

# 4th Quarter Emissions Testing Report 2016

OneSteel Recycling Hexham



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# 4th Quarter Emissions Testing Report 2016

OneSteel Recycling Hexham

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## Table of Contents

1.0	Introduction	1
2.0	Sampling Plane Requirements	3
3.0	Methodology	5
3.1	NATA Accredited Methods	5
4.0	Sampling Location	7
4.1	Sampling Location Summary	7
5.0	Equipment Calibration	9
6.0	Results	11
Appendix A		
	Field Sheets (17 pages)	A
Appendix B		
	Laboratory Results (12 pages)	B

## List of Tables

Table 1	Criteria for Selection of Sampling Planes (AS 4323.1)	3
Table 2	AECOM NATA Endorsed Methods	5
Table 3	Sampling Location Summary	7
Table 4	Shredder Baghouse Emission Results Summary, 2 December 2016	11
Table 5	Fine Particulate (PM <sub>10</sub> ), Total Particulate and Hazardous Substance (Metals) Results, 2 December 2016	12
Table 6	Hazardous Substances (Metals) Elemental Analysis Results, 2 December 2016	13

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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 2 December 2016 to investigate emission concentrations for the following parameters:

- Fine Particulates (PM<sub>10</sub>);
- 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 12605-0-M & 12605-0-P:
  - Total Particulate (TP);
  - Fine Particulates (PM<sub>10</sub>); and
  - Moisture.
- SGS Leeder Consulting laboratory NATA accreditation number 14429, performed the following analysis detailed in report number M162302:
  - 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 <sub>10</sub> 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.

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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 2 December 2016.

**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 <sup>2</sup>
Correction Factors Applied	No
Total No. Points Sampled	12
Points/Traverse	6
Sampling Performed to Standard <sup>1</sup>	Yes <sup>2</sup>

<sup>1</sup> AS 4323.1 Section 4.1

<sup>2</sup> 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 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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## 6.0 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, 2 December 2016**

Parameter	Emission Concentration (EPL Point 1)	Emission Concentration Limit
Total Particulate (TP) (mg/m <sup>3</sup> )	0.68	100
Fine Particulate (PM <sub>10</sub> ) (mg/m <sup>3</sup> )	0.37	NA
Lead (mg/m <sup>3</sup> )	0.0033	5.0
Mercury (mg/m <sup>3</sup> )	<0.00041	1.0
Total Hazardous Substances (Metals) (mg/m <sup>3</sup> )	0.011	NA

Results from testing conducted on EPL Point 1 on 2 December 2016 are below the regulatory limits listed in EPL 5345.

Table 5 Fine Particulate (PM<sub>10</sub>), Total Particulate and Hazardous Substance (Metals) Results, 2 December 2016

<b>Sampling Conditions:</b>		
Stack internal diameter at test location	760 mm	
Stack gas temperature (average)	29.0 °C	302.2 K
Stack pressure (average)	1010 hPa	
Stack gas velocity (average, stack conditions)	2.5 m/s	
Stack gas flowrate (stack conditions)	1.1 m <sup>3</sup> /s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	0.98 m <sup>3</sup> /s	
<b>Fine Particulate (PM<sub>10</sub>) Testing</b>		
Test Period	9:56 -	11:27
Fine Particulate (PM <sub>10</sub> ) Mass	0.4 mg	
Gas Volume Sampled	1.07 m <sup>3</sup>	
Fine Particulate (PM <sub>10</sub> ) Emission* <sup>1</sup>	0.37 mg/m <sup>3</sup>	
Fine Particulate (PM <sub>10</sub> ) Mass Emission Rate* <sup>2</sup>	0.36 mg/s	
Regulatory Limit	NA	
<b>Total Particulate Testing</b>		
Test Period	9:56 -	11:27
Total Particulate Mass	0.7 mg	
Gas Volume Sampled	1.02 m <sup>3</sup>	
Total Particulate Emission* <sup>1</sup>	0.68 mg/m <sup>3</sup>	
Total Particulate Mass Emission Rate* <sup>2</sup>	0.67 mg/s	
Regulatory Limit	100 mg/m <sup>3</sup>	
<b>Hazardous Substances (Metals) Testing</b>		
Test Period	9:56 -	11:27
Hazardous Substances (Metals) Mass	0.013 mg	
Gas Volume Sampled	1.22 m <sup>3</sup>	
Hazardous Substances (Metals) Emission* <sup>1</sup>	0.011 mg/m <sup>3</sup>	
Hazardous Substances (Metals) Mass Emission Rate* <sup>2</sup>	0.011 mg/s	
Regulatory Limit	NA	
<b>Moisture Content (%)</b>	<b>1.9</b>	
<b>Gas Density (dry at 1 atmosphere)</b>	<b>1.29 kg/m<sup>3</sup></b>	
<b>Dry Molecular Weight</b>	<b>28.8 g/g-mole</b>	

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<sub>std</sub> in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

Table 6 Hazardous Substances (Metals) Elemental Analysis Results, 2 December 2016

