

## Bottom Ash Data

### 2018 Week 24

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The following analytical report was sent to the Ministry of Environment and Climate Change Strategy on July 4, 2018. The data represents bottom ash composite results for week 24 of 2018 (June 10, 2018 to June 16, 2018).

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



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

Date Received: 19-JUN-18  
Report Date: 04-JUL-18 15:09 (MT)  
Version: FINAL

Client Phone: 604-521-1025

## Certificate of Analysis

Lab Work Order #: L2114743  
Project P.O. #: VANCO-0000047506  
Job Reference:  
C of C Numbers:  
Legal Site Desc:

Comments: ADDITIONAL 27-JUN-18 13:13

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Brent Mack, B.Sc.  
Account Manager

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2114743-1	L2114743-2	L2114743-3	L2114743-4	L2114743-5
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1824-A-1	BA1824-A-2	BA1824-A-3	BA1824-A-4	BA1824-A-5
Grouping	Analyte						
<b>SOIL</b>							
<b>Physical Tests</b>	Moisture (%)		18.7	17.8	18.5	18.1	18.2
	pH (1:2 soil:water) (pH)		11.07	11.44	11.50	11.25	11.29
<b>Metals</b>	Aluminum (Al) (mg/kg)		34900	32700	42300	42800	36700
	Antimony (Sb) (mg/kg)		111	93.9	129	109	101
	Arsenic (As) (mg/kg)		26.6	36.4	46.7	34.9	37.0
	Barium (Ba) (mg/kg)		603	493	520	594	519
	Beryllium (Be) (mg/kg)		0.35	0.42	0.48	0.39	0.39
	Bismuth (Bi) (mg/kg)		4.83	8.58	8.72	7.20	16.9
	Boron (B) (mg/kg)		652	827	408	517	546
	Cadmium (Cd) (mg/kg)		10.6	12.7	12.6	13.2	13.4
	Calcium (Ca) (mg/kg)		99700	131000	129000	121000	124000
	Chromium (Cr) (mg/kg)		139	177	143	183	136
	Cobalt (Co) (mg/kg)		98.5	44.0	31.7	26.2	33.3
	Copper (Cu) (mg/kg)		6120	1370	2490	2060	4140
	Iron (Fe) (mg/kg)		70200	51000	48700	52700	50200
	Lead (Pb) (mg/kg)		380	410	1030	578	649
	Lithium (Li) (mg/kg)		17.4	15.9	21.4	18.3	18.4
	Magnesium (Mg) (mg/kg)		9740	9770	10800	12700	10900
	Manganese (Mn) (mg/kg)		1060	760	790	877	884
	Mercury (Hg) (mg/kg)		<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)		31.1	33.3	39.9	29.1	25.5
	Nickel (Ni) (mg/kg)		87.4	230	167	135	162
	Phosphorus (P) (mg/kg)		9740	12800	11600	11000	12900
	Potassium (K) (mg/kg)		3850	4740	4760	5080	5160
	Selenium (Se) (mg/kg)		0.21	0.31	0.38	0.43	0.30
	Silver (Ag) (mg/kg)		9.36	3.55	3.85	3.64	4.86
	Sodium (Na) (mg/kg)		12600	15900	14800	15900	15100
	Strontium (Sr) (mg/kg)		228	316	340	344	276
	Sulfur (S) (mg/kg)		9200	12100	13800	12800	13200
Thallium (Tl) (mg/kg)		0.067	0.074	0.079	0.080	0.085	
Tin (Sn) (mg/kg)		139	115	124	117	128	
Titanium (Ti) (mg/kg)		1050	346	942	1140	446	
Tungsten (W) (mg/kg)		6.88	4.86	8.46	7.96	5.18	
Uranium (U) (mg/kg)		4.36	6.03	6.01	6.26	6.38	
Vanadium (V) (mg/kg)		49.0	55.0	54.3	54.2	52.3	
Zinc (Zn) (mg/kg)		5470	4220	4780	4070	3810	
Zirconium (Zr) (mg/kg)		1.0	1.6	1.7	1.6	1.5	

