## **metro**vancouver

### **Bottom Ash Data**

2019 Week 13

The following analytical reports were sent to the Ministry of Environment and Climate Change Strategy:

- Weekly Composite Results were submitted on April 18, 2019
- Daily Composite Results were submitted on May 10, 2019

This data represents bottom ash results for week 13 of 2019 (March 24, 2019 to March 30, 2019).

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: 01-APR-19

Report Date: 16-APR-19 11:48 (MT)

Version: FINAL

Client Phone: 604-521-1025

## Certificate of Analysis

Lab Work Order #: L2251635

Project P.O. #: VANCO-000048466

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 #13-22, and have "REP" in the Client Sample ID field. Fluid determination was not performed for samples #13-22, 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

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Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2251635-1 Soil 27-MAR-19 09:00 BA1913-A-1	L2251635-2 Soil 27-MAR-19 09:00 BA1913-A-2	L2251635-3 Soil 27-MAR-19 09:00 BA1913-A-3	L2251635-4 Soil 27-MAR-19 09:00 BA1913-A-4	L2251635-5 Soil 27-MAR-19 09:00 BA1913-A-5
Grouping	Analyte						
SOIL							
Physical Tests	Moisture (%)		21.5	22.3	20.8	21.1	21.6
	pH (1:2 soil:water) (pH)		10.74	10.68	10.72	10.80	10.38
Metals	Aluminum (Al) (mg/kg)		39400	37000	34900	45300	39700
	Antimony (Sb) (mg/kg)		166	254	176	197	174
	Arsenic (As) (mg/kg)		33.3	36.9	35.6	34.5	27.8
	Barium (Ba) (mg/kg)		552	524	468	407	432
	Beryllium (Be) (mg/kg)		0.42	0.42	0.43	0.41	0.39
	Bismuth (Bi) (mg/kg)		11.3	10.7	16.3	13.7	16.4
	Boron (B) (mg/kg)		357	366	402	535	383
	Cadmium (Cd) (mg/kg)		17.1	19.4	63.0	17.1	17.0
	Calcium (Ca) (mg/kg)		140000	140000	149000	143000	123000
	Chromium (Cr) (mg/kg)		169	506	174	187	123
	Cobalt (Co) (mg/kg)		49.0	40.0	48.5	35.3	27.0
	Copper (Cu) (mg/kg)		2570	2820	1890	2760	2840
	Iron (Fe) (mg/kg)		70000	65900	71600	53600	50700
	Lead (Pb) (mg/kg)		785	921	832	12400	463
	Lithium (Li) (mg/kg)		26.8	23.2	20.3	22.7	19.8
	Magnesium (Mg) (mg/kg)		11900	11300	11300	11600	10800
	Manganese (Mn) (mg/kg)		4230	861	820	1750	822
	Mercury (Hg) (mg/kg)		0.085	0.087	0.075	0.081	0.065
	Molybdenum (Mo) (mg/kg)		42.6	53.1	64.3	50.2	37.8
	Nickel (Ni) (mg/kg)		367	502	174	184	119
	Phosphorus (P) (mg/kg)		11200	12500	14800	12100	9910
	Potassium (K) (mg/kg)		6860	7060	6920	7140	6220
	Selenium (Se) (mg/kg)		0.39	0.43	0.51	0.51	0.47
	Silver (Ag) (mg/kg)		6.82	5.38	6.31	7.77	4.31
	Sodium (Na) (mg/kg)		17900	18500	17900	17600	17200
	Strontium (Sr) (mg/kg)		305	299	313	292	307
	Sulfur (S) (mg/kg)		15500	16900	17600	17000	16200
	Thallium (TI) (mg/kg)		0.066	0.080	0.072	0.085	0.069
	Tin (Sn) (mg/kg)		198	3970	152	208	151
	Titanium (Ti) (mg/kg)		715	704	484	574	941
	Tungsten (W) (mg/kg)		7.99	9.74	12.0	9.36	7.86
	Uranium (U) (mg/kg)		4.80	5.10	4.98	4.90	4.22
	Vanadium (V) (mg/kg)		52.7	56.5	54.7	60.6	48.2
	Zinc (Zn) (mg/kg)		4820	10600	4640	7300	7280
	Zirconium (Zr) (mg/kg)		1.1	1.3	1.1	1.6	1.7

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

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2251635-6 Soil 27-MAR-19 09:00 BA1913-A-6	L2251635-7 Soil 27-MAR-19 09:00 BA1913-A-7	L2251635-8 Soil 27-MAR-19 09:00 BA1913-A-8	L2251635-9 Soil 27-MAR-19 09:00 BA1913-A-9	L2251635-10 Soil 27-MAR-19 09:00 BA1913-A-10
Grouping	Analyte						
SOIL							
Physical Tests	Moisture (%)		21.4	21.5	20.8	20.6	21.3
	pH (1:2 soil:water) (pH)		10.24	10.24	10.22	10.15	10.40
Metals	Aluminum (Al) (mg/kg)		32400	40600	30900	36000	36600
	Antimony (Sb) (mg/kg)		175	177	180	164	195
	Arsenic (As) (mg/kg)		31.4	32.3	29.2	29.1	31.9
	Barium (Ba) (mg/kg)		497	377	464	503	542
	Beryllium (Be) (mg/kg)		0.43	0.45	0.43	0.44	0.45
	Bismuth (Bi) (mg/kg)		12.2	17.3	11.5	12.0	24.0
	Boron (B) (mg/kg)		402	350	288	266	318
	Cadmium (Cd) (mg/kg)		15.5	16.6	15.9	16.1	18.2
	Calcium (Ca) (mg/kg)		137000	139000	127000	133000	140000
	Chromium (Cr) (mg/kg)		170	171	219	173	445
	Cobalt (Co) (mg/kg)		35.5	32.6	27.2	82.6	69.5
	Copper (Cu) (mg/kg)		2020	4600	9700	1600	1630
	Iron (Fe) (mg/kg)		73300	54100	50600	49300	48900
	Lead (Pb) (mg/kg)		586	408	429	441	589
	Lithium (Li) (mg/kg)		22.8	24.0	22.1	23.5	26.6
	Magnesium (Mg) (mg/kg)		12200	11200	11700	10900	12300
	Manganese (Mn) (mg/kg)		796	793	1160	833	811
	Mercury (Hg) (mg/kg)		0.087	0.101	0.070	0.070	0.085
	Molybdenum (Mo) (mg/kg)		45.5	53.5	49.4	38.7	80.9
	Nickel (Ni) (mg/kg)		315	185	250	144	363
	Phosphorus (P) (mg/kg)		11700	10800	11600	11100	10900
	Potassium (K) (mg/kg)		6980	7210	7060	7630	7170
	Selenium (Se) (mg/kg)		0.43	0.50	0.50	0.49	0.47
	Silver (Ag) (mg/kg)		5.96	6.11	5.05	5.29	6.86
	Sodium (Na) (mg/kg)		16300	16800	15500	17600	16700
	Strontium (Sr) (mg/kg)		313	349	309	307	325
	Sulfur (S) (mg/kg)		18300	18800	17900	18600	18400
	Thallium (TI) (mg/kg)		0.064	0.090	0.063	0.066	0.068
	Tin (Sn) (mg/kg)		137	174	118	119	292
	Titanium (Ti) (mg/kg)		545	526	582	749	841
	Tungsten (W) (mg/kg)		10.3	7.42	8.84	10.8	10.7
	Uranium (U) (mg/kg)		4.28	4.51	4.44	4.61	4.42
	Vanadium (V) (mg/kg)		50.1	48.6	49.9	48.3	52.8
	Zinc (Zn) (mg/kg)		5970	4830	4500	5360	5090
	Zirconium (Zr) (mg/kg)		1.5	1.9	1.4	1.4	1.4