Sample	Total Particulate Metals (mg)	Total Particulate Metals (mg/m <sup>3</sup> )	Total Gaseous Metals (mg)	Total Gaseous Metals (mg/m <sup>3</sup> )	Total Oxidisable Mercury (mg)	Total Oxidisable Mercury (mg/m <sup>3</sup> )	Total (mg)	Total (mg/m <sup>3</sup> )	Mass Emission Rate (mg/s)
Antimony	<0.0002	<0.00016	0.000097	0.00008			0.000097	0.00008	0.000078
Arsenic	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Beryllium	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Cadmium	0.0005	0.00041	0.000048	0.000039			0.0005	0.00041	0.0004
Chromium	0.0003	0.00025	0.00055	0.00045			0.0009	0.00074	0.00072
Cobalt	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Copper	0.012	0.0099	<0.0005	<0.00041			0.012	0.0099	0.0097
Lead	0.0036	0.003	0.00055	0.00045			0.004	0.0033	0.0032
Magnesium	<0.0812	<0.067	0.00034	0.00028			0.00034	0.00028	0.00027
Manganese	0.0048	0.0039	0.0011	0.0009			0.006	0.0049	0.0048
Mercury	<0.0002	<0.00016	<0.0001	<0.000082	<0.0005	<0.00041	<0.0005	<0.00041	<0.0004
Nickel	0.0017	0.0014	<0.0003	<0.00025			0.0017	0.0014	0.0014
Selenium	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Thallium	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Tin	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Vanadium	<0.0026	<0.0021	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Zinc	<1.7	<1.4	0.0081	0.0067			0.0081	0.0067	0.0066
<b>Total Hazardous Metals*</b>	<b>0.011</b>	<b>0.009</b>	<b>0.0023</b>	<b>0.0019</b>	<b>&lt;0.0005</b>	<b>&lt;0.00041</b>	<b>0.013</b>	<b>0.011</b>	<b>0.011</b>
<b>Total Metals</b>	<b>0.023</b>	<b>0.019</b>	<b>0.011</b>	<b>0.0089</b>			<b>0.034</b>	<b>0.028</b>	<b>0.027</b>

\* 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: 2-Dec-16

<b>ANALYTE(S)</b>	<b>METHOD</b>
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:

Sampling Performed By:



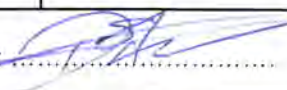

James Lang



Dylan Turnbull

**STACK ANALYSIS - PRE-SAMPLING**

Date: 2-Dec-16  
 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 <sup>2</sup>
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		PM2.5/10= 12		
No. Diameters = 6.6		No. of sampling traverses/ports sampled = 2		
Type of Upstream Disturbance: Fan Entry		PM2.5/10= 2		
Downstream (m) = 2		No. of sampling points on each traverse/port = 6		
No. Diameters = 2.6		PM2.5/10= 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				
12				
13				
14				
15				
16				
17				
18				
19				
20				
Signed: 		Checked: 		



**STACK ANALYSIS - GAS COMPOSITION AND DENSITY PRE-SAMPLING**

Date: 2-Dec-16  
 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: 9:40		Sampling port No.: 1		
Measurement No.	Time sampled	CO (ppm), (dry)	O <sub>2</sub> (%), (dry)	CO <sub>2</sub> (%), (dry)
1	9:40	0	20.9	0.0
2	9:41	0	20.9	0.0
3	9:42	0	20.9	0.0
4	9:43	0	20.9	0.0
5	9:44	0	20.9	0.0
6	9:45	0	20.9	0.0
7	9:46	0	20.9	0.0
8	9:47	0	20.9	0.0
Averages:		0.0 ppm	20.9 %	0.0 %

Moisture content (M3): 0.98  
 Moisture percentage (M2): 1.70 %

Measurements

CO: 0.0000 %,(dry)	N <sub>2</sub> : 79.1 %,(dry)
CO <sub>2</sub> : 0.0 %,(dry)	O <sub>2</sub> : 20.9 %,(dry)
Gas Compositions converted to wet basis:	
CO: 0.0000 %,(wet)	N <sub>2</sub> : 77.8 %,(wet)
CO <sub>2</sub> : 0.0 %,(wet)	O <sub>2</sub> : 20.5 %,(wet)
H <sub>2</sub> O: 1.70 % (=M2)	
Therefore, stack gas density (GD) =	1.28 kg/m <sup>3</sup> (0°C, wet, 1 atm pressure)
Therefore, stack gas density (GD) =	1.29 kg/m <sup>3</sup> (0°C, dry, 1 atm pressure)

**STACK ANALYSIS - GAS COMPOSITION AND DENSITY POST-SAMPLING**

Date: 2-Dec-16  
 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: 11:20		Sampling port No.: 1		
Measurement No.	Time sampled	CO (ppm), (dry)	O <sub>2</sub> (%), (dry)	CO <sub>2</sub> (%), (dry)
1	11:20	0	20.9	0.0
2	11:21	0	20.9	0.0
3	11:22	0	20.9	0.0
4	11:23	0	20.9	0.0
5	11:24	0	20.9	0.0
6	11:25	0	20.9	0.0
7	11:26	0	20.9	0.0
8	11:27	0	20.9	0.0
Averages:		0.0 ppm	20.9 %	0.0 %

Moisture content (M3): 0.98  
 Moisture percentage (M2): 2.08 %

Measurements

CO: 0.0000 %,(dry)	N <sub>2</sub> : 79.1 %,(dry)
CO <sub>2</sub> : 0.0 %,(dry)	O <sub>2</sub> : 20.9 %,(dry)
Gas Compositions converted to wet basis:	
CO: 0.0000 %,(wet)	N <sub>2</sub> : 77.5 %,(wet)
CO <sub>2</sub> : 0.0 %,(wet)	O <sub>2</sub> : 20.5 %,(wet)
H <sub>2</sub> O: 2.08 % (=M2)	
Therefore, stack gas density (GD) =	1.28 kg/m <sup>3</sup> (0°C, wet, 1 atm pressure)
Therefore, stack gas density (GD) =	1.29 kg/m <sup>3</sup> (0°C, dry, 1 atm pressure)

