

Report

**QA/QC Data Ratification Report for
the Automatic Urban and Rural
Network,
October – December 2002**

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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Jane Vallance-Plews

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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 to December 2002.

In addition to the 82 urban sites, this report includes 22 rural network sites and 14 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network, bringing the total number of sites to 118. The following information is contained in this 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 presented in tables, including data capture for the entire year January-December 2002
- Appendix A: Recommendations for replacing or up-grading equipment (compiled in conjunction with CMCUs).
- Appendix B: Critical sites in the AURN

1.1 Recent Changes in the Network

Following award of new contracts in October 2002, netcen have undertaken the role of QA/QC Unit for the urban, rural and London Network monitoring sites. Casella Stanger continue to be the Central Management and Co-ordination Unit (CMCU) for the urban and rural sites with Environmental Research Group (ERG, King's College London) undertaking the management role for the London Air Quality Network. Messer UK Ltd is now responsible for the supply and delivery of gas calibration cylinders to all network sites. LSO and ESU contracts for the urban and rural network sites (excluding the London Network) were re-tendered by Casella Stanger in March 2003. Details of the LSOs for the sites can be found on the AURN Hub web site at:
<http://www.aeat.co.uk/com/AURNHUB/aunhubPUBLIC-20.htm>

An overview of the main changes relating to sites in the AURN between January 2002 to April 2003 is presented below with a summary given in Table 1.1.

Monitoring at Hull Centre ceased on January 17th 2002 and the equipment was relocated to a new site at Hull Freetown which was commissioned on November 8th 2002. The Stockport site was also closed on October 3rd 2002 when the lease expired and this site was subsequently relocated on 11th October 2002 to Stockport Shaw Heath.

The Liverpool Centre Site was closed on 23rd September 2002 for health and safety reasons and consequently there is no data from the Liverpool Centre site for this quarter. The site has now been relocated approximately 10 miles away to the vacated hydrocarbon site in Speke. A new set of analysers is being installed at this site and monitoring is expected to commence in April 2003 once the site has undergone a pre-commissioning audit.

The Edinburgh Centre site was closed in April 2002 due to necessary redevelopment of the Princes Street Gardens area. A mobile station operated by Edinburgh City Council

was co-located approximately 90 metres north east of the original site. The mobile station was operating from April 24th until 19th November. It was then closed in order to prepare the local area for the Hogmanay celebrations. The mobile station has not yet been reinstated as work was taking place to repair ground in the area of the site. The original site has, in the meantime, been relocated approximately 1 mile away to Richmond Gardens. The analysers have now been installed but there has been some delay in getting mains power to the site.

Hounslow Roadside site was closed on November 16th 2002 because the building in which the monitors were housed was being sold. The site is being relocated to a cabin at the roadside of the A4 adjacent to the M4 flyover.

The monitoring station at Reading was closed at the end of January 2003 as the lease for the site had expired. Arrangements are being made to relocate the site approximately 1 mile away to Junction Cemetery. There has been a delay in the relocation of this site due to power supply problems.

QA/QC Unit audited the gravimetric PM₁₀ monitor installed at London Westminster on 15th January 2003. However, it was discovered that a component was missing from the analyser. The repair was carried out and PM₁₀ monitoring commenced on 19th February 2003. The Partisol analyser at Brighton Roadside commenced monitoring on 28th February 2003.

Additional ozone and rural NO_x analysers have recently been installed in the network in order to comply with the Third Daughter Directive (DD3) which comes into force on 9th September 2003. So far, ozone analysers have been installed at Portsmouth and Cwmbran and a NO_x analyser at Somerton. These should all be operational by the end of April 2003.

A major programme of work has now commenced on replacement of analysers at the oldest sites in the network. This is being organised by Casella Stanger with QA/QC Unit undertaking the pre-commissioning audits of the new equipment and LSO training as required.

Table 1.1 Changes to the AURN between January 2002 to April 2003

Sites	Date Commenced	Pollutants
New sites		
Wrexham	6 March 2002	NO ₂ CO SO ₂
Additional CO monitoring (DD2)		
Wrexham	6 March 2002	CO
Cwmbran	12 March 2002	CO
Northampton	12 March 2002	CO
Portsmouth	21 March 2002	CO
Wigan Leigh	15 th May 2002	CO and O ₃
Barnsley Gawber	8 th July 2002	CO
Dumfries	17 th July 2002	CO
Inverness	17 th July 2002	CO
Bournemouth	19 th July 2002	CO
Stockton-on-Tees Yarm	14 th August 2002	CO
Grangemouth	17 th January 2003	CO
Additional Gravimetric PM₁₀ (Partisol) monitoring		
Inverness	13 th February 2002 (restarted after vandalism)	PM ₁₀
Wrexham	6 th March 2002	PM ₁₀

Sites	Date Commenced	Pollutants
London Westminster	Started 19 th February 2003	PM ₁₀
Brighton Roadside	Started 28 th February 2003	PM ₁₀
Additional rural O₃ and NO_x (DD3)		
Portsmouth	Commenced 15 th April 2003	O ₃
Cwmbran	Installed awaiting audit	O ₃
Somerton	Installed awaiting audit	NO _x
Monitoring suspended		
Data Loss		
Hull Centre relocated to Hull Freetown	17 Jan 2002 - 8 th Nov 2002	All
Grangemouth – site up grade	1 st Aug 2002 – 17 th Jan 2003	All
Inverness – vandalised	30 th Sept 01 to 13 th Feb 2002	PM ₁₀ (Gravimetric)
London Bloomsbury relocation	4 Feb 2002 to 5 March 2002	All
Edinburgh mobile site temporarily closed. Permanent site in place awaiting power supply	Closed 8 th November 2002	PM ₁₀
Stockport relocated to Stockport Shaw Heath	8 th –11 th October 2002	All
Liverpool Centre closed. Relocation to Speke in progress	Closed from 23 rd September 2002.	All
Reading closed. Relocation to Junction Cemetery in progress	Closed at end of January 2003	All
Hounslow Roadside closed. To be relocated	Closed 16 th November	All

1.2 Overview of Network Performance

Ratified hourly average data capture for the network averaged 94.1% for all pollutants (O₃, NO₂, SO₂, CO and PM₁₀) during the 3-month reporting period October-December 2002 (see Table 1.2 below).

Table 1.2 AURN Ratified Data Capture (%) October – December 2002
(Using the start date of any new site)

Pollutant	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Average
Data Capture (%)	92.4	92.2	96.4	94.0	94.3	94.1

The ratified data capture statistics for the complete year (January to December 2002) are given in Table 1.3. The annual average data capture for the year was 93.0% which is consistent with the overall high levels of network performance seen over the last few years. An overview of network performance and data capture will be presented in the AURN annual report which is currently in production and will be available in the near future.

Table 1.3 AURN Ratified Data Capture (%) January–December 2002
(Using the start date of any new site)

Pollutant	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Average
Data Capture (%)	89.8	93.2	95.0	93.1	93.1	93.0

Overall, 345 out of the 393 analysers (87.8%) achieved data capture levels above the required 90% target during this reporting period. This indicates an overall increase in network performance from the previous quarter (July to September 2002) when 81.4% of the analyser achieved data capture above 90%. Table 1.4 shows the number of analysers in the network that did not achieve 90% data capture during this period. From this it can be seen that a relatively high proportion of CO analysers (18%) in the network failed to meet the target. The reason for this was mainly due to analyser malfunction and high response noise. (See Sections 3 and 4 for details).

Table 1.4 Number of Analysers with Data Capture below 90% October-December 2002

	Total Number Of Analysers	Analysers with Data Capture < 90%	Analysers with Data Capture < 80%
CO	76	14	8
NO ₂	98	13	10
O ₃	76	5	2
PM ₁₀	67	5	4
SO ₂	76	11	5
All sites	393	48	29

All data capture figures given in this report now include the gravimetric PM₁₀ data. Note that there are two PM₁₀ instruments at Northampton: a TEOM and a Partisol. Data from the Northampton TEOM instrument have been used to calculate the data capture. QA/QC Unit has developed data ratification procedures for the gravimetric analysers and an additional section on gravimetric PM₁₀ data ratification has been included in this report (Section 4.1).

A more detailed breakdown of the hourly data capture statistics for each site is presented in Section 5, Table 5.1. In total, 16 out of the 118 operational sites (13.4%) had an average data capture rate below the required 90% level for the October to December 2002 period. (See Table 1.5). The main site operational and QA/QC issues giving rise to data capture below the required 90% level are summarised in Section 4.

Table 1.5 Sites with Average Data Capture < 90%, October-December 2002 (data capture from site start date)

Site	Status	Average Data Capture(%)
Bristol Old Market	Affiliate	48.3
Coventry Memorial Park	Affiliate	89.6
Great Dun Fell	Defra	89.5
Hounslow Roadside	Affiliate	48.8
Hull Freetown	Defra	76.9
Leeds Centre	Defra	82.8
London A3 Roadside	Defra	87.4
London Southwark	Affiliate	79.1
Manchester South	Affiliate	76.2
Rochester	Affiliate	73.2
Southampton Centre	Defra	86.8
Stockport	Affiliate	58.3
Edinburgh Centre	Defra	52.6
Grangemouth	Affiliate	0.0
Cwmbran	Affiliate	85
Narberth	Affiliate	84

Netcen carried out the Winter intercalibration and site audits at 118 urban and rural sites during January-March 2003. Results from this intercalibration exercise have been used to assess the accuracy and consistency of the data for this reporting period. Details of the Winter 2003 intercalibration will be reported in July in conjunction with the next data ratification report.

QA/QC Unit's data ratification and intercalibration reports are now available on the Air Quality Archive web site at the following address:

http://www.airquality.co.uk/archive/reports/reports.php?action=category§ion_id=5

and also on the AURN project information hub web site¹.

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

¹ Password protected site: username and password available from Jane.vallance-plews@aeat.co.uk

2. Generic Data Quality Issues

2.1 Progress on the Affiliation of New Sites

The programme to install additional CO monitors to comply with the EU DD2 Directive has been completed. CO monitoring at Grangemouth was delayed until 17th January 2003 due to the site infrastructure being up-graded.

In order to comply with the third Daughter Directive (implementation date 9th September 2003), future expansion of the network is planned for 2003 to incorporate 3 new sites and further additional ozone and rural NO_x monitors. Ozone analysers have now been installed at Portsmouth and Cwmbran and a NO_x analyser at Somerton. Monitoring will commence following the QA/QC pre-commissioning audits which are scheduled for the end of April 2003. It is anticipated that NO_x analysers will be installed at Aston Hill, Bush, Glazebury, High Muffles and Yarner Wood during the next 6 months. Locations have now been agreed for the three new sites monitoring rural NO_x and O₃. These will be at Leominster (West Midlands), Ashington (North East) and Fort William (Highlands).

Further details on the second and third Daughter Directives can be found at:

<http://www.defra.gov.uk/environment/consult/air-23daughter/index.htm>

2.2 Data Capture for Critical Sites in Zones and Agglomerations

In order to meet the requirements of the Daughter Directives, any zone or agglomeration* with an exceedence of the limit value must be formally reported to the Commission. Data capture targets must be achieved, especially for the zones and agglomerations that rely on the results from a single monitoring station (i.e. critical sites). The list of the critical sites in the Network has been revised to reflect the requirements of the First, Second and Third Daughter Directives (see Appendix B). In total 61 sites have been identified as critical for DD1, DD2 or DD3. (25 sites in agglomerations and 36 in zones).

Critical sites with less than 90% data capture during the 3-month period October to December 2002 are given in Table 2.1. Reasons for data loss at these sites are given in Section 4. Table 2.2 shows the critical sites with less than 90% data capture for the entire year January-December 2002. In total 24 sites did not meet the required 90% data capture for one or more of the critical pollutants during the year 2002.

