Report

QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network, July-September 2005

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Executive Summary

Netcen carries out the quality assurance and control (QA/QC) activities for the Automatic Urban and Rural Monitoring Network (AURN) on behalf of the UK Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (DAs). This report provides a review of data ratification issues and QA/QC audit results for the 3-month period July-September 2005 .

The network has undergone significant changes since it was first established in 1992. Site numbers have increased to 125 sites to date, of which 63 are Local Authority owned sites which are affiliated to the national network. The further addition of another 2 new sites in 2006 will bring the total number of AURN sites to 127.

In general this has been a fairly good 3-month period for the AURN with a network average data capture of 89% being achieved. This is reasonably consistent with the overall data capture figure for the previous quarter (91%). However, the overall data capture for CO for the quarter was 81%, which is well down on previous quarters. There were several sites affected by relocations, which resulted in low data capture, but there were also several CO analysers showing poor performance, and the data have been deleted, either for part of for the whole of the quarter. Overall data capture for all analysers for the 9 months to 30 September is 91%, and so the overall network capture for the year should be above the required 90%, provided no major losses occur in Quarter 4. One site (Bristol Centre) is closed due to relocation for much of the fourth quarter.

Although overall network data capture was reasonably high at 89%, there were a number of critical site/analysers that missed the 90% threshold for the period, and concern must be expressed for these sites in meeting the 90% annual data capture target. The main reasons for data loss at these sites have been provided and these were predominantly due to instrument faults, response instability or sites out of service for relocation or refurbishment. Problems associated with air conditioning and temperature control were also significant. A summary of recommendations given in this report to help improve network performance is given in Appendix A4.

QA/QC Unit continues to maintain a watching brief on new methodologies and technical advances in air quality measurement in order to keep pace with any changes that may be required in the coming years, particularly in view of the recently published European CEN standards. New long-term data checking tools have been incorporated into the routine data ratification process and further measures to assist with the identification of consistent poorly performing sites are being developed.

DATA RATIFICATION JULY-SEPTEMBER 2005

Part A Data Ratification

Part A Ratification report

PART A – Ratification Report for the Automatic Urban and Rural Network, July to September 2005

1 Introduction

This quarterly report covers the Quality Assurance and Control (QA/QC) activities undertaken by netcen to ratify automatic monitoring data from Defra and the Devolved Administrations' urban and rural air quality monitoring network (AURN) for the period July-September 2005. During this period there were 125 monitoring sites in the Network of which there are 89 urban sites, 22 rural sites and a further 14 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network. There are currently 62 defra-funded sites and 63 affiliate sites. Three sites (Belfast Clara Street, Northampton PM_{10} and Brighton Roadside PM_{10}) measure PM_{10} only and are included as individual sites in the total of 125, although Northampton PM_{10} is co-located with the Northampton AURN site, and Brighton Roadside PM_{10} is close to the Brighton Roadside AURN site.

1.1 Recent Changes in the Network

This section gives an overview of the main changes that have recently taken place in the network, including site closures, relocations or the addition of any new sites to the network. A summary of changes in the AURN for the period is given in Table 1.1.

QA/QC Unit has been working closely with Casella Stanger and the Local Authorities regarding the following site commissionings and relocations:

Stockport Shaw Heath
There are plans to demolish the building housing the Stockport Shaw Heath site. The LSO is currently investigating the possibility of setting up a site across the road, using a groundhog enclosure.

Bradford Centre
This site has been relocated by approximately 15m during August 2005. The locations are considered to be equivalent therefore a new site name is not necessary.

Bristol Centre
This site closed on 15 September pending relocation due to redevelopment.

Leominster
The Leominster site was commissioned on 18 July 2005. This site measures NOx and ozone.

Cardiff
The site was removed in May for refurbishment; the site was out of commission until October.

Leamington Spa
The site was closed on 25 July due to demolition of the building housing the site. A new cabin was placed in the same location and the site Recommissioned on 21 October.

DD3 Requirements
Installation of additional ozone and rural NO_x analysers at existing sites in the network in order to comply with the Third Daughter Directive (DD3) is now complete.

Three of the four new sites required for compliance with the Third Daughter Directive (DD3) have now been commissioned. The one remaining, Fort William, is scheduled for commissioning in 2006.

A site measuring ozone in Lerwick, Shetland, commenced on 25 May 2005. The CMCU had reported that data from this site may have been unreliable, and ratification of the data from the date of commissioning has been carried out along with the July-September period. It is anticipated that PM_{10} and $PM_{2.5}$ analysers will be installed at the rural site at Auchencorth Moss (near Edinburgh) during 2006.

Changes to the network during the period July-September 2005 are summarised in Table 1.1

Table 1.1 Changes to the AURN between July-September 2005

Sites	Date Commenced	Pollutants
New site		
Leominster	18 July 2005	NOx O_3
Relocated sites		
Bristol centre	Closed 15 Sept	
Replacement equipment		
Southend on Sea	29 July (old equipment decommissioned 27 June)	CO NO_2 O_3 PM_{10} (TEOM) SO_2
Norwich Centre	14 July (old equipment decommissioned 29 June)	CO NO_2 O_3 PM_{10} (TEOM) SO_2

1.2 Overview of Network Performance

Ratified hourly average data capture for the network averaged 89% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the 3-month reporting period July-September 2005 (see Table 1.2 below). Four pollutants (CO, NO_2 PM_{10} and SO_2) had average data captures of below the required 90% during this quarter. The annual average network data capture for the calendar year 2004 was 93%.

Table 1.2 AURN Ratified Data Capture (%) by Quarter, 2005
(Using the start date of any new site)

Data Capture (%)	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Network Average
Q1 Jan-Mar 2005	92.4	93.0	94.2	95.0	96.8	90.8	94.0
Q2 April-June 2005	88.0	89.7	95.1	93.0	95.6	88.9	91.0
Q3 July-Sept 2005	81.8	87.2	92.4	88.2	97.5	86.7	89.0

Overall, 308 out of the 421 analysers (79%) achieved data capture levels above the required 90% target during this reporting period (See Table 1.3). The figures shown in Table 1.3 also demonstrate that the level of network performance has fallen throughout the year, with the number of analysers below 90% increasing again this quarter. This is particularly noticeable with CO, with overall data capture of 81.8%. This is examined more fully in Section 3.4.

Table 1.3 Number of Analysers with Data Capture below 90%

Total Number of Analysers		Analysers with Data Capture <90%		
		Q1 Jan-Mar 2005	Q2 Apr-Jun 2005	Q3 July-Sept 2005
CO	79	19	22	30
NO_2	110	19	31	32
O_3	88	11	10	11
PM_{10}	64	7	9	14
$PM_{2.5}$	4	0	1	0
SO_2	76	10	16	26
Total <90%	421	66	89	113

In total, 39 out of the 125 operational network sites (32%) had an average data capture rate below the required 90% level for the July-September 2005 period. These sites are listed in Table 1.4. The main site operational and QA/QC issues giving rise to data capture below the required 90% level are summarised in Section 4. A summary of the main recommendations made in this report to help improve network performance is given in Appendix A4.

Table 1.4 Sites with Average Data Capture < 90%, July-September 2005
(Data capture calculated from site start date)

Site	Owner	Site Average
England		
Barnsley Gawber	Affiliate	60.2
Bolton	Affiliate	84.6
Bradford Centre	DEFRA	82.9
Brighton Roadside	Affiliate	88.2
Bury Roadside	Affiliate	81.3
Camden Kerbside	Affiliate	73.7
Exeter Roadside	Affiliate	79.2
Hull Freetown	DEFRA	75.6
Leamington Spa	Affiliate	25.8
London Bexley	Affiliate	80.0
London Brent	Affiliate	79.8
London Bromley	Affiliate	47.7
London Cromwell Road 2	DEFRA	83.8

London Eltham	Affiliate	89.7
London Westminster	DEFRA	60.1
Manchester Piccadilly	DEFRA	87.1
Manchester South	Affiliate	61.0
Manchester Town Hall	DEFRA	84.7
Nottingham Centre	DEFRA	89.6
Preston	DEFRA	71.5
Redcar	Affiliate	75.8
Rotherham Centre	Affiliate	62.0
Sandwell West Bromwich	Affiliate	89.4
Southampton Centre	DEFRA	66.8
Southend-on-Sea	DEFRA	85.9
St Osyth	DEFRA	84.2
Stockport Shaw Heath	Affiliate	84.1
Thurrock	Affiliate	80.1
Tower Hamlets Roadside	Affiliate	89.7
Wirral Tranmere	DEFRA	34.4
Wolverhampton Centre	DEFRA	88.7
N Ireland		
Belfast Centre	DEFRA	82.6
Scotland		
Bush Estate	DEFRA	49.2
Glasgow City Chambers	DEFRA	68.0
Glasgow Kerbside	DEFRA	83.9
Inverness	DEFRA	88.4
Wales		
Cardiff Centre	DEFRA	0.4
Cwmbran	Affiliate	77.4
Narberth	Affiliate	78.5

The summer intercalibration was completed in September 2005. Results from this intercalibration exercise have been used to assess the accuracy and consistency of the data for this reporting period. Details of the summer 2005 intercalibration are provided in Section B of this report.

1.3 LSO Manual

Copies of the Local Site Operator's manual on disc (CD) were distributed to the network participants at the annual LSO meeting in December 2004. If LSOs have not received a copy or further copies are required please contact Andy.Cook@aeat.co.uk. The manual is also available electronically on the following web sites:
AURN Hub http://www.aeat.co.uk/com/AURNHUB/lsoman.html
Air Quality Archive http://www.aeat.co.uk/netcen/airqual/reports/lsoman/lsoman.html

1.4 AURN Hub Updates

The AURN project information hub website is located at[1]:
http://www.aeat.co.uk/com/AURNHUB/index.html.

The site is regularly up-dated and some of the more recent information includes:

[1] Password protected site: username and password available from Jeff.Lampert@aeat.co.uk

- Up-dated site lists (July 2005) and critical site list (October 2005)
- Monthly PM_{10} (Gravimetric) exceedences up to December 2005
- QA/QC Unit's data ratification and annual report, April-June 2005
- Recent Management Unit reports (July-September 2005)

The Hub has continued to provide a valuable source of information for interested organisations-see Figure 1.1

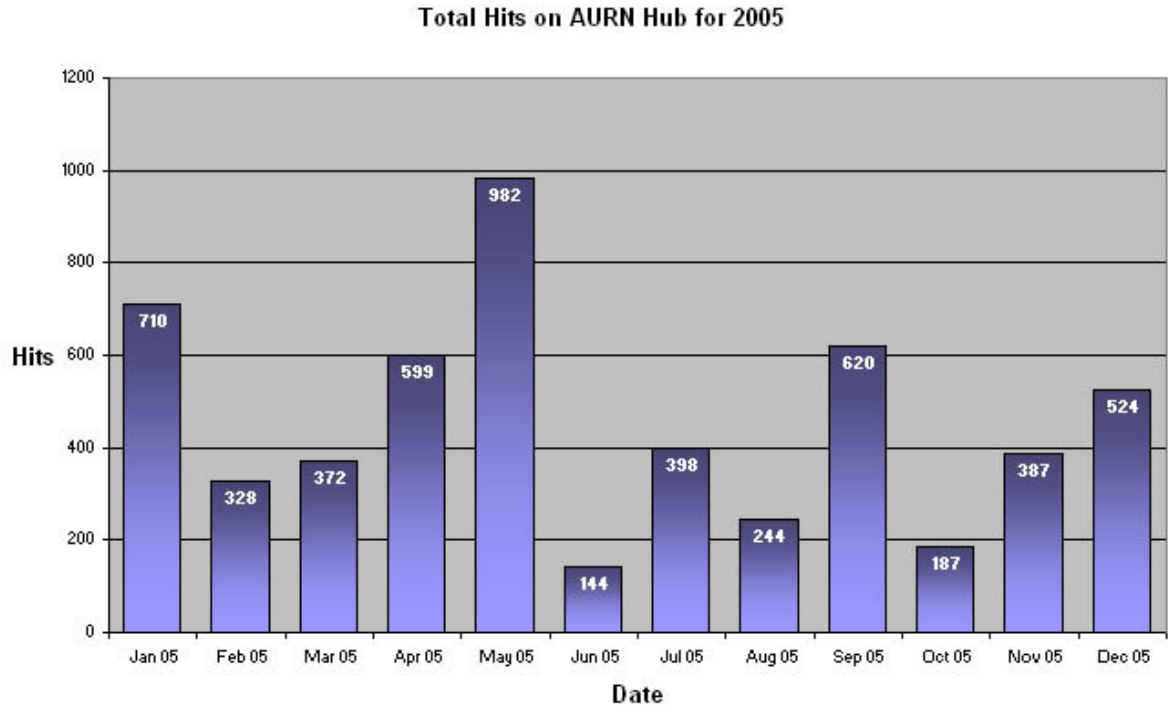

Figure 1.1 AURN Hub Monthly Usage Statistics January-December 2005

2 Generic Data Quality Issues

2.1 Progress on Monitoring Requirements of the EU Daughter Directives

Installation of all of the additional NO_x and O_3 analysers at existing sites required to comply with the third Daughter Directive (DD3) has now been completed. Further details on the third Daughter Directive can be found at:
http://www.defra.gov.uk/environment/consult/air-23daughter/index.htm

Progress is underway to install the remaining site needed to meet the requirements of DD3 at Fort William. It is anticipated that this site will be operational in 2006.

2.2 Data Capture for Critical Sites in Zones and Agglomerations

In order to meet the requirements of the Daughter Directives, any zone or agglomeration[2] with an exceedence of the limit value must be formally reported to the Commission. The critical sites are those which, if data capture falls below 90%, there will be insufficient data for the whole zone or agglomeration. In most cases the critical sites are those where there is only one site in the zone or agglomeration. However, for some pollutants (especially ozone) monitoring is required at several sites in each zone or agglomeration and hence these may all need to be classified as critical sites for that pollutant. The list of the critical sites in the Network necessary to meet the requirements of the first, second and third Daughter Directives is given in Appendix A2. In total 61 sites (195 analysers, two yet to be installed) have been identified as critical for DD1, DD2 or DD3 (25 sites in agglomerations and 36 in zones).

Data capture for all 61 of the critical sites during the 9-month period January-September 2005 is given in Section 5, Table 5.3. The critical sites with less than 90% total data capture and the main reasons for data loss at these sites are given in Table 2.1 below. In total, 56 out of the 195 critical site analysers (29%) did not meet the required 90% data capture during the period July-September 2005. Note that some critical sites also measure other pollutants which are not themselves critical.

Table 2.1 Critical sites with <90% data capture, January-September 2005

Site	Owner	CO	NO_2	O_3	PM_{10}	SO_2	Site Average	Principal reasons for data loss
England								
Barnsley Gawber	Affiliate	46.6	75.5	95.2	-	86.3	75.9	Analyser problems associated with site temperature
High Muffles	DEFRA	-	85.7	92.0	-	-	88.9	Analyser faults
Hull Freetown	DEFRA	50.7	93.4	97.2	97.1	76.6	83.0	Analyser problems associated with site temperature
Leamington Spa	Affiliate	73.8	70.8	71.5	73.9	73.9	72.8	Relocation of site to new building
Northampton	Affiliate	99.0	35.9	95.4	97.9	93.5	84.3	NOx converter fault
Preston	DEFRA	73.5	69.5	94.5	95.0	95.8	85.7	NOx converter and various analyser faults
Reading New Town	DEFRA	74.8	93.9	95.7	96.3	59.8	84.1	Noisy CO and SO_2 analysers
Southampton Centre	DEFRA	87.1	83.1	88.4	88.1	86.8	86.7	Analyser problems associated with site temperature
Stoke-on-Trent Centre	DEFRA	91.2	94.3	95.0	97.2	34.3	82.4	Noisy SO_2 analyser
Sunderland Silksworth	Affiliate	-	90.3	84.8	-	-	87.6	O_3 IZS fault
Wirral Tranmere	DEFRA	71.3	74.6	75.4	71.5	69.3	72.4	Fire near site
N Ireland								
Belfast Centre	DEFRA	94.6	41.0	94.2	94.2	94.1	83.6	NOx baseline unstable

[2] A definition of zones and agglomerations can be found under "Article 5 Assessment Zones and Agglomerations Monitoring Maps" at http://www.defra.gov.uk/environment/airquality/index.htm

Site	Owner	CO	NO_2	O_3	PM_{10}	SO_2	Site Average	Principal reasons for data loss
Scotland								
Bush Estate	DEFRA	-	29.6	97.6	-	-	63.6	Poor NOx analyser performance
Wales								
Cardiff Centre	DEFRA	45.9	46.2	46.0	40.0	43.4	44.3	Refurbishment of site
Cwmbran	Affiliate	14.4	99.3	99.4	99.2	94.2	81.3	CO analyser on incorrect range
Narberth	Affiliate	-	91.0	48.6	81.6	94.0	78.8	Leaks in ozone analyser and TEOM;

Recommendation

Every effort should be made to ensure that data capture is maximised for the critical sites. LSOs and ESUs should undertake call-outs and repairs as soon as possible to avoid unnecessary data loss at these sites.

2.3 Gravimetric PM_{10} Data Ratification

Gravimetric PM_{10} analysers (Partisols) are located at seven sites in the network (Bournemouth, Northampton, Wrexham, Dumfries, Inverness, London Westminster and Brighton Roadside PM_{10}). The gravimetric PM_{10} analyser at Northampton is also co-located with a TEOM analyser, which provides a useful check that both techniques are operating correctly. Gravimetric PM_{10} concentrations and the daily mean TEOM scaled by 1.3 at Northampton for the 9-month period January-September 2005 are shown in Figure 2.1.

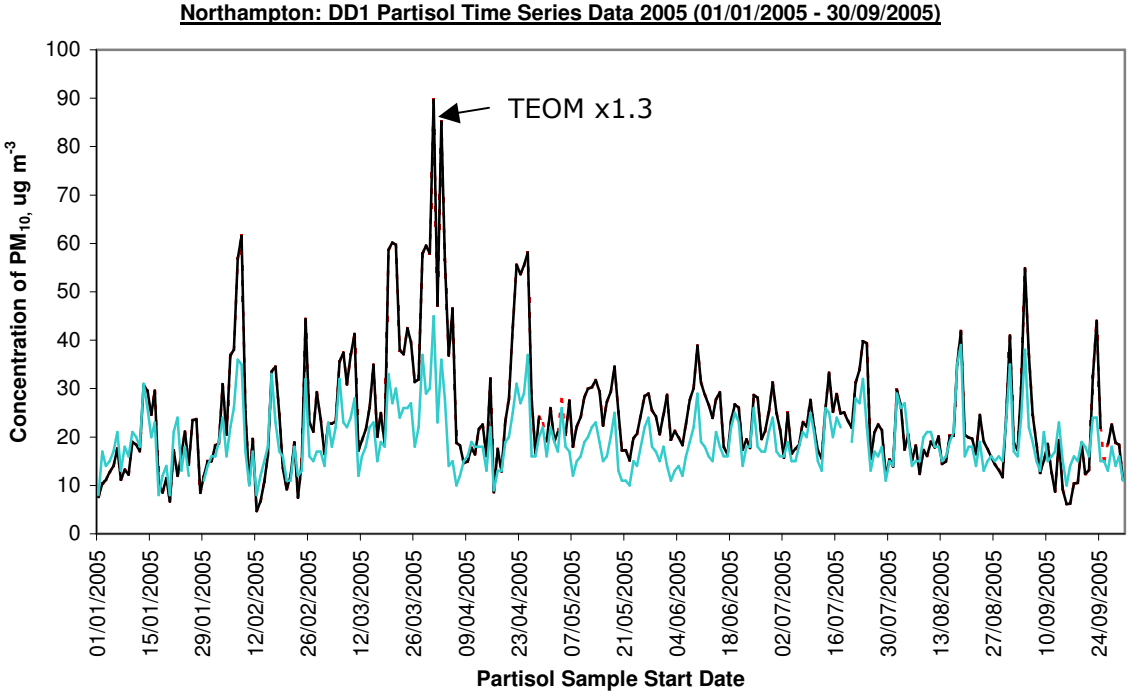

Figure 2.1 Partisol and TEOM (x1.3) Concentrations at Northampton (January-September 2005)

Data capture for the gravimetric PM_{10} (Partisol) analysers for the period July-September 2005 is given in Table 2.3. All seven sites exceeded the 90% data capture target in this quarter, with average data capture over all seven analysers of 95%. Bournemouth is the one remaining Partisol unit that still needs to be connected to telemetry via a separate mobile phone system, as the existing line is not compatible with the Partisol software.

Casella Stanger has supplied the measured data, undertaken the filter weighing and calculated the particulate concentrations.

Table 2.3 Gravimetric PM_{10} Data Capture (%) 2005

Site	3-months Data Capture (%) July-September 2005	9-months Data Capture (%) January-September 2005
Bournemouth	90	95
Brighton Roadside PM_{10}	95	92
London Westminster	96	96
Northampton	99	96
Dumfries	97	97
Inverness	94	95
Wrexham	96	90
Average	**95%**	**94%**

2.4 Auto-Calibration Run-ons

Autocalibration ”run-on” is a generic problem affecting many analysers in the network and is due to autocalibration gas leaking into the sampling system during the ambient measurement period immediately after the autocalibration cycle. The problem can be identified by examining the diurnal variation of pollutant concentrations for the individual sites. Invalid measurements (usually between 01:30 and 02:00) have been removed during data ratification. This can be a serious source of data loss resulting in one hour out of twenty four being deleted, which is 4% of the annual data capture. At some sites significantly more data are being lost resulting in data capture below the 90% data capture target for the period.

The ESUs have investigated the autocalibration run-ons at many of the sites and tried different ways to resolve the problem including thorough cleaning of the solenoid valves and installation of permapure driers. In most cases this has improved the situation but it has not always eliminated the problem completely. The 38 sites showing continuing problems with the autocalibration run-on during July to September 2005 are given in Table 2.5. Any autocalibration run-on data that look visibly significant have been deleted from these data sets during ratification.

Table 2.5 Estimate of Spike or Dip due to Auto-calibration Run-on (15-minute average) July-September 2005

NO_2
Aberdeen 4 ppb July to Sept 1 hour lost
Belfast Centre 6 ppb July to Sept 1 hour lost
Birmingham Centre 8 ppb July to Sept 1 hour lost
Bournemouth 4 ppb July to Sept 1 hour lost
Brighton Preston Park 5 ppb July to Sept 1 hour lost
Bury Roadside 5 ppb July to Sept 1 hour lost
Derry 2 ppb July to Sept 1 hour lost
Eskdalemuir 1.1 ppb July to Sept 1 hour lost
Exeter Roadside 13 ppb July to Sept 2 hours lost
Glazebury 2 ppb July and Sept 1 hour lost
Harwell 1.6 ppb July to Sept 1 hour lost
Hull Freetown 5 ppb July to Sept 1 hour lost
Leamington Spa 7 ppb July 1 hour lost
Leominster 4 ppb July to Sept 1 hour lost
London Bromley 7 ppb July to Sept 1 hour lost
London Westminster 6 ppb July to Sept 1 hour lost
Lullington Heath 1.7 ppb July to Sept 1 hour lost
Manchester Town Hall 3 ppb July to Sept 1 hour lost
Market Harborough 2.7 ppb July to Sept 2 hours lost
Middlesbrough 3 ppb July to Sept 1 hour lost
Narberth 1.9 ppb July to Sept 1 hour lost
Newcastle Centre 6 ppb July to Sept 1 hour lost
Norwich Forum 8 ppb July to Sept 1 hour lost
Preston 3 ppb July to Sept 1 hour lost
Rochester 2 ppb July to Sept 1 hour lost
Rotherham 3 ppb July to Sept 1 hour lost
Somerton 0.5 ppb July to Sept 4 hours lost
Southampton Centre 5 ppb July to Sept 1 hour lost
St Osyth 3.1 ppb July to Sept 2 hours lost
Stockport Shaw Heath 3 ppb July to Sept 1 hour lost
Thurrock 4 ppb July to Sept 1 hour lost
West London 5 ppb July to Sept 1 hour lost

Wirral Tranmere 4 ppb July to Aug 1 hour lost
Wrexham 5 ppb July to Sept 1 hour lost

NO
Narberth 1 ppb July 1 hour lost

Ozone
Derry -3 ppb July to Sept 1 hour lost - zero run-on
Wirral Tranmere 4 ppb July 1 hour zero run-on.

CO
Stoke-on-Trent -0.1 ppm July to Sept 1 hour lost zero run-on.

SO_2
Bradford -1 ppb July 1 hour lost - zero run-on
London Brent 1 ppb July to Sept 1 hour lost
Narberth 0.3 ppb July to Sept 1 hour lost
Wicken Fen 0.2 ppb July to Sept 1 hour lost

Recommendations

ESU to investigate and minimise effect where possible, especially at sites with large autocalibration run-ons or where data loss is in excess of 1 hour. In particular, Somerton (a critical site) was reportedly losing up to 4 hours per day, and overall data capture this quarter was below the required 90% as a result.

QA/QC Unit and CMCU are currently arranging meetings with the Equipment Support Units to discuss the autocalibration run-ons and to identify ways to resolve the problem. Solutions to the problems have been identified in many cases, and the necessary hardware upgrades are being installed either at routine services, or through call-outs.

