A.Lanfranco & Associates Inc.
Environmental Consultants

Prepared for

METRO VANCOUVER

Metrotower III
4515 Central Boulevard
Burnaby, BC V5H 0C6

Waste-to-Energy Facility

Emissions Test Report
Fourth Quarter 2023 Survey
Operational Certificate 107051

Prepared by Mr. Louis Agassiz

Issued: December 20, 2023

CERTIFICATION

The field monitoring for this survey was conducted by certified stack test technicians as required by the British Columbia Ministry of Environment (BC MOE) Field Sampling Manual.

The field crew consisted of:

Mr. S. Harrington (certified), Mr. J. Gibbs (certified), Mr. D. Sampson (certified), Mr. J. Ching, Mr. C. De La O, and Mr B. Lester.

The report was prepared by Mr. L. Agassiz using reporting principles and guidelines generally acceptable to Metro Vancouver (MV).

The field crew and A. Lanfranco and Associates Inc. certify that the test methods used were BC MOE/MV approved reference methods for the parameters investigated.

Report reviewed on December 19, 2023 by:

Mr. Mark Lanfranco, CST
President | Owner

Report revised on January 8, 2024 by:

Mr. Louis Agassiz, BSc
Senior Project Manager | Owner

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Table of Contents

List of Tables

List of Figures

SUMMARY

The following table displays the emission results from the three units located at Metro Vancouver's Waste-To-Energy Facility (WTEF) as well as the current emission limits as defined by the Operational Certificate (OC) issued by BC Ministry of Environment & Climate Change Strategy. This compliance survey represents the fourth quarter of 2023.

Table 1: Summary Comparison of Emissions Test Results with Limits

SUMMARY TABLE: COMPARISON OF EMISSION TEST RESULTS WITH LIMITS

Parameter	Limit	Unit 1	Unit 2	Unit 3	Facility Average
Test Date		14-15-Nov-23	15-16-Nov-23	16-17-Nov-23	
Particulate (mg/Sm^3 @ 11% O_2)	**9.0**	0.56	1.21	0.05	**0.61**
Hydrogen Fluoride (mg/Sm^3 @ 11% O_2)	**1.0**	0.060	0.062	0.038	**0.05**
Trace Metals - OC Class (mg/Sm^3 @ 11% O_2)					
Lead (Pb)	**-**	0.0013	0.0035	0.0009	**0.0019**
Arsenic (As)	**-**	0.0005	0.0015	0.0009	**0.0010**
Chromium (Cr)	**-**	0.0007	0.0017	0.0010	**0.0011**
OC Class Sum (Pb, As and Cr)	**0.064**	0.0025	0.0066	0.0028	**0.0040**
Mercury (mg/Sm^3 @ 11% O_2)	**0.02**	0.000057	0.000039	0.000051	**0.00005**
Cadmium (mg/Sm^3 @ 11% O_2)	**0.007**	0.000081	0.000177	0.000112	**0.00012**

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

The test results are very similar to those from Q3 2023. The variability observed quarter-to-quarter is well within a normal range of outcomes for this operation and is not considered significant.

1 INTRODUCTION

Metro Vancouver (MV) commissioned an emission survey at the Waste-To-Energy Facility (WTEF) in Burnaby BC, as required by the provincially approved Operational Certificate (OC). This report documents the results of a survey on Units 1, 2 and 3 for the fourth survey of four for the year 2023. This survey includes filterable particulate matter, trace metals, mercury (Hg), hydrogen fluoride (HF), ammonia (NH_3), nitrous oxide (N_2O) and volatile organic compounds (VOC). A. Lanfranco and Associates Inc. (ALAA), of Surrey, B.C., conducted the sampling program on behalf of MV. The sampling program consisted of, but was not limited to, the planning, execution, analysis, and reporting of three emission sources located at the WTEF.

This report includes a comparison of emission results to limits established in the OC, detailed emission results, a brief outline of methods employed, equipment used, and a discussion of the survey. All supporting data and appendices are presented under separate cover.

The individual sources that were monitored for compliance are identified as Unit 1, Unit 2 and Unit 3 which represent the three distinct processing lines at the WTEF. The three boilers are identified as discharge E300670 in the operational certificate.

Sampling was conducted on November 14-17, 2023.