Table 2.1 Critical Sites in Agglomerations and Zones* with < 90% data capture, October-December 2002

(All data captures are calculated from 1st October to 31st December 2002)

Critical Sites in Agglomerations		
Site	Pollutant	Data Capture(%)
Coventry Memorial Park	CO	60.2
Edinburgh Centre	All	52% (site closed)
Glasgow Centre	SO ₂	85.2
Brighton Roadside	PM ₁₀ (Gravimetric)	Not operational

* 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>

Critical Sites in Agglomerations		
Site	Pollutant	Data Capture(%)
Hull Freetown	CO	0
	NO ₂	59.1
	O ₃	59.3
	PM ₁₀	55.3
	SO ₂	60.6
Leicester Centre	CO	78.5
Liverpool Centre	All	Site closed
Southampton Centre	CO	83.7
	NO ₂	87.6
	O ₃	87.7
	PM ₁₀	87.9
	SO ₂	87
Southend-on-Sea	CO	81.4
Wirral Tranmere	CO	83.0
Critical Sites in Zones		
Cwmbran	CO	81.2
	NO ₂	75.4
	SO ₂	86.9
Derry	O ₃	85.1
Grangemouth	All	Site closed for up-grade
Great Dun Fell	O ₃	89.5

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.

Table 2.2 Critical Sites in Agglomerations and Zones with <90% data capture, January to December 2002
(All data captures are calculated from 1st January to 31st December 2002)

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Comments
Critical Sites in Agglomerations						
Belfast Centre	✓	✓	✓			
Blackpool	✓	✓	✓	✓	✓	
Bournemouth	41.9	✓	-	✓	✓	
Brighton Roadside			-	0	-	PM ₁₀ not operational yet
Bristol Centre			✓	✓	✓	
Cardiff Centre	87.7	✓	✓	✓	87.2	
Coventry Memorial Park	33.5	87.8	✓	✓	✓	
Edinburgh Centre	82.2	86	84.8	82.1	86.1	
Glasgow Centre		✓	✓		85.3	
Hove Roadside			-	-	✓	
Hull Freetown	0	14.9	14.9	13.9	15.3	
Leicester Centre	88.1	✓	✓	79.3	✓	
Liverpool Centre	40	68	66	69	70	
Newcastle Centre	✓	✓	✓	✓	✓	
Nottingham Centre	✓	✓	✓	88.9	✓	
Portsmouth	76.7	✓	-	✓	✓	
Preston	✓	✓	✓	✓	✓	
Reading	59.7	✓	✓	✓	80.4	
Sheffield Centre				✓		
Southampton Centre	83.8	✓	86.5	88.4	65.7	
Southend-on-Sea	✓	✓	✓	✓	✓	
Stoke-on-Trent Centre	✓	✓	✓	✓	✓	
Swansea	✓					
Wirral Tranmere	70.9	✓	84.2	✓	✓	
Critical Sites in Zones						
Aberdeen	✓	✓	-	72.3	✓	
Aston Hill	-	-	✓	-	-	
Barnsley Gawber	47.4	86.4		-		
Bush Estate	-	-	✓	-	-	
Canterbury	-		-	✓	-	
Cwmbran	71.6	✓	-	✓	✓	
Derry	✓	✓	✓	✓	✓	
Dumfries	✓	✓	-	✓	-	
Glazebury	-	-	✓	-	-	
Grangemouth	0	57.3	-	57.3	57.3	CO started 17/1/03
Great Dun Fell	-	-	74.3	-	-	
High Muffles	-	-	✓	-	-	
Inverness		✓	-	65.8	-	
Ladybower	-	✓	✓	-		
Leamington Spa	✓	✓	✓	✓	✓	
Lough Navar	-	-	87.7		-	
Narberth	-		✓			
Northampton	57.1	✓	-	✓	✓	
Norwich Centre		✓	✓			

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Comments
Oxford Centre	✓		-	-		
Plymouth Centre				✓		
Scunthorpe	-	-	-		✓	
Sibton	-	-	✓	-	-	
Somerton	-	-	✓	-	-	
Stockton-on-Tees Yarm	37.3	✓	-	✓	-	
Strath Vaich	-	-	✓	-	-	
Sunderland	-	-	-	-	✓	
Thurrock		✓	✓			
Wicken Fen	-	85	✓	-		
Wigan Leigh	62.4	✓	62.4	✓	✓	
Wrexham	80.9	77.8	-	78.1	69.6	
Yarner Wood	-	-	✓	-	-	
Number of Sites < 90%	18	8	8	11	9	

Key Pollutant not critical at this site
 ✓ Data capture for critical pollutant >90%
 - not monitored

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 monitoring at London Westminster commenced on 19th February 2003 and at Brighton Roadside on 28th February 2003.

The Northampton Partisol is also co-located with a TEOM 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 are shown in Figure 2.1. This shows good agreement between the two techniques during the periods when the Partisol was operational.

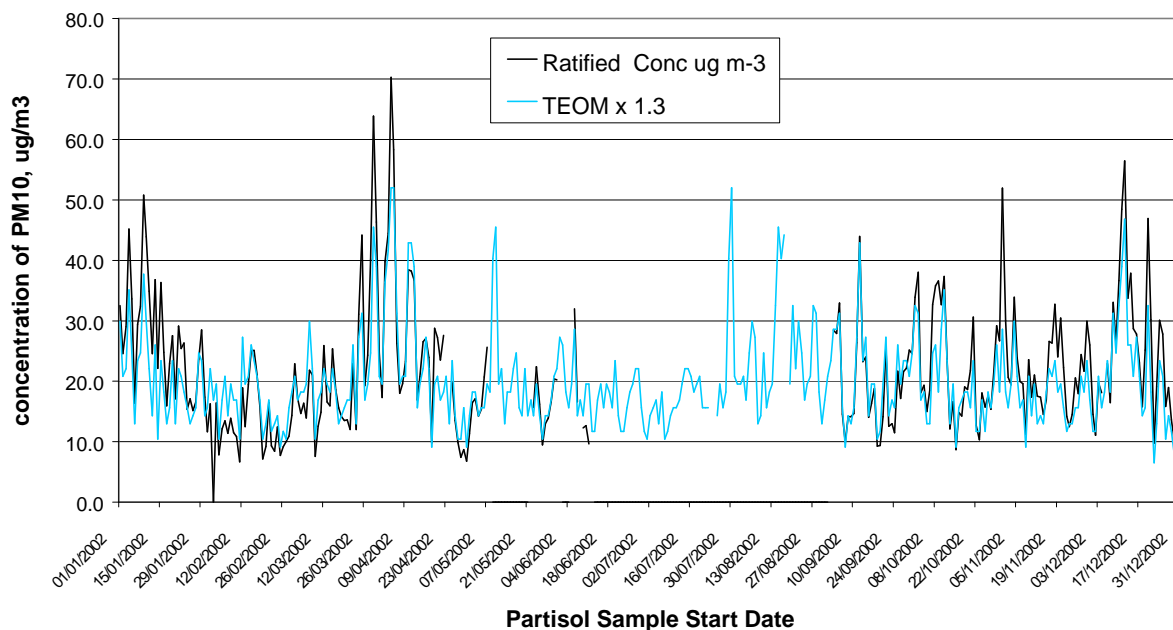


Figure 2.1 Partisol and TEOM (x1.3) Concentrations at Northampton (Jan-Dec 02)

Data capture for the gravimetric PM₁₀ (Partisol) analysers during October to December 2002 was exceptionally good with all five operational Partisols exceeding the required 90% data capture target. The average data capture for the gravimetric PM₁₀ analysers during October to December 2002 was 99.1%. Details of data loss associated with each site are given in Section 4.1. Table 2.3 also shows the gravimetric PM₁₀ data capture for the entire year January- December 2002.

Table 2.3 Gravimetric PM₁₀ Data Capture

Site	Oct-Dec 2002	Jan-Dec 2002
Bournemouth	100	95.8
Dumfries	98.9	93.7
Inverness*	97.8	65.8
Northampton	98.9	67.7
Wrexham (Started 1 st March 02)	100	93.1
Average	99.1	83.2

* site restarted 13/2/02 after being vandalised

In the previous ratification report QA/QC Unit recommended that remote collection of instrument diagnostics and alarms would be beneficial, since as much as 2 weeks (4%) data can be lost between sites visits. CMCU are currently in the process of making arrangements for the Partisol analysers to be connected to a telemetry system and telephone lines have now been installed at the stations.

2.4 NO₂ Converter Efficiencies

Three converter failures were identified during QA/QC Unit Winter 2003 intercalibration exercise. Details of these and the resulting effect on data quality are given in Table 2.4 below.

Table 2.4 Converter faults identified at the Winter 2003 Intercalibration

Site	Test Date	Converter Efficiency	Effect on Data Quality
Sheffield Centre	4/2/03	94%	None – borderline case
London A3 Roadside	9/1/03	88%	NO ₂ data deleted from last stable calibration on 3 rd December until repair of converter at the service on 22/1/03 (50 days)
Wolverhampton Centre	24/1/03	90	Data deleted from audit until converter replaced on 28/1/03. (4 days)

RECOMMENDATION

ESUs should undertake 3-monthly converter tests at Sheffield Centre, London A3 Roadside and Wolverhampton Centre to ensure satisfactory performance of the converters.

LSOs should also continue to pay careful attention to the short-term stability of the NO₂ calibration response and notify the CMCU if a declining NO₂ span response is recorded during the calibration. Full details of this check can be found in the "Trouble-shooting" section of the Site Operator's Manual.

(<http://www.aeat.co.uk/netcen/airqual/reports/Isoman/Isoman.html>)

2.5 Ozone Outliers

22 out of 76 ozone analysers (29%) were identified as outliers during QA/QC Unit Winter 2003 intercalibration exercise (see Table 2.5). Full details will be provided in the relevant intercalibration report. Data from these sites have been rescaled accordingly during the ratification process.

Table 2.5 Ozone Outliers Identified at the Winter 2003 Intercalibration Exercise

Site	Outlier	Site	Outlier
Barnsley Gawber	-16%	Leicester Centre	-15%
Belfast Centre	-12%	London Lewisham	+10%
Birmingham Centre	-17%	London Teddington	-6%
Bottesford	+16%	Lough Navar	+10%
Bradford Centre	-16%	Lullington Heath	+30%
Bush Estate	-17%	Norwich Centre	-18%
Derry	-12%	Preston	-9%
Glasgow Centre	-8%	Rotherham Centre	-6%
Glazebury	-15%	Southampton	-8%
Great Dun Fell	-15%	St Osyth	-6%
Leeds Centre	-9%	Wigan Leigh	+21%

2.6 TEOM k_0

The TEOM instruments in the AURN use a k_0 constant to determine PM_{10} concentrations. Each TEOM sensor unit has a k_0 determined by the manufacturer and this value is stamped on the sensor unit. This value must also be entered into the TEOM software to correctly calculate the concentrations. Errors can occur if the sensor unit is replaced without the software being updated. This is checked during the intercalibration exercise by the use of pre-weighted filters to determine the k_0 . The measured, stamped and software values of k_0 are then compared. Deviations within $\pm 2.5\%$ are considered acceptable. Table 2.6 shows the sites where there were deviations between the measured and stamped k_0 values.

Table 2.6 TEOM k_0 Deviations identified at the Winter 2003 Intercalibration Exercise

Site	k_0 Deviation (%)
Wigan Leigh	k_0 value on sensor and control unit miss-match.
Leicester Centre	25%

At Wigan Leigh the k_0 value stamped on the side of the control unit did not agree with the value stored in the software. The deviation between them was, however, within the acceptable limit and no corrections to the data were necessary.

A large deviation in k_0 at Leicester Centre was identified at the previous Summer 2002 audit. Results of the Winter 2003 audit again confirmed the large deviation which arose because the k_0 value stamped on the side of the unit did not match the value stored in the software. PM_{10} data from July 17th 2002 have been rescaled accordingly until the ESU corrected the discrepancy at the Winter service in April 2003.

RECOMMENDATION

ESUs should continue to ensure that the correct k_0 value is entered into the analyser software whenever the sensor unit is repaired or replaced.

