

1st Quarter Emissions Testing Report 2017

OneSteel Recycling Hexham



NATA ACCREDITATION No. 2778 (14391)
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1st Quarter Emissions Testing Report 2017

OneSteel Recycling Hexham

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Reviewed by Paul Wenta

NATA Signatory James Lang



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Rev	Revision Date	Details	Authorised	
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1.0 Introduction

AECOM was appointed by OneSteel Recycling Pty Ltd to conduct a series of measurements to determine air emissions from the Shredder Bag house Stack (EPL Point 1) at the Hexham facility. Measurements were required for NSW EPA licence compliance (EPL No. 5345).

Testing was undertaken on 9 February 2017 to investigate emission concentrations for the following parameters:

- Fine Particulates (PM₁₀);
- Total Particulate (TP); and
- Hazardous Substances (Metals) including Lead and Mercury.

Laboratory analysis was undertaken by the following laboratories which hold NATA accreditation for the specified tests:

- Steel River Testing, laboratory NATA accreditation number 18079, performed the following analysis detailed in report number 13017-0-M & 13017-0-P:
 - Total Particulate (TP);
 - Fine Particulates (PM₁₀); and
 - Moisture.
- SGS Leeder Consulting laboratory NATA accreditation number 14429, performed the following analysis detailed in report number ME301905:
 - Hazardous Substances (Metals).

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2.0 Sampling Plane Requirements

The criteria for sampling planes are specified in AS 4323.1-1995 (R2014).

Table 1 Criteria for Selection of Sampling Planes (AS 4323.1)

Type of flow disturbance	Minimum distance upstream from disturbance, diameters (D)	Minimum distance downstream from disturbance, diameters (D)
Bend, connection, junction, direction change	>2D	>6D
Louvre, butterfly damper (partially closed or closed)	>3D	>6D
Axial fan	>3D	>8D (see Note)
Centrifugal fan	>3D	>6D

NOTE: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in Items (a) to (f) below.

- a. *The gas flow is basically in the same direction at all points along each sampling traverse;*
- b. *The gas velocity at all sampling points is greater than 3 m/s;*
- c. *The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15° to the duct axis, when measured near the periphery of a circular sampling plane;*
- d. *The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean;*
- e. *The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane should not exceed 1.6:1; and*
- f. *The gas temperature at the sampling plane should preferably be above the dewpoint.*

With the exception of point 'b', the sampling plane was in accordance with AS4323.1. The gas stream velocities at each sampling point were found to be 2.5 m/s. Please note that the bag house was not running at full capacity at the time of testing.

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3.0 Methodology

3.1 NATA Accredited Methods

The following methods are accredited with the National Association of Testing Authorities (NATA) (accreditation number 2778 (14391)) and are approved for the sampling and analysis of gases. Specific details of the methods are available on request.

All sampling and analysis is conducted according to the methods in **Table 2**.

Table 2 AECOM NATA Endorsed Methods

NSW EPA Approved Methods	USEPA Methods	Method Title
AS4323.1 (NSW EPA TM-1)	USEPA (2000) Method 1	Selection of sampling positions
AS4323.2 (NSW EPA TM-15)	USEPA (2000) Method 5 under approved circumstances	Determination of total particulate matter – isokinetic manual sampling – gravimetric method
NSW EPA TM-2	USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate)	Determination of stack gas velocity and volumetric flow rate (type s pitot tube)
NSW EPA TM-22	USEPA (2000) Method 4	Determination of moisture content in stack gases
NSW EPA TM-23	USEPA (2000) Method 3	Gas analysis for the determination of dry molecular weight
NSW EPA OM-5	USEPA (1997) Method 201 or 201A (as appropriate)	Determination of PM ₁₀ emissions
NSW EPA TM-12,13 and 14	USEPA Method 29	Determination of metal emissions from stationary sources

All parameters are reported adjusted to 0°C at 1 atmosphere and dry gas.

3.2 Equipment Calibration

AECOM has a calibration schedule to ensure the emission testing equipment is maintained in good order and with known calibration. Equipment used in this project was calibrated according to the procedures and frequency identified in the AECOM calibration schedule. Details of the schedule and the calibration calculations are available on request.

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4.0 Sampling Location

4.1 Sampling Location Summary

Table 3 provides a summary of the location sampled by AECOM on 9 February 2017.

Table 3 Sampling Location Summary

Discharge Description	Shredder Baghouse Stack (EPL Point 1)
Duct Shape	Circular
Construction Material	Metal
Duct Diameter (mm)	760
Minimum No. Sampling Points	12
Sampling Ports	2
Min. Points/Traverse	6
Disturbance	No
Distance from Upstream Disturbance	6.6D
Type of Disturbance	Bend
Distance from Downstream Disturbance	2.6D
Type of Disturbance	Stack Exit
Ideal Sampling Location	Yes ²
Correction Factors Applied	No
Total No. Points Sampled	12
Points/Traverse	6
Sampling Performed to Standard ¹	Yes ²

¹ AS 4323.1 Section 4.1

² The sampling location was ideal in terms of flow disturbances, but did not comply with AS 4323.1 point b) as the corrected velocity of the gas at all sampling points was found to be 2.5 m/s (minimum 3m/s).

D = Diameters

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5.0 Results

A summary of air emission test results is shown in **Table 4**. Detailed results along with gas stream properties during the testing period can be found in **Table 5**. Speciated Hazardous Substances (Metals) results are presented in **Table 6**. Emission concentrations are converted to standard conditions of 0°C, dry gas and 1 atm pressure for comparison with regulatory limits.

Field sheets and final calculations recorded during the project are attached as **Appendix A**. Laboratory reports can be referred to in **Appendix B**.

AECOM has a calculated limit of uncertainty in regards to results. The estimation of measurement uncertainty in source testing is conducted to provide an indication of the precision of the measurement result and a degree of confidence in the range of values the reported result may represent. The measurement of uncertainty has been calculated at $\pm 13.6\%$.

Table 4 Shredder Baghouse Emission Results Summary, 9 February 2017

Parameter	Emission Concentration (EPL Point 1)	Emission Concentration Limit
Total Particulate (TP) (mg/m ³)	14	100
Fine Particulate (PM ₁₀) (mg/m ³)	0.84	NA
Lead (mg/m ³)	<0.44	5.0
Mercury (mg/m ³)	0.00048	1.0
Total Hazardous Substances (Metals) (mg/m ³)	0.018	NA

Results from testing conducted on EPL Point 1 on 9 February 2017 are below the regulatory limits listed in EPL 5345.

