sr)-Total	mg/L		0.316	0.115	0.459	0.565	0.66	0.93	0.50	0.9
Sulfur (S)-Total	mg/L		8.19	6.33	6.1	13.5	7.45	7.00	<5.0	<5.0
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00	0.00	<0.0020	<0.0020
Thallium (Tl)-Total	mg/L		<0.000010	<0.000010	0.000011	0.000046	0.000089	0.00355	0.00589	0.00155
Thorium (Th)-Total	mg/L		<0.00010	<0.00010	<0.00010	0.00014	0.000960	0.071800	0.051900	0.017800
Tin (Sn)-Total	mg/L		0.00023	<0.00010	<0.00010	<0.00010	0.00013	0.0049	0.00190	0.0062
Titanium (Ti)-Total	mg/L		0.00038	<0.00069	0.00355	0.00467	0.207	10.4	4.95000	10.3
Tungsten (W)-Total	mg/L		0.00116	<0.00010	0.0008	0.00317	0.0042	<0.0010	<0.0010	<0.0010
Uranium (U)-Total	mg/L		0.000366	0.000152	0.000219	0.000778	0.00108	0.00820	0.0228	0.00845
Vanadium (V)-Total	mg/L		<0.00050	<0.00050	0.0008	0.00184	0.0118	0.4310	0.5420	0.4010
Zinc (Zn)-Total	mg/L		0.039	0.004	0.004	0.029	0.014	0.786	1.050	0.534
Zirconium (Zr)-Total	mg/L		0.00045	<0.00020	0.00117	0.00748	0.001	0.071	0.006	0.009
Dissolved Metals (for modelling purposes)										
Aluminum (Al)-Dissolved	mg/L		0.0024	0.0055	0.009	0.0191	0.0097	0.1560	0.0480	0.2040
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	0.00161	<0.00010	<0.00010	<0.00010	<0.00010	0.00010
Arsenic (As)-Dissolved	mg/L		0.0014	0.00018	0.00138	0.00236	0.00032	0.00024	0.00034	0.00837
Barium (Ba)-Dissolved	mg/L		0.132	0.0168	0.0953	0.115	0.075	0.055	0.017	0.061
Beryllium (Be)-Dissolved	mg/L		0.00049	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		0.022	<0.010	0.012	<0.010	0.019	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	0.0000363	<0.0000050	<0.0000050	0.0000152	0.0000162	0.0000131	0.0000172
Calcium (Ca)-Dissolved	mg/L		35.1	66.8	74	76.9	88.7	98.3	18.7	43.3
Cesium (Cs)-Dissolved	mg/L		0.000409	0.000084	0.000132	0.000295	0.000049	0.000027	<0.000010	0.000011
Chromium (Cr)-Dissolved	mg/L		0.00085	0.00014	0.00018	0.00028	0.00037	0.00061	0.00032	0.00099
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	0.00065	0.00044	0.00118	0.00028	<0.00010	0.00161
Copper (Cu)-Dissolved	mg/L		0.00061	0.00559	0.00096	<0.00020	0.0089	0.0045	0.0059	0.0006
Iron (Fe)-Dissolved	mg/L		2.16	0.032	0.172	1.75	0.045	0.276	0.085	4.340
Lead (Pb)-Dissolved	mg/L		<0.000050	0.000058	<0.000050	<0.000050	<0.000050	0.000256	<0.000050	0.00029
Lithium (Li)-Dissolved	mg/L		0.0033	<0.0010	0.0017	0.003	0.0026	0.0102	0.0010	0.0016
Magnesium (Mg)-Dissolved	mg/L		7.5	2	14	14.4	10.4	14.8	1.9	7.2
Manganese (Mn)-Dissolved	mg/L		0.157	0.00694	0.126	0.56	0.076	0.0117	0.0777	1.35
Mercury (Hg) - Dissolved	mg/L		<0.0000050	0.0000061	<0.0000050	<0.0000050	0.0000052	<0.0000050	<0.0000050	0.000009
Molybdenum (Mo)-Dissolved	mg/L		0.00484	0.000457	0.00403	0.000907	0.001360	0.003840	0.000621	0.00042
Nickel (Ni)-Dissolved	mg/L		0.0006	0.00051	0.00205	0.0005	0.00148	0.00086	0.00175	0.00124
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		1.88	0.302	0.854	1.91	3.28	1.81	0.78	1.47
Rubidium (Rb)-Dissolved	mg/L		0.00189	0.00094	0.00143	0.00225	0.00584	0.00073	0.00063	0.00304
Selenium (Se)-Dissolved	mg/L		0.000186	0.000171	0.000132	0.000331	0.000385	0.001440	0.000079	0.000161
Silicon (Si)-Dissolved	mg/L		3.71	5.53	5.44	5.75	6.24	7.10	4.62	5.83
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		12	1.52	3.71	1.74	4.78	3.61	1.11	1.2
Strontium (Sr)-Dissolved	mg/L		0.31	0.114	0.492	0.54	0.62	0.14	0.03	0.25
Sulfur (S)-Dissolved	mg/L		8.17	6.68	6.27	13.9	7.41	8.28	1.83	<0.50
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000019	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00019
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.00030	<0.00030	<0.00030	0.00132	<0.00030	0.00972	0.00333	0.00994
Tungsten (W)-Dissolved	mg/L		0.00108	<0.00010	0.00045	0.00141	0.00374	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L		0.000333	0.000142	0.000223	0.000713	0.000822	0.000902	0.000028	0.000042
Vanadium (V)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	0.00144	0.00117	0.00068	<0.00050	0.00435
Zinc (Zn)-Dissolved	mg/L		0.0027	0.0035	<0.0010	<0.0010	0.002	0.0036	<0.0010	0.004
Zirconium (Zr)-Dissolved	mg/L		0.0005	<0.00020	0.00039	0.00593	0.000460	0.000350	0.000300	0.001440
Charge Balance Error (CBE)	%									

Note: CBE is calculated as (sum of cations - sum of anions) / (sum of cations + sum of anions) x 100

Table 5.8 General chemistry and metals data for groundwater samples collected in September 2020 (Page 2 of 3).

Parameter	Units	Client Sample ID	SP-FBH-09-R1-D	SP-FBH-03-D	SP-FBH-11-D	SPFBH-07-R1-D	SP-GW-MW2	SP-FBH-02-D	SP-FBH-01-D	SP-GW-DUP-1
		Date Sampled	19-Sep-2020	19-Sep-2020	19-Sep-2020	19-Sep-2020	20-Sep-2020	20-Sep-2020	20-Sep-2020	20-Sep-2020
		Time Sampled	13:05	15:35	16:54	17:45	10:00	11:05	11:44	0:00
		Media	L2507954-5	L2507954-6	L2507954-7	L2507954-8	L2507954-9	L2507954-10	L2507954-11	L2507954-12
		ALS Sample ID	Water	Water	Water	Water	Water	Water	Water	Water
Physical Tests										
Conductivity	uS/cm		414	317	600	358	562	293	420	297
Hardness (as CaCO3)	mg/L		191	122	280	143	301	134	210	134
pH	pH		7.74	7.98	7.55	7.88	7.65	7.79	7.92	7.82
Total Suspended Solids	mg/L		4640	3430	28800	55300	4440	489	5080	602
Total Dissolved Solids	mg/L		277	305	420	306	496	229	381	227
Dissolved Organic Carbon	mg/L		15	20	28	<5.0	<5.0	<5.0	5	<5.0
Anions and Nutrients										
Acidity (as CaCO3)	mg/L		3.9	<2.0	8.2	<5.0	13.3	3.3	<2.0	2.2
Alkalinity, Total (as CaCO3)	mg/L		318	185	372	267	872	176	487	179
Ammonia, Total (as N)	mg/L		0.665	0.24	3.310	0.073	0.046	0.162	0.012	0.161
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		0.82	6.64	1.36	0.49	0.13	1.46	0.31	1.67
Fluoride (F)	mg/L		0.185	0.164	0.147	0.148	0.070	0.147	0.059	0.145
Nitrate (as N)	mg/L		<0.020	0.089	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		3.510	3.720	83.800	61.000	2.640	0.171	5.100	0.164
Silica, Reactive (as SiO2)	mg/L		12.7	11.3	14.5	9.7	16.9	12.6	10.2	12.4
Sulfate (SO4)	mg/L		11.7	27.5	4.1	9.0	5.9	9.1	3.1	10.5
Total Metals (compared with guideline val										
Aluminum (Al)-Total	mg/L		76.1	363.000	762.0	15.4	108.0	6.9	118.0	6.8
Antimony (Sb)-Total	mg/L		0.00600	0.01740	0.02150	0.01890	<0.0010	0.00169	0.00830	0.00143
Arsenic (As)-Total	mg/L		0.0595	0.278	0.2590	0.2470	0.0186	0.0108	0.0628	0.0089
Barium (Ba)-Total	mg/L		0.882	4.440	3.970	5.340	0.849	0.080	0.916	0.080
Beryllium (Be)-Total	mg/L		0.01100	0.0167	0.03180	0.02650	0.00320	0.00017	0.00180	0.00016
Bismuth (Bi)-Total	mg/L		<0.00050	0.0921	0.0247	0.0156	0.00081	0.000078	<0.00050	0.000077
Boron (B)-Total	mg/L		0.110	0.170	0.170	0.280	<0.10	0.011	<0.10	0.010
Cadmium (Cd)-Total	mg/L		0.001140	0.00131	0.0030300	0.0082900	0.0007730	0.0000987	0.0008750	0.0001020
Calcium (Ca)-Total	mg/L		179.0	1220	931.0	1710.0	510.0	52.2	322.0	53.8
Cesium (Cs)-Total	mg/L		0.126000	0.07540	0.181000	0.123000	0.011400	0.000575	0.038000	0.000519
Chromium (Cr)-Total	mg/L		0.10600	0.78300	11.40000	1.07000	0.20000	0.01830	0.35400	0.01760
Cobalt (Co)-Total	mg/L		0.05550	0.52300	0.76900	0.76200	0.05700	0.00558	0.09610	0.00497
Copper (Cu)-Total	mg/L		0.131	1.270	5.1800	3.8300	0.1410	0.0122	0.2700	0.0122
Iron (Fe)-Total	mg/L		124	905	1010	1680	121	15	161	14.0
Lead (Pb)-Total	mg/L		0.0189	0.3620	0.16700	0.62000	0.04600	0.00548	0.07130	0.00538
Lithium (Li)-Total	mg/L		0.1830	0.3690	1.2500	0.6950	0.1270	0.0081	0.1000	0.0085
Magnesium (Mg)-Total	mg/L		72.1	480.0	987.0	481.0	134.0	12.2	102.0	12.7
Manganese (Mn)-Total	mg/L		2.360	23.30	24.30	43.50	2.37	0.44	5.16	0.45
Mercury (Hg)-Total	mg/L)		---	---	---	---	---	---	---	---
Molybdenum (Mo)-Total	mg/L		0.00622	0.0753	0.024	0.0349	0.00122	0.00182	0.00311	0.00154
Nickel (Ni)-Total	mg/L		0.19500	1.43000	4.43000	0.50700	0.15000	0.02250	0.21800	0.02030
Phosphorus (P)-Total	mg/L		3.37000	21.70000	51.80000	45.00000	3.72000	0.16800	3.91000	0.15700
Potassium (K)-Total	mg/L		19.900	89.400	48.900	78.900	30.000	2.960	35.200	2.980
Rubidium (Rb)-Total	mg/L		0.10	0.40	0.36	0.37	0.22	0.00	0.15	0.00
Selenium (Se)-Total	mg/L		<0.00050	0.04690	0.00534	0.00559	0.00083	0.00018	0.00292	0.00011
Silicon (Si)-Total	mg/L		109.00	482.00	896.00	629.00	210.00	13.50	190.00	13.30
Silver (Ag)-Total	mg/L		0.00559	0.04160	0.06590	0.44700	0.00049	0.00037	0.01140	0.00035
Sodium (Na)-Total	mg/L		14.30	59.40	32.50	77.90	15.60	6.36	14.90	6.42
Strontium (Sr)-Total	mg/L		0.85	5.30	3.00	7.32	0.60	0.15	1.01	0.15
Sulfur (S)-Total	mg/L		6.700	40.100	24.100	46.300	<5.0	3.800	<5.0	3.580
Tellurium (Te)-Total	mg/L		<0.0020	<0.0020	0.00	<0.0020	<0.0020	<0.00020	<0.0020	<0.00020
Thallium (Tl)-Total	mg/L		0.00121	0.0057	0.00272	0.008	0.00139	0.000039	0.00142	0.000039
Thorium (Th)-Total	mg/L		0.020900	0.073500	0.121	0.235	0.0473	0.00234	0.0201	0.00215
Tin (Sn)-Total	mg/L		<0.0010	0.01160	0.00520	0.00840	0.00320	0.00046	0.00290	0.00062
Titanium (Ti)-Total	mg/L		0.651	4.06	7.1	1.92	6.7	0.0484	10.4	0.0441
Tungsten (W)-Total	mg/L		0.0293	0.0680	0.2970	0.2580	<0.0010	0.0018	0.0485	0.0015
Uranium (U)-Total	mg/L		0.01670	0.0400	0.08680	0.03530	0.00406	0.00136	0.00601	0.00130
Vanadium (V)-Total	mg/L		0.1320	0.6460	2.0600	0.9590	0.2260	0.0091	0.5320	0.0089
Zinc (Zn)-Total	mg/L		0.255	3.030	2.100	4.350	0.344	0.034	0.295	0.036
Zirconium (Zr)-Total	mg/L		0.020	0.121	0.152	0.060	0.040	0.004	0.053	0.003
Dissolved Metals (for modelling purposes)										
Aluminum (Al)-Dissolved	mg/L		0.1610	0.0244	0.0051	0.0316	0.0035	0.0120	0.0232	0.0097
Antimony (Sb)-Dissolved	mg/L		0.00061	0.00021	0.00032	0.00058	<0.00010	0.00091	0.00040	0.00089
Arsenic (As)-Dissolved	mg/L		0.0014	0.006	0.0034	0.0006	0.0002	0.0010	0.0020	0.0010
Barium (Ba)-Dissolved	mg/L		0.171	0.017	0.574	0.010	0.031	0.035	0.032	0.034
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		0.029	<0.010	0.023	0.012	0.011	0.013	<0.010	0.012
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	0.0000051	<0.0000050	0.0000091	0.0000051	<0.0000050	0.0000162	0.0000051
Calcium (Ca)-Dissolved	mg/L		54.0	38	81.0	41.9	86.8	38.7	72.1	38.3
Cesium (Cs)-Dissolved	mg/L		0.001190	0.000034	0.000982	0.000072	<0.000010	0.000029	0.000102	0.000028
Chromium (Cr)-Dissolved	mg/L		0.00031	0.00014	0.00046	0.00012	0.00013	0.00015	0.00021	0.00011
Cobalt (Co)-Dissolved	mg/L		0.00017	0.00019	0.00028	0.00067	0.00012	0.00018	0.00020	0.00018
Copper (Cu)-Dissolved	mg/L		<0.00020	0.00133	0.0004	0.0017	0.0036	<0.00020	0.0042	<0.00020
Iron (Fe)-Dissolved	mg/L		0.94	0.1	2.74	0.11	<0.010	0.19	0.07	0.19
Lead (Pb)-Dissolved	mg/L		0.000061	0.000133	<0.000050	0.000051	0.000146	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		0.0051	0.0037	0.0118	0.0029	0.0059	0.0028	0.0017	0.0028
Magnesium (Mg)-Dissolved	mg/L		13.6	6.3	18.9	9.3	20.4	9.1	7.4	9.3
Manganese (Mn)-Dissolved	mg/L		0.076	0.272	0.263	0.153	0.037	0.160	0.055	0.162
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000051	0.0000072	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.00105	0.00846	0.00114	0.00254	0.00070	0.00135	0.00067	0.00135
Nickel (Ni)-Dissolved	mg/L		0.00062	0.00058	0.00079	0.00058	0.00086	0.00057	0.00052	0.00060
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		2.93	2.56	4.50	1.09	1.10	2.26	2.53	2.29
Rubidium (Rb)-Dissolved	mg/L		0.00483	0.00192	0.00351	0.00144	0.00081	0.00131	0.00333	0.00124
Selenium (Se)-Dissolved	mg/L		<0.000050	0.000155	0.000085	0.000078	<0.000050	0.000092	0.000070	0.000062
Silicon (Si)-Dissolved	mg/L		6.34	5.54	10.50	5.13	8.31	5.91	4.54	5.76
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		12.40	18.60	12.70	11.00	2.97	10.80	1.93	11.00
Strontium (Sr)-Dissolved	mg/L		0.567	0.215	0.405	0.150	0.097	0.127	0.187	0.129
Sulfur (S)-Dissolved	mg/L		3.85	12.50	1.52	3.23	2.10	5.09	1.00	4.77
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	0.000016	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	0.00019	0.00019	<0.00010	0.00016	0.00012	<0.00010	0.00012
Titanium (Ti)-Dissolved	mg/L		<0.0039	<0.00090	0.00056	<0.00066	<0.00030	<0.00030	0.00063	<0.00030
Tungsten (W)-Dissolved	mg/L		0.00159	0.00155	0.00288	0.01110	<0.00010	0.00119	0.00276	0.00119
Uranium (U)-Dissolved	mg/L		0.00036	0.00107	0.000168	0.000900	0.000433	0.000986	0.000349	0.000992
Vanadium (V)-Dissolved	mg/L		0.00142	<0.00050	0.00098	<0.00050	0.00103	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.001	<0.0010	0.001	0.001	0.003	<0.0010	<0.0010	<0.0010
Zirconium (Zr)-Dissolved	mg/L		0.00139	0.00025	0.00129	<0.00020	<0.00020	0.00170	0.00075	0.00175
Charge Balance Error (CBE)	%									

Note: CBE is calculated as (sum of cations - sum of anions) /

Table 5.8 General chemistry and metals data for groundwater samples collected in September 2020 (Page 3 of 3).

Parameter	Units	Client Sample ID	SP-FBH-12-D	SP-FBH-04-D
		Date Sampled	**20-Sep-2020**	**20-Sep-2020**
		Time Sampled	**14:45**	**17:10**
		Media	**L2507954-13**	**L2507954-14**
		ALS Sample ID	**Water**	**Water**
Physical Tests				
Conductivity	uS/cm		369	379
Hardness (as CaCO3)	mg/L		192	166
pH	pH		7.77	7.87
Total Suspended Solids	mg/L		28	358.0
Total Dissolved Solids	mg/L		254	258
Dissolved Organic Carbon	mg/L		22	5
Anions and Nutrients				
Acidity (as CaCO3)	mg/L		3.0	<2.0
Alkalinity, Total (as CaCO3)	mg/L		247	239
Ammonia, Total (as N)	mg/L		0.613	0.276
Bromide (Br)	mg/L		<0.10	<0.10
Chloride (Cl)	mg/L		0.40	1.79
Fluoride (F)	mg/L		0.073	0.111
Nitrate (as N)	mg/L		<0.020	<0.020
Nitrite (as N)	mg/L		<0.010	<0.010
Phosphorus (P)-Total	mg/L		0.049	0.289
Silica, Reactive (as SiO2)	mg/L		12.9	13.6
Sulfate (SO4)	mg/L		0.7	8.0
Total Metals (compared with guideline val				
Aluminum (Al)-Total	mg/L		1.7	8.8800
Antimony (Sb)-Total	mg/L		0.00049	0.00236
Arsenic (As)-Total	mg/L		0.0020	0.0094
Barium (Ba)-Total	mg/L		0.053	0.076
Beryllium (Be)-Total	mg/L		0.00011	0.00057
Bismuth (Bi)-Total	mg/L		<0.000050	0.000112
Boron (B)-Total	mg/L		<0.010	0.082
Cadmium (Cd)-Total	mg/L		0.0000194	0.0000572
Calcium (Ca)-Total	mg/L		60.2	69.7
Cesium (Cs)-Total	mg/L		0.000205	0.001620
Chromium (Cr)-Total	mg/L		0.00540	0.02390
Cobalt (Co)-Total	mg/L		0.00109	0.00837
Copper (Cu)-Total	mg/L		0.0029	0.0187
Iron (Fe)-Total	mg/L		3.88	12.7
Lead (Pb)-Total	mg/L		0.00166	0.00407
Lithium (Li)-Total	mg/L		0.0037	0.0137
Magnesium (Mg)-Total	mg/L		10.3	11.4
Manganese (Mn)-Total	mg/L		0.21	0.50
Mercury (Hg)-Total	mg/L)		---	---
Molybdenum (Mo)-Total	mg/L		0.00025	0.00274
Nickel (Ni)-Total	mg/L		0.00263	0.02410
Phosphorus (P)-Total	mg/L		0.05900	0.08800
Potassium (K)-Total	mg/L		2.080	3.640
Rubidium (Rb)-Total	mg/L		0.00	0.01
Selenium (Se)-Total	mg/L		0.00010	0.00100
Silicon (Si)-Total	mg/L		8.31	18.10
Silver (Ag)-Total	mg/L		0.00013	0.00024
Sodium (Na)-Total	mg/L		3.46	17.0
Strontium (Sr)-Total	mg/L		0.18	0.35
Sulfur (S)-Total	mg/L		<0.50	3.440
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		<0.000010	0.000074
Thorium (Th)-Total	mg/L		0.00068	0.0029
Tin (Sn)-Total	mg/L		0.00021	0.00111
Titanium (Ti)-Total	mg/L		0.0143	0.109
Tungsten (W)-Total	mg/L		0.0009	0.0018
Uranium (U)-Total	mg/L		0.00056	0.00156
Vanadium (V)-Total	mg/L		0.0053	0.0373
Zinc (Zn)-Total	mg/L		0.008	0.032
Zirconium (Zr)-Total	mg/L		0.004	0.001
Dissolved Metals (for modelling purposes)				
Aluminum (Al)-Dissolved	mg/L		0.0244	0.0063
Antimony (Sb)-Dissolved	mg/L		0.00038	0.00197
Arsenic (As)-Dissolved	mg/L		0.0004	0.0022
Barium (Ba)-Dissolved	mg/L		0.050	0.047
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		<0.010	0.082
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L		61.1	53.4
Cesium (Cs)-Dissolved	mg/L		0.000070	0.000055
Chromium (Cr)-Dissolved	mg/L		0.00032	0.00012
Cobalt (Co)-Dissolved	mg/L		0.00019	0.00038
Copper (Cu)-Dissolved	mg/L		0.0002	<0.00020
Iron (Fe)-Dissolved	mg/L		1.14	0.05
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		0.0027	0.0045
Magnesium (Mg)-Dissolved	mg/L		9.5	7.8
Manganese (Mn)-Dissolved	mg/L		0.165	0.186
Mercury (Hg) - Dissolved	mg/L		0.000005	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.00019	0.00213
Nickel (Ni)-Dissolved	mg/L		<0.00050	0.00130
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050
Potassium (K)-Dissolved	mg/L		1.97	2.33
Rubidium (Rb)-Dissolved	mg/L		0.00168	0.00210
Selenium (Se)-Dissolved	mg/L		0.000146	0.000267
Silicon (Si)-Dissolved	mg/L		6.20	6.16
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.00010
Sodium (Na)-Dissolved	mg/L		3.52	14.70
Strontium (Sr)-Dissolved	mg/L		0.171	0.316
Sulfur (S)-Dissolved	mg/L		<0.50	2.49
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	0.00017
Titanium (Ti)-Dissolved	mg/L		0.00120	<0.00030
Tungsten (W)-Dissolved	mg/L		0.00038	0.00391
Uranium (U)-Dissolved	mg/L		0.000437	0.000614
Vanadium (V)-Dissolved	mg/L		0.00098	0.00119
Zinc (Zn)-Dissolved	mg/L		<0.0010	0.001
Zirconium (Zr)-Dissolved	mg/L		0.00423	0.00045
Charge Balance Error (CBE)	%			

Note: CBE is calculated as (sum of cations - sum of anions) /

Table 5.9 General chemistry and metals data for groundwater samples collected in November 2020 (Page 1 of 2).

Parameter	Units	Client Sample ID	SP-GW-FBH-01-D	SP-GW-FBH-11-D	SP-GW-FBH-03-D	SP-GW-FBH-04-D	SP-GW-FBH-14-D	SP-GW-FBH-09-R1-D	SP-GW-FBH-07-R1-D	SP-GW-SGH20-001-D
		Date Sampled	1-Nov-2020	1-Nov-2020	1-Nov-2020	2-Nov-2020	2-Nov-2020	3-Nov-2020	3-Nov-2020	7-Nov-2020
		Time Sampled	11:51	14:09	15:15	11:57	14:32	10:02	10:49	10:52
		Media	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2526849-1	L2526849-2	L2526849-3	L2526849-4	L2526849-5	L2526849-6	L2526849-7	L2527873-1
Physical Tests										
Conductivity	uS/cm		407	618	241	402	397	417	349	341
Hardness (as CaCO3)	mg/L		201	290	103	161	184	182	182	162
pH	pH		7.99	7.65	7.98	8.09	7.42	7.98	7.98	7.61
Total Suspended Solids	mg/L		1820	1120	195	586	7220	2760	1700	600
Total Dissolved Solids	mg/L		333	392	157	255	322	251	213	239
Anions and Nutrients										
Acidity (as CaCO3)	mg/L		7.2	12.5	<2.0	<2.0	10.2	2.7	2.4	3.3
Alkalinity, Total (as CaCO3)	mg/L		265	361	119	217	556	242	195	198
Ammonia, Total (as N)	mg/L		0.043	3.14	0.1	0.341	1.39	0.666	0.047	0.0439
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		0.27	0.74	1.24	1.4	1.56	0.96	0.5	0.94
Fluoride (F)	mg/L		0.052	0.12	0.11	0.147	0.119	0.253	0.093	0.119
Nitrate (as N)	mg/L		<0.020	<0.020	<0.020	<0.020	0.029	0.027	<0.020	0.04
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		1.9	2.03	<0.30	0.062	4.3	1.99	<3.0	0.28
Silica, Reactive (as SiO2)	mg/L		10.7	24.9	12.9	15.2	15	14	13	13.7
Sulfate (SO4)	mg/L		3.2	1.02	9.88	13.1	17.4	11	8.59	13.3
Cyanides (Water)										
Cyanide, Total	mg/L		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Organic / Inorganic Carbon (Water)										
Dissolved Organic Carbon	mg/L		8.54	22.8	4.76	6.46	11.6	7.82	5.65	9.4
Total Metals (compared with guideline values for compliance purposes)										
Aluminum (Al)-Total	mg/L		22.9	28.5	2.24	6.14	78.4	16.2	0.0132	7.74
Antimony (Sb)-Total	mg/L		0.00171	0.00064	0.00036	0.00095	0.004	0.00047	0.0004	0.00071
Arsenic (As)-Total	mg/L		0.0174	0.0121	0.00835	0.00371	0.0263	0.0147	0.00068	0.0189
Barium (Ba)-Total	mg/L		0.239	0.684	0.0483	0.09	0.568	0.401	0.0129	0.0992
Beryllium (Be)-Total	mg/L		0.00048	0.00219	0.00011	0.00161	0.0029	0.00509	<0.00010	0.00098
Bismuth (Bi)-Total	mg/L		<0.000050	0.00134	0.000691	0.000267	0.00055	0.000252	<0.000050	0.000228
Boron (B)-Total	mg/L		<0.010	0.031	<0.010	0.102	<0.10	0.044	0.011	0.012
Cadmium (Cd)-Total	mg/L		0.000378	0.000125	0.0000111	0.0000423	0.000464	0.000133	0.0000081	0.00012
Calcium (Ca)-Total	mg/L		197	123	41.4	68	402	128	48.5	84.5
Cesium (Cs)-Total	mg/L		0.0114	0.008	0.000643	0.00158	0.0198	0.0241	0.000057	0.00195
Chromium (Cr)-Total	mg/L		0.0674	0.429	0.00469	0.00405	0.171	0.0221	<0.00010	0.0216
Cobalt (Co)-Total	mg/L		0.0204	0.0294	0.00305	0.0021	0.0651	0.0121	0.00039	0.0058
Copper (Cu)-Total	mg/L		0.0924	0.204	0.00925	0.00534	0.242	0.0301	0.0012	0.0339
Iron (Fe)-Total	mg/L		34.3	45	5.78	3.44	117	36	0.071	7.55
Lead (Pb)-Total	mg/L		0.0218	0.0106	0.00295	0.00845	0.0315	0.0114	<0.000050	0.0096
Lithium (Li)-Total	mg/L		0.0223	0.0533	0.0038	0.0078	0.085	0.0392	0.0019	0.0072
Magnesium (Mg)-Total	mg/L		24.8	55.4	7.64	9.58	121	28.4	10.5	9.54
Manganese (Mn)-Total	mg/L		2.04	1.37	0.428	0.281	2.16	1.07	0.12	0.402
Mercury (Hg)-Total	mg/L)									
Molybdenum (Mo)-Total	mg/L		0.000938	0.00118	0.00641	0.000839	0.0333	0.00129	0.0012	0.00612
Nickel (Ni)-Total	mg/L		0.0396	0.165	0.0083	0.00615	0.156	0.0423	<0.00050	0.0162
Phosphorus (P)-Total	mg/L		1.9	1.75	0.136	<0.050	3.27	1.49	<0.050	0.255
Potassium (K)-Total	mg/L		8.9	6.41	1.98	3.24	20.5	5.75	0.902	4.42
Rubidium (Rb)-Total	mg/L		0.0392	0.0226	0.00411	0.0127	0.116	0.0294	0.00097	0.0158
Selenium (Se)-Total	mg/L		0.000612	0.000212	0.000419	0.000469	0.00894	0.000132	<0.000050	0.00048
Silicon (Si)-Total	mg/L		35.8	72.6	10	18.4	147	30.9	5.98	19.8
Silver (Ag)-Total	mg/L		0.00183	0.00239	0.000241	0.000035	0.00141	0.000435	<0.000010	0.000458
Sodium (Na)-Total	mg/L		3.92	9.74	5.26	19.5	15.8	14.5	7.5	8.88
Strontium (Sr)-Total	mg/L		0.541	0.622	0.236	0.468	0.578	0.792	0.158	0.265
Sulfur (S)-Total	mg/L		0.97	0.54	3.99	3.49	8.9	2.75	2.02	4.22
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		0.000358	0.000156	0.000047	0.000095	0.0008	0.000242	<0.000010	0.000127
Thorium (Th)-Total	mg/L		0.0042	0.00878	0.00055	0.00579	0.0297	0.00879	<0.00010	0.00911
Tin (Sn)-Total	mg/L		0.00047	0.00055	0.00143	0.00101	0.0038	0.00028	<0.00010	0.00025
Titanium (Ti)-Total	mg/L		1.56	0.112	0.0386	0.0142	4.18	0.0653	0.00041	0.083
Tungsten (W)-Total	mg/L		0.0061	0.00653	0.00078	0.00057	0.0053	0.00091	0.00348	0.0024
Uranium (U)-Total	mg/L		0.00162	0.00504	0.000671	0.00243	0.0197	0.00804	0.000898	0.00401
Vanadium (V)-Total	mg/L		0.116	0.0802	0.0044	0.00982	0.232	0.0395	<0.00050	0.0137
Zinc (Zn)-Total	mg/L		0.0622	0.0796	0.0187	0.0114	0.221	0.0542	0.0043	0.0374
Zirconium (Zr)-Total	mg/L		0.0113	0.0097	0.00167	0.00059	0.0663	0.00221	<0.00020	0.00087
Dissolved Metals (for modelling purposes)										
Aluminum (Al)-Dissolved	mg/L		0.0123	0.138	0.0053	0.0032	0.0058	0.0023	0.0063	0.0515
Antimony (Sb)-Dissolved	mg/L		0.00033	<0.00010	<0.00010	0.00162	0.00038	0.00025	0.00035	0.00093
Arsenic (As)-Dissolved	mg/L		0.00235	0.00161	0.00615	0.00155	0.00094	0.0007	0.00096	0.0104
Barium (Ba)-Dissolved	mg/L		0.0356	0.507	0.0204	0.0429	0.0525	0.153	0.055	0.0554
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		<0.010	0.025	<0.010	0.088	0.012	0.03	0.016	<0.010
Cadmium (Cd)-Dissolved	mg/L		0.0000172	<0.0000050	<0.0000050	0.0000061	0.0000051	<0.0000050	<0.0000050	0.0000104
Calcium (Ca)-Dissolved	mg/L		69.6	84.2	33.1	51.9	61.3	51.1	60.7	56.2
Cesium (Cs)-Dissolved	mg/L		0.000069	0.000537	0.000016	0.000055	0.000105	0.000672	0.000108	0.000044
Chromium (Cr)-Dissolved	mg/L		0.00022	0.00209	<0.00010	0.00014	0.00039	0.00012	0.00035	0.00038
Cobalt (Co)-Dissolved	mg/L		0.00024	0.00033	0.00012	0.00026	<0.00010	<0.00010	<0.00010	0.00102
Copper (Cu)-Dissolved	mg/L		0.00573	0.00067	0.00131	0.00101	<0.00020	0.00023	<0.00020	0.0043
Iron (Fe)-Dissolved	mg/L		0.052	4.47	0.213	0.11	1.93	0.843	1.94	0.146
Lead (Pb)-Dissolved	mg/L		0.000115	0.000096	0.000077	0.000076	<0.000050	<0.000050	<0.000050	0.000144
Lithium (Li)-Dissolved	mg/L		<0.0010	0.0095	0.0015	0.0038	0.0034	0.0045	0.0039	0.0029
Magnesium (Mg)-Dissolved	mg/L		6.54	19.3	5.04	7.53	7.48	13.3	7.28	5.31
Manganese (Mn)-Dissolved	mg/L		0.0684	0.261	0.296	0.18	0.246	0.0595	0.24	0.145
Mercury (Hg) - Dissolved	mg/L		0.0000076	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.000713	0.000617	0.00607	0.00122	0.00134	0.000888	0.00136	0.00734
Nickel (Ni)-Dissolved	mg/L		0.00057	0.00089	<0.00050	0.0012	<0.00050	<0.00050	<0.00050	0.00204
Phosphorus (P)-Dissolved	mg/L		<0.050	0.057	<0.050	<0.050	0.052	<0.050	0.052	<0.050
Potassium (K)-Dissolved	mg/L		2.04	4.49	1.27	2.58	2.66	2.86	2.6	3.2
Rubidium (Rb)-Dissolved	mg/L		0.00328	0.00319	0.00098	0.00252	0.00189	0.00435	0.00196	0.00418
Selenium (Se)-Dissolved	mg/L		0.000084	0.000108	0.000135	0.000216	0.000164	0.000077	0.000119	0.000319
Silicon (Si)-Dissolved	mg/L		4.86	12.6	6.06	6.8	7.84	6.55	7.62	7.58
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		2.03	8.83	4.8	20.6	6.51	14.1	6.33	9.12
Strontium (Sr)-Dissolved	mg/L		0.189	0.474	0.205	0.416	0.175	0.619	0.177	0.21
Sulfur (S)-Dissolved	mg/L		0.74	<0.50	3.59	3.78	3.93	2.01	3.85	4.04
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	0.00022	0.0003	0.00026	<0.00010	0.00028	<0.00010
Titanium (Ti)-Dissolved	mg/L		0.00036	0.00326	<0.00030	<0.00030	0.00085	<0.00030	0.00094	0.00172
Tungsten (W)-Dissolved	mg/L		0.00151	0.00132	0.00019	0.00292	0.00124	0.001	0.00136	0.00441
Uranium (U)-Dissolved	mg/L		0.000441	0.000181	0.000403	0.000813	0.000283	0.000281	0.000305	0.00139
Vanadium (V)-Dissolved	mg/L		<0.00050	0.00202	<0.00050	0.00087	0.00227	0.00094	0.00239	0.00105
Zinc (Zn)-Dissolved	mg/L		<0.0010	0.0019	0.0015	0.0017	<0.0010	<0.0010	<0.0010	0.0041
Zirconium (Zr)-Dissolved	mg/L		0.00115	0.00326	<0.00020	0.00045	0.00172	0.00098	0.00172	0.00044
Charge Balance Error (CBE)	%		12.79	7.13	-6.31	5.41	48.18	8.08	5.92	6.79

Note: CBE is calculated as (sum of cations - sum of anions) / (sum of cations + sum of anions) x 100

Table 5.9 General chemistry and metals data for groundwater samples collected in November 2020 (Page 2 of 2).

