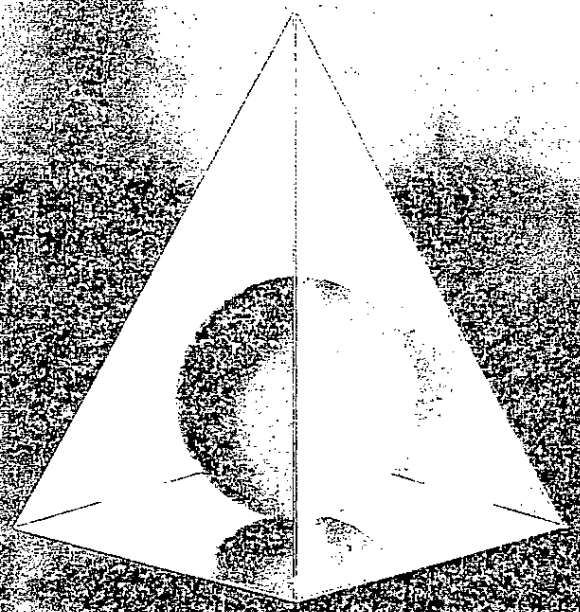
2008 Report



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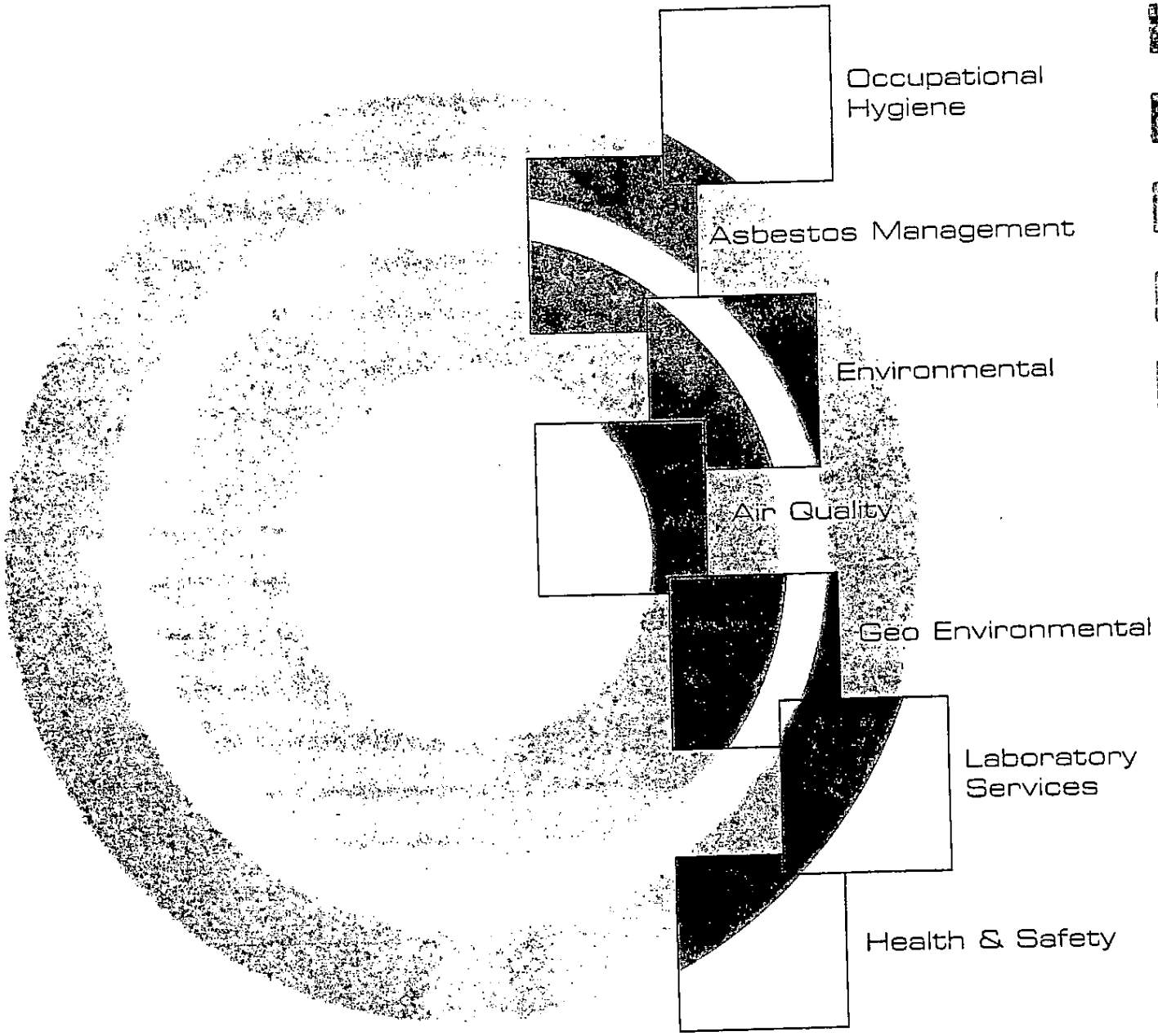

contact Tracey Scott on 0121 359 5361
or email enquiries@oehgroup.co.uk
www.oehgroup.co.uk

MEASUREMENT OF ENVIRONMENTAL EMISSIONS

FROM

METAL COATING OPERATIONS

at

LONDON TAXIS INTERNATIONAL
HOLYHEAD ROAD
COVENTRY
WARWICKSHIRE
CV5 8JJ

REPORT NO:	OEH/31689a/STAK/SL42	**CLIENT REF:**	Purchase Order No: 5709
DATE OF VISIT:	19 November, 2003	**CONTACT ON SITE:**	Chris Cuffin
DATE OF REPORT:	10 January, 2005	**DISK REFERENCE:**	N:\Consultants$\Air Quality\Andy Barnes\Jobs 2003-2004\London Taxis International For reissue\OEH31689a CS F.doc 10/01/2005 13:00

DATA PROTECTION ACT REGISTRATION NO: B0479 03 4

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Date Of Test & Test Areas	Emissions sampling from the Combi Booth Stack (Main Paint Plant) was conducted on 19th November 2003.
Test Conditions	The process was being operated under normal conditions throughout the sampling period. Further details are given below in section 2 of this report.
Compliance	In the absence of any details regarding the authorisation for the site, the emissions have been compared to the limits set out in Process Guidance Note PG6/34(2004) - Respraying of Road Vehicles.
General Observations	The stack serving the clearcoat section of the main booth was also scheduled for sampling on the test date; however no safe access to the sampling position was available so this position could not be sampled.

Surveyed and reported by:

[redacted]

Bill Roberts
Environmental Technician

Verified by:

[redacted]

Andy Barnes *BSc (Hons)*
Environmental Scientist

for and on behalf of OEH Group Limited

If you have any queries or comments regarding this report, please contact Customer Services, OEH Group Ltd. Tel: 0121 359 5361.

1 INTRODUCTION

1.1 Purpose of Survey

The aim of the survey described in this report was to verify compliance with the requirements of the relevant Process Guidance Note, PG6/34(2004) – Respraying of Road Vehicles.

1.2 Terms of Reference

London Taxis International, Holyhead Road, Coventry, Warwickshire, CV5 8JJ, has commissioned OEH Group Limited to carry out the work described in this report. Monitoring was carried out on 19th November 2003, by Bill Roberts, at the request of Chris Cuffin.

The work was carried out in accordance with OEH Proposal ref: EFH-9999, dated 9th May 2003 and with the client's instructions, as set out in Purchase Order 5709.

OEH Group is accredited under ISO-9002 for the provision of health, safety and environmental consultancy services. The work described in this report was carried out in accord with our ISO-9000 Standard Operating Procedures and Level III: Consultancy Work Instructions.

The field sampling and interpretations made in this report are not covered by the scope of OEH's accreditation under UKAS.

1.3 Plant conditions

Production schedules on the dates of the survey were described as normal. Thus, the data reported herein must be considered typical and representative of the environmental levels experienced during normal daily workloads on this site.

2 PROCESS DESCRIPTION

LTI undertake the manufacture of traditional style London Taxis. The production facility utilises a large number of processes. This survey deals only with emissions from the main paint plant combi spraybooth.

Small panels are sprayed in the booth, during this operation the extraction system from the booth is set to discharge to atmosphere.

Once spraying is completed, the exhaust air is heated and recirculated back into the booth for drying, at this stage there is no emission to atmosphere.

Once panels are dry, the heating is switched off and the extraction is again set to discharge to atmosphere.

During the test period the following timings were noted:

10:06 to 11:20 – Little or no activity, extraction exhausting to atmosphere.

11:20 to 11:52 – Spraying takes place, extraction exhausting to atmosphere.

11:52 to 12:30 – Stoving taking place, extracted air heated and recirculated – no flow in emissions stack.

12:30 to 13:45 – Items cooling, extraction exhausting to atmosphere.

3 METHODS

3.1 Stack Sampling

3.1.1 Stack Velocity & Temperature Measurements

Stack velocity was investigated using an ellipsoidal nosed pitot tube coupled to an electronic manometer. Temperature measurements were taken using a K-type thermocouple connected to an electronic thermometer.

The manometer and thermometer are subject to regular calibration by a UKAS accredited test house using NPL (National Physics Laboratory) traceable standards.

