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EMISSIONS MONITORING TEST REPORT

**Canley Garden Crematorium
Cannon Hill Road
Coventry
CV4 7DF**

27th – 28th March 2012

Report Authorised by  Date 28th May 2012

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1. INTRODUCTION

The four cremators and associated flue gas treatment systems at Canley Garden Crematorium were monitored between the 27th and 28th March 2012 to the requirements given in Process Guidance Note PG5/2 (2004) for emission releases to atmosphere for abated plant.

The work involved monitoring a range of flue gas components with the plant operating normally.

The plant comprises Nos.1, 2 & 3 Cremators that are designated as the model FTII, and No.4 Cremator that is the model type FTIII. The two cremator types are similar other than the FTIII having a wider hearth capable of accepting larger coffin sizes. Each cremator is fitted with two nozzle mix burners utilising natural gas as the support fuel.

Cremators 1 & 2 share a combined flue gas treatment system designated as Stream 1, with an identical arrangement for Cremators 3 & 4 designated as Stream 2.

The waste gases from the two cremators combine, and are ducted to a common flue gas treatment plant. The treatment plant comprises a shell and tube boiler to cool the flue gases, a reagent feeder station that introduces a blend of activated carbon/sodium bicarbonate to react with the cooled gases, and a bag filter to clean the treated gases. The waste heat from the boiler in the form of warm water is dissipated to atmosphere via a finned tube air blast cooler situated outside the crematory.

The plant operates under full microprocessor based automatic control that requires little manual intervention.

The cremators and flue gas clean up system were manufactured, installed and commissioned by Facultative Technologies Limited to meet the requirements of the Environmental Permitting (England and Wales) Regulations 2007 – (EPR 2007) as relevant to cremators, summarised in the Secretary of State's Process Guidance Note PG 5/2 (2004).

The flue ducting and test points were in accordance with the requirements of EA TGN M1.

Measurements were undertaken to enable comparisons to be made of the operation of the cremators and associated flue gas treatment system with the requirements of the Guidance Note in terms of emission releases to air.

This report details the monitoring procedures used and the results obtained from this test work along with comparisons with the Guidance Note requirements and comments where appropriate.

Relevant procedures were followed to enable quality control to be maintained throughout the test preparation, site test work, laboratory analysis, calculations and reporting.

2. PROCEDURES

2.1 Total Particulate Matter

A flue gas sample was extracted and filtered to collect total particulate matter. A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1, and the adaptations given in PG Note 5/2 (2004) Clause 9.5, allowing sampling in one line of the flue duct due to the batch nature of the cremation process.

The method employed was BS EN 13284 Part 1 and the PG Note 5/2 (2004) Clause 9.5 adaptations.

The sampling was conducted using apparatus in accordance with the requirements of BS EN 13284 Part 1.

This consisted of a heated known dimension Pyrex glass nozzle, heated Pyrex glass probe liner, heated Pyrex glass filter housing with Titanium filter support containing quartz microfibre filter (all heaters set to 160°C), PTFE sample line, dreschel absorption bottles, gas dryer (silica gel), sample line to pump, pump, gas meter, rotameter, pitot and impulse lines, electronic manometer, type K thermocouple, balance (for gravimetric moisture) and datalogger. Settings tables were pre-prepared to enable isokinetic flow to be maintained (based on online measurements of flue gas velocity and temperature to set nozzle flow / pump rate (l/min)).

Particulate matter analysis was carried out by weighing the filter and probe rinse collection on a calibrated balance, with the media being dried and weighed prior to and following the test.

Standard BS EN 13284 Part 1 was deviated from only in so far as a consequence of conducting tests in accordance with the recommendations given in the Appendices of PG5/2(04) that state that only one sampling line be used for each test run. This is contrary to the BS EN 13284 Part 1 that requires both sample lines to be used during an isokinetic test i.e. four point sampling (2 points x 2 lines) for a duct of this diameter.

The effect on uncertainty of using only one sample line is not considered to be significant and is within the calculated uncertainties stated in the report. These assumptions are on the basis that the preliminary pitot traverses confirmed the gas velocity profiles are well within required limits, and the duct diameter was small. There is no reason to suspect that the gas sampled from only one sampling plane is not representative of the duct as a whole.

The recommended deviations to procedures set down in PG 5/2 (04) Clause 9.5 and PG 5/2 (95) Clause 2.2 are a reflection that cremation is a batch process, and that changing sampling ports part-way through a cremation could introduce more errors due to the fact that a period of each cremation would not be sampled during the changeover process.

The tests reported herein were conducted to prove the performance of the cremators relative to PG5/2(04).

2.2 Hydrogen Chloride

A flue gas sample was extracted and filtered. The gas sample was then passed through an absorption medium of de-ionised water to collect hydrogen chloride.

The method employed was BS EN 1911 Parts 1-3.

Laboratory analysis for hydrogen chloride was carried out on the absorption medium using Ion Chromatography (IC).

2.3 Mercury

A flue gas sample was extracted and filtered to collect solid phase mercury.

A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1, and the adaptations given in PG Note 5/2 (2004) Clause 9.5, allowing sampling in one line of the flue duct due to the batch nature of the cremation process. The reasons for following the PG 5/2 adaptations are given above in Clause 2.1.

The gas sample was then passed through an absorption medium of acidified potassium dichromate to collect vapour phase mercury.

The method employed was BS EN 13211.

Laboratory analysis for solid and vapour phase mercury was carried out on the filter and absorption medium using cold vapour atomic fluorescence spectroscopy (CVAFS).

2.4 Carbon Monoxide

A flue gas sample was continuously extracted, filtered and dried before being passed through a pre-calibrated Siemens Ultramat 21/O₂ infrared analyser for the on-line measurement of carbon monoxide. The analyser has a fixed range of 0-1250 mg/Nm³ and was zeroed with air and calibrated with a nominal 800 ppmv carbon monoxide in balance nitrogen gas.

The method employed was BS ISO 12039.

The analyser output was continuously recorded using a Grant 'Squirrel' data logger.

For these tests a relatively high range analyser was used due to the typical pattern of carbon monoxide concentration emissions from cremators being very low (often indicated as zero) for most of the cycle, but with occasional, high, short duration spikes of CO being emitted. The convention since non-continuous emissions monitoring became a mandatory requirement for cremators during 1990, has been to attempt to monitor the magnitude of spikes, as these are often the main contributor to total CO emissions. If the mean one minute emission of CO was say 200 mg/Nm³, it would be expected that the peak concentration during that one minute averaging period would be considerably higher than this. It

follows that utilising a lower range analyser would frequently understate CO emissions, despite increasing sensitivity at low CO concentrations.

2.5 Volatile Organic Compounds

A flue gas sample was continuously extracted and filtered before being passed via a heated line through a pre-calibrated Signal 3030PM Flame Ionisation Detection (FID) analyser for the on-line measurement of volatile organic compounds. The analyser was ranged 0-100 ppmv total hydrocarbons and was zeroed with air passed through a catalytic converter and calibrated with a nominal 50 ppmv propane in balance air gas.

The method employed was BS EN 12619.

The analyser output was continuously recorded using a Grant 'Squirrel' data logger.

Similar comments apply to VOC's as CO, in that the analyser scaling is set to quantify the peaks that are the nature of the emission.

2.6 Oxygen

A flue gas sample was continuously extracted from the same position in the flue as the other pollutants extraction, filtered and dried before being passed through a pre-calibrated Siemens Ultramat 21/O₂ electrochemical cell analyser for the on-line measurement of flue oxygen.

An analogue output was taken from the plants own oxygen analyser for monitoring the oxygen content at the outlet of the secondary combustion chamber. This instrument measures the oxygen wet, and the readings were corrected to a dry basis for use in the secondary combustion chamber gas residence time calculations.

The method employed was BS ISO 12039.

The analysers were calibrated using a standard reference gas in the laboratory before and after the site visit, and with nitrogen "zero" gas and air at the start and end of each day's testing on site. It was assumed that calibration linearity was maintained during sampling, and the post checks indicated that this was the case.

The outputs of the analysers were continuously recorded using a Grant 'Squirrel' data logger.

2.7 Moisture

A flue gas sample was extracted and filtered. The gas sample was then passed through an absorption medium to collect any water vapour.

The method employed was BS EN 14790.

Flue gas moisture was determined gravimetrically by weighing the absorption medium and final gas drier prior to and following the test.

This was carried out alongside testing for hydrogen chloride and mercury.

2.8 Temperature

The cremator secondary chamber exit and flue (filter outlet) temperatures were measured by the use of calibrated Type K thermocouples.

The method employed was BS EN 13284 Part 1.

The gas temperatures were continuously recorded using a Grant 'Squirrel' data logger.

2.9 Velocity and Volumetric Flow

Flue gas velocity was found from inserting a calibrated s-type pitot tube into the flue. The pitot head pressure was then measured using a calibrated electronic manometer.

The method employed was BS EN 13284 Part 1.

The electronic manometer output was continuously recorded using a Grant 'Squirrel' data logger.

Flue gas velocity was then calculated from Bernoulli's equation as the density of the flue gas was known (from measurements of flue gas moisture and temperature).

Flue gas volumetric flow rate was found from the measurement of the flue duct size and hence its area and corrected to normalised conditions (again from measurements of flue gas moisture and temperature).

3. RESULTS

The results are summarised in Tables 1 to 4.

Total Particulate Matter, Hydrogen Chloride, Carbon Monoxide and Volatile Organic Compound determinations for Streams 1 & 2 are given in Tables 1 & 2.

Mercury determinations for Streams 1 & 2 are given in Tables 3 & 4.

Moisture determinations were made on all tests.

Carbon Monoxide, Volatile Organic Compounds, Oxygen, Temperature and Velocity and Volumetric Flow were continuously monitored.

All values in the tables are corrected to the reference conditions of 273K, 101.3kPa, 11%v/v oxygen and dry gas as given in PG5/2(04) where required.

All the data logs and calculations can be seen in Appendix 1.

All the analysis reports can be seen in Appendix 2.

Details of plant operation during testing are given in Appendix 3.

TABLE 1
Canley Garden Crematorium Stream 1 Abatement System Outlet
Emissions Monitoring 27th March 2012
Total Particulate Matter & Hydrogen Chloride Sampling

	Test 1	Test 2	Test 3	Average	Requirement to PG5/2 (2004)
Total Particulate Matter - mg/Nm ³ c.	0.34 ± 1.15	1.35 ± 1.19	1.44 ± 1.83	1.04	<20
Hydrogen Chloride - mg/Nm ³ c.	17.33 ± 0.89	40.21 ± 1.99	26.35 ± 1.35	27.96	<30
Carbon Monoxide - mg/Nm ³ c.	0.42 ± 0.02	5.22 ± 0.26	2.97 ± 0.15	2.87	<100
Organic Compounds - mg/Nm ³ c.	0.00 ± 0.00	0.51 ± 0.03	0.44 ± 0.02	0.32	<20
Flue Oxygen - %v/v dry	15.10 ± 0.10	14.59 ± 0.10	15.10 ± 0.10	14.93	
Flue Moisture - %v/v	7.0 ± 0.7	7.7 ± 0.8	8.3 ± 0.8	7.7	
- %w/w	4.5 ± 0.4	5.0 ± 0.5	5.3 ± 0.5	4.9	
Flue Temperature - Deg C	123 ± 2	131 ± 2	127 ± 2	127	
Volumetric Flow - Nm ³ /h dry	2907 ± 58	3073 ± 61	2575 ± 51	2852	

Note 1: All emissions as concentration levels are given as mg/Nm³ corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (±) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

TABLE 2
Canley Garden Crematorium Stream 2 Abatement System Outlet
Emissions Monitoring 27th March 2012
Total Particulate Matter & Hydrogen Chloride Sampling

	Test 1	Test 2	Test 3	Average	Requirement to PG5/2 (2004)
Total Particulate Matter - mg/Nm ³ c.	0.55 ± 1.50	2.06 ± 2.19	1.41 ± 2.69	1.34	<20
Hydrogen Chloride - mg/Nm ³ c.	9.45 ± 0.55	25.15 ± 1.58	24.29 ± 1.62	19.63	<30
Carbon Monoxide - mg/Nm ³ c.	26.69 ± 1.33	9.48 ± 0.47	12.48 ± 0.62	16.22	<100
Organic Compounds - mg/Nm ³ c.	0.69 ± 0.03	0.49 ± 0.02	0.32 ± 0.02	0.50	<20
Flue Oxygen - %v/v dry	16.15 ± 0.10	16.93 ± 0.10	17.29 ± 0.10	16.79	
Flue Moisture - %v/v	6.6 ± 0.7	8.0 ± 0.8	7.6 ± 0.8	7.4	
- %w/w	4.2 ± 0.4	5.1 ± 0.5	4.9 ± 0.5	4.8	
Flue Temperature - Deg C	96 ± 2	96 ± 2	95 ± 2	96	
Volumetric Flow - Nm ³ /h dry	5273 ± 105	4763 ± 95	4486 ± 90	4840	

Note 1: All emissions as concentration levels are given as mg/Nm³ corrected to 11%w/v oxygen and dry gas

Note 2: All uncertainties (±) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

TABLE 3
Canley Garden Crematorium Stream 1 Abatement System Outlet
Emissions Monitoring 28th March 2012
Mercury Sampling

	Test 4	Test 5	Test 6	Average	Requirement to PG5/2 (2004)
Mercury - $\mu\text{g}/\text{Nm}^3\text{c}$.	17.25 \pm 9.52	25.29 \pm 9.79	30.65 \pm 21.40	24.40	<50
Flue Oxygen - %v/v dry	13.98 \pm 0.10	13.89 \pm 0.10	16.35 \pm 0.10	14.74	
Flue Moisture - %v/v	6.8 \pm 0.7	6.5 \pm 0.7	4.0 \pm 0.4	5.8	
- %w/w	4.3 \pm 0.4	4.2 \pm 0.4	2.5 \pm 0.2	3.7	
Flue Temperature - Deg C	124 \pm 2	131 \pm 2	130 \pm 2	128	
Volumetric Flow - Nm^3/h dry	3084 \pm 62	3046 \pm 61	2893 \pm 58	3007	

Note 1: All emissions as concentration levels are given as $\mu\text{g}/\text{Nm}^3$ or mg/Nm^3 corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (\pm) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

TABLE 4
Canley Garden Crematorium Stream 2 Abatement System Outlet
Emissions Monitoring 27 - 28th March 2012
Mercury Sampling

		Test 4	Test 5	Test 6	Average	Requirement to PG5/2 (2004)
Mercury	- $\mu\text{g}/\text{Nm}^3\text{c}$.	14.06 \pm 21.79	15.78 \pm 12.83	6.28 \pm 20.86	12.04	<50
Flue Oxygen	- %v/v dry	17.49 \pm 0.10	16.74 \pm 0.10	17.14 \pm 0.10	17.13	
Flue Moisture	- %v/v	6.8 \pm 0.7	6.4 \pm 0.6	8.7 \pm 0.9	7.3	
	- %w/w	4.3 \pm 0.4	4.1 \pm 0.4	5.6 \pm 0.6	4.7	
Flue Temperature	- Deg C	93 \pm 2	96 \pm 2	94 \pm 2	94	
Volumetric Flow	- Nm^3/h dry	3495 \pm 70	4772 \pm 95	3865 \pm 77	4044	

Note 1: All emissions as concentration levels are given as $\mu\text{g}/\text{Nm}^3$ or mg/Nm^3 corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (\pm) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

4. COMMENTS

The results from these series of tests demonstrate that the average emissions from both plant streams satisfy the requirements of PG5/2(2004) for the releases to air of particulate matter, hydrogen chloride, mercury, carbon monoxide and volatile organic compounds.

The HCl emission from Test 2 for Stream 1 was above the emission limit value, but the average from the three tests was compliant.

No visible chimney emissions were observed throughout the test period other than the expected steam plume during preheat.

5. QUALITY CONTROL

All the tests performed were carried out to the methods given in the appropriate listed Standards using calibrated equipment. The gas analysers were calibrated prior to use using suitable calibration gases.

Analysis of the filters and absorbers was carried out in-house and at an external laboratory.

For this test work the following external laboratory was used for the given determinations:

Scientific Analysis Laboratories (SAL)	}	Hydrogen Chloride
		Mercury

APPENDIX 1

Data Logs and Calculations



Explanation of Data Logs

Data is taken from a Grant Squirrel data logger.

Time is from logger clock.

Flue Gas Temp is direct from test flue thermocouple.

Meter Temp is direct from gas meter.

(The stated meter temperature is that of the sampled gas at the meter, and is not the room ambient temperature. The temperature always increases during a test due to the heat gain from the sample pump that is contained in an enclosed box along with the gas meter, and this is quite normal).

Flue O₂ is from the Siemens Ultramat U21/O₂ analyser.

CO is from the Siemens Ultramat U21/O₂ analyser.

VOC is from the Signal 3030PM FID analyser expressed as carbon equivalent.

Sample Point Pa is from the pitot tube to an Furness Controls electronic manometer.

Duct Mean Pa is Sample Point Pa corrected for average position from traverse logs included.

The room temperature was typically 20°C, and there were no issues with the analysers overheating. Functional and calibration checks at the start and end of each test confirmed correct operation of the analysers.

All values in the tables are corrected to the reference conditions of 273K, 101.3kPa, 11%v/v oxygen and dry gas as given in PG5/2(04) where required.



Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

27/03/12

Test 1

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
09:58	110	26.7	15.67	4.31	0.00	79.5	Near	0.9374	74.5
09:59	111	26.8	15.97	7.50	0.00	91.5	Near	0.9374	85.8
10:00	111	27.1	14.75	2.94	0.00	86.2	Near	0.9374	80.8
10:01	112	27.3	16.80	2.15	0.00	91.7	Near	0.9374	86.0
10:02	114	27.5	16.84	2.06	0.00	104.4	Near	0.9374	97.8
10:03	115	27.8	16.24	0.00	0.00	109.4	Near	0.9374	102.5
10:04	117	28.1	14.56	0.72	0.00	119.3	Near	0.9374	111.8
10:05	118	28.4	15.98	3.18	0.00	136.0	Near	0.9374	127.5
10:06	118	28.8	15.62	3.11	0.00	138.3	Near	0.9374	129.7
10:07	118	29.2	15.76	2.97	0.00	115.7	Near	0.9374	108.4
10:08	118	29.6	16.11	1.09	0.00	105.4	Near	0.9374	98.8
10:09	118	30.0	17.39	0.00	0.00	107.7	Near	0.9374	101.0
10:10	119	30.4	16.64	0.00	0.00	116.9	Near	0.9374	109.6
10:11	120	30.8	15.96	0.00	0.00	102.2	Near	0.9374	95.8
10:12	120	31.2	15.65	0.00	0.00	69.4	Near	0.9374	65.0
10:13	120	31.7	15.51	0.00	0.00	65.3	Near	0.9374	61.2
10:14	120	32.0	14.87	0.00	0.00	64.6	Near	0.9374	60.6
10:15	119	32.4	14.93	0.00	0.00	56.2	Near	0.9374	52.7
10:16	119	32.9	16.19	0.00	0.00	40.6	Near	0.9374	38.0
10:17	119	33.3	14.97	0.00	0.00	48.0	Near	0.9374	45.0
10:18	119	33.7	14.94	0.00	0.00	48.8	Near	0.9374	45.7
10:19	119	34.2	13.04	0.00	0.00	39.2	Near	0.9374	36.7
10:20	119	34.6	15.83	0.00	0.00	49.7	Near	0.9374	46.6
10:21	120	35.0	15.19	0.00	0.00	84.0	Near	0.9374	78.7
10:22	120	35.4	15.51	0.00	0.00	85.9	Near	0.9374	80.5
10:23	120	35.8	14.93	0.00	0.00	72.1	Near	0.9374	67.6
10:24	120	36.2	17.15	0.00	0.00	86.8	Near	0.9374	81.4
10:25	121	36.6	15.47	0.00	0.00	103.6	Near	0.9374	97.1
10:26	122	37.0	15.62	0.00	0.00	104.8	Near	0.9374	98.3
10:27	122	37.4	15.41	0.00	0.00	92.3	Near	0.9374	86.5
10:28	122	37.8	17.32	0.00	0.00	82.7	Near	0.9374	77.6
10:29	122	38.2	15.81	0.00	0.00	89.7	Near	0.9374	84.1
10:30	122	38.5	15.85	0.00	0.00	99.1	Near	0.9374	92.9
10:31	122	38.9	16.93	0.00	0.00	95.0	Near	0.9374	89.0
10:32	122	39.3	17.67	0.00	0.00	101.3	Near	0.9374	95.0
10:33	123	39.6	16.45	0.00	0.00	107.5	Near	0.9374	100.8
10:34	124	40.0	15.72	0.00	0.00	109.9	Near	0.9374	103.0
10:35	124	40.4	17.17	0.00	0.00	89.9	Near	0.9374	84.3

10:36	124	40.7	17.88	0.00	0.00	86.9	Near	0.9374	81.5
10:37	123	41.0	17.04	0.00	0.00	85.3	Near	0.9374	80.0
10:38	124	41.4	17.23	0.00	0.00	122.7	Near	0.9374	115.0
10:39	124	41.7	16.07	1.99	0.00	117.8	Far	1.0336	121.7
10:40	125	42.0	14.54	0.19	0.00	92.5	Far	1.0336	95.6
10:41	125	42.4	14.52	0.00	0.00	80.3	Far	1.0336	83.0
10:42	126	42.7	15.06	0.00	0.00	83.1	Far	1.0336	85.9
10:43	126	42.9	15.35	0.00	0.00	103.8	Far	1.0336	107.3
10:44	126	43.1	15.94	0.95	0.00	104.7	Far	1.0336	108.2
10:45	126	43.4	15.14	6.06	0.00	96.3	Far	1.0336	99.5
10:46	126	43.6	14.01	3.30	0.00	103.4	Far	1.0336	106.9
10:47	126	43.9	13.95	0.00	0.00	92.8	Far	1.0336	95.9
10:48	126	44.1	14.04	0.00	0.00	90.2	Far	1.0336	93.2
10:49	126	44.3	14.16	0.00	0.00	78.5	Far	1.0336	81.1
10:50	126	44.5	14.48	0.00	0.00	79.1	Far	1.0336	81.8
10:51	126	44.7	14.58	0.00	0.00	81.5	Far	1.0336	84.2
10:52	125	45.0	14.34	0.00	0.00	77.8	Far	1.0336	80.4
10:53	126	45.2	14.21	0.00	0.00	75.5	Far	1.0336	78.0
10:54	126	45.4	14.01	0.00	0.00	71.7	Far	1.0336	74.1
10:55	126	45.6	13.91	0.00	0.00	69.7	Far	1.0336	72.0
10:56	126	45.8	13.72	0.00	0.00	72.7	Far	1.0336	75.1
10:57	127	46.0	14.26	0.00	0.00	76.3	Far	1.0336	78.8
10:58	126	46.2	13.71	0.00	0.00	65.5	Far	1.0336	67.7
10:59	126	46.4	13.70	0.00	0.00	68.8	Far	1.0336	71.1
11:00	126	46.6	13.90	0.00	0.00	68.0	Far	1.0336	70.3
11:01	126	46.8	13.68	0.00	0.00	61.1	Far	1.0336	63.1
11:02	126	47.0	13.73	0.00	0.00	68.7	Far	1.0336	71.0
11:03	126	47.2	13.67	0.00	0.00	70.3	Far	1.0336	72.7
11:04	127	47.4	13.44	0.00	0.00	82.4	Far	1.0336	85.1
11:05	128	47.6	14.08	0.00	0.00	87.1	Far	1.0336	90.0
11:06	128	47.7	14.33	0.00	0.00	96.4	Far	1.0336	99.6
11:07	128	47.9	14.32	0.00	0.00	92.9	Far	1.0336	96.0
11:08	129	48.1	14.74	0.00	0.00	112.3	Far	1.0336	116.1
11:09	128	48.3	14.68	0.00	0.00	103.5	Far	1.0336	107.0
11:10	128	48.4	14.86	0.00	0.00	95.8	Far	1.0336	99.0
11:11	128	48.6	14.87	0.00	0.00	85.5	Far	1.0336	88.4
11:12	127	48.8	14.42	0.00	0.00	68.4	Far	1.0336	70.7
11:13	127	49.0	14.44	0.00	0.00	60.3	Far	1.0336	62.3
11:14	127	49.1	13.78	0.00	0.00	47.1	Far	1.0336	48.7
11:15	127	49.2	13.59	0.00	0.00	49.6	Far	1.0336	51.2
11:16	127	49.4	13.64	0.00	0.00	46.1	Far	1.0336	47.6
11:17	127	49.5	13.48	0.00	0.00	44.8	Far	1.0336	46.3
11:18	127	49.7	13.98	0.00	0.00	45.4	Far	1.0336	46.9
11:19	126	49.8	14.06	0.00	0.00	37.9	Far	1.0336	39.2
11:20	126	49.9	14.55	0.00	0.00	38.2	Far	1.0336	39.5
11:21	125	50.1	14.64	0.00	0.00	37.6	Far	1.0336	38.8
11:22	125	50.2	15.01	0.00	0.00	44.1	Far	1.0336	45.5
11:23	125	50.3	15.41	0.00	0.00	39.0	Far	1.0336	40.3
11:24	125	50.4	15.15	0.00	0.00	41.2	Far	1.0336	42.5
11:25	125	50.6	15.36	0.00	0.00	37.4	Far	1.0336	38.7

11:26	125	50.7	15.45	0.00	0.00	39.3	Far	1.0336	40.6
11:27	125	50.7	14.82	0.00	0.00	42.2	Far	1.0336	43.6
11:28	124	50.7	14.04	0.00	0.00	40.2	Far	1.0336	41.6
11:29	124	50.8	15.42	0.00	0.00	36.8	Far	1.0336	38.1
11:30	124	50.9	15.54	0.00	0.00	44.2	Far	1.0336	45.7
11:31	124	50.9	14.44	0.00	0.00	49.6	Far	1.0336	51.2
11:32	124	51.0	14.79	0.00	0.00	39.4	Far	1.0336	40.7
11:33	124	51.1	15.48	0.00	0.00	37.8	Far	1.0336	39.1
11:34	124	51.2	15.33	0.00	0.00	52.6	Far	1.0336	54.4
11:35	124	51.3	14.21	0.00	0.00	41.9	Far	1.0336	43.4
11:36	124	51.4	15.92	0.00	0.00	37.0	Far	1.0336	38.2
11:37	124	51.4	15.54	0.00	0.00	49.1	Far	1.0336	50.8
11:38	124	51.5	14.53	0.00	0.00	46.9	Far	1.0336	48.5
Average	123	42.0	15.10	0.42	0.00	76.1			75.1

Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

27/03/12

Test 2

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
11:49	125	49.5	15.05	0.00	0.00	55.7	Near	0.9374	52.2
11:50	126	49.4	13.74	0.00	0.00	68.9	Near	0.9374	64.6
11:51	126	49.3	15.21	0.00	0.00	86.4	Near	0.9374	81.0
11:52	126	49.3	15.86	0.00	0.00	89.4	Near	0.9374	83.8
11:53	127	49.3	13.59	0.00	0.00	115.4	Near	0.9374	108.2
11:54	129	49.4	14.02	0.00	0.00	176.4	Near	0.9374	165.4
11:55	129	49.5	15.30	0.00	0.00	158.2	Near	0.9374	148.3
11:56	130	49.7	16.18	0.00	0.00	154.5	Near	0.9374	144.8
11:57	130	50.0	14.84	0.00	0.00	153.2	Near	0.9374	143.6
11:58	131	50.2	14.47	0.00	0.00	156.7	Near	0.9374	146.9
11:59	131	50.4	14.66	0.00	0.00	160.3	Near	0.9374	150.2
12:00	132	50.6	15.41	0.00	0.00	189.4	Near	0.9374	177.5
12:01	134	50.9	14.56	0.00	0.00	200.7	Near	0.9374	188.1
12:02	134	51.2	14.91	0.00	0.00	197.4	Near	0.9374	185.1
12:03	135	51.4	15.03	0.00	0.00	199.3	Near	0.9374	186.8
12:04	136	51.6	15.06	0.00	0.00	194.6	Near	0.9374	182.4
12:05	136	51.8	15.10	0.00	0.00	178.2	Near	0.9374	167.0
12:06	136	52.0	15.03	0.00	0.00	153.8	Near	0.9374	144.2
12:07	137	52.2	16.44	251.79	22.08	206.0	Near	0.9374	193.1
12:08	137	52.4	16.12	84.06	7.78	157.2	Near	0.9374	147.4
12:09	137	52.5	14.78	0.00	0.00	151.0	Near	0.9374	141.5
12:10	137	52.7	14.98	0.00	0.00	158.4	Near	0.9374	148.5
12:11	137	52.9	15.00	0.00	0.00	164.2	Near	0.9374	153.9
12:12	137	53.1	14.30	0.00	0.00	187.0	Near	0.9374	175.3
12:13	139	53.2	15.26	132.54	15.75	212.9	Near	0.9374	199.6
12:14	140	53.3	13.07	0.00	0.00	212.9	Near	0.9374	199.6
12:15	140	53.4	13.96	0.00	0.00	204.7	Near	0.9374	191.9
12:16	140	53.6	14.18	0.00	0.00	195.3	Near	0.9374	183.1
12:17	140	53.7	14.22	0.00	0.00	190.7	Near	0.9374	178.8
12:18	141	53.8	14.54	0.00	0.00	189.0	Near	0.9374	177.2
12:19	141	54.0	14.88	0.00	0.00	189.6	Near	0.9374	177.7
12:20	141	54.1	14.98	0.00	0.00	194.8	Near	0.9374	182.6
12:21	140	54.2	13.82	0.00	0.00	160.7	Near	0.9374	150.6
12:22	140	54.3	12.63	0.00	0.00	131.0	Near	0.9374	122.8
12:23	139	54.4	11.96	0.00	0.00	98.2	Near	0.9374	92.0
12:24	138	54.5	12.13	0.00	0.00	79.3	Far	1.0336	82.0
12:25	137	54.6	12.24	0.00	0.00	69.6	Far	1.0336	71.9
12:26	137	54.7	12.42	0.00	0.00	59.4	Far	1.0336	61.4
12:27	136	54.8	12.90	0.00	0.00	55.0	Far	1.0336	56.9
12:28	136	54.9	12.96	0.00	0.00	71.0	Far	1.0336	73.4

12:29	135	55.0	13.83	1.33	0.00	70.4	Far	1.0336	72.8
12:30	134	55.1	12.94	0.00	0.00	57.4	Far	1.0336	59.3
12:31	133	55.2	13.35	0.00	0.00	35.0	Far	1.0336	36.2
12:32	133	55.4	12.62	0.00	0.00	38.0	Far	1.0336	39.3
12:33	133	55.5	13.11	0.00	0.00	33.6	Far	1.0336	34.7
12:34	132	55.5	13.15	0.00	0.00	25.1	Far	1.0336	26.0
12:35	132	55.6	12.65	0.00	0.00	22.6	Far	1.0336	23.3
12:36	131	55.6	13.03	0.00	0.00	24.2	Far	1.0336	25.0
12:37	131	55.8	12.79	0.00	0.00	29.4	Far	1.0336	30.4
12:38	130	55.9	13.35	0.00	0.00	27.2	Far	1.0336	28.1
12:39	129	56.0	13.98	0.00	0.00	24.9	Far	1.0336	25.7
12:40	129	56.1	14.45	0.00	0.00	30.9	Far	1.0336	32.0
12:41	129	56.2	13.90	0.00	0.00	43.1	Far	1.0336	44.5
12:42	130	56.2	14.48	0.00	0.00	46.4	Far	1.0336	48.0
12:43	130	56.3	14.71	0.00	0.00	44.3	Far	1.0336	45.8
12:44	129	56.3	14.97	0.00	0.00	36.1	Far	1.0336	37.3
12:45	128	56.3	14.91	0.00	0.00	33.3	Far	1.0336	34.4
12:46	128	56.3	14.99	0.00	0.00	33.0	Far	1.0336	34.2
12:47	128	56.2	15.23	0.00	0.00	32.9	Far	1.0336	34.0
12:48	127	56.1	15.42	0.00	0.00	32.9	Far	1.0336	34.0
12:49	127	56.0	14.42	0.00	0.00	30.2	Far	1.0336	31.2
12:50	127	55.9	13.64	0.00	0.00	21.2	Far	1.0336	21.9
12:51	127	55.8	14.91	0.00	0.00	24.5	Far	1.0336	25.3
12:52	127	55.7	14.55	0.00	0.00	36.2	Far	1.0336	37.4
12:53	126	55.7	14.44	0.00	0.00	41.3	Far	1.0336	42.7
12:54	126	55.7	14.23	0.00	0.00	35.8	Far	1.0336	37.0
12:55	125	55.7	15.23	0.00	0.00	34.8	Far	1.0336	35.9
12:56	125	55.6	15.73	0.00	0.00	37.1	Far	1.0336	38.3
12:57	125	55.6	14.82	0.00	0.00	36.4	Far	1.0336	37.7
12:58	126	55.6	13.89	0.00	0.00	37.8	Far	1.0336	39.0
12:59	126	55.5	14.04	0.00	0.00	40.3	Far	1.0336	41.7
13:00	126	55.5	13.97	0.00	0.00	41.3	Far	1.0336	42.7
13:01	125	55.5	13.57	0.00	0.00	44.2	Far	1.0336	45.7
13:02	125	55.5	13.86	0.00	0.00	47.5	Far	1.0336	49.1
13:03	125	55.5	14.16	0.00	0.00	45.8	Far	1.0336	47.3
13:04	125	55.5	15.55	0.00	0.00	57.7	Far	1.0336	59.6
13:05	126	55.4	16.68	0.00	0.00	62.4	Far	1.0336	64.5
13:06	125	55.4	18.27	0.00	0.00	39.9	Far	1.0336	41.2
13:07	125	55.4	18.11	0.00	0.00	42.6	Far	1.0336	44.1
13:08	126	55.4	14.89	0.00	0.00	48.1	Far	1.0336	49.7
13:09	126	55.3	15.00	0.00	0.00	53.0	Far	1.0336	54.8
13:10	125	55.4	16.01	0.00	0.00	58.6	Far	1.0336	60.5
13:11	125	55.4	16.25	0.00	0.00	61.4	Far	1.0336	63.4
13:12	125	55.5	16.34	0.00	0.00	63.7	Far	1.0336	65.8
13:13	125	55.4	16.42	0.00	0.00	58.8	Far	1.0336	60.8
13:14	126	55.4	16.25	0.00	0.00	51.7	Far	1.0336	53.4
13:15	126	55.5	16.05	0.00	0.00	48.9	Far	1.0336	50.5
13:16	126	55.5	15.89	0.00	0.00	45.1	Far	1.0336	46.6
13:17	125	55.6	15.78	0.00	0.00	46.8	Far	1.0336	48.3
13:18	125	55.7	16.57	0.00	0.00	44.6	Far	1.0336	46.0

Average	131	54.1	14.59	5.22	0.51	89.8			86.8
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Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