Parameter	Units	Client Sample ID	SP-GW-BL-143-D	SP-GW-MW2	SP-GW-BL235	SP-GW-BL385
		Date Sampled	7-Nov-2020	8-Nov-2020	15-Nov-2020	15-Nov-2020
		Time Sampled	13:44	14:05	10:08	11:48
		Media	Groundwater	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2527873-2	L2527873-3	L2532169-1	L2532169-2
Physical Tests						
Conductivity	uS/cm		593	308	525	462
Hardness (as CaCO3)	mg/L		331	132	277	232
pH	pH		7.64	8.12	7.52	7.48
Total Suspended Solids	mg/L		10900	<3.0	<3.0	22.4
Total Dissolved Solids	mg/L		560	191	344	278
Anions and Nutrients						
Acidity (as CaCO3)	mg/L		47.8	3	7.3	6.1
Alkalinity, Total (as CaCO3)	mg/L		1370	143	252	216
Ammonia, Total (as N)	mg/L		0.063	0.465	0.372	0.013
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	0.24
Chloride (Cl)	mg/L		0.14	0.92	0.21	14.6
Fluoride (F)	mg/L		0.095	0.14	0.123	0.038
Nitrate (as N)	mg/L		<0.020	<0.020	<0.020	0.052
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010
Phosphorus (P)-Total	mg/L		5.31	<0.030	0.0156	0.0069
Silica, Reactive (as SiO2)	mg/L		<50	8.8	12.8	11.9
Sulfate (SO4)	mg/L		6.25	25.5	42.7	16
Cyanides (Water)						
Cyanide, Total	mg/L		<0.0020	<0.0020	<0.0020	<0.0020
Organic / Inorganic Carbon (Water)						
Dissolved Organic Carbon	mg/L		7.5	7.5	11.7	5.43
Total Metals (compared with guideline values for compliance						
Aluminum (Al)-Total	mg/L		176	0.004	0.0186	0.0954
Antimony (Sb)-Total	mg/L		0.001	0.00039	<0.00010	0.00188
Arsenic (As)-Total	mg/L		0.0373	0.0017	0.00259	0.00634
Barium (Ba)-Total	mg/L		1.37	0.132	0.128	0.0679
Beryllium (Be)-Total	mg/L		0.0051	0.00053	0.00014	<0.00010
Bismuth (Bi)-Total	mg/L		0.00132	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L		<0.10	0.019	<0.010	0.01
Cadmium (Cd)-Total	mg/L		0.00102	0.0000101	<0.0000050	0.0000051
Calcium (Ca)-Total	mg/L		745	37.7	87.7	70.9
Cesium (Cs)-Total	mg/L		0.0204	0.000459	0.000305	0.000135
Chromium (Cr)-Total	mg/L		0.382	0.00014	0.00034	0.00191
Cobalt (Co)-Total	mg/L		0.0941	<0.00010	0.00039	0.00045
Copper (Cu)-Total	mg/L		0.232	0.00666	<0.00050	0.00274
Iron (Fe)-Total	mg/L		230	2.45	2.01	3.06
Lead (Pb)-Total	mg/L		0.0727	0.000085	<0.000050	0.000167
Lithium (Li)-Total	mg/L		0.222	0.0027	0.0032	0.0013
Magnesium (Mg)-Total	mg/L		200	8.11	15.8	14.2
Manganese (Mn)-Total	mg/L		3.51	0.158	0.605	0.112
Mercury (Hg)-Total	mg/L)					
Molybdenum (Mo)-Total	mg/L		0.00201	0.00495	0.000933	0.000976
Nickel (Ni)-Total	mg/L		0.255	<0.00050	<0.00050	0.00185
Phosphorus (P)-Total	mg/L		6.91	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L		46.9	2.09	2.14	0.909
Rubidium (Rb)-Total	mg/L		0.381	0.00208	0.00243	0.00194
Selenium (Se)-Total	mg/L		0.00114	<0.000050	0.000058	0.000133
Silicon (Si)-Total	mg/L		341	4.45	6.45	6.19
Silver (Ag)-Total	mg/L		0.00072	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		23.5	14.1	2.07	3.09
Strontium (Sr)-Total	mg/L		0.927	0.361	0.59	0.206
Sulfur (S)-Total	mg/L		<5.0	8.47	15.5	5.92
Tellurium (Te)-Total	mg/L		<0.0020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		0.00244	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	mg/L		0.0926	<0.00010	0.00011	<0.00010
Tin (Sn)-Total	mg/L		0.0062	<0.00010	<0.00010	0.00015
Titanium (Ti)-Total	mg/L		12.4	<0.00030	0.00166	0.00255
Tungsten (W)-Total	mg/L		<0.0010	0.00134	0.00153	0.00055
Uranium (U)-Total	mg/L		0.00715	0.000387	0.00087	0.00025
Vanadium (V)-Total	mg/L		0.414	<0.00050	0.0017	0.00052
Zinc (Zn)-Total	mg/L		0.524	0.028	<0.0030	<0.0030
Zirconium (Zr)-Total	mg/L		0.0872	0.00068	0.00696	0.00082
Dissolved Metals (for modelling purposes)						
Aluminum (Al)-Dissolved	mg/L		0.065	0.0026	0.0187	0.0115
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	0.00086
Arsenic (As)-Dissolved	mg/L		0.00027	0.00157	0.00196	0.00116
Barium (Ba)-Dissolved	mg/L		0.0296	0.144	0.126	0.0632
Beryllium (Be)-Dissolved	mg/L		<0.00010	0.00058	0.00015	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		0.01	0.02	0.012	0.011
Cadmium (Cd)-Dissolved	mg/L		0.0000093	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L		96.1	38.9	85.2	69.9
Cesium (Cs)-Dissolved	mg/L		0.000011	0.00049	0.000329	0.000111
Chromium (Cr)-Dissolved	mg/L		0.00027	0.00011	0.00032	0.0002
Cobalt (Co)-Dissolved	mg/L		0.00015	<0.00010	0.00038	0.00031
Copper (Cu)-Dissolved	mg/L		0.00244	0.00114	<0.00020	0.00113
Iron (Fe)-Dissolved	mg/L		0.1	2.32	1.96	0.246
Lead (Pb)-Dissolved	mg/L		0.00012	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		0.0061	0.0038	0.0033	0.0012
Magnesium (Mg)-Dissolved	mg/L		22.1	8.33	15.6	14
Manganese (Mn)-Dissolved	mg/L		0.0308	0.156	0.589	0.104
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.000493	0.00499	0.000932	0.000841
Nickel (Ni)-Dissolved	mg/L		0.0009	<0.00050	<0.00050	0.00124
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		1.15	2.15	2.11	0.877
Rubidium (Rb)-Dissolved	mg/L		0.00116	0.00218	0.00237	0.00179
Selenium (Se)-Dissolved	mg/L		<0.000050	<0.000050	0.000074	0.000086
Silicon (Si)-Dissolved	mg/L		9.59	4.85	5.94	5.44
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		3.26	13.8	2.11	3.04
Strontium (Sr)-Dissolved	mg/L		0.108	0.372	0.599	0.212
Sulfur (S)-Dissolved	mg/L		1.78	8.31	13.9	4.83
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		0.00531	<0.00030	0.00155	<0.00030
Tungsten (W)-Dissolved	mg/L		<0.00010	0.00135	0.00139	0.0003
Uranium (U)-Dissolved	mg/L		0.0005	0.000395	0.00084	0.000249
Vanadium (V)-Dissolved	mg/L		0.00123	<0.00050	0.00152	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.0015	0.0065	0.0014	0.0012
Zirconium (Zr)-Dissolved	mg/L		0.00023	0.00072	0.00665	0.00045
Charge Balance Error (CBE)	%		60.42	1.93	2.14	2.71

Note: CBE is calculated as (sum of cations - sum of anions) /

Table 5.10 Major ion concentrations and summary of groundwater classifications for samples collected in 2019.

Borehole/ Well ID	**Vertical Depth (m)**	**Ca**	**Mg**	**Na**	**K**	**Cl**	**SO4**	**HCO3**	**TDS**	**Calcite Saturation**	**Classification**
		(mg/L)									
BL-0098	36.3	72.5	18.0	4.27	2.25	0.72	21.6	323	297	0.18	Ca-Mg-HCO$_3$
	215.7	70.5	16.0	6.36	2.11	1.90	6.97	338	292	1.54	Ca-Mg-HCO$_3$
BL-0024	42.4	73.4	11.4	1.95	0.86	0.70	23.1	277	275	0.22	Ca-HCO$_3$
	206.1	80.9	11.8	2.86	0.95	0.42	28.2	312	327	0.25	Ca-HCO$_3$
BL-0111	54.4	63.0	12.1	4.23	2.25	0.57	24.8	280	236	0.05	Ca-Mg-HCO$_3$
	125.1	64.1	12.4	4.19	2.32	0.55	24.7	277	246	0.21	Ca-Mg-HCO$_3$
	215.7	64.0	12.1	4.13	2.35	0.38	25.4	263	239	0.20	Ca-Mg-HCO$_3$
	306.3	73.3	12.0	10.3	2.53	6.17	28.6	306	279	0.33	Ca-HCO$_3$
BL-0049	46.0	77.5	15.8	2.63	1.99	2.36	27.7	322	303	-0.32	Ca-Mg-HCO$_3$
	163.9	108.0	18.2	2.70	2.18	0.72	11.6	424	422	0.41	Ca-Mg-HCO$_3$
BL-0034	54.4	86.8	13.1	2.00	1.74	1.09	13.8	462	362	-0.08	Ca-HCO$_3$
	125.1	87.1	13.1	1.92	1.71	0.56	13.6	485	368	-0.03	Ca-HCO$_3$
	261.0	90.5	17.0	3.83	2.12	1.42	20.8	473	385	0.12	Ca-HCO$_3$
	406.0	92.9	18.5	4.51	2.23	2.97	26.8	527	380	0.21	Ca-HCO$_3$
BL-0341	42.4	66.4	15.1	1.13	2.04	0.15	28.5	359	277	-0.45	Ca-Mg-HCO$_3$
BL-0385	76.4	82.2	14.6	3.65	1.14	8.58	25.1	343	300	0.24	Ca-Mg-HCO$_3$
BL-0354	73.5	76.7	12.6	1.45	0.76	0.69	19.0	301	274	-0.49	Ca-Mg-HCO$_3$
BL-0052	58.0	80.8	18.7	7.68	1.56	1.49	36.4	352	336	0.16	Ca-Mg-HCO$_3$
	133.3	81.0	19.3	8.63	1.62	1.33	35.8	327	334	0.21	Ca-Mg-HCO$_3$
	229.9	80.1	17.5	7.88	0.87	2.50	45.0	287	355	0.06	Ca-Mg-HCO$_3$
	420.2	88.9	19.3	10.3	1.23	4.02	41.0	174	371	-0.04	Ca-Mg-HCO$_3$
BL-0310	42.4	98.6	19.0	8.52	1.82	9.54	31.8	388	386	0.00	Ca-Mg-HCO$_3$
MW2	4.0	83.4	19.7	5.23	1.26	1.10	5.4	338	442	0.33	Ca-Mg-HCO$_3$
MW-B000	3.8	111	10.0	3.74	3.35	0.54	0.4	363	320	-0.14	Ca-HCO$_3$
MW-E080	3.0	98.9	6.0	2.76	2.46	0.39	0.4	128	159	-1.15	Ca-HCO$_3$
MW-K034	3.7	93.0	4.0	2.79	2.06	0.14	0.0	315	298	-0.50	Ca-HCO$_3$
TMA-RS	0	13.6	1.0	0.70	0.86	0.17	1.1	37	79	-2.49	Ca-HCO$_3$

Note: If the Calcite Saturation Index is negative, calcite is unlikely to be precipitating. If that index is positive, calcite precipitation is likely.

Table 5.11 Major ion concentrations and summary of groundwater classifications, ordered by sample depth, for representative samples collected in 2020.

Borehole/Well ID	**Date**	**Vertical Depth (m)**	**Ca**	**Mg**	**Na**	**K**	**Cl**	**SO4**	**HCO3**	**TDS$_{meas}$**	**Calcite Saturation**	**Classification**
			(mg/L)									
MW3	14-Jul-20	1.2	28.2	4.7	0.88	0.51	0.20	0.5	127	195	-0.89	Ca-HCO$_3$
MW4	14-Jul-20	1.5	24.7	2.4	1.4	0.99	0.12	4.10	95	735	-1.20	Ca-HCO$_3$
MW5	6-Jul-20	3.7	90.8	12.3	3.35	1.18	0.29	22.6	446	397	0.66	Ca-HCO$_3$
MW2	14-Jul-20	4.0	84.2	19.8	2.8	0.96	0.15	5.9	551	454	0.83	Ca-Mg-HCO$_3$
	8-Nov-20		39.0	8.3	13.8	2.15	0.92	25.5	174	191	0.44	Ca-Mg-HCO$_3$
FBH-09-R1-D	3-Nov-20	8.2	51.1	13.3	14.1	2.86	0.96	11	295	251	0.63	Ca-Mg-HCO$_3$
FBH-01-D	1-Nov-20	8.3	69.6	6.54	2.03	2.04	0.27	3.2	323	333	0.81	Ca-HCO$_3$
FBH-14-D	2-Nov-20	9.4	61.3	7.5	6.5	2.7	1.6	17.4	678	322	0.47	Ca-HCO$_3$
FBH-03-D	1-Nov-20	10.4	33.1	5.0	4.8	1.3	1.2	9.9	145	157	0.18	Ca-HCO$_3$
FHB-07-R1-D	3-Nov-20	10.8	48.5	10.5	7.5	0.9	0.5	8.6	238	213	0.53	Ca-Mg-HCO$_3$
FBH-11-D	1-Nov-20	11.2	84.2	19.3	8.8	4.5	0.7	1.0	440	392	0.66	Ca-Mg-HCO$_3$
FBH-04-D	2-Nov-20	12.4	51.9	7.5	20.6	2.6	1.4	13.1	265	255	0.70	Ca-Na-HCO$_3$
BL-321-D	15-Jul-20	23.2	53.0	13.2	18.6	4.3	0.9	6.3	301	255	0.72	Ca-Mg-HCO$_3$
BL-334-D	15-Jul-20	23.7	77.4	12.5	11.3	4.3	0.4	21.7	421	381	0.52	Ca-HCO$_3$
SGH20-001	7-Nov-20	25.6	56.2	5.3	9.1	3.2	0.9	13.3	241	239	0.23	Ca-HCO$_3$
BL-235	7-Jul-20	48.0	71.4	13.2	1.9	1.8	0.2	37.2	280	292	0.42	Ca-Mg-HCO$_3$
	15-Nov-20		85.2	15.6	2.1	2.1	0.2	42.7	307	344	0.38	Ca-Mg-HCO$_3$
BL-385	7-Jul-20	208.0	62.5	10.9	3.0	0.7	22.6	13.9	235	276	0.38	Ca-Mg-HCO$_3$
	15-Nov-20		69.9	14.0	3.0	0.9	14.6	16.0	263	278	0.21	Ca-Mg-HCO$_3$
SP11-064	6-Jul-20	635.7	53.0	1.4	1.1	0.2	0.2	17.8	172	167	-0.29	Ca-HCO$_3$
BL-143-D	7-Nov-20	764.1	96.1	22.1	3.3	1.2	0.1	6.3	1670	560	1.15	Ca-HCO$_3$

Notes

1. If the Calcite Saturation Index is negative, calcite is unlikely to be precipitating. If that index is positive, calcite precipitation is likely.

2. Yellow shading of measured TDS indicates an erroneous value reported by the laboratory, based on a comparison with the calculated TDS.

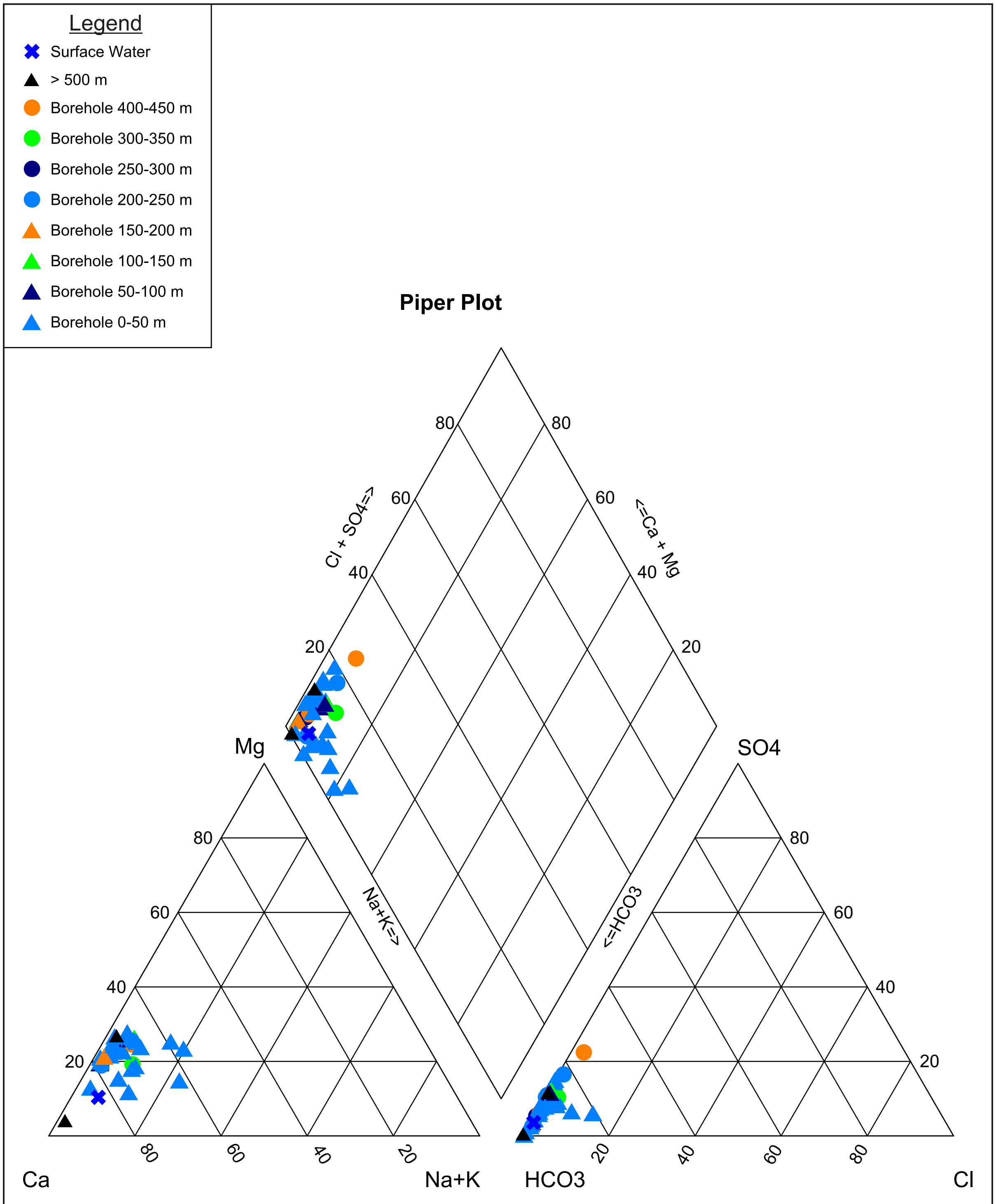


Figure 5.1 Trilinear plot showing major ion chemistry of representative groundwater samples in 2019 and 2020.

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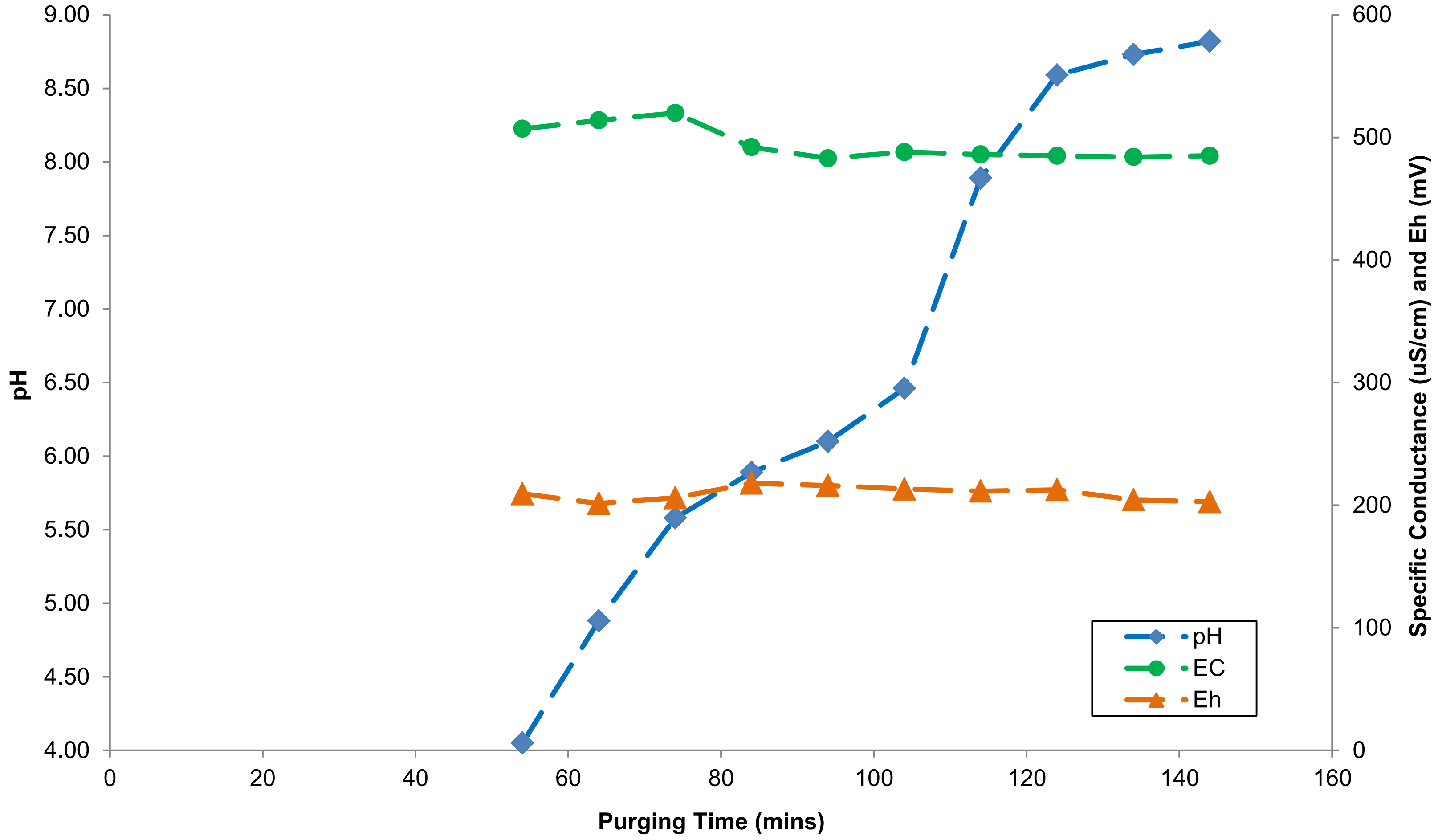

Figure 5.2	Trends in pH, specific conductance, and Eh while purging and sampling from a vertical depth of 215.7 m in borehole BL-0098.	Project No. 3134	Document Reference FFC-NL-3134-002
		Location Springpole, ON	Date February 2021

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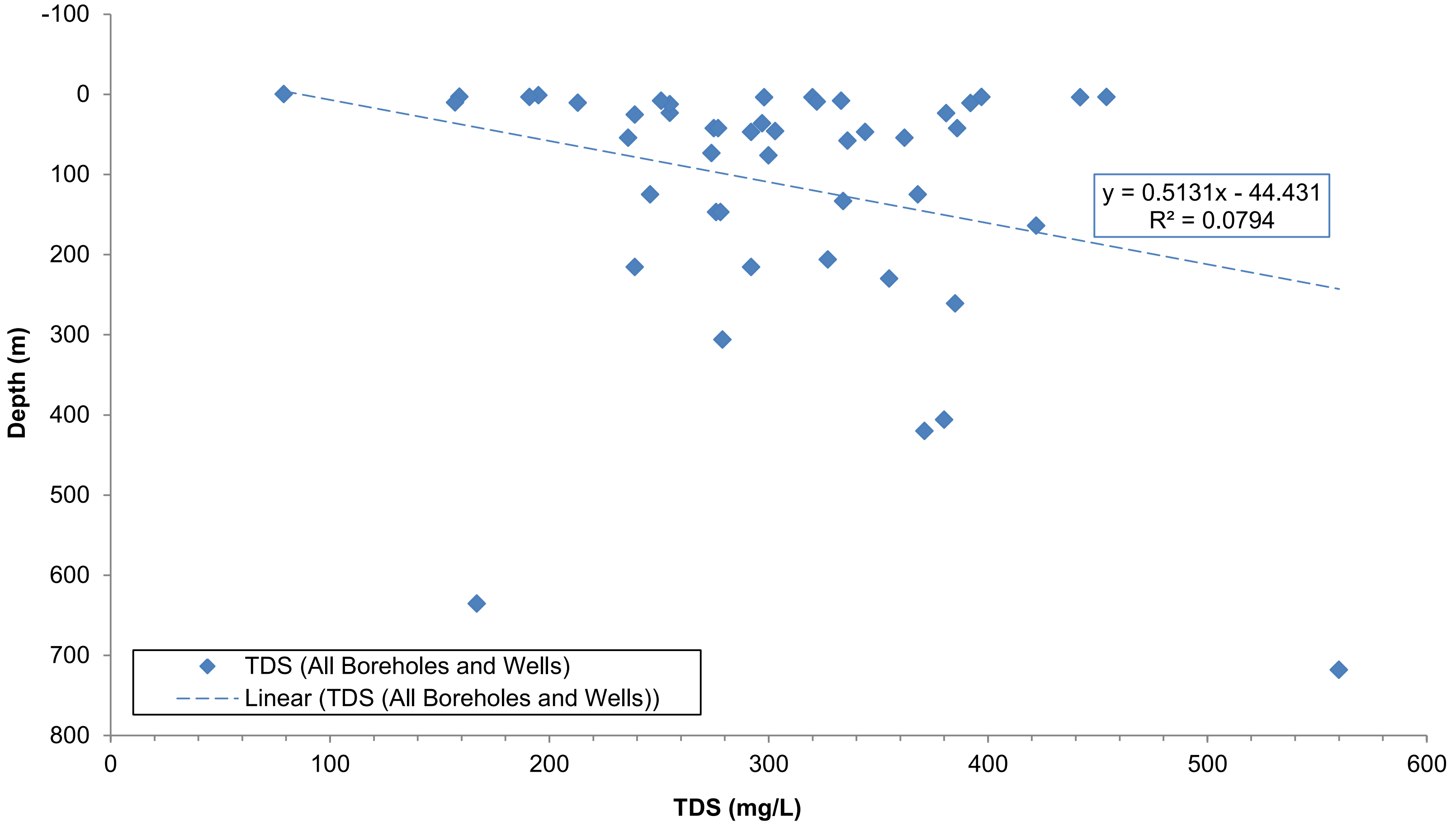

Figure 5.3 Total dissolved solids versus depth for all groundwater samples.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

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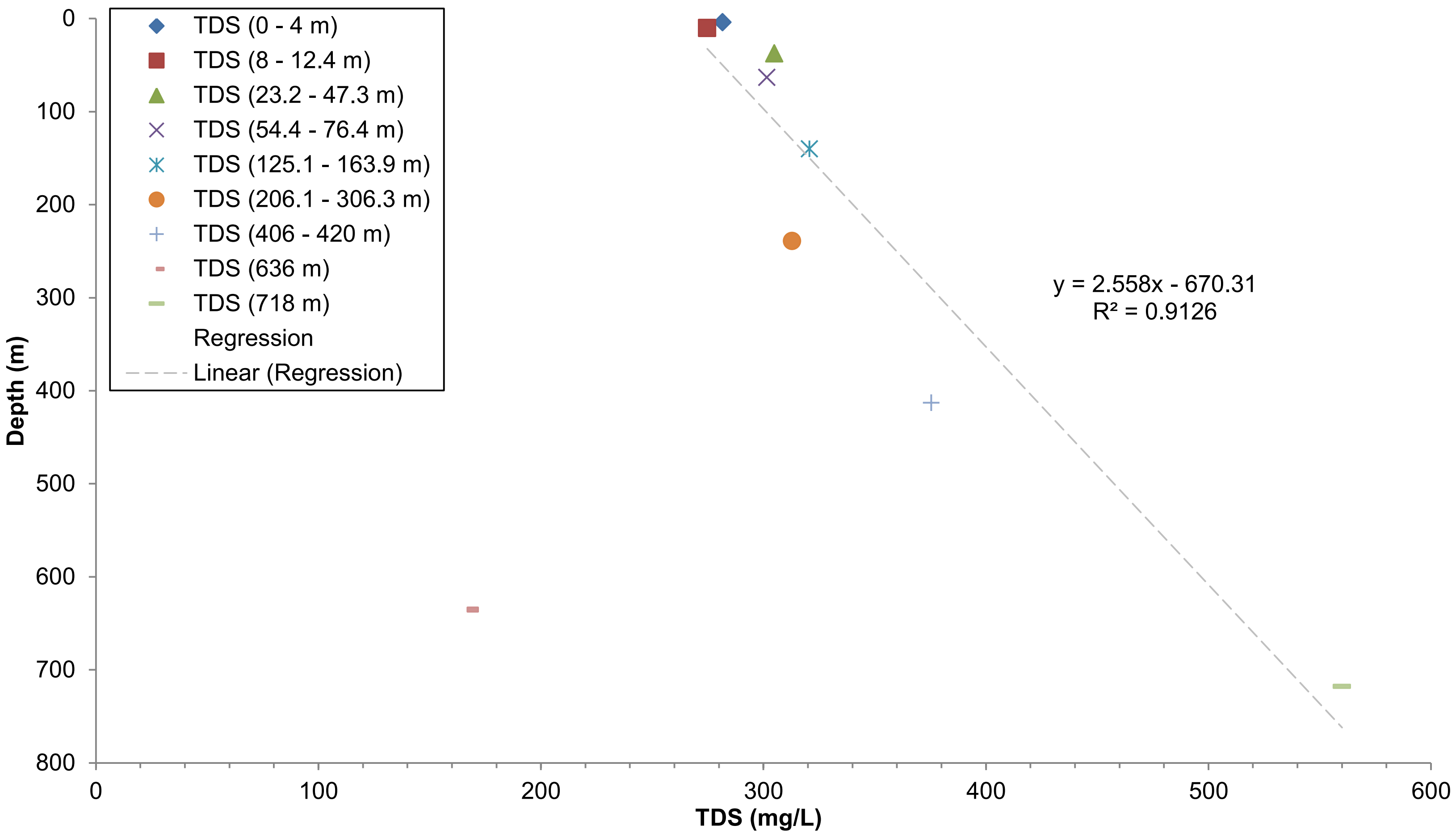

Figure 5.4 Average total dissolved solids for different depth intervals versus depth for groundwater samples.	Project No. 3134	Document Reference FFC-NL-3134-002	FFC
	Location Springpole, ON	Date February 2021	

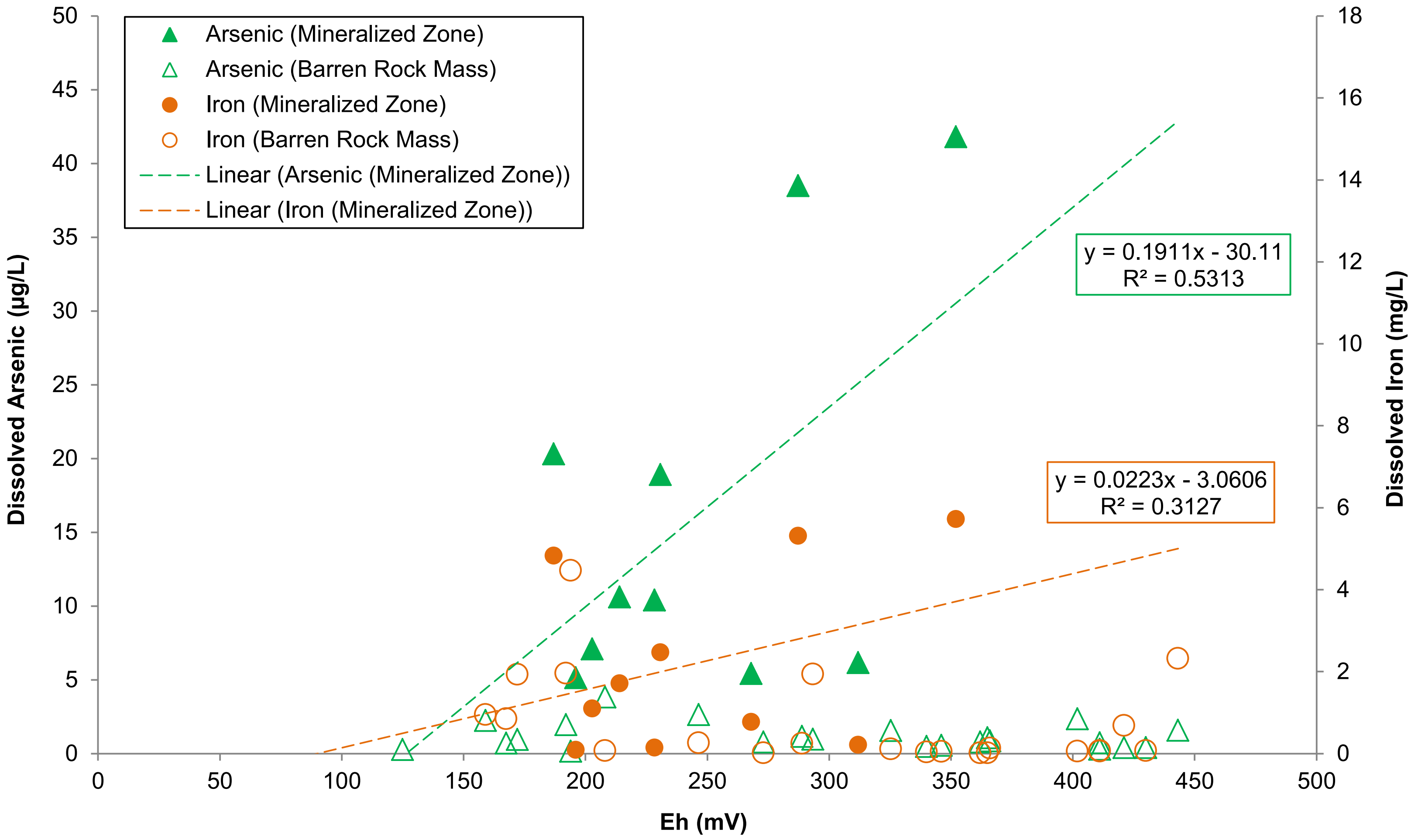

Figure 5.5 Relationship between Eh and dissolved arsenic and dissolved iron.