3.1.2 Total Particulate Matter

Periodic extractive sampling for total particulate matter was conducted using a Stackmite 9096 sampling train, incorporating an in-stack, 47mm GFA filter. Within the limitations of the stack and field conditions, the sampling protocol was in accordance with the main procedural requirements of BS EN 13284-1:2002. The sampling train was set up and checked for leaks before commencement of the survey and between each sample, all leak rates were below 2% of the maximum sampling flowrate. The Stackmite unit is calibrated annually and is traceable to NPL standards. Calibration dated 31st March 2003.

Once the fan had stopped, sampling was continued at the rate calculated during spraying. This means that the reported emissions may be an overestimate of the true levels.

BSEN 13284-1:2002 was used instead of BS ISO 9096:2003 as requested in PG6/34(2004) as the former standard is specifically designed for low level concentrations expected in the emissions.

BS ISO 9096:2003 is only designed for use in the range 20 – 1000 $mg.m^{-3}$ and BSEN 13284-1:2002 is for use at any concentration below 50 $mg.m^{-3}$.

3.1.3 Volatile Organic Compounds (VOC)

Continuous extractive sampling for VOCs was conducted using a Research Engineers Flame Ionisation Detector. The instrument was calibrated on site using standard methane span gas traceable to an NPL standard. Results are expressed as methane equivalent values. The sampling protocol was in accordance with the main procedural requirements of BS EN 13526:2002.

Continuous extractive sampling was backed up by periodic extractive sampling for VOCs using a calibrated pump connected to charcoal adsorption tubes. The method is based on, and intended to satisfy the main procedural requirements of BS EN 13649:2002. The results of this tube sampling were used to provide a correction factor for the FID sampling.

3.1.4 Isocyanates

Periodic extractive sampling for Isocyanates was conducted using a calibrated pump connected to an impinger sampling train containing a solution of 1-(2-methoxyphenyl)piperazine. The method is based on, and intended to satisfy the main procedural requirements of BS ISO 16702.

3.2 Analysis

3.2.1 Techniques & Detection Limits

Analyte	Analysis Technique	Detection Limit	Analytical Precision, %	Method Reference
TPM	Gravimetric	20 µg	1	LSOP 202
Isocyanates	HPLC	0.02 µg NCO	10	LSOP 502
Continuous VOC	Flame Ionisation Detector	0.2 $mg.m^{-3}$ as carbon	5	BS EN 13526
Periodic VOC	Gas Chromatography	2 µg as carbon	5	Variation on LSOP 402

3.2.2 Accreditation

Service Category	ISO-9002	UKAS[1]
Consultancy	Yes	No
Analysis		
- Dusts (air filter samples); Lab Method LSOP 202, based on MDHS14 (latest issue)	Yes	Yes
- Solvents (B, T, X 111-T, TCE, PERC); Lab Method LSOP402, based on Various NIOSH	Yes	Yes
- Solvents (all other species); Based on Various NIOSH	Yes	No
- Isocyanates (impinger samples); Lab Method LSOP 502, based on MDHS25 (latest issue)	Yes	No
[1]UKAS lab number 1821		
Stack sampling team is a member of the Source Testing Association		

4 PRESENTATION OF RESULTS

The following table gives summary details of the mean emission concentrations measured for all parameters from all positions.

Sampling Position	Mean Particulate Emission ($mg.m^{-3}$)	Mean Isocyanate Emission ($mg.m^{-3}$)	Mean VOC Emission ($mgC.m^{-3}$)
Main Paint Plant Combi Booth	4.2 (11:30 – 11:55)	<0.001 (11:30 – 11:52)	4.9 (10:07 – 13:45)

Results reported at Standard Conditions of 273K and 101.3kPa, no correction for water vapour content.

Detailed results for all sampling positions are included in the Appendices of this report as follows:

Appendix I lists in tabular form further details of the particulate results, including additional data from the pitot traverses, along with filter weight details and sampling parameters.

The recorded data for VOC concentrations is presented in both graphical and tabular form in Appendix II. This includes the 2-minute and 15-minute average data for VOCs.

5 DISCUSSION

The coating processes are covered by the Secretary of States Guidance Note, PG6/34(2004) – Respraying of Road Vehicles, which gives the following limits

Parameter	Emissions Limit
Total Particulate Matter	10 $mg.m^{-3}$
Isocyanates (expressed as total NCO group)	non stated (0.1 $mg.m^{-3}$ is typical limit in other guidance notes)
Volatile Organic Compounds (as total carbon excluding particulate matter)	50 $mg.m^{-3}$ as: 2 minute mean averages for spraying operations. 15 minute averages for baking operations.

5.1 Volatile Organic Compounds

The average measured emission over the entire test period was 4.9 $mg.m^{-3}$. This result is representative of the entire process.

The average over the spraying period only (11:20 – 11:52) was 12.7 $mg.m^{-3}$. This result is representative of worst case emissions.

The highest two minute average over the spraying period was 51.9 $mg.m^{-3}$.

The highest fifteen minute average over the bake period was 6.4 $mg.m^{-3}$.

5.2 Particulate Matter

The measured particulate emission concentration was 4.2 $mg.m^{-3}$ and was therefore well below the 10 $mg.m^{-3}$ emissions limit.

The sample was taken at the point of most likely emissions when spraying was occurring; this was therefore a worst case emission level.

5.3 Isocyanates

Isocyanate emissions were less than the 0.001 $mg.m^{-3}$ analytical limit of detection and as such were well below the typical emissions limit of 0.1 $mg.m^{-3}$.

The sample was taken at the point of most likely emissions when spraying was occurring; this was therefore a worst case emission level.

5.4 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Main Paint Plant Combi Booth	None	Yes - See Below	None

The sampling plane does not meet the flow requirements of BS EN 13284-1:2002 – Section 5.2, for the following reasons:

Ratio of highest to lowest gas velocity exceeded the allowed 3:1 level at 3.66:1; however there was no safe alternative position available.

There were sampling deviations from BS EN 13284-1:2002 as follows:

Only 1 sample could be performed due to the short amount of spraying taking place in the booth, the test was for 25 minutes only.

Only two sampling positions were used on one sampling line, this is because the second sampling line could not be safely accessed.

The isokinetic rate was just outside the allowed criterion of -5 to +15% at -5.6%.

6 CONCLUSIONS

From the data reported it can be seen that the process does not demonstrate compliance with the emission limits set down in the relevant Process Guidance Notes under normal and typical workloads. One two minute VOC average from the spray part of the cycle marginally exceeded the emissions limit.

7 APPENDICES

Appendix I: Detailed Particulate & Flowrate Results Tables

Appendix II: VOC Profiling Data

Appendix III: Calibration Certificates

APPENDIX I

DETAILED PARTICULATE & FLOWRATE RESULTS TABLES

Plant Type	**Combi Booth**	Stack Area (m^2)	0.454
Job Number	**OEH 31689**	Meter Temp (C)	30
Client Name	**London Taxis**	Stack Diameter (cm)	76
Date	**19th November 2003**	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	50
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	6.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	*150*	*130*	*50*	*22*	*18*	*12*	*11*	*20*	*38*	*60*
Temperature (°C)	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*
Duct Velocity (m/s)	16.1	15.0	9.3	6.2	5.6	4.5	4.4	5.9	8.1	10.2

Absolute Mean Duct Velocity (m/s)	**8.5**
Absolute Flow Rate (m^3/hr)	**13903**
Normalised Flow Rate (Nm^3/hr)	**12492**

Sampling Run 1 **Time: 11:30 - 11:55**

Sampling Point	A3	A8
Sampling Rate (l/min)	*15*	*10*
Sampling Duration (mins)	*12.5*	*12.5*
Filter No	*8110*	*8110*
Volume Sampled (m^3)	Meter 0.295	Expected 0.313

Initial Meter Reading (l)	691150
Final Meter Reading (l)	691445
Volume Sampled (l)	295
Isokineticity Error (%)	-5.6

(Maximum Allowed Error = -5 to +15%)

Corrected Volume = 0.27 Nm^3 (at NTP)

