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Assured Monitoring Group

SOURCE EMISSIONS MONITORING – KYOGLE TIMBER PLANT

BORAL TIMBER

Project ID. 10645

R_0

DATE OF RELEASE: 14/12/2016

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Unit 7, 142 Tennyson Memorial Avenue – Tennyson – Queensland - 4105

Table 1: Document approval

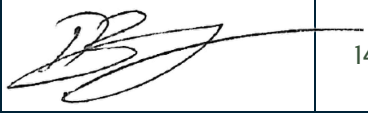
	Name	Position Title	Signature	Date
Author	Adam Dixon	Senior Consultant		14/12/2016
Reviewer	Timon Berger	Technical Manager		14/12/2016
Approved	Timon Berger	Technical Manager		14/12/2016

Table 2: Revision register

Revision	Date	Name	Issued to	Comment
R_0	14/12/2016	T. Berger	Robert Cox	Initial Release

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

Accreditation ID: 19703

NATA
WORLD RECOGNISED ACCREDITATION

EXECUTIVE SUMMARY

The following table provides a summary of results from emission monitoring on the main stack at the Boral Timber facility located near Kyogle, NSW. The emission sampling completed on the main stack release point was undertaken in order to determine the concentration and emission rate of the parameters listed in Table 3 in comparison to the requirements of NSW EPA Permit number 906.

Table 3: Summary of results

Release Point Parameter		Result	Permit Limit	Unit of Measure	Reference Conditions
Average Stack Temperature		138	-	°C	
Water vapour concentration		5.5	-	vol-%	
Carbon Dioxide Percentage		3.8	-	vol-%	
Oxygen Percentage		16.2	-	vol-%	
Dry Gas Molecular Weight		1.31	-	kg/Nm^3	
Average Stack Gas Velocity		5.9	-	m/sec	
Actual Stack Flow Rate		401	-	m^3/min	
Dry Standard Stack Flow Rate		252	-	Nm^3/min-dry	
Stack PM Concentration		4.3	-	mg/Nm^3	
Stack PM Concentration at 14 % O_2		6.8	30	mg/Nm^3	dry, 273 K, 101.3 kPa
Particulate Emission Rate		1.1	-	g/min	
Nitrogen Oxides (NOx as NO_2)		48	-	mg/Nm^3	
Nitrogen Oxides at 14 % O_2		67	500	mg/Nm^3	dry, 273 K, 101.3 kPa
Nitrogen Oxides (NOx as NO_2)		12	-	g/min	
Carbon Monoxide (CO)		41	-	mg/Nm^3	
Carbon Monoxide at 14 % O_2		56	-	mg/Nm^3	dry, 273 K, 101.3 kPa
Carbon Monoxide (CO)		10	-	g/min	
Cadmium		0.00060	-	mg/Nm^3	
Cadmium at 14% O_2		0.00095	0.2	mg/Nm^3	dry, 273 K, 101.3 kPa
Mercury	<	0.000052	-	mg/Nm^3	
Mercury at 14% O_2	<	0.000081	0.2	mg/Nm^3	dry, 273 K, 101.3 kPa
Type I and Type II substances		0.020	-	mg/Nm^3	
Type I and Type II substances at 14% O_2		0.031	1	mg/Nm^3	dry, 273 K, 101.3 kPa
Type I and Type II substances		0.0079	-	g/min	
Hydrogen Chlorides		0.92	-	mg/Nm^3	
Hydrogen Chlorides at 14% O_2		1.4	100	mg/Nm^3	dry, 273 K, 101.3 kPa
Hydrogen Chlorides emission rate		0.23	-	g/min	
Chlorine	<	0.92	-	mg/Nm^3	
Chlorine at 14% O_2	<	1.4	200	mg/Nm^3	dry, 273 K, 101.3 kPa
Chlorine emission rate	<	0.23	-	g/min	
Sulfur trioxide		0.45	-	mg/Nm^3	
Sulfur trioxide at 14% O_2		0.64	100	mg/Nm^3	dry, 273 K, 101.3 kPa
Sulfur trioxide emission rate		0.11	-	g/min	
TVOC as n-propane	<	0.59	-	mg/Nm^3	
TVOC as n-propane at 14% O_2	<	0.82	40	mg/Nm^3	dry, 273 K, 101.3 kPa
TVOC as n-propane emission rate	<	0.15	-	g/min	
Dioxins & furans (NSW-TEQ)		0.075	-	ng/Nm^3	
Dioxins & Furans (NSW-TEQ) at 14% O_2		0.10	0.1	ng/Nm^3	dry, 273 K, 101.3 kPa
Dioxins & Furans emission rate		0.000019	-	mg/min	

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1 INTRODUCTION

Assured Monitoring Group (AMG) was appointed by Boral Timber to sample and analyse source emissions from their timber facility located in Kyogle, New South Wales. Sampling was conducted by AMG on the 20th and 21st of October 2016 during typical plant operational activities.

