enviroDAT
AIR QUALITY & ENVIRONMENTAL CONSULTANTS

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Report for the Periodic Monitoring of Emissions to Air from the Landfill Gas Flare Stack Located at Standard Landfill Site, Buckley.

Part 1: **Executive Summary**

Permit Number: 37073

Operator: Flintshire County Council

Installation: Standard Landfill Site (Flare)

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
4251

Monitoring dates:	3rd April 2017
Job Number:	**R17135**
Version:	1
Address:	**Flintshire County Council**
	Standard Landfill Site
	Spencer Industrial Estate
	Buckley
	Flintshire, CH7 3LY
Monitoring Organisation:	**EnviroDat Ltd**
Address:	Science & Technology Centre
	Earley Gate
	Whiteknights Road
	Reading RG6 6BZ
Date of Report:	18th April 2017
Report Approved By:	Bruce Kester
MCERTS Registration Number:	MM 03 190 (Level II, TE1, 2, 3 & 4)
Function:	Technical Manager (Team Leader)
Signed:	

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PART 1: EXECUTIVE SUMMARY

1.1 Monitoring Objectives

Flintshire County Council operates a landfill gas engine and a flare stack at its facility located at Standard Landfill site. This combustion plant has the potential to pollute the atmosphere. Consequently, these processes are subject to regulation and periodic environmental monitoring is necessary under this regulation.

Methane is produced as a by-product of the decomposition of organic waste that is buried within the site (methanogenesis). This methane is extracted and pumped through inert piping to the engine or flare for combustion, the scale of which is dictated according to local engineering, operational requirements and methanogenic rate. The flare is designed to operate when excess gas is produced or for periods of engine maintenance.

EnviroDat Limited was requested to undertake a monitoring campaign on the flare stack. This work forms part of the annual compliance test. The pollutants monitored within the flare emissions, as required under permit 37073 are summarised below (the engine is to be tested later in 2017):

Substances to be monitored	**Emission Point Identification**	
	Engine	Flare Stack
Oxides of Nitrogen (as NO2)	**X**	✓
Carbon Monoxide	**X**	✓
Volatile Organic Compounds (VOCs)	**X**	✓
Oxygen (for correction)	**X**	✓
Moisture (for correction)	**X**	✓
Special requirements	None requested	

1.2 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Estimate of Uncertainty (2σ at 95% confidence)	Units	Reference Conditions	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method (see note below)	Operating Status
Flare Stack	Oxides of Nitrogen (as NO_2)	150	**53.0**	±3.1	$mg(N)m^{-3}$	101.3kPa, 273K, dry gas, 3% Oxygen	03/04/2017	16:01-17:01	BS EN 14792	A	At 37% MCR
	Carbon Monoxide	50	**39.7**	±3.5	$mg(N)m^{-3}$				BS EN 15058	A	
	Volatile Organic Compounds (VOCs as carbon)	10	**4.5**	±2.1	$mg(N)m^{-3}$				BS EN 12619	A	
	Moisture	-	**5.4**	n/a	%	101.3kPa, 273K, dry gas		11:00-12:00	BS EN 14790	A	
	Oxygen	-	**9.97**	±0.51	%			11:00-12:00	BS EN 14789	A	

NOTE:

A. EnviroDat Ltd MCerts/UKAS Accredited for sampling and analysis.

B. EnviroDat Ltd MCerts/UKAS Accredited for sampling only, UKAS Accredited analysis conducted by sub-contract laboratory.

C. EnviroDat Ltd MCerts/UKAS Accredited for sampling only (further clarification is given in section 1.4). Analysis of this component is not UKAS Accredited.

D. The method for sampling and analysis is not MCerts/UKAS Accredited, method follows documented in-house procedure (further clarification is given in section 1.4).

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
Flare Stack	03/04/2017	Combustion	Continuous	Landfill Gas	N/A	None	Burning 183m^3/hr (37% MCR)	N/A	N/A	N/A	N/A

1.4 Monitoring Deviations

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

PART 2: SUPPORTING INFORMATION

2.1 Appendix I: General Information

2.1.1 Monitoring organisation staff details

Monitoring at Standard Landfill Site was conducted by the following EnviroDat Engineers:

Team Leader, Bruce Kester – Mcerts Level II (TE1, 2, 3 & 4)	MM03 190
Assistant, Danny Gibbons – Mcerts Trainee	MM15 1326

2.1.2 Monitoring organisation method details

2.1.2.1 Standard Reference Conditions

All pollutant concentrations measured have been expressed at standard reference conditions of 273K, 101.3kPa, dry gas and 3% O_2.