In the meantime, we recommend that the autocalibration devices be adjusted at the problem sites to reduce the concentration of the span gas. It is strongly advised that NO_2 autocalibration span concentrations of less than 200ppb (urban sites) and 100ppb (rural sites) are used throughout the network.

3 Site Specific Issues

3.1 Norwich Centre SO_2

The analysers at Norwich Centre were replaced with new equipment at the end of June 2005. Since then, the observed SO_2 concentrations at this site appear dramatically different to those measured with the old equipment. Figure 3.1 shows a timeseries plot from April to September.

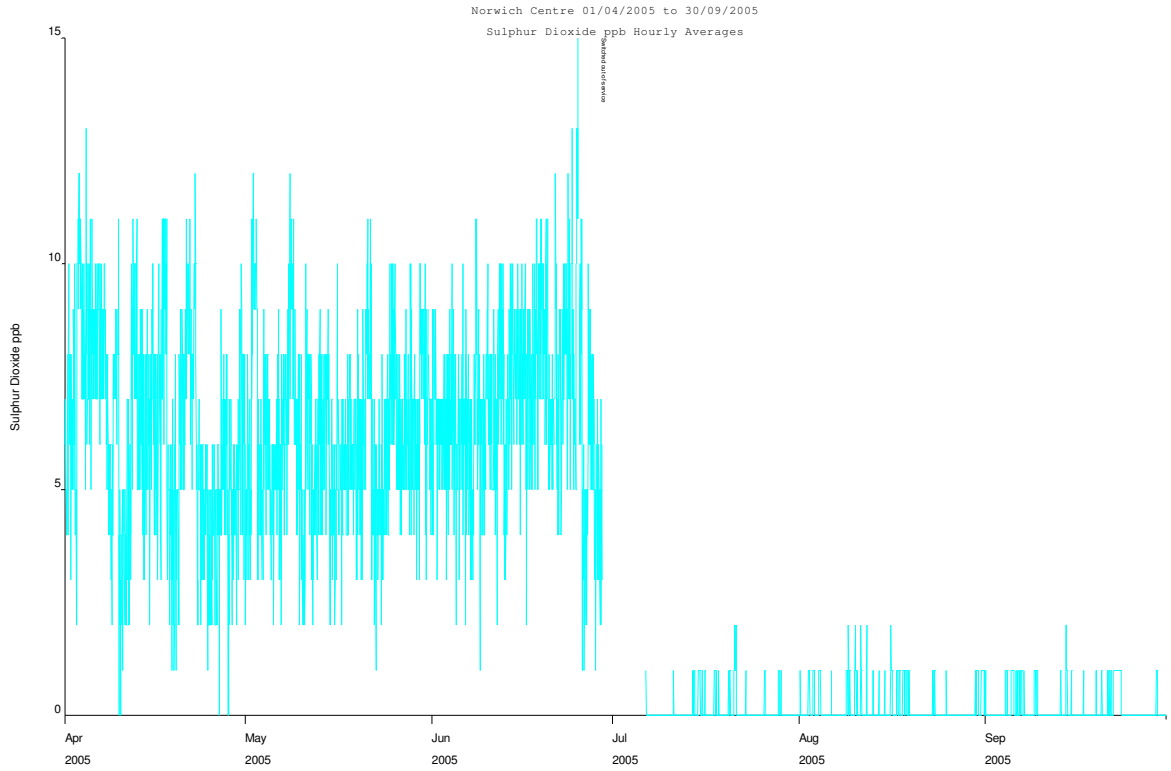

Figure 3.1 Norwich Centre SO_2 concentrations April-September 2005

Although the data up to the end of July appear excessively noisy, it may be that it is not possible to determine the correct baseline for these data. Netcen will review the data from the old analyser when reviewing the ratification for the whole year.

3.2 Rotherham SO_2

The SO_2 analyser at Rotherham has shown high signal noise and baseline drift during, and immediately following the period July-September. Figure 3.2 shows a timeseries plot of the signal output from this analyser.

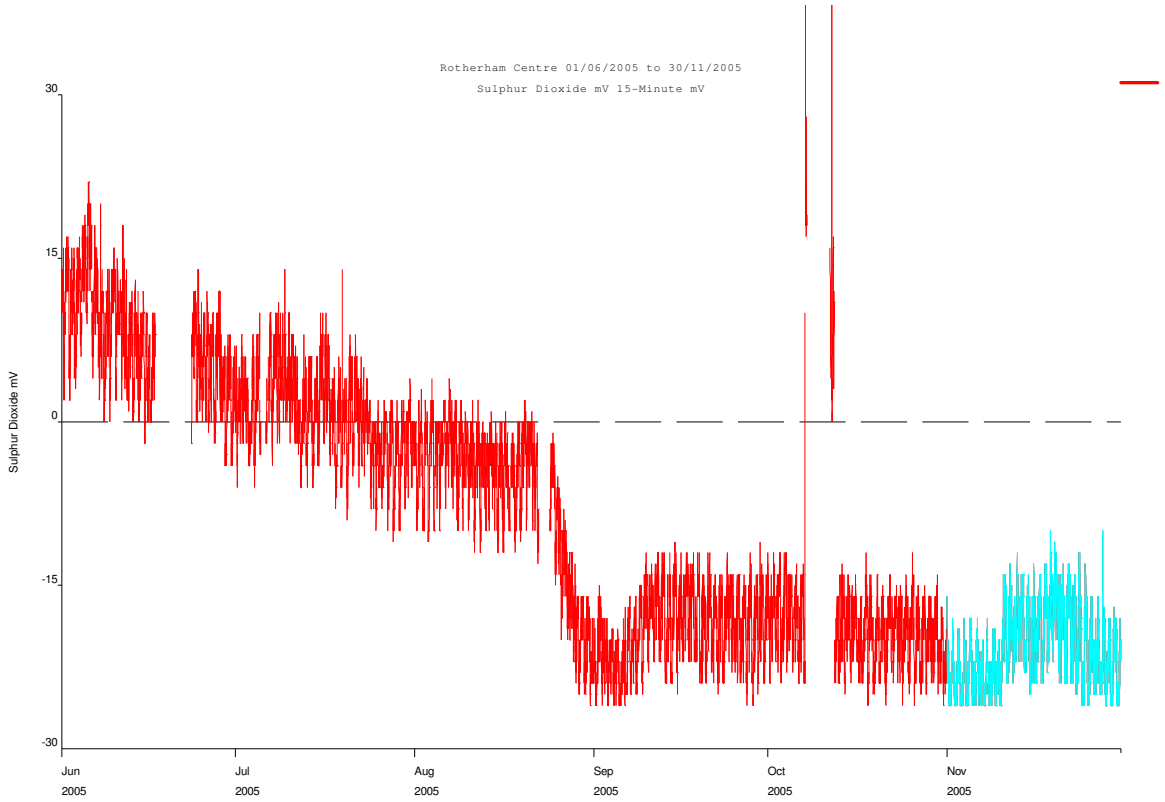

Figure 3.2 Rotherham SO_2 raw data set June-November 2005

All data from this analyser have been deleted during this period (in red), and it is likely that more will be lost from the fourth quarter. This analyser clearly needs upgrading or replacement to restore data to the required standard. There have been no valid SO_2 data collected at this site for the 9 months to September.

Recommendation

This analyser should be upgraded or replaced as soon as possible

3.3 Bolton NOx

The Bolton NOx analyser began producing poor quality data from 8 August 2005. Figure 3.3 shows the logged mV data from this site. The contrast with the good quality data collected up to this date is quite clear. No information on the reason for this change in analyser performance is available. The fault had not been rectified by 31 December.

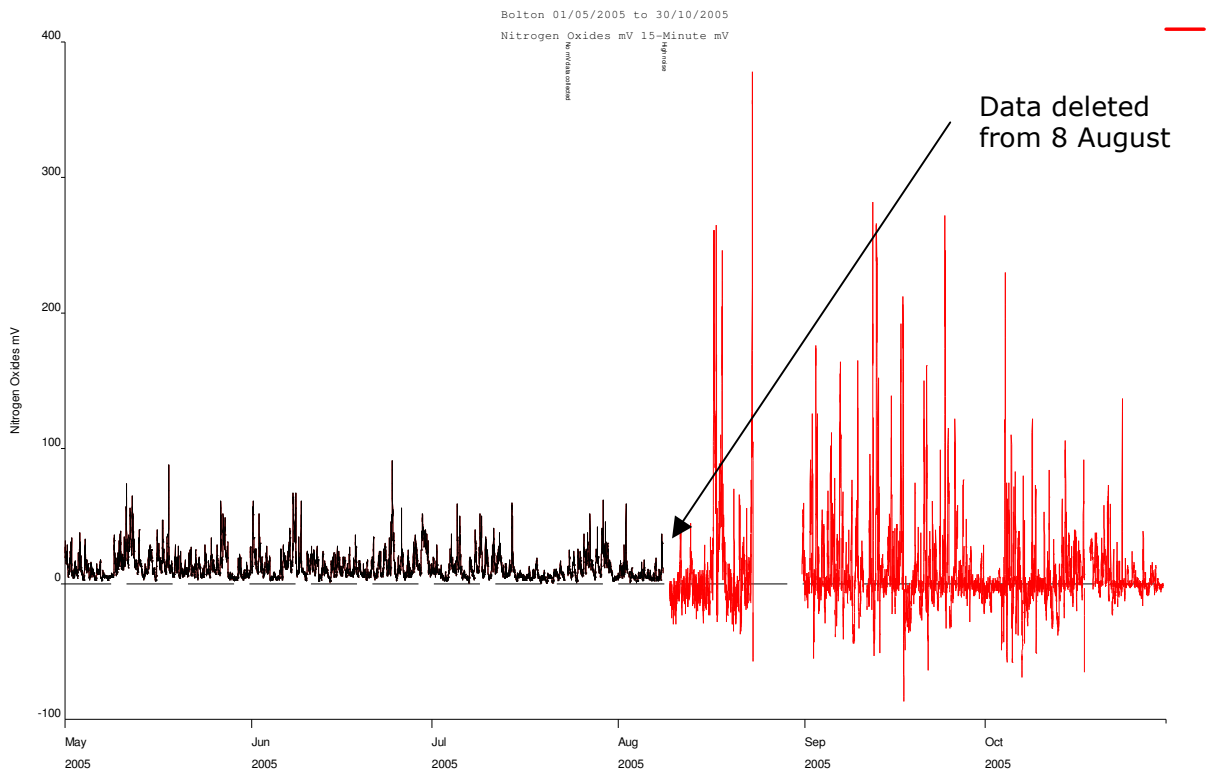

Figure 3.3 Bolton NOx raw dataset May-October 2005

Recommendation

ESU's should ensure that faulty analysers are repaired or replaced within a reasonable timescale, and that records are communicated to CMCU and QA/QC Unit

There are, of course, many other examples of long-term analyser problems which have taken an excessive length of time to resolve.

3.4 CO Analyser Performance

As mentioned in Section 1.2, the overall data capture for CO during Quarter 3 was 81.8%, which shows a significant drop on the pervious quarters in 2005. There were 10 sites where data capture was below 50% for the quarter, and 5 where capture was virtually zero. The worst affected sites, and the reasons, are given in Table 3.1.

Table 3.1 CO Sites with Low Data Capture

Site	Data capture Jul-Sept 2005	Data capture Jan-Sept 2005	Reason
Barnsley Gawber	0%	46.6%	High signal noise and instability
Bury Roadside	67.8%	71.9%	Frequent analyser faults producing unstable data
Exeter Roadside	27.4%	69.2%	Unstable data
Hull Freetown	32.3%	50.7%	Unstable data and pump problem
Leamington Spa	26.0%	73.8%	Site relocation
London Brent	68.9%	41.8%	Sticking valve and communications fault
London Bromley	0%	62.0%	Logger records only hourly averages
London Westminster	0%	51.3%	High signal noise
Preston	62.5%	73.5%	High signal noise
Sandwell West Bromwich	70.0%	85.8%	Instrument faults
Southampton Centre	65.8%	87.1%	Air conditioning fault and flow fault
Wirral Tranmere	35%	71.3%	Fire
Glasgow City Chambers	45.2%	75.0%	Unstable response related to site temperature
Glasgow Kerbside	70.9%	88.5%	Data loss following service
Cardiff Centre	0%	45.9%	Site refurbishment
Cwmbran	0%	14.4%	Analyser set on incorrect range

None of the faults were detected at the QA/QC audits (except at Brighton Roadside-see Section 9), but the data from many of the sites listed was found to be unacceptable during the ratification process. The nature of the faults identified during the ratification process may not be apparent over the short timescale involved at the QA/QC audit.

The CO data from Bromley are currently not being reported, as only hourly average data are recorded. Netcen are looking at these data with a view to restoring these data; if this is successful, the overall network data capture for CO will be improved. The status of these data will be described in the 2005 annual QA/QC report.

Recommendation

It is recommended that greater attention is paid to the performance of CO analysers which have resulted in a substantial loss of data in Q3.

3.5 Other Analysers Highlighted in Recent Reports

Several analysers have been highlighted recently as being of concern to the QA/QC unit. An update is given in Table 3.2

Table 3.2 Status of Analysers Highlighted in Previous Reports

Site	Analyser	Fault	Current status
Redcar	CO, SO_2	Poor calibrations	Calibrations now seem more consistent
Bush	NOx	Succession of analyser faults	Poor performing analyser replaced again on 15 October
Narberth	O_3	Leak	Quality of O_3 data still

			uncertain. Installation of duplicate analyser still awaited.
Southend-on-Sea	PM_{10}	Air conditioning unit blowing air onto TEOM head	No information on progress
Manchester Piccadilly Manchester South Stoke-on-Trent	SO_2	High noise	A hardware upgrade for these analysers has been identified, and appears to improve data (except M. South) The ESU has instigated a rolling programme to upgrade analysers. The situation will be closely monitored.
Various	Rural ozone analysers	Temporary instruments installed some of which have no autocals	Two analysers have been upgraded by the manufacturer and are currently under test by the ESU

Recommendation

QA/QC Unit would like to seek clarification from the Equipment Support Unit/manufacturer as to the current situation regarding the reason for the problems and what plans are in place to resolve them. We recommend that immediate attention is given to this issue as the majority of these instruments are located at critical sites.

3.6 Building Works at Sites

The QA/QC unit frequently receive reports of building or other works close to monitoring sites, which may produce unrepresentative pollutant levels for a short period of time. This is particularly relevant for PM_{10} and $PM_{2.5}$.

For the period 1 July-30 September, reports of such local works have been received for the following sites:

- Leeds
- Middlesbrough
- Nottingham

Building work is also anticipated at Bradford, Cwmbran and Stockport Shaw Heath.

4 Sites with Data Capture Below 90%

4.1 Sites with Low Data Capture

The following section provides a summary of the main site operational problems, which have resulted in data capture below the required 90% level during the reporting period July-September 2005 (Table 4.1). The number of days and hours of data lost for each

cause is also given. In some cases the data gap extends beyond this three-month reporting period.

Table 4.1 Sites with data capture below 90% July-September 2005
(Using the start date of any new site or end date of site closed)

England	Data cap	Start	End	Reason	Comments	No. hrs	No. days
Barnsley Gawber							
CO	0.00%	18-Jun-05	12-Oct-05	High noise	High noise and instability	116	2773
NO2	77.30%	11-Jul-05	11-Jul-05	Air Conditioning or Temp fault	Missing Data after IZS-Poss due to temp probs	0.3	8
		16-Jul-05	16-Jul-05	Air Conditioning or Temp fault	Missing Data - Poss due to temp problems	0.4	9
		17-Jul-05	17-Jul-05	Air Conditioning or Temp fault	Missing Data - Poss due to temp problems	0.3	6
		19-Jul-05	02-Aug-05	Air Conditioning or Temp fault	PMT temp too high	14.3	342
		19-Aug-05	19-Aug-05	Air Conditioning or Temp fault	Missing Data after IZS-Poss due to temp probs	0.3	8
		22-Aug-05	24-Aug-05	ESU service		2.2	52
		29-Aug-05	30-Aug-05	Air Conditioning or Temp fault	Missing Data - Poss due to temp problems	1.3	31
		30-Sep-05	30-Sep-05	Air Conditioning or Temp fault	Missing Data - Poss due to temp problems	0.3	8
SO2	71.60%	11-Jul-05	13-Jul-05	Air Conditioning or Temp fault	Unstable response - maybe linked to temp probs	2.7	65
		30-Jul-05	01-Aug-05	Air Conditioning or Temp fault	Missing Data - Poss due to temp problems	2	47
		16-Aug-05	24-Aug-05	Unstable response	Analyser adversely affected by temperature variation	8	191
		29-Aug-05	30-Aug-05	Air Conditioning or Temp fault	Missing Data - Poss due to temp problems	1.3	31
		16-Sep-05	27-Sep-05	Unstable response	Unstable response - maybe linked to temp probs or UV lamp	11.1	267
		30-Sep-05	30-Sep-05	Air Conditioning or Temp fault	Missing Data - Poss due to temp problems	0.3	8
Birmingham Centre							
NO2	88.40%	08-Jul-05	11-Jul-05	Power cut		2.5	61
		05-Sep-05	09-Sep-05	ESU service		4.1	98
SO2	85.00%	08-Jul-05	20-Jul-05	Pump fault	pump fault after service.	11.3	270
		05-Sep-05	07-Sep-05	ESU service		2.1	51
Blackpool Marton							
CO	82.10%	23-Aug-05	01-Sep-05	Instrument fault	Chopper motor failure	9.2	221
		19-Sep-05	21-Sep-05	ESU service		2	48
		25-Sep-05	28-Sep-05	Power fault	ENG C/O Equipment power off	3	71
Bolton							
NO2	40.60%	23-Jul-05	23-Jul-05	No mV data collected	Telemetry fault	0.5	12
		08-Aug-05	31-Dec-05	High noise	NOx converter fault	146	3494
Bradford Centre							
CO	84.70%	09-Jul-05	09-Jul-05	Instrument fault	analyser fault	0.3	6
		10-Jul-05	10-Jul-05	Instrument fault	analyser fault	0.3	6
		03-Aug-05	16-Aug-05	ESU service		13	311

NO2	83.90%	09-Jul-05	09-Jul-05	Instrument fault	analyser fault	0.3	6
		20-Jul-05	20-Jul-05	Instrument fault	analyser fault	0.4	9
		03-Aug-05	16-Aug-05	ESU service		13	311
		16-Sep-05	16-Sep-05	Instrument fault	analyser fault	0.3	7
O3	84.70%	03-Aug-05	16-Aug-05	ESU service		13	311
PM10	82.00%	22-Jul-05	25-Jul-05	Instrument fault	ENG C/O	3	71
		03-Aug-05	16-Aug-05	ESU service		13	312
SO2	78.90%	08-Jul-05	13-Jul-05	Instrument fault	ENG C/O Replaced manifold fan which was affecting the SO2 data	4.8	114
		03-Aug-05	16-Aug-05	ESU service		13	311
Brighton Roadside							
CO	77.90%	01-Sep-05	20-Sep-05	QAQC audit		19.2	460
		27-Sep-05	28-Sep-05	ESU service		0.9	21
Bristol Centre							
CO	75.90%	07-Jul-05	11-Jul-05	Sampling fault	ENG C/O Instrument was dead. Rebooted ok	4.2	100
		18-Jul-05	20-Jul-05	ESU service		2	47
		15-Sep-05	31-Dec-05	Monitoring suspended	ENG C/O Decommission site for relocation	108	2584
NO2	79.80%	18-Jul-05	20-Jul-05	ESU service		2	47
		13-Sep-05	13-Sep-05	No mV data collected		0.3	7
		15-Sep-05	31-Dec-05	Monitoring suspended	ENG C/O Decommission site for relocation	108	2584
O3	80.00%	18-Jul-05	20-Jul-05	ESU service		2	49
		15-Sep-05	31-Dec-05	Monitoring suspended	ENG C/O Decommission site for relocation	108	2584
PM10	79.30%	18-Jul-05	20-Jul-05	ESU service		1.8	44
		04-Sep-05	05-Sep-05	No mV data collected		0.6	15
		15-Sep-05	31-Dec-05	Monitoring suspended	ENG C/O Decommission site for relocation	108	2584
SO2	75.90%	07-Jul-05	11-Jul-05	Sampling fault	Sample filter holder leak	4.1	99
		18-Jul-05	20-Jul-05	ESU service		2	47
		15-Sep-05	31-Dec-05	Monitoring suspended	ENG C/O Decommission site for relocation	108	2584
Bury Roadside							
CO	67.80%	12-Jul-05	28-Jul-05	Sampling fault	Possible sample fault - Baseline shifted at LSO cal	15.9	381
		13-Aug-05	14-Aug-05	Unstable response	Analyser response unstable - affected by IZS	1	24
		17-Aug-05	26-Aug-05	Unstable response	Service & unstable response affected by IZS	8.6	206
		02-Sep-05	03-Sep-05	Unstable response	Analyser response unstable - affected by IZS	1	24
		15-Sep-05	18-Sep-05	Unstable response	Unstable response affected by cal & missing data	2.5	59
SO2	56.70%	20-Jun-05	06-Jul-05	Rapid zero or sensitivity drift	PMT wiring fault.	16.4	394
		13-Aug-05	13-Aug-05	Communication fault		0.8	18

		17-Aug-05	19-Sep-05	ESU service		33.2	796
Camden Kerbside							
NO2	54.80%	16-Jul-05	23-Aug-05	Instrument fault	Wiring and ozone generator fault	38.6	927
		12-Sep-05	12-Sep-05	Instrument fault	Faulty joint on PMT cooler fan resoldered.	0.3	6
		28-Sep-05	30-Sep-05	Instrument fault	Power supply fault on mother board.	2.2	53
Exeter Roadside							
CO	27.40%	24-Jun-05	05-Sep-05	Unstable response	Unstable baseline	73.7	1768
Hull Freetown							
CO	32.30%	22-Apr-05	28-Aug-05	Unstable response	Unstable response	127	3057
		13-Sep-05	16-Sep-05	Low flow rate	ENG C/O Pump had been disconnected	3.6	87
SO2	62.60%	09-Jun-05	31-Jul-05	Unstable response	Unstable baseline	53	1272
		10-Aug-05	12-Aug-05	ESU service	SERVICE	2.2	53
		16-Sep-05	16-Sep-05	Manifold fault	ENG C/O Manifold fan had stopped working	0.3	6
Leamington Spa							
CO	26.00%	25-Jul-05	21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
NO2	25.00%	25-Jul-05	21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
O3	26.10%	25-Jul-05	21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
PM10	26.00%	25-Jul-05	28-Oct-05	Monitoring suspended	Closed down for construction of new building	95	2281
SO2	26.00%	25-Jul-05	21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
Leicester Centre							
SO2	83.30%	01-Jul-05	12-Jul-05	Flat response	Data deleted	11.6	279
		25-Jul-05	28-Jul-05	ESU service		2.7	65
		22-Aug-05	23-Aug-05	No mV data collected		0.6	14
London Bexley							
NO2	88.90%	18-Jul-05	20-Jul-05	ESU service		2.1	50
		10-Aug-05	11-Aug-05	Sampling fault	Sample filter vibrated loose	1.2	28
		08-Sep-05	14-Sep-05	Pump fault	ENG C/O Replaced Pump	6.5	156
PM10	20.40%	26-Jun-05	15-Jul-05	Flat response	No information to date.	18.7	449
		18-Jul-05	20-Jul-05	ESU service		2.1	50
		05-Aug-05	19-Oct-05	High noise	Flat data - Low main flow.	75.6	1814
London Brent							
CO	68.90%	27-Apr-05	28-Jul-05	Instrument fault	Sticking valve	91.8	2202
		28-Sep-05	30-Sep-05	No mV data collected	Site collecting fault.	1.3	32
PM10	51.00%	20-Jul-05	01-Sep-05	Instrument fault	Mass flow controller and control unit fault.	43.3	1039

		28-Sep-05	30-Sep-05	No mV data collected	Site collecting fault.	1.3	32
London Bromley							
CO	0.00%	20-Jun-05	31-Dec-05	Logger fault	ENG C/O Fixed logger bootup fault	195	4674
London Cromwell Road 2							
CO	83.90%	19-Jul-05	21-Jul-05	No mV data collected	Power Cut/ Comms.	1.9	46
		12-Aug-05	16-Aug-05	No mV data collected	Power Cut.	4	95
		25-Aug-05	26-Aug-05	ESU service		1.1	27
		21-Sep-05	28-Sep-05	Logger fault	ENG C/O Replaced logger the temporary logger may have had a prob	7.2	172
NO2	83.80%	19-Jul-05	21-Jul-05	No mV data collected	Power Cut/ Comms.	1.9	46
		12-Aug-05	16-Aug-05	No mV data collected	Power Cut.	4	95
		25-Aug-05	26-Aug-05	ESU service	SERVICE Sample T piece was cracked needs new one but ok	1.1	26
		21-Sep-05	28-Sep-05	Logger fault	ENG C/O Replaced logger the temporary logger may have had a prob	7.1	171
SO2	83.80%	19-Jul-05	21-Jul-05	No mV data collected	Power Cut/ Comms.	1.9	46
		12-Aug-05	16-Aug-05	No mV data collected	Power Cut.	4	95
		25-Aug-05	26-Aug-05	ESU service		1.1	27
		21-Sep-05	28-Sep-05	Instrument fault	spurious data and site logger fault.	7.1	171
London Eltham							
NO2	83.30%	14-Aug-05	19-Aug-05	Instrument fault	Eng C/O repaired pump.	4.7	113
		10-Sep-05	20-Sep-05	Instrument fault	Site temperature too high	10	240
SO2	82.70%	10-Aug-05	11-Aug-05	QAQC audit	rejected period of instability following audit.	0.7	16
		02-Sep-05	06-Sep-05	Sampling fault	filter fault	4	96
		10-Sep-05	20-Sep-05	Air Conditioning or Temp fault	Air con fault	10.1	243
		30-Sep-05	30-Sep-05	ESU service		0.6	14
London Hackney							
O3	83.90%	25-Jul-05	25-Jul-05	Instrument fault	found locked up at the service.	0.6	15
		29-Jul-05	10-Aug-05	Instrument fault	Rescaled instrument.	11.6	278
		08-Sep-05	09-Sep-05	Instrument fault	ENG C/O Had locked up. Reset instrument	1.4	33
London Hillingdon							
CO	86.70%	05-Jul-05	07-Jul-05	ESU service		2.2	52
		07-Sep-05	15-Sep-05	Unstable response	ENG C/O Recalibrated	8.2	196
		30-Sep-05	30-Sep-05	Pump fault	Switched pump sections to improve flow and pressure.	1	23
London Marylebone Road							
PM10	88.10%	03-Aug-05	10-Aug-05	High noise	Reseated filter on 10 Aug	7	167
		19-Aug-05	22-Aug-05	Power cut		3.3	78
London Wandsworth							