AMG was responsible for the collection and analysis of samples, unless otherwise indicated. The samples were recovered and stored in the appropriate manner until their return to the laboratory where the samples were prepared and analysed according to the methodologies listed below in this report.

2 METHODOLGY & EQUIPMENT

2.1 Sampling methodology

All sampling and analysis was carried in accordance to the listed requirements in Table 4. Any deviations to these methods have been documented where required.

Table 4: Test methods

Parameter	Reference Method	NSW Test Method	Analysis	Comments	NATA
Sample plane criteria	AS 4323.1	TM-1	1	Nil	Yes
Gas velocity and temperature	USEPA Method 2	TM-2	1	Nil	Yes
Stack gas density	USEPA Method 3	TM-23	1	Nil	Yes
Oxygen & carbon dioxide	USEPA Method 3A	TM-23	1	A	Yes
Stack gas water vapour	USEPA Method 4	TM-22	1	Nil	Yes
Particulate matter	AS 4323.2	TM-15	1	Nil	Yes
Nitrogen oxides	USEPA Method 7E	TM-11	1	A	Yes
Sulfur trioxide	USEPA Method 8	TM-3	1	Nil	Yes
Carbon monoxide	USEPA Method 10	TM-32	1	A	Yes
Dioxins & Furans	USEPA Method 23	TM-18	2	Nil	Yes
Total VOC's	USEPA Method 18	TM-34	3	Nil	Yes
Hydrogen chloride	USEPA Method 26A	TM-8	3	Nil	Yes
Chlorine	USEPA Method 26A	TM-7	3	Nil	Yes
Heavy metals	USEPA Method 29	TM 12/13/14	3	Nil	Yes

Table 5: Analysis performed by

Note	Company	Work performed	Accreditation	Report Number
1	AMG Pty Ltd	Sampling & analysis	NATA: 19703	10645
2	AsureQuality	Analysis	IANZ: 131	16-218869
3	EnviroLab Services	Analysis	NATA: 2901	156110

Table 6: Sampling comments

Note	Comment
A	Pre & post calibration of the analyser was completed in the laboratory.

2.2 Sampling location

The below images show the Boral Timber site location and stack location, Kyogle, NSW.

Figure 1: Site location

Figure 2: Sample platform location

Table 7: Stack description

Sample location	EPA Point 1
Stack coordinates	UTM
Easting	499784.97E
Northing	6830484.21S
Stack Shape	CIRCULAR
Stack Diameter (m)	1.2
Stack Cross Section Area (m^2)	1.13
Distance to upstream disturbance (m)	6.0
Diameters (D)	5.0
Distance to downstream disturbance (m)	8.0
Diameters (D)	6.7
Total traverse point factors	1.05 , 1 , 1.05 , 16
Port size (mm)	100
Port Thread Type	BSP
Number of traverses	2
Number of points per traverse	8
Total number of traverse points	16
Flow & temperature compliance check	YES

2.3 Plant operation

During the sampling, the plant was considered to be operating at standard, representative process load. The furnace supplies heat to the drying kilns. The below screen shot provides an overview of the day of sampling (20th October 2016).

