No 1181

Report for the Periodic Monitoring of Emissions to Air Permit Number - BR8212 Knauf Insulation Cwmbran Site

23-Jan-15

Part 1 Executive Summary

Contract Reference:	Knaufin-02291
Client:	Knauf Insulation
Address:	Chapel Lane, Croesyceiliog, Cwmbran, Gwent, NP44 2YQ
Site Contact:	Warren Christy
Monitoring Organisation:	NWSS Northubrian Water Scientific Services Unit 40 Court Road Industrial Estate, Cwmbran Torfaen. NP44 3AS www.nw-ss.co.uk

This report relates to tested items only
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Report written by	Craig Harley	Date: 02 February 2015
Designation	Air Quality Test Engineer	
Report Approved by	Darren Price D. Price.	Date: 02 February 2015
Designation	Air Quality Senior Project Manager	
MCERTS Registration Number	MM03 176	
MCERTS Qualifications	Level 2; Technical Endorsements 1, 2, 3 & 4	

CONTENTS

1.1 Monitoring Objectives

The scope of work of the monitoring as shown in the following table was required to demonstrate emission concentrations.

Location	Determinand	Number of Samples	Sampling Time	Comments
Furnace Stack	Oxides of Sulphur as SO_2	3 & Field Blank	1 Hour	None

1.2 Monitoring Results

Location Furnace Stack

Process Status During Monitoring Operating as normal

Reference Conditions 273K, 101.3 Kpa, Dry Gas

Substance to be Monitored	Run	Units	Emission Limit Value	Date of Sampling	Start and End Times	Periodic Monitoring Result	Uncertainty (±)	Mass Emission Kg/hr	Vol. Flow (Nm^3/min)	Monitoring Method Reference	Accreditation for use of Method
Oxides of Sulphur as SO_2	1	mg/Nm^3	100	23-Jan-15	10:27-11:27	35.4	4.3	0.81	381	BS EN 14791	MCERTS
	2			23-Jan-15	11:32-12:32	42.1	5.1	0.92	363		
	3			23-Jan-15	12:38-13:38	36.3	4.4	0.76	350		
	Blank			23-Jan-15	10:10	0.16	0.02	-	-		

Note 1 Subcontracted analysis - RPS Laboratories Ltd : UKAS Number 0605

Note 2 Uncertainty of measurement stated at 95% confidence level

1.3 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load	Comparison of Operator CEMS and Periodic Monitoring Results			
								Substance	CEMS Results	Periodic Monitoring Results	Units
Furnace Stack	23-Jan-15	Combustion	Continuous	Gas/Oxygen	Sand, soda ash, bottle/plate cullet	Electrostatic Precipitator	As per production requirements	SO_2	Not Required by operator		

1.4 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Furnace Stack	None	None	None

Part 2: Supporting Information

2.1 Appendix 1: General Information

2.1.1 Monitoring Organisation Staff Details

2.1.2 Monitoring Organisation Method Details

2.1.3 Monitoring Organisation Equipment Checklist Reference

2.1.1 Monitoring organisation staff details

Name	Position	MCERTS Level	TE1	TE2	TE3	TE4	TE5	MCERTS registration No.
Sampling Team								
Craig Harley	Air Quality Test Engineer	II	✔	✔	✔	✔		MM05 670
Dale Padfield	Air Quality Air Technician	I	✔	✔	✔			MM13 1224
Report writing								
Craig Harley	Air Quality Test Engineer	II	✔	✔	✔	✔		MM05 670
Report Authorisation								
Darren Price	Air Qualtiy Senior Project Manager	II	✔	✔	✔	✔		MM03 176

2.1.2 Monitoring organisation method details

Determinand	NWSS In House Method ID	NWSS Reference Standard	Analytical Laboratory
Oxides of Sulphur	A62	BS EN 14791	RPS (UKAS Number 0605)

Nov Monitoring organisation equipment check list references

Equipment Checklist Ref: KNAUFIN-02767, Jan 2015

2.2 Appendix 2: Furnace Stack

Stack Diagrams & Flows

Calculation Sheets

Analytical Results (2 Pages Numbered separately)

