

Bottom Ash Data

2018 Week 19

The following analytical report was sent to the Ministry of Environment and Climate Change Strategy on June 4, 2018. The data represents bottom ash composite results for week 19 of 2018 (May 6, 2018 to May 12, 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
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Burnaby BC V3N 4V3

Date Received: 15-MAY-18
Report Date: 31-MAY-18 14:48 (MT)
Version: FINAL

Client Phone: 604-521-1025

Certificate of Analysis

Lab Work Order #: L2094712
Project P.O. #: VANCO-0000047506
Job Reference: 46693 WEEKLY BOTTOM ASH-SUITE
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL 24-MAY-18 14:32

As per client request, certain samples were re-prepped from scratch and analyzed for TCLP Metals (TCLP Cd) in 4 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. 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 | L2094712-1 soil 09-MAY-18 09:00 BA1819-A-1 | L2094712-2 soil 09-MAY-18 09:00 BA1819-A-2 | L2094712-3 soil 09-MAY-18 09:00 BA1819-A-3 | L2094712-4 soil 09-MAY-18 09:00 BA1819-A-4 | L2094712-5 soil 09-MAY-18 09:00 BA1819-A-5 | |
|---|--|--|--|--|--|--------|
| Grouping | Analyte | | | | | |
| SOIL | | | | | | |
| Physical Tests | Moisture (%) | 17.9 | 16.9 | 19.5 | 18.0 | 19.4 |
| | pH (1:2 soil:water) (pH) | 11.96 | 11.82 | 11.69 | 11.86 | 11.66 |
| Metals | Aluminum (Al) (mg/kg) | 34200 | 32500 | 41200 | 38000 | 38400 |
| | Antimony (Sb) (mg/kg) | 136 | 126 | 123 | 124 | 124 |
| | Arsenic (As) (mg/kg) | 41.2 | 59.8 | 40.0 | 35.6 | 39.1 |
| | Barium (Ba) (mg/kg) | 594 | 660 | 558 | 551 | 658 |
| | Beryllium (Be) (mg/kg) | 0.45 | 0.65 | 0.44 | 0.46 | 0.48 |
| | Bismuth (Bi) (mg/kg) | 19.8 | 6.79 | 6.49 | 11.8 | 7.30 |
| | Boron (B) (mg/kg) | 342 | 228 | 258 | 255 | 211 |
| | Cadmium (Cd) (mg/kg) | 14.5 | 12.3 | 13.0 | 12.9 | 11.0 |
| | Calcium (Ca) (mg/kg) | 131000 | 118000 | 129000 | 130000 | 129000 |
| | Chromium (Cr) (mg/kg) | 178 | 208 | 171 | 143 | 179 |
| | Cobalt (Co) (mg/kg) | 36.8 | 27.1 | 56.3 | 24.3 | 29.0 |
| | Copper (Cu) (mg/kg) | 1490 | 2040 | 2410 | 2600 | 3020 |
| | Iron (Fe) (mg/kg) | 72700 | 63000 | 62500 | 70200 | 66100 |
| | Lead (Pb) (mg/kg) | 652 | 486 | 401 | 1130 | 621 |
| | Lithium (Li) (mg/kg) | 19.4 | 19.2 | 18.1 | 20.7 | 17.3 |
| | Magnesium (Mg) (mg/kg) | 10800 | 9260 | 10300 | 11000 | 10900 |
| | Manganese (Mn) (mg/kg) | 696 | 1040 | 720 | 778 | 841 |
| | Mercury (Hg) (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Molybdenum (Mo) (mg/kg) | 43.1 | 65.0 | 30.9 | 32.9 | 46.2 |
| | Nickel (Ni) (mg/kg) | 210 | 139 | 217 | 127 | 174 |
| | Phosphorus (P) (mg/kg) | 11100 | 11300 | 12500 | 11300 | 10700 |
| | Potassium (K) (mg/kg) | 4500 | 5110 | 5570 | 4890 | 5210 |
| | Selenium (Se) (mg/kg) | 0.36 | 0.29 | 0.66 | 0.37 | 0.32 |
| | Silver (Ag) (mg/kg) | 5.87 | 6.42 | 18.5 | 6.17 | 4.45 |
| | Sodium (Na) (mg/kg) | 14400 | 15200 | 17000 | 15200 | 16200 |
| | Strontium (Sr) (mg/kg) | 368 | 386 | 388 | 406 | 502 |
| | Sulfur (S) (mg/kg) | 12900 | 10500 | 12400 | 13400 | 11500 |
| | Thallium (Tl) (mg/kg) | 0.087 | 0.088 | 0.086 | 0.084 | 0.082 |
| | Tin (Sn) (mg/kg) | 137 | 353 | 134 | 117 | 105 |
| | Titanium (Ti) (mg/kg) | 790 | 997 | 631 | 850 | 1130 |
| | Tungsten (W) (mg/kg) | 8.71 | 6.46 | 4.93 | 5.87 | 5.75 |
| | Uranium (U) (mg/kg) | 6.70 | 6.73 | 6.53 | 6.88 | 6.46 |
| | Vanadium (V) (mg/kg) | 58.5 | 58.1 | 61.0 | 58.8 | 59.8 |
| | Zinc (Zn) (mg/kg) | 4130 | 3350 | 3100 | 3400 | 3210 |
| | Zirconium (Zr) (mg/kg) | 1.6 | 1.4 | 1.9 | 1.8 | 1.3 |