2 METHODOLOGY

All services provided by A. Lanfranco and Associates Inc. were conducted in accordance with approved reference methods as issued by:

- Metro Vancouver (MV)
- BC Ministry of Environment & Climate Change Strategy (BC MOE)
- Environment Canada (EC)
- US Environmental Protection Agency (EPA)

2.1 Sampling and Analytical Methods

The following table lists the test methods used for the different parameters measured. The subsequent paragraphs briefly describe each method.

Table 2: Reference Methods

Parameter	Reference Method
Sample and Velocity traverse points	EPS 1/RM/8 A Determination of Sampling Site and Traverse Points
Velocity and flowrate	EPS 1/RM/8 B Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Gas molecular weight (O_2/CO_2)	EPS 1/RM/8 C Determination of Molecular Weight by Gas Analysis
Flue gas Moisture	EPS 1/RM/8 D Determination of Moisture Content
Particulate Matter	EPS 1/RM/8 E Determination of Particulate Matter Emissions from Stationary Sources
Trace Metals with Mercury	EPA Method 29 Determination of Metals Emissions from Stationary Sources
Hydrogen Fluoride (HF)	EPS1/RM/1 Reference Method for Source Testing: Measurement of Releases of Gaseous Hydrogen Chloride from Stationary Sources
Nitrous Oxide (N_2O)	N/A
Ammonia	EPA Method CTM 027 Procedure For Collection and Analysis of Ammonia in Stationary Sources
Volatile Organic Compounds (VOC)	EPA Method TO-15 Determination of Volatile Organic Compounds in Air

Sampling Site and Traverse Points

Primary: EPS 1/RM/8 Method A

Supporting: EPA Method 1

This method is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source. A measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. Traverse points are then located within each of these equal areas.

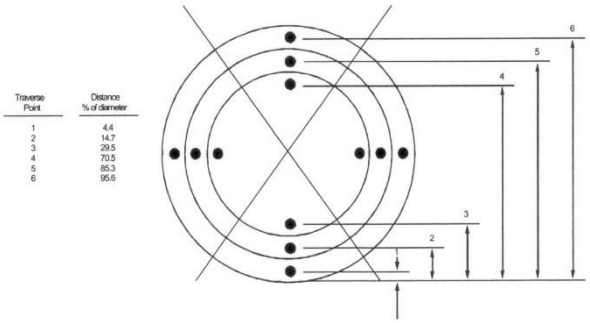

Figure 1: Example showing circular stack cross section divided

Stack Gas Velocity and Volumetric Flow Rate

Primary: EPS 1/RM/8 Method B

Supporting: EPA Method 2

The average gas velocity in a stack or duct is determined from the gas density and from the measurement of velocity pressure with an S-type pitot tube. A standard pitot tube may be used where plugging of the tube openings due to particulate matter and/or moisture is not likely to occur. Stack gas volumetric flow rate is determined from measurements of stack gas velocity, temperature, absolute pressure, dry gas composition, moisture content, and stack diameter.

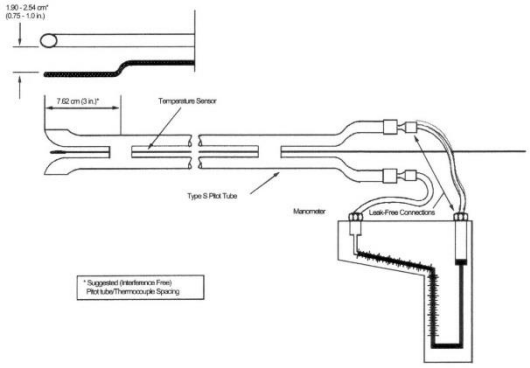

Figure 2: Type S Pitot Tube Manometer Assembly

Molecular Weight by Gas Analysis — Primary: EPS 1/RM/8 Method C; Supporting: EPA Method 3

An integrated or grab sample is extracted from a single point in the gas stream and analyzed for its components using a Fyrite analyzer, a gas chromatograph, or calibrated continuous analyzers.

Moisture Content — Primary: EPS 1/RM/8 Method D; Supporting: EPA Method 4

A gas sample is extracted from a single point in the enclosed gas stream being sampled. The moisture is condensed, and its weight measured. This weight, together with the volume of gas sampled, enables the stack gas moisture content to be calculated.

