

APPENDIX 11-C
2012 HYDROGEOLOGY BASELINE DATA REPORT



Seabridge Gold Inc.

KSM PROJECT 2012 Hydrogeology Baseline Data Report

SEABRIDGE GOLD



KSM PROJECT

2012 HYDROGEOLOGY BASELINE DATA REPORT

November 2012
Project #0868-016-22

Citation:

Rescan. 2012. *KSM Project: 2012 Hydrogeology Baseline Data Report*. Prepared for Seabridge Gold Inc. by Rescan Environmental Services Ltd.: Vancouver, British Columbia.

Prepared for:

SEABRIDGE GOLD

Seabridge Gold Inc.

Prepared by:



Engineers and Scientists

Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

KSM PROJECT

2012 HYDROGEOLOGY BASELINE

DATA REPORT

Table of Contents

Table of Contents	i
List of Figures	i
List of Tables	i
List of Appendices	ii
1. Introduction	1-1
2. Results and Discussion	2-1
2.1 Groundwater Quality	2-1
2.2 Groundwater Levels and Flow	2-1
3. Conclusions	3-1
References	R-1

List of Figures

FIGURE	PAGE
Figure 2.2-1a. Processing and Tailings Management Area: Continuous Groundwater Level Monitoring	2-11
Figure 2.2-1b. Mining Area: Continuous Groundwater Level Monitoring	2-12
Figure 2.2-2a. Temporal Water Level Fluctuations Based on Manual Measurements	2-14
Figure 2.2-2b. Temporal Water Level Fluctuations based on Manual Measurements	2-15
Figure 2.2-2c. Temporal Water Level Fluctuations based on Manual Measurements	2-16

List of Tables

TABLE	PAGE
Table 1-1. 2012 Hydrogeology Field Program Summary	1-1
Table 2.1-1a. Physical Parameters, Concentrations of Major Anions and Nutrients, and Cyanides in Groundwater in the TMA (Revised with 2012 Results)	2-2

2012 HYDROGEOLOGY BASELINE DATA REPORT

Table 2.1-1b. Total and Dissolved Metals Concentrations in Groundwater in the TMA (Revised with 2012 Results).....2-3

Table 2.1-2a. Physical Parameters, Concentrations of Major Anions and Nutrients, and Cyanides in Groundwater in the Mining Area (Revised with 2012 Results).....2-5

Table 2.1-2b. Total and Dissolved Metals Concentrations in Groundwater in the Mining Area (Revised with 2012 Results)2-7

Table 2.1-3. Relative Percent Differences for 2012 Groundwater Samples.....2-9

Table 2.2-1. 2012 Water Level Measurements 2-13

List of Appendices

Appendix A. ALS Laboratories Water Quality Analysis Reports

1. Introduction

This report was created as an update to the 2009 and 2010 Hydrogeology Baseline Report submitted by Rescan Environmental Services Ltd. (Rescan) to Seabridge Gold Inc. in October 2010 (Rescan 2010; Appendix 11-B of Chapter 11). The purpose of this report is to present and summarize hydrogeology data collected by Rescan during 2012, and to document modifications to the baseline assessment arising from this new data.

Fifteen sites were visited for hydrogeology data collection during trips in May and July 2012 (Table 1-1). These sites included fourteen well pairs installed under Rescan supervision in 2009, as well as one well installed under Klohn Crippen Berger Limited (KCB) supervision in 2008. Data collection included groundwater sampling, water level measurements, and pressure transducer downloads. Refer to the 2009 and 2010 Hydrogeology Baseline Report (Rescan 2010; Appendix 11-B of Chapter 11) for well installation details, field data collection methods, and site details.

Table 1-1. 2012 Hydrogeology Field Program Summary

Well ID	Manual Water Level	Pressure Transducer	Water Sample	Gas Detection
MW-01A	15-May		May 15 2012 (Duplicate)	
MW-01B	15-May	15-May		
MW-02A	14-May	14-May	14-May	
MW-02B	14-May	14-May		
MW-03A	15-May	15-May (damaged); 7-Jul (replaced)		
MW-03B	15-May			
MW-04A	15-May			
MW-04B	12-May			
MW-05A	12-May			
MW-05B	12-May			
MW-06A	12-May		14-May	
MW-06B	12-May			
MW-07A	13-May	13-May		
MW-07B	16-May	16-May		
MW-09A	7-Jul			
MW-09B	7-Jul			
MW-10A	7-Jul			
MW-10B	7-Jul			
MW-11A	13-May			7-Jul
MW-11B	13-May			
MW-12A	7-Jul			
MW-12B	Not accessible			
MW-13A	17-May	17-May	17-May	
MW-13B	17-May	17-May (Broken line)		

(continued)

Table 1-1. 2012 Hydrogeology Field Program Summary (completed)

Well ID	Manual Water Level	Pressure Transducer	Water Sample	Gas Detection
MW-14A	12-May	12-May	16-May	
MW-14B	12-May			
MW-15A	12-May	12-May		
MW-15B	12-May			
KC08-02	16-May	16-May		

2. Results and Discussion

2.1 GROUNDWATER QUALITY

Water samples were collected at five sites: two were located in the planned tailings management area (TMA), and three in the mine area (MA). Analytical results provided by ALS Environmental (Burnaby, BC) are presented in Appendix A. Water quality summary tables have been revised to include the 2012 results (Tables 2.1-1a and 2.1-1b, and 2.1-2a and 2.1-2b). One duplicate sample was collected (RES-MW-01A), for-which all analyte concentrations had relative percent differences (RPD) less than 20% (Table 2.1-3).

Water quality parameters were within the ranges previously observed, as documented in the Hydrogeology Baseline Report (Rescan 2010; Appendix 11-B of Chapter 11). pH measurements were within the range for neutral waters. Fluoride and sulphate concentrations were elevated in the Mitchell and Sulphurets pit areas (RES-MW-06A and RES-MW-13A), exceeding the B.C. Ministry of Environment Fresh Water Aquatic Life Guidelines (BCMOE FAL). Turbidity was low for all samples except RES-MW-13A, where it exceeded the recommended sampling limit of 50 NTU (BCMOE 2009) slightly (52.8 NTU).

Iron concentrations (both total and dissolved) were elevated in the Mining area, particularly at MW-06A downstream of the proposed Mitchell Pit. Aluminium concentrations were only elevated in the total metals analyses, indicating the aluminium source was solids in suspension in the sampling stream. A new maximum on-site total chromium concentration was observed in duplicate at RES-MW-01A. However the dissolved chromium concentration was low. Arsenic levels were elevated in the mining area, consistently above the BCMOE FAL of 0.005 mg/L. Dissolved cadmium, copper, and lead concentrations were low or below detection limits, not exceeding BCMOE FAL guidelines.

An attempt was made to collect water samples at RES-MW-11A in May 2012. The site was evacuated due to a release of pressurized gas from inside the well upon disturbance of the water column. Non-violent bubbling has been observed at this well during each visit since installation in 2009. The site was visited with a gas detector in July 2012, at which time bubbling gas was observed and identified as carbon dioxide.

2.2 GROUNDWATER LEVELS AND FLOW

Downloading and programming were conducted for ten pressure transducers. Pressure transducer time series plots have been revised to include data up to the most recent logging records, ending December 2010 (Figures 2.2-1a and 2.2-1b). This extends the available records by five months, bringing the complete datasets for continuous water level measurement to greater than one full year.

The pressure transducer installed in RES-MW-03A was not functioning upon inspection in May 2012. It was returned to the manufacturer (Solinst), and replaced under warrantee. The replacement transducer was programmed and installed in RES-MW-03A in July 2012.

Continuous water level measurements during fall 2010 demonstrate a fall recharge period followed by a winter discharge period. This coincides with the post-summer return of unsettled weather and increased precipitation levels, with the onset of freezing conditions (favouring snow accumulation) lagging. Considerable high-frequency variability occurred over this period in the mining area, at wells RES-MW-07A, MW-07B, and MW-15A in particular. Variability ranged up to 5 m over as little as one week at these wells. This variability is driven by major rain events, and demonstrates that both recharge and discharge at depths exceeding 100 mbg occurs rapidly in zones with high hydraulic conductivity. Wells with low hydraulic conductivities, such as RES-MW-13A and B (downstream of Kerr Pit), follow seasonal variability patterns, but do not show the high-frequency variability documented in high-conductivity wells.

Table 2.1-1a. Physical Parameters, Concentrations of Major Anions and Nutrients, and Cyanides in Groundwater in the TMA (Revised with 2012 Results)

Parameter	Units	# of Samples	# Samples below Detection	Minimum	Maximum	Average ¹	Standard Deviation	BCMOEFAL Guideline
Physical Parameters								
Colour, True	CU	29	29	2.5	2.5	2.5	0.0	A
Conductivity	uS/cm	29	0	213	418	295.7	69.0	ng
Hardness (as CaCO ₃)	mg/L	29	0	18.5	138	78.2	43.4	ng
pH	pH	29	0	7.37	8.78	8.28	0.23	ng
Total Suspended Solids	mg/L	29	23	1.5	121	9.8	29.2	C
Total Dissolved Solids	mg/L	29	0	122	272	175.1	49.3	ng
Turbidity	NTU	29	0	0.2	67.4	6.02	16.41	C
Anions and Nutrients								
Ammonia (as N)	mg/L	29	0	0.0899	0.561	0.36	0.17	0.681 ^E
Acidity (as CaCO ₃)	mg/L	29	17	0.5	28.1	2.03	5.08	ng
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L	29	1	58.6 ¹	126	80.2	16.3	ng
Alkalinity, Carbonate (as CaCO ₃)	mg/L	29	24	0.5 ¹	9.4	1.64	2.11	ng
Alkalinity, Hydroxide (as CaCO ₃)	mg/L	29	29	0.5 ¹	1	0.793	0.251	ng
Alkalinity, Total (as CaCO ₃)	mg/L	29	0	96.2	146	124.8	12.9	ng
Bromide (Br)	mg/L	29	29	0.025 ¹	0.025	0.025	0.000	ng
Chloride (Cl)	mg/L	29	29	0.25 ¹	0.25	0.25	0.00	600
Fluoride (F)	mg/L	29	0	0.08	0.319 ^F	0.147	0.077	0.2-0.3 ^F
Sulfate (SO ₄)	mg/L	29	0	7.98	88.4	36.3	32.4	100
Nitrate (as N)	mg/L	29	26	0.0025 ¹	0.0578	0.0065	0.0128	31.3
Nitrite (as N)	mg/L	29	25	0.0005 ¹	0.0296	0.0022	0.0059	0.06-0.60 ^H
Total Kjeldahl Nitrogen	mg/L	29	0	0.08	0.72	0.348	0.186	ng
Total Nitrogen	mg/L	29	0	0.08	0.72	0.346	0.180	ng
Total Phosphate (as P)	mg/L	11	3	0.0005 ¹	0.0325	0.0095	0.0122	ng
Total Organic Carbon	mg/L	24	8	0.1 ¹	2	0.649	0.481	ng
Cyanides								
Total Cyanide	mg/L	29	24	0.0005 ¹	0.0015	0.000641379	0.000323505	ng
Weak Cyanide	mg/L	0	0	n/a	n/a	n/a	n/a	0.01
Free Cyanide	mg/L	0	0	n/a	n/a	n/a	n/a	ng