2.7 Auto-Calibration Run-ons

This problem is seen when auto-calibration gas introduced between 0045 and 0115 remains in the instrument until about 0200. The ambient measurements between 0130 and 0200 are therefore invalid and must be removed during data ratification. This problem can occur if the solenoid valves in the pneumatic system do not close fully after the zero and span cycle. Calibration gas may then leak into the instrument during the ambient measurement period. This problem can be a serious source of data loss resulting in one hour out of twenty-four being lost, which is 4% of the annual data capture.

The ESUs have investigated this problem at many of the sites and thorough cleaning of the solenoid valves has, in most cases, resolved the problem. Sites still showing a problem with the autocalibration over-run are given in Table 2.7. Any autocalibration run-on data that look visibly significant have been deleted from these data sets during ratification, resulting in a loss of an additional hour of data each day (4% data loss).

Table 2.7 Estimate of Spike or Dip in 15-Minute Concentrations due to Auto-calibration Run-on

Site	Gas	Over-run (ppb)
Birmingham Centre	NO ₂	7 ppb
Birmingham East	NO ₂	6 ppb
Bury Roadside	NO ₂	9 ppb
Cardiff Centre	CO	0.1 ppm
Coventry Memorial Park	NO ₂	4 ppb
London Westminster	NO ₂	7 ppb
Narberth	NO ₂	3.1 ppb
Reading Centre	SO ₂	-1 ppb
Southampton Centre	CO	0.1 ppm
St Osyth	NO ₂	2.7 ppb
Walsall Willenhall	NO ₂	8 ppb
Wigan Leigh	SO ₂	1 ppb

RECOMMENDATION

The CMCU and ESUs should continue to monitor the situation and initiate service visits to clean / repair solenoid valves were necessary.

2.8 Zero Air Scrubber Materials

QA/QC Unit routinely replaces the zero air scrubber materials as part of the 6-monthly audit exercise. During the summer 2002 exercise the blue indicating silica gel (CoCl) in the zero air canisters was replaced with an orange silica gel as the blue material is considered to be harmful and must be treated as hazardous waste for disposal purposes. However, during the recent Winter 2003 audit it was noted that at some sites the orange silica gel had been replaced with the blue gel again. QA/QC Unit has, therefore, once more removed the blue gel and replaced it with orange. As there is no difference in the performance of the two materials we strongly recommend for health, safety and environmental reasons that everyone uses **orange** silica gel in the zero air scrubbers. In future, any blue silica gel found in the zero air canisters will be left on site for the LSOs/ESUs to dispose of.

RECCOMENDATION

LSOs and ESUs to ensure that orange indicating silica gel is used in the zero air canisters.

2.9 Ozone Interference at Redcar and Middlesbrough

Figure 2.2 shows that spurious high ozone concentrations were recorded on 1st October 2002 at Redcar (90 ppb 15-minute average) and Middlesbrough (60 ppb 15-minute average). Similar high concentration spikes have been recorded at these sites in the past and these have been attributed to an interference effect from VOCs or fine particulates.

RECOMMENDATION

ESUs and LSOs to ensure that a 1 micron filter is installed in the sample line of the ozone analysers at these sites in order to minimise the possible interference effect from fine particles.

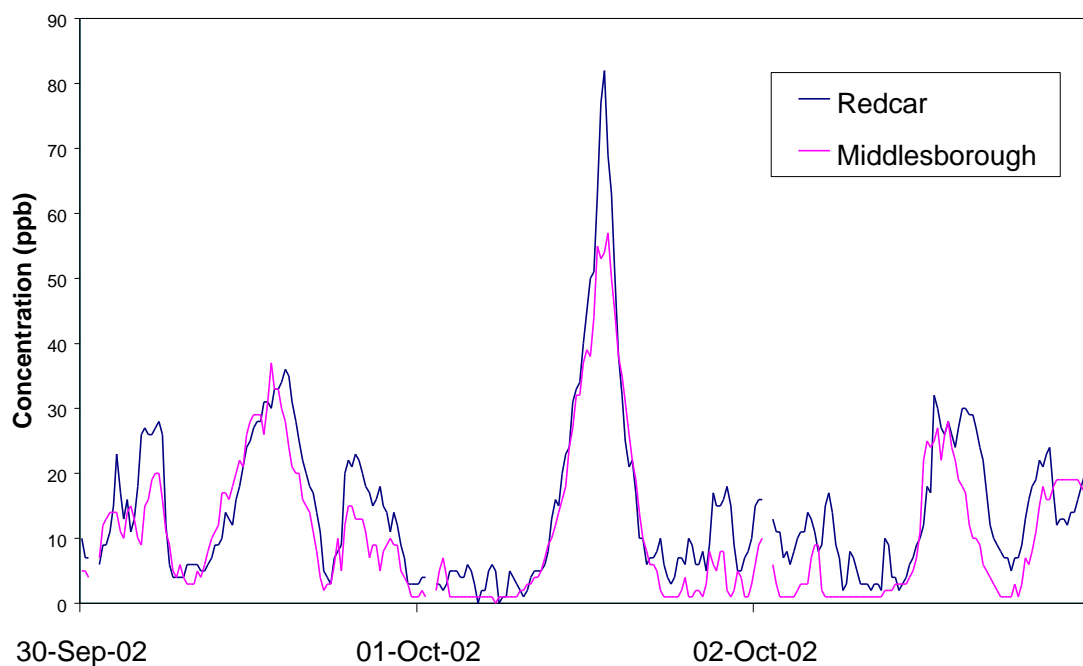


Figure 2.2 High Ozone Interference Spikes at Redcar and Middlesbrough October 1st 2002

3. Site Specific Issues

3.1 Bristol Old Market NO_x

Unusually high NO₂ concentrations were first recorded at the Bristol Old Market site in November and December 2001. At the time no obvious reason could be found to reject the data so the data were kept as provisional. High levels were seen again in April 2002 with ambient concentration increasing by approximately 70ppb above the normal level. (see Figure 3.1). QA/QC Unit therefore installed a second NO_x analyser on site to verify the data. Results from the duplicate instrument showed concentrations that broadly agreed with the original site analyser. Further site investigations by QA/QC Unit in February 2002 identified slow response from the analyser and low flow through the sample manifold (1.2 m/s) suggesting a possible obstruction or damage to the manifold. At the ESU call-out at the end of February 2002 an additional problem with the molybdenum converter was identified and the converter was replaced. This did not however rectify the sampling fault and at the summer audit in July 2002 the flow through the sample manifold was again found to be very low at 0.5 m/s. The ESU visited the site on 18th July 2002 and repaired a kink in the teflon sample line which appeared to be restricting the flow. A problem with the molybdenum converter was seen again and the analyser was removed from site from 18th July until 25th September to install a new converter. After repair the ambient levels monitored continued to be elevated and further evidence of a low sample flow was noted in November 2002 and at the Winter 2003 audit in March 2003 (0.9 m/s).

It has been concluded that the elevated concentrations were due to a sampling manifold problem, hence the duplicate analyser recording similar levels when sampling through the same manifold. Consequently the analysers were removed from their original location on 26th March 2003 and installed in the nearby replacement site with a completely new sample inlet manifold arrangement. First indications are that provisional data collected from the NO_x analyser at its new location are now lower and more typical of the levels to be expected. However, there is as yet an insufficient amount of data for this to be conclusive.

Unfortunately due to the nature of the sampling fault it has been necessary to reject all spurious data from the last reliable audit check of the manifold sample flow on 31st July 2001 to March 26th 2003 (19 months) when the site was relocated.

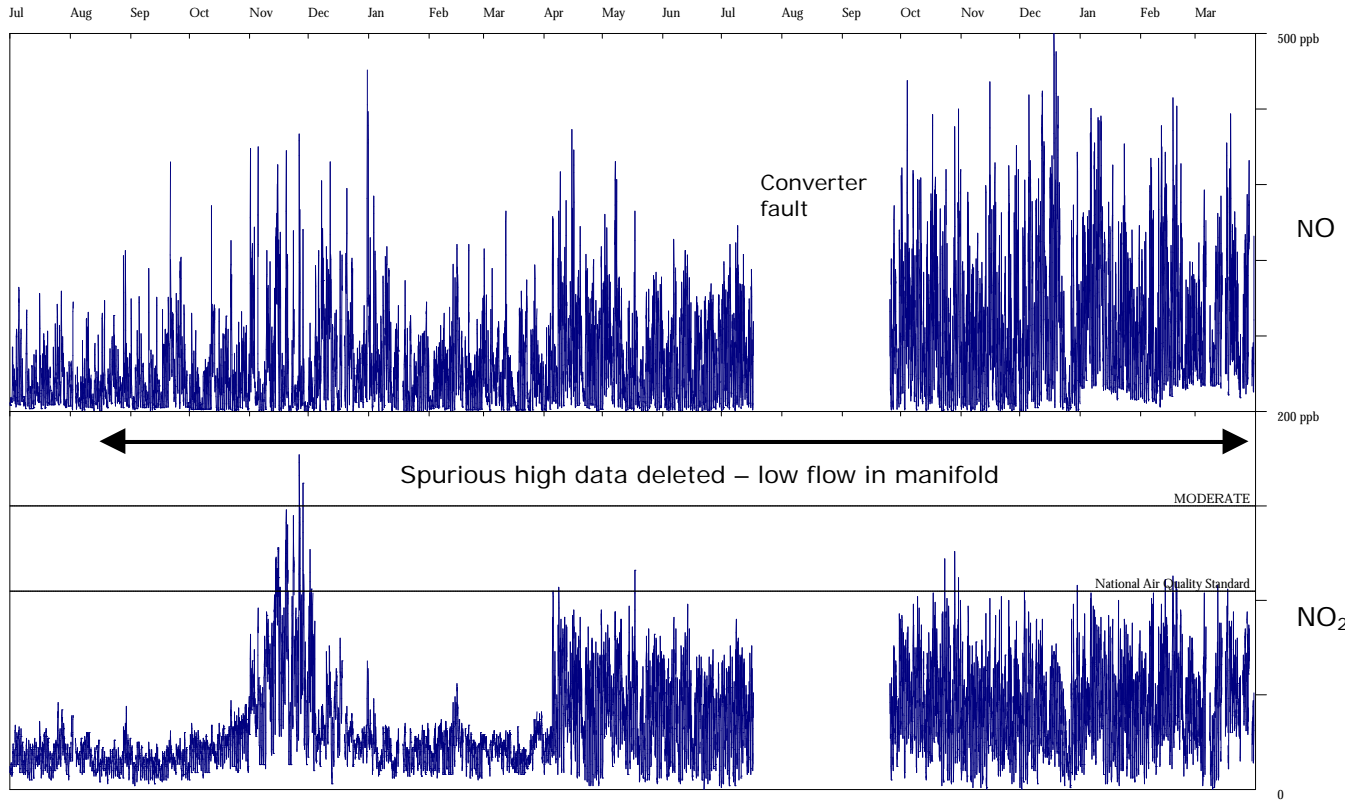


Figure 3.1 High NO₂ Concentrations at Bristol Old Market August 2001 to March 2003

3.2 Birmingham Centre SO₂

Since August 2002 the SO₂ analyser at Birmingham Centre has shown periods of high noise and drifting response due to a UV lamp fault. (See Figure 3.2). Over 2.5 months of data have been deleted due to this problem (1 August to 26th September and 18th to 28th October). The lamp was replaced at the end of October 2002.