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L2114743-6 Soil 13-JUN-18 09:00 BA1824-A-6	L2114743-7 Soil 13-JUN-18 09:00 BA1824-A-7	L2114743-8 Soil 13-JUN-18 09:00 BA1824-A-8	L2114743-9 Soil 13-JUN-18 09:00 BA1824-A-9	L2114743-10 Soil 13-JUN-18 09:00 BA1824-A-10	
Grouping	Analyte					
<b>SOIL</b>						
<b>Physical Tests</b>	Moisture (%)	17.5	17.9	17.5	18.4	17.5
	pH (1:2 soil:water) (pH)	11.24	11.18	11.61	11.51	11.31
<b>Metals</b>	Aluminum (Al) (mg/kg)	35400	47800	29100	29500	28400
	Antimony (Sb) (mg/kg)	106	113	137	128	169
	Arsenic (As) (mg/kg)	35.9	37.2	37.5	39.1	34.7
	Barium (Ba) (mg/kg)	564	578	592	558	486
	Beryllium (Be) (mg/kg)	0.37	0.40	0.40	0.38	0.40
	Bismuth (Bi) (mg/kg)	8.88	9.93	6.90	8.50	17.4
	Boron (B) (mg/kg)	788	1040	475	574	518
	Cadmium (Cd) (mg/kg)	15.0	36.8	12.3	22.1	15.1
	Calcium (Ca) (mg/kg)	122000	123000	123000	120000	116000
	Chromium (Cr) (mg/kg)	153	185	184	179	155
	Cobalt (Co) (mg/kg)	32.8	28.8	47.4	40.4	50.9
	Copper (Cu) (mg/kg)	1170	2270	7590	3670	28700
	Iron (Fe) (mg/kg)	63500	57200	62700	61800	58500
	Lead (Pb) (mg/kg)	614	906	718	506	554
	Lithium (Li) (mg/kg)	18.4	19.7	20.1	18.4	17.3
	Magnesium (Mg) (mg/kg)	10700	9770	11000	11500	10000
	Manganese (Mn) (mg/kg)	804	960	709	744	1220
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	24.9	25.8	27.9	37.9	27.1
	Nickel (Ni) (mg/kg)	94.7	137	706	170	114
	Phosphorus (P) (mg/kg)	11900	12300	11300	10800	11500
	Potassium (K) (mg/kg)	5160	4970	5110	4830	5140
	Selenium (Se) (mg/kg)	0.34	0.39	0.36	0.32	0.35
	Silver (Ag) (mg/kg)	4.93	3.52	5.36	3.08	6.76
	Sodium (Na) (mg/kg)	16300	16500	15100	15300	16000
	Strontium (Sr) (mg/kg)	294	292	289	289	271
	Sulfur (S) (mg/kg)	13100	13500	12400	12500	12500
	Thallium (Tl) (mg/kg)	0.089	0.099	0.084	0.081	0.082
	Tin (Sn) (mg/kg)	136	122	149	93.4	266
	Titanium (Ti) (mg/kg)	555	936	834	785	426
	Tungsten (W) (mg/kg)	11.7	5.10	4.40	5.06	5.17
	Uranium (U) (mg/kg)	6.35	7.20	6.35	5.99	6.23
	Vanadium (V) (mg/kg)	56.4	56.8	59.8	57.8	55.8
	Zinc (Zn) (mg/kg)	3960	4060	4790	3970	4180
	Zirconium (Zr) (mg/kg)	1.5	2.1	<1.0	1.0	1.3

