

REPORT OF PERIODIC MONITORING OF EMISSIONS TO AIR

Part A2 Process: A2/1

THE BROCKMOOR FOUNDRY COMPANY LIMITED

Leys Road
Brockmoor
Brierley Hill
West Midlands
DY5 3UJ

Monitoring Dates: 21st – 22nd August 2018

Cti Ref: E66149

Customer Ref: 52147/RB

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Date: 4th October 2018



Advanced Manufacturing Research Centre



0144

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EXECUTIVE SUMMARY REPORT

1.0 MONITORING OBJECTIVES

Sampling of emissions at The Brockmoor Foundry Company Ltd., was undertaken at the request of Mr. Rob Barlow.

The aim of the monitoring campaign was to:

- Undertake biennial compliance monitoring.
- To provide data for comparison with particulate CEMS.

in accordance with the Site Specific Protocol issued on 23rd July 2018 (Cti Ref: E66149SSP).

The company is regulated as a Part A2 Process. The available guidance notes applicable to the process are:

Sector Guidance Note IPPC SG3 Secretary of State's Guidance for the A2 Ferrous Foundries Sector

Emission limits given in the results tables are taken from the requirements given in Permit No. A2/1.

Tests were performed to quantify the levels of emissions from the following processes:

Stack Ref	Emission Source	Substances Monitored
BRO 1 (A1)	Coldbox Coremaking	Particulates
BRO 3 (A3)	4.5MW Induction Furnace	Particulates
BRO 5 (A5)	Magnesium Treatment	Particulates
BRO 7 (A7)	Knockout & Thermal Reclamation	Particulates
BRO 28 (A28)	Megaldi Cast/Cool LH Vent	Particulates
BRO 29 (A29)	Megaldi Cast/Cool RH vent	Particulates

There were no special requirements applicable to the monitoring.

2.0 MONITORING RESULTS

Note: Uncertainty figures quote in this section represent the uncertainty at the 95% confidence level

Stack Ref.: BRO 1 (A1) Coldbox Coremaking

Particulates	Test 1	Test 2	Emission Limit Value
Concentration:	2.6 mg m ⁻³	1.8 mg m ⁻³	< 20 mg m ⁻³
Mass Release:	14 g hr ⁻¹	9.3 g hr ⁻¹	-
Uncertainty:	± 0.68 mg m ⁻³	± 0.67 mg m ⁻³	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	21/08/18	21/08/18	-
Test Period:	15:46 to 16:02 16:04 to 16:20	16:38 to 16:54 16:56 to 17:12	-
Duration:	32 mins	32 mins	-
Velocity:	8.4 m s ⁻¹	8.3 m s ⁻¹	-
Process Status:	3-5 machines operating	3-5 machines operating	-
Visibility:	Emission point not observed	Emission point not observed	Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
Isokinetic Rate:	97 %	99 %	95 % to 115 %
Blank Value:	0.03 mg m ⁻³		< 10 % ELV
Cti Accreditation for Use of Method:	MCERTS	MCERTS	-
Accreditation Status of Test:	MCERTS	MCERTS	-

Stack Ref.: BRO 3 (A3) 4.5MW Induction Furnace

Particulates	Test 1	Test 2	Emission Limit Value
Concentration:	< 0.35 mg m ⁻³	< 0.29 mg m ⁻³	< 20 mg m ⁻³
Mass Release:	< 10 g hr ⁻¹	< 10 g hr ⁻¹	-
Uncertainty:	± 0.64 mg m ⁻³	± 0.53 mg m ⁻³	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	22/08/18	22/08/18	-
Test Period:	10:42 to 11:02 11:05 to 11:25	12:00 to 12:20 12:22 to 12:42	-
Duration:	40 mins	40 mins	-
Velocity:	12 m s ⁻¹	15 m s ⁻¹	-
Process Status:	2 furnaces operating	2 furnaces operating	-
Visibility:	No visible emission	No visible emission	Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
Isokinetic Rate:	102 %	102 %	95 % to 115 %
Blank Value:	0.00 mg m ⁻³		< 10 % ELV
Cti Accreditation for Use of Method:	MCERTS	MCERTS	-
Accreditation Status of Test:	MCERTS	MCERTS	-

Stack Ref.: BRO 5 (A5) Magnesium Treatment

Particulates	Test 1	Test 2	Emission Limit Value
Concentration:	0.72 mg m ⁻³	0.63 mg m ⁻³	< 20 mg m ⁻³
Mass Release:	7.0 g hr ⁻¹	6.4 g hr ⁻¹	-
Uncertainty:	± 0.63 mg m ⁻³	± 0.61 mg m ⁻³	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	21/08/18	21/08/18	-
Test Period:	11:46 to 12:02 12:06 to 12:22	13:06 to 13:22 13:24 to 13:40	-
Duration:	32 mins	32 mins	-
Velocity:	6.8 m s ⁻¹	7.0 m s ⁻¹	-
Process Status:	1 treatment / traverse	1 treatment / traverse	-
Visibility:	No visible emission	No visible emission	Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
Isokinetic Rate:	100 %	100 %	95 % to 115 %
Blank Value:	0.50 mg m ⁻³		< 10 % ELV
Cti Accreditation for Use of Method:	MCERTS	MCERTS	-
Accreditation Status of Test:	MCERTS	MCERTS	-

Stack Ref.: BRO 7 (A7) Knockout & Thermal Reclamation

Particulates	Test 1	Test 2	Emission Limit Value
Concentration:	2.4 mg m ⁻³	1.4 mg m ⁻³	< 20 mg m ⁻³
Mass Release:	130 g hr ⁻¹	74 g hr ⁻¹	-
Uncertainty:	± 0.75 mg m ⁻³	± 0.75 mg m ⁻³	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	22/08/18	22/08/18	-
Test Period:	10:48 to 11:28	11:59 to 12:39	-
Duration:	40 mins	40 mins	-
Velocity:	14 m s ⁻¹	13 m s ⁻¹	-
Process Status:	Operating throughout	Operating throughout	-
Visibility:	Emission point not observed	Emission point not observed	Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
Isokinetic Rate:	102 %	105 %	95 % to 115 %
Blank Value:	0.60 mg m ⁻³		< 10 % ELV
Cti Accreditation for Use of Method:	MCERTS	MCERTS	-
Accreditation Status of Test:	MCERTS §	MCERTS §	-

§ Test not undertaken to full requirements of BS EN 13284-1:2002 – See Section 4 for details

Stack Ref.: BRO 28 (A28) Megaldi Left Hand Vent

Particulates	Test 1	Test 2	Emission Limit Value
Concentration:	2.1 mg m ⁻³	1.9 mg m ⁻³	< 20 mg m ⁻³
Mass Release:	34 g hr ⁻¹	31 g hr ⁻¹	-
Uncertainty:	± 0.77 mg m ⁻³	± 0.77 mg m ⁻³	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	21/08/18	21/08/18	-
Test Period:	11:42 to 11:58 12:01 to 12:17	13:15 to 13:31 13:33 to 13:49	-
Duration:	32 mins	32 mins	-
Velocity:	16 m s ⁻¹	16 m s ⁻¹	-
Process Status:	Operating throughout	Operating throughout	-
Visibility:	No visible emission	No visible emission	Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
Isokinetic Rate:	102 %	102 %	95 % to 115 %
Blank Value:	0.43 mg m ⁻³		< 10 % ELV
Cti Accreditation for Use of Method:	MCERTS	MCERTS	-
Accreditation Status of Test:	MCERTS	MCERTS	-

Stack Ref.: BRO 29 (A29) Megaldi Right Hand Vent

Particulates	Test 1	Test 2	Emission Limit Value
Concentration:	3.2 mg m ⁻³	5.5 mg m ⁻³	< 20 mg m ⁻³
Mass Release:	84 g hr ⁻¹	140 g hr ⁻¹	-
Uncertainty:	± 0.69 mg m ⁻³	± 0.71 mg m ⁻³	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	21/08/18	21/08/18	-
Test Period:	14:31 to 14:47 14:53 to 15:09	15:28 to 15:44 15:46 to 16:02	-
Duration:	32 mins	32 mins	-
Velocity:	26 m s ⁻¹	26 m s ⁻¹	-
Process Status:	Operating throughout	Operating throughout	-
Visibility:	No visible emission	No visible emission	Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
Isokinetic Rate:	101 %	102 %	95 % to 115 %
Blank Value:	0.31 mg m ⁻³		< 10 % ELV
Cti Accreditation for Use of Method:	MCERTS	MCERTS	-
Accreditation Status of Test:	MCERTS	MCERTS	-