Particulate Matter — Primary: EPS 1/RM/8 Method E; Supporting: EPA Method 5

Particulate matter is withdrawn isokinetically from a number of sampling or traverse points in an enclosed gas stream. The particulate sample is collected in the nozzle, probe, and on a glass fibre filter, all maintained at a temperature of 120 ± 14°C or such other temperature as is necessary to prevent blinding of the filter from condensation. The particulate weight is determined gravimetrically after removal of uncombined water. Simultaneous determinations of the gas stream moisture content, velocity, temperature, and molecular weight allow calculations of the particulate concentration and the particulate mass emission or release rate to be made.

Trace Metal Primary: EPA Method 29 (modified)

This method is used in conjunction with the above Method 5. A stack sample is withdrawn isokinetically from the source. Particulate emissions are collected in the probe and on a heated filter, and gaseous emissions are then collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all metals including Hg) and an aqueous acidic solution of potassium permanganate (analyzed only for Hg). The recovered samples are digested, and appropriate fractions are analyzed for Hg by cold vapour atomic absorption spectroscopy (CVAAS). The remaining trace metals are analyzed with inductively coupled argon plasma emission spectroscopy (ICAP), atomic absorption spectroscopy (AAS) and graphite furnace atomic absorption spectroscopy (GFAAS). Figure 3 presents the sample train and its configuration.