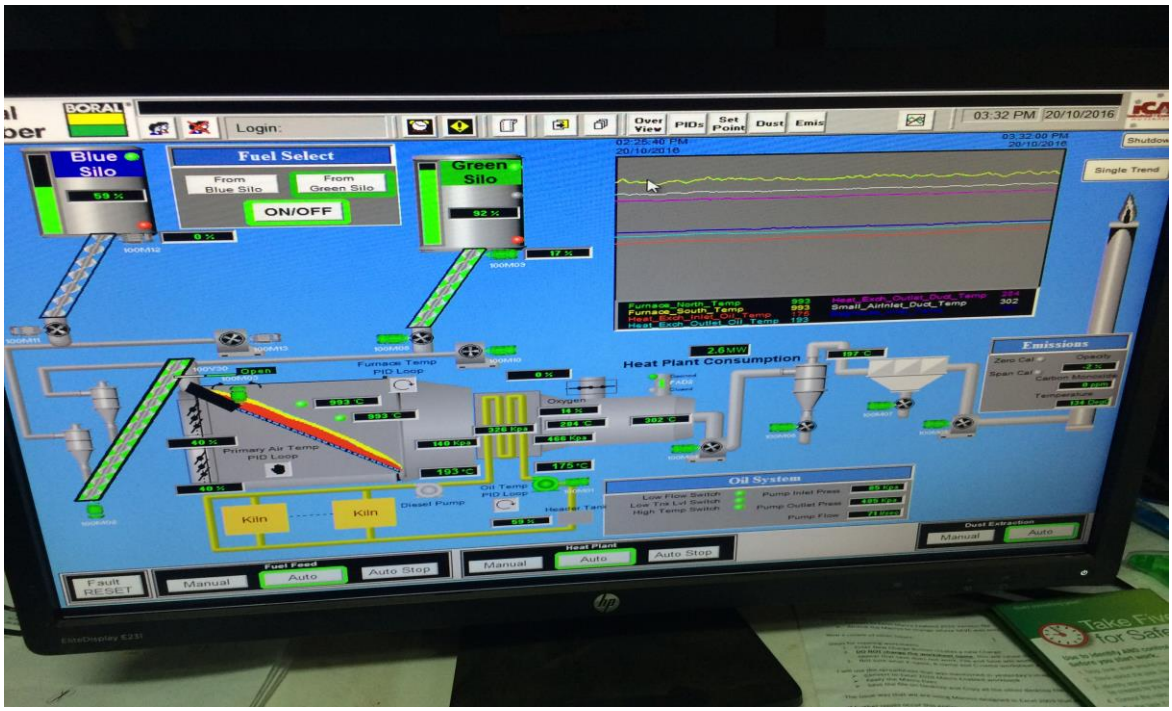

Figure 3: Furnace overview

2.4 Test equipment

The sampling equipment was transported to site using a company vehicle. The stack sample location is accessible using installed walkways and ladders. All sampling equipment was located on the stack platform and on the ground below, while sample preparation and recoveries were carried in the vehicle which acts as a mobile laboratory. For this project, two complete isokinetic and non-isokinetic sampling trains were used, along with a multi-gas combustion analyser.

All equipment used during the course of the testing is sourced from Apex Instruments, an industry leader in the supply of source testing equipment.

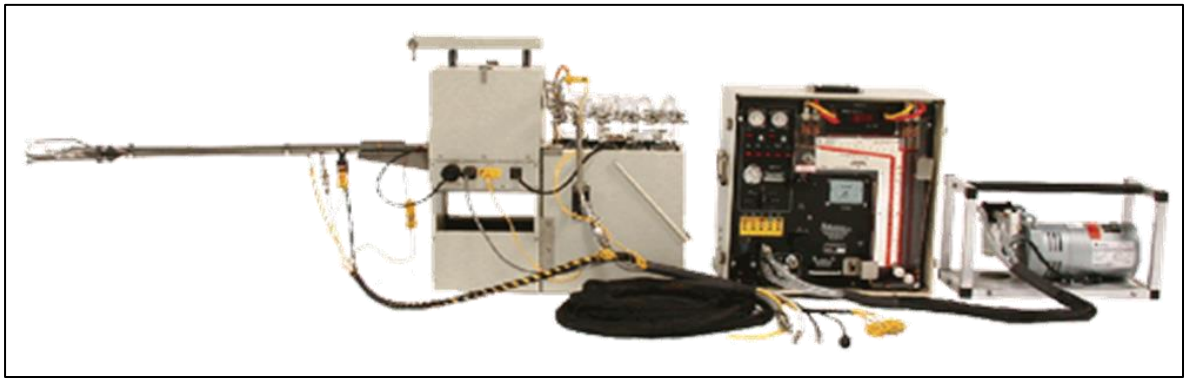

Figure 4: Full isokinetic sampling assembly

Figure 5: MRU combustion gas analyser

3 QUALITY ASSURANCE & QUALITY CONTROL (QA/QC)

AMG operates within a quality system based upon the requirements of ISO17025. Our quality system defines specific procedures and methodologies to ensure any project undertaken by AMG is conducted with the highest level of quality given the specific confines of each project

The overall objective of our QA/QC procedures is to representatively sample and accurately analyse components in the gas streams and therefore report valid measurements of emission concentrations.