3.0 OPERATING INFORMATION

Stack Ref.	Date	Process Type	Process Duration (Batch processes only)	Fuel	Feedstock	Abatement Type & operational status if abnormal	Load	Substance	Periodic Monitoring Result	Units
BRO 1 (A1)	21/08/18	Continuous	-	N/A	Sand, binder	None	Normal	Particulates ^M	2.2	mg m ⁻³
BRO 3 (A3)	22/08/18	Continuous	-	N/A	Molten Metal	Dry bag filter	Normal	Particulates ^M	< 0.32	mg m ⁻³
BRO 5 (A5)	21/08/18	Batch	5 mins (3-4/hr)	N/A	Molten metal and magnesium addition	Dry bag filter	Normal	Particulates ^M	0.68	mg m ⁻³
BRO 7 (A7)	22/08/18	Continuous	-	N/A	Sand knockout	Dry bag filter and thermal plant	Normal	Particulates ^M	1.9	mg m ⁻³
BRO 28 (A28)	21/08/18	Continuous	-	N/A	Castings	Dry bag filter	Normal	Particulates ^M	2.0	mg m ⁻³
BRO 29 (A29)	21/08/18	Continuous	-	N/A	Castings	Dry bag filter	Normal	Particulates ^M	4.4	mg m ⁻³

Accreditation Status of test – (M) MCERTS (U) UKAS (N) None

4.0 MONITORING DEVIATIONS

Substances not monitored in accordance with Environment Agency TGN M2:

Stack Ref.	Emission Source	Substance	Reason
BRO 7 (A7)	Knock-out & Thermal Reclamation	Particulates	Testing could only be conducted along one traverse. Number of sample points doubled to 8 in accordance with EA MID for BS EN 13284-1.

NOTE: According to the Environment Agency, if a deviation was out of our control, for instance due to unavoidable process or extraction system characteristics, the MCERTS accreditation of the associated test can be maintained. Where we deviate from the method due to issues directly within our control that could have been avoided, MCERTS accreditation cannot be claimed.

SUPPORTING INFORMATION

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APPENDIX I

GENERAL INFORMATION

A) Monitoring Organisation Staff Details

The following Cti staff were involved in the monitoring work reported:

Name	MCERTS Registration	Personnel Competency					Function
			TE1	TE2	TE3	TE4	
Peter Holdsworth	SIRA MM 04 563	L2	✓	✓	✓	✓	Monitoring Consultant
Adam Levesley	SIRA MM 17 1439	Trainee					Monitoring Technician

B) Monitoring Organisation Method Details

The following methods were used for the monitoring work reported:

Substance	Standard Method	Cti OP	Accreditation
All	-	300, 303, 310	-
Moisture (Water Vapour)	BS EN 14790:2017	334	MCERTS
Velocity, Temperature & Pressure	BS EN ISO 16911-1:2013	311, 331 – 336, 361, 396	MCERTS
Particulates	BS EN 13284-1:2002	311, 331 – 336, 361	MCERTS

C) Monitoring Organisation Equipment Check List References

Specific equipment items used were recorded on site sampling datasheets during the monitoring campaign which are held in the Cti environmental monitoring files alongside the associated report

D) Sub-contract Analysis Details

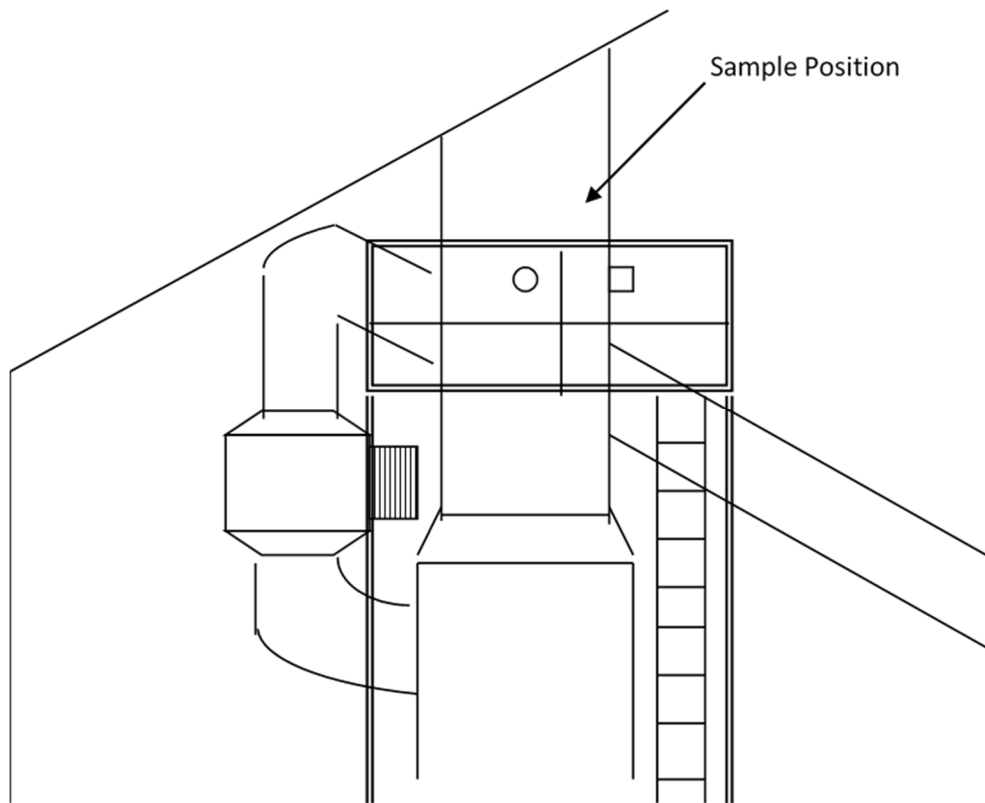
There was no sub-contract analysis associated with the work reported.

APPENDIX II

Stack Ref.: BRO 1 (A1) Coldbox Coremaking

Emission Source BRO 1 (A1) Coldbox Coremaking
 Substances monitored: Particulates
 Arrestment: None

Emission Point Description:			13284 Compliant
Duct dimensions:	0.495 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓



PARTICULATES		QAF 462_Template Version 3 / May18 / TH									
VELOCITY CALCULATION											
Site:	Brockmoor, Brierley Hill	Plant:	BRO 1 - Coldbox Coremaking			Date:	21/08/2018				
Units											
Stack diameter(Ds):	m	0.50									
Stack dimensions(L,W):	m		0.00								
Stack area(As):	m ²	0.192									
Reference temp(Tr):	K	273									
Reference Pressure (Pr):	Pa	101300									
Barometric Pressure (Pb):	mb	1005	100500	Pa							
Static Pressure (Ps):	"H ₂ O		0	Pa							
	mmH ₂ O		25	Pa							
Pitot coefficient(Cp):		0.832	Note: Use 1 if raw data corrected								
TEST ONE:											
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
	90.3	7.3	49.6	31	31	31	8.4	1.6	7.5	1.4	86
	90.3	7.3	49.6	31	31	31					
	76.7	6.2	42.1	31	33	31					
	76.7	6.2	42.1	31	33	31		Vol Flow		Vol Flow	
	64.3	5.2	35.3	31	33	31		cfm		cfm	
	64.3	5.2	35.3	31	34	31					
	69.3	5.6	38.0	31	35	32		3417		3045	
	69.3	5.6	38.0	31	35	32					
		Mean	41	31.0		32.3					
		Std	5.37	0.0							
			Pa	Temp, °C		DGM					
TEST TWO:											
Barometric Pressure (Pb):	mb	1003.5	100350	Pa							
Static Pressure (Ps):	"H ₂ O		0	Pa							
	mmH ₂ O		25	Pa							
Pitot coefficient(Cp):		0.832									
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
	62.3	5	33.9	31	32	32	8.3	1.6	7.4	1.4	86
	62.3	5	33.9	31	34	32					
	69.7	5.6	38.0	31	35	32					
	68.5	5.5	37.3	31	36	32		Vol Flow		Vol Flow	
	89.7	7.2	48.9	31	36	32		cfm		cfm	
	89.7	7.2	48.9	31	36	32					
	78.5	6.3	42.8	31	37	33		3399		3024	
	78.5	6.3	42.8	31	37	33					
		Mean	41	31		33.8					
		Std	5.61	0.0							
			Pa	Temp, °C		DGM					