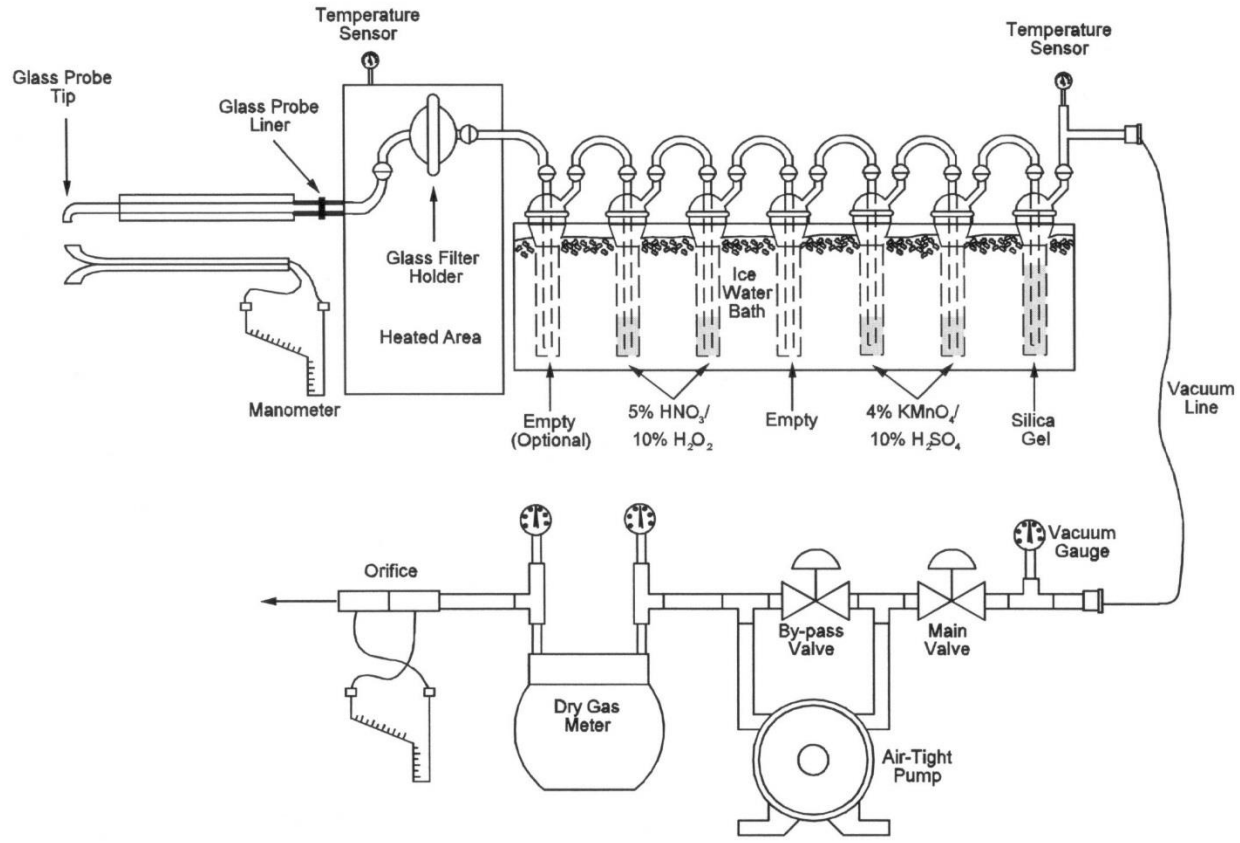

Figure 3: Particulate / Trace Metals Sampling Train

Hydrogen Fluoride — Primary: EPS 1/RM/1
Supporting: BC Method 7176106 & 7066101

HF is sampled in a four-impinger train consisting of two impingers containing distilled/deionized H_2O, one empty impinger, and a fourth containing silica gel. A sample of the stack gas is extracted from a single point near the centre of the stack over the sample duration at a constant rate. The collected samples are measured for F by ion chromatography at Element laboratory in Surrey, BC.

N_2O — Primary: N/A

Three N_2O samples were collected from each source using Viasensor G200 Medical Grade gas analyser, factory calibrated to Nitrous Oxide. The flue gas was introduced to the G200 after passing through a soda lime filter to remove CO_2. Multiple readings were taken over a one hour period, these readings were averaged on the analyzer and recorded on the data sheet.

Ammonia — Primary: EPA Method CTM-027

The absorbing solution in the first two impingers is 0.1 N H_2SO_4 and the triplicate samples were extracted at a constant rate for 60-minute durations. The collected samples are analyzed at Element laboratory in Surrey, BC.

Method Modifications

Three minor method modifications were instituted for this work.

1. Reagent blanks for metals trains were made to the same volumes as all samples. In other words, exactly 100 ml of the various reagents used to recover samples was NOT done, as some sample components (probe washing for example) required more than 100 ml to adequately clean and rinse the probe. Instead, sample recovery was conducted with however much rinsing was deemed adequate. In the laboratory, the blanks and samples were made up with the appropriate reagent so that all samples and blanks were the same volume.

2. Filter and residue weighing were not conducted with the six-hour interval technique. Instead, the sample filters and beakers were conditioned with cooling and desiccation and then weighed on two separate laboratory scales after 24 hours. Duplicate or triplicate Blank samples were carried through the gravimetric analysis, and the sample results were adjusted with the Blank data to determine the net filter and probe wash residue weight gain. This is the Environment Canada approved modified approach for weighing probe wash residue.

3. For the purposes of calculating a result, all parameters were given the value of ½ the detection limit when the analysis yielded 'non-detect' results.

All results are expressed using the metric system and corrected to standard conditions of 20 °C and 101.325 kPa, dry gas (unless otherwise noted).

3 DETAILED TEST RESULTS

The results of stack emissions were calculated using a "STACK" computer program developed by A. Lanfranco and Associates for BC MOE requirements.

Tables 3-14 present the detailed results of all emissions parameters tested and operational conditions for each of the units. Additional data and the computer outputs can be found in the accompanying Appendices.