FILTER WEIGHTS

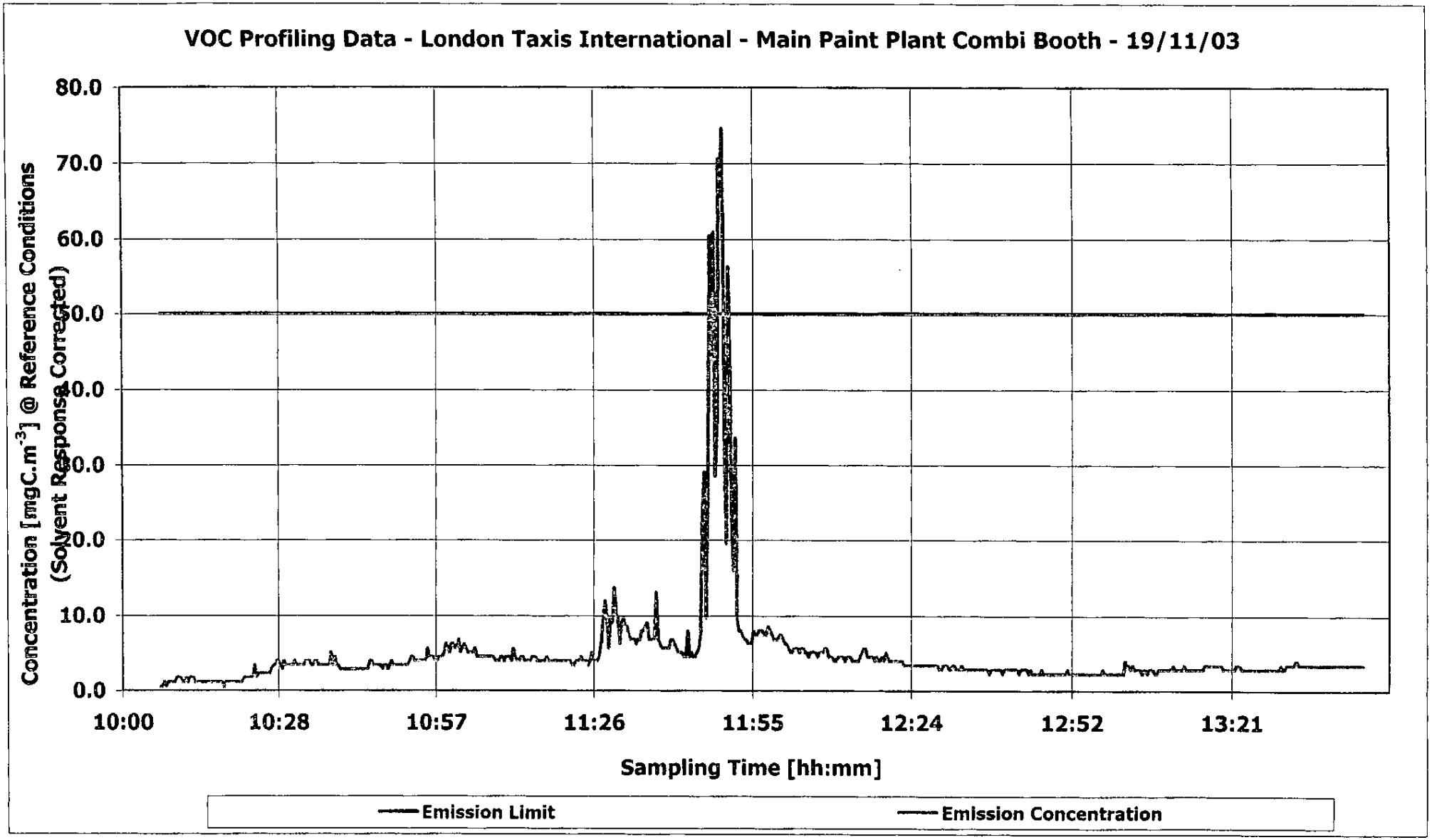
Test Number	Filter No	Pre-Weight (mg	Post-Weight (m	Gain (mg)
1	8110	56.20	57.32	1.12

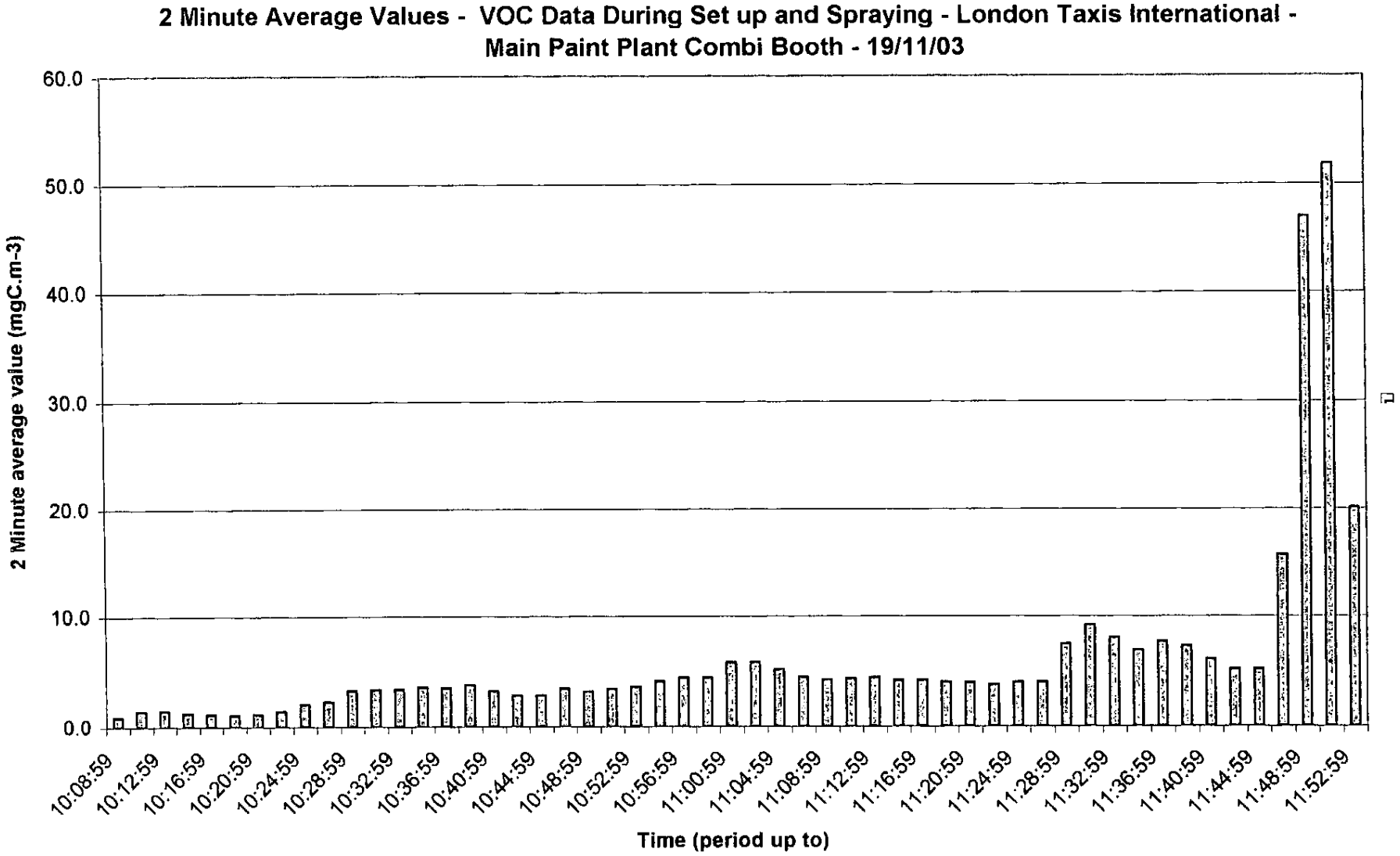
TEST RESULTS

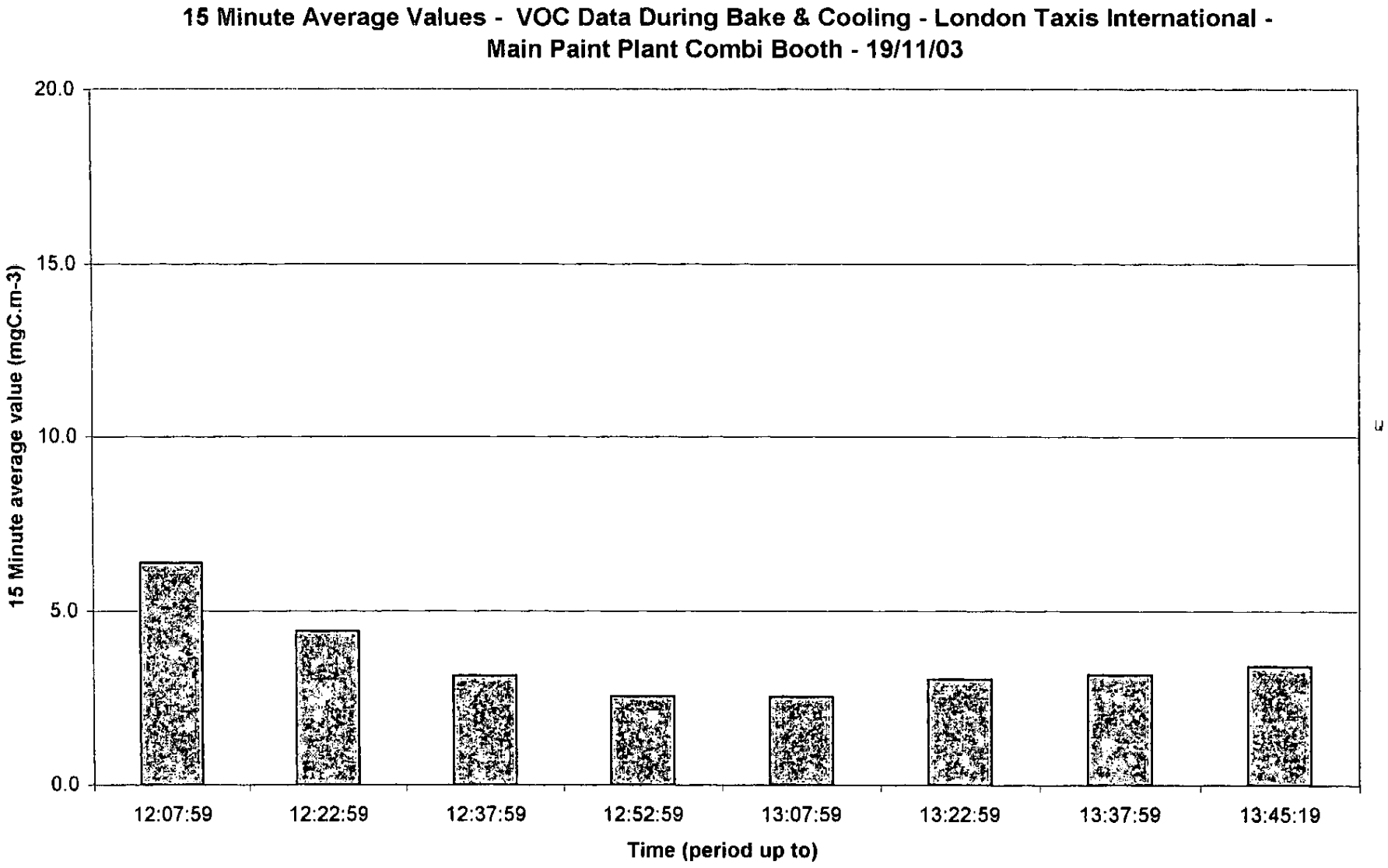
	Test 1	Mean
Particulate Concentration(mg/Nm	**4.2**	**4.2**
Mass Emission (g/hr)	**53**	**53**