PARTICULATES		Template Version 4 / Feb15 / TH					
Site:	Brockmoor, Brierley Hill	Plant:	BRO 1 - Coldbox Coremaking		Date:	21-Aug-18	
Units							
Stack diameter(Ds):	m	0.50	0.25				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m ²	0.192					
Standard 9096 or 13284:		13284					
Filter ID:		3063	3064	3065			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 1-1	BRO 1-2	BRO 1-B			
Filter weights:							
Tare Test One:		0.15046	Tare Test Two:	0.15267	Blank		
Gross Test One:		0.15246	Gross Test Two:	0.15404	0.15084		
mass collected:		0.00200		0.00137	0.00001		
Wash Out Weights:							
Tare Test One:		50.10472	Tare Test Two:	48.40722	Blank		
Gross Test One:		50.10478	Gross Test Two:	48.40708	50.06266		
mass collected:		0.0001		-0.0001	50.06208		
Control Weights:		Test 1	Test 2	Blank			
Mass Change:	Filter:	-0.00001	-0.00001	-0.00001			
Mass Change:	Beaker:	0.00018	0.00018	0.00018			
DGM Cal factor(Yd):		1.0134	1.0134				
Avg Delta H(DH):	Pa	737	735				
Barometric pressure(Pba):	Pa	100500	100350				
Reference pressure(Pri):	Pa	101325					
Avg DGM temp(Tm):	K	305.3	306.8				
Reference temp (Tr):	K	273					
Duct O2(Od):	%						
Ref O2(Or):	%						
Moisture(Bws):	%	1.1	0.50				
Gas vol sampled(Vm):	m ³	0.83	0.85				
Gas vol corrected(Vc):	m ³	0.75	0.76				
Moles Dry Gas(Mdg):	M	34	34				
Particulates collected, (Mass):	mg	2.0	1.4				
Concentration at STP dry(Cm):	mg/m ³	2.7	2.2	1.8			
Concentration at STP wet(Cw):	mg/m ³	2.6	2.2	1.8			
Concentration at ref O2(C-O2):	mg/m ³	2.7	1.8				
Minus Blank:	mg	2.0	1.4				
	mg/m ³	2.6	2.2	1.8			
	mg/m ³	2.6	2.2	1.8			
	mg/m ³	2.6	1.8				
Overall Test Blank	mg	0.02	0.02				
	mg/m ³	0.03	0.03	0.03	0.2%	0.2%	
	mg/m ³	0.03	0.03	0.03	0.2%	0.2%	
	mg/m ³	0.03	0.03	0.03	0.2%	0.2%	
Acetone Blank	mg	0.00	0.00				
	mg/m ³	0.00	0.00	0.00			
	mg/m ³	0.00	0.00	0.00			
	mg/m ³	0.00	0.00	0.00			
Emission Limit:	mg/m ³	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Cm):	mg/m ³	0.38	0.37				
Concentration at STP wet(Cw):	mg/m ³	0.37	0.37				
Concentration at ref O2(C-O2):	mg/m ³	0.38	0.37				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		580.0					
After Test One:		586.9					
H2O collected:		6.9	Moles H ₂ O:	0.38			
Before Test Two:		586.9					
After Test Two:		590.0					
H2O collected:		3.1	Moles H ₂ O:	0.17			
Test DGM readings:	l						
Before Test One:		6072.89	Before Test Two:	6910.48	Metric Millenium Inst		
After Test One:		6905.03	After Test Two:	7760.03	Meter		
Sampled vol :		832.14		849.55			
% Isokinetic		Test One:	Test Two:				
Nozzle Dia:	"	0.3280	0.3280				
Sampl time / point	mins	8	8				
Sample Duration:	mins	32	32				
Theoretical vol @ STP:	m ³	0.782	0.776				
% Isokinetic:		97	In Range	99	In Range		
Number of traverses:		2	2				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse		2	2				
Actual Points / Traverse		2	2				
Standard Uncertainty	+/-	0.34	mg/m3	0.34			
Expanded Uncertainty:	+/-	0.68	mg/m ³	0.67			
% of ELV		3.4		3.4			

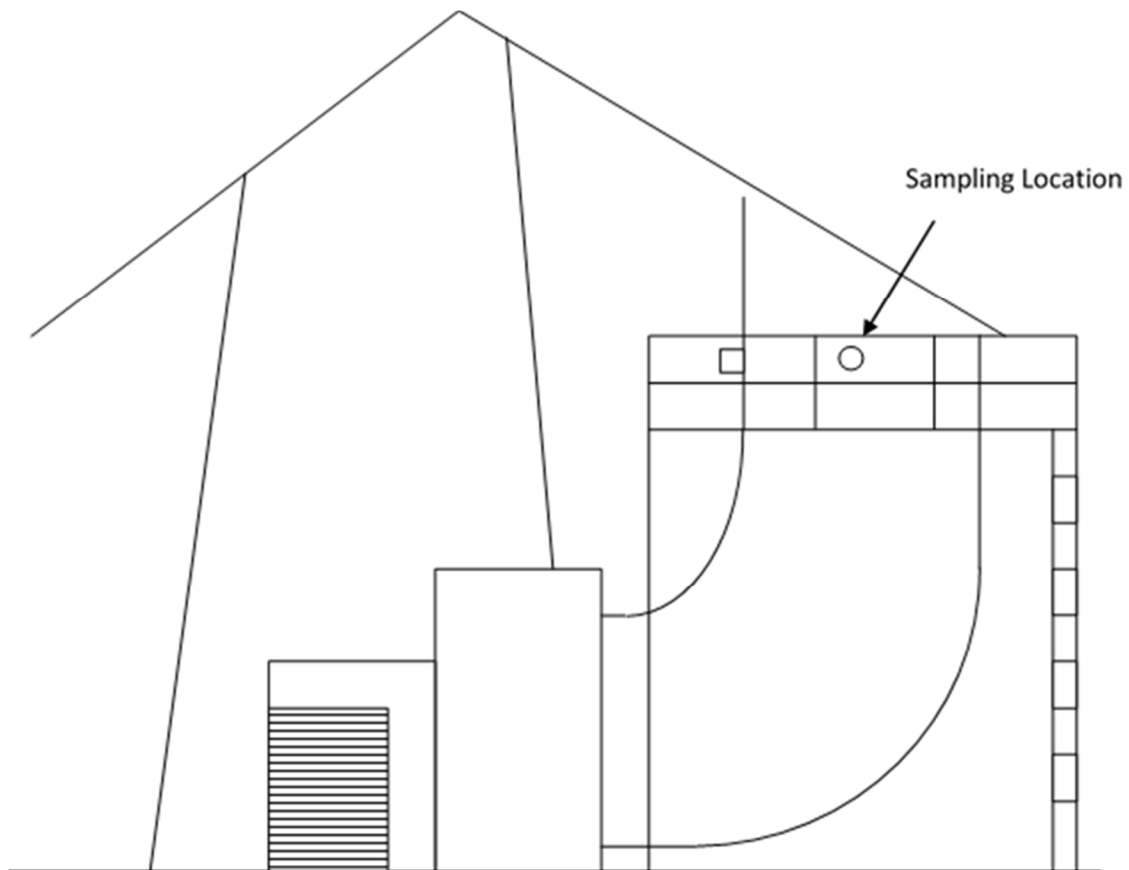
Mass Emission without blank correction	
Test One	Test Two
2.6	1.8
3.8	2.6
14	9.3
110	74
0.55	0.37
26	18

APPENDIX III

Stack Ref.: BRO 3 (A3) 4.5MW Induction Furnace

Emission Source BRO 3 (A3) 4.5MW Induction Furnace
 Substances monitored: Particulates
 Arrestment: Dry Bag Filter

Emission Point Description:			13284 / 16911 Compliant
Duct dimensions:	1.0 m diameter		-
Location of sampling plane:	In vertical duct prior to fan		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓



PARTICULATES		QAF 462_Template Version 3 / May18 / TH									
VELOCITY CALCULATION											
Site: Brockmoor, Brierley Hill		Plant: BRO 3 - Furnaces ext.		Date: 22/08/2018							
Units											
Stack diameter(Ds):	m	1.00									
Stack dimensions(L,W):	m		0.00								
Stack area(As):	m ²	0.785									
Reference temp(Tr):	K	273									
Reference Pressure (Pr):	Pa	101300									
Barometric Pressure (Pb):	mb	1003	100300	Pa							
Static Pressure (Ps):	"H ₂ O	-20	-4982	Pa							
	mmH ₂ O		0	Pa							
Pitot coefficient(Cp):		0.836	Note: Use 1 if raw data corrected								
TEST ONE:											
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
✓	45.7	11.0	75.4	43	23	23	12	9.7	10	7.8	470
✓	45.7	11.0	75.4	43	25	23					
✓	72.7	17.5	119.9	44	26	23					
✓	36.5	8.8	60.3	45	27	23		Vol Flow		Vol Flow	
✓	44.4	10.7	73.3	45	26	24		cfm		cfm	
✓	44.4	10.7	73.3	46	28	24					
✓	66.4	16.0	109.7	47	29	25		20606		16613	
✓	63.2	15.5	106.2	52	30	25					
		Mean	87	45.6		25.3					
		Std	20.38	2.7							
			Pa	Temp, °C		DGM					
TEST TWO:											
Barometric Pressure (Pb):	mb	1003	100300	Pa							
Static Pressure (Ps):	"H ₂ O	-20	-4982	Pa							
	mmH ₂ O		0	Pa							
Pitot coefficient(Cp):		0.836									
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
✓	88.4	22.0	150.8	51	27	27	15	12	12	9.6	574
✓	88.4	22.0	150.8	49	29	27					
✓	79.5	19.8	135.7	47	30	27					
✓	32.1	8.0	54.8	46	31	27		Vol Flow		Vol Flow	
✓	86.4	21.5	147.4	46	30	28		cfm		cfm	
✓	86.4	21.5	147.4	45	32	28					
✓	68.3	17.0	116.5	47	33	28		25279		20277	
		Mean	130	47		29.1					
		Std	30.50	1.8							
			Pa	Temp, °C		DGM					