Table 5 Fine Particulate (PM₁₀), Total Particulate and Hazardous Substance (Metals) Results, 9 February 2017

Sampling Conditions:		
Stack internal diameter at test location	760 mm	
Stack gas temperature (average)	29.5 °C	302.7 K
Stack pressure (average)	1018 hPa	
Stack gas velocity (average, stack conditions)	2.5 m/s	
Stack gas flowrate (stack conditions)	1.1 m ³ /s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	0.98 m ³ /s	
Fine Particulate (PM₁₀) Testing		
Test Period	11:43 -	14:00
Fine Particulate (PM ₁₀) Mass	0.8 mg	
Gas Volume Sampled	0.951 m ³	
Fine Particulate (PM ₁₀) Emission* ¹	0.84 mg/m ³	
Fine Particulate (PM ₁₀) Mass Emission Rate* ²	0.82 mg/s	
Regulatory Limit	NA mg/m ³	
Total Particulate Testing		
Test Period	11:43 -	14:00
Total Particulate Mass	12.7 mg	
Gas Volume Sampled	0.894 m ³	
Total Particulate Emission* ¹	14 mg/m ³	
Total Particulate Mass Emission Rate* ²	14 mg/s	
Regulatory Limit	100 mg/m ³	
Hazardous Substances (Metals) Testing		
Test Period	11:43 -	14:00
Hazardous Substances (Metals) Mass	0.021 mg	
Gas Volume Sampled	1.15 m ³	
Hazardous Substances (Metals) Emission* ¹	0.018 mg/m ³	
Hazardous Substances (Metals) Mass Emission Rate* ²	0.017 mg/s	
Regulatory Limit	NA	
Moisture Content (%)	2.9	
Gas Density (dry at 1 atmosphere)	1.29 kg/m³	
Dry Molecular Weight	28.8 g/g-mole	

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post-test sampling flow measurements and the respective test moisture content. See Q_{std} in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

Table 6 Hazardous Substances (Metals) Elemental Analysis Results, 9 February 2017

Sample	Total Particulate Metals (mg)	Total Particulate Metals (mg/m ³)	Total Gaseous Metals (mg)	Total Gaseous Metals (mg/m ³)	Total Oxidisable Mercury (mg)	Total Oxidisable Mercury (mg/m ³)	Total (mg)	Total (mg/m ³)	Mass Emission Rate (mg/s)
Antimony	<0.0002	<0.00017	0.00025	0.00022			0.00025	0.00022	0.00021
Arsenic	0.0001	0.000087	<0.0001	<0.000087			0.0001	0.000087	0.000084
Beryllium	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Cadmium	0.013	0.011	0.0017	0.0015			0.015	0.013	0.013
Chromium	0.0002	0.00017	0.00035	0.00031			0.0006	0.00052	0.0005
Cobalt	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Copper	<0.0002	<0.00017	0.0021	0.0018			0.0021	0.0018	0.0017
Lead	<0.3104	<0.27	<0.51	<0.44			<0.51	<0.44	<0.43
Magnesium	0.037	0.032	0.026	0.023			0.06	0.052	0.05
Manganese	<0.0038	<0.0033	<0.005	<0.0044			<0.005	<0.0044	<0.0043
Mercury	<0.0003	<0.00026	<0.0001	<0.000087	0.00055	0.00048	0.00055	0.00048	0.00047
Nickel	0.0001	0.000087	0.0028	0.0024			0.003	0.0026	0.0025
Selenium	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Thallium	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Tin	0.0002	0.00017	0.00085	0.00074			0.001	0.00087	0.00084
Vanadium	<0.0023	<0.002	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Zinc	0.68	0.59	0.0033	0.0029			0.7	0.61	0.59
Total Hazardous Metals*	0.013	0.011	0.0051	0.0044	0.00055	0.00048	0.021	0.018	0.017
Total Metals	0.73	0.63	0.037	0.033			0.78	0.68	0.66

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

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Appendix A

Field Sheets (17 pages)

Appendix A Field Sheets (17 pages)

Emission Measurement Calculations Spreadsheet**OneSteel Hexham**

AECOM's Project Number: 60493017

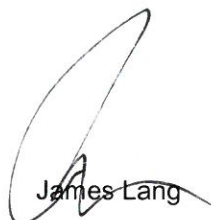
Emission Source: Shredder Stack

Date Sampled: 9-Feb-17

ANALYTE(S)	METHOD
Fine Particulate (PM10)	NSW EPA OM - 5
Total Particulate	NSW EPA TM - 15
Hazardous Substances (Metals)	NSW EPA TM - 12, 13 & 14

Observations made during testing period:
Large pause in test due to plant issues

Sampling Performed By:



James Lang



Dylan Turnbull

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Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - PRE-SAMPLING

Date: 9-Feb-17
 Client: OneSteel Hexham
 AECOM's Project No: 60493017
 Stack/Duct Description: Shredder Stack
 Test 1: Fine Particulate (PM10)
 Test 2: Total Particulate
 Test 3: Hazardous Substances (Metals)

Measurement/Observations					
Stack Internal Dimensions:					
Diameter		760 mm		Cross Sectional Area :	0.45 m ²
OR	Length	Width			
Length/Width (mm)				Minimum No. of	
Equivalent Diameter	N/A	mm		sampling points=	
				12	
Distance from sampling plane to nearest disturbances:				Total No. of sampling points =	
				12	
Upstream (m) =				5	
No. Diameters =				6.6	
Type of Upstream Disturbance:				Fan Entry	
Downstream (m) =				2	
No. Diameters =				2.6	
Type of Down Stream Disturbance:				Stack Exit	
Position of each sampling point, for each traverse:				Exclusion of any sample point numbers - comments:	
A		B		PM10/2.5 A	
PM2.5/10 B					
No.	Distance from wall	S-type Pitot distances	Distance from wall	S-Type Pitot distances	
1	33	3	33	3	
2	111	81	111	81	
3	225	195	225	195	
4	535	505	535	505	
5	649	619	649	619	
6	727	697	727	697	
7					
8					
9					
10					
11				Check of total points against minimum, (yes/no) - comments:	
12					
13					
14					
15					
16					
17					
18					
19					
20					
Signed: <i>C. Bullmond</i>				Checked: <i>[Signature]</i>	
				General Comments:	

