

Report

QA/QC Data Ratification and Annual Report for the Automatic Urban and Rural Network, October-December 2005, and Annual Review for 2005

A report produced for the Department for Environment, Food and Rural Affairs, Scottish Executive, Welsh Assembly Government and the DoE in Northern Ireland

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**QA/QC Data Ratification and Annual
Report for the Automatic Urban and
Rural Network, October-December 2005
and Annual Review for 2005**

Stewart Eaton

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Executive Summary

Part A Ratification Report for October-December 2005

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 October-December 2005.

In general this has been a fairly good 3-month period for the AURN with a network average data capture of 92% being achieved. This is an improvement on the overall data capture figure for the previous quarter (89%). The overall data capture for CO for this quarter was 93%, which is a significant improvement on the previous quarter. There were several sites affected by relocations, which resulted in low data capture. One site (Bristol Centre) was closed due to relocation for much of the fourth quarter.

Part B Annual Review for 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.

The overall data capture for 2005 was 91%. The annual average data capture for CO, NO₂ and SO₂ were all below 90%. There were a total of 34 sites for which data capture was below 90%, of which 16 are classified as critical for the First, Second or Third Daughter Directives.

Although overall network data capture was reasonably high at 91%, there were a number of critical site/analysers that missed the 90% threshold. 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. Procedures used in the UK network intercomparison now fully conform to the CEN requirements. In addition, the QA/QC Unit has undertaken a series of meetings with the Equipment Support Units (ESUs) to discuss data quality issues and to highlight changes required to fully implement CEN procedures.

This gives a review of the QA/QC Unit's activities during 2005. Further details are given in the individual quarterly data ratification reports already issued for 2005.

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Part A Ratification report

- Section 1: Introduction including recent changes that have taken place in the network and a general overview of network performance.
- Section 2: Generic data quality issues and recommendations for improving or resolving these issues.
- Section 3: Site specific issues.
- Section 4: Reasons for data loss at sites where data capture falls below 90%.
- Section 5: Data capture statistics for October-December 2005 and for the complete year so far are presented in tables.

Part B Annual Review

- Section 6: Overview of network performance
- Section 7: Summary of QA/QC Unit activities during the year
- Section 8: Update on CEN
- Section 9: Summary of changes to the network during the year
- Section 10: Site safety

PART A – Ratification Report for the Automatic Urban and Rural Network, October-December 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 October-December 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 PM₁₀ and Brighton Roadside PM₁₀) measure PM₁₀ only and are included as individual sites in the total of 125, although Northampton PM₁₀ is co-located with the Northampton AURN site, and Brighton Roadside PM₁₀ 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.

Table 1.1 Changes in the Network, October-December 2005

Site	Date closed	Date commissioned	Comments
Bristol Centre	15 Sept 2005	-	Site being redeveloped
Leamington Spa	25 July 2005	21 October 2005	Site moved to purpose-built cabin in same location

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.

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 October-December period. It is anticipated that PM₁₀ and PM_{2.5} analysers will be installed at the rural site at Auchencorth Moss (near Edinburgh) during 2006.

There were no changes (new or relocated sites, or new analysers) to the network during the period October-December 2005.

1.2 Overview of Network Performance

Ratified hourly average data capture for the network averaged 92% for all pollutants (O₃, NO₂, SO₂, CO, PM₁₀ and PM_{2.5}) during the 3-month reporting period October-December 2005 (see Table 1.2 below). All pollutants had average data captures above the required 90% during this quarter. The annual average network data capture for the calendar year 2005 was 91%.

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
Q4 Oct-Dec 2005	93.0	91.1	94.7	93.4	98.6	91.8	92.0

Overall, 353 out of the 421 analysers (85%) achieved data capture levels above the required 90% target during this reporting period (See Table 1.3). Tables 1.2 and 1.3 show that the level of network performance fell slightly during the middle two quarters in 2005, but improving again in the final quarter. This is particularly noticeable with CO, with overall data capture of 81.8% in quarter 3.

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	Q4 Oct-Dec 2005
CO	79	19	22	30	12
NO ₂	110	19	31	32	17
O ₃	88	11	10	11	12
PM ₁₀	64	7	9	14	11
PM _{2.5}	4	0	1	0	0
SO ₂	76	10	16	26	11
Total <90%	421	66	89	113	63

In total, 25 out of the 125 operational network sites (20%) had an average data capture rate below the required 90% level for the October-December 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%, October-December 2005
(Data capture calculated from site start date)**

Network Data Capture for 01/10/2005 to 31/12/2005 From start date of any new site

Site	Owner	Site Average
England		
Birmingham Centre	DEFRA	74.0
Bolton	Affiliate	75.5
Exeter Roadside	Affiliate	80.9
Hull Freetown	DEFRA	79.4
Leamington Spa	Affiliate	73.4
London Bromley	Affiliate	47.9
London Eltham	Affiliate	89.6
London Hackney	Affiliate	75.6
London Westminster	DEFRA	87.3
Manchester South	Affiliate	56.2
Manchester Town Hall	DEFRA	54.4
Rotherham Centre	Affiliate	58.9
Scunthorpe Town	Affiliate	54.7
Sheffield Centre	DEFRA	77.5
Sibton	DEFRA	88.4
Walsall Willenhall	Affiliate	27.7
Weybourne	Affiliate	56.0
Wicken Fen	DEFRA	87.1
Wirral Tranmere	DEFRA	26.0
Yarner Wood	DEFRA	70.2
N Ireland		
Scotland		
Eskdalemuir	DEFRA	87.2
Wales		
Port Talbot	Affiliate	89.3

The winter intercalibration was completed in March 2006. Results from this intercalibration exercise will be presented in the next quarterly 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 at¹:

<http://www.aeat.co.uk/com/AURNHUB/index.html>.

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

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

- Up-dated site lists (July 2005) and critical site list (October 2005)
- Monthly PM₁₀ (Gravimetric) exceedences up to December 2005
- QA/QC Unit's data ratification and intercalibration report, July-September 2005
- Recent Management Unit reports (October-December 2005)

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

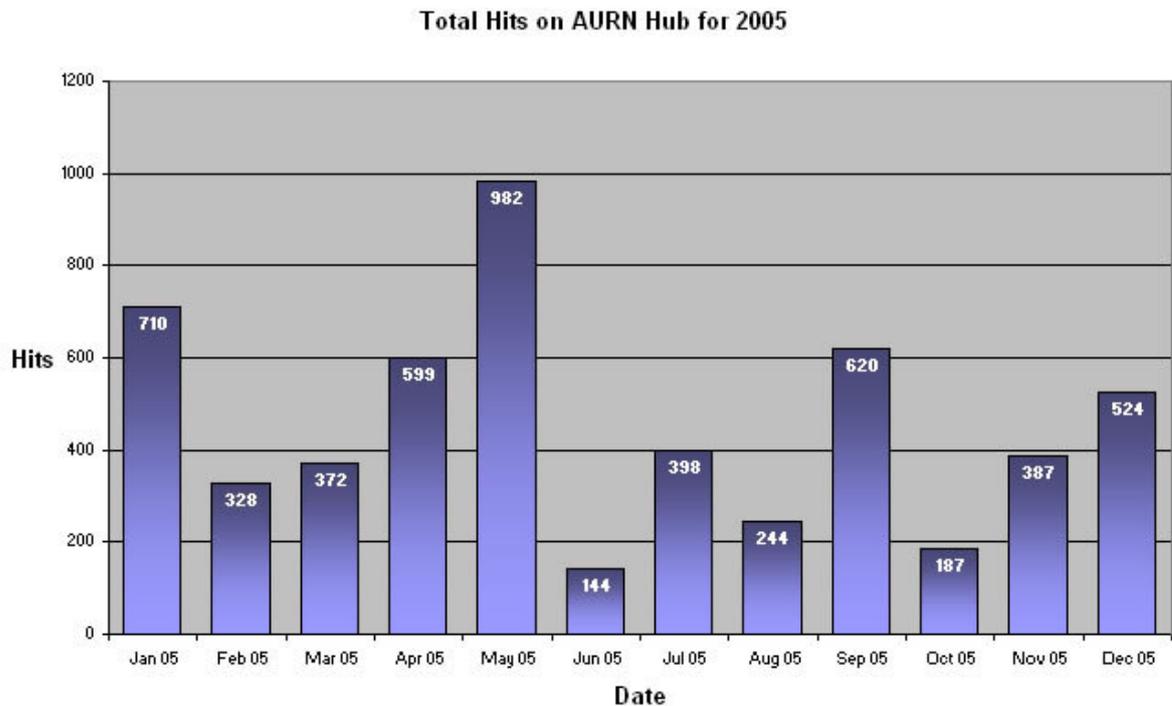


Figure 1.1 AURN Hub Monthly Usage Statistics January-December 2005

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 O₃ 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 agglomeration² 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 12-month period January-December 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 October-December 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-December 2005

Network Data Capture for 01/01/2005 to 31/12/2005 From start date of any new site

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Site Average	Principle reason for loss
England								
Barnsley Gawber	Affiliate	56.8	81.0	96.2	-	89.3	80.8	Analyser problems associated with site temperature
Hull Freetown	DEFRA	62.9	66.2	97.7	97.7	82.3	81.4	Analyser problems associated with site temperature
Leamington Spa	Affiliate	74.6	69.8	72.8	72.9	74.6	72.9	Relocation of site to new building
N'hampton	Affiliate	99.2	52.0	96.5	98.3	95.0	88.2	NOx converter fault
Preston	DEFRA	79.8	73.9	95.6	94.9	96.5	88.2	NOx converter and various analyser faults
Reading New Town	DEFRA	80.9	95.3	96.6	97.0	69.8	87.9	Noisy SO ₂ and CO analysers
Scunthorpe Town	Affiliate	-	-	-	98.1	73.6	85.9	Unstable, poor quality SO ₂ data
S'hampton Centre	DEFRA	87.8	87.2	91.3	91.0	89.9	89.4	Analyser problems associated with site temperature
Stoke-on-Trent	DEFRA	93.3	95.6	96.1	97.8	50.7	86.7	Noisy SO ₂ analyser

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	Principle reason for loss
Centre								
Wirral Tranmere	DEFRA	61.3	63.9	66.3	60.2	51.9	60.7	Fire near site
Yarner Wood	DEFRA	-	81.5	96.4	-	-	89.0	Poor quality NOx data
N Ireland								
Belfast Centre	DEFRA	94.4	54.5	95.4	95.1	95.2	86.9	Unstable NOx baseline
Scotland								
Bush Estate	DEFRA	-	45.7	98.1	-	-	71.9	Persistent problems with NOx analyser
Wales								
Cardiff Centre	DEFRA	58.3	56.3	58.3	53.8	55.4	56.4	Site closed for refurbishment
Cwmbran	Affiliate	29.4	99.3	99.5	99.2	94.0	84.3	CO analyser on incorrect range
Narberth	Affiliate	-	92.2	60.5	82.9	94.5	82.5	Leaks in O ₃ and PM ₁₀ analysers

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 PM₁₀ Data Ratification

Gravimetric PM₁₀ analysers (Partisols) are located at seven sites in the network (Bournemouth, Northampton, Wrexham, Dumfries, Inverness, London Westminster and Brighton Roadside PM₁₀). The gravimetric PM₁₀ analyser at Northampton is also co-located with a TEOM analyser, which provides a useful check that both techniques are operating correctly. Gravimetric PM₁₀ concentrations and the daily mean TEOM scaled by 1.3 at Northampton for the 12-month period January-December 2005 are shown in Figure 2.1.