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Location Springpole, ON	Date February 2021

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6.0 LONG-TERM AQUIFER TEST

6.1 Long-Term Aquifer Test Design and Objectives

Figure 6.1 is a schematic showing the design of the 401 m deep vertical test well (SPW20-001) which was constructed at the north end of the proposed open pit, approximately midway between Springpole Lake and Birch Lake (**Figure 6.2**), for this aquifer test. The borehole was constructed by first advancing the borehole to 50 m of depth using an HQ drill string and then reaming that 50 m section using a PW/PQ drill string to create a 123 mm diameter open borehole. Casing extended to approximately 4 m below the ground surface. The borehole was then extended from 50 m of depth to 401 m of depth using an HQ drill string, creating an open borehole that was 101 mm in diameter. Packer tests were completed as the borehole was being drilled using the drill string at four different depths and the hydraulic conductivity for each packer test interval was calculated. The core from the borehole was logged, the fractures were mapped, the RQD values were calculated and the Acoustic Televiewer was used to determine the orientations and character of the fractures (Fracflow, 2020b) that intersected the borehole wall.

The aquifer test was designed to characterize the fractured rock aquifer system and to obtain some indication of how the water levels would respond to pit dewatering. The main objectives of the aquifer test were to (1) determine the drawdown versus flowrate relationship; (2) determine the nature of the drawdown cone, primarily the extent and degree of anisotropy in the drawdown cone as the aquifer was stressed by pumping in the test well; (3) estimate the well efficiency in the fractured rock aquifer system; (4) determine the potential for upwelling of brackish to saline water into the proposed open pit; and (5) obtain some initial data with which to estimate the long term water quality variations when the open pit is fully developed. The proposed aquifer characterization test was permitted under a Permit To Take Water (PTTW) that was issued to First Mining Gold/Gold Canyon Resources.

The borehole design for this aquifer test was determined by the drill rig equipment that was available on site, and the expectation that the pump would have to be able to lift up to 340.7 L/min (90 USgpm) from a depth of 40 m in the borehole producing the need for a pump that was no more than 100 mm in diameter with a 3-Phase electric motor. The pump was set at 42 m below ground surface (bgs) in the test well. Power was supplied by a single phase 14 kW mobile generator and the 3-Phase power for the pump motor was created using a Variable Frequency Drive (adjustable from 30 to 60 Hz) that converted 1-Phase power into 3-Phase power. The static water level at the start of the aquifer test was 9.4 m (bgs), providing an available drawdown of approximately 28 m. The initial test runs demonstrated that the generator could not supply enough power to allow the pump motor to operate at more than 52 Hz, limiting the pump discharge to less than 189.3 L/min (50 USgpm) at the maximum expected drawdown.

This pump was connected to a 51 mm (2-inch) diameter discharge line which in turn was connected to a flowmeter at the well head to monitor flowrate and to record the total volume of water pumped from the well. Downstream of the flowmeter, a 25 mm (1-inch) diameter sampling port was connected to the discharge line to collect ground water samples at selected intervals. The discharge line and the flowmeter assembly at the well head were covered using an insulated tent and tarp to prevent damage from the cold weather conditions. From there, the 65 mm (2.5-inch) discharge line was used to discharge the water from the aquifer test, on the down-gradient side of the well into a pre-constructed water collection soak-away trench (**Figure 6.3**), to ensure no water from the aquifer test was introduced directly to Springpole Lake. The soak-away trench was approximately 30 m in length, 1.5 m wide and 1.5 m deep. The excavated material was used to create a 1.5 m wide and 1.0 m high berm around the trench which is located on the left hand side of the photographs in **Figure 6.3**. The actual soak away trench also extends slightly up-gradient as shown on the immediate right hand side of the photographs. The trench did not overflow after the berm was completed. The aquifer test discharge water percolated through the trench wall and the bottom section of the berm before seeping into Springpole Lake. The distance between the berm and the lake shore was 20 m. To address potential water quality issue, geochemical field parameters were measured for the lake water at 6 m and 12 m out from the lake shoreline and water samples were collected at those two lake monitoring points and from the pump discharge at the well head throughout the aquifer test.

The aquifer test consisted of an initial step-drawdown test (**Figure 6.4**) on October 16, 2020, to estimate the optimum pumping rate, followed by a 72-hour constant rate aquifer test that was then continued at approximately the same pumping rate as a long-term aquifer response test for approximately 29 days (**Figure 6.5**). The main flowrate used for the long-term aquifer test varied between 160 L/min (42 USgpm) and 174 L/min (46 USgpm). When the pump was shut down, the recovery of the groundwater system was monitored for approximately two days (**Figure 6.6**).

During the aquifer test, the response in the aquifer was monitored in 18 observation wells (**Figure 6.2**), which were located around the pumping well, by measuring the water level in each well once or twice each day using a water level tape. Six of the 18 observation wells were equipped with transducers (Leveloggers) that provided continuous water level and temperature measurements. The aquifer test borehole (SPW20-001) was also equipped with a Levelogger to monitor temperature and water level. Except for the vertical pumping well, all 18 observation wells were inclined wells with the plunge or dip ranging from 45 to 75 degrees from the horizontal. The orientation and depth/length data for each observation well are provided in **Table 6.1**. The location of the pumping and observation wells are shown in **Figure 6.2**, where each well is shown as the collar location and its trace line is projected to the surface.

6.2 Aquifer Response to Drawdown and Relationship to Fracture Geometry

6.2.1 Step-Drawdown Test

Step-drawdown tests are normally conducted as the first part of an aquifer test to establish the flowrate that the well can support in the long term that is consistent with the available drawdown and the pump capacity. For this aquifer test, changing the flowrate required resetting the power frequency which caused the pump to restart, making it difficult to obtain a typical series of steps in the drawdown curve. However, since the objective of this aquifer test was not to obtain the well yield but to characterize the aquifer response to the imposed drawdown, sufficient data were obtained to select a pumping rate that was consistent with the aquifer properties and pump capacity.

The flowrate for the first step (**Figure 6.4**) was set at 159 L/min (42 USgpm). The water level in the Test Well dropped rapidly but did not reach a steady state even after more than two hours of continuous pumping. The flowrate was increased gradually and a number of additional steps were attempted at slightly different flowrates but when the pump reached a flowrate of 216 L/min (57 USgpm), the pump power demand required to lift the water exceeded the power available from the generator and the generator tripped the pump. However, based on the step-drawdown test data, it was concluded that the well could be safely pumped for the long-term aquifer test with a flowrate between 135 L/min (35 USgpm) and 170 L/min (45 USgpm).

6.2.2 Long-Term Aquifer Test

The long-term aquifer test (**Figure 6.5**) was started at 4:49 pm on October 18, 2020 and the test was terminated on November 16, 2020. The long-term aquifer test was started with a flowrate of 160 L/min (42 USgpm). The flowrate was increased up to 204 L/min (54 USgpm) near the end of the long-term test. However, the flowrate during most of the long term test pumping period was between 160 L/min (42 USgpm) and 174 L/min (46 USgpm). For the last three days of the long-term test, the flowrate was increased to 189 L/min (50 USgpm) to study the aquifer response to higher flowrates with a final period with a higher flowrate. After the pump was stopped, the recovery of the water level was monitored until November 18, 2020 (**Figure 6.6**). The water level in the Test Well was recorded using the Levelogger during the long-term aquifer test. The maximum drawdown recorded at the end of the aquifer test was 21.55 m and approximately 71.4% of recovery (15.32 m) was recorded at the end of the recovery monitoring period for the long-term aquifer test.

As noted, during the long-term aquifer test in SPW20-001, water levels in the 18 observation wells (**Figure 6.2**) were measured manually once or twice per day. Six of the 18 wells were equipped with Leveloggers for continuous water level and temperature measurements. The drawdown for these six observation wells are plotted in **Figure 6.7** with the pumping well data. The calculated drawdown data using the manual water level measurements for all observation wells are presented in **Figure 6.8.** Among the observation wells, the maximum drawdown was 20.40 m in BL-0102 and the minimum drawdown was 0.91 m in SGH20-008-D. More than 10 m of drawdown was recorded in four wells, 20.40 m in BL-0102, 14.80 m in SGH20-005, 14.66 m in BL-0354, and 12.12 m in BL-0077.

During the long-term pumping, the generator that was powering the pump had to be shut down at regular intervals for servicing and those times are shown as red circles in **Figure 6.7**. The response of water levels to pump operation is readily observed in the records for the two wells with high drawdowns, BL-0102 and SGH20-005. The highly correlated response of the water level changes in BL-0102 with those in the pumping well (**Figure 6.7**) indicates that a high permeability fracture path exists between those two wells or there is a rapid reduction in permeability with increasing radial distance at that observation well location.

A contour map of the drawdown from the 18 observation wells is plotted in **Figure 6.9**. Because the observation wells are inclined wells, the shortest distance (the red dots on each borehole trace) to each observation well from the pumping well was used as the distance from the Test Well. This contour map shows that the drawdown cone extended to both Birch Lake and to Springpole Lake and that the permeability of the rock mass is anisotropic.

Both a Theis and a Jacob Straight Line aquifer analysis were performed using the drawdown data from the pumping well and the observation wells to determine the transmissivity (T), hydraulic conductivity (K), and storativity (S) of the aquifer. The log-log plot of drawdown versus time presented in **Figure 6.5** was used for the Theis type curve aquifer analysis (**Figure 6.10a)** from the pumping well – the Test Well. Based on the pumping well data, the fractured rock aquifer is best characterized as a leaky confined aquifer with a hydraulic conductivity value 2.45 E-07 m/s. The hydraulic conductivity of the aquifer was also calculated, by analyzing the drawdown data from observation well BL-0102 (**Figure 6.10b**) as 2.75e-07 m/s with a storativity of 2.12 E-06 confirming the confined nature of this aquifer response to pumping. The aquifer test drawdown data for the pumping and all of the observation wells are provided in **Appendix I**.

6.3 Source of Aquifer Discharge Water and Estimates of Long Term Water Quality

During the aquifer test, water flowed from the saturated aquifer thickness towards and into the well where it was pulled up or down the well into the pump. In a multi-layer aquifer, or where the hydraulic conductivity of the open well bore varies, the amount of water that is pulled through each zone (layer) into the wellbore varies depending on the hydraulic conductivity, layer thickness, and boundary conditions in the rock mass that form each specific zone. The percentage of the pump discharge that is contributed by each zone or interval can be calculated by normalizing the data to the transmissivity for each zone.

Figure 6.1, the Test Well schematic, was constructed to demonstrate the percent of the pump discharge that was contributed from the different borehole intervals. The percent discharge from each interval was computed using the total discharge from the well and transmissivity of each of the packer test intervals.

The average hydraulic conductivity for the aquifer was calculated using both the Thiem equation for an unconfined aquifer with steady radial flow and for steady state confined conditions (Fetter, 2001). The Thiem equation is (Fetter, 2001);

$$\mathrm{K} = \frac{Q}{2\,\pi\,(h_2^2 - h_1^2)}\, ln \frac{r_2}{r_1} \qquad [6.1]$$

Where,

K = hydraulic conductivity (L/T);
Q = pumping rate (L^3/T);
h_2 = head at distance r_2 (L);
h_1 = head at distance r_1 (L);
r_2 = radial distance from the pumping well (L); and
r_1 =pumping well Radius (L).

The hydraulic conductivity calculated using the Thiem equation for unconfined flow to a well, using the above equation, is 2.13 E-07 m/s and for the steady state confined case, the hydraulic conductivity was calculated as 4.56 E-07 m/s. By comparison, the hydraulic conductivity that was calculated using the Theis curve was 2.45 E-07 m/s.

The total saturated thickness of the wellbore was divided into three packer test intervals and the zone above the top of the first packer test seal. The hydraulic conductivity for each packer test zone was calculated using the average hydraulic conductivity obtained from the aquifer test as well as the packer testing results for the specific intervals. The transmissivity of the zone at the top of the Test Well was estimated by computing the overall Test Well transmissivity by using the hydraulic conductivity value that was computed from the aquifer test data.

The transmissivity for each packer test zone and the total transmissivity were calculated using the following equations (Fetter, 2001):

$$T_i = bK \qquad [6.2]$$

Where,

T_i = zone transmissivity (L^2/T);
K = hydraulic conductivity of each zone (L/T); and
b = the saturated thickness of the zone (L).

and,

$$T_{total} = \sum_{i=1}^{n} T_i \qquad [6.3]$$

Where,

T_{total} = total borehole transmissivity (L^2/T); and
T_i = transmissivity of each zone (L^2/T).

The percentage of pump discharge that was contributed by each zone was then calculated as T_i / T_{total} × 100, which was then multiplied by the pump discharge to determine the flow contributed by each zone.

The average hydraulic conductivity from the aquifer test is 2.45 E-07 m/s giving a total transmissivity of 9.06 E-05 m^2/s for an aquifer thickness of 370 m at maximum drawdown. The average Test Well discharge was 166.6 L/min (44 USgpm) and this flowrate was then distributed over the five intervals in the Test Well, based on the interval transmissivity, and used to estimate the percent of the pump discharge that was contributed by each borehole packer test interval.

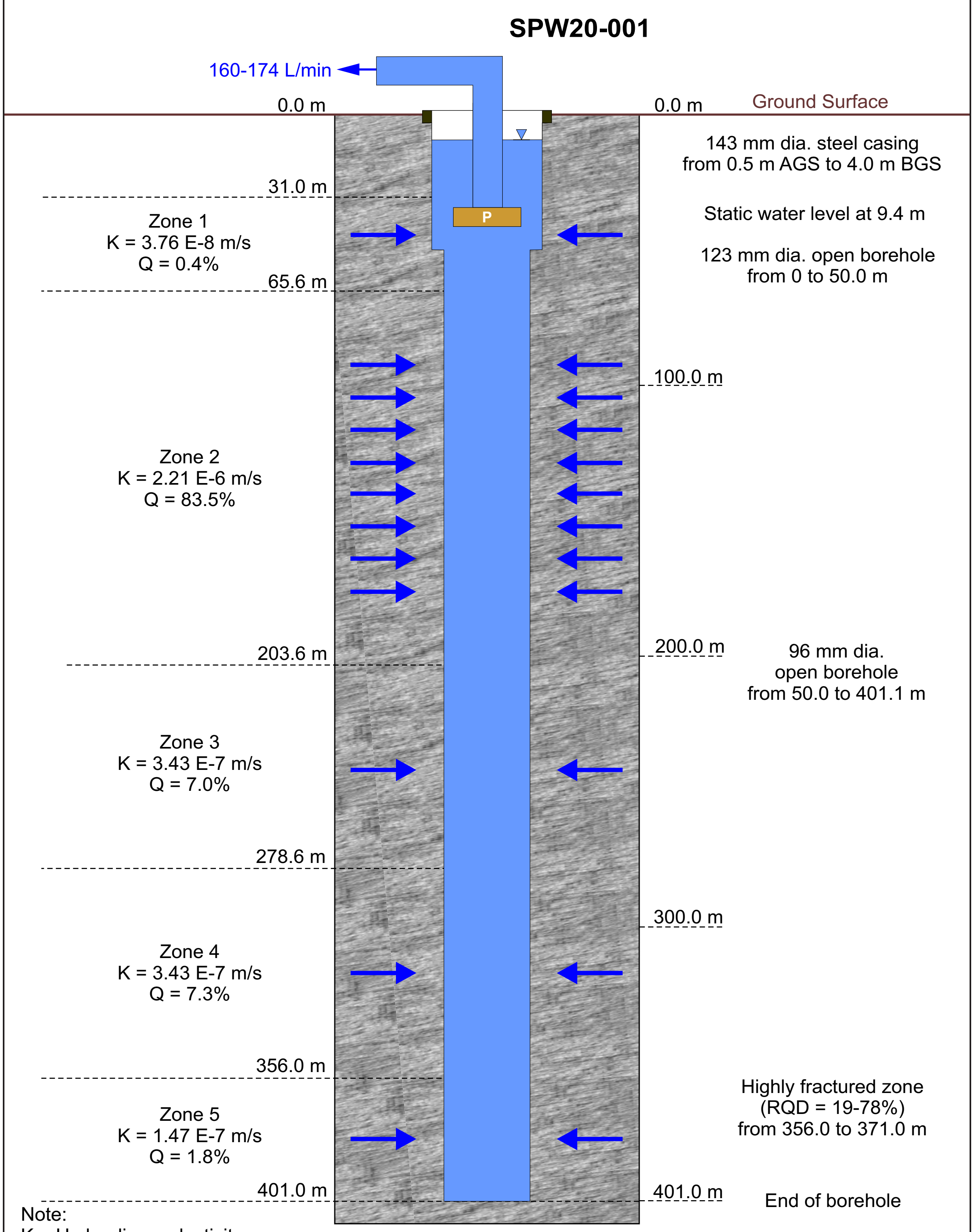
The lowest hydraulic conductivity (3.76 E-08 m/s) and transmissivity (1.30 E-06 m^2/s) were estimated for zone 1 (31.0 m to 65.6 m (bgs)), producing only 0.4% of the total discharge and a flow rate of 0.8 L/min (0.2 USgpm). The highest hydraulic conductivity (2.21 E-06 m/s) and transmissivity (3.05 E-04 m^2/s) were estimated for zone 2 (65.6 m to 203.6 m (bgs)), producing 83.5% of the total discharge and a flow rate of 139.3 L/min (36.8 USgpm). For zone 3 (203.6 m to 278.6 m (bgs)), the hydraulic conductivity and transmissivity were 3.43 E-07 m/s and 2.57 E-05 m^2/s, respectively, producing 7.0% of the total discharge and a flow rate of 11.7 L/min (3.1 USgpm). For zone 4 (278.6 m to 356.0 m (bgs)), the hydraulic conductivity and transmissivity were 3.43 E-07 m/s and 2.65 E-05 m^2/s, respectively, producing 7.3% of the total discharge and a flow rate of 12.1 L/min (3.2 USgpm). For zone 5 (356.0 m to 401.0 m (bgs)), the hydraulic conductivity and transmissivity were 1.47 E-07 m/s and 6.60 E-06 m^2/s, respectively, producing 1.8% of the total discharge and a flow rate of 3.0 L/min (0.8 USgpm.)

The computed percentage of water from each zone or interval was used to estimate the water quality at depth since it is assumed that deeper up-welling groundwater would be the source of any salinity that would be present in the mine water discharge as is typical of most shield terrains. For this site, it was assumed that the measured Chloride concentration in the pump discharge was contributed by the groundwater that was entering the borehole from below the bottom of the borehole through the fracture zone at the bottom of the Test Well – zone 5 (356 m to 401 m (bgs)). The chloride concentration obtained from the laboratory analysis was assumed to be diluted by the groundwater that was contributed from the other four zones as the water moved up the borehole producing a dilution factor of 55.5 (dilution factor = total discharge/discharge from zone 5). Using a dilution factor of 55.5, a Chloride concentration of 2,645 mg/L is estimated for the groundwater that was entering at the bottom of the Test Well – zone 5 (356 m to 401 m (bgs)) after approximately 30 days of pumping at 166.6 Lpm.

The Test Well contains approximately 3,088 litres (815 USgpm) of water when the well has drawn down 20 m. Based on the volume of water entering each zone in the well, it is estimated that it requires approximately 300 minutes for the water that enters the bottom of the well to be discharged by the pump. The changes in Chloride concentrations in the pump discharge water over the long-term aquifer test, provide the data needed to use a 3D flow and transport model to estimate travel times and the depth of the elevated Chloride below the bottom of the Test Well.

Table 6.1 Specification of the pumping and monitoring wells.

Hole ID	Easting	Northing	Elevation	Azimuth	Dip	Borehole Distance (Depth)	Transducer Installation
	UTM-NAD83-Zone15		(m)	(Degree)	(Degree)	(m)	
Pumping Well							
SPW20-001	549026.0	5694165.9	408.295	--	-90	401.0	Levelogger
Monitoring Well							
BL-0024	548927.4	5693981.9	400.387	24	-60	252.0	Levelogger
BL-0046	548852.8	5694258.2	398.789	198	-50	182.0	--
BL-0050	549259.3	5694224.8	400.698	204	-75	374.0	--
BL-0052	548916.5	5694333.5	403.536	198	-75	462.1	--
BL-0077	548882.6	5694232.8	402.205	198	-60	322.0	--
BL-0098	549028.4	5694095.3	401.563	204	-65	282.2	Levelogger
BL-0102	548936.3	5694199.3	409.23	198	-65	307.0	Levelogger
BL-0104	548882.6	5694233.1	402.363	198	-69	307.0	Levelogger
BL-0263	549038.3	5694181.0	408.63	198	-50	78.3	Levelogger
BL-0283	548812.7	5694193.0	399.755	198	-50	87.0	--
BL-0284	548827.9	5694191.9	400.534	198	-50	84.4	--
BL-0310	549209.3	5694048.3	397.108	200	-45	151.5	--
BL-0354	548935.2	5694271.4	405.912	200	-45	261.0	--
BL-0385	548880.9	5694420.3	395.106	240	-45	208.0	--
SGH20-004	548811.9	5694074.3	408.58	169	-50	25.2	--
SGH20-005	549018.5	5694323.6	408.392	121	-53	401.0	Levelogger
SGH20-008-D	549327.5	5694166.8	400.814	125	-52	28.4	--
SGH20-008-S	549327.4	5694167.0	401.127	125	-52	15.8	--



Note:
K = Hydraulic conductivity
Q = Discharge percentage

Figure 6.1 Schematic of Test Well showing K values and percent flow from different zones.

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Base orthoimages provided by First Mining Gold/Gold Canyon Resources (2020).

Figure 6.2 Location of Test Well (SPW20-001) and observation boreholes, showing surface trace of inclined boreholes.

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Document Reference
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Location
Springpole, ON

Date
February 2021

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October 23, 2020 @ 14:21
5 days after pump started.

November 14, 2020 @ 08:29
2 days before pump stopped.

Figure 6.3 Photographs of soak-away trench for long-term aquifer test discharge from Test Well (SPW20-001).

Project No.	Location	Date	Document Reference
3134	Springpole, ON	February 2021	FFC-NL-3134-002

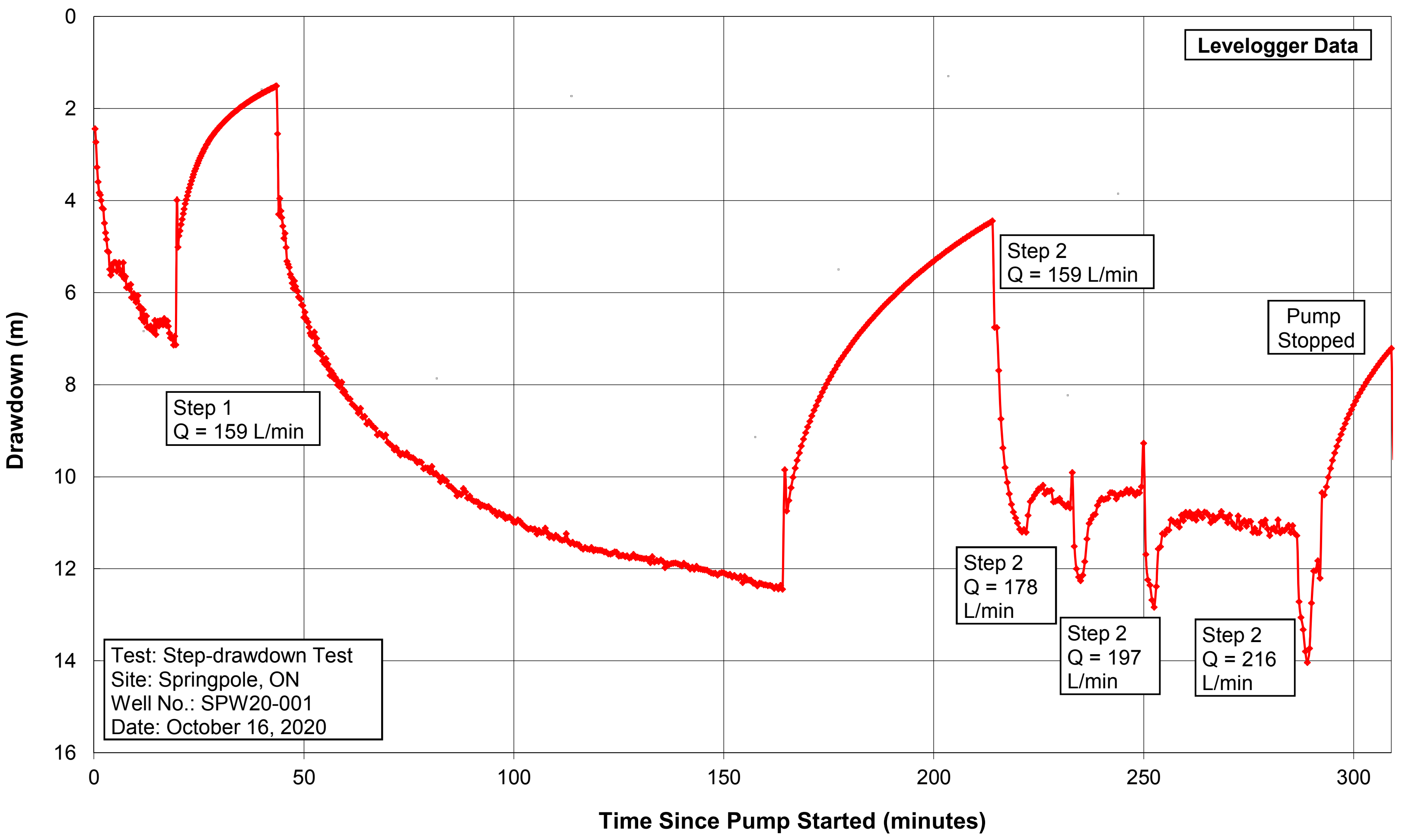

Figure 6.4 Plot of drawdown versus time for the step-drawdown test in the pumping well, SPW20-001.