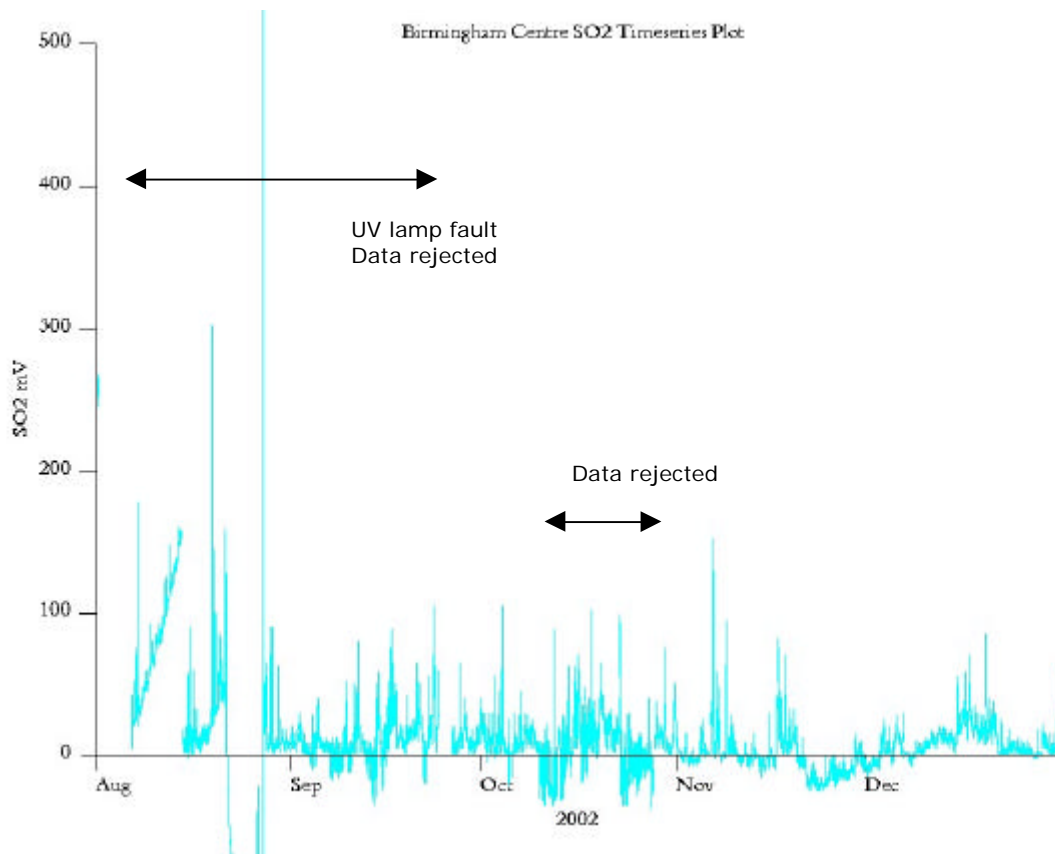


Figure 3.2 Birmingham Centre SO₂ Unstable Response

3.3 Coventry Memorial Park CO

The CO analyser at Coventry Memorial Park showed unacceptably high levels of response noise from March 2002 onwards (Figure 3.3). Over 6 months of data have been rejected from 12th March to 5th November when the analyser was repaired. This is a critical site for CO and it is therefore important that the performance of this analyser is satisfactory.

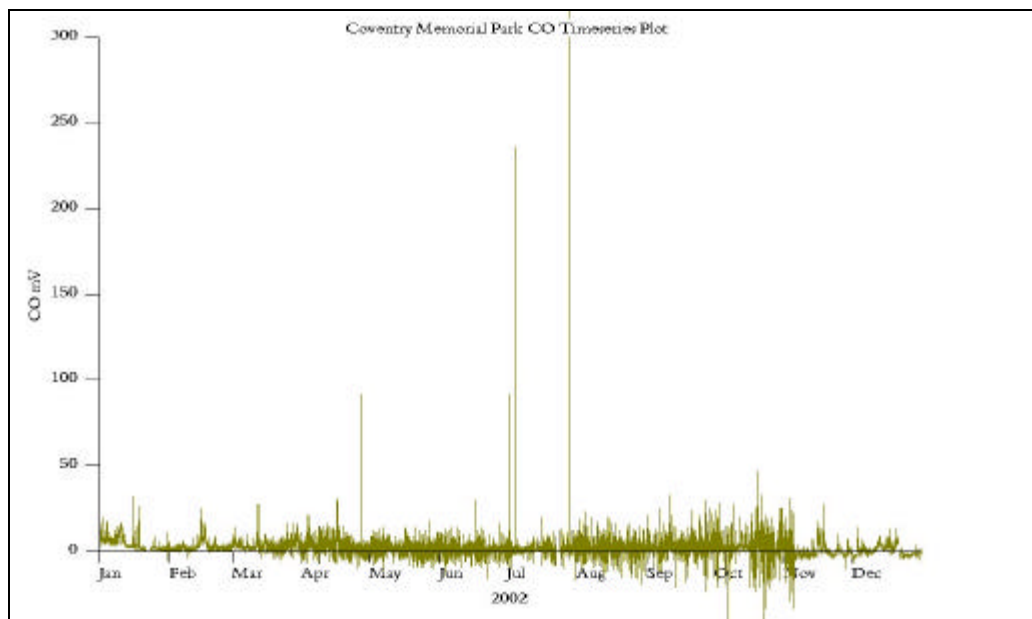


Figure 3.3 Coventry Memorial Park CO high noise response

3.4 Wolverhampton SO₂

The SO₂ analyser at Wolverhampton has shown a history of high noise and response sensitivity drifts due to UV source problems (Figure 3.4). Over 2 months of data from 15th August until 25th October have been rejected due to these problems. A replacement analyser was installed on 25th October 2002. This replacement analyser also showed a rapid baseline response drift but this could be corrected for during ratification. The ESU repaired the analyser on 7th January 2003.

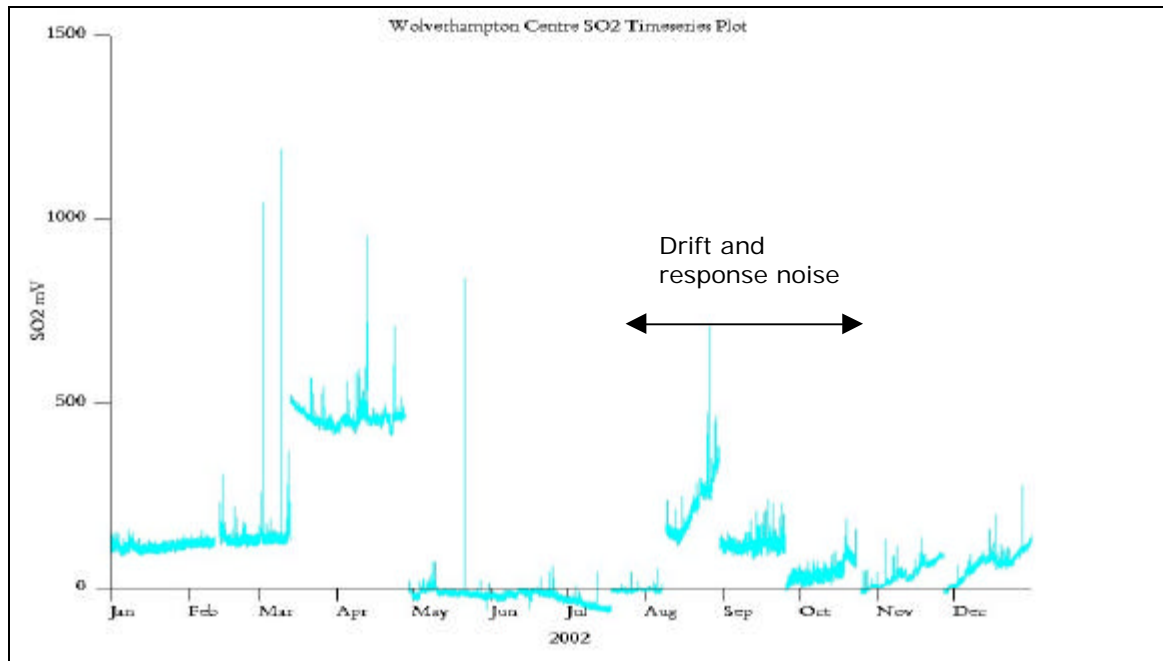


Figure 3.4 Wolverhampton SO₂ response drift and noise

3.5 Narberth SO₂

The SO₂ analyser at Narberth has shown erratic baseline response and random step changes in sensitivity since January 2002 (Figure 3.5). All data from January to June 2002 were deleted during ratification by NPL. The data from July to September was kept as provisional until the site cylinder was calibrated. These data have now been ratified. Further data were deleted from 27th September to 4th October due to an unstable baseline.

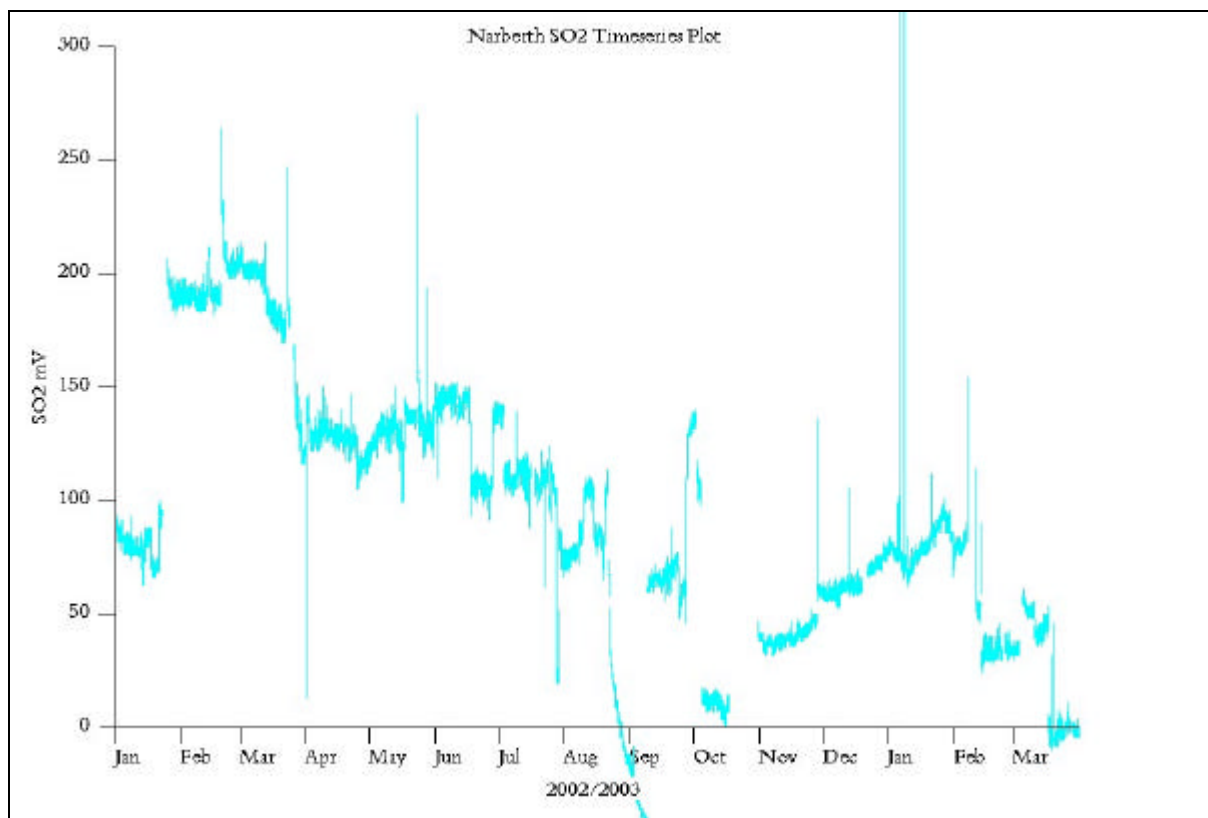


Figure 3.6 Narberth SO₂ analyser response instability and high noise

RECOMMENDATION

We recommend that the SO₂ analyser response instability at Narberth is investigated and repaired by the ESU or consideration should be given to replacing the analyser.

3.6 Glasgow Centre SO₂

The SO₂ analyser at Glasgow Centre has shown a history of response instability with random step changes in baseline response (Figure 3.6). Many of these response changes can be corrected for during the ratification process although some data have been rejected from 16-29th October, as the calibration history was insufficient for accurate data scaling. This problem was identified in the previous ratification report and appears to be on going.

