

AEAT/ENV/R/0842
Issue 1

QA/QC Data Ratification Report for the Automatic Urban Network, January - June 2001

Jane Vallance-Plews

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1. Introduction

This report covers the Quality Assurance and Control (QA/QC) activities undertaken by NETCEN to ratify automatic urban monitoring network data for the 6-month period January to June 2001. It summarises significant QA/QC issues related to the network, identifying the major site problems where data capture falls below the required 90% level. Included in this report is an up-to-date inventory of Department-owned equipment used by QA/QC Unit (Appendix A) and a recommended list of equipment that may need replacing or up-grading in the network (Appendix B).

The Network was expanded significantly during this period in order to comply with the requirements of the First European Air Quality Daughter Directive for SO₂, NO_x, PM₁₀ and lead. This Directive came into force in the UK on July 19th 2001 with the adoption of Statutory Instrument 2001 No 2315 "The Air Quality Limit Values Regulations 2001". (Further details can be found at www.hmso.gov.uk/si/si2001/20012315.htm).

Seven new sites were integrated during this period bringing the total number of operational AUN sites to 78 in June 2001. The new sites were located at Dumfries, Bournemouth, Portsmouth, Stockton-on-Tees Yarm, Wigan Leigh, Northampton and Canterbury. Three existing sites at Aberdeen, Hove and Coventry Memorial Park were also up-graded with additional analysers. Further details regarding the integration of the new sites are discussed in Section 2. Since June 2001, a further 4 sites have been added to the AUN making a total of 82 sites in November 2001.

During this reporting period the following sites were relocated or temporarily closed:

Coventry Centre	Closed on 8 th January and relocated to Coventry Memorial Park
Belfast Centre	Temporarily closed from 30 th October until 29 th January 2001 to enable the site to be up-graded to accommodate additional particulate monitors
Manchester Piccadilly	Relocated on 20 th April to a site across the gardens 80 metres from the original location

Generic data quality issues affecting the network are discussed in Section 2, whilst some of the more specific data quality issues affecting individual sites are given in Section 3. The main site operational and QA/QC issues giving rise to data capture below the required 90% level are summarised in Section 4.

Ratified hourly average data capture for the network averaged 94% for all pollutants (O₃, NO₂, SO₂, CO and PM₁₀) during this 6-month reporting period (see Table 1.1 below). This is consistent with the overall high levels of network performance seen over the last few years.

Table 1.1 AUN Ratified Data Capture (%) January - June 2001

Pollutant	O ₃	NO ₂	CO	SO ₂	PM ₁₀	Average
Data Capture (%)	96	93	93	94	96	94

A more detailed breakdown of the hourly data capture statistics for each site is presented in Section 5, Table 5.1. In total, 11 out of the 78 sites (14%) had an average data capture rate below the required 90% level for the January to June 2001 period (See Figure 1.1 below).