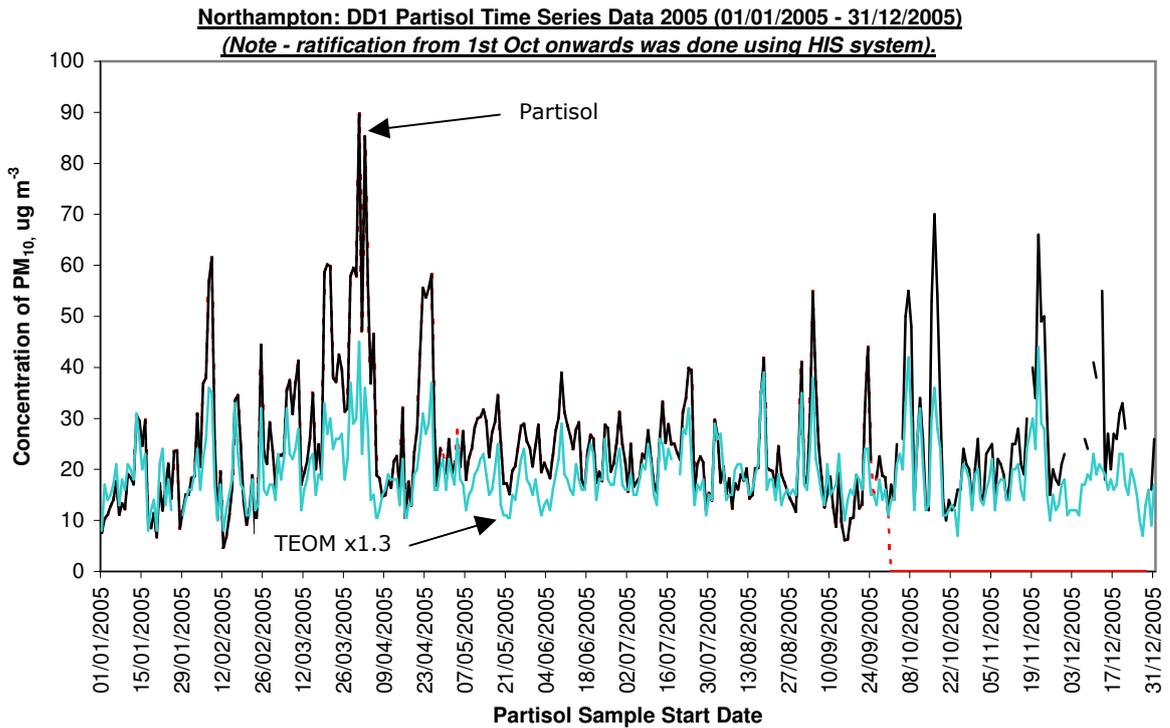


Figure 2.1 Partisol and TEOM (x1.3) Concentrations at Northampton (January-December 2005)

Data capture for the gravimetric PM₁₀ (Partisol) analysers for the period October-December 2005 is given in Table 2.3. Six of the seven sites exceeded the 90% data capture target in this quarter, with average data capture over all seven analysers of 94.7%. 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.

Bureau Veritas has supplied the measured data, undertaken the filter weighing and calculated the particulate concentrations.

Table 2.3 Gravimetric PM₁₀ Data Capture (%) 2005

Site	3-months Data Capture (%) October-December 2005	12-months Data Capture (%) January-December 2005
Bournemouth	93.5	94.2
Brighton Roadside PM ₁₀	98.9	93.7
London Westminster	98.9	95.1
Northampton	81.5	94.2
Dumfries	98.9	97.5
Inverness	94.6	94.0
Wrexham	96.7	91.8
Average	94.7	94.4

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 or silica gel driers. In most cases this has improved the situation but it has not always eliminated the problem completely. The 20 (38 in quarter 3) sites showing continuing problems with the autocalibration run-on during October to December 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: October-December 2005

Site	Pollutant	Run-On ppb	Autocal Conc ppb	Hours lost	Months
Belfast Centre	NO ₂	4.0	300	1	Oct-Dec
Birmingham Centre	NO ₂	5.0	750	1	Oct-Nov
Cardiff Centre	NO ₂	4.0	350	1	Nov-Dec
Eskdalemuir	NO ₂	2.5	500	4	Oct
				2	Nov -Dec
Exeter Roadside	NO ₂	11.0	500	1	Oct-Dec
Glazebury	NO ₂	7.1	150	2	Oct-Dec
Harwell	NO ₂	5.9	200	2	Oct-Dec
Hove Roadside	NO ₂	5.0	750	1	Oct-Dec
Leamington Spa	NO ₂	36.0	750	3	Oct-Dec
Leominster	NO ₂	2.0	500	3	Oct-Dec
Lullington Heath	NO ₂	2.2	300	2	Oct-Nov
				1	Dec
Machester Town Hall	NO ₂	6.0	450	1	Oct-Dec
Market Harborough	NO ₂	2.6	350	1	Nov-Dec
Preston	NO ₂	4.0	500	1	Oct-Dec
Rochester	NO ₂	3.4	200	2	Oct
				1	Nov-Dec
Stockport Shaw Heath	NO ₂	9.0	1100	1	Oct-Dec
Thurrock	NO ₂	4.0	400	1	Oct-Dec
Wirral Tranmere	NO ₂	5.0	300	1	Nov-Dec
Wrexham	NO ₂	4.0	350	1	Oct-Dec
Leamington Spa	NO	9.0		3	Oct-Dec
London Brent	SO ₂	1.0	900	1	Oct-Dec

The number of sites showing run-on has significantly reduced during the latter half of 2005, and it appears that the ESU's are being increasingly successful in identifying the problems that cause it. There are also several sites where the autocal concentration is too high; in particular, Stockport Shaw Heath (NO₂) and London Brent (SO₂). Leamington Spa has a significant run-on for both NO and NO₂ (though the autocal has improved during 2006), and a significant amount of data have been lost as a result.

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. QA/QC Unit and CMCU have held 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.

The NO₂ autocal at Leamington Spa is a persistent offender, and a significant amount of data are being lost. This must be addressed as a matter of urgency.

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 NO₂ autocalibration span concentrations of less than 200ppb (urban sites) and 100ppb (rural sites) are used throughout the network.

3 Site Specific Issues

3.1 Scunthorpe Town

The SO₂ analyser at Scunthorpe Town has shown very large variations in calibration results during this quarter, as well as noisy data. The audit results were also inconsistent with manual calibrations and autocalibration data. The situation is further compounded by the lack of autocalibration span data, due to the permeation tube running out some months previously. A total of 2127 hours have been deleted. A calibration plot for the analyser is shown in Figure 3.1

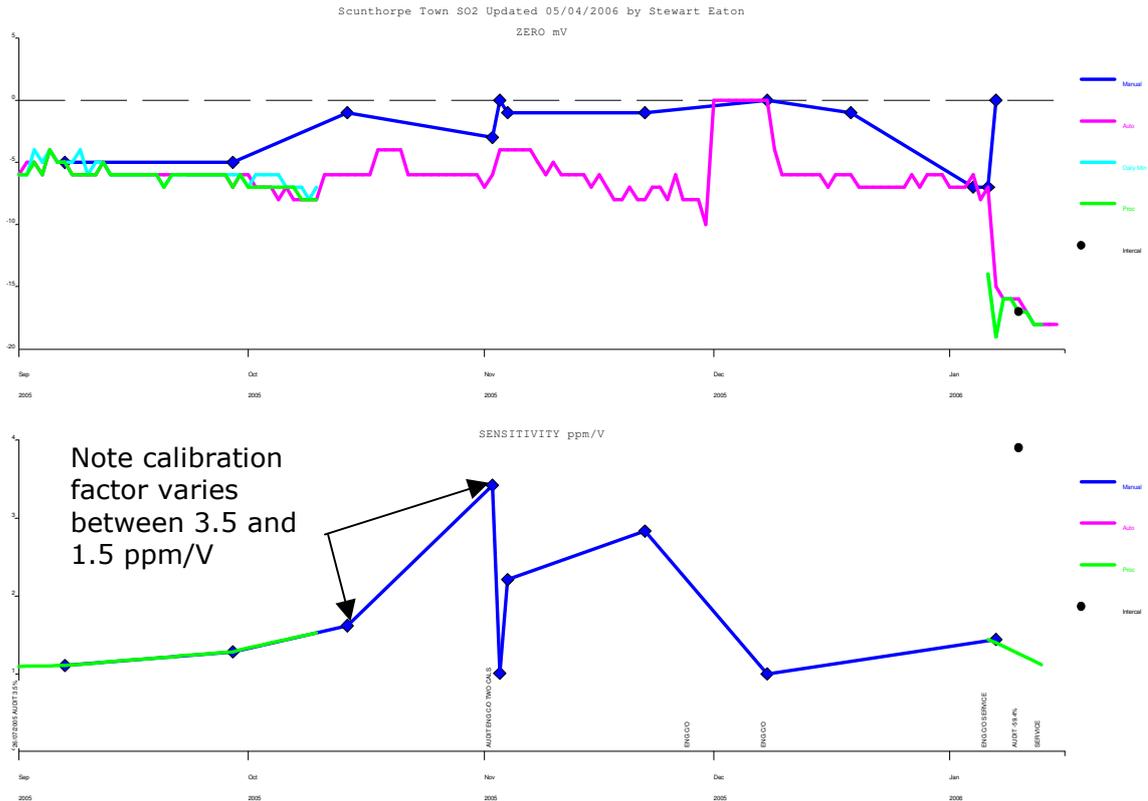


Figure 3.1 Calibration plots for Scunthorpe Town

The data improved dramatically following the ESU callout on 6 January, where the PMT was cleaned, and subsequently replaced at the service on 13 January. The permeation tube has not yet been replaced. The autocal data are useful for tracing analyser faults, and it should be replaced as soon as possible.

Recommendation

The SO₂ permeation tube at Scunthorpe Town should be replaced.

3.2 Wicken Fen Ozone

The ozone analyser at Wicken Fen developed a flow fault in December 2005. Although the data did not initially appear to be compromised, the flow data recorded by the LSO at routine calibrations was checked, and the problem diagnosed. The raw mV data are shown in Figure 3.2, and the ozone flowrate in Figure 3.3. The status of the January data will be reviewed in March 2006.

This shows the value of the diagnostic data from the analysers, and the importance of recording key parameters at routine calibrations and ESU visits.

Recommendation

LSOs should ensure all information is recorded during calibrations, as the QA/QC Unit makes increasing use of this information during ratification.