To ensure representativeness of field work, our quality procedures target:

1. Correct sampling locations
2. Sample time
3. Frequency of samples and
4. Method selection & adherence

To ensure representativeness of lab work, our quality procedures target:

1. Sample preservation
2. Chain of custody (COC)
3. Sample preparation and
4. Analytical techniques

AMG maintains strict quality assurance throughout all its sampling programs, covering on-site 'field work' and the analytical phase of our projects. Our QA program covers the calibration of all sampling and analytical apparatus where applicable and the use of spikes, replicate sample and reference standards. The test methodologies used for this project are outlined in section 2 of this document. Field test data has been recorded and calculated using direct entry into Microsoft Excel spreadsheets following the procedures of the appropriate test methods. Determination of emission concentrations has been performed using the same Microsoft Excel spreadsheets which are partially supplied as an attachment to this report. More detailed information can be supplied upon request.

QA/QC checks for this project will use validation techniques and criteria appropriate to the type of data and the purpose of the measurement to approve the test report. Records of all data will be maintained. Complete chain of custody (COC) procedures has been followed to document the entire custodial history of each sample. The COC forms also served as a laboratory sheet detailing sample ID and analysis requirements.

Table 8: Sampling data QA/QC checklist

Sampling Data QA/QC Checklist	Comment
Use of appropriate test methods	Yes
'Normal' operation of the process being tested	Yes – as instructed by client
Use of properly operating and calibrated test equipment	Yes
Use of high purity reagents	Yes
Performance of leak checks post sample (at least)	Yes

Table 9: Laboratory data QA/QC checklist

Laboratory Data QA/QC Checklist	Comment
Use of appropriate analytical methods	Yes
Use of properly operating and calibrated analytical equipment	Yes
Precision and accuracy comparable to that achieved in similar projects	Yes
Accurate reporting	Yes

4 DEFINITIONS

The following terms and abbreviations may be used in this report:

Table 10: Definitions

Symbol	Definition
<	The analytes tested for was not detected; the value stated is the reportable limit of detection
Am^3	Gas volume in cubic metres at measured conditions
AS	Australian Standard
BH	Back half of sample train (filter holder and impingers) (referred to during sample recovery)
°C	Degrees Celsius
CARB	California Air Resources Board methods
dscm	dry standard cubic meters
FH	Front half of sample train (probe and filter holder) (referred to during sample recovery)
f/ml	Fibres per millilitre
g	Grams
kg	Kilograms
m	Metres
m^3	actual gas volume in cubic metres as measured
mbar	Millibars
mg	Milligrams (10^{-3} grams)
min	Minute
ml	Millilitres
mmH_2O	Millimetres of water
Mole	SI unit that measures the amount of substance
N/A	Not applicable
ng	Nanograms (10^{-9} grams)
NATO	North Atlantic Treaty Organisation
NIOSH	National institute for occupational safety and health (USA)
Nm^3	Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa)
NMI	National Measurement Institute
NM VOC	Non methane volatile organic compound
NR	Not required on this occasion
OSHA	Occupational Safety and Health Act
ou	Odour unit
PCDD	Polychlorinated dibenzo-*p*-dioxin
PCDF	Polychlorinated dibenzofuran
PM	Particulate matter
ppb	Parts per billion
ppm	Parts per million
sec	Second
Sm^3	Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa) and corrected to a standardised value (e.g. 15% O_2)
STP	Standard temperature and pressure (0°C and 101.3 kPa)
TO	USEPA air toxics method
TWA	Time weighted average
USEPA	United States Environmental Protection Authority

5 RESULTS

Table 11 & 12 presents a summary of the isokinetic and gases analyser sample runs.

