

Bottom Ash Data

2018 Week 14

The following analytical report was sent to the Ministry of Environment and Climate Change Strategy on May 3, 2018. The data represents bottom ash composite results for week 14 of 2018 (April 1, 2018 to April 7, 2018).

The bottom ash meets the requirements of Metro Vancouver's Bottom Ash Management Plan and is suitable for beneficial use during Coquitlam Landfill closure works.



Covanta Burnaby R.E., ULC
ATTN: Steve McKinney
5150 Riverbend Drive
Burnaby BC V3N 4V3

Date Received: 10-APR-18
Report Date: 03-MAY-18 11:29 (MT)
Version: FINAL REV. 3

Client Phone: 604-521-1025

Certificate of Analysis

Lab Work Order #: L2078007
Project P.O. #: VANCO-0000047506
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments: As per client request, certain samples were re-prepped from scratch and analyzed for TCLP Metals (TCLP Cd) in varying replicate amounts. Results are reported as samples #13-24, and have "REP" in the Client Sample ID field. Fluid determination was not performed for samples #13-24, as per client instructions. The prep data was taken from the original samples but is reported with the re-prepped samples for informational purposes.

Brent Mack, B.Sc.
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 An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2078007-1	L2078007-2	L2078007-3	L2078007-4	L2078007-5
		Description	soil	soil	soil	soil	soil
		Sampled Date	04-APR-18	04-APR-18	04-APR-18	04-APR-18	04-APR-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1814-A-1	BA1814-A-2	BA1814-A-3	BA1814-A-4	BA1814-A-5
Grouping	Analyte						
SOIL							
Physical Tests	Moisture (%)		22.8	23.0	22.9	22.5	24.9
	pH (1:2 soil:water) (pH)		10.71	10.53	10.74	10.77	10.57
Metals	Aluminum (Al) (mg/kg)		34800	34300	37700	33800	44900
	Antimony (Sb) (mg/kg)		162	153	146	171	143
	Arsenic (As) (mg/kg)		38.5	33.1	33.8	34.5	31.8
	Barium (Ba) (mg/kg)		504	443	511	581	574
	Beryllium (Be) (mg/kg)		0.48	0.41	0.74	0.43	0.43
	Bismuth (Bi) (mg/kg)		14.2	9.45	15.6	10.1	14.3
	Boron (B) (mg/kg)		367	285	299	353	325
	Cadmium (Cd) (mg/kg)		45.3	33.5	19.9	19.0	17.5
	Calcium (Ca) (mg/kg)		142000	135000	135000	145000	140000
	Chromium (Cr) (mg/kg)		172	156	297	158	166
	Cobalt (Co) (mg/kg)		161	27.3	41.8	49.8	42.3
	Copper (Cu) (mg/kg)		6320	2260	2780	2480	2710
	Iron (Fe) (mg/kg)		61900	58600	55300	72400	53100
	Lead (Pb) (mg/kg)		429	538	417	615	373
	Lithium (Li) (mg/kg)		23.9	16.9	18.5	26.1	15.5
	Magnesium (Mg) (mg/kg)		11700	10600	10700	10900	10700
	Manganese (Mn) (mg/kg)		792	901	920	1090	771
	Mercury (Hg) (mg/kg)		0.092	0.096	0.058	0.053	0.139
	Molybdenum (Mo) (mg/kg)		56.4	46.7	50.1	53.0	86.6
	Nickel (Ni) (mg/kg)		200	172	204	126	1320
	Phosphorus (P) (mg/kg)		13500	12800	13200	13500	15700
	Potassium (K) (mg/kg)		6510	6610	6940	6410	6450
	Selenium (Se) (mg/kg)		0.63	0.47	0.62	0.40	0.61
	Silver (Ag) (mg/kg)		5.08	7.47	5.38	4.96	4.53
	Sodium (Na) (mg/kg)		17400	17600	18900	18000	18500
	Strontium (Sr) (mg/kg)		313	299	309	327	299
	Sulfur (S) (mg/kg)		15900	16300	16600	15200	15000
	Thallium (Tl) (mg/kg)		0.075	0.077	0.078	0.085	0.074
Tin (Sn) (mg/kg)		143	139	156	235	140	
Titanium (Ti) (mg/kg)		691	716	750	647	639	
Tungsten (W) (mg/kg)		17.1	8.96	11.5	10.5	11.3	
Uranium (U) (mg/kg)		6.40	6.22	6.36	7.88	6.68	
Vanadium (V) (mg/kg)		53.5	58.1	53.7	60.1	56.9	
Zinc (Zn) (mg/kg)		4730	5000	5610	6030	4320	
Zirconium (Zr) (mg/kg)		1.6	1.6	1.6	1.3	2.2	