PARTICULATES		Template Version 4 / Feb15 / TH					
Site:	Brockmoor, Brierley Hill	Plant:	BRO 3 - Furnaces ext.		Date:	22-Aug-18	
	Units						
Stack diameter(Ds):	m	1.00	0.50				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m ²	0.785					
Standard 9096 or 13284:		13284					
Filter ID:		3069	3070	3071			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 3-1	BRO 3-2	BRO 3-B			
Filter weights:							
Tare Test One:		0.14654	Tare Test Two:	0.14746	Blank		
Gross Test One:		0.14660	Gross Test Two:	0.14754	0.14443		
mass collected:		0.00006	0.00008	0.00001			
Wash Out Weights:							
Tare Test One:		47.97052	Tare Test Two:	47.81402	Blank		
Gross Test One:		47.97052	Gross Test Two:	47.81379	46.63638		
mass collected:		0.0000	-0.0002	-0.0001			
Control Weights:		Test 1	Test 2	Blank			
Mass Change:	Filter:	0.00000	0.00000	0.00000			
Mass Change:	Beaker:	0.00018	0.00018	0.00018			
DGM Cal factor(Yd):		1.0124	1.0134				
Avg Delta H(DH):	Pa	514	749				
Barometric pressure(Pba):	Pa	100300	100300				
Reference pressure(Pr):	Pa	101325					
Avg DGM temp(Tm):	K	298.3	302.1				
Reference temp (Tr):	K	273					
Duct O2(Od):	%						
Ref O2(Or):	%						
Moisture(Bws):	%	1.4	0.93				
Gas vol sampled(Vm):	m ³	0.86	1.1				
Gas vol corrected(Vc):	m ³	0.79	0.97				
Moles Dry Gas(Mdg):	M	35	43				
Particulates collected, (Mass):	mg	0.06	0.09	0.09			
Concentration at STP dry(Cm):	mg/m ³	0.08	0.09	0.09			
Concentration at STP wet(Cw):	mg/m ³	0.08	0.09	0.09			
Concentration at ref O2(C-O2):	mg/m ³	0.08	0.09	0.09			
Minus Blank:	mg	0.07	0.09	0.09			
	mg/m ³	0.08	0.09	0.09			
	mg/m ³	0.08	0.09	0.09			
	mg/m ³	0.08	0.09	0.09			
Overall Test Blank:	mg	0.00	0.00	0.00	% of limit Value		
	mg/m ³	0.00	0.00	0.00	0.0%	0.0%	
	mg/m ³	0.00	0.00	0.00	0.0%	0.0%	
	mg/m ³	0.00	0.00	0.00	0.0%	0.0%	
Acetone Blank:	mg	0.00	0.00	0.00			
	mg/m ³	0.00	0.00	0.00			
	mg/m ³	0.00	0.00	0.00			
	mg/m ³	0.00	0.00	0.00			
Emission Limit:	mg/m ³	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Cm):	mg/m ³	0.36	0.29				
Concentration at STP wet(Cw):	mg/m ³	0.35	0.29				
Concentration at ref O2(C-O2):	mg/m ³	0.36	0.29				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		582.2					
After Test One:		591.0					
H2O collected:		8.8	Moles H ₂ O:	0.49			
		Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test Two:		591.0					
After Test Two:		588.3					
H2O collected:		7.3	Moles H ₂ O:	0.41			
Test DGM readings:	l						
Before Test One:		7773.97	Before Test Two:	8674.87	Metric Millenium Inst		
After Test One:		8635.46	After Test Two:	9736.61	Meter		
Sampled vol :		861.49	1061.74				
% Isokinetic		Test One:	Test Two:				
Nozzle Dia:	"	0.2550	0.2550				
Sampl time / point	mins	10	10				
Sample Duration:	mins	40	40				
Theoretical vol @ STP:	m ³	0.789	0.963				
% Isokinetic:		102	In Range	102	In Range		
Number of traverses:		2	2				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse		2	2				
Actual Points / Traverse		2	2				
Standard Uncertainty	+/-	0.32	mg/m3	0.26			
Expanded Uncertainty:	+/-	0.64	mg/m ³	0.53			
% of ELV		3.2		2.6			

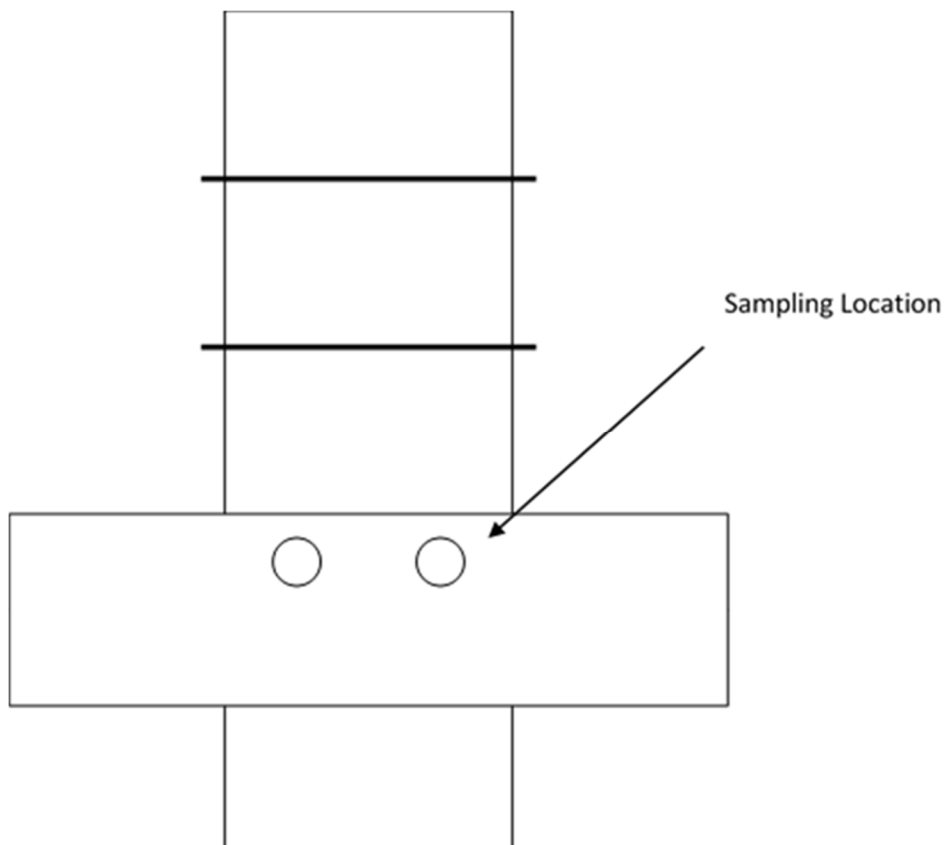
Mass Emission without blank correction	
Test One	Test Two
< 0.35	< 0.29
< 2.8	< 2.8
< 10	< 10
< 80	< 80
< 0.40	< 0.40
< 19	< 19

APPENDIX IV

Stack Ref.: BRO 5 (A5) Magnesium Treatment

Emission Source BRO 5 (A5) Magnesium Treatment
 Substances monitored: Particulates
 Arrestment: Dry Bag Filter

Emission Point Description:			13284 / 16911 Compliant
Duct dimensions:	0.675 x 0.675 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	Parallel		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓



PARTICULATES		QAF 462, Template Version 3 / May18 / TH									
VELOCITY CALCULATION											
Site: Brockmoor, Brierley Hill		Plant: BRO 5 - Mj Treatment		Date: 21/08/2018							
Units											
Stack diameter(Ds):	m	0.675	0.675	0.46							
Stack dimensions(L,W):	m										
Stack area(As):	m ²	0.456									
Reference temp(Tr):	K	273									
Reference Pressure (Pr):	Pa	101300									
Barometric Pressure (Pb):	mb	1006		100600 Pa							
Static Pressure (Ps):	"H ₂ O	0		Pa							
	mmH ₂ O	1.7		Pa							
Pitot coefficient(Cp):		0.832		Note: Use 1 if raw data corrected							
TEST ONE:											
Delta Hs (mm)	Pitot mm H ₂ O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min	
106	5.3	36.0	36	22	22	6.8	3.1	6.0	2.7	163	
106	5.3	36.0	35	23	22						
66.1	3.3	22.4	33	25	23						
70.1	3.5	23.8	32	26	23						
64.1	3.2	21.7	32	26	23						
60.1	3.0	20.4	35	28	24						
80.1	4.0	27.2	34	29	24						
80.1	4.0	27.2	33	30	25						
	Mean	27	33.8		24.7						
	Std	5.75	1.4								
		Pa	Temp, °C		DGM						
TEST TWO:											
Barometric Pressure (Pb):	mb	1006		100600 Pa							
Static Pressure (Ps):	"H ₂ O	0		Pa							
	mmH ₂ O	1.7		Pa							
Pitot coefficient(Cp):		0.832									
Delta Hs (mm)	Pitot mm H ₂ O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min	
71.5	3.5	23.8	38	28	28	7.0	3.2	6.2	2.8	169	
71.5	3.5	23.8	37	30	28						
118	5.8	39.4	36	31	29						
118	5.8	39.4	35	32	29						
71.5	3.5	23.8	34	31	29						
71.5	3.5	23.8	38	31	29						
85.8	4.2	28.5	36	31	29						
85.8	4.2	28.5	35	31	29						
	Mean	29	36		29.7						
	Std	6.38	1.4								
		Pa	Temp, °C		DGM						

PARTICULATES		Template Version 4 / Feb15 / TH		Date: 21-Aug-18			
Site:	Brockmoor, Brierley Hill	Plant:	BRO 5 - Mg Treatment				
Units							
Stack diameter(Ds):	m	0.00	0.00				
Stack dimensions(Ds):	m	0.68	0.68				
Stack area(As):	m ²	0.456					
Standard 9096 or 13284:		13284					
Filter ID:		3006	3007	3010			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 5-1	BRO 5-2	BRO 5-B			
Filter weights:							
Tare Test One:		0.14542	Tare Test Two: 0.14542	Blank 0.14723			
Gross Test One:		0.14541	Gross Test Two: 0.14536	0.14722			
mass collected:		0.00000	-0.00006	-0.00001			
Wash Out Weights:							
Tare Test One:		64.91182	Tare Test Two: 45.81266	Blank 60.03898			
Gross Test One:		64.91212	Gross Test Two: 45.81296	60.03912			
mass collected:		0.0003	0.0003	0.0001			
Control Weights:		Test 1	Test 2	Blank			
Mass Change:	Filter:	-0.00003	-0.00003	-0.00003			
Mass Change:	Beaker:	-0.00026	-0.00026	-0.00026			
DGM Cal factor(Yd):		1.0134	1.0189				
Avg Delta H(DH):	Pa	776	852				
Barometric pressure(Pba):	Pa	100600	100600				
Reference pressure(Pri):	Pa	101325					
Avg DGM temp(Tm):	K	297.7	302.7				
Reference temp (Tr):	K	273					
Duct O2(Od):	%						
Ref O2(Or):	%						
Moisture(Bws):	%	1.4	0.83				
Gas vol sampled(Vm):	m ³	0.86	0.91				
Gas vol corrected(Vc):	m ³	0.80	0.83				
Moles Dry Gas(Mdg):	M	36	37				
Particulates collected, (Mass):	mg	0.58	0.53				
Concentration at STP dry(Cm):	mg/m ³	0.73	0.68	0.64			
Concentration at STP wet(Cw):	mg/m ³	0.72	0.68	0.63			
Concentration at ref O2(C-O2):	mg/m ³	0.73		0.64			
Minus Blank:	mg	0.16	0.12				
	mg/m ³	0.21	0.17	0.14			
	mg/m ³	0.20	0.17	0.14			
	mg/m ³	0.21		0.14			
Overall Test Blank	mg	0.42	0.42		% of limit Value		
	mg/m ³	0.52	0.51	0.50	2.6%		
	mg/m ³	0.51	0.50	0.50	2.6%		
	mg/m ³	0.52		0.50	2.6%		
Acetone Blank	mg	0.40	0.40				
	mg/m ³	0.49	0.48	0.48			
	mg/m ³	0.49	0.48	0.47			
	mg/m ³	0.49		0.48			
Emission Limit:	mg/m ³	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Cm):	mg/m ³	0.36	0.34				
Concentration at STP wet(Cw):	mg/m ³	0.35	0.34				
Concentration at ref O2(C-O2):	mg/m ³	0.36	0.34				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		586.3					
After Test One:		595.4					
H2O collected:		9.1	Moles H ₂ O:	0.51			
Before Test Two:		Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
After Test Two:		595.4					
H2O collected:		601.0	Moles H ₂ O:	0.31			
Test DGM readings:	l						
Before Test One:		4258.77	Before Test Two:	5145.37	Metric Millenium Inst		
After Test One:		5120.79	After Test Two:	6051.43	Meter		
Sampled vol :		862.02		906.06			
% Isokinetic		Test One:	Test Two:				
Nozzle Dia:	"	0.3740	0.3740				
Sampl time / point	mins	8	8				
Sample Duration:	mins	32	32				
Theoretical vol @ STP:	m ³	0.814	0.841				
% Isokinetic:		100	In Range	100	In Range		
Number of traverses:		2	2				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse		2	2				
Actual Points / Traverse		2	2				
Standard Uncertainty	+/-	0.32	mg/m3	0.31			
Expanded Uncertainty:	+/-	0.63	mg/m ³	0.61			
% of ELV		3.2		3.1			

Mass Emission without blank correction

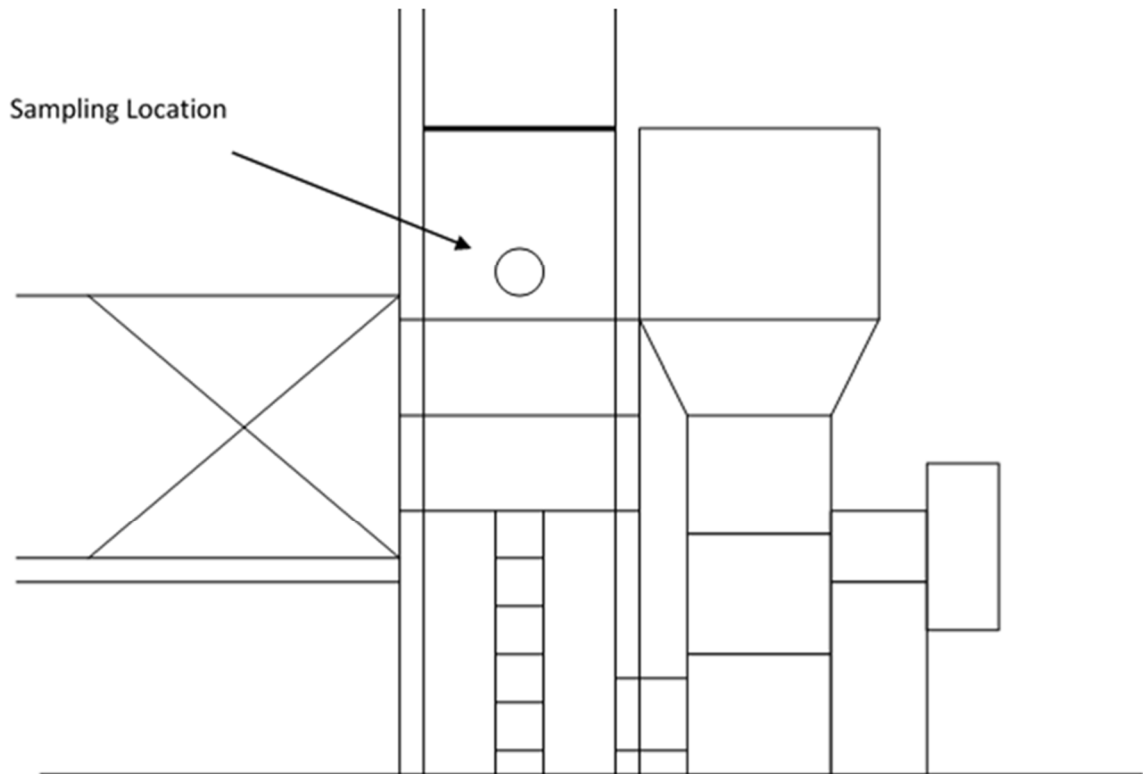
Mass Emission		
Test One	Test Two	
0.72	0.63	
2.0	1.8	mg/s
7.0	6.4	g/hr
56	51	g/8 hr day
0.28	0.26	kg/5 day week
13	12	kg/48 week year