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Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - GAS COMPOSITION AND DENSITY PRE-SAMPLING

Date: 9-Feb-17
 Client: OneSteel Hexham
 AECOM's Project No: 60493017
 Stack/Duct Description: Shredder Stack
 Test 1: Fine Particulate (PM10)
 Test 2: Total Particulate
 Test 3: Hazardous Substances (Metals)

Sampling time start: 11:35		Sampling port No.: 1		
Measurement No.	Time sampled	CO (ppm), (dry)	O ₂ (%), (dry)	CO ₂ (%), (dry)
1	11:35	0	20.9	0.0
2	11:36	0	20.9	0.0
3	11:37	0	20.9	0.0
4	11:38	0	20.9	0.0
5	11:39	0	20.9	0.0
6	11:40	0	20.9	0.0
7	11:41	0	20.9	0.0
8	11:42	0	20.9	0.0
Averages:		0.0 ppm	20.9 %	0.0 %

Moisture content (M3): 0.98
 Moisture percentage (M2): 1.90 %

Measurements

CO: 0.0000 %,(dry)	N ₂ : 79.1 %,(dry)
CO ₂ : 0.0 %,(dry)	O ₂ : 20.9 %,(dry)
Gas Compositions converted to wet basis:	
CO: 0.0000 %,(wet)	N ₂ : 77.6 %,(wet)
CO ₂ : 0.0 %,(wet)	O ₂ : 20.5 %,(wet)
H ₂ O: 1.90 % (=M2)	
Therefore, stack gas density (GD) = 1.28 kg/m ³ (0°C, wet, 1 atm pressure)	
Therefore, stack gas density (GD) = 1.29 kg/m ³ (0°C, dry, 1 atm pressure)	

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Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - GAS COMPOSITION AND DENSITY POST-SAMPLING

Date: 9-Feb-17
 Client: OneSteel Hexham
 AECOM's Project No: 60493017
 Stack/Duct Description: Shredder Stack
 Test 1: Fine Particulate (PM10)
 Test 2: Total Particulate
 Test 3: Hazardous Substances (Metals)

Sampling time start: 13:53		Sampling port No.: 1			
Measurement No.	Time sampled	CO (ppm). (dry)	O ₂ (%), (dry)	CO ₂ (%), (dry)	
1	13:53	0	20.9	0.0	
2	13:54	0	20.9	0.0	
3	13:55	0	20.9	0.0	
4	13:56	0	20.9	0.0	
5	13:57	0	20.9	0.0	
6	13:58	0	20.9	0.0	
7	13:59	0	20.9	0.0	
8	14:00	0	20.9	0.0	
Averages:		0.0 ppm	20.9 %	0.0 %	

Moisture content (M3): 0.97
 Moisture percentage (M2): 2.77 %

Measurements

CO: 0.0000 %,(dry)	N ₂ : 79.1 %,(dry)
CO ₂ : 0.0 %,(dry)	O ₂ : 20.9 %,(dry)
Gas Compositions converted to wet basis:	
CO: 0.0000 %,(wet)	N ₂ : 76.9 %,(wet)
CO ₂ : 0.0 %,(wet)	O ₂ : 20.3 %,(wet)
H ₂ O: 2.77 % (=M2)	
Therefore, stack gas density (GD) = 1.27 kg/m ³ (0°C, wet, 1 atm pressure)	
Therefore, stack gas density (GD) = 1.29 kg/m ³ (0°C, dry, 1 atm pressure)	

Stack Analysis - Pre Sampling Pitot Tube and Temperature Traverses

Date: 9-Feb-17
 Client: OneSteel Hexham
 AECOM's Project No: 60493017
 Stack/Duct Description: Shredder Stack
 Test 1: Fine Particulate (PM10)
 Test 2: Total Particulate
 Test 3: Hazardous Substances (Metals)

Time :	11:25	Barometric Pressure :	1018	hPa	
Page No. :	1 of 1	Pitot Correction Factor :	0.84		
Sampling Port No:	1 to 2	Stack Gas Density:	1.28	kg/m ³	
Pitot Tube Type :	S	(0 °C, Wet, 1 Atm)			
Sampling Position No.	Distance from far wall (mm)	Max. Differential Pressure ΔP , kilo Pascals	Max Temp. °C	Max Temp. (Ts) K	Corrected Velocity (Vs) m/s
1/1	3	0.005	28.0	301.2	2.4
1/2	81	0.005	28.0	301.2	2.4
1/3	195	0.005	28.0	301.2	2.4
1/4	505	0.005	28.0	301.2	2.4
1/5	619	0.005	28.0	301.2	2.4
1/6	697	0.005	28.0	301.2	2.4
2/1	3	0.005	28.0	301.2	2.4
2/2	81	0.005	28.0	301.2	2.4
2/3	195	0.005	28.0	301.2	2.4
2/4	505	0.005	28.0	301.2	2.4
2/5	619	0.005	28.0	301.2	2.4
2/6	697	0.005	28.0	301.2	2.4
Average			28.0	301.2	2.4

Static Pressure (Dwyer) (Pa): kPa
 Static Pressure (U-tube, if required) : 0.5 mm
 Absolute pressure in stack (hPa) : 1018.05 hPa

STACK ANALYSIS

SAMPLING OF FINE PARTICULATE (PM10)

Date: 9-Feb-17
Client: OneSteel Hexham
AECOM's Project No.: 60493017
Stack Description No.: Shredder Stack
Sample Nozzle No.: fine10
Sampling Port No.: 1 to 2
Page No.: 1 of 1
Sample Nozzle Area (An): 5.89 x 10^-5 m^2
Thimble No: T480
Blank thimble No: 0

Leak Check (Pre-Sampling)

Leak Check (Post Sampling)

Meter start: 5334.7200 Meter finish: 5334.7200 Meter start: 5335.8002 Meter finish: 5335.8002
Time start: 11:05 Time finish: 11:06 Time start: 14:01 Time finish: 14:02

Therefore, leakage rate = no leak L/min Therefore, leakage rate = no leak L/min

(>0.1 l/min. is unacceptable) (>0.1 l/min. is unacceptable)

Repeat: Repeat:
Comments: Comments:

Sampling Record Table

Barometric Pressure: 1018 hPa (start); 1018 hPa (finish)
Meter start: 5334.7238 Time start: 11:43
Meter correction factor (GMf) : 1.0000

Table with 8 columns: Sampling Position No., Stopwatch Time at Sampling Position, Distance from far wall (mm), Isokinetic Flowrate (L/min), Meter Inlet Temp. (°C), Meter Outlet Temp. (°C), Impinger Train Outlet Temp (°C), Flowrate Attained (Y/N). Rows include data for 1/1 to 1/6, 2/1 to 2/6, and an Averages row.

