

4th Quarter Emissions Testing Report 2018

OneSteel Recycling Hexham



NATA ACCREDITATION No. 2778 (14391)

Accredited for compliance with ISO/IEC 17025 – Testing

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

This document may not be reproduced except in full.

4th Quarter Emissions Testing Report 2018

OneSteel Recycling Hexham

Client: Liberty OneSteel Recycling Pty Ltd

ABN: 28 002 707 262

Prepared by

AECOM Australia Pty Ltd

17 Warabrook Boulevard, Warabrook NSW 2304, PO Box 73, Hunter Region MC NSW 2310, Australia
T +61 2 4911 4900 F +61 2 4911 4999 www.aecom.com

ABN 20 093 846 925

08-Jan-2019


Job No.: 60493017

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document 4th Quarter Emissions Testing Report 2018
Ref 60493017
Date 07-January-2019
Prepared by Sharn Crosdale
Reviewed by Paul Wenta
AECOM Approved Signatory Chad Whitburn 

Revision History


Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	08-Jan-2019	Report for Issue	Chad Whitburn Associate Director - Compliance Services	

Table of Contents

1.0	Introduction	1
2.0	Sampling Plane Requirements	2
3.0	Methodology	3
3.1	NATA Accredited Methods	3
3.2	Equipment Calibration	3
4.0	Sampling Location	4
4.1	Sampling Location Summary	4
5.0	Results	5
Appendix A		
	Field Sheets (17 pages)	A
Appendix B		
	Laboratory Results (8 pages)	B

List of Tables

Table 1	Criteria for Selection of Sampling Planes (AS 4323.1)	2
Table 2	AECOM NATA Endorsed Methods	3
Table 3	Sampling Location Summary	4
Table 4	Shredder Baghouse Emission Results Summary, 13 December 2018	5
Table 5	Fine Particulate (PM ₁₀), Total Particulate and Hazardous Substance (Metals) Results, 13 December 2018	6
Table 6	Hazardous Substances (Metals) Elemental Analysis Results, 13 December 2018	7

1.0 Introduction

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

Testing was undertaken on 13 December 2018 to investigate emission concentrations for the following parameters:

- Fine Particulates (PM_{10});
- 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 17626-0-M & 17626-0-P:
 - Total Particulate (TP);
 - Fine Particulates (PM_{10}); and
 - Moisture.
- SGS Australia Pty Ltd, NATA accreditation number 2562, performed the following analysis detailed in report number ME309136 R0:
 - Hazardous Substances (Metals).

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.

- The gas flow is basically in the same direction at all points along each sampling traverse;*
- The gas velocity at all sampling points is greater than 3 m/s;*
- 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;*
- 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;*
- 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*
- The gas temperature at the sampling plane should preferably be above the dewpoint.*

The sampling plane for EPL Point 1 was compliant with the AS4323.1.

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	N/A	Selection of sampling positions
AS4323.2	N/A	Determination of total particulate matter – isokinetic manual sampling – gravimetric method
NSW EPA TM-2	USEPA (2000) Method 2	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.

4.0 Sampling Location

4.1 Sampling Location Summary

Table 3 provides a summary of the location sampled by AECOM on 13 December 2018.

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
Correction Factors Applied	No
Total No. Points Sampled	12
Points/Traverse	6
Sampling Performed to Standard ¹	Yes

¹ AS 4323.1 Section 4.1
D = Diameters

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, 13 December 2018

Parameter	Emission Concentration (EPL Point 1)	Emission Concentration Limit
Total Particulate (TP) (mg/m ³)	44	100
Fine Particulate (PM ₁₀) (mg/m ³)	3.9	N/A
Lead (mg/m ³)	0.35	5
Mercury (mg/m ³)	0.00044	1
Total Hazardous Substances (Metals) (mg/m ³)	0.55	N/A

Results from testing conducted on EPL Point 1 on 13 December 2018 are below the regulatory limits listed in EPL 5345.

Table 5 Fine Particulate (PM₁₀), Total Particulate and Hazardous Substance (Metals) Results, 13 December 2018

Sampling Conditions:		
Stack internal diameter at test location	760 mm	306.7 K
Stack gas temperature (average)	33.5 °C	
Stack pressure (average)	1010 hPa	
Stack gas velocity (average, stack conditions)	5.2 m/s	
Stack gas flowrate (stack conditions)	2.4 m³/s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	2.1 m³/s	
Fine Particulate (PM ₁₀) Testing		
Test Period	13:35 -	15:04
Fine Particulate (PM ₁₀) Mass	4.1 mg	
Gas Volume Sampled	1.04 m³	
Fine Particulate (PM ₁₀) Emission* ¹	3.9 mg/m³	
Fine Particulate (PM ₁₀) Mass Emission Rate* ²	8.1 mg/s	
Regulatory Limit	N/A mg/m³	
Total Particulate Testing		
Test Period	13:35 -	15:04
Total Particulate Mass	43.5 mg	
Gas Volume Sampled	0.982 m³	
Total Particulate Emission* ¹	44 mg/m³	
Total Particulate Mass Emission Rate* ²	91 mg/s	
Regulatory Limit	100 mg/m³	
Hazardous Substances (Metals) Testing		
Test Period	13:35 -	15:04
Hazardous Substances (Metals) Mass	0.62 mg	
Gas Volume Sampled	1.13 m³	
Hazardous Substances (Metals) Emission* ¹	0.55 mg/m³	
Hazardous Substances (Metals) Mass Emission Rate* ²	1.1 mg/s	
Regulatory Limit	N/A mg/m³	
Moisture Content (%)	2.4	
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, 13 December 2018