2.1.2.2 NO_x (as NO_2)

A sample of the duct gas was passed via a short high temperature probe and down a heated PTFE line to a gas conditioner used to remove moisture. The conditioned (dry) gas then passed to a Horiba PG250 analyser, which, following specific pre-treatment of the NO_x within the sample, measured the concentration of NOx (as NO_2) by chemiluminescent detector, in accordance with EnviroDat Ltd. documented procedure SP14792, which implements the requirements of the standard reference method (SRM) BSEN14792. The detector and sampling system was checked prior to, and immediately following, testing to ensure operational conformity. This involved ensuring the absence of sample egress or air ingress, span and zero gas checks and system response times as necessary. All raw data was logged at 60-second intervals via a Grant Instruments Squirrel Datalogger and these are presented in Appendix II. An estimate of the uncertainty associated with the monitoring is also presented, as Appendix III.

2.1.2.3 CO

A sample of the duct gas was passed via a short high temperature probe and down a heated PTFE line to a gas conditioner used to remove moisture. The conditioned (dry) gas then passed to a Horiba PG250 analyser, which measured the concentration of CO by non-dispersive infrared (NDIR) detector, in accordance with EnviroDat Ltd. documented procedure SP15058 which implements the requirements of the SRM BSEN15058. The detector and sampling system was checked prior to, and immediately following, testing to ensure operational conformity. This involved ensuring the absence of sample egress or air ingress, span and zero gas checks and system response times as necessary. All raw data was logged at 60-second intervals via a Grant Instruments Squirrel Datalogger and these raw data are presented in Appendix II. An estimate of the uncertainty associated with the monitoring is also presented, as Appendix III.

2.1.2.4 Total VOCs

VOC sampling was performed using a Signal 3010HM analyser that measures by use of a heated flame ionisation detector (FID) in accordance with SP12619, which implements the requirements of the SRM BSEN12619:2013. The VOC analyser was positioned prior to the gas conditioner and measured the sample gas 'hot and wet.' The result was subsequently corrected to dry values. The detector and sampling system was checked prior to, and immediately following, testing to ensure operational conformity. This involved ensuring the absence of sample egress or air ingress, span and zero gas checks and system response times as necessary. All raw data was logged at 60-second intervals via a Grant Instruments Squirrel Datalogger and these raw data are presented in Appendix II. An estimate of the uncertainty associated with the monitoring is also presented, as Appendix III.

2.1.2.5 O_2

A sample of the duct gas was passed via a short high temperature probe and down a heated PTFE line to a gas conditioner used to remove moisture. The conditioned (dry) gas then passed to a Horiba PG250 analyser, which measured the concentration of O_2 by was measured by a zirconia cell, as detailed in documented procedure SP14789, which implements the requirements of the SRM BSEN14789. The detector and sampling system was checked prior to, and immediately following, testing to ensure operational conformity. This involved ensuring the absence of sample egress or air ingress, span and zero gas checks and system response times as necessary. All raw data was logged at 60-second intervals via a Grant Instruments Squirrel Datalogger and the raw data are presented in Appendix II. An estimate of the uncertainty associated with the monitoring is also presented, as Appendix III.

Determination of oxygen is essential for adjusting the prescribed pollutants to reference oxygen levels as detailed in the sites permit. This was performed in the following manner:

$$Conc_{ref} = Conc_{meas} \times \frac{(20.95-O_{2ref})}{(20.95-O_{2meas})}$$

Whereby, $Conc_{ref}$ was the concentration at reference conditions and $Conc_{meas}$ was the measured concentration, O_{2ref} is the oxygen reference conditions and O_{2meas} is the measured oxygen value.

