A.Lanfranco & Associates Inc.
Environmental Consultants

Prepared for

All Roads Construction Ltd.

Coquitlam, B.C.

EMISSION MONITORING REPORT

August 2024 COMPLIANCE SURVEY

Permit: GVA1145

Prepared by: L. Agassiz

Issued on: August 13, 2024

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. L. Forrer (certified), Mr. J. Gibbs (certified), and Mr. C. De La O (certified).

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

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

Report reviewed on Aug 13, 2024, by:

Carter Lanfranco

Carter Lanfranco, CST
Chief Operating Officer | Owner

TABLE OF CONTENTS

APPENDICES

SUMMARY

The following table presents the average emission results for the listed parameters. The emission survey was conducted at the All Roads Construction hot mix asphalt plant in Coquitlam, B.C. on August 1, 2024.

PARAMETER	RESULT	PERMITTED LEVEL
Particulate (mg/Sm^3 @ 16% O_2)	1.45	30
Carbon Monoxide (mg/Sm^3 @ 16% O_2)	65.2	200
Total Hydrocarbons (mg/Sm^3 @ 16% O_2)	11.9	40
Flowrate (Sm^3/min)	512	870
Temperature (°C)	118	

All results are at standard conditions of 20 °C and 101.325 kPa (dry)

There are no permit exceedances, and the results are like previous testing. The differences year to year are in a normal range of outcomes for this process.

1 TEST PROGRAM ORGANIZATION and INTRODUCTION

Plant Test Coordinator:	Mr. Dennis Eby Plant Manager All Roads Construction Ltd. D.Eby@allroadsconstruction.com
Sampling Coordinator:	Mr. Mark Lanfranco President | Owner A. Lanfranco and Associates Inc. (604) 881-2582 mark.lanfranco@alanfranco.com
Sampling Crew:	Mr. L. Forrer – A. Lanfranco and Associates Inc. Mr. J. Gibbs – A. Lanfranco and Associates Inc. Mr. C. De La O – A. Lanfranco and Associates Inc.

In August 2024, All Roads commissioned A. Lanfranco and Associates Inc. of Surrey, B.C. to conduct an emission survey on the baghouse stack at their Coquitlam asphalt plant.

The purpose of the survey was to measure and report various emission parameters from the asphalt manufacturing process. The testing was conducted to determine compliance with permitted particulate matter, carbon monoxide, and organics discharges at 16% O_2. The emission limits are stipulated in All Roads Permit GVA1145.

This report documents the methods used and results found for the triplicate one-hour emission tests that were conducted on August 1, 2024.

2 PROCESS DESCRIPTION

The All Roads hot mix asphalt plant, located at 2320 Rogers Avenue in Coquitlam, B.C. is a rotary drum mix asphalt plant. The unit is a natural gas fired Gencor Ultra II drum burner.

Dust laden flue gases generated in the mixer and dryer are cleaned by a Gencor CFS151 Baghouse. Following the fabric filtration, cleaned flue gases are discharged to atmosphere through a 1.37-meter stack which is monitored by a Dwyer real time particulate monitoring system. An ID fan is employed in the system.

On August 1, 2024, the plant maintained an average production rate of about 200 tonnes/hr during the monitoring.

3 METHODOLOGY

The sampling and analytical methods used throughout this survey conform to the procedures outlined in the B.C. "Source Testing Code" 2020 Edition and the B.C. air analytical manual.

3.1 Sampling Techniques

Samples from the main stack were collected from two ports located at 90 degrees to each other. Particulate samples were taken with an APEX sample train (Fig. 1) equipped with a heated five-foot stainless-steel probe and heated filter assembly. The sample ports were about 3.5 diameters downstream and 1.0 diameters upstream of the nearest disturbances. From these criteria a 24-point, two traverse sampling regime was established for the particulate tests (Fig. 2 and 2a). Each point was sampled for two and one-half minutes resulting in the final sample volumes of about 1.2 cubic meters.

Velocities were measured with an S-type pitot tube and oil manometer. The probe and connecting glassware were brushed and rinsed with distilled water and acetone into a glass sample bottle after sample completion. Flue gas analysis (O_2 and CO_2) was conducted with Fyrite analysers and an on-line CEM system. Cyclonic flow was not present in the stack.

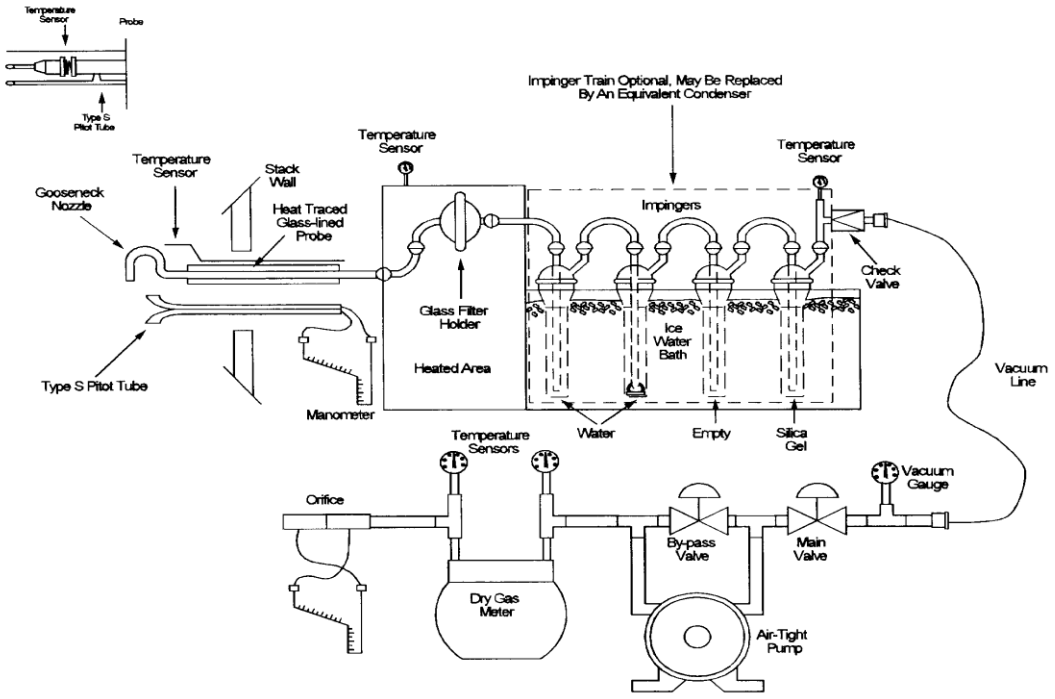


Figure 1: EPA Method 5 Particulate Sampling Train

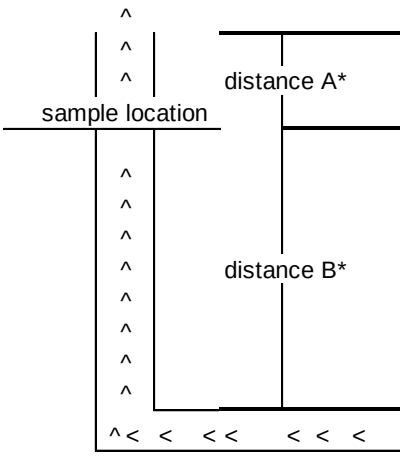
Figure - 2 Location of Traverse Points in Circular Stacks

(inches from inside w all to traverse point)

Client Stack I.D.: All Roads - Baghouse

Diameter (inches)	54		
Total Points	24	Diameters Upstream:	1
# of Ports Used	2		
Points / Traverse	12	Diameters Downstream:	3.5

Point	Distance from Wall
1	1.1
2	3.6
3	6.4
4	9.6
5	13.5
6	19.2
7	34.8
8	40.5
9	44.4
10	47.6
11	50.4
12	52.9



* distance A : duct diameters upstream from flow disturbance
* distance B : duct diameters downstream from flow disturbance
< < < < : flow direction

Figure 2a Location of Traverse Points in Circular Stacks

(percent of diameter from inside w all to traverse point)

Traverse Point Number on a Diameter	Number of Traverse Points on a Diameter					
	2	4	6	8	10	12
1	14.6%	6.7%	4.4%	3.2%	2.6%	2.1%
2	85.4%	25.0%	14.6%	10.5%	8.2%	6.7%
3		75.0%	29.6%	19.4%	14.6%	11.8%
4		93.3%	70.4%	32.3%	22.6%	17.7%
5			85.4%	67.7%	34.2%	25.0%
6			95.6%	80.6%	65.8%	35.6%
7				89.5%	77.4%	64.4%
8				96.8%	85.4%	75.0%
9					91.8%	82.3%
10					97.4%	88.2%
11						93.3%
12						97.9%

CEM System for Organics, CO and O_2

Continuous emission monitoring (CEM) was conducted for Organics (THC)/CO/O_2/CO_2 using A. Lanfranco and Associates Inc. CEM mobile laboratory. This unit is a trailer with the following instrumentation:

Name	CAI ZPA Analyzer	VIG FID	NOxygen
Manufacturer	California Analytical Instruments	Vig Industries, Inc.	California Analytical Instruments
Model	ZPA	20SHy10NAQT	650 NOxygen
Serial Number	N0C0606	7860819	U06080
Parameters	O_2, SO_2, CO_2, CO	THC, VOC	NO_x, O_2
Ranges	O_2: 0-25%, CO_2: 0-40%, SO_2: 0-200 or 0-2000 ppm, CO: 0-500 or 0-2500 ppm	0-10, 0-100, 0-1000, or 0-10000 ppm	NO/NO_x: 0-1 to 3000 ppm (user defined), O_2: 0-25%
Analyzer Type	NDIR (non-dispersive infrared) and paramagnetic	FID - Flame Ionizing Detector	Chemilumunescent and paramagnetic
Description	This instrument measures the concentration of SO_2, CO_2, and CO contained in sampling gas on the principle that different atomic molecules have an absorption spectrum in the wave band of infrared rays, and the intensity of absorption is determined by the Lambert-Beer law. O_2 is measrued with a separate paramagnetic sensor	The Total Hydrocarbon Analyzer Model-20-S measures concentrations of a wide variety of hydrocarbons in gas mixtures and in air using a Heated Flame Ionization Detector (FID). The process starts with a hydrogen flame. The resulting flame burns such a temperature as to pyrolyze most organic compounds producing ions and electrons in proportion to the concentration of carbon atoms present. Two plates are presented to the ions, one plate is electrically charged, the other plate, the collector is attached to a current to voltage amplifier. The ions are attracted to the collector where upon the ions cause a current to be induced.	The CAI Model 650 NOx/O2 Analyzer is a highly sensitive chemiluminescent (CLD) gas analyzer and a reliable paramagnetic oxygen analyzer. It measures oxides of nitrogen gas and dry basis oxygen concentrations in industrial and vehicle emission applications.

A diagram of the sampling, conditioning and analyzer system is provided in Figure 3. With this system the stack gas is withdrawn from the source through a coarse filter and stainless steel probe with associated pumps, filters and water removal components. The THC analyzer withdrew a side-stream of the filtered gas for hot FID analysis.

Prior to compliance testing and between each test all measuring instrumentation was calibrated with Protocol 1 and NIST Traceable, 1% certified calibration gas standards. Calibration gas certificates are appended.

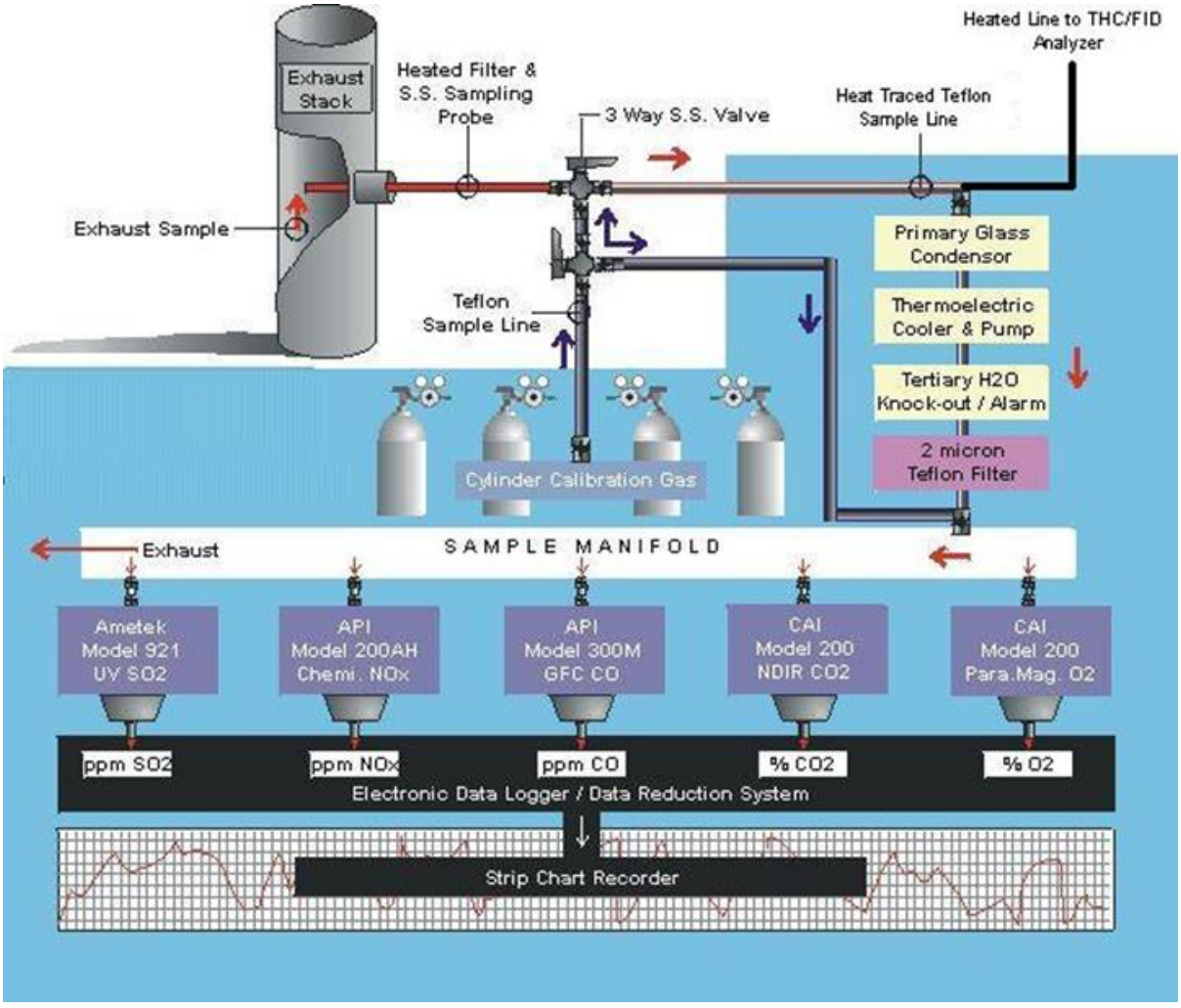


Figure 3 – CEM Measurement System Schematic

3.2 Analytical Techniques

Gravimetric analysis of the particulate samples was conducted by A. Lanfranco and Associates Inc. at their Surrey laboratory. The filters were conditioned by drying at 105 °C and desiccating for 24 hours. Final weighing of the filter occurred after the conditioning process, at which time the initial weight of the filter was subtracted. Probe washings were evaporated to dryness in porcelain dishes, desiccated for 24 hours and weighed. Blanks were carried through all procedures

CEM data was collected by data acquisition system by comparing stack gas responses to calibration gas responses.