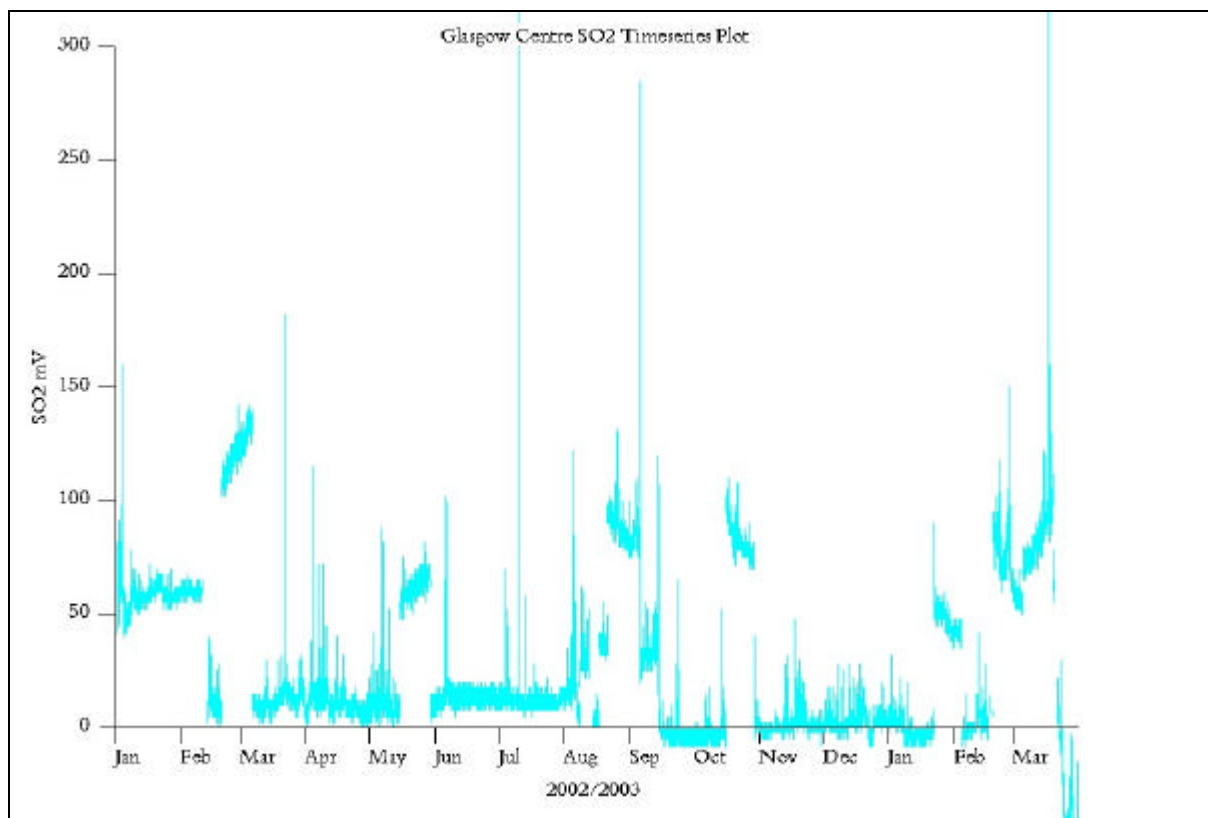


Figure 3.6 Glasgow Centre SO₂ random step changes in baseline response

RECOMMENDATION

ESU to investigate random step changes in SO₂ baseline response at Glasgow Centre (critical site).

3.7 Wirral Tranmere CO

The CO analyser at Wirral Tranmere showed intermittent periods of response instability and repeated analyser breakdowns throughout this period. (see Figure 3.7). The ESU visited the site on a number of occasions to undertake the following investigations/repair:

14 October	Replacement of IR source
25 October	Replacement of chopper motor and oscillator coil
6 November	Attention to the chopper motor
28 November	Adjustment of the IR detector
31 December	Replacement of sample pump

Although overall only a relatively small amount of data were lost (2 weeks in this period), this is a good example of a problem site requiring significantly extra effort from both the ESU to attend the faults and QA/QC Unit to ratify the data. A new replacement analyser was eventually installed on 13th February 2003.

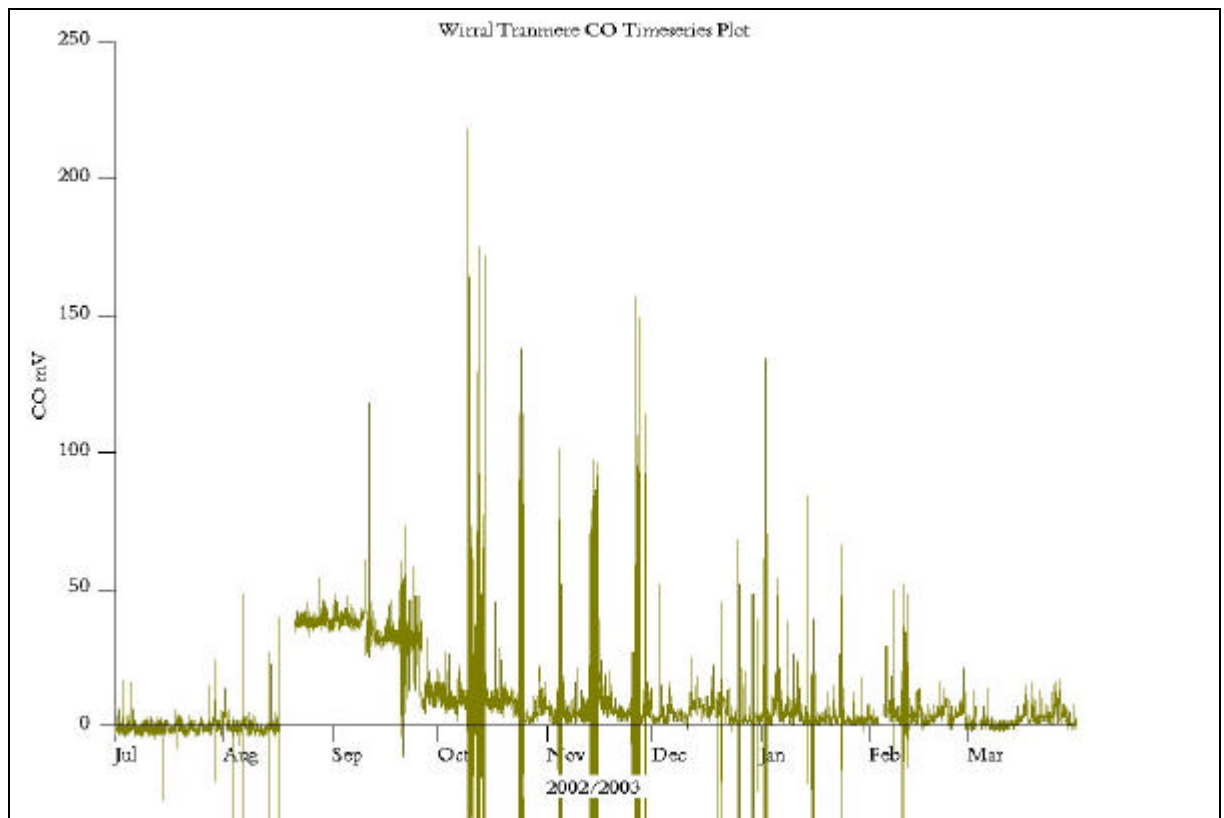


Figure 3.7 Wirral Tranmere CO intermittent high noise response

3.8 Southampton Air Conditioning

At Southampton Centre the data capture was below 90% for all pollutants during this period because the site was shut down for a month (6th September to 9th October 2002) in order to repair a fault with the air conditioning unit.

4. Sites with Data Capture Below 90%

The following section provides a summary of the main site operational problems which have resulted in data capture below the required 90% level during the reporting period October to December 2002 (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 to December 2002
(Using the start date of any new site or end date of site closed)

Data Capture (%)	Start date	End date	Comments	Days	Hours	
ENGLAND						
Birmingham Centre						
SO ₂	79.30%	10-Oct-02	28-Oct-02	Response cycling due to a UV lamp fault	18.4	442
Bristol Old Market						
NO ₂	0.00%	02-Aug-01	25-Mar-03	Spurious high data rejected due to a sampling artefact caused by a low flow rate through sample manifold. (See section 3.1). Analysers relocated on March 26 th 2003.	600	14400
Bury Roadside						
NO ₂	89.10%	03-Nov-02	05-Nov-02	Power interruption	2.5	59
		24-Nov-02	28-Nov-02	Ozonator fault	4	95
		25-Dec-02	25-Dec-02	Communications fault	0.9	21
Coventry Memorial Park						
CO	60.20%	12-Mar-02	05-Nov-02	Data rejected due to high noise response (See Section 3.3)	239	5727
		21-Dec-02	22-Dec-02	No details provided	0.5	12
Great Dun Fell						
O ₃	89.50%	30-Jul-02	10-Oct-02	Analogue to digital card failure. Replacement analyser installed but also faulty.	71.9	1725
Hounslow Roadside						
NO ₂	47.80%	16-Nov-02	31-Dec-02	Site closed on 16 th November	45.7	1096
CO	49.9%	16-Nov-02	31-Dec-02	Site closed on 16 th November	45.7	1096
Hull Freetown						
CO	0.00%	01-Jan-02	05-Nov-02	New site started on November 5 th 2002	309	7416
		06-Nov-02	31-Dec-02	Data rejected as no calibrations were carried out (empty cylinder)	56	1344
Leeds Centre						
CO	53.20%	01-Oct-02	04-Oct-02	Service	3.1	75
		18-Oct-02	21-Nov-02	Noisy and erratic response data deleted	34.2	821
		26-Nov-02	29-Nov-02	Analyser fault. New fuse and fan fitted.	2.6	63
		11-Dec-02	11-Dec-02	Noisy response data deleted	0.3	7
		20-Dec-02	21-Dec-02	Noisy response data deleted	1	23
		23-Dec-02	24-Dec-02	Noisy response data deleted	1.5	36
NO ₂	76.20%	01-Oct-02	09-Oct-02	Service and analyser fault	8.1	195

Data Capture (%)	Start date	End date	Comments	Days	Hours	
	10-Oct-02	17-Oct-02	Intermittent data loss due to a temperature fault	6.8	162	
	19-Oct-02	19-Oct-02	Missing data due to a possible logger fault	0.4	10	
	20-Dec-02	23-Dec-02	Intermittent data loss	2.9	70	
	24-Dec-02	24-Dec-02	Intermittent data loss	0.5	11	
	26-Dec-02	27-Dec-02	Intermittent data loss	0.4	10	
	28-Dec-02	28-Dec-02	Intermittent data loss	0.5	11	
	29-Dec-02	30-Dec-02	Intermittent data loss	1.1	26	
	30-Dec-02	31-Dec-02	Intermittent data loss. Air conditioning and IZS temperature lowered at call-out on 6 th January 03	0.3	8	
Leicester Centre						
CO	78.50%	18-Oct-02	21-Oct-02	ESU call-out to investigate unstable response	3.3	79
		12-Nov-02	26-Nov-02	Unstable response and baseline drift	14.6	350
		04-Dec-02	04-Dec-02	Low response data deleted	0.3	6
Liverpool Centre						
All	0%	23-Sep-02	31-Dec-02	Site closed on 23 September for health and safety reasons. To be relocated	99	2376
London A3 Roadside						
NO ₂	68.40%	03-Dec-02	22-Jan-03	Faulty NO _x converter identified at audit (88%). Data deleted from last stable calibration on 3/12/02 until service.	50	1199
London Southwark						
CO	89.90%	26-Sep-02	05-Oct-02	Site telephone line fault	9.2	221
		30-Oct-02	03-Nov-02	Communications fault	4	95
NO ₂	46.00%	26-Sep-02	05-Oct-02	Site telephone line fault	9.2	221
		30-Oct-02	03-Nov-02	Communications fault	4	95
		20-Nov-02	31-Dec-02	Photomultiplier tube cooler fault. Analyser removed from site for repair.	41.1	987
London Westminster						
SO ₂	87.00%	01-Oct-02	02-Oct-02	Sample flow fault	1.5	36
		08-Dec-02	18-Dec-02	Flow fault again due to a blocked solenoid valve	9.9	237
Lullington Heath						
NO ₂	89.10%	29-Oct-02	30-Oct-02	Noisy baseline response	0.6	15
		23-Dec-02	24-Dec-02	Power failure	0.4	9
Manchester South						
O ₃	30.80%	01-Oct-02	03-Dec-02	Data deleted due to a scrubber switching valve fault and internal sampling of ozone vented from the NO _x analyser exhaust into the hut.	63.6	1526
Plymouth Centre						
CO	83.40%	22-Oct-02	22-Oct-02	Engineer call-out	0.3	7
		17-Dec-02	24-Jan-03	Baseline drift. Optical unit and pump repaired in January.	37.7	905
Rochester						
PM ₁₀	0%	15 Aug-02	31-12-2	TEOM programme fault. Analyser removed from site and sent to USA for repair by manufacturer.	139	3334
Rotherham Centre						
SO ₂	86.90%	20-Dec-02	17-Jan-03	Pump fault	28.1	674

