

Bottom Ash Data

2018 Week 34

The following analytical report was sent to the Ministry of Environment and Climate Change Strategy on September 7, 2018. The data represents bottom ash composite results for week 34 of 2018 (August 19, 2018 to August 25, 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: 28-AUG-18
Report Date: 06-SEP-18 17:20 (MT)
Version: FINAL

Client Phone: 604-521-1025

Certificate of Analysis

Lab Work Order #: L2154327
Project P.O. #: VANCO-0000047506
Job Reference:
C of C Numbers:
Legal Site Desc:

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

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L2154327-1 SOIL 22-AUG-18 09:00 BA1834-A-1	L2154327-2 SOIL 22-AUG-18 09:00 BA1834-A-2	L2154327-3 SOIL 22-AUG-18 09:00 BA1834-A-3	L2154327-4 SOIL 22-AUG-18 09:00 BA1834-A-4	L2154327-5 SOIL 22-AUG-18 09:00 BA1834-A-5	
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	19.8	18.6	19.7	18.3	19.6
	pH (1:2 soil:water) (pH)	10.79	10.80	11.05	10.75	10.84
Metals	Aluminum (Al) (mg/kg)	33100	28700	41400	34100	45100
	Antimony (Sb) (mg/kg)	183	174	152	174	162
	Arsenic (As) (mg/kg)	45.9	48.6	41.8	45.2	51.0
	Barium (Ba) (mg/kg)	564	583	677	609	563
	Beryllium (Be) (mg/kg)	0.49	0.46	0.43	0.44	0.43
	Bismuth (Bi) (mg/kg)	11.3	9.12	12.7	47.0	25.0
	Boron (B) (mg/kg)	248	243	232	208	194
	Cadmium (Cd) (mg/kg)	20.5	16.2	28.5	20.2	19.5
	Calcium (Ca) (mg/kg)	149000	127000	145000	141000	141000
	Chromium (Cr) (mg/kg)	189	150	189	176	146
	Cobalt (Co) (mg/kg)	25.3	22.3	24.3	22.8	266
	Copper (Cu) (mg/kg)	3340	2660	2290	9590	3240
	Iron (Fe) (mg/kg)	59500	70800	86000	54900	66500
	Lead (Pb) (mg/kg)	601	2950	396	653	815
	Lithium (Li) (mg/kg)	19.5	20.8	21.2	20.7	25.0
	Magnesium (Mg) (mg/kg)	12000	11400	12500	12000	12600
	Manganese (Mn) (mg/kg)	775	754	1460	1020	948
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	125	80.0	80.3	130	93.3
	Nickel (Ni) (mg/kg)	163	117	162	116	494
	Phosphorus (P) (mg/kg)	12800	12300	12000	12700	13000
	Potassium (K) (mg/kg)	6190	6330	6240	6740	6400
	Selenium (Se) (mg/kg)	0.50	0.45	0.39	0.41	0.51
	Silver (Ag) (mg/kg)	9.74	4.51	7.79	6.01	7.73
	Sodium (Na) (mg/kg)	17200	17800	18800	18600	17800
	Strontium (Sr) (mg/kg)	337	302	340	316	316
	Sulfur (S) (mg/kg)	17400	15000	15200	15900	16200
	Thallium (Tl) (mg/kg)	0.143	0.112	0.100	0.115	0.122
	Tin (Sn) (mg/kg)	252	130	140	272	182
	Titanium (Ti) (mg/kg)	705	798	1360	959	920
	Tungsten (W) (mg/kg)	8.48	5.95	11.0	10.9	7.55
	Uranium (U) (mg/kg)	6.09	5.80	5.69	5.74	6.04
	Vanadium (V) (mg/kg)	58.1	54.6	60.9	56.9	59.5
	Zinc (Zn) (mg/kg)	5540	9110	5340	3840	7430
	Zirconium (Zr) (mg/kg)	1.2	1.1	1.5	1.3	1.7