Note:

Bold/Italic = exceeds the BCMOEFAL Guideline

1. Average is calculated using half of the detection limit when the result was below it Water Guidelines. (<http://www.bc->

3. BCWQG - FAL = Approved and Working BC Freshwater Aquatic Life Guidelines (http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html)

4. CCME - FAL = CCME Water Quality Guidelines for the Protection of Aquatic Life (http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124)

ng = no guideline

A = 30-day average transmission of white light >80% of background

B = based on aesthetic or operational guideline

C = depends on background values

D = turbidity guideline HC based on if conventional treatment/slow sand or diatomaceous earth filtration/membrane filtration turbidity <0.1 NTU (target at all times),

0.3 NTU 95th percentile, 1.0 NTU maximum for chemically assisted filtration

1.0 NTU 95th percentile, 3.0 NTU maximum for slow sand or diatomaceous earth filtration

0.1 NTU 99th percentile, 0.3 NTU maximum for membrane filtration

E = Temperature and pH dependent (see guideline). Most stringent guideline applied.

F = fluoride guideline of 0.3 mg/L if hardness ≥ 50mg/L, guideline 0.2 mg/L if hardness < 50 mg/L

G = Guideline for sum of nitrate and nitrite (both as N)

H = Nitrite BC Max depends on Cl conc, see guideline

Table 2.1-1b. Total and Dissolved Metals Concentrations in Groundwater in the TMA (Revised with 2012 Results)

	Units	Total Metals						BCMOEFAL Guideline (total)	Dissolved Metals						BCMOEFAL Guideline (dissolved)
		# of Samples	# Samples below Detection	Minimum	Maximum	Average ¹	Standard Deviation		# of Samples	# Samples below Detection	Minimum	Maximum	Average ¹	Standard Deviation	
Aluminum	mg/L	28	3	0.0045	4.12	0.34	0.96	ng	29	1	0.0015	0.0836	0.015	0.020	0.1 ^D
Antimony	mg/L	28	20	5.00E-05	0.00451	0.00055	0.0013	0.02 ^E	29	21	5.0E-05	0.0045	0.00052	0.0013	ng
Arsenic	mg/L	28	4	5.00E-05	0.00338	0.0013	0.0011	0.005	29	6	5.0E-05	0.00376	0.0012	0.0012	ng
Barium	mg/L	28	0	0.0145	0.151	0.063	0.031	5 ^E	29	0	0.0131	0.0941	0.052	0.028	ng
Beryllium	mg/L	28	28	5.00E-05	0.00025	0.00023	0.000063	0.0053 ^E	3	3	5.0E-05	0.00005	5.0E-05	0	ng
Bismuth	mg/L	28	28	0.00025	0.00025	0.00025	1.7E-19	ng	3	3	0.00025	0.00025	0.00025	0	ng
Boron	mg/L	28	4	0.0050	0.035	0.0190	0.0093	1.2	29	8	0.0050	0.03	0.0159	0.0087	ng
Cadmium	mg/L	28	9	5.00E-06	0.000029	1.36E-05	7.52E-06	E, F	29	14	5.0E-06	0.000049	1.3E-05	1.1E-05	ng
Calcium	mg/L	28	0	5.36	27.2	18.6	7.4	ng	29	0	5.39	26.1	18.0	7.6	ng
Chromium	mg/L	28	14	0.00022	0.00229	0.00057	0.00056	0.001 ^{E, G}	29	29	5.0E-05	0.00025	0.00023	0.00006	ng
Cobalt	mg/L	28	13	5.00E-05	0.00049	0.00013	0.00012	0.11	29	21	5.0E-05	0.00024	0.000077	0.000052	ng
Copper	mg/L	28	16	5.00E-05	0.00118	0.00039	0.00032	H	29	8	5.0E-05	0.00244	0.00026	0.00043	ng
Iron	mg/L	28	7	0.015	1.73	0.22	0.45	1	29	20	0.015	0.092	0.026	0.022	0.35
Lead	mg/L	28	20	2.50E-05	0.00239	0.00027	0.00060	J	29	25	2.5E-05	0.000543	0.000047	0.000096	ng
Lithium	mg/L	28	2	0.0025	0.179	0.052	0.059	5 ^E	29	3	0.0025	0.177	0.055	0.060	ng
Magnesium	mg/L	28	0	1.34	18.7	8.3	6.6	ng	29	0	1.22	18.2	8.1	6.7	ng
Manganese	mg/L	28	0	0.00939	0.242	0.051	0.055	L	29	0	0.0090	0.168	0.044	0.045	ng
Mercury	mg/L	28	28	5.00E-06	5.00E-06	5.00E-06	8.63E-22	ng	3	3	5.0E-06	5.0E-06	5.0E-06	0	ng
Molybdenum	mg/L	28	0	0.00173	0.0168	0.0061	0.0039	2	29	0	0.00162	0.0169	0.0058	0.0039	ng
Nickel	mg/L	28	15	0.00025	0.00193	0.00061	0.00049	0.025-0.150 ^{F, N}	29	26	0.00025	0.00156	0.00037	0.00036	ng
Phosphorus	mg/L	28	28	0.15	0.15	0.15	0	0.005 ^O	29	29	0.15	0.15	0.15	0	ng
Potassium	mg/L	28	0	0.416	1.54	0.96	0.32	ng	29	0	0.48	1.22	0.93	0.26	ng
Selenium	mg/L	28	16	5.00E-05	0.00252	0.00025	0.00052	ng	29	26	5.00E-05	0.0026	0.00022	0.00052	ng
Silicon	mg/L	28	0	3.25	26.7	5.78	5.69	ng	29	0	3.36	5.43	4.22	0.63	ng
Silver	mg/L	28	21	5.00E-06	0.000047	0.000010	0.000011	0.0001-0.003 ^P	29	29	5.0E-06	0.000005	5.0E-06	0	ng
Sodium	mg/L	28	0	5.5	80.9	33	28	ng	29	0	5.6	83.3	34.9	29.2	ng
Strontium	mg/L	28	0	0.42	2.72	1.18	0.65	ng	29	0	0.43	2.49	1.14	0.60	ng
Thallium	mg/L	28	27	5.00E-06	0.00005	0.000046	0.000013	0.0003 ^E	3	3	5.0E-06	5.0E-06	5.0E-06	0	ng
Tin	mg/L	28	25	5.00E-05	0.0002	0.000064	0.000039	ng	29	21	5.0E-05	0.00059	0.000116	0.000147	ng
Titanium	mg/L	28	23	0.0050	0.159	0.017	0.038	2.0-4.6 ^{E, Q}	3	3	0.0050	0.0050	0.0050	0	ng
Uranium	mg/L	28	3	5.00E-06	0.000824	0.00013	0.00019	0.3 ^E	29	4	5.0E-06	0.000289	0.000076	0.000076	ng
Vanadium	mg/L	28	24	5.00E-04	0.0025	0.00071	0.00055	ng	29	29	5.0E-04	0.0005	0.00050	0	ng
Zinc	mg/L	28	13	0.00050	0.0058	0.0015	0.0015	R	29	24	0.00050	0.010	0.0011	0.0019	ng

Note:

Bold/Italic = exceeds the BCMOEFAL Guideline

1. Average is calculated using half of the detection limit when the result was below it

2. HCDWG = Health Canada Drinking Water Guidelines. (http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php#tech_doc)

3. BCWQG - FAL = Approved and Working BC Freshwater Aquatic Life Guidelines (http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html)

4. CCME - FAL = CCME Water Quality Guidelines for the Protection of Aquatic Life (http://www.ccme.ca/publications/ceaq_rcqe.html?category_id=124)

ng = no guideline

A = based on aesthetic or operational guideline

B = operational only, 0.10 mg/L dis or total Al for conventional treatment, 0.20 mg/L dis or total Al for other treatment

C = CCME T-Al = 0.005 mg/L at pH<6.5; [Ca²⁺] <4 mg/L; DOC<2 mg/L, or = 0.1 mg/L at pH ≥ 6.5; [Ca²⁺] ≥ 4 mg/L; DOC ≥ 2 mg/L.

D = 0.1 mg/L for pH ≥ 6.5; BC Max = e (1.209 - 2.426 * [pH] + 0.286 * [pH] * [pH]) for pH <6.5

E = Working BC Max guideline only

F = CCME & BC Max cadmium guideline = 0.001 * 10{0.86[log(hardness)] - 3.2} mg/L

G = CCME and BC chromium guideline = 0.0010 mg/L (Cr VI), or 0.0089 (Cr III) which is interim. Most stringent guideline applied

H = BC Max T-Cu guideline = 0.001 * (0.094(hardness)+2) mg/L.

I = CCME guideline for copper = 0.002 mg/L at 0-120 mg/L [CaCO₃], 0.003mg/L at 120 - 180 mg/L [CaCO₃], 0.004 mg/L at > 180 mg/L [CaCO₃]

J = Max Pb guideline = 0.001 * { e(1.273 ln (hardness) - 1.460) } mg/L if hardness > 8mg/L; or 0.003 mg/L if hardness ≤ 8mg/L.