APPENDIX II

VOC PROFILING DATA


VOC Profiling Data - London Taxis International - Main Paint Plant Combi Booth - 19/11/03
Concentration [mgC.m-3] @ Reference Conditions
(Solvent Response Corrected)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
10:00
10:28
10:57
11:26
11:55
12:24
12:52
13:21
Sampling Time [hh:mm]
Emission Limit
Emission Concentration


2 Minute Average Values - VOC Data During Set up and Spraying - London Taxis International - Main Paint Plant Combi Booth - 19/11/03
2 Minute average value (mgC.m-3)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
10:08:59
10:12:59
10:16:59
10:20:59
10:24:59
10:28:59
10:32:59
10:36:59
10:40:59
10:44:59
10:48:59
10:52:59
10:56:59
11:00:59
11:04:59
11:08:59
11:12:59
11:16:59
11:20:59
11:24:59
11:28:59
11:32:59
11:36:59
11:40:59
11:44:59
11:48:59
11:52:59
Time (period up to)


15 Minute Average Values - VOC Data During Bake & Cooling - London Taxis International - Main Paint Plant Combi Booth - 19/11/03
20.0
15.0
10.0
5.0
0.0
15 Minute average value (mgC.m-3)
12:07:59
12:22:59
12:37:59
12:52:59
13:07:59
13:22:59
13:37:59
13:45:19
Time (period up to)

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
10:06:59	0.2	31	0.53
10:07:19	0.2	31	0.53
10:07:39	0.4	31	1.14
10:07:59	0.2	31	0.53
10:08:19	0.4	31	1.14
10:08:39	0.4	31	1.14
10:08:59	0.4	31	1.14
10:09:19	0.4	31	1.14
10:09:39	0.4	31	1.14
10:09:59	0.5	31	1.74
10:10:19	0.5	31	1.74
10:10:39	0.5	31	1.74
10:10:59	0.4	31	1.14
10:11:19	0.4	31	1.14
10:11:39	0.5	31	1.74
10:11:59	0.4	31	1.14
10:12:19	0.5	31	1.74
10:12:39	0.5	31	1.74
10:12:59	0.5	31	1.74
10:13:19	0.4	31	1.14
10:13:39	0.4	31	1.14
10:13:59	0.4	31	1.14
10:14:19	0.4	31	1.14
10:14:39	0.4	31	1.14
10:14:59	0.4	31	1.14
10:15:19	0.4	31	1.14
10:15:39	0.4	31	1.14
10:15:59	0.4	31	1.14
10:16:19	0.4	31	1.14
10:16:39	0.4	31	1.14
10:16:59	0.4	31	1.14
10:17:19	0.4	31	1.14
10:17:39	0.4	31	1.14
10:17:59	0.4	31	1.14
10:18:19	0.4	31	1.14
10:18:39	0.2	31	0.53
10:18:59	0.4	31	1.14
10:19:19	0.4	31	1.14
10:19:39	0.4	31	1.14
10:19:59	0.4	31	1.14
10:20:19	0.4	31	1.14
10:20:39	0.4	31	1.14
10:20:59	0.4	31	1.14
10:21:19	0.4	31	1.14

VOC Emission Data

OEH Group Limited

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
10:21:39	0.4	31	1.14
10:21:59	0.4	31	1.14
10:22:19	0.5	31	1.74
10:22:39	0.5	31	1.74
10:22:59	0.5	31	1.74
10:23:19	0.5	31	1.74
10:23:39	0.5	31	1.74
10:23:59	0.5	31	1.74
10:24:19	1.1	31	3.41
10:24:39	0.5	31	1.74
10:24:59	0.7	31	2.27
10:25:19	0.7	31	2.27
10:25:39	0.7	31	2.27
10:25:59	0.7	31	2.27
10:26:19	0.7	31	2.27
10:26:39	0.7	31	2.27
10:26:59	0.7	31	2.27
10:27:19	0.9	31	2.88
10:27:39	1.1	31	3.41
10:27:59	1.1	31	3.41
10:28:19	1.2	31	4.01
10:28:39	1.2	31	4.01
10:28:59	1.1	31	3.41
10:29:19	0.9	31	2.88
10:29:39	1.2	31	4.01
10:29:59	1.1	31	3.41
10:30:19	1.1	31	3.41
10:30:39	1.1	31	3.41
10:30:59	1.1	31	3.41
10:31:19	1.1	31	3.41
10:31:39	1.2	31	4.01
10:31:59	1.1	31	3.41
10:32:19	1.1	31	3.41
10:32:39	1.1	31	3.41
10:32:59	1.1	31	3.41
10:33:19	1.1	31	3.41
10:33:39	1.2	31	4.01
10:33:59	1.2	31	4.01
10:34:19	1.2	31	4.01
10:34:39	1.1	31	3.41
10:34:59	1.1	31	3.41
10:35:19	1.2	31	4.01
10:35:39	1.2	31	4.01
10:35:59	1.1	31	3.41

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
10:36:19	1.1	31	3.41
10:36:39	1.1	31	3.41
10:36:59	1.1	31	3.41
10:37:19	1.1	31	3.41
10:37:39	1.1	31	3.41
10:37:59	1.1	31	3.41
10:38:19	1.6	31	5.15
10:38:39	1.1	31	3.41
10:38:59	1.4	31	4.54
10:39:19	1.1	31	3.41
10:39:39	1.1	31	3.41
10:39:59	0.9	31	2.88
10:40:19	0.9	31	2.88
10:40:39	0.9	31	2.88
10:40:59	0.9	31	2.88
10:41:19	0.9	31	2.88
10:41:39	0.9	31	2.88
10:41:59	0.9	31	2.88
10:42:19	0.9	31	2.88
10:42:39	0.9	31	2.88
10:42:59	0.9	31	2.88
10:43:19	0.9	31	2.88
10:43:39	0.9	31	2.88
10:43:59	0.9	31	2.88
10:44:19	0.9	31	2.88
10:44:39	0.9	31	2.88
10:44:59	0.9	31	2.88
10:45:19	1.2	31	4.01
10:45:39	1.2	31	4.01
10:45:59	1.1	31	3.41
10:46:19	1.1	31	3.41
10:46:39	1.1	31	3.41
10:46:59	1.1	31	3.41
10:47:19	1.1	31	3.41
10:47:39	0.9	31	2.88
10:47:59	1.1	31	3.41
10:48:19	1.1	31	3.41
10:48:39	0.9	31	2.88
10:48:59	1.1	31	3.41
10:49:19	1.2	31	4.01
10:49:39	1.1	31	3.41
10:49:59	1.1	31	3.41
10:50:19	1.1	31	3.41
10:50:39	1.1	31	3.41

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
10:50:59	1.1	31	3.41
10:51:19	1.1	31	3.41
10:51:39	1.1	31	3.41
10:51:59	1.1	31	3.41
10:52:19	1.1	31	3.41
10:52:39	1.2	31	4.01
10:52:59	1.4	31	4.54
10:53:19	1.4	31	4.54
10:53:39	1.2	31	4.01
10:53:59	1.2	31	4.01
10:54:19	1.2	31	4.01
10:54:39	1.2	31	4.01
10:54:59	1.2	31	4.01
10:55:19	1.2	31	4.01
10:55:39	1.2	31	4.01
10:55:59	1.8	31	5.68
10:56:19	1.4	31	4.54
10:56:39	1.4	31	4.54
10:56:59	1.4	31	4.54
10:57:19	1.2	31	4.01
10:57:39	1.2	31	4.01
10:57:59	1.4	31	4.54
10:58:19	1.4	31	4.54
10:58:39	1.4	31	4.54
10:58:59	1.6	31	5.15
10:59:19	2.0	31	6.29
10:59:39	1.8	31	5.68
10:59:59	1.6	31	5.15
11:00:19	2.0	31	6.29
11:00:39	2.0	31	6.29
11:00:59	1.8	31	5.68
11:01:19	1.8	31	5.68
11:01:39	2.1	31	6.82
11:01:59	1.6	31	5.15
11:02:19	1.8	31	5.68
11:02:39	2.0	31	6.29
11:02:59	1.8	31	5.68
11:03:19	1.6	31	5.15
11:03:39	1.6	31	5.15
11:03:59	1.6	31	5.15
11:04:19	1.6	31	5.15
11:04:39	1.8	31	5.68
11:04:59	1.4	31	4.54
11:05:19	1.4	31	4.54