Data Capture (%)	Start date	End date	Comments	Days	Hours	
Sheffield Centre						
CO	68.80%	02-Oct-02	09-Oct-02	Data rejected due to analyser response drift caused by a blockage on the outlet valve pressurising the analyser	7.5	179
		23-Oct-02	13-Nov-02	Data rejected due to an unstable and drifting zero baseline caused by an optical balance fault.	21.1	506
Southampton Centre						
CO	83.70%	06-Sep-02	09-Oct-02	Site switched off for repairs to air conditioning unit	33.7	808
		11-Nov-02	13-Nov-02	Service	2	49
		17-Dec-02	17-Dec-02	Out of service switch left on after calibration	0.3	6
NO ₂	87.60%	12-Sep-02	09-Oct-02	Site switched off - air conditioning fault	26.8	642
		11-Nov-02	13-Nov-02	Service	2	49
O ₃	87.70%	06-Sep-02	09-Oct-02	Site switched off – air conditioning fault	33.3	800
		11-Nov-02	13-Nov-02	Service	2	49
PM ₁₀	87.90%	06-Sep-02	09-Oct-02	Site switched off – air conditioning fault	33.3	799
		11-Nov-02	13-Nov-02	Service	1.8	44
		10-Dec-02	10-Dec-02	LSO cal	0.3	6
SO ₂	87.00%	06-Sep-02	10-Oct-02	Site switched off – air conditioning fault	34.3	824
		11-Nov-02	13-Nov-02	Service	2	49
Southend-on-Sea						
CO	81.40%	01-Dec-02	17-Dec-02	Pump fault causing sensitivity drift and spurious calibration data.	16.5	397
Stockport						
CO	77.80%	03-Oct-02	31-Dec-02	Site closed on 3 rd October as lease expired. Relocated to Stockport Shaw Heath	3.7	88
NO ₂	0.00%	20-Sep-02	31-Dec-02	Internal sampling from 20 th September to site closure on 3 rd October.	13.3	319
PM ₁₀	77.80%	03-Oct-02	31-Dec-02	Site closed 3 rd October	3.7	88
SO ₂	77.80%	03-Oct-02	31-Dec-02	Site closed 3 rd October	3.7	88
Wirral Tranmere						
			General	Many intermittent CO analyser faults resulting in 9 ESU call-outs during this period (See section 3.7)		
CO	83.00%	09-Oct-02	14-Oct-02	IR source failure. IR lamp replaced	5.2	124
		24-Oct-02	25-Oct-02	Chopper motor and oscillator coil faults	1.5	35
		04-Nov-02	05-Nov-02	Chopper motor failed again.	0.7	17
		13-Nov-02	16-Nov-02	Intermittent fault giving erratic signal. Analyser reset	2.9	69
		25-Nov-02	27-Nov-02	Intermittent fault	2.6	63
		29-Nov-02	29-Nov-02	Intermittent fault. Signal detection potentiometer adjusted at call-out	0.3	6
		25-Dec-02	25-Dec-02	Recurring fault giving noisy data	0.3	8
		29-Dec-02	30-Dec-02	Recurring fault giving noisy data. New pump installed and connections to PCBs remade.	0.6	14
Wolverhampton Centre						
SO ₂	72.60%	15-Aug-02	25-Oct-02	UV source problem resulting in noisy and drifting response (see Section 3.4)	71.5	1715
NORTHERN IRELAND						
Derry						
O ₃	85.10%	18-Oct-02	18-Oct-02	Data missing due to communications fault	0.3	6
		27-Oct-02	28-Oct-02	Communications fault	1.3	32

Data Capture (%)	Start date	End date	Comments	Days	Hours
	31-Oct-02	05-Nov-02	Pump fault	5.2	124
	08-Nov-02	08-Nov-02	Communications fault	0.4	9
	16-Dec-02	20-Dec-02	Blocked flow restrictor	3.7	88
	25-Dec-02	27-Dec-02	Communications fault	2.3	56

SCOTLAND

Edinburgh Centre

CO	52.80%	19-Nov-02	06-Jan-03	Site (mobile trailer belonging to the Council) closed to prepare for Hogmanay celebrations	48.6	1167
NO ₂	53.10%	19-Nov-02	31-Dec-02	Site closed	42.6	1023
O ₃	51.60%	23-Oct-02	24-Oct-02	Analyser accidentally switched off by LSO	1	23
		19-Nov-02	05-Jan-03	Site closed	47.6	1143
PM ₁₀	52.40%	19-Nov-02	05-Jan-03	Site closed	47.6	1143
SO ₂	53.10%	19-Nov-02	06-Jan-03	Site closed	48.6	1167

Glasgow Centre

SO ₂	85.20%	16-Oct-02	29-Oct-02	Spurious step change in baseline. (See Section 3.6)	13.2	316
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Grangemouth

NO ₂	0.00%	01-Aug-02	31-Dec-02	Site closed to up-grade facilities for CO analyser and LA equipment. Re-opened 17 January 2003	153	3663
PM ₁₀	0.00%	30-Jul-02	31-Dec-02	Site closed to up-grade facilities	154	3705
SO ₂	0.00%	01-Aug-02	31-Dec-02	Site closed to up-grade facilities	153	3663

WALES

Cwmbran

CO	81.20%	24-Oct-02	25-Oct-02	Power supply failure	0.8	19
		30-Oct-02	05-Nov-02	Manifold fan fault after power failure	5.8	138
		09-Nov-02	18-Nov-02	Unexplained step change in response sensitivity	9.6	230
		17-Dec-02	18-Dec-02	Power failure	1.1	26
NO ₂	75.40%	24-Oct-02	25-Oct-02	Power supply failure	0.8	19
		01-Nov-02	18-Nov-02	Manifold fan fault and instrument response noise	17.6	423
		17-Dec-02	20-Dec-02	Power supply failure	2.6	63
SO ₂	86.90%	24-Oct-02	26-Oct-02	Power supply failure	1.5	35
		30-Oct-02	05-Nov-02	Manifold fan fault after power failure	5.8	138
		17-Dec-02	18-Dec-02	Power supply failure	1.2	28

Narberth

NO ₂	70.20%	01-Oct-02	22-Oct-02	Step change in sensitivity due to faulty thermo cooler. Data could not be accurately scaled as there were no before/after repair calibrations (cylinder empty).	21.4	514
		28-Nov-02	28-Nov-02	Communications fault	0.3	7
		19-Dec-02	21-Dec-02	Communications fault	2.2	53
		25-Dec-02	25-Dec-02	Communications fault	0.3	6
SO ₂	83.90%	27-Sep-02	04-Oct-02	Baseline unstable due to UV lamp fault	6.7	160
		18-Oct-02	22-Oct-02	Power supply failure	4.6	110
		26-Oct-02	26-Oct-02	Baseline unstable	0.4	10
		28-Oct-02	31-Oct-02	Analyser fault. ESU call-out to adjust UV lamp	3	71
		28-Nov-02	28-Nov-02	Communications fault	0.3	7
		19-Dec-02	21-Dec-02	Communications fault	2.2	53
		25-Dec-02	25-Dec-02	Communications fault	0.3	6

4.1 Gravimetric PM₁₀ Sites with Data Capture Below 90%

There are no details of data loss to report for gravimetric PM₁₀ sites as all sites had capture above 90%. This was a very good quarter for Partisol data capture with all five operational sites achieving data capture above 97%.

5. Ratified Data Capture Statistics

Table 5.1 provides the ratified data capture figures for each site for the 3-month period October to December 2002. Data capture values below 90% are shown in the shaded boxes. Table 5.2 shows the data capture for the whole year January – December 2002

Table 5.1 AURN Ratified Data Capture (%) for October to December 2002
(Using the start date of any new site or end date of site closed)

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Site Average
ENGLAND						
Barnsley 12	-	-	-	-	99.5	99.5
Barnsley Gawber	98.9	98.6	99	-	98.8	98.8
Bath Roadside	90.7	99.5	-	-	-	95.1
Billingham	-	99.5	-	-	-	99.5
Birmingham Centre	99.5	90.2	99	99.5	79.3	93.5
Birmingham East	97.9	93.2	97.4	97.5	97.7	96.7
Blackpool	99.5	99.4	99.4	99	99.5	99.4
Bolton	99	98.9	98.9	99.1	99	99
Bottesford	-	-	99	-	-	99
Bournemouth	99.7	99.8	-	100	99.7	99.8
Bradford Centre	99.7	96.2	98.6	99.5	97.3	98.3
Brighton Roadside	99.5	98.3	-	-	-	98.9
Bristol Centre	99.2	98.1	99.1	98.9	92.4	97.5
Bristol Old Market	96.5	0	-	-	-	48.3
Bury Roadside	95.9	89.1	95.8	95.8	96	94.5
Cambridge Roadside	-	98.7	-	-	-	98.7
Camden Kerbside	-	99.5	-	99.8	-	99.6
Canterbury	-	99.7	-	99.6	-	99.7
Coventry Memorial Park	60.2	94.5	99	98.7	95.3	89.6
Exeter Roadside	98.6	98.7	97.9	-	98.7	98.4
Glazebury	-	-	99.8	-	-	99.8
Great Dun Fell	-	-	89.5	-	-	89.5
Haringey Roadside	-	96.2	-	99.3	-	97.8
Harwell	-	98	93.7	-	98.1	96.6
High Muffles	-	-	99.9	-	-	99.9
Hounslow Roadside	49.9	47.8	-	-	-	48.8
Hove Roadside	99.4	99.4	-	-	99.4	99.4
Hull Freetown	0	97	97.4	90.8	99.5	76.9
Ladybower	-	99.4	99.4	-	99.4	99.4
Leamington Spa	99.4	99.1	99.6	99.5	99.5	99.4
Leeds Centre	53.2	76.2	95.7	95.7	93.3	82.8
Leicester Centre	78.5	99.1	99.6	97.9	99.6	94.9
Liverpool Centre (closed)	0	0	0	0	0	0
London A3 Roadside	94.1	68.4	-	99.5	-	87.4
London Bexley	97.5	92	99.6	98.6	98.3	97.2
London Bloomsbury	94.8	99.1	98.9	94.9	99.6	97.5