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	0.00125	0.00111	0.000148	0.000131			0.0014	0.00124	0.00254
Arsenic	0.00034	0.000301	<0.0001	<0.0000885			0.00034	0.000301	0.000617
Beryllium	<0.0001	<0.0000885	<0.0001	<0.0000885			<0.0001	<0.0000885	<0.000181
Cadmium	0.00455	0.00403	<0.0001	<0.0000885			0.0046	0.00407	0.00834
Chromium	0.0876	0.0776	0.00125	0.00111			0.089	0.0788	0.162
Cobalt	0.00133	0.00118	<0.0001	<0.0000885			0.0013	0.00115	0.00236
Copper	0.0323	0.0286	0.00099	0.000876			0.033	0.0292	0.0599
Lead	0.404	0.358	0.00029	0.000257			0.404	0.358	0.734
Magnesium	0.219	0.194	<0.0029	<0.00257			0.22	0.195	0.4
Manganese	0.0554	0.049	0.00679	0.00601			0.062	0.0549	0.113
Mercury	0.0001	0.0000885	0.0000483	0.0000428	0.000351	0.000311	0.0005	0.000443	0.000908
Nickel	0.0565	0.05	0.00049	0.000434			0.057	0.0505	0.104
Selenium	0.00012	0.000106	<0.0001	<0.0000885			0.00012	0.000106	0.000217
Thallium	<0.0001	<0.0000885	<0.0001	<0.0000885			<0.0001	<0.0000885	<0.000181
Tin	0.00193	0.00171	<0.0141	<0.0125			0.0019	0.00168	0.00344
Vanadium	<0.0097	<0.00859	<0.0086	<0.00761			<0.0001	<0.0000885	<0.000181
Zinc	3.1	2.74	0.0058	0.00514			3.1	2.74	5.62
Total Hazardous Metals*	0.61	0.54	0.0090	0.0080	0.00035	0.00031	0.62	0.55	1.13
Total Metals	3.96	3.51	0.016	0.014			3.98	3.52	7.22

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

This page has been left blank intentionally.

Appendix A

Field Sheets (17 pages)

Appendix A Field Sheets (17 pages)

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

OneSteel Hexham

AECOM's Project Number: 60493017

Emission Source: Shredder Stack

Date Sampled: 13-Dec-18

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:

Sampling Performed By:


Dylan Turnbull
Sharn Crosdale
Brendan Schrader

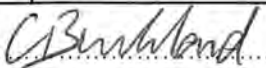
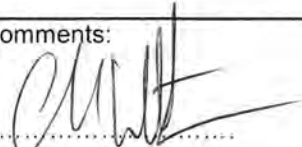
ANZ

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - PRE-SAMPLING

Date: 13-Dec-18
 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	
			PM2.5/10= 12	
Upstream (m) = 5			No. of sampling traverses/ports sampled = 2	
No. Diameters = 6.6			PM2.5/10= 2	
Type of Upstream Disturbance: Fan Entry			No. of sampling points on each traverse/port = 6	
Downstream (m) = 2			PM2.5/10= 6	
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			Check of total points against minimum, (yes/no) - comments:	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
Signed: 			Checked: 	

ANZ

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - GAS COMPOSITION AND DENSITY PRE-SAMPLING

Date: 13-Dec-18
 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: 13:35		Sampling port No.: 1		
Measurement No.	Time sampled	CO (ppm), (dry)	O ₂ (%), (dry)	CO ₂ (%), (dry)
1	13:35	0	20.9	0.0
2	13:36	0	20.9	0.0
3	13:37	0	20.9	0.0
4	13:38	0	20.9	0.0
5	13:39	0	20.9	0.0
6	13:40	0	20.9	0.0
7	13:41	0	20.9	0.0
8	13:42	0	20.9	0.0
Averages:		0.0 ppm	20.9 %	0.0 %

Moisture content (M3): 0.99

Moisture percentage (M2): 1.40 %

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 : 78.0 %, (wet)
CO ₂ : 0.0 %, (wet)	O ₂ : 20.6 %, (wet)
H ₂ O: 1.40 % (=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)	

ANZ

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - GAS COMPOSITION AND DENSITY POST-SAMPLING

Date: 13-Dec-18
 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: 14:50		Sampling port No.: 1		
Measurement No.	Time sampled	CO (ppm), (dry)	O ₂ (%), (dry)	CO ₂ (%), (dry)
1	14:50	0	20.9	0.0
2	14:51	0	20.9	0.0
3	14:52	0	20.9	0.0
4	14:53	0	20.9	0.0
5	14:54	0	20.9	0.0
6	14:55	0	20.9	0.0
7	14:56	0	20.9	0.0
8	14:57	0	20.9	0.0
Averages:		0.0 ppm	20.9 %	0.0 %

Moisture content (M3): 0.98

Moisture percentage (M2): 2.13 %

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 : 77.4 %,(wet)
CO ₂ : 0.0 %,(wet)	O ₂ : 20.5 %,(wet)
H ₂ O: 2.13 % (=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)	

Q4AN(EV)-332-FM31

Date: 13-Dec-18
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)

Static Pressure (Dwyer) (Pa):	kPa
Static Pressure (U-tube, if required) :	-2.9 mm
Absolute pressure in stack (hPa) :	1010.22 hPa

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS

SAMPLING OF FINE PARTICULATE (PM₁₀)

Date: 13-Dec-18

Client: OneSteel Hexham

AECOM's Project No: 60493017

Stack Description No.: Shredder Stack

Sample Nozzle No.:	Fine8	Sample Nozzle Area (A _n):	3.57	x 10 ⁻⁵ m ²
--------------------	-------	---------------------------------------	------	-----------------------------------