APPENDIX V

Stack Ref.: BRO 7 (A7) Knockout & Thermal Reclamation

Emission Source BRO 7 (A7) Knockout & Thermal Reclamation
 Substances monitored: Particulates
 Arrestment: Dry Bag Filter

Emission Point Description:			13284 / 16911 Compliant
Duct dimensions:	1.29 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	1 x 4 " BSP		✗
Number of sample lines:	One		✗
Arrangement of sample lines:	Not applicable		✗
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓



PARTICULATES		QAF 462, Template Version 3 / May18 / TH									
VELOCITY CALCULATION											
Site: Brockmoor, Brierley Hill		Plant: BRO 7 - KO and Sandplant		Date: 22/08/2018							
Units											
Stack diameter(Ds):	m	1.29									
Stack dimensions(L,W):	m		0.00								
Stack area(As):	m ²	1.307									
Reference temp(Tr):	K	273									
Reference Pressure (Pr):	Pa	101300									
Barometric Pressure (Pb):	mb	1003	100300	Pa							
Static Pressure (Ps):	"H ₂ O	-14.3	-3562	Pa							
	mmH ₂ O		0	Pa							
Pitot coefficient(Cp):		0.84	Note: Use 1 if raw data corrected								
TEST ONE:											
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
	63.1	27.2	188	30		20	14	18	12	15	919
	56.4	24.3	168	31		20					
	41.3	17.8	123	31		21					
	20.4	8.8	61	32		21					
	17.2	7.4	51	32		21					
	32.5	14	97	32		22					
	38.3	16.5	114	32		23		37888		32438	
	36.0	15.5	107	32		23					
		Mean	114	31.5		21.4					
		Std	44.20	0.7							
			Pa	Temp, °C		DGM					
TEST TWO:											
Barometric Pressure (Pb):	mb	1003	100300	Pa							
Static Pressure (Ps):	"H ₂ O	-14.3	-3562	Pa							
	mmH ₂ O		0	Pa							
Pitot coefficient(Cp):		0.844									
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
	64.3	27	189	31		24	13	17	11	15	883
	53.8	22.6	158	31		24					
	39.0	16.4	115	33		25					
	21.2	8.9	62	34		25					
	17.4	7.3	51	36		26					
	30.5	12.8	89	36		26					
	35.2	14.8	103	39		26		36783		31198	
	28.6	12	84	35		27					
		Mean	106	34		25.4					
		Std	43.75	2.5							
			Pa	Temp, °C		DGM					
CONTINUOUS MONITOR CALIBRATION CALCULATIONS											
Test No.	Iso test mgm	Duration mins	Meter mgm	Duration mins	Ave Iso	Ave Meter	Old Gain:	0.602			
1	2.4	40	1.7954	40	1.89	1.83	New Gain:	0.622			
2	1.4	40	1.8673	40							

PARTICULATES		Template Version 4 / Feb15 / TH		Date: 22-Aug-18			
Site:	Brockmoor, Brierley Hill	Plant:	BRO 7 - KO and Sandplant				
Units							
Stack diameter(Ds):	m	1.29	0.65				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m ²	1.307					
Standard 9096 or 13284:		13284					
Filter ID:		3066	3067	3068			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 7-1	BRO 7-2	BRO 7-B			
Filter weights:							
Tare Test One:		0.14886	Tare Test Two: 0.14539	Blank 0.14481			
Gross Test One:		0.14997	Gross Test Two: 0.14588	0.14482			
mass collected:		0.00111	0.00050	0.00001			
Wash Out Weights:							
Tare Test One:		52.03129	Tare Test Two: 48.37562	Blank 48.33098			
Gross Test One:		52.03158	Gross Test Two: 48.37582	48.33112			
mass collected:		0.0003	0.0002	0.0001			
Control Weights:		Test 1	Test 2	Blank			
Mass Change:	Filter:	0.00000	0.00000	0.00000			
Mass Change:	Beaker:	-0.00026	-0.00026	-0.00026			
DGM Cal factor(Yd):		0.9732	0.9732				
Avg Delta H(DH):	Pa	374	355				
Barometric pressure(Pba):	Pa	100300	100300				
Reference pressure(Pp):	Pa	101325					
Avg DGM temp(Tm):	K	294.4	298.4				
Reference temp (Tr):	K	273					
Duct O2(Od):	%						
Ref O2(Or):	%						
Moisture(Bws):	%	1.9	1.6				
Gas vol sampled(Vm):	m ³	0.76	0.77				
Gas vol corrected(Vc):	m ³	0.68	0.68				
Moles Dry Gas(Mdg):	M	30	30				
Particulates collected, (Mass):	mg	1.7	0.96				
Concentration at STP dry(Cm):	mg/m ³	2.4	1.9	1.4			
Concentration at STP wet(Cw):	mg/m ³	2.4	1.9	1.4			
Concentration at ref O2(C-O2):	mg/m ³	2.4		1.4			
Minus Blank:	mg	1.2	0.54				
	mg/m ³	1.8	1.3	0.80			
	mg/m ³	1.8	1.3	0.79			
	mg/m ³	1.8		0.80			
Overall Test Blank	mg	0.42	0.42		% of limit Value		
	mg/m ³	0.61	0.61	0.61	3.1%		
	mg/m ³	0.60	0.60	0.60	3.0%		
	mg/m ³	0.61	0.61	0.61	3.1%		
Acetone Blank	mg	0.40	0.40				
	mg/m ³	0.59	0.58	0.59			
	mg/m ³	0.58	0.58	0.58			
	mg/m ³	0.59	0.59	0.59			
Emission Limit:	mg/m ³	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Cm):	mg/m ³	0.42	0.42				
Concentration at STP wet(Cw):	mg/m ³	0.41	0.41				
Concentration at ref O2(C-O2):	mg/m ³	0.42	0.42				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		590.0					
After Test One:		590.3					
H2O collected:		10.3	Moles H ₂ O: 0.57				
Before Test Two:		590.3					
After Test Two:		598.9					
H2O collected:		8.6	Moles H ₂ O: 0.48				
Test DGM readings:	m ³						
Before Test One:		808.000	Before Test Two: 808.774	Imperial Apex 572			
After Test One:		808.757	After Test Two: 809.541	Meter			
Sampled vol :		0.757	0.767				
% Isokinetic		Test One:	Test Two:				
Nozzle Dia:	"	0.2185	0.2185				
Sampl time / point	mins	5	5				
Sample Duration:	mins	40	40				
Theoretical vol @ STP:	m ³	0.680	0.654				
% Isokinetic:		102	In Range	105	In Range		
Number of traverses:		1	1				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse		4	4				
Actual Points / Traverse		8	8				
Standard Uncertainty	+/-	0.38	mg/m3 0.37				
Expanded Uncertainty:	+/-	0.75	mg/m ³ 0.75				
% of ELV		3.8	3.7				

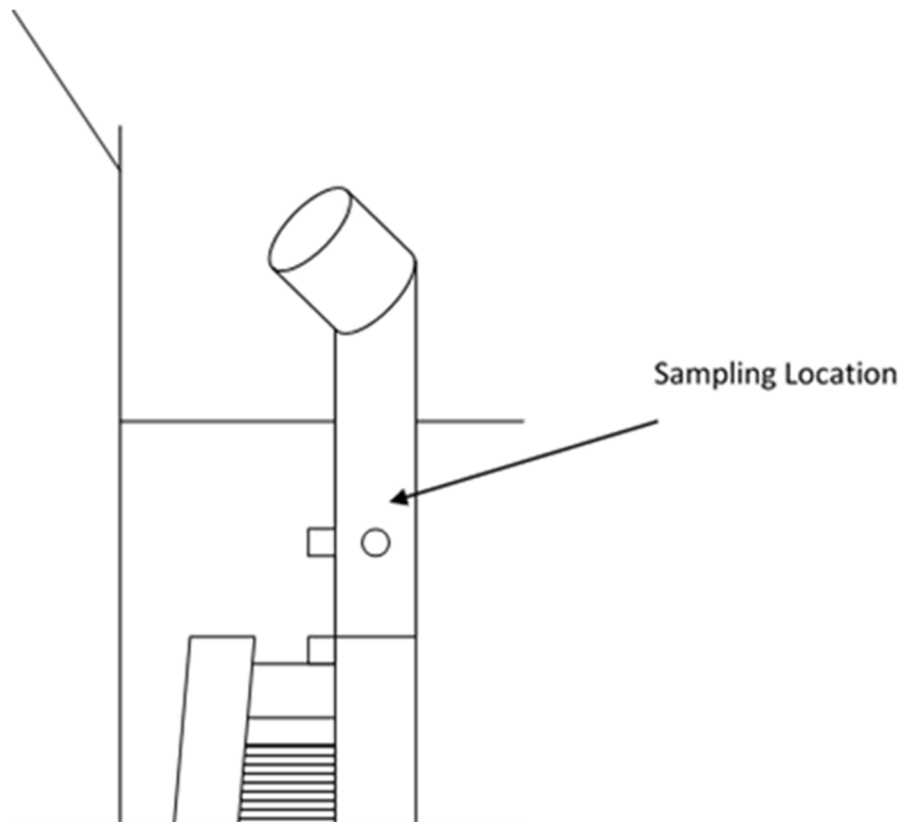
Mass Emission		
Test One	Test Two	
2.4	1.4	
37	20	mg/s
132	74	g/hr
1056	589	g/8 hr day
5.3	2.9	kg/5 day week
254	141	kg/48 week year