* 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	L2078007-6 soil 04-APR-18 09:00 BA1814-A-6	L2078007-7 soil 04-APR-18 09:00 BA1814-A-7	L2078007-8 soil 04-APR-18 09:00 BA1814-A-8	L2078007-9 soil 04-APR-18 09:00 BA1814-A-9	L2078007-10 soil 04-APR-18 09:00 BA1814-A-10	
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	23.5	23.5	22.6	21.3	21.9
	pH (1:2 soil:water) (pH)	10.91	10.90	10.64	10.82	10.86
Metals	Aluminum (Al) (mg/kg)	38500	31500	34600	38200	41300
	Antimony (Sb) (mg/kg)	153	152	154	131	141
	Arsenic (As) (mg/kg)	31.2	38.0	30.9	29.3	32.8
	Barium (Ba) (mg/kg)	523	585	562	575	576
	Beryllium (Be) (mg/kg)	0.43	1.79	0.44	0.40	0.46
	Bismuth (Bi) (mg/kg)	9.63	198	10.8	8.21	12.0
	Boron (B) (mg/kg)	340	357	364	324	406
	Cadmium (Cd) (mg/kg)	23.2	18.2	19.2	16.8	26.5
	Calcium (Ca) (mg/kg)	141000	131000	148000	123000	161000
	Chromium (Cr) (mg/kg)	170	161	180	154	963
	Cobalt (Co) (mg/kg)	20.5	105	26.6	19.6	67.8
	Copper (Cu) (mg/kg)	14300	11900	1890	3110	4630
	Iron (Fe) (mg/kg)	56500	70300	60800	61100	86100
	Lead (Pb) (mg/kg)	423	1010	470	397	700
	Lithium (Li) (mg/kg)	16.1	18.0	16.1	13.5	17.6
	Magnesium (Mg) (mg/kg)	12100	9550	11600	10600	12100
	Manganese (Mn) (mg/kg)	704	740	750	860	1190
	Mercury (Hg) (mg/kg)	0.091	0.093	0.173	0.088	0.070
	Molybdenum (Mo) (mg/kg)	56.7	57.2	45.2	46.6	126
	Nickel (Ni) (mg/kg)	117	155	636	112	678
	Phosphorus (P) (mg/kg)	13200	12700	13400	10600	14700
	Potassium (K) (mg/kg)	6570	6250	6710	5960	6700
	Selenium (Se) (mg/kg)	0.43	0.52	0.53	0.44	0.44
	Silver (Ag) (mg/kg)	6.99	5.26	5.28	3.94	6.51
	Sodium (Na) (mg/kg)	19500	17100	18700	17100	18800
	Strontium (Sr) (mg/kg)	367	284	321	271	314
	Sulfur (S) (mg/kg)	15300	14700	15400	13700	16600
	Thallium (Tl) (mg/kg)	0.091	0.074	0.073	0.073	0.085
	Tin (Sn) (mg/kg)	152	819	115	178	162
	Titanium (Ti) (mg/kg)	753	712	714	1390	830
	Tungsten (W) (mg/kg)	9.10	8.73	9.98	21.7	11.5
	Uranium (U) (mg/kg)	6.51	6.46	6.95	7.02	7.01
	Vanadium (V) (mg/kg)	55.9	54.3	53.8	59.8	66.7
	Zinc (Zn) (mg/kg)	7200	5570	4750	4380	6590
	Zirconium (Zr) (mg/kg)	1.5	1.3	1.4	1.8	1.5