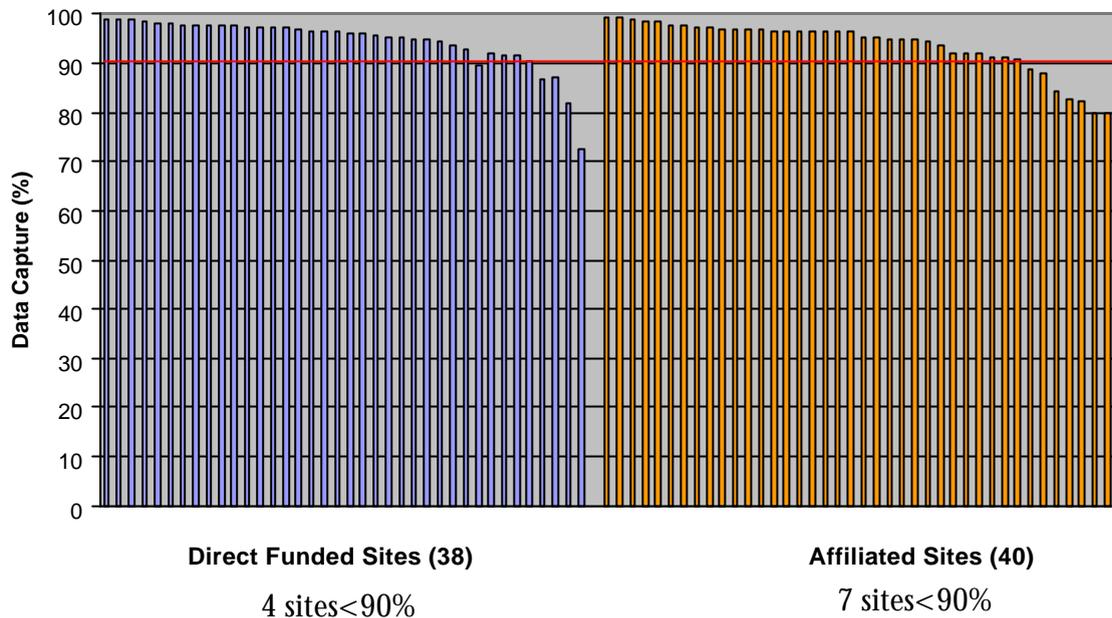


Figure 1.1 AUN Data Capture January-June 2001

Affiliation of Local Authority sites into the network started in 1997 and since then there has been a general improvement in the overall performance of the affiliated sites. The figures in Table 1.2 show that, over the last few years, the number of affiliated sites failing to reach target data capture has fallen from 59% in 1997, to 18% in 2001. As seen in Figure 1.1, there is now very little difference between the overall performance of the affiliated sites compared to the direct funded sites, with 90% of the direct funded sites and 82% of the affiliated sites achieving the target 90% data capture level during this ratification period.

Table 1.2 Percentage of Sites with Data Capture below 90% Target Level

Ratification Period	Direct Funded Sites	Affiliated Sites
1997	28%	59%
1998	8%	23%
1999	3%	42%
2000	10%	23%
January – June 2001	10%	18%

QA/QC Unit carried out the summer network intercalibration and site audits during July to September 2001 and the results have been used to assess the accuracy and consistency of the data for this reporting period. Details of this intercalibration and audit exercise will be reported separately.

QA/QC Unit's data ratification and intercalibration reports are now available via the Web at the following address: http://www.aeat.co.uk/netcen/airqual/reports/research00_01/304.html

2. Generic Data Quality Issues

2.1 PROGRESS ON THE AFFILIATION OF NEW SITES

In order to comply with requirements of the First European Daughter Directive (DD1), a number of new sites were integrated into the network during this period. QA/QC Unit and CMCU worked closely to ensure that the 11 new sites were operational and additional monitors installed at a further 3 existing sites by the time that DD1 came into force in the UK on 19th July 2001. QA/QC Unit also carried out the pre-affiliation site audits and site operator training in order to ensure smooth integration of the new sites into the network. Seven of the sites affiliated started on or around 1 January 2001, and five more were operational before the deadline of 19 July 2001. One site (Wrexham) commenced operation on 6th July but was subsequently vandalised and closed for security reasons. Details of the new sites affiliated are provided in Table 2.1. In addition, gravimetric PM₁₀ analysers (Partisols) have recently been installed at Bournemouth, Dumfries and Inverness. Installation of gravimetric PM₁₀ analysers at Wrexham has been delayed due to site security problems and also at Hove due to planning permission issues.

Data capture from the new sites, calculated from 1st January 2001 for the whole 6-month period (January to June), is shown in Figure 2.1 below. Many of the sites have achieved the 90% target for the first 6 months of the year. However, where data capture is already below 80%, it will not be possible for that site to achieve the 90% data capture target for the year 2001.