* 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 | L2094712-6 soil 09-MAY-18 09:00 BA1819-A-6 | L2094712-7 soil 09-MAY-18 09:00 BA1819-A-7 | L2094712-8 soil 09-MAY-18 09:00 BA1819-A-8 | L2094712-9 soil 09-MAY-18 09:00 BA1819-A-9 | L2094712-10 soil 09-MAY-18 09:00 BA1819-A-10 | |
|---|--|--|--|--|--|--------|
| Grouping | Analyte | | | | | |
| SOIL | | | | | | |
| Physical Tests | Moisture (%) | 19.8 | 17.9 | 19.3 | 19.9 | 17.8 |
| | pH (1:2 soil:water) (pH) | 11.77 | 11.85 | 11.82 | 11.70 | 11.73 |
| Metals | Aluminum (Al) (mg/kg) | 29400 | 27500 | 30400 | 39000 | 32600 |
| | Antimony (Sb) (mg/kg) | 128 | 122 | 181 | 122 | 136 |
| | Arsenic (As) (mg/kg) | 41.5 | 44.4 | 39.8 | 36.4 | 45.2 |
| | Barium (Ba) (mg/kg) | 619 | 621 | 642 | 621 | 615 |
| | Beryllium (Be) (mg/kg) | 0.43 | 0.45 | 0.41 | 0.42 | 0.43 |
| | Bismuth (Bi) (mg/kg) | 7.70 | 5.90 | 8.78 | 6.32 | 71.5 |
| | Boron (B) (mg/kg) | 184 | 243 | 175 | 180 | 196 |
| | Cadmium (Cd) (mg/kg) | 16.2 | 11.5 | 11.8 | 15.7 | 14.3 |
| | Calcium (Ca) (mg/kg) | 134000 | 137000 | 127000 | 127000 | 136000 |
| | Chromium (Cr) (mg/kg) | 163 | 146 | 147 | 146 | 204 |
| | Cobalt (Co) (mg/kg) | 189 | 25.1 | 46.7 | 33.6 | 27.1 |
| | Copper (Cu) (mg/kg) | 4740 | 2440 | 5740 | 3720 | 2280 |
| | Iron (Fe) (mg/kg) | 53200 | 61400 | 64700 | 67400 | 71600 |
| | Lead (Pb) (mg/kg) | 443 | 438 | 11400 | 393 | 567 |
| | Lithium (Li) (mg/kg) | 22.1 | 18.2 | 19.3 | 18.6 | 19.3 |
| | Magnesium (Mg) (mg/kg) | 11700 | 10700 | 11000 | 10100 | 10500 |
| | Manganese (Mn) (mg/kg) | 809 | 804 | 811 | 749 | 838 |
| | Mercury (Hg) (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Molybdenum (Mo) (mg/kg) | 76.3 | 33.8 | 34.4 | 29.4 | 36.6 |
| | Nickel (Ni) (mg/kg) | 320 | 118 | 765 | 192 | 216 |
| | Phosphorus (P) (mg/kg) | 11800 | 11200 | 10800 | 11200 | 11700 |
| | Potassium (K) (mg/kg) | 5010 | 4950 | 4640 | 4990 | 5260 |
| | Selenium (Se) (mg/kg) | 0.30 | 0.35 | 0.38 | 0.34 | 0.40 |
| | Silver (Ag) (mg/kg) | 7.36 | 5.01 | 4.91 | 8.45 | 6.42 |
| | Sodium (Na) (mg/kg) | 15500 | 15400 | 14900 | 16100 | 15500 |
| | Strontium (Sr) (mg/kg) | 417 | 392 | 363 | 437 | 396 |
| | Sulfur (S) (mg/kg) | 12000 | 11400 | 11800 | 11500 | 12800 |
| | Thallium (Tl) (mg/kg) | 0.090 | 0.077 | 0.150 | 0.088 | 0.082 |
| | Tin (Sn) (mg/kg) | 255 | 116 | 161 | 1770 | 374 |
| | Titanium (Ti) (mg/kg) | 581 | 416 | 946 | 1040 | 826 |
| | Tungsten (W) (mg/kg) | 7.51 | 8.71 | 14.6 | 5.56 | 7.32 |
| | Uranium (U) (mg/kg) | 6.70 | 6.58 | 6.19 | 6.36 | 7.14 |
| | Vanadium (V) (mg/kg) | 59.2 | 57.5 | 55.3 | 55.2 | 66.9 |
| | Zinc (Zn) (mg/kg) | 8310 | 3710 | 4580 | 4610 | 3860 |
| | Zirconium (Zr) (mg/kg) | <1.0 | 1.3 | 1.1 | 1.8 | 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 | L2094712-11 soil 09-MAY-18 09:00 BA1819-A-11 | L2094712-12 soil 09-MAY-18 09:00 BA1819-A-12 | L2094712-13 soil 09-MAY-18 09:00 BA1819-A-4 REP 1 | L2094712-14 soil 09-MAY-18 09:00 BA1819-A-4 REP 2 | L2094712-15 soil 09-MAY-18 09:00 BA1819-A-4 REP 3 |
|---|--|--|---|---|---|
| Grouping | Analyte | | | | |
| SOIL | | | | | |
| Physical Tests | Moisture (%) | 17.5 | 19.7 | | |
| | pH (1:2 soil:water) (pH) | 11.79 | 11.62 | | |
| Metals | Aluminum (Al) (mg/kg) | 32500 | 29600 | | |
| | Antimony (Sb) (mg/kg) | 124 | 146 | | |
| | Arsenic (As) (mg/kg) | 36.8 | 51.3 | | |
| | Barium (Ba) (mg/kg) | 581 | 511 | | |
| | Beryllium (Be) (mg/kg) | 0.45 | 0.38 | | |
| | Bismuth (Bi) (mg/kg) | 6.35 | 8.69 | | |
| | Boron (B) (mg/kg) | 179 | 192 | | |
| | Cadmium (Cd) (mg/kg) | 13.1 | 12.4 | | |
| | Calcium (Ca) (mg/kg) | 143000 | 116000 | | |
| | Chromium (Cr) (mg/kg) | 135 | 136 | | |
| | Cobalt (Co) (mg/kg) | 46.6 | 118 | | |
| | Copper (Cu) (mg/kg) | 2360 | 1560 | | |
| | Iron (Fe) (mg/kg) | 52100 | 61100 | | |
| | Lead (Pb) (mg/kg) | 412 | 1140 | | |
| | Lithium (Li) (mg/kg) | 17.4 | 22.8 | | |
| | Magnesium (Mg) (mg/kg) | 9950 | 10100 | | |
| | Manganese (Mn) (mg/kg) | 3000 | 681 | | |
| | Mercury (Hg) (mg/kg) | <0.050 | <0.050 | | |
| | Molybdenum (Mo) (mg/kg) | 34.1 | 27.4 | | |
| | Nickel (Ni) (mg/kg) | 156 | 121 | | |
| | Phosphorus (P) (mg/kg) | 11400 | 9550 | | |
| | Potassium (K) (mg/kg) | 4980 | 4660 | | |
| | Selenium (Se) (mg/kg) | 0.39 | 0.33 | | |
| | Silver (Ag) (mg/kg) | 4.09 | 3.57 | | |
| | Sodium (Na) (mg/kg) | 15400 | 14300 | | |
| | Strontium (Sr) (mg/kg) | 430 | 331 | | |
| | Sulfur (S) (mg/kg) | 13200 | 11200 | | |
| | Thallium (Tl) (mg/kg) | 0.075 | 0.088 | | |
| | Tin (Sn) (mg/kg) | 113 | 145 | | |
| | Titanium (Ti) (mg/kg) | 603 | 605 | | |
| | Tungsten (W) (mg/kg) | 7.84 | 4.47 | | |
| | Uranium (U) (mg/kg) | 6.30 | 6.24 | | |
| | Vanadium (V) (mg/kg) | 56.6 | 53.6 | | |
| | Zinc (Zn) (mg/kg) | 3850 | 3610 | | |
| | Zirconium (Zr) (mg/kg) | 2.7 | 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 | L2094712-16 soil 09-MAY-18 09:00 BA1819-A-4 REP 4 | L2094712-17 soil 09-MAY-18 09:00 BA1819-A-7 REP 1 | L2094712-18 soil 09-MAY-18 09:00 BA1819-A-7 REP 2 | L2094712-19 soil 09-MAY-18 09:00 BA1819-A-7 REP 3 | L2094712-20 soil 09-MAY-18 09:00 BA1819-A-7 REP 4 |
|---|---|---|---|---|---|
| Grouping | Analyte | | | | |
| SOIL | | | | | |
| Physical Tests | Moisture (%) pH (1:2 soil:water) (pH) | | | | |
| Metals | Aluminum (Al) (mg/kg) Antimony (Sb) (mg/kg) Arsenic (As) (mg/kg) Barium (Ba) (mg/kg) Beryllium (Be) (mg/kg) Bismuth (Bi) (mg/kg) Boron (B) (mg/kg) Cadmium (Cd) (mg/kg) Calcium (Ca) (mg/kg) Chromium (Cr) (mg/kg) Cobalt (Co) (mg/kg) Copper (Cu) (mg/kg) Iron (Fe) (mg/kg) Lead (Pb) (mg/kg) Lithium (Li) (mg/kg) Magnesium (Mg) (mg/kg) Manganese (Mn) (mg/kg) Mercury (Hg) (mg/kg) Molybdenum (Mo) (mg/kg) Nickel (Ni) (mg/kg) Phosphorus (P) (mg/kg) Potassium (K) (mg/kg) Selenium (Se) (mg/kg) Silver (Ag) (mg/kg) Sodium (Na) (mg/kg) Strontium (Sr) (mg/kg) Sulfur (S) (mg/kg) Thallium (Tl) (mg/kg) Tin (Sn) (mg/kg) Titanium (Ti) (mg/kg) Tungsten (W) (mg/kg) Uranium (U) (mg/kg) Vanadium (V) (mg/kg) Zinc (Zn) (mg/kg) Zirconium (Zr) (mg/kg) | | | | |