* 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	L2078007-11 soil 04-APR-18 09:00 BA1814-A-11	L2078007-12 soil 04-APR-18 09:00 BA1814-A-12	L2078007-13 soil 04-APR-18 09:00 BA1814-A-1 REP 1	L2078007-14 soil 04-APR-18 09:00 BA1814-A-1 REP 2	L2078007-15 soil 04-APR-18 09:00 BA1814-A-1 REP 3
Grouping	Analyte				
SOIL					
Physical Tests	Moisture (%)	22.3	22.4		
	pH (1:2 soil:water) (pH)	10.76	10.68		
Metals	Aluminum (Al) (mg/kg)	38000	30200		
	Antimony (Sb) (mg/kg)	158	146		
	Arsenic (As) (mg/kg)	35.5	32.7		
	Barium (Ba) (mg/kg)	572	510		
	Beryllium (Be) (mg/kg)	0.43	0.46		
	Bismuth (Bi) (mg/kg)	42.8	12.1		
	Boron (B) (mg/kg)	316	325		
	Cadmium (Cd) (mg/kg)	20.8	21.7		
	Calcium (Ca) (mg/kg)	140000	138000		
	Chromium (Cr) (mg/kg)	183	159		
	Cobalt (Co) (mg/kg)	33.6	33.2		
	Copper (Cu) (mg/kg)	4580	1530		
	Iron (Fe) (mg/kg)	76300	48900		
	Lead (Pb) (mg/kg)	870	1670		
	Lithium (Li) (mg/kg)	16.0	18.1		
	Magnesium (Mg) (mg/kg)	11100	11500		
	Manganese (Mn) (mg/kg)	1270	4710		
	Mercury (Hg) (mg/kg)	0.399	0.072		
	Molybdenum (Mo) (mg/kg)	109	55.9		
	Nickel (Ni) (mg/kg)	121	121		
	Phosphorus (P) (mg/kg)	12300	13000		
	Potassium (K) (mg/kg)	7220	6970		
	Selenium (Se) (mg/kg)	0.60	0.54		
	Silver (Ag) (mg/kg)	25.8	5.56		
	Sodium (Na) (mg/kg)	18400	17900		
	Strontium (Sr) (mg/kg)	291	288		
	Sulfur (S) (mg/kg)	15600	16100		
	Thallium (Tl) (mg/kg)	0.087	0.082		
	Tin (Sn) (mg/kg)	158	209		
	Titanium (Ti) (mg/kg)	909	591		
	Tungsten (W) (mg/kg)	18.7	12.7		
	Uranium (U) (mg/kg)	5.84	6.59		
	Vanadium (V) (mg/kg)	67.2	55.7		
	Zinc (Zn) (mg/kg)	5240	4860		
	Zirconium (Zr) (mg/kg)	1.6	2.1		

* 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	L2078007-16 soil 04-APR-18 09:00 BA1814-A-1 REP 4	L2078007-17 soil 04-APR-18 09:00 BA1814-A-1 REP 5	L2078007-18 soil 04-APR-18 09:00 BA1814-A-1 REP 6	L2078007-19 soil 04-APR-18 09:00 BA1814-A-1 REP 7	L2078007-20 soil 04-APR-18 09:00 BA1814-A-1 REP 8
Grouping	Analyte				
SOIL					
Physical Tests	Moisture (%) pH (1:2 soil:water) (pH)				
Metals	Aluminum (Al) (mg/kg) Antimony (Sb) (mg/kg) Arsenic (As) (mg/kg) Barium (Ba) (mg/kg) Beryllium (Be) (mg/kg) Bismuth (Bi) (mg/kg) Boron (B) (mg/kg) Cadmium (Cd) (mg/kg) Calcium (Ca) (mg/kg) Chromium (Cr) (mg/kg) Cobalt (Co) (mg/kg) Copper (Cu) (mg/kg) Iron (Fe) (mg/kg) Lead (Pb) (mg/kg) Lithium (Li) (mg/kg) Magnesium (Mg) (mg/kg) Manganese (Mn) (mg/kg) Mercury (Hg) (mg/kg) Molybdenum (Mo) (mg/kg) Nickel (Ni) (mg/kg) Phosphorus (P) (mg/kg) Potassium (K) (mg/kg) Selenium (Se) (mg/kg) Silver (Ag) (mg/kg) Sodium (Na) (mg/kg) Strontium (Sr) (mg/kg) Sulfur (S) (mg/kg) Thallium (Tl) (mg/kg) Tin (Sn) (mg/kg) Titanium (Ti) (mg/kg) Tungsten (W) (mg/kg) Uranium (U) (mg/kg) Vanadium (V) (mg/kg) Zinc (Zn) (mg/kg) Zirconium (Zr) (mg/kg)				