Calibration gas mixtures used were:

Cylinder Name	Cylinder NIST Number	Expiry Date	Pressure (PSI)	THC (ppm)	CO (ppm)	O_2 (Vol. %)	CO_2 (Vol. %)
Zero Gas (N_2)	EB0091075	N/A	1300	0	0	0	0
1 Gas	T0M85AE	15-Apr-32	1850	-	504.4	-	-
2 Gas	AS759544	18-Jul-31	500	-	242.6	-	-
Mid Meth	CC137247	06-Feb-32	1800	45.05	-	-	-
High Meth	CC341054	18-Jan-26	1000	87.5	-	-	-
O_2/CO_2	CC106742	06-Jul-31	800	-	-	11.00	10.94

4 RESULTS

The results of the particulate and stack parameters were calculated using a computer program consistent with reporting requirements of Metro Vancouver. Standard conditions used were 20 °C and 101.325 kPa (dry).

Detailed test results are presented in Table 1. Supporting data is presented in Tables 2, 3 and the Appendices. CEM minutely averages are presented in Appendix 1. Corrections to 16% O_2 were made with CEM data. Total Hydrocarbons are expressed as Methane (CH_4).

TABLE 1: Baghouse Stack Emission Test Results

Parameter		Test 1	Test 2	Test 3	Average
Test Date		1-Aug-24	1-Aug-24	1-Aug-24	
Test Time		7:40 - 8:42	8:55 - 9:58	10:10 - 11:13	
CEM Test Time		7:40 - 8:40	8:55 - 9:55	10:10 - 11:10	
Duration	(minutes)	60	60	60	
Particulate	(mg/Sm^3)	3.62	1.14	2.42	2.39
Particulate	(mg/Sm^3 @ 16% O_2)	2.22	0.69	1.45	1.45
Particulate	(kg/hr)	0.11	0.03	0.07	0.07
Particulate	(kg/day)	2.67	0.84	1.79	1.77
Flowrate	(Sm^3/min)	513	510	514	512
Flowrate	(Am^3/min)	933	943	939	938
Temperature	(°C)	114	120	120	118
CO	(mg/Sm^3 @ 16% O_2)	69.5	69.4	56.6	65.2
THC	(mg/Sm^3 @ 16% O_2)	13.9	11.7	10.2	11.9
O_2	(vol % dry)	12.9	12.8	12.7	12.8
CO_2	(vol % dry)	4.56	4.62	4.72	4.63
H_2O	(vol %)	27.5	27.7	26.7	27.3
Isokinetic Variation	(%)	99.8	101	100	100

Standard conditions (S) of 20 °C and 101.325 kPa dry

TABLE 2: PROCESS OPERATING CONDITIONS

Run	Date	Run Time	Production Rate (Tonnes/hr)	Mix Temp. (°C)	RAP
Run 1	1-Aug-24	7:40 - 8:42	190	155	16%
Run 2	1-Aug-24	8:55 - 9:58	205	160	16%
Run 3	1-Aug-24	10:10 - 11:13	205	158	16%
Average			200	158	16%

TABLE 3: GRAMS PER TONNE OF ASPHALT

Parameter	Mass Emission (grams/tonne of asphalt)
Particulate Matter	0.22
Carbon Monoxide	10.0
Total Hydrocarbons	1.83

5 DISCUSSION OF RESULTS

Particulate emissions from the asphalt plant ranged from 0.69 to 2.22 mg/Sm^3 at 16% O_2, averaging 1.45 mg/Sm^3 at 16% O_2. This result is well below the permitted level of 30 mg/Sm^3 @ 16% O_2 and indicates that the particulate abatement system is functioning at an acceptable level.

The carbon monoxide, organics, volumetric flowrate and particulate for this survey are in compliance with All Roads Construction Ltd. Permit GVA1145 dated August 30, 2022.

There were no problems encountered in sample collection or analysis. Particulate samples were collected isokinetically at all points and the process operated in a normal manner during testing. The test results, therefore, are considered to be an accurate representation of emission characteristics for the process conditions maintained on the test date.

APPENDIX 1

COMPUTER OUTPUTS of

MEASURED and CALCULATED DATA

Client:	All Roads	**Date:**	1-Aug-24
Jobsite:	Coquitlam, BC	**Run:**	1 - Particulate
Source:	Baghouse Stack	**Run Time:**	7:40 - 8:42

Particulate Concentration:	**3.6**	**mg/dscm**	0.0016	gr/dscf
	2.0	mg/Acm	0.0009	gr/Acf
	2.2	mg/dscm (@ 16% O2)	0.0010	gr/dscf (@ 16% O2)
Emission Rate:	0.11	kg/hr	0.246	lb/hr
Sample Gas Volume:	1.1754	dscm	41.510	dscf
Total Sample Time:	60.0	minutes		
Average Isokineticity:	99.8	%		

Flue Gas Characteristics

Moisture:	27.46	%		
Temperature	114.2	oC	237.5	oF
Flow	513.4	dscm/min	18130	dscf/min
	8.56	dscm/sec	302.2	dscf/sec
	932.9	Acm/min	32945	Acf/min
Velocity	10.523	m/sec	34.52	f/sec
Gas Analysis	12.92	% O2	4.56	% CO2
	29.246	Mol. Wt (g/gmole) Dry	26.158	Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	All Roads	**Date:**	1-Aug-24
Jobsite:	Coquitlam, BC	**Run:**	1 - Particulate
Source:	Baghouse Stack	**Run Time:**	7:40 - 8:42

Control Unit (Y)	1.0001
Nozzle Diameter (in.)	0.3340
Pitot Factor	0.8557
Baro. Press. (in. Hg)	30.00
Static Press. (in. H2O)	-0.15
Stack Height (ft)	40
Stack Diameter (in.)	54.0
Stack Area (sq.ft.)	15.904
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.5

Gas Analysis (Vol. %):

	CO2	O2
CEMS	4.56	12.92
Average =	**4.56**	**12.92**

Condensate Collection:

Impinger 1 (grams)	215.0
Impinger 2 (grams)	85.0
Impinger 3 (grams)	18.0
Impinger 4 (grams)	15.8
Total Gain (grams)	**333.8**

Collection:

Filter (grams)	**0.00005**
Washings (grams)	**0.00420**
Total (grams)	**0.00425**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	232.628							
1	1	2.5	234.380	0.250	1.56	76	76	227	1.1	99.6
	2	5.0	236.200	0.270	1.68	76	76	229	3.6	99.7
	3	7.5	237.990	0.260	1.61	76	76	231	6.4	100.0
	4	10.0	239.800	0.270	1.66	75	75	235	9.6	99.7
	5	12.5	241.640	0.280	1.72	75	75	237	13.5	99.7
	6	15.0	243.490	0.280	1.72	78	78	237	19.2	99.7
	7	17.5	245.370	0.290	1.78	78	78	241	34.8	99.9
	8	20.0	247.180	0.270	1.65	77	77	242	40.5	99.9
	9	22.5	248.990	0.270	1.64	77	77	244	44.4	100.0
	10	25.0	250.860	0.290	1.77	78	78	244	47.6	99.5
	11	27.5	252.700	0.280	1.71	78	78	244	50.4	99.7
	12	30.0	254.340	0.220	1.35	79	79	243	52.9	99.9
		0.0	254.340							
2	1	2.5	256.060	0.240	1.49	81	81	237	1.1	99.5
	2	5.0	257.750	0.230	1.42	81	81	237	3.6	99.9
	3	7.5	259.370	0.210	1.30	82	82	237	6.4	100.0
	4	10.0	261.020	0.220	1.37	82	82	236	9.6	99.4
	5	12.5	262.680	0.220	1.37	83	83	237	13.5	99.9
	6	15.0	264.370	0.230	1.43	83	83	237	19.2	99.5
	7	17.5	266.100	0.240	1.49	84	84	238	34.8	99.6
	8	20.0	267.870	0.250	1.55	84	84	238	40.5	99.9
	9	22.5	269.650	0.250	1.56	86	86	238	44.4	100.1
	10	25.0	271.430	0.250	1.56	86	86	237	47.6	100.0
	11	27.5	273.240	0.260	1.63	86	86	237	50.4	99.7
	12	30.0	274.830	0.200	1.25	87	87	237	52.9	99.6
			Average:	0.251	1.553	80.3	80.3	237.5		99.8

Client:	All Roads	**Date:**	1-Aug-24
Jobsite:	Coquitlam, BC	**Run:**	2 - Particulate
Source:	Baghouse Stack	**Run Time:**	8:55 - 9:58

Particulate Concentration:	**1.1**	**mg/dscm**	0.0005	gr/dscf
	0.6	mg/Acm	0.0003	gr/Acf
	0.7	mg/dscm (@ 16% O2)	0.0003	gr/dscf (@ 16% O2)
Emission Rate:	0.03	kg/hr	0.077	lb/hr
Sample Gas Volume:	1.1854	dscm	41.864	dscf
Total Sample Time:	60.0	minutes		
Average Isokineticity:	101.2	%		

Flue Gas Characteristics

Moisture:	27.68	%		
Temperature	119.7	oC	247.5	oF
Flow	510.2	dscm/min	18017	dscf/min
	8.50	dscm/sec	300.3	dscf/sec
	943.2	Acm/min	33308	Acf/min
Velocity	10.639	m/sec	34.90	f/sec
Gas Analysis	12.77	% O2	4.62	% CO2
	29.249	Mol. Wt (g/gmole) Dry	26.136	Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	All Roads	**Date:**	1-Aug-24
Jobsite:	Coquitlam, BC	**Run:**	2 - Particulate
Source:	Baghouse Stack	**Run Time:**	8:55 - 9:58

Control Unit (Y)	1.0001
Nozzle Diameter (in.)	0.3340
Pitot Factor	0.8557
Baro. Press. (in. Hg)	30.00
Static Press. (in. H2O)	-0.15
Stack Height (ft)	40
Stack Diameter (in.)	54.0
Stack Area (sq.ft.)	15.904
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.5

Gas Analysis (Vol. %):

	CO2	O2
CEMS	4.62	12.77
Average =	**4.62**	**12.77**

Condensate Collection:

Impinger 1 (grams)	265.0
Impinger 2 (grams)	58.0
Impinger 3 (grams)	5.0
Impinger 4 (grams)	12.4
Total Gain (grams)	**340.4**

Collection:

Filter (grams)	**0.00005**
Washings (grams)	**0.00130**
Total (grams)	**0.00135**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	275.008							
1	1	2.5	276.730	0.230	1.46	89	89	246	1.1	101.2
	2	5.0	278.490	0.240	1.52	89	89	246	3.6	101.3
	3	7.5	280.170	0.220	1.40	89	89	246	6.4	100.9
	4	10.0	281.860	0.220	1.40	90	90	246	9.6	101.4
	5	12.5	283.550	0.220	1.40	90	90	245	13.5	101.3
	6	15.0	285.280	0.230	1.47	91	91	245	19.2	101.2
	7	17.5	287.010	0.230	1.47	91	91	244	34.8	101.2
	8	20.0	288.810	0.250	1.59	90	90	246	40.5	101.3
	9	22.5	290.610	0.250	1.59	90	90	246	44.4	101.3
	10	25.0	292.410	0.250	1.59	91	91	248	47.6	101.3
	11	27.5	294.280	0.270	1.72	91	91	248	50.4	101.3
	12	30.0	295.930	0.210	1.33	91	91	248	52.9	101.2
		0.0	295.930							
2	1	2.5	297.730	0.250	1.60	92	92	246	1.1	101.0
	2	5.0	299.640	0.280	1.79	92	92	246	3.6	101.3
	3	7.5	301.480	0.260	1.66	92	92	246	6.4	101.2
	4	10.0	303.350	0.270	1.72	92	92	246	9.6	100.9
	5	12.5	305.250	0.280	1.78	92	92	250	13.5	101.0
	6	15.0	307.160	0.280	1.78	93	93	250	19.2	101.4
	7	17.5	309.100	0.290	1.84	93	93	250	34.8	101.2
	8	20.0	310.980	0.270	1.72	94	94	250	40.5	101.4
	9	22.5	312.860	0.270	1.72	95	95	251	44.4	101.3
	10	25.0	314.810	0.290	1.85	95	95	250	47.6	101.3
	11	27.5	316.730	0.280	1.79	96	96	250	50.4	101.4
	12	30.0	318.470	0.230	1.47	96	96	250	52.9	101.3
			Average:	0.253	1.611	91.8	91.8	247.5		101.2

Client:	All Roads	**Date:**	1-Aug-24
Jobsite:	Coquitlam, BC	**Run:**	3 - Particulate
Source:	Baghouse Stack	**Run Time:**	10:10 - 11:13

Particulate Concentration:	**2.4**	**mg/dscm**	0.0011	gr/dscf
	1.3	mg/Acm	0.0006	gr/Acf
	1.4	mg/dscm (@ 16% O2)	0.0006	gr/dscf (@ 16% O2)
Emission Rate:	0.07	kg/hr	0.164	lb/hr
Sample Gas Volume:	1.1798	dscm	41.663	dscf
Total Sample Time:	60.0	minutes		
Average Isokineticity:	100.1	%		

Flue Gas Characteristics

Moisture:	26.72	%		
Temperature	120.3	oC	248.6	oF
Flow	513.7	dscm/min	18140	dscf/min
	8.56	dscm/sec	302.3	dscf/sec
	938.8	Acm/min	33153	Acf/min
Velocity	10.589	m/sec	34.74	f/sec
Gas Analysis	12.72	% O2	4.72	% CO2
	29.264	Mol. Wt (g/gmole) Dry	26.254	Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	All Roads	**Date:**	1-Aug-24
Jobsite:	Coquitlam, BC	**Run:**	3 - Particulate
Source:	Baghouse Stack	**Run Time:**	10:10 - 11:13

Control Unit (Y)	1.0001
Nozzle Diameter (in.)	0.3340
Pitot Factor	0.8557
Baro. Press. (in. Hg)	30.00
Static Press. (in. H2O)	-0.15
Stack Height (ft)	40
Stack Diameter (in.)	54.0
Stack Area (sq.ft.)	15.904
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.5