NWSS

Velocity and Temperature Data **DATE:** 23/01/2015 **JOB REF.:** 2767

Client:	Knauf			**Operators:**	CH/DPd		
Location:	Cwmbran			**Test For:**	SO2		
Stack:	Furnace			**In-house method:**	A62		
Pitot Type:	S	**Pitot Cp:**	0.81	**Probe ID:**	3371	**Meter ID:**	1046
Bar. Pressure:	102	**Static:**	1.8	**Duct Shape : Circle (C) or Square (S)**			C
Ambient Temp.:	15			**Stack Diameter (mm):**	1000	by	
Stack O2 (%):				**Port Length (mm):**		80	
Stack CO2 (%):				**Area (m2):**		0.79	
Stack Moisture (%):							

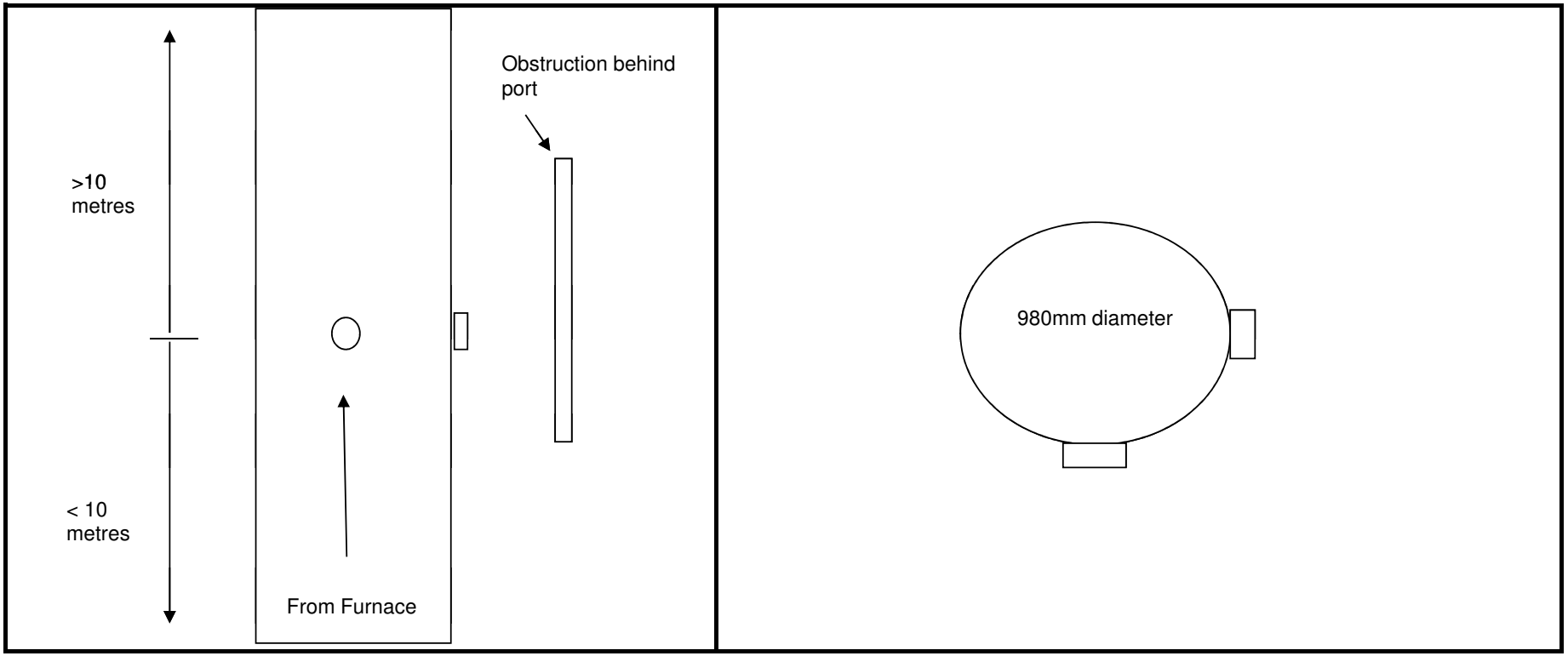
Traverse Point Number	Distance (mm)	Sample Port 1 Temp. °C	Sample Port 1 ΔP cm H2O	Sample Port 1 Sq.root ΔP	Sample Port 2 Temp. °C	Sample Port 2 ΔP cm H2O	Sample Port 2 Sq.root ΔP
1	148	157	1.2	1.1	157	1.2	1.1
2	854	157	1.25	1.1	157	1.1	1.0
3							
4							
5							
6							
7							
8							
9							
10							
Total	TA=	314		TB=	8		
Average		157	1.23	1.11	157.00	1.15	1.07