* 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	L2154327-6 SOIL 22-AUG-18 09:00 BA1834-A-6	L2154327-7 SOIL 22-AUG-18 09:00 BA1834-A-7	L2154327-8 SOIL 22-AUG-18 09:00 BA1834-A-8	L2154327-9 SOIL 22-AUG-18 09:00 BA1834-A-9	L2154327-10 SOIL 22-AUG-18 09:00 BA1834-A-10	
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	18.9	19.0	19.1	19.0	20.3
	pH (1:2 soil:water) (pH)	10.82	10.81	10.80	10.91	10.81
Metals	Aluminum (Al) (mg/kg)	34300	39800	32800	42600	37500
	Antimony (Sb) (mg/kg)	164	143	167	141	178
	Arsenic (As) (mg/kg)	44.6	49.9	46.1	38.4	45.7
	Barium (Ba) (mg/kg)	496	607	547	648	566
	Beryllium (Be) (mg/kg)	0.45	0.46	0.45	0.48	0.41
	Bismuth (Bi) (mg/kg)	17.3	14.5	18.8	8.05	20.0
	Boron (B) (mg/kg)	213	199	247	226	194
	Cadmium (Cd) (mg/kg)	20.5	62.5	21.1	15.7	17.3
	Calcium (Ca) (mg/kg)	139000	133000	145000	141000	136000
	Chromium (Cr) (mg/kg)	295	214	163	156	196
	Cobalt (Co) (mg/kg)	45.0	66.0	32.9	21.9	26.1
	Copper (Cu) (mg/kg)	2320	2150	4610	2680	2680
	Iron (Fe) (mg/kg)	63700	63700	64500	53700	64700
	Lead (Pb) (mg/kg)	475	474	715	425	959
	Lithium (Li) (mg/kg)	20.9	19.5	20.7	20.5	18.6
	Magnesium (Mg) (mg/kg)	12100	10700	11700	12600	12400
	Manganese (Mn) (mg/kg)	862	803	754	819	802
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	97.1	89.3	92.0	87.7	92.4
	Nickel (Ni) (mg/kg)	276	110	125	126	110
	Phosphorus (P) (mg/kg)	13200	12800	11200	13800	12500
	Potassium (K) (mg/kg)	6790	6470	6530	5730	6240
	Selenium (Se) (mg/kg)	0.42	0.39	0.42	0.37	0.38
	Silver (Ag) (mg/kg)	4.37	6.00	4.20	6.21	9.05
	Sodium (Na) (mg/kg)	17900	17200	17800	17400	17000
	Strontium (Sr) (mg/kg)	342	645	322	324	382
	Sulfur (S) (mg/kg)	17800	15600	17100	13500	15100
	Thallium (Tl) (mg/kg)	0.176	0.435	0.128	0.101	0.122
	Tin (Sn) (mg/kg)	140	227	146	166	175
	Titanium (Ti) (mg/kg)	724	990	897	862	827
	Tungsten (W) (mg/kg)	7.19	8.07	7.56	13.3	10.3
	Uranium (U) (mg/kg)	6.10	5.69	6.21	5.34	5.73
	Vanadium (V) (mg/kg)	59.5	57.6	62.3	53.7	60.1
	Zinc (Zn) (mg/kg)	12100	4120	5920	5510	4460
	Zirconium (Zr) (mg/kg)	1.4	1.5	1.2	1.5	1.3