Table 3: Unit 1 Summary of Emission Test Results

Parameter	Run 1	Run 2	Run 3	Average
Test Date - Particulate/Metals	14-Nov-23	15-Nov-23	15-Nov-23	
Test Time - Particulate/Metals	12:17 - 14:19	09:11 - 11:57	12:14 - 14:17	
Duration - Minutes	120	120	120	
Test Date - Acid Gases	15-Nov-23	15-Nov-23	15-Nov-23	
Test Time - Acid Gases	09:51-11:38	11:49-12:49	13:01-14:01	
Duration - Minutes	60	60	60	
Stack Temperature (°C)	148	142	142	144
Average Gas Velocity (m/s)	13.3	14.0	14.7	14.0
Dry Flow Rate (Sm^3/min)	1160	1198	1260	1206
Moisture (Vol. %)	14.1	16.6	17.0	15.9
Oxygen (Vol. %)(dry basis)	11.0	9.9	10.1	10.3
Carbon Dioxide (Vol. %)(dry basis)	8.7	10.0	9.6	9.4
Particulate (mg/Sm^3 @ 11% O_2)	0.25	0.22	1.22	**0.56**
Hydrogen Fluoride (mg/Sm^3 @ 11% O_2)	0.085	0.067	0.029	**0.060**
Ammonia (mg/Sm^3 @ 11% O_2)	2.95	8.99	3.29	**5.08**
Nitrous Oxide (mg/Sm^3 @ 11% O_2)*	9.79	2.80	12.73	**8.44**
Total Hydrocarbons (mg/Sm^3 @ 11% O_2)	3.53	6.30	4.15	**4.66**
Trace Metals - Operational Certificate List (mg/Sm^3 @ 11% O_2)				
OC Class (Pb, As and Cr)	0.00276	0.00334	0.00140	**0.00250**
Aluminum (mg/Sm^3 @ 11% O_2)	0.01237	0.01430	0.01131	0.01266
Cadmium (mg/Sm^3 @ 11% O_2)	0.00010	0.00006	0.00009	0.00008
Lead (mg/Sm^3 @ 11% O_2)	0.00131	0.00150	0.00097	0.00126
Mercury (mg/Sm^3 @ 11% O_2)	0.00009	0.00004	0.00004	0.000057
Phosphorus (mg/Sm^3 @ 11% O_2)	0.00342	0.00179	0.00044	0.00188
Isokinetic Variation (%)	101	107	107	105

*N_2O was sampled on November 15, 2023

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 4: Unit 1 Trace Metals Emissions (OC Class)

Metal	Test 1 (mg/m^3 @ 11% O_2)	Test 2 (mg/m^3 @ 11% O_2)	Test 3 (mg/m^3 @ 11% O_2)	Average (mg/m^3 @ 11% O_2)
OC Class				
Pb	0.00131	0.00150	0.00097	0.00126
As	0.00038	0.00080	0.00035	0.00051
Cr	0.00107	0.00103	0.00007	0.00072
Sum of OC Class	0.00276	0.00334	0.00140	0.00250
Other				
Al	0.01237	0.01430	0.01131	0.01266
Cd	0.00010	0.00006	0.00009	0.00008
P	0.00342	0.00179	0.00044	0.00188
Hg	0.00009	0.00004	0.00004	0.00006

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 5: Unit 1 Detailed Trace Metals Emissions

Metal	Test 1 (mg/m^3 @ 11% O_2)	Test 2 (mg/m^3 @ 11% O_2)	Test 3 (mg/m^3 @ 11% O_2)	Average (mg/m^3 @ 11% O_2)
Pb	0.00131	0.00150	0.00097	0.00126
Sb	0.00162	0.00268	0.00186	0.00205
Cu	0.00010	0.00007	0.00054	0.00024
Mn	0.00046	0.00095	0.00021	0.00054
V	0.00038	0.00030	0.00035	0.00034
Zn	0.00784	0.00640	0.00498	0.00641
As	0.00038	0.00080	0.00035	0.00051
Cr	0.00107	0.00103	0.00007	0.00072
Co	0.00023	0.00007	0.00008	0.00013
Ni	0.00103	0.00104	0.00032	0.00080
Se	0.00127	0.00234	0.00389	0.00250
Te	0.00076	0.00033	0.00071	0.00060
Tl	0.00057	0.00045	0.00053	0.00052
Cd	0.00010	0.00006	0.00009	0.00008
Hg	0.00009	0.00004	0.00004	0.00006

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 6: Unit 1 - Summary of Operating Data

Parameter		Run 1	Run 2	Run 3	Normal
Test Date - Particulate/Metals		14-Nov-23	15-Nov-23	15-Nov-23	
Test Time - Particulate/Metals		12:17 - 14:19	09:11 - 11:57	12:14 - 14:17	
Boiler Steam Production	(kg/h)	37894	36353	37533	38690
Percentage of normal	(%)	98%	94%	97%	
Boiler Secondary Combustion Zone Temp	(°C)	919	878	921	927
Percentage of normal	(%)	99%	95%	99%	
Rate of refuse fired	(kg/hr)	10000	10000	10000	10000
Percentage of normal	(%)	100%	100%	100%	
Rate of aux. fuel fired (Natural Gas)	m^3/hr	73	0	0	77
Percentage of normal (%)	(%)	95%	0%	0%	