Flow-stability criteria for periodic sampling of particulates

Criteria	Requirement	Actual
Angle of gas flow	<±15° from stack longitudinal axis	<±15°
Flow direction	No local negative flow	Positive flow
Minimum velocity	5 Pa for pitot tubes	107.8 Pa
Gas velocity variatior	Ratio of highest to lowest less than 3:1 (9:1 Pitot)	1.0 :1
Temperature variatio	≤ ±5% of mean temperature in Kelvin	0.0 %

Permit Number	Operator Name	Installation Name	Installation Address
BR8212	Knauf Cwmbran	Pont-y-Felin Works	Chapel Lane, Croesyceiliog, Cwmbran, Gwent, NP44 2YQ

Furnace Stack



NORMAL

CLIENT:	**Knauf**	**SAMPLE DATE:**	**23-Jan-15**
		BLANK DATE:	**23-Jan-15**
LOCATION:	**Cwmbran**		
		TIME OF SAMPLING:	**10:27-11:27**
STACK:	**A1 Furnace**	**TIME OF BLANK:**	**10:10**

SAMPLING DATA			**CEN SO2 1**
Run Time (min)		60	
Total mass H_2O collected (g)		11.5	
Pitot tube constant,Cp		0.81	
Dry gas meter (DGM) volume (litres)		163.41	
Temperature DGM (°C)		9	
Temperature stack (°C)		156	
Mean pitot tube pressure drop (traverse), delta P(cm H_2O)		1.2	
Mean pitot tube pressure drop at sample point (traverse), delta P(cm H_2O)		1.2	
Mean pitot tube pressure drop(sample run) , delta P(cm H_2O)		1.2	
Barometric Pressure (kPa)		101.9	
X-sectional area of stack (m^2)		0.8	
Efficiency of the 1st Impinger (%)		99	
Field Blank as a percentage of ELV (%)		N/A	
Reference Conditions			
Temperature (K)		273	
Pressure (kPa)		101.3	
Oxygen (%)		21	
As a dry gas			
Emission Limit Value (mg/Nm^3)		N/A	
Flow Data			
Velocity, actual (m/s)		14	
Velocity, ntp (m/s)		9	
Vol.Flow, actual (m^3/min)		648	
Vol.Flow, ntp wet gas		415	
Vol.Flow, ntp dry gas (m^3/min)		381	
Volume sampled, ntp, dry gas (Nm^3)		0.16	
Volume sampled, ntp, wet gas (Nm^3)		0.17	
Analytical Data (max µg collected)		**Sample Run**	**Blank**
Sulphate (SO_4)		8433	39
Concentration Data (mg/Nm3 unless otherwise stated)		**Wet Gas**	**Dry Gas**
O_2 (% vol)dry	N/A		
H_2O (% vol)	8.3		
Sulphur Dioxide Blank		0.15	0.16
Sulphur Dioxide		32.4	35.4
Mass Emissions Data (Kg/Hr unless otherwise stated)			
Sulphur Dioxide			0.81

CLIENT: Knauf

LOCATION: Cwmbran

STACK: A1 Furnace

Sulphur Dioxide Uncertainty Calculations		CEN SO2 1	Blank
Sampling Uncertainty (@ 95% confidence level)	%	10	10
Sample Volume @ Reference Conditions	m3	0.159	0.159
Volume Impinger 1	ml	126	103
Volume Impinger 2	ml	136	118
Concentration @ Reference Conditions	mg/Nm3	35.4	0.2

NWSS have calculated total sampling uncertainty at a 95 % confidence level for different sampling conditions.
The results were between 6 and 9 %.
NWSS have decided to quote a 'worst case' sampling uncertainty of 10% to cover all sampling procedures.