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | Sample ID | L2094712-1 | L2094712-2 | L2094712-3 | L2094712-4 | L2094712-5 |
|--------------------|-------------------------------------|--------------|------------|------------|------------|------------|------------|
| | | Description | soil | soil | soil | soil | soil |
| | | Sampled Date | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 |
| | | Sampled Time | 09:00 | 09:00 | 09:00 | 09:00 | 09:00 |
| | | Client ID | BA1819-A-1 | BA1819-A-2 | BA1819-A-3 | BA1819-A-4 | BA1819-A-5 |
| Grouping | Analyte | | | | | | |
| SOIL | | | | | | | |
| TCLP Metals | 1st Preliminary pH (pH) | | 11.77 | 11.72 | 11.76 | 11.73 | 11.76 |
| | 2nd Preliminary pH (pH) | | 9.98 | 9.65 | 9.84 | 9.83 | 9.87 |
| | Final pH (pH) | | 5.96 | 5.97 | 6.05 | 5.87 | 5.96 |
| | Extraction Solution Initial pH (pH) | | 2.86 | 2.86 | 2.86 | 2.86 | 2.86 |
| | Antimony (Sb)-Leachable (mg/L) | | <1.0 | <1.0 | <1.0 | <1.0 | 1.8 |
| | 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) | | 2.22 | 2.60 | 2.37 | 2.35 | 2.24 |
| | Cadmium (Cd)-Leachable (mg/L) | | 0.324 | 0.182 | 0.381 | 0.892 | 0.171 |
| | Calcium (Ca)-Leachable (mg/L) | | 1960 | 2050 | 2080 | 2020 | 2060 |
| | Chromium (Cr)-Leachable (mg/L) | | <0.25 | <0.25 | <0.25 | <0.25 | <0.25 |
| | Cobalt (Co)-Leachable (mg/L) | | 0.589 | 2.31 | 1.16 | 0.902 | 0.646 |
| | Copper (Cu)-Leachable (mg/L) | | 1.69 | 1.80 | 1.39 | 1.70 | 1.47 |
| | Iron (Fe)-Leachable (mg/L) | | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | Lead (Pb)-Leachable (mg/L) | | 1.24 | <0.25 | <0.25 | <0.25 | 0.49 |
| | Magnesium (Mg)-Leachable (mg/L) | | 117 | 126 | 129 | 121 | 124 |
| | Mercury (Hg)-Leachable (mg/L) | | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| | Nickel (Ni)-Leachable (mg/L) | | 0.48 | 0.86 | 0.63 | 0.61 | 0.55 |
| | 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) | | 64.9 | 43.6 | 52.9 | 45.6 | 41.4 |