Sample No.: 110	Sample No.: 110
Sampling Port No.: 1 to 2	Thimble No.: T1

Sampling Port No:	1 to 2	Thimble No:	1 to 2
Page No:	1 of 1	Blank thimble No:	0

Leak Check (Pre-Sampling)

Meter start: 514.7012 Meter finish:

Time start: 12:20 Time finish:

Leak Check (Post Sampling)

Meter start: 515.8898 Meter finish: 515.8898

Time start: 15:04 Time finish: 15:05

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: 1011 hPa (start):

1011 hPa (finish)

Meter start: 514.7037

Time start: 13:35

Meter correction factor (GMf) : 1.0000

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)
1/1	0:07:00	33	13.4	31.0	30.0		Yes
1/2	0:06:30	111	13.4	35.0	30.0		Yes
1/3	0:06:30	225	13.4	37.0	31.0		Yes
1/4	0:07:00	535	13.4	39.0	32.0		Yes
1/5	0:07:00	649	13.4	40.0	33.0		Yes
1/6	0:06:45	727	13.4	41.0	33.0		Yes
2/1	0:07:30	33	13.4	42.0	34.0		Yes
2/2	0:07:30	111	13.4	43.0	35.0		Yes
2/3	0:07:45	225	13.4	43.0	35.0		Yes
2/4	0:08:00	535	13.4	44.0	35.0		Yes
2/5	0:07:45	649	13.4	44.0	36.0		Yes
2/6	0:07:45	727	13.4	44.0	36.0		Yes
Averages				40.3	33.3	no result	

Meter Finish: 515.8880

Time Finish: 15:04

Total Condensate collected: 7 ml

Silica gel No(s) used: 112

STACK ANALYSIS

SAMPLING OF TOTAL PARTICULATE

Date: 13-Dec-18

Client: OneSteel Hexham

AECOM's Project No: 60493017

Stack Description No.: Shredder Stack

Sample Nozzle No.: S4

Sample Nozzle Area (A_n): 4.5 $\times 10^{-5} \text{ m}^2$

Sampling Port No.: 1 to 2

Thimble No: T22

Page No: 1 of 1

Blank thimble No:

Leak Check (Pre-Sampling)

Meter start: 5472.4642 Meter finish:

Time start: 12:22 Time finish:

Leak Check (Post Sampling)

Meter start: 5473.5964 Meter finish: 5473.5964

Time start: 15:06 Time finish: 15:07

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: 1011 hPa (start);

Meter start: 5472.4662

Time start:

1011 hPa (finish)

13:35

Meter correction factor (GMf) : 0.9900

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)
1/1	0:07:15	33	13.2	30.0	30.0		Yes
1/2	0:14:30	111	12.4	35.0	30.0		Yes
1/3	0:21:45	225	12.4	37.0	31.0		Yes
1/4	0:29:00	535	13.2	39.0	32.0		Yes
1/5	0:36:15	649	13.2	40.0	32.0		Yes
1/6	0:43:30	727	12.7	41.0	33.0		Yes
2/1	0:50:45	33	14.0	42.0	33.0		Yes
2/2	0:58:00	111	14.2	43.0	34.0		Yes
2/3	1:05:15	225	14.5	43.0	35.0		Yes
2/4	1:12:30	535	15.0	44.0	35.0		Yes
2/5	1:19:45	649	14.2	44.0	36.0		Yes
2/6	1:27:00	727	14.5	44.0	36.0		Yes
Averages				40.2	33.1	no result	

Averages:	
Meter Finish:	5473.5938

Time Finish: 15:04

Total Condensate collected: 8 ml

Silica gel No(s) used: 19

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS

SAMPLING OF HAZARDOUS SUBSTANCES (METALS)

Date: 13-Dec-18

Client: OneSteel Hexham

AECOM's Project No: 60493017

Stack Description No.: Shredder Stack

Sample Nozzle No.: G64

Sampling Port No.: 1 to 2

Page No: 1 of 1

Sample Nozzle Area (A_n): 4.78 x 10⁻⁵ m²

Thimble No: 0

Blank thimble No:

Leak Check (Pre-Sampling)

Meter start: 22146.3440 Meter finish:

Time start: 12:24 Time finish:

Leak Check (Post Sampling)

Meter start: 22147.6306 Meter finish: 22147.6306

Time start: 15:08 Time finish: 15:09

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: 1011 hPa (start):

1011 hPa (finish)

Meter start: 22146.3462

Time start: 13:35

Meter correction factor (GMf) : 1.0000

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)
1/1	0:07:15	33	14.2	29.0	29.0		Yes
1/2	0:14:30	111	13.3	32.0	29.0		Yes
1/3	0:21:45	225	13.3	34.0	30.0		Yes
1/4	0:29:00	535	14.2	36.0	31.0		Yes
1/5	0:36:15	649	14.2	38.0	32.0		Yes
1/6	0:43:30	727	13.6	40.0	33.0		Yes
2/1	0:50:45	33	15.0	41.0	34.0		Yes
2/2	0:58:00	111	15.3	42.0	35.0		Yes
2/3	1:05:15	225	15.5	42.0	36.0		Yes
2/4	1:12:30	535	16.1	43.0	37.0		Yes
2/5	1:19:45	649	15.3	43.0	37.0		Yes
2/6	1:27:00	727	15.5	44.0	38.0		Yes
Averages				38.7	33.4	no result	