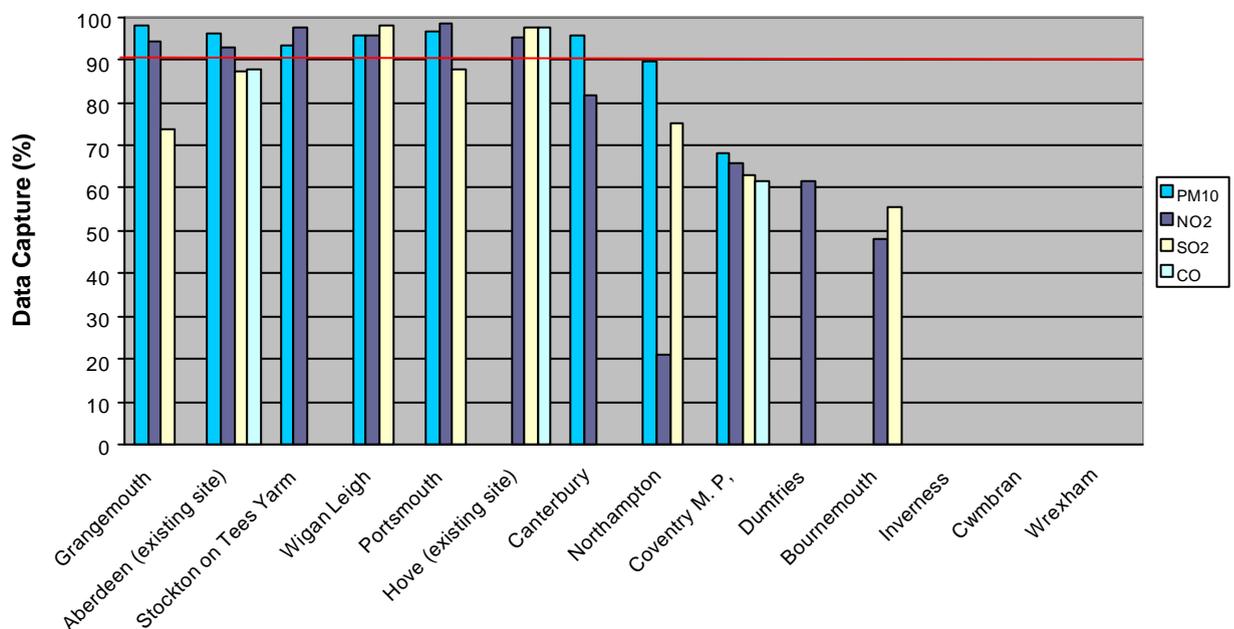


Figure 2.1 Data Capture from New DD1 Sites, January-June 2001

Table 2.1 Status on the Affiliation of New DD1 Sites

Site	Status	Pollutants	Data From	Comments
Grangemouth	Affil	NO ₂ , SO ₂ , PM ₁₀	1 Jan 2001	
Aberdeen (existing site)	Affil	SO ₂	1 Jan 2001	
Stockton-on-Tees Yarm	Affil	NO ₂ , PM ₁₀	1 Jan 2001	
Wigan Leigh	Affil	NO ₂ , SO ₂ , PM ₁₀	1 Jan 2001	
Portsmouth	Affil	NO ₂ , SO ₂ , PM ₁₀	1 Jan 2001 (NO ₂ , PM ₁₀) 16 Jan 2001 (SO ₂)	
Hove (existing site)	Affil	SO ₂ , PM ₁₀	3 Jan (SO ₂)	Installation of PM ₁₀ monitor held up by planning restrictions
Canterbury	Affil	NO ₂ , PM ₁₀	2 Jan 2001 (PM ₁₀) 1 Feb 2001 (NO ₂)	NO/NO ₂ channel mismatch in Jan data rejected to 1 st Feb
Northampton	Affil	NO ₂ , SO ₂ , PM ₁₀	12 th Jan 2001 (PM ₁₀) 12 th Feb 2001 (SO ₂) 24 May 2001 (NO ₂)	No calibrations for scaling Incorrect configuration and channel cycling effected converter efficiency (120%).
Coventry Memorial Park (existing site relocated)	Affil	PM ₁₀	26 th Feb 2001	Site relocated to Coventry Memorial Park. Monitoring commenced 26 th Feb
Dumfries	DEFRA	NO ₂	1 March 2001	
Bournemouth	Affil	NO ₂ , SO ₂	5 March 2001	
Inverness	DEFRA	NO ₂	17 th July 2001	
Cwmbran	DEFRA	NO ₂ , SO ₂ , PM ₁₀	20 th July 2001	Site relocation 18 th July. Manifold sample pump problem until 20 th July.
Wrexham	DEFRA	NO ₂ , SO ₂ , PM ₁₀	-	Site installed 6 th July but serious vandalism – monitors removed awaiting security check.

2.2 NO₂ CONVERTER EFFICIENCIES

The summer 2001 intercalibration exercise identified four sites that failed the NO_x converter test and 1 “borderline” case where the converter was found to be operating just marginally below the 95% level. (See Table 2.2 below).