K = CCME total lead is 0.001 mg/L for [CaCO₃] from 0-60 mg/L, 0.002 mg/L for [CaCO₃] from 60-120 mg/L, 0.004 mg/L for [CaCO₃] from 120-180 mg/L, and 0.007 mg/L for [CaCO₃] >180 mg/L

L = BC Max Mn guideline 0.01102 *(hardness) + 0.54 mg/L

M = 0.000026 mg/L inorganic Hg, 0.000004 mg/L MeHg. Assumed inorganic in groundwater

N = CCME and BC guideline for nickel = 0.025 mg/L at 0-60 mg/L [CaCO₃], 0.065mg/L at 60 - 120 mg/L [CaCO₃], 0.110 mg/L at 120 - 180 mg/L [CaCO₃], 0.150 mg/L at > 180 mg/L [CaCO₃]

O = Salmon-predominant lakes only. Most stringent guidelines applied

P = Max Ag guideline of 0.003 mg/L if hardness > 100mg/L, max of 0.0001mg/L if hardness ≤ 100mg/L

Q = BC Max Ti guideline (median thresholds) of 2 mg/L for Scenedesmus (green algae) and 4.6 mg/L for Daphnia (waterflea invert)

R = Max Zn guideline = 0.001 * [33 + 0.75*(hardness - 90)] mg/L. If hardness ≤ 90 mg/L use minimum guideline of 0.033 mg/L.

Table 2.1-2a. Physical Parameters, Concentrations of Major Anions and Nutrients, and Cyanides in Groundwater in the Mining Area (Revised with 2012 Results)

Parameter	Units	# of Samples	# Samples below Detection	Minimum	Maximum	Average ¹	Standard Deviation	BCMOEFAL Guideline
Physical Parameters								
Colour, True	CU	68	63	2.5	55.5	4.65	9.55	A
Conductivity	uS/cm	68	0	213	7460	950	1491	ng
Hardness (as CaCO ₃)	mg/L	69	0	84.6	2430	314	443	ng
pH	pH	68	0	3.77	8.83	7.58	0.95	ng
Total Suspended Solids	mg/L	68	22	1.5	1220	56	161	C
Total Dissolved Solids	mg/L	68	0	142	6620	718	1189	ng
Turbidity	NTU	68	0	0.12	2510	79	309	C
Anions and Nutrients								
Ammonia (as N)	mg/L	69	24	0.0025	6.64	0.29	1.21	0.681 ^E
Acidity (as CaCO ₃)	mg/L	68	4	0.5	1480	54	194	ng
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L	68	1	1.0	3487	175	560	ng
Alkalinity, Carbonate (as CaCO ₃)	mg/L	68	66	0.5	5	1.06	0.54	ng
Alkalinity, Hydroxide (as CaCO ₃)	mg/L	68	68	0.5	5	1.04	0.54	ng
Alkalinity, Total (as CaCO ₃)	mg/L	68	3	1.0	5720	285	920	ng
Bromide (Br)	mg/L	68	66	0.025	6.97	0.34	1.16	ng
Chloride (Cl)	mg/L	68	48	0.25	51	3.56	8.80	600
Fluoride (F)	mg/L	68	5	0.04	3.57	0.74	0.78	0.2-0.3 ^F
Sulfate (SO ₄)	mg/L	68	0	11.2	1420	230	299	100
Nitrate (as N)	mg/L	68	65	0.0025	0.178	0.019	0.035	31.3
Nitrite (as N)	mg/L	68	67	0.0005	0.025	0.0029	0.0054	0.06-0.60 ^H
Total Kjeldahl Nitrogen	mg/L	68	38	0.025	10.1	0.49	1.83	ng
Total Nitrogen	mg/L	69	37	0.025	10.1	0.46	1.69	ng
Total Phosphate (as P)	mg/L	24	9	0.0005	0.041	0.0059	0.0103	ng
Total Organic Carbon	mg/L	69	24	0.1	32.1	1.95	4.13	ng
Cyanides								
Total Cyanide	mg/L	69	51	0.00050	0.00350	0.00091	0.00077	ng
Weak Cyanide	mg/L	0	0	n/a	n/a	n/a	n/a	0.01
Free Cyanide	mg/L	0	0	n/a	n/a	n/a	n/a	ng

Note:

Bold/Italic = exceeds the BCMOEFAL Guideline

1. Average is calculated using half of the detection limit when the result was below it

2. HCDWG = Health Canada Drinking Water Guidelines. (http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php#tech_doc)

3. BCWQG - FAL = Approved and Working BC Freshwater Aquatic Life Guidelines (http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html)

4. CCME - FAL = CCME Water Quality Guidelines for the Protection of Aquatic Life (http://www.ccme.ca/publications/ceaq_rcqe.html?category_id=124)

ng = no guideline

A = 30-day average transmission of white light >80% of background

B = based on aesthetic or operational guideline

C = depends on background values

D = turbidity guideline HC based on if conventional

turbidity <0.1 NTU (target at all times),

0.3 NTU 95th percentile, 1.0 NTU maximum for chemically assisted filtration

1.0 NTU 95th percentile, 3.0 NTU maximum for slow sand or diatomaceous earth filtration

0.1 NTU 99th percentile, 0.3 NTU maximum for membrane filtration

E = Temperature and pH dependent (see guideline). Most stringent guideline applied.

F = fluoride guideline of 0.3 mg/L if hardness ≥ 50mg/L, guideline 0.2 mg/L if hardness < 50 mg/L

G = Guideline for sum of nitrate and nitrite (both as N)

H = Nitrite BC Max depends on Cl conc, see guideline

Table 2.1-2b. Total and Dissolved Metals Concentrations in Groundwater in the Mining Area (Revised with 2012 Results)

	Units	Total Metals						BCMOEFAL Guideline (total)	Dissolved Metals						BCMOEFAL Guideline (dissolved)
		# of Samples	#Samples below Detection	Minimum	Maximum	Average ¹	Standard Deviation		# of Samples	# Samples below Detection	Minimum	Maximum	Average ¹	Standard Deviation	
Aluminum	mg/L	69	7	0.002	30.6	1.72	4.47	ng	68	7	0.0010	16.2	0.47	2.14	0.1 ^D
Antimony	mg/L	69	16	5.00E-05	0.047	0.0053	0.0093	0.02 ^E	68	17	5.0E-05	0.0487	0.0049	0.0092	ng
Arsenic	mg/L	69	2	5.00E-05	0.156	0.018	0.028	0.005	68	3	1.0E-04	0.0841	0.015	0.023	ng
Barium	mg/L	69	0	0.00745	0.617	0.076	0.109	5 ^E	68	0	0.00717	0.443	0.048	0.071	ng
Beryllium	mg/L	69	64	5.00E-05	0.0050	0.00073	0.00104	0.0053 ^E	3	2	5.0E-05	0.0003	0.00017	0.00011	ng
Bismuth	mg/L	69	68	0.00025	0.0050	0.00075	0.00112	ng	3	3	0.00025	0.0013	0.00058	0.00058	ng
Boron	mg/L	69	41	0.005	8.23	0.36	1.57	1.2	68	46	0.0050	9.03	0.39	1.70	ng
Cadmium	mg/L	69	19	5.00E-06	0.0211	0.00073	0.00283	E, F	68	22	5.0E-06	0.0195	0.00067	0.00269	ng
Calcium	mg/L	69	0	28.2	478	95.2	92.3	ng	68	0	28.4	482	94.9	94.7	ng
Chromium	mg/L	69	27	0.00018	0.025	0.0037	0.0057	0.001 ^{E, G}	68	60	5.0E-05	0.015	0.0015	0.0030	ng
Cobalt	mg/L	69	13	5.00E-05	0.0571	0.0061	0.0124	0.11	68	18	5.00E-05	0.053	0.0057	0.0125	ng
Copper	mg/L	69	13	0.0001	14	0.38	1.79	H	68	12	5.0E-05	12.6	0.34	1.64	ng
Iron	mg/L	69	0	0.041	44.9	6.1	11.0	1	68	21	0.015	50.7	4.9	10.9	0.35
Lead	mg/L	69	14	2.50E-05	0.496	0.012	0.061	J	68	48	2.5E-05	0.089	0.0025	0.012	ng
Lithium	mg/L	69	46	0.00105	0.66	0.056	0.158	5 ^E	68	47	0.00109	0.7	0.058	0.165	ng
Magnesium	mg/L	69	0	1.1	273	18.8	51.5	ng	68	0	0.985	299	19.3	54.9	ng
Manganese	mg/L	69	0	0.0162	3.9	0.85	1.14	L	68	0	0.0118	4.26	0.82	1.16	ng
Mercury	mg/L	69	59	5.00E-06	0.000248	1.17E-05	3.14E-05	ng	3	3	5.0E-06	5.0E-06	5.0E-06	0	ng
Molybdenum	mg/L	69	0	0.000293	0.131	0.0106	0.0195	2	68	0	0.00026	0.105	0.0098	0.0172	ng
Nickel	mg/L	69	19	0.00025	0.087	0.0077	0.0154	0.025-0.150 ^{E, N}	68	22	0.00025	0.085	0.0066	0.0156	ng
Phosphorus	mg/L	69	69	0.15	0.64	0.167	0.071	0.005 ^O	68	68	0.15	0.30	0.157	0.031	ng
Potassium	mg/L	69	0	0.301	53.2	4.40	10.09	ng	68	0	0.278	55	4.25	10.5	ng
Selenium	mg/L	69	37	5.00E-05	0.0859	0.0025	0.0106	ng	68	45	5.0E-05	0.086	0.0025	0.0108	ng
Silicon	mg/L	69	0	2.89	47	8.98	6.37	ng	68	0	2.6	15.9	6.96	2.53	ng
Silver	mg/L	69	38	5.00E-06	0.0025	0.00020	0.00051	0.0001-0.003 ^P	68	60	5.0E-06	0.00143	6.4E-05	0.00025	ng
Sodium	mg/L	69	3	1	1560	116	327	ng	68	0	2.0	1510	111	298	ng
Strontium	mg/L	69	0	0.245	5.84	1.28	1.41	ng	68	0	0.245	5.96	1.26	1.43	ng
Thallium	mg/L	69	66	5.00E-06	0.001	0.00015	0.00022	0.0003 ^E	3	2	5.0E-06	2.5E-05	1.8E-05	1.1E-05	ng
Tin	mg/L	69	47	5.00E-05	0.00427	0.00038	0.00070	ng	68	43	5.0E-05	0.00109	0.00025	0.00027	ng
Titanium	mg/L	69	38	0.005	0.668	0.033	0.085	2.0-4.6 ^{E, Q}	3	3	0.0050	0.0050	0.0050	0	ng
Uranium	mg/L	69	3	5.00E-06	0.0155	0.0020	0.0033	0.3 ^E	68	1	1.0E-05	0.0157	0.0019	0.0032	ng
Vanadium	mg/L	69	48	5.00E-04	0.0772	0.0043	0.0100	ng	68	64	5.0E-04	0.010	0.0016	0.0021	ng
Zinc	mg/L	69	15	0.0005	0.948	0.068	0.146	R	68	26	0.0005	0.898	0.052	0.133	ng