Meter Finish:	22147.6280
---------------	------------

Time Finish: 15:04

Total Condensate collected: 12 ml

Silica gel No(s) used: 26

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

Stack Analysis - Post Sampling Pitot Tube and Temperature Traverses

Date: 13-Dec-18
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 :	15:10	Barometric Pressure :		1010.5	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	0.022	34.0	307.2	5.2
1/2	81	0.020	34.0	307.2	4.9
1/3	195	0.019	34.0	307.2	4.8
1/4	505	0.019	34.0	307.2	4.8
1/5	619	0.021	34.0	307.2	5.1
1/6	697	0.021	34.0	307.2	5.1
2/1	3	0.023	34.0	307.2	5.3
2/2	81	0.023	34.0	307.2	5.3
2/3	195	0.024	34.0	307.2	5.4
2/4	505	0.026	34.0	307.2	5.6
2/5	619	0.025	34.0	307.2	5.5
2/6	697	0.024	34.0	307.2	5.4
Average			34.0	307.2	5.2

Static Pressure (Dwyer) (Pa):	kPa
Static Pressure (U-tube, if required) :	-2.7 mm
Absolute pressure in stack (hPa) :	1010.24 hPa

ANZ

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

Stack Analysis - Hazardous Substances Elemental Analysis Results

Date: 13-Dec-18
AECOM's Project No:Client: OneSteel Hexham
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	0.00125	0.000148			
Arsenic	0.00034	<0.0001			
Beryllium	<0.0001	<0.0001			
Cadmium	0.00455	<0.0001			
Chromium	0.0876	0.00125			
Cobalt	0.00133	<0.0001			
Copper	0.0323	0.00099			
Lead	0.404	0.00029			
Magnesium	0.219	<0.0029			
Manganese	0.0554	0.00679			
Mercury	0.0001	0.0000483	<0.0001	0.000351	<0.0001
Nickel	0.0565	0.00049			
Selenium	0.00012	<0.0001			
Thallium	<0.0001	<0.0001			
Tin	0.00193	<0.0141			
Vanadium	<0.0097	<0.0086			
Zinc	3.1	0.0058			

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: 13-Dec-18
AECOM's Project No:Client: OneSteel Hexham
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	0.00125	0.00111	0.000148	0.000131			0.0014	0.00124	0.00254
Arsenic	0.00034	0.000301	<0.0001	<0.0000885			0.00034	0.000301	0.000617
Beryllium	<0.0001	<0.0000885	<0.0001	<0.0000885			<0.0001	<0.0000885	<0.000181
Cadmium	0.00455	0.00403	<0.0001	<0.0000885			0.0046	0.00407	0.00834
Chromium	0.0876	0.0776	0.00125	0.00111			0.089	0.0788	0.162
Cobalt	0.00133	0.00118	<0.0001	<0.0000885			0.0013	0.00115	0.00236
Copper	0.0323	0.0286	0.00099	0.000876			0.033	0.0292	0.0599
Lead	0.404	0.358	0.00029	0.000257			0.404	0.358	0.734
Magnesium	0.219	0.194	<0.0029	<0.00257			0.22	0.195	0.4
Manganese	0.0554	0.049	0.00679	0.00601			0.062	0.0549	0.113
Mercury	0.0001	0.0000885	0.0000483	0.0000428	0.000351	0.000311	0.0005	0.000443	0.000908
Nickel	0.0565	0.05	0.00049	0.000434			0.057	0.0505	0.104
Selenium	0.00012	0.000106	<0.0001	<0.0000885			0.00012	0.000106	0.000217
Thallium	<0.0001	<0.0000885	<0.0001	<0.0000885			<0.0001	<0.0000885	<0.000181
Tin	0.00193	0.00171	<0.0141	<0.0125			0.0019	0.00168	0.00344
Vanadium	<0.0097	<0.00859	<0.0086	<0.00761			<0.0001	<0.0000885	<0.000181
Zinc	3.1	2.74	0.0058	0.00514			3.1	2.74	5.62
Total Hazardous Metals*	0.61	0.54	0.0090	0.0080	0.00035	0.00031	0.62	0.55	1.13
Total Metals	3.96	3.51	0.016	0.014			3.98	3.52	7.22

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

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - FINAL CALCULATIONS

Fine Particulate (PM10)

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

Date: 13-Dec-18

Client: OneSteel Hexham

AECOM's Project No:

60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV_3):	1.1843 m ³	Average barometric pressure (P_{BARO}):	1010.5 hPa
Average gas meter temp. ($T_{M,2}$):	36.8 °C	Average pressure at meter ($P_{M,2}$):	1010.50 hPa
	310.0 K		
Sample gas volume (MV_4): (0°C, dry gas, 1 atm pressure):	1.0409 m ³		

(B) PM10 concentration at standard conditions

Blank thimble No.:	0	Blank weight:	g
Thimble No. used:	T15	PM10 Weight:	0.0041 g
Final PM10 Weight (M_{p1}):	0.00410 g		
PM10 Concentration (C_1):	$= M_{p1} / MV_4 =$		0.0039 g/m ³ (0°C, dry gas, 1atm pressure)
			3.9 mg/m ³ (0°C, dry gas, 1atm pressure)

CO₂ Basis 12 %
 Average CO₂%: 0.0 %

Therefore, C_c : $= C_a \times 12 / CO_2\% =$ 0.0039 g/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)
 ;and $C_{c1} =$ 3.9 mg/m³ (0°C, dry gas, 1atm pressure, 12% CO₂)

O₂ Basis 7 %
 Average O₂%: 20.9 %

Therefore, C_b : $= C_a \times (21 - O_{2ref}\%) / (21 - O_{2mea}\%)$ 0.55 g/m³ (0°C, dry gas, 1atm pressure, 7% O₂)
 ;and $C_{b1} =$ 550 mg/m³ (0°C, dry gas, 1atm pressure, 7% O₂)

(C) Moisture content

Silica Gel Number: 112

$V_v =$	5 g (from laboratory report)	$V_w =$	7 mL (=grams) (recorded on Laboratory Form 108)
Volume of Water Vapour Condensed ($V_{wc(std)}$):	0.0093		
Volume of Water Vapour Condensed ($V_{wsg(std)}$):	0.0067		