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2114743-11	L2114743-12	L2114743-13	L2114743-14	L2114743-15
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1824-A-11	BA1824-A-12	BA1824-A-4 REP 1	BA1824-A-4 REP 2	BA1824-A-4 REP 3
Grouping	Analyte						
<b>SOIL</b>							
<b>Physical Tests</b>	Moisture (%)		18.4	17.2			
	pH (1:2 soil:water) (pH)		11.15	11.27			
<b>Metals</b>	Aluminum (Al) (mg/kg)		60200	32000			
	Antimony (Sb) (mg/kg)		102	110			
	Arsenic (As) (mg/kg)		35.3	35.9			
	Barium (Ba) (mg/kg)		581	476			
	Beryllium (Be) (mg/kg)		0.36	0.37			
	Bismuth (Bi) (mg/kg)		25.7	8.37			
	Boron (B) (mg/kg)		701	485			
	Cadmium (Cd) (mg/kg)		56.9	58.3			
	Calcium (Ca) (mg/kg)		108000	122000			
	Chromium (Cr) (mg/kg)		152	244			
	Cobalt (Co) (mg/kg)		27.3	25.7			
	Copper (Cu) (mg/kg)		1860	1720			
	Iron (Fe) (mg/kg)		48700	62100			
	Lead (Pb) (mg/kg)		462	500			
	Lithium (Li) (mg/kg)		16.2	17.5			
	Magnesium (Mg) (mg/kg)		9040	9980			
	Manganese (Mn) (mg/kg)		703	989			
	Mercury (Hg) (mg/kg)		<0.050	<0.050			
	Molybdenum (Mo) (mg/kg)		25.3	23.7			
	Nickel (Ni) (mg/kg)		138	121			
	Phosphorus (P) (mg/kg)		10600	12600			
	Potassium (K) (mg/kg)		5780	4980			
	Selenium (Se) (mg/kg)		0.33	0.34			
	Silver (Ag) (mg/kg)		6.01	2.99			
	Sodium (Na) (mg/kg)		15600	15000			
	Strontium (Sr) (mg/kg)		263	304			
	Sulfur (S) (mg/kg)		11300	13800			
	Thallium (Tl) (mg/kg)		0.080	0.084			
Tin (Sn) (mg/kg)		100	117				
Titanium (Ti) (mg/kg)		1680	577				
Tungsten (W) (mg/kg)		4.76	4.95				
Uranium (U) (mg/kg)		5.69	6.51				
Vanadium (V) (mg/kg)		51.3	55.3				
Zinc (Zn) (mg/kg)		4090	4100				
Zirconium (Zr) (mg/kg)		4.5	1.4				

\* 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	L2114743-16 Soil 13-JUN-18 09:00 BA1824-A-4 REP 4	L2114743-17 Soil 13-JUN-18 09:00 BA1824-A-7 REP 1	L2114743-18 Soil 13-JUN-18 09:00 BA1824-A-7 REP 2	L2114743-19 Soil 13-JUN-18 09:00 BA1824-A-7 REP 3	L2114743-20 Soil 13-JUN-18 09:00 BA1824-A-7 REP 4
Grouping	Analyte				
<b>SOIL</b>					
<b>Physical Tests</b>	Moisture (%) pH (1:2 soil:water) (pH)				
<b>Metals</b>	Aluminum (Al) (mg/kg) Antimony (Sb) (mg/kg) Arsenic (As) (mg/kg) Barium (Ba) (mg/kg) Beryllium (Be) (mg/kg) Bismuth (Bi) (mg/kg) Boron (B) (mg/kg) Cadmium (Cd) (mg/kg) Calcium (Ca) (mg/kg) Chromium (Cr) (mg/kg) Cobalt (Co) (mg/kg) Copper (Cu) (mg/kg) Iron (Fe) (mg/kg) Lead (Pb) (mg/kg) Lithium (Li) (mg/kg) Magnesium (Mg) (mg/kg) Manganese (Mn) (mg/kg) Mercury (Hg) (mg/kg) Molybdenum (Mo) (mg/kg) Nickel (Ni) (mg/kg) Phosphorus (P) (mg/kg) Potassium (K) (mg/kg) Selenium (Se) (mg/kg) Silver (Ag) (mg/kg) Sodium (Na) (mg/kg) Strontium (Sr) (mg/kg) Sulfur (S) (mg/kg) Thallium (Tl) (mg/kg) Tin (Sn) (mg/kg) Titanium (Ti) (mg/kg) Tungsten (W) (mg/kg) Uranium (U) (mg/kg) Vanadium (V) (mg/kg) Zinc (Zn) (mg/kg) Zirconium (Zr) (mg/kg)				