*Normal refers to the average operating rate from the previous 30 days

Table 7: Unit 2 Summary of Emission Test Results

Parameter	Run 1	Run 2	Run 3	Average
Test Date - Particulate/Metals	15-Nov-23	16-Nov-23	16-Nov-23	
Test Time - Particulate/Metals	13:23 - 15:25	09:47 - 11:50	12:02 - 14:05	
Duration - Minutes	120	120	120	
Test Date - Acid Gases	16-Nov-23	16-Nov-23	16-Nov-23	
Test Time - Acid Gases	09:56-10:56	11:08-12:08	12:21-13:21	
Duration - Minutes	60	60	60	
Stack Temperature (°C)	144	142	143	143
Average Gas Velocity (m/s)	13.4	13.1	13.4	13.3
Dry Flow Rate (Sm^3/min)	1156	1128	1173	1152
Moisture (Vol. %)	15.4	16.4	15.0	15.6
Oxygen (Vol. %)(dry basis)	10.9	10.1	10.7	10.5
Carbon Dioxide (Vol. %)(dry basis)	10.6	10.0	9.4	10.0
Particulate (mg/Sm^3 @ 11% O_2)	2.20	0.15	1.28	**1.21**
Hydrogen Fluoride (mg/Sm^3 @ 11% O_2)	0.046	0.069	0.071	**0.062**
Ammonia (mg/Sm^3 @ 11% O_2)	4.59	13.78	12.12	**10.16**
Nitrous Oxide (mg/Sm^3 @ 11% O_2)*	13.54	13.74	16.72	**14.66**
Total Hydrocarbons (mg/Sm^3 @ 11% O_2)	3.14	3.65	3.36	**3.38**
Trace Metals - Operational Certificate List (mg/Sm^3 @ 11% O_2)				
OC Class (Pb, As and Cr)	0.00551	0.00646	0.00784	**0.00660**
Aluminum (mg/Sm^3 @ 11% O_2)	0.00532	0.00210	0.00214	0.00318
Cadmium (mg/Sm^3 @ 11% O_2)	0.00016	0.00026	0.00011	0.00018
Lead (mg/Sm^3 @ 11% O_2)	0.00249	0.00394	0.00404	0.00349
Mercury (mg/Sm^3 @ 11% O_2)	0.00004	0.00004	0.00004	0.00004
Phosphorus (mg/Sm^3 @ 11% O_2)	0.00456	0.00293	0.00512	0.00421
Isokinetic Variation (%)	100	104	103	102

*N_2O was sampled on November 16, 2023

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 8: Unit 2 Trace Metals Emissions (OC Class)

Metal	Test 1 (mg/m^3 @ 11% O_2)	Test 2 (mg/m^3 @ 11% O_2)	Test 3 (mg/m^3 @ 11% O_2)	Average (mg/m^3 @ 11% O_2)
OC Class				
Pb	0.0025	0.0039	0.0040	0.0035
As	0.0017	0.0016	0.0012	0.0015
Cr	0.0013	0.0010	0.0027	0.0017
Sum of OC Class	0.0055	0.0065	0.0078	0.0066
Other				
Al	0.00532	0.00210	0.00214	0.0032
Cd	0.00016	0.00026	0.00011	0.0002
P	0.00456	0.00293	0.00512	0.0042
Hg	0.00004	0.00004	0.00004	0.0000

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 9: Unit 2 Detailed Trace Metals Emissions

Metal	Test 1 (mg/m^3 @ 11% O_2)	Test 2 (mg/m^3 @ 11% O_2)	Test 3 (mg/m^3 @ 11% O_2)	Average (mg/m^3 @ 11% O_2)
Pb	0.00249	0.00394	0.00404	0.00349
Sb	0.00095	0.00105	0.00107	0.00102
Cu	0.00049	0.00010	0.00022	0.00027
Mn	0.00076	0.00126	0.00269	0.00157
V	0.00038	0.00042	0.00043	0.00041
Zn	0.00528	0.01304	0.00850	0.00894
As	0.00167	0.00155	0.00115	0.00146
Cr	0.00135	0.00097	0.00265	0.00166
Co	0.00010	0.00009	0.00011	0.00010
Ni	0.00038	0.00184	0.00231	0.00151
Se	0.00485	0.00063	0.00064	0.00204
Te	0.00076	0.00084	0.00085	0.00082
Tl	0.00057	0.00063	0.00064	0.00061
Cd	0.00016	0.00026	0.00011	0.00018
Hg	0.00004	0.00004	0.00004	0.00004