Meter Finish: 5335.7975 Time Finish: 14:00
Total Condensate collected: 8 ml Silica gel No(s) used: P32

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Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS

SAMPLING OF TOTAL PARTICULATE

Date: 9-Feb-17

Client: OneSteel Hexham

AECOM's Project No: 60493017

Stack Description No.: Shredder Stack

Sample Nozzle No.: S6 Sample Nozzle Area (An): 9.16 x 10^-5 m^2

Sampling Port No.: 1 to 2 Thimble No: T485

Page No: 1 of 1 Blank thimble No:

Leak Check (Pre-Sampling)

Meter start: 208.3542 Meter finish: 208.3542

Time start: 11:07 Time finish: 11:08

Leak Check (Post Sampling)

Meter start: 209.3770 Meter finish: 209.3770

Time start: 14:03 Time finish: 14:04

Therefore, leakage rate = no leak L/min Therefore, leakage rate = no leak L/min

(>0.1 l/min. is unacceptable) (>0.1 l/min. is unacceptable)

Repeat: Repeat:
Comments: Comments:

Sampling Record Table

Barometric Pressure: 1018 hPa (start); 1018 hPa (finish)

Meter start: 208.3572 Time start: 11:43

Meter correction factor (GMf): 1.0000

Table with 8 columns: Sampling Position No., Stopwatch Time at Sampling Position, Distance from far wall (mm), Isokinetic Flowrate (L/min), Meter Inlet Temp. (°C), Meter Outlet Temp. (°C), Impinger Train Outlet Temp (°C), Flowrate Attained (Y/N). Rows include sampling points 1/1-1/6 and 2/1-2/6, and an Averages row.

Meter Finish: 209.3748 Time Finish: 14:00
Total Condensate collected: 4 ml Silica gel No(s) used: P33

Emission Measurement Calculations Spreadsheet

Stack Analysis - Post Sampling Pitot Tube and Temperature Traverses

Date: 9-Feb-17
Client: OneSteel Hexham
AECOM's Project No: 60493017
Stack/Duct Description: Shredder Stack
Test 1: Fine Particulate (PM10)
Test 2: Total Particulate
Test 3: Hazardous Substances (Metals)

Table with 6 columns: Sampling Position No., Distance from far wall (mm), Max. Differential Pressure ΔP, kilo Pascals, Max Temp. °C, Max Temp. (Ts) K, Corrected Velocity (Vs) m/s. Includes an 'Average' row at the bottom.

Static Pressure (Dwyer) (Pa): kPa
Static Pressure (U-tube, if required) : 0.5 mm
Absolute pressure in stack (hPa) : 1018.05 hPa

Emission Measurement Calculations Spreadsheet

Stack Analysis - Hazardous Substances Elemental Analysis Results

Date: 9-Feb-17 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

Metal	Particulate Metals Results	Gaseous Metals Results	Oxidisable Mercury Results		
	Front Half, Filter, Acetone Rinses and Acid Rinses (mg). Containers 1, 2 and 3	Back Half, Impingers + Acid Rinses (mg) Container 4	KO Impinger + Acid Rinses (mg) (5A)	KMnO ₄ /H ₂ SO ₄ + Rinses (mg) (5B)	Residue Rinse 8N HCl (mg) (If Required) (5C)
Antimony	<0.0002	0.00025			
Arsenic	0.0001	<0.0001			
Beryllium	<0.0002	<0.0001			
Cadmium	0.013	0.0017			
Chromium	0.0002	0.00035			
Cobalt	<0.0002	<0.0001			
Copper	<0.0002	0.0021			
Lead	<0.3104	<0.51			
Magnesium	0.037	0.026			
Manganese	<0.0038	<0.005			
Mercury	<0.0003	<0.0001	<0.0001	0.00055	<0.0001
Nickel	0.0001	0.0028			
Selenium	<0.0002	<0.0001			
Thallium	<0.0002	<0.0001			
Tin	0.0002	0.00085			
Vanadium	<0.0023	<0.0001			
Zinc	0.68	0.0033			

Note: Where the blank has returned a less than value, half of this value was subtracted from the sample result as a blank correction
 ie for a blank value of <0.0005, 0.00025 was subtracted from the sample result.

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

Stack Analysis - Hazardous Substances Elemental Analysis Results Continued

Date: 9-Feb-17 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

Sample	Total Particulate Metals (mg)	Total Particulate Metals (mg/m ³)	Total Gaseous Metals (mg)	Total Gaseous Metals (mg/m ³)	Total Oxidisable Mercury (mg)	Total Oxidisable Mercury (mg/m ³)	Total (mg)	Total (mg/m ³)	Mass Emission Rate (mg/s)
Antimony	<0.0002	<0.00017	0.00025	0.00022			0.00025	0.00022	0.00021
Arsenic	0.0001	0.000087	<0.0001	<0.000087			0.0001	0.000087	0.000084
Beryllium	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Cadmium	0.013	0.011	0.0017	0.0015			0.015	0.013	0.013
Chromium	0.0002	0.00017	0.00035	0.00031			0.0006	0.00052	0.0005
Cobalt	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Copper	<0.0002	<0.00017	0.0021	0.0018			0.0021	0.0018	0.0017
Lead	<0.3104	<0.27	<0.51	<0.44			<0.51	<0.44	<0.43
Magnesium	0.037	0.032	0.026	0.023			0.06	0.052	0.05
Manganese	<0.0038	<0.0033	<0.005	<0.0044			<0.005	<0.0044	<0.0043
Mercury	<0.0003	<0.00026	<0.0001	<0.000087	0.00055	0.00048	0.00055	0.00048	0.00047
Nickel	0.0001	0.000087	0.0028	0.0024			0.003	0.0026	0.0025
Selenium	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Thallium	<0.0002	<0.00017	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Tin	0.0002	0.00017	0.00085	0.00074			0.001	0.00087	0.00084
Vanadium	<0.0023	<0.002	<0.0001	<0.000087			<0.0002	<0.00017	<0.00017
Zinc	0.68	0.59	0.0033	0.0029			0.7	0.61	0.59
Total Hazardous Metals*	0.013	0.011	0.0051	0.0044	0.00055	0.00048	0.021	0.018	0.017
Total Metals	0.73	0.63	0.037	0.033			0.78	0.68	0.66