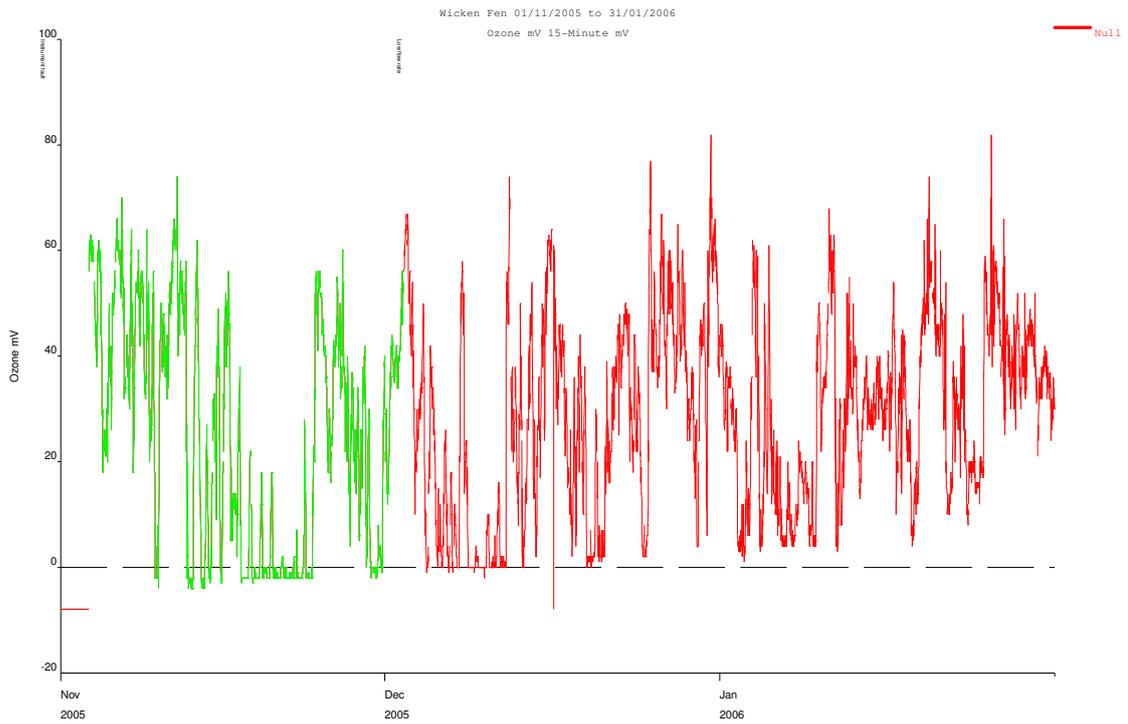


Figure 3.2 Wicken Fen Ozone Nov 2005-Jan 2006

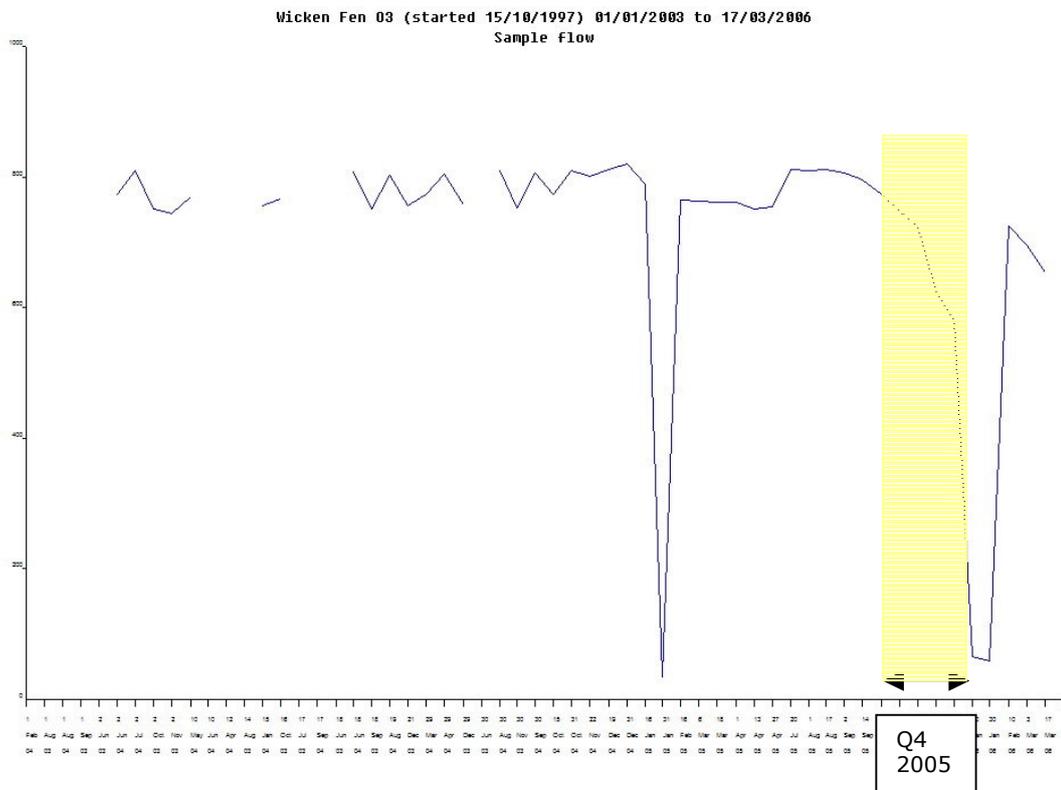


Figure 3.3 Wicken Fen Ozone Flowrate

3.3 CO Analyser Performance

The poor data capture rate for CO across the network was described in the July-September quarterly report. The situation has improved somewhat in the October-December period, but overall data capture for CO for 2005 was still below 90%. As discussed previously, site closures have contributed significantly to this data loss, but poor analyser performance has also been a problem. One site (London Bromley) had no data for the fourth quarter due to a data logging problem; actions have been initiated to rectify this.

Recommendation

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

3.4 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
Norwich Centre	SO ₂	Large step change between old and replacement analysers	Situation is being closely monitored; a duplicate analyser has been installed
Rotherham	SO ₂	Very noisy and cyclic response	Analyser refurbishment awaited; all 2005 data rejected
Bolton	NOx	Converter fault	Analyser repaired Q1 2006
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	Baffle fitted to roof to deflect air conditioning blowing on to inlet
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 autocal	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.

3.5 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 PM₁₀ and PM_{2.5}.

For the period 1 October-31 December, reports of such local works have been received for the following sites:

- Leeds
- Middlesbrough
- Nottingham
- Bradford
- Cwmbran
- Glasgow Centre

Building work is also anticipated at 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 analyser operational problems, which have resulted in data capture below the required 90% level during the reporting period October-December 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% October-December 2005
(Using the start date of any new site or end date of site closed)

01/10/2005 to 31/12/2005 Gaps in 15-minute table >= 6 hours and data capture <= 90%							Days	Hours
Pollutant	% Cap	Start date	End date	Reason	Comments	Lost	Lost	
England								
Barnsley Gawber								
CO	87.10%	18-Jun-05	12-Oct-05	High noise	High noise and instability	116	2773	
Birmingham Centre								
CO	76.00%	04-Oct-05	05-Oct-05	Vandalism	No mV data collected possible power outage	1.1	27	
		31-Oct-05	31-Oct-05	Communication fault	Call out: Logger repeatedly losing its date & time	0.5	11	
		16-Nov-05	06-Dec-05	Logger fault		20.1	483	
NO2	73.30%	04-Oct-05	05-Oct-05	Vandalism	No mV data collected possible power outage	1.1	27	
		31-Oct-05	31-Oct-05	Communication fault	ENG C/O IZS not working. Fixed connection to logger	0.5	11	
		02-Nov-05	02-Nov-05	Instrument fault	Call out: Logger repeatedly losing its date & time	0.3	6	
		16-Nov-05	06-Dec-05	Logger fault		20.1	483	

O3	71.80%	04-Oct-05 05-Oct-05	Vandalism		1.1	27
		31-Oct-05 31-Oct-05	Communication fault	No mV data collected possible power outage	0.5	11
		13-Nov-05 14-Nov-05	Unstable response	Poor quality data	0.3	8
		16-Nov-05 09-Dec-05		ENG C/O Very unstable. Replaced UV lamp	23.2	557
PM10	73.00%	04-Oct-05 05-Oct-05	Vandalism		1.1	27
		31-Oct-05 31-Oct-05	Communication fault	No mV data collected possible power outage	0.5	11
		16-Nov-05 09-Dec-05		ENG C/O Teom had lost its programming. Reconfigured	23.1	554
SO2	75.90%	04-Oct-05 05-Oct-05	Vandalism		1.1	27
		31-Oct-05 31-Oct-05	Communication fault	No mV data collected possible power outage	0.5	11
		16-Nov-05 06-Dec-05	Logger fault	Call out: Logger repeatedly losing its date & time	20.1	483
Bolton						
NO2	0.00%	08-Aug-05 24-Jan-06	High noise	NOx converter fault	169	4057
SO2	83.90%	18-Oct-05 18-Oct-05	No mV data collected	No data collected info requested.	0.4	9
		30-Oct-05 31-Oct-05	No mV data collected	Possible comms fault	0.5	13
		18-Dec-05 23-Jan-06	Instrument fault	UV Lamp failure.	35.9	861
Exeter Roadside						
SO2	29.10%	04-Oct-05 05-Oct-05	Flat response	Flat data period	1	24
		01-Nov-05 30-Nov-05	Instrument fault	UV lamp and motherboard failure	30	720
Glazebury						
NO2	83.90%	08-Nov-05 18-Nov-05	Low flow rate	Various leaks & blockages in analyser	10	240
Hull Freetown						
NO2	0.00%	16-Sep-05 31-Jan-06	Instrument fault	High baseline does not correspond to zero calcs	138	3303
Leamington Spa						
CO	76.90%	25-Jul-05 21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
NO2	67.00%	25-Jul-05 21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
O3	76.70%	25-Jul-05 21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
PM10	69.70%	25-Jul-05 28-Oct-05	Monitoring suspended	Closed down for construction of new building	95	2281
SO2	76.80%	25-Jul-05 21-Oct-05	Monitoring suspended	Closed down for construction of new building	88.4	2122
London Bexley						
PM10	70.30%	05-Aug-05 19-Oct-05	High noise	Low main flow	75.6	1814
		26-Nov-05 01-Dec-05	Flat response	Spurious data	4.2	101
		27-Dec-05 31-Dec-05	Flat response	Spurious data	4.3	102
London Brent						
PM10	83.40%	22-Nov-05 07-Dec-05	Unstable response	Spurious data after filter change at LSO calibration 25 November.	14.9	358

London Bromley

CO	0.00%	20-Jun-05 16-Feb-06	Logger fault	No data collected. Logger gives spurious zeros	242	5802
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London Eltham

NO2	75.10%	18-Oct-05 18-Oct-05	Instrument fault	Eng C/O replaced peltier cooler.	0.3	6
		23-Nov-05 15-Dec-05	Instrument fault	Ozone generator leak	22.1	531
PM10	86.00%	11-Dec-05 22-Dec-05	High noise	Call out for noisy data	10.8	259

London Hackney

O3	33.60%	01-Nov-05 31-Dec-05	Instrument fault	Needs new firmware	61	1463
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London Harlington

PM10	63.50%	08-Nov-05 09-Nov-05	Instrument fault	Amplifier board fault	1	24
		10-Nov-05 15-Nov-05	Instrument fault	Amplifier board fault	5.1	122
		16-Nov-05 06-Dec-05	Instrument fault	Amplifier board fault	20.1	482
		07-Dec-05 08-Dec-05	Communication fault	No data collected	1.1	26
		15-Dec-05 18-Dec-05	High noise	Poor quality data	3.1	74
		21-Dec-05 22-Dec-05	Communication fault	No data collected	0.8	19

London Southwark

CO	89.40%	22-Dec-05 16-Feb-06	Air Conditioning or Temp fault	Air con fault	56.5	1355
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London Westminster

CO	54.30%	23-May-05 11-Nov-05	High noise	mV data drifting + step change and noisy.	173	4147
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Manchester Piccadilly

SO2	85.00%	01-Jan-05 14-Oct-05	High noise	Very noisy and unstable	286	6875
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Manchester South

NO2	0.00%	01-Aug-05 31-Jan-06	ESU service	Converter efficiency failed (93%) at audit	184	4416
O3	89.30%	31-Oct-05 09-Nov-05	Switched out-of-service	ENG C/O Refitted instrument	9.3	224
SO2	79.30%	01-Jan-05 18-Oct-05	Unknown	ENG C/O noisy response lamp reset.	290	6969
		26-Dec-05 26-Dec-05	Unstable response	Poor quality data	0.8	20

Manchester Town Hall

CO	13.70%	23-Sep-05 03-Nov-05	Unstable response	Unstable baseline	41.1	986
		08-Nov-05 09-Nov-05	Unstable response	ENG C/O M300 Drift. No fault found	1.2	28
		17-Nov-05 07-Feb-06	Unstable response	unstable baseline	82.1	1970

Middlesbrough

CO	88.50%	13-Oct-05 18-Oct-05	Instrument removed for repair	ENG C/O CO source failure. Engineer replaced source	5.3	126
		07-Nov-05 07-Nov-05	No mV data collected	No data collected-possible comms fault heater cable perished 3.30 to 9.45 on 17 Nov	0.5	12
		16-Nov-05 17-Nov-05	Instrument fault	Nov	1.5	35
		16-Dec-05 19-Dec-05	ESU service	ENG C/O Bench heater replaced	3.1	74

Plymouth Centre

SO2	85.80%	19-Dec-05 12-Jan-06	High noise	Very noisy	24.2	580
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Preston

NO2	87.20%	01-Aug-05 07-Oct-05	NO2 converter fault	Converter efficiency 91.8% at Audit. NO2 data rejected	67.1	1610
		17-Oct-05 17-Oct-05	High noise	Spurious data	0.3	8
		24-Oct-05 24-Oct-05	Logger fault	Negative data follows IZS. Software fault	0.3	7
		04-Nov-05 04-Nov-05	Logger fault	Negative data follows IZS. Software fault	0.4	9
		02-Dec-05 02-Dec-05	Logger fault	Negative data follows IZS. Software fault	0.4	9
		16-Dec-05 16-Dec-05	Logger fault	Negative data follows IZS. Software fault	0.4	9

Redcar

O3	83.80%	02-Dec-05 03-Dec-05	Instrument fault	Sample flow fault.	0.9	21
		15-Dec-05 16-Dec-05	Instrument fault	Sample flow fault.	0.4	10
		18-Dec-05 31-Dec-05	Instrument fault	Various faults in between call outs	13.3	318

Rotherham Centre

O3	82.90%	07-Oct-05 12-Oct-05	Logger fault	Logger corruption 12.00 to 17.15	5	121
		31-Oct-05 10-Nov-05	Instrument fault	ENG C/O Replaced pump	10.2	245
SO2	0.00%	01-Jan-05 01-Jan-06	Unstable response	Cyclic response temperature related	366	8784

Scunthorpe Town

SO2	9.80%	10-Oct-05 06-Jan-06	Unstable response	See Section 3.1	88.6	2127
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Sheffield Centre

NO2	0.00%	05-Sep-05 22-Feb-06	Unstable response	Data showed unusual elevated and rising NO2 concentrations not seen at other sites	170	4084
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Sibton

O3	88.40%	01-Nov-05 07-Nov-05	Unstable response	ENG C/O Cleaned ref sample valve and replace scrubber can.	6.2	148
		25-Nov-05 25-Nov-05	Logger fault	Call out: Logger fault	0.3	6
		27-Dec-05 30-Dec-05	Logger fault	Noisy. Suspected motherboard fault. Needs replacement	4	96