2.1.2.6 Moisture

Moisture levels in the stack were determined gravimetrically to the requirements of BSEN14790, which implements the requirements of the SRM BSEN14790. The equipment consisted of an Apex Instruments USEPA Method Five apparatus. This consisted of a heated probe, heated filter and impinger bucket, connected to the sampling console. The console contained a calibrated dry gas meter. The data obtained from this system combined with the gravimetric increases allowed water content to be calculated. The moisture correction factor was calculated in the following manner:

$$\frac{(100-[H_2O]reference)}{(100-[H_2O]measured)}$$

This correction factor is only applied to the VOC result and was not applied to the combustion gases as the sample train for combustion gases uses a gas conditioner to remove moisture and introduces dried gas to the analyser. The raw data relating to the moisture test is presented as Appendix IV.

2.1.3 Monitoring organisation equipment and gas check list references

EQUIPMENT			
Item	**Reference**	**Calibration Due**	**PAT Due**
Portable Gas Analyser	PGA#06	12-Mar-18	Oct-17
Flame Ionisation Detector Analyser	FID#05	30-Oct-17	Oct-17
Gas Conditioner	COND#05	30-Oct-17	Oct-17
Data Logger	DL#04	21-Nov-17	-
Digital Barometer	DB#18	11-Aug-17	-
Balance	BAL#02	29-Mar-18	-
Heated Line[1]	HL#01	27-Feb-18	-
Heated Line[2]	HL#02	27-Feb-18	-
Heated Line[3]	HL#03	27-Feb-18	Oct-17
Heated Line Controller	HLC#02	27-Feb-18	Oct-17
Heated Filter Holder	HFH#03	22-Jan-18	Oct-17
'Apex' Kit	APEX#06	See each item	Oct-17
Dry Gas Meter ('Apex')	DGM#14	6-Nov-17	-
Timepiece[1] ('Apex')	TP#20	6-Nov-17	-
Timepiece[2]	TP#17	2-Nov-17	-
Thermocouple[1]	TC#46	6-Nov-17	-
Thermocouple[2] ('Apex' Dogleg Exit)	TC#08	15-Nov-17	-
Thermocouple[3] ('Apex' Dry Gas Meter)	TC#24	6-Nov-17	-

GAS CYLINDERS			
	Certificate No.	**Level**	**Validity**
'Zero' Gas (%)[1]	Eq64MLW	99.9995%	-
Carbon Monoxide Span Gas[2]	EM41XDJ	157.9ppm	03-Nov-17
Nitrogen Dioxide Span Gas[2]	EM41XDJ	96.3ppm	03-Nov-17
Oxygen Span Gas (%)[2]	EQ69VLY	7.92%	09-Mar-18
VOC Span Gas[2]	EQ69VLY	8.04ppm	09-Mar-18

2.2 Appendix II: Emission Point Reference Data & Results

2.2.1 Photograph of Sampling Location on Flare

Sampling from approx..1.00m diameter flare using Envirodat hydraulic mast

2.2.2 Homogeneity testing

BS EN 15259 stipulates that the exhaust gases emitted from combustion processes are tested to ensure homogeneity and that a representative sample is obtained during the monitoring, subject to a number of caveats as elucidated in Environment Agency guidance MID15259. The details of the testing at each emission point are summarised below:

Stack	Result of Homogeneity Testing
Flare Stack	N/A – Due to the health & safety implications of working on a live flare, homogeneity assumed and single point sampling acceptable.

2.2.3 Gas analyser site measurements and calibrations

The data in Charts 1 to 3 and in Table 1 are expressed in mgm^{-3} @ STP and is uncorrected for O_2. In addition, VOC results are expressed as methane equivalent. This data was subsequently converted to reference oxygen concentrations (Section 1.2) with the addition of moisture correction for VOCs. Analyser calibration data is shown in Table 2.