27/03/12

Test 3

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
13:29	126	53.0	16.58	0.00	0.00	44.3	Near	0.9374	41.5
13:30	126	52.7	12.86	0.00	0.00	47.0	Near	0.9374	44.1
13:31	127	52.6	13.21	0.00	0.00	58.3	Near	0.9374	54.6
13:32	127	52.6	14.47	0.00	0.00	88.4	Near	0.9374	82.9
13:33	130	52.6	13.14	0.00	0.00	180.4	Near	0.9374	169.1
13:34	132	52.6	14.37	14.40	2.16	207.1	Near	0.9374	194.2
13:35	131	52.6	14.71	8.81	0.59	149.6	Near	0.9374	140.3
13:36	131	52.6	14.41	0.53	0.00	112.5	Near	0.9374	105.4
13:37	130	52.7	15.67	0.00	0.00	93.9	Near	0.9374	88.0
13:38	130	52.8	14.79	0.00	0.00	82.3	Near	0.9374	77.1
13:39	130	52.9	14.18	0.00	0.00	87.9	Near	0.9374	82.4
13:40	130	53.0	15.40	0.00	0.00	92.5	Near	0.9374	86.7
13:41	130	53.0	16.15	0.00	0.00	101.1	Near	0.9374	94.8
13:42	130	53.0	15.40	0.00	0.00	113.3	Near	0.9374	106.3
13:43	131	53.1	16.64	0.00	0.00	117.2	Near	0.9374	109.9
13:44	131	53.2	16.45	0.00	0.00	90.3	Near	0.9374	84.6
13:45	131	53.3	15.11	0.00	0.00	75.3	Near	0.9374	70.6
13:46	130	53.3	16.47	0.00	0.00	69.9	Near	0.9374	65.6
13:47	130	53.4	15.93	0.00	0.00	71.3	Near	0.9374	66.8
13:48	129	53.5	15.59	0.00	0.00	66.7	Near	0.9374	62.5
13:49	129	53.5	14.80	0.00	0.00	68.1	Near	0.9374	63.8
13:50	129	53.6	15.62	0.00	0.00	57.1	Near	0.9374	53.6
13:51	129	53.6	14.36	0.00	0.00	48.2	Near	0.9374	45.2
13:52	129	53.7	14.05	0.00	0.00	49.6	Near	0.9374	46.5
13:53	129	53.8	15.67	0.00	0.00	53.3	Near	0.9374	50.0
13:54	129	53.9	15.87	0.00	0.00	69.0	Near	0.9374	64.7
13:55	129	54.0	16.06	0.00	0.00	79.8	Near	0.9374	74.8
13:56	128	54.1	15.79	0.00	0.00	67.3	Near	0.9374	63.1
13:57	128	54.2	14.41	0.00	0.00	54.7	Near	0.9374	51.3
13:58	128	54.2	14.19	0.00	0.00	42.4	Near	0.9374	39.7
13:59	127	54.3	15.70	0.00	0.00	40.7	Near	0.9374	38.1
14:00	128	54.4	15.97	0.00	0.00	44.1	Near	0.9374	41.4
14:01	127	54.4	14.96	0.00	0.00	37.4	Far	1.0336	38.7
14:02	127	54.5	15.30	7.51	0.00	36.0	Far	1.0336	37.2
14:03	126	54.6	11.71	0.00	0.00	32.0	Far	1.0336	33.0
14:04	126	54.6	15.38	34.89	5.68	52.2	Far	1.0336	53.9
14:05	126	54.7	17.28	36.66	6.32	43.1	Far	1.0336	44.5
14:06	125	54.7	14.26	0.00	0.00	31.0	Far	1.0336	32.1
14:07	125	54.8	12.50	0.00	0.00	20.5	Far	1.0336	21.2

14:08	125	54.8	15.72	0.00	0.00	21.7	Far	1.0336	22.4
14:09	125	54.9	17.18	0.00	0.00	23.0	Far	1.0336	23.8
14:10	124	54.9	17.48	0.00	0.00	23.1	Far	1.0336	23.9
14:11	124	55.0	17.78	0.00	0.00	28.3	Far	1.0336	29.2
14:12	124	55.1	14.63	0.00	0.00	40.4	Far	1.0336	41.7
14:13	124	55.2	15.19	0.00	0.00	49.9	Far	1.0336	51.6
14:14	124	55.3	16.76	0.00	0.00	58.2	Far	1.0336	60.2
14:15	125	55.4	17.02	0.00	0.00	69.4	Far	1.0336	71.8
14:16	125	55.5	16.28	0.00	0.00	65.7	Far	1.0336	67.9
14:17	125	55.5	15.05	0.00	0.00	54.9	Far	1.0336	56.7
14:18	125	55.5	15.55	0.00	0.00	47.1	Far	1.0336	48.7
14:19	124	55.6	17.19	0.00	0.00	41.5	Far	1.0336	42.9
14:20	123	55.7	17.92	0.00	0.00	30.7	Far	1.0336	31.7
14:21	123	55.7	17.97	0.00	0.00	28.3	Far	1.0336	29.2
14:22	123	55.8	18.02	0.00	0.00	31.7	Far	1.0336	32.8
14:23	123	55.9	14.89	0.00	0.00	29.6	Far	1.0336	30.6
14:24	123	55.9	15.31	0.00	0.00	30.6	Far	1.0336	31.7
14:25	123	55.9	14.52	0.00	0.00	50.7	Far	1.0336	52.4
14:26	124	56.0	15.98	164.52	25.25	95.9	Far	1.0336	99.1
14:27	125	56.1	13.84	0.00	0.00	109.9	Far	1.0336	113.6
14:28	125	56.2	14.96	0.00	0.00	90.0	Far	1.0336	93.0
14:29	124	56.2	14.94	0.00	0.00	57.8	Far	1.0336	59.8
14:30	124	56.2	14.09	0.00	0.00	48.8	Far	1.0336	50.4
14:31	124	56.3	13.97	0.00	0.00	49.9	Far	1.0336	51.6
14:32	125	56.3	12.95	0.00	0.00	105.9	Far	1.0336	109.5
14:33	128	56.4	14.15	0.00	0.00	140.1	Far	1.0336	144.8
14:34	128	56.4	15.15	0.00	0.00	96.1	Far	1.0336	99.3
14:35	128	56.4	15.21	0.00	0.00	72.7	Far	1.0336	75.1
14:36	128	56.5	14.70	0.00	0.00	61.4	Far	1.0336	63.5
14:37	127	56.5	14.59	0.00	0.00	56.3	Far	1.0336	58.2
14:38	127	56.6	14.48	0.00	0.00	62.8	Far	1.0336	64.9
14:39	127	56.6	14.59	0.00	0.00	60.6	Far	1.0336	62.6
14:40	127	56.7	14.91	0.00	0.00	53.5	Far	1.0336	55.3
14:41	127	56.7	14.80	0.00	0.00	49.9	Far	1.0336	51.6
14:42	127	56.8	14.49	0.00	0.00	39.1	Far	1.0336	40.4
14:43	127	56.8	13.32	0.00	0.00	32.5	Far	1.0336	33.6
14:44	127	56.9	12.93	0.00	0.00	32.8	Far	1.0336	34.0
14:45	126	56.9	13.00	0.00	0.00	32.1	Far	1.0336	33.2
14:46	126	56.9	13.38	0.00	0.00	28.4	Far	1.0336	29.4
14:47	126	57.0	15.02	0.00	0.00	33.3	Far	1.0336	34.4
14:48	125	57.1	14.68	0.00	0.00	39.6	Far	1.0336	40.9
14:49	125	57.1	15.09	0.00	0.00	39.0	Far	1.0336	40.3
14:50	125	57.1	14.98	0.00	0.00	34.9	Far	1.0336	36.1
14:51	126	57.1	13.70	0.00	0.00	45.6	Far	1.0336	47.2
14:52	126	57.2	13.17	0.00	0.00	47.0	Far	1.0336	48.6
14:53	126	57.3	15.66	0.00	0.00	49.2	Far	1.0336	50.9
14:54	126	57.3	16.14	0.00	0.00	60.3	Far	1.0336	62.3
14:55	126	57.3	15.62	0.00	0.00	59.1	Far	1.0336	61.1
14:56	126	57.3	13.89	0.00	0.00	53.9	Far	1.0336	55.8
14:57	125	57.4	13.85	0.00	0.00	58.2	Far	1.0336	60.2

14:58	125	57.5	16.66	0.00	0.00	53.5	Far	1.0336	55.3
Average	127	55.1	15.10	2.97	0.44	61.7			60.9

Canley Garden Crematorium Stream 1 Abatement System Outlet

Total Particulate Matter and Hydrogen Chloride

Contract Canley Garden Crematorium, DEM0562
 Date 27th March 2012
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST
 Absorbent H₂O

Test Log	Test 1		Test 2		Test 3	
Barometric Pressure(kPa)	103.6		103.6		103.6	
Gas Meter Temperature(Deg C)	42.0		54.1		55.1	
Oxygen Concentration(%v/v dry)	15.10		14.59		15.10	
Flue Gas Volumetric Flow(Nm ³ /h dry)	2907		3073		2575	
	Start	End	Start	End	Start	End
Time	09:58	11:38	11:49	13:18	13:29	14:58
Gas Meter Reading(Am ³ dry)	1811.834	1812.994	1812.994	1814.064	1814.064	1814.822
Absorber Weight(g)	3550.6	3613.2	3455.3	3516.8	3511.1	3558.1
Filter Reference	CO270312F1,2,1		CO270312F1,2,2		CO270312F1,2,3	
Filter Weight(g)	0.54069	0.54080	0.53935	0.53977	0.53655	0.53684
Probe Rinse Reference	CO270312R1,2,1		CO270312R1,2,2		CO270312R1,2,3	
Probe Rinse Weight(g)	79.6543	79.6544	79.6544	79.6548	79.6548	79.6550
Sample Reference HCl	CO270312 H3 4-A1		CO270312 H3 4-A2		CO270312 H3 4-A 3 A&B	
Absorbent Volume(ml)	500		500		250	
Absorbent(mg/l as HCl)	21		47		40	
Blank(mg/l as HCl)	0.06		0.06		0.06	

Calculation: General

Barometric Pressure(kPa)	103.6	103.6	103.6
Gas Meter temperature(Deg C)	42.0	54.1	55.1
Gas Volume Sampled(Am ³ dry)	1.160	1.070	0.758
Gas Volume Sampled(Nm ³ dry)	1.0281	0.9133	0.6450
Mass of Dry Gas(g @ 1292.8 g/Nm ³)	1329.13	1180.68	833.89
Change in Absorber Weight(g)	62.6	61.5	47.0
Water Vapour Volume(Nm ³ @ 803.9 g/Nm ³)	0.0779	0.0765	0.0585
Gas Volume(Nm ³ wet)	1.1060	0.9898	0.7035
Mass of Wet Gas(g)	1391.73	1242.18	880.89
Moisture Concentration(%v/v)	7.0	7.7	8.3
Moisture Concentration(%ww)	4.5	5.0	5.3

Calculation: Particulate

Increase In Filter Weights(g)	0.00021	0.00079	0.00054
Particulate Emission(mg/Nm ³ dry)	0.20	0.86	0.84
Oxygen Concentration(%v/v dry)	15.10	14.59	15.10
Particulate Emission	0.34	1.35	1.44
(mg/Nm³ @ 11 %v/v Oxygen dry)			
Flue Gas Volumetric Flow(Nm ³ /h dry)	2907	3073	2575
Particulate Emission(g/h)	0.58	2.65	2.17
Required Sample Velocity(Nm/s)	8.45	9.03	7.48
Nozzle Used(mm)	5.0	5.0	5.0
Area of Nozzle(m ²)	0.00001963	0.00001963	0.00001963
Test Duration(mins)	100	89	89
Actual Sample Velocity(Nm/s)	8.73	8.71	6.15
Isokinetic Closure(%)	103	96	82
		94	

Calculation: HCl

Absorbent(mg/l as HCl)	21.00	47.00	40.06
Blank(mg/l as HCl)	0.06	0.06	0.06
Chloride Absorbed(mg/l as HCl)	20.94	46.94	40
Chloride Absorbed(mg as HCl)	10.47	23.47	10.00
HCl(mg)	10.47	23.47	10.00
HCl Emission(mg/Nm ³ dry)	10.18	25.70	15.50
Oxygen Concentration(%v/v dry)	15.10	14.59	15.10
HCl Emission	17.33	40.21	26.35
(mg/Nm³ @ 11 %v/v Oxygen dry)			
Flue Gas Volumetric Flow(Nm ³ /h dry)	2907	3073	2575
HCl Emission(g/h)	29.60	78.98	39.91

Canley Garden Crematorium Stream 1 Abatement System Outlet

Flue Gas Volumetric Flow

Contract Canley Garden Crematorium, DEM0562
Date 27th March 2012
Location Flue Gas Abatement System Outlet
Engineer(s) JB & ST

Test Log	Test 1	Test 2	Test 3
Flue Gas Temperature(Deg C)	123	131	127
Flue Gas Pitot Head Sample Points(Pa)	76.1	89.8	61.7
Flue Gas Pitot Head Duct Mean(Pa)	75.1	86.8	60.9
Flue Gas Moisture(%v/v)	7.0	7.7	8.3
Flue Gas Moisture(%w/w)	4.5	5.0	5.3
Flue Gas Duct Dimensions(mm)	350 mm Diameter Circular Stack		
Flue Gas Duct Area(m ²)	0.0962		

Calculation

Flue Gas Density(kg/m ³)	0.8759	0.8577	0.8652
<u>Sample Points</u>			
Flue Gas Velocity(Am/s)	13.18	14.47	11.94
Flue Gas Volumetric Flowrate(Am ³ /h)	4565	5013	4136
Flue Gas Volumetric Flowrate(Am ³ /h dry)	4244	4625	3792
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	2925	3127	2590
<u>Duct Mean</u>			
Flue Gas Velocity(Am/s)	13.10	14.22	11.87
Flue Gas Volumetric Flowrate(Am ³ /h)	4537	4927	4111
Flue Gas Volumetric Flowrate(Am ³ /h dry)	4217	4546	3769
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	2907	3073	2575

Canley Garden Crematorium Stream 1 Abatement System Outlet

Preliminary Pitot Traverse

Traverse Position	Plane 1 / Bottom		Probe Position	Plane 2 / Side		Probe Position
	Pa	Root(Pa)		Pa	Root(Pa)	
1 Near	75	8.66		77	8.77	
2	79	8.89	S. Point	78	8.83	
3	82	9.06		82	9.06	
4	85	9.22		83	9.11	
5	86	9.27		84	9.17	
6	86	9.27		83	9.11	
7	82	9.06		80	8.94	
8	81	9.00		79	8.89	
9	80	8.94	S. Point	77	8.77	
10 Far	78	8.83		76	8.72	
Sum		90.20			89.37	

Overall Total Root(Pa) 179.58
 Average Root(Pa) 8.98
 Equivalent Pa 80.6

Duct Mean Correction Factor 0.9374 Near Velocity Within 3:1 (9:1 Pa)
 Flow > 5 Pa All Points
 1.0336 Far No Negative Flow
 Swirl < 15°

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

27/03/12

Test 1

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
09:30	90	28.9	18.90	58.73	13.26	179.8	Near	0.9590	172.4
09:31	90	28.8	16.10	53.14	4.95	163.0	Near	0.9590	156.3
09:32	91	28.8	15.80	56.61	2.17	155.4	Near	0.9590	149.0
09:33	91	28.9	16.70	89.43	3.01	163.0	Near	0.9590	156.3
09:34	92	29.0	16.50	58.36	2.87	186.5	Near	0.9590	178.8
09:35	92	29.1	16.00	35.18	0.32	194.9	Near	0.9590	186.9
09:36	92	29.4	16.80	29.73	0.00	170.5	Near	0.9590	163.5
09:37	92	29.7	16.90	38.08	0.00	186.5	Near	0.9590	178.8
09:38	92	30.0	16.20	44.41	0.00	178.9	Near	0.9590	171.6
09:39	92	30.2	16.00	42.01	0.00	171.4	Near	0.9590	164.3
09:40	95	30.4	17.10	147.57	0.00	319.2	Near	0.9590	306.1
09:41	96	30.6	16.20	114.37	0.00	284.8	Near	0.9590	273.1
09:42	96	30.8	15.60	77.55	0.00	247.0	Near	0.9590	236.8
09:43	95	31.1	16.10	63.60	0.00	250.3	Near	0.9590	240.1
09:44	95	31.4	16.10	60.32	0.00	284.8	Near	0.9590	273.1
09:45	95	31.8	16.10	58.06	0.00	275.5	Near	0.9590	264.2
09:46	96	32.1	15.90	44.92	0.00	247.0	Near	0.9590	236.8
09:47	96	32.5	15.10	37.08	0.00	227.6	Near	0.9590	218.3
09:48	98	32.8	14.60	39.49	0.00	273.0	Near	0.9590	261.8
09:49	98	33.2	15.50	39.80	0.00	273.0	Near	0.9590	261.8
09:50	98	33.5	15.90	37.63	0.00	283.1	Near	0.9590	271.5
09:51	97	33.9	15.90	40.00	0.00	283.1	Near	0.9590	271.5
09:52	96	34.3	15.90	41.77	0.00	277.2	Near	0.9590	265.8
09:53	97	34.6	15.40	39.98	0.00	279.7	Near	0.9590	268.2
09:54	98	35.0	15.40	45.72	0.00	273.8	Near	0.9590	262.6
09:55	99	35.3	15.40	44.10	0.00	281.4	Near	0.9590	269.9
09:56	99	35.7	15.50	53.49	0.00	278.0	Near	0.9590	266.6
09:57	99	36.0	15.40	51.99	10.37	321.7	Near	0.9590	308.5
09:58	99	36.3	15.60	47.61	0.00	341.0	Near	0.9590	327.1
09:59	98	36.6	15.80	37.10	0.93	324.2	Near	0.9590	310.9
10:00	98	36.9	15.50	44.36	1.76	298.2	Near	0.9590	286.0
10:01	98	37.3	15.40	42.49	3.75	288.1	Near	0.9590	276.3
10:02	99	37.6	15.20	31.15	0.28	277.2	Near	0.9590	265.8
10:03	98	38.0	15.50	28.85	0.00	250.3	Near	0.9590	240.1
10:04	98	38.3	15.40	25.64	0.00	275.5	Near	0.9590	264.2
10:05	98	38.6	15.70	26.15	0.00	297.4	Near	0.9590	285.2
10:06	97	38.9	15.60	27.15	0.00	270.5	Near	0.9590	259.4
10:07	97	39.2	15.00	23.75	0.00	241.1	Near	0.9590	231.2
10:08	97	39.5	14.80	23.30	0.00	241.1	Near	0.9590	231.2
10:09	99	39.8	14.80	19.74	0.00	267.1	Near	0.9590	256.2