Gas Analysis (Vol. %):

	CO2	O2
CEMS	4.72	12.72
Average =	**4.72**	**12.72**

Condensate Collection:

Impinger 1 (grams)	214.0
Impinger 2 (grams)	95.0
Impinger 3 (grams)	3.0
Impinger 4 (grams)	10.8
Total Gain (grams)	**322.8**

Collection:

Filter (grams)	**0.00005**
Washings (grams)	**0.00280**
Total (grams)	**0.00285**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	318.934							
1	1	2.5	320.750	0.250	1.60	97	97	250	1.1	100.1
	2	5.0	322.670	0.280	1.79	97	97	250	3.6	100.1
	3	7.5	324.520	0.260	1.67	97	97	250	6.4	100.0
	4	10.0	326.410	0.270	1.73	97	97	257	9.6	100.8
	5	12.5	328.330	0.280	1.79	97	97	250	13.5	100.1
	6	15.0	330.250	0.280	1.79	97	97	250	19.2	100.1
	7	17.5	332.210	0.290	1.86	98	98	249	34.8	100.1
	8	20.0	334.100	0.270	1.73	98	98	249	40.5	100.1
	9	22.5	335.990	0.270	1.73	98	98	249	44.4	100.1
	10	25.0	337.920	0.280	1.80	98	98	248	47.6	100.3
	11	27.5	339.780	0.260	1.67	98	98	248	50.4	100.3
	12	30.0	341.530	0.230	1.48	98	98	248	52.9	100.2
		0.0	341.530							
	1	2.5	343.280	0.230	1.48	99	99	247	1.1	100.0
	2	5.0	345.070	0.240	1.55	99	99	247	3.6	100.1
	3	7.5	346.780	0.220	1.42	99	99	247	6.4	99.9
	4	10.0	348.490	0.220	1.42	99	99	247	9.6	99.9
	5	12.5	350.200	0.220	1.42	99	99	247	13.5	99.9
	6	15.0	351.910	0.220	1.42	99	99	247	19.2	99.9
	7	17.5	353.660	0.230	1.49	100	100	247	34.8	99.8
	8	20.0	355.520	0.260	1.68	100	100	248	40.5	99.9
	9	22.5	357.350	0.250	1.61	100	100	248	44.4	100.2
	10	25.0	359.180	0.250	1.61	100	100	248	47.6	100.2
	11	27.5	361.040	0.260	1.68	100	100	248	50.4	99.9
	12	30.0	362.710	0.210	1.36	100	100	248	52.9	99.7
			Average:	0.251	1.616	98.5	98.5	248.6		100.1

A. Lanfranco and Associates Inc.
METLab CEM Report

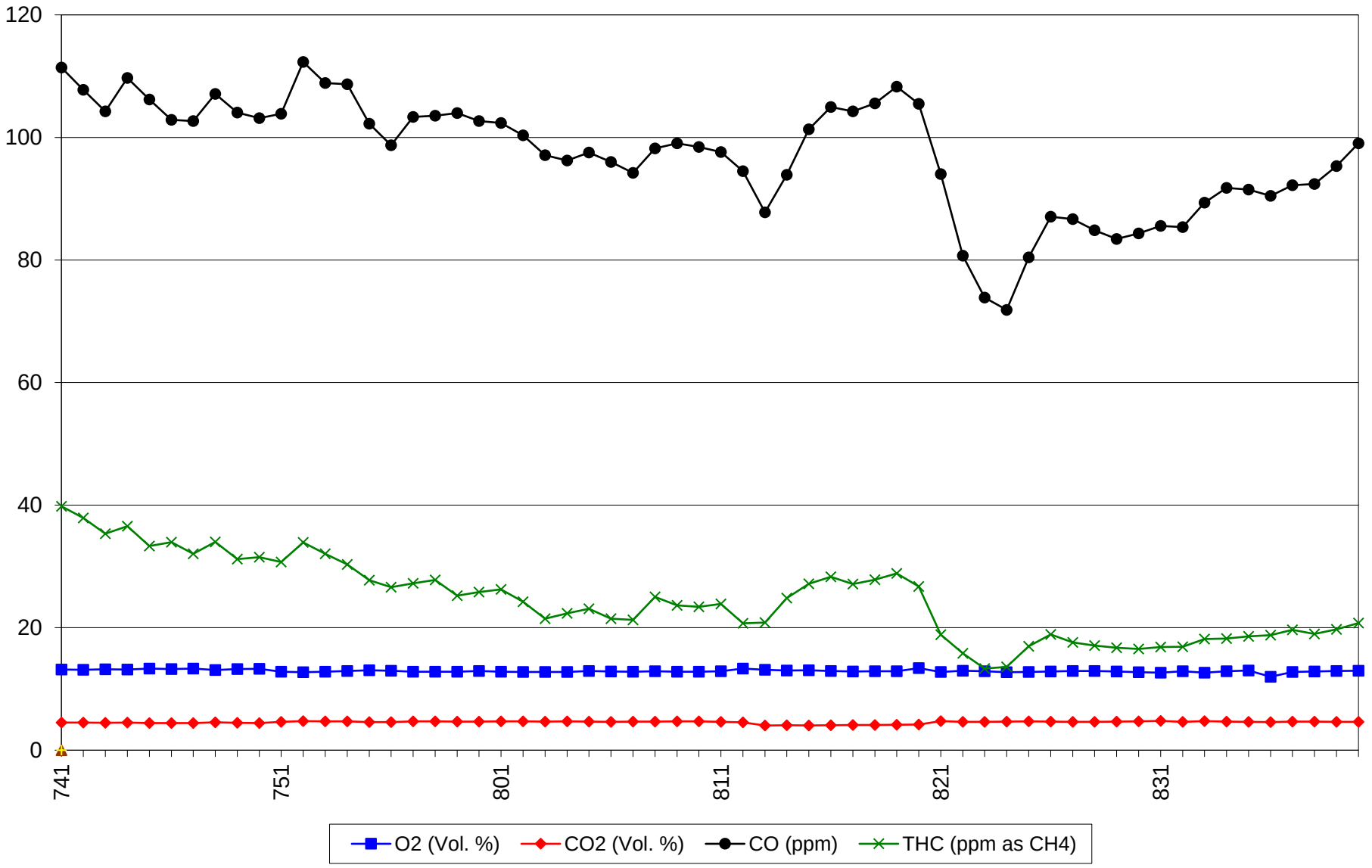
Client:	All Roads - Coquitlam, BC			Moisture % =
Source:	Baghouse	**O2 Correction**	16	27.46
Run:	1	**Year:**	2024	

Date	**Time**	**O_2** (Vol. %)	**CO_2** (Vol. %)	**CO** (ppm)	**THC** (ppm as CH_4)
1-Aug	741	13.15	4.53	111.41	39.82
1-Aug	742	13.12	4.50	107.79	37.91
1-Aug	743	13.19	4.48	104.27	35.32
1-Aug	744	13.14	4.52	109.70	36.55
1-Aug	745	13.32	4.44	106.18	33.30
1-Aug	746	13.24	4.43	102.86	33.95
1-Aug	747	13.32	4.43	102.66	32.06
1-Aug	748	13.10	4.53	107.08	34.01
1-Aug	749	13.26	4.46	104.06	31.18
1-Aug	750	13.26	4.42	103.16	31.50
1-Aug	751	12.81	4.61	103.86	30.69
1-Aug	752	12.74	4.74	112.32	33.90
1-Aug	753	12.81	4.71	108.90	32.03
1-Aug	754	12.91	4.69	108.69	30.33
1-Aug	755	13.02	4.57	102.25	27.76
1-Aug	756	12.95	4.59	98.73	26.60
1-Aug	757	12.79	4.69	103.36	27.22
1-Aug	758	12.79	4.70	103.56	27.80
1-Aug	759	12.79	4.67	103.96	25.21
1-Aug	800	12.92	4.67	102.66	25.80
1-Aug	801	12.81	4.69	102.35	26.23
1-Aug	802	12.76	4.69	100.34	24.24
1-Aug	803	12.78	4.67	97.12	21.48
1-Aug	804	12.77	4.71	96.21	22.32
1-Aug	805	12.94	4.68	97.52	23.08
1-Aug	806	12.86	4.63	96.01	21.46
1-Aug	807	12.82	4.65	94.20	21.26
1-Aug	808	12.89	4.68	98.23	25.02
1-Aug	809	12.80	4.72	99.03	23.63
1-Aug	810	12.79	4.69	98.43	23.42
1-Aug	811	12.88	4.64	97.62	23.87
1-Aug	812	13.31	4.53	94.50	20.71
1-Aug	813	13.13	4.02	87.76	20.84
1-Aug	814	13.00	4.06	93.90	24.81
1-Aug	815	13.04	4.03	101.35	27.13
1-Aug	816	12.94	4.08	104.97	28.29
1-Aug	817	12.84	4.10	104.27	27.13
1-Aug	818	12.88	4.10	105.57	27.84
1-Aug	819	12.87	4.14	108.29	28.84
1-Aug	820	13.39	4.20	105.47	26.73
1-Aug	821	12.77	4.75	94.00	18.85
1-Aug	822	12.94	4.62	80.72	15.79
1-Aug	823	12.90	4.64	73.87	13.32
1-Aug	824	12.74	4.68	71.86	13.59
1-Aug	825	12.77	4.71	80.41	16.94
1-Aug	826	12.84	4.66	87.06	18.88
1-Aug	827	12.94	4.64	86.65	17.60
1-Aug	828	12.91	4.63	84.84	17.08
1-Aug	829	12.83	4.66	83.43	16.71
1-Aug	830	12.71	4.72	84.34	16.52
1-Aug	831	12.65	4.78	85.55	16.85
1-Aug	832	12.89	4.64	85.35	16.89
1-Aug	833	12.65	4.76	89.37	18.15
1-Aug	834	12.90	4.66	91.79	18.24
1-Aug	835	13.00	4.61	91.48	18.56
1-Aug	836	11.98	4.59	90.48	18.75
1-Aug	837	12.77	4.66	92.19	19.63
1-Aug	838	12.84	4.66	92.39	18.96
1-Aug	839	12.94	4.63	95.31	19.71
1-Aug	840	12.96	4.62	99.03	20.74
	Average	12.92	4.56	97.2	24.6
	Minimum	11.98	4.02	71.9	13.3
	Maximum	13.39	4.78	112.3	39.8
Mass Concentration (mg/m3 dry)		**n/a**	**n/a**	**113.2**	**22.6**
Mass Concentration (mg/m3 dry) Corrected to 16% O2				**69.5**	**13.9**
	Range	*25.0*	*20.00*	*500.0*	*100.0*
Calibration Summary		**O2**	**CO2**	**CO**	**THC**
Gas (Cert. Value)		**11.00**	**10.94**	**242.6**	**45.1**
Analyzer Initial Span		11.18	10.91	242.1	45.35
Analyzer Initial Zero		0.21	0.01	-0.35	-0.35
Initial Gas Response		11.31	10.85	242.9	45.4
Final Gas Response		11.12	10.99	248.2	43.7
Initial Zero Response		0.32	0.09	1.6	-0.35
Final Zero Response		0.04	0.06	7.4	0.74
Error Summary					
Analyzer Cal. Err	(+/- 2% or 5% THC)	0.7%	-0.1%	-0.1%	0.7%
Analyzer Zero Err	(+/- 2% or 5% THC)	0.8%	0.1%	-0.1%	-0.4%
Initial Span Syste	(+/- 5%)	0.5%	-0.3%	0.2%	0.0%
Final Span Syste	(+/- 5%)	-0.2%	0.4%	1.2%	-1.6%
Initial Zero Syste	(+/- 5%)	0.4%	0.4%	0.4%	0.0%
Final Zero Syste	(+/- 5%)	-0.7%	0.3%	1.6%	1.1%
Test Span Drift	(+/- 3%)	-0.8%	0.7%	1.1%	-1.6%
Test Zero Drift	(+/- 3%)	-1.1%	-0.2%	1.2%	1.1%

Baghouse Stack - Run 1 (August 1, 2024)

All Roads - Coquitlam, BC

METLab CEM Results



A. Lanfranco and Associates Inc.

A. Lanfranco and Associates Inc.
METLab CEM Report

Client:	All Roads - Coquitlam, BC			Moisture % =	
Source:	Baghouse	**O2 Correction**	16		27.68
Run:	2	**Year:**	2024		

Date	**Time**	**O_2** (Vol. %)	**CO_2** (Vol. %)	**CO** (ppm)	**THC** (ppm as CH_4)
1-Aug	856	12.78	4.62	92.60	19.68
1-Aug	857	12.67	4.65	91.69	19.67
1-Aug	858	12.82	4.62	93.51	20.02
1-Aug	859	12.85	4.58	94.01	19.89
1-Aug	900	12.91	4.56	90.79	19.20
1-Aug	901	12.90	4.52	90.28	19.17
1-Aug	902	12.87	4.55	91.09	19.82
1-Aug	903	12.89	4.57	93.51	20.33
1-Aug	904	12.81	4.61	91.29	19.03
1-Aug	905	12.89	4.52	87.97	18.03
1-Aug	906	12.91	4.54	88.67	18.35
1-Aug	907	12.89	4.56	88.37	16.72
1-Aug	908	12.72	4.63	92.70	19.95
1-Aug	909	12.71	4.60	89.48	18.47
1-Aug	910	12.79	4.65	94.52	20.61
1-Aug	911	12.79	4.63	95.62	20.30
1-Aug	912	12.78	4.55	94.21	20.81
1-Aug	913	12.87	4.57	94.31	20.12
1-Aug	914	12.85	4.60	92.90	19.19
1-Aug	915	12.80	4.61	91.49	17.90
1-Aug	916	12.73	4.60	90.48	18.79
1-Aug	917	12.87	4.61	106.71	24.36
1-Aug	918	12.77	4.61	105.40	23.32
1-Aug	919	12.65	4.64	104.09	24.30
1-Aug	920	12.84	4.59	104.29	23.57
1-Aug	921	12.76	4.64	105.50	25.11
1-Aug	922	12.92	4.57	103.49	23.37
1-Aug	923	12.86	4.56	101.17	23.10
1-Aug	924	12.84	4.58	103.18	22.61
1-Aug	925	12.80	4.58	102.08	22.14
1-Aug	926	12.66	4.65	101.87	22.24
1-Aug	927	12.64	4.71	103.69	22.31
1-Aug	928	12.89	4.58	106.11	24.30
1-Aug	929	12.78	4.57	115.48	27.36
1-Aug	930	12.80	4.64	123.64	27.67
1-Aug	931	12.81	4.60	114.98	24.04
1-Aug	932	12.69	4.67	109.53	22.65
1-Aug	933	12.75	4.64	104.09	21.63
1-Aug	934	12.89	4.56	97.44	18.88
1-Aug	935	12.92	4.54	96.73	19.74
1-Aug	936	12.75	4.63	98.95	19.49
1-Aug	937	12.72	4.61	97.54	18.34
1-Aug	938	12.73	4.65	99.45	19.94
1-Aug	939	12.83	4.60	101.97	20.91
1-Aug	940	12.80	4.57	101.87	21.84
1-Aug	941	12.72	4.60	103.79	22.01
1-Aug	942	12.74	4.65	102.98	21.20
1-Aug	943	12.75	4.63	101.47	20.89
1-Aug	944	12.64	4.70	102.78	21.36
1-Aug	945	12.77	4.62	102.18	20.70
1-Aug	946	12.79	4.60	100.66	21.10
1-Aug	947	12.64	4.66	101.07	21.76
1-Aug	948	12.56	4.71	101.67	21.51
1-Aug	949	12.75	4.66	100.16	20.58
1-Aug	950	12.62	4.67	98.55	20.58
1-Aug	951	12.72	4.65	96.63	19.41
1-Aug	952	12.71	4.64	94.11	18.67
1-Aug	953	12.65	4.66	94.52	19.28
1-Aug	954	12.47	4.76	95.22	18.76
1-Aug	955	12.65	4.72	94.92	19.58
	Average	12.77	4.62	98.8	20.9
	Minimum	12.47	4.52	88.0	16.7
	Maximum	12.92	4.76	123.6	27.7
Mass Concentration (mg/m3 dry)		**n/a**	**n/a**	**115.1**	**19.3**
Mass Concentration (mg/m3 dry) Corrected to 16% O2				**69.4**	**11.7**
	Range	*25.0*	*20.00*	*500.0*	*100.0*