**Stack Analysis - Pre Sampling Pitot Tube and Temperature Traverses**

Date: 2-Dec-16  
 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 :	9:40	Barometric Pressure :	1010	hPa
Page No. :	1 of 1	Pitot Correction Factor :	0.84	
Sampling Port No:	1 to 2	Stack Gas Density:	1.28	kg/m <sup>3</sup>
Pitot Tube Type :	S			(0 °C, Wet, 1 Atm)

Sampling Position No.	Distance from far wall (mm)	Max. Differential Pressure $\Delta P$ , 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) : 1010.05 hPa









**Emission Measurement Calculations Spreadsheet**

**Stack Analysis - Post Sampling Pitot Tube and Temperature Traverses**

Date: 2-Dec-16  
 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 : 11:35		Barometric Pressure : 1010 hPa			
Page No. : 1 of 1		Pitot Correction Factor : 0.84			
Sampling Port No: 1 to 2		Stack Gas Density: 1.28 kg/m <sup>3</sup>			
Pitot Tube Type : S		(0 °C, Wet, 1 Atm)			
Sampling Position No.	Distance from far wall (mm)	Max. Differential Pressure $\Delta P$ , kilo Pascals	Max Temp. °C	Max Temp. (Ts) K	Corrected Velocity (Vs) m/s
1/1	3	0.005	30.0	303.2	2.5
1/2	81	0.005	30.0	303.2	2.5
1/3	195	0.005	30.0	303.2	2.5
1/4	505	0.005	30.0	303.2	2.5
1/5	619	0.005	30.0	303.2	2.5
1/6	697	0.005	30.0	303.2	2.5
2/1	3	0.005	30.0	303.2	2.5
2/2	81	0.005	30.0	303.2	2.5
2/3	195	0.005	30.0	303.2	2.5
2/4	505	0.005	30.0	303.2	2.5
2/5	619	0.005	30.0	303.2	2.5
2/6	697	0.005	30.0	303.2	2.5
Average			30.0	303.2	2.5

Static Pressure (Dwyer) (Pa): kPa  
 Static Pressure (U-tube, if required) : 0.5 mm  
 Absolute pressure in stack (hPa) : 1010.05 hPa

**Stack Analysis - Hazardous Substances Elemental Analysis Results**

Date: 2-Dec-16 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 <sub>4</sub> /H <sub>2</sub> SO <sub>4</sub> + Rinses (mg) (5B)	Residue Rinse 8N HCl (mg) (If Required) (5C)
Antimony	<0.0002	0.000097			
Arsenic	<0.0002	<0.0001			
Beryllium	<0.0002	<0.0001			
Cadmium	0.0005	0.000048			
Chromium	0.0003	0.00055			
Cobalt	<0.0002	<0.0001			
Copper	0.012	<0.0005			
Lead	0.0036	0.00055			
Magnesium	<0.0812	0.00034			
Manganese	0.0048	0.0011			
Mercury	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005
Nickel	0.0017	<0.0003			
Selenium	<0.0002	<0.0001			
Thallium	<0.0002	<0.0001			
Tin	<0.0002	<0.0001			
Vanadium	<0.0026	<0.0001			
Zinc	<1.7	0.0081			

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: 2-Dec-16 Client: OneSteel Hexham  
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

Sample	Total Particulate Metals (mg)	Total Particulate Metals (mg/m <sup>3</sup> )	Total Gaseous Metals (mg)	Total Gaseous Metals (mg/m <sup>3</sup> )	Total Oxidisable Mercury (mg)	Total Oxidisable Mercury (mg/m <sup>3</sup> )	Total (mg)	Total (mg/m <sup>3</sup> )	Mass Emission Rate (mg/s)
Antimony	<0.0002	<0.00016	0.000097	0.00008			0.000097	0.00008	0.000078
Arsenic	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Beryllium	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Cadmium	0.0005	0.00041	0.000048	0.000039			0.0005	0.00041	0.0004
Chromium	0.0003	0.00025	0.00055	0.00045			0.0009	0.00074	0.00072
Cobalt	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Copper	0.012	0.0099	<0.0005	<0.00041			0.012	0.0099	0.0097
Lead	0.0036	0.003	0.00055	0.00045			0.004	0.0033	0.0032
Magnesium	<0.0812	<0.067	0.00034	0.00028			0.00034	0.00028	0.00027
Manganese	0.0048	0.0039	0.0011	0.0009			0.006	0.0049	0.0048
Mercury	<0.0002	<0.00016	<0.0001	<0.000082	<0.0005	<0.00041	<0.0005	<0.00041	<0.0004
Nickel	0.0017	0.0014	<0.0003	<0.00025			0.0017	0.0014	0.0014
Selenium	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Thallium	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Tin	<0.0002	<0.00016	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Vanadium	<0.0026	<0.0021	<0.0001	<0.000082			<0.0002	<0.00016	<0.00016
Zinc	<1.7	<1.4	0.0081	0.0067			0.0081	0.0067	0.0066
Total Hazardous Metals*	0.011	0.009	0.0023	0.0019	<0.0005	<0.00041	0.013	0.011	0.011
Total Metals	0.023	0.019	0.011	0.0089			0.034	0.028	0.027