Table 11: Sample information

Source Data					
Client		Boral Timber	Boral Timber	Boral Timber	Boral Timber
Site		Kyogle	Kyogle	Kyogle	Kyogle
Sample Point		EPA Point 1	EPA Point 1	EPA Point 1	EPA Point 1
Reference Method		USEPA M23	USEPA M29	USEPA M26A	USEPA M8
Test Parameters		Dioxins/Furan	PM & Heavy Metals	HCL & CL2	SO3
Historical Data & Hardware Information - Manual Sample					
Run Start Date	dd-mm-yy	Thursday, 20 October 2016	Friday, 21 October 2016	Friday, 21 October 2016	Thursday, 20 October 2016
Project ID		10645	10645	10645	10645
Run ID		-1	-2	-3	-4
Run Start Time	hh:mm	11:01:00	8:48:00	11:10:00	17:50:00
Run Stop Time	hh:mm	17:09:00	10:08:00	12:30:00	19:10:00
Positioning compliance check with AS4323.1		Non-ideal	Non-ideal	Non-ideal	Non-ideal
Flow & temperature compliance check with AS4323.1		YES	YES	YES	YES
Traverse pt factors; up, down, total & trav pts		1.05 , 1 , 1.05 , 16	1.05 , 1 , 1.05 , 16	1.05 , 1 , 1.05 , 16	1.05 , 1 , 1.05 , 16
Console Serial Number		SN174	SN174	SN174	SN174
Meter Calibration Factor		1.016	1.016	1.016	1.016
Orifice Coefficient	(DH@)	45.80	45.80	45.80	45.80
Pitot Tube Coefficient		0.84	0.84	0.84	0.84
Actual Nozzle Diameter	mm	8.89	8.89	8.89	8.89
Stack Test Data					
Initial Meter Volume	m^3	6.906	3.680	5.066	0.498
Final Meter Volume	m^3	12.789	4.924	6.277	1.662
Actual Sampling Time	minutes	368	80	80	80
Average Meter Temperature	°C	32	25	36	29
Average Stack Temperature	°C	140	140	140	132
Barometric Pressure	mb	1014	1013	1013	1014
Stack Static Pressure	mm H_2O	-9.9	-9.9	-9.9	-9.9
Absolute Stack Pressure	mb	1013	1012	1012	1013
Sample Volumes					
Actual Meter Volume	m^3	5.977	1.264	1.230	1.183
Standard Meter Volume	Nm^3	5.366	1.160	1.088	1.074
Moisture Content Data					
Water vapour concentration	%	4.1	6.4	5.7	5.7
Stack Gas Density Analysis Data					
Carbon Dioxide Percentage	%	3.7	3.8	3.7	3.8
Oxygen Percentage	%	15.9	16.5	16.3	16.1
Carbon Monoxide Percentage	%	0.00	0.00	0.00	0.00
Nitrogen Percentage	%	80.3	47.0	46.7	56.4
Dry Gas Molecular Weight	kg/Nm^3	1.31	1.31	1.31	1.31
Dry Gas Molecular Weight	g/g-mole	29.2	29.3	29.2	29.3
Wet Stack Gas Molecular Weight	g/g-mole	28.8	28.5	28.6	28.6
Volumetric Flow Rate Data (at Sample Plane)					
Average Stack Gas Velocity	m/sec	5.9	6.1	5.9	5.7
Stack Diameter	m	1.20	1.20	1.20	1.20
Stack Cross-Sectional Area	m^2	1.13	1.13	1.13	1.13
Upstream distance (from disturbance)	m	6.00	6.00	6.00	6.00
Downstream distance (from disturbance)	m	8.00	8.00	8.00	8.00
Actual Stack Flow Rate	m^3/min	399	415	402	388
Wet Standard Stack Flow Rate	$Nm^3/min\text{-}wet$	264	274	265	262
Dry Standard Stack Flow Rate	$Nm^3/min\text{-}dry$	253	257	250	247
Percent of Isokinetic Rate	%	105	103	99	99