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

$B_{ws} =$ 1.51 %

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 = $(ii) \times \frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$
 = 1.137 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 5.27 m/s
- (ii) Average of post-sampling velocities: 5.20 m/s
- (iii) Average of while-sampling velocities: N/A m/s
- (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 5.23 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)

$$Q_{stack} = V_s \times A = 2.37 \text{ m}^3/\text{s (stack conditions)}$$

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

$$Q_{std} = 2.1 \text{ m}^3/\text{s (0°C, dry gas, 1 atm pressure)}$$

(G) Mass Emission Rate

$$R_m = C_{1a} \times Q_{std} = 0.0081 \text{ g/s (0°C, dry gas, 1 atm pressure)}$$

$$= 8.1 \text{ mg/s (0°C, dry gas, 1 atm pressure)}$$

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - FINAL CALCULATIONS

Total Particulate

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

Date: 13-Dec-18

Client: OneSteel Hexham

AECOM's Project No:

60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV ₃):	1.1163 m ³	Average barometric pressure (P _{BARO}):	1011 hPa
Average gas meter temp. (T _{M,2}):	36.6 °C	Average pressure at meter (P _{M,2}):	1010.50 hPa
	309.8 K		
Sample gas volume (MV ₄); (0°C, dry gas, 1 atm pressure):	0.9817 m ³		

(B) Total Particulate concentration at standard conditions

Blank thimble No.:		Blank weight:	g
Thimble No. used:	T22	Total Particulate Weight	0.0435 g
Final Total Particulate Weight (Mp1):	0.04350 g		
Total Particulate Concentration (C1):	=M _{p1} /MV ₄ =	0.044 g/m ³ (0°C, dry gas, 1atm pressure)	

;and C₂ =44 mg/m³ (0°C, dry gas, 1atm pressure)CO₂ Basis 12 %Average CO₂%: 0.0 %Therefore, C_c: = C_a x 12/CO₂% =0.044 g/m³ (0°C, dry gas, 1atm pressure, 12% CO₂);and C_{c1} =44 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}%)6.2 g/m³ (0°C, dry gas, 1atm pressure, 7% O₂);and C_{b1} =6200 mg/m³ (0°C, dry gas, 1atm pressure, 7% O₂)

(C) Moisture content

Silica Gel Number: 19

V_v = 8.4 g (from laboratory report)V_w =8 mL (=grams)
(recorded on
Laboratory Form
108)Volume of Water Vapour Condensed (V_{wc(std)}) = 0.0107Volume of Water Vapour Condensed (V_{wsg(std)}) = 0.0112

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

B_{ws} = 2.18 %

ANZ

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

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):
 1.29 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) x $\frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$
 = 1.146 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 5.27 m/s
- (ii) Average of post-sampling velocities: 5.20 m/s
- (iii) Average of while-sampling velocities: N/A m/s
- (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 5.23 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)

$$Q_{\text{stack}} = V_s \times A = 2.37 \text{ m}^3/\text{s} \text{ (stack conditions)}$$

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

$$Q_{\text{std}} = 2.1 \text{ m}^3/\text{s} \text{ (0°C, dry gas, 1 atm pressure)}$$

(G) Mass Emission Rate

$$R_m = C_{1a} \times Q_{\text{std}} = 0.091 \text{ g/s (0°C, dry gas, 1 atm pressure)}$$

$$= 91 \text{ mg/s (0°C, dry gas, 1 atm pressure)}$$

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

STACK ANALYSIS - FINAL CALCULATIONS

Hazardous Substances (Metals)

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

Date: 13-Dec-18

Client: OneSteel Hexham

AECOM's Project No:

60493017 Stack/Duct Description: Shredder Stack

(A) Sample gas volume at standard conditions

Metered volume (MV ₃):	1.2818 m ³	Average barometric pressure (P _{BARO}):	1010.5 hPa
Average gas meter temp. (T _{M,2}):	36.0 °C	Average pressure at meter (P _{M,2}):	1010.50 hPa
	309.2 K		
Sample gas volume (MV ₄); (0°C, dry gas, 1 atm pressure):	1.1295 m ³		

(B) Metals concentration at standard conditions

Blank thimble No.:		Blank weight:	g
Thimble No. used:	0	Metals Weight:	0.000622 g
Final Metals Weight (Mp1):	0.00062 g		
Metals Concentration (C1):	=Mp1/MV ₄ =		0.00055 g/m ³ (0°C, dry gas, 1atm pressure)

CO ₂ Basis	12 %	and C ₂ =	0.55 mg/m ³ (0°C, dry gas, 1atm pressure)
Average CO ₂ %:	0.0 %		

Therefore, C _c :	= C _a x 12/CO ₂ % =	0.00055 g/m ³ (0°C, dry gas, 1atm pressure, 12% CO ₂)
	and C _{c1} =	0.55 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} %)	0.077 g/m ³ (0°C, dry gas, 1atm pressure, 7% O ₂)
	and C _{b1} =	77 mg/m ³ (0°C, dry gas, 1atm pressure, 7% O ₂)

(C) Moisture content

Silica Gel Number: 26

V _v =	11.5 g (from laboratory report)	V _w =	12 mL (=grams) (recorded on Laboratory Form 108)
Volume of Water Vapour Condensed (V _{wc(std)}) =	0.0160		
Volume of Water Vapour Condensed (V _{wsg(std)}) =	0.0154		

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

B _{ws} =	2.70 %
-------------------	--------

ANZ

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

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 = $(ii) \times \frac{(273.2)}{(273.2+T_s)} \times \frac{(P_s)}{(1013.25)}$
 = 1.146 kg/m³ (stack conditions, wet)