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ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | Sample ID | L2094712-6 | L2094712-7 | L2094712-8 | L2094712-9 | L2094712-10 |
|--------------------|-------------------------------------|--------------|------------|------------|------------|------------|-------------|
| | | Description | soil | soil | soil | soil | soil |
| | | Sampled Date | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 |
| | | Sampled Time | 09:00 | 09:00 | 09:00 | 09:00 | 09:00 |
| | | Client ID | BA1819-A-6 | BA1819-A-7 | BA1819-A-8 | BA1819-A-9 | BA1819-A-10 |
| Grouping | Analyte | | | | | | |
| SOIL | | | | | | | |
| TCLP Metals | 1st Preliminary pH (pH) | | 11.69 | 11.74 | 11.74 | 11.67 | 11.68 |
| | 2nd Preliminary pH (pH) | | 9.97 | 9.77 | 9.70 | 9.50 | 9.38 |
| | Final pH (pH) | | 5.93 | 5.89 | 5.99 | 5.98 | 5.80 |
| | Extraction Solution Initial pH (pH) | | 2.86 | 2.86 | 2.86 | 2.86 | 2.86 |
| | 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) | | 2.14 | 2.29 | 2.21 | 2.40 | 2.40 |
| | Cadmium (Cd)-Leachable (mg/L) | | 0.185 | 1.26 | 0.203 | 0.223 | 0.262 |
| | Calcium (Ca)-Leachable (mg/L) | | 1970 | 2020 | 2030 | 2050 | 2020 |
| | Chromium (Cr)-Leachable (mg/L) | | <0.25 | <0.25 | <0.25 | <0.25 | <0.25 |
| | Cobalt (Co)-Leachable (mg/L) | | 0.768 | 0.547 | 2.18 | 2.72 | 1.00 |
| | Copper (Cu)-Leachable (mg/L) | | 1.57 | 1.43 | 0.842 | 2.05 | 1.37 |
| | Iron (Fe)-Leachable (mg/L) | | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| | Lead (Pb)-Leachable (mg/L) | | 1.93 | 0.30 | 0.31 | <0.25 | <0.25 |
| | Magnesium (Mg)-Leachable (mg/L) | | 124 | 124 | 125 | 121 | 123 |
| | Mercury (Hg)-Leachable (mg/L) | | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| | Nickel (Ni)-Leachable (mg/L) | | 0.47 | 0.76 | 0.71 | 0.90 | 0.82 |
| | 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) | | 71.1 | 47.9 | 48.7 | 44.0 | 57.9 |