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Site Average
London Brent	99.7	99.4	99.8	99.5	99.5	99.6
London Bromley	99.6	99.7	-	-	-	99.7
London Cromwell Road 2	90.9	90.9	-	-	90.1	90.6
London Eltham	-	99.7	99.7	99.5	99.6	99.6
London Hackney	99.4	99.3	95.3	-	-	98
London Haringey	-	-	99.8	-	-	99.8
London Hillingdon	99.5	99.4	99.5	99	99.5	99.3
London Lewisham	-	99.7	99.6	-	99.8	99.7
London Marylebone Road	98.3	97.2	98	99	98.5	98.2
London N. Kensington	99.5	99.5	99.5	97.9	99.7	99.2
London Southwark	89.9	46	90.1	-	90.2	79.1
London Teddington	-	99.5	99.5	-	99.5	99.5
London Wandsworth	-	99.4	99.4	-	-	99.4
London Westminster	99.5	95.3	99.5	-	87	95.4
Lullington Heath	-	89.1	98.4	-	96.4	94.6
Manchester Piccadilly	99.4	99.5	99.6	93.6	99.3	98.3
Manchester South	-	99.4	30.8	-	98.4	76.2
Manchester Town Hall	96.2	99.2	-	-	-	97.7
Middlesbrough	99.6	99.6	99.4	99.4	99.6	99.5
Newcastle Centre	96.2	94.4	99.5	99.6	97.9	97.5
Northampton	99.7	99.6	-	99.9	95.2	98.6
Northampton (Partisol)	-	-	-	-	98.9	-
Norwich Centre	91.5	97.8	97.8	97.8	93.1	95.6
Norwich Roadside	-	99.4	-	-	-	99.4
Nottingham Centre	99.4	99.4	95.5	94.2	99.5	97.6
Oxford Centre	99.5	99.6	-	-	99.5	99.5
Plymouth Centre	83.4	99.2	99	99	95.5	95.2
Portsmouth	99.4	96.8	-	95.2	99.2	97.6
Preston	99.5	99.5	96.3	98.2	99.5	98.6
Reading	99.5	99.3	99.6	99.3	92.4	98
Redcar	99.7	95.2	99.7	99.6	99.3	98.7
Rochester	-	97.6	97.6	0	97.6	73.2
Rotherham Centre	-	99.2	99.4	-	86.9	95.1
Salford Eccles	99.2	99.2	99.1	97.9	99.2	98.9
Sandwell West Bromwich	99.1	99.6	98.7	-	99.6	99.3
Scunthorpe	-	-	-	99.5	99.5	99.5
Sheffield Centre	68.8	99.6	99.7	99.5	99.6	93.5
Sheffield Tinsley	98.5	99.7	-	-	-	99.1
Sibton	-	-	99.8	-	-	99.8
Somerton	-	-	99.4	-	-	99.4
Southampton Centre	83.7	87.6	87.7	87.9	87	86.8
Southend-on-Sea	81.4	99.1	99.7	99.2	99.3	95.7
Southwark Roadside	99.5	99.4	-	-	99.3	99.4
St Osyth	97.8	91.8	97.9	-	-	95.8
Stockport	77.8	0	-	77.8	77.8	58.3
Stockport Shaw Heath	97.7	97.5	-	95.6	97.7	97.1
Stockton-on-Tees Yarm	95.5	97.6	-	99.8	-	97.6
Stoke-on-Trent Centre	98.6	98.4	97.6	97.2	98.4	98.1
Sunderland	-	-	-	-	99.1	99.1

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Site Average
Thurrock	99.6	99.5	99.5	99	99.6	99.4
Tower Hamlets Roadside	99	99.6	-	-	-	99.3
Walsall Alumwell	-	97.1	-	-	-	97.1
Walsall Willenhall	-	95.4	-	-	-	95.4
West London	95.1	99.6	-	-	-	97.4
Weybourne	-	-	100	-	-	100
Wicken Fen	-	97.5	98.9	-	98.9	98.4
Wigan Leigh	97.7	97.8	97.8	97.8	93.7	97
Wirral Tranmere	83	96.1	93.8	97.9	99.2	94
Wolverhampton Centre	98.8	99.2	99.3	99.5	72.6	93.9
Yarner Wood	-	-	99.8	-	-	99.8
NORTHERN IRELAND						
Belfast Centre	99.4	99.3	99.6	99.8	99.6	99.5
Belfast Clara St	-	-	-	94.2	-	94.2
Belfast East	-	-	-	-	99.7	99.7
Derry	94.6	94.8	85.1	94.4	94.3	92.6
Lough Navar	-	-	97.4	98.5	-	98
SCOTLAND						
Aberdeen	99.8	99.4	-	99.2	99.7	99.5
Bush Estate	-	-	99.2	-	-	99.2
Dumfries	98.7	99.3	-	98.9	-	99
Edinburgh Centre	52.8	53.1	51.6	52.4	53.1	52.6
Eskdalemuir	-	-	99.2	-	-	99.2
Glasgow Centre	99.3	99.1	91	99	85.2	94.7
Glasgow City Chambers	94.7	94	-	-	-	94.3
Glasgow Kerbside	99.7	99.4	-	98.8	-	99.3
Grangemouth	-	0	-	0	0	0
Inverness	99.6	99.6	-	97.8	-	99
Strath Vaich	-	-	98.1	-	-	98.1
WALES						
Aston Hill	-	-	99.8	-	-	99.8
Cardiff Centre	93.3	97.1	97.4	96.2	92.8	95.3
Cwmbran	81.2	75.4	-	96.6	86.9	85
Narberth	-	70.2	91.2	90.7	83.9	84
Port Talbot	-	99.5	99.5	98.4	99.4	99.2
Swansea	99.5	99.5	99.5	99.5	97.7	99.2
Wrexham	99.7	95.3	-	100	99.6	98.7
Number of sites	76	98	76	67	76	
Network Mean (%)	92.4	92.2	96.4	94	94.3	94.1

Sites and instruments established between 01/10/2002 and 31/12/2002

Site	Instruments	Start Date
Hull Freetown	CO NO ₂ O ₃ PM ₁₀ SO ₂	06/11/2002
Stockport Shaw Heath	CO NO ₂ PM ₁₀ SO ₂	09/10/2002

Table 5.2 AURN Ratified Data Capture (%) for January to December 2002
(Using the start date of any new site or end date of site closed)

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Site Average
ENGLAND						
Barnsley 12	-	-	-	-	98.8	98.8
Barnsley Gawber	97.8	86.4	88.3	-	86.2	89.7
Bath Roadside	93.5	98.1	-	-	-	95.8
Billingham	-	97.8	-	-	-	97.8
Birmingham Centre	95.9	92.8	98.1	97	77.9	92.4
Birmingham East	95.4	91.4	96.5	96.6	96.5	95.3
Blackpool	95.9	96.3	97.4	98	98.4	97.2
Bolton	97.7	98.2	98.3	98.6	96.7	97.9
Bottesford	-	-	99.3	-	-	99.3
Bournemouth	92.1	91.1	-	94.8	96.8	93.7
Bradford Centre	98.1	96.9	94.9	98	96.3	96.8
Brighton Roadside	97.4	95.1	-	-	-	96.2
Bristol Centre	97.8	95.9	98.2	95.6	96.4	96.8
Bristol Old Market	82.7	0	-	-	-	41.3
Bury Roadside	95.7	93.8	95.3	95.8	96.5	95.4
Cambridge Roadside	-	94	-	-	-	94
Camden Kerbside	-	96.7	-	99.2	-	98
Canterbury	-	98.2	-	99.3	-	98.8
Coventry Memorial Park	33.5	87.8	97.6	97.8	93.8	82.1
Exeter Roadside	94.2	93.3	97.9	-	97.1	95.6
Glazebury	-	-	98.5	-	-	98.5
Great Dun Fell	-	-	74.3	-	-	74.3
Haringey Roadside	-	98.1	-	98.7	-	98.4
Harwell	-	97.8	97.1	-	98.2	97.7
High Muffles	-	-	93.8	-	-	93.8
Hounslow Roadside	84.9	82.4	-	-	-	83.6
Hove Roadside	98.2	94	-	-	98.2	96.8
Hull Centre	90.7	94.6	95.6	95.3	95.6	94.4
Hull Freetown	0	97	97.4	90.8	99.5	76.9
Ladybower	-	97.4	97.3	-	97.2	97.3
Leamington Spa	98.6	96.3	98.8	98.3	98.8	98.1
Leeds Centre	71.3	87.1	97.7	97.9	90.1	88.8
Leicester Centre	88.1	94.5	92.7	79.3	95.1	89.9
Liverpool Centre	54.3	93.1	90.8	95.1	95.5	85.8
London A3 Roadside	97.2	88	-	96.7	-	94
London Bexley	90.6	89.6	96.5	97.8	86.8	92.2
London Bloomsbury	88	90.7	89.9	84.9	89.9	88.6
London Brent	99	98.3	99.1	98.3	98.9	98.7
London Bromley	92.3	97.3	-	-	-	94.8
London Cromwell Road 2	93.4	95.2	-	-	85.2	91.3
London Eltham	-	98.6	97.4	94.6	95.9	96.6
London Hackney	86.5	88.2	88.9	-	-	87.9
London Haringey	-	-	97.9	-	-	97.9
London Hillingdon	85.9	96.7	97.8	97.7	97.6	95.2
London Lewisham	-	93.5	83.8	-	96	91.1

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Site Average
London Marylebone Road	97.5	98.5	97	98.1	96.5	97.5
London N. Kensington	96	98.5	99	98.5	99.3	98.3
London Southwark	94.8	84	94.3	-	93.2	91.6
London Sutton	-	98.9	98.9	-	-	98.9
London Teddington	-	98.3	98.8	-	98.8	98.7
London Wandsworth	-	98.2	99.1	-	-	98.7
London Westminster	94.3	96.9	97	-	90.8	94.8
Lullington Heath	-	91.1	93.6	-	91.6	92.1
Manchester Piccadilly	97.1	90.2	94.5	94.9	98.3	95
Manchester South	-	88.5	78.8	-	96.9	88.1
Manchester Town Hall	96.6	98.7	-	-	-	97.6
Middlesbrough	86	82.1	98.1	79.1	97.9	88.6
Newcastle Centre	90.3	94.5	98	98.2	97.6	95.7
Northampton	70.6	99.1	-	99.2	98	91.7
Northampton (Partisol)	-	-	-	-	70.4	-
Norwich Centre	96.3	94.9	94.8	96.5	96.8	95.9
Norwich Roadside	-	97.7	-	-	-	97.7
Nottingham Centre	98.1	98	94.4	88.9	98	95.5
Oxford Centre	92.3	99.2	-	-	97.3	96.3
Plymouth Centre	89.9	96.5	97.4	98.1	97	95.8
Portsmouth	97.9	98.2	-	97.2	94.3	96.9
Preston	95.5	98	94.7	97.7	97.2	96.6
Reading	59.7	95.4	93.4	98.3	80.4	85.4
Redcar	96.2	93.8	97.6	97.5	97	96.4
Rochester	-	98.4	98.4	60.7	98.4	89
Rotherham Centre	-	95.2	98.6	-	95.1	96.3
Salford Eccles	97.2	97.4	92.5	96.2	95.7	95.8
Sandwell West Bromwich	96.5	94.3	97.1	-	94.3	95.5
Scunthorpe	-	-	-	84.4	96.3	90.3
Sheffield Centre	75.5	98.2	98.3	94	97.4	92.7
Sheffield Tinsley	98.7	96.8	-	-	-	97.8
Sibton	-	-	99.1	-	-	99.1
Somerton	-	-	97.5	-	-	97.5
Southampton Centre	83.8	90.3	86.5	88.4	65.7	82.9
Southend-on-Sea	92.6	95.9	96.7	97.2	95.7	95.6
Southwark Roadside	83.8	86.6	-	-	85.4	85.3
St Osyth	98.1	95.9	98.2	-	-	97.4
Stockport	96.9	90.4	-	93.2	96.8	94.3
Stockport Shaw Heath	97.7	97.5	-	95.6	97.7	97.1
Stockton-on-Tees Yarm	96.6	97.4	-	96.9	-	97
Stoke-on-Trent Centre	93.2	95.6	93.9	96.5	96	95
Sunderland	-	-	-	-	99	99
Sutton Roadside	97.7	93.6	-	97.2	95.7	96
Thurrock	97.3	94.2	97.2	82	97.3	93.6
Tower Hamlets Roadside	98.6	98.5	-	-	-	98.5
Walsall Alumwell	-	97.5	-	-	-	97.5
Walsall Willenhall	-	94	-	-	-	94
West London	96.6	96.7	-	-	-	96.7
Weybourne	-	-	96.3	-	-	96.3
Wicken Fen	-	85	98.5	-	98.6	94