10:10	99	40.1	15.10	17.86	0.00	278.0	Near	0.9590	266.6
10:11	99	40.4	15.30	17.26	0.00	266.3	Far	1.0384	276.5
10:12	98	40.7	15.20	17.48	0.00	252.0	Far	1.0384	261.7
10:13	97	41.0	15.10	23.64	0.00	231.0	Far	1.0384	239.9
10:14	96	41.4	14.90	27.63	0.00	213.4	Far	1.0384	221.6
10:15	96	41.8	14.80	26.86	0.00	192.4	Far	1.0384	199.8
10:16	96	42.1	14.90	28.95	0.00	184.8	Far	1.0384	191.9
10:17	97	42.4	15.40	34.06	0.00	201.6	Far	1.0384	209.3
10:18	97	42.7	15.80	34.00	0.00	201.6	Far	1.0384	209.3
10:19	96	43.0	16.30	28.25	0.00	217.6	Far	1.0384	225.9
10:20	97	43.4	15.90	16.55	0.32	264.6	Far	1.0384	274.8
10:21	95	43.7	16.40	14.21	0.35	201.6	Far	1.0384	209.3
10:22	95	43.9	16.60	11.44	0.00	196.6	Far	1.0384	204.1
10:23	96	44.2	16.10	8.62	0.33	236.9	Far	1.0384	246.0
10:24	97	44.5	16.40	8.09	0.35	203.3	Far	1.0384	211.1
10:25	97	44.7	17.00	8.82	0.40	200.8	Far	1.0384	208.5
10:26	97	44.9	16.70	6.09	0.38	239.4	Far	1.0384	248.6
10:27	96	45.2	17.10	4.65	0.00	248.6	Far	1.0384	258.2
10:28	96	45.5	17.00	1.76	0.00	251.2	Far	1.0384	260.8
10:29	95	45.7	16.60	3.66	0.00	199.1	Far	1.0384	206.7
10:30	96	46.0	17.20	4.25	0.00	231.0	Far	1.0384	239.9
10:31	97	46.3	16.60	0.91	0.00	257.9	Far	1.0384	267.8
10:32	98	46.7	16.80	0.96	0.00	231.8	Far	1.0384	240.7
10:33	98	47.0	17.40	0.00	0.00	254.5	Far	1.0384	264.3
10:34	98	47.3	16.80	0.00	0.00	285.6	Far	1.0384	296.6
10:35	97	47.5	17.10	0.00	0.00	250.3	Far	1.0384	259.9
10:36	96	47.8	17.60	0.00	0.00	241.1	Far	1.0384	250.3
10:37	97	48.0	17.10	0.00	0.00	262.1	Far	1.0384	272.2
10:38	97	48.2	16.90	0.00	0.00	252.0	Far	1.0384	261.7
10:39	98	48.4	16.90	0.00	0.00	236.9	Far	1.0384	246.0
10:40	98	48.6	16.90	0.00	0.00	196.6	Far	1.0384	204.1
10:41	97	48.8	16.60	0.00	0.00	171.4	Far	1.0384	177.9
10:42	96	49.0	16.50	0.00	0.00	167.2	Far	1.0384	173.6
10:43	96	49.2	16.60	0.00	0.00	169.7	Far	1.0384	176.2
10:44	95	49.4	16.50	0.00	12.94	156.2	Far	1.0384	162.2
10:45	95	49.6	16.60	0.69	0.00	152.9	Far	1.0384	158.8
10:46	95	49.8	16.50	1.34	0.00	149.5	Far	1.0384	155.3
10:47	95	50.0	16.70	0.23	0.00	156.2	Far	1.0384	162.2
10:48	96	50.1	16.60	0.00	0.00	162.1	Far	1.0384	168.4
10:49	95	50.3	16.90	0.25	0.00	164.6	Far	1.0384	171.0
10:50	95	50.4	16.80	0.00	0.00	173.0	Far	1.0384	179.7
10:51	94	50.6	16.90	0.00	0.00	159.6	Far	1.0384	165.7
10:52	94	50.7	16.70	0.00	0.00	159.6	Far	1.0384	165.7
10:53	94	50.9	16.80	0.00	0.00	149.5	Far	1.0384	155.3
10:54	95	50.9	16.60	0.00	0.00	151.2	Far	1.0384	157.0
Average	96	40.3	16.15	26.69	0.69	229.5			228.6

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

27/03/12

Test 2

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
11:08	95	49.0	17.20	29.98	0.00	150.4	Near	0.9590	144.2
11:09	93	48.9	17.50	22.21	0.00	125.2	Near	0.9590	120.0
11:10	93	49.0	17.60	23.46	0.00	120.1	Near	0.9590	115.2
11:11	93	49.2	17.20	18.31	0.00	127.7	Near	0.9590	122.4
11:12	93	49.5	17.30	10.09	0.00	147.8	Near	0.9590	141.8
11:13	93	49.7	16.80	16.06	0.00	130.2	Near	0.9590	124.9
11:14	93	49.9	17.00	46.10	0.00	122.6	Near	0.9590	117.6
11:15	93	50.2	16.80	52.27	0.00	114.2	Near	0.9590	109.6
11:16	93	50.4	16.70	25.52	0.00	131.0	Near	0.9590	125.7
11:17	93	50.6	16.70	19.90	0.00	142.0	Near	0.9590	136.1
11:18	93	50.9	16.60	22.87	0.00	134.4	Near	0.9590	128.9
11:19	93	51.2	17.10	21.45	0.00	131.0	Near	0.9590	125.7
11:20	93	51.4	17.20	14.06	0.00	125.2	Near	0.9590	120.0
11:21	94	51.5	16.40	7.00	0.00	144.5	Near	0.9590	138.6
11:22	93	51.7	17.00	18.64	0.00	104.2	Near	0.9590	99.9
11:23	93	51.9	16.90	13.02	0.00	117.6	Near	0.9590	112.8
11:24	93	52.2	17.10	17.83	0.00	141.1	Near	0.9590	135.3
11:25	94	52.3	16.40	9.40	0.00	125.2	Near	0.9590	120.0
11:26	93	52.5	16.70	13.11	0.00	117.6	Near	0.9590	112.8
11:27	93	52.7	17.00	17.13	29.96	110.9	Near	0.9590	106.3
11:28	93	52.8	17.00	17.38	0.00	161.3	Near	0.9590	154.7
11:29	96	53.0	17.80	61.28	0.00	303.2	Near	0.9590	290.8
11:30	98	53.1	16.70	55.95	0.00	273.8	Near	0.9590	262.6
11:31	97	53.2	15.90	33.69	0.00	217.6	Near	0.9590	208.6
11:32	97	53.5	16.30	26.32	0.00	211.7	Near	0.9590	203.0
11:33	97	53.5	16.60	17.16	0.00	241.9	Near	0.9590	232.0
11:34	97	53.7	16.60	14.18	0.00	246.1	Near	0.9590	236.0
11:35	96	53.7	16.70	16.15	0.00	216.7	Near	0.9590	207.8
11:36	96	53.8	16.10	4.51	0.00	194.0	Near	0.9590	186.1
11:37	97	53.9	15.20	1.56	0.00	202.4	Near	0.9590	194.1
11:38	98	53.9	14.90	6.41	0.00	231.8	Near	0.9590	222.3
11:39	97	54.0	15.90	6.11	0.00	202.4	Near	0.9590	194.1
11:40	97	54.0	15.20	2.77	0.00	205.0	Near	0.9590	196.6
11:41	97	54.2	15.40	2.33	0.00	241.9	Near	0.9590	232.0
11:42	97	54.3	15.90	1.77	0.00	277.2	Near	0.9590	265.8
11:43	97	54.3	16.30	1.93	0.00	275.5	Far	1.0384	286.1
11:44	98	54.4	16.50	2.01	0.00	267.1	Far	1.0384	277.4
11:45	98	54.5	16.20	1.47	0.00	243.6	Far	1.0384	253.0
11:46	98	54.5	15.90	1.97	0.00	224.3	Far	1.0384	232.9
11:47	98	54.6	16.10	2.26	0.00	211.7	Far	1.0384	219.8
11:48	97	54.8	16.00	3.42	0.00	178.9	Far	1.0384	185.8

11:49	96	54.9	16.00	2.01	0.00	168.0	Far	1.0384	174.5
11:50	96	54.9	15.90	1.58	0.00	224.3	Far	1.0384	232.9
11:51	97	55.0	16.10	2.46	0.00	213.4	Far	1.0384	221.6
11:52	96	55.2	16.90	0.74	0.00	165.5	Far	1.0384	171.8
11:53	97	55.3	16.50	2.68	0.00	218.4	Far	1.0384	226.8
11:54	98	55.4	16.50	0.89	0.00	264.6	Far	1.0384	274.8
11:55	97	55.4	17.00	14.61	0.00	241.1	Far	1.0384	250.3
11:56	97	55.4	17.50	4.33	0.00	245.3	Far	1.0384	254.7
11:57	97	55.5	16.80	2.88	0.00	240.2	Far	1.0384	249.5
11:58	97	55.6	16.80	4.08	0.00	219.2	Far	1.0384	227.7
11:59	97	55.7	17.00	2.02	0.00	180.6	Far	1.0384	187.5
12:00	97	55.7	17.50	2.31	0.00	194.9	Far	1.0384	202.4
12:01	97	55.8	17.20	0.00	0.00	238.6	Far	1.0384	247.7
12:02	97	55.8	17.10	0.00	0.00	247.8	Far	1.0384	257.3
12:03	97	55.8	16.80	0.00	0.00	256.2	Far	1.0384	266.0
12:04	96	55.8	16.80	0.00	0.00	220.9	Far	1.0384	229.4
12:05	96	55.8	17.30	0.00	0.00	184.0	Far	1.0384	191.0
12:06	97	55.8	17.10	0.00	0.00	225.1	Far	1.0384	233.8
12:07	98	55.8	17.40	0.00	0.00	238.6	Far	1.0384	247.7
12:08	98	55.9	17.80	0.00	0.00	243.6	Far	1.0384	253.0
12:09	97	55.9	18.00	0.00	0.00	243.6	Far	1.0384	253.0
12:10	97	56.0	18.20	0.00	0.00	234.4	Far	1.0384	243.4
12:11	96	56.1	18.20	0.00	0.00	220.1	Far	1.0384	228.5
12:12	97	56.1	18.20	0.00	0.00	215.0	Far	1.0384	223.3
12:13	97	56.0	18.40	0.00	0.00	220.9	Far	1.0384	229.4
12:14	99	56.0	18.00	0.00	0.00	262.1	Far	1.0384	272.2
12:15	99	56.1	17.60	0.00	0.00	241.9	Far	1.0384	251.2
12:16	97	56.0	17.90	0.00	0.00	175.6	Far	1.0384	182.3
12:17	95	56.0	18.50	0.00	0.00	128.5	Far	1.0384	133.5
12:18	95	56.0	17.30	0.00	0.00	146.2	Far	1.0384	151.8
12:19	94	55.9	18.00	0.00	0.54	134.4	Far	1.0384	139.6
12:20	94	55.9	17.60	0.00	0.48	136.9	Far	1.0384	142.2
12:21	94	55.9	17.60	0.00	0.48	114.2	Far	1.0384	118.6
12:22	94	55.9	17.70	0.00	0.98	105.0	Far	1.0384	109.0
12:23	95	56.0	17.80	0.00	1.52	125.2	Far	1.0384	130.0
12:24	95	56.0	17.40	0.00	1.80	157.9	Far	1.0384	164.0
12:25	94	56.1	17.60	0.00	2.39	146.2	Far	1.0384	151.8
Average	96	54.0	16.93	9.48	0.49	190.1			191.3

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

27/03/12

Test 3

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa	Sample Point Used	Factor	Duct Mean Pa
12:41	95	52.2	18.70	36.26	0.71	173.0	Near	0.9590	165.9
12:42	95	51.6	18.10	37.36	0.56	161.3	Near	0.9590	154.7
12:43	94	51.6	18.50	48.33	0.65	131.0	Near	0.9590	125.7
12:44	94	51.6	18.40	43.31	0.63	131.9	Near	0.9590	126.5
12:45	93	51.7	18.70	44.22	0.71	128.5	Near	0.9590	123.2
12:46	93	51.8	18.80	47.20	0.00	140.3	Near	0.9590	134.5
12:47	94	51.9	18.70	53.95	0.00	145.3	Near	0.9590	139.4
12:48	94	52.0	18.40	47.21	0.00	141.1	Near	0.9590	135.3
12:49	94	52.2	18.10	57.26	0.00	137.8	Near	0.9590	132.1
12:50	94	52.4	17.80	56.86	0.00	143.6	Near	0.9590	137.7
12:51	94	52.5	18.30	55.95	0.00	152.0	Near	0.9590	145.8
12:52	94	52.6	18.60	39.80	0.00	124.3	Near	0.9590	119.2
12:53	94	52.8	18.70	93.31	0.71	163.0	Near	0.9590	156.3
12:54	94	53.0	18.90	78.63	0.78	120.1	Near	0.9590	115.2
12:55	93	53.2	18.40	0.00	0.63	94.9	Near	0.9590	91.0
12:56	93	53.4	18.20	0.00	0.00	73.1	Near	0.9590	70.1
12:57	93	53.6	17.50	0.00	0.00	79.8	Near	0.9590	76.5
12:58	92	53.7	17.70	0.00	0.00	73.9	Near	0.9590	70.9
12:59	92	53.8	17.60	0.00	0.00	91.6	Near	0.9590	87.8
13:00	93	53.9	17.10	0.00	0.00	126.8	Near	0.9590	121.6
13:01	93	54.1	17.00	0.00	0.00	131.0	Near	0.9590	125.7
13:02	93	54.2	16.90	0.00	0.00	127.7	Near	0.9590	122.4
13:03	95	54.3	17.10	69.26	0.00	252.0	Near	0.9590	241.7
13:04	97	54.3	17.40	34.75	0.00	273.0	Near	0.9590	261.8
13:05	97	54.4	16.20	4.82	0.00	210.0	Near	0.9590	201.4
13:06	96	54.6	16.30	0.00	0.00	165.5	Near	0.9590	158.7
13:07	96	54.8	16.40	0.00	0.00	163.0	Near	0.9590	156.3
13:08	95	54.9	16.10	0.00	0.00	160.4	Near	0.9590	153.9
13:09	95	55.0	16.10	0.00	0.00	195.7	Near	0.9590	187.7
13:10	95	55.2	16.10	0.00	0.00	173.9	Near	0.9590	166.7
13:11	96	55.5	15.40	0.00	0.00	173.9	Near	0.9590	166.7
13:12	96	55.6	15.10	0.00	0.00	157.9	Near	0.9590	151.4
13:13	96	55.8	16.10	0.00	0.00	164.6	Far	1.0384	171.0
13:14	96	56.0	16.20	0.00	0.00	163.8	Far	1.0384	170.1
13:15	96	56.2	16.30	0.00	0.00	177.2	Far	1.0384	184.1
13:16	96	56.3	16.20	0.00	0.00	178.9	Far	1.0384	185.8
13:17	95	56.4	16.20	0.00	0.00	162.1	Far	1.0384	168.4
13:18	95	56.7	16.20	0.00	0.00	146.2	Far	1.0384	151.8
13:19	96	56.8	16.30	0.00	0.00	176.4	Far	1.0384	183.2
13:20	97	57.0	16.10	0.00	0.00	161.3	Far	1.0384	167.5

13:21	96	57.1	15.70	0.00	0.00	166.3	Far	1.0384	172.7
13:22	96	57.3	16.20	0.00	2.69	169.7	Far	1.0384	176.2
13:23	96	57.4	16.30	0.00	1.38	161.3	Far	1.0384	167.5
13:24	95	57.6	16.40	0.00	12.30	153.7	Far	1.0384	159.6
13:25	95	57.8	16.50	0.00	0.00	147.8	Far	1.0384	153.5
13:26	95	58.0	16.60	0.00	0.00	144.5	Far	1.0384	150.0
13:27	96	58.1	16.70	0.00	0.00	138.6	Far	1.0384	143.9
13:28	96	58.3	17.00	0.00	0.00	170.5	Far	1.0384	177.1
13:29	96	58.4	17.50	0.00	0.00	185.6	Far	1.0384	192.8
13:30	96	58.5	17.60	0.00	0.00	185.6	Far	1.0384	192.8
13:31	95	58.6	17.60	0.00	0.00	178.9	Far	1.0384	185.8
13:32	95	58.7	17.60	0.00	0.00	184.0	Far	1.0384	191.0
13:33	96	58.8	16.70	0.00	0.00	207.5	Far	1.0384	215.5
13:34	96	58.8	17.50	0.00	0.00	160.4	Far	1.0384	166.6
13:35	97	58.9	17.80	0.00	0.00	182.3	Far	1.0384	189.3
13:36	98	59.1	17.40	0.00	0.00	240.2	Far	1.0384	249.5
13:37	97	59.2	17.60	0.00	0.00	220.9	Far	1.0384	229.4
13:38	96	59.2	18.30	0.00	0.00	189.8	Far	1.0384	197.1
13:39	96	59.2	18.00	0.00	0.00	226.0	Far	1.0384	234.6
13:40	97	59.2	17.30	0.00	0.00	214.2	Far	1.0384	222.4
13:41	97	59.0	17.80	0.00	0.00	195.7	Far	1.0384	203.2
13:42	97	58.9	17.50	0.00	0.00	161.3	Far	1.0384	167.5
13:43	98	58.8	18.20	0.00	0.00	189.0	Far	1.0384	196.3
13:44	98	58.7	17.80	0.00	0.00	251.2	Far	1.0384	260.8
13:45	98	58.5	17.60	0.00	0.00	241.1	Far	1.0384	250.3
13:46	97	58.4	18.20	0.00	0.00	227.6	Far	1.0384	236.4
13:47	98	58.3	17.40	0.00	0.00	244.4	Far	1.0384	253.8
13:48	97	58.2	17.90	0.00	0.00	195.7	Far	1.0384	203.2
Average	95	55.8	17.29	12.48	0.32	167.4			168.3

