

## Bottom Ash Data

2018 Week 9

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The following analytical report was sent to the Ministry of Environment and Climate Change Strategy on March 26, 2018. The data represents bottom ash composite results for week 9 of 2018 (February 25, 2018 to March 3, 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  
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Burnaby BC V3N 4V3

Date Received: 06-MAR-18  
Report Date: 22-MAR-18 12:17 (MT)  
Version: FINAL

Client Phone: 604-521-1025

## Certificate of Analysis

Lab Work Order #: L2064237  
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 #13-16, and have "REP" in the Client Sample ID field. Fluid determination was not performed for samples #13-16, as per client instructions. The prep data was taken from the original samples but is reported with the re-prepped samples for informational purposes.

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Brent Mack, B.Sc.  
Account Manager

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L2064237-1 Soil 28-FEB-18 09:00 BA1809-A-1	L2064237-2 Soil 28-FEB-18 09:00 BA1809-A-2	L2064237-3 Soil 28-FEB-18 09:00 BA1809-A-3	L2064237-4 Soil 28-FEB-18 09:00 BA1809-A-4	L2064237-5 Soil 28-FEB-18 09:00 BA1809-A-5	
Grouping	Analyte					
<b>SOIL</b>						
<b>Physical Tests</b>	Moisture (%)	21.8	23.0	23.1	24.9	22.0
	pH (1:2 soil:water) (pH)	12.09	11.94	12.13	11.93	12.02
<b>Metals</b>	Aluminum (Al) (mg/kg)	33700	39800	35500	45500	40700
	Antimony (Sb) (mg/kg)	144	123	232	120	141
	Arsenic (As) (mg/kg)	22.1	28.6	31.7	22.2	23.2
	Barium (Ba) (mg/kg)	576	569	590	644	682
	Beryllium (Be) (mg/kg)	0.40	0.42	0.48	0.48	0.41
	Bismuth (Bi) (mg/kg)	8.40	9.33	10.1	8.19	8.77
	Boron (B) (mg/kg)	241	167	196	228	223
	Cadmium (Cd) (mg/kg)	13.7	14.8	11.6	11.4	14.8
	Calcium (Ca) (mg/kg)	136000	140000	144000	152000	155000
	Chromium (Cr) (mg/kg)	243	403	202	258	458
	Cobalt (Co) (mg/kg)	30.7	51.4	24.3	132	63.1
	Copper (Cu) (mg/kg)	1790	7220	2240	2310	8550
	Iron (Fe) (mg/kg)	73400	64800	70600	57500	51700
	Lead (Pb) (mg/kg)	506	3470	4220	806	459
	Lithium (Li) (mg/kg)	15.6	20.7	14.2	22.8	16.1
	Magnesium (Mg) (mg/kg)	9890	10300	11800	13000	14900
	Manganese (Mn) (mg/kg)	839	901	1010	884	861
	Mercury (Hg) (mg/kg)	0.178	0.199	0.181	0.177	0.265
	Molybdenum (Mo) (mg/kg)	33.2	43.5	32.3	32.5	50.5
	Nickel (Ni) (mg/kg)	158	234	151	171	280
	Phosphorus (P) (mg/kg)	11400	12400	11700	13900	14100
	Potassium (K) (mg/kg)	5590	5560	5840	6110	5780
	Selenium (Se) (mg/kg)	0.36	0.33	0.37	0.34	0.47
	Silver (Ag) (mg/kg)	4.17	12.2	5.02	21.7	6.40
	Sodium (Na) (mg/kg)	14300	15400	15400	17400	16900
	Strontium (Sr) (mg/kg)	407	360	350	395	357
	Sulfur (S) (mg/kg)	12100	14100	11800	12500	12900
	Thallium (Tl) (mg/kg)	0.081	0.088	0.082	0.091	0.104
	Tin (Sn) (mg/kg)	112	142	116	703	127
	Titanium (Ti) (mg/kg)	874	618	645	651	1130
	Tungsten (W) (mg/kg)	4.80	5.60	5.36	6.04	5.58
	Uranium (U) (mg/kg)	6.78	6.89	6.93	7.01	6.81
	Vanadium (V) (mg/kg)	55.5	57.5	57.6	61.9	64.5
	Zinc (Zn) (mg/kg)	3970	3970	3390	3860	14600
	Zirconium (Zr) (mg/kg)	1.5	1.5	1.6	2.2	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	L2064237-6 Soil 28-FEB-18 09:00 BA1809-A-6	L2064237-7 Soil 28-FEB-18 09:00 BA1809-A-7	L2064237-8 Soil 28-FEB-18 09:00 BA1809-A-8	L2064237-9 Soil 28-FEB-18 09:00 BA1809-A-9	L2064237-10 Soil 28-FEB-18 09:00 BA1809-A-10	
Grouping	Analyte					
<b>SOIL</b>						
<b>Physical Tests</b>	Moisture (%)	22.9	23.5	24.4	22.7	23.4
	pH (1:2 soil:water) (pH)	11.76	11.95	11.92	12.03	11.89
<b>Metals</b>	Aluminum (Al) (mg/kg)	40000	49400	33200	54300	33700
	Antimony (Sb) (mg/kg)	125	141	128	124	125
	Arsenic (As) (mg/kg)	26.8	29.2	24.6	21.4	23.1
	Barium (Ba) (mg/kg)	668	699	682	622	637
	Beryllium (Be) (mg/kg)	0.45	0.44	0.44	0.42	0.43
	Bismuth (Bi) (mg/kg)	6.81	9.15	12.6	14.8	8.67
	Boron (B) (mg/kg)	230	200	205	217	216
	Cadmium (Cd) (mg/kg)	12.6	14.1	15.9	12.5	12.6
	Calcium (Ca) (mg/kg)	139000	160000	144000	142000	147000
	Chromium (Cr) (mg/kg)	150	364	405	231	160
	Cobalt (Co) (mg/kg)	20.1	81.5	67.8	21.5	152
	Copper (Cu) (mg/kg)	2070	2940	1740	1630	17900
	Iron (Fe) (mg/kg)	67300	71700	62300	46700	53900
	Lead (Pb) (mg/kg)	979	530	557	462	899
	Lithium (Li) (mg/kg)	14.5	21.3	15.8	19.3	21.8
	Magnesium (Mg) (mg/kg)	12200	12800	12700	11600	13400
	Manganese (Mn) (mg/kg)	1040	1110	1100	859	886
	Mercury (Hg) (mg/kg)	0.165	0.169	0.183	0.142	0.165
	Molybdenum (Mo) (mg/kg)	36.1	56.1	65.7	44.2	39.1
	Nickel (Ni) (mg/kg)	127	217	199	168	120
	Phosphorus (P) (mg/kg)	12700	15600	13600	14700	14000
	Potassium (K) (mg/kg)	5250	6200	5740	6060	5850
	Selenium (Se) (mg/kg)	0.35	0.42	0.38	0.32	0.58
	Silver (Ag) (mg/kg)	4.63	5.48	3.88	6.55	13.3
	Sodium (Na) (mg/kg)	16200	19000	15700	17200	16200
	Strontium (Sr) (mg/kg)	344	389	366	335	366
	Sulfur (S) (mg/kg)	10800	15000	12900	12600	12700
	Thallium (Tl) (mg/kg)	0.072	0.088	0.076	0.084	0.092
	Tin (Sn) (mg/kg)	169	130	113	5340	128
	Titanium (Ti) (mg/kg)	1020	948	1140	1110	694
	Tungsten (W) (mg/kg)	3.56	5.30	5.34	4.77	3.45
	Uranium (U) (mg/kg)	5.97	7.09	6.52	6.74	7.02
	Vanadium (V) (mg/kg)	56.8	68.1	57.4	60.4	59.1
	Zinc (Zn) (mg/kg)	3720	4620	3600	3130	11500
	Zirconium (Zr) (mg/kg)	1.3	2.1	1.5	2.6	1.5