Note:

Bold/italic = exceeds the BCMOEFAL Guideline

1. Average is calculated using half of the detection limit when the result was below it

2. HCDWG = Health Canada Drinking Water Guidelines. (http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php#tech_doc)

3. BCWQG - FAL = Approved and Working BC Freshwater Aquatic Life Guidelines (http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html)

4. CCME - FAL = CCME Water Quality Guidelines for the Protection of Aquatic Life (http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124)

ng = no guideline

A = based on aesthetic or operational guideline

B = operational only, 0.10 mg/L dis or total Al for conventional treatment, 0.20 mg/L dis or total Al for other treatment

C = CCME T-Al = 0.005 mg/L at pH<6.5; [Ca²⁺] <4 mg/L; DOC<2 mg/L, or = 0.1 mg/L at pH ≥ 6.5; [Ca²⁺] ≥ 4 mg/L; DOC ≥ 2 mg/L.

D = 0.1 mg/L for pH ≥ 6.5; BC Max = e (1.209 - 2.426 * [pH] + 0.286 * [pH] * [pH]) for pH <6.5

E = Working BC Max guideline only

F = CCME & BC Max cadmium guideline = 0.001 * 10{0.86[log(hardness)] - 3.2} mg/L

G = CCME and BC chromium guideline = 0.0010 mg/L (Cr VI), or 0.0089 (Cr III) which is interim. Most stringent guideline applied

H = BC Max T-Cu guideline = 0.001 * (0.094(hardness)+2) mg/L.

I = CCME guideline for copper = 0.002 mg/L at 0-120 mg/L [CaCO₃], 0.003mg/L at 120 - 180 mg/L [CaCO₃], 0.004 mg/L at > 180 mg/L [CaCO₃]

J = Max Pb guideline = 0.001 * { e(1.273 ln (hardness) - 1.460) } mg/L if hardness > 8mg/L; or 0.003 mg/L if hardness ≤ 8mg/L.

K = CCME total lead is 0.001 mg/L for [CaCO₃] from 0-60 mg/L, 0.002 mg/L for [CaCO₃] from 60-120 mg/L, 0.004 mg/L for [CaCO₃] from 120-180 mg/L, and 0.007 mg/L for [CaCO₃] >180 mg/L

L = BC Max Mn guideline 0.01102 *(hardness) + 0.54 mg/L

M = 0.000026 mg/L inorganic Hg, 0.000004 mg/L MeHg. Assumed inorganic in groundwater

N = CCME and BC guideline for nickel = 0.025 mg/L at 0-60 mg/L [CaCO₃], 0.065mg/L at 60 - 120 mg/L [CaCO₃], 0.110 mg/L at 120 - 180 mg/L [CaCO₃], 0.150 mg/L at > 180 mg/L [CaCO₃]

O = Salmon-predominant lakes only. Most stringent guidelines applied

P =Max Ag guideline of 0.003 mg/L if hardness > 100mg/L, max of 0.0001mg/L if hardness ≤ 100mg/L

Q = BC Max Ti guideline (median thresholds) of 2 mg/L for Scenedesmus (green algae) and 4.6 mg/L for Daphnia (waterflea invert)

R = Max Zn guideline = 0.001 * [33 + 0.75*(hardness - 90)] mg/L. If hardness ≤ 90 mg/L use minimum guideline of 0.033 mg/L.

Table 2.1-3. Relative Percent Differences for 2012 Groundwater Samples

Analytes	RES-MW-01A Sample 1	RES-MW-01A Sample 2	RPD (%)
Physical Tests			
Colour, True	<5.0	<5.0	-
Conductivity	275	270	0.5
Hardness (as CaCO ₃)	18.5	19.0	0.7
pH	8.65	8.78	0.4
Total Suspended Solids	4.7	<3.0	A
Total Dissolved Solids	166	168	0.3
Turbidity	7.45	7.00	1.6
Alkalinity, Bicarbonate (as CaCO ₃)	119	119	0.0
Alkalinity, Total (as CaCO ₃)	137	128	1.7
Ammonia as N	0.409	0.440	1.8
Bromide (Br)	<0.050	<0.050	-
Chloride (Cl)	<0.50	<0.50	-
Fluoride (F)	0.123	0.119	0.8
Total Kjeldahl Nitrogen	0.450	0.460	0.5
Total Nitrogen	0.450	0.460	0.5
Ortho Phosphate as P	0.0325	0.0246	6.9
Total Phosphate as P	0.0372	0.0292	6.0
Sulfate (SO ₄)	25.0	24.5	0.5
Cyanide, Total	<0.0010	<0.0010	-
Total Organic Carbon	0.53	<0.50	A
Total Metals			
Aluminum (Al)-Total	0.506	0.365	8.1
Antimony (Sb)-Total	<0.00010	0.00013	A
Arsenic (As)-Total	0.00020	0.00019	1.3
Barium (Ba)-Total	0.0849	0.0773	2.3
Beryllium (Be)-Total	<0.00010	<0.00010	-
Bismuth (Bi)-Total	<0.00050	<0.00050	-
Boron (B)-Total	0.024	0.024	0.0
Cadmium (Cd)-Total	<0.000010	<0.000010	-
Calcium (Ca)-Total	5.54	5.36	0.8
Chromium (Cr)-Total	0.00229	0.00167	7.8
Cobalt (Co)-Total	0.00013	<0.00010	A
Copper (Cu)-Total	0.00067	<0.00050	A
Iron (Fe)-Total	0.532	0.317	12.7
Lead (Pb)-Total	0.000152	0.000134	3.1
Lithium (Li)-Total	0.0553	0.0531	1.0
Magnesium (Mg)-Total	1.42	1.34	1.4
Manganese (Mn)-Total	0.0162	0.0149	2.1

(continued)

Table 2.1-3. Relative Percent Differences for 2012 Groundwater Samples (completed)

Analytes	RES-MW-01A Sample 1	RES-MW-01A Sample 2	RPD (%)
Total Metals (cont'd)			
Molybdenum (Mo)-Total	0.00421	0.00398	1.4
Nickel (Ni)-Total	0.00155	0.00090	13.3
Phosphorus (P)-Total	<0.30	<0.30	-
Potassium (K)-Total	1.20	1.14	1.3
Selenium (Se)-Total	<0.00010	<0.00010	-
Silicon (Si)-Total	4.66	4.34	1.8
Silver (Ag)-Total	<0.000010	<0.000010	-
Sodium (Na)-Total	60.8	55.8	2.1
Strontium (Sr)-Total	0.740	0.706	1.2
Uranium (U)-Total	0.000082	0.000065	5.8
Zinc (Zn)-Total	<0.0030	<0.0030	-
Dissolved Metals			
Aluminum (Al)-Dissolved	0.0050	0.0050	0.0
Antimony (Sb)-Dissolved	<0.00010	<0.00010	-
Arsenic (As)-Dissolved	0.00012	0.00014	3.8
Barium (Ba)-Dissolved	0.0474	0.0530	2.8
Cadmium (Cd)-Dissolved	<0.000010	<0.000010	-
Calcium (Ca)-Dissolved	5.39	5.40	0.0
Chromium (Cr)-Dissolved	<0.00010	<0.00010	-
Cobalt (Co)-Dissolved	<0.00010	<0.00010	-
Copper (Cu)-Dissolved	<0.00050	<0.00050	-
Iron (Fe)-Dissolved	<0.030	<0.030	-
Lead (Pb)-Dissolved	<0.000050	<0.000050	-
Magnesium (Mg)-Dissolved	1.22	1.35	2.5
Manganese (Mn)-Dissolved	0.0113	0.0125	2.5
Molybdenum (Mo)-Dissolved	0.00389	0.00380	0.6
Potassium (K)-Dissolved	1.11	1.22	2.4
Silicon (Si)-Dissolved	3.46	3.50	0.3
Sodium (Na)-Dissolved	55.5	55.9	0.2
Strontium (Sr)-Dissolved	0.681	0.682	0.0
Tin (Sn)-Dissolved	<0.00010	<0.00010	-
Uranium (U)-Dissolved	0.000045	0.000045	0.0
Zinc (Zn)-Dissolved	<0.0030	<0.0030	-

Notes:

"-" - Analyte concentration not measured, or no RPD calculated because both samples below detection limit