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions (mgC.m^{-3})	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) (mgC.m^{-3})
11:05:39	1.4	31	4.54
11:05:59	1.4	31	4.54
11:06:19	1.4	31	4.54
11:06:39	1.4	31	4.54
11:06:59	1.4	31	4.54
11:07:19	1.4	31	4.54
11:07:39	1.4	31	4.54
11:07:59	1.4	31	4.54
11:08:19	1.2	31	4.01
11:08:39	1.2	31	4.01
11:08:59	1.2	31	4.01
11:09:19	1.4	31	4.54
11:09:39	1.4	31	4.54
11:09:59	1.2	31	4.01
11:10:19	1.4	31	4.54
11:10:39	1.4	31	4.54
11:10:59	1.4	31	4.54
11:11:19	1.2	31	4.01
11:11:39	1.8	31	5.68
11:11:59	1.4	31	4.54
11:12:19	1.2	31	4.01
11:12:39	1.2	31	4.01
11:12:59	1.4	31	4.54
11:13:19	1.4	31	4.54
11:13:39	1.2	31	4.01
11:13:59	1.2	31	4.01
11:14:19	1.2	31	4.01
11:14:39	1.2	31	4.01
11:14:59	1.4	31	4.54
11:15:19	1.4	31	4.54
11:15:39	1.4	31	4.54
11:15:59	1.2	31	4.01
11:16:19	1.2	31	4.01
11:16:39	1.2	31	4.01
11:16:59	1.2	31	4.01
11:17:19	1.2	31	4.01
11:17:39	1.4	31	4.54
11:17:59	1.2	31	4.01
11:18:19	1.2	31	4.01
11:18:39	1.2	31	4.01
11:18:59	1.2	31	4.01
11:19:19	1.2	31	4.01
11:19:39	1.2	31	4.01
11:19:59	1.2	31	4.01

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
11:20:19	1.2	31	4.01
11:20:39	1.2	31	4.01
11:20:59	1.2	31	4.01
11:21:19	1.2	31	4.01
11:21:39	1.2	31	4.01
11:21:59	1.2	31	4.01
11:22:19	1.1	31	3.41
11:22:39	1.1	31	3.41
11:22:59	1.2	31	4.01
11:23:19	1.2	31	4.01
11:23:39	1.2	31	4.01
11:23:59	1.4	31	4.54
11:24:19	1.2	31	4.01
11:24:39	1.2	31	4.01
11:24:59	1.2	31	4.01
11:25:19	1.1	31	3.41
11:25:39	1.2	31	4.01
11:25:59	1.6	31	5.15
11:26:19	1.2	31	4.01
11:26:39	1.2	31	4.01
11:26:59	1.2	31	4.01
11:27:19	1.4	31	4.54
11:27:39	2.1	31	6.82
11:27:59	3.0	31	9.69
11:28:19	3.7	31	11.97
11:28:39	3.0	31	9.69
11:28:59	1.8	31	5.68
11:29:19	3.0	31	9.69
11:29:39	2.8	31	9.09
11:29:59	4.3	31	13.71
11:30:19	3.2	31	10.22
11:30:39	3.0	31	9.69
11:30:59	2.0	31	6.29
11:31:19	2.8	31	9.09
11:31:39	3.0	31	9.69
11:31:59	2.7	31	8.56
11:32:19	2.7	31	8.56
11:32:39	2.3	31	7.42
11:32:59	2.1	31	6.82
11:33:19	2.1	31	6.82
11:33:39	2.1	31	6.82
11:33:59	2.0	31	6.29
11:34:19	2.1	31	6.82
11:34:39	2.1	31	6.82

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
11:34:59	2.5	31	7.95
11:35:19	2.5	31	7.95
11:35:39	2.7	31	8.56
11:35:59	2.8	31	9.09
11:36:19	2.1	31	6.82
11:36:39	2.1	31	6.82
11:36:59	2.1	31	6.82
11:37:19	2.1	31	6.82
11:37:39	4.1	31	13.10
11:37:59	2.1	31	6.82
11:38:19	2.0	31	6.29
11:38:39	1.8	31	5.68
11:38:59	1.8	31	5.68
11:39:19	1.8	31	5.68
11:39:39	1.8	31	5.68
11:39:59	1.8	31	5.68
11:40:19	2.1	31	6.82
11:40:39	2.1	31	6.82
11:40:59	2.0	31	6.29
11:41:19	1.8	31	5.68
11:41:39	1.6	31	5.15
11:41:59	1.6	31	5.15
11:42:19	1.6	31	5.15
11:42:39	1.4	31	4.54
11:42:59	1.4	31	4.54
11:43:19	2.5	31	7.95
11:43:39	1.4	31	4.54
11:43:59	1.6	31	5.15
11:44:19	1.4	31	4.54
11:44:39	1.4	31	4.54
11:44:59	1.6	31	5.15
11:45:19	1.8	31	5.68
11:45:39	2.3	31	7.42
11:45:59	7.4	31	23.93
11:46:19	9.1	31	29.08
11:46:39	3.0	31	9.69
11:46:59	9.1	31	29.08
11:47:19	18.8	31	60.44
11:47:39	13.7	31	43.93
11:47:59	19.0	31	60.97
11:48:19	8.9	31	28.48
11:48:39	11.0	31	35.37
11:48:59	22.0	31	70.66
11:49:19	20.4	31	65.59

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
11:49:39	23.2	31	74.67
11:49:59	10.3	31	33.10
11:50:19	6.0	31	19.39
11:50:39	17.6	31	56.42
11:50:59	13.5	31	43.32
11:51:19	6.9	31	22.27
11:51:39	5.0	31	15.98
11:51:59	10.5	31	33.63
11:52:19	3.0	31	9.69
11:52:39	2.5	31	7.95
11:52:59	2.5	31	7.95
11:53:19	2.3	31	7.42
11:53:39	2.1	31	6.82
11:53:59	2.1	31	6.82
11:54:19	2.0	31	6.29
11:54:39	2.0	31	6.29
11:54:59	2.0	31	6.29
11:55:19	2.5	31	7.95
11:55:39	2.3	31	7.42
11:55:59	2.3	31	7.42
11:56:19	2.5	31	7.95
11:56:39	2.5	31	7.95
11:56:59	2.5	31	7.95
11:57:19	2.3	31	7.42
11:57:39	2.3	31	7.42
11:57:59	2.7	31	8.56
11:58:19	2.5	31	7.95
11:58:39	2.3	31	7.42
11:58:59	2.1	31	6.82
11:59:19	2.1	31	6.82
11:59:39	2.1	31	6.82
11:59:59	2.3	31	7.42
12:00:19	2.3	31	7.42
12:00:39	2.1	31	6.82
12:00:59	2.0	31	6.29
12:01:19	2.0	31	6.29
12:01:39	1.8	31	5.68
12:01:59	1.6	31	5.15
12:02:19	1.6	31	5.15
12:02:39	1.8	31	5.68
12:02:59	1.8	31	5.68
12:03:19	1.8	31	5.68
12:03:39	1.6	31	5.15
12:03:59	1.8	31	5.68

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
12:04:19	1.8	31	5.68
12:04:39	1.6	31	5.15
12:04:59	1.6	31	5.15
12:05:19	1.4	31	4.54
12:05:39	1.6	31	5.15
12:05:59	1.6	31	5.15
12:06:19	1.6	31	5.15
12:06:39	1.6	31	5.15
12:06:59	1.4	31	4.54
12:07:19	1.6	31	5.15
12:07:39	1.6	31	5.15
12:07:59	1.6	31	5.15
12:08:19	1.8	31	5.68
12:08:39	1.8	31	5.68
12:08:59	1.4	31	4.54
12:09:19	1.4	31	4.54
12:09:39	1.4	31	4.54
12:09:59	1.2	31	4.01
12:10:19	1.2	31	4.01
12:10:39	1.4	31	4.54
12:10:59	1.4	31	4.54
12:11:19	1.4	31	4.54
12:11:39	1.4	31	4.54
12:11:59	1.2	31	4.01
12:12:19	1.4	31	4.54
12:12:39	1.4	31	4.54
12:12:59	1.4	31	4.54
12:13:19	1.2	31	4.01
12:13:39	1.2	31	4.01
12:13:59	1.2	31	4.01
12:14:19	1.2	31	4.01
12:14:39	1.4	31	4.54
12:14:59	1.6	31	5.15
12:15:19	1.8	31	5.68
12:15:39	1.8	31	5.68
12:15:59	1.4	31	4.54
12:16:19	1.4	31	4.54
12:16:39	1.4	31	4.54
12:16:59	1.4	31	4.54
12:17:19	1.2	31	4.01
12:17:39	1.4	31	4.54
12:17:59	1.2	31	4.01
12:18:19	1.2	31	4.01
12:18:39	1.4	31	4.54