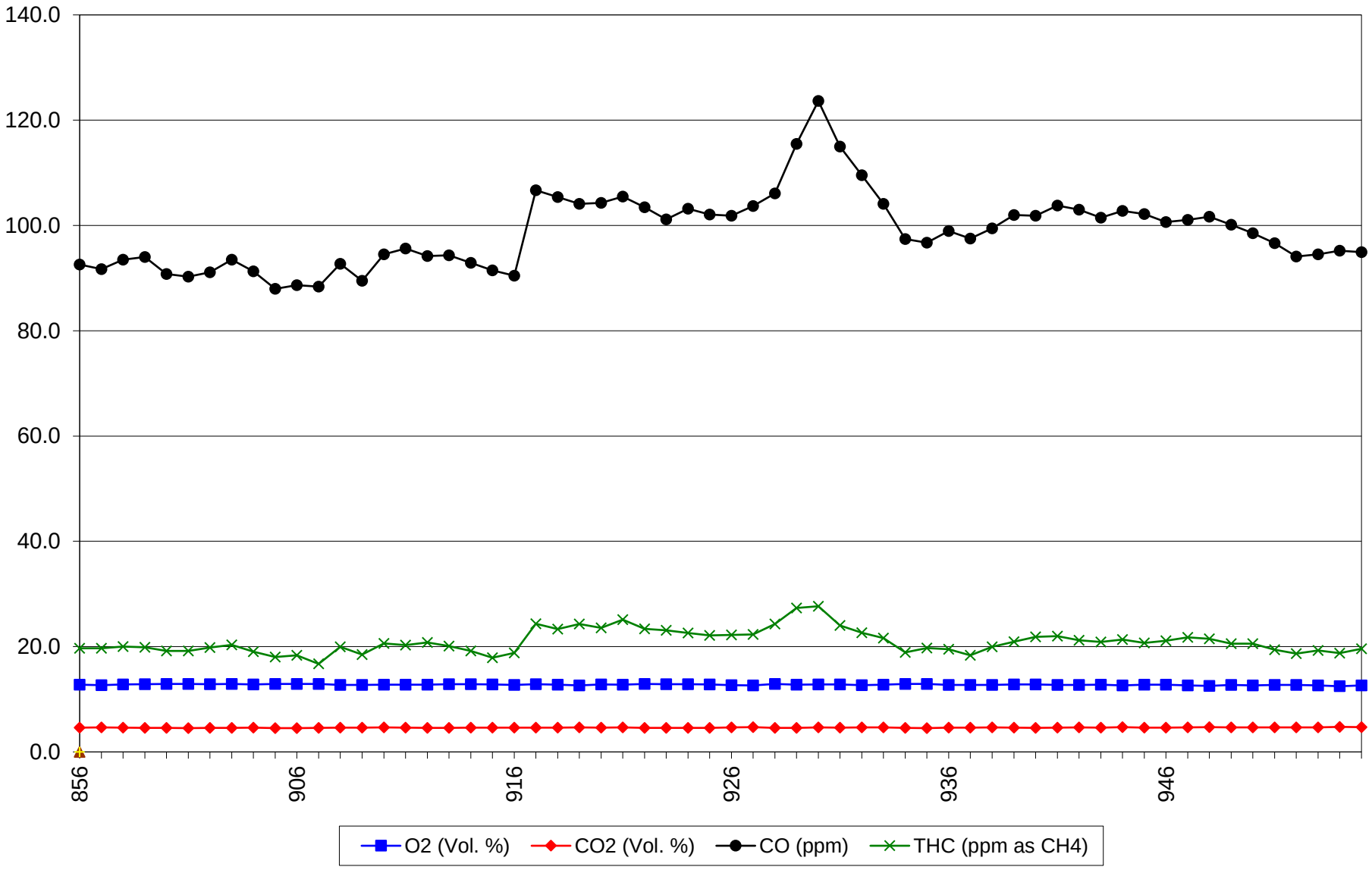
Calibration Summary	**O2**	**CO2**	**CO**	**THC**
Gas (Cert. Value)	**11.00**	**10.94**	**242.6**	**45.1**
Analyzer Initial Span	11.18	10.91	242.1	45.35
Analyzer Initial Zero	0.21	0.01	-0.35	-0.35
Initial Gas Response	11.12	10.99	248.2	43.7
Final Gas Response	10.94	10.89	248.7	44.2
Initial Zero Response	0.04	0.06	7.4	0.74
Final Zero Response	0.09	0.04	8.0	0.20

Error Summary				
Analyzer Cal. Erro	(+/- 2% or 5% TH	0.7%	-0.1%	-0.1%	0.7%
Analyzer Zero Erro	(+/- 2% or 5% TH	0.8%	0.1%	-0.1%	-0.4%
Initial Span Syster	(+/- 5%)	-0.2%	0.4%	1.2%	-1.6%
Final Span Systen	(+/- 5%)	-1.0%	-0.1%	1.3%	-1.1%
Initial Zero Systen	(+/- 5%)	-0.7%	0.3%	1.6%	1.1%
Final Zero System	(+/- 5%)	-0.5%	0.2%	1.7%	0.6%
Test Span Drift	(+/- 3%)	-0.7%	-0.5%	0.1%	0.5%

Baghouse Stack - Run 2 (August 1, 2024)

All Roads - Coquitlam, BC

METLab CEM Results



A. Lanfranco and Associates Inc.

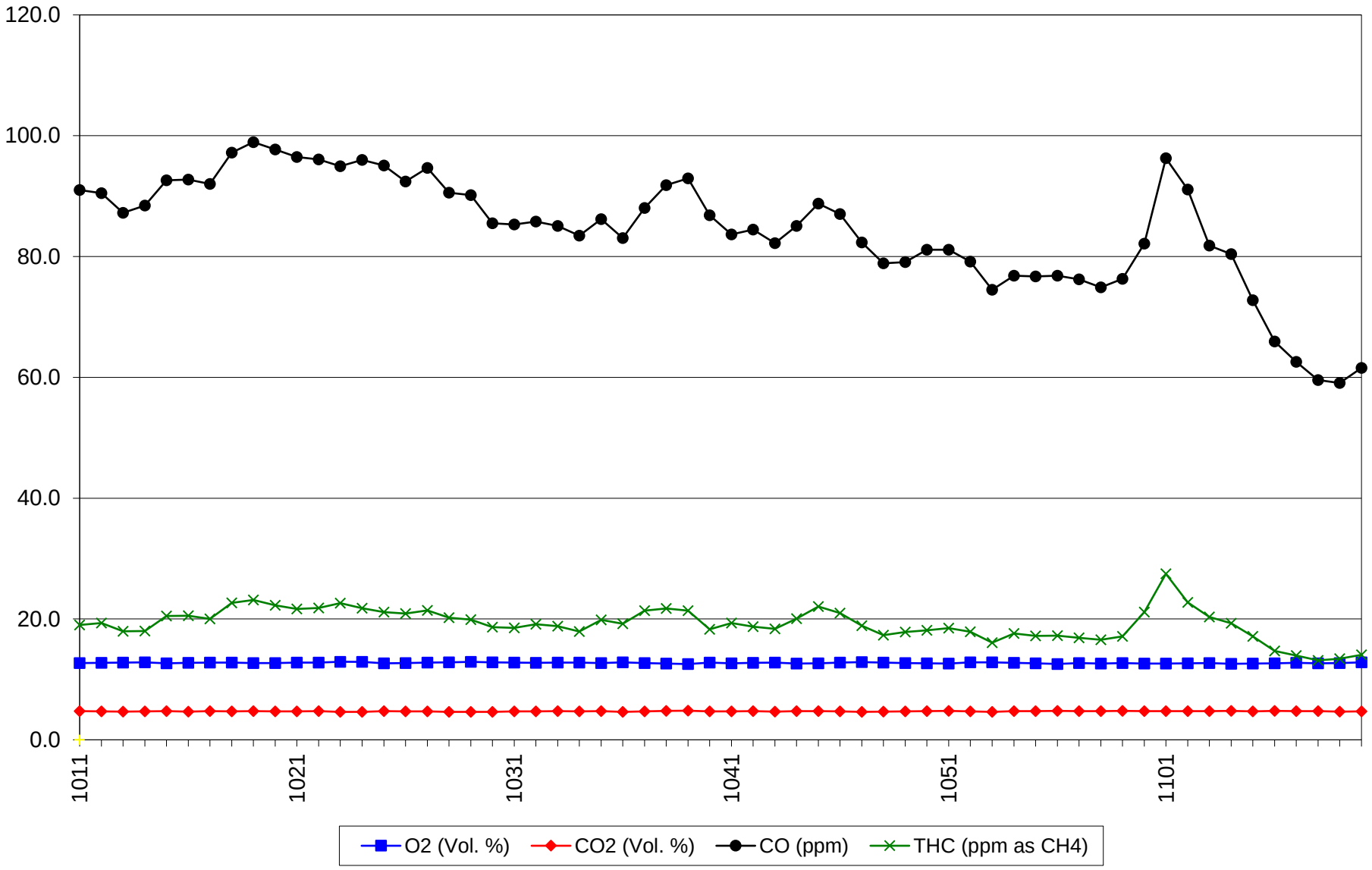
A. Lanfranco and Associates Inc.
METLab CEM Report

Client:	All Roads - Coquitlam, BC			Moisture % =	
Source:	Baghouse	**O2 Correction**	16		26.72
Run:	3	**Year:**	2024		
		O_2	**CO_2**	**CO**	**THC**
Date	**Time**	(Vol. %)	(Vol. %)	(ppm)	(ppm as CH_4)
1-Aug	1011	12.70	4.75	91.00	19.01
1-Aug	1012	12.75	4.72	90.49	19.34
1-Aug	1013	12.77	4.68	87.23	17.98
1-Aug	1014	12.82	4.70	88.45	18.00
1-Aug	1015	12.68	4.74	92.63	20.48
1-Aug	1016	12.75	4.68	92.73	20.52
1-Aug	1017	12.76	4.74	92.01	20.03
1-Aug	1018	12.80	4.72	97.21	22.66
1-Aug	1019	12.70	4.73	98.94	23.13
1-Aug	1020	12.70	4.71	97.72	22.27
1-Aug	1021	12.78	4.70	96.50	21.66
1-Aug	1022	12.77	4.74	96.09	21.81
1-Aug	1023	12.92	4.62	94.97	22.61
1-Aug	1024	12.89	4.63	95.99	21.79
1-Aug	1025	12.66	4.75	95.07	21.13
1-Aug	1026	12.72	4.72	92.42	20.90
1-Aug	1027	12.78	4.72	94.66	21.42
1-Aug	1028	12.82	4.64	90.59	20.20
1-Aug	1029	12.90	4.64	90.18	19.88
1-Aug	1030	12.82	4.64	85.49	18.65
1-Aug	1031	12.78	4.69	85.29	18.51
1-Aug	1032	12.74	4.72	85.80	19.13
1-Aug	1033	12.77	4.73	85.09	18.80
1-Aug	1034	12.76	4.69	83.45	17.94
1-Aug	1035	12.70	4.76	86.21	19.86
1-Aug	1036	12.84	4.64	83.05	19.19
1-Aug	1037	12.71	4.70	88.04	21.40
1-Aug	1038	12.62	4.77	91.81	21.75
1-Aug	1039	12.56	4.82	92.93	21.40
1-Aug	1040	12.79	4.71	86.82	18.28
1-Aug	1041	12.66	4.72	83.66	19.32
1-Aug	1042	12.73	4.75	84.47	18.72
1-Aug	1043	12.79	4.68	82.23	18.35
1-Aug	1044	12.63	4.75	85.09	20.06
1-Aug	1045	12.66	4.76	88.75	22.08
1-Aug	1046	12.79	4.72	87.02	20.97
1-Aug	1047	12.84	4.64	82.33	18.89
1-Aug	1048	12.80	4.67	78.87	17.31
1-Aug	1049	12.71	4.70	79.07	17.86
1-Aug	1050	12.65	4.73	81.11	18.11
1-Aug	1051	12.63	4.78	81.11	18.48
1-Aug	1052	12.83	4.69	79.18	17.89
1-Aug	1053	12.83	4.64	74.49	16.08
1-Aug	1054	12.75	4.73	76.83	17.59
1-Aug	1055	12.67	4.73	76.73	17.21
1-Aug	1056	12.56	4.81	76.83	17.25
1-Aug	1057	12.70	4.73	76.22	16.88
1-Aug	1058	12.61	4.75	74.90	16.57
1-Aug	1059	12.69	4.78	76.32	17.13
1-Aug	1100	12.64	4.76	82.13	21.14
1-Aug	1101	12.63	4.76	96.29	27.47
1-Aug	1102	12.67	4.74	91.10	22.76
1-Aug	1103	12.71	4.75	81.82	20.33
1-Aug	1104	12.60	4.78	80.40	19.27
1-Aug	1105	12.62	4.73	72.76	17.11
1-Aug	1106	12.66	4.77	65.93	14.69
1-Aug	1107	12.73	4.75	62.57	13.96
1-Aug	1108	12.68	4.74	59.55	13.15
1-Aug	1109	12.70	4.67	59.07	13.42
1-Aug	1110	12.82	4.71	61.55	14.05
	Average	12.72	4.72	81.09	18.65
	Minimum	12.56	4.64	59.07	13.15
	Maximum	12.90	4.82	96.29	27.47
Mass Concentration (mg/m3 dry)		**n/a**	**n/a**	**94.5**	**17.0**
Mass Concentration (mg/m3 dry) Corrected to 16% O2				**56.6**	**10.2**
	Range	*25.0*	*20.00*	*500.0*	*100.0*
Calibration Summary		**O2**	**CO2**	**CO**	**THC**
Gas (Cert. Value)		**11.00**	**10.94**	**242.6**	**45.1**
Analyzer Initial Span		11.18	10.91	242.1	45.35
Analyzer Initial Zero		0.21	0.01	-0.35	-0.35
Initial Gas Response		10.94	10.89	248.7	44.2
Final Gas Response		10.93	10.85	244.1	44.4
Initial Zero Response		0.09	0.04	8.0	0.20
Final Zero Response		0.12	0.04	8.6	-0.13
Error Summary					
Analyzer Cal. Erro	(+/- 2% or 5% TH	0.7%	-0.1%	-0.1%	0.7%
Analyzer Zero Err	(+/- 2% or 5% TH	0.8%	0.1%	-0.1%	-0.4%
Initial Span Syster	(+/- 5%)	-1.0%	-0.1%	1.3%	-1.1%
Final Span Systen	(+/- 5%)	-1.0%	-0.3%	0.4%	-0.9%
Initial Zero Systen	(+/- 5%)	-0.5%	0.2%	1.7%	0.6%
Final Zero System	(+/- 5%)	-0.4%	0.2%	1.8%	0.2%
Test Span Drift	(+/- 3%)	0.0%	-0.2%	-0.9%	0.2%

Baghouse Stack - Run 3 (August 1, 2024)

All Roads - Coquitlam, BC

METLab CEM Results



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APPENDIX 2

CALCULATIONS

The following sections show the equations and define the variables that were used for this survey. The equations are organized in four sections. Equations 1-11 were used to calculate particulate concentration at standard conditions on a dry basis and with an Oxygen correction. Equations 11-26 were used to sample within the 100 ± 10% isokinetic variation and to confirm that sampling meets this isokinetic variation threshold. Equations 26-28 were used to calculate the volumetric flowrate of the stack flue gas. Equations 29-36 were used to calculate the results from the CEM system.

A2.1 Contaminant Concentration Calculations

$$c = \frac{m}{V_{std}} \quad \textbf{Equation 1}$$

$$m_{part} = m_{filter} + m_{pw} + m_{cond} \quad \textbf{Equation 2}$$

$$m_i = m_{ana,i} - m_{blank} \quad \textbf{Equation 3}$$

$$V_{std} = \frac{V_{std(imp)}}{35.315} \quad \textbf{Equation 4}$$

$$V_{std(imp)} = \frac{V_{samp} \times y \times P_m \times (T_{std} + 459.67)}{P_{std} \times (T_{m(ave)} + 459.67)} \quad \textbf{Equation 5}$$

$$V_{samp} = V_{final} - V_{init} \quad \textbf{Equation 6}$$

$$P_m = P_B + \frac{\Delta H_{ave}}{13.6} \quad \textbf{Equation 7}$$

$$\Delta H_{ave} = \frac{1}{n}\sum_{i=1}^{n} \Delta H_{i(act)}, where\ n = the\ number\ of\ points \quad \textbf{Equation 8}$$

$$OC = \frac{20.9 - \%O_{2c}}{20.9 - \%O_{2m}} \quad \textbf{Equation 9}$$

$$\%O_{2m} = \frac{1}{n}\sum_{i=1}^{n} \%O_{2i}, where\ n = the\ number\ of\ O_2\ measurements \quad \textbf{Equation 10}$$

$$\%CO_{2m} = \frac{1}{n}\sum_{i=1}^{n} \%CO_{2i}, where\ n = the\ number\ of\ CO_2\ measurements \quad \textbf{Equation 11}$$

Where,

c	= *Contaminant concentration*
m	= *Contaminant mass*
m_i	= *Net analytical mass (mg, ng, or µg)*
$m_{ana,i}$	= *Analytical mass (mg, ng, or µg)*
m_{blank}	= *Blank analytical mass (mg, ng, or µg)*
m_{part}	= *Total particulate mass (mg)*
m_{filter}	= *Net particulate gain from filter (mg)*
m_{pw}	= *Net particulate gain from probe wash (mg)*
m_{cond}	= *Net condensable particulate from lab analysis (mg)*
$V_{std(imp)}$	= *Sample volume at standard conditions (ft^3)*
V_{std}	= *Sample volume at standard conditions (m^3)*
V_{samp}	= *Sample volume at actual conditions (ft^3)*
V_{final}	= *Final gas meter reading (ft^3)*
V_{init}	= *Initial gas meter reading (ft^3)*
T_{std}	= *Standard temperature (68 °F)*
T_m	= *Gas meter temperature (°F)*
$T_{m(ave)}$	= *Average gas meter temperature (°F)*
P_m	= *Absolute meter pressure (inches of Hg)*
P_B	= *Barometric pressure (inches of Hg)*
ΔH_{ave}	= *Average of individual point orifice pressures (inches of H_2O)*
$\Delta H_{i(act)}$	= *Individual recorded point orifice pressures (inches of H_2O)*
OC	= *Oxygen correction factor (dimensionless)*
$\%O_{2c}$	= *Oxygen concentration to correct to (% dry basis)*
$\%O_{2m}$	= *Average measured stack gas oxygen concentration (% dry basis)*
$\%CO_{2m}$	= *Average measured stack gas oxygen concentration (% dry basis)*

Equation 1 is the general concentration calculation used for all contaminants. The contaminant mass, *m*, is the net analytic mass for the given contaminant. For particulate, *m* is the sum of the mass contributed from probe washing and filter particulate.

A2.2 Isokinetic Variation Calculations

$$\Delta H_i = \frac{2.62 \times 10^7 \times c_p \times A_n \times (1 - B_{wo}) \times M_D \times (T_m + 459.67) \times \Delta p_i}{k_o \times M_w \times (T_{Stk} + 459.67)}$$ **Equation 11**

$$R_m = 85.49 \times c_p \times \sqrt{\Delta p_i} \times \sqrt{\frac{(T_{stk_i} + 459.67)}{M_w \times P_B}} \times 60 \times A_n \times \frac{(T_{m_i} + 459.67) \times (1 - B_{wo})}{(T_{stk_i} + 459.67) \times y}$$ **Equation 12**

$$A_n = \pi \left(\frac{d_n}{24}\right)^2$$ **Equation 13**

$$M_w = M_D \times (1 - B_{wo}) + 18 \times B_{wo}$$ **Equation 14**

$$M_D = 0.44 \times \%CO_2 + 0.32 \times \%O_2 + 0.28 \times (100 - \%CO_2 - \%O_2)$$ **Equation 15**

$$T_{Stk} = \frac{1}{n}\sum_{i=1}^{n} T_{Stk_i}, where\ n = the\ number\ of\ points$$ **Equation 16**

$$B_{wo} = \frac{V_{cond}}{V_{cond} + V_{std(imp)}}$$ **Equation 17**

$$V_{cond} = 0.04707 \times V_{gain}$$ **Equation 18**

$$Iso = \frac{1}{n}\sum_{i=1}^{n} Iso_i, where\ n = the\ number\ of\ points$$ **Equation 19**

$$Iso_i = \frac{v_{nzi}}{v_i}$$ **Equation 20**

$$v_i = 85.49 \times c_p \times \sqrt{\Delta p_i} \times \sqrt{\frac{(T_{Stk_i} + 459.67)}{(P_{Stk} \times M_W)}}$$ **Equation 21**

$$v_{nzi} = \frac{(V_i - V_{i-1}) \times y \times (T_{Stk_i} + 459.67) \times (P_B + \frac{\Delta H_{i(act)}}{13.6})}{A_n \times t_i \times 60 \times (T_{m(i)} + 459.67) \times P_{stk} \times (1 - B_{wo})}$$ **Equation 22**

$$P_{stk} = P_B + \frac{P_g}{13.6}$$ **Equation 23**

Equation 24

$$v_{stk} = \frac{1}{n}\sum_{i=1}^{n} v_i \text{ , where } n = \text{the number of points}$$

Equation 25

$$v_{nz} = \frac{1}{n}\sum_{i=1}^{n} v_{nzi} \text{ , where } n = \text{the number of points}$$

Where,

A_n	= *Nozzle area (ft^2)*
d_n	= *Diameter of nozzle (inches)*
c_p	= *Pitot coefficient (dimensionless)*
Δp_i	= *Individual point differential pressures (inches of H_2O)*
T_{Stk}	= *Average flue gas temperature (°F), second subscript i, indicates individual point measurements*
$\Delta H_{i(act)}$	= *Calculated individual point orifice pressures (inches of H_2O)*
P_g	= *Stack Static pressure (inches of H_2O)*
P_{stk}	= *Absolute stack pressure (inches of Hg)*
M_w	= *Wet gas molecular weight (g/gmol)*
M_D	= *Dry gas molecular weight (g/gmol)*
$\%CO_2$	= *Stack gas carbon dioxide concentration (% dry basis)*
$\%O_2$	= *Stack gas oxygen concentration (% dry basis)*
B_{wo}	= *Stack gas water vapour, proportion by volume*
V_{cond}	= *Total volume of water vapor collected, corrected to standard conditions (ft^3)*
V_{gain}	= *Condensate gain of impinger contents (mL)*
P_{std}	= *Standard pressure (29.92 inches of Hg)*
v_{stk}	= *Average flue gas velocity (ft/sec)*
v_i	= *Individual point flue gas velocity (ft/sec)*
v_{nz}	= *Average velocity at nozzle(ft/sec)*
v_{nzi}	= *Individual point velocity at nozzle(ft/sec)*
Iso_i	= *Individual point isokinetic variation (%)*
Iso	= *Average isokinetic variation (%)*
R_m	= *Isokinetic sampling rate (ft^3/min)*

A2.3 Volumetric Flowrate Calculations

$$Q_S = Q_A \times \frac{(T_{Std} + 459.67)}{(T_{Stk} + 459.67)} \times \frac{P_{Stk}}{P_{Std}}$$ **Equation 26**

$$Q_A = \frac{v_{stk} \times 60 \times A_{stk}}{35.315}$$ **Equation 27**

$$A_{stk} = \pi \left(\frac{d}{24}\right)^2$$ **Equation 28**

Where,

Q_A = *Actual flowrate (Am^3/min)*
Q_S = *Flowrate (m^3/min) at standard conditions on a dry basis*
A_{stk} = *Area of stack (ft^2)*
d = *Diameter of stack (inches)*

A2.4 CEM Calculations

$$[CEM]_i = \frac{(2 \times [CEM]_{mi} - (Z_F + Z_I))}{(S_I + S_F) - (Z_I + Z_F)} \times G_c$$ **Equation 29**

$$E_A = \left(\frac{A_{IS} - G_C}{G_C}\right) \times 100\%$$ **Equation 30**

$$B_{IS} = \left(\frac{S_I - A_{IS}}{R}\right) \times 100\%$$ **Equation 31**

$$B_{FS} = \left(\frac{S_F - A_{IS}}{R}\right) \times 100\%$$ **Equation 32**

$$B_{IZ} = \left(\frac{Z_I - A_{IZ}}{R}\right) \times 100\%$$ **Equation 33**

$$B_{FZ} = \left(\frac{Z_F - A_{IZ}}{R}\right) \times 100\%$$ **Equation 34**

$$D_S = \left(\frac{S_F - S_I}{R}\right) \times 100\%$$ **Equation 35**

$$D_Z = \left(\frac{Z_F - Z_I}{R}\right) \times 100\%$$ **Equation 36**

Where:

$[CEM]_i$ = One-minute average calibration corrected CEM parameter concentration (ppm or % vol)

$[CEM]_{mi}$ = One-minute average measured CEM parameter concentration (ppm or % vol)

S_I = Initial calibration span gas system response (ppm or % vol)

S_F = Final calibration span gas system response (ppm or % vol)

Z_I = Initial calibration zero gas system response (ppm or % vol)

Z_F = Final calibration zero gas system response (ppm or % vol)

A_{IS} = Initial calibration span gas analyzer response (ppm or % vol)

A_{IZ} = Final calibration zero gas analyzer response (ppm or % vol)

E_A = Analyzer calibration error (%)

B_{IS} = Initial system span bias (%)

B_{FS} = Final system span bias (%)

B_{IZ} = Initial system zero bias (%)

B_{FZ} = Final system zero bias (%)

D_S = Test span drift (%)

D_Z = Test zero drift (%)

G_c = Calibration span gas certified concentration (ppm or % vol)

R = Analyzer range (ppm or % vol)

APPENDIX 3

ANALYTICAL DATA

GRAVIMETRIC ANALYTICAL RESULTS

Client:	All Roads	**Sample Date:**	01-Aug-24
Source:	Baghouse Stack	**Location:**	Coquitlam, BC

A. Lanfranco & Associates Standard Operating Procedure:

SOP 1.2.1 Gravimetric determination of total particulate matter

	Initial (g)	Final (g)	Net (g)	Blank Corrected Net (g)
Filters				
Run 1	0.3666	0.3662	-0.0004	ND
Run 2	0.3482	0.3474	-0.0008	ND
Run 3	0.3678	0.3670	-0.0008	ND
Blank	0.3642	0.3643	0.0001	
Probe Washes				
Run 1	121.0466	121.0519	0.0053	0.0042
Run 2	123.0822	123.0846	0.0024	0.0013
Run 3	123.6076	123.6115	0.0039	0.0028
Blank	124.9589	124.9600	0.0011	
	Run 1	**Run 2**	**Run 3**	
Silica Gels	15.8	12.4	10.8	

Task	**Personnel**	**Date**	**Quality Control**	**Y/N**
Fiter Recovery:	J. Dennis	01-Aug-24	Adequate PW volume:	Y
PW Initial Analysis:	C. De La O	02-Aug-24	No sample leakage:	Y
PW, Filter and Gel Final Analysis:	L. Agassiz	08-Aug-24	Filter not compromised:	Y
Data entered to computer:	L. Agassiz	08-Aug-24		

Comments:

No problems encountered in sample analysis.

APPENDIX 4

FIELD DATA SHEETS

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CLIENT	All Roads			NOZZLE	Std	DIAMETER, IN.	.3340	IMPINGER	INITIAL	FINAL	TOTAL GAIN				
SOURCE	Baghouse			PROBE	~~SA-2~~ SA-1	Cp	~~.8556~~ .8552	VOLUMES	(mL)	(mL)	(mL)				
PARAMETER / RUN No	PM10c/21							Imp. #1	600	516					
DATE	9.1.24			PORT LENGTH		3.5"		Imp. #2	200	185					
OPERATOR:	JG+CD			STATIC PRESSURE, IN. H2O		-.15		Imp. #3	~~60~~	18					
CONTROL UNIT	CAE 3099	Y	1.0001	STACK DIAMETER		54.0		Imp. #4	601						
		ΔH@	1.780	STACK HEIGHT		40		Imp. #5							
								Imp. #6							
BAROMETRIC PRESSURE, IN. Hg	30.0			INITIAL LEAK TEST		.001@15"		Upstream Diameters							
ASSUMED MOISTURE, Bw	28%			FINAL LEAK TEST		.001@15"		Downstream Diameters							

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F					Pump Vac. IN. Hg	Fyrites			
					Dry Gas Outlet	Stack	Probe	Box	Impinger Exit		CO_2 Vol. %	O_2 Vol. %		
	7:40	232.628												
1		234.38	.25	1.56	76	227	250	251	54	1.0	@CEM			
2	5	236.20	.27	1.68	76	229								
3		237.99	.26	1.61	76	231	250	249	54	1.0				
4	10	239.80	.27	1.66	75	235								
5		241.64	.28	1.72	75	237	250	251	54	1.0				
6	15	243.44	.28	1.72	78	237								
7		245.37	.29	1.78	78	241	250	251	54	1.5				
8	20	247.16	.27	1.65	77	242								
9		248.99	.27	1.64	77	244								
10	25	250.86	.29	1.77	78	244	250	251	54	1.5				
11		252.70	.28	1.71	78	244								
12	30	254.34	.22	1.35	79	243	250	252	54	1.0				
1		256.06	.24	1.49	81	237	250	249	57	1.5				
2	5	257.75	.23	1.42	81	237								
3		259.37	.21	1.30	82	237	250	250	54	1.5				
4	10	261.02	.22	1.37	82	236								
5		262.68	.22	1.37	83	237	250	252	59	2.0				
6	15	264.37	.23	1.43	83	237								
7		266.10	.24	1.49	84	238	251	251	59	2.0				
8	20	267.87	.25	1.55	84	238								
9		269.65	.25	1.56	86	237	250	252	59	2.0				
10	25	271.43	.25	1.59	86	237								
11		273.24	.26	1.63	86	237	250	251	59	1.5				
12		274.83	.20	1.25	87	237								
	8:42	END TEST.												

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CLIENT	All Roads				NOZZLE	ST65	DIAMETER, IN.	.3340		IMPINGER	INITIAL	FINAL	TOTAL GAIN					
SOURCE	Exhaust				PROBE	ST-1	Cp	.8557		VOLUMES	(mL)	(mL)	(mL)					
PARAMETER / RUN No	PM 5c/R2									Imp. #1	100	365						
DATE	8.1.24				PORT LENGTH		3.5			Imp. #2	100	158						
OPERATOR	JG + CD				STATIC PRESSURE, IN. H2O		-.15			Imp. #3	0	5						
CONTROL UNIT	CAE 3099	Y	1.0001		STACK DIAMETER		54.0			Imp. #4	Blk							
		ΔH@	1.780		STACK HEIGHT		410.0			Imp. #5								
										Imp. #6								
BAROMETRIC PRESSURE, IN. Hg	30.0				INITIAL LEAK TEST		.02 @ 15"			Upstream Diameters								
ASSUMED MOISTURE, Bw	27%				FINAL LEAK TEST		.00 @ 15"			Downstream Diameters								

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F					Pump Vac. IN. Hg	Fyrites					
					Dry Gas Outlet	Stack	Probe	Box	Impinger Exit		CO_2 Vol. %	O_2 Vol. %				
	8:55	275.008														
1		276.73	.23	1.46	89	246	250	257	54	1.5	CEM					
2	5	278.49	.24	1.52	89	246										
3		280.17	.22	1.40	89	246	250	252	54	1.5						
4	10	281.96	.22	1.40	90	246										
5		283.55	.22	1.40	90	245	250	257	54	1.0						
6	15	285.28	.23	1.47	91	245										
7		287.01	.23	1.47	91	244	252	257	54	1.0						
8	20	288.81	.25	1.59	90	246										
9		290.61	.25	1.59	90	246	250	280	54	1.0						
10	25	292.41	.25	1.59	91	248										
11		294.28	.27	1.72	91	248	252	257	54	1.0						
12	30	295.93	.21	1.33	91	248										
1		297.73	.25	1.60	92	246	250	254	54	2.0						
2	5	299.64	.28	1.79	92	246										
3		301.48	.26	1.66	92	246	251	253	54	2.0						
4	10	303.32	.27	1.72	92	246										
5		305.25	.28	1.78	92	252	250	248	54	2.0						
6	15	307.16	.28	1.78	93	250										
7		309.10	.29	1.84	93	250	250	249	54	1.5						
8	20	310.98	.27	1.72	94	250										
9		312.86	.27	1.72	95	251	251	250	54	1.5						
10	25	314.81	.29	1.85	95	250										
11		316.73	.28	1.79	96	250	252	250	54	2.0						
12		318.47	.23	1.47	96	250										
	4:58	END test														

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CLIENT All Roads	NOZZLE St 65 DIAMETER, IN. .3540	IMPINGER VOLUMES	INITIAL (mL) / FINAL (mL) / TOTAL GAIN (mL)
SOURCE Baghouse	PROBE SA-1 Cp .8537	Imp. #1	100 / 314 /
PARAMETER / RUN No partic 1R3	PORT LENGTH 3.5	Imp. #2	100 / 195 /
DATE 8.1.24	STATIC PRESSURE, IN. H2O -.15	Imp. #3	0 / 3 /
OPERATOR: JG FCD	STACK DIAMETER 54.0	Imp. #4	Gel / /
CONTROL UNIT CAE J099 Y 1.0001	STACK HEIGHT 40.0	Imp. #5	/ /
ΔH@ 1.780		Imp. #6	/ /
BAROMETRIC PRESSURE, IN. Hg 30.0	INITIAL LEAK TEST .001 @ 15"	Upstream Diameters	
ASSUMED MOISTURE, Bw [illegible]	FINAL LEAK TEST .001 @ 15"	Downstream Diameters	

Point	Clock Time	Dry Gas Meter ft^3	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites CO_2 Vol. %	O_2 Vol. %
	10:10	318.934										
1		320.75	.25	1.60	97	250	250	280	59	1.5	CEM	
2	5	322.67	.28	1.79	97	250						
3		324.52	.26	1.67	97	250	250	251	59	1.5		
4	10	326.41	.27	1.73	97	251						
5		328.33	.28	1.79	97	250	250	250	59	2.0		
6	15	330.25	.28	1.79	97	250						
7		332.21	.29	1.86	98	249	250	251	59	2.0		
8	20	334.10	.27	1.73	98	249						
9		335.99	.27	1.73	98	249	255	250	59	2.0		
10	25	337.92	.28	1.80	98	248						
11		339.78	.26	1.67	98	248	250	250	59	2.0		
12	30	341.53	.23	1.48	98	248						
1		343.28	.23	1.48	99	247	250	253	58	1.5		
2	5	345.02	.24	1.55	99	247						
3		346.78	.22	1.42	99	247	250	252	58	1.5		
4	10	348.49	.22	1.42	99	247						
5		350.20	.22	1.42	99	247	250	252	58	1.5		
6	15	351.91	.22	1.42	99	247						
7		353.66	.23	1.49	100	247	250	252	58	2.0		
8	20	355.52	.26	1.68	100	248						
9		357.35	.25	1.61	100	248	252	252	58	2.0		
10	25	359.18	.25	1.61	100	248						
11		361.00	.26	1.68	100	248	250	251	58	2.0		
12		362.71	.21	1.36	100	248						
	11:13	END test										

LF

1/2

CEM FIELD DATA SHEET

Client: All Roads
Source: Baghouse Stack
Date: August 1, 2024

Technician: LF
Ambient Temp (°C):
Barometric Pressure (in. Hg): 30.03

	N_2	H_2	1 Gas	2 Gas	3 Gas	4 Gas	5 Gas	O_2	Comb Air	Low Meth	Mid Meth	High Meth
Cylinder #	075		5AE	544				742			247	054
Pressure (psi)	1300	9000	1850	500				800			1800	1000
Expiry Date			4/15/32	7/18/31				7/6/31			2/6/32	11/18/26
O_2 (%)								11.00				
CO_2 (%)								10.94				
CO (ppm)			504.4	242.6								
THC (ppm)											45.05	87.5
CH_4 (ppm)												
SO_2 (ppm)												
NOx (ppm)												

Analyzer Range	O_2	CO_2	CO	THC	SO_2	NOx	CH_4
	25%	20%	0-500	0-100			

CEM READINGS

Time	Source	O_2	CO_2	CO	THC	SO_2	NOx	CH_4	Response Time (sec)
Manifold	Ambient								O_2 Up 47
0630	N_2	0.21	0.01	-0.35					O_2 Dn 44
	1 Gas			502.8					CO_2 Up 49
	2 Gas			242.07					CO_2 Dn 52
	O_2/CO_2	11.18	10.91						CO Up 45
									CO Dn 43
STACK	N_2	0.32	0.09	1.60	-0.35				THC Up 35
0645	1 Gas			501.7					THC Dn 39
	2 Gas			242.9					SO_2 Up
	O_2/CO_2	11.31	10.85						SO_2 Dn
	High meth				87.96				NOx Up
	mid meth				45.35				NOx Dn
									CH_4 Up
Run #1	N_2	0.04	0.06	7.40	0.74				CH_4 Dn
0740-0840	2 Gas			248.2					
	O_2/CO_2	11.12	10.99						
	Mid meth				43.72				
Run #2	N_2	0.09	0.04	8.04	0.20				
0855-0955	2 Gas			248.66					
	O_2/CO_2	10.94	10.89						
	mid meth				44.24				

LF

2/2

CEM FIELD DATA SHEET

Client: All Roads
Source: Baghouse Cont.
Date: August 1, 2024

Technician:
Ambient Temp (°C):
Barometric Pressure (in. Hg):

	N_2	H_2	1 Gas	2 Gas	3 Gas	4 Gas	5 Gas	O_2	Comb Air	Low Meth	Mid Meth	High Meth
Cylinder #												
Pressure (psi)												
Expiry Date												
O_2 (%)												
CO_2 (%)												
CO (ppm)												
THC (ppm)												
CH_4 (ppm)												
SO_2 (ppm)												
NOx (ppm)												

Analyzer Range	O_2	CO_2	CO	THC	SO_2	NOx	CH_4

CEM READINGS

Time	Source	O_2	CO_2	CO	THC	SO_2	NOx	CH_4	Response Time (sec)
Run #3	N2	0.12	0.04	8.56	-0.13				O_2 Up
10:10 - 11:10	2 Gas			244.1	244.1				O_2 Dn
	O_2/CO_2	10.93	10.85						CO_2 Up
	mid meth				44.44				CO_2 Dn
									CO Up
									CO Dn
									THC Up
									THC Dn
									SO_2 Up
									SO_2 Dn
									NOx Up
									NOx Dn
									CH_4 Up
									CH_4 Dn

APPENDIX 5

CALIBRATION DATA and CERTIFICATIONS

A.Lanfranco & Associates inc.

EPA Method 5

Meter Box Calibration

English Meter Box Units, English K' Factor

Model #: CAE JO99
Serial #: 0028-022210-1

Date: 24-Jun-24
Barometric Pressure: 29.98 (in. Hg)
Theoretical Critical Vacuum: 14.14 (in. Hg)

!!!!!!!!!
IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).
!!!!!!!!!

---------- DRY GAS METER READINGS ----------									-CRITICAL ORIFICE READINGS-					
					Initial Temps.		Final Temps.					-- Ambient Temperature --		
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
3.65	15.00	72.165	88.145	15.980	70.0	70.0	70.0	70.0	73	0.8185	16.0	70.0	75.0	72.5
1.90	16.00	88.145	100.473	12.328	70.0	70.0	72.0	72.0	63	0.5956	19.0	74.0	76.0	75.0
1.10	27.00	100.473	116.682	16.209	73.0	73.0	74.0	74.0	55	0.4606	21.0	76.0	79.0	77.5
0.65	15.00	116.682	123.550	6.868	74.0	74.0	75.0	75.0	48	0.3560	22.5	78.0	84.0	81.0
0.32	20.00	123.550	129.810	6.260	75.0	75.0	76.0	76.0	40	0.2408	24.0	85.0	88.0	82.5

********** RESULTS **********

--- DRY GAS METER ---		--------- ORIFICE ---------			-- DRY GAS METER --		--------- ORIFICE ---------			
					CALIBRATION FACTOR Y		CALIBRATION FACTOR dH@			
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	Value (number)	Variation (number)	Value (in H2O)	Value (mm H2O)	Variation (in H2O)	Ko (value)
16.088	455.6	15.951	451.7	16.061	0.9915	-0.009	1.812	46.04	0.033	0.717
12.335	349.3	12.352	349.8	12.495	1.0013	0.001	1.787	45.38	0.007	0.716
16.111	456.3	16.082	455.4	16.345	0.9982	-0.002	1.730	43.93	-0.050	0.731
6.806	192.7	6.883	194.9	7.041	1.0113	0.011	1.706	43.32	-0.074	0.727
6.187	175.2	6.176	174.9	6.382	0.9982	-0.002	1.865	47.37	0.085	0.705
				Average Y---------->	**1.0001**		**Average dH@----->**	**1.780**	**45.2**	**Average Ko----->**	**0.719**

TEMPERATURE CALIBRATION

Calibration Standard -------> Omega Model CL23A S/N:T-218768

Reference	Temperature Device Reading									
Set-Point	Stack		Hot Box		Probe		Imp Out		Aux	
(deg F)	(deg F)	(% diff)	(deg F)	(% diff)	(deg F)	(% diff)	(deg F)	(% diff)	(deg F)	(% diff)
32	33	0.20%	31	-0.20%	29	-0.61%	33	0.20%	33	0.20%
100	101	0.18%	99	-0.18%	97	-0.54%	101	0.18%	101	0.18%
300	300	0.00%	299	-0.13%	297	-0.39%	300	0.00%	300	0.00%
500	500	0.00%	499	-0.10%	496	-0.42%	500	0.00%	500	0.00%
1000	1000	0.00%	998	-0.14%	996	-0.27%	999	-0.07%	999	-0.07%

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.
For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.
For Temperature Devicee, the reading must be within 1.5% of certified calibration standard (absolute temperature) to be acceptable.

Calibrated by: Liam Forrer Signature: _____ Date: June 24, 2024

Pitot Tube Calibration

Date: 02-Jul-24 Temp (R): 539
Pbar (in.Hg): 29.88 Dn (in.): 0.25

Pitot ID: **5A-1**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.220	0.295	31.3	0.8549	0.0007
0.350	0.470	39.5	0.8543	0.0014
0.490	0.655	46.8	0.8563	0.0006
0.560	0.750	50.0	0.8555	0.0002
0.660	0.880	54.3	0.8574	0.0017
		Average :	0.8557	0.0009

Pitot ID: **5A-2**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.225	0.300	31.7	0.8574	0.0003
0.300	0.400	36.6	0.8574	0.0003
0.480	0.640	46.3	0.8574	0.0003
0.670	0.890	54.7	0.8590	0.0013
0.705	0.940	56.1	0.8574	0.0003
		Average :	0.8577	0.0005

Pitot ID: **ST 5A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.210	0.290	30.6	0.8425	0.0003
0.375	0.520	40.9	0.8407	0.0020
0.480	0.660	46.3	0.8443	0.0015
0.545	0.750	49.3	0.8439	0.0012
0.630	0.870	53.0	0.8425	0.0003
		Average :	0.8428	0.0011

Pitot ID: **ST 5B**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.210	0.290	30.6	0.8425	0.0017
0.360	0.500	40.1	0.8400	0.0007
0.490	0.670	46.8	0.8466	0.0059
0.610	0.860	52.2	0.8338	0.0070
0.700	0.970	55.9	0.8410	0.0002
		Average :	0.8408	0.0031

Pitot ID: **5A-3**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.240	0.320	32.7	0.8574	0.0010
0.330	0.440	38.4	0.8574	0.0010
0.430	0.575	43.8	0.8561	0.0002
0.550	0.740	49.5	0.8535	0.0028
0.690	0.920	55.5	0.8574	0.0010
		Average :	0.8563	0.0012

Pitot ID: **5A-4**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.235	0.320	32.4	0.8484	0.0042
0.345	0.470	39.2	0.8482	0.0040
0.440	0.605	44.3	0.8443	0.0001
0.520	0.710	48.2	0.8472	0.0030
0.630	0.890	53.0	0.8329	0.0113
		Average :	0.8442	0.0045

Pitot ID: **5A-5**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.210	0.280	30.6	0.8574	0.0043
0.350	0.470	39.5	0.8543	0.0012
0.455	0.620	45.1	0.8481	0.0050
0.540	0.730	49.1	0.8515	0.0016
0.700	0.940	55.9	0.8543	0.0012
		Average :	0.8531	0.0027

Pitot ID:

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
		Average :		

* Average absolute deviation must not exceed 0.01.

Calibrated by: Christian De La O Signature: Date: July 2, 2024

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

NOZZLE DIAMETER CALIBRATION FORM

Calibrated by: Christian De La O
Date: 01-Jul-24

Signature: 

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft^2)
ST01	0.1250	0.1260	0.1260	0.0010	0.1257	0.0000861
ST05	0.1705	0.1702	0.1710	0.0008	0.1706	0.0001587
SS-1	0.1700	0.1709	0.1710	0.0010	0.1706	0.0001588
SS-7	0.1710	0.1710	0.1715	0.0005	0.1712	0.0001598
ST11	0.2065	0.2050	0.2060	0.0015	0.2058	0.0002311
SS-8	0.2077	0.2070	0.2084	0.0014	0.2077	0.0002353
ST10	0.2120	0.2100	0.2118	0.0020	0.2113	0.0002434
SS-18	0.2300	0.2316	0.2312	0.0016	0.2309	0.0002909
ST15	0.2400	0.2395	0.2385	0.0015	0.2393	0.0003124
SS-2	0.2401	0.2387	0.2381	0.0020	0.2390	0.0003115
SS-3	0.2438	0.2437	0.2439	0.0002	0.2438	0.0003242
SS-24	0.2412	0.2445	0.2416	0.0033	0.2424	0.0003206
B	0.2400	0.2410	0.2415	0.0015	0.2408	0.0003163
SS-14	0.2441	0.2475	0.2447	0.0034	0.2454	0.0003285
ST30	0.2460	0.2455	0.2435	0.0025	0.2450	0.0003274
ST20	0.2505	0.2495	0.2500	0.0010	0.2500	0.0003409
A	0.2509	0.2528	0.2518	0.0019	0.2518	0.0003459
SS-9	0.2680	0.2710	0.2703	0.0030	0.2698	0.0003969
ST40	0.2860	0.2846	0.2855	0.0014	0.2854	0.0004442
SS-30	0.2923	0.2962	0.2945	0.0039	0.2943	0.0004725
SS-13	0.3060	0.3070	0.3065	0.0010	0.3065	0.0005124
ST60	0.3000	0.3015	0.3005	0.0015	0.3007	0.0004931
ST50	0.3015	0.3040	0.3055	0.0040	0.3037	0.0005029
SS-10	0.3176	0.3205	0.3213	0.0037	0.3198	0.0005578
SS-327	0.3250	0.3264	0.3256	0.0014	0.3257	0.0005785
ST65	0.3325	0.3345	0.3350	0.0025	0.3340	0.0006084
ST66	0.3250	0.3264	0.3256	0.0014	0.3257	0.0005785
ST80	0.3650	0.3655	0.3661	0.0011	0.3655	0.0007288
ST75	0.3675	0.3650	0.3675	0.0025	0.3667	0.0007333
SS-5	0.3666	0.3690	0.3677	0.0024	0.3678	0.0007377
SS-16	0.3709	0.3731	0.3706	0.0025	0.3715	0.0007529
ST76	0.3740	0.3740	0.3745	0.0005	0.3742	0.0007636
ST85	0.3955	0.3990	0.3970	0.0035	0.3972	0.0008603
SS-15	0.4002	0.4024	0.4033	0.0031	0.4020	0.0008813
DD	0.4035	0.4047	0.4045	0.0012	0.4042	0.0008912
SS11	0.4155	0.4183	0.4176	0.0028	0.4171	0.0009490
ST70	0.4210	0.4239	0.4230	0.0029	0.4226	0.0009742
ST86	0.4538	0.4566	0.4535	0.0031	0.4546	0.0011273
C	0.4955	0.4935	0.4945	0.0020	0.4945	0.0013337
SS-491	0.4885	0.4915	0.4889	0.0030	0.4896	0.0013076
SS-49	0.4955	0.4960	0.4956	0.0005	0.4957	0.0013402
SS-6	0.4949	0.4955	0.4942	0.0013	0.4949	0.0013357
SS-492	0.4910	0.4901	0.4940	0.0039	0.4917	0.0013186
ST90	0.4950	0.4975	0.4960	0.0025	0.4962	0.0013427
ST92	0.5030	0.5035	0.5010	0.0025	0.5025	0.0013772
SS-558	0.5575	0.5538	0.5572	0.0037	0.5562	0.0016871
ST96	0.5493	0.5531	0.5519	0.0038	0.5514	0.0016585
SS-635	0.6306	0.6335	0.6345	0.0039	0.6329	0.0021845
SS-12	0.7435	0.7415	0.7414	0.0021	0.7421	0.0030039

Where:

(a) D1, D2, D3 = three different nozzle diameters; each diameter must be measured to within (0.025mm) 0.001 in.

(b) Difference = maximum difference between any two diameters; must be less than or equal to (0.1mm) 0.004 in.

(c) Average = average of D1, D2 and D3

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

TEMPERATURE CALIBRATION FORM

Calibrated by: Louis Agassiz

Date: 12-Jul-24

Signature: 

TEMPERATURE DEVICE CALIBRATIONS

Reference Device			Temperature Settings (degrees F)													
Model CL23A Calibrator			32		100		200		300		500		800		1700	
Device	**ALA #**	**Serial #**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**
Omega HH11A	3	300132	32	0.00%	99	-0.18%	201	0.15%	301	0.13%	500	0.00%	800	0.00%	1699	-0.05%
Omega HH11A	4	200167	32	0.00%	99	-0.18%	200	0.00%	303	0.39%	499	-0.10%	799	-0.08%	1697	-0.14%
Omega HH11A	6	600059	33	0.20%	100	0.00%	201	0.15%	300	0.00%	499.2	-0.08%	798	-0.16%	1696	-0.19%
TPI 341K	7	2.0315E+10	31	-0.20%	99.6	-0.07%	199	-0.15%	301	0.13%	499.1	-0.09%	799.1	-0.07%	1695	-0.23%
TPI 341K	8	2.0313E+10	32	0.00%	99.7	-0.05%	200.4	0.06%	301	0.13%	498.5	-0.16%	799.2	-0.06%	1696	-0.19%
Cont Cmpny	10	102008464	31	-0.20%	99.2	-0.14%	199.5	-0.08%	299	-0.13%	499	-0.10%	799.1	-0.07%	1699	-0.05%
Omega HH11	14	409426	32.5	0.10%	99.1	-0.16%	199	-0.15%	298	-0.26%	501	0.10%	799.1	-0.07%	1698	-0.09%
TPI 341K	16	400120029	31	-0.20%	100	0.00%	199.2	-0.12%	299.3	-0.09%	501	0.10%	799.1	-0.07%	1700	0.00%
TPI 341K	18	2.0329E+10	31	-0.20%	99.8	-0.04%	199.2	-0.12%	299.8	-0.03%	500	0.00%	799.5	-0.04%	1701	0.05%
TPI 341K	20	2.0329E+10	31	-0.20%	99.2	-0.14%	199.1	-0.14%	299	-0.13%	499.2	-0.08%	799.2	-0.06%	1699	-0.05%
TPI 341K	22	2.0329E+10	32	0.00%	99.6	-0.07%	199.2	-0.12%	298.4	-0.21%	499.1	-0.09%	798.5	-0.12%	1698	-0.09%
Reference device is a NIST certified digital thermocouple calibrator																
Variation expressed as a percentage of the absolute temperature must be within 1.5 %																

BAROMETER CALIBRATION FORM						
		Pbar Env Canada		Device (inches of Hg)		Difference
Device	Cal Date	(kPa)	(inches of Hg)	Reading	Elevation Corrected	(Env Can - Elv Corr)
LA	15-Jul-24	99.8	29.46	29.37	29.44	0.02
DS	15-Jul-24	99.8	29.46	29.36	29.43	0.03
CL	15-Jul-24	99.8	29.46	29.37	29.44	0.02
JC	15-Jul-24	99.8	29.46	29.34	29.41	0.05
LF	15-Jul-24	99.8	29.46	29.36	29.43	0.03
SH	15-Jul-24	99.8	29.46	29.35	29.42	0.04
CDO	15-Jul-24	99.8	29.46	29.34	29.41	0.05
JG	15-Jul-24	99.8	29.46	29.32	29.39	0.07
ML	15-Jul-24	99.8	29.46	29.34	29.41	0.05
BL	15-Jul-24	99.8	29.46	29.36	29.43	0.03

Calibrated by: Louis Agassiz Signature:  Date: 15-Jul-24

Performance Specification is

Device Corrected for Elevation must be +/- 0.1 " Hg of ENV CANADA SEA-LEVEL Pbar

Enter Environment canada Pressure from their website for Vancouver (link below)
and the reading from your barometer on the ground floor of the office.

https://weather.gc.ca/city/pages/bc-74_metric_e.html

Canadian Association for Laboratory Accreditation Inc.

Certificate of Accreditation

A. Lanfranco and Associates Inc.
101 - 9488 - 189th Street
Surrey, British Columbia

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Accreditation No.: 1004232
Issued On: 4/11/2023
Accreditation Date: 2/5/2021
Expiry Date: 10/11/2025

President and CEO

For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.cala.ca.

MOUNT ROYAL UNIVERSITY

Faculty of Continuing Education and Extension

Jeremy Shawn Gibbs

has successfully completed

Stack Sampling

35 Hours / 2019

May 22, 2019

Date

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BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional Jeremy Gibbs

   Title Environmental technician

2. Are you a registered member of a professional association in B.C.? ☐ Yes ☑ No

   Name of Association: _____ Registration # _____

3. Brief description of professional services:
   Environmental Consultant Specialize in air and atmospheric sciences

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature:

X _____

Print Name: Jeremy Gibbs

Witnessed by:

X _____

Print Name: Connor Laan

Date signed: Nov 1, 2020

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) *is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and*

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Conflict of Interest Disclosure Statement

A qualified professional [1] providing services to either the Ministry of Environment and Climate Change Strategy ("ministry"), or to a regulated person for the purpose of obtaining an authorization from the ministry, or pursuant to a requirement imposed under the *Environmental Management Act,* the *Integrated Pest Management Act* or the *Park Act* has a real or perceived conflict of interest when the qualified professional, or their relatives, close associates or personal friends have a financial or other interest in the outcome of the work being performed.

A real or perceived conflict of interest occurs when a qualified professional has

a) an ownership interest in the regulated person's business;

b) an opportunity to influence a decision that leads to financial benefits from the regulated person or their business other than a standard fee for service (e.g. bonuses, stock options, other profit sharing arrangements);

c) a personal or professional interest in a specific outcome;

d) the promise of a long term or ongoing business relationship with the regulated person, that is contingent upon a specific outcome of work;

e) a spouse or other family member who will benefit from a specific outcome; or

f) any other interest that could be perceived as a threat to the independence or objectivity of the qualified professional in performing a duty or function.

Qualified professionals who work under ministry legislation must take care in the conduct of their work that potential conflicts of interest within their control are avoided or mitigated. Precise rules in conflict of interest are not possible and professionals must rely on guidance of their professional associations, their common sense, conscience and sense of personal integrity.

Declaration

I Jeremy Gibbs, as a member of **Air and Waste Management Association** declare

Select one of the following:

☒ Absence from conflict of interest

Other than the standard fee I will receive for my professional services, I have no financial or other interest in the outcome of this **project**. I further declare that should a conflict of interest arise in the future during the course of this work, I will fully disclose the circumstances in writing and without delay to **Mr. Sajid Barlas**, erring on the side of caution.

☐ Real or perceived conflict of interest

Description and nature of conflict(s):

_____

_____

_____

I will maintain my objectivity, conducting my work in accordance with my Code of Ethics and standards of practice.

In addition, I will take the following steps to mitigate the real or perceived conflict(s) I have disclosed, to ensure the public interest remains paramount:

_____

_____

_____

Further, I acknowledge that this disclosure may be interpreted as a threat to my independence and will be considered by the statutory decision maker accordingly.

This conflict of interest disclosure statement is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Signature:

X _____

Print name: Jeremy Gross

Witnessed by:

X _____

Print name: Mark Lanfranco

Date: Dec.16, 2020

[1]*Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) *is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and*

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

MOUNT ROYAL UNIVERSITY
Faculty of Continuing Education

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1910
CALGARY, ALBERTA

Liam Forrer

has successfully completed

Stack Sampling

The Faculty of Continuing Education
Mount Royal University

30 hours | May 26, 2023

Dimitra Fotopoulos, Vice Dean
Professional and Continuing Education

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional Liam Forrer

Title Environmental Technician

2. Are you a registered member of a professional association in B.C.? ☐ Yes ☒ No

Name of Association: _____ Registration # _____

3. Brief description of professional services:

Environmental consulting, specializing in air and atmospheric sciences

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature:

x Liam Forrer

Print Name: Liam Forrer

Witnessed by:

x Daryl Sampson

Print Name: Daryl Sampson

Date signed: July 12, 2023

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Conflict of Interest Disclosure Statement

A qualified professional [1] providing services to either the Ministry of Environment and Climate Change Strategy ("ministry"), or to a regulated person for the purpose of obtaining an authorization from the ministry, or pursuant to a requirement imposed under the *Environmental Management Act,* the *Integrated Pest Management Act* or the *Park Act* has a real or perceived conflict of interest when the qualified professional, or their relatives, close associates or personal friends have a financial or other interest in the outcome of the work being performed.

A real or perceived conflict of interest occurs when a qualified professional has

a) an ownership interest in the regulated person's business;

b) an opportunity to influence a decision that leads to financial benefits from the regulated person or their business other than a standard fee for service (e.g. bonuses, stock options, other profit sharing arrangements);

c) a personal or professional interest in a specific outcome;

d) the promise of a long term or ongoing business relationship with the regulated person, that is contingent upon a specific outcome of work;

e) a spouse or other family member who will benefit from a specific outcome; or

f) any other interest that could be perceived as a threat to the independence or objectivity of the qualified professional in performing a duty or function.

Qualified professionals who work under ministry legislation must take care in the conduct of their work that potential conflicts of interest within their control are avoided or mitigated. Precise rules in conflict of interest are not possible and professionals must rely on guidance of their professional associations, their common sense, conscience and sense of personal integrity.

Declaration

I Liam Forrer, as a member of **Air and Waste Management Association** declare

Select one of the following:

☒ Absence from conflict of interest

Other than the standard fee I will receive for my professional services, I have no financial or other interest in the outcome of this **project**. I further declare that should a conflict of interest arise in the future during the course of this work, I will fully disclose the circumstances in writing and without delay to **Mr. Sajid Barlas**, erring on the side of caution.

☐ Real or perceived conflict of interest

Description and nature of conflict(s):

_____

_____

_____

I will maintain my objectivity, conducting my work in accordance with my Code of Ethics and standards of practice.

In addition, I will take the following steps to mitigate the real or perceived conflict(s) I have disclosed, to ensure the public interest remains paramount:

_____

_____

_____

Further, I acknowledge that this disclosure may be interpreted as a threat to my independence and will be considered by the statutory decision maker accordingly.

This conflict of interest disclosure statement is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Signature:

X Liam Forrer

Print name: Liam Forrer

Date: July 12, 2023

Witnessed by:

X _____

Print name: Mark Lanfranco

[1]*Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

AIR LIQUIDE CANADA INC.
1250, Boul. René-Lévesque
West, #1700 – Montréal, QC
H3B 5E6
Phone: (514) 933-0303

PJLA
Testing
Accreditation #
.80384

CERTIFICATE OF ANALYSIS
Grade: EPA Protocol

Work Order Number:	1869644	**Cylinder Number:**	T0M85AE
Part Number:	A1359010	**Cylinder Size:**	30AL
Laboratory:	SPG Calgary - AB	**Cylinder Volume:**	4.1 M3
Certification Date:	04/15/2024	**Cylinder Pressure:**	2000 PSI
Expiration Date:	04/15/2032	**Valve Outlet Connection:**	CGA 660

Certification performed in reference to EPA document 600/R-12/531 (EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards and G1 protocol (AA for NOX is included in the NO G1 protocol method) – May 2012), using the assay procedures listed and NIST/NTRM traceable standards.
Do not use this cylinder below 100 psi.

ANALYTICAL RESULTS

Component	Nominal Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	500 PPM	504.4 PPM	G1	+/- 0.09 %	04/15/2024
SULFUR DIOXIDE	90 PPM	88.22 PPM	G1	+/- 0.26 %	04/15/2024
NITRIC OXIDE	90 PPM	91.11 PPM	G1	+/- 0.20 %	04/15/2024
NOX	90 PPM	91.24 PPM	G1	+/- 0.20 %	04/15/2024
NITROGEN	BALANCE				

TRACEABILITY

Type	Lot ID	Cylinder #	Composition	Uncertainty	Expiration Date
GMIS	82-124614181-1	CC338627	894.5 PPM CO in N2	+/- 0.8 %	04/25/2025
GMIS	160-402793213-1	CC407330	303.1 PPM SO2 in N2	+/- 1.2 %	08/01/2031
GMIS	82-124614181-1	CC338627	88.01 PPM NO in N2	+/- 1.0 %	04/25/2025
GMIS	54-402589876-1	CC522261	3.209 PPM NO2 in N2	+/- 2.0 %	11/29/2025

ANALYTICAL EQUIPMENT

Instrument	Analytical Principle	Last Multipoint Calibration
MKS 2031 FT-IR	Fourier transform infrared spectroscopy	CO: 04/08/2024
MKS 2031 FT-IR	Fourier transform infrared spectroscopy	SO2: 03/26/2024
MKS 2031 FT-IR	Fourier transform infrared spectroscopy	NO: 04/05/2024

CERTIFIED BY: _____
STEVEN SHIEH
Lab Tech.

REVISED BY: _____
AYMEN OUESLATI
Lab Supervisor

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID: F22018

DocNumber: 000119242

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

A LANFRANCO & ASSOC INC
101 9488 189TH ST
SURREY BC V4N 4

Praxair Order Number: 54230389
Customer P. O. Number:
Customer Reference Number:

Fill Date: 1/9/2018
Part Number: NI ME90ME-AS
Lot Number: 70086800906
Cylinder Style & Outlet: AS CGA 350
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	**1/18/2026**		NIST Traceable
Cylinder Number:	**CC341054**		Analytical Uncertainty:
87.5	**ppm**	**METHANE**	± 1 %
	Balance	**NITROGEN**	

Certifcation Information: *Certification Date:* 1/18/2018 *Term:* 96 Months *Expiration Date:* 1/18/2026

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: METHANE

Requested Concentration: 90 ppm
Certified Concentration: 87.5 ppm
Instrument Used: HORIBA, FIA-510, 851135122
Analytical Method: Flame Ionization Detector
Last Multipoint Calibration: 12/19/2017

First Analysis Data:						**Date:**	1/18/2018
Z:	0	**R:**	100.3	**C:**	87.1	**Conc:**	87.506
R:	100.2	**Z:**	0	**C:**	87.2	**Conc:**	87.606
Z:	0	**C:**	87.1	**R:**	100.2	**Conc:**	87.506
UOM:	ppm			**Mean Test Assay:**			87.539 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC211670
Ref. Std. Conc: 100.7 ppm
Ref. Std. Traceable to SRM # : 2751
SRM Sample # : 212-09-AL
SRM Cylinder # : SX-20000

Second Analysis Data:						**Date:**	
Z:	0	**R:**	0	**C:**	0	**Conc:**	0
R:	0	**Z:**	0	**C:**	0	**Conc:**	0
Z:	0	**C:**	0	**R:**	0	**Conc:**	0
UOM:	ppm			**Mean Test Assay:**			0 ppm

Analyzed by: Jose Vasquez

Certified by: Danielle Burns

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
6141 Easton Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF BATCH ANALYSIS

Grade of Product: CEM-CAL ZERO

Customer:	AIR LIQUIDE CANADA		
Part Number:	NI CZ15A	Reference Number:	160-402991125-1
Cylinder Analyzed:	EB0091075	Cylinder Volume:	142.0 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2000 PSIG
Analysis Date:	Mar 22, 2024	Valve Outlet:	580
Lot Number:	160-402991125-1		

ANALYTICAL RESULTS

Component	Requested Purity		Certified Concentration
NITROGEN	99.9995 %		99.9995 %
NOx	0.1 PPM	<LDL	0.02 PPM
SO2	0.1 PPM	<LDL	0.02 PPM
THC	0.1 PPM	<	0.06 PPM
CARBON MONOXIDE	0.5 PPM	<	0.02 PPM
CARBON DIOXIDE	1.0 PPM	<	0.01 PPM

Cylinders in Batch:

CC102603, CC17052, CC221353, CC36477, CC419393, CC42131, CC431395, CC477678, CC486056, EB0091075, SG9138060BAL, SG9153901, SG9169071BAL, XC004245B, XC031341B

Notes: Gross Weight: 27.4 Kg
Net Weight: 4.5 Kg
P/N A0485344
PO# 89523379

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

Approved for Release

MESSER
Gases for Life

Edmonton Spec Gas Plant/Usine
12143 68th Street
Edmonton AB T5B 1P9
Canada

MEPA METHANE 45PPM N2 BAL 152SZ/ MEPA MÉTHANE 45PPM N2 BAL 152SZ EPA PROTOCOL

Component Composant	Nominal Nominale	Certified Certifiée
Methane / MÉTHANE	45 PPM	45.05 PPM
Nitrogen / AZOTE	BAL	

Cylinder Details/ Détails - bouteille:
Cylinder Size/ Taille de la bouteille: 152 Contents/ Capacité: 4.000 M3 Valve Outlet/ Robinet de sortie: 350 Nominal Pressure/Pression nominale: 2,000 PSG

Analytical Details/ Détails d'analyse:
Certification Accuracy ± 1%
Certification de précision ± 1%

To reorder, please quote/ Pour renouveler une commande, veuillez indiquer le code: V24107503
Certificate Date (mm/dd/yy) / Date du certificat (mm/jj/aa) :02/07/2024 Use by / Utilisé par: 02/06/2032

Digitally signed and approved by/ signé électroniquement et approuvé par
Analyst/Analyste: Jed Verville

Lot No./ No. lot	Cylinder No./ No. bouteille	Code	Page
1817371	CC137247	V24107503	1/1

MESSER CANADA INC
530 Watson St. East
Whitby, ON, Canada L1N 5R9

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number # 24108974
Lot # 1719097
Cylinder Number: AS759544

PGVP ID # L12023
Procedure: G1
Gas Type Code: SNC
Cylinder pressure: 2000 psig

Certification date
July 17, 2023

Expiration Date
July 18, 2031

ANALYTICAL RESULTS

Component	Requested Concentration ± blending tolerance	Date of Assay	Mean Concentration	Certified Concentration Uncertainty expressed at 95% confidence
Carbon Monoxide	245 ppm ± 5%	July 17, 2023	242.6 ppm	242.6 ± 1.21 ppm
Nitric Oxide	95 ppm ± 5%	July 10, 2023 July 17, 2023	98.91 ppm 98.83 ppm	98.87 ± 0.32 ppm
Sulfur Dioxide	95 ppm ± 5%	July 10, 2023 July 17, 2023	93.32 ppm 93.62 ppm	93.47 ± 0.43 ppm
Oxides of Nitrogen -	95 ppm ± 5%	July 10, 2023 July 17, 2023	98.91 ppm 98.83 ppm	98.87 ± 0.32 ppm

BALANCE GAS: Nitrogen

cyl 544

REFERENCE STANDARDS

Component	Type	Serial Number	Reference Number	Concentration	Expiration Date
Carbon Monoxide	GMIS NTRM	CC 421188 ff 22244	1392043 2-X-65 (1680b)	244.2 ± 0.5 ppm 494.8 ± 10 ppm	June 27, 2028 September 20, 2021
Nitric Oxide	GMIS SRM	cc311875 FF20686	1491662 43-M-06	95.71 ± 0.46 ppm 251.5 ± 0.8 ppm	March 12, 2029 October 29, 2023
Sulfur Dioxide	GMIS NTRM	CC173648 ff 22293	1450509 94-I-20	102 ± 0.32 ppm 494.6 ± 1.9 ppm	September 5, 2025 August 30, 2021
Oxides of Nitrogen	GMIS NTRM	cc311875-NOX FF20686-NOX	1491662 43-M-06	95.71 ± 0.46 ppm 251.5 ± 0.8 ppm	March 12, 2029 October 29, 2023

CERTIFICATION INSTRUMENTS

Component	Make/Model	Measurement Principle	Serial Number	Last calibration
Carbon Monoxide	FTIR CX 4015	Infrared	122434	July 4, 2023
Nitric Oxide	FTIR CX 4015	Infrared	122434	June 23, 2023
Sulfur Dioxide	FTIR CX 4015	Infrared	122434	June 23, 2023
Oxides of Nitrogen -	FTIR CX 4015	Infrared	122434	June 23, 2023

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE 2012 EPA PROTOCOL PROCEDURE

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

Analyst: Joey Zhao Signature _____ Date: July 17, 2023

Notes:

Tel: 1-(866) 385-5349 Fax:1-(866) 385-5347

MESSER

MESSER CANADA INC
530 Watson St. East
Whitby, ON, Canada L1N 5R9

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number # 24095743
Lot # 1719096
Cylinder Number: CC106742

PGVP ID # L12023
Procedure: G1
Gas Type Code: OC2
Cylinder pressure: 2000 psig

Certification date
July 5, 2023

Expiration Date
July 6, 2031

ANALYTICAL RESULTS

Component	Requested Concentration ± blending tolerance	Date of Assay	Mean Concentration	Certified Concentration Uncertainty expressed at 95% confidence
Oxygen	11 % ± 5%	July 5, 2023	11.00 %	11.00 ± 0.05 %
Carbon Dioxide	11 % ± 5%	July 5, 2023	10.94 %	10.94 ± 0.09 %

BALANCE GAS: Nitrogen

REFERENCE STANDARDS

Component	Type	Serial Number	Reference Number	Concentration	Expiration Date
Oxygen	GMIS	551109	1501278	24 ± 0.05 %	June 25, 2029
	SRM	FF61023	71-F-XX	20.753 ± 0.02 %	February 27, 2026
Carbon Dioxide	GMIS	CC173721	1438051	19.96 ± 0.02 %	May 31, 2026
	NTRM	SG9916842	101001	19.98 ± 0.14 %	June 16, 2022

CERTIFICATION INSTRUMENTS

Component	Make/Model	Measurement Principle	Serial Number	Last calibration
Oxygen	FTIR CX 4015	Infrared	122434	June 20, 2023
Carbon Dioxide	FTIR CX 4015	Infrared	122434	June 23, 2023

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE 2012 EPA PROTOCOL PROCEDURE

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

Analyst: Joey Zhao Signature _____ Date: July 5, 2023

Notes:

Tel: 1-(866) 385-5349 Fax:1-(866) 385-5347