Table 12: Test results

Source Data						
Sample Point		EPA Point 1	EPA Point 1	EPA Point 1	EPA Point 1	
Test Parameters		Dioxins/Furan	PM & Heavy Metals	HCL & CL2	SO3	
Particulate Matter (PM) Concentration						
Stack PM Concentration	mg/Nm^3		4.3			
Stack PM Concentration at 14 % O_2	mg/Nm^3		6.8			
Particulate Emission Rate	g/min		1.11			
Combustion Gases						
Nitrogen Oxides (NOx as NO_2)	mg/Nm^3	48				
Nitrogen Oxides at 14 % O_2	mg/Nm^3	67				
Nitrogen Oxides (NOx as NO_2)	g/min	12				
Carbon Monoxide (CO)	mg/Nm^3	41				
Carbon Monoxide at 14 % O_2	mg/Nm^3	56				
Carbon Monoxide (CO)	g/min	10				
Heavy Metals (USEPA Method 29)						
Antimony	µg/Nm^3		< 4.9			
Arsenic	µg/Nm^3		< 4.9			
Beryllium	µg/Nm^3		< 0.37			
Cadmium	µg/Nm^3		0.60			
Cadmium at 14% O2	µg/Nm^3		0.95			
Chromium	µg/Nm^3		< 1.0			
Cobalt	µg/Nm^3		< 0.37			
Copper	µg/Nm^3		< 4.3			
Lead	µg/Nm^3		9.5			
Manganese	µg/Nm^3		6.6			
Nickel	µg/Nm^3		2.9			
Selenium	µg/Nm^3		< 4.9			
Tin	µg/Nm^3		< 12.2			
Vanadium	µg/Nm^3		< 6.1			
Mercury	µg/Nm^3		< 0.052			
Mercury at 14% O_2	µg/Nm^3		< 0.081			
Type I and Type II substances - lower bound	µg/Nm^3		20			
Type I and Type II substances at 14% O2	µg/Nm^3		31			
Type I and Type II substances	g/min		0.01			
Acid gases & VOCs						
HCl	mg/Nm^3			0.92		
HCl at 14% O_2	mg/Nm^3			1.4		
HCl emission rate	g/min			0.23		
Cl_2	mg/Nm^3			< 0.92		
Cl_2 at 14% O_2	mg/Nm^3			< 1.4		
Cl emission rate	g/min			< 0.23		
SO_3	mg/Nm^3				0.45	
SO_3 at 14% O_2	mg/Nm^3				0.64	
SO_3 emission rate	g/min				0.11	
Total VOC	mg/Nm^3	< 0.59				
TVOC at 14% O_2	mg/Nm^3	< 0.82				
TVOC emission rate	g/min	< 0.15				
Dioxin and Furan (USEPA Method 23)						
2378 TCDF	ng/Nm^3	0.024				
Total TCDF isomers	ng/Nm^3	0.87				
2378 TCDD	ng/Nm^3	< 0.0021				
Total TCDD isomers	ng/Nm^3	< 0.075				
12378 PeCDF	ng/Nm^3	0.032				
23478 PeCDF	ng/Nm^3	0.057				
Total PeCDF isomers	ng/Nm^3	0.80				
12378 PeCDD	ng/Nm^3	0.0060				
Total PeCDD isomers	ng/Nm^3	0.14				
123478 HxCDF	ng/Nm^3	0.090				
123678 HxCDF	ng/Nm^3	0.080				
234678 HxCDF	ng/Nm^3	0.10				
123789 HxCDF	ng/Nm^3	0.013				
Total HxCDF isomers	ng/Nm^3	0.86				
123478 HxCDD	ng/Nm^3	0.0067				
123678 HxCDD	ng/Nm^3	0.020				
123789 HxCDD	ng/Nm^3	0.0092				
Total HxCDD isomers	ng/Nm^3	0.24				
1234678 HpCDF	ng/Nm^3	0.29				
1234789 HpCDF	ng/Nm^3	0.074				
Total HpCDF isomers	ng/Nm^3	0.67				
1234678 HpCDD	ng/Nm^3	0.13				
Total HpCDD isomers	ng/Nm^3	0.29				
OCDF	ng/Nm^3	0.34				
OCDD	ng/Nm^3	0.30				
Sum of congeners – Lower	ng/Nm^3	4.5				
Medium	ng/Nm^3	4.6				
Upper	ng/Nm^3	4.6				
Total I-TEQ – Lower	ng/Nm^3	0.073				
Lower at 14% O_2	ng/Nm^3	0.10				
Medium	ng/Nm^3	0.074				
Upper	ng/Nm^3	0.075				
Total NSW-TEQ – Lower	ng/Nm^3	0.075				
Lower at 14% O_2	ng/Nm^3	0.10				
Medium	ng/Nm^3	0.076				
Upper	ng/Nm^3	0.077				