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2064237-11	L2064237-12	L2064237-13	L2064237-14	L2064237-15
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1809-A-11	BA1809-A-12	BA1809-A-9 REP 1	BA1809-A-9 REP 2	BA1809-A-9 REP 3
Grouping	Analyte						
<b>SOIL</b>							
<b>Physical Tests</b>	Moisture (%)		23.3	21.9			
	pH (1:2 soil:water) (pH)		12.05	12.02			
<b>Metals</b>	Aluminum (Al) (mg/kg)		36400	35800			
	Antimony (Sb) (mg/kg)		133	139			
	Arsenic (As) (mg/kg)		32.7	24.9			
	Barium (Ba) (mg/kg)		566	612			
	Beryllium (Be) (mg/kg)		0.42	0.40			
	Bismuth (Bi) (mg/kg)		11.9	13.9			
	Boron (B) (mg/kg)		182	181			
	Cadmium (Cd) (mg/kg)		33.9	15.0			
	Calcium (Ca) (mg/kg)		147000	155000			
	Chromium (Cr) (mg/kg)		382	204			
	Cobalt (Co) (mg/kg)		322	34.1			
	Copper (Cu) (mg/kg)		4390	3740			
	Iron (Fe) (mg/kg)		54500	71500			
	Lead (Pb) (mg/kg)		1150	856			
	Lithium (Li) (mg/kg)		39.4	16.4			
	Magnesium (Mg) (mg/kg)		12800	13400			
	Manganese (Mn) (mg/kg)		882	1110			
	Mercury (Hg) (mg/kg)		0.170	0.196			
	Molybdenum (Mo) (mg/kg)		49.5	47.7			
	Nickel (Ni) (mg/kg)		309	169			
	Phosphorus (P) (mg/kg)		14100	15800			
	Potassium (K) (mg/kg)		6150	5950			
	Selenium (Se) (mg/kg)		0.40	0.43			
	Silver (Ag) (mg/kg)		6.03	6.83			
	Sodium (Na) (mg/kg)		16300	17200			
	Strontium (Sr) (mg/kg)		481	461			
	Sulfur (S) (mg/kg)		13300	14600			
	Thallium (Tl) (mg/kg)		0.088	0.086			
Tin (Sn) (mg/kg)		385	126				
Titanium (Ti) (mg/kg)		778	859				
Tungsten (W) (mg/kg)		3.97	5.16				
Uranium (U) (mg/kg)		7.04	7.12				
Vanadium (V) (mg/kg)		66.0	69.0				
Zinc (Zn) (mg/kg)		4190	3860				
Zirconium (Zr) (mg/kg)		3.0	2.0				