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

STACK ANALYSIS - FINAL CALCULATIONS

Fine Particulate (PM10)

(Calculations performed in accordance with relevant test method as defined on cover page)

Date: 9-Feb-17 Client: OneSteel Hexham
AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV₃): 1.0737 m³ Average barometric pressure (P_{BARO}) 1018 hPa
Average gas meter temp. (T_{M,2}): 36.7 °C 309.9 K Average pressure at meter (P_{M,2}) 1018.00 hPa
Sample gas volume (MV₄); (0°C, dry gas, 1 atm pressure): 0.9510 m³

(B) PM10 concentration at standard conditions

Blank thimble No.: 0 Blank weight: g
Thimble No. used: T480 PM10 Weight: 0.0008 g
Final PM10 Weight (Mp1): 0.00080 g
PM10 Concentration (C1): =M_{p1}/MV₄= 0.00084 g/m³ (0°C, dry gas, 1atm pressure)

;and C₂ = 0.84 mg/m³ (0°C, dry gas, 1atm pressure)
CO₂ Basis 12 %
Average CO₂%; 0.0 %

Therefore, C_c: = C_a x 12/CO₂% = 0.00084 g/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)
;and C_{c1} = 0.84 mg/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)

O₂ Basis 7 %
Average O₂%; 20.9 %

Therefore, C_b: =C_a x (21 - O_{2ref}%)/(21 - O_{2mea}%) 0.12 g/m³ (0°C, dry gas, 1atm pressure, 7% O₂)
;and C_{b1} = 120 mg/m³ (0°C, dry gas, 1atm pressure, 7% O₂)

(C) Moisture content

Silica Gel Number: P32
V_v = 11 g (from laboratory report) V_w = 8 mL (=grams) (recorded on Laboratory Form 108)
Volume of Water Vapour Condensed (V_{wc(std)}) = 0.0107
Volume of Water Vapour Condensed (V_{wsg(std)}) = 0.0147

Therefore, B_{ws} = $\frac{(V_{wc(std)} + V_{wsg(std)})}{(V_{wc(std)} + V_{wsg(std)} + V_{m(std)})}$

B_{ws} = 2.60 %

Emission Measurement Calculations Spreadsheet

STACK ANALYSIS - FINAL CALCULATIONS CONTINUED

Fine Particulate (PM10)

(D) Gas Composition and Density (Re-calculation)

- (i) Initial gas density for sampling: 1.28 kg/m³ (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
 - 1.28 kg/m³ (0°C, wet, 1 atm pressure)
 - 1.29 kg/m³ (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions =

$$(ii) \times \frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$$

= 1.161 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 2.40 m/s
- (ii) Average of post-sampling velocities: 2.50 m/s
- (iii) Average of while-sampling velocities: N/A m/s
- (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 - 2.45 m/s (stack conditions, wet)
 - N/A m/s (stack conditions, wet)

(Note: (Vs) is from all individual data, not from (i) and (ii) alone.)

(F) Volumetric Flowrates (Reference Method US-EPA Method 2, NSW-EPA TM-2)

$$Q_{stack} = V_s \times A = 1.11 \text{ m}^3/\text{s (stack conditions)}$$

$$Q_{std} = Q_{stack} \times \frac{P_s}{(P_{std})} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$$

$$Q_{std} = 1.0 \text{ m}^3/\text{s (0°C, dry gas, 1 atm pressure)}$$

(G) Mass Emission Rate

Rm =	C _{1a} x Qstd =	0.00082	g/s (0°C, dry gas, 1 atm pressure)	
	=	0.82	mg/s (0°C, dry gas, 1 atm pressure)	
	C _{1a} x Qstd =	0.00082	g/s (0°C, dry gas, 1 atm pressure	12% CO ₂)
	=	0.82	mg/s (0°C, dry gas, 1 atm pressure	12% CO ₂)
	C _{1a} x Qstd =	0.12	g/s (0°C, dry gas, 1 atm pressure	7% O ₂)
	=	120	mg/s (0°C, dry gas, 1 atm pressure	7% O ₂)

STACK ANALYSIS - FINAL CALCULATIONS

Total Particulate

(Calculations performed in accordance with relevant test method as defined on cover page)

Date: 9-Feb-17 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV ₃):	1.0176 m ³	Average barometric pressure (P _{BARO}):	1018 hPa
Average gas meter temp. (T _{M,2}):	39.3 °C	Average pressure at meter (P _{M,2}):	1018.00 hPa
	312.5 K		
Sample gas volume (MV ₄); (0°C, dry gas, 1 atm pressure):	0.8938 m ³		

(B) Total Particulate concentration at standard conditions

Blank thimble No.:		Blank weight:	g
Thimble No. used:	T485	Total Particulate Weight	0.0127 g
Final Total Particulate Weight (Mp1):	0.01270 g		
Total Particulate Concentration (C1):	=Mp ₁ /MV ₄ =		0.014 g/m ³ (0°C, dry gas, 1atm pressure)

CO ₂ Basis	12 %	;and C ₂ =	14 mg/m ³ (0°C, dry gas, 1atm pressure)
Average CO ₂ %:	0.0 %		

Therefore, C _c :	= C _a x 12/CO ₂ % =	0.014 g/m ³ (0°C, dry gas, 1atm pressure, 12% CO ₂)
	;and C _{c1} =	14 mg/m ³ (0°C, dry gas, 1atm pressure, 12% CO ₂)

O ₂ Basis	7 %
Average O ₂ %:	20.9 %

Therefore, C _b :	=C _a x (21 - O _{2ref} %)/(21 - O _{2mea} %)	2 g/m ³ (0°C, dry gas, 1atm pressure, 7% O ₂)
	;and C _{b1} =	2000 mg/m ³ (0°C, dry gas, 1atm pressure, 7% O ₂)

(C) Moisture content

Silica Gel Number:	P33		
V _v =	9.9 g (from laboratory report)	V _w =	4 mL (=grams) (recorded on Laboratory Form 108)
Volume of Water Vapour Condensed (V _{wc(std)}) =	0.0053		
Volume of Water Vapour Condensed (V _{wsg(std)}) =	0.0132		