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ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | Sample ID | L2094712-11 | L2094712-12 | L2094712-13 | L2094712-14 | L2094712-15 |
|--------------------|-------------------------------------|--------------|-------------|-------------|------------------|------------------|------------------|
| | | Description | soil | soil | soil | soil | soil |
| | | Sampled Date | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 |
| | | Sampled Time | 09:00 | 09:00 | 09:00 | 09:00 | 09:00 |
| | | Client ID | BA1819-A-11 | BA1819-A-12 | BA1819-A-4 REP 1 | BA1819-A-4 REP 2 | BA1819-A-4 REP 3 |
| Grouping | Analyte | | | | | | |
| SOIL | | | | | | | |
| TCLP Metals | 1st Preliminary pH (pH) | | 11.72 | 11.70 | 11.73 | 11.73 | 11.73 |
| | 2nd Preliminary pH (pH) | | 9.28 | 9.57 | 9.83 | 9.83 | 9.83 |
| | Final pH (pH) | | 5.93 | 5.89 | 5.92 | 5.91 | 5.95 |
| | Extraction Solution Initial pH (pH) | | 2.86 | 2.86 | 2.88 | 2.88 | 2.88 |
| | 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) | | 2.56 | 2.15 | | | |
| | Cadmium (Cd)-Leachable (mg/L) | | 0.242 | 0.220 | 0.202 | 0.401 | 0.184 |
| | Calcium (Ca)-Leachable (mg/L) | | 2150 | 1980 | | | |
| | Chromium (Cr)-Leachable (mg/L) | | <0.25 | <0.25 | | | |
| | Cobalt (Co)-Leachable (mg/L) | | 0.733 | 0.515 | | | |
| | Copper (Cu)-Leachable (mg/L) | | 1.34 | 1.22 | | | |
| | Iron (Fe)-Leachable (mg/L) | | <5.0 | <5.0 | | | |
| | Lead (Pb)-Leachable (mg/L) | | 1.05 | <0.25 | | | |
| | Magnesium (Mg)-Leachable (mg/L) | | 131 | 121 | | | |
| | Mercury (Hg)-Leachable (mg/L) | | <0.0010 | <0.0010 | | | |
| | Nickel (Ni)-Leachable (mg/L) | | 0.59 | 0.54 | | | |
| | 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) | | 55.2 | 53.7 | | | |