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
12:18:59	1.2	31	4.01
12:19:19	1.6	31	5.15
12:19:39	1.4	31	4.54
12:19:59	1.2	31	4.01
12:20:19	1.2	31	4.01
12:20:39	1.2	31	4.01
12:20:59	1.2	31	4.01
12:21:19	1.2	31	4.01
12:21:39	1.2	31	4.01
12:21:59	1.2	31	4.01
12:22:19	1.2	31	4.01
12:22:39	1.1	31	3.41
12:22:59	1.1	31	3.41
12:23:19	1.1	31	3.41
12:23:39	1.1	31	3.41
12:23:59	1.1	31	3.41
12:24:19	1.1	31	3.41
12:24:39	1.1	31	3.41
12:24:59	1.1	31	3.41
12:25:19	1.1	31	3.41
12:25:39	1.1	31	3.41
12:25:59	1.1	31	3.41
12:26:19	1.1	31	3.41
12:26:39	1.1	31	3.41
12:26:59	1.1	31	3.41
12:27:19	1.1	31	3.41
12:27:39	1.1	31	3.41
12:27:59	1.1	31	3.41
12:28:19	1.1	31	3.41
12:28:39	1.1	31	3.41
12:28:59	0.9	31	2.88
12:29:19	0.9	31	2.88
12:29:39	1.1	31	3.41
12:29:59	1.1	31	3.41
12:30:19	1.1	31	3.41
12:30:39	0.9	31	2.88
12:30:59	0.9	31	2.88
12:31:19	1.1	31	3.41
12:31:39	1.1	31	3.41
12:31:59	0.9	31	2.88
12:32:19	0.9	31	2.88
12:32:39	0.9	31	2.88
12:32:59	1.1	31	3.41
12:33:19	0.9	31	2.88

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
12:33:39	0.9	31	2.88
12:33:59	0.9	31	2.88
12:34:19	0.9	31	2.88
12:34:39	0.9	31	2.88
12:34:59	0.9	31	2.88
12:35:19	0.9	31	2.88
12:35:39	0.9	31	2.88
12:35:59	0.9	31	2.88
12:36:19	0.9	31	2.88
12:36:39	0.9	31	2.88
12:36:59	0.9	31	2.88
12:37:19	0.9	31	2.88
12:37:39	0.9	31	2.88
12:37:59	0.7	31	2.27
12:38:19	0.9	31	2.88
12:38:39	0.9	31	2.88
12:38:59	0.9	31	2.88
12:39:19	0.9	31	2.88
12:39:39	0.9	31	2.88
12:39:59	0.9	31	2.88
12:40:19	0.7	31	2.27
12:40:39	0.9	31	2.88
12:40:59	0.9	31	2.88
12:41:19	0.9	31	2.88
12:41:39	0.9	31	2.88
12:41:59	0.9	31	2.88
12:42:19	0.9	31	2.88
12:42:39	0.9	31	2.88
12:42:59	0.9	31	2.88
12:43:19	0.7	31	2.27
12:43:39	0.9	31	2.88
12:43:59	0.9	31	2.88
12:44:19	0.9	31	2.88
12:44:39	0.9	31	2.88
12:44:59	0.7	31	2.27
12:45:19	0.9	31	2.88
12:45:39	0.7	31	2.27
12:45:59	0.7	31	2.27
12:46:19	0.7	31	2.27
12:46:39	0.7	31	2.27
12:46:59	0.7	31	2.27
12:47:19	0.9	31	2.88
12:47:39	0.7	31	2.27
12:47:59	0.7	31	2.27

VOC Emission Data

OEH Group Limited

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
12:48:19	0.7	31	2.27
12:48:39	0.7	31	2.27
12:48:59	0.7	31	2.27
12:49:19	0.7	31	2.27
12:49:39	0.7	31	2.27
12:49:59	0.7	31	2.27
12:50:19	0.7	31	2.27
12:50:39	0.7	31	2.27
12:50:59	0.7	31	2.27
12:51:19	0.7	31	2.27
12:51:39	0.7	31	2.27
12:51:59	0.9	31	2.88
12:52:19	0.7	31	2.27
12:52:39	0.7	31	2.27
12:52:59	0.7	31	2.27
12:53:19	0.7	31	2.27
12:53:39	0.7	31	2.27
12:53:59	0.7	31	2.27
12:54:19	0.7	31	2.27
12:54:39	0.7	31	2.27
12:54:59	0.7	31	2.27
12:55:19	0.7	31	2.27
12:55:39	0.7	31	2.27
12:55:59	0.7	31	2.27
12:56:19	0.7	31	2.27
12:56:39	0.7	31	2.27
12:56:59	0.7	31	2.27
12:57:19	0.7	31	2.27
12:57:39	0.7	31	2.27
12:57:59	0.7	31	2.27
12:58:19	0.9	31	2.88
12:58:39	0.7	31	2.27
12:58:59	0.7	31	2.27
12:59:19	0.7	31	2.27
12:59:39	0.7	31	2.27
12:59:59	0.7	31	2.27
13:00:19	0.7	31	2.27
13:00:39	0.7	31	2.27
13:00:59	0.7	31	2.27
13:01:19	0.7	31	2.27
13:01:39	0.7	31	2.27
13:01:59	0.7	31	2.27
13:02:19	1.2	31	4.01
13:02:39	1.1	31	3.41

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
13:02:59	1.1	31	3.41
13:03:19	0.9	31	2.88
13:03:39	1.1	31	3.41
13:03:59	0.9	31	2.88
13:04:19	0.9	31	2.88
13:04:39	0.9	31	2.88
13:04:59	0.9	31	2.88
13:05:19	0.7	31	2.27
13:05:39	0.9	31	2.88
13:05:59	0.9	31	2.88
13:06:19	0.7	31	2.27
13:06:39	0.9	31	2.88
13:06:59	0.9	31	2.88
13:07:19	0.9	31	2.88
13:07:39	0.7	31	2.27
13:07:59	0.7	31	2.27
13:08:19	0.9	31	2.88
13:08:39	0.9	31	2.88
13:08:59	0.9	31	2.88
13:09:19	0.9	31	2.88
13:09:39	0.9	31	2.88
13:09:59	0.9	31	2.88
13:10:19	0.9	31	2.88
13:10:39	0.9	31	2.88
13:10:59	1.1	31	3.41
13:11:19	0.9	31	2.88
13:11:39	0.9	31	2.88
13:11:59	0.9	31	2.88
13:12:19	0.9	31	2.88
13:12:39	0.9	31	2.88
13:12:59	1.1	31	3.41
13:13:19	0.9	31	2.88
13:13:39	0.9	31	2.88
13:13:59	0.9	31	2.88
13:14:19	0.9	31	2.88
13:14:39	0.9	31	2.88
13:14:59	0.9	31	2.88
13:15:19	0.9	31	2.88
13:15:39	0.9	31	2.88
13:15:59	0.9	31	2.88
13:16:19	0.9	31	2.88
13:16:39	1.1	31	3.41
13:16:59	1.1	31	3.41
13:17:19	1.1	31	3.41

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
13:17:39	1.1	31	3.41
13:17:59	1.1	31	3.41
13:18:19	1.1	31	3.41
13:18:39	1.1	31	3.41
13:18:59	1.1	31	3.41
13:19:19	1.1	31	3.41
13:19:39	1.1	31	3.41
13:19:59	0.9	31	2.88
13:20:19	0.9	31	2.88
13:20:39	0.9	31	2.88
13:20:59	0.9	31	2.88
13:21:19	0.9	31	2.88
13:21:39	0.9	31	2.88
13:21:59	0.9	31	2.88
13:22:19	1.1	31	3.41
13:22:39	1.1	31	3.41
13:22:59	1.1	31	3.41
13:23:19	0.9	31	2.88
13:23:39	0.9	31	2.88
13:23:59	0.9	31	2.88
13:24:19	0.9	31	2.88
13:24:39	0.9	31	2.88
13:24:59	0.9	31	2.88
13:25:19	0.9	31	2.88
13:25:39	0.9	31	2.88
13:25:59	0.9	31	2.88
13:26:19	0.9	31	2.88
13:26:39	0.9	31	2.88
13:26:59	0.9	31	2.88
13:27:19	0.9	31	2.88
13:27:39	0.9	31	2.88
13:27:59	0.9	31	2.88
13:28:19	0.9	31	2.88
13:28:39	0.9	31	2.88
13:28:59	0.9	31	2.88
13:29:19	0.9	31	2.88
13:29:39	0.9	31	2.88
13:29:59	0.9	31	2.88
13:30:19	1.1	31	3.41
13:30:39	0.9	31	2.88
13:30:59	0.9	31	2.88
13:31:19	1.1	31	3.41
13:31:39	1.1	31	3.41
13:31:59	1.1	31	3.41

VOC Emission Data

Job Ref:	**OEH 31689**
Client Name:	**LTI**
Location:	**Combi Booth**
Date:	**19-Nov-03**
Scientist:	**BR**

Technical Details

Instrument Type	**FID**
Calib Gas	**Methane**
% C:	**75**
Sample Number:	**SA 5376**
Instrument Range:	**440**
Emission Limit:	**50**