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Springpole, ON	February, 2021

FFC

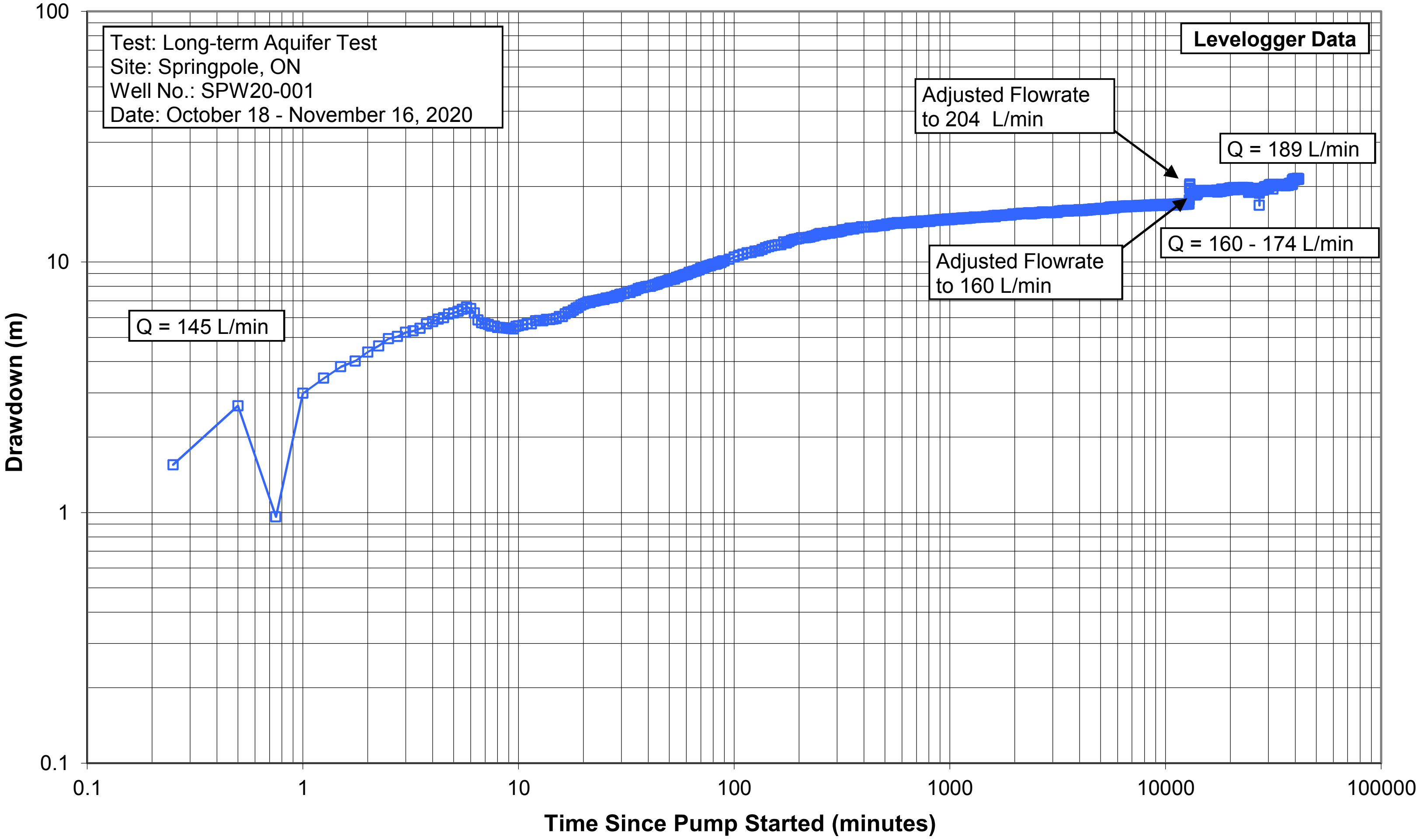


Figure 6.5 Log-log plot of drawdown versus time for the pumping well during the long-term aquifer test.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February, 2021

FFC

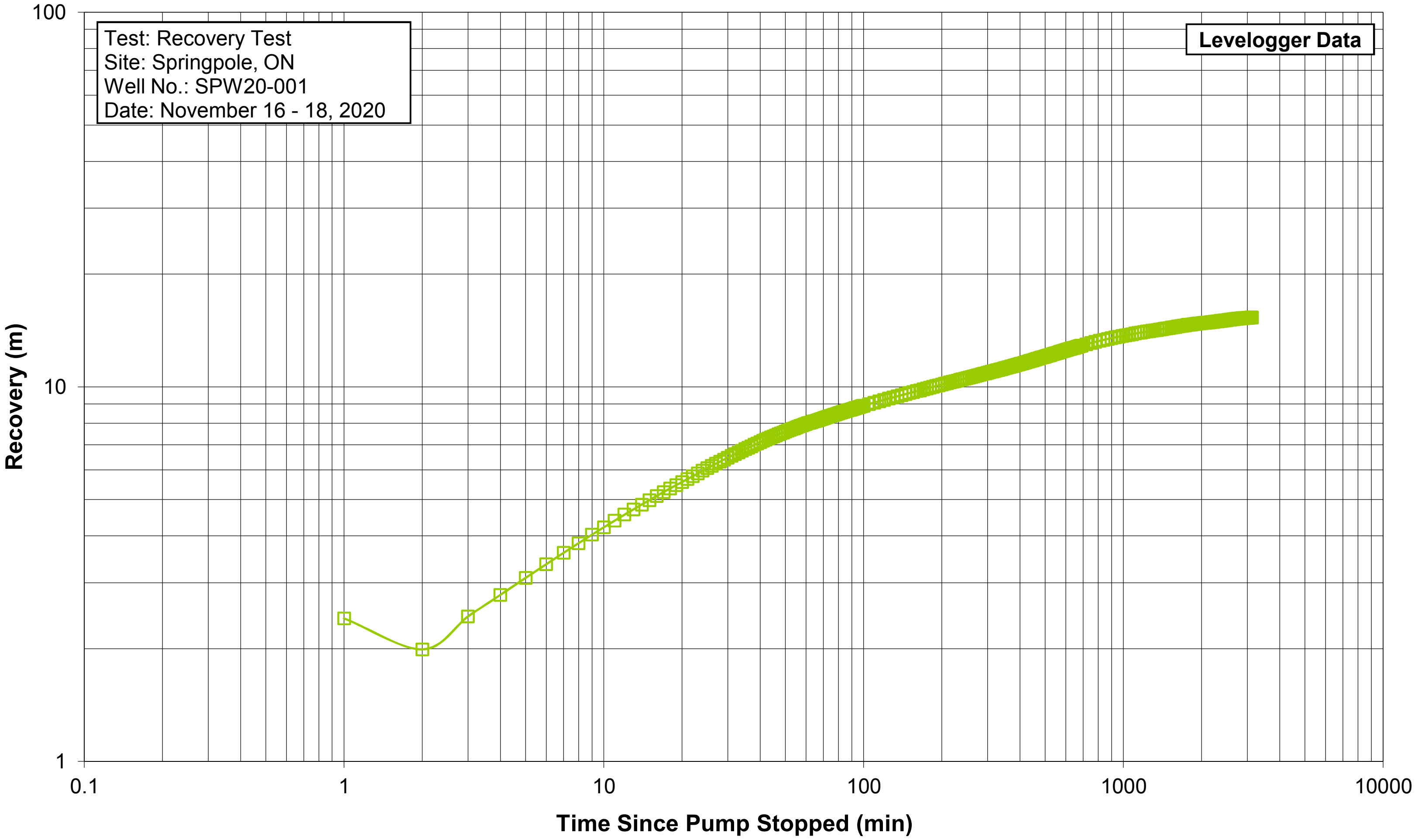


Figure 6.6 Plot of recovery versus time for water level recovery in the pumping well after the termination of the long-term aquifer test.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February, 2021

FFC

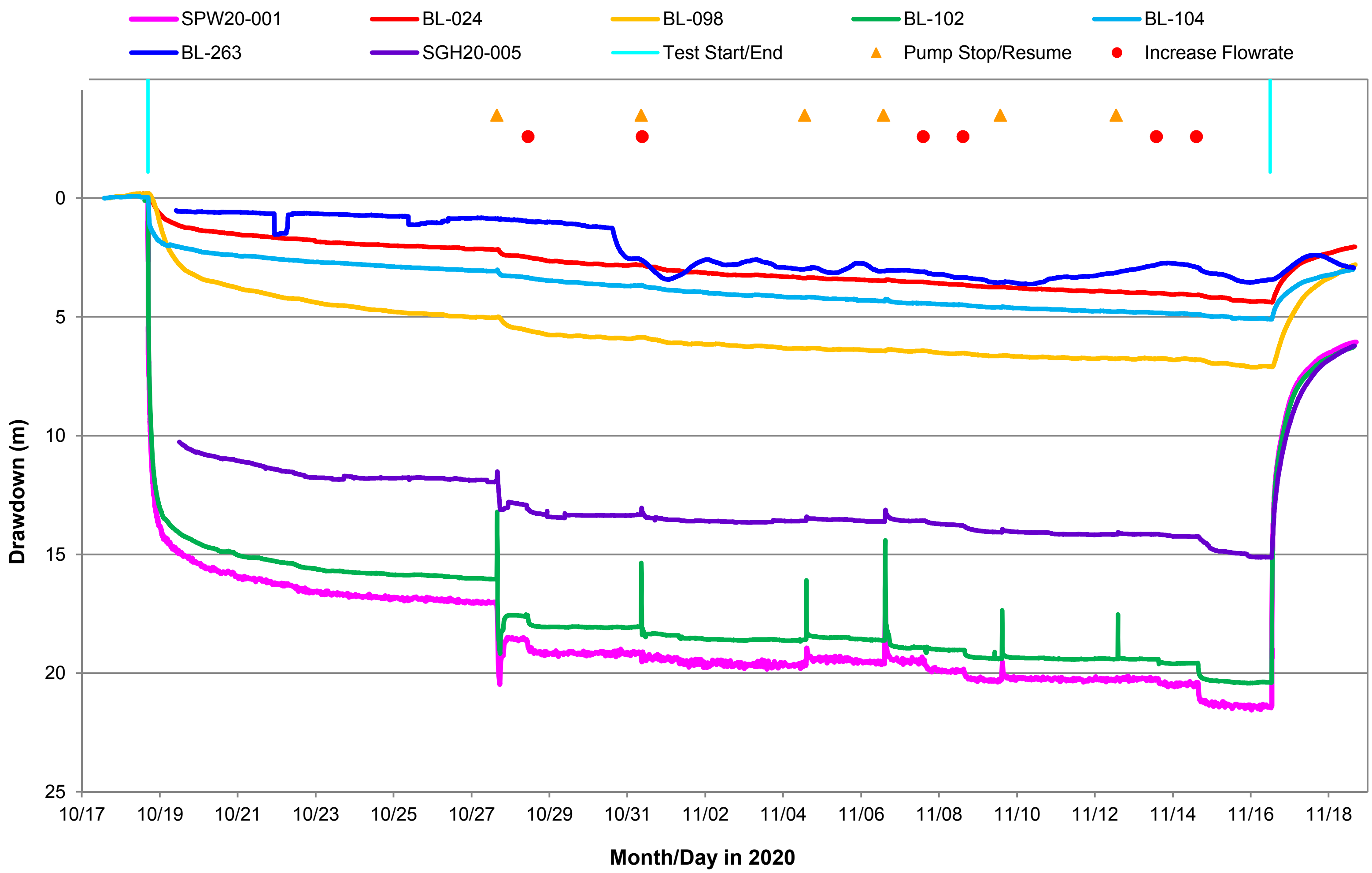


Figure 6.7 Drawdowns measured using Leveloggers in six observation wells and in the Test Well with the pump stop and resume times shown by the triangles and flowrate increase time by solid dots.

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

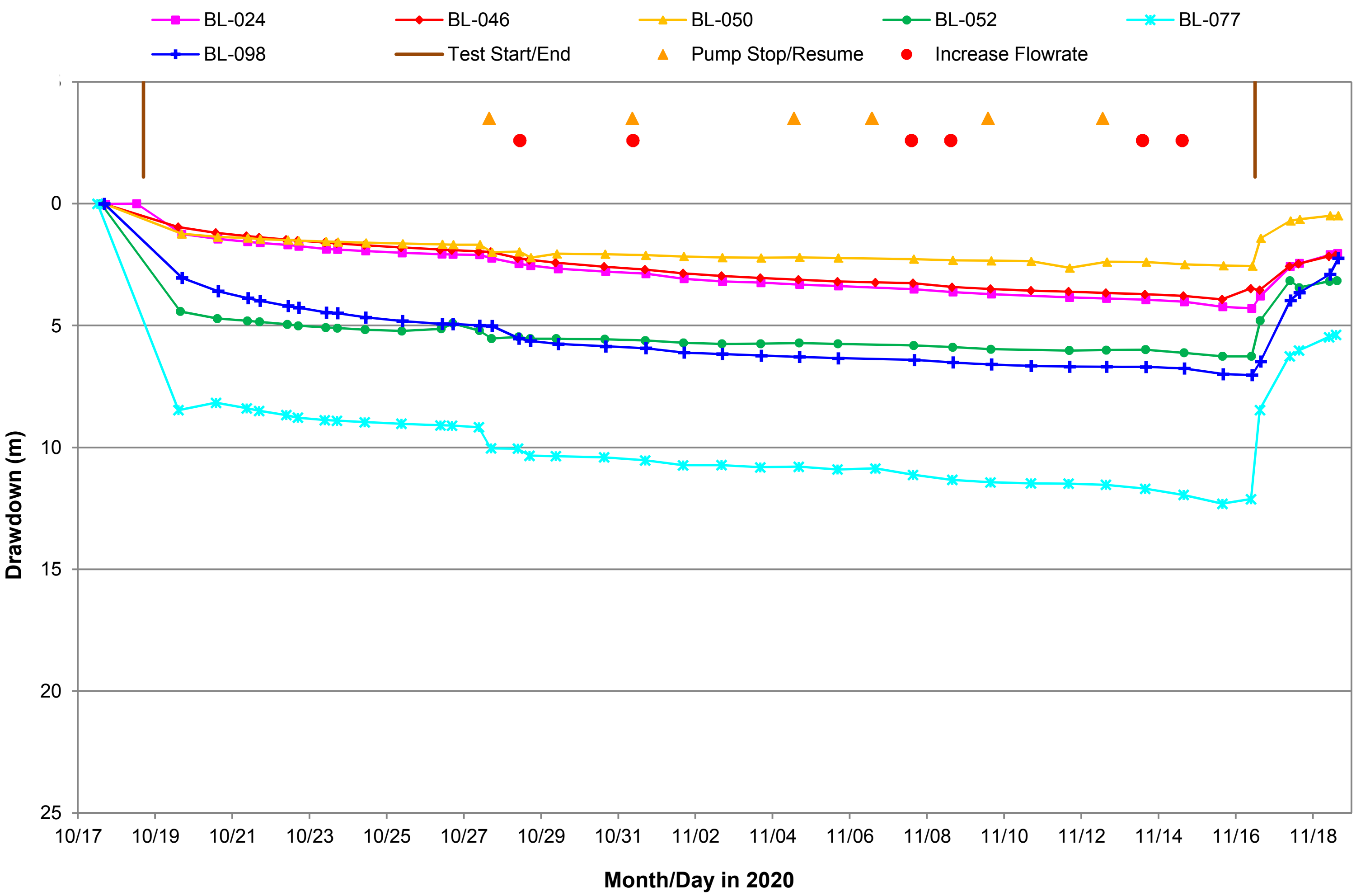


Figure 6.8	Drawdowns measured manually in 18 observation wells and in the Test Well with the pump stop and resume times shown by the triangles and flowrate increase time by solid dots (Page 1 of 3).

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

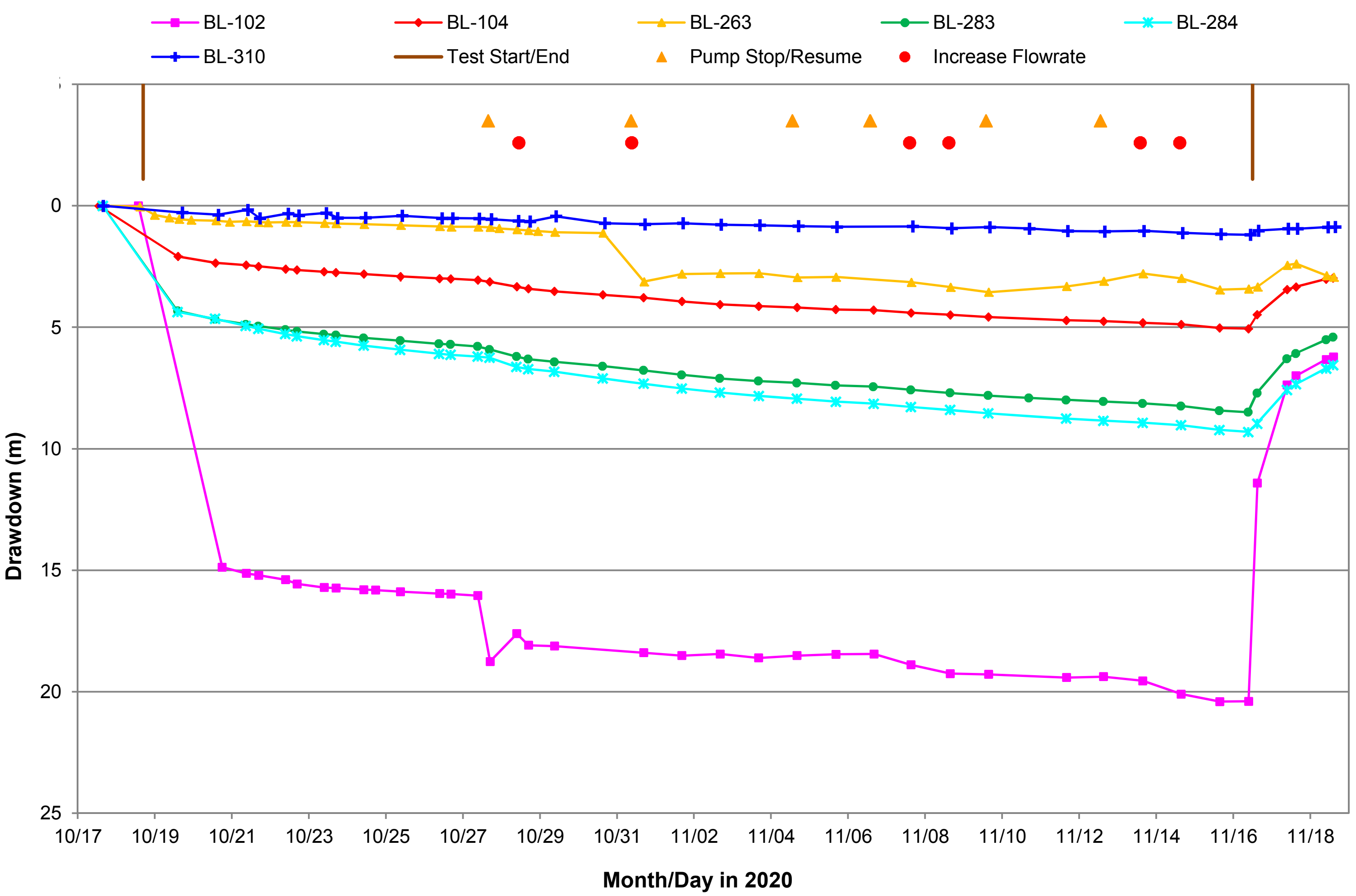


Figure 6.8 Drawdowns measured manually in 18 observation wells and in the Test Well with the pump stop and resume times shown by the triangles and flowrate increase time by solid dots (Page 2 of 3).

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date February 2021

FFC

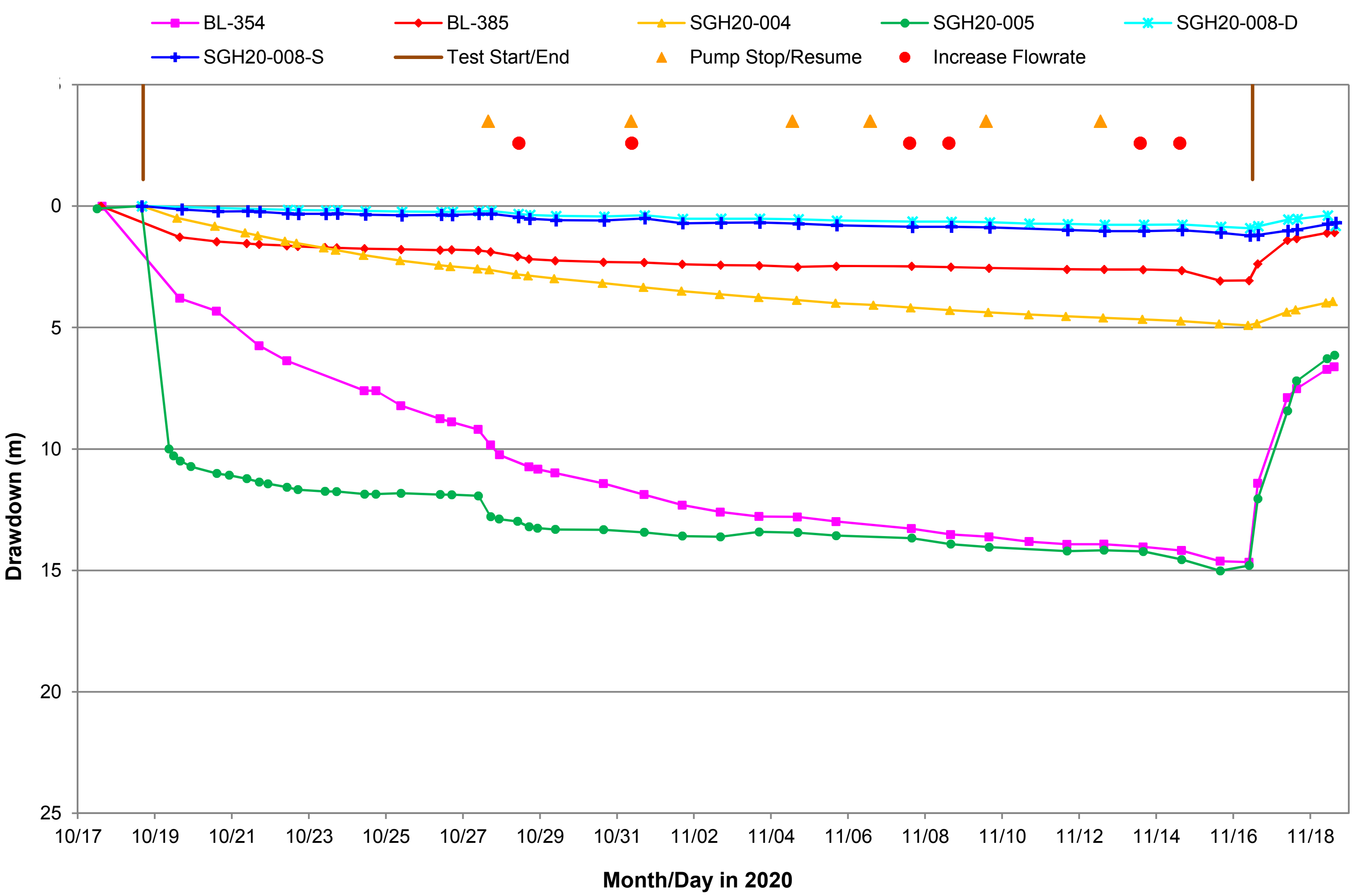
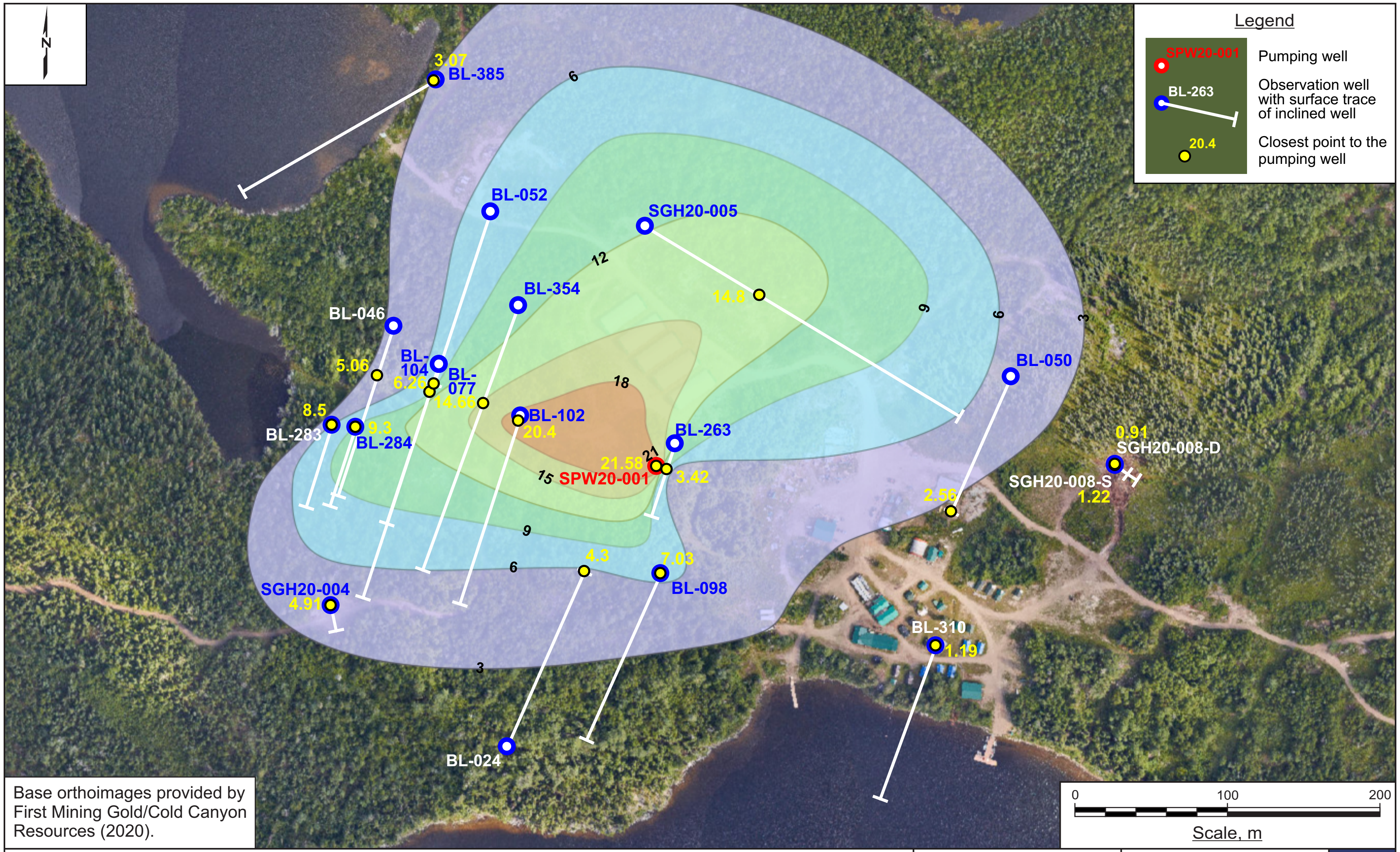


Figure 6.8 Drawdowns measured manually in 18 observation wells and in the Test Well with the pump stop and resume times shown by the triangles and flowrate increase time by solid dots (Page 3 of 3).

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

FFC



Base orthoimages provided by First Mining Gold/Cold Canyon Resources (2020).

Figure 6.9 Contour map of the drawdown around the Test Well (SPW20-001).

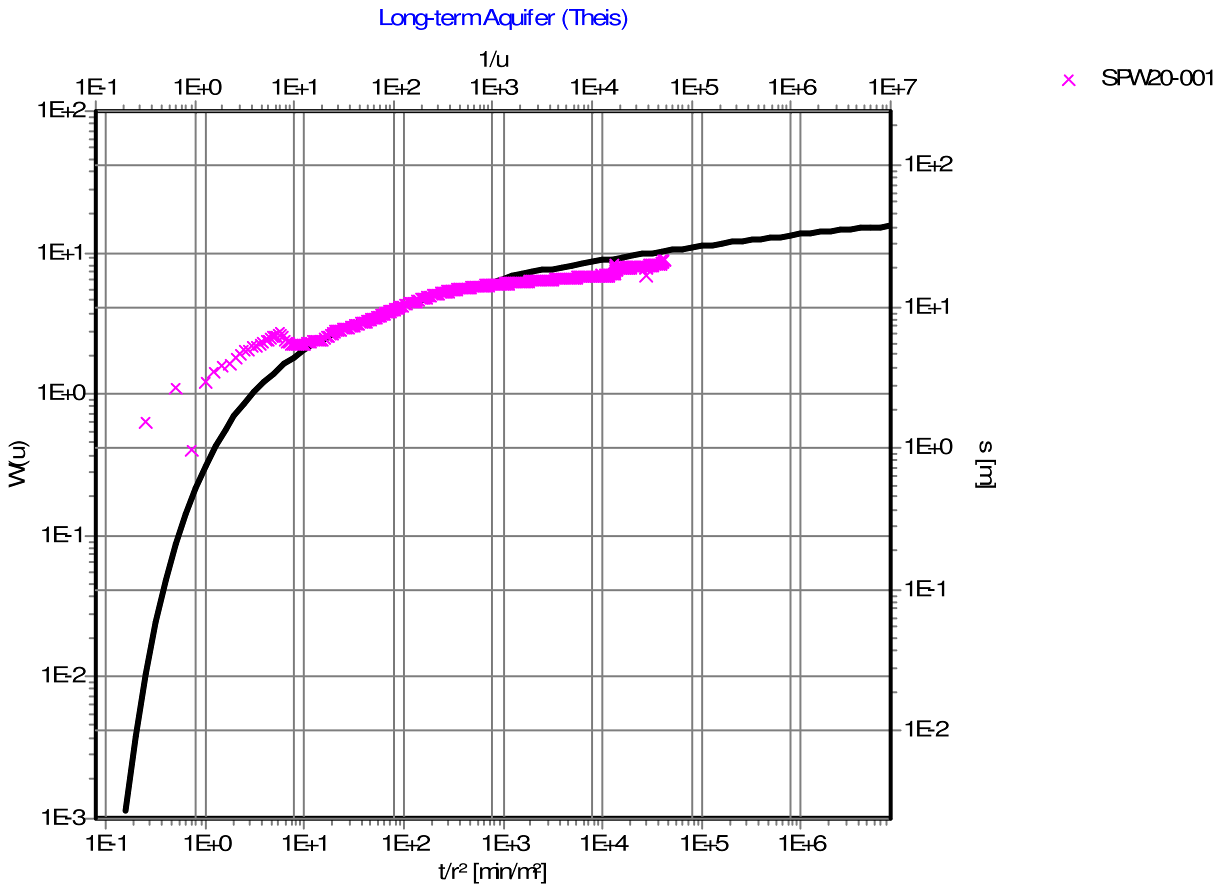
Project No.
3134

Document Reference
FFC-NL-3134-002

Location
Springpole, ON

Date
February 2021

FFC

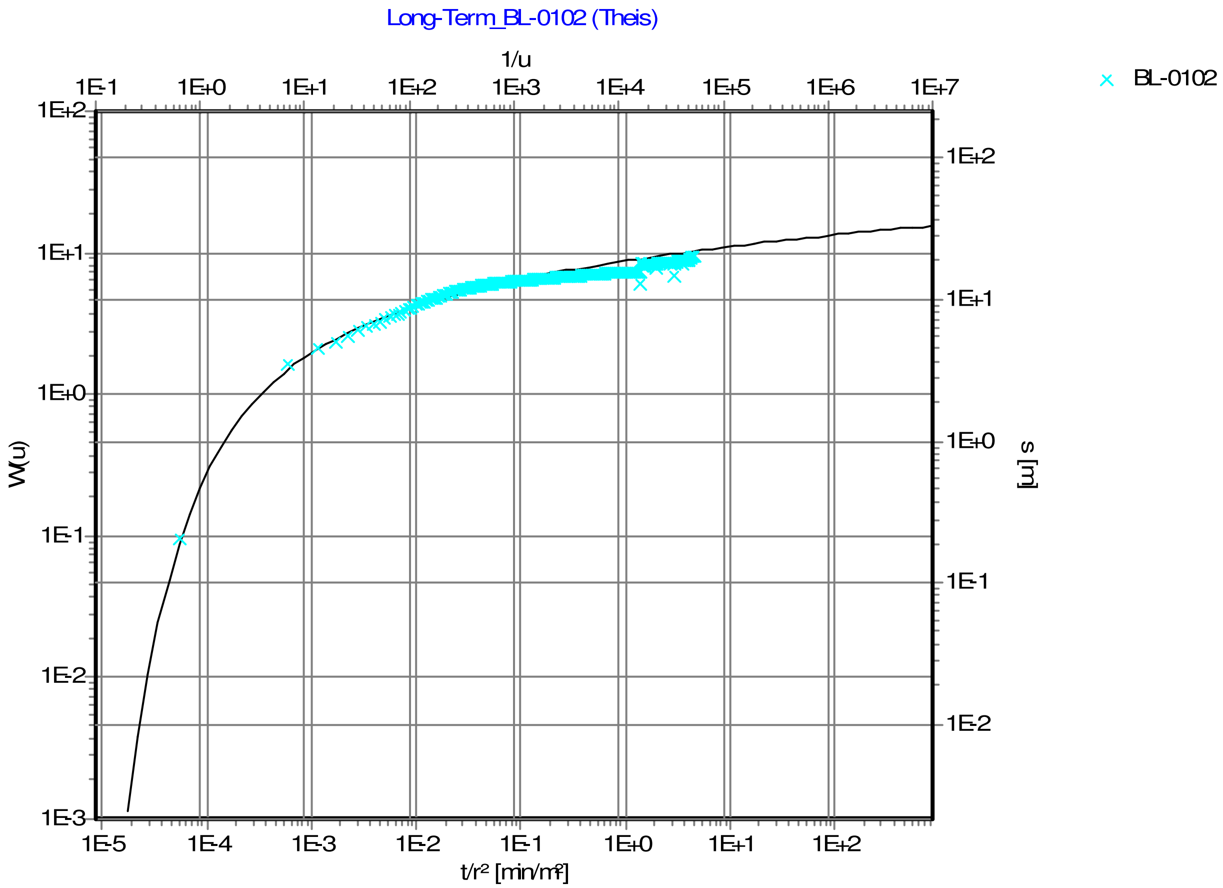


Test name:	**Long-term Aquifer Test - Test Well**
Analysis method:	**Theis**

Analysis results:	Transmissivity:	9.06E-5 [m²/s]	Conductivity:	2.45E-7 [m/s]
	Storativity:	1.72E-2		

Test parameters:	Pumping well:	SPW20-001	Aquifer thickness:	370 [m]
	Casing radius:	0.048 [m]		
	Screen length:	392.954 [m]		
	Screen radius:	0.048 [m]		
	Discharge rate:	237.6 [m³/d]		

Figure 6.10a Analysis of the long-term aquifer test on the Test Well, SPW20-001, using the Theis method on a log-log plot.



Test name:	**Long-Term Aquifer Test - Observation Well**
Analysis method:	**Theis**

Analysis results:	Transmissivity:	1.02E-4 [m²/s]	Conductivity:	2.75E-7 [m/s]
	Storativity:	2.12E-6		

Test parameters:	Pumping well:	SPW20-001	Aquifer thickness:	370 [m]
	Casing radius:	0.048 [m]		
	Screen length:	392.954 [m]		
	Screen radius:	0.048 [m]		
	Discharge rate:	237.6 [m³/d]		

Figure 6.10b Analysis of aquifer test on the observation well, BL-0102, using the Theis method on a log-log plot during the long-term aquifer test on the Test Well, SPW20-001.

7.0 GEOCHEMICAL ASSESSMENT OF LONG-TERM AQUIFER TEST

7.1 Receiving Water Chemistry

Groundwater from SPW20-001 was discharged into a berm that then seeped through the silty-sandy material in the wall of the trench and the berm and into Springpole Lake. This was a requirement of the PTTW permit. The berm was 20 m from the Springpole Lake shoreline. Surface water samples were collected from two locations in the lake to monitor for potential impacts. One sampling station was 6 m offshore (sample Lake 1) and the other was 12 m offshore (sample Lake 2). All samples were analyzed for the standard list of major ions, total metals and dissolved metals. Results are presented in **Table 7.1**. There were no significant changes in surface water chemistry at either sampling station during the aquifer test..

7.2 Groundwater Chemistry

7.2.1 Analytical

Groundwater samples were collected daily from the discharge water at SPW20-001 during the long-term aquifer test. Selected samples were analyzed for the standard list of major ions, total metals and dissolved metals. Most samples were analyzed for chloride. Results are presented in **Table 7.2**. The laboratory analytical reports are provided in **Appendix H**.

Groundwater samples were clear and colourless after a period of continuous pumping. Concentrations of total suspended solids (TSS) remained below detection limits in all samples. The concentrations of various trace metals were generally lower than the concentrations detected at other monitoring well and borehole locations. |One has to consider the possibility that elevated metals in those situations may, in part, reflect impacts from drilling fluids. The potential effects of drilling fluids on groundwater chemistry are discussed at some length in **Section 5.5.2**.

7.2.2 Groundwater Classifications

All groundwater samples collected from SPW20-001 were classified in trilinear space (**Figure 7.1**) using the AquaChem geochemical software (Waterloo Hydrogeologic, 2006).