(E) Gas Velocities

- (i) Average of pre-sampling velocities: 5.27 m/s
- (ii) Average of post-sampling velocities: 5.20 m/s
- (iii) Average of while-sampling velocities: N/A m/s
- (iv) Overall average of pre-sampling and post-sampling velocities (Vs):
 5.23 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)

$$Q_{stack} = V_s \times A = 2.37 \text{ m}^3/\text{s} \text{ (stack conditions)}$$

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

$$Q_{std} = 2.1 \text{ m}^3/\text{s} \text{ (0°C, dry gas, 1 atm pressure)}$$

(G) Mass Emission Rate

$$R_m = C_{1a} \times Q_{std} = 0.0011 \text{ g/s (0°C, dry gas, 1 atm pressure)}$$

$$= 1.1 \text{ mg/s (0°C, dry gas, 1 atm pressure)}$$

Emission Measurement Calculations Spreadsheet

Q4AN(EV)-332-FM31

EMISSION MONITORING RESULTS, SHREDDER STACK ONESTEEL HEXHAM 13-Dec-18 FINE PARTICULATE (PM10) TOTAL PARTICULATE HAZARDOUS SUBSTANCES (METALS)		
Sampling Conditions:		
Stack internal diameter at test location	760 mm	
Stack gas temperature (average)	33.5 °C	306.7 K
Stack pressure (average)	1010 hPa	
Stack gas velocity (average, stack conditions)	5.2 m/s	
Stack gas flowrate (stack conditions)	2.4 m ³ /s	
Stack gas flowrate (0°C, dry gas, 1 atm pressure)	2.1 m ³ /s	
Fine Particulate (PM10) Testing		
Test Period	13:35	- 15:04
Fine Particulate (PM10) Mass	4.1 mg	
Gas Volume Sampled	1.04 m ³	
Fine Particulate (PM10) Emission*1	3.9 mg/m ³	
Fine Particulate (PM10) Mass Emission Rate*2	8.1 mg/s	
Regulatory Limit	N/A mg/m ³	
Total Particulate Testing		
Test Period	13:35	- 15:04
Total Particulate Mass	43.5 mg	
Gas Volume Sampled	0.982 m ³	
Total Particulate Emission*1	44 mg/m ³	
Total Particulate Mass Emission Rate*2	91 mg/s	
Regulatory Limit	100 mg/m ³	
Hazardous Substances (Metals) Testing		
Test Period	13:35	- 15:04
Hazardous Substances (Metals) Mass	0.62 mg	
Gas Volume Sampled	1.13 m ³	
Hazardous Substances (Metals) Emission*1	0.55 mg/m ³	
Hazardous Substances (Metals) Mass Emission Rate*2	1.1 mg/s	
Regulatory Limit	N/A mg/m ³	
Moisture Content (%)		
	2.4	
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)

Steel River Testing

5/11 McIntosh Drive, Mayfield West, NSW 2304

Phone: 02 49677880

STACK EMISSION - PARTICULATES REPORT

Origin: AECOM - Newcastle

Report : 17626-0-P

Page 1 of 1

Project: 60493017

Description : Stack Emission Samples

Date : 21-Dec-18

Received: 14-Dec-18

Report To : Cyre Buckland

Copy to: FILE

17 Warabrook Blvd, Warabrook NSW 2304

Thimble ID		Volume (mL)	Total Particulate Matter (g)
T15	Thimble	-	0.0041
T22	Thimble	-	0.0435



NATA Accredited Laboratory 18079

Accredited for compliance with
ISO/IEC 17025 - Testing

Note : Sampled by Client

Reported By: M. Campbell

Michael Campbell - Director

Determined in Accordance With:
Particulate matter - total in stack gases by
gravimetric using in-house M300;
Acetone/Water Rinse using AS4323.2
Refer Form F422 - Measurement Uncertainty

Steel River Testing

5/11 McIntosh Drive, Mayfield West, NSW 2304

Phone: 02 49677880

STACK EMISSION - MOISTURE REPORT

Origin: AECOM - Newcastle

Report : 17626-0-M

Page 1 of 1

Project: 60493017

Description : Stack Emission Samples

Date : 21-Dec-18

Received: 14-Dec-18

Report To : Cyre Buckland

Copy to: FILE

17 Warabrook Blvd, Warabrook NSW 2304

Jar ID	Moisture (g)
112	5.0
D19	8.4
D26	11.5



NATA Accredited Laboratory 18079

Accredited for compliance with
ISO/IEC 17025 - Testing

Reported By: M. Campbell

Michael Campbell - Director

Determined in Accordance With:
Moisture content in stack gases by gravimetric
using in-house M301
Refer Form F422 - Measurement Uncertainty



ANALYTICAL REPORT



Accreditation No. 2562

CLIENT DETAILS

Contact **Cye Buckland**
Client **AECOM Australia Pty Ltd**
Address **17 Warabrook Boulevard
Warabrook
SYDNEY NSW 2304**

Telephone **02 8295 3600**
Facsimile **02 8934 0001**
Email **cye.buckland@aecom.com**

Project **(Not specified)**
Order Number **60493017/3.1**
Samples **12**

LABORATORY DETAILS

Manager **Adam Atkinson**
Laboratory **SGS Melbourne EH&S**
Address **10/585 Blackburn Road
Notting Hill Victoria 3168**

Telephone **+61395743200**
Facsimile **+61395743399**
Email **Au.SampleReceipt.Melbourne@sgs.com**

SGS Reference **ME309136 R0**
Date Received **19 Dec 2018**
Date Reported **02 Jan 2019**