Table 2.2 Sites with low NO_x converter efficiency (summer 2001 audit)

Site	C.E	Analyser	Date tested	Comment
Norwich Roadside	85%	API	14/8/01	
Barnsley Gawber	86%	Ambirack	4/9/01	Converter had been replaced on 24 th April following LSO concerns about response stability.
Aberdeen	92%	API	12/9/01	Tested and failed twice
Glasgow Centre	90.5%	Signal	24/7/01	Passed last audit but failed previous 2 (failed 3 out of last 4 audits.)
Bolton	89/97	ML98	11/7/01	Borderline : failed at high concentration but passed at lower concentration (300ppm NO ₂)

Following QA/QC Unit’s recommendations given in the last ratification report, the Equipment Support Unit carried out additional converter tests three months after the service, at sites where the converters had shown a history of poor performance. Results of the 3-month converter tests carried out by the ESU (Signal) are given in Table 2.3. In general, the early detection of poor converter performance by the ESU during these 3-month tests has helped to expedite the repair/replacement of faulty converters and minimise data loss during this 6-month ratification period.

Table 2.3 Equipment Support Unit’s 3-monthly converter test results

Site	Converter Status	Test Date	Result (%)	Test Date	Result (%)
Coventry	New converter fitted 20/4/01	20/4/01	100	26/7/01	98
Manchester South	New converter fitted 7/2/01	20/2/01	99.4	13/6/01	100
Nottingham	New converter fitted 27/2/01	16/3/01	98.4	6/9/01	99.6
Rotherham	New converter fitted 20/2/01 Temp increased to 350°C 15/3/01	15/3/01	97.8	19/9/01	97.4

Careful examination of the data was carried out in order to determine the effect of the low NO₂ converter results on data quality. Where available, chart records or 1-minute calibration data were used to examine the response stability during the LSO’s fortnightly NO₂ calibrations. In cases where the converter efficiency was low, a noticeable decline in the response of the NO₂

span could often be seen during the calibrations. The effect of low converter efficiency on data quality and any resulting data loss is shown in Table 2.4.

Table 2.4 Effect of Low Converter Efficiency on Data Quality

Site/Analyser	C.E	Effect on data quality	Data loss
Norwich Roadside (API)	85%	Evidence of response drift and calibration instability seen from 1 st June	1/6/01 to 31/8/01 (3 months)
Barnsley Gawber (Ambirack)	86%	1-minute calibration data provided by the ESU showed a fall in the NO ₂ calibration response from 1 st August.	1/8/01 to service on 13/9/01 (1.5 months)
Aberdeen (API)	92%	No significant effect seen in response stability.	None
Glasgow Centre (Signal)	90.5%	Drift in calibration sensitivity seen at end of June	28/06/01 to 31/07/01 (5 weeks)
Bolton (ML98)	89/97%	Converter passed test at lower concentration therefore accepted.	None

RECOMMENDATIONS

- | | |
|-----|---|
| i) | The ESUs should carry out 3-monthly converter tests at sites where the analysers have failed the converter test or are considered borderline cases. We therefore recommend 3-month converter tests at Norwich Roadside, Barnsley Gawber, Aberdeen, Glasgow Centre and Bolton. |
| ii) | LSOs should continue to pay careful attention to the stability of the NO ₂ calibration response and notify CMCU if a declining NO ₂ span response is recorded. Full details of this check can be found in the “Trouble-shooting” section of the Site Operator’s Manual. (http://ariadne.aeat.co.uk/netcen/airqual/reports/lsoman/lsoman.html) |

2.3 CO AND SO₂ ZERO TRUNCATION

At some sites the data have shown that the analyser’s response to zero air or low ambient concentrations appear “truncated” and a constant output of zero ppb may be recorded for several days in a row. As a result, these sites stand out as having an unusually high number of days where the concentration was zero ppb/ppm during this ratification period (January-June 01). At other sites there are typically less than 3 days where the daily average concentration is 0ppb/ppm. The most significant effect appears to be seen with the SO₂ analysers at the following sites:

Site	Pollutant	No of days concentration is at zero ppb/ppm	Analyser
Oxford Centre	SO ₂	18	ML 9850
Exeter Roadside	SO ₂	17	ML 9850
Bolton	SO ₂	11	ML 9850
Bournemouth	SO ₂	13	API

Following QA/QC Unit's recommendations in the last report, the Equipment Support Unit (ETi) undertook a thorough investigation at Oxford Centre – a site which always shows an unusually high number of days when the SO₂ analyser response was constantly recording 0ppb. The results of these investigations were as follows:

- The automatic zero function was found to be disabled - no further action taken.
- The charcoal column (for zero air) was found to be in good condition and orientated to prevent air by-passing charcoal inside the column - no further action taken.
- The analyser was found to be configured with an offset. At 2ppb gas reading the logger displayed 102mV. Zero potentiometer saturation was also checked and found to be okay.
- Response time was set to Kalman which is a time response filter that helps give the best noise free signal without compromising response time.
- The sample system was also leak checked – no leaks were found.