A - One result below detection, RPD unknown

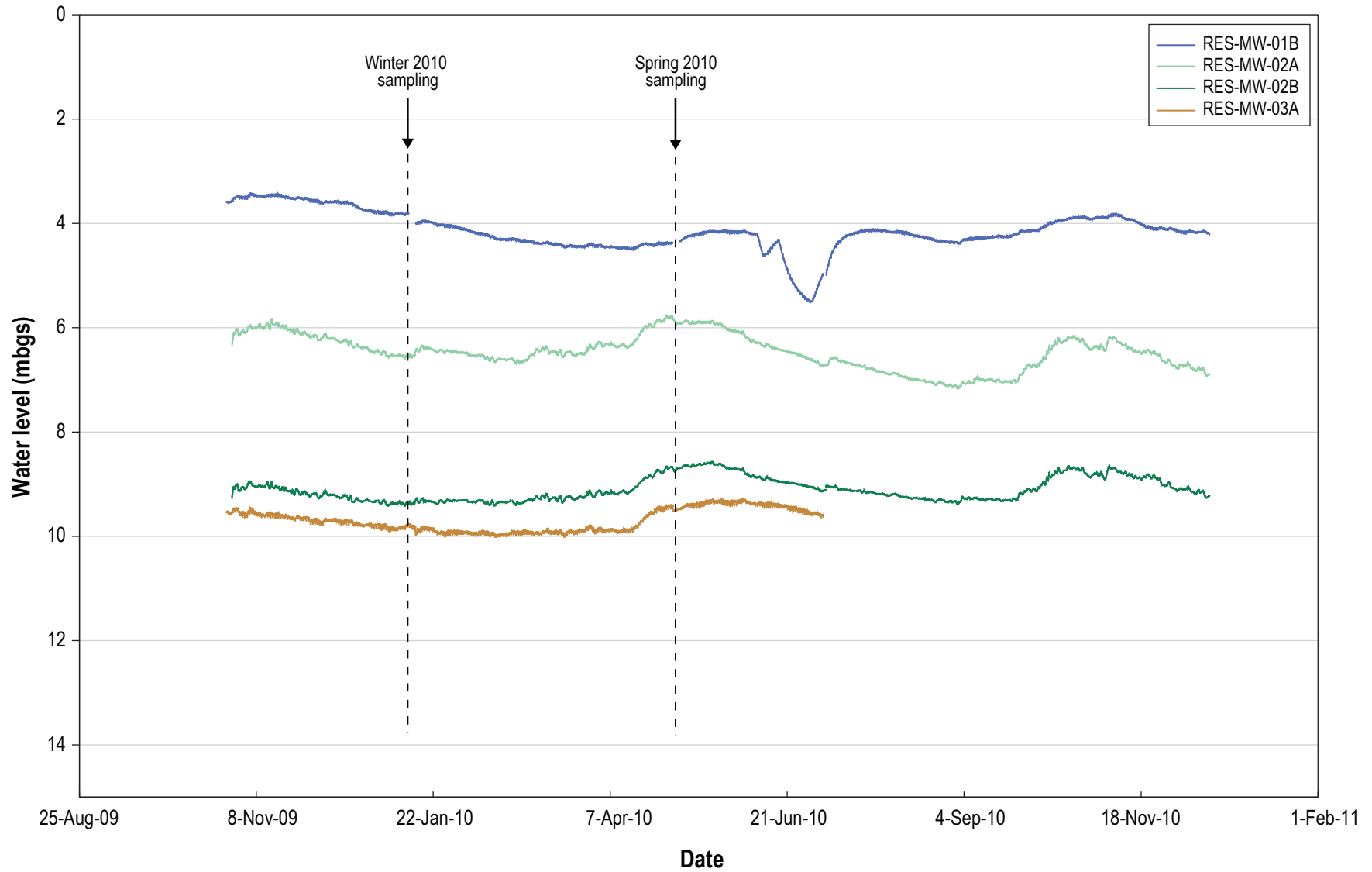


Figure 2.2-1a

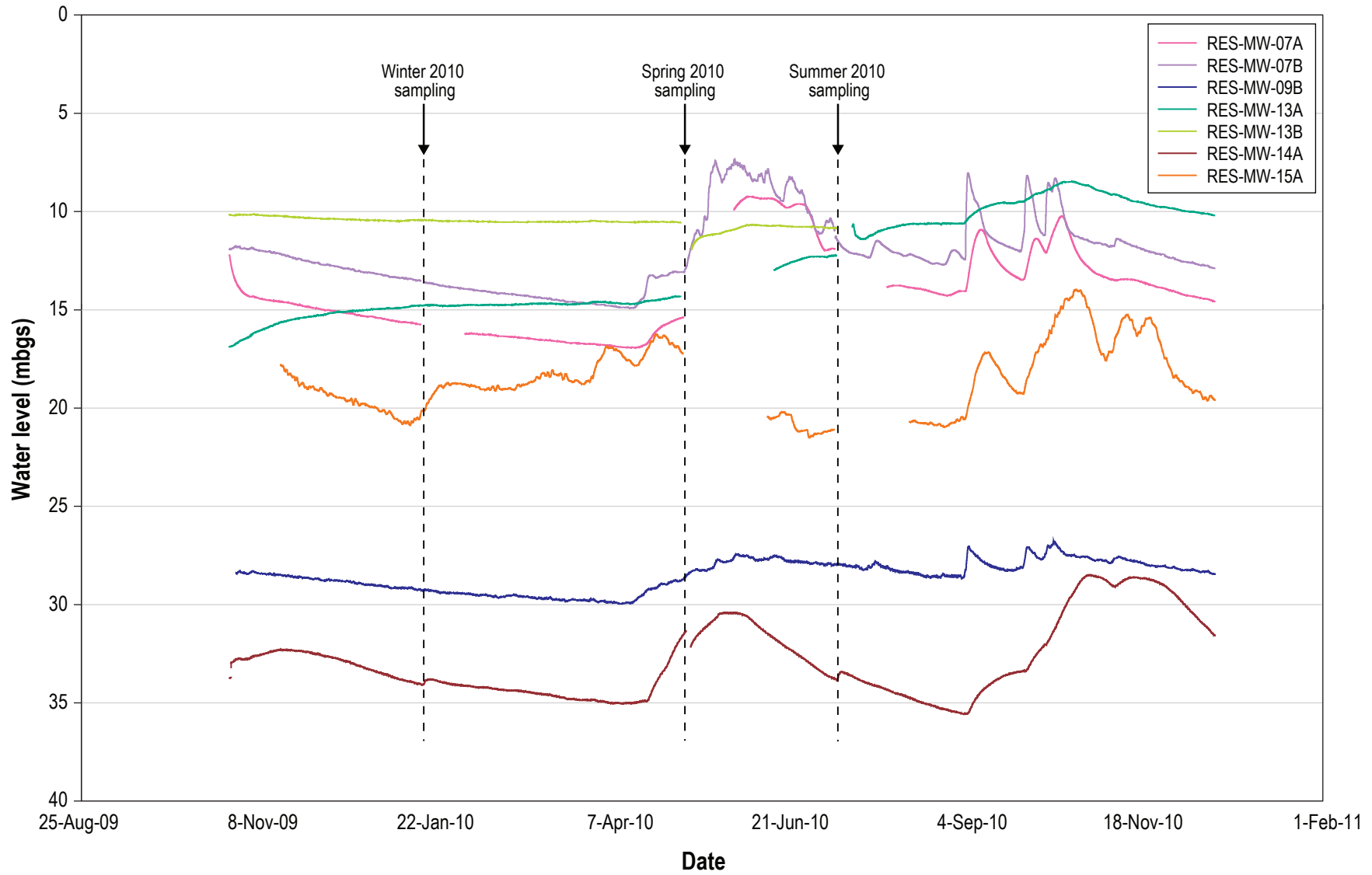


Figure 2.2-1b

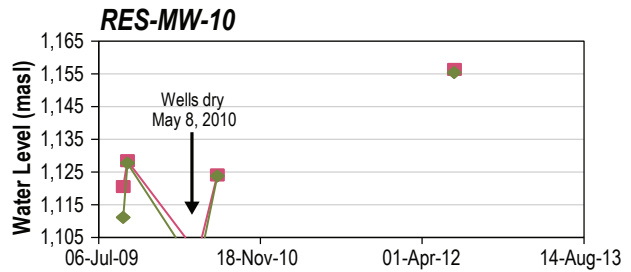
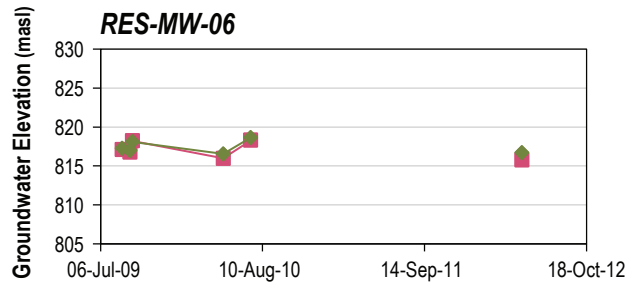
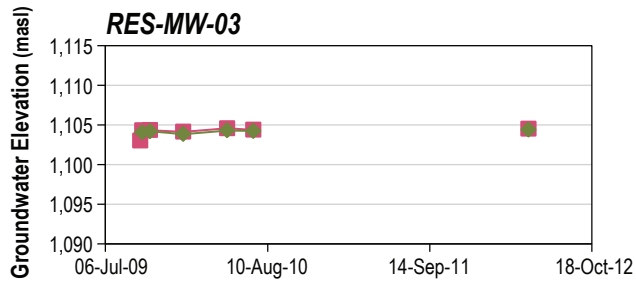
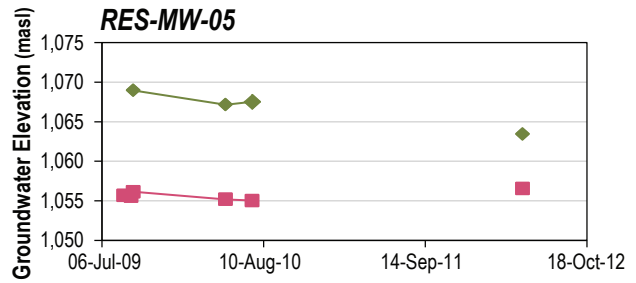
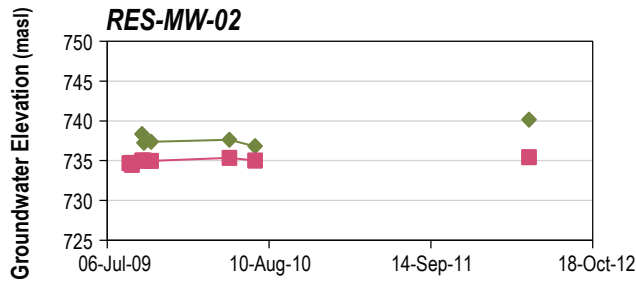
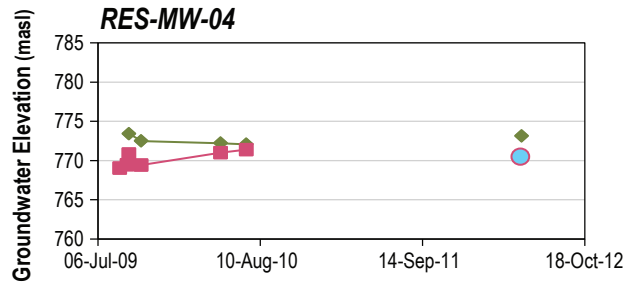
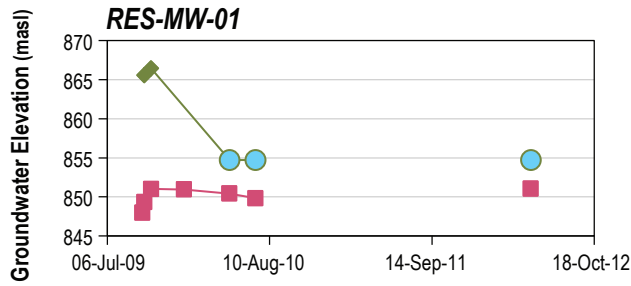
Water level measurements were taken at all sites visited (tabulated in Table 2.2-1). Water level time series plots have been revised to include 2012 measurements (Figures 2.2-2a to 2.2-2c). Recharge (downward gradient) and discharge (upward gradient) patterns identified in the Hydrogeology Baseline Report (Rescan 2010; Appendix 11-B of Chapter 11) were reflected throughout the 2012 measurements.