Canley Garden Crematorium Stream 2 Abatement System Outlet

Total Particulate Matter and Hydrogen Chloride

Contract Canley Garden Crematorium, DEM0562
 Date 27th March 2012
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST
 Absorbent H₂O

Test Log	Test 1		Test 2		Test 3	
Barometric Pressure(kPa)	103.6		103.6		103.6	
Gas Meter Temperature(Deg C)	40.3		54.0		55.8	
Oxygen Concentration(%v/v dry)	16.15		16.93		17.29	
Flue Gas Volumetric Flow(Nm ³ /h dry)	5273		4763		4486	
	Start	End	Start	End	Start	End
Time	09:30	10:54	11:08	12:25	12:41	13:48
Gas Meter Reading(Am ³ dry)	510.413	511.488	511.488	512.406	512.406	513.230
Absorber Weight(g)	3631.6	3686.4	3409.1	3464.0	3603.3	3649.8
Filter Reference	CO270312F3,4,1		CO270312F3,4,2		CO270312F3,4,3	
Filter Weight(g)	0.53999	0.54006	0.53789	0.53807	0.53944	0.53954
Probe Rinse Reference	CO270312R1		CO270312R2		CO270312R3	
Probe Rinse Weight(g)	67.3668	67.3670	67.3670	67.3675	67.3675	67.3677
Sample Reference HCl	CO270312 H3 4-A1		CO270312 H3 4-A2		CO270312 H3 4-A 3 A&B	
Absorbent Volume(ml)	500		500		250	
Absorbent(mg/l as HCl)	8.8		16		25	
Blank(mg/l as HCl)	0.06		0.06		0.06	

Calculation: General

Barometric Pressure(kPa)	103.6	103.6	103.6
Gas Meter temperature(Deg C)	40.3	54.0	55.8
Gas Volume Sampled(Am ³ dry)	1.075	0.918	0.824
Gas Volume Sampled(Nm ³ dry)	0.9579	0.7839	0.6996
Mass of Dry Gas(g @ 1292.8 g/Nm ³)	1238.39	1013.43	904.48
Change in Absorber Weight(g)	54.8	54.9	46.5
Water Vapour Volume(Nm ³ @ 803.9 g/Nm ³)	0.0682	0.0683	0.0578
Gas Volume(Nm ³ wet)	1.0261	0.8522	0.7575
Mass of Wet Gas(g)	1293.19	1068.33	950.98
Moisture Concentration(%v/v)	6.6	8.0	7.6
Moisture Concentration(%w/w)	4.2	5.1	4.9

Calculation: Particulate

Increase In Filter Weights(g)	0.00025	0.00065	0.00036
Particulate Emission(mg/Nm ³ dry)	0.27	0.83	0.52
Oxygen Concentration(%v/v dry)	16.15	16.93	17.29
Particulate Emission (mg/Nm³ @ 11 %v/v Oxygen dry)	0.55	2.06	1.41
Flue Gas Volumetric Flow(Nm ³ /h dry)	5273	4763	4486
Particulate Emission(g/h)	1.40	3.97	2.33
Required Sample Velocity(Nm/s)	15.25	13.71	12.92
Nozzle Used(mm)	4.0	4.0	4.0
Area of Nozzle(m ²)	0.00001257	0.00001257	0.00001257
Test Duration(mins)	84	77	67
Actual Sample Velocity(Nm/s)	15.12	13.50	13.85
Isokinetic Closure(%)	99	99	107
		102	

Calculation: HCl

Absorbent(mg/l as HCl)	8.80	16.00	25.08
Blank(mg/l as HCl)	0.06	0.06	0.06
Chloride Absorbed(mg/l as HCl)	8.74	15.94	25.02
Chloride Absorbed(mg as HCl)	4.37	7.97	6.26
HCl(mg)	4.37	7.97	6.26
HCl Emission(mg/Nm ³ dry)	4.56	10.17	8.94
Oxygen Concentration(%v/v dry)	16.15	16.93	17.29
HCl Emission (mg/Nm³ @ 11 %v/v Oxygen dry)	9.45	25.15	24.29
Flue Gas Volumetric Flow(Nm ³ /h dry)	5273	4763	4486
HCl Emission(g/h)	24.05	48.42	40.11

Canley Garden Crematorium Stream 2 Abatement System Outlet

Flue Gas Volumetric Flow

Contract Canley Garden Crematorium, DEM0562
Date 27th March 2012
Location Flue Gas Abatement System Outlet
Engineer(s) JB & ST

Test Log	Test 1	Test 2	Test 3
Flue Gas Temperature(Deg C)	96	96	95
Flue Gas Pitot Head Sample Points(Pa)	229.5	190.1	167.4
Flue Gas Pitot Head Duct Mean(Pa)	228.6	191.3	168.3
Flue Gas Moisture(%v/v)	6.6	8.0	7.6
Flue Gas Moisture(%w/w)	4.2	5.1	4.9
Flue Gas Duct Dimensions(mm)	350 mm Diameter Circular Stack		
Flue Gas Duct Area(m ²)	0.0962		

Calculation

Flue Gas Density(kg/m ³)	0.9411	0.9385	0.9405
<u>Sample Points</u>			
Flue Gas Velocity(Am/s)	22.08	20.13	18.87
Flue Gas Volumetric Flowrate(Am ³ /h)	7648	6972	6535
Flue Gas Volumetric Flowrate(Am ³ /h dry)	7140	6413	6036
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	5283	4748	4473
<u>Duct Mean</u>			
Flue Gas Velocity(Am/s)	22.04	20.19	18.92
Flue Gas Volumetric Flowrate(Am ³ /h)	7634	6994	6553
Flue Gas Volumetric Flowrate(Am ³ /h dry)	7127	6433	6052
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	5273	4763	4486

Canley Garden Crematorium Stream 2 Abatement System Outlet

Preliminary Pitot Traverse

Traverse Position	Plane 1 / Bottom		Probe Position	Plane 2 / Side		Probe Position
	Pa	Root(Pa)		Pa	Root(Pa)	
1 Near	164	12.81		163	12.77	
2	171	13.08	S. Point	169	13.00	
3	175	13.23		176	13.27	
4	180	13.42		182	13.49	
5	183	13.53		183	13.53	
6	182	13.49		183	13.53	
7	179	13.38		181	13.45	
8	176	13.27		178	13.34	
9	173	13.15	S. Point	175	13.23	
10 Far	168	12.96		170	13.04	
Sum		132.31			132.64	

Overall Total Root(Pa) 264.95
 Average Root(Pa) 13.25
 Equivalent Pa 175.5

Duct Mean Correction Factor 0.9590 Near Velocity Within 3:1 (9:1 Pa)
 Flow > 5 Pa All Points
 1.0384 Far No Negative Flow
 Swirl < 15°

Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

28/03/12

Test 4

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
09:40	109	27.0	15.44	56.7	Far	1.0336	58.6
09:41	110	27.1	13.49	60.4	Far	1.0336	62.5
09:42	112	27.2	13.66	86.4	Far	1.0336	89.3
09:43	113	27.4	15.10	89.7	Far	1.0336	92.7
09:44	116	27.5	14.12	130.3	Far	1.0336	134.6
09:45	116	27.8	14.68	110.5	Far	1.0336	114.2
09:46	116	28.0	13.84	101.4	Far	1.0336	104.8
09:47	116	28.3	14.15	81.3	Far	1.0336	84.1
09:48	116	28.6	14.62	66.8	Far	1.0336	69.0
09:49	116	29.0	14.31	73.0	Far	1.0336	75.4
09:50	117	29.4	13.97	88.7	Far	1.0336	91.6
09:51	118	29.7	13.71	84.8	Far	1.0336	87.6
09:52	119	30.1	13.64	84.6	Far	1.0336	87.4
09:53	120	30.5	14.08	86.9	Far	1.0336	89.9
09:54	120	30.9	14.18	88.9	Far	1.0336	91.9
09:55	120	31.3	14.09	100.7	Far	1.0336	104.1
09:56	121	31.7	14.52	106.1	Far	1.0336	109.7
09:57	121	32.0	14.18	102.2	Far	1.0336	105.7
09:58	121	32.5	13.85	91.8	Far	1.0336	94.9
09:59	121	32.8	13.83	88.5	Far	1.0336	91.5
10:00	122	33.2	14.18	90.2	Far	1.0336	93.3
10:01	123	33.6	14.30	107.8	Far	1.0336	111.4
10:02	124	34.0	14.22	121.0	Far	1.0336	125.0
10:03	125	34.4	14.01	134.9	Far	1.0336	139.5
10:04	125	34.8	14.23	136.4	Far	1.0336	141.0
10:05	126	35.1	13.99	132.3	Far	1.0336	136.8
10:06	127	35.5	14.28	152.5	Far	1.0336	157.7
10:07	127	35.8	14.65	151.4	Far	1.0336	156.5
10:08	127	36.2	14.60	141.0	Far	1.0336	145.7
10:09	128	36.6	14.22	146.3	Far	1.0336	151.2
10:10	128	37.0	14.27	151.9	Far	1.0336	157.0
10:11	128	37.4	14.16	142.1	Far	1.0336	146.9
10:12	128	37.7	14.27	135.2	Far	1.0336	139.8
10:13	128	38.1	14.64	137.3	Far	1.0336	141.9
10:14	128	38.3	14.65	124.4	Far	1.0336	128.6
10:15	128	38.7	14.42	130.9	Far	1.0336	135.3
10:16	128	39.0	14.15	139.6	Far	1.0336	144.3
10:17	128	39.3	14.24	115.1	Far	1.0336	119.0
10:18	127	39.7	14.30	79.5	Far	1.0336	82.1
10:19	126	40.1	14.75	66.5	Far	1.0336	68.7

10:20	125	40.4	14.23	54.1	Far	1.0336	55.9
10:21	126	40.7	14.11	62.0	Far	1.0336	64.0
10:22	126	41.0	14.30	65.1	Far	1.0336	67.2
10:23	126	41.3	14.72	64.9	Near	0.9374	60.9
10:24	126	41.6	14.54	47.7	Near	0.9374	44.7
10:25	126	41.9	13.45	52.5	Near	0.9374	49.2
10:26	125	42.2	14.28	58.6	Near	0.9374	54.9
10:27	125	42.5	14.22	55.9	Near	0.9374	52.4
10:28	124	42.8	13.90	51.6	Near	0.9374	48.4
10:29	124	43.1	13.15	43.2	Near	0.9374	40.5
10:30	124	43.4	14.17	42.9	Near	0.9374	40.2
10:31	124	43.6	13.82	46.5	Near	0.9374	43.6
10:32	125	43.9	14.72	89.9	Near	0.9374	84.3
10:33	125	44.2	14.19	95.4	Near	0.9374	89.4
10:34	124	44.5	13.77	61.3	Near	0.9374	57.5
10:35	124	44.7	13.59	42.4	Near	0.9374	39.8
10:36	123	44.9	12.86	47.0	Near	0.9374	44.1
10:37	123	45.2	12.94	44.0	Near	0.9374	41.2
10:38	124	45.4	13.07	59.9	Near	0.9374	56.1
10:39	124	45.6	14.07	69.2	Near	0.9374	64.9
10:40	125	45.9	14.20	75.2	Near	0.9374	70.5
10:41	125	46.1	13.77	89.2	Near	0.9374	83.6
10:42	126	46.3	13.48	120.9	Near	0.9374	113.3
10:43	125	46.6	14.74	96.3	Near	0.9374	90.2
10:44	125	46.8	13.45	101.6	Near	0.9374	95.2
10:45	126	47.0	13.87	137.3	Near	0.9374	128.7
10:46	128	47.2	13.94	156.5	Near	0.9374	146.7
10:47	130	47.4	14.22	158.9	Near	0.9374	149.0
10:48	130	47.6	14.59	132.4	Near	0.9374	124.2
10:49	130	47.9	14.94	110.1	Near	0.9374	103.2
10:50	130	48.0	14.81	97.9	Near	0.9374	91.8
10:51	129	48.2	14.87	84.9	Near	0.9374	79.6
10:52	128	48.3	14.08	70.1	Near	0.9374	65.8
10:53	127	48.5	14.05	51.7	Near	0.9374	48.4
10:54	127	48.7	12.69	41.4	Near	0.9374	38.8
10:55	127	48.9	11.57	48.5	Near	0.9374	45.4
10:56	127	49.1	12.15	30.1	Near	0.9374	28.2
10:57	127	49.2	12.67	37.2	Near	0.9374	34.8
10:58	127	49.4	12.52	50.5	Near	0.9374	47.4
10:59	127	49.6	10.98	58.5	Near	0.9374	54.8
11:00	127	49.8	13.51	62.2	Near	0.9374	58.3
11:01	126	50.0	15.68	48.3	Near	0.9374	45.3
11:02	125	50.1	11.81	28.7	Near	0.9374	26.9
11:03	125	50.3	13.46	26.4	Near	0.9374	24.8
11:04	125	50.4	14.81	37.7	Near	0.9374	35.4
11:05	125	50.6	13.46	40.8	Near	0.9374	38.2
11:06	125	50.7	12.49	35.6	Near	0.9374	33.4
11:07	125	50.8	15.29	54.5	Near	0.9374	51.1
11:08	125	50.9	13.60	41.1	Near	0.9374	38.5
11:09	125	51.1	14.65	41.7	Near	0.9374	39.1

Average	124	40.5	13.98	84.8			84.3
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Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

28/03/12

Test 5

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
11:20	126	48.9	15.46	71.3	Far	1.0336	73.7
11:21	126	48.8	13.56	75.3	Far	1.0336	77.8
11:22	126	48.8	13.86	70.8	Far	1.0336	73.2
11:23	126	48.9	13.84	62.4	Far	1.0336	64.5
11:24	126	49.1	14.05	64.1	Far	1.0336	66.3
11:25	126	49.2	14.15	79.5	Far	1.0336	82.2
11:26	127	49.4	13.20	82.5	Far	1.0336	85.2
11:27	128	49.6	12.54	145.1	Far	1.0336	150.0
11:28	130	49.8	15.20	156.6	Far	1.0336	161.8
11:29	129	50.0	15.90	113.3	Far	1.0336	117.1
11:30	129	50.2	15.14	86.0	Far	1.0336	88.9
11:31	128	50.4	13.80	66.9	Far	1.0336	69.1
11:32	128	50.7	13.34	61.0	Far	1.0336	63.0
11:33	128	50.9	12.78	66.9	Far	1.0336	69.1
11:34	129	51.0	13.51	102.5	Far	1.0336	105.9
11:35	130	51.2	14.62	145.5	Far	1.0336	150.4
11:36	131	51.4	15.15	150.6	Far	1.0336	155.7
11:37	131	51.5	15.07	143.3	Far	1.0336	148.1
11:38	132	51.7	14.92	155.8	Far	1.0336	161.0
11:39	133	51.9	15.06	156.2	Far	1.0336	161.4
11:40	133	52.1	15.05	148.1	Far	1.0336	153.0
11:41	134	52.3	15.90	155.2	Far	1.0336	160.4
11:42	134	52.4	14.38	146.9	Far	1.0336	151.8
11:43	135	52.6	15.73	154.5	Far	1.0336	159.7
11:44	134	52.8	13.88	124.5	Far	1.0336	128.7
11:45	133	52.9	13.16	95.5	Far	1.0336	98.8
11:46	134	53.1	12.41	114.8	Far	1.0336	118.7
11:47	135	53.3	13.18	183.8	Far	1.0336	189.9
11:48	137	53.5	13.93	219.4	Far	1.0336	226.8
11:49	138	53.6	14.27	212.0	Far	1.0336	219.1
11:50	139	53.7	13.99	201.9	Far	1.0336	208.6
11:51	140	53.9	13.29	202.3	Far	1.0336	209.1
11:52	141	54.0	12.73	186.3	Far	1.0336	192.6
11:53	141	54.1	13.17	181.1	Far	1.0336	187.2
11:54	142	54.2	13.43	167.9	Far	1.0336	173.5
11:55	141	54.4	13.27	145.7	Far	1.0336	150.6
11:56	141	54.5	11.82	115.6	Far	1.0336	119.5
11:57	140	54.6	10.38	118.7	Far	1.0336	122.7
11:58	140	54.8	10.90	107.1	Near	0.9374	100.4
11:59	140	54.9	11.53	116.2	Near	0.9374	109.0
12:00	140	55.0	12.21	114.1	Near	0.9374	107.0
12:01	140	55.1	12.01	97.4	Near	0.9374	91.3