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

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		Sample ID Description Sampled Date Sampled Time Client ID	L2251635-11 Soil 27-MAR-19 09:00 BA1913-A-11	L2251635-12 Soil 27-MAR-19 09:00 BA1913-A-12	L2251635-13 Soil 27-MAR-19 09:00 BA1913-A-8 REP 1	L2251635-14 Soil 27-MAR-19 09:00 BA1913-A-8 REP 2	L2251635-15 Soil 27-MAR-19 09:00 BA1913-A-8 REP 3
Grouping	Analyte						
SOIL							
Physical Tests	Moisture (%)		21.1	19.5			
	pH (1:2 soil:water) (pH)		10.20	10.22			
Metals	Aluminum (Al) (mg/kg)		37800	31700			
	Antimony (Sb) (mg/kg)		170	157			
	Arsenic (As) (mg/kg)		33.0	27.1			
	Barium (Ba) (mg/kg)		503	449			
	Beryllium (Be) (mg/kg)		0.45	0.44			
	Bismuth (Bi) (mg/kg)		16.0	10.4			
	Boron (B) (mg/kg)		405	292			
	Cadmium (Cd) (mg/kg)		16.3	20.4			
	Calcium (Ca) (mg/kg)		136000	132000			
	Chromium (Cr) (mg/kg)		207	228			
	Cobalt (Co) (mg/kg)		36.9	83.1			
	Copper (Cu) (mg/kg)		2570	2620			
	Iron (Fe) (mg/kg)		65200	50600			
	Lead (Pb) (mg/kg)		1150	802			
	Lithium (Li) (mg/kg)		25.2	47.3			
	Magnesium (Mg) (mg/kg)		11000	10400			
	Manganese (Mn) (mg/kg)		975	1040			
	Mercury (Hg) (mg/kg)		0.078	0.094			
	Molybdenum (Mo) (mg/kg)		55.7	59.7			
	Nickel (Ni) (mg/kg)		182	246			
	Phosphorus (P) (mg/kg)		10600	9830			
	Potassium (K) (mg/kg)		8680	6950			
	Selenium (Se) (mg/kg)		0.51	0.42			
	Silver (Ag) (mg/kg)		19.7	4.78			
	Sodium (Na) (mg/kg)		18600	17100			
	Strontium (Sr) (mg/kg)		325	331			
	Sulfur (S) (mg/kg)		18900	16400			
	Thallium (TI) (mg/kg)		0.076	0.064			
	Tin (Sn) (mg/kg)		352	198			
	Titanium (Ti) (mg/kg)		929	492			
	Tungsten (W) (mg/kg)		12.2	8.29			
	Uranium (U) (mg/kg)		4.51	4.27			
	Vanadium (V) (mg/kg)		65.4	46.8			
	Zinc (Zn) (mg/kg)		5390	4880			
	Zirconium (Zr) (mg/kg)		1.7	1.6			

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

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		Sample ID Description Sampled Date Sampled Time Client ID	L2251635-16 Soil 27-MAR-19 09:00 BA1913-A-8 REP 4	L2251635-17 Soil 27-MAR-19 09:00 BA1913-A-12 REP	L2251635-18 Soil 27-MAR-19 09:00 BA1913-A-12 REP 2	L2251635-19 Soil 27-MAR-19 09:00 BA1913-A-12 REP 3	L2251635-20 Soil 27-MAR-19 09:00 BA1913-A-12 REF
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 (TI) (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)						

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

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	27-MAR-19	L2251635-22 Soil 27-MAR-19 09:00 BA1913-A-12 REP 6		
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 (TI) (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)					

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

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	Sample ID Description Sampled Date Sampled Time Client ID	L2251635-1 Soil 27-MAR-19 09:00 BA1913-A-1	L2251635-2 Soil 27-MAR-19 09:00 BA1913-A-2	L2251635-3 Soil 27-MAR-19 09:00 BA1913-A-3	L2251635-4 Soil 27-MAR-19 09:00 BA1913-A-4	L2251635-5 Soil 27-MAR-19 09:00 BA1913-A-5
Grouping	Analyte					
SOIL						
TCLP Metals	1st Preliminary pH (pH)	11.07	11.17	11.15	11.19	11.18
	2nd Preliminary pH (pH)	8.91	9.05	9.05	9.01	8.91
	Final pH (pH)	6.22	6.28	6.14	6.09	6.14
	Extraction Solution Initial pH (pH)	2.84	2.84	2.84	2.84	2.84
	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)	6.14	5.12	4.62	4.62	5.01
	Cadmium (Cd)-Leachable (mg/L)	0.382	0.488	0.265	0.320	0.307
	Calcium (Ca)-Leachable (mg/L)	2120	2150	2200	2110	2110
	Chromium (Cr)-Leachable (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)	0.352	0.607	0.703	0.992	0.957
	Copper (Cu)-Leachable (mg/L)	0.537	0.532	0.617	0.629	0.937
	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	0.38	<0.25
	Magnesium (Mg)-Leachable (mg/L)	126	127	125	131	127
	Mercury (Hg)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)	1.03	0.95	0.82	0.84	0.92
	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 (TI)-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)	40.2	54.4	42.3	42.9	55.4