Therefore, B_{ws} =
$$\frac{(V_{wc(std)} + V_{wsg(std)})}{(V_{wc(std)} + V_{wsg(std)} + V_{m(std)})}$$

B_{ws} = 2.03 %

Emission Measurement Calculations Spreadsheet

STACK ANALYSIS - FINAL CALCULATIONS CONTINUED

Total Particulate

(D) Gas Composition and Density (Re-calculation)

- (i) Initial gas density for sampling: 1.28 kg/m³ (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
 - 1.28 kg/m³ (0°C, wet, 1 atm pressure)
 - 1.29 kg/m³ (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions =

$$(ii) \times \frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$$

= 1.161 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 2.40 m/s
- (ii) Average of post-sampling velocities: 2.50 m/s
- (iii) Average of while-sampling velocities: N/A m/s
- (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 - 2.45 m/s (stack conditions, wet)
 - N/A m/s (stack conditions, wet)

(Note: (Vs) is from all individual data, **not** from (i) and (ii) alone.)

(F) Volumetric Flowrates (Reference Method US-EPA Method 2, NSW-EPA TM-2)

$$Q_{stack} = V_s \times A = 1.11 \text{ m}^3/\text{s (stack conditions)}$$

$$Q_{std} = Q_{stack} \times \frac{P_s}{(P_{std})} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$$

$$Q_{std} = 1.0 \text{ m}^3/\text{s (0°C, dry gas, 1 atm pressure)}$$

(G) Mass Emission Rate

Rm =	C _{1a} x Qstd =	0.014	g/s (0°C, dry gas, 1 atm pressure)		
	=	14	mg/s (0°C, dry gas, 1 atm pressure)		
	C _{1a} x Qstd =	0.014	g/s (0°C, dry gas, 1 atm pressure	12%	CO ₂)
	=	14	mg/s (0°C, dry gas, 1 atm pressure	12%	CO ₂)
	C _{1a} x Qstd =	1.9	g/s (0°C, dry gas, 1 atm pressure	7%	O ₂)
	=	1900	mg/s (0°C, dry gas, 1 atm pressure	7%	O ₂)

STACK ANALYSIS - FINAL CALCULATIONS

Hazardous Substances (Metals)

(Calculations performed in accordance with relevant test method as defined on cover page)

Date: 9-Feb-17 Client: OneSteel Hexham
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV ₃):	1.2887 m ³	Average barometric pressure (P _{BARO}):	1018 hPa
Average gas meter temp. (T _{M,2}):	35.3 °C	Average pressure at meter (P _{M,2}):	1018.00 hPa
	308.5 K		
Sample gas volume (MV ₄); (0°C, dry gas, 1 atm pressure):	1.1466 m ³		

(B) Metals concentration at standard conditions

Blank thimble No.:		Blank weight:	g
Thimble No. used:	0	Metals Weight:	0.000021 g
Final Metals Weight (Mp1):	0.00002 g		
Metals Concentration (C1):	=M _{p1} /MV ₄ =		0.000018 g/m ³ (0°C, dry gas, 1atm pressure)

		;and C ₂ =	0.018 mg/m ³ (0°C, dry gas, 1atm pressure)
CO ₂ Basis	12 %		
Average CO ₂ %:	0.0 %		

Therefore, C _c :	= C _a x 12/CO ₂ % =	0.000018 g/m ³ (0°C, dry gas, 1atm pressure, 12% CO ₂)
	;and C _{c1} =	0.018 mg/m ³ (0°C, dry gas, 1atm pressure, 12% CO ₂)

O ₂ Basis	7 %
Average O ₂ %:	20.9 %

Therefore, C _b :	=C _a x (21 - O _{2ref} %)/(21 - O _{2mea} %)	0.0025 g/m ³ (0°C, dry gas, 1atm pressure, 7% O ₂)
	;and C _{b1} =	2.5 mg/m ³ (0°C, dry gas, 1atm pressure, 7% O ₂)

(C) Moisture content

Silica Gel Number:	G57		
V _v =	12.9 g (from laboratory report)	V _w =	20 mL (=grams) (recorded on Laboratory Form 108)
Volume of Water Vapour Condensed (V _{wc(std)}) =	0.0267		
Volume of Water Vapour Condensed (V _{wsg(std)}) =	0.0172		

Therefore, B_{ws} =
$$\frac{(V_{wc(std)} + V_{wsg(std)})}{(V_{wc(std)} + V_{wsg(std)} + V_{m(std)})}$$

B_{ws} = 3.69 %

Emission Measurement Calculations Spreadsheet

STACK ANALYSIS - FINAL CALCULATIONS CONTINUED

Hazardous Substances (Metals)

(D) Gas Composition and Density (Re-calculation)

- (i) Initial gas density for sampling: 1.28 kg/m³ (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
 - 1.29 kg/m³ (0°C, wet, 1 atm pressure)
 - 1.29 kg/m³ (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions =

$$(ii) \times \frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$$

= 1.170 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 2.40 m/s
- (ii) Average of post-sampling velocities: 2.50 m/s
- (iii) Average of while-sampling velocities: N/A m/s
- (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 - 2.45 m/s (stack conditions, wet)
 - N/A m/s (stack conditions, wet)

(Note: (Vs) is from all individual data, **not** from (i) and (ii) alone.)

(F) Volumetric Flowrates (Reference Method US-EPA Method 2, NSW-EPA TM-2)

$$Q_{stack} = V_s \times A = 1.11 \text{ m}^3/\text{s (stack conditions)}$$

$$Q_{std} = Q_{stack} \times \frac{P_s}{(P_{std})} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$$

$$Q_{std} = 1.0 \text{ m}^3/\text{s (0°C, dry gas, 1 atm pressure)}$$

(G) Mass Emission Rate

Rm =	C _{1a} x Qstd =	0.000017	g/s (0°C, dry gas, 1 atm pressure)		
	=	0.017	mg/s (0°C, dry gas, 1 atm pressure)		
	C _{1a} x Qstd =	0.000017	g/s (0°C, dry gas, 1 atm pressure	12%	CO ₂)
	=	0.017	mg/s (0°C, dry gas, 1 atm pressure	12%	CO ₂)
	C _{1a} x Qstd =	0.0024	g/s (0°C, dry gas, 1 atm pressure	7%	O ₂)
	=	2.4	mg/s (0°C, dry gas, 1 atm pressure	7%	O ₂)