NO2	89.40%	08-Jul-05	11-Jul-05	Instrument fault	Eng C/O internal cooling fan failed.	3.2	76
		13-Sep-05	19-Sep-05	Instrument fault	Box temperature too high.	6.1	147
London Westminster							
CO	0.00%	23-May-05	24-Oct-05	High noise	Unstable response and zero	154	3704
NO2	61.20%	10-Jun-05	01-Aug-05	Instrument fault	PMT valve and pump fault.	52.5	1260
		19-Sep-05	20-Sep-05	No mV data collected	All instruments down.	1.2	28
SO2	88.00%	23-Jul-05	24-Jul-05	Unstable response	Noisy signal	0.8	19
		19-Sep-05	28-Sep-05	Sampling fault	ENG C/O Cleaned sample valves.	9.3	223
Manchester Piccadilly							
NO2	69.30%	24-Jan-05	13-Jul-05	NO2 converter fault	Converter efficiency 92%	170	4078
		21-Jul-05	22-Jul-05	Instrument fault	Chamber fault	1.4	34
		24-Jul-05	25-Jul-05	Unstable response	Unstable data	0.3	8
		02-Sep-05	15-Sep-05	Switched out-of-service	Dat rejected, several ESU callouts	13.1	315
SO2	76.00%	11-Jul-05	13-Jul-05	ESU service		1.9	46
		02-Sep-05	21-Sep-05	Unstable response	ENG C/O Installed replacement analyser but data unuseable.	19.6	471
Manchester South							
NO2	85.90%	31-Jan-05	13-Jul-05	ESU service		163	3909
SO2	0.00%	01-Jan-05	18-Oct-05	Unknown	ENG C/O noisy response lamp reset.	290	6970
Manchester Town Hall							
CO	75.30%	30-Jun-05	15-Jul-05	Unstable response	Unstable data	14.5	349
		23-Sep-05	03-Oct-05	Unstable response	Unstable baseline	10.1	242
Market Harborough							
NO2	89.40%	06-Jul-05	08-Jul-05	Low flow rate	Backing paper left on filter	1.9	45
		25-Jul-05	26-Jul-05	ESU service		1	25
Northampton							
NO2	79.30%	26-Jan-05	19-Jul-05	NO2 converter fault	Data rejected 1/1-18/7. Analyser converter efficiency 110%	174	4180
SO2	81.80%	18-Jul-05	19-Jul-05	ESU service	Service. Replaced Hopcalite CO faulty; replacement analyser installed	1.3	30
		25-Aug-05	08-Sep-05	ESU service	Service. New gas flow meter fitted	15	360
Nottingham Centre							
CO	79.60%	17-Jun-05	04-Jul-05	Instrument fault	CO Analyser fault-factory rework	17.1	410
		21-Jul-05	21-Jul-05	Logger fault	Logger fault	0.5	11
		27-Jul-05	29-Jul-05	ESU service		2.3	55
		10-Sep-05	21-Sep-05	Sampling fault	Split pipe inside instrument- no spanning either.	11.5	276
		30-Sep-05	01-Oct-05	Power cut	All channels off. Probable power cut	1.2	28

					Probable power cut		
NO2	87.90%	18-Jun-05	07-Jul-05	Air Conditioning or Temp fault	Signal varies with site temperature	19.3	463
		17-Jul-05	18-Jul-05	Air Conditioning or Temp fault	Signal varies with site temperature	1	24
		21-Jul-05	21-Jul-05	Logger fault	Logger fault	0.5	11
		27-Jul-05	29-Jul-05	ESU service		2.3	55
		30-Sep-05	01-Oct-05	Power cut	All channels off. Probable power cut	1.2	28
SO2	88.90%	18-Jun-05	07-Jul-05	Instrument fault	Instrument replaced	18.8	452
		21-Jul-05	21-Jul-05	Logger fault	Logger fault	0.5	11
		27-Jul-05	29-Jul-05	ESU service		2.3	55
		30-Sep-05	01-Oct-05	Power cut	All channels off. Probable power cut	1.2	28
Portsmouth							
CO	81.50%	30-Aug-05	15-Sep-05	High noise	Noisy signal	16.6	398
Preston							
CO	62.50%	29-Jun-05	01-Aug-05	High noise	Very noisy signal	33.5	803
		28-Sep-05	01-Oct-05	QAQC audit		3.4	81
NO2	26.90%	14-Jul-05	19-Jul-05	Monitoring suspended	Electronics fault affecting all channels	4.8	116
		01-Aug-05	07-Oct-05	NO2 converter fault	Converter efficiency 91.8% at audit. NO2 data rejected	67	1609
O3	87.40%	14-Jul-05	22-Jul-05	High noise	ENG C/O Noisy instruments	8.5	204
		28-Sep-05	01-Oct-05	ESU service		3.4	81
PM10	89.60%	13-Jul-05	19-Jul-05	High noise	ENG C/O Noisy instruments	6	145
		06-Sep-05	06-Sep-05	QAQC audit		0.4	10
		28-Sep-05	04-Oct-05	Service		6	144
Reading New Town							
SO2	76.00%	18-Apr-05	22-Jul-05	Unstable response	Data unstable	95.8	2298
Redcar							
CO	74.50%	17-Aug-05	09-Sep-05	Logger fault		23.1	554
NO2	30.50%	09-Mar-05	02-Sep-05	NO2 converter fault	Low converter efficiency	177	4258
SO2	83.70%	12-Aug-05	19-Aug-05	Instrument fault	Intermittent gaps UV lamp fault	7.2	173
		02-Sep-05	09-Sep-05	Logger fault	data not logged.	7.3	176
Rotherham Centre							
NO2	89.10%	06-Jul-05	06-Jul-05	No mV data collected	No Data collected info requested	0.3	6
		02-Aug-05	04-Aug-05	No mV data collected	NOx only gap and a/cals continued throughout	2.3	54
		16-Aug-05	17-Aug-05	QAQC audit	AUDIT but no data from the morning before	1.3	32
		22-Aug-05	24-Aug-05	ESU service		1.9	46
		19-Sep-05	19-Sep-05	No data	Left in span mode after cal.	0.3	6
SO2	0.00%	01-Jan-05	30-Sep-05	Unstable response	Substantial baseline drift and signal noise	273	6552
Salford Eccles							
PM10	66.80%	21-Jul-05	21-Jul-05	Unstable response	Settling after filter	0.5	13

					change.		
		18-Aug-05	02-Sep-05	High noise	Pump problem caused noisy data	15.1	363
		15-Sep-05	29-Sep-05	High noise	Filter poorly seated	14.1	338
Sandwell West Bromwich							
CO	70.00%	25-Jul-05	27-Jul-05	ESU service		2.1	51
		19-Aug-05	20-Aug-05	No mV data collected	Poss power failure confirmation requested	1.2	28
		02-Sep-05	26-Sep-05	Instrument fault	IR Source fault	23.8	571
Somerton							
NO2	84.70%	19-Jul-05	20-Jul-05	ESU service		1.3	30
		11-Aug-05	12-Aug-05	Power cut	Powercut following LSO Cal	1.1	27
Southampton Centre							
CO	65.80%	26-Jul-05	28-Jul-05	ESU service		2.1	50
		04-Aug-05	30-Aug-05	Air Conditioning or Temp fault	ENG C/O Air con fault	26.2	629
		17-Sep-05	20-Sep-05	Instrument fault	flow fault	2.8	66
NO2	64.70%	26-Jul-05	28-Jul-05	ESU service		2.1	50
		04-Aug-05	31-Aug-05	Air Conditioning or Temp fault	ENG C/O Air con fault	27.6	662
O3	68.80%	26-Jul-05	28-Jul-05	ESU service		2.1	50
		04-Aug-05	30-Aug-05	Air Conditioning or Temp fault	ENG C/O Air con fault	26.2	628
PM10	68.90%	26-Jul-05	28-Jul-05	ESU service		2.1	50
		04-Aug-05	30-Aug-05	Air Conditioning or Temp fault	ENG C/O Air con fault	26.2	629
SO2	65.80%	26-Jul-05	28-Jul-05	ESU service		2.1	50
		04-Aug-05	02-Sep-05	Air Conditioning or Temp fault	ENG C/O Air con fault	29	695
Southend-on-Sea							
CO	86.60%	27-Jun-05	11-Jul-05	Monitoring suspended	Site decommisisioned after service	14.5	347
		14-Sep-05	15-Sep-05	QAQC audit	Analysers left out of service after audit	1	24
NO2	86.60%	25-Jun-05	11-Jul-05	Instrument removed for repair	ENG C/O Decommissioned rack	16.8	402
		14-Sep-05	15-Sep-05	QAQC audit	Analysers left out of service after audit	1	25
O3	84.60%	27-Jun-05	14-Jul-05	ESU service		17.1	410
PM10	84.80%	27-Jun-05	13-Jul-05	Monitoring suspended	ENG C/O Horiba instruments installed	16.4	394
		22-Jul-05	22-Jul-05	Switched out-of-service	LSO Cal	0.3	6
		14-Sep-05	14-Sep-05	QAQC audit	Analysers left out of service after audit	0.5	12
SO2	86.60%	27-Jun-05	11-Jul-05	Monitoring suspended	ENG C/O Rack and PC Decommissioned	14.5	347
		14-Sep-05	15-Sep-05	QAQC audit	Analysers left out of service after audit	1	24
St Osyth							
CO	80.30%	13-Sep-05	01-Oct-05	Baseline truncated	Signal baseline truncation after service; baseline offset changed.	18	433
NO2	83.50%	13-Sep-05	14-Sep-05	ESU service		1.1	26
		21-Sep-05	30-Sep-05	Sampling fault	ENG C/O Sample fan found detached from manifold	9	215
O3	88.60%	13-Sep-05	14-Sep-05	ESU service		1.1	26
		21-Sep-05	30-Sep-05	Sampling fault	ENG C/O Sample fan found detached from	9	215

					found detached from manifold		
Stockport Shaw Heath							
PM10	46.10%	26-Jan-05	19-Aug-05	Low flow rate	Low flow	205	4920
Stoke-on-Trent Centre							
CO	87.40%	22-Jun-05	05-Jul-05	Instrument fault	Signal noise after repair	13.5	325
		15-Aug-05	17-Aug-05	ESU service		2.1	51
Thurrock							
CO	80.90%	30-Aug-05	16-Sep-05	ESU service		17.1	411
NO2	72.60%	28-Jul-05	02-Aug-05	Logger fault	Logger problems	4.6	110
		30-Aug-05	16-Sep-05	ESU service		17.1	411
O3	80.80%	30-Aug-05	16-Sep-05	ESU service		17.1	411
PM10	85.20%	24-Jul-05	25-Jul-05	Unstable response	Unstable data	1.1	27
		29-Jul-05	04-Aug-05	Unstable response	Unstable data	5.2	125
		11-Aug-05	15-Aug-05	Logger fault	Unstable data	4.1	98
		22-Aug-05	22-Aug-05	QAQC audit		0.5	11
		30-Aug-05	01-Sep-05	ESU service		2.1	50
SO2	80.80%	30-Aug-05	16-Sep-05	ESU service		17.1	411
Tower Hamlets Roadside							
CO	81.40%	18-Aug-05	02-Sep-05	Rapid zero or sensitivity drift	Data rejected by ERG recovers at LSO calibration.	15.4	370
		29-Sep-05	30-Sep-05	ESU service		1.3	30
Wicken Fen							
SO2	86.80%	11-Jul-05	19-Jul-05	Instrument fault	UV Lamp fault	7.9	189
Wigan Centre							
SO2	89.70%	15-Aug-05	24-Aug-05	ESU service		9	215
Wirral Tranmere							
CO	35.00%	20-Jul-05	21-Jul-05	No mV data collected	no data	0.3	8
		02-Aug-05	23-Nov-05	No mV data collected	site off due to fire	113	2708
NO2	33.40%	20-Jul-05	21-Jul-05	No mV data collected	no data	0.3	8
		02-Aug-05	24-Nov-05	No mV data collected	site off due to fire	114	2733
O3	33.70%	20-Jul-05	21-Jul-05	No mV data collected	no data	0.3	8
		02-Aug-05	23-Nov-05	No mV data collected	site off due to fire	113	2708
PM10	35.00%	20-Jul-05	21-Jul-05	No mV data collected	no data	0.3	8
		02-Aug-05	31-Dec-05	No mV data collected	site off due to fire	151	3632
SO2	35.10%	20-Jul-05	21-Jul-05	No mV data collected	no data	0.3	8
		02-Aug-05	23-Nov-05	No mV data collected	site off due to fire	113	2708
Wolverhampton Centre							
NO2	73.90%	01-Aug-05	23-Aug-05	ESU service		22.1	531
		06-Sep-05	06-Sep-05	Unstable response		0.5	11
		14-Sep-05	14-Sep-05	Unstable response		0.3	6
		20-Sep-05	20-Sep-05	Unstable response		0.3	6

Yarner Wood							
NO2	86.10%	07-Jul-05	07-Jul-05	Unstable response	Unstable after LSO Cal	0.6	15
		14-Jul-05	15-Jul-05	ESU service		1	23
		31-Jul-05	11-Aug-05	Logger fault		10.6	255
N Ireland							
Belfast Centre							
NO2	24.50%	03-Apr-05	07-Sep-05	Unstable response	Baseline unstable and noisy	157	3776
Scotland							
Bush Estate							
NO2	0.00%	20-May-05	06-Oct-05	High noise	Noisy response	139	3341
Glasgow Centre							
NO2	86.70%	07-Aug-05	16-Aug-05	Instrument fault	PMT cooling fan and pump replaced.	9.5	227
		31-Aug-05	02-Sep-05	ESU service		2	47
Glasgow City Chambers							
CO	45.20%	10-Jul-05	29-Jul-05	Air Conditioning or Temp fault	Erratic output - temp related	19.5	468
		31-Aug-05	07-Oct-05	ESU service		37.2	892
Glasgow Kerbside							
CO	70.90%	31-Aug-05	26-Sep-05	ESU service		26.3	631
PM10	83.00%	26-Jul-05	09-Aug-05	Communication fault	recurring problem	13.7	328
		24-Aug-05	24-Aug-05	Communication fault	recurring problem	0.3	7
		31-Aug-05	01-Sep-05	Communication fault	recurring problem	1.2	28
Inverness							
NO2	83.70%	23-Aug-05	06-Sep-05	Sampling fault	Leak found at Audit. Poor data quality	13.8	332
		19-Sep-05	20-Sep-05	ESU service		1	23
Wales							
Cardiff Centre							
CO	0.30%	09-May-05	30-Sep-05	Switched out-of-service	Removed for refurbishment	144	3465
NO2	0.50%	09-May-05	30-Sep-05	Switched out-of-service	Removed for refurbishment	144	3460
O3	0.40%	09-May-05	30-Sep-05	Switched out-of-service	Removed for refurbishment	144	3464
PM10	0.50%	09-May-05	30-Sep-05	Switched out-of-service	Removed for refurbishment	144	3462
SO2	0.00%	09-May-05	03-Oct-05	Switched out-of-service	Removed for refurbishment	148	3545
Cwmbran							
CO	0.00%	09-Feb-05	24-Oct-05	No calibrations	Over range on span calibration	257	6168
SO2	88.50%	08-Jul-05	17-Jul-05	High noise	Noisy data	10	240
Narberth							
O3	38.40%	21-May-05	26-Aug-05	Low flow rate	Falling concentrations	97.2	2333

Swansea						
SO2	87.70%	27-Jul-05	05-Aug-05	ESU service	9.1	219
		31-Aug-05	02-Sep-05	No mV data collected	1.6	38

Eng C/O-Engineer call-out
LSO C/O-LSO call-out

5 Ratified Data Capture Statistics

Table 5.1 provides the ratified data capture figures for each site for the 3-month period July-September 2005. Data capture values below 90% are shown in the shaded boxes.

Table 5.1 Ratified Network Data Statistics July to September 2005
(Using the start date of any new site or end date of site closed)

Network Data Capture for 01/07/2005 to 30/09/2005 From start date of any new site

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
England								
Barnsley 12	DEFRA	-	-	-	-	-	97.4	97.4
Barnsley Gawber	Affiliate	0.0	77.3	92.0	-	-	71.6	60.2
Bath Roadside	Affiliate	98.0	98.1	-	-	-	-	98.0
Billingham	DEFRA	-	97.8	-	-	-	-	97.8
Birmingham Centre	DEFRA	94.3	88.4	94.4	94.5	-	85.0	91.3
Birmingham Tyburn	Affiliate	98.2	98.1	98.5	99.0	-	97.2	98.2
Blackpool Marton	DEFRA	82.1	90.8	92.5	93.7	-	92.3	90.3
Bolton	Affiliate	96.7	40.6	96.2	92.6	-	96.7	84.6
Bottesford	Affiliate	-	-	99.5	-	-	-	99.5
Bournemouth	Affiliate	97.1	90.7	97.4	-	-	96.5	95.4
Bradford Centre	DEFRA	84.7	83.9	84.7	82.0	-	78.9	82.9
Brentford Roadside	Affiliate	99.3	99.4	-	-	-	-	99.3
Brighton Preston Park	DEFRA	-	94.9	99.0	-	-	-	96.9
Brighton Roadside	Affiliate	77.9	98.6	-	-	-	-	88.2
Bristol Centre	DEFRA	90.7	95.3	95.6	94.8	-	90.7	93.4
Bristol Old Market	Affiliate	98.6	98.2	-	-	-	-	98.4
Bury Roadside	Affiliate	67.8	91.0	94.8	96.4	-	56.7	81.3
Cambridge Roadside	Affiliate	-	99.9	-	-	-	-	99.9
Camden Kerbside	Affiliate	-	54.8	-	92.5	-	-	73.7
Canterbury	Affiliate	-	98.5	-	98.4	-	-	98.5
Coventry	DEFRA	98.1	98.1	98.3	98.4	-	98.2	98.2

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
Memorial Park								
Exeter Roadside	Affiliate	27.4	92.7	98.4	-	-	98.4	79.2
Glazebury	DEFRA	-	92.8	95.8	-	-	-	94.3
Great Dun Fell	DEFRA	-	-	99.8	-	-	-	99.8
Haringey Roadside	Affiliate	-	98.1	-	99.2	-	-	98.6
Harwell	DEFRA	-	94.1	98.2	92.1	98.3	98.1	96.2
High Muffles	DEFRA	-	91.3	99.2	-	-	-	95.2
Hove Roadside	Affiliate	92.9	97.2	-	-	-	97.0	95.7
Hull Freetown	DEFRA	32.3	91.4	95.2	96.3	-	62.6	75.6
Ladybower	DEFRA	-	97.9	97.9	-	-	97.8	97.9
Leamington Spa	Affiliate	26.0	25.0	26.1	26.0	-	26.0	25.8
Leeds Centre	DEFRA	98.3	98.1	98.1	97.5	-	98.3	98.1
Leicester Centre	DEFRA	96.0	94.9	96.1	95.7	-	83.3	93.2
Leominster	DEFRA	-	94.6	98.8	-	-	-	96.7
Liverpool Speke	Affiliate	97.1	97.2	97.1	96.1	-	97.1	96.9
London A3 Roadside	DEFRA	98.4	97.9	-	98.5	-	-	98.3
London Bexley	Affiliate	97.2	88.9	96.1	20.4	-	97.4	80.0
London Bloomsbury	DEFRA	93.9	96.0	92.9	97.9	97.8	97.6	96.0
London Brent	Affiliate	68.9	90.6	96.3	51.0	-	92.1	79.8
London Bromley	Affiliate	0.0*	95.5	-	-	-	-	47.7
London Cromwell Road 2	DEFRA	83.9	83.8	-	-	-	83.8	83.8
London Eltham	Affiliate	-	83.3	97.9	95.0	-	82.7	89.7
London Hackney	Affiliate	99.3	98.6	83.9	-	-	-	60.8
London Haringey	Affiliate	-	-	99.3	-	-	-	99.3
London Harlington	Affiliate	99.7	99.5	98.7	91.0	-	-	97.2
London Hillingdon	DEFRA	86.7	90.1	96.9	96.9	-	96.7	93.5
London Lewisham	Affiliate	-	99.5	98.4	-	-	99.5	99.2
London Marylebone Road	Affiliate	94.3	93.6	94.7	88.1	95.8	94.4	93.5
London N. Kensington	Affiliate	99.3	99.2	99.3	98.3	-	99.3	99.1
London Southwark	Affiliate	96.9	97.9	98.0	-	-	97.9	97.6
London Teddington	Affiliate	-	99.6	99.7	-	-	99.7	99.7
London Wandsworth	Affiliate	-	89.4	99.4	-	-	-	94.4
London Westminster	DEFRA	0.0	61.2	91.1	-	-	88.0	60.1
Lullington Heath	DEFRA	-	93.6	98.2	-	-	98.0	96.6
Manchester Piccadilly	DEFRA	97.0	69.3	97.0	96.2	-	76.0	87.1

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
Manchester South	Affiliate	-	85.9	97.1	-	-	0.0	61.0
Manchester Town Hall	DEFRA	75.3	94.0	-	-	-	-	84.7
Market Harborough	DEFRA	98.1	89.4	98.4	-	-	-	95.3
Middlesbrough	Affiliate	98.1	91.8	92.6	96.7	-	98.1	95.5
Newcastle Centre	DEFRA	99.4	95.2	99.4	99.5	-	99.4	98.5
Northampton	Affiliate	98.0	79.3	96.3	97.7	-	81.8	90.6
Norwich Centre	DEFRA	93.7	93.5	91.2	93.0	-	93.7	93.0
Norwich Forum Roadside	Affiliate	-	93.4	-	-	-	-	93.4
Nottingham Centre	DEFRA	79.6	87.9	95.9	95.9	-	88.9	89.6
Oxford Centre Roadside	Affiliate	99.1	99.2	-	-	-	99.2	99.2
Plymouth Centre	DEFRA	94.5	97.2	97.3	97.1	-	97.2	96.7
Portsmouth	Affiliate	81.5	95.2	99.7	98.6	-	99.6	94.9
Preston	DEFRA	62.5	26.9	87.4	89.6	-	90.9	71.5
Reading New Town	DEFRA	93.4	96.5	97.2	96.3	-	76.0	91.9
Redcar	Affiliate	74.5	30.5	93.6	96.6	-	83.7	75.8
Rochester	Affiliate	-	93.9	98.1	98.0	98.2	94.2	96.5
Rotherham Centre	Affiliate	-	89.1	96.7	-	-	0.0	62.0
Salford Eccles	Affiliate	98.3	97.7	98.0	66.8	-	97.2	91.6
Sandwell West Bromwich	Affiliate	70.0	96.0	95.7	-	-	96.0	89.4
Scunthorpe Town	Affiliate	-	-	-	97.9	-	98.0	98.0
Sheffield Centre	DEFRA	97.2	97.2	97.2	97.1	-	97.2	97.2
Sheffield Tinsley	DEFRA	98.3	98.2	-	-	-	-	98.3
Sibton	DEFRA	-	-	99.6	-	-	-	99.6
Somerton	Affiliate	-	84.7	96.9	-	-	-	90.8
Southampton Centre	DEFRA	65.8	64.7	68.8	68.9	-	65.8	66.8
Southend-on-Sea	DEFRA	86.6	86.6	84.6	84.8	-	86.6	85.9
Southwark Roadside	Affiliate	93.2	98.0	-	-	-	97.5	96.2
St Osyth	DEFRA	80.3	83.5	88.6	-	-	-	84.2
Stockport Shaw Heath	Affiliate	98.1	93.9	-	46.1	-	98.6	84.1
Stockton-on-Tees Yarm	Affiliate	97.5	98.5	-	98.2	-	-	98.1
Stoke-on-Trent Centre	DEFRA	87.4	96.1	97.0	97.0	-	94.8	94.5
Sunderland	DEFRA	-	-	-	-	-	98.5	98.5
Sunderland Silksworth	Affiliate	-	98.5	98.2	-	-	-	98.4
Thurrock	Affiliate	80.9	72.6	80.8	85.2	-	80.8	80.1
Tower Hamlets Roadside	Affiliate	81.4	98.1	-	-	-	-	89.7
Walsall	DEFRA	-	98.0	-	-	-	-	98.0

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
Alumwell								
Walsall Willenhall	Affiliate	-	99.4	-	-	-	-	99.4
West London	DEFRA	97.6	92.9	-	-	-	-	95.3
Weybourne	Affiliate	-	-	95.0	-	-	-	95.0
Wicken Fen	DEFRA	-	97.9	97.9	-	-	86.8	94.2
Wigan Centre	Affiliate	97.6	98.2	97.4	98.0	-	89.7	96.2
Wirral Tranmere	DEFRA	35.0	33.4	33.7	35.0	-	35.1	34.4
Wolverhampton Centre	DEFRA	92.4	73.9	92.1	92.7	-	92.4	88.7
Yarner Wood	DEFRA	-	86.1	98.3	-	-	-	92.2
N Ireland								
Belfast Centre	DEFRA	97.0	24.5	97.5	96.8	-	97.4	82.6
Belfast Clara St	Affiliate	-	-	-	96.3	-	-	96.3
Belfast East	DEFRA	-	-	-	-	-	99.3	99.3
Derry	Affiliate	96.2	92.3	92.6	96.2	-	96.5	94.7
Lough Navar	DEFRA	-	-	94.3	99.2	-	-	96.8
Scotland								
Aberdeen	Affiliate	97.7	93.4	97.9	97.5	-	97.5	96.8
Bush Estate	DEFRA	-	0.0	98.4	-	-	-	49.2
Dumfries	DEFRA	98.2	98.5	-	-	-	-	98.3
Edinburgh St Leonards	DEFRA	98.3	91.6	98.1	96.5	-	98.2	96.5
Eskdalemuir	DEFRA	-	95.1	99.6	-	-	-	97.4
Glasgow Centre	DEFRA	96.9	86.7	97.0	95.9	-	97.2	94.7
Glasgow City Chambers	DEFRA	45.2	90.9	-	-	-	-	68.0
Glasgow Kerbside	DEFRA	70.9	97.9	-	83.0	-	-	83.9
Grangemouth	Affiliate	99.0	99.2	-	97.3	-	99.2	98.7
Inverness	DEFRA	93.2	83.7	-	-	-	-	88.4
Lerwick	DEFRA	-	-	93.0	-	-	-	93.0
Strath Vaich	DEFRA	-	-	99.9	-	-	-	99.9
Wales								
Aston Hill	DEFRA	-	98.2	98.2	-	-	-	98.2
Cardiff Centre	DEFRA	0	0	0	0	-	0	0
Cwmbran	Affiliate	0.0	99.5	99.5	99.3	-	88.5	77.4
Narberth	Affiliate	-	91.3	38.4	92.2	-	92.3	78.5
Port Talbot	Affiliate	-	93.4	90.4	91.3	-	94.2	92.3
Swansea	Affiliate	95.2	95.1	95.3	95.6	-	87.7	93.8
Wrexham	DEFRA	98.3	94.2	-	-	-	98.4	97.0
Number of sites		79	110	88	64	4	76	123
Number of sites < 90%		31	32	11	14	0	26	40
Network Mean (%)		80.5	87.2	92.4	88.2	97.5	86.7	89

* London Bromley CO may yet be reported. See Section 3.4

Table 5.2 provides the ratified data capture figures for each site for the 9-month period January-September 2005.