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

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	Sample ID Description Sampled Date Sampled Time Client ID	L2251635-6 Soil 27-MAR-19 09:00 BA1913-A-6	L2251635-7 Soil 27-MAR-19 09:00 BA1913-A-7	L2251635-8 Soil 27-MAR-19 09:00 BA1913-A-8	L2251635-9 Soil 27-MAR-19 09:00 BA1913-A-9	L2251635-10 Soil 27-MAR-19 09:00 BA1913-A-10
Grouping	Analyte					
SOIL						
TCLP Metals	1st Preliminary pH (pH)	11.16	11.12	11.17	11.11	11.17
	2nd Preliminary pH (pH)	9.22	9.07	9.23	9.08	8.72
	Final pH (pH)	6.10	6.10	6.22	5.85	5.96
	Extraction Solution Initial pH (pH)	2.84	2.84	2.84	2.84	2.84
	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)	4.71	4.49	4.25	4.34	5.39
	Cadmium (Cd)-Leachable (mg/L)	0.284	0.260	0.540	0.306	0.297
	Calcium (Ca)-Leachable (mg/L)	2130	2050	2060	1950	2010
	Chromium (Cr)-Leachable (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)	1.15	0.514	0.377	0.639	0.837
	Copper (Cu)-Leachable (mg/L)	0.933	0.413	1.84	1.42	0.674
	Iron (Fe)-Leachable (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Lead (Pb)-Leachable (mg/L)	<0.25	0.31	0.40	0.52	0.49
	Magnesium (Mg)-Leachable (mg/L)	136	124	125	124	126
	Mercury (Hg)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)	0.91	0.94	0.74	0.86	0.84
	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 (TI)-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)	54.2	99.8	45.8	52.1	47.5

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

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Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2251635-11 Soil 27-MAR-19 09:00 BA1913-A-11	L2251635-12 Soil 27-MAR-19 09:00 BA1913-A-12	L2251635-13 Soil 27-MAR-19 09:00 BA1913-A-8 REP 1	L2251635-14 Soil 27-MAR-19 09:00 BA1913-A-8 REP 2	L2251635-15 Soil 27-MAR-19 09:00 BA1913-A-8 REP 3
Grouping	Analyte					
SOIL						
TCLP Metals	1st Preliminary pH (pH)	11.08	11.13	11.17	11.17	11.17
	2nd Preliminary pH (pH)	9.27	9.04	9.23	9.23	9.23
	Final pH (pH)	6.06	6.10	6.30	6.08	6.13
	Extraction Solution Initial pH (pH)	2.84	2.84	2.86	2.86	2.86
	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)	5.25	4.78			
	Cadmium (Cd)-Leachable (mg/L)	0.427	3.78	0.288	0.486	0.356
	Calcium (Ca)-Leachable (mg/L)	2080	2080			
	Chromium (Cr)-Leachable (mg/L)	<0.25	<0.25			
	Cobalt (Co)-Leachable (mg/L)	0.643	0.760			
	Copper (Cu)-Leachable (mg/L)	0.982	0.220			
	Iron (Fe)-Leachable (mg/L)	<5.0	<5.0			
	Lead (Pb)-Leachable (mg/L)	<0.25	<0.25			
	Magnesium (Mg)-Leachable (mg/L)	120	134			
	Mercury (Hg)-Leachable (mg/L)	<0.0010	<0.0010			
	Nickel (Ni)-Leachable (mg/L)	1.13	1.59			
	Selenium (Se)-Leachable (mg/L)	<1.0	<1.0			
	Silver (Ag)-Leachable (mg/L)	<0.050	<0.050			
	Thallium (TI)-Leachable (mg/L)	<1.0	<1.0			
	Vanadium (V)-Leachable (mg/L)	<0.15	<0.15			
	Zinc (Zn)-Leachable (mg/L)	59.7	48.6			

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

L2251635 CONTD....

Version:

### PAGE 10 of 13 16-APR-19 11:48 (MT)

**FINAL** 

### ALS ENVIRONMENTAL ANALYTICAL REPORT

L2251635-16 L2251635-17 L2251635-18 L2251635-19 L2251635-20 Sample ID Description Soil Soil Soil Soil Soil 27-MAR-19 27-MAR-19 27-MAR-19 27-MAR-19 27-MAR-19 Sampled Date 09:00 09:00 09:00 Sampled Time 09:00 09:00 BA1913-A-12 REP BA1913-A-12 REP BA1913-A-12 REP BA1913-A-12 REP BA1913-A-8 REP 4 Client ID Grouping Analyte SOIL 1st Preliminary pH (pH) **TCLP Metals** 11.17 11.13 11.13 11.13 11.13 2nd Preliminary pH (pH) 9.04 9.04 9.04 9.04 9.23 Final pH (pH) 6.29 5.93 6.12 6.00 6.02 Extraction Solution Initial pH (pH) 2.86 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) 0.698 0.324 0.285 1.32 0.340 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 (TI)-Leachable (mg/L) Vanadium (V)-Leachable (mg/L) Zinc (Zn)-Leachable (mg/L)

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

L2251635 CONTD.... PAGE 11 of 13 16-APR-19 11:48 (MT)

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL

0	Client ID	09:00 BA1913-A-12 REP 5	27-MAR-19 09:00 BA1913-A-12 REP 6		
Grouping	Analyte				
SOIL					
TCLP Metals	1st Preliminary pH (pH)	11.13	11.13		
	2nd Preliminary pH (pH)	9.04	9.04		
	Final pH (pH)	5.90	5.99		
	Extraction Solution Initial pH (pH)	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)	0.328	0.389		
	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 (TI)-Leachable (mg/L)				
	Vanadium (V)-Leachable (mg/L)				
	Zinc (Zn)-Leachable (mg/L)				
1					

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

### **Reference Information**

L2251635 CONTD.... PAGE 12 of 13 16-APR-19 11:48 (MT) Version: FINΔI

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Bismuth (Bi)	DUP-H	L2251635-5
Duplicate	Chromium (Cr)	DUP-H	L2251635-5
Duplicate	Cobalt (Co)	DUP-H	L2251635-5
Duplicate	Copper (Cu)	DUP-H	L2251635-5
Duplicate	Lead (Pb)	DUP-H	L2251635-5
Duplicate	Lithium (Li)	DUP-H	L2251635-5
Duplicate	Nickel (Ni)	DUP-H	L2251635-5
Duplicate	Zinc (Zn)	DUP-H	L2251635-5
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2251635-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2251635-13, -14, -15, -16, -17, -18, -19, -20, -21, -22
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L2251635-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cobalt (Co)-Leachable	MS-B	L2251635-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Zinc (Zn)-Leachable	MS-B	L2251635-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9

### **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.

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
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** 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 Metals in Soil by CRC ICPMS EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

**MET-TCLP-CCMS-VA** Soil Metals by ICPMS (TCLP) FPA 1311/6020A

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. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

**MOISTURE-VA** CCME PHC in Soil - Tier 1 (mod) Moisture content

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of two hours.