12:02	139	55.2	11.80	80.9	Near	0.9374	75.8
12:03	138	55.3	11.40	61.8	Near	0.9374	57.9
12:04	137	55.4	10.76	47.6	Near	0.9374	44.7
12:05	137	55.6	10.67	43.7	Near	0.9374	41.0
12:06	136	55.7	10.55	51.9	Near	0.9374	48.6
12:07	136	55.8	10.44	49.3	Near	0.9374	46.2
12:08	135	55.8	10.38	50.7	Near	0.9374	47.5
12:09	135	55.8	10.51	49.8	Near	0.9374	46.7
12:10	135	55.8	10.83	46.5	Near	0.9374	43.6
12:11	134	55.8	10.54	45.7	Near	0.9374	42.8
12:12	134	55.8	10.58	42.0	Near	0.9374	39.4
12:13	134	55.7	10.76	39.9	Near	0.9374	37.4
12:14	133	55.7	10.96	35.2	Near	0.9374	33.0
12:15	133	55.7	10.94	32.1	Near	0.9374	30.1
12:16	132	55.7	10.91	29.5	Near	0.9374	27.7
12:17	131	55.7	10.99	28.4	Near	0.9374	26.6
12:18	131	55.7	11.30	26.8	Near	0.9374	25.1
12:19	131	55.7	11.66	25.9	Near	0.9374	24.3
12:20	130	55.7	12.07	25.8	Near	0.9374	24.2
12:21	130	55.7	12.34	24.8	Near	0.9374	23.2
12:22	130	55.7	12.70	24.4	Near	0.9374	22.9
12:23	129	55.7	13.25	22.8	Near	0.9374	21.4
12:24	128	55.7	13.60	21.5	Near	0.9374	20.2
12:25	128	55.7	13.81	21.4	Near	0.9374	20.1
12:26	128	55.7	14.18	21.1	Near	0.9374	19.7
12:27	127	55.7	14.36	20.7	Near	0.9374	19.4
12:28	127	55.7	14.64	20.8	Near	0.9374	19.5
12:29	127	55.8	14.21	30.1	Near	0.9374	28.2
12:30	127	55.7	13.96	30.8	Near	0.9374	28.9
12:31	127	55.7	15.61	40.3	Near	0.9374	37.7
12:32	127	55.8	16.05	55.1	Near	0.9374	51.7
12:33	127	55.9	16.49	57.4	Near	0.9374	53.8
12:34	127	55.9	16.69	57.8	Near	0.9374	54.2
12:35	127	55.9	16.24	70.5	Near	0.9374	66.1
12:36	128	55.9	16.47	65.1	Near	0.9374	61.0
12:37	128	56.0	17.14	57.9	Near	0.9374	54.3
12:38	128	56.0	17.35	69.7	Near	0.9374	65.3
12:39	127	56.0	17.09	72.1	Near	0.9374	67.6
12:40	127	56.1	17.12	71.4	Near	0.9374	66.9
12:41	127	56.1	17.23	70.5	Near	0.9374	66.1
12:42	127	56.1	17.24	70.2	Near	0.9374	65.8
12:43	127	56.1	17.35	66.7	Near	0.9374	62.5
12:44	127	56.2	17.26	50.3	Near	0.9374	47.1
12:45	127	56.2	16.23	39.1	Near	0.9374	36.7
12:46	126	56.2	14.45	24.2	Near	0.9374	22.7
12:47	126	56.3	16.76	28.5	Near	0.9374	26.7
12:48	126	56.3	17.02	52.8	Near	0.9374	49.5
12:49	127	56.4	17.38	83.0	Near	0.9374	77.8
12:50	127	56.4	17.97	83.8	Near	0.9374	78.6
12:51	128	56.4	18.03	83.3	Near	0.9374	78.1

12:52	128	56.5	18.07	85.0	Near	0.9374	79.6
Average	131	54.1	13.89	83.6			83.4

Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

28/03/12

Test 6

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
13:10	132	52.0	16.83	111.3	Far	1.0336	115.0
13:11	131	51.9	15.40	79.0	Far	1.0336	81.7
13:12	130	51.8	15.41	52.3	Far	1.0336	54.1
13:13	129	51.8	16.98	48.0	Far	1.0336	49.6
13:14	129	51.9	15.94	69.5	Far	1.0336	71.8
13:15	130	52.0	15.31	110.6	Far	1.0336	114.3
13:16	130	52.2	15.83	105.4	Far	1.0336	108.9
13:17	131	52.3	15.54	118.0	Far	1.0336	122.0
13:18	133	52.5	15.29	136.1	Far	1.0336	140.7
13:19	134	52.7	15.20	154.0	Far	1.0336	159.2
13:20	135	52.8	14.97	193.6	Far	1.0336	200.1
13:21	137	53.0	14.40	236.2	Far	1.0336	244.2
13:22	138	53.1	14.30	201.9	Far	1.0336	208.7
13:23	138	53.3	15.18	177.4	Far	1.0336	183.4
13:24	138	53.4	14.91	155.9	Far	1.0336	161.1
13:25	138	53.5	15.25	160.1	Far	1.0336	165.4
13:26	138	53.7	15.48	159.6	Far	1.0336	165.0
13:27	138	53.8	15.27	128.4	Far	1.0336	132.7
13:28	137	54.0	15.97	97.4	Far	1.0336	100.7
13:29	136	54.1	15.93	94.5	Far	1.0336	97.7
13:30	135	54.2	16.15	87.4	Far	1.0336	90.3
13:31	134	54.3	15.95	101.5	Far	1.0336	104.9
13:32	134	54.5	16.12	106.2	Far	1.0336	109.7
13:33	134	54.6	14.76	115.7	Far	1.0336	119.6
13:34	135	54.8	15.38	101.6	Far	1.0336	105.0
13:35	135	54.8	15.58	115.5	Far	1.0336	119.4
13:36	135	54.9	15.26	125.7	Far	1.0336	129.9
13:37	134	55.1	15.73	96.8	Far	1.0336	100.0
13:38	134	55.2	14.55	84.4	Far	1.0336	87.3
13:39	133	55.3	14.60	63.6	Far	1.0336	65.7
13:40	132	55.4	16.15	43.5	Far	1.0336	45.0
13:41	131	55.5	16.18	32.4	Far	1.0336	33.5
13:42	130	55.6	15.85	23.1	Far	1.0336	23.9
13:43	130	55.7	15.69	19.9	Far	1.0336	20.6
13:44	129	55.8	15.71	16.8	Far	1.0336	17.4
13:45	128	55.9	13.43	13.6	Far	1.0336	14.1
13:46	128	56.0	13.28	18.3	Far	1.0336	18.9
13:47	128	56.1	16.57	26.8	Far	1.0336	27.7
13:48	127	56.3	17.66	31.3	Far	1.0336	32.4
13:49	127	56.3	18.44	43.8	Far	1.0336	45.3
13:50	127	56.4	18.91	44.0	Far	1.0336	45.5

13:51	127	56.5	19.12	43.9	Far	1.0336	45.4
13:52	127	56.6	19.29	36.4	Far	1.0336	37.6
13:53	126	56.7	19.04	11.0	Far	1.0336	11.4
13:54	125	56.7	17.71	17.1	Far	1.0336	17.7
13:55	125	56.8	16.04	16.0	Far	1.0336	16.6
13:56	124	56.8	17.13	16.8	Far	1.0336	17.3
13:57	124	56.9	17.69	15.4	Far	1.0336	15.9
13:58	124	56.9	17.80	12.9	Far	1.0336	13.3
13:59	123	57.0	17.83	12.6	Far	1.0336	13.0
14:00	123	57.1	17.97	12.1	Near	0.9374	11.3
14:01	123	57.1	18.09	12.8	Near	0.9374	12.0
14:02	122	57.2	18.28	15.5	Near	0.9374	14.5
14:03	122	57.3	17.78	19.8	Near	0.9374	18.5
14:04	122	57.3	17.20	18.9	Near	0.9374	17.7
14:05	122	57.3	17.22	18.6	Near	0.9374	17.4
14:06	121	57.4	17.26	18.9	Near	0.9374	17.7
14:07	121	57.5	17.34	17.4	Near	0.9374	16.3
14:08	120	57.5	18.08	3.2	Near	0.9374	3.0
14:09	120	57.6	18.15	4.7	Near	0.9374	4.4
14:10	119	57.6	17.06	1.1	Near	0.9374	1.0
Average	130	55.1	16.35	69.3			71.4

Canley Garden Crematorium Stream 1 Abatement System Outlet

Mercury

Contract Canley Garden Crematorium, DEM0562
 Date 28th March 2012
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST
 Absorbent 4% K₂CR₂O₇ / 20% HNO₃ in H₂O

Test Log	Test 4		Test 5		Test 6	
Barometric Pressure(kPa)	103.2		103.2		103.2	
Gas Meter Temperature(Deg C)	40.5		54.1		55.1	
Oxygen Concentration(%v/v dry)	13.98		13.89		16.35	
Flue Gas Volumetric Flow(Nm ³ /h dry)	3084		3046		2893	
Time	Start	End	Start	End	Start	End
	09:40	11:09	11:20	12:52	13:10	14:10
Gas Meter Reading(Am ³ dry)	1814.842	1815.822	1815.822	1816.807	1816.807	1817.498
Absorber Weight(g)	3499.2	3550.1	3575.4	3622.5	3511.1	3530.5
Filter Reference	CO280312 HG1 2 F4		CO280312 HG1 2 F5		CO280312 HG1 2 F6	
Filter Fraction Analysed	1		1		1	
Filter(µg as Hg)	0.01		0.03		0.06	
Filter Blank(µg as Hg)	0.01		0.01		0.01	
Probe Rinse Reference	Washed into HgA4		Washed into HgA5		Washed into HgA6A	
Probe Rinse Volume(ml)	0		0		0	
Probe Rinse(µg/l as Hg)	0		0		0	
Probe Rinse Blank(µg/l as Hg)	0		0		0	
Absorbent Reference	CO280312 HG1 2A4		CO280312 HG1 2A5		CO280312 HG1 2A6 A&B	
Absorbent Volume(ml)	500		500		250	250
Absorbent(µg/l as Hg)	26		35		36	7
Absorbent Blank(µg/l as Hg)	5		5		5	5

Calculation: General

Barometric Pressure(kPa)	103.2	103.2	103.2
Gas Meter Temperature(Deg C)	40.5	54.1	55.1
Gas Volume Sampled(Am ³ dry)	0.980	0.985	0.691
Gas Volume Sampled(Nm ³ dry)	0.8693	0.8374	0.5858
Mass of Dry Gas(g @ 1292.8 g/Nm ³)	1123.86	1082.62	757.27
Change in Absorber Weight(g)	50.9	47.1	19.4
Water Vapour Volume(Nm ³ @ 803.9 g/Nm ³)	0.0633	0.0586	0.0241
Gas Volume(Nm ³ wet)	0.9326	0.8960	0.6099
Mass of Wet Gas(g)	1174.76	1129.72	776.67
Moisture Concentration(%v/v)	6.8	6.5	4.0
Moisture Concentration(%w/w)	4.3	4.2	2.5

Calculation: Mercury

Filter(μg as Hg)	0.00	0.02	0.05
Probe Rinse(μg as Hg)	0.00	0.00	0.00
Absorbent(μg as Hg)	10.50	15.00	8.25
Total Mercury Sampled(μg)	10.50	15.02	8.30
Mercury Emission($\mu\text{g}/\text{Nm}^3$ dry)	12.08	17.94	14.17
Oxygen Concentration(%v/v dry)	13.98	13.89	16.35
Mercury Emission ($\mu\text{g}/\text{Nm}^3$ @ 11 %v/v Oxygen dry)	17.25	25.29	30.65
Flue Gas Volumetric Flowrate(Nm^3/h dry)	3084	3046	2893
Mercury Emission(g/h)	0.037	0.055	0.041
Required Sample Velocity(Nm/s)	8.93	8.80	8.23
Nozzle Used(mm)	5.0	5.0	5.0
Area of Nozzle(m^2)	0.00001963	0.00001963	0.00001963
Test Duration(mins)	89	92	60
Actual Sample Velocity(Nm/s)	8.29	7.73	8.29
Isokinetic Closure(%)	93	88	101
		94	



Canley Garden Crematorium Stream 1 Abatement System Outlet

Flue Gas Volumetric Flow

Contract Canley Garden Crematorium, DEM0562
 Date 28th March 2012
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST

Test Log	Test 4	Test 5	Test 6
Flue Gas Temperature(Deg C)	124	131	130
Flue Gas Pitot Head Sample Points(Pa)	84.8	83.6	69.3
Flue Gas Pitot Head Duct Mean(Pa)	84.3	83.4	71.4
Flue Gas Moisture(%v/v)	6.8	6.5	4.0
Flue Gas Moisture(%w/w)	4.3	4.2	2.5
Flue Gas Duct Dimensions(mm)	350 mm Diameter Circular Stack		
Flue Gas Duct Area(m ²)	0.0962		

Calculation

Flue Gas Density(kg/m ³)	0.8745	0.8589	0.8685
<u>Sample Points</u>			
Flue Gas Velocity(Am/s)	13.93	13.95	12.63
Flue Gas Volumetric Flowrate(Am ³ /h)	4825	4831	4375
Flue Gas Volumetric Flowrate(Am ³ /h dry)	4497	4516	4202
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	3093	3048	2850
<u>Duct Mean</u>			
Flue Gas Velocity(Am/s)	13.89	13.94	12.82
Flue Gas Volumetric Flowrate(Am ³ /h)	4811	4828	4441
Flue Gas Volumetric Flowrate(Am ³ /h dry)	4484	4512	4265
Flue Gas Volumetric Flowrate(Nm³/h dry)	3084	3046	2893

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

27/03/12

Test 4

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
13:58	95	55.4	17.60	126.0	Far	1.0384	130.8
13:59	95	55.2	17.20	113.4	Far	1.0384	117.8
14:00	95	55.1	17.50	107.5	Far	1.0384	111.7
14:01	94	55.2	17.70	103.3	Far	1.0384	107.3
14:02	94	55.4	18.00	105.8	Far	1.0384	109.9
14:03	94	55.7	17.40	130.2	Far	1.0384	135.2
14:04	94	55.9	17.00	139.4	Far	1.0384	144.8
14:05	95	56.2	16.60	135.2	Far	1.0384	140.4
14:06	95	56.4	16.90	134.4	Far	1.0384	139.6
14:07	95	56.6	17.70	151.2	Far	1.0384	157.0
14:08	95	56.8	17.70	150.4	Far	1.0384	156.1
14:09	95	57.0	17.50	153.7	Far	1.0384	159.6
14:10	94	57.2	18.00	130.2	Far	1.0384	135.2
14:11	94	57.4	18.00	108.4	Far	1.0384	112.5
14:12	94	57.6	17.60	102.5	Far	1.0384	106.4
14:13	94	57.8	17.60	99.1	Far	1.0384	102.9
14:14	93	57.9	17.80	83.2	Far	1.0384	86.4
14:15	93	58.1	18.20	98.3	Far	1.0384	102.1
14:16	93	58.3	17.90	96.6	Far	1.0384	100.3
14:17	93	58.5	17.90	91.6	Far	1.0384	95.1
14:18	93	58.6	17.60	96.6	Far	1.0384	100.3
14:19	92	58.8	17.50	78.1	Far	1.0384	81.1
14:20	92	58.9	18.10	75.6	Far	1.0384	78.5
14:21	92	59.1	18.10	84.0	Far	1.0384	87.2
14:22	93	59.2	17.70	89.0	Far	1.0384	92.5
14:23	93	59.3	17.50	110.9	Far	1.0384	115.1
14:24	93	59.4	17.80	105.8	Far	1.0384	109.9
14:25	92	59.6	17.80	100.8	Far	1.0384	104.7
14:26	92	59.8	17.70	97.4	Far	1.0384	101.2
14:27	93	60.0	17.30	118.4	Far	1.0384	123.0
14:28	94	60.1	17.80	149.5	Far	1.0384	155.3
14:29	94	60.2	17.80	120.1	Far	1.0384	124.7
14:30	93	60.3	17.00	97.4	Far	1.0384	101.2
14:31	93	60.5	16.40	80.6	Far	1.0384	83.7
14:32	92	60.5	17.80	85.7	Far	1.0384	89.0
14:33	92	60.6	18.00	71.4	Far	1.0384	74.1
14:34	91	60.7	18.80	56.3	Far	1.0384	58.4
14:35	91	60.8	17.90	52.9	Far	1.0384	55.0
14:36	91	61.0	16.70	42.8	Far	1.0384	44.5
14:37	91	61.1	17.20	39.5	Far	1.0384	41.0
14:38	91	61.1	18.00	53.8	Far	1.0384	55.8

14:39	91	61.2	17.20	63.0	Far	1.0384	65.4
14:40	91	61.3	18.40	52.1	Far	1.0384	54.1
14:41	90	61.4	17.20	49.6	Near	0.9590	47.5
14:42	91	61.5	17.00	83.2	Near	0.9590	79.7
14:43	91	61.5	18.90	61.3	Near	0.9590	58.8
14:44	90	61.7	19.00	62.2	Near	0.9590	59.6
14:45	91	61.8	17.10	70.6	Near	0.9590	67.7
14:46	90	62.0	18.00	50.4	Near	0.9590	48.3
14:47	91	62.1	17.40	63.8	Near	0.9590	61.2
14:48	92	62.2	17.50	123.5	Near	0.9590	118.4
14:49	93	62.3	18.30	157.1	Near	0.9590	150.6
14:50	95	62.4	16.60	199.1	Near	0.9590	190.9
14:51	95	62.5	17.20	173.0	Near	0.9590	165.9
14:52	95	62.5	18.00	154.6	Near	0.9590	148.2
14:53	94	62.5	17.30	150.4	Near	0.9590	144.2
14:54	94	62.5	17.70	136.9	Near	0.9590	131.3
14:55	94	62.6	18.20	147.8	Near	0.9590	141.8
14:56	94	62.6	16.60	156.2	Near	0.9590	149.8
14:57	94	62.6	17.00	154.6	Near	0.9590	148.2
14:58	95	62.6	17.20	158.8	Near	0.9590	152.2
14:59	96	62.6	16.90	162.1	Near	0.9590	155.5
15:00	95	62.7	17.40	137.8	Near	0.9590	132.1
15:01	95	62.8	18.00	153.7	Near	0.9590	147.4
15:02	95	62.9	17.10	173.0	Near	0.9590	165.9
15:03	95	62.9	16.70	161.3	Near	0.9590	154.7
15:04	95	62.9	17.10	146.2	Near	0.9590	140.2
15:05	96	63.0	17.50	152.9	Near	0.9590	146.6
15:06	96	63.2	16.40	162.1	Near	0.9590	155.5
15:07	97	63.4	16.50	142.8	Near	0.9590	136.9
15:08	97	63.3	16.80	170.5	Near	0.9590	163.5
15:09	97	63.3	18.00	205.0	Near	0.9590	196.6
15:10	96	63.4	18.00	143.6	Near	0.9590	137.7
15:11	94	63.3	17.40	78.1	Near	0.9590	74.9
15:12	94	63.3	16.80	63.8	Near	0.9590	61.2
15:13	93	63.3	16.60	58.8	Near	0.9590	56.4
15:14	93	63.3	16.80	52.1	Near	0.9590	49.9
15:15	93	63.4	16.80	46.2	Near	0.9590	44.3
15:16	92	63.4	16.70	44.5	Near	0.9590	42.7
15:17	92	63.4	16.80	50.4	Near	0.9590	48.3
15:18	92	63.4	16.90	60.5	Near	0.9590	58.0
15:19	92	63.5	16.90	58.0	Near	0.9590	55.6
15:20	92	63.5	17.00	51.2	Near	0.9590	49.1
15:21	91	63.4	16.90	46.2	Near	0.9590	44.3
15:22	91	63.4	17.20	42.0	Near	0.9590	40.3
15:23	91	63.4	17.30	42.8	Near	0.9590	41.1
15:24	91	63.4	17.40	46.2	Near	0.9590	44.3
15:25	90	63.3	17.50	44.5	Near	0.9590	42.7
15:26	90	63.2	17.80	44.5	Near	0.9590	42.7
15:27	90	63.2	18.10	44.5	Near	0.9590	42.7
15:28	90	63.1	18.30	46.2	Near	0.9590	44.3