Table 2.2-1. 2012 Water Level Measurements

Well ID	Date	Stickup	Ground Elevation (masl)	Water Level (mbsu)	Water Level (mbg)	Water Elevation (masl)
KC08-02	May 16 2012	unknown	691	16.84	-	-
MW-01A	May 15 2012	1.01	855	0	-1.01	856.01
MW-01B	May 15 2012	0.94	855	4.61	3.67	851.33
MW-02A	May 14 2012	0.76	744	4.5	3.74	740.26
MW-02B	May 14 2012	0.9	744	9.85	8.95	735.05
MW-03A	May 15 2012	0.7	1114	10.025	9.325	1104.68
MW-03B	May 15 2012	0.94	1114	10.12	9.18	1104.82
MW-04A	May 15 2012	0.58	771	-1.62	-2.2	773.20
MW-04B	May 12 2012	1.38	770	0.03	-1.35	771.35
MW-05A	May 12 2012	0.858	1068	4.66	3.802	1064.20
MW-05B	May 12 2012	0.785	1067	11.59	10.805	1056.20
MW-06A	May 12 2012	1.61	818	2.73	1.12	816.88
MW-06B	May 12 2012	1.25	818	3.1	1.85	816.15
MW-07A	May 13 2012	1.33	1456	16.71	15.38	1440.62
MW-07B	May 16 2012	0.96	1456	14.05	13.09	1442.91
MW-09A	July 7 2012	1.52	1322	25.743	24.223	1297.78
MW-09B	July 8 2012	1.33	1322	28.188	26.858	1295.14
MW-10A	July 9 2012	1.27	1185	30.917	29.647	1155.35
MW-10B	July 10 2012	1.00	1185	29.546	28.546	1156.45
MW-11A	May 13 2012	1.48	491	0	-1.48	492.48
MW-11B	May 13 2012	1.495	491	1.74	0.245	490.76
MW-12A	July 13 2012	1.32	702	25.354	24.034	677.97
MW-13A	May 17 2012	1.59	1011	10.84	9.25	1001.75
MW-13B	May 17 2012	1.35	1011	11.91	10.56	1000.44
MW-14A	May 12 2012	0.84	847	30.42	29.58	817.42
MW-14B	May 12 2012	1.42	847	24.11	22.69	824.31
MW-15A	May 12 2012	1.48	589	12.87	11.39	577.61
MW-15B	May 12 2012	1.44	589	14.05	12.61	576.39

Processing and Tailing Management Area

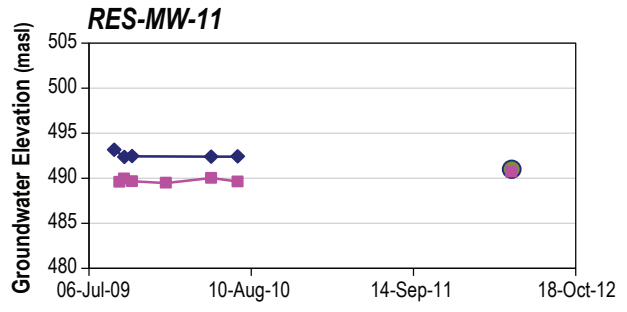
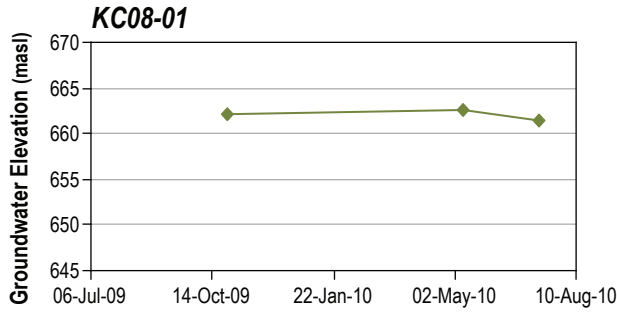
Mitchell Pit Area



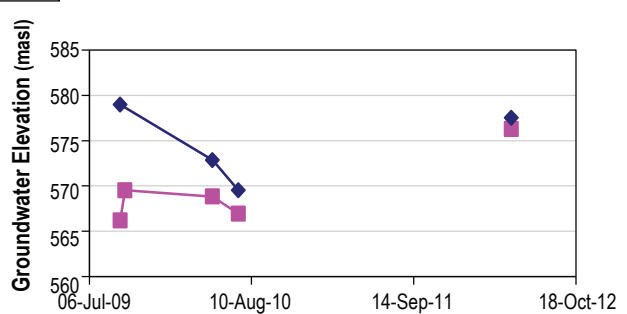
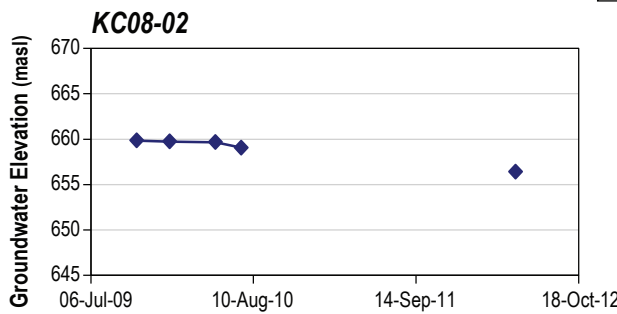
Note: ● Flowing artesian, pressure gauge not available. Water level assumed top of casing.

McTagg/Mitchell Creek Rock Storage Area

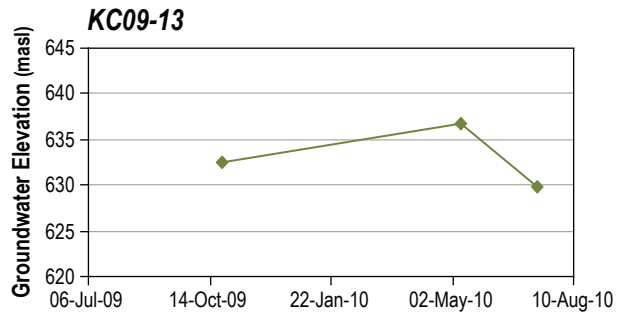
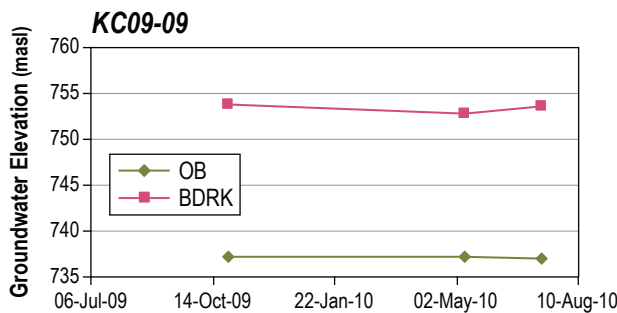
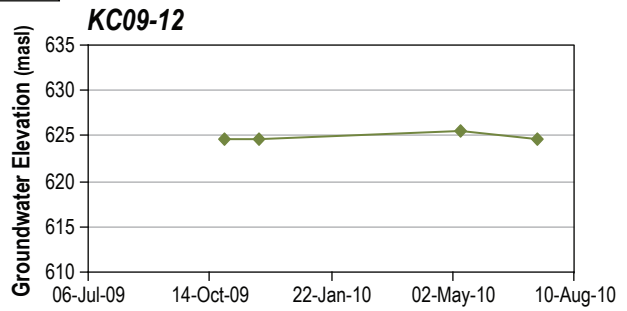
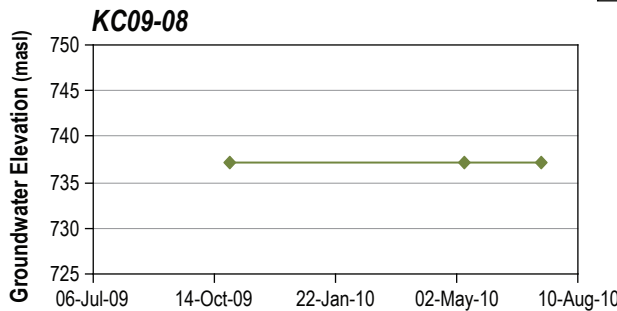
Water Storage Pond to the Confluence with the Sulphurets Creek



Legend for KC08-01 and RES-MW-11:
 A: Green diamond
 B: Pink square



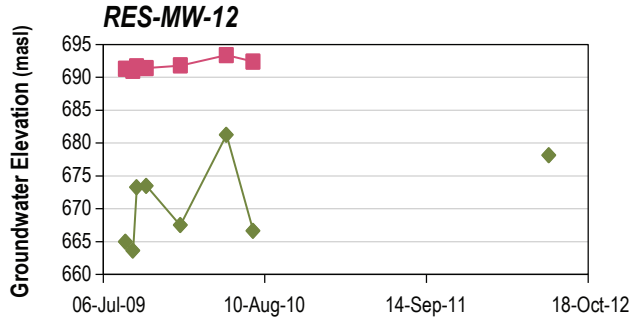
Legend for KC08-02 and RES-MW-11 (continued):
 A: Green diamond
 B: Pink square



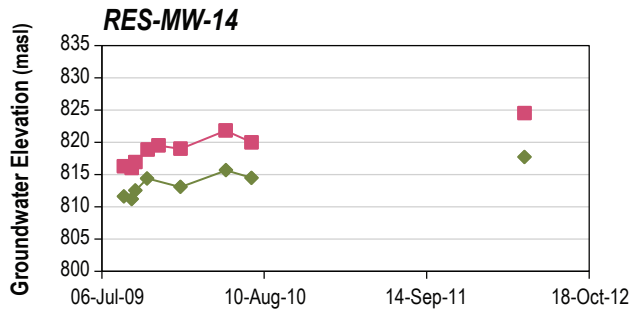
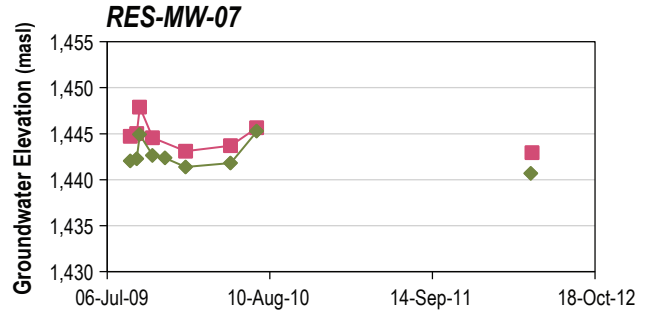
Note: ● Flowing artesian, pressure gauge not available. Water level assumed top of casing.