PH-1:2-VA 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:

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

### **Laboratory Definition Code Laboratory Location**

**Reference Information** 

L2251635 CONTD....
PAGE 13 of 13
16-APR-19 11:48 (MT)
Version: FINAL

### **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.

# ALS) Environmental

### Chain of Custody / Analytical Request Forn Canada Toll Free: 1 800 668 9878

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Covanta Burnaby R.E., ULC ATTN: Steve McKinney 5150 Riverbend Drive Burnaby BC V3N 4V3 Date Received: 18-APR-19

Report Date: 01-MAY-19 18:08 (MT)

Version: FINAL

Client Phone: 604-521-1025

## Certificate of Analysis

Lab Work Order #: L2260398

Project P.O. #: VANCO-0000048466

Job Reference: C of C Numbers: Legal Site Desc:

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Brent Mack, B.Sc. Account Manager

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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



L2260398 CONTD....

PAGE 2 of 5 01-MAY-19 18:08 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260398-1 Soil 25-MAR-19 09:00 DBA1913-A-01-01	L2260398-2 Soil 25-MAR-19 09:00 DBA1913-A-01-02	L2260398-3 Soil 25-MAR-19 09:00 DBA1913-A-01-03	L2260398-4 Soil 25-MAR-19 09:00 DBA1913-A-01-04	L2260398-5 Soil 25-MAR-19 09:00 DBA1913-A-01-05
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	10.55	10.44	10.13	10.31	10.29
TCLP Metals	1st Preliminary pH (pH)	11.10	11.06	11.11	11.06	11.09
	2nd Preliminary pH (pH)	9.23	9.11	9.32	9.00	9.26
	Final pH (pH)	6.18	6.17	6.23	6.07	6.17
	Extraction Solution Initial pH (pH)	2.84	2.84	2.84	2.84	2.84
	Cadmium (Cd)-Leachable (mg/L)	0.244	0.197	0.219	0.206	0.209

L2260398 CONTD....

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Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	25-MAR-19	L2260398-7 Soil 25-MAR-19 09:00 DBA1913-A-01-07	L2260398-8 Soil 25-MAR-19 09:00 DBA1913-A-01-08	L2260398-9 Soil 25-MAR-19 09:00 DBA1913-A-01-09	L2260398-10 Soil 25-MAR-19 09:00 DBA1913-A-01-10
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	10.28	10.32	10.26	10.21	10.33
TCLP Metals	1st Preliminary pH (pH)	11.15	11.23	11.15	11.15	11.17
	2nd Preliminary pH (pH)	9.08	9.15	8.99	9.12	9.43
	Final pH (pH)	6.23	6.29	6.19	6.18	6.24
	Extraction Solution Initial pH (pH)	2.84	2.84	2.84	2.84	2.84
	Cadmium (Cd)-Leachable (mg/L)	0.218	0.419	0.280	0.220	0.199

L2260398 CONTD.... PAGE 4 of 5

ALS ENVIRONMENTAL ANALYTICAL REPORT

01-MAY-19 18:08 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260398-11 Soil 25-MAR-19 09:00 DBA1913-A-01-11	L2260398-12 Soil 25-MAR-19 09:00 DBA1913-A-01-12		
Grouping	Analyte				
SOIL					
Physical Tests	pH (1:2 soil:water) (pH)	9.88	10.21		
TCLP Metals	1st Preliminary pH (pH)	11.18	11.20		
	2nd Preliminary pH (pH)	8.97	9.26		
	Final pH (pH)	6.29	6.22		
	Extraction Solution Initial pH (pH)	2.84	2.84		
	Cadmium (Cd)-Leachable (mg/L)	0.272	0.202		
		0.272	0.202		

## Reference Information

L2260398 CONTD....

PAGE 5 of 5
01-MAY-19 18:08 (MT)

Version: FINAL

### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

MET-TCLP-CCMS-VA Soil Metals by ICPMS (TCLP) EPA 1311/6020A

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. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

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:

 Laboratory Definition Code
 Laboratory Location

 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.

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	5150 Riverbend Dri			Email 1:	smckinney@co	vantaenergy.com	<u> </u>	Emergency	/ (1-2 Bus. Da	ıys) - 100% Sı	urcharge -	Contact	ALS to Co	nfirm TA	Γ
	Burnaby BC			Email 2:	dskrypnyk@cov	anta.com	С	Same Day	or Weekend I	Emergency - C	ontact AL	S to Conf	rm TAT		
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Covanta Burnaby R.E., ULC

ATTN: Steve McKinney 5150 Riverbend Drive Burnaby BC V3N 4V3 Date Received: 18-APR-19

Report Date: 07-MAY-19 12:28 (MT)

Version: FINAL

Client Phone: 604-521-1025

## Certificate of Analysis

Lab Work Order #: L2260401

Project P.O. #: VANCO-000048466

Job Reference: C of C Numbers:

Legal Site Desc: Includes 2:1 pH

### 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 #13-17, and have "REP" in the Client Sample ID field. Fluid determination was not performed for samples #13-17, 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

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L2260401 CONTD....

PAGE 2 of 6 07-MAY-19 12:28 (MT)

## Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260401-1 Soil 26-MAR-19 09:00 DBA1913-A-02-01	L2260401-2 Soil 26-MAR-19 09:00 DBA1913-A-02-02	L2260401-3 Soil 26-MAR-19 09:00 DBA1913-A-02-03	L2260401-4 Soil 26-MAR-19 09:00 DBA1913-A-02-04	L2260401-5 Soil 26-MAR-19 09:00 DBA1913-A-02-05
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	10.15	10.09	10.06	10.10	10.03
TCLP Metals	1st Preliminary pH (pH)	11.16	11.13	11.15	11.20	11.16
	2nd Preliminary pH (pH)	9.13	8.91	8.92	9.03	9.06
	Final pH (pH)	6.07	6.21	5.83	6.12	6.30
	Extraction Solution Initial pH (pH)	2.83	2.83	2.83	2.83	2.83
	Cadmium (Cd)-Leachable (mg/L)	0.202	0.243	0.275	0.198	0.267

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

L2260401 CONTD....

PAGE 3 of 6 07-MAY-19 12:28 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260401-6 Soil 26-MAR-19 09:00 DBA1913-A-02-06	L2260401-7 Soil 26-MAR-19 09:00 DBA1913-A-02-07	L2260401-8 Soil 26-MAR-19 09:00 DBA1913-A-02-08	L2260401-9 Soil 26-MAR-19 09:00 DBA1913-A-02-09	L2260401-10 Soil 26-MAR-19 09:00 DBA1913-A-02-010
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	10.14	10.11	10.12	10.23	10.04
TCLP Metals	1st Preliminary pH (pH)	11.15	11.10	11.14	11.20	11.09
	2nd Preliminary pH (pH)	8.92	8.88	9.07	9.27	8.96
	Final pH (pH)	5.94	6.28	6.21	6.28	6.21
	Extraction Solution Initial pH (pH)	2.83	2.83	2.83	2.83	2.83
	Cadmium (Cd)-Leachable (mg/L)	0.281	0.190	0.487	0.245	0.207

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

L2260401 CONTD....