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2154327-11	L2154327-12	L2154327-13	L2154327-14	L2154327-15
		Description	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampled Date	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1834-A-11	BA1834-A-12	BA1834-A-1 REP 1	BA1834-A-1 REP 2	BA1834-A-1 REP 3
Grouping	Analyte						
SOIL							
Physical Tests	Moisture (%)		18.5	19.6			
	pH (1:2 soil:water) (pH)		10.88	10.88			
Metals	Aluminum (Al) (mg/kg)		37400	45000			
	Antimony (Sb) (mg/kg)		158	174			
	Arsenic (As) (mg/kg)		37.3	48.3			
	Barium (Ba) (mg/kg)		543	474			
	Beryllium (Be) (mg/kg)		0.45	0.45			
	Bismuth (Bi) (mg/kg)		11.8	16.7			
	Boron (B) (mg/kg)		216	214			
	Cadmium (Cd) (mg/kg)		15.3	21.1			
	Calcium (Ca) (mg/kg)		152000	143000			
	Chromium (Cr) (mg/kg)		143	165			
	Cobalt (Co) (mg/kg)		29.2	102			
	Copper (Cu) (mg/kg)		1710	2260			
	Iron (Fe) (mg/kg)		51100	42100			
	Lead (Pb) (mg/kg)		434	1040			
	Lithium (Li) (mg/kg)		21.6	22.5			
	Magnesium (Mg) (mg/kg)		10500	11000			
	Manganese (Mn) (mg/kg)		726	719			
	Mercury (Hg) (mg/kg)		<0.050	<0.050			
	Molybdenum (Mo) (mg/kg)		124	106			
	Nickel (Ni) (mg/kg)		166	116			
	Phosphorus (P) (mg/kg)		10100	11500			
	Potassium (K) (mg/kg)		5640	6230			
	Selenium (Se) (mg/kg)		0.35	0.36			
	Silver (Ag) (mg/kg)		5.17	4.46			
	Sodium (Na) (mg/kg)		15600	16700			
	Strontium (Sr) (mg/kg)		497	312			
	Sulfur (S) (mg/kg)		14600	17300			
	Thallium (Tl) (mg/kg)		0.117	0.118			
	Tin (Sn) (mg/kg)		122	172			
	Titanium (Ti) (mg/kg)		870	961			
	Tungsten (W) (mg/kg)		7.08	12.8			
	Uranium (U) (mg/kg)		6.31	6.08			
Vanadium (V) (mg/kg)		54.8	55.7				
Zinc (Zn) (mg/kg)		3700	4620				
Zirconium (Zr) (mg/kg)		1.5	1.9				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2154327-16 SOIL 22-AUG-18 09:00 BA1834-A-1 REP 4	L2154327-17 SOIL 22-AUG-18 09:00 BA1834-A-5 REP 1	L2154327-18 SOIL 22-AUG-18 09:00 BA1834-A-5 REP 2	L2154327-19 SOIL 22-AUG-18 09:00 BA1834-A-5 REP 3	L2154327-20 SOIL 22-AUG-18 09:00 BA1834-A-5 REP 4
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%) pH (1:2 soil:water) (pH)					
Metals	Aluminum (Al) (mg/kg) Antimony (Sb) (mg/kg) Arsenic (As) (mg/kg) Barium (Ba) (mg/kg) Beryllium (Be) (mg/kg) Bismuth (Bi) (mg/kg) Boron (B) (mg/kg) Cadmium (Cd) (mg/kg) Calcium (Ca) (mg/kg) Chromium (Cr) (mg/kg) Cobalt (Co) (mg/kg) Copper (Cu) (mg/kg) Iron (Fe) (mg/kg) Lead (Pb) (mg/kg) Lithium (Li) (mg/kg) Magnesium (Mg) (mg/kg) Manganese (Mn) (mg/kg) Mercury (Hg) (mg/kg) Molybdenum (Mo) (mg/kg) Nickel (Ni) (mg/kg) Phosphorus (P) (mg/kg) Potassium (K) (mg/kg) Selenium (Se) (mg/kg) Silver (Ag) (mg/kg) Sodium (Na) (mg/kg) Strontium (Sr) (mg/kg) Sulfur (S) (mg/kg) Thallium (Tl) (mg/kg) Tin (Sn) (mg/kg) Titanium (Ti) (mg/kg) Tungsten (W) (mg/kg) Uranium (U) (mg/kg) Vanadium (V) (mg/kg) Zinc (Zn) (mg/kg) Zirconium (Zr) (mg/kg)					

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2154327-21 SOIL 22-AUG-18 09:00 BA1834-A-9 REP 1	L2154327-22 SOIL 22-AUG-18 09:00 BA1834-A-9 REP 2	L2154327-23 SOIL 22-AUG-18 09:00 BA1834-A-9 REP 3	L2154327-24 SOIL 22-AUG-18 09:00 BA1834-A-9 REP 4
Grouping	Analyte				
SOIL					
Physical Tests	Moisture (%) pH (1:2 soil:water) (pH)				
Metals	Aluminum (Al) (mg/kg) Antimony (Sb) (mg/kg) Arsenic (As) (mg/kg) Barium (Ba) (mg/kg) Beryllium (Be) (mg/kg) Bismuth (Bi) (mg/kg) Boron (B) (mg/kg) Cadmium (Cd) (mg/kg) Calcium (Ca) (mg/kg) Chromium (Cr) (mg/kg) Cobalt (Co) (mg/kg) Copper (Cu) (mg/kg) Iron (Fe) (mg/kg) Lead (Pb) (mg/kg) Lithium (Li) (mg/kg) Magnesium (Mg) (mg/kg) Manganese (Mn) (mg/kg) Mercury (Hg) (mg/kg) Molybdenum (Mo) (mg/kg) Nickel (Ni) (mg/kg) Phosphorus (P) (mg/kg) Potassium (K) (mg/kg) Selenium (Se) (mg/kg) Silver (Ag) (mg/kg) Sodium (Na) (mg/kg) Strontium (Sr) (mg/kg) Sulfur (S) (mg/kg) Thallium (Tl) (mg/kg) Tin (Sn) (mg/kg) Titanium (Ti) (mg/kg) Tungsten (W) (mg/kg) Uranium (U) (mg/kg) Vanadium (V) (mg/kg) Zinc (Zn) (mg/kg) Zirconium (Zr) (mg/kg)				