The major ion concentrations that were used to generate the trilinear plot are presented in **Table 7.3**. Groundwater evolved during the test from a calcium-magnesium-bicarbonate (Ca-Mg-HCO_3) type in early-time, to a calcium-bicarbonate-sulphate (Ca-HCO_3-SO_4) type, and a calcium-sulphate-bicarbonate (Ca-SO_4-HCO_3) type in late-time. Data points showed a clear shift from left-centre of the diamond field toward the top of that field, and that shift coincided with increasing total dissolved solids (TDS) concentrations. Measured TDS increased from

338 mg/L to 825 mg/L. While sulphate became the dominant anion with continued pumping time, chloride also increased from 0.55 mg/L to 48.1 mg/L.

7.3 Stable Isotopic Composition

Several samples of groundwater and lake water were collected during the long-term aquifer test to test the value of using stable isotopes as a tracer to identify source waters and mixing histories. Sampling methods, basic isotopic concepts and results are presented below.

7.3.1 Sample Collection and Analysis

Water samples for stable isotope analysis required no acidification or chilling for preservation. The only requirements for ensuring sample integrity were that the samples be collected in high density polyethylene (HDPE) bottles without headspace to prevent isotopic exchange with atmospheric gases. Bottle lids were sealed with adhesive tape after collection. All samples were shipped to the Environmental Isotope Laboratory (EIL) at the University of Waterloo, Ontario, Canada for analysis.

7.3.2 Conventional Notation and Uncertainty

Oxygen and hydrogen isotope ratios are expressed or reported by EIL as deviations in per mil (‰) relative to Vienna Standard Mean Ocean Water (VSMOW), which is the standard convention. EIL runs an array of standard waters calibrated to VSMOW and Vienna Standard Antarctic Light Precipitation (VSLAP), with the qualifier that the laboratory analysis of another reference standard, Vienna Greenland Ice Sheet Project (VGISP) water, gives the correct value using the results from the other two. An algebraic equation, calculated from observed versus measured for the standards, is used to produce the analytical results for samples in spreadsheet form. EIL's approach is understood to be consistent with the method described by Coplen (1996).

Conventional delta-notation (δ) is used where,

$$\delta^{18}\text{O or }\delta^{2}\text{H} = [R_{sample}/R_{standard} - 1] \times 10^{3}‰ \qquad [7.1]$$

and R is the ratio of either the oxygen isotopes, $^{18}O/^{16}O$, or the hydrogen isotopes, $^{2}H/^{1}H$, where ^{2}H is known as deuterium.. When discussing the results for individual samples, one typically refers to the heavier isotope as representing the value of the ratio (i.e., oxygen-18 or deuterium).

When examining stable isotope data, it is important that the analytical uncertainty of the analyses be quantified and considered in data interpretation. EIL routinely conducts replicate analyses for oxygen isotopes at the rate of approximately three in every five samples. The analytical uncertainties for oxygen-18 and deuterium analyses by EIL are taken to be the sum of the mean and standard deviations for the differences between the repeated samples. For oxygen-18, EIL's analytical uncertainty was ± 0.13‰. For deuterium, EIL's analytical uncertainty was ± 0.66‰ for deuterium.

7.3.3 Basic Isotopic Concepts

The stable isotopes of oxygen and hydrogen are nearly ideal natural tracers of water through the hydrologic system because they are not normally involved in rock-water reactions at low temperatures and, instead, behave conservatively when mixed with other waters. Extended periods of rock-water interaction that lead to the formation of brine have to been known to produce a non-conservative isotopic exchange between water and rock that leads to a deuterium enrichment.

The isotopic composition of precipitation varies seasonally in response to temperature changes and is well described by what is known as the Global Meteoric Water Line, or GMWL (Craig, 1961):

$$\delta^{18}H = 8\delta^{18}O + 10 \qquad [7.2]$$

At Springpole, where monitoring of the long-term isotopic composition of precipitation has not been carried out, the mean-annual isotopic composition of precipitation, δ_p, has been approximated using data collected at the Experimental Lakes Area (ELA) in northwestern Ontario (IAEA/WMO Global Network of Isotopes in Precipitation, Station 7185001), which is located between Kenora and Dryden. The mean annual $\delta^{18}O$ composition of precipitation (δp) at that site was -14.93‰, based on 157 samples collected between 1997 and 2010. The equivalent $\delta^{2}H$ composition for the same period was -109.2‰. The ELA monitoring station, located approximately 210 km southwest of Springpole Lake (49°40'12" north and 93.43'11.99" west), is expected to provide a reasonably good first approximation of δ_p for Springpole.

The mean annual isotopic composition of shallow ground water, δ_G, is expected to be similar to δ_p. That is because the process of infiltration of snowmelt and rain water into the subsurface throughout the year smooths over the extreme seasonal variations in the isotopic composition of precipitation and provides a naturally-integrated isotopic signature.

During the ice-free months of the year, isotopic enrichment of surface water occurs as a result of the evaporation process. Evaporation is a non-equilibrium process whereby kinetic effects produce an isotopic enrichment in the residual surface water. On a binary plot in δ^{18} O versus $\delta^{2}H$ space, there is a systematic shift in the isotopic composition of surface waters as they progressively evaporate. Evaporated samples will plot to the right of the GMWL. Surface waters that undergo varying degrees of evaporation will show varying degrees of enrichment and, because these bodies of water naturally integrate diurnal variations in evaporation conditions over the summer period, they are spread along a Local Evaporation Line (LEL) which intersects the GMWL at δp. The slope of the LEL will be less than the slope of the GMWL, which is 8 in δ^{18} O versus d^2H space, and the slope of the LEL will vary from region to region depending on the influence of varying local conditions (temperature, humidity, wind speed, fetch, etc.). Once the LEL has been defined, the degree of shift along the LEL provides an indication of the extent of evaporation.

Stable isotopes have been shown to be useful as tracers of the origin, movement, and history of water in crystalline bedrock terrain (e.g., Frape and Fritz, 1987) and have demonstrated potential for evaluating the degree of surface water-groundwater interaction in the vicinity of mining operations. Due to the unique fingerprint of evaporation on the stable oxygen and hydrogen isotopes of water (e.g., Gibson et al., 1993), and their conservative behaviour during transport in the subsurface, they are particularly useful in water balance investigations, and identifying the occurrence and source of surface water in underground areas (Gibson et al., 2017; 2019).

7.3.4 Isotopic Data

Oxygen-18 and deuterium values for four groundwater samples from pumping well SPW20 and Springpole Lake are presented in **Table 7.4**.

7.3.5 Discussion of Isotopic Results

Figure 7.2 presents a plot of δ^{18}O versus δ^2H for all surface water and groundwater samples. The GMWL is shown on that figure, as are the 157 samples of precipitation that were collected at the ELA. All precipitation samples fall along that line and are well-represented by the GMWL. Surface water from Springpole Lake is shifted to the right of the GMWL due to evaporative enrichment. Given the relatively large size Springpole Lake, it is presently assumed that the lake has an approximate steady-state isotopic composition throughout the year, compared with small ponds and streams in the area. All four groundwater samples plot on the GMWL.

As mentioned earlier, the mean annual isotopic composition of precipitation (δ_p) at ELA is expected to provide a first-order approximation of δp for the Springpole Lake Project site (δ^{18}O of -14.93‰ and δ^2H of -109.2‰). The position of δp is shown in **Figure 7.2** and it is also expected to provide a good approximation of the mean annual isotopic composition of shallow groundwater, δg. The estimated position of the Local Evaporation Line (LEL) for the Springpole Lake Project site is drawn between δp and the isotopic composition of surface water in Springpole Lake.

The groundwater sample that was collected from pumping well SWP20, on October 29, 2020 was relatively enriched in δ^{18}O and δ^2H relative to subsequent groundwater samples collected in

November, and had a very weak evaporation signature. Groundwater data points shifted progressively from right to left during the test, and the position of the last groundwater sample collected on November 16, 2020 coincides with δp. Those results indicate that groundwater discharge water from SPW20 was probably derived from present-day meteoric water and did not contain any significant contributions of evaporated lakewater, from either Springpole Lake or Birch Lake, in late pumping time. The isotopic response to pumping also suggests that the fractured-bedrock aquifer is confined or semi-confined, rather than being unconfined and in direct communication with the water table.

The strong contrast between the stable isotopic composition of lake water versus groundwater means that the stable isotopes can be an effective tool for tracing and mapping sources of inflows into the future open pit

7.4 Groundwater Sources

7.4.1 Insights from General Chemistry

Stable isotopic data confirm that the origin of groundwater produced in late-time, during the long-term aquifer test, is meteoric water derived from natural groundwater recharge, with little or no contributions from evaporated lake water. Further deciphering of the origin of groundwater produced from SPW20-001 requires an understanding of the source of increasing concentrations of the major ions, but in particular sulphate and chloride. Changes in the major ion chemistry of groundwater during the aquifer test were dominated by increasing calcium (89.3 mg/L to 179 mg/L), sulphate (42 mg/L to 300 mg/L), and chloride (<0.55 mg/L to 48.1 mg/L).

Samples from SPW20-001, plotted in trilinear space (**Figure 7.1**), define a continuum between a Ca-HCO_3 type groundwater and a Ca-Mg-SO_4-HCO_3 type groundwater as the dominant end members. TDS increased along that continuum and there was a slight curve or tilt in the trend (see lower right triangle of trilinear plot) due to rising chloride. That pattern suggests simple mixing between two dominant end members.

Chloride is a chemically conservative tracer in low temperature groundwater systems and it is instructive to consider chloride, and its relationship to bromide, which is also chemically conservative. Bromide was a minor constituent in groundwater discharge, but its concentration increased from not detected (< 0.1 mg/L) to 0.91 mg/L during the aquifer test. The Br/Cl ratio remained relatively constant, varying between 0.019 and 0.021, averaging 0.0195 (St. Dev. 0.0007). The Br/Cl ratios for samples of Canadian Shield Brines range between 0.0060 and 0.0125, compared with 0.0035 for sea water, which indicates that Shield brines have undergone an enrichment in bromide or a depletion in chloride relative to seawater (Frape, et al., 1984). Shield brines are typically dominated by calcium, sodium and chloride, but all other aspects of their chemistry are highly dependent on the local geology. Marine halite typically contains only 50 to 100 parts per million Br (Knauth, 1988). As a result, a halite dissolution brine will have a

Br/Cl ratio that is an order of magnitude smaller than the Br/Cl ratio for seawater (i.e., 10^{-4}) (Briggins and Cross, 1995; Knauth, 1988). The relatively high Br/Cl ratios of groundwater samples from SPW20-001 suggest that mixing with saline groundwater or brine was not the source of rising chloride and bromide. The constant value of the ratio suggests a common source water.

Figure 7.3 shows concentrations of sulphate and TDS relative to chloride for groundwater samples from individual monitoring wells and boreholes, and for samples collected from SPW20-001. There is strong correlation between sulphate and chloride, and TDS and chloride for SPW20-001, but no such correlation for groundwater samples from other monitoring wells and boreholes. Further, sulphate, chloride and TDS in samples from SPW20-001, that were collected after the first week of pumping, had concentrations that were much higher than concentrations measured in any other monitoring wells or boreholes across the site. Given the observed correlation between TDS and depth that was presented earlier in this report (**Figure 5.3**), one could infer that the rising TDS reflects increasing contributions from a relatively deep groundwater source. That scenario is supported by the behaviour of dissolved oxygen.

Dissolved oxygen (DO) tended to decrease with time during the aquifer test. DO increased initially from 4.88 mg/L on October 18, to 6.07 mg/L on October 21, but showed an overall decrease to 1.64 mg/L by the end of the test, on November 16. The overall trend supports the idea that shallow groundwater remained a significant source of groundwater discharge from the pumping well, but the proportion of more reduced (anaerobic) groundwater from depth appears to have increased with time. Field staff noted a strong sulphur odour on the discharge water during the last 14 days of the aquifer test.

The pH increased from near neutral to 7.25 during the aquifer test. Metals solubility generally decreases with increasing pH, which is consistent with the relatively low concentrations of dissolved metals observed in discharge water from SPW20-001, compared with other wells and boreholes. A notable decrease in dissolved arsenic and an increase in dissolved iron occurred in groundwater discharge from SPW20-001 with pumping time. Arsenic decreased from 6.36 µg/L to 3.87 µg/L, and iron increased from 0.928 mg/L to1.65 mg/L. Potential geochemical controls are discussed in the following section.

7.4.2 Simple Mixing Model

PHREEQC was used to mix a groundwater sample from MW3, as a representative low-TDS end member, with SPW20-001-201116 as a representative high TDS end member to determine if the ion proportions observed in the other samples from the test are simple mixtures of the two end members, or if other geochemical processes are required to explain their chemistry.

Figure 7.4 shows the actual measured changes in the ion ratio (Ca+Mg+K)/Na and in concentrations of Ca, Na, Mg and K relative to chloride for samples collected during the aquifer test. **Figure 7.5** shows the modeled changes in the same parameters. Simple mixing between shallow and deep groundwater appears to explain the general behaviour of the major ions in groundwater discharge from SPW20-001. Note, however, that the starting concentrations for each parameter in the modeled output are lower than those observed for early-time samples from the aquifer test. Therefore, a shallow groundwater that is more dilute than MW3 is needed to represent the chemically-dilute end member.

7.4.3 Insights into Other Potential Geochemical Processes

There is evidence to suggest that the process of simple mixing, described above, was unlikely to be chemically conservative. Field staff noted that hydrogen sulphide (H_2S) odours were developing in the discharge water after the first fourteen days of pumping SPW20-001. While the presence of H_2S is a potential concern for dewatering the future open pit, because the gas is toxic to aquatic life, a number of treatment measures are available to remove H_2S from groundwater. Options include media filtration using greensand, oxidation by chlorination, adsorption onto catalytic carbon, and air sparging (i.e., aeration).

Olfactory evidence of H_2S is strong, albeit qualitative evidence for sulphate reduction to have occurred in the subsurface aqueous environment. Sulphate reduction involves bacteria using oxygen in the sulphate anion to oxidize organic matter and produce sulphide species; either HS^- when the pH is above 7, or H_2S when the pH is below 7. The general stoichiometry of the process is expressed by the following two equations (Drever, 1988; Miao et al., 2012):

$$SO_4^{2-} + 2CH_2O = H_2S + HCO_3^- \qquad [7\text{-}3]$$

$$2H^+ + SO_4^{2-} + 4H_2 = H_2S + 4H_2O \qquad [7\text{-}4]$$

Both H_2S and bicarbonate are produced by the oxidation of organic matter (Equation 7-3). Hydrogen ions are also consumed (Equation 7-4) and that increases solution pH. Since rising and relatively high concentrations of sulphate were measured in samples of discharge water, and there was olfactory evidence for increasing H_2S during the aquifer test, it stands to reason that some of the H_2S was probably being oxidized back to sulphate during mixing with shallow groundwater. Since the pH continued to increase during the aquifer test, any pH reduction that would have occurred by a reversal of the reaction depicted in Equation 7-4 would have to be buffered by another reaction. That buffering may have been supplied by calcite dissolution.

Calcium concentrations in groundwater discharge from SPW20-001 increased from 89.3 mg/L to 179 mg/L during the aquifer test, while there was a marginal decrease in bicarbonate from 328 mg/L to 291 mg/L. The bicarbonate decrease may have been due to calcite precipitation based on the increase in calcite saturation indices from negative to positive values during the aquifer test (**Table 7.3**). Groundwater discharge was undersaturated with respect to calcite at the start of the aquifer test (SI -0.06) and increased to above saturation by the end of the aquifer test (SI 0.29).

Dissolution of other minerals may have contributed to the rising sulphate in discharge water from SPW20-001. Sulphate-bearing minerals that may be dissolving under oxidizing conditions at circumneutral pH or higher, based on calculations using PHREEQC, are alunite ($KAl_3(OH)_6(SO4)_2$), jarosite ($KFe_3(SO4)_2(OH)_6$), and gypsum ($CaSO_4$). Alunite and jarosite have similar mineral structures and are common secondary alteration minerals in potassium-rich volcanic rocks such as trachyte and rhyolite (Kerr, 1977).

Precipitation of a number of other minerals may also have influenced the groundwater chemistry, based on positive saturation indices calculated using PHREEQC. Speciation of the last sample from SPW20-001 showed that barite ($BaSO_4$), birnessite (MnO_2), ferrihydrite ($Fe(OH)_3$), and a variety of clay minerals, such as beidellite and clinoptolite, were supersaturated and may have been precipitating.

The possibility of ion exchange reactions controlling the chemistry of groundwater during the aquifer test was examined. The kinetics of ion exchange are relatively fast compared with mineral dissolution and precipitation reactions and others have noted that flowing groundwater can interact with more cation exchange sites than under stagnant conditions (Kim and Yun, 2005). An examination of the binary relationship between the two major cations, calcium and sodium, showed a strong correlation with a positive slope that suggests ion exchange was not a major controlling factor in the observed chemistry of the discharge water from SPW20-001.

Table 7.1 General chemistry and metals data for surface water samples collected from Springpole Lake during the long-term aquifer test (Page 1 of 3).

Parameter	Units	Client Sample ID	3134 - AQ - LAKE1-201018	3134 - AQ - LAKE2-201018	3134 - AQ - LAKE1-201019	3134 - AQ - LAKE2-201019	3134-AQ-LAKE1-201020	3134-AQ-LAKE2-201020	3134-AQ-LAKE1-201021
		Date Sampled	18-Oct-2020	18-Oct-2020	19-Oct-2020	19-Oct-2020	20-Oct-2020	20-Oct-2020	21-Oct-2020
		Time Sampled	12:15	12:30	08:15	08:30	09:30	09:40	13:40
		Media	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		ALS Sample ID	L2518840-1	L2518840-2	L2518840-4	L2518840-5	L2521162-1	L2521162-2	L2521162-4
Physical Tests									
Conductivity	uS/cm		66.5	64.7	67.4	65.3	69.2	66.8	72.2
Hardness (as CaCO3)	mg/L		31.7	31.1		31.5	32	30.6	30.7
pH	pH		7.37	7.38	7.37	7.37	7.55	7.45	7.58
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		47	48	47	43	43	43	47
Anions and Nutrients									
Acidity (as CaCO3)	mg/L		3	2.7	2.5	2.6	2.1	<2.0	2
Alkalinity, Total (as CaCO3)	mg/L		31.2	31.4	32	31.5	34	32.4	33.3
Ammonia, Total (as N)	mg/L		<0.0050	2.01	1.97	1.93	0.0408	<0.0050	0.32
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		<0.24	<0.23	<0.18	<0.17	0.2	0.21	<0.42
Fluoride (F)	mg/L		0.037	0.038	0.027	0.029	0.03	0.029	0.032
Nitrate (as N)	mg/L		0.091	<0.020	<0.020	<0.020	<0.020	0.034	0.043
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L		0.435	2.19	2.18	2.33	0.369	0.323	0.696
Orthophosphate (as PO)	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Phosphorus (P)-Total	mg/L		<0.030	<0.030	<0.030	<0.030	0.0095	0.0084	0.0091
Sulphate (SO4)	mg/L		2	1.99	1.54	1.58	2.01	1.63	2.03
Organic/Inorganic Carbon									
Dissolved Organic Carbon	mg/L		6.91	6.88	6.46	6.89	8.55	8.44	8.39
Total Organic Carbon	mg/L		7.19	6.73	6.76	6.86	8.99	8.97	8.79
Total Metals (compared with guideline values for compliance purposes)									
Aluminum (Al)-Total	mg/L		0.0079	0.0076	0.0093	0.0115	0.0076	0.0081	0.01
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L		0.0006	0.00058	0.00058	0.00058	0.00056	0.00057	0.00055
Barium (Ba)-Total	mg/L		0.00767	0.00775	0.00774	0.00766	0.00784	0.00761	0.00754
Beryllium (Be)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	mg/L		10.5	10.5	10.5	10.5	10.4	10	10.1
Cesium (Cs)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	mg/L		0.00015	0.00013	0.00011	0.00011	0.00021	0.00017	0.00012
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L		0.00073	0.00072	0.00071	0.00071	0.0007	0.00073	0.00087
Iron (Fe)-Total	mg/L		0.023	0.024	0.028	0.025	0.031	0.027	0.032
Lead (Pb)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L		1.5	1.51	1.57	1.53	1.55	1.48	1.5
Manganese (Mn)-Total	mg/L		0.00382	0.00386	0.00461	0.00421	0.00536	0.00436	0.00454
Mercury (Hg)-Total	mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L		0.000106	0.000113	0.000112	0.000117	0.000115	0.000106	0.000116
Nickel (Ni)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00074	<0.00050
Phosphorus (P)-Total	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L		0.656	0.639	0.645	0.641	0.656	0.657	0.655
Rubidium (Rb)-Total	mg/L		0.00159	0.00168	0.0017	0.00165	0.00172	0.00161	0.00163
Selenium (Se)-Total	mg/L		0.000083	0.000125	0.000082	0.000079	0.000091	0.000098	0.000073
Silicon (Si)-Total	mg/L		1.07	1.11	1.14	1.12	1.03	1.03	1
Silver (Ag)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		0.71	0.701	0.697	0.686	0.722	0.686	0.696
Strontium (Sr)-Total	mg/L		0.0248	0.0247	0.026	0.0256	0.028	0.0247	0.0252
Sulfur (S)-Total	mg/L		1.07	1.06	1.03	0.92	0.8	0.54	0.59
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	<0.00010
Titanium (Ti)-Total	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00051
Tungsten (W)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L		0.000013	0.000014	0.000014	0.000012	0.000012	0.000011	0.000013
Vanadium (V)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals (for modelling purposes)									
Aluminum (Al)-Dissolved	mg/L		0.0024	0.0019		0.0021	0.002	0.0022	0.0022
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		0.00061	0.00064		0.00055	0.00052	0.00051	0.0005
Barium (Ba)-Dissolved	mg/L		0.0074	0.00729		0.00718	0.0074	0.00706	0.00717
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		<0.010	<0.010		<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L		10.3	10.1		10.3	10.3	9.91	9.92
Cesium (Cs)-Dissolved	mg/L		<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L		<0.00010	0.00012		<0.00010	<0.00010	0.00021	0.00014
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00065	0.00075		0.00062	0.0006	0.00061	0.00075
Iron (Fe)-Dissolved	mg/L		<0.010	<0.010		<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L		1.43	1.41		1.44	1.54	1.42	1.45
Manganese (Mn)-Dissolved	mg/L		0.0006	0.00054		0.00057	0.00152	0.0004	0.00098
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.000091	0.000091		0.000104	0.000102	0.000093	0.000097
Nickel (Ni)-Dissolved	mg/L		<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		0.648	0.664		0.643	0.654	0.644	0.641
Rubidium (Rb)-Dissolved	mg/L		0.00161	0.00163		0.00161	0.00164	0.00168	0.00167
Selenium (Se)-Dissolved	mg/L		0.000087	0.000092		0.000075	0.00007	0.000068	0.000069
Silicon (Si)-Dissolved	mg/L		0.995	0.985		1.05	1.06	1.05	1.01
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		0.664	0.67		0.658	0.781	0.691	0.737
Strontium (Sr)-Dissolved	mg/L		0.0232	0.0231		0.0238	0.027	0.0233	0.0234
Sulfur (S)-Dissolved	mg/L		<0.50	<0.50		<0.50	0.56	<0.50	<0.50
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010		0.00015	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L		0.000012	<0.000010		0.000011	0.00001	<0.000010	0.00001
Vanadium (V)-Dissolved	mg/L		<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.0026	<0.0010		<0.0010	0.001	0.0012	0.0011
Zirconium (Zr)-Dissolved	mg/L		<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals									
Chromium (VI)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium, Hexavalent	ug/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylmercury (as MeHg)-Total	ug/L		<0.000020	<0.000020	<0.000020	<0.000020			
Aggregate Organics									
Chemical Oxygen Demand	mg/L		31	34	35	37	29	26	24

Table 7.1 General chemistry and metals data for surface water samples collected from Springpole Lake during the long-term aquifer test (Page 2 of 3).

Parameter	Units	Client Sample ID	3134-AQ-LAKE2-201021	3134-AQ-LAKE1-201024	3134-AQ-LAKE2-201024	3134-AQ_LAKE1-201029	3134-AQ_LAKE2-201029	3134-AQ-LAKE1-201104	3134-AQ-SMW20-002-201104
		Date Sampled	21-Oct-2020	24-Oct-2020	24-Oct-2020	29-Oct-2020	29-Oct-2020	4-Nov-2020	4-Nov-2020
		Time Sampled	14:00	14:10	14:30	11:28	11:38	10:26	10:31
		Media	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		ALS Sample ID	L2521162-5	L2522994-1	L2522994-2	L2524864-1	L2524864-2	L2526890-1	L2526861-2
Physical Tests									
Conductivity	uS/cm		68.3	67.3	66.5	71.3	67.1	66.1	66.6
Hardness (as CaCO3)	mg/L		32.7	32	32.5	32.8	32.1	32.4	32.6
pH	pH		7.56	7.38	7.43	7.25	7.28	7.44	7.48
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		46	50	51	46	51	41	49
Anions and Nutrients									
Acidity (as CaCO3)	mg/L		<2.0	<2.0	<2.0	2.2	2.2	2	<2.0
Alkalinity, Total (as CaCO3)	mg/L		32.5	32.4	32.3	32	31.7	31.9	31.9
Ammonia, Total (as N)	mg/L		<0.0050	0.0332	0.0611	0.544	0.12	2.2	0.103
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		<0.33	0.25	0.51	0.38	0.25	0.58	0.39
Fluoride (F)	mg/L		0.033	0.024	0.033	0.03	0.032	0.031	0.026
Nitrate (as N)	mg/L		<0.020	0.03	0.055	0.042	0.026	0.04	0.027
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L		0.406	0.311	0.321	0.976	0.416	2.83	
Orthophosphate (as PO)	mg/L		<0.0030	<0.0030	0.003	0.0082	0.0038	<0.0030	<0.0030
Phosphorus (P)-Total	mg/L		0.0106	0.0087	0.0081	0.0096	0.01	0.0111	0.0115
Sulphate (SO4)	mg/L		1.79	1.98	2.12	2.91	1.91	1.94	2.22
Organic/Inorganic Carbon									
Dissolved Organic Carbon	mg/L		8.44	7.1	7.06	7.8	8.11	7.25	8.08
Total Organic Carbon	mg/L		8.82	6.71	6.88	7.63	8.18	9.4	
Total Metals (compared with guideline values for compliance purpose									
Aluminum (Al)-Total	mg/L		0.007	0.0099	0.008	0.008	0.0083	0.0097	0.0084
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L		0.00057	0.00056	0.00059	0.00059	0.0006	0.0006	0.00058
Barium (Ba)-Total	mg/L		0.00786	0.00809	0.00817	0.00832	0.00804	0.00771	0.00764
Beryllium (Be)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	mg/L		10.2	10.5	10.3	10.6	10.4	10.9	10.8
Cesium (Cs)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	mg/L		0.00014	0.00037	0.00023	0.00017	0.00018	<0.00010	0.00016
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L		0.00133	0.00082	0.0007	0.0007	0.00072	0.00071	0.00078
Iron (Fe)-Total	mg/L		0.025	0.04	0.033	0.052	0.054	0.049	0.046
Lead (Pb)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L		<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L		1.51	1.52	1.52	1.6	1.54	1.54	1.52
Manganese (Mn)-Total	mg/L		0.0039	0.00573	0.00527	0.011	0.0105	0.00805	0.00804
Mercury (Hg)-Total	mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	Not Analyzed
Molybdenum (Mo)-Total	mg/L		0.000102	0.000118	0.000113	0.000116	0.000117	0.000108	0.00012
Nickel (Ni)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L		0.666	0.671	0.674	0.688	0.682	0.69	0.679
Rubidium (Rb)-Total	mg/L		0.00178	0.00166	0.00163	0.00169	0.00167	0.00176	0.00175
Selenium (Se)-Total	mg/L		0.000073	0.000068	0.000059	0.000116	0.000097	0.000111	0.000075
Silicon (Si)-Total	mg/L		1.02	1.25	1.2	1.32	1.33	1.2	1.19
Silver (Ag)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		0.693	0.745	0.72	0.764	0.755	0.773	0.771
Strontium (Sr)-Total	mg/L		0.0247	0.0291	0.0275	0.0275	0.0266	0.0273	0.0273
Sulfur (S)-Total	mg/L		<0.50	0.53	0.62	<0.50	0.69	<0.50	<0.50
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		<0.000010	<0.000010	<0.000010	0.00001	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.00030	<0.00030	<0.00030	0.0005	<0.00051	0.00037	<0.00030
Tungsten (W)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L		0.000012	0.000014	0.000014	0.000015	0.000014	0.000013	0.000014
Vanadium (V)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals (for modelling purposes)									
Aluminum (Al)-Dissolved	mg/L		0.0204	0.0024	0.0023	0.0021	0.0016	0.0021	0.0027
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		0.00048	0.00054	0.00051	0.00052	0.00051	0.00053	0.00054
Barium (Ba)-Dissolved	mg/L		0.0161	0.00772	0.00765	0.00786	0.00757	0.00717	0.00715
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L		10.6	10.4	10.6	10.6	10.4	10.5	10.6
Cesium (Cs)-Dissolved	mg/L		0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L		0.00023	0.00023	0.00019	0.00014	<0.00010	0.00014	0.00012
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00425	0.00062	0.00063	0.00064	0.00063	0.00062	0.00066
Iron (Fe)-Dissolved	mg/L		<0.010	0.012	0.011	0.019	0.017	0.014	0.015
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L		1.49	1.49	1.47	1.57	1.48	1.52	1.51
Manganese (Mn)-Dissolved	mg/L		0.00107	0.00135	0.00113	0.00381	0.00339	0.00155	0.00155
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.000114	0.000111	0.000112	0.000108	0.000124	0.000101	0.000099
Nickel (Ni)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		0.69	0.687	0.686	0.695	0.688	0.678	0.665
Rubidium (Rb)-Dissolved	mg/L		0.00184	0.00167	0.00166	0.00167	0.00171	0.00168	0.00164
Selenium (Se)-Dissolved	mg/L		0.000108	0.000073	0.000062	0.000096	0.000084	0.000095	0.000093
Silicon (Si)-Dissolved	mg/L		1.03	1.13	1.12	1.31	1.27	1.13	1.15
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		0.751	0.741	0.72	0.765	0.72	0.764	0.756
Strontium (Sr)-Dissolved	mg/L		0.0254	0.0289	0.028	0.0288	0.0256	0.0261	0.0267
Sulfur (S)-Dissolved	mg/L		<0.50	0.77	0.79	<0.50	<0.50	<0.50	<0.50
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L		0.000013	0.000013	<0.000010	0.00001	0.00001	0.000012	0.000012
Vanadium (V)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.0027	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium (Zr)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals									
Chromium (VI)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium, Hexavalent	ug/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
Methylmercury (as MeHg)-Total	ug/L								
Aggregate Organics									
Chemical Oxygen Demand	mg/L		28	22	23	26	26	29	

Table 7.1 General chemistry and metals data for surface water samples collected from Springpole Lake during the long-term aquifer test (Page 3 of 3).