* 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	L2078007-21 soil 04-APR-18 09:00 BA1814-A-5 REP 1	L2078007-22 soil 04-APR-18 09:00 BA1814-A-5 REP 2	L2078007-23 soil 04-APR-18 09:00 BA1814-A-5 REP 3	L2078007-24 soil 04-APR-18 09:00 BA1814-A-5 REP 4	
Grouping	Analyte				
SOIL					
Physical Tests	Moisture (%) pH (1:2 soil:water) (pH)				
Metals	Aluminum (Al) (mg/kg) Antimony (Sb) (mg/kg) Arsenic (As) (mg/kg) Barium (Ba) (mg/kg) Beryllium (Be) (mg/kg) Bismuth (Bi) (mg/kg) Boron (B) (mg/kg) Cadmium (Cd) (mg/kg) Calcium (Ca) (mg/kg) Chromium (Cr) (mg/kg) Cobalt (Co) (mg/kg) Copper (Cu) (mg/kg) Iron (Fe) (mg/kg) Lead (Pb) (mg/kg) Lithium (Li) (mg/kg) Magnesium (Mg) (mg/kg) Manganese (Mn) (mg/kg) Mercury (Hg) (mg/kg) Molybdenum (Mo) (mg/kg) Nickel (Ni) (mg/kg) Phosphorus (P) (mg/kg) Potassium (K) (mg/kg) Selenium (Se) (mg/kg) Silver (Ag) (mg/kg) Sodium (Na) (mg/kg) Strontium (Sr) (mg/kg) Sulfur (S) (mg/kg) Thallium (Tl) (mg/kg) Tin (Sn) (mg/kg) Titanium (Ti) (mg/kg) Tungsten (W) (mg/kg) Uranium (U) (mg/kg) Vanadium (V) (mg/kg) Zinc (Zn) (mg/kg) Zirconium (Zr) (mg/kg)				

* 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		L2078007-1 soil 04-APR-18 09:00 BA1814-A-1	L2078007-2 soil 04-APR-18 09:00 BA1814-A-2	L2078007-3 soil 04-APR-18 09:00 BA1814-A-3	L2078007-4 soil 04-APR-18 09:00 BA1814-A-4	L2078007-5 soil 04-APR-18 09:00 BA1814-A-5
Grouping	Analyte					
SOIL						
Speciated Metals	Hexavalent Chromium (mg/kg)	<0.10				
TCLP Metals	1st Preliminary pH (pH)	11.54	11.41	11.51	11.46	11.46
	2nd Preliminary pH (pH)	8.89	8.90	8.87	8.70	8.76
	Final pH (pH)	5.99	5.91	6.13	5.99	5.89
	Extraction Solution Initial pH (pH)	2.87	2.87	2.87	2.87	2.87
	Antimony (Sb)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Barium (Ba)-Leachable (mg/L)	<2.5	<2.5	<2.5	<2.5	<2.5
	Beryllium (Be)-Leachable (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025
	Boron (B)-Leachable (mg/L)	5.21	4.15	4.37	4.07	5.43
	Cadmium (Cd)-Leachable (mg/L)	0.729	0.294	0.218	0.434	0.578
	Calcium (Ca)-Leachable (mg/L)	2100	2080	1990	2090	2060
	Chromium (Cr)-Leachable (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)	0.608	0.482	0.749	0.309	0.273
	Copper (Cu)-Leachable (mg/L)	1.00	0.613	1.04	1.50	1.64
	Iron (Fe)-Leachable (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Lead (Pb)-Leachable (mg/L)	<0.25	<0.25	<0.25	0.72	0.25
	Magnesium (Mg)-Leachable (mg/L)	134	117	111	120	117
	Mercury (Hg)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)	0.49	1.08	0.46	0.48	0.44
	Selenium (Se)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Silver (Ag)-Leachable (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Thallium (Tl)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V)-Leachable (mg/L)	<0.15	<0.15	<0.15	<0.15	<0.15
	Zinc (Zn)-Leachable (mg/L)	58.9	60.4	44.2	45.1	42.7