COMMENTS

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

SIGNATORIES

MING

Weiming Dai
Inorganic Supervisor

Rzhang

Ryan Zhang
Team Leader

Sample Number	ME309136.001	ME309136.002	ME309136.003	ME309136.004
Sample Matrix	Filter	Filter	Impinger	Impinger
Sample Date	12 Dec 2018	12 Dec 2018	12 Dec 2018	12 Dec 2018
Sample Name	Metals 1	Metals 12	Metals 3	Metals 4

Parameter

Units

LOR

Metals in Filters M29 ETC MA-1400.FL.M29.02 USEPA M29 Method: EPA29_FILT Tested: 24/12/2018

Sb	µg total	0.05	0.20	<0.05	-	-
As	µg total	0.05	0.69	0.65	-	-
Be	µg total	0.05	<0.05	<0.05	-	-
Cd	µg total	0.05	2.7	<0.05	-	-
Cr	µg total	0.05	86	2.1	-	-
Co	µg total	0.05	0.48	<0.05	-	-
Cu	µg total	0.05	6.0	0.49	-	-
Pb	µg total	0.05	25	0.72	-	-
Mg	µg total	0.05	370	320	-	-
Mn	µg total	0.05	15	1.3	-	-
Hg	µg total	0.05	0.16	0.06	-	-
Ni	µg total	0.05	51	0.25	-	-
Se	µg total	0.05	0.17	<0.05	-	-
Tl	µg total	0.05	<0.05	<0.05	-	-
Sn	µg total	0.05	0.89	0.16	-	-
V	µg total	0.25	3.6	4.7	-	-
Zn	µg total	0.05	7400	5800	-	-

Metals in Impingers M29 ETC MA-1400.IMP.M29.06 (ug total) Method: EPA29_METIMP Tested: 28/12/2018

Sb	µg total	0.1	-	-	1.1	0.2
As	µg total	0.1	-	-	0.3	<0.1
Be	µg total	0.1	-	-	<0.1	<0.1
Cd	µg total	0.1	-	-	1.9	<0.1
Cr	µg total	0.1	-	-	3.7	1.3
Co	µg total	0.1	-	-	0.9	<0.1
Cu	µg total	0.1	-	-	27	1.3
Pb	µg total	0.1	-	-	380	0.6
Mg	µg total	0.1	-	-	170	2.9
Mn	µg total	0.1	-	-	42	7.1
Hg	µg total	0.1	-	-	<0.1	0.1
Ni	µg total	0.1	-	-	5.9	0.8
Se	µg total	0.1	-	-	<0.1	<0.1
Tl	µg total	0.1	-	-	<0.1	<0.1
Sn	µg total	0.1	-	-	1.3	13
V	µg total	0.1	-	-	2.5	5.4
Zn	µg total	0.1	-	-	1500	9.0
Sample Volume*	mL	-	-	-	98	310

Sample Number	ME309136.005	ME309136.006	ME309136.007	ME309136.008
Sample Matrix	Impinger	Impinger	Impinger	Impinger
Sample Date	12 Dec 2018	12 Dec 2018	12 Dec 2018	12 Dec 2018
Sample Name	Metals 8A	Metals 9	Metals 5A	Metals 5C

Parameter	Units	LOR				
Metals in Filters M29 ETC MA-1400.FL.M29.02 USEPA M29 Method: EPA29_FILT Tested: 24/12/2018						
Sb	µg total	0.05	-	-	-	-
As	µg total	0.05	-	-	-	-
Be	µg total	0.05	-	-	-	-
Cd	µg total	0.05	-	-	-	-
Cr	µg total	0.05	-	-	-	-
Co	µg total	0.05	-	-	-	-
Cu	µg total	0.05	-	-	-	-
Pb	µg total	0.05	-	-	-	-
Mg	µg total	0.05	-	-	-	-
Mn	µg total	0.05	-	-	-	-
Hg	µg total	0.05	-	-	-	-
Ni	µg total	0.05	-	-	-	-
Se	µg total	0.05	-	-	-	-
Tl	µg total	0.05	-	-	-	-
Sn	µg total	0.05	-	-	-	-
V	µg total	0.25	-	-	-	-
Zn	µg total	0.05	-	-	-	-

Metals in Impingers M29 ETC MA-1400.IMF.M29.06 (µg total) Method: EPA29_METIMP Tested: 24/12/2018						
Sb	µg total	0.1	<0.1	<0.1	-	-
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	0.1	-	-
Cr	µg total	0.1	<0.1	<0.1	-	-
Co	µg total	0.1	<0.1	<0.1	-	-
Cu	µg total	0.1	0.2	0.1	-	-
Pb	µg total	0.1	0.2	0.1	-	-
Mg	µg total	0.1	1.5	1.4	-	-
Mn	µg total	0.1	0.3	<0.1	-	-
Hg	µg total	0.1	<0.1	<0.1	<0.1	<0.1
Ni	µg total	0.1	0.2	0.1	-	-
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	14	-	-
V	µg total	0.1	5.0	3.6	-	-
Zn	µg total	0.1	2.0	1.1	-	-
Sample Volume*	mL	-	300	210	100	240

Sample Number	ME309136.009	ME309136.010	ME309136.011	ME309136.012
Sample Matrix	Impinger	Impinger	KMnO4	KMnO4
Sample Date	12 Dec 2018	12 Dec 2018	12 Dec 2018	12 Dec 2018
Sample Name	Metals 8B	Metals 11	Metals 5B	Metals 10

Parameter

Units

LOR

Metals in Filters M29 ETC MA-1400.FL.M29.02 USEPA M29 Method: EPA29_FILT Tested: 24/12/2018