Figure 2.2-2b

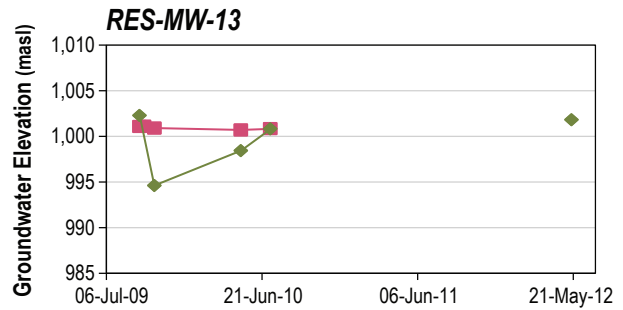
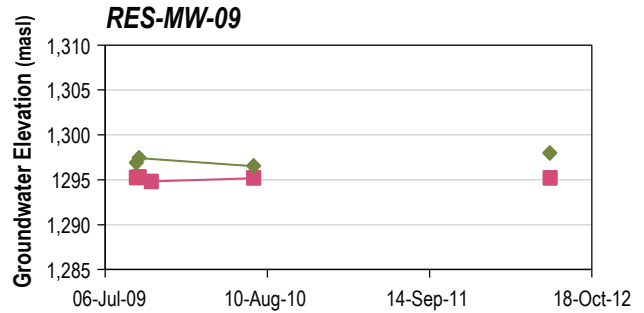
Sulphurets Valley and Rock Storage Area



Sulphurets Pit Area



Kerr Pit Area



Temporal Water Level Fluctuations Based on Manual Measurements

Figure 2.2-2c

3. Conclusions

Most data collected during the 2012 Hydrogeology field program are consistent with results and conclusions documented in the Hydrogeology Baseline Report (Rescan 2010; Appendix 11-B of Chapter 11), and therefore validate the existing baseline assessment. Groundwater quality analyses did not give rise to guideline exceedances in locations where they had not been documented previously. Water level measurements were within seasonal ranges previously documented and validated the existing conceptual groundwater flow model.

New continuous water level data spanning fall 2010 demonstrate a recharge period during the fall months followed by a discharge period during the winter. This trend is documented in both the mining and tailings management areas.

References

- BC MOE (British Columbia Ministry of Environment). 2009. Draft Water and Air Resource Protection Guidelines for Mine Proponents and Operators -Baseline Monitoring.
- Rescan. 2010. *KSM Project: 2009 and 2010 Hydrogeology Baseline Data Report*. Vancouver, BC: Prepared for Seabridge Gold Inc. by Rescan Environmental Services Ltd.

Appendix A

ALS Laboratories Water Sample Analysis Report



RESCAN ENVIRONMENTAL SERVICES
ATTN: Tyler Gale
Sixth Floor
1111 West Hastings Street
Vancouver BC V6E 2J3

Date Received: 23-MAY-12
Report Date: 01-JUN-12 16:22 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: L1151277
Project P.O. #: NOT SUBMITTED
Job Reference: 0868-017-27
C of C Numbers: 10-253250
Legal Site Desc:

Amber Springer
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1151277-1	L1151277-2	L1151277-3	L1151277-4	L1151277-5
		Description	WATER	WATER	WATER	WATER	WATER
		Sampled Date	15-MAY-12	14-MAY-12	14-MAY-12	17-MAY-12	16-MAY-12
		Sampled Time	12:30	12:45	17:00	17:45	11:20
		Client ID	RES-MW-01A	RES-MW-02A	RES-MW-06A	RES-MW-13A	RES-MW-14A
Grouping	Analyte						
WATER							
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	Conductivity (uS/cm)	275	406	600	2660	285	
	Hardness (as CaCO3) (mg/L)	18.5	35.5	263	183	140	
	pH (pH)	8.65	8.39	7.33	8.80	8.15	
	Total Suspended Solids (mg/L)	4.7	<3.0	8.0	54.0	<3.0	
	Total Dissolved Solids (mg/L)	166	246	432	1920	178	
	Turbidity (NTU)	7.45	0.50	25.4	52.8	1.45	
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	12.5	<1.0	2.9	
	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	119	126	97.9	60.8	136	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	9.4	<1.0	<2.0	<1.0	<2.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<2.0	<1.0	<2.0	
	Alkalinity, Total (as CaCO3) (mg/L)	129	126	97.9	60.8	136	
	Ammonia, Total (as N) (mg/L)	0.409	0.557	0.0082	0.248	0.0554	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<1.0	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<10	<0.50	
	Fluoride (F) (mg/L)	0.123	0.315	1.30	0.98	0.078	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.10	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.020	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.450	0.720	<0.050	0.440	<0.050	
	Total Nitrogen (mg/L)	0.450	0.720	<0.050	0.440	<0.050	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0325	<0.0010	<0.0010	0.0305	0.0015	
	Phosphorus (P)-Total (mg/L)	0.0372	0.0066	<0.0020	0.108	0.0032	
	Sulfate (SO4) (mg/L)	25.0	85.4	219	1270	23.3	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.53	0.73	<0.50	2.50	<0.50	
Total Metals	Aluminum (Al)-Total (mg/L)	0.506	0.0185	0.0106	0.110	0.0087	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	0.00012	<0.00050	0.00435	
	Arsenic (As)-Total (mg/L)	0.00020	<0.00010	0.00794	0.0117	0.0381	
	Barium (Ba)-Total (mg/L)	0.0849	0.0179	0.0117	0.0240	0.0498	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	0.00023	<0.00050	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.0025	<0.00050	
	Boron (B)-Total (mg/L)	0.024	0.034	0.017	0.152	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.000010	0.000010	0.000022	<0.000050	<0.000010	
	Calcium (Ca)-Total (mg/L)	5.54	11.7	92.7	66.2	43.6	
	Chromium (Cr)-Total (mg/L)	0.00229	0.00033	0.00023	0.00125	0.00043	
	Cobalt (Co)-Total (mg/L)	0.00013	<0.00010	0.00742	<0.00050	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1151277-6 WATER 15-MAY-12 15:30 RES-MW-26A			
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	<5.0			
	Conductivity (uS/cm)	270			
	Hardness (as CaCO3) (mg/L)	19.0			
	pH (pH)	8.78			
	Total Suspended Solids (mg/L)	<3.0			
	Total Dissolved Solids (mg/L)	168			
	Turbidity (NTU)	7.00			
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	<1.0			
	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	119			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	8.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	128			
	Ammonia, Total (as N) (mg/L)	0.440			
	Bromide (Br) (mg/L)	<0.050			
	Chloride (Cl) (mg/L)	<0.50			
	Fluoride (F) (mg/L)	0.119			
	Nitrate (as N) (mg/L)	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.460			
	Total Nitrogen (mg/L)	0.460			
	Orthophosphate-Dissolved (as P) (mg/L)	0.0246			
	Phosphorus (P)-Total (mg/L)	0.0292			
	Sulfate (SO4) (mg/L)	24.5			
Cyanides	Cyanide, Total (mg/L)	<0.0010			
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)	0.365			
	Antimony (Sb)-Total (mg/L)	0.00013			
	Arsenic (As)-Total (mg/L)	0.00019			
	Barium (Ba)-Total (mg/L)	0.0773			
	Beryllium (Be)-Total (mg/L)	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.00050			
	Boron (B)-Total (mg/L)	0.024			
	Cadmium (Cd)-Total (mg/L)	<0.000010			
	Calcium (Ca)-Total (mg/L)	5.36			
	Chromium (Cr)-Total (mg/L)	0.00167			
	Cobalt (Co)-Total (mg/L)	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1151277-1 WATER 15-MAY-12 12:30 RES-MW-01A	L1151277-2 WATER 14-MAY-12 12:45 RES-MW-02A	L1151277-3 WATER 14-MAY-12 17:00 RES-MW-06A	L1151277-4 WATER 17-MAY-12 17:45 RES-MW-13A	L1151277-5 WATER 16-MAY-12 11:20 RES-MW-14A	
Grouping	Analyte					
WATER						
Total Metals	Copper (Cu)-Total (mg/L)	0.00067	<0.00050	0.00087	<0.0025 ^{DLA}	<0.00050
	Iron (Fe)-Total (mg/L)	0.532	<0.030	5.62	0.419	0.191
	Lead (Pb)-Total (mg/L)	0.000152	<0.000050	0.000131	0.00047	<0.000050
	Lithium (Li)-Total (mg/L)	0.0553	0.179	0.0100	0.428	0.00105
	Magnesium (Mg)-Total (mg/L)	1.42	1.78	7.95	10.6	8.09
	Manganese (Mn)-Total (mg/L)	0.0162	0.0248	2.72	0.693	0.0162
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.00421	0.00199	0.00236	0.00181	0.00230
	Nickel (Ni)-Total (mg/L)	0.00155	<0.00050	0.00243	<0.0025 ^{DLA}	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	1.20	1.15	1.71	9.07	0.483
	Selenium (Se)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00050 ^{DLA}	<0.00010
	Silicon (Si)-Total (mg/L)	4.66	3.83	5.36	2.89	7.07
	Silver (Ag)-Total (mg/L)	<0.000010	0.000016	<0.000010	<0.000050 ^{DLA}	<0.000010
	Sodium (Na)-Total (mg/L)	60.8	77.9	21.0	623	4.2
	Strontium (Sr)-Total (mg/L)	0.740	1.54	0.990	2.29	0.796
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000024	0.000026	<0.000050 ^{DLA}	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00075	<0.00010
	Titanium (Ti)-Total (mg/L)	0.026	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.000082	<0.000010	0.000193	0.000428	0.000034
	Vanadium (V)-Total (mg/L)	0.0019	<0.0010	<0.0010	<0.0050 ^{DLA}	<0.0010
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0052	0.118	0.388	0.0059
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0050	<0.0030	<0.0030	0.016 ^{DLA}	<0.0030
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00010	<0.00050 ^{DLA}	0.00386
	Arsenic (As)-Dissolved (mg/L)	0.00012	<0.00010	0.00777	0.00985	0.0378
	Barium (Ba)-Dissolved (mg/L)	0.0474	0.0165	0.0111	0.0195	0.0480
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	0.00022	<0.00050 ^{DLA}	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.0025 ^{DLA}	<0.00050
	Boron (B)-Dissolved (mg/L)	0.021	0.029	0.014	0.146 ^{DLA}	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	<0.000010	0.000014	<0.000050 ^{DLA}	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	5.39	11.3	92.1	56.5	43.0
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00050 ^{DLA}	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00735	<0.00050 ^{DLA}	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.0025 ^{DLA}	<0.00050
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	5.36	0.115	0.168
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.00025 ^{DLA}	<0.000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1151277-6 WATER 15-MAY-12 15:30 RES-MW-26A			
Grouping	Analyte				
WATER					
Total Metals	Copper (Cu)-Total (mg/L)	<0.00050			
	Iron (Fe)-Total (mg/L)	0.317			
	Lead (Pb)-Total (mg/L)	0.000134			
	Lithium (Li)-Total (mg/L)	0.0531			
	Magnesium (Mg)-Total (mg/L)	1.34			
	Manganese (Mn)-Total (mg/L)	0.0149			
	Mercury (Hg)-Total (mg/L)	<0.000010			
	Molybdenum (Mo)-Total (mg/L)	0.00398			
	Nickel (Ni)-Total (mg/L)	0.00090			
	Phosphorus (P)-Total (mg/L)	<0.30			
	Potassium (K)-Total (mg/L)	1.14			
	Selenium (Se)-Total (mg/L)	<0.00010			
	Silicon (Si)-Total (mg/L)	4.34			
	Silver (Ag)-Total (mg/L)	<0.000010			
	Sodium (Na)-Total (mg/L)	55.8			
	Strontium (Sr)-Total (mg/L)	0.706			
	Thallium (Tl)-Total (mg/L)	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010			
	Titanium (Ti)-Total (mg/L)	0.027			
	Uranium (U)-Total (mg/L)	0.000065			
	Vanadium (V)-Total (mg/L)	0.0014			
	Zinc (Zn)-Total (mg/L)	<0.0030			
Dissolved Metals	Dissolved Metals Filtration Location	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0050			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00014			
	Barium (Ba)-Dissolved (mg/L)	0.0530			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050			
	Boron (B)-Dissolved (mg/L)	0.021			
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010			
	Calcium (Ca)-Dissolved (mg/L)	5.40			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	<0.00050			
	Iron (Fe)-Dissolved (mg/L)	<0.030			
	Lead (Pb)-Dissolved (mg/L)	<0.000050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1151277-1 WATER 15-MAY-12 12:30 RES-MW-01A	L1151277-2 WATER 14-MAY-12 12:45 RES-MW-02A	L1151277-3 WATER 14-MAY-12 17:00 RES-MW-06A	L1151277-4 WATER 17-MAY-12 17:45 RES-MW-13A	L1151277-5 WATER 16-MAY-12 11:20 RES-MW-14A	
Grouping	Analyte					
WATER						
Dissolved Metals	Lithium (Li)-Dissolved (mg/L)	0.0542	0.177	0.0102	0.411	0.00109
	Magnesium (Mg)-Dissolved (mg/L)	1.22	1.75	7.99	10.3	8.03
	Manganese (Mn)-Dissolved (mg/L)	0.0113	0.0238	2.71	0.452	0.0155
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	0.00389	0.00180	0.00217	0.00083	0.00208
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00240	<0.0025 ^{DLA}	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	1.11	1.15	1.72	8.91	0.476
	Selenium (Se)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00050 ^{DLA}	<0.00010
	Silicon (Si)-Dissolved (mg/L)	3.46	3.66	5.15	2.76	7.25
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000050 ^{DLA}	<0.000010
	Sodium (Na)-Dissolved (mg/L)	55.5	73.0	18.9	593	4.0
	Strontium (Sr)-Dissolved (mg/L)	0.681	1.42	0.947	2.13	0.762
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000024	<0.000050 ^{DLA}	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00050 ^{DLA}	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.000045	<0.000010	0.000188	0.000309	0.000032
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0050 ^{DLA}	<0.0010
	Zinc (Zn)-Dissolved (mg/L)	<0.0030	0.0039	0.119	<0.015 ^{DLA}	0.0034