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2114743-1	L2114743-2	L2114743-3	L2114743-4	L2114743-5
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1824-A-1	BA1824-A-2	BA1824-A-3	BA1824-A-4	BA1824-A-5
Grouping	Analyte						
<b>SOIL</b>							
<b>TCLP Metals</b>	1st Preliminary pH (pH)		11.55	11.44	11.45	11.48	11.48
	2nd Preliminary pH (pH)		8.64	8.47	8.60	8.69	8.44
	Final pH (pH)		5.73	5.81	6.05	5.67	5.90
	Extraction Solution Initial pH (pH)		2.85	2.85	2.85	2.85	2.85
	Antimony (Sb)-Leachable (mg/L)		<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As)-Leachable (mg/L)		<1.0	<1.0	<1.0	<1.0	<1.0
	Barium (Ba)-Leachable (mg/L)		<2.5	<2.5	<2.5	<2.5	<2.5
	Beryllium (Be)-Leachable (mg/L)		<0.025	<0.025	<0.025	<0.025	<0.025
	Boron (B)-Leachable (mg/L)		6.47	6.54	10.5	6.40	8.96
	Cadmium (Cd)-Leachable (mg/L)		0.218	0.166	0.461	1.57	0.171
	Calcium (Ca)-Leachable (mg/L)		1830	1880	1930	1860	1870
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)		0.503	0.581	0.345	0.508	0.401
	Copper (Cu)-Leachable (mg/L)		1.14	1.98	1.19	0.805	1.23
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0	<5.0	<5.0	<5.0
	Lead (Pb)-Leachable (mg/L)		1.32	0.99	0.34	0.92	0.48
	Magnesium (Mg)-Leachable (mg/L)		104	113	111	107	111
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)		0.63	0.42	0.45	0.53	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)		58.5	57.2	39.6	58.0	46.3

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2114743-6	L2114743-7	L2114743-8	L2114743-9	L2114743-10
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1824-A-6	BA1824-A-7	BA1824-A-8	BA1824-A-9	BA1824-A-10
Grouping	Analyte						
<b>SOIL</b>							
<b>TCLP Metals</b>	1st Preliminary pH (pH)		11.47	11.44	11.49	11.56	11.50
	2nd Preliminary pH (pH)		8.70	8.87	8.58	8.81	8.63
	Final pH (pH)		5.91	5.78	5.90	6.05	5.91
	Extraction Solution Initial pH (pH)		2.85	2.85	2.85	2.85	2.85
	Antimony (Sb)-Leachable (mg/L)		<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As)-Leachable (mg/L)		<1.0	<1.0	<1.0	<1.0	<1.0
	Barium (Ba)-Leachable (mg/L)		<2.5	<2.5	<2.5	<2.5	<2.5
	Beryllium (Be)-Leachable (mg/L)		<0.025	<0.025	<0.025	<0.025	<0.025
	Boron (B)-Leachable (mg/L)		7.77	7.74	8.67	8.31	7.91
	Cadmium (Cd)-Leachable (mg/L)		0.185	0.907	0.480	0.155	0.231
	Calcium (Ca)-Leachable (mg/L)		1800	1710	1840	1940	1900
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	Cobalt (Co)-Leachable (mg/L)		1.05	0.542	0.466	0.802	0.617
	Copper (Cu)-Leachable (mg/L)		1.42	1.08	1.09	1.07	1.36
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0	<5.0	<5.0	<5.0
	Lead (Pb)-Leachable (mg/L)		1.05	0.97	<0.25	<0.25	<0.25
	Magnesium (Mg)-Leachable (mg/L)		107	101	111	118	117
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Leachable (mg/L)		0.57	1.17	0.97	0.58	0.60
	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)		95.1	51.8	40.8	49.0	46.9

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



## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2114743-11	L2114743-12	L2114743-13	L2114743-14	L2114743-15
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1824-A-11	BA1824-A-12	BA1824-A-4 REP 1	BA1824-A-4 REP 2	BA1824-A-4 REP 3
Grouping	Analyte						
<b>SOIL</b>							
<b>TCLP Metals</b>	1st Preliminary pH (pH)		11.49	11.46	11.48	11.48	11.48
	2nd Preliminary pH (pH)		8.78	8.63	8.69	8.69	8.69
	Final pH (pH)		6.02	5.87	5.72	5.66	5.82
	Extraction Solution Initial pH (pH)		2.85	2.85	2.89	2.89	2.89
	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)		7.73	10.7			
	Cadmium (Cd)-Leachable (mg/L)		0.174	0.245	0.219	0.243	0.185
	Calcium (Ca)-Leachable (mg/L)		1870	1840			
	Chromium (Cr)-Leachable (mg/L)		<0.25	<0.25			
	Cobalt (Co)-Leachable (mg/L)		0.501	1.44			
	Copper (Cu)-Leachable (mg/L)		1.55	0.459			
	Iron (Fe)-Leachable (mg/L)		<5.0	<5.0			
	Lead (Pb)-Leachable (mg/L)		1.25	<0.25			
	Magnesium (Mg)-Leachable (mg/L)		111	109			
	Mercury (Hg)-Leachable (mg/L)		<0.0010	<0.0010			
	Nickel (Ni)-Leachable (mg/L)		0.62	1.32			
	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)		51.9	45.7			