Emission Measurement Calculations Spreadsheet

EMISSION MONITORING RESULTS, SHREDDER STACK ONESTEEL HEXHAM 9-Feb-17 FINE PARTICULATE (PM10) TOTAL PARTICULATE HAZARDOUS SUBSTANCES (METALS)		
Sampling Conditions:		
Stack internal diameter at test location	760 mm	
Stack gas temperature (average)	29.5 °C	302.7 K
Stack pressure (average)	1018 hPa	
Stack gas velocity (average, stack conditions)	2.5 m/s	
Stack gas flowrate (stack conditions)	1.1 m ³ /s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	0.98 m ³ /s	
Fine Particulate (PM10) Testing		
Test Period	11:43	- 14:00
Fine Particulate (PM10) Mass	0.8 mg	
Gas Volume Sampled	0.951 m ³	
Fine Particulate (PM10) Emission*1	0.84 mg/m ³	
Fine Particulate (PM10) Mass Emission Rate*2	0.82 mg/s	
Regulatory Limit	NA mg/m ³	
Total Particulate Testing		
Test Period	11:43	- 14:00
Total Particulate Mass	12.7 mg	
Gas Volume Sampled	0.894 m ³	
Total Particulate Emission*1	14 mg/m ³	
Total Particulate Mass Emission Rate*2	14 mg/s	
Regulatory Limit	100 mg/m ³	
Hazardous Substances (Metals) Testing		
Test Period	11:43	- 14:00
Hazardous Substances (Metals) Mass	0.021 mg	
Gas Volume Sampled	1.15 m ³	
Hazardous Substances (Metals) Emission*1	0.018 mg/m ³	
Hazardous Substances (Metals) Mass Emission Rate*2	0.017 mg/s	
Regulatory Limit	NA	
Moisture Content (%)	2.9	
Gas Density (dry at 1 atmosphere)	1.29 kg/m ³	
Dry Molecular Weight	28.8 g/g-mole	

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See Q_{std} in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.



Appendix B

Laboratory Results
(8 pages)

Appendix B Laboratory Results (8 pages)

CLIENT DETAILS

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 Project **(Not specified)**
 Order Number **60493017/2.1**
 Samples **12**

LABORATORY DETAILS

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 SGS Reference **ME301905 R0**
 Date Received **14 Feb 2017**
 Date Reported **24 Mar 2017**

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(14420).

SIGNATORIES



Adam Atkinson
Business Manager



Bharat Rana
Chemist

MING

Weiming Dai
Inorganic Supervisor

Sample Number	ME301905.001	ME301905.002	ME301905.003	ME301905.004
Sample Matrix	Air	Other	Other	Other
Sample Date	09 Feb 2017	09 Feb 2017	09 Feb 2017	09 Feb 2017
Sample Name	Metals No.1	Metals No.3	Metals No.4	Metals No.5A

Parameter Units LOR
Metals in Filters M29 ETC MA-1400.FL.M29.02 USEPA M29 Method: EPA29_FILT Tested: 7/3/2017

Parameter	Units	LOR	ME301905.001	ME301905.002	ME301905.003	ME301905.004
Sb	µg total	0.2	<0.2	-	-	-
As	µg total	0.2	0.2	-	-	-
Be	µg total	0.2	<0.2	-	-	-
Cd	µg total	0.2	13	-	-	-
Cr	µg total	0.2	0.7	-	-	-
Co	µg total	0.2	<0.2	-	-	-
Cu	µg total	0.2	<0.2	-	-	-
Pb	µg total	0.2	0.8	-	-	-
Mg	µg total	2	71	-	-	-
Mn	µg total	0.2	0.8	-	-	-
Hg	µg total	0.2	<0.2	-	-	-
Ni	µg total	0.2	0.3	-	-	-
Se	µg total	0.2	<0.2	-	-	-
Tl	µg total	0.2	<0.2	-	-	-
Sn	µg total	0.2	0.3	-	-	-
V	µg total	0.2	2.2	-	-	-
Zn	µg total	0.2	1100	-	-	-

Metals in Impingers M29 ETC MA-1400.IMP.M29.06 (ug total) Method: EPA29_METIMP Tested: 7/3/2017

Parameter	Units	LOR	ME301905.001	ME301905.002	ME301905.003	ME301905.004
Sb	µg total	0.1	-	<0.1	0.3	-
As	µg total	0.1	-	<0.1	<0.1	-
Be	µg total	0.1	-	<0.1	<0.1	-
Cd	µg total	0.1	-	<0.1	1.8	-
Cr	µg total	0.1	-	<0.1	0.4	-
Co	µg total	0.1	-	<0.1	<0.1	-
Cu	µg total	0.1	-	0.1	2.2	-
Pb	µg total	0.1	-	99	330	-
Mg	µg total	0.1	-	1.4	30	-
Mn	µg total	0.1	-	<0.1	1.0	-
Hg	µg total	0.1	-	<0.1	<0.1	<0.1
Ni	µg total	0.1	-	<0.1	2.9	-
Se	µg total	0.1	-	0.1	<0.1	-
Tl	µg total	0.1	-	<0.1	<0.1	-
Sn	µg total	0.1	-	<0.1	0.9	-
V	µg total	0.1	-	<0.1	<0.1	-
Zn	µg total	0.1	-	7.1	3.4	-
Sample Volume	mL	-	-	99	330	100



ANALYTICAL REPORT

ME301905 R0

	Sample Number	ME301905.005	ME301905.006	ME301905.007	ME301905.008
	Sample Matrix	Other	Other	Other	Other
	Sample Date	09 Feb 2017	09 Feb 2017	09 Feb 2017	09 Feb 2017
	Sample Name	Metals No.5B	Metals No.5C	Metals No.8A	Metals No.8B
Parameter	Units	LOR			

Metals in Filters M29 ETC MA-1400.FL.M29.02 USEPA M29 Method: EPA29_FILT Tested: 7/3/2017