15:29	90	63.1	18.30	57.1	Near	0.9590	54.8
15:30	89	63.1	18.10	57.1	Near	0.9590	54.8
15:31	89	63.1	18.30	56.3	Near	0.9590	54.0
Average	93	60.9	17.49	100.4			99.9

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

28/03/12

Test 5

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
12:47	87	33.7	16.50	118.4	Far	1.0384	123.0
12:48	87	33.7	17.30	117.6	Far	1.0384	122.1
12:49	87	33.8	17.20	120.1	Far	1.0384	124.7
12:50	88	34.0	17.90	131.9	Far	1.0384	136.9
12:51	89	34.2	16.40	141.1	Far	1.0384	146.5
12:52	90	34.3	16.30	157.9	Far	1.0384	164.0
12:53	90	34.6	16.60	124.3	Far	1.0384	129.1
12:54	90	34.9	16.40	162.1	Far	1.0384	168.4
12:55	91	35.1	16.10	169.7	Far	1.0384	176.2
12:56	90	35.4	16.90	130.2	Far	1.0384	135.2
12:57	91	35.7	16.50	141.1	Far	1.0384	146.5
12:58	91	36.1	16.70	152.0	Far	1.0384	157.9
12:59	92	36.4	16.20	162.1	Far	1.0384	168.4
13:00	93	36.8	16.20	159.6	Far	1.0384	165.7
13:01	94	37.1	16.20	196.6	Far	1.0384	204.1
13:02	94	37.5	17.10	219.2	Far	1.0384	227.7
13:03	94	37.8	16.40	225.1	Far	1.0384	233.8
13:04	94	38.1	16.40	178.1	Far	1.0384	184.9
13:05	93	38.5	16.70	165.5	Far	1.0384	171.8
13:06	94	38.8	16.50	161.3	Far	1.0384	167.5
13:07	95	39.2	16.60	177.2	Far	1.0384	184.1
13:08	95	39.5	16.00	154.6	Far	1.0384	160.5
13:09	95	39.9	16.20	165.5	Far	1.0384	171.8
13:10	95	40.3	16.90	183.1	Far	1.0384	190.2
13:11	95	40.7	16.60	227.6	Far	1.0384	236.4
13:12	95	41.1	16.20	202.4	Far	1.0384	210.2
13:13	95	41.5	16.60	149.5	Far	1.0384	155.3
13:14	95	41.8	16.50	155.4	Far	1.0384	161.4
13:15	95	42.2	17.00	163.0	Far	1.0384	169.2
13:16	96	42.5	16.00	192.4	Far	1.0384	199.8
13:17	96	42.8	16.40	185.6	Far	1.0384	192.8
13:18	95	43.2	16.60	182.3	Far	1.0384	189.3
13:19	95	43.6	17.20	173.9	Far	1.0384	180.6
13:20	95	43.9	16.30	176.4	Far	1.0384	183.2
13:21	96	44.1	16.80	184.8	Far	1.0384	191.9
13:22	97	44.4	15.80	197.4	Far	1.0384	205.0
13:23	97	44.6	15.00	204.1	Far	1.0384	212.0
13:24	97	44.8	15.80	187.3	Far	1.0384	194.5
13:25	96	45.1	15.80	152.0	Near	0.9590	145.8
13:26	96	45.4	15.70	137.8	Near	0.9590	132.1
13:27	95	45.6	15.90	131.9	Near	0.9590	126.5
13:28	95	45.9	15.50	132.7	Near	0.9590	127.3

13:29	96	46.2	15.30	187.3	Near	0.9590	179.6
13:30	97	46.6	15.80	189.8	Near	0.9590	182.1
13:31	97	47.0	16.10	172.2	Near	0.9590	165.1
13:32	97	47.3	16.30	183.1	Near	0.9590	175.6
13:33	97	47.6	16.50	196.6	Near	0.9590	188.5
13:34	97	48.0	16.40	223.4	Near	0.9590	214.3
13:35	97	48.3	16.30	253.7	Near	0.9590	243.3
13:36	97	48.6	17.00	186.5	Near	0.9590	178.8
13:37	97	48.9	16.50	191.5	Near	0.9590	183.7
13:38	98	49.2	15.80	224.3	Near	0.9590	215.1
13:39	98	49.5	16.70	217.6	Near	0.9590	208.6
13:40	99	49.8	16.50	268.0	Near	0.9590	257.0
13:41	98	50.1	17.00	205.0	Near	0.9590	196.6
13:42	98	50.4	16.90	229.3	Near	0.9590	219.9
13:43	98	50.7	15.90	262.1	Near	0.9590	251.3
13:44	98	51.0	17.50	219.2	Near	0.9590	210.2
13:45	97	51.3	17.10	163.8	Near	0.9590	157.1
13:46	98	51.6	15.80	172.2	Near	0.9590	165.1
13:47	98	51.9	16.90	226.8	Near	0.9590	217.5
13:48	99	52.1	16.10	275.5	Near	0.9590	264.2
13:49	98	52.4	16.80	248.6	Near	0.9590	238.4
13:50	98	52.7	17.20	242.8	Near	0.9590	232.8
13:51	97	53.0	17.30	165.5	Near	0.9590	158.7
13:52	96	53.2	17.60	136.1	Near	0.9590	130.5
13:53	98	53.5	15.90	215.0	Near	0.9590	206.2
13:54	99	53.7	16.50	226.8	Near	0.9590	217.5
13:55	99	54.0	17.00	280.6	Near	0.9590	269.1
13:56	100	54.2	16.30	309.1	Near	0.9590	296.4
13:57	100	54.3	16.60	302.4	Near	0.9590	290.0
13:58	98	54.6	18.70	239.4	Near	0.9590	229.6
13:59	97	54.7	17.60	183.1	Near	0.9590	175.6
14:00	97	54.9	16.60	160.4	Near	0.9590	153.9
14:01	98	55.1	16.40	220.1	Near	0.9590	211.1
14:02	100	55.3	16.50	267.1	Near	0.9590	256.2
14:03	101	55.5	16.70	300.7	Near	0.9590	288.4
14:04	101	55.6	17.10	305.8	Near	0.9590	293.2
14:05	100	55.8	16.90	295.7	Near	0.9590	283.6
14:06	100	55.9	16.90	280.6	Near	0.9590	269.1
14:07	99	56.0	17.10	269.6	Near	0.9590	258.6
14:08	99	55.9	16.90	252.8	Near	0.9590	242.5
14:09	98	56.0	16.90	235.2	Near	0.9590	225.6
14:10	99	56.2	16.90	230.2	Near	0.9590	220.7
14:11	98	56.3	16.90	204.1	Near	0.9590	195.7
14:12	98	56.5	17.00	194.9	Near	0.9590	186.9
14:13	98	56.6	17.10	188.2	Near	0.9590	180.4
14:14	97	56.7	17.50	178.9	Near	0.9590	171.6
14:15	96	56.8	17.60	151.2	Near	0.9590	145.0
14:16	96	56.9	17.20	145.3	Near	0.9590	139.4
14:17	96	57.0	17.50	139.4	Near	0.9590	133.7
14:18	96	57.0	17.60	140.3	Near	0.9590	134.5

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

28/03/12

Test 6

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa	Sample Point	Factor	Duct Mean Pa
14:52	93	54.1	17.80	176.4	Far	1.0384	183.2
14:53	94	54.0	17.20	170.5	Far	1.0384	177.1
14:54	94	54.0	18.00	141.1	Far	1.0384	146.5
14:55	94	54.2	17.80	134.4	Far	1.0384	139.6
14:56	94	54.4	18.10	130.2	Far	1.0384	135.2
14:57	93	54.5	18.10	126.8	Far	1.0384	131.7
14:58	93	54.7	16.00	147.0	Far	1.0384	152.6
14:59	95	54.9	16.30	221.8	Far	1.0384	230.3
15:00	96	55.0	17.40	211.7	Far	1.0384	219.8
15:01	96	55.1	17.90	165.5	Far	1.0384	171.8
15:02	96	55.3	16.70	131.0	Far	1.0384	136.1
15:03	95	55.4	17.80	133.6	Far	1.0384	138.7
15:04	95	55.5	18.20	146.2	Far	1.0384	151.8
15:05	94	55.7	18.10	137.8	Far	1.0384	143.1
15:06	94	55.9	16.80	124.3	Far	1.0384	129.1
15:07	94	56.2	17.60	113.4	Far	1.0384	117.8
15:08	94	56.4	17.60	88.2	Far	1.0384	91.6
15:09	94	56.6	16.70	84.8	Far	1.0384	88.1
15:10	94	56.8	16.10	100.8	Far	1.0384	104.7
15:11	94	57.0	17.40	68.0	Far	1.0384	70.7
15:12	93	57.1	17.50	55.4	Far	1.0384	57.6
15:13	93	57.3	16.70	84.0	Far	1.0384	87.2
15:14	93	57.4	16.80	88.2	Far	1.0384	91.6
15:15	92	57.6	17.90	55.4	Far	1.0384	57.6
15:16	92	57.7	18.00	57.1	Far	1.0384	59.3
15:17	93	57.9	16.90	93.2	Far	1.0384	96.8
15:18	93	58.1	17.10	88.2	Far	1.0384	91.6
15:19	92	58.2	18.10	59.6	Far	1.0384	61.9
15:20	92	58.3	18.30	64.7	Far	1.0384	67.2
15:21	93	58.4	17.30	99.1	Far	1.0384	102.9
15:22	93	58.5	17.70	93.2	Far	1.0384	96.8
15:23	93	58.6	17.70	101.6	Far	1.0384	105.5
15:24	93	58.7	18.70	104.2	Far	1.0384	108.2
15:25	92	58.7	17.00	87.4	Far	1.0384	90.7
15:26	92	58.9	16.90	85.7	Far	1.0384	89.0
15:27	93	59.1	16.90	115.1	Far	1.0384	119.5
15:28	92	59.2	19.10	83.2	Far	1.0384	86.4
15:29	93	59.3	18.40	126.0	Far	1.0384	130.8
15:30	93	59.5	18.30	101.6	Far	1.0384	105.5
15:31	93	59.5	18.80	107.5	Far	1.0384	111.7
15:32	94	59.6	17.60	176.4	Far	1.0384	183.2

15:33	96	59.7	17.90	199.9	Far	1.0384	207.6
15:34	97	59.7	16.30	226.0	Far	1.0384	234.6
15:35	97	59.7	16.50	205.8	Far	1.0384	213.7
15:36	96	59.8	18.20	173.9	Far	1.0384	180.6
15:37	95	59.9	16.50	160.4	Far	1.0384	166.6
15:38	95	60.0	16.70	144.5	Far	1.0384	150.0
15:39	95	60.1	16.40	148.7	Far	1.0384	154.4
15:40	96	60.2	15.90	168.8	Far	1.0384	175.3
15:41	97	60.3	16.30	170.5	Far	1.0384	177.1
15:42	97	60.4	16.80	154.6	Near	0.9590	148.2
15:43	96	60.5	16.60	143.6	Near	0.9590	137.7
15:44	96	60.6	16.50	146.2	Near	0.9590	140.2
15:45	96	60.7	16.30	148.7	Near	0.9590	142.6
15:46	95	60.7	16.30	149.5	Near	0.9590	143.4
15:47	95	60.8	16.30	142.8	Near	0.9590	136.9
15:48	96	60.9	16.40	150.4	Near	0.9590	144.2
15:49	96	61.0	16.40	138.6	Near	0.9590	132.9
15:50	97	61.0	16.60	146.2	Near	0.9590	140.2
15:51	97	61.1	16.70	142.8	Near	0.9590	136.9
15:52	97	61.2	16.50	163.8	Near	0.9590	157.1
15:53	96	61.2	16.80	152.9	Near	0.9590	146.6
15:54	95	61.2	16.70	131.0	Near	0.9590	125.7
15:55	95	61.2	16.50	133.6	Near	0.9590	128.1
15:56	96	61.2	16.30	131.0	Near	0.9590	125.7
15:57	96	61.2	16.30	125.2	Near	0.9590	120.0
15:58	96	61.3	16.50	131.0	Near	0.9590	125.7
15:59	96	61.3	16.80	124.3	Near	0.9590	119.2
16:00	95	61.3	16.80	118.4	Near	0.9590	113.6
16:01	95	61.4	17.00	121.0	Near	0.9590	116.0
16:02	95	61.4	16.90	128.5	Near	0.9590	123.2
16:03	95	61.5	16.80	120.1	Near	0.9590	115.2
16:04	95	61.5	17.10	104.2	Near	0.9590	99.9
16:05	95	61.5	17.00	100.0	Near	0.9590	95.9
16:06	95	61.6	17.00	99.1	Near	0.9590	95.1
16:07	95	61.6	17.00	115.9	Near	0.9590	111.2
16:08	95	61.6	17.30	125.2	Near	0.9590	120.0
16:09	94	61.6	17.20	106.7	Near	0.9590	102.3
16:10	94	61.5	17.20	94.9	Near	0.9590	91.0
16:11	94	61.6	17.00	87.4	Near	0.9590	83.8
16:12	94	61.6	17.00	102.5	Near	0.9590	98.3
16:13	94	61.5	17.20	115.9	Near	0.9590	111.2
16:14	94	61.5	17.20	119.3	Near	0.9590	114.4
Average	94	59.0	17.14	126.4			127.3

Canley Garden Crematorium Stream 2 Abatement System Outlet

Mercury

Contract Canley Garden Crematorium, DEM0562
 Date 27 - 28th March 2012
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST
 Absorbent 4% K₂CR₂O₇ / 20% HNO₃ in H₂O

Test Log	Test 4		Test 5		Test 6	
Barometric Pressure(kPa)	103.6		103.2		103.2	
Gas Meter Temperature(Deg C)	60.9		47.9		59.0	
Oxygen Concentration(%v/v dry)	17.49		16.74		17.14	
Flue Gas Volumetric Flow(Nm ³ /h dry)	3495		4772		3865	
	Start	End	Start	End	Start	End
Time	13:58	15:31	12:47	14:29	14:52	16:14
Gas Meter Reading(Am ³ dry)	513.259	514.172	514.172	515.403	515.403	516.267
Absorber Weight(g)	3409.4	3454.2	3658.3	3716.8	3680.6	3736.2
Filter Reference	CO270312 HG3 4 F4		CO280312 HG3 4 F5		CO280312 HG3 4 F6	
Filter Fraction Analysed	1		1		1	
Filter(µg as Hg)	0.24		0.13		0.25	
Filter Blank(µg as Hg)	0.01		0.01		0.01	
Probe Rinse Reference	Washed into HgA4		Washed into HgA5		Washed into HgA6A	
Probe Rinse Volume(ml)	0		0		0	
Probe Rinse(µg/l as Hg)	0		0		0	
Probe Rinse Blank(µg/l as Hg)	0		0		0	
Absorbent Reference	CO270312 HG3 4A4		CO280312 HG3 4A5		CO280312 HG3 4A6 A&B	
Absorbent Volume(ml)	500		500		250	
Absorbent(µg/l as Hg)	12		19		11	
Absorbent Blank(µg/l as Hg)	5		5		5	

Calculation: General

Barometric Pressure(kPa)	103.6	103.2	103.2
Gas Meter Temperature(Deg C)	60.9	47.9	59.0
Gas Volume Sampled(Am ³ dry)	0.913	1.231	0.864
Gas Volume Sampled(Nm ³ dry)	0.7635	1.0668	0.7239
Mass of Dry Gas(g @ 1292.8 g/Nm ³)	987.07	1379.18	935.85
Change in Absorber Weight(g)	44.8	58.5	55.6
Water Vapour Volume(Nm ³ @ 803.9 g/Nm ³)	0.0557	0.0728	0.0692
Gas Volume(Nm ³ wet)	0.8192	1.1396	0.7931
Mass of Wet Gas(g)	1031.87	1437.68	991.45
Moisture Concentration(%v/v)	6.8	6.4	8.7
Moisture Concentration(%w/w)	4.3	4.1	5.6

Calculation: Mercury

Filter(μg as Hg)	0.23	0.12	0.24
Probe Rinse(μg as Hg)	0.00	0.00	0.00
Absorbent(μg as Hg)	3.50	7.00	1.50
Total Mercury Sampled(μg)	3.73	7.12	1.74
Mercury Emission($\mu\text{g}/\text{Nm}^3$ dry)	4.89	6.67	2.40
Oxygen Concentration(%v/v dry)	17.49	16.74	17.14
Mercury Emission ($\mu\text{g}/\text{Nm}^3$ @ 11 %v/v Oxygen dry)	14.06	15.78	6.28
Flue Gas Volumetric Flowrate(Nm^3/h dry)	3495	4772	3865
Mercury Emission(g/h)	0.017	0.032	0.009
Required Sample Velocity(Nm/s)	10.12	13.88	11.12
Nozzle Used(mm)	4.0	4.0	4.0
Area of Nozzle(m^2)	0.00001257	0.00001257	0.00001257
Test Duration(mins)	93	102	82
Actual Sample Velocity(Nm/s)	10.89	13.87	11.71
Isokinetic Closure(%)	108	100	105
		104	