\* 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: 2-Dec-16 Client: OneSteel Hexham  
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV <sub>3</sub> ):	1.2323 m <sup>3</sup>	Average barometric pressure (P <sub>BARO</sub> ):	1010 hPa
Average gas meter temp. (T <sub>M,2</sub> ):	40.2 °C	Average pressure at meter (P <sub>M,2</sub> ):	1010.00 hPa
	313.4 K		
Sample gas volume (MV <sub>4</sub> ); (0°C, dry gas, 1 atm pressure):	1.0708 m <sup>3</sup>		

(B) PM10 concentration at standard conditions

Blank thimble No.:	NA	Blank weight:	g
Thimble No. used:	T398	PM10 Weight:	0.0004 g
Final PM10 Weight (Mp1):	0.00040 g		
PM10 Concentration (C1):	=M <sub>p1</sub> /MV <sub>4</sub> =		0.00037 g/m <sup>3</sup> (0°C, dry gas, 1atm pressure)

CO<sub>2</sub> Basis 12 % ;and C<sub>2</sub> = 0.37 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure)

Average CO<sub>2</sub> %: 0.0 %

Therefore, C<sub>c</sub>: = C<sub>a</sub> x 12/CO<sub>2</sub>% = 0.00037 g/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 12% CO<sub>2</sub>)

;and C<sub>c1</sub> = 0.37 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 12% CO<sub>2</sub>)

O<sub>2</sub> Basis 7 %

Average O<sub>2</sub> %: 20.9 %

Therefore, C<sub>b</sub>: = C<sub>a</sub> x (21 - O<sub>2ref</sub>%) / (21 - O<sub>2mea</sub>%) = 0.052 g/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 7% O<sub>2</sub>)

;and C<sub>b1</sub> = 52 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 7% O<sub>2</sub>)

(C) Moisture content

Silica Gel Number: P38

V<sub>v</sub> = 9.8 g (from laboratory report)

V<sub>w</sub> = 10 mL (=grams)

Volume of Water Vapour Condensed (V<sub>wc(std)</sub>) = 0.0133

(recorded on

Volume of Water Vapour Condensed (V<sub>wsg(std)</sub>) = 0.0131

Laboratory Form

Therefore, B<sub>ws</sub> = 
$$\frac{(V_{wc(std)} + V_{wsg(std)})}{(V_{wc(std)} + V_{wsg(std)} + V_{m(std)})}$$

108)

B<sub>ws</sub> = 2.41 %

**STACK ANALYSIS - FINAL CALCULATIONS CONTINUED**

**Fine Particulate (PM10)**

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

- (i) Initial gas density for sampling: 1.28 kg/m<sup>3</sup> (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
  - 1.29 kg/m<sup>3</sup> (0°C, wet, 1 atm pressure)
  - 1.29 kg/m<sup>3</sup> (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions =
 
$$(ii) \times \frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$$

= 1.163 kg/m<sup>3</sup> (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)

Qstack = Vs x A = 1.11 m<sup>3</sup>/s (stack conditions)

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

Qstd = 1.0 m<sup>3</sup>/s (0°C, dry gas, 1 atm pressure)

(G) Mass Emission Rate

Rm =	C <sub>1a</sub> x Qstd =	0.00036	g/s (0°C, dry gas, 1 atm pressure )		
	=	0.36	mg/s (0°C, dry gas, 1 atm pressure )		
	C <sub>1a</sub> x Qstd =	0.00036	g/s (0°C, dry gas, 1 atm pressure	12%	CO <sub>2</sub> )
	=	0.36	mg/s (0°C, dry gas, 1 atm pressure	12%	CO <sub>2</sub> )
	C <sub>1a</sub> x Qstd =	0.051	g/s (0°C, dry gas, 1 atm pressure	7%	O <sub>2</sub> )
	=	51	mg/s (0°C, dry gas, 1 atm pressure	7%	O <sub>2</sub> )

**STACK ANALYSIS - FINAL CALCULATIONS**

**Total Particulate**

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

Date: 2-Dec-16 Client: OneSteel Hexham  
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV <sub>3</sub> ):	1.1689 m <sup>3</sup>	Average barometric pressure (P <sub>BARO</sub> ):	1010 hPa
Average gas meter temp. (T <sub>M,2</sub> ):	37.7 °C	Average pressure at meter (P <sub>M,2</sub> ):	1010.00 hPa
	310.9 K		
Sample gas volume (MV <sub>4</sub> ); (0°C, dry gas, 1 atm pressure):	1.0239 m <sup>3</sup>		

(B) Total Particulate concentration at standard conditions

Blank thimble No.:	NA	Blank weight:	g
Thimble No. used:	T399	Total Particulate Weight:	0.0007 g
Final Total Particulate Weight (Mp1):	0.00070 g		
Total Particulate Concentration (C1):	= M <sub>p1</sub> /MV <sub>4</sub> =		0.00068 g/m <sup>3</sup> (0°C, dry gas, 1atm pressure)
			0.68 mg/m <sup>3</sup> (0°C, dry gas, 1atm pressure)

CO<sub>2</sub> Basis 12 % ;and C<sub>2</sub> = 0.68 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure)

Average CO<sub>2</sub>%: 0.0 %

Therefore, C<sub>c</sub>: = C<sub>a</sub> x 12/CO<sub>2</sub>% = 0.00068 g/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 12% CO<sub>2</sub>)