APPENDIX VI

**Stack Ref.: BRO 28 Megaldi Cast/Cool
(A28) LH Vent**

Emission Source BRO 28 (A28) Megaldi Cast/Cool LH Vent
 Substances monitored: Particulates
 Arrestment: Dry Bag Filter

Emission Point Description:			13284 / 16911 Compliant
Duct dimensions:	0.63 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓



PARTICULATES		QAF 462_Template Version 3 / May18 / TH										
VELOCITY CALCULATION												
Site:	Brockmoor, Brierley Hill		Plant:	BRO28 - Megaldi LH Vent			Date:	21/08/2018				
Units												
Stack diameter(Ds):	m	0.63										
Stack dimensions(L,W):	m				0.00							
Stack area(As):	m ²	0.312										
Reference temp(Tr):	K	273										
Reference Pressure (Pr):	Pa	101300										
Barometric Pressure (Pb):	mb	1006	100600	Pa								
Static Pressure (Ps):	"H ₂ O		0	Pa								
	mmH ₂ O		6.2	Pa								
Pitot coefficient(Cp):		0.836	Note: Use 1 if raw data corrected									
TEST ONE:												
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min	
	74.9	32.0	219.3	35		19	16	5.1	14	4.5	267	
	74.9	32.0	219.3	37		20						
	36.5	15.6	106.9	38		20						
	35.1	15.0	102.8	38		21		Vol Flow		Vol Flow		
	30.9	13.2	90.5	38		21		cfm		cfm		
	31.4	13.4	91.8	36		22						
	74.9	32.0	219.3	35		22		10765		9435		
	74.9	32.0	219.3	35		23						
		Mean	159	36.5		21.0						
		Std	60.86	1.3								
			Pa	Temp, °C		DGM						
TEST TWO:												
Barometric Pressure (Pb):	mb	1006	100600	Pa								
Static Pressure (Ps):	"H ₂ O		0	Pa								
	mmH ₂ O		6.2	Pa								
Pitot coefficient(Cp):		0.836										
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min	
	31.5	13.4	91.8	39		25	16	5.1	14	4.4	266	
	31.0	13.2	90.5	39		24						
	75.2	32	219.3	39		25						
	75.2	32	219.3	38		25		Vol Flow		Vol Flow		
	75.2	32	219.3	39		25		cfm		cfm		
	75.2	32	219.3	40		26						
	36.2	15.4	105.6	41		26		10800		9379		
	34.8	14.8	101.4	40		27						
		Mean	158	39		25.4						
		Std	61.17	0.9								
			Pa	Temp, °C		DGM						

PARTICULATES		Template Version 4 / Feb15 / TH					
Site: Brockmoor, Brierley Hill		Plant:	BRO28 - Megaldi LH Vent				
		Date:	21-Aug-18				
Units							
Stack diameter(Ds):	m	0.63	0.32				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m ²	0.312					
Standard 9096 or 13284:		13284					
Filter ID:		3060	3061	3062			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 28-1	BRO 28-2	BRO 28-B			
Filter weights:				Blank			
Tare Test One:		0.14709	Tare Test Two: 0.14484	0.14654			
Gross Test One:		0.14775	Gross Test Two: 0.14549	0.14658			
mass collected:		0.00065	0.00065	0.00004			
Wash Out Weights:				Blank			
Tare Test One:		50.86882	Tare Test Two: 48.05852	52.26648			
Gross Test One:		50.86932	Gross Test Two: 48.05890	52.26646			
mass collected:		0.0005	0.0004	0.0000			
Control Weights:		Test 1	Test 2	Blank			
Mass Change:	Filter:	-0.00001	-0.00001	-0.00001			
Mass Change:	Beaker:	-0.00026	-0.00026	-0.00026			
DGM Cal factor(Yd):		0.9733	0.9733				
Avg Delta H(DH):	Pa	531	532				
Barometric pressure(Pba):	Pa	100600	100600				
Reference pressure(Pr):	Pa	101325	294.0	298.4			
Avg DGM temp(Tm):	K						
Reference temp (Tr):	K	273					
Duct O2(Od):	%						
Ref O2(Or):	%						
Moisture(Bws):	%	1.41	1.05				
Gas vol sampled(Vm):	m ³	0.74	0.75				
Gas vol corrected(Vc):	m ³	0.67	0.67				
Moles Dry Gas(Mdg):	M	29.82	29.78				
Particulates collected, (Mass):	mg	1.4	1.3				
Concentration at STP dry(Om):	mg/m ³	2.1	2.0				
Concentration at STP wet(Cw):	mg/m ³	2.1	2.0				
Concentration at ref O2(C-O2):	mg/m ³	2.1	1.9				
Minus Blank:	mg	1.1	1.0				
	mg/m ³	1.7	1.6				
	mg/m ³	1.7	1.6				
	mg/m ³	1.7	1.5				
Overall Test Blank	mg	0.29	0.29	% of limit Value			
	mg/m ³	0.43	0.43	2.2%			
	mg/m ³	0.43	0.43	2.1%			
	mg/m ³	0.43	0.43	2.2%			
Acetone Blank	mg	0.23	0.23				
	mg/m ³	0.35	0.35				
	mg/m ³	0.34	0.35				
	mg/m ³	0.35	0.35				
Emission Limit:	mg/m ³	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Om):	mg/m ³	0.43	0.43				
Concentration at STP wet(Cw):	mg/m ³	0.42	0.42				
Concentration at ref O2(C-O2):	mg/m ³	0.43	0.43				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		585.1					
After Test One:		592.8					
H2O collected:		7.7	Moles H ₂ O: 0.43				
Before Test Two:		592.8					
After Test Two:		598.5					
H2O collected:		5.7	Moles H ₂ O: 0.32				
Test DGM readings:	m ³						
Before Test One:		804.765	Before Test Two: 805.510	Imperial Apex 572			
After Test One:		805.505	After Test Two: 806.261	Meter			
Sampled vol :		0.740	0.750				
% Isokinetic		Test One:	Test Two:				
Nozzle Dia:	"	0.2185	0.2185				
Sampl time / point	mins	8	8				
Sample Duration:	mins	32	32				
Theoretical vol @ STP:	m ³	0.663	0.660				
% Isokinetic:		102	In Range	102	In Range		
Number of traverses:		2	2				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse		2	2				
Actual Points / Traverse		2	2				
Standard Uncertainty	+/-	0.38	mg/m3	0.38			
Expanded Uncertainty:	+/-	0.77	mg/m ³	0.77			
% of ELV		3.8		3.8			