	Unit	Source	Value	Value
Analytical Uncertainty	%	From AQC data	7	7
Impinger 1 1/2 LOD	mg/l	From AQC data	0.026	0.026
Impinger 2 1/2 LOD	mg/l	From AQC data	0.026	0.026
mass Sulphate collected in Impinger 1	mg	Lab result	8.3	0.0
mass Sulphate collected in Impinger 2	mg	Lab result	0.1	0.0
Maximum Sulphate Collected	mg	Calculation	8.43	0.04
Impinger 1 Analytical Uncertainty as Sulphate	mg	Calculation	0.58	0.00
Impinger 2 Analytical Uncertainty as Sulphate	mg	Calculation	0.01	0.00
Total Analytical Uncertainty as Sulphate	mg	Calculation	0.58	0.00
Sampling Uncertainty as Sulphate	mg	Calculation	0.84	0.00
Total Uncertainty as Sulphur Dioxide	mg	Calculation	0.683	0.004
Total Uncertainty as Sulphur Dioxide	mg/Nm3	Calculation	4.30	0.02
Total Uncertainty as Sulphur Dioxide	%	Calculation	12	15

NORMAL

CLIENT:	**Knauf**	**SAMPLE DATE:**	**23-Jan-15**
		BLANK DATE:	**23-Jan-15**
LOCATION:	**Cwmbran**		
		TIME OF SAMPLING:	**11:32-12:32**
STACK:	**A1 Furnace**	**TIME OF BLANK:**	**10:10**

SAMPLING DATA			**CEN SO2 2**
Run Time (min)		60	
Total mass H_2O collected (g)		12.1	
Pitot tube constant,Cp		0.81	
Dry gas meter (DGM) volume (litres)		166.75	
Temperature DGM (°C)		18	
Temperature stack (°C)		158	
Mean pitot tube pressure drop (traverse), delta P(cm H_2O)		1.2	
Mean pitot tube pressure drop at sample point (traverse), delta P(cm H_2O)		1.1	
Mean pitot tube pressure drop(sample run) , delta P(cm H_2O)		1.1	
Barometric Pressure (kPa)		101.9	
X-sectional area of stack (m^2)		0.8	
Efficiency of the 1st Impinger (%)		99	
Field Blank as a percentage of ELV (%)		N/A	
Reference Conditions			
Temperature (K)		273	
Pressure (kPa)		101.3	
Oxygen (%)		21	
As a dry gas			
Emission Limit Value (mg/Nm^3)		N/A	
Flow Data			
Velocity, actual (m/s)		13	
Velocity, ntp (m/s)		8	
Vol.Flow, actual (m^3/min)		622	
Vol.Flow, ntp wet gas		397	
Vol.Flow, ntp dry gas (m^3/min)		363	
Volume sampled, ntp, dry gas (Nm^3)		0.16	
Volume sampled, ntp, wet gas (Nm^3)		0.17	
Analytical Data (max µg collected)		**Sample Run**	**Blank**
Sulphate (SO_4)		9931	39
Concentration Data (mg/Nm3 unless otherwise stated)		**Wet Gas**	**Dry Gas**
O_2 (% vol)dry	N/A		
H_2O (% vol)	8.7		
Sulphur Dioxide Blank		0.15	0.16
Sulphur Dioxide		38.4	42.1
Mass Emissions Data (Kg/Hr unless otherwise stated)			
Sulphur Dioxide			0.92

CLIENT: Knauf

LOCATION: Cwmbran

STACK: A1 Furnace

Sulphur Dioxide Uncertainty Calculations		CEN SO2 2	Blank
Sampling Uncertainty (@ 95% confidence level)	%	10	10
Sample Volume @ Reference Conditions	m3	0.157	0.157
Volume Impinger 1	ml	109	103
Volume Impinger 2	ml	123	118
Concentration @ Reference Conditions	mg/Nm3	42.1	0.2

NWSS have calculated total sampling uncertainty at a 95 % confidence level for different sampling conditions.
The results were between 6 and 9 %.
NWSS have decided to quote a 'worst case' sampling uncertainty of 10% to cover all sampling procedures.