Table 5.2 Ratified Network Data Statistics January to September 2005

(Using the start date of any new site or end date of site closed)

Network Data Capture for 01/01/2005 to 30/09/2005 From start date of any new site

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
England								
Barnsley 12	DEFRA	-	-	-	-	-	98.1	98.1
Barnsley Gawber	Affiliate	**46.6**	**75.5**	**95.2**	-	-	86.3	**75.9**
Bath Roadside	Affiliate	91.8	91.8	-	-	-	-	91.8
Billingham	DEFRA	-	97.2	-	-	-	-	97.2
Birmingham Centre	DEFRA	88.0	83.7	92.1	92.3	-	88.8	89.0
Birmingham Tyburn	Affiliate	99.0	98.9	99.1	99.1	-	98.6	98.9
Blackpool Marton	DEFRA	**83.6**	**90.7**	**92.4**	**94.1**	-	**92.3**	**90.6**
Bolton	Affiliate	97.6	78.8	97.5	96.2	-	97.7	93.6
Bottesford	Affiliate	-	-	99.2	-	-	-	99.2
Bournemouth	Affiliate	**97.9**	**92.9**	**98.0**	-	-	**97.7**	**96.6**
Bradford Centre	DEFRA	87.2	84.9	91.1	90.6	-	89.5	88.7
Brentford Roadside	Affiliate	79.7	99.4	-	-	-	-	89.5
Brighton Preston Park	DEFRA	-	**95.6**	**98.6**	-	-	-	**97.1**
Brighton Roadside	Affiliate	87.2	98.7	-	-	-	-	92.9
Bristol Centre	DEFRA	95.8	**97.1**	**97.3**	**96.8**	-	**95.5**	**96.5**
Bristol Old Market	Affiliate	99.0	98.7	-	-	-	-	98.8
Bury Roadside	Affiliate	71.9	88.3	95.1	95.8	-	75.3	85.3
Cambridge Roadside	Affiliate	-	97.2	-	-	-	-	97.2
Camden Kerbside	Affiliate	-	79.8	-	97.2	-	-	88.5
Canterbury	Affiliate	-	94.0	-	**98.9**	-	-	**96.5**
Coventry Memorial Park	DEFRA	**98.6**	**98.7**	**98.5**	**98.8**	-	**98.6**	**98.6**
Exeter Roadside	Affiliate	69.2	79.4	98.5	-	-	98.6	86.4
Glazebury	DEFRA	-	**94.2**	**97.9**	-	-	-	**96.0**
Great Dun Fell	DEFRA	-	-	**99.2**	-	-	-	**99.2**
Haringey Roadside	Affiliate	-	96.3	-	94.2	-	-	95.3
Harwell	DEFRA	-	91.5	97.5	95.9	97.9	97.5	96.1
High Muffles	DEFRA	-	**85.7**	**92.0**	-	-	-	**88.9**
Hove Roadside	Affiliate	96.3	95.8	-	-	-	**95.2**	**95.8**
Hull Freetown	DEFRA	**50.7**	**93.4**	**97.2**	**97.1**	-	**76.6**	**83.0**
Ladybower	DEFRA	-	91.0	96.0	-	-	94.8	93.9
Leamington Spa	Affiliate	**73.8**	**70.8**	**71.5**	**73.9**	-	**73.9**	**72.8**
Leeds Centre	DEFRA	89.8	89.3	90.3	67.5	-	90.5	85.5

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
Leicester Centre	DEFRA	**97.1**	**97.0**	**97.3**	**97.1**	-	**93.1**	**96.3**
Leominster	DEFRA	-	**94.6**	**98.8**	-	-	-	**96.7**
Liverpool Speke	Affiliate	**97.9**	**97.8**	**97.9**	**97.4**	-	**97.9**	**97.8**
London A3 Roadside	DEFRA	98.2	98.0	-	98.2	-	-	98.2
London Bexley	Affiliate	96.3	93.8	96.8	70.2	-	97.5	90.9
London Bloomsbury	DEFRA	89.4	91.9	90.4	93.0	92.8	92.0	91.6
London Brent	Affiliate	41.8	86.0	95.5	82.6	-	94.8	80.1
London Bromley	Affiliate	62.0	94.6	-	-	-	-	78.3
London Cromwell Road 2	DEFRA	92.2	93.6	-	-	-	93.6	93.2
London Eltham	Affiliate	-	87.6	98.0	76.3	-	93.0	88.7
London Hackney	Affiliate	94.3	98.6	92.8	-	-	-	95.2
London Haringey	Affiliate	-	-	99.5	-	-	-	99.5
London Harlington	Affiliate	99.2	99.1	98.9	92.1	-	-	97.3
London Hillingdon	DEFRA	87.9	92.7	90.1	95.1	-	95.1	92.2
London Lewisham	Affiliate	-	99.2	99.2	-	-	97.1	98.5
London Marylebone Road	Affiliate	97.7	97.3	97.8	95.4	98.1	97.5	97.3
London N. Kensington	Affiliate	95.4	94.6	97.1	98.8	-	99.3	97.0
London Southwark	Affiliate	98.1	98.5	98.3	-	-	97.9	98.2
London Teddington	Affiliate	-	93.3	99.3	-	-	99.1	97.3
London Wandsworth	Affiliate	-	96.0	96.9	-	-	-	96.5
London Westminster	DEFRA	51.3	77.3	95.1	-	-	94.7	79.6
Lullington Heath	DEFRA	-	84.0	97.8	-	-	96.9	92.9
Manchester Piccadilly	DEFRA	97.4	31.8	97.5	97.3	-	65.8	77.9
Manchester South	Affiliate	-	37.6	96.9	-	-	0.0	44.8
Manchester Town Hall	DEFRA	84.1	94.9	-	-	-	-	89.5
Market Harborough	DEFRA	98.6	92.0	98.7	-	-	-	96.4
Middlesbrough	Affiliate	95.4	91.6	94.6	95.1	-	96.4	94.6
Newcastle Centre	DEFRA	**97.5**	**94.6**	**97.4**	**97.5**	-	**95.3**	**96.5**
Northampton	Affiliate	**99.0**	**35.9**	**95.4**	**97.9**	-	**93.5**	**84.3**
Norwich Centre	DEFRA	96.0	**78.6**	**92.7**	95.7	-	96.0	**91.8**

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
Norwich Forum Roadside	Affiliate	-	93.5	-	-	-	-	93.5
Norwich Roadside	Affiliate	-	95.9	-	-	-	-	95.9
Nottingham Centre	DEFRA	**82.4**	**89.6**	**97.3**	**97.2**	-	**90.5**	**91.4**
Oxford Centre Roadside	Affiliate	**94.7**	97.5	-	-	-	**98.5**	**96.9**
Plymouth Centre	DEFRA	96.9	97.8	84.4	**96.9**	-	97.9	**94.7**
Portsmouth	Affiliate	**92.6**	**97.4**	**99.0**	**98.4**	-	**98.7**	**97.2**
Preston	DEFRA	**73.5**	**69.5**	**94.5**	**95.0**	-	**95.8**	**85.7**
Reading New Town	DEFRA	**74.8**	**93.9**	**95.7**	**96.3**	-	**59.8**	**84.1**
Redcar	Affiliate	84.3	34.2	79.1	94.0	-	92.7	76.9
Rochester	Affiliate	-	95.8	98.4	97.7	97.8	95.2	97.0
Rotherham Centre	Affiliate	-	92.1	94.5	-	-	0.0	62.2
Salford Eccles	Affiliate	94.5	78.1	95.1	84.6	-	94.8	89.4
Sandwell West Bromwich	Affiliate	85.8	95.2	95.1	-	-	89.9	91.5
Scunthorpe Town	Affiliate	-	-	-	**97.6**	-	95.1	**96.4**
Sheffield Centre	DEFRA	97.2	88.3	97.9	**97.9**	-	97.6	**95.8**
Sheffield Tinsley	DEFRA	98.7	96.6	-	-	-	-	97.7
Sibton	DEFRA	-	-	**92.2**	-	-	-	**92.2**
Somerton	Affiliate	-	**88.2**	**94.6**	-	-	-	**91.4**
Southampton Centre	DEFRA	**87.1**	**83.1**	**88.4**	**88.1**	-	**86.8**	**86.7**
Southend-on-Sea	DEFRA	**92.9**	**89.3**	**91.1**	**91.7**	-	**91.5**	**91.3**
Southwark Roadside	Affiliate	93.7	98.6	-	-	-	98.4	96.9
St Osyth	DEFRA	90.8	**90.8**	**95.4**	-	-	-	**92.3**
Stockport Shaw Heath	Affiliate	67.2	89.5	-	24.5	-	98.7	70.0
Stockton-on-Tees Yarm	Affiliate	**98.6**	**98.9**	-	**98.8**	-	-	**98.7**
Stoke-on-Trent Centre	DEFRA	**91.2**	**94.3**	**95.0**	**97.2**	-	**34.3**	**82.4**
Sunderland	DEFRA	-	-	-	-	-	**98.1**	**98.1**
Sunderland Silksworth	Affiliate	-	**90.3**	**84.8**	-	-	-	**87.6**
Thurrock	Affiliate	92.2	**87.6**	**92.4**	93.5	-	92.2	**91.6**
Tower Hamlets Roadside	Affiliate	84.4	98.8	-	-	-	-	91.6
Walsall Alumwell	DEFRA	-	98.7	-	-	-	-	98.7
Walsall Willenhall	Affiliate	-	83.8	-	-	-	-	83.8
West London	DEFRA	94.2	92.9	-	-	-	-	93.5
Weybourne	Affiliate	-	-	96.2	-	-	-	96.2

Site	Owner	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Site Average
Wicken Fen	DEFRA	-	**98.6**	**98.6**	-	-	91.7	**96.3**
Wigan Centre	Affiliate	**98.5**	**97.2**	**98.3**	**94.9**	-	**96.1**	**97.0**
Wirral Tranmere	DEFRA	**71.3**	**74.6**	**75.4**	**71.5**	-	**69.3**	**72.4**
Wolverhampton Centre	DEFRA	95.1	89.1	95.6	96.0	-	88.0	92.7
Yarner Wood	DEFRA	-	**93.7**	**98.3**	-	-	-	**96.0**
N Ireland								
Belfast Centre	DEFRA	**94.6**	**41.0**	**94.2**	94.2	-	94.1	**83.6**
Belfast Clara St	Affiliate	-	-	-	94.1	-	-	94.1
Belfast East	DEFRA	-	-	-	-	-	99.2	99.2
Derry	Affiliate	**96.4**	**92.7**	**83.5**	**96.4**	-	**90.5**	**91.9**
Lough Navar	DEFRA	-	-	**97.9**	99.3	-	-	**98.6**
Scotland								
Aberdeen	Affiliate	**98.5**	**95.5**	**98.5**	**98.2**	-	**98.2**	**97.8**
Bush Estate	DEFRA	-	**29.6**	**97.6**	-	-	-	**63.6**
Dumfries	DEFRA	**96.5**	**95.9**	-	-	-	-	**96.2**
Edinburgh St Leonards	DEFRA	**98.7**	**95.4**	**96.7**	**97.1**	-	**98.5**	**97.3**
Eskdalemuir	DEFRA	-	**94.4**	**99.3**	-	-	-	**96.8**
Glasgow Centre	DEFRA	92.9	**94.2**	**96.2**	97.5	-	**96.8**	**95.5**
Glasgow City Chambers	DEFRA	75.0	93.5	-	-	-	-	84.2
Glasgow Kerbside	DEFRA	88.5	97.9	-	92.1	-	-	92.8
Grangemouth	Affiliate	**99.3**	**99.1**	-	**98.7**	-	**99.3**	**99.1**
Inverness	DEFRA	96.6	**93.5**	-	-	-	-	**95.0**
Lerwick	DEFRA	-	-	93.7	-	-	-	93.7
Strath Vaich	DEFRA	-	-	**91.6**	-	-	-	**91.6**
Wales								
Aston Hill	DEFRA	-	**97.2**	**98.6**	-	-	-	**97.9**
Cardiff Centre	DEFRA	**45.9**	**46.2**	**46.0**	**40.0**	-	**43.4**	**44.3**
Cwmbran	Affiliate	**14.4**	**99.3**	**99.4**	**99.2**	-	**94.2**	**81.3**
Narberth	Affiliate	-	91.0	**48.6**	81.6	-	94.0	**78.8**
Port Talbot	Affiliate	-	96.3	94.3	95.0	-	91.2	94.2
Swansea	Affiliate	**96.9**	93.2	96.9	97.1	-	94.3	**95.7**
Wrexham	DEFRA	**98.3**	**94.3**	-	-	-	**98.5**	**97.0**
Number of sites		79	111	88	64	4	76	124
Number of sites < 90%		30	34	9	11	0	16	36
Network Mean (%)		87.3	88.7	93.9	91.6	96.6	89.2	91

Shaded boxes are for data capture < 90%
Bold data captures are for critical instruments and sites

Sites and instruments established between 01/01/2005 and 30/09/2005
Blackpool Marton, defra,CO, NO_2, O_3, PM_{10} and SO_2 14/06/2005
Leominster, defra,NO_2, O_3 18/07/2005

Lerwick, defra,O_3, 25/05/2005

* Provisional data capture

Table 5.3 shows the ratified AURN data capture for the 61 **critical sites** in the network for the 9-month period January to September 2005. Sites with less than 90% data capture are shaded. This table contains the overall data capture for 9 months, regardless of when sites started or finished monitoring.

Table 5.3 AURN Ratified Data Capture (%) for CRITICAL SITES January to September 2005 (disregards start or end dates**)**

Network Data Capture for 01/01/2005 to 30/09/2005 From start date of any new site

Site	Owner	CO	NO2	O3	PM10	SO2	Site Average
England							
Barnsley Gawber	Affiliate	**46.6**	**75.5**	**95.2**	-	86.3	**75.9**
Blackpool Marton	DEFRA	**83.6**	**90.7**	**92.4**	**94.1**	**92.3**	**90.6**
Bournemouth	Affiliate	**97.9**	**92.9**	**98.0**	-	**97.7**	**96.6**
Brighton Preston Park	DEFRA	-	**95.6**	**98.6**	-	-	**97.1**
Bristol Centre	DEFRA	95.8	**97.1**	**97.3**	**96.8**	**95.5**	**96.5**
Canterbury	Affiliate	-	94.0	-	**98.9**	-	**96.5**
Coventry Memorial Park	DEFRA	**98.6**	**98.7**	**98.5**	**98.8**	**98.6**	**98.6**
Glazebury	DEFRA	-	**94.2**	**97.9**	-	-	**96.0**
Great Dun Fell	DEFRA	-	-	**99.2**	-	-	**99.2**
High Muffles	DEFRA	-	**85.7**	**92.0**	-	-	**88.9**
Hove Roadside	Affiliate	96.3	95.8	-	-	**95.2**	**95.8**
Hull Freetown	DEFRA	**50.7**	**93.4**	**97.2**	**97.1**	**76.6**	**83.0**
Leamington Spa	Affiliate	**73.8**	**70.8**	**71.5**	**73.9**	**73.9**	**72.8**
Leicester Centre	DEFRA	**97.1**	**97.0**	**97.3**	**97.1**	**93.1**	**96.3**
Leominster	DEFRA	-	**94.6**	**98.8**	-	-	**96.7**
Liverpool Speke	Affiliate	**97.9**	**97.8**	**97.9**	**97.4**	**97.9**	**97.8**
Newcastle Centre	DEFRA	**97.5**	**94.6**	**97.4**	**97.5**	**95.3**	**96.5**
Northampton	Affiliate	**99.0**	**35.9**	**95.4**	**97.9**	**93.5**	**84.3**
Norwich Centre	DEFRA	96.0	**78.6**	**92.7**	95.7	96.0	**91.8**
Nottingham Centre	DEFRA	**82.4**	**89.6**	**97.3**	**97.2**	**90.5**	**91.4**
Oxford Centre Roadside	Affiliate	**94.7**	97.5	-	-	**98.5**	**96.9**
Plymouth Centre	DEFRA	96.9	97.8	84.4	**96.9**	97.9	**94.7**
Portsmouth	Affiliate	**92.6**	**97.4**	**99.0**	**98.4**	**98.7**	**97.2**
Preston	DEFRA	**73.5**	**69.5**	**94.5**	**95.0**	**95.8**	**85.7**
Reading New Town	DEFRA	**74.8**	**93.9**	**95.7**	**96.3**	**59.8**	**84.1**
Scunthorpe Town	Affiliate	-	-	-	**97.6**	95.1	**96.4**
Sheffield Centre	DEFRA	97.2	88.3	97.9	**97.9**	97.6	**95.8**
Sibton	DEFRA	-	-	**92.2**	-	-	**92.2**
Somerton	Affiliate	-	**88.2**	**94.6**	-	-	**91.4**
Southampton Centre	DEFRA	**87.1**	**83.1**	**88.4**	**88.1**	**86.8**	**86.7**
Southend-on-Sea	DEFRA	**92.9**	**89.3**	**91.1**	**91.7**	**91.5**	**91.3**
St Osyth	DEFRA	90.8	**90.8**	**95.4**	-	-	**92.3**
Stockton-on-Tees Yarm	Affiliate	**98.6**	**98.9**	-	**98.8**	-	**98.7**
Stoke-on-Trent Centre	DEFRA	**91.2**	**94.3**	**95.0**	**97.2**	**34.3**	**82.4**
Sunderland	DEFRA	-	-	-	-	**98.1**	**98.1**
Sunderland	Affiliate	-	**90.3**	**84.8**	-	-	**87.6**

Silksworth							
Thurrock	Affiliate	92.2	**87.6**	**92.4**	93.5	92.2	**91.6**
Wicken Fen	DEFRA	-	**98.6**	**98.6**	-	91.7	**96.3**
Wigan Centre	Affiliate	**98.5**	**97.2**	**98.3**	**94.9**	**96.1**	**97.0**
Wirral Tranmere	DEFRA	**71.3**	**74.6**	**75.4**	**71.5**	**69.3**	**72.4**
Yarner Wood	DEFRA	-	**93.7**	**98.3**	-	-	**96.0**
N Ireland							
Belfast Centre	DEFRA	**94.6**	**41.0**	**94.2**	94.2	94.1	**83.6**
Derry	Affiliate	**96.4**	**92.7**	**83.5**	**96.4**	**90.5**	**91.9**
Lough Navar	DEFRA	-	-	**97.9**	99.3	-	**98.6**
Scotland							
Aberdeen	Affiliate	**98.5**	**95.5**	**98.5**	**98.2**	**98.2**	**97.8**
Bush Estate	DEFRA	-	**29.6**	**97.6**	-	-	**63.6**
Dumfries	DEFRA	**96.5**	**95.9**	-	-	-	**96.2**
Edinburgh St Leonards	DEFRA	**98.7**	**95.4**	**96.7**	**97.1**	**98.5**	**97.3**
Eskdalemuir	DEFRA	-	**94.4**	**99.3**	-	-	**96.8**
Glasgow Centre	DEFRA	92.9	**94.2**	**96.2**	97.5	**96.8**	**95.5**
Grangemouth	Affiliate	**99.3**	**99.1**	-	**98.7**	**99.3**	**99.1**
Inverness	DEFRA	96.6	**93.5**	-	-	-	**95.0**
Strath Vaich	DEFRA	-	-	**91.6**	-	-	**91.6**
Wales							
Aston Hill	DEFRA	-	**97.2**	**98.6**	-	-	**97.9**
Cardiff Centre	DEFRA	**45.9**	**46.2**	**46.0**	**40.0**	**43.4**	**44.3**
Cwmbran	Affiliate	**14.4**	**99.3**	**99.4**	**99.2**	**94.2**	**81.3**
Narberth	Affiliate	-	91.0	**48.6**	81.6	94.0	**78.8**
Swansea	Affiliate	**96.9**	93.2	96.9	97.1	94.3	**95.7**
Wrexham	DEFRA	**98.3**	**94.3**	-	-	**98.5**	**97.0**
Number of sites		40	53	49	36	40	59
Number of sites < 90%		11	16	8	5	8	16
Network Mean (%)		87.4	87.8	92.6	93.3	89.7	91

Shaded boxes are for data capture < 90%
Bold data captures are for critical instruments and sites

Critical sites and instruments established between 01/01/2005 and 30/09/2005
Blackpool Marton,CO, NO_2, O_3, PM_{10}, SO_2,14/06/2005
Leominster, NO_2, O_3 18/07/2005

Note that critical sites where monitoring has not yet commenced are not included in the above table.

RECOMMENDATION
Every effort should be made to ensure that data capture is maximised for the critical sites. LSOs and ESUs should undertake call-outs and repairs as soon as possible to avoid unnecessary data loss at these sites.

Appendix A1

As requested by the Department, QA/QC Unit has provided a list of suggestions for equipment that may need replacing or upgrading in the network. The following provides a summary of the outstanding issues to date since January 2004. Recommendations have been prioritised as follows:

Priority	Definition	Time-scale
High*	Immediate action necessary to avoid compromising data capture/quality or safety. Critical sites should be treated as high priority.	Within 2 weeks
Medium	Essential but not immediate	3-6 months
Low	Desirable but not essential	As appropriate

*Note – QA/QC Unit's practice is to notify CMCU immediately of any high priority issues at the time of the event.