Somerton

NO2	83.70%	07-Oct-05 08-Oct-05	Power cut		0.5	13
		04-Nov-05 17-Nov-05	Sampling fault	Internal sampling	13	312
		19-Nov-05 19-Nov-05	Power cut		0.8	18

Southampton Centre

CO	89.90%	03-Oct-05 04-Oct-05	Unstable response	Poor quality data following calibration	0.6	15
		13-Oct-05 14-Oct-05	Communication fault	no mV data collected	1	25
		18-Oct-05 19-Oct-05	Unstable response	Poor quality data following calibration	0.7	16
		31-Oct-05 01-Nov-05	Unstable response	Poor quality data following calibration	0.6	15
		12-Nov-05 14-Nov-05	Communication fault	no mV data collected	1.7	41
		17-Nov-05 19-Nov-05	Unstable response	ENG C/O No flow. Replaced and cleaned some plumbing	1.7	40
		25-Dec-05 28-Dec-05	Communication fault	no mV data collected	2.5	61

Southwark Roadside

CO	86.40%	18-Nov-05 30-Nov-05	Flat response	ENG C/O new source and pump installed.	12	289
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Thurrock

NO2	76.20%	08-Oct-05 28-Oct-05	Instrument fault	Removed for repair by ESU	19.7	473
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Walsall Willenhall

NO2	27.70%	26-Oct-05 18-Jan-06	No mV data collected	NOx analyser cooler failure.	84.3	2023
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Weybourne

O3	56.00%	05-Oct-05 06-Oct-05	No mV data collected	Missing data	1	23
		22-Nov-05 10-Feb-06	Sampling fault	Either flow blockage or contamination	80	1919

Wicken Fen

O3	63.50%	30-Oct-05 03-Nov-05	Instrument fault	Faulty instrument internal connection 1.30 to 12.45 on 3 Nov	4	95
		02-Dec-05 03-Feb-06	Low flow rate	Data rejected	62.8	1508

Wirral Tranmere

CO	31.70%	02-Aug-05 23-Nov-05	No mV data collected	site off due to fire	113	2708
		27-Nov-05 28-Nov-05	No mV data collected	Logger fault	0.6	14
		28-Nov-05 30-Nov-05	No mV data collected	Logger fault	1.6	38
		02-Dec-05 02-Dec-05	No mV data collected	Logger fault	0.5	12
		06-Dec-05 07-Dec-05	ESU service		0.8	20
		12-Dec-05 13-Dec-05	ESU service		0.8	20
		20-Dec-05 24-Dec-05	High noise	Very noisy	4	96
NO2	32.30%	02-Aug-05 24-Nov-05	No mV data collected	site off due to fire	114	2733
		06-Dec-05 12-Dec-05	No calibrations	Probably running on wrong range	6.2	148
O3	39.40%	02-Aug-05 23-Nov-05	No mV data collected	site off due to fire	113	2708
		06-Dec-05 07-Dec-05	ESU service		1	23
		12-Dec-05 13-Dec-05	ESU service		1	24
PM10	26.60%	02-Aug-05 06-Dec-05	No mV data collected	site off due to fire	126	3025
		14-Dec-05 14-Dec-05	Unstable response	Negative data	0.4	9
SO2	0.00%	02-Aug-05 31-Dec-05	No mV data collected	site off due to fire	151	3632

Yarner Wood

NO2	49.60%	16-Nov-05 31-Dec-05	Unstable response	Data rejected	46	1104
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N Ireland**Derry**

NO2	90.00%	11-Nov-05 11-Nov-05	Unknown		0.3	7
		07-Dec-05 13-Dec-05	Pump fault	pump replaced on 12th	6.4	153
		29-Dec-05 06-Jan-06	Instrument fault	Call out: Potential electronic fault flagging of all instruments	7.8	188

Scotland**Aberdeen**

PM10	72.80%	05-Oct-05 11-Oct-05	Unstable response	Unstable	6.3	150
		21-Nov-05 01-Dec-05	Logger fault	Possibly logger fault	9.5	227
		22-Dec-05 15-Jan-06	Logger fault	Possibly logger fault	23.3	559

Edinburgh St Leonards

O3	83.20%	07-Nov-05	15-Nov-05	Instrument removed for repair	Instrument replaced after a repair then failure.	8.2	196
		14-Dec-05	19-Dec-05	Instrument removed for repair	Computer/comms failure then instrument replaced.	5.3	126
		26-Dec-05	27-Dec-05	No mV data collected	Missing data between a/cals.	1	24
		31-Dec-05	31-Dec-05	No mV data collected	End of year problem	0.3	8

Eskdalemuir

NO2	88.00%	03-Oct-05	03-Oct-05	ESU service		0.3	8
O3	86.30%	03-Oct-05	03-Oct-05	ESU service		0.3	8
		16-Dec-05	28-Dec-05	Instrument fault	Photo Ref Warning. Replaced ozone lamp.	12.1	290

Glasgow Kerbside

PM10	86.80%	21-Oct-05	01-Nov-05	Unstable response	TEOM instability	11	263
		15-Dec-05	16-Dec-05	Unstable response	Spurious data	0.3	7

Wales

Cardiff Centre

NO2	86.70%	09-May-05	03-Oct-05	Switched out-of-service	Removed for refurbishment	147	3536
		12-Oct-05	14-Oct-05	Instrument fault	Likely analyser fault Eng. c/o on 14th	2.2	52
		07-Nov-05	08-Nov-05	Instrument fault	Short period of high negative readings	0.3	8
		16-Nov-05	17-Nov-05	No mV data collected		1.4	34
		06-Dec-05	07-Dec-05	Instrument fault	Rejected period before eng c/o for o/run	1.4	34

Cwmbran

CO	73.90%	09-Feb-05	24-Oct-05	No calibrations	Over range on span calibration	257	6168
		22-Dec-05	22-Dec-05	Power cut		0.3	7

Narberth

PM10	87.00%	01-Oct-05	01-Oct-05	No mV data collected	All channels missing data - cause unknown - info requested	0.3	8
		25-Nov-05	28-Nov-05	No mV data collected	All channels missing data - cause unknown - info requested	3.2	77
		21-Dec-05	29-Dec-05	Low flow rate	ENG C/O Reseated filter	8	191

Port Talbot

PM10	61.90%	03-Nov-05	07-Dec-05	Instrument removed for repair	ENG C/O Return site TEOM Control unit and ET Sensor unit to site.	34.2	821
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Swansea

SO2	84.50%	03-Nov-05	08-Nov-05	Unstable response	Unstable baseline. Hot swap analyser	5.2	124
		01-Dec-05	10-Dec-05	Unstable response	Unstable baseline	8.5	204

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 October-December 2005. Data capture values below 90% are shown in the shaded boxes.

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

Network Data Capture for 01/10/2005 to 31/12/2005 From start date of any new site

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
England								
Barnsley 12	DEFRA	-	-	-	-	-	94.6	94.6
Barnsley Gawber	Affiliate	87.1	98.6	99.2	-	-	98.3	95.8
Bath Roadside	Affiliate	99.6	99.6	-	-	-	-	99.6
Billingham	DEFRA	-	98.6	-	-	-	-	98.6
Birmingham Centre	DEFRA	76.0	73.3	71.8	73.0	-	75.9	73.8
Birmingham Tyburn	Affiliate	99.7	99.4	99.7	96.9	-	99.7	98.7
Blackpool Marton	DEFRA	95.9	99.0	99.8	99.2	-	91.4	97.4
Bolton	Affiliate	98.3	0.0	98.0	97.3	-	83.9	79.1
Bottesford	Affiliate	-	-	99.6	-	-	-	99.6
Bournemouth	Affiliate	99.7	98.8	99.9	-	-	99.7	98.3
Bradford Centre	DEFRA	99.0	98.7	99.1	99.4	-	91.4	97.8
Brentford Roadside	Affiliate	95.4	99.5	-	-	-	-	97.5
Brighton Preston Park	DEFRA	-	98.5	98.5	-	-	-	98.5
Brighton Roadside	Affiliate	99.7	99.8	-	-	-	-	99.8
Brighton Roadside PM10	Affiliate	-	-	-	-	-	-	98.9
Bristol Old Market	Affiliate	99.7	99.6	-	-	-	-	99.6
Bury Roadside	Affiliate	96.3	96.8	97.2	97.3	-	97.1	97.0
Cambridge Roadside	Affiliate	-	94.0	-	-	-	-	94.0
Camden Kerbside	Affiliate	-	99.5	-	95.7	-	-	96.9
Canterbury	Affiliate	-	99.6	-	99.7	-	-	99.7
Coventry Memorial Park	DEFRA	99.2	99.5	99.2	99.5	-	99.4	99.4
Exeter Roadside	Affiliate	99.6	95.3	99.6	-	-	29.1	80.9
Glazebury	DEFRA	-	83.9	99.5	-	-	-	91.7
Great Dun Fell	DEFRA	-	-	99.7	-	-	-	99.7
Haringey Roadside	Affiliate	-	99.1	-	99.6	-	-	99.5

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
Harwell	DEFRA	-	91.0	99.3	99.6	99.6	99.1	98.0
High Muffles	DEFRA	-	97.5	97.5	-	-	-	97.5
Hove Roadside	Affiliate	99.5	95.5	-	-	-	99.6	98.2
Hull Freetown	DEFRA	99.0	0.0	99.2	99.5	-	99.2	82.7
Ladybower	DEFRA	-	94.0	98.1	-	-	94.0	95.4
Leamington Spa	Affiliate	76.9	67.0	76.7	69.7	-	76.8	72.8
Leeds Centre	DEFRA	99.6	99.6	99.6	98.7	-	99.6	99.3
Leicester Centre	DEFRA	97.6	97.2	97.5	97.2	-	97.2	97.3
Leominster	DEFRA	-	91.1	99.6	-	-	-	95.3
Liverpool Speke	Affiliate	90.8	99.5	99.5	95.4	-	99.5	96.7
London A3 Roadside	DEFRA	93.4	98.1	-	98.1	-	-	96.9
London Bexley	Affiliate	99.5	99.5	99.7	70.3	-	96.2	89.3
London Bloomsbury	DEFRA	99.5	99.2	93.6	99.2	99.1	99.3	98.4
London Brent	Affiliate	99.2	99.0	99.3	83.4	-	95.1	93.2
London Bromley	Affiliate	0.0	95.9	-	-	-	-	47.9
London Cromwell Road 2	DEFRA	99.2	94.0	-	-	-	99.0	97.4
London Eltham	Affiliate	-	75.1	98.2	86.0	-	99.0	88.9
London Hackney	Affiliate	99.7	93.4	33.6	-	-	-	75.6
London Haringey	Affiliate	-	-	99.6	-	-	-	99.6
London Harlington	Affiliate	99.7	98.6	99.6	63.5	-	-	85.0
London Hillingdon	DEFRA	93.2	96.1	99.1	99.2	-	99.1	97.6
London Lewisham	Affiliate	-	99.2	99.4	-	-	96.7	98.4
London Marylebone Road	Affiliate	98.6	98.8	98.8	98.5	95.8	98.7	98.2
London N. Kensington	Affiliate	98.6	99.6	99.5	99.4	-	99.4	99.3
London Southwark	Affiliate	89.4	99.2	90.3	-	-	99.3	94.5
London Teddington	Affiliate	-	98.3	98.3	-	-	98.2	98.3
London Wandsworth	Affiliate	-	97.8	99.1	-	-	-	98.5
London Westminster	DEFRA	54.3	98.5	98.2	-	-	98.4	89.6
Lullington Heath	DEFRA	-	92.3	99.4	-	-	99.2	97.0
Manchester Piccadilly	DEFRA	99.2	98.7	99.1	99.2	-	85.0	96.7
Manchester South	Affiliate	-	0.0	89.3	-	-	79.3	56.2
Manchester Town Hall	DEFRA	13.7	95.0	-	-	-	-	54.4
Market	DEFRA	99.6	97.0	99.5	-	-	-	98.7