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2078007-6	L2078007-7	L2078007-8	L2078007-9	L2078007-10
		Description	soil	soil	soil	soil	soil
		Sampled Date	04-APR-18	04-APR-18	04-APR-18	04-APR-18	04-APR-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1814-A-6	BA1814-A-7	BA1814-A-8	BA1814-A-9	BA1814-A-10
Grouping	Analyte						
SOIL							
Speciated Metals	Hexavalent Chromium (mg/kg)						
TCLP Metals	1st Preliminary pH (pH)	11.49	11.44	11.49	11.44	11.42	
	2nd Preliminary pH (pH)	8.75	8.77	8.74	8.26	8.61	
	Final pH (pH)	5.94	6.00	5.90	6.07	5.94	
	Extraction Solution Initial pH (pH)	2.87	2.87	2.87	2.87	2.87	
	Antimony (Sb)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	
	Arsenic (As)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	
	Barium (Ba)-Leachable (mg/L)	<2.5	<2.5	<2.5	<2.5	<2.5	
	Beryllium (Be)-Leachable (mg/L)	<0.025	<0.025	<0.025	<0.025	<0.025	
	Boron (B)-Leachable (mg/L)	4.23	5.29	4.67	4.26	4.25	
	Cadmium (Cd)-Leachable (mg/L)	0.312	0.240	0.280	0.256	0.236	
	Calcium (Ca)-Leachable (mg/L)	2040	2080	2070	2110	2010	
	Chromium (Cr)-Leachable (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	Cobalt (Co)-Leachable (mg/L)	0.541	0.494	0.515	0.355	0.217	
	Copper (Cu)-Leachable (mg/L)	1.60	1.35	0.759	0.916	0.918	
	Iron (Fe)-Leachable (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0	
	Lead (Pb)-Leachable (mg/L)	0.27	<0.25	0.52	<0.25	0.43	
	Magnesium (Mg)-Leachable (mg/L)	118	118	119	124	116	
	Mercury (Hg)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Leachable (mg/L)	0.52	0.50	0.62	0.54	1.13	
	Selenium (Se)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	
	Silver (Ag)-Leachable (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Thallium (Tl)-Leachable (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	
	Vanadium (V)-Leachable (mg/L)	<0.15	<0.15	<0.15	<0.15	<0.15	
	Zinc (Zn)-Leachable (mg/L)	70.3	86.4	48.3	50.3	53.0	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2078007-11	L2078007-12	L2078007-13	L2078007-14	L2078007-15
		Description	soil	soil	soil	soil	soil
		Sampled Date	04-APR-18	04-APR-18	04-APR-18	04-APR-18	04-APR-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1814-A-11	BA1814-A-12	BA1814-A-1 REP 1	BA1814-A-1 REP 2	BA1814-A-1 REP 3
Grouping	Analyte						
SOIL							
Speciated Metals	Hexavalent Chromium (mg/kg)						
TCLP Metals	1st Preliminary pH (pH)	11.55	11.53	11.54	11.54	11.54	
	2nd Preliminary pH (pH)	8.93	9.14	8.89	8.89	8.89	
	Final pH (pH)	6.14	6.13	6.09	6.06	5.97	
	Extraction Solution Initial pH (pH)	2.87	2.87	2.87	2.87	2.87	
	Antimony (Sb)-Leachable (mg/L)	<1.0	<1.0				
	Arsenic (As)-Leachable (mg/L)	<1.0	<1.0				
	Barium (Ba)-Leachable (mg/L)	<2.5	<2.5				
	Beryllium (Be)-Leachable (mg/L)	<0.025	<0.025				
	Boron (B)-Leachable (mg/L)	4.74	4.49				
	Cadmium (Cd)-Leachable (mg/L)	0.282	0.295	0.255	6.52	0.242	
	Calcium (Ca)-Leachable (mg/L)	2130	2010				
	Chromium (Cr)-Leachable (mg/L)	<0.25	<0.25				
	Cobalt (Co)-Leachable (mg/L)	0.352	0.413				
	Copper (Cu)-Leachable (mg/L)	1.18	1.34				
	Iron (Fe)-Leachable (mg/L)	<5.0	<5.0				
	Lead (Pb)-Leachable (mg/L)	<0.25	<0.25				
	Magnesium (Mg)-Leachable (mg/L)	118	114				
	Mercury (Hg)-Leachable (mg/L)	<0.0010	<0.0010				
	Nickel (Ni)-Leachable (mg/L)	0.68	0.43				
	Selenium (Se)-Leachable (mg/L)	<1.0	<1.0				
	Silver (Ag)-Leachable (mg/L)	<0.050	<0.050				
	Thallium (Tl)-Leachable (mg/L)	<1.0	<1.0				
	Vanadium (V)-Leachable (mg/L)	<0.15	<0.15				
	Zinc (Zn)-Leachable (mg/L)	57.3	37.9				