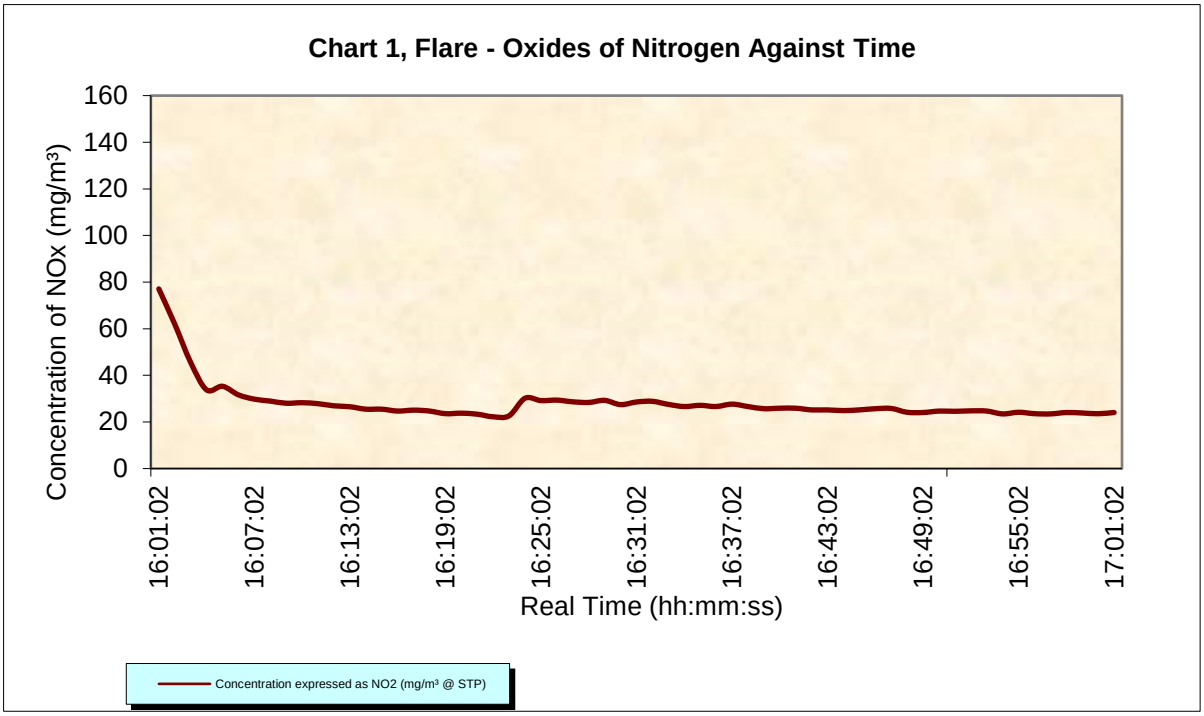
Chart 1, Flare - Oxides of Nitrogen Against Time
Concentration of NOx (mg/m³)
160
140
120
100
80
60
40
20
0
16:01:02
16:07:02
16:13:02
16:19:02
16:25:02
16:31:02
16:37:02
16:43:02
16:49:02
16:55:02
17:01:02
Real Time (hh:mm:ss)
Concentration expressed as NO2 (mg/m³ @ STP)