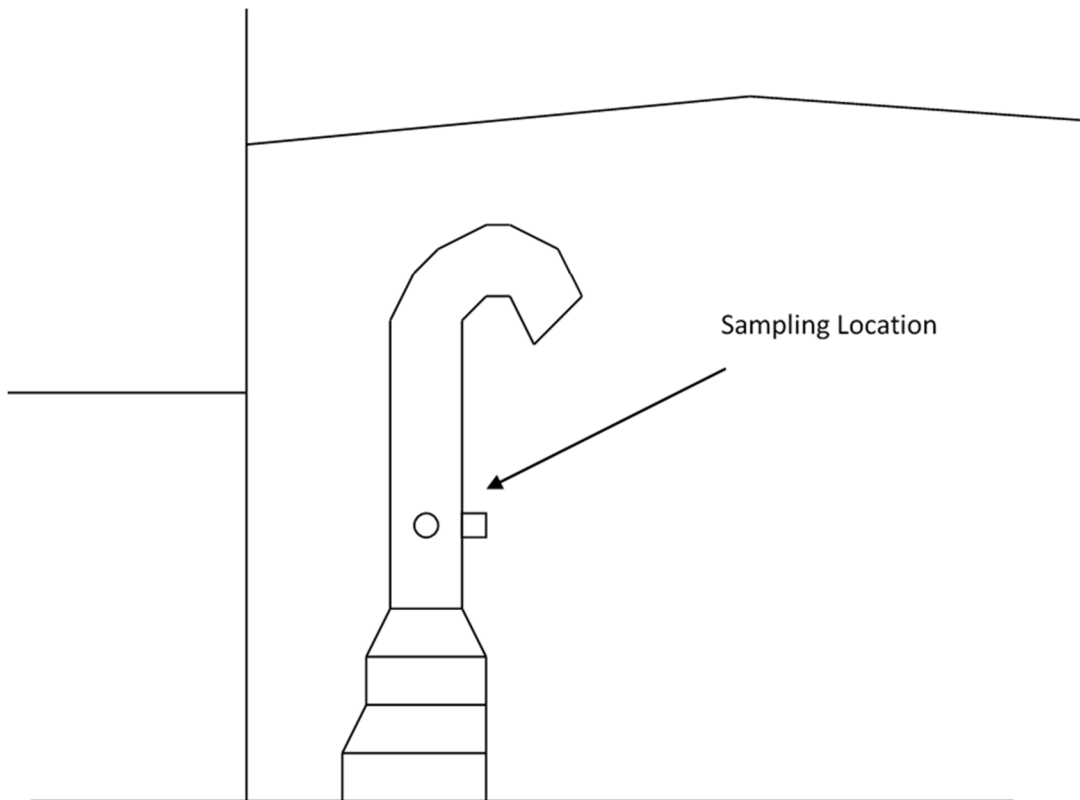
Mass Emission without blank correction	
Test One	Test Two
2.1	1.9
9.4	8.5
34	31
270	245
1.3	1.2
65	59

APPENDIX VII

**Stack Ref.: BRO 29 Megaldi Cast/Cool
(A29) RH Vent**

Emission Source BRO 29 (A29) Megaldi Cast/Cool RH Vent
 Substances monitored: Particulates
 Arrestment: Dry Bag Filter

Emission Point Description:			13284 / 16911 Compliant
Duct dimensions:	0.63 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓



PARTICULATES		QAF 462, Template Version 3 / May18 / TH									
VELOCITY CALCULATION											
Site:	Brockmoor, Brierley Hill		Plant:	BRO 29 - Megaldi RH Vent			Date:	21/08/2018			
Units											
Stack diameter(Ds):	m	0.63									
Stack dimensions(L,W):	m				0.00						
Stack area(As):	m ²	0.312									
Reference temp(Tr):	K	273									
Reference Pressure (Pr):	Pa	101300									
Barometric Pressure (Pb):	mb	1006	100600	Pa							
Static Pressure (Ps):	"H ₂ O		0	Pa							
	mmH ₂ O	7	69	Pa							
Pitot coefficient(Cp):		0.836	Note: Use 1 if raw data corrected								
TEST ONE:											
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
	53.4	46	315	33		26	26	8.2	23	7.3	437
	53.4	46	315	34		27					
	90.5	78	535	33		27					
	88.2	76	521	33		28					
	55.7	48	329	33		28					
	55.7	48	329	32		28					
	76.6	66	452	30		29		17370		15445	
	78.9	68	466	29		29					
		Mean	408	32.1		27.8					
		Std	89.30	1.6							
			Pa	Temp, °C		DGM					
TEST TWO:											
Barometric Pressure (Pb):	mb	1005.5	100550	Pa							
Static Pressure (Ps):	"H ₂ O		0	Pa							
	mmH ₂ O	7	69	Pa							
Pitot coefficient(Cp):		0.836									
	Delta Hs (mm)	Pitot mm H ₂ O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m ³ /s	STP V(m/s)	Vol Flow m ³ /s	Vol Flow m ³ /min
✓	53.8	46	315	36		28	26	8.2	23	7.2	430
✓	56.2	48	329	35		28					
✓	74.9	64	439	36		29					
✓	74.9	64	439	37		29					
✓	51.5	44	302	38		30					
✓	51.5	44	302	38		30					
✓	93.6	80	548	36		31		17320		15187	
✓	91.3	78	535	34		31					
		Mean	401	36		29.5					
		Std	96.63	1.3							
			Pa	Temp, °C		DGM					

PARTICULATES		Template Version 4 / Feb15 / TH					
Site:	Brockmoor, Brierley Hill	Plant:	BRO 29 - Megaldi RH Vent		Date:	21-Aug-18	
Units							
Stack diameter(Ds):	m	0.63	0.32				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m ²	0.312					
Standard 9096 or 13284:		13284					
Filter ID:		3003	3004	3005			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 29-1	BRO 29-2	BRO 29-B			
Filter weights:				Blank			
Tare Test One:		0.14802	Tare Test Two: 0.15024	0.15265			
Gross Test One:		0.14997	Gross Test Two: 0.15344	0.15263			
mass collected:		0.00195	0.00320	-0.00002			
Wash Out Weights:				Blank			
Tare Test One:		61.59518	Tare Test Two: 47.80412	50.13356			
Gross Test One:		61.59538	Gross Test Two: 47.80483	50.13352			
mass collected:		0.0002	0.0007	0.0000			
Control Weights:		Test 1	Test 2	Blank			
Mass Change:	Filter:	-0.00003	-0.00003	-0.00003			
Mass Change:	Beaker:	-0.00026	-0.00026	-0.00026			
DGM Cal factor(Yd):			0.9741	0.9747			
Avg Delta H(DH):	Pa		677	671			
Barometric pressure(Pba):	Pa		100600	100550			
Reference pressure(P _r):	Pa	101325					
Avg DGM temp(T _m):	K		300.8	302.5			
Reference temp (Tr):	K	273					
Duct O ₂ (O _d):	%						
Ref O ₂ (O _r):	%						
Moisture(Bws):	%		1.1	0.74			
Gas vol sampled(V _m):	m ³		0.85	0.86			
Gas vol corrected(V _c):	m ³		0.75	0.75			
Moles Dry Gas(M _{dg}):	M		34	34			
Particulates collected, (Mass):	mg		2.4	4.2			
Concentration at STP dry(C _m):	mg/m ³		3.2	4.4	5.6		
Concentration at STP wet(C _w):	mg/m ³		3.2	4.4	5.5		
Concentration at ref O ₂ (C-O ₂):	mg/m ³		3.2		5.6		
Minus Blank:	mg		2.2	4.0			
	mg/m ³		2.9	4.1	5.3		
	mg/m ³		2.9	4.1	5.2		
	mg/m ³		2.9		5.3		
Overall Test Blank	mg		0.23	0.23		% of limit Value	
	mg/m ³		0.31	0.31	0.31	1.5%	1.5%
	mg/m ³		0.30	0.31	0.31	1.5%	1.5%
	mg/m ³		0.31	0.31	0.31	1.5%	1.5%
Acetone Blank	mg		0.22	0.22			
	mg/m ³		0.29	0.29	0.29		
	mg/m ³		0.29	0.29	0.29		
	mg/m ³		0.29		0.29		
Emission Limit:	mg/m ³	20					
Test Detection limit:							
Particulates collected, (Mass):	mg		0.29	0.29			
Concentration at STP dry(C _m):	mg/m ³		0.38	0.38			
Concentration at STP wet(C _w):	mg/m ³		0.37	0.38			
Concentration at ref O ₂ (C-O ₂):	mg/m ³		0.38	0.38			
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		581.3					
After Test One:		588.1					
H ₂ O collected:		6.8	Moles H ₂ O:	0.38			
Before Test Two:		588.1	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5
After Test Two:		592.6					
H ₂ O collected:		4.5	Moles H ₂ O:	0.25			
Test DGM readings:	m ³						
Before Test One:		806.2686	Before Test Two:	807.1330	Imperial Apex 572		
After Test One:		807.1222	After Test Two:	807.9905	Meter		
Sampled vol :		0.8536		0.8575			
% Isokinetic		Test One:		Test Two:			
Nozzle Dia:	"	0.1820		0.1820			
Sampl time / point	mins	8		8			
Sample Duration:	mins	32		32			
Theoretical vol @ STP:	m ³	0.754		0.741			
% Isokinetic:		101	In Range	102	In Range		
Number of traverses:		2		2			
Theoretical Number of Traverses:		2		2			
Theoretical Points / Traverse		2		2			
Actual Points / Traverse		2		2			
Standard Uncertainty	+/-	0.34	mg/m3	0.36			
Expanded Uncertainty:	+/-	0.69	mg/m ³	0.71			
% of ELV		3.4		3.6			

Mass Emission without blank correction		
	3.2	5.5
Mass Emission		
Test One	Test Two	
23	40	mg/s
84	143	g/hr
671	1141	g/8 hr day
3.4	5.7	kg/5 day week
161	274	kg/48 week year