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
Harborough								
Middlesboro'	Affiliate	88.5	95.7	99.2	97.3	-	98.9	96.2
Newcastle Centre	DEFRA	97.4	97.0	97.3	96.9	-	97.4	97.1
Northampton	Affiliate	99.7	99.6	99.7	99.3	-	99.6	99.5
Northampton PM10	Affiliate	-	-	-	-	-	-	81.5
Norwich Centre	DEFRA	99.7	96.5	96.1	99.1	-	99.7	98.4
Norwich Forum Roadside	Affiliate	-	99.4	-	-	-	-	99.4
Nottingham Centre	DEFRA	98.7	98.6	98.8	96.0	-	98.8	97.8
Oxford Centre Roadside	Affiliate	98.4	98.3	-	-	-	96.8	97.8
Plymouth Centre	DEFRA	99.7	98.6	99.7	98.9	-	85.8	97.0
Portsmouth	Affiliate	99.5	99.8	99.6	99.4	-	99.6	99.6
Preston	DEFRA	98.6	87.2	99.0	94.9	-	98.6	95.5
Reading New Town	DEFRA	99.2	99.4	99.6	99.0	-	99.5	99.3
Redcar	Affiliate	99.6	99.5	83.8	96.6	-	94.7	95.2
Rochester	Affiliate	-	93.8	99.7	99.7	99.7	97.6	98.4
Rotherham Centre	Affiliate	-	93.8	82.9	-	-	0.0	58.9
Salford Eccles	Affiliate	98.2	98.3	98.1	97.9	-	98.2	98.1
Sandwell W. Bromwich	Affiliate	98.7	99.0	98.1	-	-	98.9	98.7
Scunthorpe Town	Affiliate	-	-	-	99.5	-	9.8	69.6
Sheffield Centre	DEFRA	95.8	0.0	99.5	92.8	-	99.5	80.1
Sheffield Tinsley	DEFRA	99.7	99.7	-	-	-	-	99.7
Sibton	DEFRA	-	-	88.4	-	-	-	88.4
Somerton	Affiliate	-	83.7	97.9	-	-	-	90.8
Southampton Centre	DEFRA	89.9	99.4	99.6	99.6	-	99.0	97.9
Southend-on-Sea	DEFRA	99.7	99.6	99.7	99.4	-	99.7	99.6
Southwark Roadside	Affiliate	86.4	99.6	-	-	-	99.6	95.2
St Osyth	DEFRA	99.3	99.6	91.5	-	-	-	96.8
Stockport Shaw Heath	Affiliate	99.9	95.2	-	98.8	-	99.9	98.5
Stockton-on-Tees Yarm	Affiliate	95.7	99.8	-	99.7	-	-	98.7
Stoke-on-Trent Centre	DEFRA	99.6	99.5	99.5	99.7	-	99.1	99.5
Sunderland	DEFRA	-	-	-	-	-	99.7	99.7
Sunderland Silksworth	Affiliate	-	99.9	99.8	-	-	-	99.8
Thurrock	Affiliate	99.0	76.2	99.5	97.7	-	99.4	94.9
Tower Hamlets Roadside	Affiliate	99.6	99.6	-	-	-	-	99.6
Walsall Alumwell	DEFRA	-	99.8	-	-	-	-	99.8
Walsall	Affiliate	-	27.7	-	-	-	-	27.7

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Site Average
Willenhall								
West London	DEFRA	92.4	99.5	-	-	-	-	95.9
Weybourne	Affiliate	-	-	56.0	-	-	-	56.0
Wicken Fen	DEFRA	-	99.0	63.5	-	-	98.9	87.1
Wigan Centre	Affiliate	97.8	98.8	97.7	98.1	-	98.6	98.2
Wirral Tranmere	DEFRA	31.7	32.3	39.4	26.6	-	0.0	26.1
W'hampton Centre	DEFRA	99.5	99.0	99.5	92.7	-	99.5	97.1
Yarner Wood	DEFRA	-	49.6	90.8	-	-	-	70.2
N Ireland								
Belfast Centre	DEFRA	93.7	94.6	99.0	97.7	-	98.7	96.9
Belfast Clara St	Affiliate	-	-	-	96.6	-	-	96.6
Belfast East	DEFRA	-	-	-	-	-	99.5	99.5
Derry	Affiliate	95.8	90.0	96.1	99.0	-	95.7	95.9
Lough Navar	DEFRA	-	-	99.7	99.5	-	-	99.6
Scotland								
Aberdeen	Affiliate	100.0	100.0	100.0	72.8	-	100.0	90.9
Bush Estate	DEFRA	-	93.5	99.5	-	-	-	96.5
Dumfries	DEFRA	99.5	99.5	-	-	-	-	99.3
Edinburgh St Leonards	DEFRA	99.2	98.0	83.2	99.1	-	99.1	96.3
Eskdalemuir	DEFRA	-	88.0	86.3	-	-	-	87.2
Glasgow Centre	DEFRA	99.5	99.5	99.6	99.3	-	99.5	99.4
Glasgow City Chambers	DEFRA	92.3	98.1	-	-	-	-	95.2
Glasgow Kerbside	DEFRA	99.7	99.5	-	86.8	-	-	93.2
Grangemouth	Affiliate	99.6	99.5	-	99.5	-	97.9	99.2
Inverness	DEFRA	99.6	99.6	-	-	-	-	97.9
Lerwick	DEFRA	-	-	98.0	-	-	-	98.0
Strath Vaich	DEFRA	-	-	95.7	-	-	-	95.7
Wales								
Aston Hill	DEFRA	-	99.5	99.5	-	-	-	99.5
Cardiff Centre	DEFRA	95.3	86.7	95.2	95.1	-	91.1	93.1
Cwmbran	Affiliate	73.9	99.2	99.6	99.2	-	93.2	94.1
Narberth	Affiliate	-	95.7	95.7	87.0	-	95.8	92.2
Port Talbot	Affiliate	-	99.5	96.3	61.9	-	99.3	83.8
Swansea	Affiliate	98.7	99.1	99.0	99.2	-	84.5	96.6
Wrexham	DEFRA	99.4	95.3	-	-	-	99.4	97.7
Number of sites		78	109	87	63	4	75	124
Number of sites < 90%		12	17	12	11	0	11	25
Network Mean (%)		93.0	91.1	94.7	93.4	98.6	91.8	92

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

Table 5.2 provides the ratified data capture figures for each site for the 12-month period January-December 2005.

Table 5.2 Ratified Network Data Statistics January to December 2005
(Using the start date of any new site or end date of site closed)

Network Data Capture for 01/01/2005 to 31/12/2005

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM ₂₅	SO ₂	Site Average
England								
Barnsley 12	DEFRA	-	-	-	-	-	97.2	97.2
Barnsley Gawber	Affiliate	56.8	81.0	96.2	-	-	89.3	80.8
Bath Roadside	Affiliate	93.8	93.8	-	-	-	-	93.8
Billingham	DEFRA	-	97.5	-	-	-	-	97.5
Birmingham Centre	DEFRA	85.0	81.1	87.0	87.4	-	85.5	85.6
Birmingham Tyburn	Affiliate	99.2	99.0	99.2	98.6	-	98.9	98.9
Blackpool Marton	DEFRA	89.3	94.5	95.8	96.4	-	91.9	94.1
Bolton	Affiliate	97.8	58.9	97.6	96.5	-	94.2	90.2
Bottesford	Affiliate	-	-	99.3	-	-	-	99.3
Bournemouth	Affiliate	98.4	94.4	98.5	-	-	98.2	96.7
Bradford Centre	DEFRA	90.2	88.4	93.1	92.8	-	90.0	91.2
Brentford Roadside	Affiliate	83.6	99.4	-	-	-	-	91.5
Brighton Preston Park	DEFRA	-	96.3	98.6	-	-	-	97.4
Brighton Roadside	Affiliate	90.3	99.0	-	-	-	-	94.6
Brighton Roadside PM10	Affiliate	-	-	-	-	-	-	93.7
Bristol Centre	DEFRA	95.8	97.2	97.3	96.8	-	95.5	96.6
Bristol Old Market	Affiliate	99.2	98.9	-	-	-	-	99.0
Bury Roadside	Affiliate	78.0	90.4	95.7	96.2	-	80.8	89.5
Cambridge Roadside	Affiliate	-	96.4	-	-	-	-	96.4
Camden Kerbside	Affiliate	-	84.8	-	96.8	-	-	92.8
Canterbury	Affiliate	-	95.5	-	99.1	-	-	97.9
Coventry Memorial Park	DEFRA	98.7	98.9	98.7	98.9	-	98.8	98.8
Exeter Roadside	Affiliate	76.9	83.4	98.8	-	-	81.1	85.0
Glazebury	DEFRA	-	91.6	98.3	-	-	-	95.0
Great Dun Fell	DEFRA	-	-	99.4	-	-	-	99.4
Haringey Roadside	Affiliate	-	97.0	-	95.6	-	-	96.1
Harwell	DEFRA	-	91.4	97.9	96.8	98.3	97.9	96.5
High Muffles	DEFRA	-	88.7	93.3	-	-	-	91.0
Hove Roadside	Affiliate	97.1	95.7	-	-	-	96.3	96.4
Hull Freetown	DEFRA	62.9	66.2	97.7	97.7	-	82.3	84.1
Ladybower	DEFRA	-	91.8	96.5	-	-	94.6	94.3
Leamington Spa	Affiliate	74.6	69.8	72.8	72.9	-	74.6	72.9
Leeds Centre	DEFRA	92.2	91.9	92.7	75.3	-	92.8	86.7
Leicester Centre	DEFRA	97.2	97.0	97.3	97.1	-	94.1	96.7
Leominster	DEFRA	-	92.7	99.3	-	-	-	96.0

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM ₂₅	SO ₂	Site Average
Liverpool Speke	Affiliate	96.1	98.2	98.3	96.9	-	98.3	97.5
London A3 Roadside	DEFRA	97.0	98.0	-	98.2	-	-	97.9
London Bexley	Affiliate	97.1	95.3	97.5	70.3	-	97.2	87.9
London Bloomsbury	DEFRA	91.9	93.8	91.2	94.6	94.4	93.9	93.5
London Brent	Affiliate	56.3	89.0	96.4	82.8	-	94.9	83.7
London Bromley	Affiliate	46.3	94.9	-	-	-	-	70.6
London Cromwell Road 2	DEFRA	94.0	93.7	-	-	-	95.0	94.2
London Eltham	Affiliate	-	84.5	98.0	78.7	-	94.6	86.9
London Hackney	Affiliate	95.7	97.2	77.9	-	-	-	90.3
London Haringey	Affiliate	-	-	99.6	-	-	-	99.6
London Harlington	Affiliate	99.3	99.0	99.1	84.9	-	-	93.4
London Hillingdon	DEFRA	89.2	93.6	92.4	96.1	-	96.1	93.9
London Lewisham	Affiliate	-	99.2	99.2	-	-	97.0	98.5
London Marylebone Rd	Affiliate	98.0	97.7	98.0	96.2	97.5	97.8	97.3
London N. Kensington	Affiliate	96.2	95.8	97.7	99.0	-	99.3	97.8
London Southwark	Affiliate	95.9	98.7	96.3	-	-	98.3	97.3
London Teddington	Affiliate	-	94.6	99.0	-	-	98.9	97.5
London Wandsworth	Affiliate	-	96.4	97.5	-	-	-	97.0
London Westminster	DEFRA	52.0	82.6	95.9	-	-	95.6	84.2
Lullington Heath	DEFRA	-	86.1	98.2	-	-	97.5	94.0
Manchester Piccadilly	DEFRA	97.9	48.6	97.9	97.8	-	21.4	76.9
Manchester South	Affiliate	-	6.5	95.0	-	-	20.0	40.5
Manchester Town Hall	DEFRA	66.3	94.9	-	-	-	-	80.6
Market Harborough	DEFRA	98.8	93.2	98.9	-	-	-	97.0
Middlesboro'	Affiliate	93.7	92.6	95.8	95.7	-	97.0	95.1
Newcastle Centre	DEFRA	97.4	95.2	97.4	97.4	-	95.8	96.8
Northampton	Affiliate	99.2	52.0	96.5	98.3	-	95.0	89.9
Northampton PM10	Affiliate	-	-	-	-	-	-	94.2
Norwich Centre	DEFRA	96.9	83.1	93.6	96.5	-	96.9	93.9
Norwich Forum Roadside	Affiliate	-	95.5	-	-	-	-	95.5