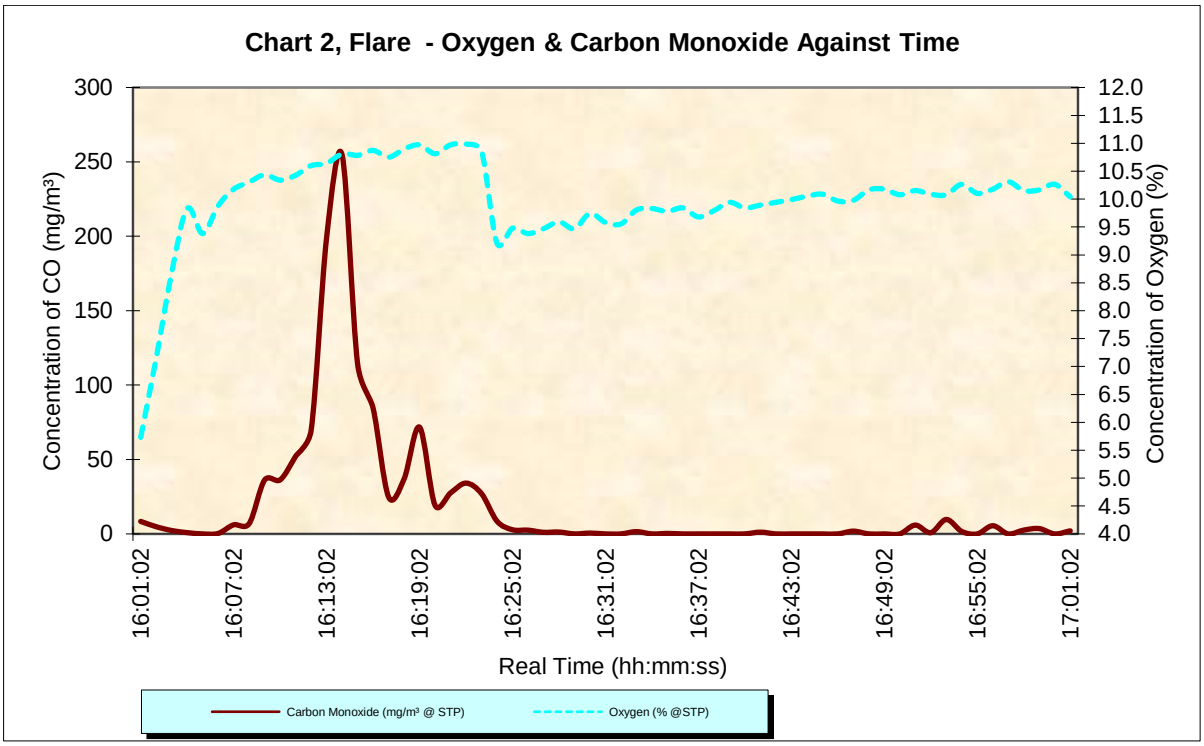
Chart 2, Flare - Oxygen & Carbon Monoxide Against Time
Concentration of CO (mg/m³)
300
250
200
150
100
50
0
Concentration of Oxygen (%)
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
16:01:02
16:07:02
16:13:02
16:19:02
16:25:02
16:31:02
16:37:02
16:43:02
16:49:02
16:55:02
17:01:02
Real Time (hh:mm:ss)
Carbon Monoxide (mg/m³ @ STP)
Oxygen (% @STP)