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>				
	L2064237-16 Soil 28-FEB-18 09:00 BA1809-A-9 REP 4				
Grouping	Analyte				
<b>SOIL</b>					
<b>Physical Tests</b>	Moisture (%) pH (1:2 soil:water) (pH)				
<b>Metals</b>	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	L2064237-1	L2064237-2	L2064237-3	L2064237-4	L2064237-5
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1809-A-1	BA1809-A-2	BA1809-A-3	BA1809-A-4	BA1809-A-5
Grouping	Analyte						
<b>SOIL</b>							
<b>TCLP Metals</b>	1st Preliminary pH (pH)		11.80	11.78	11.94	11.92	12.03
	2nd Preliminary pH (pH)		9.10	8.86	9.56	9.12	9.72
	Final pH (pH)		6.07	6.05	6.07	5.70	5.92
	Extraction Solution Initial pH (pH)		2.90	2.90	2.90	2.90	2.90
	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)		2.09	2.11	2.12	2.11	2.16
	Cadmium (Cd)-Leachable (mg/L)		0.125	0.137	0.143	0.130	0.148
	Calcium (Ca)-Leachable (mg/L)		1990	1950	1930	1880	1950
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)		0.418	0.393	0.617	0.362	1.80
	Copper (Cu)-Leachable (mg/L)		0.408	0.815	0.870	0.319	0.536
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0	<5.0	<5.0	<5.0
	Lead (Pb)-Leachable (mg/L)		<0.25	0.45	<0.25	0.28	<0.25
	Magnesium (Mg)-Leachable (mg/L)		135	127	130	118	131
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)		0.36	0.44	0.42	0.38	0.80
	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)		27.1	26.0	34.1	28.5	56.4

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2064237-6	L2064237-7	L2064237-8	L2064237-9	L2064237-10
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1809-A-6	BA1809-A-7	BA1809-A-8	BA1809-A-9	BA1809-A-10
Grouping	Analyte						
<b>SOIL</b>							
<b>TCLP Metals</b>	1st Preliminary pH (pH)		11.92	11.84	11.85	11.89	11.87
	2nd Preliminary pH (pH)		9.59	9.30	9.21	8.86	9.38
	Final pH (pH)		6.13	6.59	5.95	5.84	5.90
	Extraction Solution Initial pH (pH)		2.90	2.90	2.85	2.85	2.85
	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)		2.06	2.12	2.29	2.08	2.35
	Cadmium (Cd)-Leachable (mg/L)		0.221	0.146	0.161	1.29	0.199
	Calcium (Ca)-Leachable (mg/L)		1940	1930	1980	1860	2000
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)		0.285	0.921	0.596	0.902	0.474
	Copper (Cu)-Leachable (mg/L)		0.967	0.476	0.790	0.777	0.722
	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	<0.25	0.31
	Magnesium (Mg)-Leachable (mg/L)		127	124	132	117	130
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)		0.37	0.47	0.56	0.43	0.77
	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)		28.0	39.2	50.3	78.9	50.8