PAGE 4 of 6 07-MAY-19 12:28 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260401-11 Soil 26-MAR-19 09:00 DBA1913-A-02-011	L2260401-12 Soil 26-MAR-19 09:00 DBA1913-A-02-012	L2260401-13 Soil 26-MAR-19 09:00 DBA1913-A-02-012 REP 1	L2260401-14 Soil 26-MAR-19 09:00 DBA1913-A-02-012 REP 2	L2260401-15 Soil 26-MAR-19 09:00 DBA1913-A-02-012 REP 3
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	10.14	10.09			
TCLP Metals	1st Preliminary pH (pH)	11.12	11.11	11.11	11.11	11.11
	2nd Preliminary pH (pH)	8.57	9.12	9.12	9.12	9.12
	Final pH (pH)	6.40	6.19	6.02	6.06	6.01
	Extraction Solution Initial pH (pH)	2.83	2.83	2.83	2.83	2.83
	Cadmium (Cd)-Leachable (mg/L)	0.175	5.05	0.252	0.232	0.226

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

L2260401 CONTD.... PAGE 5 of 6

## ALS ENVIRONMENTAL ANALYTICAL REPORT

07-MAY-19 12:28 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260401-16 Soil 26-MAR-19 09:00 DBA1913-A-02-012 REP 4	L2260401-17 Soil 26-MAR-19 09:00 DBA1913-A-02-012 REP 5		
Grouping	Analyte				
SOIL					
Physical Tests	pH (1:2 soil:water) (pH)				
TCLP Metals	1st Preliminary pH (pH)	11.11	11.11		
	2nd Preliminary pH (pH)	9.12	9.12		
	Final pH (pH)	6.03	6.02		
	Extraction Solution Initial pH (pH)	2.83	2.83		
	Cadmium (Cd)-Leachable (mg/L)	0.304	0.240		
		0.001	0.2.0		

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

# L2260401 CONTD.... PAGE 6 of 6 07-MAY-19 12:28 (MT) Version: FINAL

### **Reference Information**

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2260401-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2260401-13, -14, -15, -16, -17
	· · ·		

### **Qualifiers for Individual Parameters Listed:**

Qualifier Description

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**
MET-TOLD-COMS-VA	Soil	Metals by ICPMS (TCLP)	EDA 1311/6020A

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. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

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:

<b>Laboratory Definition Code</b>	Laboratory Location
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.

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COC#	 	_	

GENF 20.00 Front

L2260401-COFC Report To Report Format / D. sted (Rush for routine analysis subject to availability)گ Covanta Energy Ct. Standard Regular (Standard Turnaround Times - Business Days) Company: Steve Mckinney / Dan Skrypnyk Excel Digital ☐ Fax Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT Contact: PDF Address: 5150 Riverbend Drive Email 1: smckinney@covantaenergy.com Emergency (1-2 Bus, Days) - 100% Surcharge - Contact ALS to Confirm TAT Burnaby BC Email 2: dskrypnyk@covanta.com Same Day or Weekend Emergency - Contact ALS to Confirm TAT Phone: 604-521-1025 Fax: **Analysis Request** Email 3: sarah.wellman@metrovancouver.org Yes ☐ No brent.kirkpatrick@metrovancouver.org rjohnson4@covanta.com Same as Report ? Please indicate below Filtered, Preserved or both (F, P, F/P) Invoice To Client / Project Information No Hardcopy of Invoice with Report? Yes Job #: PO / AFE: Weekly Bottom Ash - Suite Company: Contact: LSD: (includes 2:1 pH) Address: Number of Containers CD-TCLP-VA(Cd and Phone: Fax: Quote #: Lab Work Order # ALS Sampler: Contact: (lab use only) \* Sample Sample Identification Date Time Sample Type (This description will appear on the report) (dd-mmm-yy) (bh:mm) X DBA1913-A-02-01 26-Mar-19 9:00 Soil X DBA1913-A-02-02 26-Mar-19 9:00 Soil DBA1913-A-02-03 26-Mar-19 9:00 Soil Х Х DBA1913-A-02-04 26-Mar-19 9:00 Soil Х DBA1913-A-02-05 26-Mar-19 9:00 Soil DBA1913-A-02-06 26-Mar-19 9:00 Soil Х X DBA1913-A-02-07 26-Mar-19 9:00 Soil X DBA1913-A-02-08 26-Mar-19 9:00 Soil 1 DBA1913-A-02-09 26-Mar-19 9:00 Х Soil 1 X DBA1913-A-02-10 26-Mar-19 9:00 Soil X DBA1913-A-02-11 26-Mar-19 9:00 Soit DBA1913-A-02-12 26-Mar-19 9:00 Soil 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) Date (dd-mmm-yy) Time (hh-mm) Released by: Received by: Observations: Date: Time: Temperature: Verified by: Date: Time: Yes / No ? If Yes add SIF

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Address:	5150 Riverbend D	rive		Email 1:	smckinney@co	vantaenergy.cor	<u>n</u> O	Emergeno	y (1-2 Bus. I	Days) - 10	00% Sur	charge -	Contact Al	LS to Confirm	n TAT					
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Phone:	604-521-1025	Fax:		Email 3:	sarah.wellman@	metrovancouve	er.org	Analysis Request												
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	DBA1913-A-02-02				26-Mar-19	9:00	Soil	х								1				
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	DBA1913-A-02-06	1			26-Mar-19	9:00	Soil	х								1				
	DBA1913-A-02-07				26-Mar-19	9:00	Soil	х								1				
	DBA1913-A-02-08				26-Mar-19	9:00	Soil	Х								1				
	DBA1913-A-02-09				26-Mar-19	9:00	Soil	Х								1				
	DBA1913-A-02-10				26-Mar-19	9:00	Soil	X								1				
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Covanta Burnaby R.E., ULC ATTN: Steve McKinney 5150 Riverbend Drive Burnaby BC V3N 4V3 Date Received: 18-APR-19

Report Date: 01-MAY-19 18:13 (MT)

Version: FINAL

Client Phone: 604-521-1025

## Certificate of Analysis

Lab Work Order #: L2260397

Project P.O. #: VANCO-000048466

Job Reference: C of C Numbers: Legal Site Desc:

15 Mack

Brent Mack, B.Sc. Account Manager

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L2260397 CONTD....