* 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	L2078007-16 soil 04-APR-18 09:00 BA1814-A-1 REP 4	L2078007-17 soil 04-APR-18 09:00 BA1814-A-1 REP 5	L2078007-18 soil 04-APR-18 09:00 BA1814-A-1 REP 6	L2078007-19 soil 04-APR-18 09:00 BA1814-A-1 REP 7	L2078007-20 soil 04-APR-18 09:00 BA1814-A-1 REP 8
Grouping	Analyte				
SOIL					
Speciated Metals	Hexavalent Chromium (mg/kg)				
TCLP Metals	1st Preliminary pH (pH)				
	11.54	11.54	11.54	11.54	11.54
	2nd Preliminary pH (pH)				
	8.89	8.89	8.89	8.89	8.89
	Final pH (pH)				
	6.27	6.24	6.22	6.43	5.84
	Extraction Solution Initial pH (pH)				
	2.87	2.86	2.86	2.86	2.86
	Antimony (Sb)-Leachable (mg/L)				
	Arsenic (As)-Leachable (mg/L)				
	Barium (Ba)-Leachable (mg/L)				
	Beryllium (Be)-Leachable (mg/L)				
	Boron (B)-Leachable (mg/L)				
	Cadmium (Cd)-Leachable (mg/L)				
	0.238	0.290	0.327	0.222	0.248
	Calcium (Ca)-Leachable (mg/L)				
	Chromium (Cr)-Leachable (mg/L)				
	Cobalt (Co)-Leachable (mg/L)				
	Copper (Cu)-Leachable (mg/L)				
	Iron (Fe)-Leachable (mg/L)				
	Lead (Pb)-Leachable (mg/L)				
	Magnesium (Mg)-Leachable (mg/L)				
	Mercury (Hg)-Leachable (mg/L)				
	Nickel (Ni)-Leachable (mg/L)				
	Selenium (Se)-Leachable (mg/L)				
	Silver (Ag)-Leachable (mg/L)				
	Thallium (Tl)-Leachable (mg/L)				
	Vanadium (V)-Leachable (mg/L)				
	Zinc (Zn)-Leachable (mg/L)				

* 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	L2078007-21 soil 04-APR-18 09:00 BA1814-A-5 REP 1	L2078007-22 soil 04-APR-18 09:00 BA1814-A-5 REP 2	L2078007-23 soil 04-APR-18 09:00 BA1814-A-5 REP 3	L2078007-24 soil 04-APR-18 09:00 BA1814-A-5 REP 4	
Grouping	Analyte				
SOIL					
Speciated Metals	Hexavalent Chromium (mg/kg)				
TCLP Metals	1st Preliminary pH (pH)	11.46	11.46	11.46	11.46
	2nd Preliminary pH (pH)	8.76	8.76	8.76	8.76
	Final pH (pH)	5.86	5.96	6.08	6.26
	Extraction Solution Initial pH (pH)	2.86	2.86	2.86	2.86
	Antimony (Sb)-Leachable (mg/L)				
	Arsenic (As)-Leachable (mg/L)				
	Barium (Ba)-Leachable (mg/L)				
	Beryllium (Be)-Leachable (mg/L)				
	Boron (B)-Leachable (mg/L)				
	Cadmium (Cd)-Leachable (mg/L)	0.307	0.267	0.246	0.282
	Calcium (Ca)-Leachable (mg/L)				
	Chromium (Cr)-Leachable (mg/L)				
	Cobalt (Co)-Leachable (mg/L)				
	Copper (Cu)-Leachable (mg/L)				
	Iron (Fe)-Leachable (mg/L)				
	Lead (Pb)-Leachable (mg/L)				
	Magnesium (Mg)-Leachable (mg/L)				
	Mercury (Hg)-Leachable (mg/L)				
	Nickel (Ni)-Leachable (mg/L)				
	Selenium (Se)-Leachable (mg/L)				
	Silver (Ag)-Leachable (mg/L)				
	Thallium (Tl)-Leachable (mg/L)				
	Vanadium (V)-Leachable (mg/L)				
	Zinc (Zn)-Leachable (mg/L)				