	Recommendations January 2006	Priority	Action
18	Rotherham SO_2 analyser shows excessive noise and baseline drift-recommend upgrade or replacement	High	Repair/replacement to be actioned by ESUs
17	The performance of CO analysers needs close attention by all parties, and poorly performing analysers replaced or upgraded	High	LSOs and CMCU to check performance carefully; ESU's to action repairs promptly
	Recommendations October 2005	**Priority**	**Action**
16	The external loggers at Dumfries, Inverness and Wrexham should be replaced with code switches to allow remote interrogation of the analyser status	Medium	CMCU
15	The air conditioning unit at Southend-on-Sea needs to be repositioned to avoid influence on PM_{10} measurements	High	CMCU to arrange
	Recommendations July 2005	**Priority**	**Action**
14	Several analysers still exhibit poor performance-see items 10 and 7 below.	High	Repair/replacement to be actioned by ESUs
13	Continuing problems with some autocal run-ons causing loss of up to 2 hours per day	High	Many sites now cured, but some need attention at next ESU visit
	Recommendations May 2005	**Priority**	**Action**
11	SO_2 analyser at Stoke-on-Trent shows severe baseline response drift. Recommend immediate repair/up-grading	High Critical Site	Now fixed, but most data deleted this quarter

10	The SO_2 analyser at Manchester South has shown a history of high noise response and should be up-graded or repaired.	Medium	Analyser performance still poor
	Recommendations October 2004		
7	Recommend repair or up-grading of 11 unstable CO analysers detailed in Section 3.1 of this report. Of these, Barnsley Gawber (Affiliate) and Nottingham Centre (Defra) are critical for CO.	High Critical sites	On-going
6	Further advice for AURN equipment replacement and up-grading was given to CMCU on 8th September 2004.		On-going
	Recommendations July 2004		
4	Sheffield Tinsley CO noisy and drifting response. Recommend up-grade or repair	Medium	Still drifting

APPENDIX A2

CRITICAL SITES IN THE AURN (October 2005)

Table A1 Critical Sites in Agglomerations

Site Name	Agglomeration	Critical Pollutants		
		DD1	DD2[7]	DD3
Belfast Centre	Belfast Urban Area	NO_2	CO	NO_2 O_3
Blackpool Marton	Blackpool Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Bournemouth+	Bournemouth Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Brighton Preston Park	Brighton/Worthing/Littlehampton			NO_2 O_3
Brighton Roadside PM_{10}	Brighton/Worthing/Littlehampton	PM_{10}		
Bristol Centre	Bristol Urban Area	PM_{10} SO_2		NO_2 O_3
Cardiff Centre	Cardiff Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Coventry Memorial Park+	Coventry/Bedworth	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Edinburgh St Leonards	Edinburgh Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Glasgow Centre	Glasgow Urban Area	SO_2		NO_2 O_3
Hove Roadside+	Brighton/Worthing/Littlehampton	SO_2		
Hull Freetown	Kingston upon Hull	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Leicester Centre	Leicester Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Liverpool Speke	Liverpool Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Newcastle Centre	Tyneside	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Nottingham Centre	Nottingham Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Portsmouth+	Portsmouth Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Preston	Preston Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Reading New Town	Reading/Wokingham Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Sheffield Centre	Sheffield Urban Area	PM_{10}		
Southampton Centre	Southampton Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Southend-on-Sea	Southend Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Stoke-on-Trent Centre	The Potteries	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Swansea+	Swansea Urban Area		CO	
Wirral Tranmere	Birkenhead Urban Area	NO_2 PM_{10} SO_2	CO	NO_2 O_3

"+ indicates Affiliate site"

Note 7: Addresses CO, Benzene not included here

Table A2 Critical Sites in Zones

Site Name	Zone	Critical Pollutant		
		DD1	DD2[7]	DD3
Aberdeen+	North East Scotland	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Aston Hill	North Wales			NO_2 O_3
Barnsley Gawber+	Yorkshire & Humberside	NO_2	CO	NO_2 O_3
Bush Estate	Central Scotland			NO_2 O_3
Canterbury+	South East	PM_{10}		
Cwmbran+	South Wales	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Derry+	Northern Ireland	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Dumfries	Scottish Borders	NO_2 PM_{10}	CO	
Eskdalemuir	Scottish Borders			NO_2 O_3
Fort William	Highland			NO_2[6] O_3[6]
Glazebury	North West & Merseyside			NO_2 O_3
Grangemouth+	Central Scotland	NO_2 PM_{10} SO_2	CO	
Great Dunn Fell	North West & Merseyside			O_3[3]
High Muffles	Yorkshire & Humberside			NO_2 O_3
Inverness	Highland	NO_2 PM_{10}		
Leamington Spa+	West Midlands	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Leominster	West Midlands			NO_2[4] O_3
Lough Navar	Northern Ireland			O_3[3]
Narberth	South Wales			O_3[3]
Northampton+	East Midlands	NO_2 PM_{10}[2] SO_2	CO	NO_2 O_3
Norwich Centre	Eastern			NO_2 O_3
Oxford Centre Roadside+	South East	SO_2	CO	
Plymouth Centre	South West	PM_{10}		
Scunthorpe Town+	Yorkshire & Humberside	PM_{10}		
Sibton	Eastern			O_3[3]
Somerton	South West			NO_2 O_3
St Osyth	Eastern			NO_2 O_3
Stockton-on-Tees Yarm+	North East	NO_2 PM_{10}	CO	
Strath Vaich	Highland			O_3[3]
Sunderland	North East	SO_2		
Sunderland Silkworth+	North East			NO_2 O_3
Thurrock	Eastern			NO_2 O_3
Wicken Fen	Eastern			NO_2 O_3
Wigan Leigh+/Centre[+8]	North West & Merseyside	NO_2 PM_{10} SO_2	CO	NO_2 O_3
Wrexham	North Wales	NO_2 PM_{10} SO_2	CO	
Yarner Wood	South West			NO_2 O_3

Total of 61 Critical Sites (25 in Agglomerations and 36 in Zones)
51% of network stations critical under one or more Daughter Directives
"+ indicates Affiliate site"

Note 2: PM_{10} monitored by Gravimetric and TEOM
Note 3: DD3 Critical as Rural Background station
Note 4: If NO_2 at Leominster is Suburban then NO_2 at Leamington Spa is no longer critical for DD1
Note 6: Not Affiliated/Monitoring yet
Note 7: Addresses CO, Benzene not included here

APPENDIX A3

Inventory of Defra owned Equipment

An up-to-date inventory of Department-owned equipment used by the QA/QC Unit is provided below:

QA/QC Unit's inventory of Department-owned equipment, October 2005

Computer software	The HIS (Heuristic Information System) software suite used for all data management. A few specific capabilities of HIS were developed in order to meet specific Department deliverables or requirements (examples include software for annual report analysis/compilation, for formatting/transmitting network data to archive or DDU and for reporting Directive compliance data to the EC).
Field support equipment	Field support equipment: 1 intercalibration equipment set (includes mass flow controllers and read-out unit) A second intercalibration (commissioned January 2001) UV photometers: API model M401 s/n 123- purchased April 1999 (on temporary loan to Siemens) API model 401 s/n 151 - purchased October 2000 API model 401 s/n 176 – purchased December 2002 (on temporary loan to Horiba) API model 401 s/n 290 – purchased May 2004 API model 401 s/n 291 – purchased May 2004 API model 401 s/n 292 purchased May 2004 API model 401 s/n 293 purchased May 2004 Mass flow controllers - purchased April 2002 (incorporated into existing audit dilution apparatus) 3 Drycal flow meters - purchased September 2002 1 Mass flow controller read-out unit to be incorporated in the audit dilution apparatus – purchased September 2002. A third intercalibration kit (commissioned May 2004) Drycal flow meter – purchased March 2004 Sabio 2010 dilution calibrator – purchased February 2005 Sabio 2020 zero air generator – purchased February 2005 Sabio 2030 ozone photometer – purchased February 2005
Zero air pumps	6 spare zero air pumps for routine maintenance/repair of zero air generators in the AURN.
Analysers	AC31 dual chamber NO_x analyser TEI 43C SO_2 analyser TEI 48C CO analyser M265 chemiluminescent ozone analyser (All of the above purchased on behalf of Defra by Casella Stanger in March 2003 and transferred to QA/QC Unit)

APPENDIX A4

Summary of Recommendations

This appendix provides a summary of all the recommendations given in this report.

	Need	Recommendation	Section	FAO
1	Improve data capture at critical sites	LSOs and ESUs should undertake call-outs as soon as possible at these sites	2.2 +5	LSOs and ESUs
2	Autocalibration run-on	Investigate problem of autocalibration run on at sites given in Table 2.5. Autocalibration span concentrations to be <200ppb for urban sites and <100ppb for rural sites.	2.4	ESUs
3	Norwich Centre SO_2	The status of the data from the old analyser is to be reviewed for acceptability	3.1	QA/QC Unit
4	Rotherham Centre SO_2	The SO_2 analyser should be upgraded or replaced as soon as possible	3.2	ESU
5	Bolton NOx	ESU's to ensure repairs are carried out as soon as possible.	3.3	ESU
6	CO analysers	It is recommended that greater attention is paid to the performance of CO analysers which have resulted in a substantial loss of data in Q3.	3.4	ESUs QA/QC and CMCU
7	NO2 calibrations	It is recommended that LSO's continue to pay particular attention to the NO_2 calibration results, to see whether the NO response is significantly higher (>10ppb) than that obtained for the zero calibration. These observations should be reported to CMCU as soon as possible	8.2	LSOs
8	Cleaning NOx switching valves	It is strongly recommended that ESU's clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards	8.2	ESUs

PART B - Intercalibration Report for the Automatic Urban and Rural Network, July to September 2005

6 Introduction

In Summer 2005, netcen undertook an intercalibration of the 125 monitoring stations in operation in the defra and the Devolved Administrations sponsored Urban and Rural Monitoring Network. This has allowed data from all of the analysers in the networks to be harmonised to a single set of audit standards, thereby improving confidence in the accuracy, consistency and traceability of air pollution measurements made in the UK.

The tests were undertaken to cross-reference the individual data sets to common traceable calibration standards. This enabled the consistency of measurements throughout the network to be determined. The following major checks are made:

1. **Analyser accuracy and precision**, as a basic check to ensure reliable datasets from the analysers.
2. **Instrument linearity**, to check that doubling a concentration of gas to the analyser results in a doubling of the analyser signal response. If an analyser is not linear, data cannot be reliably scaled into concentrations.
3. **Instrument signal noise**, to check for a stable analyser response to calibration gases.
4. **Analyser response time**, to check that the analyser responds quickly to a change in gas concentrations.
5. **Leak and flow checks**, to ensure that ambient air reaches the analysers, without being compromised in any way.
6. **NOx analyser converter efficiency**, to ensure reliable operation. This is the device that allows the measurement of NO_2 to be undertaken, so it must work acceptably.
7. **TEOM k_o evaluation**. The analyser uses this factor to calculate mass concentrations, so the value is calculated to determine its accuracy.
8. **Particulate analyser flow rate checks**, to ensure that the flow rates through critical parts of the analyser are within specified limits.
9. **SO_2 analyser hydrocarbon interference**, as certain hydrocarbons are known to interfere with the SO_2 detector.
10. **Evaluation of site cylinder concentrations**, using a set of netcen certified cylinders that are taken to all the sites. The concentrations of the site cylinders are used to scale pollution datasets, so it is important to ensure that the concentration of gas in the cylinder does not change.
11. **Competence of Local Site Operators** (LSO) in undertaking calibrations. As it is the calibrations by the LSO's that are used to scale pollution datasets, it is important to check that these are undertaken competently.

In addition to the above tests, a "Network Intercomparison" is conducted. This exercise utilises audit gas cylinders transported to each site in the Network. These cylinders have been recently calibrated by the Calibration Laboratory at netcen, and allow us to examine how different site analysers respond when they

are supplied with the same gas used at other sites. For ozone analysers, the calibration is undertaken with recently calibrated ozone photometers.

The technique used to process the intercomparison results is broadly as follows:

- The analyser responses to audit gas are converted into concentrations, using provisional calibration factors obtained on the day of the intercalibration. This factor is also used for the provisional data supplied to the web/teletext.
- These individual results are tabulated, and statistical analyses undertaken (e.g. network average result, network standard deviation, deviation of individual sites from the network mean etc.)

These results are then used to pick out problem sites, or "outliers", which are investigated further to determine reasons and investigate possible remedies for the outliers. The definition of an outlier is a site result that falls outside the following limits:

- ±10% of the network average for NOx, CO and SO_2 analysers,
- ±5% of the reference standard photometer for Ozone analysers,
- ±2.5 % of the stated k_0 value for TEOM analysers,
- ±10% for particulate analyser flow rates,
- ±10% for the recalculation of site cylinder concentrations.

Thus, the intercalibration investigates the quality of provisional data output by the Management Units for use in forecasting, teletext and the web. It also provides input into the ratification process by highlighting sites where close scrutiny of datasets is likely to be required.

As stated earlier, any outliers that are identified are rigorously checked to determine the cause, and corrective action taken, if necessary. There are a number of likely main causes for outlier results, as discussed below:

- Drift of an analyser between scheduled LSO calibrations. This is by far the most common cause of an outlier result, and one that is simply corrected for during ratification of data.
- Drift of site cylinder concentrations between intercalibrations. Site cylinders can sometimes become unstable, especially at low pressures. All site cylinder concentrations are checked every six months, and are replaced as necessary.
- Erroneous calibration factors. It can occasionally happen that an analyser calibration is unsuccessful, and results in unsuitable scaling factors being used to produce pollution datasets. These are identified and corrected during ratification.
- Pressurisation of the sampling system at the audit. Occasionally, an analyser can be very sensitive to small changes in applied flow rates of calibration gas. This is more difficult to identify and correct, and may have consequences for data quality.
- Leaks, sample switching valves, etc. Outliers can be generated if an analyser is not sampling ambient air properly. It is likely that if a leaking analyser is identified, data losses will result.

The procedures used to determine network performance are documented in netcen Work Instructions. These methods are regularly updated and improved and have been evaluated by the United Kingdom Accreditation Service (UKAS). netcen holds ISO17025 accreditation for the on-site calibration of all the analyser types (NOx, CO, SO_2, O_3) and for the determination of the TEOM k_0 factor and particulate analyser flow rates used in the network. An ISO17025 certificate of

calibration (Calibration Laboratory number 0401) for the AURN is appended to this report.

A total of 122 sites were audited in this exercise;
The site at Cardiff has been closed pending site refurbishment
The analysers at London Bromley were not in operation at the time of the audit
A fire near the Wirral Tranmere site had damaged the electricity supply

During this period, new sites were established at Lerwick and Leominster, the site at Blackpool was relocated to Blackpool Marton, the site at Bradford Roadside was repositioned (approximately 20 metres), and the analysers at Norwich Centre and Southend on Sea were replaced.

The following sections of this report identify analysers that did not meet performance standards, investigates the possible causes of these results and recommends any remedial action required.

7 Results Summary

The results of the intercalibration are summarised in Table 7.1 below:

Table 7.1 – Summary of network performance

Parameter	Number of outliers	Number in network	% outliers in total
NOx analyser	28	110	25%
CO analyser	6	80	7%
SO_2 analyser	10	77	13%
Ozone analyser	17	89	19%
TEOM and BAM analysers	0 k_0, 3 flow	70 TEOM PM_{10} 1 BAM 4 $PM_{2.5}$	4%
Gravimetric PM_{10} analysers	0	7	0%
Total	64	438	14%

An outlier is defined as an analyser that shows a deviation from the network mean of greater than 10% for NOx, CO and SO_2 and 5% from the standard photometer for O_3. For PM_{10} and $PM_{2.5}$ analysers, the flow rates must be within 10% of the specified limits and the TEOM k_0 factor must be within 2.5% of the stated value.

In addition to these results, 11 of the 377 site cylinders (~3%) used to scale instrument data into concentrations appeared to have drifted by more than 10% from their certificated values. Five NO_x converters were found to be lower than the 95% acceptance limit, while a further two converters were found to be higher than 105%.

The number of analyser outliers identified is significantly lower than the previous exercise. At the winter 2005 intercalibration 18% of the analysers in use were identified as outliers.

Table 7.2 below presents a breakdown of the outliers identified, on a site-by-site basis:

Table 7.2 – Performance Breakdown

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}
ENGLAND						
Barnsley 12				OK		
Barnsley Gawber		OK	OK	OK	Outlier -10%	
Bath Roadside		OK	OK			
Billingham		Outlier +22%				
Birmingham Centre		OK	OK	OK	OK	OK
Birmingham Tyburn		OK	OK	OK	OK	OK
Blackpool Marton		OK	OK	OK	OK	OK
Bolton		OK	OK	OK	Outlier +7%	OK
Bottesford					OK	
Bournemouth		OK	OK	OK	OK	OK
Bradford Centre		Outlier -18%	OK	OK	OK	OK
Brentford Roadside		Outlier -16%	OK			
Brighton Preston Park		OK			OK	
Brighton Roadside		OK	Analyser fault			
Brighton Roadside PM_{10}						OK
Bristol Centre		OK	OK	Outlier -24%	OK	OK
Bristol Old Market		Outlier +20%	OK			
Bury Roadside		OK	Outlier +18%	Outlier +17%	Outlier +7%	OK
Cambridge Roadside		OK				
Camden Kerbside		OK				OK
Canterbury		OK				OK
Coventry Memorial Park		Outlier +14%	OK	OK	OK	OK
Exeter Roadside		OK	OK	OK	OK	
Glazebury		Outlier -11%			OK	
Great Dun Fell					OK	
Haringey Roadside		OK				Flow outlier
Harwell		OK		OK	OK	OK
High Muffles		Converter 109%			OK	
Hove Roadside		OK	OK	OK		
Hull Freetown		Outlier +11%	OK	OK	Outlier +9%	OK
Ladybower		Outlier -14%		Outlier -11%	OK	
Leamington Spa		OK	OK	OK	Outlier +17%	OK
Leeds Centre		OK	OK	OK	OK	OK
Leicester Centre		Outlier +15%	OK	OK	OK	OK
Leominster		OK			OK	OK
Liverpool Speke		OK	OK	Outlier +13%	Outlier +8%	OK
London A3 Roadside		Outlier +19%	OK			OK
London Bexley		OK	OK	OK	OK	OK
London Bloomsbury		Outlier +18%	OK	OK	OK	OK
London Brent		OK	OK	OK	OK	OK
London Bromley		not audited	not audited			
London Cromwell Road 2		OK	OK	OK	OK	
London Eltham		Outlier -13%		OK	OK	OK
London Hackney		OK	OK		Outlier +20%	

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}
London Haringey					Outlier -36%	
London Harlington		OK	OK		OK	OK
London Hillingdon		OK	OK	OK	Outlier -8%	OK
London Lewisham		OK		Outlier +17%	Outlier -22%	
London Marylebone Road		OK	OK	OK	OK	OK
London N. Kensington		Outlier -19%	OK	OK	OK	OK
London Southwark		OK	OK	OK	OK	
London Teddington		OK		OK	OK	
London Wandsworth		OK			OK	
London Westminster		Outlier -23%	OK	OK	OK	OK
Lullington Heath		OK		OK	OK	
Manchester Piccadilly		Outlier -11% Converter 92%	OK	OK	OK	OK
Manchester South		Converter 93%		OK	OK	
Manchester Town Hall		OK	OK			
Market Harborough		OK	OK		OK	
Middlesbrough		Outlier +11%	OK	OK	OK	OK
Newcastle Centre		OK	OK	OK	OK	OK
Northampton		Outlier +17% Converter 134%	OK	Outlier +14%	OK	Flow outlier
Northampton PM_{10} (Grav)						OK
Norwich Centre		OK	OK	OK	OK	OK
Norwich Roadside		OK				
Nottingham Centre		OK	OK	OK	OK	OK
Oxford Centre Roadside		OK	OK	OK		
Plymouth Centre		OK	Outlier +21%	OK	Outlier +28%	OK
Portsmouth		OK	OK	OK	OK	OK
Preston		Outlier -13% Converter 91%	Outlier -29%	OK	OK	OK
Reading New Town		OK	OK	OK	OK	OK
Redcar		Outlier +16% Converter 91%	Outlier +31%	OK	OK	OK
Rochester		OK		OK	OK	OK
Rotherham Centre		Outlier -13%		Outlier -16%		
Salford Eccles		OK	OK	OK	OK	OK
Sandwell West Bromwich		Outlier +20%	OK	OK	OK	
Scunthorpe Town				OK		OK
Sheffield Centre		OK	OK	OK	OK	OK
Sheffield Tinsley		OK	OK			
Sibton					OK	
Somerton		OK			OK	
Southampton Centre		Outlier +11%	OK	OK	OK	OK
Southend-on-Sea		OK	Outlier -15%	OK	OK	OK
Southwark Roadside		OK	OK	OK		
St Osyth		OK	OK		OK	
Stockport Shaw Heath		Outlier +16%	OK	Outlier +17%		Flow outlier
Stockton-on-Tees Yarm		OK	OK			OK
Stoke-on-Trent Centre		Outlier +13%	OK	Outlier -16%	OK	OK
Sunderland				OK		
Sunderland Silksworth		OK			OK	
Thurrock		OK	OK	OK	OK	OK

SITE	Date visited	NO_x	CO	SO_2	O_3	PM_{10}
Tower Hamlets Roadside		OK	OK			
Walsall Alumwell		OK				
Walsall Willenhall		OK				
West London		OK	OK			
Weybourne					OK	
Wicken Fen		OK		OK	OK	
Wigan Centre		OK	OK	OK	OK	OK
Wirral Tranmere		not audited	not audited	not audited	not audited	not audited
Wolverhampton Centre		OK Converter 94%	OK	OK	OK	OK
Yarner Wood		OK			OK	
NORTHERN IRELAND						
Belfast Centre		Outlier +17%	OK	OK	Outlier +7%	OK
Belfast Clara St						OK
Belfast East				OK		
Derry		OK	OK	Outlier -11%	Outlier +12%	OK
Lough Navar					Outlier +18%	OK
SCOTLAND						
Aberdeen		OK	OK	OK	OK	OK
Bush Estate		OK			OK	
Dumfries		OK	OK			OK
Edinburgh St Leonards		OK	OK	OK	OK	OK
Eskdalemuir		OK			Outlier -11%	
Glasgow Centre		OK	OK	OK	OK	OK
Glasgow City Chambers		OK	OK			
Glasgow Kerbside		OK	OK			OK
Grangemouth		OK	OK	OK	OK	OK
Inverness		Outlier +12%	OK			OK
Lerwick					OK	
Strath Vaich					Outlier +12%	
WALES						
Aston Hill		OK			OK	
Cardiff Centre		not audited	not audited	not audited	not audited	not audited
Cwmbran		OK	Outlier +28%	OK	OK	OK
Narberth		Outlier +16%		OK	Outlier +13%	Flow outlier
Port Talbot		OK		OK	OK	OK
Swansea		OK	OK	OK	OK	OK
Wrexham		Outlier -18%	OK	OK		OK

The following sections look at each pollutant in turn and investigate causes for outliers.

8 Oxides of Nitrogen

8.1 Intercalibration Outliers

The intercalibration highlighted that the results from 28 sites were outside the ±10% acceptance limit from the network mean. This result is slightly better than the winter intercalibration, when 29 analysers (28%) were identified as outliers.

Seven outliers can be attributed to changes in the site cylinder concentrations, as listed below:

1. Bristol Old Market
2. Hull Freetown 3x®
3. Leicester Centre
4. London Eltham
5. Middlesbrough 2x®
6. Northampton
7. Preston

® denotes a repeat offender

The actions arising as a result of cylinder outliers are described in Section 13.

Data from all the affected sites has been carefully examined and rescaled as needed. No data have been lost as a result of the rescaling.

Nineteen outliers can be attributed to drifts in calibration factors between LSO calibrations, and no data will be lost as a result of these findings.

The analyser at London A3 Roadside failed to respond to NO_2 calibration gases, though it passed the converter test.

A further two outliers appear to be due to unsuccessful calibrations (Brentford Roadside, Redcar).

Using the methodology detailed in Section 6, comparison of the network averages to audit cylinder concentrations showed that the network measures concentrations of NOx to within 2% of the network standards. The percentage standard deviations of these results, which is an indication of how close the results are grouped together, were less than 5% in both cases. These are very good results, and demonstrate that data from the vast majority of NOx analysers are accurate, harmonised and traceable to national metrology standards.

8.2 Leaking switching valves

This phenomenon has been observed as a significant cause of outliers in NOx analysers. When NO_2 gas is used for calibration, some analysers have been seen to produce a significant NO signal. This gives cause for concern, because a cylinder of NO_2 will be virtually 100% NO_2, very little NO will be present in the mixture.

Analysers that exhibit this behaviour could be underestimating concentrations of NO_2, as highlighted by the following nine analysers:

1. London Lewisham - measured 11 ppb NO in an NO_2 cylinder (not outlier)
2. Northampton – measured 60 ppb NO in an NO_2 cylinder (outlier)
3. Sheffield Tinsley - measured 15 ppb NO in an NO_2 cylinder (not outlier)
4. Somerton - measured 16 ppb NO in an NO_2 cylinder (not outlier)
5. Stockport Shaw Heath - measured 26 ppb NO in an NO_2 cylinder (outlier)
6. West London - measured 12 ppb NO in an NO_2 cylinder (not outlier)
7. Dumfries - measured 11ppb NO in an NO_2 cylinder ® (not outlier)
8. Yarner Wood - measured 13 ppb NO in an NO_2 cylinder (not outlier)
9. Wrexham – measured 21 ppb NO in an NO_2 cylinder 2x® (outlier)

® denotes a repeat offender

These results are significantly better than those found at the winter 2005 exercise where 17 analysers were seen to have this response.

The most likely cause for this observation is a leaking switching valve inside the analyser. The valves cycle the analysers between sampling NOx, NO and, on some models, reference gases, and any leaks within these systems appear to manifest themselves when calibrating the analysers with NO_2 gas. In many ways, this phenomenon is similar to the leaking main valve faults common to ozone analysers. Unfortunately, as the valves are inside the analysers, it is not possible for LSO's or QA/QC to leak check these valves.