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 10: Unit 2 - Summary of Operating Data

Parameter		Run 1	Run 2	Run 3	Normal
Test Date - Particulate/Metals		15-Nov-23	16-Nov-23	16-Nov-23	
Test Time - Particulate/Metals		13:23 - 15:25	09:47 - 11:50	12:02 - 14:05	
Boiler Steam Production	**(kg/h)**	34424	35477	35597	35201
Percentage of normal	**(%)**	98%	101%	101%	
Boiler Secondary Combustion Zone Temp	**(°C)**	886	919	910	930
Percentage of normal	**(%)**	95%	99%	98%	
Rate of refuse fired	**(kg/hr)**	10000	10000	10000	10000
Percentage of normal	**(%)**	100%	100%	100%	
Rate of aux. fuel fired (Natural Gas)	**m^3/hr**	0	0	0	106
Percentage of normal (%)	**(%)**	0%	0%	0%	

*Normal refers to the average operating rate from the previous 30 days

Table 11: Unit 3 Summary of Emission Test Results

Parameter	Run 1	Run 2	Run 3	Average
Test Date - Particulate/Metals	16-Nov-23	17-Nov-23	17-Nov-23	
Test Time - Particulate/Metals	13:11 - 15:13	09:06 - 11:09	11:29 - 13:30	
Duration - Minutes	120	120	120	
Test Date - Acid Gases	17-Nov-23	17-Nov-23	17-Nov-23	
Test Time - Acid Gases	09:39-10:39	10:54-11:54	12:06-13:06	
Duration - Minutes	60	60	60	
Stack Temperature (°C)	152	146	146	148
Average Gas Velocity (m/s)	12.8	11.6	12.0	12.1
Dry Flow Rate (Sm^3/min)	1065	985	1008	1019
Moisture (Vol. %)	17.3	16.9	17.9	17.3
Oxygen (Vol. %)(dry basis)	9.3	8.3	8.1	8.5
Carbon Dioxide (Vol. %)(dry basis)	10.6	12.1	12.0	11.6
Particulate (mg/Sm^3 @ 11% O_2)	0.04	0.06	0.04	**0.05**
Hydrogen Fluoride (mg/Sm^3 @ 11% O_2)	0.047	0.034	0.032	**0.038**
Ammonia (mg/Sm^3 @ 11% O_2)	1.88	1.73	2.19	**1.93**
Nitrous Oxide (mg/Sm^3 @ 11% O_2)*	5.38	9.21	0.71	**5.10**
Total Hydrocarbons (mg/Sm^3 @ 11% O_2)	2.51	3.65	3.64	**3.27**
Trace Metals - Operational Certificate List (mg/Sm^3 @ 11% O_2)				
OC Class (Pb, As and Cr)	0.00327	0.00196	0.00309	**0.00277**
Aluminum (mg/Sm^3 @ 11% O_2)	0.00409	0.00751	0.17875	0.06345
Cadmium (mg/Sm^3 @ 11% O_2)	0.00009	0.00016	0.00008	0.00011
Lead (mg/Sm^3 @ 11% O_2)	0.0006	0.0006	0.0015	0.0009
Mercury (mg/Sm^3 @ 11% O_2)	0.00005	0.00005	0.00005	0.00005
Phosphorus (mg/Sm^3 @ 11% O_2)	0.00655	0.00514	0.00899	0.00689
Isokinetic Variation (%)	102	105	106	104

*N_2O was sampled on November 17, 2023

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 12: Unit 3 Trace Metals Emissions (OC Class)