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2154327-1	L2154327-2	L2154327-3	L2154327-4	L2154327-5
		Description	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampled Date	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1834-A-1	BA1834-A-2	BA1834-A-3	BA1834-A-4	BA1834-A-5
Grouping	Analyte						
SOIL							
TCLP Metals	1st Preliminary pH (pH)		11.32	11.14	11.19	11.23	11.26
	2nd Preliminary pH (pH)		8.44	7.60	8.33	8.45	7.99
	Final pH (pH)		5.84	5.97	5.86	5.92	5.78
	Extraction Solution Initial pH (pH)		2.89	2.89	2.89	2.89	2.89
	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)		2.39	2.16	2.19	2.20	2.15
	Cadmium (Cd)-Leachable (mg/L)		1.63	0.242	0.250	0.233	0.601
	Calcium (Ca)-Leachable (mg/L)		1880	1910	1900	1870	1860
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)		0.697	1.06	0.463	0.275	0.487
	Copper (Cu)-Leachable (mg/L)		1.99	1.33	1.77	0.632	1.88
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0	<5.0	<5.0	<5.0
	Lead (Pb)-Leachable (mg/L)		0.27	<0.25	<0.25	<0.25	<0.25
	Magnesium (Mg)-Leachable (mg/L)		124	122	122	122	118
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)		0.64	0.58	1.96	0.72	0.51
	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)		65.2	50.2	44.7	44.6	44.4

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2154327-6	L2154327-7	L2154327-8	L2154327-9	L2154327-10
		Description	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampled Date	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1834-A-6	BA1834-A-7	BA1834-A-8	BA1834-A-9	BA1834-A-10
Grouping	Analyte						
SOIL							
TCLP Metals	1st Preliminary pH (pH)		11.23	11.29	11.26	11.30	11.33
	2nd Preliminary pH (pH)		8.40	8.30	8.38	7.95	8.75
	Final pH (pH)		5.88	5.85	5.88	5.81	5.98
	Extraction Solution Initial pH (pH)		2.89	2.89	2.89	2.89	2.89
	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)		2.18	2.15	2.25	2.31	2.13
	Cadmium (Cd)-Leachable (mg/L)		0.255	0.256	0.265	1.07	0.215
	Calcium (Ca)-Leachable (mg/L)		1880	1860	1900	1890	1860
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)		0.274	0.301	0.477	0.322	0.448
	Copper (Cu)-Leachable (mg/L)		1.34	1.32	1.88	1.63	0.328
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0	<5.0	<5.0	<5.0
	Lead (Pb)-Leachable (mg/L)		0.29	0.27	0.83	0.58	<0.25
	Magnesium (Mg)-Leachable (mg/L)		122	118	122	118	115
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)		0.53	0.63	0.72	0.53	0.52
	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)		43.4	39.9	43.0	43.4	42.6

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2154327-11	L2154327-12	L2154327-13	L2154327-14	L2154327-15
		Description	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampled Date	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1834-A-11	BA1834-A-12	BA1834-A-1 REP 1	BA1834-A-1 REP 2	BA1834-A-1 REP 3
Grouping	Analyte						
SOIL							
TCLP Metals	1st Preliminary pH (pH)		11.38	11.35	11.32	11.32	11.32
	2nd Preliminary pH (pH)		8.54	8.55	8.44	8.44	8.44
	Final pH (pH)		5.97	5.99	5.97	5.91	5.88
	Extraction Solution Initial pH (pH)		2.89	2.89	2.91	2.91	2.91
	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)		2.23	2.29			
	Cadmium (Cd)-Leachable (mg/L)		0.199	0.340	0.264	0.275	0.283
	Calcium (Ca)-Leachable (mg/L)		1880	1880			
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25			
	Cobalt (Co)-Leachable (mg/L)		1.11	0.465			
	Copper (Cu)-Leachable (mg/L)		0.359	1.50			
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0			
	Lead (Pb)-Leachable (mg/L)		<0.25	0.48			
	Magnesium (Mg)-Leachable (mg/L)		122	120			
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010			
	Nickel (Ni)-Leachable (mg/L)		0.61	0.70			
	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)		44.1	53.2			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2154327-16	L2154327-17	L2154327-18	L2154327-19	L2154327-20
		Description	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampled Date	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1834-A-1 REP 4	BA1834-A-5 REP 1	BA1834-A-5 REP 2	BA1834-A-5 REP 3	BA1834-A-5 REP 4
Grouping	Analyte						
SOIL							
TCLP Metals	1st Preliminary pH (pH)		11.32	11.26	11.26	11.26	11.26
	2nd Preliminary pH (pH)		8.44	7.99	7.99	7.99	7.99
	Final pH (pH)		5.89	5.93	5.72	5.86	5.54
	Extraction Solution Initial pH (pH)		2.91	2.91	2.91	2.91	2.91
	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)		0.276	0.325	0.261	0.242	0.284
	Calcium (Ca)-Leachable (mg/L)						
	Chromium (Cr)-Leachable (mg/L)						
	Cobalt (Co)-Leachable (mg/L)						
	Copper (Cu)-Leachable (mg/L)						
	Iron (Fe)-Leachable (mg/L)						
	Lead (Pb)-Leachable (mg/L)						
	Magnesium (Mg)-Leachable (mg/L)						
	Mercury (Hg)-Leachable (mg/L)						
	Nickel (Ni)-Leachable (mg/L)						
	Selenium (Se)-Leachable (mg/L)						
	Silver (Ag)-Leachable (mg/L)						
	Thallium (Tl)-Leachable (mg/L)						
	Vanadium (V)-Leachable (mg/L)						
	Zinc (Zn)-Leachable (mg/L)						