;and C<sub>c1</sub> = 0.68 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 12% CO<sub>2</sub>)

O<sub>2</sub> Basis 7 %

Average O<sub>2</sub>%: 20.9 %

Therefore, C<sub>b</sub>: = C<sub>a</sub> x (21 - O<sub>2ref</sub>%)/(21 - O<sub>2mea</sub>%) = 0.095 g/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 7% O<sub>2</sub>)

;and C<sub>b1</sub> = 95 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 7% O<sub>2</sub>)

(C) Moisture content

Silica Gel Number: M301

V<sub>v</sub> = 11.6 g (from laboratory report) V<sub>w</sub> = 0 mL (=grams) (recorded on Laboratory Form 108)

Volume of Water Vapour Condensed (V<sub>wc(std)</sub>) = 0.0000

Volume of Water Vapour Condensed (V<sub>wsg(std)</sub>) = 0.0155

Therefore, B<sub>ws</sub> = 
$$\frac{(V_{wc(std)} + V_{wsg(std)})}{(V_{wc(std)} + V_{wsg(std)} + V_{m(std)})}$$

B<sub>ws</sub> = 1.49 %

**STACK ANALYSIS - FINAL CALCULATIONS CONTINUED**

**Total Particulate**

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

- (i) Initial gas density for sampling: 1.28 kg/m<sup>3</sup> (from Laboratory Form 107)
- (ii) Re-calculated gas density based on moisture content in (c):
  - 1.28 kg/m<sup>3</sup> (0°C, wet, 1 atm pressure)
  - 1.29 kg/m<sup>3</sup> (0°C, dry, 1 atm pressure)
- (iii) Gas density at stack conditions =
  - (ii) x  $\frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$
  - = 1.154 kg/m<sup>3</sup> (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<sub>stack</sub> = V<sub>s</sub> x A = 1.11 m<sup>3</sup>/s (stack conditions)

Q<sub>std</sub> = Q<sub>stack</sub> x  $\frac{P_s}{(P_{std})} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$

Q<sub>std</sub> = 1.0 m<sup>3</sup>/s (0°C, dry gas, 1 atm pressure)

(G) Mass Emission Rate

R <sub>m</sub> =	C <sub>1a</sub> x Q <sub>std</sub> =	0.00067	g/s (0°C, dry gas, 1 atm pressure )		
	=	0.67	mg/s (0°C, dry gas, 1 atm pressure )		
	C <sub>1a</sub> x Q <sub>std</sub> =	0.00067	g/s (0°C, dry gas, 1 atm pressure	12%	CO <sub>2</sub> )
	=	0.67	mg/s (0°C, dry gas, 1 atm pressure	12%	CO <sub>2</sub> )
	C <sub>1a</sub> x Q <sub>std</sub> =	0.094	g/s (0°C, dry gas, 1 atm pressure	7%	O <sub>2</sub> )
	=	94	mg/s (0°C, dry gas, 1 atm pressure	7%	O <sub>2</sub> )

**STACK ANALYSIS - FINAL CALCULATIONS**

**Hazardous Substances (Metals)**

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

Date: 2-Dec-16 Client: OneSteel Hexham  
 AECOM's Project No: 60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV<sub>3</sub>): 1.3693 m<sup>3</sup> Average barometric pressure (P<sub>BARO</sub>): 1010 hPa  
 Average gas meter temp. (T<sub>M,2</sub>): 33.0 °C  
 306.2 K Average pressure at meter (P<sub>M,2</sub>): 1010.00 hPa  
 Sample gas volume (MV<sub>4</sub>); (0°C, dry gas, 1 atm pressure): 1.2178 m<sup>3</sup>

(B) Metals concentration at standard conditions

Blank thimble No.: NA Blank weight: g  
 Thimble No. used: NA Metals Weight: 0.000013 g  
 Final Metals Weight (Mp1): 0.00001 g  
 Metals Concentration (C1): =M<sub>p1</sub>/MV<sub>4</sub>= 0.000011 g/m<sup>3</sup> (0°C, dry gas, 1atm pressure)  
 ;and C<sub>2</sub> = 0.011 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure)

CO<sub>2</sub> Basis 12 %  
 Average CO<sub>2</sub>%: 0.0 %

Therefore, C<sub>c</sub>: = C<sub>a</sub> x 12/CO<sub>2</sub>% = 0.000011 g/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 12% CO<sub>2</sub>)  
 ;and C<sub>c1</sub> = 0.011 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 12% CO<sub>2</sub>)

O<sub>2</sub> Basis 7 %  
 Average O<sub>2</sub>%: 20.9 %

Therefore, C<sub>D</sub>: =C<sub>a</sub> x (21 - O<sub>2ref</sub>%)/(21 - O<sub>2mea</sub>%) = 0.0015 g/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 7% O<sub>2</sub>)  
 ;and C<sub>b1</sub> = 1.5 mg/m<sup>3</sup> (0°C, dry gas, 1atm pressure, 7% O<sub>2</sub>)

(C) Moisture content

Silica Gel Number: G058  
 V<sub>v</sub> = 14 g (from laboratory report) V<sub>w</sub> = 8 mL (=grams) (recorded on Laboratory Form 108)  
 Volume of Water Vapour Condensed (V<sub>wc(std)</sub>) = 0.0107  
 Volume of Water Vapour Condensed (V<sub>wsg(std)</sub>) = 0.0187