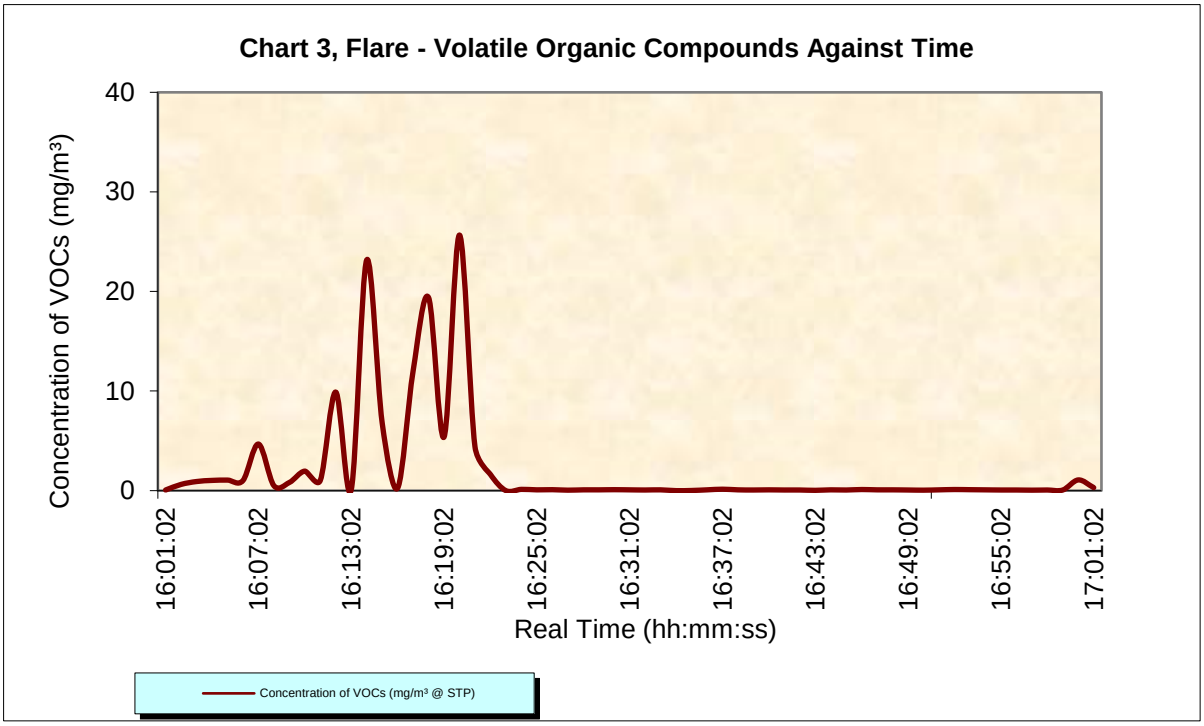

Table 1 – Flare, Raw Data

Time	Oxygen Dry Gas (%)	VOC Wet Gas (mgC/m³)	CO Dry Gas (mg/m³)	Nox Dry Gas (mg/m³)	Comment
16:01:02	5.7	0.1	8.4	77.1	
16:02:02	7.2	0.6	4.8	62.0	
16:03:02	8.7	0.9	2.3	45.5	
16:04:02	9.8	1.0	0.9	33.8	
16:05:02	9.4	1.1	0.0	35.3	
16:06:02	9.9	1.0	0.3	31.6	
16:07:02	10.2	4.7	6.1	29.8	
16:08:02	10.3	0.5	6.9	29.0	
16:09:02	10.4	0.8	36.3	28.0	
16:10:02	10.3	2.0	36.3	28.3	
16:11:02	10.4	1.0	52.2	27.8	
16:12:02	10.6	9.9	69.6	26.9	
16:13:02	10.6	0.1	199.2	26.5	
16:14:02	10.8	23.2	254.7	25.5	
16:15:02	10.8	6.8	114.3	25.5	
16:16:02	10.9	0.3	84.5	24.7	
16:17:02	10.8	12.0	24.9	25.1	
16:18:02	10.9	19.4	36.9	24.7	
16:19:02	11.0	5.4	71.7	23.6	
16:20:02	10.8	25.7	19.2	23.8	

Time	Oxygen Dry Gas (%)	VOC Wet Gas (mgC/m³)	CO Dry Gas (mg/m³)	Nox Dry Gas (mg/m³)	Comment
16:21:02	11.0	4.4	27.5	23.3	
16:22:02	11.0	1.6	34.1	22.2	
16:23:02	10.9	0.0	27.1	22.6	
16:24:02	9.2	0.1	8.6	30.2	
16:25:02	9.5	0.1	2.8	29.2	
16:26:02	9.4	0.1	2.5	29.4	
16:27:02	9.5	0.0	1.1	28.6	
16:28:02	9.6	0.1	1.3	28.4	
16:29:02	9.5	0.1	0.0	29.3	
16:30:02	9.7	0.1	0.6	27.4	
16:31:02	9.6	0.1	0.0	28.6	
16:32:02	9.6	0.1	0.0	28.9	
16:33:02	9.8	0.1	1.5	27.5	
16:34:02	9.8	0.0	0.0	26.6	
16:35:02	9.8	0.0	0.3	27.1	
16:36:02	9.8	0.1	0.0	26.6	
16:37:02	9.7	0.1	0.0	27.6	
16:38:02	9.8	0.1	0.0	26.6	
16:39:02	9.9	0.1	0.0	25.7	
16:40:02	9.8	0.1	0.0	25.9	
16:41:02	9.9	0.1	1.2	25.9	
16:42:02	9.9	0.1	0.0	25.2	
16:43:02	10.0	0.0	0.0	25.2	
16:44:02	10.1	0.1	0.0	24.9	
16:45:02	10.1	0.1	0.0	25.2	
16:46:02	10.0	0.1	0.0	25.7	
16:47:02	10.0	0.1	1.9	25.8	
16:48:02	10.2	0.1	0.0	24.2	
16:49:02	10.2	0.1	0.0	24.0	
16:50:02	10.1	0.0	0.0	24.7	
16:51:02	10.2	0.1	5.9	24.6	
16:52:02	10.1	0.1	0.8	24.8	
16:53:02	10.1	0.1	9.7	24.7	
16:54:02	10.3	0.1	1.7	23.5	
16:55:02	10.1	0.1	0.0	24.2	
16:56:02	10.2	0.1	5.5	23.6	
16:57:02	10.3	0.0	0.0	23.5	
16:58:02	10.2	0.1	2.6	24.0	
16:59:02	10.2	0.1	3.6	23.8	
17:00:02	10.3	1.1	0.0	23.5	
17:01:02	10.0	0.3	2.1	24.0	