	Unit	Source	Value	Value
Analytical Uncertainty	%	From AQC data	7	7
Impinger 1 1/2 LOD	mg/l	From AQC data	0.026	0.026
Impinger 2 1/2 LOD	mg/l	From AQC data	0.026	0.026
mass Sulphate collected in Impinger 1	mg	Lab result	9.8	
mass Sulphate collected in Impinger 2	mg	Lab result	0.1	0.0
Maximum Sulphate Collected	mg	Calculation	9.93	0.03
Impinger 1 Analytical Uncertainty as Sulphate	mg	Calculation	0.69	0.00
Impinger 2 Analytical Uncertainty as Sulphate	mg	Calculation	0.01	0.00
Total Analytical Uncertainty as Sulphate	mg	Calculation	0.69	0.00
Sampling Uncertainty as Sulphate	mg	Calculation	0.99	0.00
Total Uncertainty as Sulphur Dioxide	mg	Calculation	0.806	0.003
Total Uncertainty as Sulphur Dioxide	mg/Nm3	Calculation	5.12	0.02
Total Uncertainty as Sulphur Dioxide	%	Calculation	12	13

NORMAL

CLIENT:	**Knauf**	**SAMPLE DATE:**	**23-Jan-15**
		BLANK DATE:	**23-Jan-15**
LOCATION:	**Cwmbran**		
		TIME OF SAMPLING:	**12:38-13:38**
STACK:	**A1 Furnace**	**TIME OF BLANK:**	**10:10**

SAMPLING DATA			**CEN SO2 3**
Run Time (min)		60	
Total mass H_2O collected (g)		10.7	
Pitot tube constant,Cp		0.81	
Dry gas meter (DGM) volume (litres)		180.54	
Temperature DGM (°C)		19	
Temperature stack (°C)		158	
Mean pitot tube pressure drop (traverse), delta P(cm H_2O)		1.2	
Mean pitot tube pressure drop at sample point (traverse), delta P(cm H_2O)		1.0	
Mean pitot tube pressure drop(sample run) , delta P(cm H_2O)		1.0	
Barometric Pressure (kPa)		101.9	
X-sectional area of stack (m^2)		0.8	
Efficiency of the 1st Impinger (%)		99	
Field Blank as a percentage of ELV (%)		N/A	
Reference Conditions			
Temperature (K)		273	
Pressure (kPa)		101.3	
Oxygen (%)		21	
As a dry gas			
Emission Limit Value (mg/Nm^3)		N/A	
Flow Data			
Velocity, actual (m/s)		13	
Velocity, ntp (m/s)		8	
Vol.Flow, actual (m^3/min)		592	
Vol.Flow, ntp wet gas		377	
Vol.Flow, ntp dry gas (m^3/min)		350	
Volume sampled, ntp, dry gas (Nm^3)		0.17	
Volume sampled, ntp, wet gas (Nm^3)		0.18	
Analytical Data (max µg collected)		**Sample Run**	**Blank**
Sulphate (SO_4)		9262	39
Concentration Data (mg/Nm3 unless otherwise stated)		**Wet Gas**	**Dry Gas**
O_2 (% vol)dry	N/A		
H_2O (% vol)	7.3		
Sulphur Dioxide Blank		0.14	0.15
Sulphur Dioxide		33.7	36.3
Mass Emissions Data (Kg/Hr unless otherwise stated)			
Sulphur Dioxide			0.76

CLIENT: Knauf

LOCATION: Cwmbran

STACK: A1 Furnace

Sulphur Dioxide Uncertainty Calculations		CEN SO2 3	Blank
Sampling Uncertainty (@ 95% confidence level)	%	10	10
Sample Volume @ Reference Conditions	m3	0.170	0.170
Volume Impinger 1	ml	114	103
Volume Impinger 2	ml	106	118
Concentration @ Reference Conditions	mg/Nm3	36.3	0.2

NWSS have calculated total sampling uncertainty at a 95 % confidence level for different sampling conditions.
The results were between 6 and 9 %.
NWSS have decided to quote a 'worst case' sampling uncertainty of 10% to cover all sampling procedures.