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | Sample ID | L2094712-16 | L2094712-17 | L2094712-18 | L2094712-19 | L2094712-20 |
|--------------------|-------------------------------------|--------------|------------------|------------------|------------------|------------------|------------------|
| | | Description | soil | soil | soil | soil | soil |
| | | Sampled Date | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 | 09-MAY-18 |
| | | Sampled Time | 09:00 | 09:00 | 09:00 | 09:00 | 09:00 |
| | | Client ID | BA1819-A-4 REP 4 | BA1819-A-7 REP 1 | BA1819-A-7 REP 2 | BA1819-A-7 REP 3 | BA1819-A-7 REP 4 |
| Grouping | Analyte | | | | | | |
| SOIL | | | | | | | |
| TCLP Metals | 1st Preliminary pH (pH) | | 11.73 | 11.74 | 11.74 | 11.74 | 11.74 |
| | 2nd Preliminary pH (pH) | | 9.83 | 9.77 | 9.77 | 9.77 | 9.77 |
| | Final pH (pH) | | 5.99 | 5.91 | 6.08 | 5.94 | 5.89 |
| | Extraction Solution Initial pH (pH) | | 2.88 | 2.88 | 2.88 | 2.88 | 2.88 |
| | 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) | | 0.208 | 0.259 | 0.231 | 0.477 | 0.287 |
| | 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) |
|---------------------|------------------------|-----------|---|
| Method Blank | Sulfur (S) | B | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate | Antimony (Sb) | DUP-H | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate | Manganese (Mn) | DUP-H | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate | Molybdenum (Mo) | DUP-H | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate | Selenium (Se) | DUP-H | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate | Sulfur (S) | DUP-H | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate | Zinc (Zn) | DUP-H | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Duplicate | Thallium (Tl) | DUP-H,J | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Matrix Spike | Calcium (Ca)-Leachable | MS-B | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Matrix Spike | Cobalt (Co)-Leachable | MS-B | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |
| Matrix Spike | Zinc (Zn)-Leachable | MS-B | L2094712-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9 |