Table 2 – Flare, Analyser Calibration Data

ANALYSER CALIBRATION DATA					
Pre Sampling Check					
		NO (ppm)	**CO (ppm)**	**O2 (%)**	**VOC's (ppm)**
Range		100	200	25	100
Zero Gas	**Cylinder No.**	EQ64MLW			Scrubbed Air
Span Gas	**Cylinder No.**	EM41XDJ	EM41XDJ	EQ69VLY	EQ69VLY
	Certified Value	96.3	157.9	7.92	8.04
Zero Check	**Value**	0.2	0.9	0.02	0.1
<2 x repeatability (Yes/No)		YES	YES	YES	YES
Down Line Zero & Span Check					
Zero Gas	**Value**	0.2	0.7	0.02	0.1
	<2% of span	**YES**	**YES**	**YES**	**YES**
Span Gas	**Value**	95.9	157.4	7.93	8.02
	Within 2% of span	YES	YES	YES	YES
Post Sampling Drift Check					
Zero Gas	**Value**	0.2	1	0.05	0
	Drift (%)	0.0	0.2	0.4	1.2
	Validation	**No Correction Required**	**No Correction Required**	**No Correction Required**	**No Correction Required**
Span Gas	**Value**	96.8	156.4	7.93	8.05
	Drift (%)	0.9	0.6	0.0	0.4
	Validation	**No Correction Required**	**No Correction Required**	**No Correction Required**	**No Correction Required**

2.3 Appendix III: Uncertainty Calculation

2.3.1 Flare, Uncertainties

NOx - Measurement performance related to stationary conditions		
Performance characteristic	**Uncertainty**	**Value of uncertainty quantity**
Standard deviation of repeatability at zero	u_{r0}	0.80
Standard deviation of repeatability at span level	u_{rs}	0.10
Lack of fit	u_{fit}	0.47
Drift	u_{0dr}	1.34
volume or pressure flow dependence	u_{spres}	0.01
atmopsheric pressure dependence	u_{apres}	0.24
ambient temperature dependence	u_{temp}	0.35
NH3 (20 mg/m3)	u_{interf}	0.14
CO2 (15%)	-	0.02
H2O (30%)	-	0.01
Error in logger voltage	-	0.10
Dependence on voltage	u_{volt}	0.03
Converter efficiency	u_{ceff}	0.13
losses in the line (leak)	u_{leak}	0.32
Uncertainty of calibration gas	u_{calib}	0.32

NOx Measurement uncertainty		Result	27.78	mg/m^3
Combined uncertainty			1.57	mg/m^3
Expanded uncertainty	k =	2	3.15	mg/m^3
Uncertainty corrected to std conds			3.15	mg.m-3 (corrected)
Expanded uncertainty	**expressed with a level of confidence of 95%**		**2.10**	**% ELV**
Expanded uncertainty	**expressed with a level of confidence of 95%**		**3.15**	**$mg.m^{-3}$ of result**

CO - Measurement performance related to stationary conditions		
Performance characteristic	**Uncertainty**	**Value of uncertainty quantity**
Standard deviation of repeatability at zero	u_{r0}	0.80
Standard deviation of repeatability at span level	u_{rs}	0.10
Lack of fit	u_{fit}	0.58
Drift	u_{0dr}	1.56
volume or pressure flow dependence	u_{spres}	0.00
atmopsheric pressure dependence	u_{apres}	0.23
ambient temperature dependence	u_{temp}	0.00
CO2 (15%)	u_{interf}	0.00
N2O (40mgm3)	-	0.00
CH4 (57mgm3)	-	0.00
H2O (1%)	-	0.00
Dependence on voltage	u_{volt}	0.03
Error in Logger reading	-	0.20
losses in the line (leak)	u_{leak}	0.24
Uncertainty of calibration gas	u_{calib}	0.24

CO Measurement uncertainty		Result	20.80	mg/m^3
Combined uncertainty			1.73	mg/m^3
Expanded uncertainty	k =	2	3.46	mg/m^3
Uncertainty corrected to std conds			3.46	mg.m-3 (corrected)
Expanded uncertainty	**expressed with a level of confidence of 95%**		**6.93**	**% ELV**
Expanded uncertainty	**expressed with a level of confidence of 95%**		**3.46**	**$mg.m^{-3}$ of result**