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM ₂₅	SO ₂	Site Average
Norwich Roadside	Affiliate	-	95.9	-	-	-	-	95.9
Nottingham Centre	DEFRA	86.5	91.9	97.7	96.9	-	92.6	93.8
Oxford Centre Roadside	Affiliate	95.7	97.7	-	-	-	98.1	97.1
Plymouth Centre	DEFRA	97.6	98.0	88.2	97.4	-	94.8	95.6
Portsmouth	Affiliate	94.4	98.0	99.2	98.7	-	98.9	98.0
Preston	DEFRA	79.8	73.9	95.6	94.9	-	96.5	89.3
Reading New Town	DEFRA	80.9	95.3	96.6	97.0	-	69.8	89.4
Redcar	Affiliate	88.2	50.7	80.3	94.7	-	93.2	83.6
Rochester	Affiliate	-	95.3	98.7	98.2	98.3	95.8	97.4
Rotherham Centre	Affiliate	-	92.5	91.6	-	-	0.0	61.4
Salford Eccles	Affiliate	95.4	83.2	95.9	88.0	-	95.7	91.0
Sandwell W. Bromwich	Affiliate	89.0	96.2	95.8	-	-	92.2	93.3
Scunthorpe Town	Affiliate	-	-	-	98.1	-	73.6	89.9
Sheffield Centre	DEFRA	96.9	66.0	98.3	96.6	-	98.1	92.1
Sheffield Tinsley	DEFRA	99.0	97.4	-	-	-	-	98.2
Sibton	DEFRA	-	-	91.3	-	-	-	91.3
Somerton	Affiliate	-	87.1	95.4	-	-	-	91.3
Southampton Centre	DEFRA	87.8	87.2	91.3	91.0	-	89.9	89.7
Southend-on-Sea	DEFRA	94.6	91.9	93.2	93.6	-	93.6	93.4
Southwark Roadside	Affiliate	91.9	98.8	-	-	-	98.7	96.5
St Osyth	DEFRA	93.0	93.0	94.4	-	-	-	93.5
Stockport Shaw Heath	Affiliate	75.5	91.0	-	43.2	-	99.0	70.4
Stockton-on-Tees Yarm	Affiliate	97.9	99.1	-	99.0	-	-	98.7
Stoke-on-Trent Centre	DEFRA	93.3	95.6	96.1	97.8	-	50.7	88.6
Sunderland	DEFRA	-	-	-	-	-	98.5	98.5
Sunderland Silksworth	Affiliate	-	92.7	88.6	-	-	-	90.7
Thurrock	Affiliate	93.9	84.7	94.2	94.6	-	94.0	92.7
Tower Hamlets Roadside	Affiliate	88.3	99.0	-	-	-	-	93.6
Walsall Alumwell	DEFRA	-	99.0	-	-	-	-	99.0
Walsall Willenhall	Affiliate	-	69.6	-	-	-	-	69.6
West London	DEFRA	93.7	94.6	-	-	-	-	94.1
Weybourne	Affiliate	-	-	86.1	-	-	-	86.1
Wicken Fen	DEFRA	-	98.7	89.7	-	-	93.5	94.0
Wigan Centre	Affiliate	98.3	97.6	98.2	95.7	-	96.7	97.0
Wirral Tranmere	DEFRA	61.3	63.9	66.3	60.2	-	51.9	60.6
W'hampton Centre	DEFRA	96.2	91.6	96.6	95.1	-	90.9	94.3
Yarner Wood	DEFRA	-	81.5	96.4	-	-	-	89.0

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM ₂₅	SO ₂	Site Average
N Ireland								
Belfast Centre	DEFRA	94.4	54.5	95.4	95.1	-	95.2	88.3
Belfast Clara St	Affiliate	-	-	-	94.7	-	-	94.7
Belfast East	DEFRA	-	-	-	-	-	99.3	99.3
Derry	Affiliate	96.3	92.0	86.7	97.1	-	91.8	93.5
Lough Navar	DEFRA	-	-	98.3	99.3	-	-	99.0
Scotland								
Aberdeen	Affiliate	98.9	96.6	98.9	91.8	-	98.7	96.1
Bush Estate	DEFRA	-	45.7	98.1	-	-	-	71.9
Dumfries	DEFRA	97.2	96.8	-	-	-	-	97.2
Edinburgh St Leonards	DEFRA	98.8	96.0	93.3	97.6	-	98.6	97.0
Eskdalemuir	DEFRA	-	92.8	96.0	-	-	-	94.4
Glasgow Centre	DEFRA	94.6	95.6	97.0	97.9	-	97.5	96.8
Glasgow City Chambers	DEFRA	79.4	94.6	-	-	-	-	87.0
Glasgow Kerbside	DEFRA	91.3	98.3	-	90.8	-	-	92.8
Grangemouth	Affiliate	99.3	99.2	-	98.9	-	98.9	99.1
Inverness	DEFRA	97.3	95.1	-	-	-	-	95.5
Lerwick	DEFRA	-	-	95.5	-	-	-	95.5
Strath Vaich	DEFRA	-	-	92.7	-	-	-	92.7
Wales								
Aston Hill	DEFRA	-	97.8	98.8	-	-	-	98.3
Cardiff Centre	DEFRA	58.3	56.3	58.3	53.8	-	55.4	56.0
Cwmbran	Affiliate	29.4	99.3	99.5	99.2	-	94.0	86.7
Narberth	Affiliate	-	92.2	60.5	82.9	-	94.5	82.6
Port Talbot	Affiliate	-	97.1	94.8	86.6	-	93.3	91.7
Swansea	Affiliate	97.3	94.7	97.5	97.6	-	91.8	96.1
Wrexham	DEFRA	98.6	94.6	-	-	-	98.7	95.9
Number of sites		79	111	88	64	4	76	126
Number of sites < 90%		25	30	12	13	0	15	34
Network Mean (%)		88.8	89.1	94.1	92.1	97.1	89.2	91

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

The following sites and instruments were established between 01/01/2005 and 31/12/2005
 Blackpool Marton, 14/06/2005
 Leominster 18/07/2005
 Norwich Forum Roadside, 08/04/2005
 Lerwick, 25/05/2005

Table 5.3 shows the ratified AURN data capture for the 61 **critical sites** in the network for the 12-month period January to December 2005. Sites with less than 90% data capture are shaded. This table contains the overall data capture for 12 months, regardless of when sites started or finished monitoring. A total of 16 critical sites had a data capture of less than 90%.

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

Network Data Capture for 01/01/2005 to 31/12/2005 From start date of any new site

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM ₂₅	SO ₂	Site Average
England								
Barnsley Gawber	Affiliate	56.8	81.0	96.2	-	-	89.3	80.8
Blackpool Marton	DEFRA	89.3	94.5	95.8	96.4	-	91.9	94.1
Bournemouth	Affiliate	98.4	94.4	98.5	-	-	98.2	96.7
Brighton Preston Park	DEFRA	-	96.3	98.6	-	-	-	97.4
Brighton Roadside PM10	Affiliate	-	-	-	-	-	-	93.7
Bristol Centre	DEFRA	95.8	97.2	97.3	96.8	-	95.5	96.6
Canterbury	Affiliate	-	95.5	-	99.1	-	-	97.9
Coventry Memorial Park	DEFRA	98.7	98.9	98.7	98.9	-	98.8	98.8
Glazebury	DEFRA	-	91.6	98.3	-	-	-	95.0
Great Dun Fell	DEFRA	-	-	99.4	-	-	-	99.4
High Muffles	DEFRA	-	88.7	93.3	-	-	-	91.0
Hove Roadside	Affiliate	97.1	95.7	-	-	-	96.3	96.4
Hull Freetown	DEFRA	62.9	66.2	97.7	97.7	-	82.3	84.1
Leamington Spa	Affiliate	74.6	69.8	72.8	72.9	-	74.6	72.9
Leicester Centre	DEFRA	97.2	97.0	97.3	97.1	-	94.1	96.7
Leominster	DEFRA	-	92.7	99.3	-	-	-	96.0
Liverpool Speke	Affiliate	96.1	98.2	98.3	96.9	-	98.3	97.5
Newcastle Centre	DEFRA	97.4	95.2	97.4	97.4	-	95.8	96.8
Northampton	Affiliate	99.2	52.0	96.5	98.3	-	95.0	89.9
Northampton PM10	Affiliate	-	-	-	-	-	-	94.2
Norwich Centre	DEFRA	96.9	83.1	93.6	96.5	-	96.9	93.9
Nottingham Centre	DEFRA	86.5	91.9	97.7	96.9	-	92.6	93.8
Oxford Centre Roadside	Affiliate	95.7	97.7	-	-	-	98.1	97.1
Plymouth Centre	DEFRA	97.6	98.0	88.2	97.4	-	94.8	95.6
Portsmouth	Affiliate	94.4	98.0	99.2	98.7	-	98.9	98.0
Preston	DEFRA	79.8	73.9	95.6	94.9	-	96.5	89.3
Reading New Town	DEFRA	80.9	95.3	96.6	97.0	-	69.8	89.4
Scunthorpe Town	Affiliate	-	-	-	98.1	-	73.6	89.9
Sheffield Centre	DEFRA	96.9	66.0	98.3	96.6	-	98.1	92.1
Sibton	DEFRA	-	-	91.3	-	-	-	91.3
Somerton	Affiliate	-	87.1	95.4	-	-	-	91.3
Southampton	DEFRA	87.8	87.2	91.3	91.0	-	89.9	89.7

Site	Owner	CO	NO ₂	O ₃	PM ₁₀	PM ₂₅	SO ₂	Site Average
Centre								
Southend-on-Sea	DEFRA	94.6	91.9	93.2	93.6	-	93.6	93.4
St Osyth	DEFRA	93.0	93.0	94.4	-	-	-	93.5
Stockton-on-Tees Yarm	Affiliate	97.9	99.1	-	99.0	-	-	98.7
Stoke-on-Trent Centre	DEFRA	93.3	95.6	96.1	97.8	-	50.7	88.6
Sunderland	DEFRA	-	-	-	-	-	98.5	98.5
Sunderland Silksworth	Affiliate	-	92.7	88.6	-	-	-	90.7
Thurrock	Affiliate	93.9	84.7	94.2	94.6	-	94.0	92.7
Wicken Fen	DEFRA	-	98.7	89.7	-	-	93.5	94.0
Wigan Centre	Affiliate	98.3	97.6	98.2	95.7	-	96.7	97.0
Wirral Tranmere	DEFRA	61.3	63.9	66.3	60.2	-	51.9	60.6
Yarner Wood	DEFRA	-	81.5	96.4	-	-	-	89.0
N Ireland								
Belfast Centre	DEFRA	94.4	54.5	95.4	95.1	-	95.2	88.3
Derry	Affiliate	96.3	92.0	86.7	97.1	-	91.8	93.5
Lough Navar	DEFRA	-	-	98.3	99.3	-	-	99.0
Scotland								
Aberdeen	Affiliate	98.9	96.6	98.9	91.8	-	98.7	96.1
Bush Estate	DEFRA	-	45.7	98.1	-	-	-	71.9
Dumfries	DEFRA	97.2	96.8	-	-	-	-	97.2
Edinburgh St Leonards	DEFRA	98.8	96.0	93.3	97.6	-	98.6	97.0
Eskdalemuir	DEFRA	-	92.8	96.0	-	-	-	94.4
Glasgow Centre	DEFRA	94.6	95.6	97.0	97.9	-	97.5	96.8
Grangemouth	Affiliate	99.3	99.2	-	98.9	-	98.9	99.1
Inverness	DEFRA	97.3	95.1	-	-	-	-	95.5
Strath Vaich	DEFRA	-	-	92.7	-	-	-	92.7
Wales								
Aston Hill	DEFRA	-	97.8	98.8	-	-	-	98.3
Cardiff Centre	DEFRA	58.3	56.3	58.3	53.8	-	55.4	56.0
Cwmbran	Affiliate	29.4	99.3	99.5	99.2	-	94.0	86.7
Narberth	Affiliate	-	92.2	60.5	82.9	-	94.5	82.6
Swansea	Affiliate	97.3	94.7	97.5	97.6	-	91.8	96.1
Wrexham	DEFRA	98.6	94.6	-	-	-	98.7	95.9
Number of sites		40	53	49	36	0	40	61
Number of sites < 90%		11	16	8	4	0	9	16
Network Mean (%)		89.3	88.3	93.3	93.6	-	90.3	92

Shaded boxes are for data capture < 90%

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.

Part B Annual Review

6 Overview of Network Performance

This section provides an overview of network performance during 2005. More details are given in the individual reports for each quarter-see Section 7.

6.1 Network Expansion

The number of sites in the network continues to grow, albeit more slowly than recent years. The total number of sites operational in 2005 was 125, with a further two (Fort William and Auchencorth Moss) scheduled for commissioning during 2006. Of these, 64 are fully funded sites, and 63 are affiliated, mainly from local authorities. This is shown in Figure 6.1.