Qualifiers for Individual Parameters Listed:

| Qualifier | Description |
|-----------|---|
| B | Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable. |
| DUP-H | Duplicate results outside ALS DQO, due to sample heterogeneity. |
| DUP-H,J | Duplicate results outside ALS DQO, due to sample heterogeneity. Duplicate results and limits are expressed in terms of absolute difference. |
| MS-B | Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. |

Test Method References:

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---------------------------|--------|--|---|
| AG-200.2-A-CCMS-VA | Soil | Elevated Ag in Soil by CRC ICPMS | EPA 200.2/6020A |
| | | 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. Analysis is by Collision/Reaction Cell ICPMS. | |
| 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.

Reference Information

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.



L2094712-COFC

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"/> PDF <input type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax | | | | <input checked="" type="radio"/> Regular (Standard Turnaround Times - Business Days) <input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT <input type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT <input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT | | | | | | | | | |
| Contact: Steve Mckinney / Dan Skrypnik | | | Email 1: smckinney@covanta.com | | | | | | | | | | | | | |
| Address: 5150 Riverbend Drive Burnaby BC | | | Email 2: rjohnson4@covanta.com | | | | | | | | | | | | | |
| Phone: 604-521-1025 | | | Email 3: dskrypnik@covanta.com | | | | | | | | | | | | | |
| Fax: <input type="checkbox"/> Yes <input type="checkbox"/> No | | | 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: | | | ALS Contact: | | | | | | | | | | | | | |
| Fax: | | | Sampler: | | | | | | | | | | | | | |
| Lab Work Order # (lab use only) | | | | | | | | | | | | | | | | |
| 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 | | | | | | |
| BA1819-A-1 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-2 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-3 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-4 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-5 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-6 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-7 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-8 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-9 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-10 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-11 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| BA1819-A-12 | | | 09-May-18 | 9:00 | Soil | X | X | | X | 1 | | | | | | |
| Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details | | | | | | | | | | | | | | | | |
| Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. | | | | | | | | | | | | | | | | |
| By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab. | | | | | | | | | | | | | | | | |
| Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses. | | | | | | | | | | | | | | | | |
| SHIPMENT RELEASE (client use) | | | | SHIPMENT RECEPTION (lab use only) | | | | SHIPMENT VERIFICATION (lab use only) | | | | | | | | |
| Released by: | Date (dd-mm-yy) | Time (hh-mm) | Received by: | Date: | Time: | Temperature: | Verified by: | Date: | Time: | Observations: | | | | | | |
| <i>[Signature]</i> | 15-May-18 | 08:00 | <i>[Signature]</i> | MAY 15 2018 | 11:10 AM | 24.52°C | | | | Yes / No ? If Yes add SIF | | | | | | |
| | | | | | | | | | | | GENF 20.00 Front | | | | | |