Sb	µg total	0.05	-	-	-	-
As	µg total	0.05	-	-	-	-
Be	µg total	0.05	-	-	-	-
Cd	µg total	0.05	-	-	-	-
Cr	µg total	0.05	-	-	-	-
Co	µg total	0.05	-	-	-	-
Cu	µg total	0.05	-	-	-	-
Pb	µg total	0.05	-	-	-	-
Mg	µg total	0.05	-	-	-	-
Mn	µg total	0.05	-	-	-	-
Hg	µg total	0.05	-	-	-	-
Ni	µg total	0.05	-	-	-	-
Se	µg total	0.05	-	-	-	-
Tl	µg total	0.05	-	-	-	-
Sn	µg total	0.05	-	-	-	-
V	µg total	0.25	-	-	-	-
Zn	µg total	0.05	-	-	-	-

Metals in Impingers M29 ETC MA-1400.IMP.M29.06 (ug total) Method: EPA29_METIMP Tested: 24/12/2018

Sb	µg total	0.1	-	-	-	-
As	µg total	0.1	-	-	-	-
Be	µg total	0.1	-	-	-	-
Cd	µg total	0.1	-	-	-	-
Cr	µg total	0.1	-	-	-	-
Co	µg total	0.1	-	-	-	-
Cu	µg total	0.1	-	-	-	-
Pb	µg total	0.1	-	-	-	-
Mg	µg total	0.1	-	-	-	-
Mn	µg total	0.1	-	-	-	-
Hg	µg total	0.1	<0.1	<0.1	0.4	<0.1
Ni	µg total	0.1	-	-	-	-
Se	µg total	0.1	-	-	-	-
Tl	µg total	0.1	-	-	-	-
Sn	µg total	0.1	-	-	-	-
V	µg total	0.1	-	-	-	-
Zn	µg total	0.1	-	-	-	-
Sample Volume*	mL	-	100	260	390	100

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.

Metals in Filters M29 ETC MA-1400,FL,M29.02 USEPA M29 Method: EPA29_FILT

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Sb	LB024415	µg total	0.05	<0.05	110%
As	LB024415	µg total	0.05	<0.05	109%
Be	LB024415	µg total	0.05	<0.05	107%
Cd	LB024415	µg total	0.05	<0.05	106%
Cr	LB024415	µg total	0.05	<0.05	107%
Co	LB024415	µg total	0.05	<0.05	112%
Cu	LB024415	µg total	0.05	<0.05	105%
Pb	LB024415	µg total	0.05	<0.05	107%
Mg	LB024415	µg total	0.05	<0.05	109%
Mn	LB024415	µg total	0.05	<0.05	96%
Hg	LB024415	µg total	0.05	<0.05	108%
Ni	LB024415	µg total	0.05	<0.05	105%
Se	LB024415	µg total	0.05	<0.05	103%
Tl	LB024415	µg total	0.05	<0.05	108%
Sn	LB024415	µg total	0.05	<0.05	105%
V	LB024415	µg total	0.25	<0.25	107%
Zn	LB024415	µg total	0.05	<0.05	97%

Metals in Impingers M29 ETC MA-1400,IMP,M29.06 (µg total) Method: EPA29_METIMP

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Sb	LB024416	µg total	0.1	<0.1	111%
As	LB024416	µg total	0.1	<0.1	113%
Be	LB024416	µg total	0.1	<0.1	104%
Cd	LB024416	µg total	0.1	<0.1	107%
Cr	LB024416	µg total	0.1	<0.1	110%
Co	LB024416	µg total	0.1	<0.1	120%
Cu	LB024416	µg total	0.1	<0.1	108%
Pb	LB024416	µg total	0.1	<0.1	112%
Mg	LB024416	µg total	0.1	<0.1	109%
Mn	LB024416	µg total	0.1	<0.1	99%
Hg	LB024416	µg total	0.1	<0.1	
Ni	LB024416	µg total	0.1	<0.1	110%
Se	LB024416	µg total	0.1	<0.1	107%
Tl	LB024416	µg total	0.1	<0.1	114%
Sn	LB024416	µg total	0.1	<0.1	107%
V	LB024416	µg total	0.1	<0.1	111%
Zn	LB024416	µg total	0.1	<0.1	100%
Sample Volume*	LB024416	mL	-	100	NA

METHOD

METHODOLOGY SUMMARY

EPA 29

Analysis of acid-leachable metals by Inductively Coupled Plasma-Mass Spectrometer (ICP-MS). This method is based on USEPA 3051A, USEPA M29, and USEPA 6020A. Filters are digested using the appropriate sample preparation methods. A representative sample is extracted in concentrated acid using microwave heating by the CEM-MarsXPress (with Built-in USEPA method) Microwave Digestion system. The sample and acid are placed in a microwave vessel (TFM), which is then capped and heated in the microwave unit. After cooling, the vessel contents are diluted with DI water, then filtered/settled/centrifuged and analysed by ICP MS.

EPA29

This method covers the analysis of acid-leachable metals by Inductively Coupled Plasma-Mass Spectrometer (ICP-MS). This method is based on USEPA M29, USEPA 3015A and USEPA 6020A. Prior to analysis, samples are be solubilised or digested using the appropriate sample preparation methods.

FOOTNOTES

IS Insufficient sample for analysis.
 LNR Sample listed, but not received.
 * NATA accreditation does not cover the performance of this service.
 ** Indicative data, theoretical holding time exceeded.

LOR Limit of Reporting
 11 Raised or Lowered Limit of Reporting
 QFH QC result is above the upper tolerance
 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 \pm 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:

- 1 Bq is equivalent to 27 pCi
- 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/MIP-AU-FNV-QU-022%20QA%20QC%20Plan.pdf>

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

This report must not be reproduced, except in full.