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2154327-21	L2154327-22	L2154327-23	L2154327-24
		Description	SOIL	SOIL	SOIL	SOIL
		Sampled Date	22-AUG-18	22-AUG-18	22-AUG-18	22-AUG-18
		Sampled Time	09:00	09:00	09:00	09:00
		Client ID	BA1834-A-9 REP 1	BA1834-A-9 REP 2	BA1834-A-9 REP 3	BA1834-A-9 REP 4
Grouping	Analyte					
SOIL						
TCLP Metals	1st Preliminary pH (pH)	11.30	11.30	11.30	11.30	
	2nd Preliminary pH (pH)	7.95	7.95	7.95	7.95	
	Final pH (pH)	5.58	5.74	5.74	5.95	
	Extraction Solution Initial pH (pH)	2.91	2.91	2.91	2.91	
	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)	0.267	0.555	0.328	0.281	
	Calcium (Ca)-Leachable (mg/L)					
	Chromium (Cr)-Leachable (mg/L)					
	Cobalt (Co)-Leachable (mg/L)					
	Copper (Cu)-Leachable (mg/L)					
	Iron (Fe)-Leachable (mg/L)					
	Lead (Pb)-Leachable (mg/L)					
	Magnesium (Mg)-Leachable (mg/L)					
	Mercury (Hg)-Leachable (mg/L)					
	Nickel (Ni)-Leachable (mg/L)					
	Selenium (Se)-Leachable (mg/L)					
	Silver (Ag)-Leachable (mg/L)					
	Thallium (Tl)-Leachable (mg/L)					
	Vanadium (V)-Leachable (mg/L)					
	Zinc (Zn)-Leachable (mg/L)					

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Iron (Fe)	DUP-H	L2154327-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2154327-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2154327-13, -14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L2154327-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cobalt (Co)-Leachable	MS-B	L2154327-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Zinc (Zn)-Leachable	MS-B	L2154327-1, -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	Soil	Mercury by CVAAS (TCLP)	EPA 1311/245.7
This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using atomic absorption spectrophotometry (EPA 245.7).			
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
This method uses a heated strong acid digestion with HNO ₃ and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.			
MET-TCLP-ICP-VA	Soil	Metals by ICPOES (TCLP)	EPA 1311/6010B
This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1
This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.			
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL
This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.			

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

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

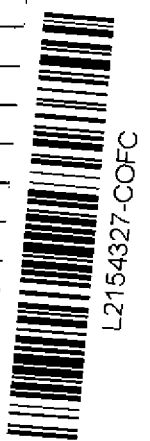
COC # _____

Page _____ of _____

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

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

Lab Work Order # (lab use only)		ALS Contact:	Sampler:												
Sample #	Sample Identification (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		
	BA1834-A-1	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-2	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-3	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-4	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-5	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-6	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-7	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-8	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-9	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-10	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-11	22-Aug-18	9:00	Soil	X	X		X						1	
	BA1834-A-12	22-Aug-18	9:00	Soil	X	X		X						1	



Special Instru s 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)			Observations: Yes / No ? If Yes add SIF
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	
<i>[Signature]</i>	28-Aug-18	07:20	<i>[Signature]</i>	Aug 28	11:10	21.6 °C				