The Equipment Support Unit therefore concluded that:

“ The ML9850B analyser has superior noise characteristics aided by the Kalman filter. The logger system could also be ignored on the basis that the Siemens operated site utilises the ML RS232 capabilities; these do not allow for data manipulation or errors.”

RECOMMENDATION

QA/QC Unit to carry out further investigation of response sensitivity at Oxford Centre and to maintain a close watch on the effect of truncated zero response on data quality at the other sites.

2.4 OZONE OUTLIERS

A total of 15 out of the 47 ozone analysers (32%) tested during the summer 2001 audit were found to be outliers. (See Table 2.5 below). Full details will be provided in the forthcoming summer 2001 Intercalibration report. Data from these sites have been rescaled accordingly during the ratification process and there has been no resulting data loss.

Table 2.5 Ozone Outliers Identified at the Summer 2001 Intercalibration Exercise

Site	Outlier (%)	Site	Outlier (%)
Barnsley Gawber	-9.4	Reading	-8.7
Belfast Centre	6.6	Redcar	6.1
Bristol Centre	9.1	Rotherham Centre	-6.9
Exeter Roadside	-17.8	Salford Eccles	11.8
London Bloomsbury	-18.1	Sheffield Centre	-5.6
Manchester South	6	Southampton Centre	10.9
Nottingham Centre	-9.3	Wolverhampton C	35.1
Preston	-8.9		

2.5 DATA CAPTURE FOR CRITICAL SITES IN ZONES AND AGGLOMERATIONS

As described in Section 2.1, the task of getting new sites installed and operational in order to meet the requirements of the First Daughter Directive has taken place during this reporting period. 2001 will be the first year for which data are to be formally reported to the Commission under the Directive and any zone or agglomeration with an exceedance of the limit value must be reported. It is therefore important that data capture targets are achieved, especially for the zones and agglomerations that rely on the results from a single monitoring station (i.e. critical sites). The 36 critical sites in the AUN are listed below in Table 2.6. An indication of whether or not the 90% data capture target has been achieved during the first 6-months of the year is also provided. If data capture is below 80% during the first 6-months of the year, then it will not be possible for that site to achieve the target 90% data capture for the year. Details of data capture and reasons for data loss can be found in Section 4.

Table 2.6 Critical Sites in Zones and Agglomerations*

Critical Sites in Agglomerations	90% Data Capture Achieved (January - June 2001)		
	NO ₂	SO ₂	PM ₁₀
Blackpool	X	✓	✓
Bournemouth	X	X	-
Coventry Memorial Park	X	X	X
Hove Roadside	M	M	X
Hull Centre	✓	✓	✓
Leicester Centre	✓	✓	✓
Liverpool Centre	✓	✓	✓
Newcastle Centre	X	✓	✓
Nottingham Centre	X	✓	✓
Portsmouth	✓	X	✓
Preston	✓	✓	✓
Reading	✓	✓	✓
Southampton	✓	✓	✓
Southend-on-Sea	✓	✓	✓
Stoke-on-Trent	✓	✓	✓
Wirral Tranmere	✓	X	✓
Belfast Centre	X	M	M
Edinburgh	✓	✓	✓
Glasgow Centre	M	✓	M
Cardiff Centre	✓	✓	✓
Critical Sites in Zones			
Barnsley Gawber	✓	M	-
Canterbury	M	-	✓
Leamington Spa	✓	✓	✓
Northampton	X	X	X
Oxford Centre	M	✓	-
Plymouth Centre	M	M	✓
Scunthorpe	-	M	X

Stockton-on-Tees Yarm	✓	-	✓

3. Site Specific Issues

3.1 PLYMOUTH CENTRE OZONE

QA/QC Unit has been concerned about the relatively high levels of ozone recorded at Plymouth Centre compared to levels recorded at nearby sites. Figure 3.1 shows a comparison of the ozone data recorded at Plymouth compared with Southampton from January 2001. It can be seen that from March 2001, the ozone levels at Plymouth appear to increase and are, on average, 10-15ppb higher than the levels recorded at Southampton. The analyser at Plymouth has been calibrated against a standard reference photometer during the audits, but has always shown satisfactory response. In September, QA/QC Unit installed an additional analyser at the site operating in parallel with the original site analyser. Results from the two instruments will be analysed when available. In the meantime, ozone data from this site should be considered as provisional until the investigation is complete.