Recommendation

It is recommended that LSO's continue to pay particular attention to the NO_2 calibration results, to see whether the NO response is significantly higher (>10ppb) than that obtained for the zero calibration. These observations should be reported to CMCU as soon as possible.

These faults were highlighted to the ESU's in the weekly report emails during the intercalibration, to ensure that particular attention was paid to servicing and cleaning these switching valves during services, to try to minimise the occurrence of these outliers.

Recommendation

It is strongly recommended that ESU's clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards.

Netcen will continue to monitor these results at audit visits.

8.3 Converter Tests

Five converters were found to be less than 95% efficient:

- Manchester Piccadilly – 92%
- Manchester South – 93%
- Preston – 91%
- Redcar 91%
- Wolverhampton – 94% (borderline - no data rejected)

The converter at High Muffles was found to be 109% efficient.
The converter at Northampton was found to be 134% efficient.

The High Muffles analyser was found to have a correction factor set in the software to allow for an inefficient converter. The ESU has agreed to ensure analyser converter efficiencies have been set to 100% in the software. The Northampton NOx analyser had a fault with the timing of the NOx/NO switching valve.

It is worth noting at this point that the future requirement for the performance of NOx analysers will become much tighter. Converters will still need to be at least 95% efficient, but all NO_2 data will need to be rescaled to reflect the inefficiencies of the individual converters. In addition to this rescaling, data from any analysers with converters found to be lower than 95% efficient will be rejected. Clearly, significant future effort will be required to rescale this amount of data.

9 Carbon Monoxide

The intercalibration showed that the results from 6 analysers were outside the ±10% acceptance criterion. This result is identical to the winter intercalibration, when six analysers were also identified as outliers.

Four outliers can be attributed to drifts in calibration factors between LSO calibrations, and no data were lost as a result of this.

The result at Bury Roadside appears to be due to an unsuccessful calibration. This has been corrected during ratification; again no data were lost as a result.

The analyser at Preston appeared to exhibit sensitivity to pressure differences when calibration gas was supplied to the instrument. The data from this analyser have been carefully examined during ratification; no data have been rejected as a result of these findings.

The analyser at Brighton Roadside had an IR source fault at the time of the audit

Comparison of the network average to the audit cylinder concentration showed that the network measures CO concentrations to within 1% of the reference standard. The percentage standard deviation was less than 4%. These are excellent results, and demonstrate that data from the CO analysers are accurate, harmonised and traceable to national metrology standards. There are, however, a number of issues with several CO analysers in the network which have resulted in substantial losses of data-see section 3.4.

10 Sulphur Dioxide

10.1 Intercalibration Outliers

The intercalibration showed that the results from 10 analysers were outside the ±10% acceptance criterion. This is slightly better than the winter intercalibration, when eleven analysers (14%) were identified as outliers.

Five outliers can be attributed to drifts in calibration factors between LSO calibrations, and no data were lost as a result of this.

Three outliers arose as a result of changes in site cylinder concentrations as listed below:

1. Bury Roadside
2. Northampton
3. Rotherham

Actions arising from cylinder outliers are described in Section 13.

Data from all the affected sites has been carefully examined and rescaled as needed. No data have been lost as a result of the rescaling.

A further two outliers appear to be due to unsuccessful calibrations (Bristol Centre, Stockport Shaw Heath).

Comparison of the network average to the audit cylinder concentration showed that the network measures SO_2 concentrations to within 1% of the reference standard. The percentage standard deviation was less than 4%. These are excellent results, and demonstrate that data from the SO_2 analysers are accurate, harmonised and traceable to national metrology standards.

10.2 m-xylene tests

The efficiency of the hydrocarbon "kicker" was evaluated with a 1 ppm m-xylene cylinder. The kicker selectively removes hydrocarbons from the sample inlet prior to analysis. This is an important test, because m-xylene behaves in a similar manner to SO_2 when exposed to UV light within the analyser, and could therefore interfere with the analyser response, if the kicker does not function properly.

To pass the test, the analyser must not respond by more than 1% (10 ppb) of the m-xylene cylinder concentration. However, it should be noted that this particular test is very demanding; typical ambient hourly maximum concentrations of this pollutant rarely exceed 50 ppb, and annual concentrations rarely exceed 5 ppb. In future, there will be no formal requirement for analysers in the field to pass this test, once type approval has been granted. For these reasons, the acceptance criteria have been relaxed to allow a maximum response of 50ppb.

There were no outliers identified during this intercalibration: the maximum m-xylene response observed for any analyser was 32ppb (compared to 34ppb at the winter 05 intercalibration)

11 Ozone

Calibration of the network analysers against the netcen reference photometers showed that 17 analysers were outside the ±5% acceptance criterion. This is better than the previous exercise, where 23 analysers tested (27%) were identified as outliers.

Of the 17 analysers, 7 had drifted by less than 10%; ratification of these datasets was straightforward, with no loss of data.

7 of the remaining analysers had drifted by less than 20%. Ratification of the data from these analysers has been more complex, to ensure that suitable scaling of the data could be applied, but no losses of data were necessary.

The other 3 analysers had drifted by more than 20%.

These results are better than the winter 2004 intercalibration, when 7 analysers were found to be more than 20% from the reference photometer.

12 Particulate analysers

12.1 TEOM k_0

There were no outliers for TEOM k_0 during this intercalibration - all calibration factors were calculated to be within 2.5% of their stated values.

12.2 Analyser Flow Rates

The flow rates of the analysers at three sites were found to be outside the ±10% acceptance limit:

1. Haringey Roadside (Total and Main Flows -13%)
2. Northampton TEOM (Total Flow -14%)
3. Stockport Shaw Heath (Main and Aux Flows -20%)

The analyser at Haringey Roadside also failed the leak tests, although careful examination of the dataset, and the circumstances surrounding the fault, have resulted in no loss of data.

13 Site Cylinder Concentrations

During the intercalibration, the concentrations of the on-site cylinders were evaluated using the audit cylinder standards. The calculated results showed that 11 of the 377 cylinders (~3%) used to scale analyser data into concentrations (NO, CO and SO_2) appear to be outside the ±10% acceptance criterion. This is similar to the Winter 2005 roadshow, where 2.5% (10 cylinders) were outside the acceptance limits.

In addition, the concentrations of 18 NO_2 cylinders appear to have drifted by more than 10%.

In total, 29 of the 377 cylinders (~7.5%) were outside the acceptance limits. This is better than the previous intercalibration, where 9% of the cylinders were found to be out of specification.

The site cylinder evaluations are performed by calibrating the analysers with audit and site cylinder gas through the same inlet system, and using the conditioned site cylinder regulators, thus minimising any possible errors due to contaminated tubing or regulators.

As a result of this exercise, the following cylinders were identified for replacement:

1. Belfast Centre NO
2. Bristol Old Market NO
3. Hull Freetown NO
4. Leicester Centre NO
5. Rotherham SO_2

The Belfast Centre, Hull Freetown and Leicester Centre sites were replaced late 2005; the Bristol and Rotherham cylinders will be replaced in January 2006.

The following cylinders have had new concentrations determined:

1. Bury Roadside SO_2
2. Eskdalemuir NO
3. Middlesbrough NO
4. Northampton SO_2

The performance of the remaining cylinders will be re-examined at the next intercalibration.

14 Site Information

We have compiled additional information about the monitoring stations in the network, including the types of sampling systems deployed on site.

The Table below presents information about the sampling systems deployed on site, together with accurate, validated grid references. Considerable effort has been made, both in compiling these grid references. It should be noted that while the measurements are accurate to within 1 metre, the uncertainty of the GPS system used is typically the order of ±10 metres.

The following Table 14.1 presents the information collated to date:

Table 14.1 – Site Information

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
Aberdeen	Glass	NJ944074	394416	807408	57° 9' 27.1" N	2° 5' 38" W	10
Aston Hill	Glass	SO299901	329902	290062	52° 30' 13.3" N	3° 02' 3" W	370

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
Barnsley 12	Narrow-bore Teflon	SE343065	434276	406542	53° 33' 16" N	1° 29' 3" W	120
Barnsley Gawber	Wide-bore Teflon	SE325075	432529	407472	51° 33' 46" N	1° 30' 37" W	105
Bath Roadside	Narrow-bore Teflon	ST755658	375473	165845	51° 23' 27.7" N	2° 21' 14.4" W	35
Belfast Centre	Glass				54° 35' 58.8" N	5° 55′ 39.3′′W	10
Belfast Clara St	N/A				54° 35' 27.3" N	5° 53' 39.4" W	10
Belfast East	Narrow-bore Teflon				54° 35′ 47.5′′N	5° 54′ 2.1′′W	10
Billingham	Glass	NZ470237	446962	523650	54° 36' 21" N	1° 16' 28" W	15
Birmingham Centre	Glass	SP063869	406342	286862	52° 28' 47" N	1° 54' 29" W	140
Birmingham Tyburn	Glass	SP116905	411625	290457	52° 30' 43" N	1° 49' 48" W	95
Blackpool Marton	Wide-bore Teflon	SD339347	333863	434745	53° 48' 17.2" N	3° 0' 20.6" W	5
Bolton	Wide-bore Teflon	SD710086	371000	408562	53° 34' 22" N	2° 26' 22" W	105
Bottesford	Narrow-bore Teflon	SK798377	479768	337654	52° 55' 49" N	0° 48' 53" W	30
Bournemouth	Narrow-bore Teflon	SZ123933	412320	93344	50° 44' 22" N	1° 49' 36" W	10
Bradford Centre	Wide-bore Teflon	SE166330	416652	433038	53° 47' 36.2" N	1° 44' 55.3" W	102
Brentford Roadside	Narrow-bore Teflon	TQ174780	517425	178074	51° 29' 20.2" N	0° 18' 33"	10
Brighton Preston Park	Wide-bore Teflon	TQ305062	530508	106222	50° 50' 27" N	0° 8' 52" W	30
Brighton Roadside	Glass	TQ313043	531307	104305	50° 49' 24" N	0° 8' 14" W	10
Brighton Roadside $_{PM10}$	N/A	TQ313043	531322	104302	50° 49' 24 N	0° 8' 13" W	10
Bristol Centre	Glass	ST594733	359427	173285	51° 27' 25" N	2° 35' 7" W	15
Bristol Old Market	Glass	ST596732	359570	173173	51° 27' 22" N	2° 35' 59" W	20
Bury Roadside	Glass	SD809048	380922	404772	53° 32' 21" N	2° 17' 22" W	100
Bush Estate	Hi Flow wide tube	NT246639	324626	663880	55° 51' 44" N	3° 12' 22" W	185
Cambridge Roadside	Narrow-bore Teflon	TL452582	545248	258155	52° 12' 9" N	0° 7' 26" E	10
Camden Kerbside	Narrow-bore Teflon	TQ266844	526640	184433	51° 32' 41" N	0° 10' 31" W	50
Canterbury	Narrow-bore Teflon	TR162573	616198	157330	51° 16' 25" N	1° 5; 55" E	30
Cardiff Centre	Glass	ST184765	318417	176505	51° 28' 53" N	3° 10' 34" W	12

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
Coventry Memorial Park	Wide-bore Teflon	SP328773	432801	277340	52° 23' 35" N	1° 31' 10" W	95
Cwmbran	Wide-bore Teflon	ST305954	330510	195436	51° 39' 11.7" N	3° 0' 20.2" W	65
Derry	Wide-bore Teflon				55° 0' 1.5" N	7° 19' 42.1" W	25
Dumfries	Narrow-bore Teflon	NX970763	297012	576278	55° 4' 14" N	3° 36' 52" W	20
Edinburgh St Leonards	Glass	NT263731	326250	673132	55° 56' 44" N	3° 10' 57" W	30
Eskdalemuir	Narrow-bore Teflon	NT235030	323528	603030	55° 18' 55.1" N	3° 12' 22" W	260
Exeter Roadside	Stainless Steel	SX919928	291940	92840	50° 43' 30" N	3° 31' 56" W	35
Glasgow Centre	Wide-bore Teflon	NS589650	258902	665028	55° 51' 28.4" N	4° 15' 21" W	5
Glasgow City Chambers	Narrow-bore Teflon	NS595653	259528	665308	55° 51' 38" N	4° 14' 45" W	15
Glasgow Kerbside	Wide-bore Teflon	NS587652	258708	665200	55° 51' 33" N	4° 15' 32" W	10
Glazebury	Narrow-bore Teflon	SJ687960	368733	396034	53° 27' 36" N	2° 28' 21" W	20
Grangemouth	Wide-bore Teflon	NS938810	293840	681032	56° 0' 38" N	3° 42' 15" W	5
Great Dun Fell	Narrow-bore Teflon	NY710322	371020	532190	54° 41' 2.4" N	2° 27' 4" W	850
Haringey Roadside	Narrow-bore Teflon	TQ339907	533885	190669	51° 35' 56" N	0° 4' 6" W	15
Harwell	Wide-bore Teflon	SU468860	446772	186020	51° 34' 16" N	1° 19' 36" W	125
High Muffles	Wide-bore Teflon	SE775939	477535	493865	54° 20' 4" N	0° 48' 33" W	260
Hove Roadside	Glass	TQ301045	530088	104484	50° 49' 31" N	0° 9' 16" W	30
Hull Freetown	Glass	TA095293	509478	429329	53° 44' 55.1" N	0° 20' 27" W	0
Inverness	Glass	NH657457	265720	845680	57° 28' 53.5" N	4° 14' 29" W	10
Ladybower	Wide-bore Teflon	SK166896	416575	389565	53° 24' 10" N	1° 45' 8" W	360
Leamington Spa	Glass	SP319657	431932	265743	52° 17' 20" N	1° 31' 59" W	55
Leeds Centre	Glass	SE300343	429976	434268	53° 48' 13" N	1° 32' 47" W	60
Leicester Centre	Glass	SK588041	458767	304083	52° 37' 53" N	1° 7' 59" W	65
Leominster	Glass	SO498584	349773	258387	52° 13' 17" N	2° 44' 12" W	75
Lerwick	Narrow-bore Teflon	HU453397	445345	1139685	60° 8' 21" N	1° 11' 8" W	85
Liverpool Speke	Glass	SJ439836	343860	383598	53° 20' 47" N	2° 50' 41" W	35
London A3 Roadside	Wide-bore	TQ190652	518983	165220	51° 22' 25" N	0° 17' 31" W	30

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
	Teflon						
London Bexley	Glass	TQ519764	551852	176396	51° 27' 58" N	0° 11' 05" E	10
London Bloomsbury	Glass	TQ301820	530107	182041	51° 31' 02" N	0° 07' 14" W	20
London Brent	Glass	TQ196893	519570	189275	51° 35' 23" N	0° 16' 31" W	50
London Bromley	Narrow-bore Teflon	TQ405693	540533	169334	51° 24' 20" N	0° 1' 09" E	65
London Cromwell Road 2	Wide-bore Teflon	TQ265790	526530	178975	51° 29' 44" N	0° 10' 43" W	5
London Eltham	Narrow-bore Teflon	TQ440747	543978	174668	51° 27' 10" N	0° 4' 15" E	65
London Hackney	Wide-bore Teflon	TQ348862	534812	186230	51° 33' 32" N	0° 3' 24" W	20
London Haringey	Narrow-bore Teflon	TQ299891	529914	189132	51° 35' 10" N	0° 7' 34" W	40
London Harlington	Narrow-bore Teflon	TQ083778	508299	177809	51° 29' 20" N	0° 26' 30" W	25
London Hillingdon	Glass	TQ069786	506933	178607	51° 29' 47" N	0° 27' 40" W	25
London Lewisham	Narrow-bore Teflon	TQ377737	537680	173685	51° 26' 44" N	0° 1' 13" W	20
London Marylebone Road	Glass	TQ281820	528120	182000	51° 31' 21" N	0° 09' 17" W	30
London N. Kensington	Narrow-bore Teflon	TQ240817	524040	181740	51° 31' 16" N	0° 12' 48" W	20
London Southwark	Glass	TQ322786	532245	178565	51° 29' 26" N	0° 05' 48" W	20
London Teddington	Glass	TQ155704	515538	170427	51° 25' 16" N	0° 20' 23" W	20
London Wandsworth	Narrow-bore Teflon	TQ258747	525778	174677	51° 27' 26" N	0° 11' 28" W	10
London Westminster	Glass	TQ298789	529796	178949	51° 29' 41" N	0° 07' 54" W	0
Lough Navar	Glass				54° 26′ 21.5" N	7° 53′ 55.9" W	
Lullington Heath	Wide-bore Teflon	TQ539018	553855	101740	50° 47' 41" N	0° 10' 54" E	115
Mace Head	Narrow-bore Teflon				53° 19′ 35.2′′N	9° 54′ 14.1′′W	5
Market Harborough	Glass	SP833959	483337	295905	52° 53' 17" N	0° 46' 20" W	145
Manchester Piccadilly	Glass	SJ843983	384310	398325	53° 28' 53"N	2° 14' 16" W	60
Manchester South	Glass	SJ839858	383912	385828	53° 22' 09"N	2° 14' 36" W	65

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
Manchester Town Hall	Wide-bore Teflon	SJ839980	383874	397976	53° 28' 42"N	2° 14' 40" W	60
Middlesbrough	Glass	NZ505196	450480	519632	54° 34' 10" N	1° 13' 16" W	5
Narberth	Wide-bore Teflon	SN146127	214640	212700	51° 46' 56" N	4° 41' 19" W	160
Newcastle Centre	Glass	NZ250649	425016	564940	54° 58' 42" N	1° 36' 38" W	45
Northampton	Glass	SP761645	476111	264524	52° 16' 25" N	0° 53' 09" W	125
Norwich Centre	Wide-bore Teflon	TG231089	623078	308910	52° 37' 55" N	1° 17' 42" E	20
Norwich Roadside Forum	Narrow-bore Teflon	TG230085	622998	308521	52° 37' 43" N	1° 17' 37" E	35
Nottingham Centre	Glass	SK574401	457420	340050	52° 57' 17" N	1° 08' 48" W	40
Oxford Centre	Wide-bore Teflon	SP514062	451366	206152	51° 45' 06" N	1° 15' 26" W	60
Plymouth Centre	Glass	SX477546	247742	54610	50° 22' 18" N	4° 08' 33" W	10
Port Talbot	Glass	SS780882	278036	188249	51° 34' 48" N	3° 45' 42" W	30
Portsmouth	Glass	SU657036	465686	103607	50° 49' 42" N	1° 04' 07" W	5
Preston	Wide-bore Teflon	SD552301	355248	430143	53° 45' 56" N	2° 40' 49" W	45
Reading New Town	Wide-bore Teflon	SU734732	473441	173198	51° 27' 11" N	0° 56' 40" W	45
Redcar	Glass	NZ600246	459975	524563	54° 36' 46" N	1° 4' 22" W	5
Rochester	Narrow-bore Teflon	TQ831762	583133	176220	51° 27' 19" N	0° 38' 04"E	14
Rotherham Centre	Teflon coated metal	SK431930	443088	393028	53° 25' 56" N	1° 21' 11" W	40
Salford Eccles	Glass	SJ779987	377932	398713	53° 29' 05" N	2° 20' 02" W	30
Sandwell West Bromwich	Glass	SP003915	400395	291503	52° 31' 17" N	1° 59' 44" W	165
Scunthorpe Town	Narrow-bore Teflon	SE904108	490421	410812	53° 35' 9.9" N	0° 38' 7.7 W	35
Sheffield Centre	Glass	SK351868	435134	386885	53° 22' 40" N	1° 28' 24" W	75
Sheffield Tinsley	Glass	SK402906	440240	390585	53° 24.639' N	1° 23.770 W	45
Sibton	Wide-bore Teflon	TM363719	636295	271870	52° 17' 39" N	1° 27' 49" E	45
Somerton	Wide-bore Teflon	ST485265	348544	126525	51° 02' 09" N	2° 44' 07" W	45
Southampton Centre	Glass	SU426123	442565	112255	50° 54' 30" N	1° 23' 46" W	5
Southend-on-Sea	Wide-bore Teflon	TQ856861	585566	186130	51° 32' 37.6" N	0° 40' 29" E	35
Southwark Roadside	Wide-bore Teflon	TQ346777	534621	177680	51° 28' 55" N	0° 03' 46" W	5

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
St Osyth	Glass	TM104132	610426	213205	51° 46' 41" N	1° 02' 56" E	5
Stockport Shaw Heath	Glass	SJ894896	389386	389604	53° 24' 11" N	2° 09' 40" W	75
Stockton-on-Tees Yarm	Wide-bore Teflon	NZ419129	441908	512886	54° 30' 34" N	1° 21' 15" W	10
Stoke-on-Trent Centre	Wide-bore Teflon	SJ883479	388348	347894	53° 01' 42" N	2° 10' 31" W	180
Strath Vaich	Wide-bore Teflon	NH348748	234829	874785	57° 43' 56" N	4° 46' 33" W	270
Sunderland	Narrow-bore Teflon	NZ399570	439855	556990	54° 54' 22" N	1° 22' 48" W	20
Sunderland Silksworth	Wide-bore Teflon	NZ381545	438142	554478	54° 53' 1" N	1° 24' 25" W	110
Swansea	Glass	SS656932	265566	193158	51° 37' 16" N	3° 56' 36" W	20
Thurrock	Glass	TQ610779	561018	177894	51° 28' 38" N	0° 19' 02" E	5
Tower Hamlets Roadside	Narrow-bore Teflon	TQ359822	535914	182230	51° 31' 22" N	0° 02' 32" W	10
Walsall Alumwell	Narrow-bore Teflon	SJ994983	399374	298264	52° 34' 56" N	2° 00' 38" W	130
Walsall Willenhall	Glass	SJ979012	397860	201173	52° 36' 30" N	2° 01' 59" W	150
West London	Wide-bore Teflon	TQ250788	525041	178751	51° 29' 38" N	0° 12' 01" W	5
Weybourne	Narrow-bore Teflon	TG098438	609832	343775	52° 57' 01" N	1° 07' 19" E	20
Wicken Fen	Wide-bore Teflon	TL563692	556310	269210	52° 17' 56" N	0° 17' 27" E	10
Wigan Centre	Wide-bore Teflon	SD578060	357825	406025	53° 32' 58" N	2° 38' 17" W	45
Wirral Tranmere	Wide-bore Teflon	SJ321866	332096	386644	53° 22' 20.9"N	3° 01' 17.5" W	30
Wolverhampton Centre	Glass	SO914989	391368	298942	52° 35' 18" N	2° 07' 44" W	150
Wrexham	Glass	SJ329499	332862	349904	53° 02' 32" N	3° 00' 10" W	80
Yarner Wood	Wide-bore Teflon	SX786789	278605	78948	50° 35' 51" N	3° 42' 59" W	120

The grid references quoted in the above table are obtained from GPS measurements, confirmed by reference to Ordnance Survey 1:25000 maps and internet street mapping services. The 6 figure easting and northing references are obtained from GPS measurements, quoted to 1 metre accuracy, and also referenced to internet street mapping services. It should be noted that these figures are likely to carry an uncertainty of ±10 metres.

For sites in Northern Ireland and Mace Head in Ireland, Latitude and Longitude references are used to ensure accurate positioning. The GB and Irish grid reference systems are slightly different, which can lead to positioning errors.

It is suggested that Management Units check the accuracy of their databases and websites against these data, and provide feedback or update accordingly.

15 CEN

The European Committee for Normalisation (CEN) have prepared a series of documents prescribing how analysers must be operated, to produce datasets that conform to the Data Quality Objectives of the EC Directives. The CEN documents for operation of air pollution analysers; ISO14211 (NOx), ISO14212 (SO_2), ISO14626 (CO) and ISO14625 (O_3) set out a series of performance criteria for analysers which must be achieved, both in the field and under laboratory conditions.

By way of example, the performance of an analyser in the field must pass a number of tests, including:

- Linearity – the analyser must have a maximum error at any point of less than 6% of the predicted value. Netcen now reports maximum residuals from linearity tests, to evaluate the performance of current analysers against these tougher requirements.

- NOx Converter efficiency must be better than 95%. Data must be rescaled for efficiencies between 95 and 99.9%, but rejected if below 95%. Again, this is tighter than currently, where we accept "borderline" failures. Netcen already use the CEN method for undertaking converter tests.

- The sampling system that delivers air to the analyser must remove no more than 2% of the gas to be analysed. Netcen continue to evaluate systems to calibrate sampling systems, but this is not currently undertaken on a routine basis in the UK.
  A report on the evaluation of methodologies to test losses of gases to sampling manifolds has been completed by QA/QC Unit and this is available on the AURN Hub and Air Quality Archive.

- The concentration of the site cylinders will need to be determined every six months, and the revised values used to scale ambient data. This is a change to our current procedures, where no action is taken until a cylinder deviates from its stated value by more than 10%. Netcen have introduced a new procedure for handling drifting cylinder concentrations. The winter 2006 intercalibration will be used to evaluate a new methodology for calculating site cylinder concentrations and uncertainties. In future, the uncertainty of these calculations will need to be substantially lower than the current 10% limit (in the order of 4-5% maximum).

- The determination of an SO_2 analyser response to meta xylene will not be required for ongoing field tests. For the AURN, netcen will continue to assess the performance of the hydrocarbon kickers, but action will not be recommended unless the result is very high (greater than 50ppb response to a 1ppm m xylene cylinder)

The CEN operating methodologies have been formally ratified, and adopted into the requirements of the Framework and Daughter Directives. Member States

now have until 1 January 2008 to ensure their monitoring networks are compliant. Netcen are taking steps to ensure the procedures used in the UK comply with the requirements ahead of any imposed deadlines. To this end, the procedures used winter 2006 intercomparison will be fully compliant with the CEN protocols.