Parameter	Units	Client Sample ID	3134-AQ-LAKE2-201104	3134-AQ-LAKE1-201109	3134-AQ-LAKE2-201109	3134-AQ-LAKE1-201117	3134-AQ-LAKE2-201117
		Date Sampled	4-Nov-2020	9-Nov-2020	9-Nov-2020	17-Nov-2020	17-Nov-2020
		Time Sampled	10:37	10:13	10:30	11:12	11:40
		Media	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		ALS Sample ID	L2526890-3	L2527908-1	L2527908-2	L2532200-1	L2532200-2
Physical Tests							
Conductivity	uS/cm		65.9	67.1	66	66.2	66.3
Hardness (as CaCO3)	mg/L		32.2	32	34.1	32	32.5
pH	pH		7.47	7.58	7.57	7.43	7.4
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L		46	29	28	49	50
Anions and Nutrients							
Acidity (as CaCO3)	mg/L		<2.0	2.4	2.5	2.5	2.5
Alkalinity, Total (as CaCO3)	mg/L		31.3	32.5	31.9	31.7	31.9
Ammonia, Total (as N)	mg/L		3.8	0.0808	5.1	0.013	0.0206
Bromide (Br)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L		0.41	0.88	<0.30	0.23	0.24
Fluoride (F)	mg/L		0.026	0.023	<0.020	0.035	0.036
Nitrate (as N)	mg/L		0.032	0.026	0.022	0.027	0.032
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	mg/L		3.85	0.4	6.27	0.363	0.344
Orthophosphate (as PO)	mg/L		0.003	0.0035	0.0032	<0.0030	<0.0030
Phosphorus (P)-Total	mg/L		0.0119	0.0096	0.0121	0.0106	0.0088
Sulphate (SO4)	mg/L		2.38	12.4	0.89	1.75	2.27
Organic/Inorganic Carbon							
Dissolved Organic Carbon	mg/L		7.62	8.4	9	7.31	7.68
Total Organic Carbon	mg/L		9.06	8.54	8.58	8.22	8.15
Total Metals (compared with guideline values for compliance purpose							
Aluminum (Al)-Total	mg/L		0.0065	0.0075	0.0076	0.0088	0.0085
Antimony (Sb)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L		0.0006	0.00075	0.00071	0.00056	0.00057
Barium (Ba)-Total	mg/L		0.00761	0.00792	0.00778	0.00762	0.0076
Beryllium (Be)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L		<0.010	<0.015	<0.015	<0.010	<0.010
Cadmium (Cd)-Total	mg/L		0.0000051	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	mg/L		10.9	11.3	11.1	10.8	10.7
Cesium (Cs)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	mg/L		<0.00010	0.00019	0.00011	0.00021	0.00021
Cobalt (Co)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L		0.00071	0.00074	0.00071	0.00083	0.00081
Iron (Fe)-Total	mg/L		0.039	0.094	0.042	0.035	0.033
Lead (Pb)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L		1.52	1.65	1.62	1.52	1.53
Manganese (Mn)-Total	mg/L		0.00769	0.00836	0.00785	0.007	0.0066
Mercury (Hg)-Total	mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L		0.000119	0.000142	0.000126	0.000115	0.000117
Nickel (Ni)-Total	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L		0.696	0.696	0.705	0.728	0.71
Rubidium (Rb)-Total	mg/L		0.00169	0.00182	0.00189	0.00176	0.00177
Selenium (Se)-Total	mg/L		0.000092	0.000119	0.000104	0.000087	<0.000050
Silicon (Si)-Total	mg/L		1.21	1.29	1.32	1.24	1.2
Silver (Ag)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L		0.742	0.803	0.778	0.755	0.739
Strontium (Sr)-Total	mg/L		0.0271	0.0348	0.0282	0.0261	0.0256
Sulfur (S)-Total	mg/L		<0.50	0.61	0.57	1.19	1.18
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L		0.000011	0.000018	0.000015	0.000014	0.000012
Vanadium (V)-Total	mg/L		<0.00050	0.00055	0.00052	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L		<0.0030	<0.0030	0.0041	<0.0030	<0.0030
Zirconium (Zr)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals (for modelling purposes)							
Aluminum (Al)-Dissolved	mg/L		0.0023	0.0015	0.0019	0.0016	0.0014
Antimony (Sb)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L		0.00051	0.00054	0.0006	0.00051	0.00052
Barium (Ba)-Dissolved	mg/L		0.00722	0.00684	0.0076	0.00706	0.00696
Beryllium (Be)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L		10.4	10.3	11.1	10.3	10.4
Cesium (Cs)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L		0.00016	<0.00010	0.00013	0.00013	0.00016
Cobalt (Co)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L		0.00062	0.00068	0.00067	0.00067	0.00071
Iron (Fe)-Dissolved	mg/L		0.012	0.011	0.011	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L		1.49	1.53	1.57	1.55	1.56
Manganese (Mn)-Dissolved	mg/L		0.00099	0.0008	0.00064	0.00035	0.00035
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.000099	0.000104	0.000104	0.000112	0.00011
Nickel (Ni)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L		0.674	0.641	0.719	0.704	0.701
Rubidium (Rb)-Dissolved	mg/L		0.00167	0.00168	0.00183	0.00173	0.00166
Selenium (Se)-Dissolved	mg/L		0.000091	0.000053	0.000096	0.000117	0.000079
Silicon (Si)-Dissolved	mg/L		1.14	1.17	1.29	1.17	1.18
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L		0.724	0.726	0.782	0.733	0.741
Strontium (Sr)-Dissolved	mg/L		0.0257	0.0297	0.0281	0.0257	0.0261
Sulfur (S)-Dissolved	mg/L		<0.50	0.94	<0.50	<0.50	0.52
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010	<0.000010	0.000035	<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L		<0.000010	0.000012	0.000013	0.000012	0.000011
Vanadium (V)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.0013	<0.0010	0.0023	0.0013	<0.0010
Zirconium (Zr)-Dissolved	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Speciated Metals							
Chromium (VI)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium, Hexavalent	ug/L		<0.50	<0.50	<0.50	<0.50	<0.50
Methylmercury (as MeHg)-Total	ug/L			<0.000020	<0.000020	0.000027	0.000022
Aggregate Organics							
Chemical Oxygen Demand	mg/L		27	27	30		

Table 7.2 General chemistry and metals data for groundwater samples collected during the long-term aquifer test (Page 1 of 4).

Parameter	Units	Client Sample ID	3134 - AQ - SPW20-001-201018	3134 - AQ - SPW20-001-201019	3134-AQ-SPW20-001-201020	3134-AQ-SPW20-001-201021	3134-AQ-SPW20-001-201024	3134-AQ-SPW20-001-201026	3134-AQ-SPW20-001-201027
		Date Sampled	**18-Oct-2020**	**19-Oct-2020**	**20-Oct-2020**	**21-Oct-2020**	**24-Oct-2020**	**26-Oct-2020**	**27-Oct-2020**
		Time Sampled	**18:00**	**10:15**	**10:30**	**14:55**	**15:30**	**12:00**	**10:35**
		Media	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**
		ALS Sample ID	**L2518840-3**	**L2518840-6**	**L2521162-3**	**L2521162-6**	**L2523011-1**	**L2523001-1**	**L2524864-4**
Physical Tests									
Conductivity	uS/cm		547	616	712	767	800		
Hardness (as CaCO3)	mg/L			311	342	390	393		
pH	pH		7.47	7.59	7.72	8.01	7.93		
Total Suspended Solids	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0		
Total Dissolved Solids	mg/L		338	401	486	529	610		
Anions and Nutrients									
Acidity (as CaCO3)	mg/L		12.2	15.6	5	3.4	<2.0		
Alkalinity, Total (as CaCO3)	mg/L		269	284	262	260	248		
Ammonia, Total (as N)	mg/L					0.174	0.237		
Bromide (Br)	mg/L		<0.10	0.11	<0.10	0.36	0.44		
Chloride (Cl)	mg/L		<0.55	5.62	11.7	17.1	23.3	22.7	26.1
Fluoride (F)	mg/L		0.061	0.104	0.105	0.123	0.149		
Nitrate (as N)	mg/L		0.026	<0.020	<0.020	<0.020	0.023		
Nitrite (as N)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010		
Total Kjeldahl Nitrogen	mg/L								
Orthophosphate (as PO)	mg/L						<0.0030		
Phosphorus (P)-Total	mg/L						<0.0030		
Sulphate (SO4)	mg/L		42.1	93.2	123	157	191		
Organic/Inorganic Carbon									
Dissolved Organic Carbon	mg/L		5.14	<0.50	7.44	7.51	6.22		
Total Organic Carbon	mg/L								
Total Metals (compared with guideline values for compliance purposes)									
Aluminum (Al)-Total	mg/L		0.0513	0.02	0.0425	0.0122	0.011		
Antimony (Sb)-Total	mg/L		0.00056	0.00085	0.00093	0.0008	0.00048		
Arsenic (As)-Total	mg/L		0.0103	0.00666	0.00497	0.00477	0.00475		
Barium (Ba)-Total	mg/L		0.0834	0.0854	0.0931	0.0934	0.0898		
Beryllium (Be)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		
Boron (B)-Total	mg/L		<0.010	0.012	0.015	0.017	0.025		
Cadmium (Cd)-Total	mg/L		0.0000092	0.0000092	0.0000061	0.0000092	<0.0000050		
Calcium (Ca)-Total	mg/L		89.3	100	113	124	133		
Cesium (Cs)-Total	mg/L		0.000224	0.00026	0.000315	0.000336	0.000365		
Chromium (Cr)-Total	mg/L		0.0005	0.00038	0.00039	0.00043	0.00044		
Cobalt (Co)-Total	mg/L		0.00065	0.00063	0.00073	0.00044	0.00028		
Copper (Cu)-Total	mg/L		0.00097	0.00072	0.0006	<0.00050	<0.00050		
Iron (Fe)-Total	mg/L		1.08	0.915	1.23	1.09	1.2		
Lead (Pb)-Total	mg/L		0.000117	0.000214	0.000257	0.000238	0.000227		
Lithium (Li)-Total	mg/L		0.0024	0.0022	0.0024	0.0025	0.0027		
Magnesium (Mg)-Total	mg/L		16.8	17	16.9	17.1	17.1		
Manganese (Mn)-Total	mg/L		0.569	0.598	0.574	0.557	0.505		
Mercury (Hg)-Total	mg/L)								
Molybdenum (Mo)-Total	mg/L		0.00539	0.00392	0.0035	0.00313	0.00268		
Nickel (Ni)-Total	mg/L		0.00332	0.00341	0.00341	0.00241	0.00175		
Phosphorus (P)-Total	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050		
Potassium (K)-Total	mg/L		1.77	1.68	1.82	1.9	2		
Rubidium (Rb)-Total	mg/L		0.0026	0.00256	0.00257	0.00268	0.00258		
Selenium (Se)-Total	mg/L		<0.000050	0.00005	<0.000050	0.000071	<0.000050		
Silicon (Si)-Total	mg/L		5.1	5.25	5.35	5.5	5.94		
Silver (Ag)-Total	mg/L		0.000065	0.000012	<0.000010	<0.000010	<0.000010		
Sodium (Na)-Total	mg/L		2.34	4.66	8.39	11.1	14.4		
Strontium (Sr)-Total	mg/L		0.8	1.26	1.97	2.4	3.03		
Sulfur (S)-Total	mg/L		14.9	24.7	42.6	54.4	65.3		
Tellurium (Te)-Total	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00021		
Thallium (Tl)-Total	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		
Thorium (Th)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		
Tin (Sn)-Total	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		
Titanium (Ti)-Total	mg/L		0.0012	0.00046	<0.00063	<0.00030	<0.00030		
Tungsten (W)-Total	mg/L		0.0112	0.00857	0.00786	0.00713	0.00598		
Uranium (U)-Total	mg/L		0.000539	0.000541	0.00053	0.000512	0.000474		
Vanadium (V)-Total	mg/L		0.00118	0.0012	0.00121	0.00121	0.0014		
Zinc (Zn)-Total	mg/L		0.0703	0.0267	0.0226	0.0241	0.0138		
Zirconium (Zr)-Total	mg/L		0.00192	0.00215	0.0024	0.00253	0.00302		
Dissolved Metals (for modelling purposes)									
Aluminum (Al)-Dissolved	mg/L			0.0117	0.0102	0.011	0.0095		
Antimony (Sb)-Dissolved	mg/L			0.00082	0.00086	0.00081	0.00047		
Arsenic (As)-Dissolved	mg/L			0.00636	0.00484	0.00468	0.00462		
Barium (Ba)-Dissolved	mg/L			0.0856	0.086	0.0922	0.0899		
Beryllium (Be)-Dissolved	mg/L			<0.00010	<0.00010	0.00011	0.00011		
Bismuth (Bi)-Dissolved	mg/L			<0.000050	<0.000050	<0.000050	<0.000050		
Boron (B)-Dissolved	mg/L			0.012	0.016	0.02	0.031		
Cadmium (Cd)-Dissolved	mg/L			0.0000094	0.0000081	0.000005	<0.0000050		
Calcium (Ca)-Dissolved	mg/L			98.7	110	128	130		
Cesium (Cs)-Dissolved	mg/L			0.000247	0.000288	0.000344	0.000367		
Chromium (Cr)-Dissolved	mg/L			0.00035	0.00036	0.0004	0.00033		
Cobalt (Co)-Dissolved	mg/L			0.0006	0.0005	0.00043	0.00028		
Copper (Cu)-Dissolved	mg/L			0.00048	0.0003	0.00026	<0.00020		
Iron (Fe)-Dissolved	mg/L			0.928	0.929	1.11	1.18		
Lead (Pb)-Dissolved	mg/L			0.000161	0.000185	0.000179	0.0002		
Lithium (Li)-Dissolved	mg/L			0.0023	0.0025	0.0023	0.0024		
Magnesium (Mg)-Dissolved	mg/L			15.8	16.2	17.1	16.6		
Manganese (Mn)-Dissolved	mg/L			0.564	0.559	0.567	0.498		
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		
Molybdenum (Mo)-Dissolved	mg/L			0.00372	0.00327	0.00319	0.00252		
Nickel (Ni)-Dissolved	mg/L			0.00315	0.00262	0.00234	0.00168		
Phosphorus (P)-Dissolved	mg/L			<0.050	<0.050	<0.050	<0.050		
Potassium (K)-Dissolved	mg/L			1.68	1.8	1.98	2.05		
Rubidium (Rb)-Dissolved	mg/L			0.00249	0.00255	0.00269	0.00257		
Selenium (Se)-Dissolved	mg/L			0.000084	0.000066	0.000054	0.000073		
Silicon (Si)-Dissolved	mg/L			5.09	5.33	5.85	5.67		
Silver (Ag)-Dissolved	mg/L			<0.000010	<0.000010	<0.000010	<0.000010		
Sodium (Na)-Dissolved	mg/L			4.38	8.35	11.5	14.5		
Strontium (Sr)-Dissolved	mg/L			1.18	1.86	2.47	2.94		
Sulfur (S)-Dissolved	mg/L			27.2	41.9	58.1	61.1		
Tellurium (Te)-Dissolved	mg/L			<0.00020	<0.00020	<0.00020	<0.00020		
Thallium (Tl)-Dissolved	mg/L			<0.000010	<0.000010	<0.000010	<0.000010		
Thorium (Th)-Dissolved	mg/L			<0.00010	<0.00010	<0.00010	<0.00010		
Tin (Sn)-Dissolved	mg/L			<0.00010	<0.00010	<0.00010	<0.00010		
Titanium (Ti)-Dissolved	mg/L			<0.00030	<0.00030	<0.00030	<0.00030		
Tungsten (W)-Dissolved	mg/L			0.00871	0.00745	0.00715	0.00586		
Uranium (U)-Dissolved	mg/L			0.000523	0.000476	0.000529	0.000436		
Vanadium (V)-Dissolved	mg/L			0.00089	0.00103	0.00109	0.00114		
Zinc (Zn)-Dissolved	mg/L			0.0292	0.0207	0.0223	0.0208		
Zirconium (Zr)-Dissolved	mg/L			0.002	0.00222	0.00261	0.00276		
Speciated Metals									
Chromium (VI)-Dissolved	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		
Chromium, Hexavalent	ug/L								
Methylmercury (as MeHg)-Total	ug/L								
Aggregate Organics									
Chemical Oxygen Demand	mg/L								

Table 7.2 General chemistry and metals data for groundwater samples collected during the long-term aquifer test (Page 2 of 4).

Parameter	Units	Client Sample ID	3134-AQ-SPW20-001-201028	3134-AQ-SPW20-001-201029	3134-AQ-SPW20-001-201030	3134-AQ-SPW20-001-201031	3134-AQ-SPW20-001-201101	3134-AQ-SPW20-001-201102	3134-AQ-SPW20-001-201103
		Date Sampled	28-Oct-2020	29-Oct-2020	30-Oct-2020	31-Oct-2020	01-Nov-2020	02-Nov-2020	03-Nov-2020
		Time Sampled	11:00	11:00	14:17	11:22	15:38	15:24	15:08
		Media	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2524864-5	L2524864-3	L2526858-1	L2526858-2	L2526858-3	L2526858-4	L2526858-5
Physical Tests									
Conductivity	uS/cm			917					
Hardness (as CaCO3)	mg/L			455					
pH	pH			7.4					
Total Suspended Solids	mg/L			<3.0					
Total Dissolved Solids	mg/L			682					
Anions and Nutrients									
Acidity (as CaCO3)	mg/L			2					
Alkalinity, Total (as CaCO3)	mg/L			240					
Ammonia, Total (as N)	mg/L			0.397					
Bromide (Br)	mg/L			0.65					
Chloride (Cl)	mg/L		31.6	33.4	36.6	37	38.8	7.99	40.8
Fluoride (F)	mg/L			0.183					
Nitrate (as N)	mg/L			<0.020					
Nitrite (as N)	mg/L			<0.010					
Total Kjeldahl Nitrogen	mg/L								
Orthophosphate (as PO)	mg/L			<0.0030					
Phosphorus (P)-Total	mg/L			<0.0030					
Sulphate (SO4)	mg/L			256					
Organic/Inorganic Carbon									
Dissolved Organic Carbon	mg/L			7.46					
Total Organic Carbon	mg/L								
Total Metals (compared with guideline values for compliance purpose									
Aluminum (Al)-Total	mg/L			0.0115					
Antimony (Sb)-Total	mg/L			0.00037					
Arsenic (As)-Total	mg/L			0.0046					
Barium (Ba)-Total	mg/L			0.0904					
Beryllium (Be)-Total	mg/L			0.00012					
Bismuth (Bi)-Total	mg/L			<0.000050					
Boron (B)-Total	mg/L			0.029					
Cadmium (Cd)-Total	mg/L			<0.0000050					
Calcium (Ca)-Total	mg/L			154					
Cesium (Cs)-Total	mg/L			0.000414					
Chromium (Cr)-Total	mg/L			0.00038					
Cobalt (Co)-Total	mg/L			0.00021					
Copper (Cu)-Total	mg/L			<0.00050					
Iron (Fe)-Total	mg/L			1.41					
Lead (Pb)-Total	mg/L			0.000226					
Lithium (Li)-Total	mg/L			0.0034					
Magnesium (Mg)-Total	mg/L			17.3					
Manganese (Mn)-Total	mg/L			0.517					
Mercury (Hg)-Total	mg/L)								
Molybdenum (Mo)-Total	mg/L			0.00237					
Nickel (Ni)-Total	mg/L			0.00157					
Phosphorus (P)-Total	mg/L			<0.050					
Potassium (K)-Total	mg/L			2.18					
Rubidium (Rb)-Total	mg/L			0.00287					
Selenium (Se)-Total	mg/L			0.000061					
Silicon (Si)-Total	mg/L			6.9					
Silver (Ag)-Total	mg/L			<0.000010					
Sodium (Na)-Total	mg/L			19.4					
Strontium (Sr)-Total	mg/L			3.8					
Sulfur (S)-Total	mg/L			92.7					
Tellurium (Te)-Total	mg/L			0.0002					
Thallium (Tl)-Total	mg/L			<0.000010					
Thorium (Th)-Total	mg/L			<0.00010					
Tin (Sn)-Total	mg/L			<0.00010					
Titanium (Ti)-Total	mg/L			<0.00051					
Tungsten (W)-Total	mg/L			0.00563					
Uranium (U)-Total	mg/L			0.000468					
Vanadium (V)-Total	mg/L			0.00149					
Zinc (Zn)-Total	mg/L			0.0214					
Zirconium (Zr)-Total	mg/L			0.00343					
Dissolved Metals (for modelling purposes)									
Aluminum (Al)-Dissolved	mg/L			0.0093					
Antimony (Sb)-Dissolved	mg/L			0.00037					
Arsenic (As)-Dissolved	mg/L			0.00445					
Barium (Ba)-Dissolved	mg/L			0.094					
Beryllium (Be)-Dissolved	mg/L			0.00014					
Bismuth (Bi)-Dissolved	mg/L			<0.000050					
Boron (B)-Dissolved	mg/L			0.025					
Cadmium (Cd)-Dissolved	mg/L			<0.0000050					
Calcium (Ca)-Dissolved	mg/L			154					
Cesium (Cs)-Dissolved	mg/L			0.000416					
Chromium (Cr)-Dissolved	mg/L			0.0004					
Cobalt (Co)-Dissolved	mg/L			0.00021					
Copper (Cu)-Dissolved	mg/L			<0.00020					
Iron (Fe)-Dissolved	mg/L			1.39					
Lead (Pb)-Dissolved	mg/L			0.000188					
Lithium (Li)-Dissolved	mg/L			0.0028					
Magnesium (Mg)-Dissolved	mg/L			17.1					
Manganese (Mn)-Dissolved	mg/L			0.506					
Mercury (Hg) - Dissolved	mg/L			<0.0000050					
Molybdenum (Mo)-Dissolved	mg/L			0.00238					
Nickel (Ni)-Dissolved	mg/L			0.00136					
Phosphorus (P)-Dissolved	mg/L			<0.050					
Potassium (K)-Dissolved	mg/L			2.15					
Rubidium (Rb)-Dissolved	mg/L			0.00289					
Selenium (Se)-Dissolved	mg/L			0.000177					
Silicon (Si)-Dissolved	mg/L			6.72					
Silver (Ag)-Dissolved	mg/L			<0.000010					
Sodium (Na)-Dissolved	mg/L			19.2					
Strontium (Sr)-Dissolved	mg/L			3.77					
Sulfur (S)-Dissolved	mg/L			88					
Tellurium (Te)-Dissolved	mg/L			0.00021					
Thallium (Tl)-Dissolved	mg/L			<0.000010					
Thorium (Th)-Dissolved	mg/L			<0.00010					
Tin (Sn)-Dissolved	mg/L			<0.00010					
Titanium (Ti)-Dissolved	mg/L			0.00044					
Tungsten (W)-Dissolved	mg/L			0.00541					
Uranium (U)-Dissolved	mg/L			0.000441					
Vanadium (V)-Dissolved	mg/L			0.00139					
Zinc (Zn)-Dissolved	mg/L			0.0211					
Zirconium (Zr)-Dissolved	mg/L			0.00332					
Speciated Metals									
Chromium (VI)-Dissolved	mg/L			<0.00050					
Chromium, Hexavalent	ug/L								
Methylmercury (as MeHg)-Total	ug/L								
Aggregate Organics									
Chemical Oxygen Demand	mg/L								

Table 7.2 General chemistry and metals data for groundwater samples collected during the long-term aquifer test (Page 3 of 4).

Parameter	Units	Client Sample ID	3134-AQ-SPW20-001-201104	3134-AQ-SMW20-001-101104	3134-AQ-SPW20-001-201105	3134-AQ-SPW20-001-201106	3134-AQ-SPW20-001-201107	3134-AQ-SPW20-001-201108	3134-AQ-SPW20-001-201109*
		Date Sampled	04-Nov-2020	04-Nov-2020	05-Nov-2020	06-Nov-2020	07-Nov-2020	08-Nov-2020	09-Nov-2020
		Time Sampled	09:19	10:31	15:33	15:08	14:20	14:45	09:19
		Media	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2526861-1	L2526890-2	L2527938-1	L2527938-2	L2527938-3	L2527938-4	L2527928-1
Physical Tests									
Conductivity	uS/cm		1040	1040					1050
Hardness (as CaCO3)	mg/L		480	479					526
pH	pH		7.97	7.93					7.99
Total Suspended Solids	mg/L		<3.0	<3.0					<3.0
Total Dissolved Solids	mg/L		741	731					757
Anions and Nutrients									
Acidity (as CaCO3)	mg/L		7.9	4.8					8.8
Alkalinity, Total (as CaCO3)	mg/L		242	243					242
Ammonia, Total (as N)	mg/L		0.366	0.32					0.461
Bromide (Br)	mg/L		0.72	0.78					0.83
Chloride (Cl)	mg/L		37.2	37	47.4	47	48.4	52.2	39.8
Fluoride (F)	mg/L		0.173	0.179					0.163
Nitrate (as N)	mg/L		<0.020	<0.020					<0.020
Nitrite (as N)	mg/L		<0.010	<0.010					<0.010
Total Kjeldahl Nitrogen	mg/L			0.567					
Orthophosphate (as PO)	mg/L		<0.0030	<0.0030					<0.0030
Phosphorus (P)-Total	mg/L		0.0052	0.0063					0.0058
Sulphate (SO4)	mg/L		266	268					254
Organic/Inorganic Carbon									
Dissolved Organic Carbon	mg/L		7.95	8.19					12.3
Total Organic Carbon	mg/L			8.4					
Total Metals (compared with guideline values for compliance purpose									
Aluminum (Al)-Total	mg/L		0.0109	0.0109					0.0161
Antimony (Sb)-Total	mg/L		0.00023	0.00023					0.0002
Arsenic (As)-Total	mg/L		0.00434	0.00448					0.00445
Barium (Ba)-Total	mg/L		0.0973	0.0989					0.106
Beryllium (Be)-Total	mg/L		<0.00010	0.00011					0.00014
Bismuth (Bi)-Total	mg/L		<0.000050	<0.000050					<0.000050
Boron (B)-Total	mg/L		0.031	0.031					0.033
Cadmium (Cd)-Total	mg/L		<0.0000050	<0.0000050					<0.0000050
Calcium (Ca)-Total	mg/L		170	168					179
Cesium (Cs)-Total	mg/L		0.00045	0.000449					0.000474
Chromium (Cr)-Total	mg/L		0.00044	0.0005					0.00044
Cobalt (Co)-Total	mg/L		0.00015	0.00015					0.00014
Copper (Cu)-Total	mg/L		<0.00050	<0.00050					<0.00050
Iron (Fe)-Total	mg/L		1.56	1.59					1.53
Lead (Pb)-Total	mg/L		0.00022	0.000241					0.000219
Lithium (Li)-Total	mg/L		0.0024	0.0025					0.0029
Magnesium (Mg)-Total	mg/L		17.5	17.8					19.3
Manganese (Mn)-Total	mg/L		0.503	0.5					0.504
Mercury (Hg)-Total	mg/L)			<0.0000050					
Molybdenum (Mo)-Total	mg/L		0.00231	0.00233					0.00218
Nickel (Ni)-Total	mg/L		0.00092	0.00097					0.00083
Phosphorus (P)-Total	mg/L		<0.050	<0.050					<0.050
Potassium (K)-Total	mg/L		2.25	2.36					2.39
Rubidium (Rb)-Total	mg/L		0.0029	0.00297					0.00302
Selenium (Se)-Total	mg/L		0.000094	0.00007					0.000055
Silicon (Si)-Total	mg/L		6.51	6.51					7.27
Silver (Ag)-Total	mg/L		<0.000010	<0.000010					0.000012
Sodium (Na)-Total	mg/L		22.6	23					24.6
Strontium (Sr)-Total	mg/L		4.35	4.32					4.69
Sulfur (S)-Total	mg/L		105	105					103
Tellurium (Te)-Total	mg/L		0.00028	0.00023					0.00042
Thallium (Tl)-Total	mg/L		<0.000010	<0.000010					<0.000010
Thorium (Th)-Total	mg/L		<0.00010	<0.00010					<0.00010
Tin (Sn)-Total	mg/L		<0.00010	<0.00010					<0.00010
Titanium (Ti)-Total	mg/L		0.00035	0.00039					<0.00063
Tungsten (W)-Total	mg/L		0.00453	0.00465					0.00471
Uranium (U)-Total	mg/L		0.000483	0.000481					0.000483
Vanadium (V)-Total	mg/L		0.00165	0.00169					0.00193
Zinc (Zn)-Total	mg/L		0.0038	0.0042					0.007
Zirconium (Zr)-Total	mg/L		0.00396	0.004					0.00427
Dissolved Metals (for modelling purposes)									
Aluminum (Al)-Dissolved	mg/L		0.0097	0.0092					0.0098
Antimony (Sb)-Dissolved	mg/L		0.00023	0.00021					0.00019
Arsenic (As)-Dissolved	mg/L		0.00421	0.00429					0.00414
Barium (Ba)-Dissolved	mg/L		0.0957	0.0959					0.104
Beryllium (Be)-Dissolved	mg/L		0.00013	0.00012					0.00014
Bismuth (Bi)-Dissolved	mg/L		<0.000050	<0.000050					<0.000050
Boron (B)-Dissolved	mg/L		0.029	0.029					0.032
Cadmium (Cd)-Dissolved	mg/L		<0.0000050	<0.0000050					<0.0000050
Calcium (Ca)-Dissolved	mg/L		163	163					179
Cesium (Cs)-Dissolved	mg/L		0.000432	0.000434					0.000471
Chromium (Cr)-Dissolved	mg/L		0.00041	0.00039					0.00038
Cobalt (Co)-Dissolved	mg/L		0.00014	0.00014					0.00013
Copper (Cu)-Dissolved	mg/L		<0.00020	<0.00020					<0.00020
Iron (Fe)-Dissolved	mg/L		1.52	1.49					1.49
Lead (Pb)-Dissolved	mg/L		0.000205	0.000197					0.000163
Lithium (Li)-Dissolved	mg/L		0.0028	0.0026					0.0036
Magnesium (Mg)-Dissolved	mg/L		17.5	17.5					19
Manganese (Mn)-Dissolved	mg/L		0.484	0.481					0.51
Mercury (Hg) - Dissolved	mg/L		<0.0000050	<0.0000050					<0.0000050
Molybdenum (Mo)-Dissolved	mg/L		0.00213	0.00216					0.00211
Nickel (Ni)-Dissolved	mg/L		0.00086	0.00088					0.00083
Phosphorus (P)-Dissolved	mg/L		<0.050	<0.050					<0.050
Potassium (K)-Dissolved	mg/L		2.28	2.2					2.48
Rubidium (Rb)-Dissolved	mg/L		0.00288	0.00288					0.003
Selenium (Se)-Dissolved	mg/L		0.000089	0.000072					<0.000050
Silicon (Si)-Dissolved	mg/L		6.28	6.22					7.41
Silver (Ag)-Dissolved	mg/L		<0.000010	<0.000010					<0.000010
Sodium (Na)-Dissolved	mg/L		21.5	21.4					24.8
Strontium (Sr)-Dissolved	mg/L		4.22	4.15					4.58
Sulfur (S)-Dissolved	mg/L		94.3	94.1					110
Tellurium (Te)-Dissolved	mg/L		<0.00020	<0.00020					<0.00020
Thallium (Tl)-Dissolved	mg/L		<0.000010	<0.000010					<0.000010
Thorium (Th)-Dissolved	mg/L		<0.00010	<0.00010					<0.00010
Tin (Sn)-Dissolved	mg/L		<0.00010	<0.00010					<0.00010
Titanium (Ti)-Dissolved	mg/L		0.00038	<0.00030					<0.00045
Tungsten (W)-Dissolved	mg/L		0.0045	0.00427					0.00453
Uranium (U)-Dissolved	mg/L		0.000454	0.000454					0.000497
Vanadium (V)-Dissolved	mg/L		0.00144	0.00144					0.00163
Zinc (Zn)-Dissolved	mg/L		0.0044	0.0047					0.0082
Zirconium (Zr)-Dissolved	mg/L		0.00373	0.00366					0.00411
Speciated Metals									
Chromium (VI)-Dissolved	mg/L		<0.00050	<0.00050					<0.00050
Chromium, Hexavalent	ug/L			<0.50					
Methylmercury (as MeHg)-Total	ug/L								
Aggregate Organics									
Chemical Oxygen Demand	mg/L			26					

Table 7.2 General chemistry and metals data for groundwater samples collected during the long-term aquifer test (Page 4 of 4).

Parameter	Units	Client Sample ID	3134-AQ-SPW20-001-201110	3134-AQ-SPW20-001-201111	3134-AQ-SPW20-001-201112	3134-AQ-SPW20-001-201113	3134-AQ-SPW20-001-201114	3134-AQ-SPW20-001-201115	3134-AQ-SPW20-001-201116
		Date Sampled	10-Nov-2020	11-Nov-2020	12-Nov-2020	13-Nov-2020	14-Nov-2020	15-Nov-2020	16-Nov-2020
		Time Sampled	15:50	14:42	14:07	14:07	14:30	14:15	11:40
		Media	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
		ALS Sample ID	L2532212-1	L2532212-2	L2532212-3	L2532212-4	L2532212-5	L2532212-6	L2532206-1
Physical Tests									
Conductivity	uS/cm								1090
Hardness (as CaCO3)	mg/L								526
pH	pH								7.57
Total Suspended Solids	mg/L								<3.0
Total Dissolved Solids	mg/L								825
Anions and Nutrients									
Acidity (as CaCO3)	mg/L								7.9
Alkalinity, Total (as CaCO3)	mg/L								239
Ammonia, Total (as N)	mg/L								0.372
Bromide (Br)	mg/L								0.91
Chloride (Cl)	mg/L		45.3	45.9	45.6	46.8	47.6	47.8	48.1
Fluoride (F)	mg/L								0.22
Nitrate (as N)	mg/L								<0.10
Nitrite (as N)	mg/L								<0.050
Total Kjeldahl Nitrogen	mg/L								
Orthophosphate (as PO)	mg/L								<0.0030
Phosphorus (P)-Total	mg/L								<0.0030
Sulphate (SO4)	mg/L								300
Organic/Inorganic Carbon									
Dissolved Organic Carbon	mg/L								7.94
Total Organic Carbon	mg/L								
Total Metals (compared with guideline values for compliance purpose									
Aluminum (Al)-Total	mg/L								0.0136
Antimony (Sb)-Total	mg/L								0.00017
Arsenic (As)-Total	mg/L								0.00399
Barium (Ba)-Total	mg/L								0.113
Beryllium (Be)-Total	mg/L								0.00013
Bismuth (Bi)-Total	mg/L								<0.000050
Boron (B)-Total	mg/L								0.038
Cadmium (Cd)-Total	mg/L								<0.0000050
Calcium (Ca)-Total	mg/L								186
Cesium (Cs)-Total	mg/L								0.000476
Chromium (Cr)-Total	mg/L								0.00042
Cobalt (Co)-Total	mg/L								0.00011
Copper (Cu)-Total	mg/L								<0.00050
Iron (Fe)-Total	mg/L								1.65
Lead (Pb)-Total	mg/L								0.000219
Lithium (Li)-Total	mg/L								0.0035
Magnesium (Mg)-Total	mg/L								18.5
Manganese (Mn)-Total	mg/L								0.482
Mercury (Hg)-Total	mg/L)								
Molybdenum (Mo)-Total	mg/L								0.00191
Nickel (Ni)-Total	mg/L								0.00067
Phosphorus (P)-Total	mg/L								<0.050
Potassium (K)-Total	mg/L								2.49
Rubidium (Rb)-Total	mg/L								0.0031
Selenium (Se)-Total	mg/L								<0.000050
Silicon (Si)-Total	mg/L								6.87
Silver (Ag)-Total	mg/L								<0.000010
Sodium (Na)-Total	mg/L								25.9
Strontium (Sr)-Total	mg/L								4.77
Sulfur (S)-Total	mg/L								105
Tellurium (Te)-Total	mg/L								0.00022
Thallium (Tl)-Total	mg/L								<0.000010
Thorium (Th)-Total	mg/L								<0.00010
Tin (Sn)-Total	mg/L								<0.00010
Titanium (Ti)-Total	mg/L								<0.00060
Tungsten (W)-Total	mg/L								0.00421
Uranium (U)-Total	mg/L								0.000484
Vanadium (V)-Total	mg/L								0.00165
Zinc (Zn)-Total	mg/L								0.0055
Zirconium (Zr)-Total	mg/L								0.00434
Dissolved Metals (for modelling purposes)									
Aluminum (Al)-Dissolved	mg/L								0.0104
Antimony (Sb)-Dissolved	mg/L								0.00016
Arsenic (As)-Dissolved	mg/L								0.00387
Barium (Ba)-Dissolved	mg/L								0.115
Beryllium (Be)-Dissolved	mg/L								0.00014
Bismuth (Bi)-Dissolved	mg/L								<0.000050
Boron (B)-Dissolved	mg/L								0.033
Cadmium (Cd)-Dissolved	mg/L								<0.0000050
Calcium (Ca)-Dissolved	mg/L								179
Cesium (Cs)-Dissolved	mg/L								0.000461
Chromium (Cr)-Dissolved	mg/L								0.00042
Cobalt (Co)-Dissolved	mg/L								0.00011
Copper (Cu)-Dissolved	mg/L								<0.00020
Iron (Fe)-Dissolved	mg/L								1.65
Lead (Pb)-Dissolved	mg/L								0.000192
Lithium (Li)-Dissolved	mg/L								0.0027
Magnesium (Mg)-Dissolved	mg/L								19.3
Manganese (Mn)-Dissolved	mg/L								0.502
Mercury (Hg) - Dissolved	mg/L								<0.0000050
Molybdenum (Mo)-Dissolved	mg/L								0.00185
Nickel (Ni)-Dissolved	mg/L								0.00068
Phosphorus (P)-Dissolved	mg/L								<0.050
Potassium (K)-Dissolved	mg/L								2.39
Rubidium (Rb)-Dissolved	mg/L								0.00289
Selenium (Se)-Dissolved	mg/L								<0.000050
Silicon (Si)-Dissolved	mg/L								6.85
Silver (Ag)-Dissolved	mg/L								<0.000010
Sodium (Na)-Dissolved	mg/L								27.4
Strontium (Sr)-Dissolved	mg/L								4.85
Sulfur (S)-Dissolved	mg/L								99.3
Tellurium (Te)-Dissolved	mg/L								<0.00020
Thallium (Tl)-Dissolved	mg/L								<0.000010
Thorium (Th)-Dissolved	mg/L								<0.00010
Tin (Sn)-Dissolved	mg/L								<0.00010
Titanium (Ti)-Dissolved	mg/L								0.00044
Tungsten (W)-Dissolved	mg/L								0.00402
Uranium (U)-Dissolved	mg/L								0.000477
Vanadium (V)-Dissolved	mg/L								0.00157
Zinc (Zn)-Dissolved	mg/L								0.0049
Zirconium (Zr)-Dissolved	mg/L								0.00399
Speciated Metals									
Chromium (VI)-Dissolved	mg/L								<0.00050
Chromium, Hexavalent	ug/L								
Methylmercury (as MeHg)-Total	ug/L								
Aggregate Organics									
Chemical Oxygen Demand	mg/L								

Table 7.3 Major ion concentrations and summary of groundwater classifications for samples collected from SPW20-001 during the long-term aquifer test.