Metal	Test 1 (mg/m^3 @ 11% O_2)	Test 2 (mg/m^3 @ 11% O_2)	Test 3 (mg/m^3 @ 11% O_2)	Average (mg/m^3 @ 11% O_2)
OC Class				
Pb	0.00061	0.00059	0.00152	0.00091
As	0.00176	0.00055	0.00037	0.00090
Cr	0.00090	0.00081	0.00120	0.00097
Sum of OC Class	0.00327	0.00196	0.00309	0.00277
Other				
Al	0.00409	0.00751	0.17875	0.0635
Cd	0.00009	0.00016	0.00008	0.0001
P	0.00655	0.00514	0.00899	0.0069
Hg	0.00005	0.00005	0.00005	0.0001

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 13: Unit 3 Detailed Trace Metals Emissions

Metal	Test 1 (mg/m^3 @ 11% O_2)	Test 2 (mg/m^3 @ 11% O_2)	Test 3 (mg/m^3 @ 11% O_2)	Average (mg/m^3 @ 11% O_2)
Pb	0.00061	0.00059	0.00152	0.00091
Sb	0.00174	0.00563	0.00094	0.00277
Cu	0.00010	0.00052	0.00082	0.00048
Mn	0.00010	0.00010	0.00019	0.00013
V	0.00041	0.00040	0.00037	0.00039
Zn	0.00528	0.00648	0.00933	0.00703
As	0.00176	0.00055	0.00037	0.00090
Cr	0.00090	0.00081	0.00120	0.00097
Co	0.00030	0.00063	0.00009	0.00034
Ni	0.00151	0.00051	0.00116	0.00106
Se	0.00061	0.00180	0.00249	0.00163
Te	0.00123	0.00633	0.00206	0.00320
Tl	0.00061	0.00059	0.00103	0.00075
Cd	0.00009	0.00016	0.00008	0.00011
Hg	0.00005	0.00005	0.00005	0.00005

All data is corrected to standard conditions (S) of 20 °C, 101.325 kPa (dry) unless otherwise noted.

Table 14: Unit 3 - Summary of Operating Data

Parameter		Run 1	Run 2	Run 3	Normal
Test Date - Particulate/Metals		16-Nov-23	17-Nov-23	17-Nov-23	
Test Time - Particulate/Metals		13:11 - 15:13	09:06 - 11:09	11:29 - 13:30	
Boiler Steam Production	**(kg/h)**	38484	38160	37979	34917
Percentage of normal	**(%)**	110%	109%	109%	
Boiler Secondary Combustion Zone Temp	**(°C)**	903	934	941	900
Percentage of normal	**(%)**	100%	104%	105%	
Rate of refuse fired	**(kg/hr)**	10000	10000	10000	10000
Percentage of normal	**(%)**	100%	100%	100%	
Rate of aux. fuel fired (Natural Gas)	**m^3/hr**	0	0	0	90
Percentage of normal (%)	**(%)**	0%	0%	0%	

*Normal refers to the average operating rate from the previous 30 days

4 DISCUSSION

All Units are in compliance with limits as set out in the OC.

The Run 1 sample for N_2O on Unit 3 was destroyed in transportation. Therefore, the average of Runs 2 and 3 was entered to represent a third replicate.

As stated in Section 2.1, EPA Method 5/29 was modified slightly to accommodate performance based analytical protocols utilized in B.C. for trace metals sampling and analysis. The analytical modification consists of using volumes of recovery reagents different than the method stipulates. In order to validate (ie performance-based QA) the modification, sample Blanks and all samples were made up to the same volume, so that subtraction of the Blank data, was done on equivalent sample sizes. In addition, special Hg spiking of blank filters and peroxide solutions was conducted. This spiking is referred to as a “matrix spike” and is reported in Appendix B, Quality Control for mercury, where the recovery of spiked mercury was calculated to be an acceptable 85 to 115%. It should be noted that independent front half/back half analysis of all trace metals was conducted for this survey. In addition, individual quartz filter blanks were analyzed for each unit.

Sampling was conducted in accordance with their respective reference methods (EPA 29 except as discussed) and passed all appropriate quality assurance and quality control criteria. None of the sample points on any of the three units were outside of the allowable +/- 10% for isokinetic rate.

During the monitoring, there were no environmental observations made that would impact the validity of the test program. The weather was normal with light rain and wind on one day, but otherwise dry.

All sampling was conducted/supervised by certified emission testing personnel, using calibrated source sampling equipment and quality-controlled reagents. It is therefore

stated that the survey and this report complies with MV's WTEF compliance testing requirements for this fourth survey in 2023.