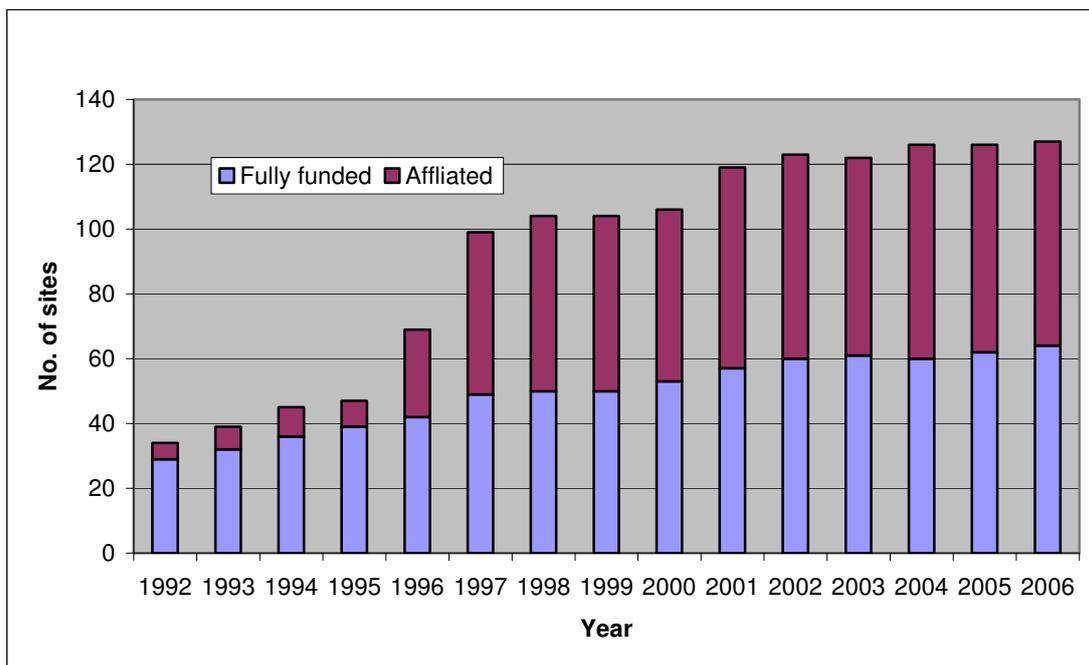


Figure 6.1 Site Numbers in the AURN

7 Review of QA/QC Unit Activities

7.1 QA/QC Reports

The QA/QC Unit has produced detailed quarterly reports giving an overview of network performance, reasons for data losses and data capture statistics.

Recommendations for equipment and site upgrades and replacements have also been made. A list of the reports for 2005 is given in Table 7.1.

Table 7.1 QA/QC data Ratification and Intercalibration Reports, 2005

	Type	Report Title	Reference
1	Ratification and Intercalibration	QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network, January-March 2005	AEAT/ENV/R/2014
2	Ratification	QA/QC Data Ratification Report for the Automatic Urban and Rural Network, April-June 2005	AEAT/ENV/R/2058
3	Ratification and Intercalibration	QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network July-September 2005	AEAT/ENV/R/2115
4	Ratification and Annual Review	QA/QC Data Ratification and Annual Report for the Automatic Urban and Rural Network October-December 2005	AEAT/ENV/R/2185

All reports are available on the Air Quality Information Archive (www.airquality.co.uk) and on the AURN Hub.

7.2 Network Intercalibrations

Two complete network intercomparisons were carried out at 6-monthly intervals during 2005. These are an important part of the overall QA/QC programme for the AURN network. The purpose of these intercomparisons is to determine the network measurement accuracy, consistency and intercomparability across the entire network. The latest exercise covered all 125 sites (except Southwark Roadside, see below, and those closed for relocation/refurbishment at the time). The procedures used, and a summary of the results obtained, are provided in the January-March and October-December QA/QC reports. The Southwark Roadside site was not audited during the winter 2006 intercalibration exercise, as it has not been possible to gain access to the site.

A summary of the number of analysers in the network found to be providing provisional data outwith the defined accuracy limits (the "outlier" sites) is given in Figure 7.1. A full definition of what constitutes an outlier site for the different

pollutants is given in the appropriate Quarterly Reports (see Table 7.1). Note also that, for the vast majority of these outlier sites, the data will have been fully corrected as part of the subsequent data ratification process.

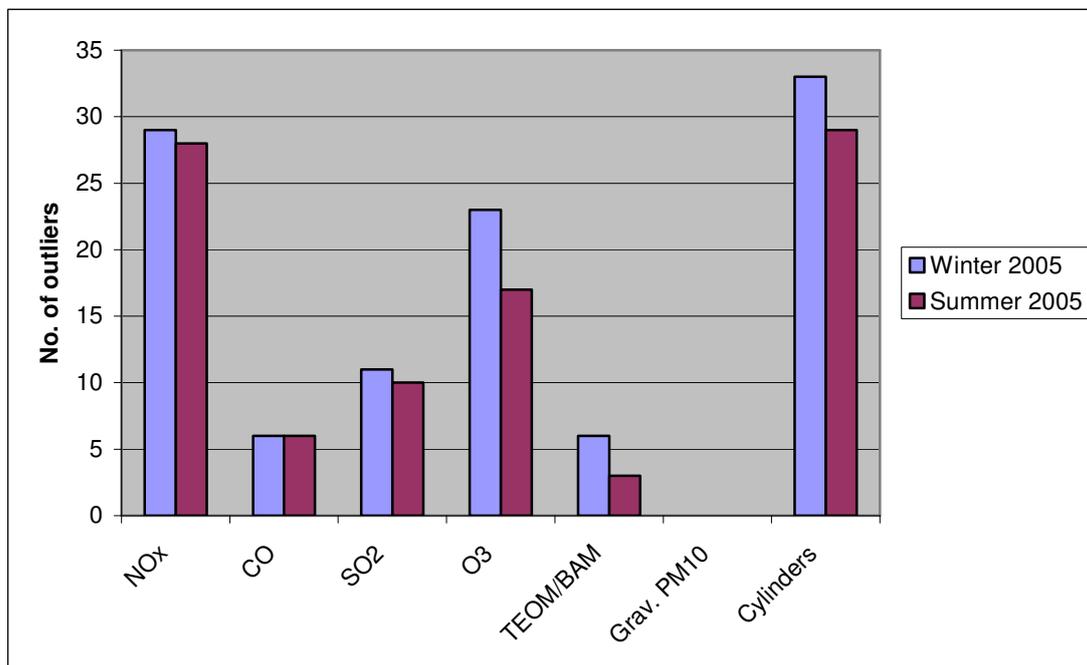


Figure 7.1 Outliers identified during 2005 intercalibration exercises.

Sites which have been commissioned, recommissioned in new locations or have had new analysers installed have been audited by the QA/QC Unit prior to the publication of the data from the site.

The intercalibration visits are also used to ensure information about network sites and analysers are correct and up to date-see Appendix B1. For example, at recent network intercalibration exercises, information has been gathered on the sample manifold systems used at all sites, the detailed set-up parameters for the TEOM particle analysers, and how site locations compare to the requirements listed in the EC Directives.

7.3 ESU, CMCU, LSO and QA/QC Meetings

During 2005, the QA/QC Unit has also arranged a series of meetings with the CMCU and the ESUs from the defra/DA funded sites. These were held to discuss specific data quality issues, and to highlight changes in ESU procedures that may result from the adoption of CEN standards-see Section 8. The QA/QC Unit have provided the ESUs with spreadsheets to calculate various analyser performance parameters (eg converter efficiency, linearity) in line with the CEN requirements; ESUs have been requested to integrate the principles into their routine site tests.

All parties were in agreement that work undertaken by the ESUs is a vitally important part of the overall data quality management process for the network, and it is planned to repeat the meetings at regular intervals.

As in previous years, the QA/QC Unit has attended the AURN and LAQN LSO meetings, and presented network updates as appropriate. These presentations are available on the AURN Hub.

7.4 International Intercomparisons

The QA/QC Unit attended an EC intercomparison at JRC Ispra, in May 2005. The pollutants measured were NO, NO₂, SO₂ and CO. The final results have not yet been circulated, but preliminary results show netcen's results for SO₂ and CO were good, but the the NO_x analyser used for this intercomparison had a fault and no results are available.

The WHO have organised an intercomparison in Germany during May 2006, which netcen staff will attend. The pollutants to be measured are NO₂, SO₂ and ozone.

7.5 Network Data Capture

The overall network data capture for 2005 was 91%, which is above the 90% target level. However, inevitably, not all sites achieved >90% and a table of data capture for the 34 sites with less than 90% capture is given in Table 7.1.

Table 7.1 Sites with Annual Average Data Capture for 2005

Network Data Capture for 01/01/2005 to 31/12/2005 From start date of any new site

Site	Owner	Site Average
Barnsley Gawber	Affiliate	80.8
Birmingham Centre	DEFRA	85.2
Bolton	Affiliate	89.0
Bury Roadside	Affiliate	88.2
Exeter Roadside	Affiliate	85.0
Hull Freetown	DEFRA	81.4
Leamington Spa	Affiliate	72.9
Leeds Centre	DEFRA	89.0
London Brent	Affiliate	83.9
London Bromley	Affiliate	70.6
London Eltham	Affiliate	89.0
London Westminster	DEFRA	84.2
Manchester Piccadilly	DEFRA	72.7
Manchester South	Affiliate	40.5
Manchester Town Hall	DEFRA	80.6
Northampton	Affiliate	88.2
Preston	DEFRA	88.2
Reading New Town	DEFRA	87.9
Redcar	Affiliate	81.4
Rotherham Centre	Affiliate	61.4
Scunthorpe Town	Affiliate	85.9
Southampton Centre	DEFRA	89.4
Stockport Shaw Heath	Affiliate	77.2
Stoke-on-Trent Centre	DEFRA	86.7
Walsall Willenhall	Affiliate	69.6
Weybourne	Affiliate	86.1
Wirral Tranmere	DEFRA	60.7
Yarner Wood	DEFRA	89.0
Belfast Centre	DEFRA	86.9
Bush Estate	DEFRA	71.9
Glasgow City Chambers	DEFRA	87.0

Cardiff Centre	DEFRA	56.4
Cwmbran	Affiliate	84.3
Narberth	Affiliate	82.5

It should be noted that the overall annual average data captures for CO, NOx and SO2 were all below the target 90% data capture for the year.

A summary of data capture by pollutant for the year 2005 is given in Table 7.2

Table 7.2 Summary of data capture by pollutant, 2005

	CO	NO ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	Average
Number of sites	79	111	88	64	4	76	126
Number of sites < 90%	25	30	12	13	0	15	34
Network Mean (%)	88.8	89.1	94.1	92.1	97.1	89.2	91

In terms of reporting air quality data to the European Commission for compliance with European Air Quality Directives, it is important to identify the data capture from the critical sites to see where there may be insufficient data capture for a particular UK zone or agglomeration. Overall, there were 48 critical site analysers in 14 agglomerations/zones with annual average data capture below 90%. These are grouped by pollutant as follows:

11 CO analysers:

- Barnsley Gawber
- Blackpool Marton
- Hull Freetown
- Leamington Spa
- Nottingham Centre
- Preston
- Reading New Town
- Southampton Centre
- Wirral Tranmere
- Cardiff Centre
- Cwmbran

16 NO₂ analysers

- Barnsley Gawber
- High Muffles
- Hull Freetown
- Leamington Spa
- Northampton
- Norwich Centre
- Preston
- Sheffield Centre
- Somerton
- Southampton Centre
- Thurrock
- Wirral Tranmere
- Yarner Wood
- Belfast Centre
- Bush
- Cardiff Centre

8 O₃ analysers

- Leamington Spa
- Plymouth Centre
- Sunderland Silkworth
- Wicken Fen
- Wirral Tranmere
- Derry
- Cardiff Centre
- Narberth

4 PM₁₀ analysers

- Leamington Spa
- Wirral Tranmere
- Cardiff Centre
- Narberth

9 SO₂ analysers

- Barnsley Gawber
- Hull Freetown
- Leamington Spa
- Reading New Town
- Scunthorpe Town
- Southampton Centre
- Stoke-on-Trent Centre
- Wirral Tranmere
- Cardiff Centre

For these sites, pollution statistics calculated for analysers with data capture down to 75% or modelled data have to be used. However, neither of these approaches is entirely satisfactory. Hence, the QA/QC unit continues to make the recommendation that greater attention needs to be paid to minimising data loss from the critical sites.

The network annual average data capture of 91% is down slightly on previous years. During 2004, there were 44 critical site analysers with less than 90% data capture. The network is clearly operating in a steady-state level of operation, despite some ageing analysers and sites closed, sometimes for extended periods, for relocation or refurbishment. Figure 7.1 shows the annual network data capture since the start of the AURN in 1992.