Therefore, B<sub>ws</sub> =  $\frac{(V_{wc(std)}+V_{wsg(std)})}{(V_{wc(std)}+V_{wsg(std)}+V_{m(std)})}$

B<sub>ws</sub> = 2.35 %

**STACK ANALYSIS - FINAL CALCULATIONS CONTINUED**

**Hazardous Substances (Metals)**

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

(i) Initial gas density for sampling:	1.28 kg/m <sup>3</sup> (from Laboratory Form 107)
(ii) Re-calculated gas density based on moisture content in (c):	1.28 kg/m <sup>3</sup> (0°C, wet, 1 atm pressure) 1.29 kg/m <sup>3</sup> (0°C, dry, 1 atm pressure)
(iii) Gas density at stack conditions =	(ii) x $\frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$
=	1.154 kg/m <sup>3</sup> (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)

Qstack =	Vs x A =	1.11 m <sup>3</sup> /s (stack conditions)
Qstd =	Qstack x $\frac{P_s}{(P_{std})} \times \frac{(T_{std})}{(T_s)} \times \frac{(100 - B_w)}{100}$	
Qstd =	1.0 m <sup>3</sup> /s (0°C, dry gas, 1 atm pressure)	

(G) Mass Emission Rate

Rm =	C <sub>1a</sub> x Qstd =	0.000011	g/s (0°C, dry gas, 1 atm pressure )	
	=	0.011	mg/s (0°C, dry gas, 1 atm pressure )	
	C <sub>1a</sub> x Qstd =	0.000011	g/s (0°C, dry gas, 1 atm pressure	12% CO <sub>2</sub> )
	=	0.011	mg/s (0°C, dry gas, 1 atm pressure	12% CO <sub>2</sub> )
	C <sub>1a</sub> x Qstd =	0.0015	g/s (0°C, dry gas, 1 atm pressure	7% O <sub>2</sub> )
	=	1.5	mg/s (0°C, dry gas, 1 atm pressure	7% O <sub>2</sub> )

EMISSION MONITORING RESULTS, SHREDDER STACK ONESTEEL HEXHAM 2-Dec-16 FINE PARTICULATE (PM10) TOTAL PARTICULATE HAZARDOUS SUBSTANCES (METALS)		
<b>Sampling Conditions:</b>		
Stack internal diameter at test location	760 mm	
Stack gas temperature (average)	29.0 °C	302.2 K
Stack pressure (average)	1010 hPa	
Stack gas velocity (average, stack conditions)	2.5 m/s	
Stack gas flowrate (stack conditions)	1.1 m <sup>3</sup> /s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	0.98 m <sup>3</sup> /s	
<b>Fine Particulate (PM10) Testing</b>		
Test Period	9:56	- 11:27
Fine Particulate (PM10) Mass	0.4 mg	
Gas Volume Sampled	1.07 m <sup>3</sup>	
Fine Particulate (PM10) Emission*1	0.37 mg/m <sup>3</sup>	
Fine Particulate (PM10) Mass Emission Rate*2	0.36 mg/s	
Regulatory Limit	NA mg/m <sup>3</sup>	
<b>Total Particulate Testing</b>		
Test Period	9:56	- 11:27
Total Particulate Mass	0.7 mg	
Gas Volume Sampled	1.02 m <sup>3</sup>	
Total Particulate Emission*1	0.68 mg/m <sup>3</sup>	
Total Particulate Mass Emission Rate*2	0.67 mg/s	
Regulatory Limit	100 mg/m <sup>3</sup>	
<b>Hazardous Substances (Metals) Testing</b>		
Test Period	9:56	- 11:27
Hazardous Substances (Metals) Mass	0.013 mg	
Gas Volume Sampled	1.22 m <sup>3</sup>	
Hazardous Substances (Metals) Emission*1	0.011 mg/m <sup>3</sup>	
Hazardous Substances (Metals) Mass Emission Rate*2	0.011 mg/s	
Regulatory Limit	NA mg/m <sup>3</sup>	
<b>Moisture Content (%)</b>	1.9	
<b>Gas Density (dry at 1 atmosphere)</b>	1.29 kg/m <sup>3</sup>	
<b>Dry Molecular Weight</b>	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<sub>std</sub> in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.







# Appendix B

Laboratory Results  
(12 pages)

## Appendix B Laboratory Results (12 pages)

# Steel River Testing



5/11 McIntosh Drive, Mayfield West, NSW 2304

Phone: 02 49677880

## STACK EMISSION - PARTICULATES REPORT

**Origin:** AECOM - Newcastle

**Report :** 12605-0-P

Page 1 of 1

**Project:** 60493017

**Description :** Stack Emission Samples

**Date :** 09-Dec-16

Received: 07-Dec-16

**Report To :** Colin Clarke

**Copy to:** FILE

17 Warabrook Blvd, Warabrook NSW 2304

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Thimble ID		Volume (mL)	Total Particulate Matter (g)
T398	Filter	-	0.0004
T399	Filter	-	0.0007



NATA Accredited Laboratory 18079

Accredited for compliance with  
ISO/IEC 17025 - Testing

*Note : Sampled by Client*

**Reported By:** M. Campbell

Michael 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 :** 12605-0-M Page 1 of 1  
**Description :** Stack Emission Samples  
Received: 07-Dec-16  
**Date :** 09-Dec-16  
**Report To :** Colin Clarke  
17 Warabrook Blvd, Warabrook NSW 2304  
**Copy to:** FILE