16 Safety

Netcen undertakes regular extensive risk assessments of all its activities on-site, to ensure that its staff are not exposed to unsafe practices while working.

There are no significant issues identified that presented significant risk during this intercalibration exercise. The issue of safe roof access, to audit PM_{10} analyser flow rates has largely been worked around. This has been achieved either by installing ladder securing points on the outside of the huts, or by auditing flow rates inside the monitoring station. However, performing flow measurements inside means that we are unable to perform satisfactory leak tests on the entire sampling systems of these analysers. For this reason, it would be useful if safer roof access (ladder securing points) could be considered for the following sites:

1. Blackpool
2. London Brent
3. Southend-on-Sea
4. Narberth

In addition, safe roof access is not possible at the following sites:

1. Bolton
2. Coventry Memorial Park

We are also currently investigating the safety of roof access arrangements at Marylebone Road.

17 Certification

The Network Certificate of Calibration is presented in Appendix B1. This certificate presents the results of the individual analyser scaling factors on the day of the audit, as calculated by netcen using the audit cylinder standards, in accordance with our UKAS accreditation.

18 Summary

The intercalibration exercise has demonstrated its value as an effective tool in determining overall site performance and assessing the reliability and traceability of air quality measurements from a large scale network. The results from this

intercalibration have been used to assess data quality during the ratification of the network datasets for the period April to September 2005.

APPENDIX B1

Network Certificate of Calibration

netcen
netcen is an operating division of AEA Technology plc

CERTIFICATE OF CALIBRATION

551 Harwell, Didcot, Oxfordshire OX11 0QJ. Telephone 0870 1906465 Facsimile 0870 1906377

UKAS CALIBRATION
0401

Certificate No: 01449
AEA Identification Number: 45077030

Approved Signatories: K. Stevenson
S. Eaton ✓

Signed: Date:

Date of issue: 6 February 2006

Customer Name and Address: Dr Janet Dixon
AEQ Division
Department for Environment, Food and Rural Affairs
Ashdown House (Zone E14)
123 Victoria Street
London SW1E 6DE

Description: Calibration factors for monitoring stations in the Automatic Urban Monitoring Network

1. Carbon Monoxide

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
	Scottish Sites						
05-Sep	Aberdeen	10269	0	0.3	1.000	3	1.2
08-Sep	Dumfries	1498	-62	0.3	0.021	3	1.6
01-Sep	Edinburgh St Leonards	14331	0	0.3	1.025	3	0.8
25-Aug	Glasgow Centre	0410-009	-7	0.3	0.052	3	3.7
23-Aug	Glasgow City Chambers	api-65	0	0.3	1.015	3	0.5
24-Aug	Glasgow Kerbside		2	0.3	0.053	3	0.5
31-Aug	Grangemouth	12894	1	0.3	1.040	3	1.4
06-Sep	Inverness	1500	0	0.3	1.015	3	1.4
	Welsh Sites						
	Cardiff	Site	closed	no tests	possible		
14-Sep	Cwmbran	103006	0	0.3	1.003	3	1.4
19-Jul	Swansea	70	1	0.3	0.051	3	1.2
25-Jul	Wrexham	12556	84	0.3	0.010	3	0.9
	N.Irish Sites						
26-Jul	Belfast Centre	m1811m491	455	0.3	0.005	3	2.0
27-Jul	Derry	J-AR-009	1	0.3	0.054	3	0.4

The reported 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.

netcen
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CERTIFICATE OF CALIBRATION

551 Harwell, Didcot, Oxfordshire OX11 0QJ. Telephone 0870 1906465 Facsimile 0870 1906377

UKAS CALIBRATION
0401

Certificate No: 01449

AEA Identification Number: 45077030

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
	English Sites						
16-Aug	Barnsley Gawber		-2	0.3	0.046	3	2.2
15-Aug	Bath Roadside	api-11388	16	0.3	0.052	3	0.8
31-Aug	Birmingham Centre	et 14418	-27	0.3	0.055	3	2.4
02-Aug	Birmingham Tyburn	106006	0	0.3	1.041	3	1.2
06-Sep	Blackpool Marton	L-AR-010	3	0.3	0.051	3	0.9
02-Aug	Bolton	440	2	0.3	0.986	3.1	2.5
19-Aug	Bournemouth	1501	0	0.3	1.015	3	0.6
27-Jul	Bradford Centre		10	0.3	0.031	3.1	1.7
29-Jul	Brentford Roadside	co11m104	6	0.3	1.010	3.5	1.4
01-Sep	Brighton Roadside	1434					
11-Jul	Bristol Centre	257	0	0.3	1.020	3	1.8
25-Jul	Bristol Old Market	10429	0	0.3	1.005	3	1.8
02-Aug	Bury Roadside	277	0	0.3	0.953	3.1	2.7
28-Jul	Coventry Memorial Park	207001	0	0.3	1.079	3	0.9
12-Jul	Exeter Roadside	244	22	0.3	0.055	3	0.8
02-Sep	Hove Roadside	1433	1	0.5	1.045	3.5	0.7
25-Jul	Hull Freetown	m489	52	0.3	0.049	3.1	1.7
22-Jul	Leamington Spa	399	20	0.3	0.051	3	1.9
27-Jul	Leeds Centre	207003	0	0.3	1.029	3	1.0
21-Jul	Leicester Centre	207004	0	0.3	1.010	3	0.6
07-Sep	Liverpool Speke	m1807m487	1035	0.3	0.005	3	1.1
30-Jun	London A3 Roadside	H-AR-001	-20	0.3	0.046	3	1.3
12-Jul	London Bexley	443	1	0.3	0.967	3	1.7
29-Jun	London Bloomsbury	14330	3	0.3	0.050	3	0.9
20-Jul	London Brent	ML9830-339	25	0.3	0.048	3	3.2
09-Aug	London Cromwell Rd 2	10776	16	0.3	0.050	3	0.8
05-Jul	London Hackney	m2113-m546	57	0.3	0.024	3	5.4
24-Aug	London Harlington	m3001045	0	0.3	1.000	3	0.5
27-Jun	London Hillingdon	0410.005	-48	0.3	0.049	3	3.4
16-Aug	London Marylebone Rd	651	-1	0.3	0.993	4.7	2.0
30-Jun	London N. Kensington	360	1	0.3	1.030	3.1	0.4
26-Jul	London Southwark	843	1	0.3	1.000	3	0.9
06-Sep	London Westminster	867	6	0.3	0.050	3	1.6
05-Jul	Manchester Piccadilly	0410-008	-6	0.3	0.045	3	0.3
05-Jul	Manchester Town Hall	720	6	0.3	0.046	3	4.8
18-Jul	Market Harborough	60983	747	0.3	0.006	26*	0.2
09-Aug	Middlesbrough	204	-1	0.3	1.020	3.1	1.5
08-Aug	Newcastle Centre	m-488	49	0.3	0.049	3	0.4
01-Jul	Northampton	8905410102	0	0.3	0.986	3	0.5
21-Jun	Norwich Centre		-2	0.3	0.051	3	0.3
20-Jul	Nottingham Centre		-7	0.3	0.045	3	0.4
28-Jun	Oxford Centre Roadside	214b-127	101	0.3	0.053	3	0.9
13-Jul	Plymouth Centre		-1	0.3	0.046	3	0.9

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UKAS CALIBRATION
0401

Certificate No: 01449

AEA Identification Number: 45077030

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppm)	[2]Calibration Factor	Uncertainty (%)	*Maximum Residual (%)
27-Jun	Portsmouth	902015	0	0.3	1.157	3.1	0.9
06-Sep	Preston	L-AR-013	5	0.3	0.084	3	0.9
30-Jun	Reading New Town		-5	0.3	0.044	3	1.2
10-Aug	Redcar	300	19	0.3	0.044	3.4	5.0
06-Jul	Salford Eccles	2386	0	0.3	0.995	3	3.7
19-Jul	Sandwell West Bromwich	151	16	0.3	0.047	3	0.4
15-Aug	Sheffield Centre	410-006	-6	0.3	0.049	3	2.6
15-Aug	Sheffield Tinsley	95487	-2	0.3	0.073	3	0.8
13-Jul	Southampton Centre	m1810-m490	46	0.3	0.054	3.2	2.7
22-Jun	Southend-on-Sea		0	0.3	0.064	3	2.0
29-Jul	Southwark Roadside	358	-2	0.3	1.041	3	1.0
21-Sep	St Osyth	60872	-22	0.3	0.006	26*	0.8
07-Jul	Stockport Shaw Heath	1701	25	0.3	0.050	3	2.0
10-Aug	Stockton-on-Tees Yarm	m-399	1	0.3	0.953	3.1	0.4
01-Aug	Stoke-on-Trent Centre		-23	0.3	0.045	3.2	1.0
22-Aug	Thurrock	95024	29	0.3	0.047	3	0.8
21-Jul	Tower Hamlets Roadside	272	10	0.3	1.431	3	2.3
09-Aug	West London	94683	0	0.3	0.051	3	1.4
03-Aug	Wigan Centre	6011	0	0.3	1.022	3.1	1.1
01-Aug	Wolverhampton Centre		-1	0.3	0.052	4.5	23.3

2. Sulphur Dioxide

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
	Scottish Sites							
05-Sep	Aberdeen	et 12182	1	5	1.025	5	1.4	26.1
01-Sep	Edinburgh St Leonards	14320	3	5	1.080	5	0.7	23.2
25-Aug	Glasgow Centre	43c-1400	13	5	0.193	5	0.3	1.0
31-Aug	Grangemouth	703b-274	-1	5	1.016	5.2	4.7	20.8
	Welsh Sites							
	Cardiff	Site	closed	no tests	possible			
14-Sep	Cwmbran	408001	1	5	0.966	6.4	2.6	8.2
18-Jul	Narberth	H-RS-458	59	5	0.863	9.3	5.1	25.5
19-Jul	Port Talbot	943	-2	5	1.081	5	4.4	8.6
19-Jul	Swansea	168	8	5	0.214	5	2.4	11.2
25-Jul	Wrexham	12183	28	5	0.205	5	0.9	17.6
	N.Irish Sites							
26-Jul	Belfast Centre	m1637m637	200	5	0.192	5	0.6	4.4
26-Jul	Belfast East	10778	3	5	0.963	5	1.9	17.8
27-Jul	Derry	J-AR-009	35	5	0.939	5	1.1	14.1
	English Sites							
17-Aug	Barnsley 12	10781	7	5	0.972	5	0.5	17.0

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UKAS CALIBRATION
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Certificate No: 01449

AEA Identification Number: 45077030

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
16-Aug	Barnsley Gawber		113	5	1.286	9.3	2.3	13.5
31-Aug	Birmingham Centre	et 14352	10	4	0.201	5.7	2.2	20.1
02-Aug	Birmingham Tyburn	301002	1	5	0.969	5.4	3.7	1.1
06-Sep	Blackpool Marton	L-AR-010	21	5	1.300	5	0.8	15.6
02-Aug	Bolton	780	2	5	1.009	5	0.4	16.7
19-Aug	Bournemouth	1179	1	5	1.015	5	0.3	19.8
27-Jul	Bradford Centre		99	5	1.322	7.3	4.5	16.9
11-Jul	Bristol Centre	73	3	5	1.435	6	0.6	21.5
02-Aug	Bury Roadside	559	-3	5	0.831	5	5.9	27.2
28-Jul	Coventry Memorial Park	215003	1	5	1.115	5	0.2	-1.1
12-Jul	Exeter Roadside	1835	21	5	0.978	5.3	0.8	24.0
28-Jun	Harwell	83	4	5	0.471	5.6	1.2	not tested
02-Sep	Hove Roadside	1178	2	5	1.057	5.7	1.3	17.0
25-Jul	Hull Freetown	m686	233	4	0.148	5.2	5.6	21.5
06-Jul	Ladybower		4	5	1.161	6.5	4.9	1.2
22-Jul	Leamington Spa	584	20	5	0.997	5	3.1	15.5
27-Jul	Leeds Centre	214004	1	5	0.919	5	5.4	2.1
21-Jul	Leicester Centre	215001	1	5	1.119	4	2.3	2.2
07-Sep	Liverpool Speke	m1514m626	244	5	0.363	6.2	1.8	20.3
12-Jul	London Bexley	318	3	5	0.965	5	5.3	9.9
29-Jun	London Bloomsbury	14323	37	5	0.206	5.4	1.4	21.9
20-Jul	London Brent	9850 633	20	5	1.000	5	0.1	not tested
09-Aug	London Cromwell Rd 2	10779	5	5	1.063	5.7	3.1	6.1
10-Aug	London Eltham	822	33	5	1.078	5	0.7	25.6
27-Jun	London Hillingdon	77580-386	8	4	0.187	5.9	3.3	5.6
05-Sep	London Lewisham	M1220M498	1	5	0.946	5.7	0.4	19.6
16-Aug	London Marylebone Rd	411	4	5	0.971	5.3	2.1	9.1
30-Jun	London N. Kensington	1020	52	5	1.022	5.8	2.2	32.4
26-Jul	London Southwark	535	0	5	1.006	5	1.0	0.0
27-Jul	London Teddington	374	0	0	1.026	0	0.0	0.0
06-Sep	London Westminster	api-705	4	5	1.000	5.4	0.3	22
18-Jul	Lullington Heath	9850-m640	101	5	0.502	5	1.6	not tested
05-Jul	Manchester Piccadilly	0477-013	-38	4	0.199	5.4	10.7	27.0
04-Jul	Manchester South	E4770104	128	4	0.203	6.5	9.5	28.8
09-Aug	Middlesbrough	1660	0	5	1.167	5	0.8	21.0
08-Aug	Newcastle Centre	m-689	240	4	0.211	5	1.0	26.0
01-Jul	Northampton	890563033	1	5	0.869	4	3.9	2.6
21-Jun	Norwich Centre		99	6	2.897	9.5	1.6	10.1
20-Jul	Nottingham Centre	0477-0176	3	4	0.188	5	0.4	0.9
28-Jun	Oxford Centre Roadside	376b-161	92	5	0.929	5	0.5	10.9
13-Jul	Plymouth Centre		1	5	0.951	5.6	2.4	1.9
27-Jun	Portsmouth	578323093	-1	5	0.872	5	2.8	0.7
06-Sep	Preston	L-AR-013	57	5	1.229	5.8	1.6	16.6
30-Jun	Reading New Town		46	5	0.854	5	1.4	not tested
10-Aug	Redcar	482	13	5	1.039	5	1.0	17.7
22-Jul	Rochester	m100-414	7	5	1.103	6.3	9.5	2.2

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Certificate No: 01449

AEA Identification Number: 45077030

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)	*m-xylene interference (ppb)
17-Aug	Rotherham Centre	d14770109	-8	5	0.891	5	1.8	21.4
06-Jul	Salford Eccles	2346	2	5	1.350	5.8	2.4	15.9
19-Jul	Sandwell West Bromwich	137	0	5	1.018	5	0.4	12.2
26-Jul	Scunthorpe Town	468	-16	5	1.227	7.6	15.1	18.7
15-Aug	Sheffield Centre	0477-015	-50	4	0.210	5.3	3.4	24.2
13-Jul	Southampton Centre	m1768-m676	220	4	0.199	5	4.1	not tested
22-Jun	Southend-on-Sea		152	5	1.140	8.3	3.2	14.8
29-Jul	Southwark Roadside	659	-5	5	1.063	5	0.5	5.1
07-Jul	Stockport Shaw Heath	1690	9	5	0.906	5.9	9.3	24.0
01-Aug	Stoke-on-Trent Centre		-34	5	1.541	5	0.9	14.6
11-Aug	Sunderland	72	7	5	1.309	5	0.7	10.5
22-Aug	Thurrock	10554	6	5	0.938	5	1.4	9.4
04-Jul	Wicken Fen	api-082	-30	5	0.569	3	0.8	17.6
03-Aug	Wigan Centre	57674025	1	5	0.950	5	1.1	3.3
01-Aug	Wolverhampton Centre		8	4	0.201	6.1	10.7	2.0

3. Ozone

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
	Scottish Sites						
05-Sep	Aberdeen	800	0	3	0.973	3.1	1.1
31-Aug	Bush Estate	77087-385	-1	3	0.511	3.1	0.9
01-Sep	Edinburgh St Leonards	14334	3	3	1.015	3.1	0.4
22-Aug	Eskdalemuir	158	8	3	0.572	3.1	0.8
25-Aug	Glasgow Centre	427-013	-8	3	0.200	3.1	0.4
29-Jun	Lerwick	m2517-m389	1	3	1.003	3.2	1.1
05-Sep	Strath Vaich	324	-1	3	0.438	3.4	2.2
	Welsh Sites						
05-Sep	Aston Hill	14337	-10	3	0.480	3.1	0.5
	Cardiff	Site	closed	no tests	possible		
14-Sep	Cwmbran	205004	0*	*	0.995*	*	1.2
18-Jul	Narberth	H-RS-459	0*	*	0.888*	*	2.4
19-Jul	Port Talbot	339	6*	*	0.500*	*	0.8
19-Jul	Swansea	156	10*	*	0.104*	*	2.4
	N.Irish Sites						
26-Jul	Belfast Centre	m1626-m335	224	3	0.093	3.1	1.7
27-Jul	Derry	J-AR-009	0	3	0.899	3.2	2.0
09-Aug	Lough Navar	14346	0	3	0.449	3.1	0.6
	English Sites						
16-Aug	Barnsley Gawber		-5	3	1.102	3.2	1.4
31-Aug	Birmingham Centre	et 14357	-13	3	0.102	3.1	0.4

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UKAS CALIBRATION
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Certificate No: 01449

AEA Identification Number: 45077030

Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
02-Aug	Birmingham Tyburn	301002	1*	*	0.977*	*	0.4
06-Sep	Blackpool Marton	L-AR-010	0	3	0.993	3.1	0.6
02-Aug	Bolton	195	1	3	0.939	3.2	0.7
04-Aug	Bottesford	61689-332	5*	*	0.985*	*	1.4
19-Aug	Bournemouth	824	0*	*	0.956*	*	0.7
27-Jul	Bradford Centre		2*	*	0.962*	*	0.7
01-Sep	Brighton Preston Park	542	2	3	0.514	3.1	0.4
11-Jul	Bristol Centre	155	-1	3	0.995	3.1	0.8
02-Aug	Bury Roadside	106	-1	3	0.926	3.5	2.0
28-Jul	Coventry Memorial Park	205001	1	3	0.944	3.1	0.0
12-Jul	Exeter Roadside	1317	22	3	0.986	3.1	0.7
04-Jul	Glazebury	138	2*	*	0.490*	*	0.8
07-Sep	Great Dun Fell	176	2	3	0.503	3.2	0.5
28-Jun	Harwell	367	-8	3	0.531	3.2	1.7
14-Sep	High Muffles	346	-2	3	0.482	3.3	1.2
25-Jul	Hull Freetown	m356	222*	*	0.092*	*	1.7
06-Jul	Ladybower	125b-101	52*	*	0.503*	*	1.5
22-Jul	Leamington Spa	110	20	3	1.128	3.2	1.8
27-Jul	Leeds Centre	206003	1*	*	1.007*	*	0.7
21-Jul	Leicester Centre	205006	3	3	0.964	3.1	0.4
14-Jul	Leominster	ET 014470	0*	*	0.964*	*	0.5
07-Sep	Liverpool Speke	m1584m331	254	3	0.093	3.1	1.2
12-Jul	London Bexley	403	1*	*	1.009*	*	0.6
29-Jun	London Bloomsbury	14907	0*	*	0.099*	*	0.2
20-Jul	London Brent	9812-128	19	3	0.949	3.1	0.0
10-Aug	London Eltham	375	8	3	0.976	3.1	0.6
05-Jul	London Hackney	m2110-m382	100	3	0.838	3.1	0.6
08-Jul	London Haringey	538	10	3	1.553	4.0	4.1
24-Aug	London Harlington	107	0*	*	1.002*	*	0.5
27-Jun	London Hillingdon	0427-012	0*	*	0.110*	*	0.8
05-Sep	London Lewisham	939B-187	2	3	1.282	3.1	1.4
16-Aug	London Marylebone Rd	769	1*	*	1.007*	*	0.9
30-Jun	London N. Kensington	497	10	3	0.999	3.1	0.3
26-Jul	London Southwark	5776	4	3	1.016	3.1	0.5
27-Jul	London Teddington	58811320	-24	3	0.232	3.1	0.3
17-Aug	London Wandsworth	401	9*	*	1.057*	*	0.7
06-Sep	London Westminster	api-879	6	3	0.505	3.1	1.8
18-Jul	Lullington Heath	9810-m337	98	3	0.485	3.2	0.8
05-Jul	Manchester Piccadilly		-4*	*	0.189*	*	6.2
04-Jul	Manchester South	E4270102	-20*	*	0.096*	*	4.2
18-Jul	Market Harborough	60894	3	3	0.522	3.1	1.1
09-Aug	Middlesbrough	944	-1*	*	0.988*	*	1.2
08-Aug	Newcastle Centre	m-357	243*	*	0.093*	*	3.3
01-Jul	Northampton	8905240110	3	3	1.053	3.1	0.5
21-Jun	Norwich Centre		0*	*	1.014*	*	0.8
20-Jul	Nottingham Centre	0427-011	-9	3	0.098	3.1	0.9
13-Jul	Plymouth Centre		-4	3	0.393	3.1	0.8
27-Jun	Portsmouth	205002	1	3	1.005	3.1	0.3

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Date Year =2005	Site	Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max Residual (%)
06-Sep	Preston	L-AR-013	-4	3	0.967	3.2	1.8
30-Jun	Reading New Town		9	3	1.035	3.2	2.8
10-Aug	Redcar	799	5*	*	0.489*	*	0.6
22-Jul	Rochester	m400-378	1*	*	0.998*	*	0.4
17-Aug	Rotherham Centre	d4270106	-2	3	0.901	3.2	1.0
06-Jul	Salford Eccles	2363	0*	*	0.944*	*	0.5
19-Jul	Sandwell West Bromwich	121	6	3	0.505	3.1	0.2
15-Aug	Sheffield Centre	gra427-010	-14	3	0.102	3.1	0.5
05-Jul	Sibton	api-219	3	3	0.480	3.1	0.2
15-Jul	Somerton	427	1	3	0.494	3.1	0.8
13-Jul	Southampton Centre	m1802-m354	220*	*	0.098*	*	1.3
22-Jun	Southend-on-Sea		0*	*	1.015*	*	1.2
21-Sep	St Osyth	60869	0	3	0.474	3.2	1.1
01-Aug	Stoke-on-Trent Centre		3	4.0	0.987	4.0	3.9
11-Aug	Sunderland Silksworth	436	1*	*	0.963*	*	0.4
22-Aug	Thurrock	10788	1*	*	0.528*	*	1.0
07-Jul	Weybourne	70532-366	0	3	1.020	3.1	0.5
04-Jul	Wicken Fen	api-165	-6	3	0.497	3.1	0.3
03-Aug	Wigan Centre	4009	1	3	0.962	3.2	0.2
01-Aug	Wolverhampton Centre		5	3	0.102	3.1	0.8
12-Jul	Yarner Wood	347	-7	3	0.485	3.2	1.2

4. Oxides of Nitrogen

Date Year =2005	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
	Scottish Sites								
05-Sep	Aberdeen	NO NOx	et 10268	1 0	5 5.4	1.378 1.412	5 5	0.1 0.2	97.8
31-Aug	Bush Estate	NO NOx	42c-77564-386	41 42	5 5.3	0.788 0.789	5 5	0.4 0.5	99.0
08-Sep	Dumfries	NO NOx	1494	4 4	5 5.2	0.532 0.535	5 5	0.5 0.6	96.5
01-Sep	Edinburgh St Leonards	NO NOx	14327	1 1	5 5.4	1.467 1.513	5 5	0.3 0.5	98.2
22-Aug	Eskdalemuir	NO NOx	347	5 5	5 5.3	0.945 0.939	5 5	0.6 0.2	99.2
25-Aug	Glasgow Centre	NO NOx		-5 -8	5 5.2	0.391 0.396	5 5	2.8 2.9	100.3
23-Aug	Glasgow City Chambers	NO NOx	api-575	0 0	5 5.3	1.010 1.023	5 5	0.5 1.5	96.9
24-Aug	Glasgow Kerbside	NO NOx	ambi002	-7 -7	* *	2.313 2.381	* *	not tested	not tested
31-Aug	Grangemouth	NO NOx	700b-312	0 2	5 5.5	1.138 1.147	5 5	0.5 0.8	97.3
06-Sep	Inverness	NO NOx	1489	1 2	5 5.3	1.144 1.143	5 5	1.0 0.8	99.5