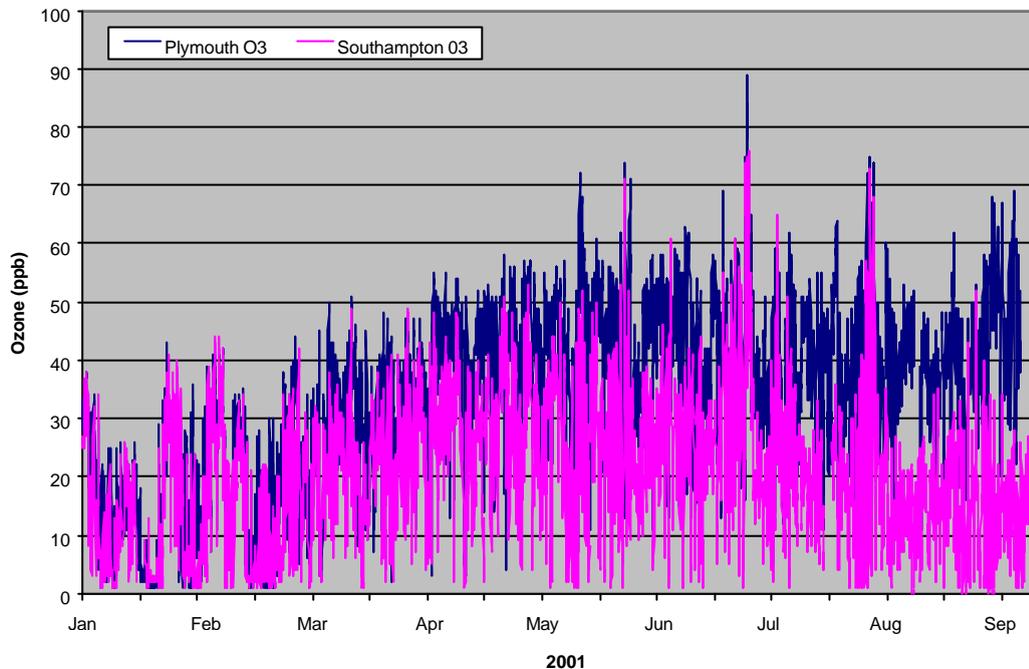


Figure 3.1 High Ozone Levels at Plymouth compared with Southampton

RECOMMENDATION

QA/QC Unit to report on the progress of the parallel monitoring and ESU to repair/replace the analyser if necessary.

3.2 SANDWELL WEST BROMWICH CO

The CO analyser at Sandwell West Bromwich showed unacceptably high levels of noise and baseline response instability during the period April to September 2001. (See Figure 3.2). This meant that it was not possible to accurately scale the data and, as a result, all data have been rejected from 20th March until the end of August (note this may be extended until the repair). The site has subsequently been visited by the Equipment Support Unit in October 2001.

RECOMMENDATION

ESU to investigate CO response noise and instability at Sandwell West Bromwich.