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Jar ID	Moisture (g)
G058	14.0
M301	11.6
P38	9.8



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

**Reported By:** M. Campbell  
Michael Campbell

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

Chartered Chemists  
22-Dec-2016

**REPORT NUMBER: M162302**  
Site/Client Ref: 60493017/1.1  
Order No: 60493017/1.1

**AECOM**  
17 Warabrook Bvde  
Warabrook  
  
NSW 2304  
Attention: Colin Clarke

### CERTIFICATE OF ANALYSIS

**SAMPLES:** Twelve samples were received for analysis

**DATE RECEIVED:** 6-Dec-2016

**DATE COMMENCED:** 6-Dec-2016

**METHODS:** See Attached Results

**RESULTS:** Please refer to attached pages for results.  
Note: Results are based on samples as received at SGS laboratories

**REPORTED BY:**



**Ming Dai**  
Senior Chemist



NATA Accredited Laboratory Number: 14429

Accredited for compliance  
with ISO/IEC 17025.

## ANALYTICAL RESULTS

Matrix: Filter

Method: USEPA M29 (Analysis only) - MA-1400.FL.M29.02

Sample units are expressed in µg total

Test Started: 16/12/2016

Analyte Name	Sampled Date	Leeder ID	2016028745	2016028746	2016028747
		Client ID	Metals 1	Metals 12	Method
	PQL				Blank
Sb	0.2		nd	nd	nd
As	0.2		nd	0.2	nd
Be	0.2		nd	nd	nd
Cd	0.2		0.2	nd	nd
Cr	0.2		0.7	0.8	nd
Co	0.2		nd	nd	nd
Cu	0.2		9.0	1.8	nd
Pb	0.2		1.1	0.5	nd
Mg	2		48	81	nd
Mn	0.2		1.2	0.8	nd
Hg	0.2		nd	nd	nd
Ni	0.2		1.4	0.5	nd
Se	0.2		nd	nd	nd
Tl	0.2		nd	nd	nd
Sn	0.2		nd	nd	nd
V	0.2		2.1	2.6	nd
Zn	0.2		930	1700	nd

## ANALYTICAL RESULTS

**Matrix: Impinger Solution**

**Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.06 Metals in Impingers (ug total)**

Sample units are expressed in µg total

Test Started: 16/12/2016

Analyte Name	Sampled Date PQL	Leeder ID Client ID	2016028748 Metals 3	2016028749 Metals 4
Sb	0.1		nd	0.2
As	0.1		0.1	nd
Be	0.1		nd	nd
Cd	0.1		0.4	0.1
Cr	0.1		0.4	0.6
Co	0.1		nd	nd
Cu	0.1		4.6	0.5
Pb	0.1		3.0	0.6
Mg	0.1		5.2	2.3
Mn	0.1		4.7	1.7
Hg	0.1		nd	nd
Ni	0.1		0.8	0.3
Se	0.1		nd	nd
Tl	0.1		nd	nd
Sn	0.1		0.1	0.1
V	0.1		nd	nd
Zn	0.1		28	8.2
Sample Volume (mL)			94	310

## ANALYTICAL RESULTS

Matrix: Impinger Solution

Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.06 Metals in Impingers (ug total)

Sample units are expressed in µg total

Test Started: 16/12/2016

Analyte Name	Leader ID Client ID	Sampled Date PQL	2016028750	2016028751	2016028752	2016028753	2016028754
			Metals 8A	Metals 9	Metals 5A	Metals 5C	Metals 8B
Sb		0.1	nd	0.1			
As		0.1	nd	nd			
Be		0.1	nd	nd			
Cd		0.1	nd	nd			
Cr		0.1	nd	nd			
Co		0.1	nd	nd			
Cu		0.1	0.2	0.3			
Pb		0.1	nd	nd			
Mg		0.1	0.2	1.7			
Mn		0.1	0.3	0.3			
Hg		0.1	nd	nd	nd	nd	nd
Ni		0.1	nd	0.3			
Se		0.1	nd	nd			
Tl		0.1	nd	nd			
Sn		0.1	nd	0.1			
V		0.1	nd	nd			
Zn		0.1	nd	nd			
Sample Volume (mL)			300	200	100	250	100



## ANALYTICAL RESULTS

**Matrix: Impinger Solution**

**Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.06 Metals in Impingers (ug total)**

Sample units are expressed in µg total

Test Started: 16/12/2016

Analyte Name	Sampled Date PQL	Leader ID	2016028755	2016028756
		Client ID	Metals 11	Method
				Blank
Sb	0.1			nd
As	0.1			nd
Be	0.1			nd
Cd	0.1			nd
Cr	0.1			nd
Co	0.1			nd
Cu	0.1			nd
Pb	0.1			nd
Mg	0.1			nd
Mn	0.1			nd
Hg	0.1		nd	nd
Ni	0.1			nd
Se	0.1			nd
Tl	0.1			nd
Sn	0.1			nd
V	0.1			nd
Zn	0.1			nd
Sample Volume (mL)			250	

**Matrix: KMnO4**

**Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.04 Mercury in Impingers (ug total)**

Sample units are expressed in µg total

Test Started: 16/12/2016

Analyte Name	Sampled Date PQL	Leader ID	2016028757	2016028758	2016028759
		Client ID	Metals 5B	Metals 10	Method
					Blank
Hg	0.5		nd	nd	nd
Sample Volume (mL)			390	110	