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Date Year =2005	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
	Welsh Sites								
05-Sep	Aston Hill	NO NOx	13067	16 13	5 5.3	1.190 1.210	5 5	1.0 0.6	98.1
	Cardiff			Site	closed	no tests	possible		
14-Sep	Cwmbran	NO NOx	406003	-2 4	5 5.3	1.189 1.188	5 5	2.2 1.7	98.2
18-Jul	Narberth	NO NOx	H-RS-459	41 41	5 5.3	0.855 0.886	5 5	3.5 7.1	98.7
19-Jul	Port Talbot	NO NOx	320	-3 -2	5 5.6	1.355 1.385	5 5	0.8 0.7	96.3
19-Jul	Swansea	NO NOx	148	0 5	5 5.2	0.514 0.523	5 5	2.0 1.2	98.8
25-Jul	Wrexham	NO NOx	12185	6 6	5 5.2	0.476 0.480	5 5	2.6 2.6	99.4
	N.Irish Sites								
26-Jul	Belfast Centre	NO NOx	m1804-m733	257 274	5 5.4	0.504 0.520	5 5	0.9 1.8	100.7
27-Jul	Derry	NO NOx	j-ar-009	43 44	5.3 6.3	2.484 2.531	5 5	1.8 2.0	96.1
	English Sites								
16-Aug	Barnsley Gawber	NO NOx		67 70	7.9 8.2	2.798 2.909	5 5	1.2 1.5	95.5
15-Aug	Bath Roadside	NO NOx	api-12758	5 3	5 5.5	1.168 1.171	5 5	0.5 0.6	98.7
09-Aug	Billingham	NO NOx	574	-2 -4	5 5.6	2.065 2.088	5 5	0.8 0.8	98.4
31-Aug	Birmingham Centre	NO NOx	et 14324	-5 -5	5 5.2	0.485 0.492	5 5	0.4 0.2	98.5
02-Aug	Birmingham Tyburn	NO NOx	209006	0 -1	5 5.3	1.049 1.052	5 5.1	0.2 0.7	101.0
06-Sep	Blackpool Marton	NO NOx	L-AR-010	103 107	5 5.6	1.332 1.371	5 5	1.7 0.6	100.0
02-Aug	Bolton	NO NOx	433	1 5	3 5.6	1.232 1.321	5.1 5.5	0.7 2.9	98.9
19-Aug	Bournemouth	NO NOx	522	0 0	5 5.3	1.104 1.095	5 5.4	0.4 0.2	99.1
27-Jul	Bradford Centre	NO NOx		14 14	5 6.1	2.924 3.212	5 5	9.5 7.8	100.0
29-Jul	Brentford Roadside	NO NOx	9841b-m712	-4 -4	5 5.4	1.024 1.060	5 5	8.4 10.8	98.8
01-Sep	Brighton Preston Park	NO NOx	2222	2 2	5 5.3	1.109 1.131	5 5.2	1.0 1.0	95.3
01-Sep	Brighton Roadside	NO NOx	1225	1 2	5 5.3	1.232 1.246	5 5	0.6 0.7	96.7
11-Jul	Bristol Centre	NO NOx	77	0 2	5 5.3	1.129 1.162	5 5	0.5 0.5	98.3
25-Jul	Bristol Old Market	NO NOx	10510	0 0	5 5.4	1.441 1.495	5 5.3	1.7 3.2	96.6

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UKAS CALIBRATION
0401

Certificate No: 01449

AEA Identification Number: 45077030

Date Year =2005	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
02-Aug	Bury Roadside	NO NOx	229	13 22	5 5.5	1.121 1.199	5.3 5.3	1.4 2.4	105.4
04-Jul	Cambridge Roadside	NO NOx	42c-55355-303	0 1	5 5.3	0.948 0.949	5 5.3	0.8 0.5	99.6
28-Jun	Camden Kerbside	NO NOx	623	2 2	5 5.4	1.478 1.280	5.5 5.6	0.5 1.3	99.5
22-Jul	Canterbury	NO NOx	11666	-1 -1	5 5.4	1.279 1.277	5.2 5.4	3.2 2.1	96.5
28-Jul	Coventry Memorial Park	NO NOx	21003	0 2	5 5.3	1.020 1.030	5 5.1	0.6 0.6	97.2
12-Jul	Exeter Roadside	NO NOx	85	20 21	5 5.6	1.987 2.200	5 5	0.5 1.3	99.0
04-Jul	Glazebury	NO NOx	78	4 5	5 5.3	0.639 0.626	5 5	1.2 1.7	96.4
26-Aug	Haringey Roadside	NO NOx	397	2 2	5 5.3	1.075 1.165	5 5	1.4 1.3	99.5
28-Jun	Harwell	NO NOx	79	-8 -10	5 5.3	1.249 1.238	5 5	0.5 1.0	99.5
14-Sep	High Muffles	NO NOx	ml-413b-181	48 56	5 5.2	0.485 0.497	5 5	0.5 1.0	109
02-Sep	Hove Roadside	NO NOx	199	2 4	5 5.3	0.988 0.997	5 5	0.2 0.5	97.8
25-Jul	Hull Freetown	NO NOx	m732	210 215	5 5.2	0.398 0.405	5 5	0.8 0.9	98.2
06-Jul	Ladybower	NO NOx	189	0 3	5 5.2	0.578 0.566	5 5	0.4 1.0	99.1
22-Jul	Leamington Spa	NO NOx	228	24 22	5 5.9	2.689 2.737	5 5.2	0.9 0.4	101.1
27-Jul	Leeds Centre	NO NOx	210005	-1 -5	5 5.3	1.025 1.004	5 5	1.3 1.0	97.1
21-Jul	Leicester Centre	NO NOx	210004	0 0	5 5.3	1.021 1.089	5 5.1	1.0 1.5	100.9
14-Jul	Leominster	NO NOx	014863	0 3	5 5.3	1.004 1.013	5.1 5.5	5.3 5.6	98.8
07-Sep	Liverpool Speke	NO NOx	m1805-m734	240 237	5 5.4	0.403 0.415	5 5	0.8 0.3	96.1
30-Jun	London A3 Roadside	NO NOx	H-AR-001	58 60	5.5 8	2.577 2.693	6.2 6.8	2.0 1.9	100.0
12-Jul	London Bexley	NO NOx	327	3 1	5 5.3	0.990 1.006	5 6.2	3.1 2.4	98.4
29-Jun	London Bloomsbury	NO NOx	14328	14 13	5 5.2	0.386 0.398	5 5.1	0.3 0.4	98.5
20-Jul	London Brent	NO NOx	ML9841-	23 32	5 11.2	2.377 2.776	5.2 5	4.1 1.3	94.8
09-Aug	London Cromwell Rd 2	NO NOx	10775	-3 2	5 5.5	1.621 1.693	5 5	1.0 0.6	96.9
10-Aug	London Eltham	NO NOx	307	3 5	5 5.5	1.163 1.169	5 5	0.8 0.9	95.9
05-Jul	London Hackney	NO NOx	532b-234	103 102	5 5.3	1.071 1.112	5 5.5	0.5 0.5	97.9

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Date Year =2005	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
24-Aug	London Harlington	NO NOx	m200 a1090	0 3	5 5.3	1.205 1.222	5 5	1.0 0.8	97.3
27-Jun	London Hillingdon	NO NOx	g-ra0447-010	1 4	5 5.3	0.510 0.526	5.5 5.8	3.2 3.5	97.5
05-Sep	London Lewisham	NO NOx	M1231-M530	0 2	5 5.7	1.162 1.285	5 5	1.3 1.2	98.0
16-Aug	London Marylebone Rd	NO NOx	439	2 -11	5 5.3	1.086 1.038	5 5	1.6 0.5	97.3
30-Jun	London N. Kensington	NO NOx	459	2 11	5 5.3	1.107 1.239	5 5.4	0.5 0.5	100.0
26-Jul	London Southwark	NO NOx	197	2 2	5 5.4	1.358 1.385	5 5.2	2.6 0.9	98.5
27-Jul	London Teddington	NO NOx	287	-1 -3	5 5.3	1.092 1.079	5 5.2	0.5 0.4	98.7
17-Aug	London Wandsworth	NO NOx	378	5 4	5 5.4	1.340 1.283	5 5	1.4 3.2	95.5
06-Sep	London Westminster	NO NOx	573	1 1	5 5.6	2.048 2.088	5 5	0.8 3.9	99.2
18-Jul	Lullington Heath	NO NOx	9841b-m675	100 100	5 5.4	0.970 0.987	5 5	0.5 0.5	97.1
05-Jul	Manchester Piccadilly	NO NOx	G-RA0447-006	-9 -2	5 7.5	0.478 0.483	5 5	2.6 2.3	92.2
04-Jul	Manchester South	NO NOx	J-RA0447-008	-9 5	5 5.2	0.435 0.446	5 5	7.7 9.3	92.7
05-Jul	Manchester Town Hall	NO NOx	846	1 2	5 5.9	2.684 2.703	5 5.2	6.9 7.5	101.0
18-Jul	Market Harborough	NO NOx	61963	-1 -4	5 5.2	0.413 0.423	5 5.1	0.9 0.7	96.5
09-Aug	Middlesbrough	NO NOx	2287	3 3	5 5.3	1.071 1.197	5 5	0.8 1.5	100.0
08-Aug	Newcastle Centre	NO NOx	m-730	248 248	5 5.2	0.725 0.727	5 5	0.4 0.9	99.4
01-Jul	Northampton	NO NOx	8513180611	-5 -9	5 5.3	0.982 1.000	5 5.3	1.4 1.3	133.7
21-Jun	Norwich Centre	NO NOx	ws123	72 78	5 5.4	0.890 0.918	5.3 6.1	3.4 3.1	100.0
06-Jul	Norwich Forum Roadside	NO NOx	api-296	-2 0	5 5.3	1.122 1.153	5 5.4	0.9 0.6	98.2
20-Jul	Nottingham Centre	NO NOx	gra-0477-009	-45 -45	5 5.2	0.402 0.416	5 5.1	2.1 1.7	97.4
28-Jun	Oxford Centre Roadside	NO NOx	411b-179	100 105	5 5.5	1.130 1.184	5.1 6.1	0.9 0.5	95.6
13-Jul	Plymouth Centre	NO NOx		-3 -3	5 5.6	2.022 2.013	5 5	1.8 1.4	100.0
27-Jun	Portsmouth	NO NOx	903005	1 1	5 5.3	1.070 1.050	5 5.7	1.4 1.4	99.2
06-Sep	Preston	NO NOx	L-AR-013	53 54	7.2 5.9	2.717 2.783	5 5	1 0.9	91.3
30-Jun	Reading New	NO		9	5	1.268	5.1	3.1	

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Date Year =2005	Site Town	NOx	Analyser number	[1]Zero output 10	Uncertainty (ppb) 5.4	[2]Calibration Factor 1.308	Uncertainty (%) 5.3	*Max residual (%) 3.1	*Converter efficiency (%) 98.6
10-Aug	Redcar	NO	497	0	5	0.979	5	0.5	
		NOx		0	5.3	0.984	5	0.2	91.2
22-Jul	Rochester	NO	m20-473	-1	5	1.282	6.2	8.3	
		NOx		-3	5.4	1.277	6.8	8.5	97.0
17-Aug	Rotherham Centre	NO	q-ra0447-001	4	5	1.430	5	1.3	
		NOx		3	5.4	1.448	5	1.3	96.7
06-Jul	Salford Eccles	NO	2381	1	5	1.156	5	1.3	
		NOx		2	5.3	1.168	5	1.5	101.9
19-Jul	Sandwell West Bromwich	NO	114	1	5	0.952	5	1.7	
		NOx		-1	5.3	0.977	5.1	1.7	99.6
15-Aug	Sheffield Centre	NO	g-ra0447-008	6	5	0.448	5	1.1	
		NOx		0	5.2	0.460	5	0.8	97.6
15-Aug	Sheffield Tinsley	NO	10772	-7	5	2.574	5	0.5	
		NOx		-7	5.8	2.623	5	0.4	98.8
15-Jul	Somerton	NO	2120	2	5	0.506	5	0.4	
		NOx		4	5.2	0.500	5	0.4	99.4
13-Jul	Southampton Centre	NO	m1781-m1723	223	5	0.417	5	0.3	
		NOx		244	5.3	0.439	5.2	0.9	97.5
22-Jun	Southend-on-Sea	NO	l-ar-011	48	5	2.325	9.2	2.6	
		NOx		49	6.3	2.364	7.4	1.6	101.9
29-Jul	Southwark Roadside	NO	1443	3	5	1.446	5	1.3	
		NOx		2	5.4	1.486	5.2	0.8	96.5
21-Sep	St Osyth	NO	60988	2	5	0.476	5	1.1	
		NOx		5	5.2	0.490	5	0.2	99.1
07-Jul	Stockport Shaw Heath	NO	1853	21	5	2.101	5	4.9	
		NOx		23	5.7	2.221	5	6.3	98.2
10-Aug	Stockton-on-Tees Yarm	NO	1356	0	5	1.214	5	0.8	
		NOx		-3	5.3	1.256	5	0.3	99.1
01-Aug	Stoke-on-Trent Centre	NO		55	5	1.392	5.9	4.0	
		NOx		56	6.6	1.488	6.3	4.0	103.3
11-Aug	Sunderland Silksworth	NO	734b-322	-1	5	1.080	5	0.3	
		NOx		-3	5.5	1.107	5	0.2	98.3
22-Aug	Thurrock	NO	11004	2	5	1.096	5	1.0	
		NOx		4	5.3	1.121	5	0.9	95.5
21-Jul	Tower Hamlets Roadside	NO	306	2	5	1.446	5	1.5	
		NOx		5	5.4	1.428	5	1.9	98.8
07-Jul	Walsall Alumwell	NO	10771	1	5	1.144	5	1.3	
		NOx		0	5.3	1.181	5.2	1.9	100.9
18-Aug	Walsall Willenhall	NO	1337	-2	5	1.163	5	0.7	
		NOx		-2	5.5	1.183	5	0.3	97.6
09-Aug	West London	NO	10774	-3	5	1.063	5	0.8	
		NOx		-2	5.3	1.077	5	1.1	98.1
04-Jul	Wicken Fen	NO	api-2223	17	5	0.531	5	0.7	
		NOx		15	5.2	0.525	5.3	0.9	99.6
03-Aug	Wigan Centre	NO	805005	0	5	0.995	5	1.4	
		NOx		-1	5.4	1.031	5.1	1.4	98.6
01-Aug	Wolverhampton Centre	NO		13	5	0.634	5.1	7.4	
		NOx		1	6.1	0.633	5.7	5.9	93.9

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AEA Identification Number: 45077030

Date Year =2005	Site		Analyser number	[1]Zero output	Uncertainty (ppb)	[2]Calibration Factor	Uncertainty (%)	*Max residual (%)	*Converter efficiency (%)
12-Jul	Yarner Wood	NO NOx	1784	5 4	5 5.3	1.079 1.051	5 5	1.3 0.7	 97.4

5. Particulate Analysers

Date Year =2005	Site	Analyser number	Calculated Spring Constant k_0	Uncertainty (%)	[4]k_0 accuracy (%)	[3]Measured Main Flow (l/min)	Uncertainty (%)	[3]Measured Total Flow **Aux Flow** (l/min)	Uncertainty (%)
	Scottish Sites								
05-Sep	Aberdeen	24427	11728	1	1.4	**2.99**	2.2	**13.60**	2.2
08-Sep	Dumfries							16.93	2.2
01-Sep	Edinburgh St Leonards	21308	12854	1	0.3	2.01	2.2	16.44	2.2
25-Aug	Glasgow Centre	22980	13020	1	-0.9	2.00	2.2	17.72	2.2
24-Aug	Glasgow Kerbside	24444	15198	1	0.9	not	tested	17.45	2.2
31-Aug	Grangemouth	22763	12454	1	-1.6	2.92	2.2	16.15	2.2
06-Sep	Inverness	1298-127						analyser	fault
	Welsh Sites								
	Cardiff	Site	closed	no tests	possible				
14-Sep	Cwmbran	21557	12555	1	0.1	2.90	2.2	16.13	2.2
18-Jul	Narberth	21143	12573	1	0.7	**2.66**	2.2	**13.47**	2.2
19-Jul	Port Talbot	9402	10812	1	2.0	**3.04**	2.2	**13.85**	2.2
19-Jul	Swansea	2130	14466	1	-0.7	2.03	2.2	**14.83**	2.2
25-Jul	Wrexham	212240001						14.88	2.2
	N.Irish Sites								
26-Jul	Belfast Centre	24423	14247	1	0.4	2.09	2.2	16.15	2.2
26-Jul	Belfast Clara St	25456	11769	1	-1.1	2.02	2.2	16.82	2.2
27-Jul	Derry	49608	10943	1	0.5	2.11	2.2	16.83	2.2
09-Aug	Lough Navar	21196	12975	1	1.2	**2.97**	2.2	**13.78**	2.2
	English Sites								
31-Aug	Birmingham Centre	2297	12343	1	2.2	2.99	2.2	15.57	2.2
02-Aug	Birmingham Tyburn	24637	13712	1	0.7	**2.9**	**2.2**	**13.39**	**2.2**
06-Sep	Blackpool Marton	24424	13003	1	0.9	2.00	2.2	15.26	2.2
02-Aug	Bolton	21197	15189	1	0.2	**3.28**	**2.2**	**13.48**	**2.2**
19-Aug	Bournemouth	70003						16.55	2.2
27-Jul	Bradford Centre	21494	11424	1	0.6	**2.1**	**2.2**	**14.54**	**2.2**
01-Sep	Brighton Roadside							16.41	2.2
11-Jul	Bristol Centre	24426	12995	1	-1.4	2.02	2.2	15.74	2.2
02-Aug	Bury Roadside	658	11577	1	-0.2	2.02	2.2	16.33	2.2
28-Jun	Camden Kerbside	21306	16543	1	0.8	**2.94**	**2.2**	**13.46**	**2.2**
22-Jul	Canterbury	20931	13940	1	-0.7	**2.94**	**2.2**	**13.39**	**2.2**
28-Jul	Coventry	25026	12997	1	-1.4	**2.93**	**2.2**	**13.70**	**2.2**

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Date Year =2005	Site	Analyser number	Calculated Spring Constant k_0	Uncertainty (%)	$^4k_0$ accuracy (%)	^{3}Measured Main Flow (l/min)	Uncertainty (%)	^{3}Measured Total Flow **Aux Flow** (l/min)	Uncertainty (%)
	Memorial Park								
26-Aug	Haringey Roadside	9407	11394	1	-0.5	2.62	2.2	14.41	2.2
28-Jun	Harwell	21489	14876	1	-0.3	3.04	2.2	17.69	2.2
28-Jun	Harwell $PM_{2.5}$	21490	10873	1	-0.1	3.00	2.2	16.60	2.2
25-Jul	Hull Freetown	24445	14237	1	0.9	**2.00**	**2.2**	**14.77**	**2.2**
22-Jul	Leamington Spa	2075	11124	1	1.7	**3.05**	**2.2**	**14.12**	**2.2**
27-Jul	Leeds Centre	24451	13413	1	0.1	**3.12**	**2.2**	**13.89**	**2.2**
21-Jul	Leicester Centre	24442	14002	1	-0.2	3.09	2.2	16.99	2.2
07-Sep	Liverpool Speke	24450	15848	1	0.2	1.99	2.2	15.59	2.2
30-Jun	London A3 Roadside	24455	12442	1	0.1	1.99	2.2	16.39	2.2
12-Jul	London Bexley	2000	10612	1	1.4	2.02	2.2	16.06	2.2
29-Jun	London Bloomsbury	24446	13821	1	0.6	3.00	2.2	15.90	2.2
29-Jun	London Bloomsbury $PM_{2.5}$	21492	14936	1	-0.1	2.96	2.2	15.62	2.2
20-Jul	London Brent	21145	17671	1	0.9	**3.01**	**2.2**	**16.18**	**2.2**
10-Aug	London Eltham	5144	8142	1	-0.7	3.07	2.2	16.45	2.2
24-Aug	London Harlington	22835	14153	1	-0.4	**1.95**	**2.2**	**14.68**	**2.2**
27-Jun	London Hillingdon	24422	14247	1	0.0	1.95	2.2	15.31	2.2
16-Aug	London Marylebone Road	21306	13512	1	1.3	**3.08**	**2.2**	**13.70**	**2.2**
16-Aug	London Marylebone Road $PM_{2.5}$	21493	14767	1	1.3	**3.07**	**2.2**	**13.63**	**2.2**
30-Jun	London N. Kensington	20715	10788	1	-0.3	3.14	2.2	16.73	2.2
06-Sep	London Westminster	445090201						16.87	2.2
05-Jul	Manchester Piccadilly	2000	12241	1	1.6	**2.02**	**2.2**	**14.21**	**2.2**
09-Aug	Middlesbrough	24325	13860	1	-1.9	**2.04**	**2.2**	**14.43**	**2.2**
08-Aug	Newcastle Centre	24448	13648	1	-1.3	**3.01**	**2.2**	**13.57**	**2.2**
01-Jul	Northampton	21621	11080	1	-0.6	2.91	2.2	14.36	2.2
01-Jul	Northampton Partisol							17.17	2.2
21-Jun	Norwich Centre	21495	12201	1	-0.1	**1.87**	**2.2**	**14.04**	**2.2**
20-Jul	Nottingham Centre	20904	8568	1	-1.2	2.04	2.2	15.69	2.2
13-Jul	Plymouth Centre	24428	13037	1	0.7	2.13	2.2	15.58	2.2
27-Jun	Portsmouth	21578	10598	1	0.2	**3.05**	**2.2**	**12.42**	**2.2**
06-Sep	Preston	22881	12862	1	-0.7	**2.01**	**2.2**	**14.35**	**2.2**
30-Jun	Reading New Town	2000	13346	1	1.1	1.95	2.2	15.89	2.2
10-Aug	Redcar	21344	11723	1	-0.5	3.08	2.2	16.47	2.2
22-Jul	Rochester	24381	11971	1	-0.7	2.88	2.2	16.66	2.2
22-Jul	Rochester $PM_{2.5}$	21491	13763	1	-1.3	2.98	2.2	16.14	2.2

The reported 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.

netcen
netcen is an operating division of AEA Technology plc

CERTIFICATE OF CALIBRATION

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UKAS CALIBRATION
0401

Certificate No: 01449

AEA Identification Number: 45077030

Date Year =2005	Site	Analyser number	Calculated Spring Constant k_0	Uncertainty (%)	[4]k_0 accuracy (%)	[3]Measured Main Flow (l/min)	Uncertainty (%)	[3]Measured Total Flow **Aux Flow** (l/min)	Uncertainty (%)
06-Jul	Salford Eccles	21168	14606	1	1.3	**2.03**	**2.2**	**14.41**	**2.2**
26-Jul	Scunthorpe Town	25472	13271	1	-2.4	**2.95**	**2.2**	**13.58**	**2.2**
15-Aug	Sheffield Centre	25024	12075	1	-1.4	2.03	2.2	16.26	2.2
13-Jul	Southampton Centre	1484	13987	1	0.8	2.00	2.2	15.59	2.2
22-Jun	Southend-on-Sea	22927	13460	1	0.5	**1.99**	**2.2**	**14.25**	**2.2**
07-Jul	Stockport Shaw Heath	2000	10660	1	2.3	**3.59**	**2.2**	**11.08**	**2.2**
10-Aug	Stockton-on-Tees Yarm	2285	14143	1	-1.0	3.00	2.2	16.11	2.2
01-Aug	Stoke-on-Trent Centre	25028	12422	1	-0.6	2.02	2.2	16.39	2.2
22-Aug	Thurrock	25039	12826	1	-1.1	**3.04**	**2.2**	**13.90**	**2.2**
03-Aug	Wigan Leigh	22015	12059	1	0.0	3.20	2.2	16.92	2.2
01-Aug	Wolverhampton Centre	20917	13931	1	1.4	2.01	2.2	16.91	2.2

The above factors have been calculated using certified standards. The analysers listed above have been tested for zero response, calibration factor, linearity, converter efficiency (NOx analysers), m-xylene interference (SO_2 analysers), k_0 / main flow rate (for TEOM analysers) and total flow rate (for particulate analysers), by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified.

The calibration results for NOx, NO, CO, SO_2, O_3 and Particulates are those that fall within our scope of accreditation. Results marked with an asterisk (*) on this certificate are not UKAS accredited, but have been included for completeness.

[1] The zero response is the zero reading on the logging system of the analyser when audit zero gas was introduced to the analysers under test.

[2] The calibration factor is the multiplying factor required to scale the reading on the data logging system into concentration units (ppb for NO, NOx and SO_2, ppm for CO – 1ppm = 1000 ppb). It should be used in conjunction with the analyser output and the zero response, according to the following equation:

Concentration = (output – zero response) x Calibration factor

The scaling factor for gaseous analysers is calculated using mole fraction concentrations.

[3] The measured main flow rate (where this is applicable) is the flow rate through the sensor unit of a TEOM analyser. The measured aux flow rate (where this is applicable) is the flow rate through the bypass tubing of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are $l.min^{-1}$. Measurements shown in **bold** are not made at the normal sample inlet and may not therefore accurately represent the actual flow through the inlet.

[4] The k_0 accuracy value (specifically for TEOM analysers) indicates the closeness of the calculated result to the manufacturer's specified value of k_0.

* The maximum residual is the percentage maximum deviation of the worst linearity point from the line of best fit

* R^2 is the correlation coefficient of linearity

* Converter is the measured efficiency of the NO_2 to NO converter in the Nitrogen Oxides analyser

meta-xylene interference is the response of the SO_2 analyser when supplied with approx 1ppm meta-xylene

This certificate is an electronic representation of the original, signed by Stewart Eaton on 8 February 2006. Photocopies can be obtained by writing to Brian Stacey at the address given on the top of the certificate.