PAGE 2 of 5 01-MAY-19 18:13 (MT)

Version: FINAL

## ALS ENVIRONMENTAL ANALYTICAL REPORT

L2260397-1 L2260397-2 L2260397-3 L2260397-4 L2260397-5 Sample ID Description Soil Soil Soil Soil Soil 27-MAR-19 27-MAR-19 27-MAR-19 27-MAR-19 27-MAR-19 Sampled Date 09:00 09:00 09:00 09:00 09:00 Sampled Time DBA1913-A-03-01 DBA1913-A-03-02 DBA1913-A-03-03 DBA1913-A-03-04 DBA1913-A-03-05 Client ID Grouping **Analyte** SOIL **Physical Tests** pH (1:2 soil:water) (pH) 10.08 10.09 10.07 10.16 10.03 1st Preliminary pH (pH) **TCLP Metals** 10.81 10.86 10.95 10.92 10.78 2nd Preliminary pH (pH) 8.97 8.88 2.85 9.05 9.05 Final pH (pH) 5.79 5.73 5.50 5.78 5.98 Extraction Solution Initial pH (pH) 2.85 2.85 2.87 2.85 2.85 Cadmium (Cd)-Leachable (mg/L) 0.190 0.187 0.187 0.199 0.162

L2260397 CONTD....

PAGE 3 of 5 01-MAY-19 18:13 (MT)

Version: FINAL

SOIL  Physical Tests pH  TCLP Metals 1st 2nd Fina Extr	Analyte		DBA1913-A-03-07	09:00 DBA1913-A-03-08	27-MAR-19 09:00 DBA1913-A-03-09	27-MAR-19 09:00 DBA1913-A-03-10
SOIL  Physical Tests pH  TCLP Metals 1st 2nd Fina Extr	Allalyte					
Physical Tests pH  TCLP Metals 1st 2nd Find Extr	•					
TCLP Metals 1st 2nd Fina Extr	H (1:2 soil:water) (pH)	10.15	9.97	10.16	10.47	10.06
2nd Fina Exti	st Preliminary pH (pH)	10.10	10.85	10.93	10.94	10.89
Fina Ext	nd Preliminary pH (pH)	8.86	8.82	8.93	8.71	9.07
Ext	nal pH (pH)	5.79	5.84	5.72	5.77	6.04
	traction Solution Initial pH (pH)	2.85	2.85	2.85	2.84	2.84
	admium (Cd)-Leachable (mg/L)	0.213	0.181	0.186	0.204	0.181

L2260397 CONTD.... PAGE 4 of 5

ALS ENVIRONMENTAL ANALYTICAL REPORT

01-MAY-19 18:13 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260397-11 Soil 27-MAR-19 09:00 DBA1913-A-03-11	L2260397-12 Soil 27-MAR-19 09:00 DBA1913-A-03-12		
Grouping	Analyte				
SOIL					
Physical Tests	pH (1:2 soil:water) (pH)	10.08	10.15		
TCLP Metals	1st Preliminary pH (pH)	10.87	10.93		
	2nd Preliminary pH (pH)	8.86	8.76		
	Final pH (pH)	5.96	5.93		
	Extraction Solution Initial pH (pH)	2.84	2.84		
	Cadmium (Cd)-Leachable (mg/L)	0.392	0.258		
		0.502	0.200		

L2260397 CONTD....
PAGE 5 of 5

01-MAY-19 18:13 (MT) Version: FINAL

### **Reference Information**

### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

MET-TCLP-CCMS-VA Soil Metals by ICPMS (TCLP) EPA 1311/6020A

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. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

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:

 Laboratory Definition Code
 Laboratory Location

 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.



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<u> </u>	Burnaby BC			Email 2:	dskrypnyk@cov	anta.com	0	Same Da	y or Weeken	d Emergeno	y - Cont	act ALS	to Confir	n TAT			
Phone:	604-521-1025	Fax:		Email 3:	sarah.wellman@	metrovancouve	er.org			1	Analys	is Re	quest				
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	DBA1913-A-03-02				27-Mar-19	9:00	Soil	х									1
	DBA1913-A-03-03			·	27-Mar-19	9:00	Soil	х									1
	DBA1913-A-03-04				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-05				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-06				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-07				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-08				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-09				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-10				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-11				27-Mar-19	9:00	Soil	Х									1
	DBA1913-A-03-12				27-Mar-19	9:00	Soil	Х									1
	Special Inst	tructions / Regu	ılations with wa	ater or land use (CCM	E-Freshwater A	quatic Life/BC	CSR - Commercia	I/AB Ti	er 1 - Natı	ıral, etc)	/ Haza	ardou	s Detail	s			
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Covanta Burnaby R.E., ULC ATTN: Steve McKinney

5150 Riverbend Drive Burnaby BC V3N 4V3 Date Received: 18-APR-19

Report Date: 26-APR-19 16:18 (MT)

Version: FINAL

Client Phone: 604-521-1025

# Certificate of Analysis

Lab Work Order #: L2260400

Project P.O. #: VANCO-0000048466

Job Reference: C of C Numbers:

Legal Site Desc: Includes 2:1 pH

1 30 Mack

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



PAGE 2 of 5 26-APR-19 16:18 (MT)

Version: FINAL

## ALS ENVIRONMENTAL ANALYTICAL REPORT

L2260400-1 L2260400-2 L2260400-3 L2260400-4 L2260400-5 Sample ID Description Soil Soil Soil Soil Soil 28-MAR-19 28-MAR-19 28-MAR-19 28-MAR-19 28-MAR-19 Sampled Date 09:00 09:00 09:00 09:00 09:00 Sampled Time DBA1913-A-04-01 DBA1913-A-04-02 DBA1913-A-04-03 DBA1913-A-04-04 DBA1913-A-04-05 Client ID Grouping **Analyte** SOIL **Physical Tests** pH (1:2 soil:water) (pH) 9.90 9.88 9.95 9.92 9.95 1st Preliminary pH (pH) **TCLP Metals** 11.00 10.92 11.02 11.09 11.09 2nd Preliminary pH (pH) 9.11 9.20 9.09 9.28 9.03 Final pH (pH) 5.77 5.90 5.73 5.86 5.70 Extraction Solution Initial pH (pH) 2.85 2.85 2.85 2.85 2.85 Cadmium (Cd)-Leachable (mg/L) 0.186 0.613 0.285 0.208 0.206

PAGE 3 of 5 26-APR-19 16:18 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260400-6 Soil 28-MAR-19 09:00 DBA1913-A-04-06	L2260400-7 Soil 28-MAR-19 09:00 DBA1913-A-04-07	L2260400-8 Soil 28-MAR-19 09:00 DBA1913-A-04-08	L2260400-9 Soil 28-MAR-19 09:00 DBA1913-A-04-09	L2260400-10 Soil 28-MAR-19 09:00 DBA1913-A-04-010
Grouping	Analyte					
SOIL	·					
Physical Tests	pH (1:2 soil:water) (pH)	10.00	9.93	10.02	9.97	9.94
TCLP Metals	1st Preliminary pH (pH)	11.10	11.14	11.10	11.09	11.09
	2nd Preliminary pH (pH)	9.07	9.11	9.17	9.06	9.13
	Final pH (pH)	5.80	5.46	5.84	5.75	5.56
	Extraction Solution Initial pH (pH)	2.85	2.85	2.85	2.85	2.85
	Cadmium (Cd)-Leachable (mg/L)	0.225	0.218	0.248	0.206	0.209