Sb	µg total	0.2	-	-	-	-
As	µg total	0.2	-	-	-	-
Be	µg total	0.2	-	-	-	-
Cd	µg total	0.2	-	-	-	-
Cr	µg total	0.2	-	-	-	-
Co	µg total	0.2	-	-	-	-
Cu	µg total	0.2	-	-	-	-
Pb	µg total	0.2	-	-	-	-
Mg	µg total	2	-	-	-	-
Mn	µg total	0.2	-	-	-	-
Hg	µg total	0.2	-	-	-	-
Ni	µg total	0.2	-	-	-	-
Se	µg total	0.2	-	-	-	-
Tl	µg total	0.2	-	-	-	-
Sn	µg total	0.2	-	-	-	-
V	µg total	0.2	-	-	-	-
Zn	µg total	0.2	-	-	-	-

Metals in Impingers M29 ETC MA-1400.IMP.M29.06 (ug total) Method: EPA29_METIMP Tested: 28/2/2017

Sb	µg total	0.1	-	-	<0.1	-
As	µg total	0.1	-	-	<0.1	-
Be	µg total	0.1	-	-	<0.1	-
Cd	µg total	0.1	-	-	<0.1	-
Cr	µg total	0.1	-	-	<0.1	-
Co	µg total	0.1	-	-	<0.1	-
Cu	µg total	0.1	-	-	<0.1	-
Pb	µg total	0.1	-	-	<0.1	-
Mg	µg total	0.1	-	-	310	-
Mn	µg total	0.1	-	-	1.1	-
Hg	µg total	0.1	0.6	<0.1	<0.1	<0.1
Ni	µg total	0.1	-	-	<0.1	-
Se	µg total	0.1	-	-	<0.1	-
Tl	µg total	0.1	-	-	<0.1	-
Sn	µg total	0.1	-	-	<0.1	-
V	µg total	0.1	-	-	<0.1	-
Zn	µg total	0.1	-	-	<0.1	-
Sample Volume	mL	-	400	250	310	100

Sample Number	ME301905.009	ME301905.010	ME301905.011	ME301905.012
Sample Matrix	Other	Other	Other	Air
Sample Date	09 Feb 2017	09 Feb 2017	09 Feb 2017	09 Feb 2017
Sample Name	Metals No.9	Metals No.10	Metals No.11	Metals No.12

Parameter Units LOR
Metals in Filters M29 ETC MA-1400.FL.M29.02 USEPA M29 Method: EPA29_FILT Tested: 7/3/2017

Parameter	Units	LOR	ME301905.009	ME301905.010	ME301905.011	ME301905.012
Sb	µg total	0.2	-	-	-	<0.2
As	µg total	0.2	-	-	-	<0.2
Be	µg total	0.2	-	-	-	<0.2
Cd	µg total	0.2	-	-	-	<0.2
Cr	µg total	0.2	-	-	-	0.5
Co	µg total	0.2	-	-	-	<0.2
Cu	µg total	0.2	-	-	-	<0.2
Pb	µg total	0.2	-	-	-	0.4
Mg	µg total	2	-	-	-	34
Mn	µg total	0.2	-	-	-	0.7
Hg	µg total	0.2	-	-	-	0.3
Ni	µg total	0.2	-	-	-	0.2
Se	µg total	0.2	-	-	-	<0.2
Tl	µg total	0.2	-	-	-	<0.2
Sn	µg total	0.2	-	-	-	<0.2
V	µg total	0.2	-	-	-	2.3
Zn	µg total	0.2	-	-	-	430

Metals in Impingers M29 ETC MA-1400.IMP.M29.06 (ug total) Method: EPA29_METIMP Tested: 7/3/2017

Parameter	Units	LOR	ME301905.009	ME301905.010	ME301905.011	ME301905.012
Sb	µg total	0.1	<0.1	-	-	-
As	µg total	0.1	<0.1	-	-	-
Be	µg total	0.1	<0.1	-	-	-
Cd	µg total	0.1	<0.1	-	-	-
Cr	µg total	0.1	<0.1	-	-	-
Co	µg total	0.1	<0.1	-	-	-
Cu	µg total	0.1	<0.1	-	-	-
Pb	µg total	0.1	200	-	-	-
Mg	µg total	0.1	2.5	-	-	-
Mn	µg total	0.1	1.9	-	-	-
Hg	µg total	0.1	<0.1	<0.1	<0.1	-
Ni	µg total	0.1	<0.1	-	-	-
Se	µg total	0.1	<0.1	-	-	-
Tl	µg total	0.1	<0.1	-	-	-
Sn	µg total	0.1	<0.1	-	-	-
V	µg total	0.1	<0.1	-	-	-
Zn	µg total	0.1	0.6	-	-	-
Sample Volume	mL	-	200	100	250	-

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD

METHODOLOGY SUMMARY

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
		-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

- Note that in terms of units of radioactivity:
- a. 1 Bq is equivalent to 27 pCi
 - b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : [http://www.sgs.com.au/~media/Local/Australia/Documents/ Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf](http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf)

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Steel River Testing

5/11 McIntosh Drive, Mayfield West, NSW 2304
Phone: 02 49677880

STACK EMISSION - PARTICULATES REPORT

Origin: AECOM - Newcastle
Project: 60493017
Report : 13017-0-P Page 1 of 1
Description : Stack Emission Samples
Received: 10-Feb-17
Date : 14-Feb-17
Report To : Cye Buckland
17 Warabrook Blvd, Warabrook NSW 2304
Copy to: FILE

Thimble ID		Volume (mL)	Total Particulate Matter (g)
T480	Filter	-	0.0008
T485	Filter	-	0.0127



NATA Accredited Laboratory 18079
Accredited for compliance with
ISO/IEC 17025 - Testing

Note : Sampled by Client

Reported By: J. Campbell

Jason Campbell

Determined in Accordance With:
Particulate matter - total in stack gases by
gravimetric using in-house M300;
Acetone/Water Rinse using AS4323.2

Steel River Testing

5/11 McIntosh Drive, Mayfield West, NSW 2304
Phone: 02 49677880

STACK EMISSION - MOISTURE REPORT

Origin: AECOM - Newcastle
Project: 60493017
Report : 13017-0-M Page 1 of 1
Description : Stack Emission Samples
Received: 10-Feb-17
Date : 14-Feb-17
Report To : Cye Buckland
17 Warabrook Blvd, Warabrook NSW 2304
Copy to: FILE

Jar ID	Moisture (g)
G57	12.9
P32	11.0
P33	9.9



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ISO/IEC 17025 - Testing

Reported By: J. Campbell
Jason Campbell

Determined in Accordance With:
Moisture content in stack gases by gravimetric
using in-house M301

This is the last page of the report

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