QA/QC RESULTS

Matrix: Filter

Method: USEPA M29 (Analysis only) - MA-1400.FL.M29.02

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 16/12/2016

Analyte Name	Sampled Date PQL	Leeder ID Client ID	2016028760 Method	2016028761 Method
			Spike	Spike Dup
Sb			89	90
As			86	87
Be			104	107
Cd			90	91
Cr			91	91
Co			91	92
Cu			92	92
Pb			76	76
Mg			98	101
Mn			95	96
Hg			83	82
Ni			99	100
Se			85	83
Tl			76	76
Sn			98	100
V			101	100
Zn			112	112

## QA/QC RESULTS

**Matrix: Impinger Solution**

**Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.06 Metals in Impingers (ug total)**

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 16/12/2016

Analyte Name	Sampled Date PQL	Leeder ID Client ID	2016028762 Method	2016028763 Method
			Spike	Spike Dup
Sb			104	105
As			100	103
Be			111	106
Cd			106	106
Cr			101	102
Co			101	102
Cu			108	109
Pb			93	93
Mg			113	116
Mn			115	117
Hg			102	101
Ni			107	110
Se			99	105
Tl			90	91
Sn			109	110
V			112	117
Zn			106	105

**Matrix: KMnO4**

**Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.04 Mercury in Impingers (ug total)**

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 16/12/2016

Analyte Name	Sampled Date PQL	Leeder ID Client ID	2016028764 Method
			Spike
Hg			101

**Matrix: KMnO4**

**Method: USEPA M29 (Analysis only) - MA-1400.IMP.M29.04 Mercury in Impingers (ug total)**

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 16/12/2016

Analyte Name	Sampled Date PQL	Leeder ID Client ID	2016028765 Method
			Spike Dup
Hg			100

**QUALIFIERS / NOTES FOR REPORTED RESULTS**

- PQL Practical Quantitation Limit
- nd Not Detected – The analyte was not detected above the reported PQL.
- is Insufficient Sample to perform this analysis.
- T Tentative identification based on computer library search of mass spectra.
- NC Not calculated and/or Results below PQL
- NV No Vacuum, Canister received above standard atmospheric pressure
- nr Not Requested for analysis.
- R Rejected Result – results for this analysis failed QC checks.
- SQ Semi-Quantitative result – quantitation based on a generic response factor for this class of analyte.
- IM Inappropriate method of analysis for this compound
- U Unable to provide Quality Control data – high levels of compounds in sample interfered with analysis of QC results.
- UF Unable to provide Quality Control data- Surrogates failed QC checks due to sample matrix effects
- L Analyte detected at a level above the linear response of calibration curve.
- E Estimated result. NATA accreditation does not cover estimated results.
- C1 These compounds co-elute.
- Parameter Not Determined
- CT Elevated concentration. Results reported from carbon tube analysis
- \*\* Sample shows non-petroleum hydrocarbon profile

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**APPENDIX ONE.**

**CHAIN OF CUSTODY DOCUMENT**



**Chain of Custody Record -  
SGS Leeder Consulting**

Dispatch samples to: Unit 5/18 Redland Drive, Mitcham, VIC, 3132

Attn: Lyndall Stevens - Contact Ph: (03) 9874 1988 Fax: (03) 9874 1933 Email: au.samplerreceipt.mitcham@sgs.com

CLIENT NAME: AECOM		CONTACT PHONE No: 02 4911 4900		Sample Disposal (Please X) After: 4 Weeks ( ) 6 Weeks ( )														
CLIENT ADDRESS: 17 Warabrook I Warabrook NSW 2304		CONTACT FAX No: 02 4911 4999																
CONTACT: Colin Clarke		RESULTS REQUIRED BY: Standard																
SAMPLED BY: DT JL		EMAIL REPORT TO: colin.clarke@aecom.com																
PROJECT REF. / ORDER No: 60493017/1.1		LAB QUOTE NUMBER:																
Client Sample ID	Date Sampled	Matrix		Containers/Preservation (please tick)								Metals - USEPA Method 29*	Analyses Required (Analyte + Method Code)					
		Filter	Impinger	0.1-1L Jar(G) n.a.	0.1-1.0 litre(P) Nat.	40ml Vial(G) Nat.	0.1-1L H2SO4 (P)	125mL HCl acid washed	125mL (P) Zn Acc.	125mL (P) NaOH	125mL (P) Filtered Yes/No			(G=glass, P=plastic) 125mL (P) NaOH				
Metals 1		X																
Metals 3			X		X													
Metals 4			X		X													
Metals 5A			X		X													
Metals 5B			X		X													
Metals 5C			X		X													
Metals 8A			X		X													
Metals 8B			X		X													
Metals 9			X		X													
Metals 10			X		X													
Metals 11			X		X													
Metals 12			X		X													
Totals:		2	8	2	2	8	2	2	8									
<b>CHAIN OF CUSTODY RECORD</b>																		
RELEASED BY: (Name)	(Signature)	(Date / Time)	Custody Seals Intact?															
RECEIVED BY: Dylan Turnbull	(Signature)	(Date / Time)	Samples Received Chilled?															
RECEIVED BY: (Name)	(Signature)	(Date / Time)																
<p>Please Note: Dissolved metals require filtering in the field. Please indicate whether the HNO3 acidified sample has been filtered.</p> <p>Comments: (eg. Highly contaminated samples, reporting requirements etc)</p> <p>*Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mg, Mn, Hg, Ni, Se, Ti, Sn, V, Zn</p>																		

End of Report

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