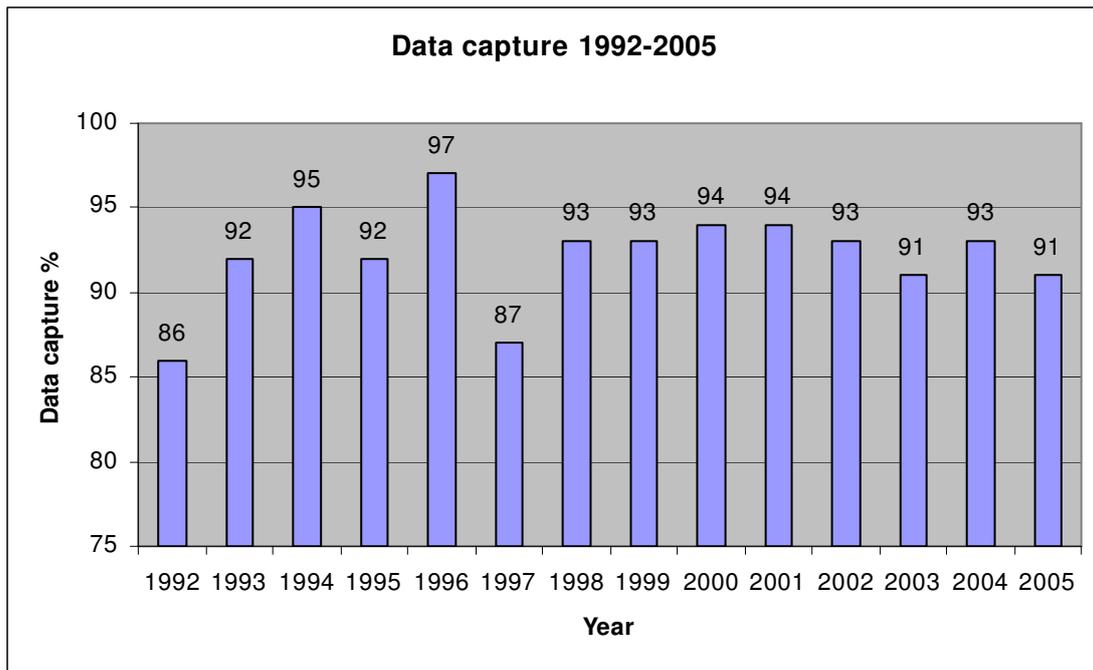


Figure 7.1 Annual Average Data Capture 1992-2005

7.6 Investigation of Spurious Data

The data ratification process involves checking many millions of 15-minute average concentrations every year. Although the majority of analysers operate satisfactorily, there are inevitably some problems that require more detailed investigation by the QA/QC unit during the ratification process. The QA/QC Unit works closely with the LSOs, the ESUs and the CMCU in order to resolve these issues and process the data accordingly. All parties involved are encouraged to provide sufficient information to streamline this process as much as possible. Unfortunately, there are still instances where instruments faults remain undetected and large quantities of data are lost. Summaries of the more common reasons for data loss are discussed below.

NOx converters

At each QA/QC intercomparison, a small number of NOx converters are found to be less than the required 95% efficient. Where this is the case, the information from ESU service and repairs are checked to try to find the last date at which an acceptable converter test result has been obtained, or to identify an event which may indicate when the fault actually occurred (eg substitution of a replacement analyser). In some cases, no relevant information is available, and in the worst-case situation, data will be rejected back to the previous service visit (often 6 months previous). To minimise the risk of this, the QA/QC Unit has repeatedly requested that ESU's carry out converter tests at all service visits, and at relevant repair call-outs.

Noisy analyser outputs

There are several analysers on the network that produce very noisy signal outputs. Many of these have been highlighted in previous reports, and ESUs have been made aware of them. The most common offenders are CO and SO₂ analysers. An example is shown in Figure 7.2

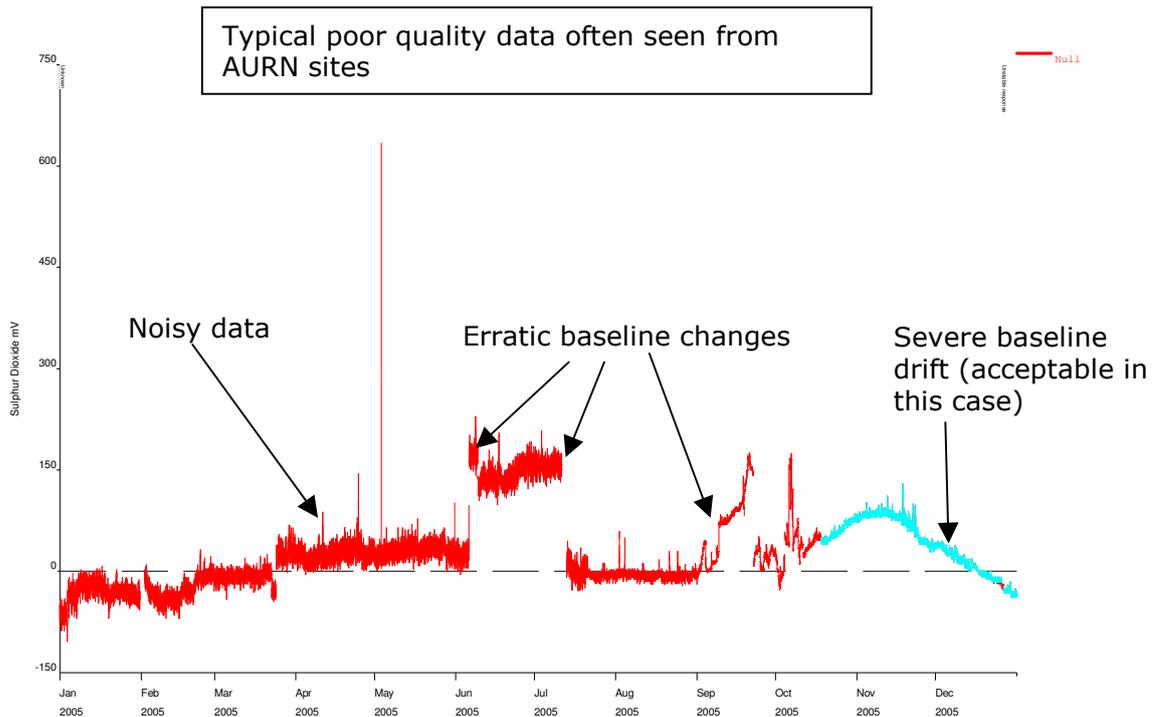


Figure 7.2 Example of Poor Quality Data

Rapid drifts or erratic changes in zero or calibration factor

Some analysers have a tendency to drift over time. In most cases, these can be accommodated using manual calibration values, assisted by daily autocalibration data. However, some drift so rapidly that it is difficult to establish where the signal baseline actually lies. Figure 7.2 also shows erratic changes in baseline, both step-changes and baseline drift.

Leaks

Both gaseous and particle analysers are susceptible to leaks. The analysers are tested for this at 6-month QA/QC visits, and at ESU visits. Where leaks are identified, information is sought as to when this might have occurred, and an assessment is made of the likely effect on data quality. Small leaks are unlikely to have a major effect on measured data; where the leak is more substantial, the effect is often visible in the measured data, particularly when compared with data from other nearby sites.

Leaks in the bypass flow on a TEOM analyser may affect the particle size fraction of the analyser inlet.

Air conditioning faults

Most of the sites have air conditioning units to control internal temperature. If these units fail, the internal temperature may rise significantly, or may vary by an unacceptable degree. Varying temperatures often cause analysers output signal to change, and the reliability of analysers is significantly reduced when exposed to elevated temperatures. CO analysers in particular suffer from signal drift when the temperature is not well controlled. Significant problems have been experienced during 2005 at Sheffield Centre, Barnsley Gawber, Hull Freetown and Southampton Centre.

Automatic calibration run-on

As described in Section 2.4, there have been persistent problems across the network with the daily span checks for NO₂ (and less so for SO₂) causing run-on into the ambient data. This only occurs where the span check is provided by a permeation tube, and commonly results in the loss of up to one hour’s data each day. This problem has been raised with the ESUs, and considerable progress has been made to reduce the problem. In many cases, the run-on is reduced to acceptable levels by reducing the concentration of the span check gas, and several ESUs are now installing permeation tubes with lower permeation rates.

7.7 Site Closures, Refurbishments and Infrastructural Repairs

During 2005, a significant amount of data were lost through site closures for relocation or refurbishment. The sites worst affected are given in Table 7.3

Table 7.3 Sites Subject to Closure or Relocation, 2005

Site	Monitoring stopped	Monitoring restarted	Reason	Days lost
Cardiff	9/5/05	3/10/05	Refurbishment of enclosure	147
Leamington Spa	25/7/05	21/10/05	Construction of new site enclosure	88
Wirral Tranmere	2/8/05	23/11/05	Fire close to site	113
Bristol Centre	15/9/05	-	Relocation due to redevelopment of surrounding area	Continuing

Whilst some degree of data loss was inevitable in these cases, all possible efforts should be made in future to minimise the data loss due to site closures.

In addition, a number of sites have been affected by nearby building works, Some of these have measured elevated pollutant levels during this work, particularly particles. The most significant building works affected Bradford, Leeds, Middlesbrough, Cwmbran, Nottingham and Glasgow Centre.

8 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; BS EN14211 (NO_x), BS EN14212 (SO₂), BS EN14626 (CO) and BS EN14625 (O₃) 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 pollutant 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. 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 SO₂ 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 are now finalised and published and are, at present, being incorporated into the requirements of the Framework and Daughter Directives. It is likely that Member States will 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 for the winter 2006 intercomparison were fully compliant with the CEN protocols.

9 Changes to the Network during 2005

There have been several changes to network sites during 2005; these are summarised in Table 8.1

Table 8.1 Changes to Network sites during 2005

Site	Date closed	Date opened	Reason	Comments
Norwich Roadside	14 Feb 05	31 May 05	Site relocation	Renamed Norwich Forum Roadside
Blackpool	10 Nov 04	13 Jun 05	Site relocation	Renamed Blackpool Marton
Bath Roadside	27 April 05	27 April 2005	Site relocation	Site moved short distance
Leominster	-	18 Jul 05	New site	
Cardiff	9 May 05	30 Sep 05	Refurbishment of cabin	
Middlesbrough	18 May 05	23 May 05	Site relocation	Site moved 17m
Lerwick	-	25 May 05	New site	
Leamington Spa	25 Jul 05	21 Oct 05	Relocation of site to new cabin	
Bradford Centre	3 Aug 05	3 Aug 05	Site relocation	Site moved 15m
Bristol Centre	15 Sept 05	-	Site relocation	New site expected early 2006

In addition, the monitoring equipment has been replaced at Leeds Centre (April 2005), Norwich Centre (14 July) and Southend on Sea (29 July).

10 ISO17025 Accreditation

The QA/QC Unit has maintained its ISO17025 accreditation for 6-monthly site calibrations and calibration of ambient gas mixtures. A copy of the schedule can be found at

http://www.ukas.org.uk/calibration/lab_detail.asp?lab_id=902&vMenuOption=3

During 2005, this accreditation has been extended to cover field operations carried out from the AEA Technology office at Glengarnock, Ayrshire.

A total of four surveillance and assessment visits were carried out by UKAS- two at monitoring sites, one at Harwell and one at Glengarnock.

11 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 issues identified that presented significant risk during the winter 2006 intercalibration exercise. The issue of safe roof access, to audit PM₁₀ 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 is recommended that safer roof access (ladder securing points) be installed at 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.

In addition, it has been noted that a number of sites have become untidy or cluttered, and pose a trip or other hazard to any staff working in them. It is recommended that LSOs be encouraged to keep sites tidy.

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 April 2006			
	None		
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 July 2005		Priority	Action
14	Several analysers still exhibit poor performance-	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
10	The SO ₂ analyser at Manchester South has shown a history of high noise response and should be upgraded or repaired.	Medium	Analyser performance still poor

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: PM₁₀ monitored by Gravimetric and TEOM

Note 3: DD3 Critical as Rural Background station

Note 4: If NO₂ at Leominster is Suburban then NO₂ 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, May 2006

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. Leamington Spa NOx must be considered a priority. Autocalibration span concentrations to be <200ppb for urban sites and <100ppb for rural sites.	2.4	ESUs
3	Scunthorpe Town	The SO ₂ permeation tube should be replaced as soon as possible	3.1	LSO
4	Analyser status information	LSOs should ensure all information is recorded during calibrations, as the QA/QC Unit makes increasing use of this information during ratification.	3.2	LSOs
5	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 2005.	3.4	ESUs QA/QC and CMCU

APPENDIX B1

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
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

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
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
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

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
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 Teflon	TQ190652	518983	165220	51° 22' 25" N	0° 17' 31" W	30
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

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
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
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

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
	Teflon						
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

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
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
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

Site Name	Manifold type	Grid Reference	6 figure easting	6 figure northing	Longitude	Latitude	Altitude (m)
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.