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



## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2064237-11	L2064237-12	L2064237-13	L2064237-14	L2064237-15
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18	28-FEB-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1809-A-11	BA1809-A-12	BA1809-A-9 REP 1	BA1809-A-9 REP 2	BA1809-A-9 REP 3
Grouping	Analyte						
<b>SOIL</b>							
<b>TCLP Metals</b>	1st Preliminary pH (pH)		11.96	11.87	11.89	11.89	11.89
	2nd Preliminary pH (pH)		9.70	9.05	8.86	8.86	8.86
	Final pH (pH)		5.96	5.79	5.91	5.91	6.03
	Extraction Solution Initial pH (pH)		2.85	2.85	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)		2.26	2.39			
	Cadmium (Cd)-Leachable (mg/L)		0.156	0.162	0.858	0.222	0.157
	Calcium (Ca)-Leachable (mg/L)		1880	1980			
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25			
	Cobalt (Co)-Leachable (mg/L)		0.200	0.674			
	Copper (Cu)-Leachable (mg/L)		0.697	0.204			
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0			
	Lead (Pb)-Leachable (mg/L)		<0.25	<0.25			
	Magnesium (Mg)-Leachable (mg/L)		126	131			
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010			
	Nickel (Ni)-Leachable (mg/L)		0.45	0.42			
	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)		38.7	59.6			

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L2064237-16			
		Soil	28-FEB-18	09:00	BA1809-A-9 REP 4
Grouping	Analyte				
<b>SOIL</b>					
<b>TCLP Metals</b>	1st Preliminary pH (pH)	11.89			
	2nd Preliminary pH (pH)	8.86			
	Final pH (pH)	5.99			
	Extraction Solution Initial pH (pH)	2.87			
	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)	0.157			
	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 &amp; Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Mercury (Hg)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Chromium (Cr)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Cobalt (Co)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Copper (Cu)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Lead (Pb)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Nickel (Ni)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Titanium (Ti)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Zinc (Zn)	DUP-H	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Duplicate	Molybdenum (Mo)	DUP-H,J	L2064237-10, -11, -12, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L2064237-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L2064237-10, -11, -12, -8, -9
Matrix Spike	Cobalt (Co)-Leachable	MS-B	L2064237-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Cobalt (Co)-Leachable	MS-B	L2064237-10, -11, -12, -8, -9
Matrix Spike	Zinc (Zn)-Leachable	MS-B	L2064237-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Zinc (Zn)-Leachable	MS-B	L2064237-10, -11, -12, -8, -9

## Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
DUP-H,J	Duplicate results outside ALS DQO, due to sample heterogeneity. Duplicate results and limits are expressed in terms of absolute difference.
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**
<b>HG-200.2-CVAF-VA</b>	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.	
<b>HG-TCLP-CVAFS-VA</b>	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).	
<b>MET-200.2-CCMS-VA</b>	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
		This method uses a heated strong acid digestion with HNO <sub>3</sub> 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.	
<b>MET-TCLP-ICP-VA</b>	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).	
<b>MOISTURE-VA</b>	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.	
<b>PH-1:2-VA</b>	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**

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VA                                      ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

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**Chain of Custody Numbers:**

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**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.*



Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

<b>Report To</b>		<b>Report Format / Distribution</b>		<b>Service Requested</b> (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 Skrypyk	<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="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT	
	<input type="checkbox"/> Yes <input type="checkbox"/> No	Email 3:	dskrpynyk@covanta.com	<b>Analysis Request</b>	
			brent.kirkpatrick@metrovancover.org		
			Sarah.Wellman@metrovancover.org		

<b>Invoice To</b>		<b>Client / Project Information</b>		Please indicate below Filtered, Preserved or both (F, P, F/P)									
Same as Report ?		Job #:											
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input type="checkbox"/> No		PO / AFE: PO# 46693 Weekly Bottom Ash - Suite											
Company:		LSD: (includes 2:1 pH)											
Contact:		Quote #:											
Address:		ALS Contact:											
Phone:		Sampler:											
Lab Work (lab #)													
L2064237-COFC													

Sample #	(This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	MET-TCLP-VA (all metals, Hg)		MOISTURE	Chrome 6	MET-CSR-FULL-VA (all metals)		Number of Containers
					X	X			X	X	
BA1809-A-1		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-2		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-3		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-4		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-5		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-6		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-7		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-8		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-9		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-10		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-11		28-Feb-18	9:00	Soil	X	X			X		1
BA1809-A-12		28-Feb-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)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
<i>[Signature]</i>	6/3/18	8:00	<i>[Signature]</i>	6/3/18	11:40	19.4 °C				Yes / No ? If Yes add SIF