Sampling Time	VOC as Methane Equivalent@ Reference Conditions ($mgC.m^{-3}$)	Stack Temp (°C)	VOC as Carbon @ Reference Conditions (Solvent Response Corrected) ($mgC.m^{-3}$)
13:32:19	1.1	31	3.41
13:32:39	1.1	31	3.41
13:32:59	1.2	31	4.01
13:33:19	1.2	31	4.01
13:33:39	1.1	31	3.41
13:33:59	1.1	31	3.41
13:34:19	1.1	31	3.41
13:34:39	1.1	31	3.41
13:34:59	1.1	31	3.41
13:35:19	1.1	31	3.41
13:35:39	1.1	31	3.41
13:35:59	1.1	31	3.41
13:36:19	1.1	31	3.41
13:36:39	1.1	31	3.41
13:36:59	1.1	31	3.41
13:37:19	1.1	31	3.41
13:37:39	1.1	31	3.41
13:37:59	1.1	31	3.41
13:38:19	1.1	31	3.41
13:38:39	1.1	31	3.41
13:38:59	1.1	31	3.41
13:39:19	1.1	31	3.41
13:39:39	1.1	31	3.41
13:39:59	1.1	31	3.41
13:40:19	1.1	31	3.41
13:40:39	1.1	31	3.41
13:40:59	1.1	31	3.41
13:41:19	1.1	31	3.41
13:41:39	1.1	31	3.41
13:41:59	1.1	31	3.41
13:42:19	1.1	31	3.41
13:42:39	1.1	31	3.41
13:42:59	1.1	31	3.41
13:43:19	1.1	31	3.41
13:43:39	1.1	31	3.41
13:43:59	1.1	31	3.41
13:44:19	1.1	31	3.41
13:44:39	1.1	31	3.41
13:44:59	1.1	31	3.41
13:45:19	1.1	31	3.41
Average	**1.5**	**Average**	**4.9**

APPENDIX III

CALIBRATION CERTIFICATES

STACKMITE CALIBRATION DATA SHEET

Name: ANDY BARNES

Signed: [redacted]

Date: 31/03/03

Test Stackmite Ref: AQ 001

Reference Gas Meter Ref: AQ 046

Reference Gas Meter Calibration Date: 04/03/03

Reference Gas Meter Calibration Certificate No: N 1096 766F

Section 1 – Test Readings

Test Meter Readings (litres)			Time		Reference Meter Readings (litres)			Indicated Flow on Rotameter
Start	Stop	Diff	Start	Stop	Start	Stop	Diff	(l/min)
173635	174217	582	1141	1211	5101	5692	591	20
174220	174670	450	1212	1242	5695	6146	451	15
174675	174979	304	1243	1313	6150	6452	302	10
174985	175139	154	1315	1345	6457	6608	151	5

Section 2 – Calculations

Indicated Flow on Rotameter (l/min)	Actual Flowrate (l/min)	Rotameter % Error	Test Meter Volume (litres)	Reference Meter Volume (litres)	Gas Meter % Error
20	19.70	-1.50	582	591	-1.52
15	15.03	+0.22	450	451	-0.22
10	10.07	+0.70	304	302	+0.66
5	5.03	+0.60	154	151	+1.99%

OEH GROUP LIMITED
AS500 LOW FLOW PUMP - CERTIFICATE OF CONFORMITY

Pump No	Run Time (min)	Start Count	Stop Count	Pump Setting (0 - 100)	Measured flow rate ml/min (average of 5 readings over period)	Calculated volume per stroke (ml/stroke)	Initial	Signature	Date
AQ029	20	481404	484367	20	70.56	0.48	WR	W Roberts	19603
AQ029	21	484367	489453	40	116.2	0.48	WR	W Roberts	19603
						#DIV/0!			
						#DIV/0!			
						#DIV/0!			
						#DIV/0!			
						#DIV/0!			

SORBENT TUBE / ISOCYANATE SAMPLING PUMP

OEH GROUP LIMITED
AS500 LOW FLOW PUMP - CERTIFICATE OF CONFORMITY

Pump No	Run Time (min)	Start Count	Stop Count	Pump Setting (0 - 100)	Measured flow rate ml/min (average of 5 readings over period)	Calculated volume per stroke (ml/stroke)	Initial	Signature	Date
AQ021	20	171414	176195	40	110	0.46	WR	W Roberts	18603
AQ021	20	176195	179292	20	70.5	0.46	WR	W Roberts	18603
						#DIV/0!			
						#DIV/0!			
						#DIV/0!			
						#DIV/0!			
						#DIV/0!			

SORBENT NEE / ISOCYANATE SAMPLING PUMP.

AQ046

CERTIFICATE OF CALIBRATION

DATE OF ISSUE 04 March 2003 CERTIFICATE NUMBER N1096766F

UKAS CALIBRATION
0072

Wyko Calibration Services
Romsey Laboratory
UNIVERSAL HOUSE
ROMSEY INDUSTRIAL ESTATE
ROMSEY
HAMPSHIRE
SO51 0HR
Telephone 01794 523935
Facsimile 01794 523910
Email cal.services@wyko.co.uk
Website www.cal.wyko.co.uk

WYKO INDUSTRIAL SERVICES
...much more than you imagine

APPROVED SIGNATORY
[✓] P. Davies
[ ] W.Hatt
[ ]
[ ]

Customer : OEH GROUP LTD
Address : 253-255 GREAT LISTER STREET
BIRMINGHAM
B7 4BS

Order No : 3564

Apparatus Tested - DRY GAS METER AQ 046 REFERENCE METER.

Type No : SK25

Serial No : 0003729

Inventory No : -

Manufacturer : KIMMON MFG CO LTD

Range/Scale : Calibrated range: 0.5 TO 2.5 m^3/h
Resolution: 0.001 m^3/h, QMax 2.5 m^3/h

Test Conditions -

Date Instrument Received : 03 March 2003

Date Calibration Completed : 04 March 2003

Ambient Temperature : 20 ± 2 °C

Reference No : 1096766

Certified by [redacted]

MEASURING TAPE CALIBRATION DATA SHEET

Name: W Roberts

Signed: W Roberts

Date: 17 March 03

Test Measuring Tape Ref: AQ 047

Test Measuring Tape Length: 5m

Reference Ruler Ref: AQ 045

Reference Ruler Calibration Date: 28 Feb 03

Reference Ruler Calibration Certificate No: 98275

Test Tape Interval	Reference Ruler Reading	Error (%)	Allowed Tolerance	Pass/ Fail?
0.000 – 1.000m	1·000	–	± 0.5%	✓
1.000 – 2.000m	1·000	–	± 0.5%	✓
2.000 – 3.000m	1·000	–	± 0.5%	✓
3.000 – 4.000m	1·000	–	± 0.5%	✓
4.000 – 5.000m	1·000	–	± 0.5%	✓
5.000 – 6.000m			± 0.5%	
6.000 – 7.000m			± 0.5%	

AQ045

CERTIFICATE OF CALIBRATION

Issued by: RS Components Ltd

Date of Issue: 28-Feb-2003 Certificate No. 98275

UKAS CALIBRATION
0310

RS Calibration
Calibration and Repair Service
Venture Close, Lammas Rd, Corby,
Northants NN17 5UB

Tel: 01536 405545
Fax: 01536 401590

Approved signatory
K.O'Malley

CUSTOMER	OEH Group Ltd. Birmingham B7 4BS
INSTRUMENT	1m/39in Steel Rule. AQ045
PROCEDURE ID.	MLCP57 REFERENCE RULE
MANUFACTURER	Rabone
SERIAL No.	RS12974
DATE RECEIVED	N/A
DATE CALIBRATED	28-Feb-2003

REMARKS

The measured results were found to be within the tolerances specified in BS 4372:1968.

Uncertainties
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.The uncertainty evaluation has been carried out in accordance with UKAS requirements.

DEUTSCHER KALIBRIERDIENST DKD

AQ064

Kalibrierlaboratorium für die Meßgröße Druck
Calibration laboratory for pressure measurement

MANOMETER

Akkreditiert durch die / accredited by the

Akkreditierungsstelle des DKD bei der
PHYSIKALISCH-TECHNISCHEN BUNDESANSTALT (PTB)

Deutscher Akkreditierungs Rat
DAR
DKD-K-11204

testo — industrial services
calibration validation training

0648
DKD-K-11204
03-08

Kalibrierschein
Calibration Certificate
Certificat d'étalonnage

Kalibrierzeichen
Calibration mark
Marque d'étalonnage

Gegenstand *Object* *Objet*	Druckmessgerät	pressure instrument
Hersteller *Manufacturer* *Fabricant*	testo AG D-79853 Lenzkirch	
Typ *Type* *Type*	0560 5121	
Fabrikat/Serien-Nr. *Serial number* *Numéro de série*	30208034	
Auftraggeber *Customer* *Client*	E.I.M. (Northern) Ltd. GB-SK1 3HZ Stockport	
Auftragsnummer *Order No.* *Numéro de commande*	185546	
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate* *Numéro de pages*		- 5 -
Datum der Kalibrierung *Date of calibration* *Date d'étalonnage*		**15.08.2003**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Der DKD ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DKD is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.
Ce certificat d'étalonnage documente la traçabilité des grandeurs mesurées par raccordement aux étalons nationaux en conformité avec le Système international d'unités (SI).
Le DKD est signataire des accords multi-latéraux de la European co-operation for Accreditation (EA) et de la International Laboratory Accreditation Cooperation (ILAC) pour la reconnaissance mutuelle des certificats d'étalonnage.
L'utilisateur est tenu de faire étalonner le matériel référencé ci-dessus à des intervalles appropriés.

Stempel *Seal* *Cachet*	Datum *Date* *Date*	Stellv.Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory* *Directeur du laboratoire d'étalonnage*	Bearbeiter *Person in charge* *Personne responsable*
Deutscher Kalibrierdienst DKD-K-11204	15.08.2003	Falko Harich	Melanie Mink

testo industrial services GmbH
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DEUTSCHER KALIBRIERDIENST DKD

0648
DKD-K-11204
03-08

Seite **2** zum Kalibrierschein vom **15.08.2003**

Kalibriergegenstand:

Typ:	Druckmeßgerät
Messart:	positiver Überdruck
Messbereich:	0...20 mbar
Auflösung:	0,01 mbar
Genauigkeit:	± 0,5% v.Ew.