VOC - Measurement performance related to stationary conditions		
Performance characteristic	**Uncertainty**	**Value of uncertainty quantity**
Standard deviation of repeatability at zero	u_{r0}	0.80
Standard deviation of repeatability at span level	u_{rs}	0.10
Lack of fit	u_{fit}	0.37
Drift	u_{0dr}	0.95
volume or pressure flow dependence	u_{spres}	0.00
atmopsheric pressure dependence	u_{apres}	0.15
ambient temperature dependence	u_{temp}	0.00
NH3 (20 mg/m3)	u_{interf}	0.00
CO2 (15%)	-	0.00
H2O (30%)	-	0.00
Error on Logger voltage	-	0.10
Dependence on voltage	u_{volt}	0.03
losses in the line (leak)	u_{leak}	0.03
Uncertainty of calibration gas	u_{calib}	0.03

VOC Measurement uncertainty		Result	2.25	mg/m^3
Combined uncertainty			1.04	mg/m^3
Expanded uncertainty	k =	2	2.08	mg/m^3
Uncertainty corrected to std conds			2.08	mg.m-3 (corrected)
Expanded uncertainty	**expressed with a level of confidence of 95%**		**20.83**	**% ELV**
Expanded uncertainty	**expressed with a level of confidence of 95%**		**2.08**	**$mg.m^{-3}$ of result**

Oxygen - Measurement performance related to stationary conditions		
Performance characteristic	**Uncertainty**	**Value of uncertainty quantity**
Standard deviation of repeatability at zero	u_{r0}	0.20
Standard deviation of repeatability at span level	u_{rs}	0.03
Lack of fit	u_{fit}	0.12
Drift	u_{0dr}	0.13
volume or pressure flow dependence	u_{spres}	0.00
atmopsheric pressure dependence	u_{apres}	0.01
ambient temperature dependence	u_{temp}	0.05
CO2 (15%)	-	0.00
NO(300)	-	0.06
NO2(30)	-	0.00
dependence on voltage	u_{volt}	0.02
losses in the line (leak)	u_{leak}	0.12
Error in Logger voltage	-	0.03
Uncertainty of calibration gas	u_{calib}	0.12

O2 Measurement uncertainty		Result	9.97	%vol
Combined uncertainty			0.26	%vol
% of value			2.56	%
Expanded uncertainty	**expressed with a level of confidence of 95%**		**5.12**	**% of value**
Expanded uncertainty	**expressed with a level of confidence of 95%**		**0.51**	**% vol**

2.4 Appendix IV: Moisture Calculations

2.4.1 Flare, Moisture

Test No	T1		**Site**	Flintshire		
Date	3-3-17			Standard		
pbar (mbar)	999		**Stack**	Flare		
pbar (mnHg)	749		**Job Number:**	R17135		
Nozzle Diameter (mm)	n/a		**Site Team:**	**BK & DWG**		
Temp of Meter (in)/(out) deg. C	16		**Data Entered By:**		BK	
ΔH_{ave} (mmH_20)	10.0					
DGM Cal Factor (Y)	1.0422		Enter Data into coloured cells only			

Start Volume Reading	3434.8640	**m³**		**Start time**	16:01	**hr:min**
End Volume Reading	3435.4134	**m³**		**End time**	17:01	**hr:min**
Volume Sampled	**0.5726**	**m³**		**Total time**	01:00	**hr:min**

IMPINGER	**1**	**2**	**3**	**4**	**Initials of Analyst**
Absorber Solution (Type):	**H2O**	**H2O**	**KO IMP**	**SILICA**	
Sample No:	**n/a**	**n/a**	**n/a**	**n/a**	
Analysis Required:	**n/a**	**n/a**	**n/a**	**n/a**	
Initial Weight of Impingers plus absorber (g)	768.6	870.4	653.8	827.0	DWG
Final Weight of Impingers plus absorber (g)	785.7	870.6	653.3	834.8	DWG
Weight Gain (g)	**17.1**	**0.2**	**-0.5**	**7.8**	

Total Weight Gain (1+2+3+4) (g)	**24.6**

Gas Volume of water at 0°C (l)	30.63
Gas Meter volume at 0°C (l)	533.93

Moisture content of Gases (%)	**5.4**