Sample ID	**Date**	**Ca**	**Mg**	**Na**	**K**	**Cl**	**SO4**	**HCO3**	**TDS**	**Calcite Saturation**	**Classification**
		(mg/L)									
SPW20-001-201018	18-Oct-20	89.3	16.8	2.34	1.77	0.55	42.1	328	338	-0.06	Ca-Mg-HCO_3
SPW20-001-201019	19-Oct-20	98.7	15.8	4.38	1.68	5.62	93.2	346	401	-0.23	Ca-HCO_3-SO_4
SPW20-001-201020	20-Oct-20	110	16.2	8.35	1.80	11.7	123	319	486	-0.25	Ca-HCO_3-SO_4
SPW20-001-201021	21-Oct-21	128	17.1	11.5	1.98	17.1	157	317	529	0.03	Ca-HCO_3-SO_4
SPW20-001-201024	24-Oct-21	130	16.6	14.5	2.05	23.3	191	302	610	0.17	Ca-HCO_3-SO_4
SPW20-001-201029	29-Oct-21	154	17.1	19.2	2.15	33.4	256	293	682	0.09	Ca-SO_4-HCO3
SPW20-001-201104	4-Nov-21	163	17.5	21.5	2.28	37.2	266	295	741	0.04	Ca-SO_4-HCO3
SPW20-001-201109	9-Nov-21	179	19.0	24.8	2.48	39.8	254	295	757	0.30	Ca-HCO_3-SO_4
SPW20-001-201116	16-Nov-21	179	19.3	27.4	2.39	48.1	300	291	825	0.29	Ca-SO_4-HCO3

Note: If the Calcite Saturation Index is negative, calcite is unlikely to be precipitating. If that index is positive, calcite precipitation is likely.

Table 7.4 Stable isotope concentrations in groundwater and lake water from the long-term aquifer test.

Sample	**Date**	**Lab ID**	**$\delta^{18}O$ ($^{o}/_{oo}$)**		**$\delta^{2}H$ ($^{o}/_{oo}$)**	
	(mm/dd/yyy)		Result	Repeat	Result	Repeat
3134-AQ-SPW20-001-201029	10/29/2020	447194	-14.25	-14.18	-106.22	-105.52
3134-AQ-SPW20-001-201104	11/6/2020	447195	-14.54		-106.52	
3134-AQ-SPW20-001-201109	11/9/2020	447196	-14.55	-14.56	-107.17	-107.39
3134-AQ-SPW20-001-201116	11/16/2020	447197	-14.89		-108.10	
3134-AQ-Lake2-201118	11/18/2020	447198	-9.46	-9.33	-81.22	-80.94

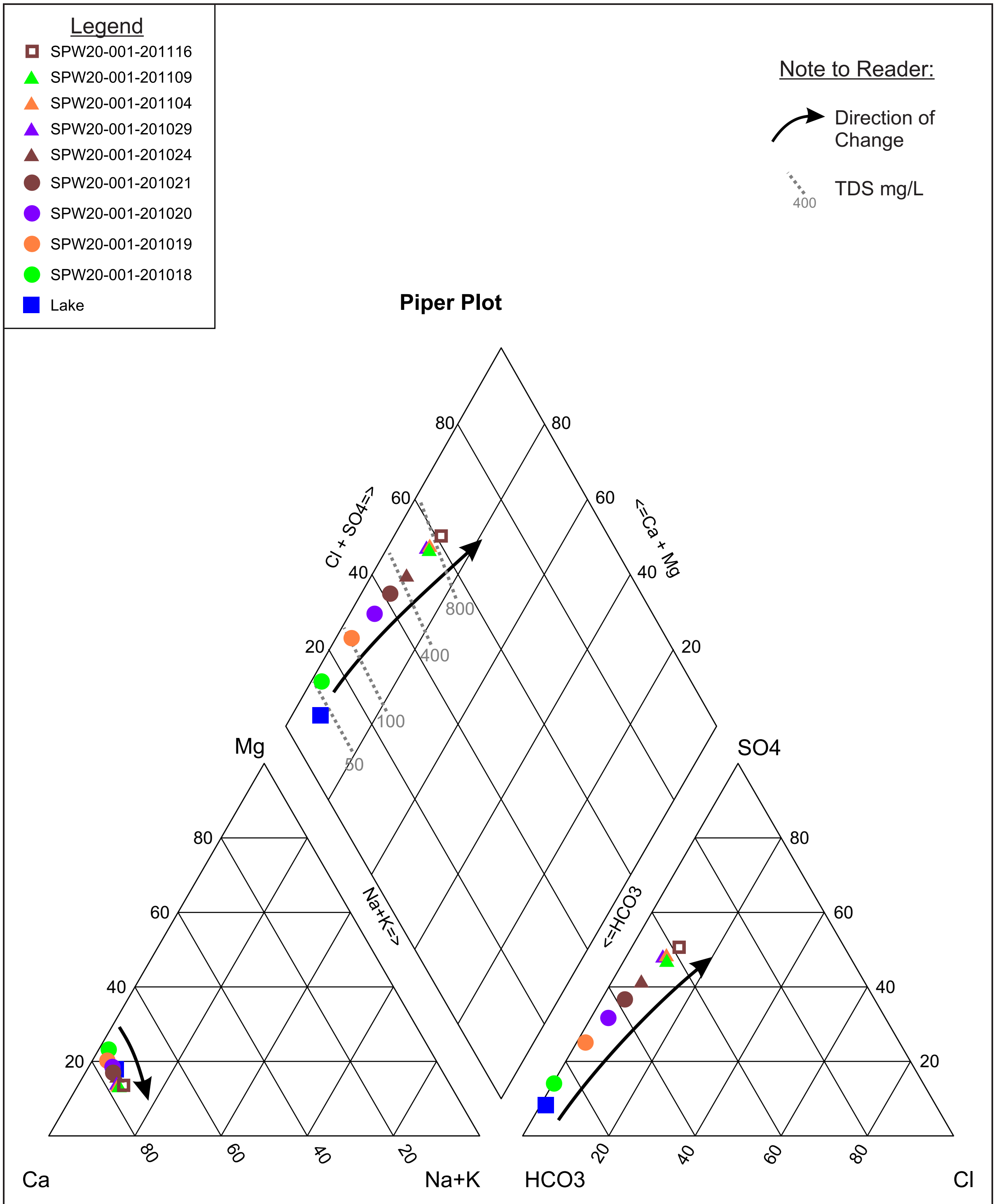


Figure 7.1 Trilinear plot showing groundwater chemistry from the long-term aquifer test.

Project No.
3134

Document Reference
FFC-NL-3134-002

Location
Springpole, ON

Date
February 2021

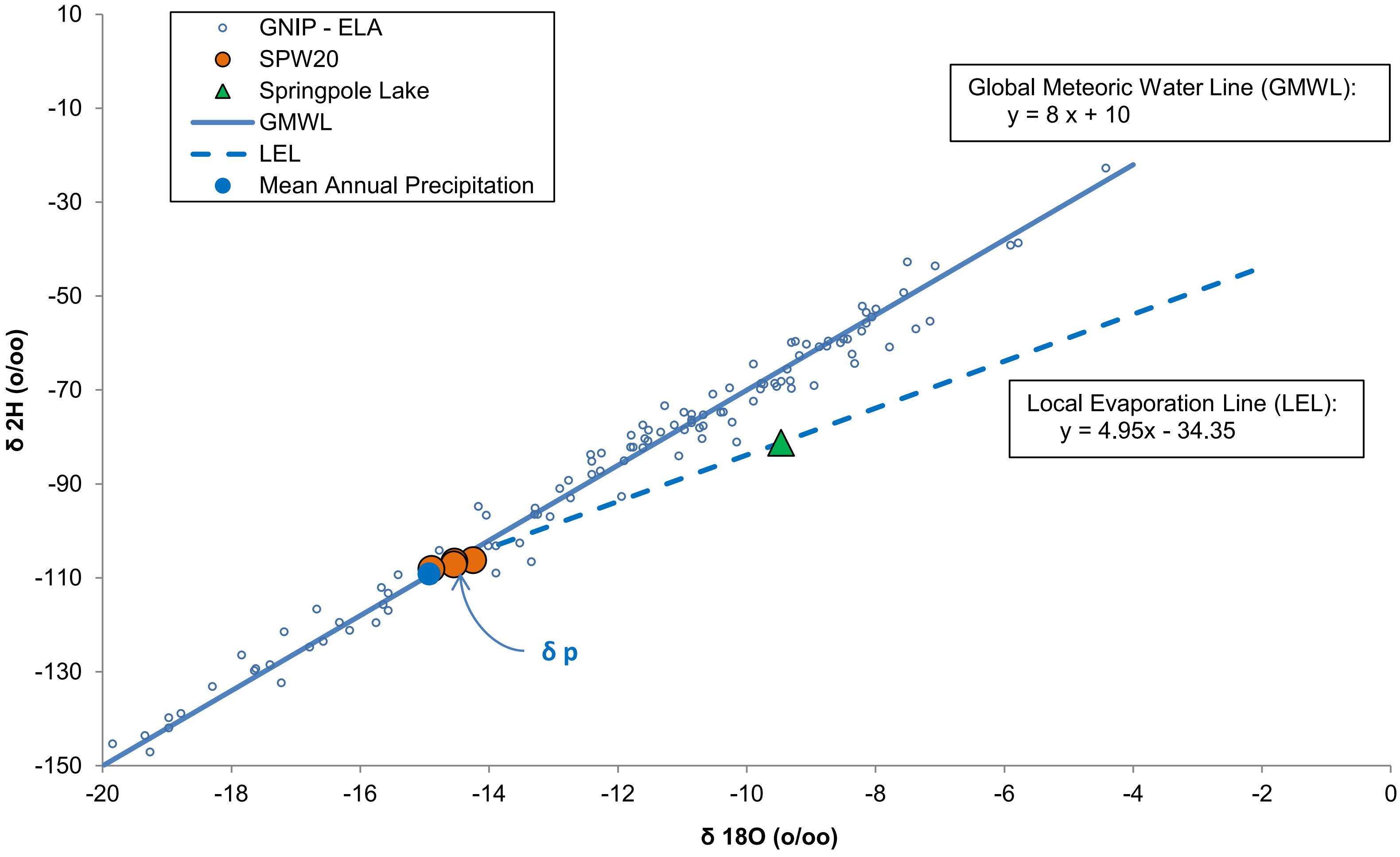


Figure 7.2 Isotopic composition of groundwater from the long-term aquifer test relative to Springpole Lake, GMWL, and LEL.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

FFC

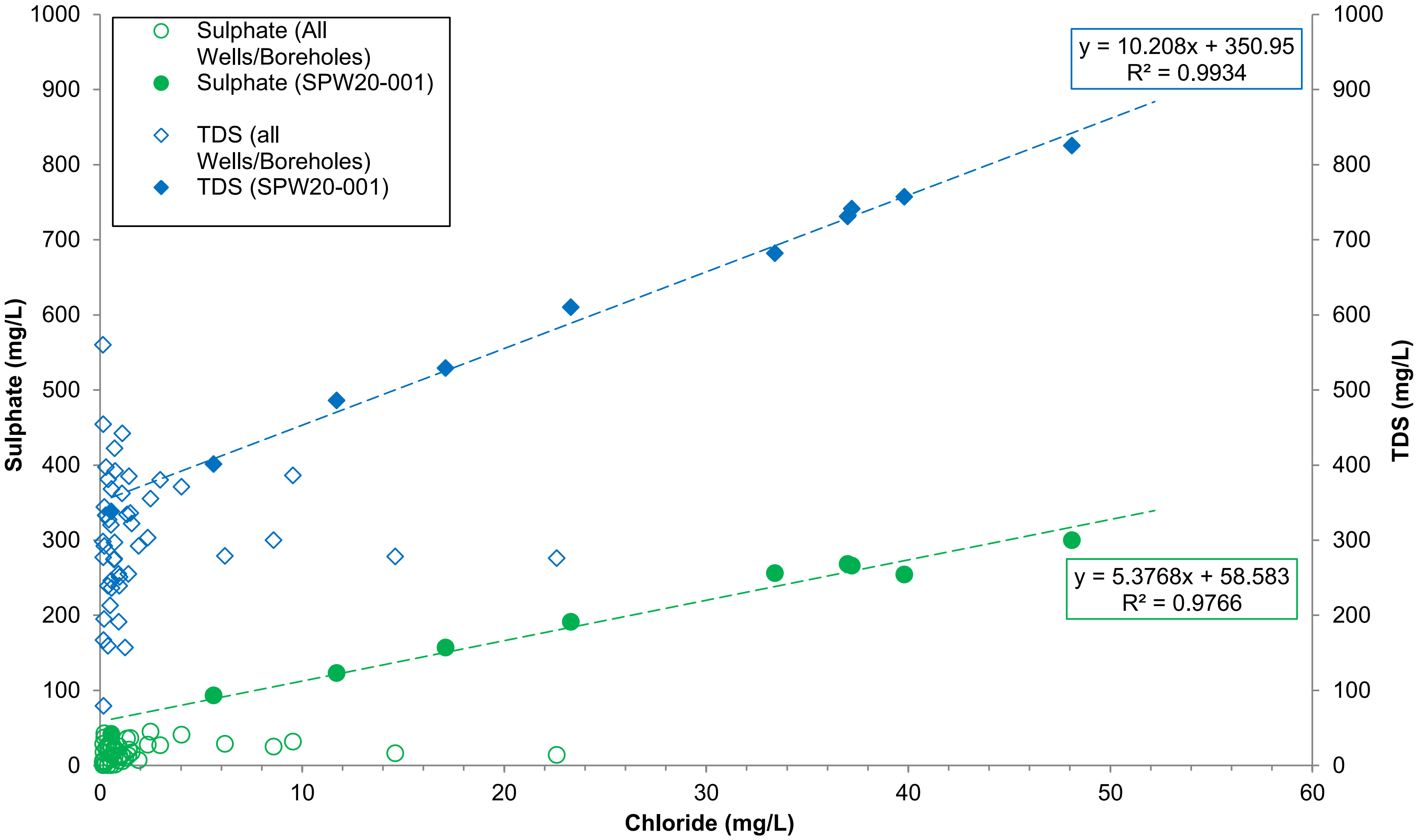


Figure 7.3 Chloride versus sulphate and total dissolved solids in groundwater samples from SPW20-001 during the long-term aquifer test.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	Date
Springpole, ON	February 2021

FFC

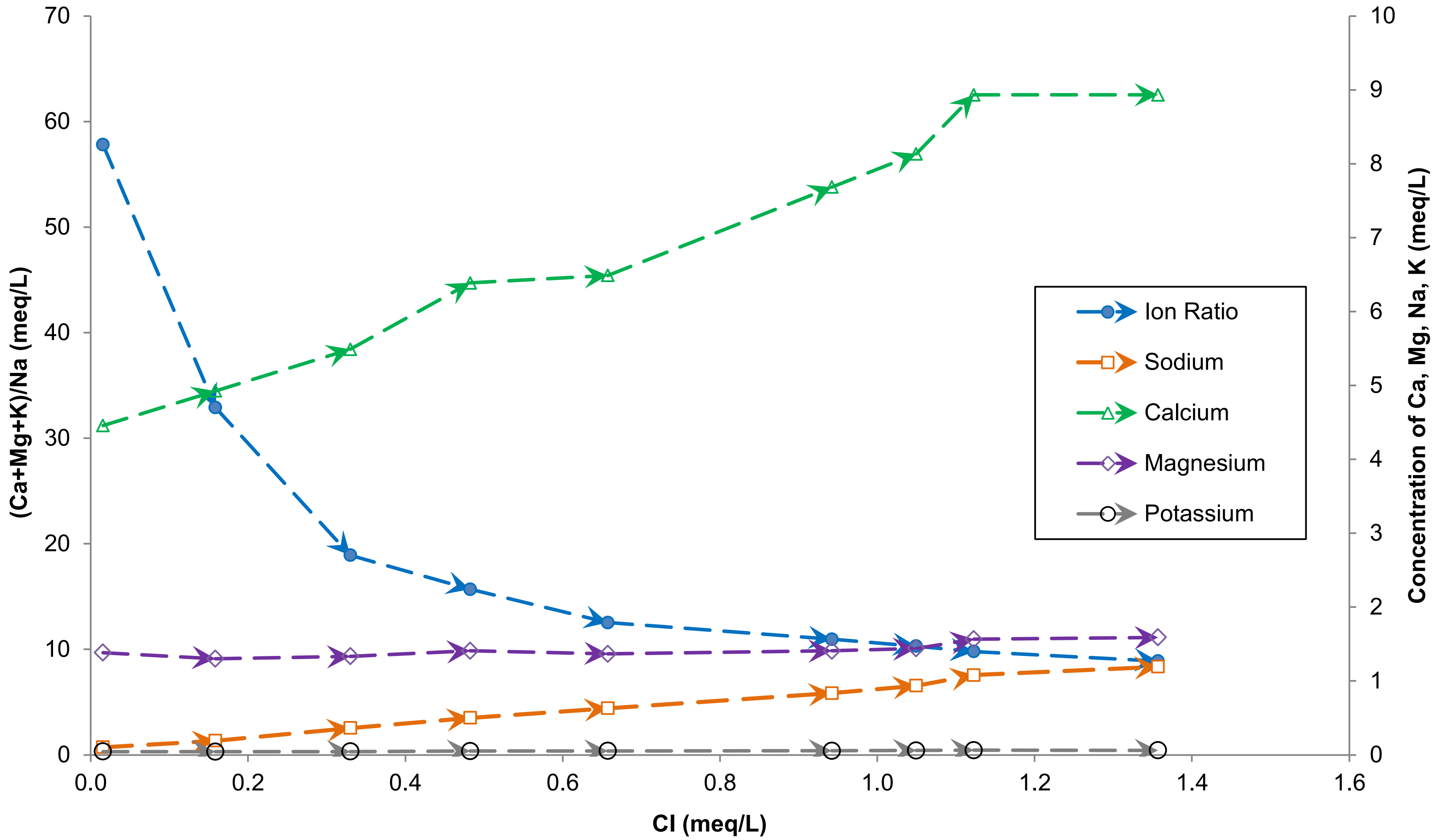


Figure 7.4 Major cation concentrations and ratio of (Ca+Mg+K)/Na relative to chloride during the long-term aquifer test at SPW20-001.

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	**Date**
Springpole, ON	February 2021

FFC

8.0 SUMMARY

The Springpole Lake project site is surrounded by large lakes, primarily Birch Lake to the east, north and west and, once the cofferdams are in place and the open pit section of the lake has been dewatered, the southern boundary of the mining operation will be formed by Springpole Lake. The starter open pit and the main open pit will create a deep (approximately 350 m) groundwater sink and the drawdown cone from the open pit and any dewatering wells that may be constructed is expected to extend horizontally to Birch Lake on the northwest end of the open pit and to the cofferdam and island sections that will form the boundary for the southern part of Springpole Lake. In addition, the drawdown cone will extend into the fractured bedrock both on the northeast side of the open pits and into the southwest side of the main open pit where the mine rock and mine tailings storage area is expected to be located.

The geotechnical program confirmed that the Springpole Lake Project site is characterized by overburden, with variable thickness, over fractured bedrock. Overall, all areas of the project site have very low relief with the difference in elevation of the landmass that is located between Springpole Lake and Birch Lake not exceeding 25 to 30 m. The project site area is characterized by a series of rolling hills with intervening depressions. The depressions have relatively thick overburden up to at least 5 m thick and the overburden on the high ground generally ranges from exposed bedrock to a metre or so of organic and granular cover. The water table is close to the surface in the depressions but can be up to 2.56 m or more below ground surface on the high ground. The water table data are essential to calibration of a 3D numerical flow and transport model where the topographic detail can be included in the model mesh.

Based on the low relief within and around the Springpole Lake Project site, the shallow groundwater flow system is characterized by a number of small recharge areas (the elevated areas) and adjacent discharge areas (the adjacent depressions) producing a shallow to intermediate groundwater flow system that interacts with the small surface water drainage basins and the larger lakes. Recharge to the deeper groundwater flow system is considered to be limited. The deeper groundwater flow system is considered to be relatively stagnant with low groundwater gradients (estimated at <0.0001) and low groundwater velocities (estimated at <0.00001 m/day) that are typical of low to moderate permeability regional bedrock flow systems. Excavation and dewatering of the proposed open pit will have a significant but temporary impact on both the shallow and the deep groundwater flow system baseline conditions but with the deep flow system being re-established as the pit lake is flooded at the end of mining.

Near surface fractured bedrock normally has a porosity of less than 1% while overburden materials generally have porosities that range from 20% to 40% or more. However, fractured bedrock has a wide range of hydraulic conductivity values when compared to a typical layer of granular overburden, and the regularly-fractured bedrock normally exhibits a logarithmic decrease in permeability with depth below the ground surface. For the bedrock in the immediate project area, the rock matrix has very low permeability. The rock mass permeability at this site is contributed by the fracture or discontinuity system and the focus of this hydrogeology program was on characterizing the geometrical and hydraulic properties of the fracture system.

The fracture geometry was assessed by conducting Acoustic Televiewer (AT) surveys in 21 old exploration boreholes and in 11 dedicated hydrogeology-pit wall stability (SGH) boreholes. All of the boreholes were inclined except for one 400 m deep vertical borehole that was constructed for a long-term aquifer test. The AT data confirmed that the dominant fracture set had a northwest to southeast strike and dipped to the north-northeast. A less dominant fracture set has a northeast to southwest strike and a near vertical dip. A sub-horizontal fracture set is present throughout the project site.

The SGH core logs and AT logs identified a number of large scale structures in the form of borehole intersections of highly-fractured to intensely-fractured rock, confirming that the project site is cut by a number of fracture or shear zones that are expected to be zones of high permeability, based on the borehole packer injection test data. The extent and orientation of those large-scale features have not been determined but are assumed to have primarily a northwest to southeast trend based on the assumption that the large scale structures mimic the orientation of the small scale structures.

The permeability of the fracture system across the project site was assessed by conducting air-lift tests, and several sets of borehole packer injection tests. The air-lift hydraulic conductivities varied by approximately three orders of magnitude, since the open hole air-lift test averaged the data over the full length of the borehole. The hydraulic conductivity values from the packer injection tests varied over approximately five orders of magnitude since the tests were conducted over specific sections of each borehole rather than the entire borehole. The packer tests, while exhibiting some degree of censoring and truncation in the data distribution, confirmed that high permeability zones do exist within the rock mass around the proposed open pit but that overall the rock mass has a moderate permeability.

The rock mass permeability was further assessed by conducting a long-term (30-day) aquifer test that demonstrated that the rock mass permeability is highly anisotropic as would be expected given the dominance of the northwest-southeast trending facture set. This permeability anisotropy is expected to produce a highly elliptical northwest to southeast trending drawdown cone when the open pit is being dewatered.

Groundwater samples were collected from a number of monitoring wells and boreholes to determine if there was any significant degree of spatial and temporal variability in groundwater quality across the Springpole Lake Project site, and to try and relate any such variability to the geology and the characteristics of the flow system. Most intermediate to deep groundwater samples from boreholes that were completed in the fractured-bedrock were alkaline in nature, while samples collected from shallow borehole depths and from overburden wells were slightly acidic to near neutral. Groundwater samples were classified as either calcium-bicarbonate (Ca-HCO_3) type or calcium-magnesium-bicarbonate (Ca-Mg-HCO_3) type, having total dissolved solids (TDS) concentrations between 157 mg/L and 1,360 mg/L. The majority of groundwater samples collected were either saturated or supersaturated with respect to calcite. Carbonatites and secondary carbonate mineralization on fracture planes, and in vesicles of amygdaloidal volcanics and volcanic breccia would be the most reactive and most probable sources of calcium and bicarbonate.

The orebody at the Springpole Lake Project site consists of zones of disseminated pyrite and arsenopyrite within variably developed stockworks that are surrounded by intensely altered wall rocks. The interaction of those sulphides with groundwater has generated significant concentrations of sulphate as well as dissolved arsenic, dissolved iron and other heavy metals in some groundwater samples. Elevated concentrations of dissolved zinc in some groundwater samples suggested the presence of sphalerite in association with pyrite and arsenopyrite. Trace concentrations of silver may be associated with rocks such as trachyte, which have an alkalic affinity. While the groundwater has been shown to be oxidizing in nature, based on the presence of dissolved oxygen and positive values of Eh, sulphide oxidation creates low pH conditions that were not widely observed in Springpole groundwater samples. The alkaline nature of most groundwater samples from Springpole suggests that any acidification generated by sulphide oxidation within the existing, natural flow system may be neutralized by concomitant dissolution of carbonate mineralogy. The situation with mined and crushed rock may be very different.

Groundwater samples were collected daily from the discharge water at SPW20-001 during the long-term aquifer test. Groundwater evolved during the test from a calcium-magnesium-bicarbonate ($Ca-Mg-HCO_3$) type in early-time, to a calcium-bicarbonate-sulphate ($Ca-HCO_3-SO_4$) type, and then a calcium-sulphate-bicarbonate ($Ca-SO_4-HCO_3$) type in late-time. Measured TDS increased from 338 mg/L to 825 mg/L. During the aquifer test, calcium increased from 89.3 mg/L to 179 mg/L, sulphate increased from 42 mg/L to 300 mg/L, and chloride increased from not detected (<0.55 mg/L) to 48.1 mg/L.

Analysis of the packer test data demonstrated that the flow into the Test Well could be distributed over five zones based on the packer injection test data with the zone at the bottom of the 400 m deep borehole only contributing approximately 3 L/min to the 166.5 L/min pump discharge. Assuming that the Chloride measured in the pump discharge originated from below the bottom of the Test Well, a dilution factor of 55.5 was calculated. This analysis suggests that the groundwater immediately bellow the bottom of the Test Well that is pulled into the Test well through a fracture zone by a 20 m drawdown had a Chloride concentration of approximately 2,645 mg/L after 30 days of pumping the Test Well.

Stable isotopic data confirm that the origin of groundwater produced in late-time, during the long-term aquifer test, was meteoric water derived from natural groundwater recharge, with little or no contributions from evaporated lake water. Samples from SPW20-001, plotted in trilinear space, defined a continuum between a $Ca-HCO_3$ type groundwater and a $Ca-Mg-SO_4-HCO_3$ type groundwater as the dominant end members. TDS increased along that continuum, suggesting mixing between a shallow groundwater source and a deep groundwater source. The mixing process may not have been chemically conservative. Olfactory evidence of the presence of hydrogen sulphide (H_2S) after the first 14 days of pumping provided strong, albeit qualitative evidence for sulphate reduction to have occurred in the subsurface aqueous environment.

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APPENDIX A

Geotechnical Data and GPR Profiles from the Tailings Management Area

Project: Springpole Lake Geotech

Client: First Mining Gold

Location: Springpole Lake, ON

Log of Monitoring Well: B000

Project No: 3134

Date: September 29, 2019

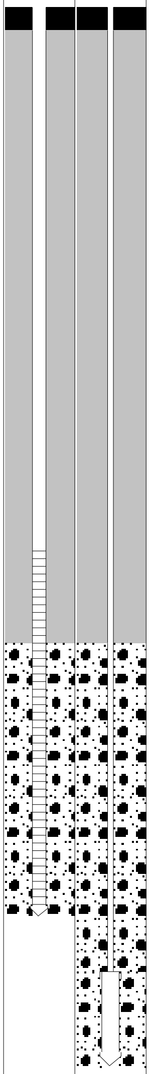
SUBSURFACE PROFILE

Geologic Description	Elevation (m)
Ground Surface (GS)	0
Peat/bog	-2.64
Peat/bog interface with granular bottom Silt/clay with small snail shells	-3.04
Grey highly consolidated sand and silt/clay	-3.88
Assumed grey highly consolidated sand and silt/clay	-4.4
End of Borehole	

SAMPLE

Standard Penetration Test "N" Value per 300 mm

20 60



Well Description

WL 0.11 m AGS in DP
WL 0.0 m BGS in MW

Bentonite packing from 0 to 0.1 m

Native peat/bog packing from 0 m to 2.64 m

DP: 0.01 m dia. Waterra tube from 0.91 m AGS to 3.99 m (0.03 m dia. pipe installed as well head protector)

MW: 0.03 m dia. Riser from 0.74 m AGS to 2.26 m

MW: 0.03 m dia. Screen from 2.26 m to 3.76 m

Native sand packing from 2.64 m to 4.39 m

Screw-on pointed end cap

Drive-point from 3.99 m to 4.39 m

Fracflow Consultants Inc.
154 Major's Path
St. John's, NL A1A 5A1
Phone: (709) 739-7270
Fax: (709) 753-5101

Drilling Method: Hand Augering and Drive-point Piezometer

Driller: Fracflow Consultants Inc.

Datum: Geodetic

Sheet: 1 of 1

Project: Springpole Lake Geotech

Client: First Mining Gold

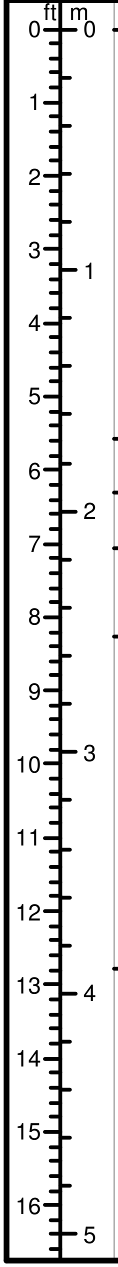
Location: Springpole Lake, ON

Log of Monitoring Well: E080

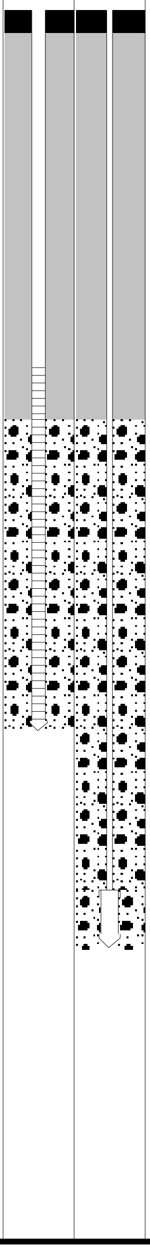
Project No: 3134

Date: September 29, 2019

SUBSURFACE PROFILE				SAMPLE					
Depth	Symbol	Geologic Description	Elevation (m)	Sample Type	Sample Sequence	"N" Value	Recovery (%)	% Fines	Standard Penetration Test "N" Value per 300 mm 20 60
		Ground Surface (GS)	0						
		Peat/bog with some roots	-1.7						
		Soil and peat/bog interface	-1.92						
		Medium grey sand	-2.15						
		Coarse grey sand	-2.52						
		Fine grey sand	-3.9						
		End of Borehole							



Monitoring Well (MW) | Drive-point (DP)



Well Description

WL 0.0 m BGS in MW
WL 0.11 m AGS in DP

Bentonite packing from 0 to 0.1 m

Native peat/bog packing from 0 m to 1.70 m

DP: 0.01 m dia. Waterra tube from 0.94 m AGS to 3.65 m (0.03 m dia. pipe installed as well head protector)

MW: 0.03 m dia. Riser from 0.82 m AGS to 1.48 m

MW: 0.03 m dia. Screen from 1.48 m to 2.98 m

Native sand packing from 1.70 m to 3.90 m

Screw-on pointed end cap

Drive-point from 3.65 m to 3.90 m

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Phone: (709) 739-7270
Fax: (709) 753-5101

Drilling Method: Hand Augering and Drive-point Piezometer

Driller: Fracflow Consultants Inc.