Canley Garden Crematorium Stream 2 Abatement System Outlet

Flue Gas Volumetric Flow

Contract Canley Garden Crematorium, DEM0562
 Date 27 - 28th March 2012
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST

Test Log	Test 4	Test 5	Test 6
Flue Gas Temperature(Deg C)	93	96	94
Flue Gas Pitot Head Sample Points(Pa)	100.4	189.0	126.4
Flue Gas Pitot Head Duct Mean(Pa)	99.9	186.2	127.3
Flue Gas Moisture(%v/v)	6.8	6.4	8.7
Flue Gas Moisture(%w/w)	4.3	4.1	5.6
Flue Gas Duct Dimensions(mm)	350 mm Diameter Circular Stack		
Flue Gas Duct Area(m ²)	0.0962		

Calculation

Flue Gas Density(kg/m ³)	0.9486	0.9423	0.9402
<u>Sample Points</u>			
Flue Gas Velocity(Am/s)	14.55	20.03	16.40
Flue Gas Volumetric Flowrate(Am ³ /h)	5039	6938	5680
Flue Gas Volumetric Flowrate(Am ³ /h dry)	4696	6495	5185
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	3504	4808	3852
<u>Duct Mean</u>			
Flue Gas Velocity(Am/s)	14.51	19.88	16.45
Flue Gas Volumetric Flowrate(Am ³ /h)	5027	6886	5699
Flue Gas Volumetric Flowrate(Am ³ /h dry)	4685	6446	5202
Flue Gas Volumetric Flowrate(Nm³/h dry)	3495	4772	3865

APPENDIX 2

Analysis Reports



Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd Certificate of Analysis

Hadfield House
Hadfield Street
Crombrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2404

Report Number: 274362-1

Date of Report: 25-Apr-2012

Customer: Davies & Co (Engineering)
PO Box 11
Leeds
LS10 2XS

Customer Contact: Mr Steve Atherton

Customer Job Reference: DEM0562
Customer Purchase Order: 50000605
Date Job Received at SAL: 10-Apr-2012
Date Analysis Started: 11-Apr-2012
Date Analysis Completed: 25-Apr-2012

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs



Report checked
and authorised by :
Kayeigh McCann
Project Manager

Issued by :
Kayeigh McCann
Project Manager

Signature valid

Digitally signed by Kayeigh
McCann
Date: 2012.04.25 17:27:27 BST
Reason: Issue
Location: SAL

Page 1 of 3

SAL Reference: 274362 Customer Reference: DEM0562									
Impinger (4%K ₂ Cr ₂ O ₇ /20%HNO ₃) Analysed as Impinger (4%K ₂ Cr ₂ O ₇ /20%HNO ₃) Miscellaneous									
SAL Reference		274362 017	274362 018	274362 019	274362 020	274362 021			
Customer Sample Reference		CO270312 HG3 4A4	CO280312 HG3 4A5	CO280312 HG3 4A6A	CO280312 HG3 4A6B	CO280312 HG1 2A4			
Test Sample		AR	AR	AR	AR	AR			
Determinand	Method	LOD	Units	Symbol					
Mercury	CVAFS (BS EN 13211)	5	µg/l	U	12	19	11	<5	26
Volume	CVAFS (BS EN 13211)	1	ml	U	67	66	67	66	69

SAL Reference: 274362 Customer Reference: DEM0562									
Impinger (4%K ₂ Cr ₂ O ₇ /20%HNO ₃) Analysed as Impinger (4%K ₂ Cr ₂ O ₇ /20%HNO ₃) Miscellaneous									
SAL Reference		274362 022	274362 023	274362 024	274362 025				
Customer Sample Reference		CO280312 HG1 2A5	CO280312 HG1 2A6A	CO280312 HG1 2A6B	CO280312 HG1 2A6C	CO280312 HG1 2A6D	CO280312 HG1 2A6E	CO280312 HG1 2A6F	CO280312 HG1 2A6G
Test Sample		AR	AR	AR	AR	AR	AR	AR	AR
Determinand	Method	LOD	Units	Symbol					
Mercury	CVAFS (BS EN 13211)	5	µg/l	U	35	36	7	<5	
Volume	CVAFS (BS EN 13211)	1	ml	U	76	72	73	64	

SAL Reference: 274362 Customer Reference: DEM0562									
Filter Analysed as Filter Miscellaneous									
SAL Reference		274362 010	274362 011	274362 012	274362 013	274362 014			
Customer Sample Reference		CO270312 HG3 4F4	CO280312 HG3 4F5	CO280312 HG3 4F6	CO280312 HG3 4F7	CO280312 HG3 4F8	CO280312 FHG1 2-4	CO280312 FHG1 2-5	CO280312 FHG1 2-6
Test Sample		AR	AR	AR	AR	AR	AR	AR	AR
Determinand	Method	LOD	Units	Symbol					
Mercury	CVAFS (HF Digest BS EN 13211)	0.01	µg	U	0.24	0.13	(13) 0.25	<0.01	0.03

SAL Reference: 274362 Customer Reference: DEM0562									
Filter Analysed as Filter Miscellaneous									
SAL Reference		274362 015	274362 016						
Customer Sample Reference		CO280312 FHG1 2-6	CO280312 HG1 2-6						
Test Sample		AR	AR						
Determinand	Method	LOD	Units	Symbol					
Mercury	CVAFS (HF Digest BS EN 13211)	0.01	µg	U	0.06	0.01			

SAL Reference: 274362 Customer Reference: DEM0562									
Impinger(DI water) Analysed as Impinger(DI water) Miscellaneous									
SAL Reference		274362 001	274362 002	274362 003	274362 004	274362 005			
Customer Sample Reference		CO270312 H3 4-A1	CO270312 H3 4-A2	CO270312 H3 4-A3A	CO270312 H3 4-A3B	CO270312 HA1 2-1			
Test Sample		AR	AR	AR	AR	AR			
Determinand	Method	LOD	Units	Symbol					
Hydrogen Chloride	IC	0.05	mg/l	U	(13) 8.8	(13) 16	(13) 25	(13) 0.08	(13) 21
Volume	Vol	1	ml	U	64	66	66	64	70

SAL Reference: 274362					
Customer Reference: DEM0562					
Impinger(DI water) Analysed as Impinger(DI water)					
Miscellaneous					
SAL Reference		274362 006	274362 007	274362 008	274362 009
Customer Sample Reference		CO270312 HA1 2-2	CO270312 HA1 2-3A	CO270312 HA1 2-3B	CO280312 HOB
Test Sample		AR	AR	AR	AR
Determinand	Method	LOD	Units	Symbol	
Hydrogen Chloride	IC	0.05	mg/l	U	47 (13) 40 (13) 0.06 (13) 0.06
Volume	Vol	1	ml	U	72 70 70 70

Index to symbols used in 274362-1

Value	Description
AR	As Received
19	Due to high levels the analysis was conducted on a diluted sample
13	Results have been blank corrected
U	Analysis is UKAS accredited



Particulate Weight Determination

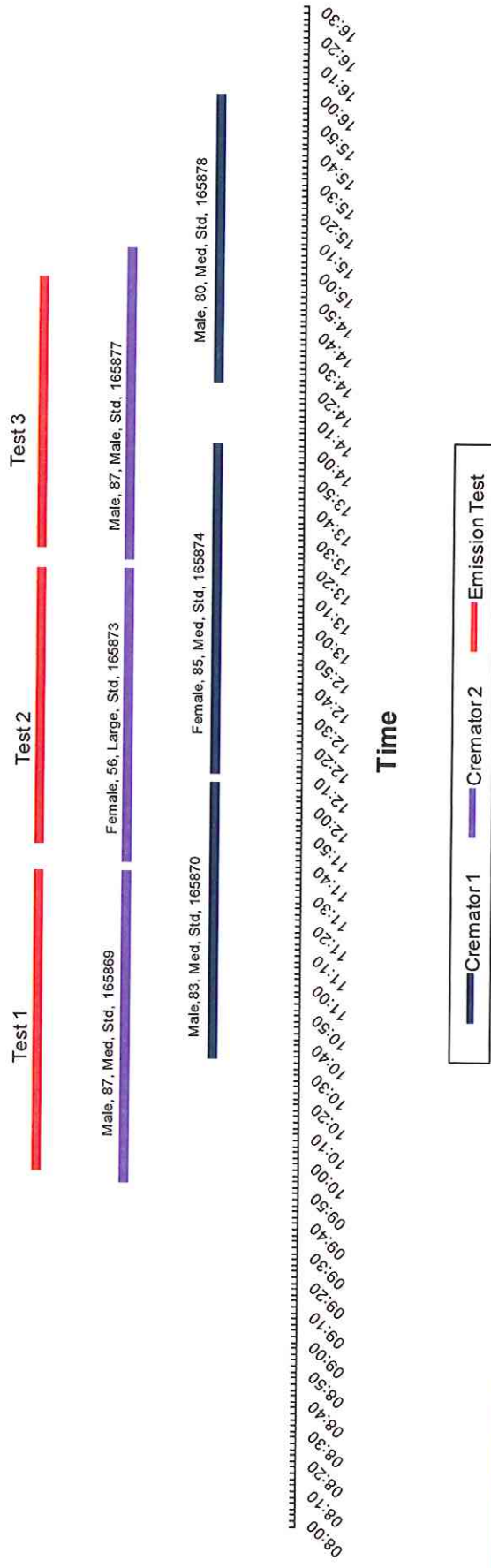
Filter / Rinse Reference		Clean Dry Weight g	Dirty Dry Weight g
CO270312F1,2,1	D13	0.54069	0.5408
CO270312F1,2,2	D15	0.53935	0.53977
CO270312F1,2,3	D17	0.53655	0.53684
CO270312R1,2,1	1	79.65429	79.65439
CO270312R1,2,2	2	79.65439	79.65476
CO270312R1,2,3	3	79.65476	79.65501
CO270312F3,4,1	D12	0.53999	0.54006
CO270312F3,4,2	D14	0.53789	0.53807
CO270312F3,4,3	D16	0.53944	0.53954
CO270312R1	1	67.36682	67.36700
CO270312R2	2	67.36700	67.36748
CO270312R3	3	67.36748	67.36774



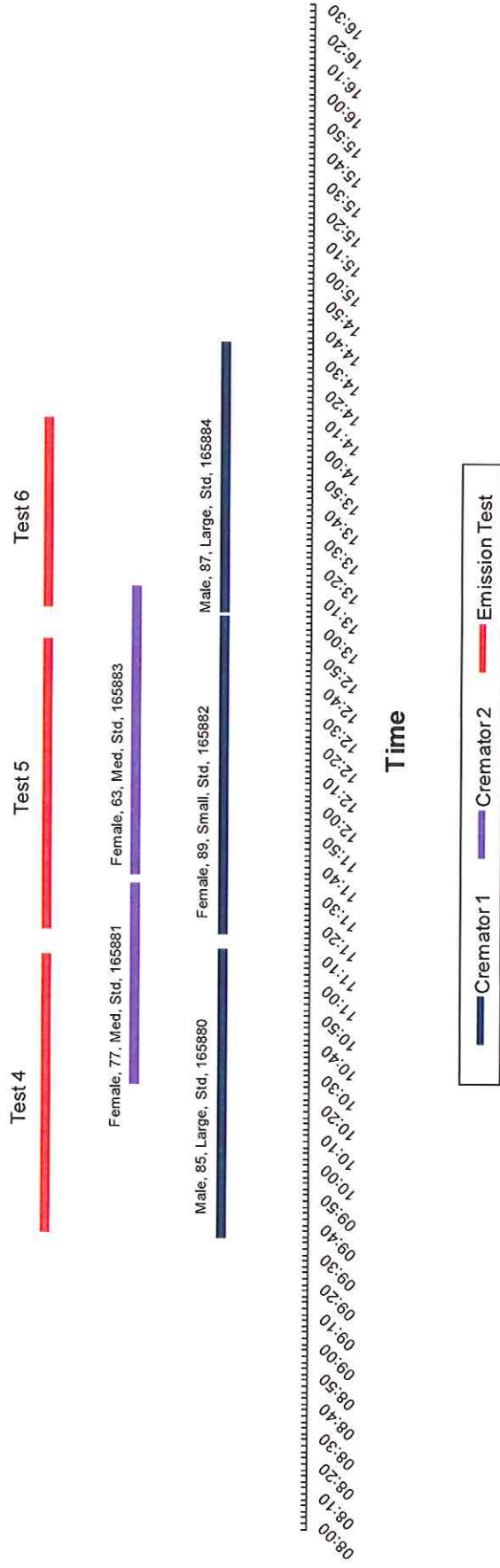
APPENDIX 3

Details of Plant Operation During Testing

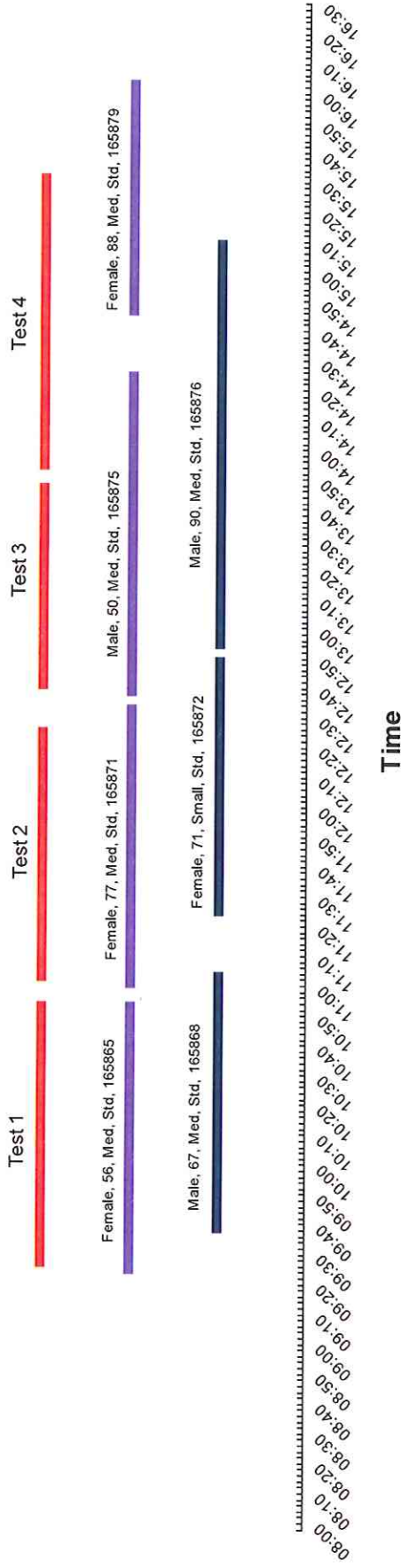
Canley Garden Crematorium Stream 1, Cremators 1 & 2 Emission Tests 27/03/2012 Plant Operation & Test Periods



Canley Garden Crematorium Stream 2, Cremators 1 & 2 Emission Tests 28/03/2012 Plant Operation & Test Periods



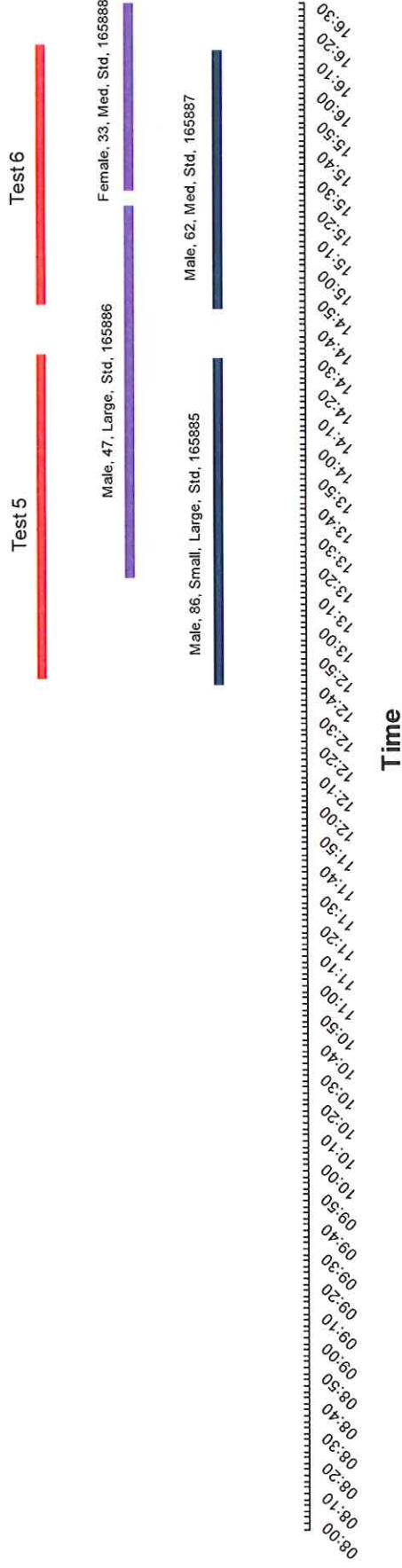
Canley Garden Crematorium Stream 2, Cremators 3 & 4 Emission Tests 27/03/2012 Plant Operation & Test Periods



Legend: █ Cremator 3 █ Cremator 4 █ Emission Test



**Canley Garden Crematorium Stream 2, Cremators 3 & 4
Emission Tests 28/03/2012
Plant Operation & Test Periods**



— Cremator 3 — Cremator 4 — Emission Test