Site	CO	NO ₂	O ₃	PM ₁₀	SO ₂	Site Average
Wigan Leigh	98.6	97.8	98.7	98.5	94.2	97.6
Wirral Tranmere	70.9	94.2	84.2	97.2	96.2	88.6
Wolverhampton Centre	72.4	96.8	95.3	98.3	77	88
Yarner Wood	-	-	92	-	-	92
NORTHERN IRELAND						
Belfast Centre	97.4	94.5	96.4	97.6	97.2	96.6
Belfast Clara St	-	-	-	93.8	-	93.8
Belfast East	-	-	-	-	96.9	96.9
Derry	92.8	94.7	92	96.4	95	94.2
Lough Navar	-	-	87.7	95.7	-	91.7
SCOTLAND						
Aberdeen	97.8	97.4	-	72.3	97.5	91.3
Bush Estate	-	-	97.4	-	-	97.4
Dumfries	93	95.1	-	93.7	-	93.9
Edinburgh Centre	82.2	86	84.8	82.1	86.1	84.2
Eskdalemuir	-	-	99.4	-	-	99.4
Glasgow Centre	94.8	94.7	93.3	97.9	85.3	93.2
Glasgow City Chambers	96	95.1	-	-	-	95.6
Glasgow Kerbside	97.6	97.2	-	97	-	97.2
Grangemouth	-	57.3	-	57.3	57.3	57.3
Inverness	94.3	97.8	-	74.5	-	88.9
Strath Vaich	-	-	95.3	-	-	95.3
WALES						
Aston Hill	-	-	90	-	-	90
Cardiff Centre	87.7	94.2	98.4	96.9	87.2	92.9
Cwmbran	88.6	90.4	-	97.3	91.2	91.9
Narberth	-	85.7	90.8	90.5	44.3	77.8
Port Talbot	-	96.8	94.9	97.7	96.6	96.5
Swansea	95	98	98.3	98.2	97.7	97.5
Wrexham	98.1	94.4	-	93	84.4	92.5
Number of sites	79	102	79	70	79	
Network Mean (%)	89.8	93.2	95	93.1	93.1	93

Sites and instruments established between 01/01/2002 and 31/12/2002

Site	Pollutant	Site start date
Barnsley Gawber	CO	08/07/2002
Bournemouth	CO	19/07/2002
Dumfries	CO	17/07/02
Hull Freetown	CO NO ₂ O ₃ PM ₁₀ SO ₂	06/11/2002
Inverness	CO, PM ₁₀ (gravimetric)	17/07/02 13/2/02
Northampton	CO	12/03/2002
Portsmouth	CO	21/03/2002
St Osyth	CO NO ₂ O ₃	11/05/2002
Stockport Shaw Heath	CO NO ₂ PM ₁₀ SO ₂	09/10/2002
Stockton-on-Tees Yarm	CO	13/08/2002
Wigan Leigh	CO O ₃	15/05/2002
Cwmbran	CO	12/03/2002
Wrexham	CO NO ₂ SO ₂ PM ₁₀ (gravimetric)	06/03/2002

Appendix A

As requested by the Department, QA/QC Unit has provided a list of suggestions for equipment that may need replacing or up grading in the network. The following provides a summary of the list and the actions taken to date. Recommendations have been prioritised from October 2000 as follows:

Priority	Definition	Time-scale
High*	Immediate action necessary to avoid compromising data capture/quality or safety	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: October 1998	Action	
1	Replace old teflon-coated sample manifolds at former SUN sites	Completed	
2	Replace long sample line at Manchester Town Hall	Completed	
3	Use of 1 micron sample filters on API ozone analysers	In-hand at Defra sites	
4	Fitting all AUN sites with ladder securing clips	In hand	
5	Improving access to PM ₁₀ head at Scunthorpe (Affiliate site)	No action	
6	Safer access to Walsall Alumwell	Railings installed	
7	Installing temperature probes at sites without air-conditioning	Access to temp data from Ambirack sites now possible	
	Recommendations: April 2000		
8	Consideration could be given to up-grading the "older generation" Ambirack system at Coventry in view of the problems identified at the audit.	Site relocated and analysers up-graded (February 2001)	
	Recommendations: October 2000	Priority	Action
9	The site at Walsall Alumwell should be moved from school roof to ground level in order to improve site access and safety.	Medium	Railings installed
10	Safer access to PM ₁₀ head at Scunthorpe	Medium	Outstanding
11	Safer access to PM ₁₀ head at Stockport. Check that the recent fire damage to the next door building has not reduced the structural integrity of the shared flat roof.	Medium	Smoke damage only
12	The CO analyser at Birmingham Centre is very noisy (outside the ± 0.5 ppm acceptance level) and should be considered for replacement/up-grade	Medium	A new instrument was installed in March 2001
	Recommendations April 2001	Priority	Action
13	Up-grade or repair noisy CO analyser at Birmingham Centre	Medium	New instrument installed March 01
	Recommendations October 2001	Priority	Action
14	Up-grade or repair noisy CO analyser at Hull Centre	Medium	Site temporarily closed. Re-opened at Hull Freetown 8/11/02

	Recommendations May 2002	Priority	Action
None			
	Recommendations November 2002	Priority	Action
15	Up-grade or repair noisy CO analyser at Reading (Ambirak)	Critical Site	Repaired July 02
16	Up-grade or repair CO analyser (Environnement SA) at Liverpool (response noise and drift).	Critical Site	Site Closed
17	Up-grade or repair noisy analyser at Coventry Memorial Park (SO ₂ , and CO – Ambirak)	Critical Site	Scheduled for Winter Service
18	Up-grade or repair noisy PM ₁₀ analyser (TEOM) at Leicester Centre	Critical Site	To be replaced
19	Add remote dial up facility to collect instrument diagnostics for all Partisol analysers in the Network	Critical Sites	Phone lines installed – in hand
	Recommendations February 2003	Priority	Action
20	Sunderland SO ₂ baseline response cycling	Medium	ESU investigated but no fault found. On-going
21	Investigate/repair SO ₂ analyser at Glasgow Centre (random step changes in sensitivity)	Critical Site	On-going
22	Repair/replace Narberth SO ₂ analyser (response instability)	High	On-going
	Recommendations April 2003	Priority	Action
23	ESU to carry out a 3-month converter test at Sheffield Centre, London A3 Roadside and Wolverhampton Centre.	Medium	
24	Investigation of auto calibration run-on problem at sites identified in Table 2.7	Medium	
25	Investigate/repair unstable SO ₂ analyser at Narberth or replace analyser.	High	
26	Investigate/repair SO ₂ analyser at Glasgow Centre (random step changes in sensitivity)	Critical Site	
27	Casella Stanger and QA/QC Unit are currently working in conjunction to carry out a programme of site up-grades involving equipment replacement at a number of original EUN sites and rural sites in the network.	Some priority sites for new analysers have been identified	

APPENDIX B

CRITICAL SITES IN THE AURN (17/02/2003)

Table B1 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
Wirral Tranmere	Birkenhead Urban Area	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Blackpool	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 ⁶
Brighton Preston Park	Brighton/Worthing/Littlehampton			NO ₂ O ₃ ⁶
Brighton Roadside+	Brighton/Worthing/Littlehampton	PM ₁₀ ¹		
Hove Roadside+	Brighton/Worthing/Littlehampton	SO ₂		
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 Centre	Edinburgh Urban Area	NO ₂ ⁵ PM ₁₀ ⁵ SO ₂ ⁵	CO ⁵	NO ₂ ⁵ O ₃ ⁵
Glasgow Centre	Glasgow Urban Area	SO ₂		NO ₂ O ₃
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 ⁵ PM ₁₀ ⁵ SO ₂ ⁵	CO ⁵	NO ₂ ⁵ O ₃ ⁵
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 ⁶
Preston	Preston Urban Area	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Reading	Reading/Wokingham Urban Area	NO ₂ ⁵ PM ₁₀ ⁵ SO ₂ ⁵	CO ⁵	NO ₂ ⁵ O ₃ ⁵
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
Swansea+	Swansea Urban Area		CO	
Stoke-on-Trent Centre	The Potteries	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

"+" indicates Affiliate site"

Note 1: PM₁₀ not monitoring yet

Note 2: PM₁₀ monitored by Gravimetric and TEOM

Note 3: DD3 Critical as Rural Background station

Note 4: If NO₂ at Shrewsbury/Leominster is Suburban then NO₂ at Leamington Spa is no longer critical for DD1

Note 5: Monitoring temporarily suspended due to site relocation

Note 6: Not Affiliated/Monitoring yet. Target date 09 September 2003

Note 7: Addresses CO, Benzene not included here

Table B2 Critical sites in Zones

Site Name	Zone	Critical Pollutant		
		DD1	DD2 ⁷	DD3
Grangemouth+	Central Scotland	NO ₂ PM ₁₀ SO ₂	CO	
Bush Estate	Central Scotland			NO ₂ ⁶ O ₃
Ladybower	East Midlands			NO ₂ O ₃
Northampton+	East Midlands	NO ₂ PM ₁₀ ² SO ₂	CO	NO ₂ O ₃ ⁶
Sibton	Eastern			O ₃ ³
Norwich Centre	Eastern			NO ₂ O ₃
Wicken Fen	Eastern			NO ₂ O ₃
Thurrock	Eastern			NO ₂ O ₃
Fort William	Highland			NO ₂ ⁶ O ₃ ⁶
Strath Vaich	Highland			O ₃ ³
Inverness	Highland	NO ₂ PM ₁₀		
Ashington	North East			NO ₂ ⁶ O ₃ ⁶
Stockton-on-Tees Yarm+	North East	NO ₂ PM ₁₀	CO	
Sunderland	North East	SO ₂		
Aberdeen+	North East Scotland	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃ ⁶
Aston Hill	North Wales			NO ₂ ⁶ O ₃
Wrexham	North Wales	NO ₂ PM ₁₀ SO ₂	CO	
Great Dunn Fell	North West & Merseyside			O ₃ ³
Wigan Leigh+	North West & Merseyside	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Glazebury	North West & Merseyside			NO ₂ ⁶ O ₃
Lough Navar	Northern Ireland			O ₃ ³
Derry+	Northern Ireland	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Dunslair Heights	Scottish Borders			NO ₂ ⁶ O ₃ ⁶
Dumfries	Scottish Borders	NO ₂ PM ₁₀	CO	
Canterbury+	South East	PM ₁₀		
Oxford Centre+	South East	SO ₂	CO	
Narberth	South Wales			O ₃ ³
Cwmbran+	South Wales	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃ ⁶
Somerton	South West			NO ₂ ⁶ O ₃
Yarner Wood	South West			NO ₂ ⁶ O ₃
Plymouth Centre	South West	PM ₁₀		
Shrewsbury/Leominster	West Midlands			NO ₂ ^{4&6} O ₃ ⁶
Leamington Spa+	West Midlands	NO ₂ PM ₁₀ SO ₂	CO	NO ₂ O ₃
Barnsley Gawber+	Yorkshire & Humberside	NO ₂	CO	NO ₂ O ₃
High Muffles	Yorkshire & Humberside			NO ₂ ⁶ O ₃
Scunthorpe+	Yorkshire & Humberside	PM ₁₀		

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 1: PM₁₀ not monitoring yet

Note 2: PM₁₀ monitored by Gravimetric and TEOM

Note 3: DD3 Critical as Rural Background station

Note 4: If NO₂ at Shrewsbury/Leominster is Suburban then NO₂ at Leamington Spa is no longer critical for DD1

Note 5: Monitoring temporarily suspended due to site relocation

Note 6: Not Affiliated/Monitoring yet. Target date 09 September 2003