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1151277-6	WATER	15-MAY-12	15:30	RES-MW-26A
Grouping	Analyte					
WATER						
Dissolved Metals	Lithium (Li)-Dissolved (mg/L)	0.0554				
	Magnesium (Mg)-Dissolved (mg/L)	1.35				
	Manganese (Mn)-Dissolved (mg/L)	0.0125				
	Mercury (Hg)-Dissolved (mg/L)	<0.000010				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00380				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.30				
	Potassium (K)-Dissolved (mg/L)	1.22				
	Selenium (Se)-Dissolved (mg/L)	<0.00010				
	Silicon (Si)-Dissolved (mg/L)	3.50				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	55.9				
	Strontium (Sr)-Dissolved (mg/L)	0.682				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.010				
	Uranium (U)-Dissolved (mg/L)	0.000045				
	Vanadium (V)-Dissolved (mg/L)	<0.0010				
	Zinc (Zn)-Dissolved (mg/L)	<0.0030				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Bromide (Br)	DLM	L1151277-1, -2, -3, -4, -5, -6
Duplicate	Nitrite (as N)	DLM	L1151277-4
Duplicate	Nitrite (as N)	DLM	L1151277-4
Matrix Spike	Fluoride (F)	MS-B	L1151277-1, -2, -3, -4, -5, -6
Matrix Spike	Nitrate (as N)	MS-B	L1151277-1, -2, -3, -4, -5, -6
Matrix Spike	Sulfate (SO4)	MS-B	L1151277-1, -2, -3, -4, -5, -6
Matrix Spike	Arsenic (As)-Total	MS-B	L1151277-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Total	MS-B	L1151277-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L1151277-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1151277-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L1151277-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"
		This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.	
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity
		This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.	
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 "Alkalinity"
		This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.	
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 Alkalinity
		This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.	
ALK-SCR-VA	Water	Alkalinity by colour or titration	EPA 310.2 OR APHA 2320
		This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method. OR This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.	
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.
		This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".	
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
		This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".	
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.
		This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".	
ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0
		This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.	
ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0
		This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.	
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CN-T-L-CFA-VA Water Low Level Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Apparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-LOW-CVAFS-VA Water Dissolved Mercury in Water by CVAFS(Low) EPA SW-846 3005A & EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-LOW-CVAFS-VA Water Total Mercury in Water by CVAFS(Low) EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

N-TOT-COMBUST-VA Water Total Nitrogen in Water by Combustion EN 12260 (EU STD METHOD)

This analysis is carried out, on hydrochloric acid preserved samples, using procedures modified from Method EN 12260 "Water quality - Determination of nitrogen - Determination of bound nitrogen (TNb), following oxidation to nitrogen oxides." Total Nitrogen is determined directly by pyrolysis with infrared detection using automated instrumentation.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

Reference Information

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

P-T-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-CALC-VA Water TKN in Water (Calculation) BC MOE LABORATORY MANUAL (2005)

Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

10-253250

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Report To		Report Format / Distribution		Service Request: (Rush subject to availability - Contact ALS to confirm TAT)	
Company: Rescan		Standard: <input checked="" type="checkbox"/> Other (specify):		<input checked="" type="checkbox"/> Regular (Standard Turnaround Times - Business Days)	
Contact: Tyler Gale		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital Fax		Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT	
Address: 1111 W. Hastings St. Vancouver, BC, V6E 2T3		Email 1: tgale@rescan.com		Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT	
Phone: 604-689-9460 Fax: 604-687-4277		Email 2: tychen@rescan.com		Same Day or Weekend Emergency - Contact ALS to confirm TAT	

Invoice To		Client / Project Information		Analysis Request						Number of Containers
Same as Report ? (circle) Yes or No (if No, provide details)		Job #: 0968-017-27		(Indicate Filtered or Preserved, F/P)						
Copy of Invoice with Report? (circle) Yes or No		PO / AFE:								
Company:		LSD:		General Chem. P P P P P P						
Contact:		Quote #:		Cyanide						
Address:				TOC						
Phone: Fax:		ALS Amber Springer		Nutrients						
Lab Work Order # (lab use only)		Sampler: Tyler Gale		Total Metals						
U151277				Dissolved Metals						

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General Chem.	Cyanide	TOC	Nutrients	Total Metals	Dissolved Metals	Number of Containers
RES-MW-01A		15-05-12	12:30	Water							6
RES-MW-02A		14-05-12	12:45								
RES-MW-06A		14-05-12	17:00								
RES-MW-13A		17-05-12	17:45								
RES-MW-14A		16-05-12	11:20								
RES-MW-20A		15-05-12	15:30								

Special instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
Tyler Gale	May 18/12	15:30	[Signature]	May 23	15:00	12.8 °C				Yes / No ? If Yes add SIF