Bezugsnormal:

Modell:	V1600/1, Ser.-Nr.:11447-99
Messbereich	0,2-160 mbar
Messunsicherheit:	2 * 10-4 * pe, jedoch nicht kleiner als 1 µbar
Kalibrierzeichen:	0072 PTB 99

Umgebungsbedingungen:

Temperatur:	(20	± 3) °C
Luftdruck:	(930	± 30) mbar
Fallbeschleunigung:	(9,80681 ± 2•10$^{-5)}$ m/s²	

Messbedingungen:

Druckübertragungsmittel:	Luft
Druckbezugsebene:	Mitte Druckanschluß
Endwertbelastung:	2 min
Anzahl der Meßwerte:	34
Einbaulage:	horizontal

Kalibrierverfahren:

Die Kalibrierung erfolgte nach DKD R6-1 (Dezember 1998) Ablauf B

Bemerkungen:

Deutscher DKD-K-11204 Kalibrierdienst

testo industrial services GmbH
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DEUTSCHER KALIBRIERDIENST DKD

0648
DKD-K-11204
03-08

Seite **3** zum Kalibrierschein vom **15.08.2003**

Messergebnisse:

pe in mbar	Ablesung am KG				Mittelwert in mbar	Mess-abweichung in mbar	Wiederhol-barkeit in mbar	Hysterese in mbar	U mit k=2 in mbar
	M1 auf in mbar	M2 ab in mbar	M3 auf in mbar	M4 ab in mbar					
0,000	0,00	0,02	0,00	0,01	0,008	0,008	0,000	0,020	0,017
2,006	1,97	1,99	1,98		1,983	-0,023	0,010	0,020	0,018
4,010	3,95	3,96	3,96		3,958	-0,052	0,010	0,010	0,015
6,010	5,93	5,96	5,94		5,948	-0,062	0,010	0,030	0,022
8,010	7,93	7,95	7,94		7,943	-0,067	0,010	0,020	0,018
10,010	9,95	9,96	9,96		9,958	-0,053	0,010	0,010	0,015
12,010	11,96	11,97	11,96		11,965	-0,045	0,000	0,010	0,014
14,009	13,92	13,92	13,94		13,925	-0,084	0,020	0,000	0,018
16,010	15,90	15,91	15,92		15,910	-0,100	0,020	0,010	0,019
18,009	17,90	17,91	17,92		17,910	-0,099	0,020	0,010	0,019
20,008	19,92	19,93	19,95		19,933	-0,075	0,030	0,010	0,023

Messunsicherheit:

Erst nach Korrektion des abgelesenen Druckwertes am Kalibriergegenstand mit dem Wert der Messabweichung (siehe Tabelle), entspricht der Betrag der in der Tabelle angegebenen Messunsicherheit.

maximale Messabweichung:	0,0998	mbar	(0,499% vom Endwert)
maximale Hysterese:	0,0300	mbar	(0,150% vom Endwert)
maximale Meßunsicherheit:	0,0228	mbar	(0,114% vom Endwert)

Der Kalibriergegenstand hält die vom Hersteller festgelegten Fehlergrenzen ein.

Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k=2 ergibt. Sie wurde gemäß DKD-3 ermittelt. Der Wert der Messgröße liegt mit einer Wahrscheinlichkeit von 95% im zugeordneten Werteintervall.

Am Kalibriergegenstand ist eine Kalibriermarke angebracht, die mit der Kalibriernummer dieses DKD-Scheines, sowie mit dem Kalibriermonat und Jahr versehen wurde.

Der Deutsche Kalibrierdienst ist Unterzeichner des multilateralen Übereinkommens der European cooperation for Accreditation (EA) zur gegenseitigen Anerkennung der Kalibrierscheine. Die anderen Unterzeichner sind zur Zeit die Akkreditierungsstellen in Belgien, Dänemark, Finnland, Frankreich, Irland, Italien, den Niederlanden, Norwegen, Portugal, Österreich, Schweden, der Schweiz, Spanien, Tschechische Republik und dem Vereinigten Königreich. Ferner bestehen entsprechende Übereinkommen mit den Akkreditierungsstellen Australiens, Neuseelands und Südafrikas.

Deutscher DKD-K-11204 Kalibrier

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The German original text is valid in case of doubt.

Calibration object:

Type:	Pressure measuring instrument
Measuring method:	Positive overpressure
Measuring range :	0...20 mbar
Resolution:	0,01 mbar
Accuracy:	± 0,5% v.Ew.

Reference standard:

Model:	V1600/1, Ser.-Nr.:11447-99
Measuring range	0,2-160 mbar
Measuring uncertainty:	2 * 10-4 * pe, but not smaller than 1 µbar
Calibration sign:	0072 PTB 99

Ambience condition:

Temperature:	(20	± 3) °C
Air pressure:	(930	± 30) mbar
acceleration of the fall:	(9,80681 ± 2•10^{-5}) m/s²	

Measurement conditions:

Pressure exchanger:	air
Pressure level:	Centre pressure connection
Limit value stress:	2 min
Number of measured values:	34
Fitting position:	horizontal

Calibration method:

The calibration has been executed according to DKD R6-1 (December 1998) course B

Remarks:

Deutscher DKD-K-11204 Kalibri

The German original text is valid in case of doubt.

Measuring results:

Pressure mbar	Value M1 up mbar	M2 down mbar	M3 up mbar	M4 down mbar	Average mbar	Deviation mbar	Repeatability mbar	Hysteresis mbar	U with k=2 mbar
0,000	0,00	0,02	0,00	0,01	0,008	0,008	0,000	0,020	0,017
2,006	1,97	1,99	1,98		1,983	-0,023	0,010	0,020	0,018
4,010	3,95	3,96	3,96		3,958	-0,052	0,010	0,010	0,015
6,010	5,93	5,96	5,94		5,948	-0,062	0,010	0,030	0,022
8,010	7,93	7,95	7,94		7,943	-0,067	0,010	0,020	0,018
10,010	9,95	9,96	9,96		9,958	-0,053	0,010	0,010	0,015
12,010	11,96	11,97	11,96		11,965	-0,045	0,000	0,010	0,014
14,009	13,92	13,92	13,94		13,925	-0,084	0,020	0,000	0,018
16,010	15,90	15,91	15,92		15,910	-0,100	0,020	0,010	0,019
18,009	17,90	17,91	17,92		17,910	-0,099	0,020	0,010	0,019
20,008	19,92	19,93	19,95		19,933	-0,075	0,030	0,010	0,023

Measuring uncertainty:

Only after correction of the pressure value reading on the calibration object with the value of the drift (see table), the amount equals the measuring uncertainty in the table.

Maximum drift:	0,0998	mbar	(0,499% of limit value)
Maximum hysteresis:	0,0300	mbar	(0,150% of limit value)
Maximum measuring uncertainty:	0,0228	mbar	(0,114% of limit value)

The calibration object meets the error limit determined by the manufacturer.

The extended measuring uncertainty, resulting of the standard measuring uncertainty multiplied with the extension factor k=2. It has been determined according to DKD-3. The value of the measurable is within the assigned value interval with a probability of 95%.

A calibration label has been applied to the calibration object, provided with the calibration number of this DKD-certificate as well as with the month and the year of the calibration.

The Deutsche Kalibrierdienst is signatory of the multilateral convention of the European cooperation for Accreditation (EA) for mutual acceptance of calibration certificates. The other signatories are at present the accreditation authorities in Belgium, Denmark, Finnland, France, Ireland, Italy, Netherlands, Norway, Portugal, Austria, Sweden, Switzerland, Spain and the United Kingdom. Furthermore there are corresponding agreements with accreditation authorities in Australia, New Zealand and the Republic of South Africa.

Deutscher DKD-K-11204 Kalibrie

AQ060

CERTIFICATE OF CALIBRATION

Issued by: RS Components Ltd

Date of Issue: 15 Jul 2003 Certificate No. X13001

UKAS CALIBRATION
0310

RS Calibration

Calibration and Repair Service

Venture Close, Lammas Rd, Corby,
Northants NN17 5UB

Tel: 01536 405545
Fax: 01536 401590

[redacted]

Approved Signatory: K.Mistry( ) S.Randall( ) M.Connelly(✓) A.Bagshaw( ) J.Richards( ) I.Phillips( ) M.Tiney( )

Client	OEH GROUP LTD. BIRMINGHAM B7 4BS
Instrument	Iso-Tech RS53 Temperature Indicator
Serial No.	23000112
Client Reference	N/A
Procedure ID.	206.3744 Wav9100 Rev P2
Date Received	N/A
Date of Calibration	15 Jul 2003

Remarks

This is a new instrument therefore no adjustment was necessary.

Uncertainties

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Form No BED.008
ISSUE. 3

CERTIFICATE OF ANALYSIS

Date of Issue 8th May 2003	Certificate No 030508-3-CC

Customer	OEH Group	**Analyst**	N. Jones
Customer Order No	3605	**Method of Analysis**	G. C.
Cylinder Type/Size	103 Litre	**Accuracy**	+/-2%
Cylinder No	2793	**Std. Used**	2793

Component	Required Concentration	Actual Concentration
Methane	90ppm	91.4ppm
Balance Air		

Analyst [redacted] *Supervisor* [redacted]

Traceability Statement

All equipment used is traceable to NPL standards
{National Physics Laboratory Ref No. 086006 / MW 468-109}

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