L2260400 CONTD.... PAGE 4 of 5

ALS ENVIRONMENTAL ANALYTICAL REPORT

26-APR-19 16:18 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260400-11 Soil 28-MAR-19 09:00 DBA1913-A-04-011	L2260400-12 Soil 28-MAR-19 09:00 DBA1913-A-04-012		
Grouping	Analyte				
SOIL					
Physical Tests	pH (1:2 soil:water) (pH)	9.90	10.04		
TCLP Metals	1st Preliminary pH (pH)	11.07	11.08		
	2nd Preliminary pH (pH)	9.02	9.11		
	Final pH (pH)	5.73	5.67		
	Extraction Solution Initial pH (pH)	2.85	2.85		
	Cadmium (Cd)-Leachable (mg/L)	0.215	0.224		
	. , , , , , , , , , , , , , , , , , , ,	0.213	0.224		

## **Reference Information**

L2260400 CONTD....

PAGE 5 of 5

26-APR-19 16:18 (MT)

Version: FINAL

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ALS Test Code Matrix Test Description Method Reference\*\*

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 ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

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

mg/L - milligrams per litre.

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

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		Special Instru	ıctions / Regulation	s with water or lai	nd use (CCM	-Freshwater A	quatic Life/BC	CSR - Commercia	I/AB Tier	1 - Natu	ral, etc)	/ Hazaro	lous De	etails		
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Covanta Burnaby R.E., ULC ATTN: Steve McKinney 5150 Riverbend Drive Burnaby BC V3N 4V3 Date Received: 18-APR-19

Report Date: 01-MAY-19 12:30 (MT)

Version: FINAL

Client Phone: 604-521-1025

# Certificate of Analysis

Lab Work Order #: L2260396

Project P.O. #: VANCO-0000048466

Job Reference: C of C Numbers: Legal Site Desc:

13 Mack

Brent Mack, B.Sc. Account Manager

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L2260396 CONTD....

PAGE 2 of 5 01-MAY-19 12:30 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260396-1 Soil 29-MAR-19 09:00 DBA1913-A-05-01	L2260396-2 Soil 29-MAR-19 09:00 DBA1913-A-05-02	L2260396-3 Soil 29-MAR-19 09:00 DBA1913-A-05-03	L2260396-4 Soil 29-MAR-19 09:00 DBA1913-A-05-04	L2260396-5 Soil 29-MAR-19 09:00 DBA1913-A-05-05
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	10.00	9.90	9.98	10.15	9.91
TCLP Metals	1st Preliminary pH (pH)	10.71	10.71	10.82	10.81	10.90
	2nd Preliminary pH (pH)	9.01	8.93	8.80	8.40	8.92
	Final pH (pH)	5.94	5.82	5.86	5.74	5.70
	Extraction Solution Initial pH (pH)	2.85	2.85	2.85	2.85	2.85
	Cadmium (Cd)-Leachable (mg/L)	0.215	0.198	0.192	0.194	0.229

L2260396 CONTD....

PAGE 3 of 5 01-MAY-19 12:30 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260396-6 Soil 29-MAR-19 09:00 DBA1913-A-05-06	L2260396-7 Soil 29-MAR-19 09:00 DBA1913-A-05-07	L2260396-8 Soil 29-MAR-19 09:00 DBA1913-A-05-08	L2260396-9 Soil 29-MAR-19 09:00 DBA1913-A-05-09	L2260396-10 Soil 29-MAR-19 09:00 DBA1913-A-05-10
Grouping	Analyte					
SOIL	, , , , , , , , , , , , , , , , , , ,					
Physical Tests	pH (1:2 soil:water) (pH)	9.96	10.00	10.05	10.02	10.08
TCLP Metals	1st Preliminary pH (pH)	10.89	10.86	10.83	10.82	10.89
	2nd Preliminary pH (pH)	9.08	8.95	9.03	9.04	9.01
	Final pH (pH)	5.74	5.71	5.77	5.73	5.81
	Extraction Solution Initial pH (pH)	2.85	2.85	2.85	2.85	2.85
	Cadmium (Cd)-Leachable (mg/L)	0.203	0.220	0.566	0.239	0.213

L2260396 CONTD.... PAGE 4 of 5

ALS ENVIRONMENTAL ANALYTICAL REPORT

01-MAY-19 12:30 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2260396-11 Soil 29-MAR-19 09:00 DBA1913-A-05-11	L2260396-12 Soil 29-MAR-19 09:00 DBA1913-A-05-12		
Grouping	Analyte				
SOIL					
Physical Tests	pH (1:2 soil:water) (pH)	10.02	10.13		
TCLP Metals	1st Preliminary pH (pH)	10.82	10.82		
	2nd Preliminary pH (pH)	8.99	9.09		
	Final pH (pH)	5.78	5.72		
	Extraction Solution Initial pH (pH)	2.85	2.85		
	Cadmium (Cd)-Leachable (mg/L)	0.506	0.198		
		0.000	0.100		

## Reference Information

L2260396 CONTD....

PAGE 5 of 5

01-MAY-19 12:30 (MT)

Version: FINAL

## **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

MET-TCLP-CCMS-VA Soil Metals by ICPMS (TCLP) EPA 1311/6020A

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. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

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:

 Laboratory Definition Code
 Laboratory Location

 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.

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By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

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Covanta Burnaby R.E., ULC ATTN: Steve McKinney 5150 Riverbend Drive Burnaby BC V3N 4V3 Date Received: 18-APR-19

Report Date: 10-MAY-19 12:12 (MT)

Version: FINAL REV. 2

Client Phone: 604-521-1025

## **Certificate of Analysis**

Lab Work Order #: L2260403

Project P.O. #: VANCO-0000048466

Job Reference:

C of C Numbers:

Legal Site Desc: Includes 2:1 pH

#### 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 #13-20, and have "REP" in the Client Sample ID field. Fluid determination was not performed for samples #13-20, 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

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PAGE 2 of 6 10-MAY-19 12:12 (MT)

Version: FINAL REV. 2

	Sample ID Description Sampled Date Sampled Time Client ID	L2260403-1 Soil 30-MAR-19 09:00 DBA1913-A-06-01	L2260403-2 Soil 30-MAR-19 09:00 DBA1913-A-06-02	L2260403-3 Soil 30-MAR-19 09:00 DBA1913-A-06-03	L2260403-4 Soil 30-MAR-19 09:00 DBA1913-A-06-04	L2260403-5 Soil 30-MAR-19 09:00 DBA1913-A-06-05
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	9.93	9.91	10.08	9.92	9.92
TCLP Metals	1st Preliminary pH (pH)	10.87	10.82	10.89	10.99	10.93
	2nd Preliminary pH (pH)	8.53	8.23	8.51	6.53	8.42
	Final pH (pH)	5.65	5.65	6.00	5.68	5.80
	Extraction Solution Initial pH (pH)	2.86	2.86	2.86	2.86	2.86
	Cadmium (Cd)-Leachable (mg/L)	0.465	0.794	0.192	0.704	0.180