	Unit	Source	Value	Value
Analytical Uncertainty	%	From AQC data	7	7
Impinger 1 1/2 LOD	mg/l	From AQC data	0.026	0.026
Impinger 2 1/2 LOD	mg/l	From AQC data	0.026	0.026
mass Sulphate collected in Impinger 1	mg	Lab result	9.2	0.0
mass Sulphate collected in Impinger 2	mg	Lab result	0.1	0.0
Maximum Sulphate Collected	mg	Calculation	9.26	0.04
Impinger 1 Analytical Uncertainty as Sulphate	mg	Calculation	0.64	0.00
Impinger 2 Analytical Uncertainty as Sulphate	mg	Calculation	0.01	0.00
Total Analytical Uncertainty as Sulphate	mg	Calculation	0.64	0.00
Sampling Uncertainty as Sulphate	mg	Calculation	0.93	0.00
Total Uncertainty as Sulphur Dioxide	mg	Calculation	0.751	0.004
Total Uncertainty as Sulphur Dioxide	mg/Nm3	Calculation	4.42	0.02
Total Uncertainty as Sulphur Dioxide	%	Calculation	12	15

Test Certificate

Date 30/01/2015

Client	Northumbrian Water Ltd Northumberland Dock Road Wallsend Tyne & Wear NE28 0QD	**Order No.**	-
		Certificate No.	**WK15-0413**
		Issue No.	1
Contact	Craig Harley	**Date Received**	27/01/2015
Description	8 solutions for SO2	**Technique**	IC Stack

Sample No.	**823962**	**A1 Furnace Stack-Run 1 Imp 1**		**Method**
Sulphur dioxide		44.0 µg/ml	126 ml	C27(U)
Sample No.	**823963**	**A1 Furnace Stack-Run 1 Imp 2**		**Method**
Sulphur dioxide		0.57 µg/ml	136 ml	C27(U)
Sample No.	**823964**	**A1 Furnace Stack-Run 2 Imp 1**		**Method**
Sulphur dioxide		60.2 µg/ml	109 ml	C27(U)
Sample No.	**823965**	**A1 Furnace Stack-Run 2 Imp 2**		**Method**
Sulphur dioxide		0.48 µg/ml	123 ml	C27(U)
Sample No.	**823966**	**A1 Furnace Stack-Run 3 Imp 1**		**Method**
Sulphur dioxide		53.5 µg/ml	114 ml	C27(U)
Sample No.	**823967**	**A1 Furnace Stack-Run 3 Imp 2**		**Method**
Sulphur dioxide		0.68 µg/ml	106 ml	C27(U)
Sample No.	**823968**	**A1 Furnace Stack-Blank Imp 1**		**Method**
Sulphur dioxide		0.11 µg/ml	103 ml	C27(U)
Sample No.	**823969**	**A1 Furnace Stack-Blank Imp 2**		**Method**
Sulphur dioxide		0.12 µg/ml	118 ml	C27(U)

RPS Laboratories Ltd. Unit 12. Waters Edge Business Park. Modwen Road. Salford. M5 3EZ
Tel: (0161) 872 2443 Fax: (0161) 877 3959

UKAS TESTING 0605

Date 30/01/2015

Test Certificate

Client Northumbrian Water Ltd

Certificate No. WK15-0413

Issue No. 1

Tested By Nicholas Lynch, Lora McKerracher — Date 29/01/2015

Approved By — Date 30/01/2015

Joanne Dewhurst
Laboratory Manager

For and on authority of RPS Laboratories Ltd.

Method Symbols
(U) Analysis is UKAS Accredited
(N) Analysis is not UKAS Accredited

Concentration values (mg/m3 and ppm) are calculated on the basis of information provided by the customer.
Results stated as ml are refering to the sample volume.

RPS Laboratories terms and conditions apply - a copy is available on request.
Analysis carried out on samples 'as received'

RPS Laboratories Ltd. Unit 12. Waters Edge Business Park. Modwen Road. Salford. M5 3EZ
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