Datum: Geodetic

Sheet: 1 of 1

Project: Springpole Lake Geotech

Client: First Mining Gold

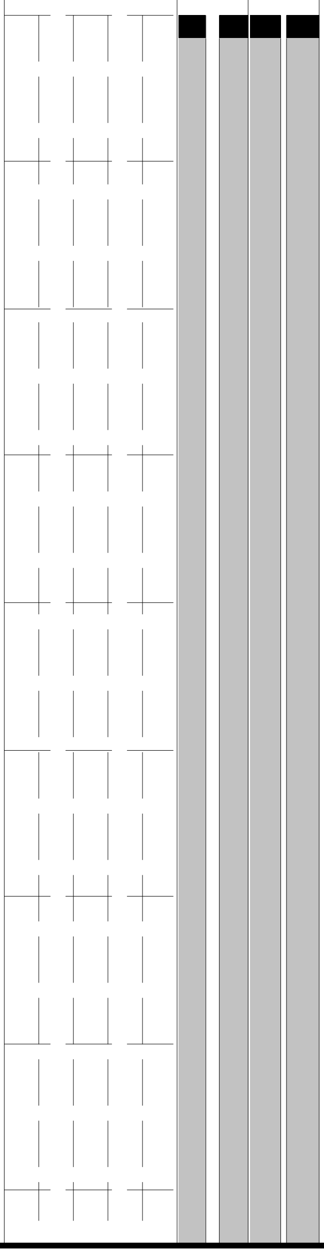
Location: Springpole Lake, ON

Log of Monitoring Well: G002

Project No: 3134

Date: September 28-29, 2019

SUBSURFACE PROFILE				SAMPLE								
Depth (ft / m)	Symbol	Geologic Description	Elevation (m)	Sample Type	Sample Sequence	"N" Value	Recovery (%)	% Fines	Standard Penetration Test "N" Value per 300 mm (20, 60)	Monitoring Well (MW)	Drive-point (DP)	Well Description
0 ft / 0 m		Ground Surface (GS)	0									Bentonite packing from 0 to 0.1 m
0–16 ft / 0–5 m		Peat/bog No Recovery										Native peat/bog packing from 0 m to 8.50 m DP: 0.01 m dia. Waterra tube from 0.59 m AGS to 8.90 m (0.03 m dia. Pipe installed as well head protector) ▼ WL 2.19 m BGS in DP MW: 0.03 m dia. Riser from 0.54 AGS m to 6.96 m
5 m			-5									



Fracflow Consultants Inc.
154 Major's Path
St. John's, NL A1A 5A1
Phone: (709) 739-7270
Fax: (709) 753-5101

Drilling Method: Hand Augering and Drive-point Piezometer

Driller: Fracflow Consultants Inc.

Datum: Geodetic

Sheet: 1 of 2

Project: Springpole Lake Geotech

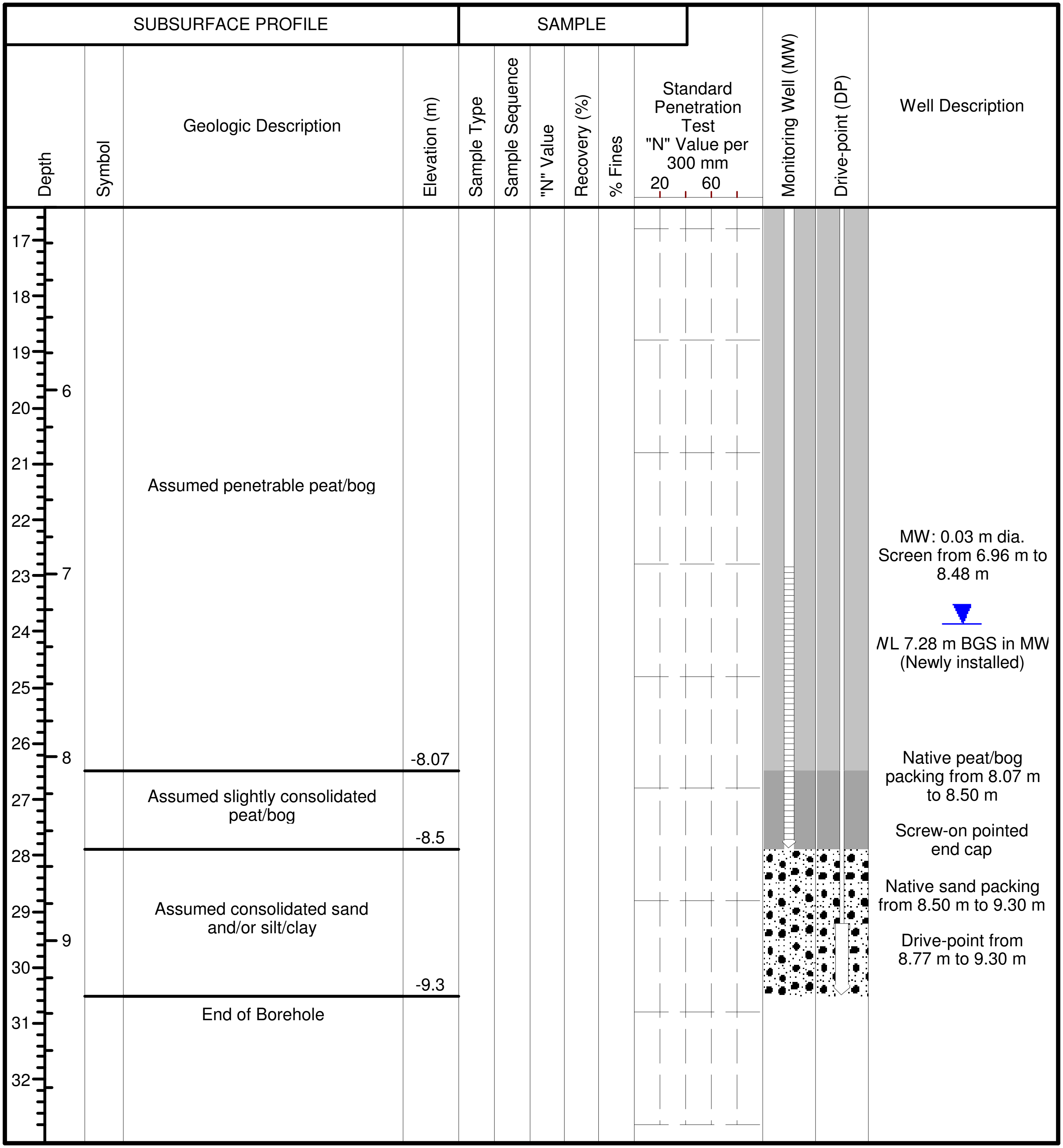
Client: First Mining Gold

Location: Springpole Lake, ON

Log of Monitoring Well: G002

Project No: 3134

Date: September 28-29, 2019



Geologic Description	Elevation (m)
Assumed penetrable peat/bog	-8.07
Assumed slightly consolidated peat/bog	-8.5
Assumed consolidated sand and/or silt/clay	-9.3
End of Borehole	

Well Description

MW: 0.03 m dia.
Screen from 6.96 m to 8.48 m

WL 7.28 m BGS in MW
(Newly installed)

Native peat/bog packing from 8.07 m to 8.50 m

Screw-on pointed end cap

Native sand packing from 8.50 m to 9.30 m

Drive-point from 8.77 m to 9.30 m

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Phone: (709) 739-7270
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Drilling Method: Hand Augering and Drive-point Piezometer

Driller: Fracflow Consultants Inc.

Datum: Geodetic

Sheet: 2 of 2

Project: Springpole Lake Geotech

Client: First Mining Gold

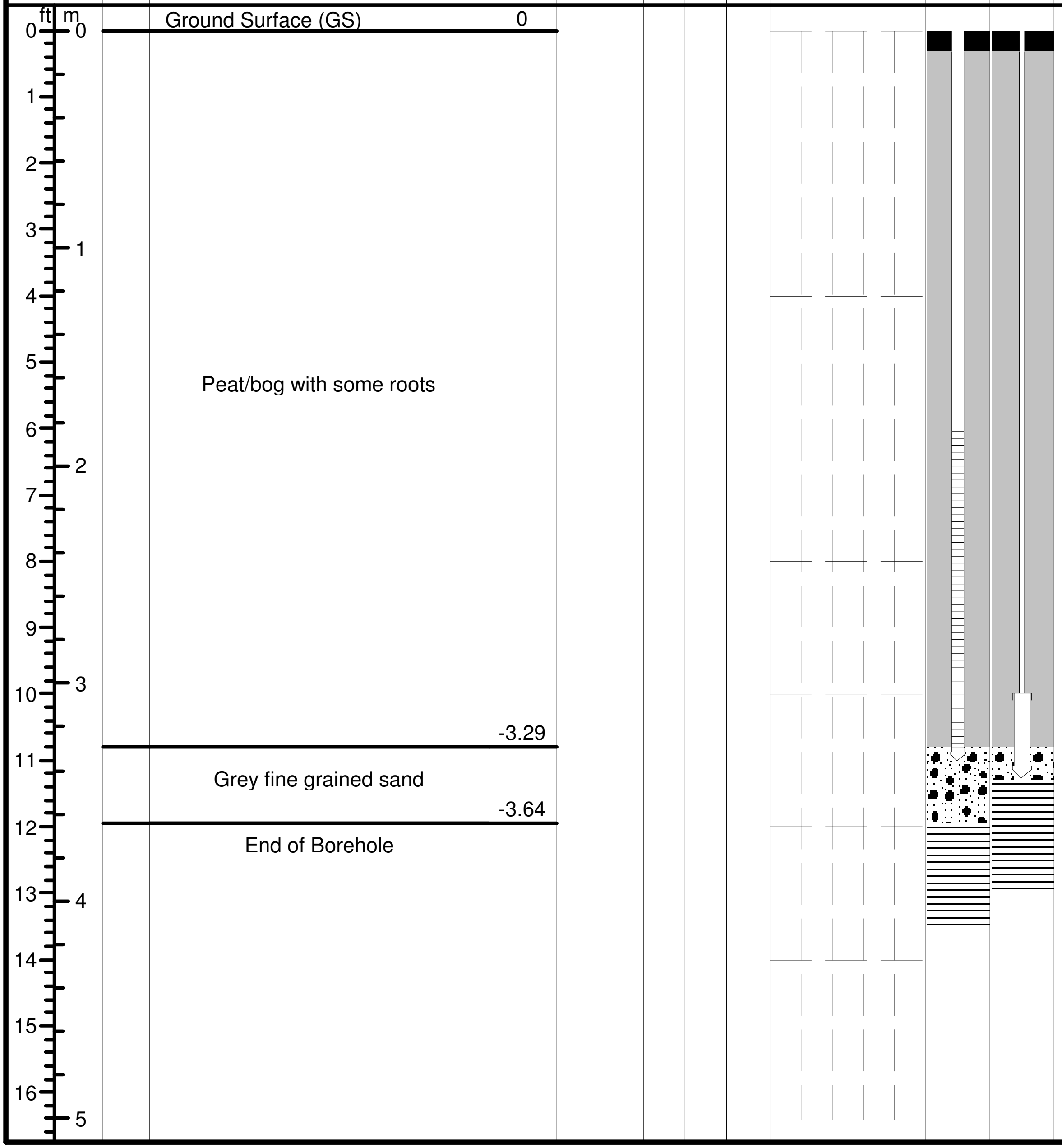
Location: Springpole Lake, ON

Log of Monitoring Well: G106

Project No: 3134

Date: September 28, 2019

SUBSURFACE PROFILE				SAMPLE								
Depth (ft / m)	Symbol	Geologic Description	Elevation (m)	Sample Type	Sample Sequence	"N" Value	Recovery (%)	% Fines	Standard Penetration Test "N" Value per 300 mm (20, 60)	Monitoring Well (MW)	Drive-point (DP)	Well Description
0		Ground Surface (GS)	0									Bentonite packing from 0 to 0.1 m WL 0.32 m BGS in MW Native peat/bog packing from 0 m to 3.29 m DP: 0.01 m dia. Waterra tube from 0.80 m AGS to 3.04 m (0.03 m dia. Pipe installed as well head protector) MW: 0.03 m dia. Riser from 1.15 m AGS to 1.85 m MW: 0.03 m dia. Screen from 1.85 m to 3.35 m Drive-point from 3.04 m to 3.44 m WL 3.05 m BGS in DP
		Peat/bog with some roots										
		Grey fine grained sand	-3.29									Screw-on pointed end cap Native sand packing from 3.29 to bottom Hard material encountered at 3.44 m and 3.64 m
		End of Borehole	-3.64									



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Drilling Method: Hand Augering and Drive-point Piezometer

Driller: Fracflow Consultants Inc.

Datum: Geodetic

Sheet: 1 of 1

Project: Springpole Lake Geotech

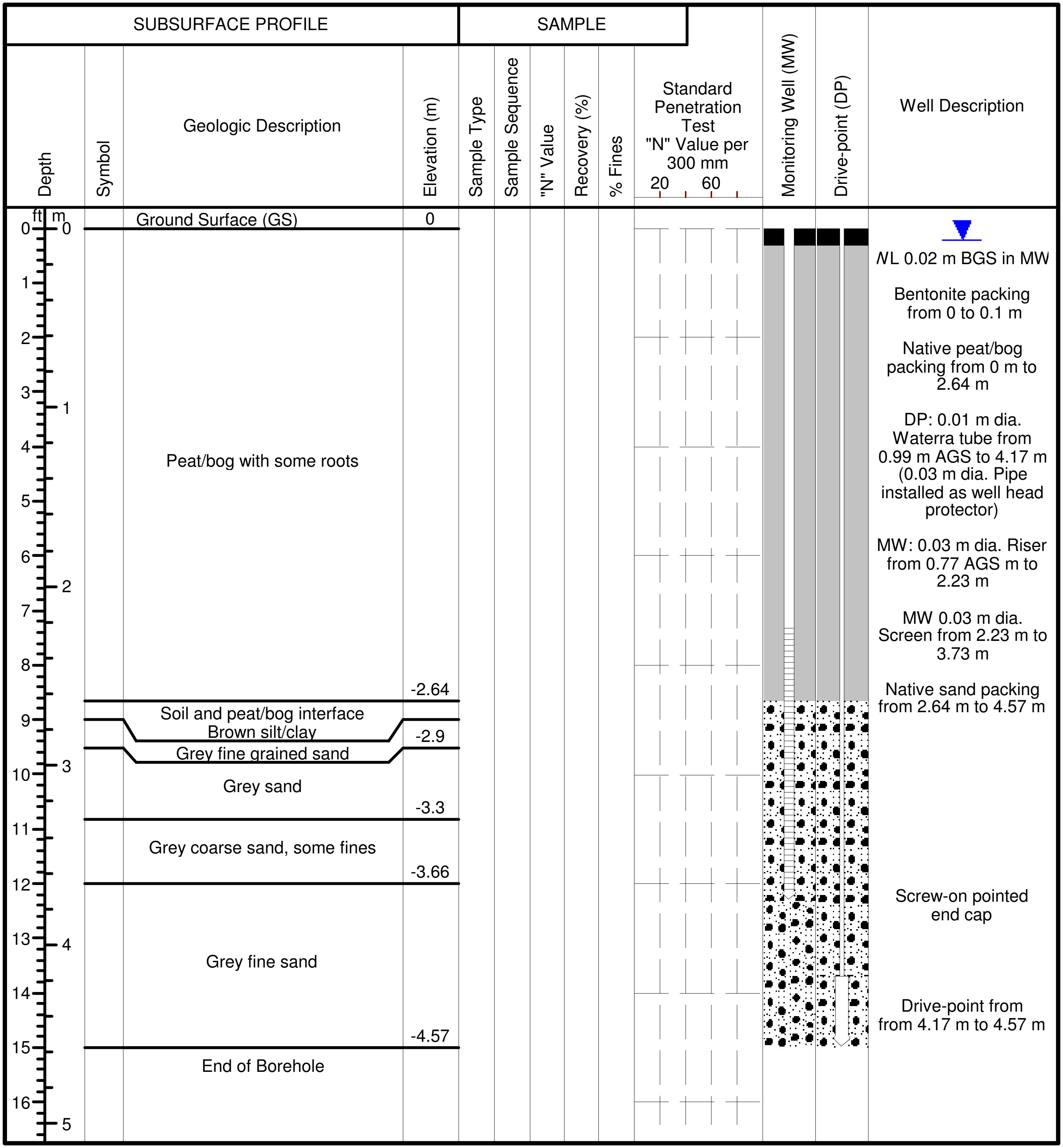
Client: First Mining Gold

Location: Springpole Lake, ON

Log of Monitoring Well: K034

Project No: 3134

Date: September 28, 2019



Geologic Description	Elevation (m)
Ground Surface (GS)	0
Peat/bog with some roots	-2.64
Soil and peat/bog interface Brown silt/clay	-2.9
Grey fine grained sand Grey sand	-3.3
Grey coarse sand, some fines	-3.66
Grey fine sand	-4.57
End of Borehole	

Well Description

WL 0.02 m BGS in MW

Bentonite packing from 0 to 0.1 m

Native peat/bog packing from 0 m to 2.64 m

DP: 0.01 m dia. Waterra tube from 0.99 m AGS to 4.17 m (0.03 m dia. Pipe installed as well head protector)

MW: 0.03 m dia. Riser from 0.77 AGS m to 2.23 m

MW 0.03 m dia. Screen from 2.23 m to 3.73 m

Native sand packing from 2.64 m to 4.57 m

Screw-on pointed end cap

Drive-point from from 4.17 m to 4.57 m

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Drilling Method: Hand Augering and Drive-point Piezometer

Driller: Fracflow Consultants

Datum: Geodetic

Sheet: 1 of 1

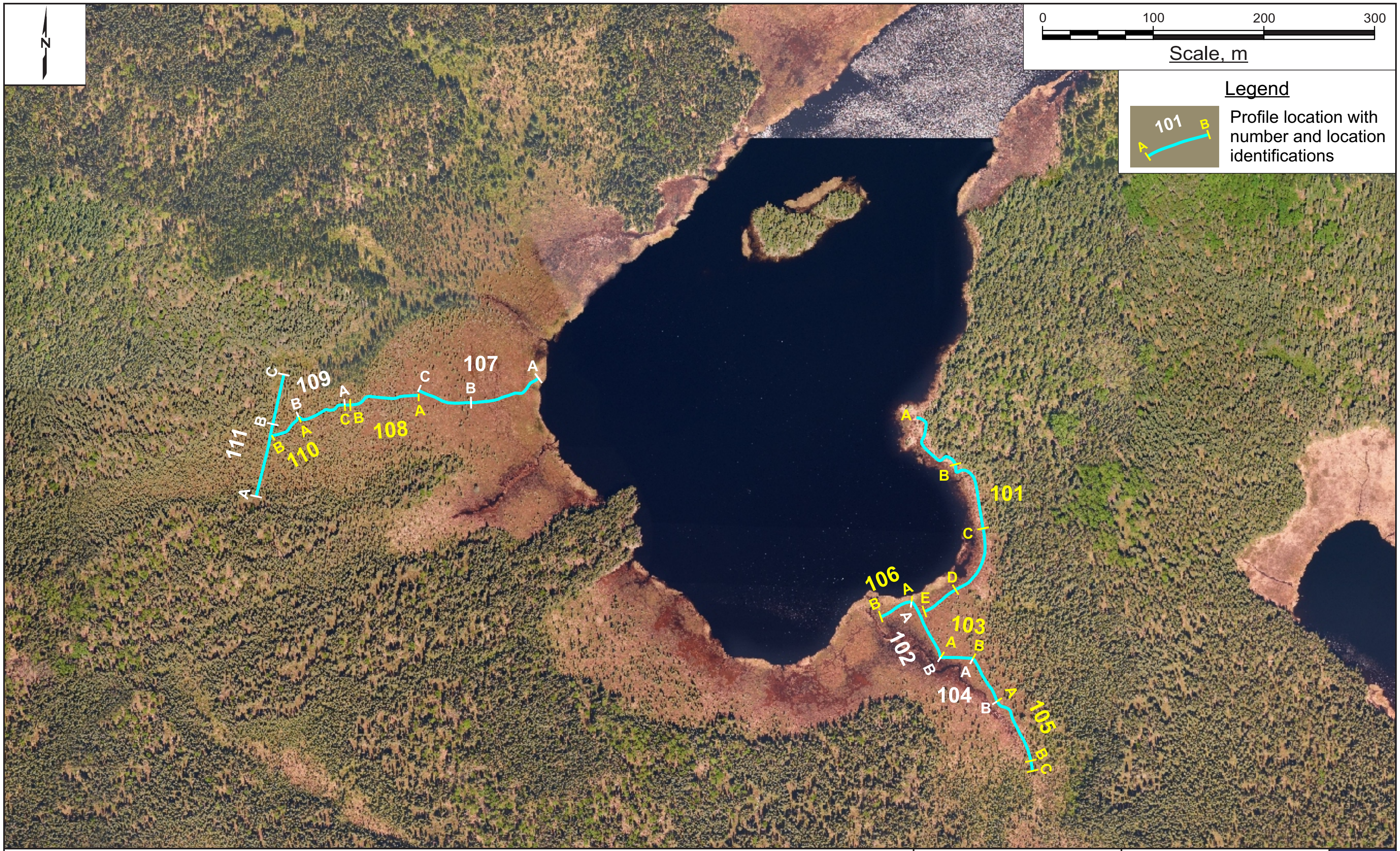


Figure A1 Location of the GPR profiles surveyed at the Tailings Management Area (TMA).

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date December 2019

FFC

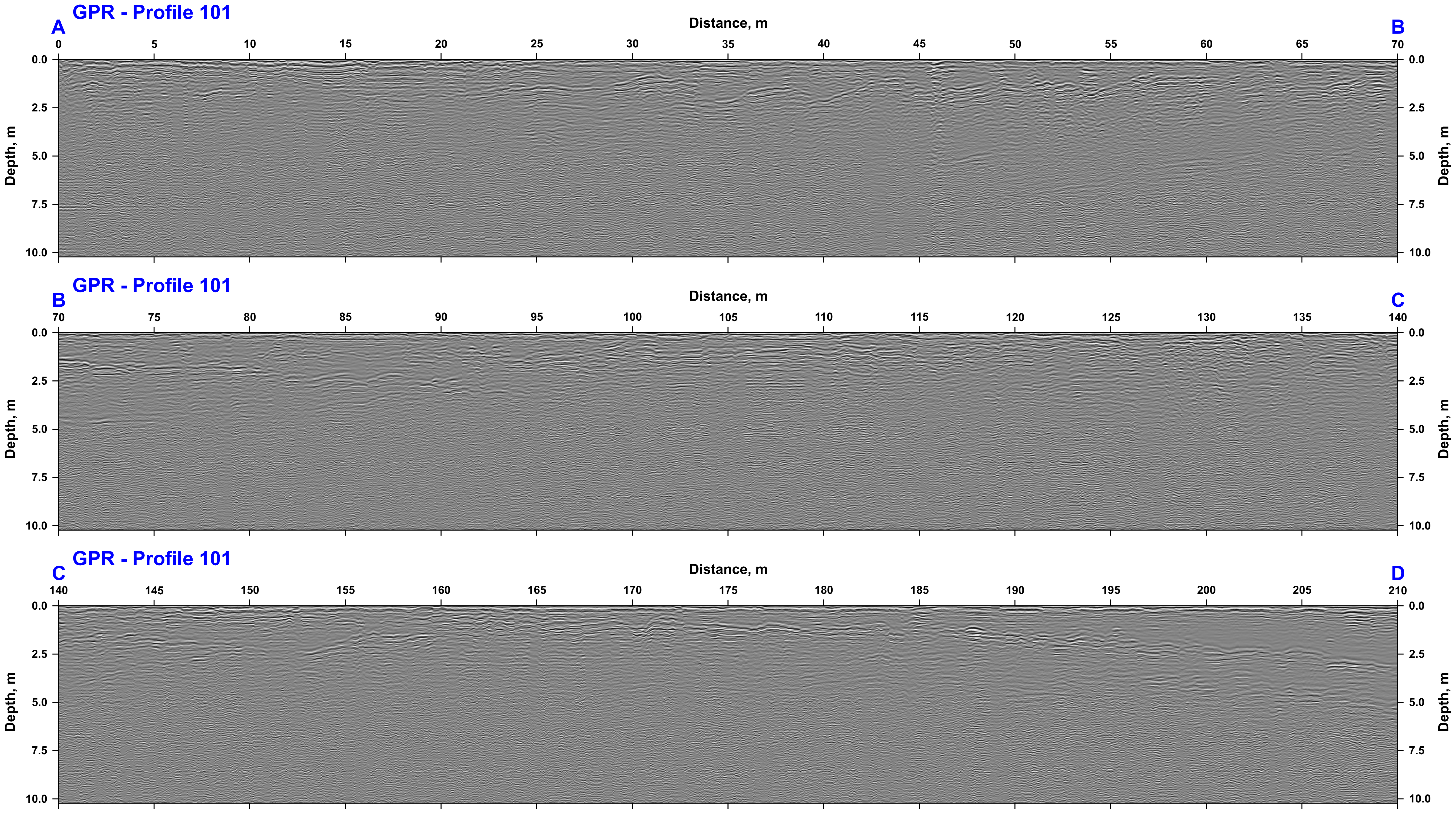


Figure A2 Ground penetrating radar survey using 160 MHz antenna on Profile 101 at the Tailings Management Area (TMA) (Page 1 of 2).

Project No. 3134	Document Reference FFC-NL-3134-002
Location Springpole, ON	Date December 2019

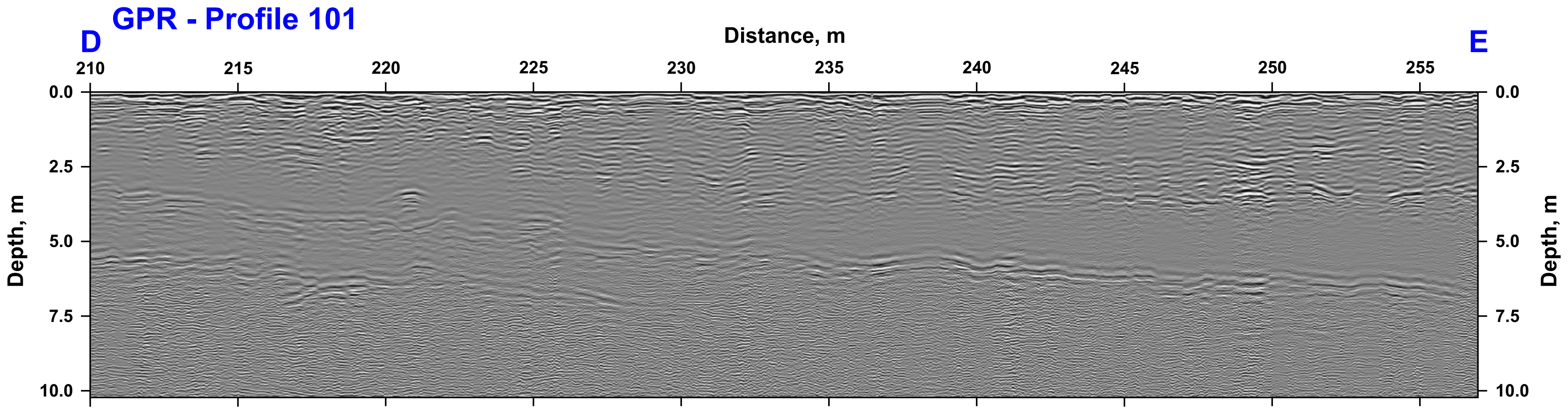
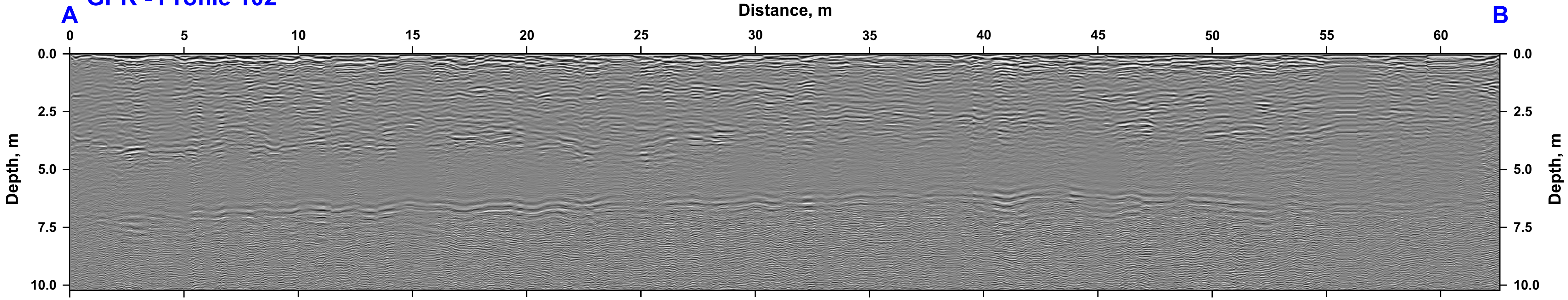


Figure A2 Ground penetrating radar survey using 160 MHz antenna on Profile 101 at the Tailings Management Area (TMA) (Page 2 of 2).

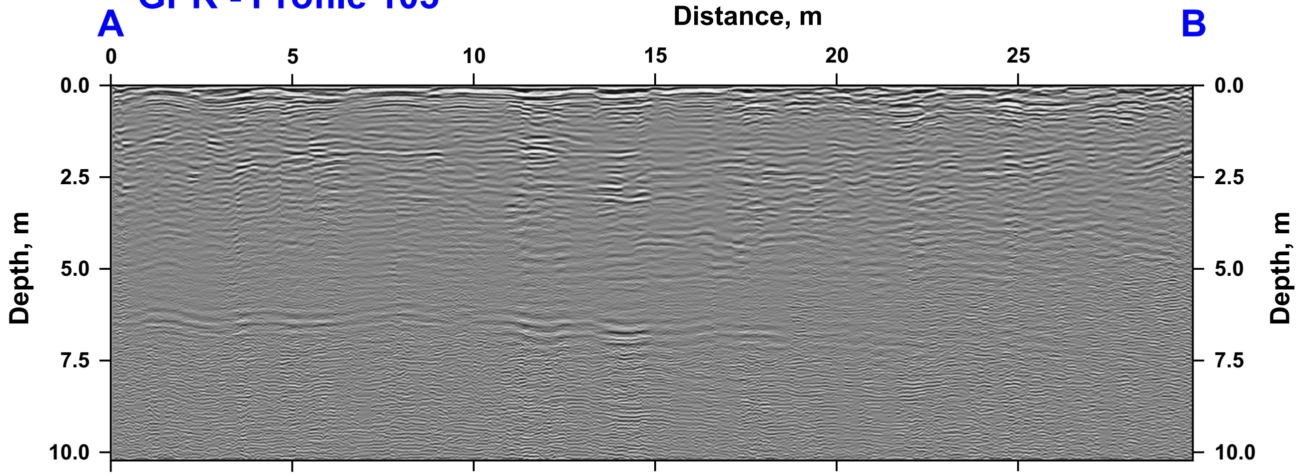
Project No.	Document Reference
3134	FFC-NL-3134-002
Location	**Date**
Springpole, ON	December 2019

FFC

GPR - Profile 102



GPR - Profile 103



GPR - Profile 104

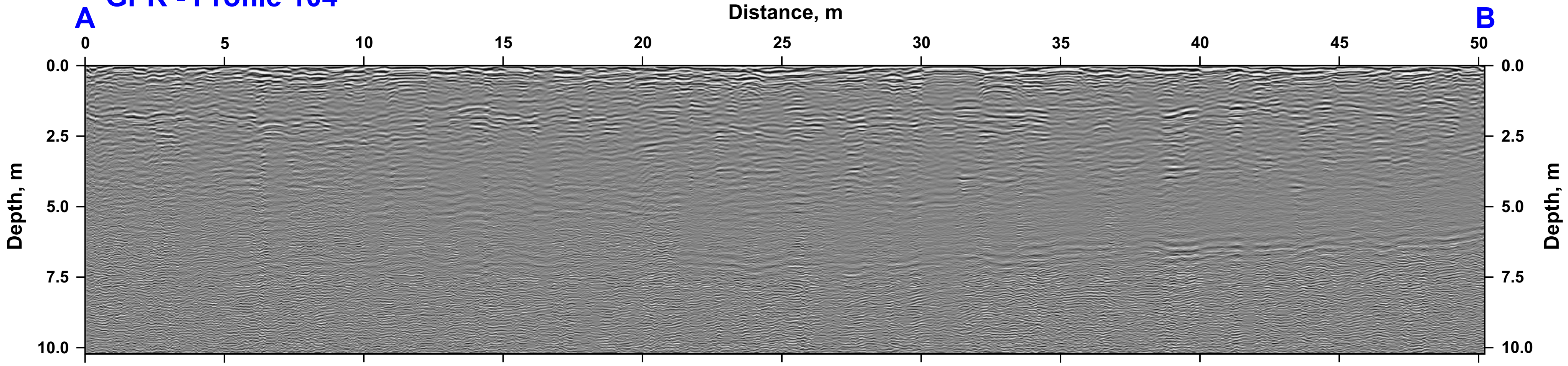


Figure A3 Ground penetrating radar survey using 160 MHz antenna on Profiles 002, 003 and 004 at the Tailings Management Area (TMA).

Project No.	Document Reference
3134	FFC-NL-3134-002
Location	**Date**
Springpole, ON	December 2019

FFC