* 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	Cadmium (Cd)	DUP-H	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Cobalt (Co)	DUP-H	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Copper (Cu)	DUP-H	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Lead (Pb)	DUP-H	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Tin (Sn)	DUP-H	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Duplicate	Tungsten (W)	DUP-H	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cobalt (Co)-Leachable	MS-B	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Zinc (Zn)-Leachable	MS-B	L2078007-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Certified Reference Material	Hexavalent Chromium	RM-L	L2078007-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RM-L	Reference Material recovery was below ALS DQO. Lab Control Sample and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CR-CR6-3060-ED	Soil	Chromium, Hexavalent (Cr +6)	APHA 3500-CR C, EPA 3060A ALKALINE
		Field moist samples are digested with a sodium hydroxide/sodium carbonate solution. After cooling and filtration, the rinsate is adjusted to pH 9, and injected on an ion chromatograph to separate the hexavalent chromium ion. A post column color reaction with diphenylcarbohydrazide and absorbance measurement at 530 nm completes the quantitation.	
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)
		Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.	
HG-TCLP-CVAFS-VA	Soil	Mercury by CVAAS (TCLP)	EPA 1311/245.7
		This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using atomic absorption spectrophotometry (EPA 245.7).	
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
		This method uses a heated strong acid digestion with HNO3 and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.	
MET-TCLP-ICP-VA	Soil	Metals by ICPOES (TCLP)	EPA 1311/6010B
		This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).	
MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1
		This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.	
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL
		This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.	

** 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:

Reference Information

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

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.

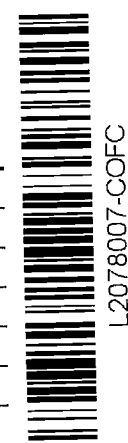
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Report To	Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company: Covanta Energy	<input type="checkbox"/> Standard <input type="checkbox"/> Other	<input checked="" type="radio"/> Regular (Standard Turnaround Times - Business Days)
Contact: Steve McKinney / Dan Skrypnik	<input checked="" type="checkbox"/> PDF <input type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax	<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address: 5150 Riverbend Drive Burnaby BC	Email 1: smckinney@covanta.com	<input type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
Phone: 604-521-1025 Fax: <input type="checkbox"/> Yes <input type="checkbox"/> No	Email 2: rjohnson4@covanta.com	<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT
	Email 3: dskrypnik@covanta.com	Analysis Request
	brent.kirkpatrick@metrovancover.org	
	Sarah.Wellman@metrovancover.org	

Invoice To Same as Report? <input type="checkbox"/> Yes <input type="checkbox"/> No	Client / Project Information	Please indicate below Filtered, Preserved or both (F, P, F/P)	
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input type="checkbox"/> No	Job #:		
Company:	PO / AFE: PO# 46693 Weekly Bottom Ash - Suite		
Contact:	LSD: (includes 2:1 pH)		
Address:			
Phone: Fax:	Quote #:		

Lab Work Order # (lab use only)	ALS Contact:	Sampler:					MET-TCLP-VA (all metals, Hg)	MOISTURE	Chrome 6	MET-CSR+FULL-VA (all metals)					Number of Containers
Sample #	Sample Identification (This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type										
BA1814-A-1			04-Apr-18	9:00	Soil	X	X	X	X					1	
BA1814-A-2			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-3			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-4			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-5			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-6			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-7			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-8			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-9			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-10			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-11			04-Apr-18	9:00	Soil	X	X		X					1	
BA1814-A-12			04-Apr-18	9:00	Soil	X	X		X					1	



Special Instructions / Regulations 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 provided on a separate Excel tab.
 Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy): 19-APR-18	Time (hh-mm): 07:30	Received by: ZJ JC	Date: APR 10 2018	Time: 11 35AM	Temperature: 22.0C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF