December 4, 2018

Lavington Pellet Limited Partnership
9900 School Road
Coldstream, B.C.,
V1B 3C7

Attention: **Jamie Colliss**
Re: **Air Emission Testing of November 13, 2018**
Permit 107369, ME1718-352

As requested our firm provided a series of air emission tests at your facility in Lavington BC.

Testing Parameters

- CF-12
  - Total Particulate Testing (including Condensable Organics) State of Oregon Method 7

Key Personnel

- Report Generation: Matt McCall
- Field Supervisor: Dave Brandle/Dan Lawrence
- Plant Contact: Jamie Colliss

All testing procedures were conducted in accordance with acceptable methodologies as listed in the latest revision of the BC Field Sampling Manual. A copy of the method and/or Sampling Manual are digitally available upon request. All lab analysis for back half condensable organic fractions was analyzed by EXOVA Laboratories in Surrey BC. A copy of their report can be found in the Appendix of this report.

Results are summarized immediately following this cover letter. Please note that all results are expressed on a dry basis and reference conditions of 20 deg C, 1 atm pressure.

If you have any questions or concerns please don't hesitate to contact us at your earliest convenience.

Sincerely,

MCCALL ENVIRONMENTAL
Matt McCall
Digitally signed by Matt McCall
DN: cn=Matt McCall, o=McCall Environmental, ou, email=matt@mccallenvironmental.net, c=CA
Date: 2018.12.04 16:17:31 -08'00'
Matt McCall

PRINCE GEORGE
Prince George, B.C.
Tel: 250-962-6921
Fax: 250-962-6931
admin@mccallenvironmental.net
www.mccallenvironmental.net

VICTORIA
Victoria, B.C.
Tel: 250-381-7482
Fax: 250-381-7483
admin@mccallenvironmental.net
www.mccallenvironmental.net

Summary of Test Results

CF12 November 13, 2018 Summary of Test Results 1-3

Gas Temperature:	102	^{o}F	39	^{o}C
Moisture Content (by volume):	1.77	%		
Average Stack Gas Velocity:	57.9	ft/sec	17.63	m/sec
Total Actual Gas Flow Rate:	68141	ACFM		
Dry Gas flow Rate at Reference Conditions:	60553	SCFM	28.58	m^3/sec
Total Particulate Concentration:				
Dry Basis Actual at Reference Conditions	0.002	gr/ft^3	3.5	mg/m^3
Front Half Particulate	0.001	gr/ft^3	2.0	mg/m^3
Back Half Condensibles	0.001	gr/ft^3	1.5	mg/m^3
Mass Emission Rate	0.78	lbs/hr	0.36	kg/hr

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Pinnacle Pellet **13-Nov-18**
CF-12 **Permit Number: 107369**
Lavington BC

AVERAGE OF AIR EMISSION TESTS 1 TO 3

Gas Temperature:	102 ^{o}F	39 ^{o}C
Moisture Content (by volume):	1.77 %	
Average Stack Gas Velocity:	57.9 ft/sec	17.63 m/sec
Total Actual Gas Flow Rate:	68141 ACFM	
Dry Gas flow Rate at Reference Conditions:	60553 SCFM	28.58 m^3/sec
Total Particulate Concentration:		
Dry Basis Actual at Reference Conditions	0.002 gr/ft^3	3.5 mg/m^3
Front Half Particulate	0.001 gr/ft^3	2.0 mg/m^3
Back Half Condensibles	0.001 gr/ft^3	1.5 mg/m^3
Mass Emission Rate	0.78 lbs/hr	0.36 kg/hr

SUMMARY OF AIR EMISSION TESTS

TEST 1:

Gas Temperature:	96 ^{o}F	36 ^{o}C
Moisture Content (by volume):	1.2 %	
Average Stack Gas Velocity:	57.1 ft/sec	17.4 m/sec
Total Actual Gas Flow Rate:	67238 ACFM	
Dry Gas flow Rate at Reference Conditions:	60700 SCFM	28.6 m^3/sec
Total Particulate Concentration:		
Dry Basis Actual at Reference Conditions	.001 gr/ft^3	3.4 mg/m^3
Front Half Particulate	.001 gr/ft^3	1.9 mg/m^3
Back Half Condensibles	.001 gr/ft^3	1.5 mg/m^3
Mass Emission Rate	0.78 lbs/hr	0.35 kg/hr

TEST 2:

Gas Temperature:	102 ^{o}F	39 ^{o}C
Moisture Content (by volume):	2.3 %	
Average Stack Gas Velocity:	58.2 ft/sec	17.7 m/sec
Total Actual Gas Flow Rate:	68532 ACFM	
Dry Gas flow Rate at Reference Conditions:	60547 SCFM	28.6 m^3/sec
Total Particulate Concentration:		
Dry Basis Actual at Reference Conditions	.001 gr/ft^3	3.0 mg/m^3
Front Half Particulate	.001 gr/ft^3	1.5 mg/m^3
Back Half Condensibles	.001 gr/ft^3	1.5 mg/m^3
Mass Emission Rate	0.67 lbs/hr	0.31 kg/hr

TEST 3:

Gas Temperature:	108 ^{o}F	42 ^{o}C
Moisture Content (by volume):	1.7 %	
Average Stack Gas Velocity:	58.3 ft/sec	17.8 m/sec
Total Actual Gas Flow Rate:	68653 ACFM	
Dry Gas flow Rate at Reference Conditions:	60412 SCFM	28.5 m^3/sec
Total Particulate Concentration:		
Dry Basis Actual at Reference Conditions	.002 gr/ft^3	4.0 mg/m^3
Front Half Particulate	.001 gr/ft^3	2.5 mg/m^3
Back Half Condensibles	.001 gr/ft^3	1.5 mg/m^3
Mass Emission Rate	0.90 lbs/hr	0.41 kg/hr

DATA FOR TESTS 1 TO 3

Client:	**Pinnacle Pellet**	
Plant Location:	**Lavington BC**	
Process:	**CF-12**	
Permit Number:	**107369**	
Job Number:	**ME1718-352**	
Pollution Control Permit:	**15.0**	**mg/m3**
Number of Tests:	**3**	**tests**
Minutes per Point:	**2.5**	**minutes**

	TEST 1	TEST 2	TEST 3
Filter Number:	60	61	62
Date of Test:	13-Nov-18	13-Nov-18	13-Nov-18
Start Time:	9:30	11:00	12:20
Stop Time:	10:35	12:04	13:25
On-line Sampling Time:	60	60	60
Testing Personnel:	DL/NA	DL/NA	DL/NA
Sampler Model:	1012	1012	1012
Barometric Pressure("Hg):	28.75	28.75	28.75
Static Pressure("H_2O):	0.65	0.65	0.65
%CO_2:	2.1	2.1	2.1
%O_2:	18.8	18.8	18.8
%CO:	0.0	0.0	0.0
%N_2:	79.1	79.1	79.1
Diameter of Nozzle(inches):	0.215	0.215	0.215
Meter Factor:	0.9956	0.9956	0.9956
Type-S Pitot Tube Coefficient:	0.83300	0.83300	0.83300
Cross Sectional Area of Stack(ft^2):	19.63	19.63	19.63
Impinger Condensate(g):	11	22	17
Weight of Moisture in Silica Gel(g):	1.5	2.0	1.0
Weight of Filter Particulate(g):	0.0003	0.0002	0.0002
Weight of Probe Washings(g):	0.0022	0.0018	0.0032
Weight of Impinger Content Organic(g):	0.0020	0.0020	0.0020
Total Weight of Particulate(g):	0.0045	0.0040	0.0054

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Sampling Data for - *TEST 1*
Pinnacle Pellet
CF-12
Lavington BC

13-Nov-18

SAMPLE POINT	VELOCITY HEAD ("H_2O)	ORIFICE PRESSURE ("H_2O)	DRY GAS METER		STACK GAS TEMP (^oF)	GAS SAMPLE VOLUME (ft^3)	ISOKINETICS
			TEMP IN (^oF)	TEMP OUT (^oF)			
A-12	1.05	1.73	48	48	107	0.00	0.98
A-11	1.00	1.69	52	44	94	1.97	1.02
A-10	0.95	1.60	52	44	93	4.00	0.96
A-9	1.00	1.69	54	45	94	5.86	0.95
A-8	0.95	1.61	56	46	93	7.76	1.00
A-7	0.90	1.53	59	48	95	9.71	1.04
A-6	0.95	1.63	60	51	94	11.70	0.95
A-5	1.00	1.72	63	53	96	13.57	0.98
A-4	0.95	1.64	65	55	94	15.55	1.01
A-3	0.95	1.65	68	57	95	17.55	1.00
A-2	1.00	1.74	70	60	94	19.54	1.03
A-1	0.90	1.57	74	64	98	21.65	0.97
B-12	1.10	1.93	75	65	96	23.55	0.99
B-11	1.00	1.76	77	68	98	25.70	0.98
B-10	1.00	1.77	78	69	96	27.74	1.01
B-9	0.95	1.68	81	72	99	29.84	0.99
B-8	0.95	1.69	82	74	97	31.87	1.01
B-7	1.00	1.78	85	78	98	33.94	1.00
B-6	0.95	1.70	85	79	96	36.06	0.99
B-5	0.90	1.61	87	79	96	38.10	1.02
B-4	0.95	1.70	86	82	95	40.15	1.02
B-3	0.95	1.72	90	84	95	42.27	0.99
B-2	0.90	1.63	90	86	94	44.33	1.03
B-1	0.90	1.63	91	86	95	46.42	1.03
						48.51	

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Sampling Data for - *TEST 2*
Pinnacle Pellet
CF-12
Lavington BC

13-Nov-18

SAMPLE POINT	VELOCITY HEAD ("H_2O)	ORIFICE PRESSURE ("H_2O)	DRY GAS METER		STACK GAS TEMP (^oF)	GAS SAMPLE VOLUME (ft^3)	ISOKINETICS
			TEMP IN (^oF)	TEMP OUT (^oF)			
B-12	1.10	2.01	86	86	100	0.00	1.04
B-11	1.05	1.90	80	81	98	2.31	1.05
B-10	1.05	1.92	81	85	97	4.57	1.01
B-9	0.95	1.73	83	84	97	6.75	1.02
B-8	0.90	1.65	85	85	96	8.85	1.04
B-7	0.95	1.74	87	86	98	10.94	1.00
B-6	1.00	1.83	87	87	98	13.00	1.02
B-5	1.00	1.85	91	90	98	15.16	1.04
B-4	1.00	1.85	92	90	99	17.37	1.01
B-3	1.05	1.94	92	91	98	19.51	1.04
B-2	0.95	1.75	94	93	101	21.78	1.00
B-1	0.90	1.66	94	93	100	23.87	1.03
A-12	1.05	1.95	96	95	101	25.95	1.00
A-11	1.00	1.85	96	94	102	28.15	1.00
A-10	1.00	1.85	99	97	104	30.30	1.02
A-9	0.95	1.76	99	97	105	32.50	1.02
A-8	0.95	1.76	101	99	106	34.63	1.03
A-7	1.00	1.86	100	100	105	36.79	1.03
A-6	1.00	1.85	102	101	107	39.00	1.00
A-5	1.00	1.85	102	102	106	41.16	1.02
A-4	1.05	1.96	105	104	107	43.37	1.02
A-3	1.00	1.90	104	104	107	45.64	1.02
A-2	0.90	1.68	106	105	107	47.85	1.00
A-1	0.90	1.68	106	106	108	49.92	0.99
						51.95	

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Sampling Data for - *TEST 3*
Pinnacle Pellet
CF-12
Lavington BC

13-Nov-18

SAMPLE POINT	VELOCITY HEAD ("H_2O)	ORIFICE PRESSURE ("H_2O)	DRY GAS METER		STACK GAS TEMP (^oF)	GAS SAMPLE VOLUME (ft^3)	ISOKINETICS
			TEMP IN (^oF)	TEMP OUT (^oF)			
A-12	1.05	1.94	100	100	106	0.00	1.04
A-11	1.1	2.02	90	99	106	2.30	1.01
A-10	1.05	1.91	90	96	108	4.57	1.05
A-9	1	1.83	93	97	105	6.87	1.01
A-8	0.95	1.74	94	97	107	9.04	1.04
A-7	1	1.83	95	95	107	11.22	1.03
A-6	1	1.84	96	97	108	13.43	1.05
A-5	0.95	1.74	98	97	107	15.68	1.04
A-4	1	1.84	98	98	105	17.85	1.03
A-3	0.95	1.76	102	102	107	20.07	1.02
A-2	0.9	1.66	101	100	107	22.23	1.03
A-1	0.9	1.67	103	102	107	24.35	1.09
B-12	1.10	2.03	102	102	108	26.60	0.99
B-11	1.00	1.86	104	103	107	28.84	1.03
B-10	1.00	1.85	104	104	109	31.08	1.05
B-9	0.95	1.76	104	104	108	33.35	1.05
B-8	1.00	1.85	105	105	109	35.58	1.02
B-7	0.95	1.77	107	107	108	37.80	1.00
B-6	0.90	1.67	106	106	109	39.93	1.03
B-5	0.95	1.68	107	106	107	42.07	1.02
B-4	0.95	1.77	107	107	109	44.24	1.01
B-3	1.00	1.87	108	108	108	46.40	1.04
B-2	1.00	1.86	106	107	109	48.67	1.03
B-1	0.95	1.78	108	109	109	50.92	1.01
						53.07	

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Pinnacle Pellet
CF-12
Pinnacle Pellet

Data for ***TEST 1***

OVERALL ISOKINETICS - TEST 1: 0.997

Delta P:	**0.964**	**"H_2O**	**Us avg:**	**57.09**	**ft/sec**
Delta H:	**1.683**		**ACFM:**	**67238**	**ft^3/min**
Tm avg:	**528.0**	**^oR**	**SDCFM:**	**60700**	**ft^3/min**
Ts avg:	**555.9**	**^oR**	**Vm std:**	**46.61**	**ft^3**
Bwo:	**0.012**		**Vm corr:**	**48.30**	**ft^3**
Md:	**29.09**		**Vm:**	**48.51**	**ft^3**
Ms:	**28.95**		**MF:**	**0.9956**	
Pb:	**28.75**	**"Hg**	**PCON:**	**3.41**	**mg/m^3**
Pm:	**28.87**	**"Hg**	**ERAT:**	**0.35**	**kg/hr**
Ps:	**28.80**	**"Hg**			

Data for ***TEST 2***

OVERALL ISOKINETICS - TEST 2: 1.020

Delta P:	**0.987**	**"H_2O**	**Us avg:**	**58.19**	**ft/sec**
Delta H:	**1.824**		**ACFM:**	**68532**	**ft^3/min**
Tm avg:	**554.2**	**^oR**	**SDCFM:**	**60547**	**ft^3/min**
Ts avg:	**561.9**	**^oR**	**Vm std:**	**47.57**	**ft^3**
Bwo:	**0.023**		**Vm corr:**	**51.72**	**ft^3**
Md:	**29.09**		**Vm:**	**51.95**	**ft^3**
Ms:	**28.83**		**MF:**	**0.9956**	
Pb:	**28.75**	**"Hg**	**PCON:**	**2.97**	**mg/m^3**
Pm:	**28.88**	**"Hg**	**ERAT:**	**0.31**	**kg/hr**
Ps:	**28.80**	**"Hg**			

Data for ***TEST 3***

OVERALL ISOKINETICS - TEST 3: 1.031

Delta P:	**0.983**	**"H_2O**	**Us avg:**	**58.29**	**ft/sec**
Delta H:	**1.814**		**ACFM:**	**68653**	**ft^3/min**
Tm avg:	**561.6**	**^oR**	**SDCFM:**	**60412**	**ft^3/min**
Ts avg:	**567.5**	**^oR**	**Vm std:**	**47.96**	**ft^3**
Bwo:	**0.017**		**Vm corr:**	**52.84**	**ft^3**
Md:	**29.09**		**Vm:**	**53.07**	**ft^3**
Ms:	**28.90**		**MF:**	**0.9956**	
Pb:	**28.75**	**"Hg**	**PCON:**	**4.00**	**mg/m^3**
Pm:	**28.88**	**"Hg**	**ERAT:**	**0.41**	**kg/hr**
Ps:	**28.80**	**"Hg**			

Air Emission Monitoring Procedure

Particulate Sampling (Napp-Baldwin Model 31 Sampler)

Particulate sampling and gas velocity measurements were conducted using a Napp-Baldwin Model 31 stack sampler in accordance with the methods specified in EPA Method 5 (See Figure 1).

The air discharge was sampled isokinetically at the centroid of a series of equal area segments across the duct or stack. The stack gas velocity and temperature was recorded during the sample collection period with a calibrated pitot tube and thermocouple mounted on the sampling probe. The sample was delivered from the probe to a cyclone and a filter holder containing a 110mm Type A glass fiber filter. The gas sample was then drawn in through a series of four glass impingers which condensed and absorbed the water from the gas. A leakless vacuum pump carried he sampled gas through a dry gas test meter where the volume, temperature, and pressure were measured; and finally through a flow indicating orifice which allowed for the rapid adjustment to isokinetic sampling rates.

At the end of each test, the probe interior, cyclone and connecting tubing from the probe to the filter housing were rinsed with distilled water and acetone. These washings were evaporated to dryness and the resulting solids were weighed. The weight of the cyclone flask and the filter was used together with the weight of solids in the washings to calculate the particulate concentration. The moisture content of the stack gas was determined from the quantity of water condensed in the impingers and absorbed in the silica gel.

O_2, CO_2, CO (where applicable)

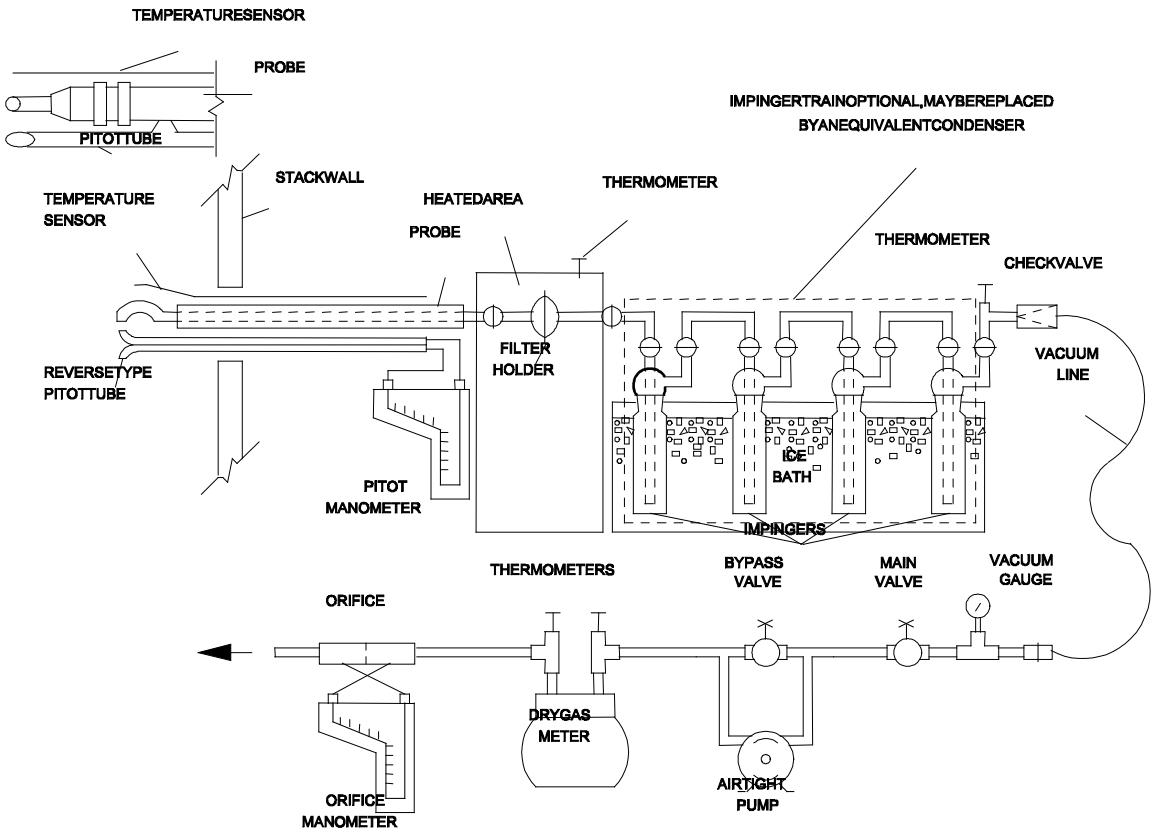
O_2, CO_2, and CO were found using either Fuji Analytical Analyzer by means of infrared and paramagnetic technology (EPA 3A) or by fyrite (EPA Method 3).

NOx (where applicable)

NOx was found using and API Model 252 NOx analyzer that utilizes chemiluminescent technology. Stack gas was Samples were taken over a minimum period of three hours.

VOC's (where applicable)

Hydrocarbons were measured in accordance with EPA method 25A. Samples were drawn in one hour test runs using a total hydrocarbon analyzer that utilizes Flame Ionization Technology.



EPA Method 5 Diagram- Figure 1

CALCULATIONS

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

Nomenclature.

A_n = Cross-sectional area of nozzle, m^2 (ft^2).
B_{ws} = Water vapor in the gas stream, proportion by volume.
C_a = Acetone blank residue concentration, mg/g.
c_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
I = Percent of isokinetic sampling.
L_a = Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate, whichever is less.
L_i = Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change (i = l, 2, 3...n), m^3/min (cfm).
L_p = Leakage rate observed during the post-test leak check, m^3/min (cfm).
m_a = Mass of residue of acetone after evaporation, mg.
m_n = Total amount of particulate matter collected, mg.
M_w = Molecular weight of water, l8.0 g/g-mole (l8.0 lb/lb-mole).
P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).
P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
R = Ideal gas constant, 0.06236 [(mmHg)(m^3)]/[(°K)(g-mole)] {2l.85 [(in. Hg)(ft^3)]/[(°R)(lb-mole)]}.
T_m = Absolute average DGM temperature (see Figure 5-2), °K (°R).
T_s = Absolute average stack gas temperature (see Figure 5-2), °K (°R).
T_{std} = Standard absolute temperature, 293°K (528°R).
V_a = Volume of acetone blank, ml.
V_{aw} = Volume of acetone used in wash, ml.
V_{lc} = Total volume liquid collected in impingers and silica gel (see Figure 5-3), ml.
V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).
$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).
$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).
v_s = Stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec).
W_a = Weight of residue in acetone wash, mg.
Y = Dry gas meter calibration factor.
ΔH = Average pressure differential across the orifice meter (see Figure 5-2), mm H_20 (in. H_20).
ρ_a = Density of acetone, mg/ml (see label on bottle).
ρ_w = Density of water, 0.9982 g/ml (0.00220l lb/ml).
θ = Total sampling time, min.
θ_l = Sampling time interval, from the beginning of a run until the first component change, min.
θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.
θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.
l3.6 = Specific gravity of mercury.
60 = Sec/min.
l00 = Conversion to percent.

Average Dry Gas Meter Temperature and Average Orifice Pressure Drop.

Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20°C, 760 mm Hg or 68°F, 29.92 in. Hg) by using Equation 5-l.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m} \right) \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}} \right] \qquad \text{Eq. 5-1}$$

$$= K_1 V_m Y \frac{P_{bar} + \left(\frac{\Delta H}{13.6} \right)}{T_m}$$

where:

K_l = 0.3858 °K/mm Hg for metric units,

= l7.64 °R/in. Hg for English units.

NOTE: Equation 5-l can be used as written unless leakage rate observed during any of the mandatory leak checks (i.e., the post-test leak check or leak checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, Equation 5-l must be modified as follows:

(a) Case I. No component changes made during sampling run. In this case, replace V_m in Equation 5-l with the expression:

$$[V_m - (L_p - L_a)\,\theta]$$

(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m in Equation 5-l by the expression:

$$\left[V_m - (L_1 - L_a)\theta_1 - \sum_{i=2}^{n} (L_i - L_a)\theta_i - (L_p - L_a)\theta_p \right]$$

and substitute only for those leakage rates (L_i or L_p) which exceed L_a.

Volume of Water Vapor.

$$V_{w(std)} = \frac{V_{lc}\,\rho_w\,R\,T_{std}}{M_w\,P_{std}} = K_2\,V_{lc} \qquad \text{Eq. 5-2}$$

where:

K_2 = 0.00l333 m^3/ml for metric units,

= 0.04707 ft^3/ml for English units.

Moisture Content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \qquad \text{Eq. 5-3}$$

Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a \rho_a} \qquad \text{Eq. 5-4}$$

Acetone Wash Blank.

$$W_a = C_a V_{aw} \rho_a \qquad \text{Eq. 5-5}$$

Total Particulate Weight. Determine the total particulate matter catch from the sum of the weights obtained from Containers l and 2 less the acetone blank (see Figure 5-3).

Particulate Concentration.

$$C_s = (0.001 g/mg)(m_n / V_{m(std)}) \qquad \text{Eq. 5-6}$$

Conversion Factors:

From	To	Multiply by
scf	m^3	0.02832
g/ft^3	gr/ft^3	l5.43
g/ft^3	lb/ft^3	2.205×10^{-3}
g/ft^3	g/m^3	35.3l

Isokinetic Variation.

Calculation from Raw Data.

$$I = \frac{100 T_s \left[K_3 V_{1c} + (V_m Y / T_m)(P_{bar} + \Delta H/13.6)\right]}{60\theta V_s P_s A_n} \qquad \text{Eq. 5-7}$$

where:

K_3 = 0.003454 [(mm Hg)(m^3)]/[(ml)(°K)] for metric units,

= 0.002669 [(in. Hg)(ft^3)]/[(ml)(°R)] for English units.

Calculation from Intermediate Values.

$$I = \frac{100\, T_s\, V_{m(std)}\, P_{std}}{60\, T_{std}\, v_s\, \theta\, A_n\, P_s\, (1 - B_{ws})} = \frac{K_4\, T_s\, V_{m(std)}}{P_s\, v_s\, A_n\, \theta (1 - B_{ws})} \qquad \text{Eq.5-8}$$

where:

K_4 = 4.320 for metric units,

= 0.09450 for English units.

Acceptable Results. If 90 percent ≤ I ≤ ll0 percent, the results are acceptable. If the PM results are low in comparison to the standard, and "I" is over 110 percent or less than 90 percent, the Administrator may opt to accept the results. Citation 4 in the Bibliography may be used to make acceptability judgments. If "I" is judged to unacceptable, reject the results, and repeat the test.

Average Stack Gas Velocity.

$$v_s = K_p\, C_p\, (\sqrt{\Delta p})_{avg} \sqrt{\frac{T_{s(avg)}}{P_s\, M_s}}$$

Average Stack Gas Dry Volumetric Flow Rate.

$$Q_{sd} = 3{,}600 (1 - B_{ws})\, v_s\, A\, \frac{T_{std}}{T_{s(avg)}}\, \frac{P_s}{P_{std}}$$

where:

A	=	Cross-sectional area of stack, m^2 (ft^2).
B_{ws}	=	Water vapor in the gas stream (from Method 5 or Reference Method 4), proportion by volume.
C_p	=	Pitot tube coefficient, dimensionless.
K_p	=	Pitot tube constant,
M_d	=	Molecular weight of stack gas, dry basis (see Section 3.6), g/gmole (lb/lb-mole).
M_s	=	Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).

$$= M_d (1 - B_{ws}) + 18.0\, B_{ws} \qquad \text{Eq. 2-5}$$

P_{bar}	=	Barometric pressure at measurement site, mm Hg (in. Hg).
P_g	=	Stack static pressure, mm Hg (in. Hg).
P_s	=	Absolute stack pressure, mm Hg (in. Hg),

$$= P_{bar} + P_g$$

P_{std}	=	Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
Q_{sd}	=	Dry volumetric stack gas flow rate corrected to standard conditions, dsm^3/hr (dscf/hr).
t_s	=	Stack temperature, □C (□F).
T_s	=	Absolute stack temperature, □K (□R).

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.8

Pitot I.D.: **14**

Wind Tunnel Temperature (^{O}F): 71.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
12.29	0.03427	0.04839	0.83312
19.68	0.08793	0.12608	0.82678
39.42	0.35272	0.51508	0.81923
63.06	0.90269	1.26316	0.83690
81.38	1.50344	2.11714	0.83426
103.58	2.43563	3.34104	0.84528

Average= 0.83260

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.8

Pitot I.D.: **15**

Wind Tunnel Temperature (^{O}F): 67.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
12.95	0.03837	0.05383	0.83580
25.27	0.14607	0.21112	0.82348
54.86	0.68828	0.98426	0.82787
76.96	1.35481	1.90537	0.83480
93.23	1.98821	2.76796	0.83905
133.65	4.08556	5.61440	0.84452

Average= 0.83425

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.85

Pitot I.D.: **148**

Wind Tunnel Temperature (^{O}F): 71.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
13.69	0.04262	0.06065	0.82988
19.13	0.08321	0.11798	0.83141
41.58	0.39311	0.56173	0.82819
63.08	0.90476	1.26630	0.83683
81.24	1.50057	2.07940	0.84100
99.32	2.24318	3.18588	0.83072

Average= 0.83300

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.85

Pitot I.D.: **242**

Wind Tunnel Temperature (^{O}F): 71.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
12.71	0.03676	0.05091	0.84120
19.02	0.08230	0.11495	0.83765
41.06	0.38343	0.53104	0.84123
62.85	0.89820	1.20776	0.85375
82.67	1.55395	2.11982	0.84763
103.76	2.44808	3.49980	0.82799

Average= 0.84158

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.83

Pitot I.D.: **248**

Wind Tunnel Temperature (^{O}F): 71.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
12.49	0.03545	0.04995	0.83396
19.92	0.09017	0.12459	0.84223
40.44	0.37165	0.53192	0.82753
62.76	0.89496	1.25108	0.83732
81.58	1.51225	2.12472	0.83521
103.80	2.44834	3.47904	0.83050

Average= 0.83446

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.85

Pitot I.D.: **270**

Wind Tunnel Temperature (^{O}F): 71.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
12.13	0.03343	0.04760	0.82969
20.29	0.09360	0.13172	0.83456
41.06	0.38326	0.53622	0.83697
63.48	0.91627	1.24964	0.84772
82.85	1.56068	2.12276	0.84887
103.39	2.43039	3.30182	0.84937

Average= 0.84120

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.85

Pitot I.D.: **286**

Wind Tunnel Temperature (^{O}F): 71.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
11.99	0.03270	0.04571	0.83735
19.99	0.09088	0.12640	0.83946
41.41	0.38986	0.53259	0.84701
62.08	0.87628	1.19016	0.84948
81.76	1.52008	2.05643	0.85116
102.44	2.38606	3.23704	0.84997

Average= 0.84574

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

Calibration Certificate for S-Type Pitot Tube

Date: Jan 11/18

Barometric Pressure ("Hg): 29.85

Pitot I.D.: **294**

Wind Tunnel Temperature (^{O}F): 71.0

Nozzle: 0.250

Wind Velocity (ft/sec)	*Ref.Pitot ("H_2O)*	*S-Type Pitot ("H_2O)*	*Pitot Factor*
12.28	0.03431	0.04849	0.83276
20.62	0.09665	0.13581	0.83517
40.72	0.37711	0.51819	0.84455
63.63	0.92067	1.25359	0.84842
81.73	1.51873	2.06836	0.84833
103.07	2.41538	3.28817	0.84850

Average= 0.84295

Note: The new pitot tip should be installed so that the serial number engraved is aligned directly into the gas stream.

CALIBRATION CERTIFICATE
DRY GAS METER

DATE: July 3/18

CONSOLE MANUF.: NAPP/MILLENNIUM MODEL 32

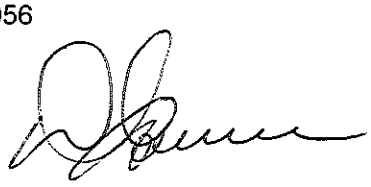
CONSOLE I.D.: MU 1012

PARAMETER SUMMARY	RUN #1	RUN #2	RUN #3
Ta = Ambient (WTM) Temperature (oF.)	64.0	64.0	64.0
P=Pres. Differential at WTM ("Hg)	0.0956	0.1766	0.2428
Pb= Atmospheric Pressure ("Hg)	28.25	28.25	28.25
Pv= Vapour Pressure Water at Temp. Ta ("Hg)	0.6006	0.6006	0.6006
H=Pres. Differential at Orifice	1.0	2.0	3.0
Ti= Dry Test Meter Inlet Temp. (oF.)	80.0	75.0	83.0
To= Dry Test Meter Outlet Temp. (oF.)	79.0	68.0	82.0
Ri= Initial Dry Test volume (ft3)	0.00	0.00	0.00
Rf= Final Dry Test Volume (ft3)	4.94	4.87	5.04
Vi= Initial Wet Test Volume (ft3)	0.0	0.0	0.0
Vf= Final Wet Test Volume (ft3)	5.000	5.000	5.000
Pw= Pb - (^P/13.59) "Hg	28.1544	28.0734	28.0072
Pd= Pb + (^H/13.59) "Hg	28.3236	28.3972	28.4708
Tw= Ta +460 (oR.)	524.0	524.0	524.0
Td= [(Ti + To)/2] + 460 (oR.)	539.5	531.5	542.5
Bw= Pv/Pb ("Hg)	0.0213	0.0213	0.0213
WET TEST METER FACTOR (WTMF)	0.9922	0.9922	0.9922
ated Y Value)(WTMF)	1.0059	0.9998	0.9812

Y (MEAN)(WTMF) = 0.9956

N.R. MCCALL & ASSOCIATES LTD.

Calibrating Technician Signature:



ORIFICE METER CALIBRATION

DATE: July 3/18

CONSOLE I.D. MU 1012

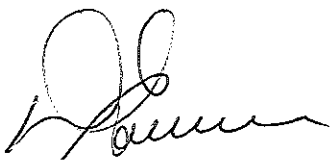
	RUN 1	RUN 2	RUN 3
MD= mol. wt. dry air	28.967	28.967	28.967
Pb=bar. pressure "Hg	28.25	28.25	28.25
Y=gas meter factor	1.0059	1.0059	0.9998
Delta H=	0.5	1	1.5
Ri=int. gas meter vol.	0	0	0
Rf=final gas meter vol.	2.21	3.19	3.88
min. samp	5	5	5
Qm=Y(Rf-Ri)/^T(FT3/MIN)	0.4446078	0.6417642	0.7758448
To=meter outlet Temp (oF)	82	83	84
Tm=meter out temp. (oR)	542	543	544
Pm=Pb + ^H	28.286792	28.3235835	28.3603753
SQRT(Tm/Pm*H/Md)	0.5750969	0.8135309	0.99663775
Ko=orifice const.	0.7731006	0.78886272	0.77846218

Ko MEAN = 0.7801419

Ko*4*144= 449.36171

McCALL ENVIRONMENTAL LTD.

Calibrating Technician Signature:



ORIFICE METER CALIBRATION

DATE: July 3/18

CONSOLE I.D. MU 1012

	RUN 4	RUN 5	RUN 6
MD= mol. wt. dry air	28.967	28.967	28.967
Pb=bar. pressure "Hg	28.25	28.25	28.25
Y=gas meter factor	0.9998	0.9812	0.9812
Delta H=	2	2.5	3
Ri=int. gas meter vol.	0	0	0
Rf=final gas meter vol.	4.49	5.03	5.42
min. samp	5	5	5
Qm=Y(Rf-Ri)/^T(FT3/MIN)	0.8978204	0.9870872	1.0636208
To=meter outlet Temp (oF)	82	86	87
Tm=meter out temp. (oR)	542	546	547
Pm=Pb + ^H	28.397167	28.4339588	28.4707506
SQRT(Tm/Pm*H/Md)	1.1479563	1.28734782	1.41059738
Ko=orifice const.	0.7821033	0.7667603	0.75402153

Ko MEAN = 0.7676284

Ko*4*144= 442.15394

McCALL ENVIRONMENTAL LTD.

Calibrating Technician Signature:

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Exova

Analytical Report

Bill To:	McCall Environmental	Project ID:	Pinnacle Pellet	Lot ID:	**1313836**
	6733 Buchanan Road	Project Name:	CF-12	Control Number:	C0066916
	Coldstream, BC, Canada	Project Location:	Lavington, BC	Date Received:	Nov 16, 2018
	V1B 3C5	LSD:		Date Reported:	Nov 21, 2018
Attn:	Accounts Payable	P.O.:		Report Number:	2348978
Sampled By:		Proj. Acct. code:			
Company:					

Reference Number	1313836-1	1313836-2	1313836-3
Sample Date	Nov 13, 2018	Nov 13, 2018	Nov 13, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	CF-12 Test 1	CF-12 Test 2	CF-12 Test 3
Matrix	Water	Water	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Oil and Grease	Total	mg/sample	<2	<2	<2	2
Volume	Sample volume	mL	310	320	320	
pH adjustment	required prior to O&G extraction		Yes	Yes	Yes	

Approved by:

Matthew Norman, BSc, PChem
Operations Chemist

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Methodology and Notes

Bill To:	McCall Environmental	Project ID:	Pinnacle Pellet	Lot ID:	**1313836**
	6733 Buchanan Road	Project Name:	CF-12	Control Number:	C0066916
	Coldstream, BC, Canada	Project Location:	Lavington, BC	Date Received:	Nov 16, 2018
	V1B 3C5	LSD:		Date Reported:	Nov 21, 2018
Attn:	Accounts Payable	P.O.:		Report Number:	2348978
Sampled By:		Proj. Acct. code:			
Company:					

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Oil and Grease in water (Surrey)	BCELM	*	Oil & Grease in Water - Direct Hexane Extraction, Oil & Grease	Nov 16, 2018	Exova Surrey

** Reference Method Modified*

References

BCELM	B.C. Environmental Laboratory Manual

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.
Results relate only to samples as submitted.

This is to verify that

Matthew McCall

has successfully completed

a course of study in

Source Testing for Particulates

(35 hours)

Endorsed by
The B.C. Ministry of Environment

Dated at Burnaby, British Columbia, Canada
December 14, 1990

DEAN

REGISTRAR

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

North Carolina State University

Environmental Programs

This certificate awarded to

Danny Lawrence

for satisfactory completion of course and examination for

SI: 414 Quality Assurance for Source Emission Measurements

Inez F. VanArsdall
Manager

Christine E. Murphy
Registrar

May 22, 2000
Date Completed

3.5 CEUs

Awarded under EPA Assistance Agreement CT - 825724

Environmental Programs
Industrial Extension Service
College of Engineering
North Carolina State University

Cyclofilter 12

i. Average hourly dryer exit gas temperature during testing;
44.6 C

ii. Average hourly dryer ODt for the biomass dryer system for the previous month;
30.2 ODT/hr

iii. 90th percentile hourly ODt throughput for the biomass dryers (Section 4.3);
38.5 ODT/hr

iv. Average hourly throughput ODt for the biomass dryer system during stack testing;
20.3 ODT/hr