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2114743-16	L2114743-17	L2114743-18	L2114743-19	L2114743-20
		Description	Soil	Soil	Soil	Soil	Soil
		Sampled Date	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18	13-JUN-18
		Sampled Time	09:00	09:00	09:00	09:00	09:00
		Client ID	BA1824-A-4 REP 4	BA1824-A-7 REP 1	BA1824-A-7 REP 2	BA1824-A-7 REP 3	BA1824-A-7 REP 4
Grouping	Analyte						
<b>SOIL</b>							
<b>TCLP Metals</b>	1st Preliminary pH (pH)		11.48	11.44	11.44	11.44	11.44
	2nd Preliminary pH (pH)		8.69	8.87	8.87	8.87	8.87
	Final pH (pH)		5.86	5.76	5.81	5.97	5.80
	Extraction Solution Initial pH (pH)		2.89	2.89	2.89	2.89	2.89
	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)		0.239	0.179	0.209	0.184	0.175
	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	Bismuth (Bi)	DUP-H	L2114743-1
Duplicate	Boron (B)	DUP-H	L2114743-1
Duplicate	Cobalt (Co)	DUP-H	L2114743-1
Duplicate	Copper (Cu)	DUP-H	L2114743-1
Duplicate	Lead (Pb)	DUP-H	L2114743-1
Duplicate	Silver (Ag)	DUP-H	L2114743-1
Duplicate	Tungsten (W)	DUP-H	L2114743-1
Certified Reference Material	Titanium (Ti)	MES	L2114743-10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Boron (B)-Leachable	MS-B	L2114743-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cadmium (Cd)-Leachable	MS-B	L2114743-13, -14, -15, -16, -17, -18, -19, -20
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L2114743-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Cobalt (Co)-Leachable	MS-B	L2114743-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Zinc (Zn)-Leachable	MS-B	L2114743-1, -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.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>HG-200.2-CVAF-VA</b>	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)
Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.			
<b>HG-TCLP-CVAFS-VA</b>	Soil	Mercury by CVAAS (TCLP)	EPA 1311/245.7
This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using atomic absorption spectrophotometry (EPA 245.7).			
<b>MET-200.2-CCMS-VA</b>	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
This method uses a heated strong acid digestion with HNO <sub>3</sub> and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.			
<b>MET-TCLP-ICP-VA</b>	Soil	Metals by ICPOES (TCLP)	EPA 1311/6010B
This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>MOISTURE-VA</b>	Soil	Moisture content	CWS for PHC in Soil - Tier 1
This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.			
<b>PH-1:2-VA</b>	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL
This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.			

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

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

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

## Reference Information

VA

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### Chain of Custody Numbers:

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#### **GLOSSARY OF REPORT TERMS**

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

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

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

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

*mg/L - milligrams per litre.*

*< - Less than.*

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

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

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

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

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



L2114743-COFC

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

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

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

<b>Invoice To</b> Same as Report ?		<b>Client / Project Information</b>		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:											

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	MET-TCLP-VA (all metals, Hg)	MOISTURE	Chrome 6	MET-CSR+FULL-VA (all metals)	Number of Containers
BA1824-A-1		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-2		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-3		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-4		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-5		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-6		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-7		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-8		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-9		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-10		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-11		13-Jun-18	9:00	Soil	X	X		X	1
BA1824-A-12		13-Jun-18	9:00	Soil	X	X		X	1

**Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details**

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

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

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

<b>SHIPMENT RELEASE (client use)</b>			<b>SHIPMENT RECEPTION (lab use only)</b>				<b>SHIPMENT VERIFICATION (lab use only)</b>			
Released by:	Date (dd-mm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
	19-Jun-18	08:00	HA	6/19	11:35am	26 °C				