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

PAGE 3 of 6 10-MAY-19 12:12 (MT)

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL REV. 2

	Sample ID Description Sampled Date Sampled Time Client ID	L2260403-6 Soil 30-MAR-19 09:00 DBA1913-A-06-06	L2260403-7 Soil 30-MAR-19 09:00 DBA1913-A-06-07	L2260403-8 Soil 30-MAR-19 09:00 DBA1913-A-06-08	L2260403-9 Soil 30-MAR-19 09:00 DBA1913-A-06-09	L2260403-10 Soil 30-MAR-19 09:00 DBA1913-A-06-010
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	9.90	10.03	9.91	9.96	9.92
TCLP Metals	1st Preliminary pH (pH)	10.92	10.95	10.97	10.91	10.97
	2nd Preliminary pH (pH)	8.01	6.82	7.28	6.20	7.65
	Final pH (pH)	6.07	5.97	5.98	5.92	5.74
	Extraction Solution Initial pH (pH)	2.86	2.86	2.86	2.86	2.86
	Cadmium (Cd)-Leachable (mg/L)	0.170	0.249	0.442	0.491	0.219

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

PAGE 4 of 6 10-MAY-19 12:12 (MT)

Version: FINAL REV. 2

	Sample ID Description Sampled Date Sampled Time Client ID	L2260403-11 Soil 30-MAR-19 09:00 DBA1913-A-06-011	L2260403-12 Soil 30-MAR-19 09:00 DBA1913-A-06-012	L2260403-13 Soil 30-MAR-19 09:00 DBA1913-A-06-02 REP 1	L2260403-14 Soil 30-MAR-19 09:00 DBA1913-A-06-02 REP 2	L2260403-15 Soil 30-MAR-19 09:00 DBA1913-A-06-04 REP 1
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	9.94	9.98			
TCLP Metals	1st Preliminary pH (pH)	10.92	10.97	10.82	10.82	10.99
	2nd Preliminary pH (pH)	8.34	8.24	8.23	8.23	6.53
	Final pH (pH)	5.93	5.97	5.98	5.89	5.95
	Extraction Solution Initial pH (pH)	2.86	2.86	2.83	2.83	2.83
	Cadmium (Cd)-Leachable (mg/L)	0.212	0.177	0.485	0.381	0.464

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

PAGE 5 of 6 10-MAY-19 12:12 (MT)

Version: FINAL REV. 2

	Sample ID Description Sampled Date Sampled Time Client ID	L2260403-16 Soil 30-MAR-19 09:00 DBA1913-A-06-04 REP 2	L2260403-17 Soil 30-MAR-19 09:00 DBA1913-A-06-02 REP 3	L2260403-18 Soil 30-MAR-19 09:00 DBA1913-A-06-02 REP 4	L2260403-19 Soil 30-MAR-19 09:00 DBA1913-A-06-04 REP 3	L2260403-20 Soil 30-MAR-19 09:00 DBA1913-A-06-04 REP 4
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)					
TCLP Metals	1st Preliminary pH (pH)	10.99	10.82	10.82	10.99	10.99
	2nd Preliminary pH (pH)	6.53	8.23	8.23	6.53	6.53
	Final pH (pH)	5.93	6.48	6.29	6.40	6.31
	Extraction Solution Initial pH (pH)	2.83	2.84	2.84	2.84	2.84
	Cadmium (Cd)-Leachable (mg/L)	0.436	0.696	0.274	0.491	0.296

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

# L2260403 CONTD.... PAGE 6 of 6 10-MAY-19 12:12 (MT)

Version: FINAL REV. 2

## **Reference Information**

#### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2260403-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2260403-13, -14, -15, -16
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2260403-17, -18, -19, -20

#### **Qualifiers for Individual Parameters Listed:**

Qualifier Description

Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

MS-B

ALS Test Code	Matrix	Test Description	Method Reference**
MET-TCI P-CCMS-VA	Soil	Metals by ICPMS (TCLP)	FPA 1311/6020A

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. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

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:

Laboratory Definition Code	Laboratory Location
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.

# (ALS) Environmental



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L2260403-COFC Report Format / Disc ed (Rush for routine analysis subject to availability) Report To Standard Other Company: Covanta Energy Regular (Standard Turnaround Times - Business Days) ✓ PDF ☐ Excel Steve Mckinney / Dan Skrypnyk Fax Contact: ☐ Digital Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT 5150 Riverbend Drive Address: Email 1: smckinney@covantaenergy.com Emergency (1-2 Bus, Days) - 100% Surcharge - Contact ALS to Confirm TAT Burnaby BC Email 2: dskrypnyk@covanta.com Same Day or Weekend Emergency - Contact ALS to Confirm TAT **Analysis Request** Fax: Phone: 604-521-1025 Email 3: sarah.wellman@metrovancouver.org Yes No brent.kirkpatrick@metrovancouver.org rjohnson4@covanta.com Invoice To Same as Report ? Client / Project Information Please indicate below Filtered, Preserved or both (F. P. F/P) No Hardcopy of Invoice with Report? Job #: PO / AFE: Weekly Bottom Ash - Suite Company: pH steps) SD: Contact: (includes 2:1 pH) Address: of Containers Phone: Fax: Quote #: CD-TCLP-VA(Cd Lab Work Order # ALS Sampler: Contact: (lab use only) Sample Identification Sample Date Time Sample Type (dd-mmm-yy) (hh:mm) (This description will appear on the report) X DBA1913-A-06-01 30-Mar-19 9:00 Soil DBA1913-A-06-02 Х 30-Mar-19 9:00 Soil X DBA1913-A-06-03 9:00 30-Mar-19 Soil X DBA1913-A-06-04 9:00 30-Mar-19 Soil DBA1913-A-06-05 9:00 Х 30-Mar-19 Soil X DBA1913-A-06-06 30-Mar-19 9:00 Soil X DBA1913-A-06-07 30-Mar-19 9:00 Soil DBA1913-A-06-08 9:00 X 30-Mar-19 Soil X DBA1913-A-06-09 9:00 30-Mar-19 Soil Х DBA1913-A-06-10 30-Mar-19 9:00 Soil DBA1913-A-06-11 9:00 X 30-Mar-19 Soil DBA1913-A-06-12 9:00 X 30-Mar-19 Soil 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: Temperature: Verified by: Date: Time: Observations: 4/18 111700 Yes / No? If Yes add SIF



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