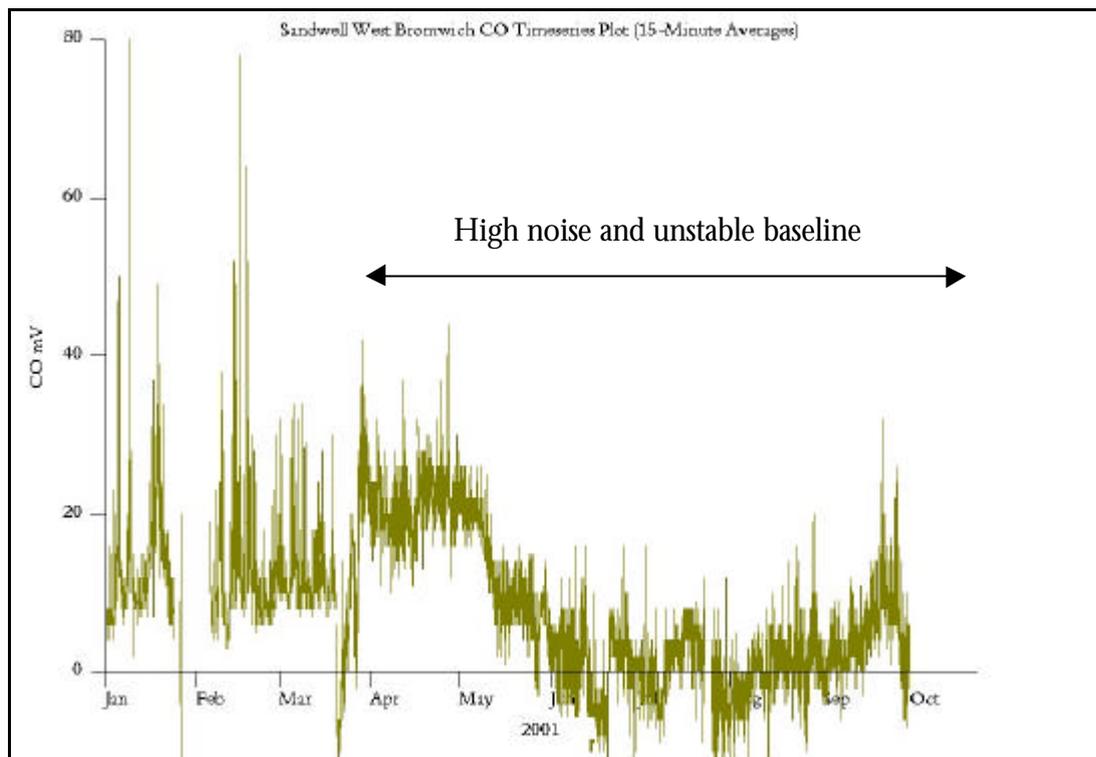


Figure 3.2 Sandwell West Bromwich CO response instability and high noise

3.3 EXETER ROADSIDE CO

The CO zero baseline at this site appears very unstable from July 2001 onwards. This may result in significant data loss during the next ratification period. (see Figure 3.3)

RECOMMENDATION

We recommend that the Equipment Support Unit investigate the unstable baseline response fault unless repair has already taken place.

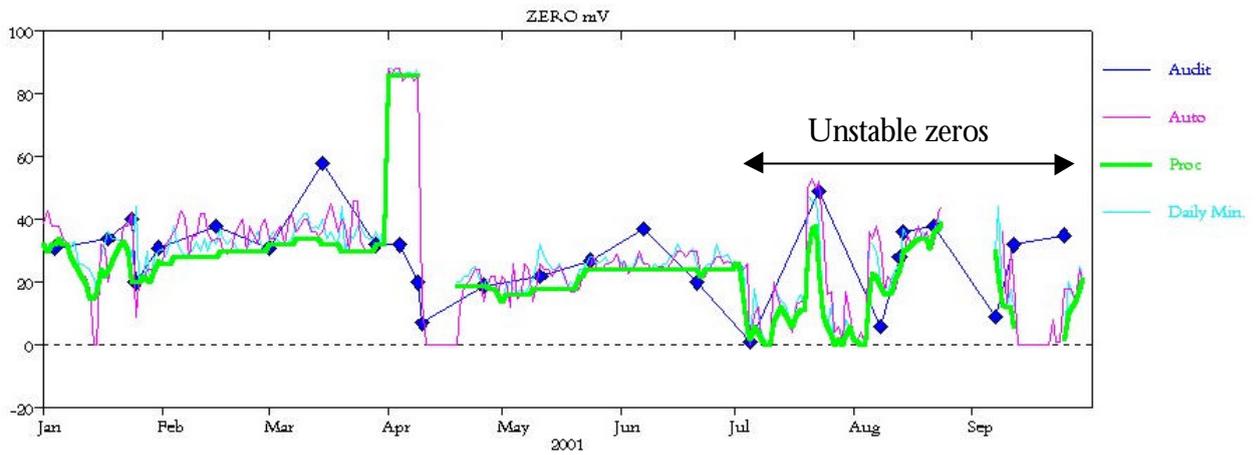


Figure 3.3 Exeter Roadside unstable CO calibration zeros

3.4 THURROCK CO

There appears to be a problem with the configuration of the CO zero baseline at this site. The manual and autocalibration zeros values show normal day-to-day variations, whilst the daily minimum values appear to be cut off at 0mV. This makes data scaling difficult as the true baseline zero response is unknown.

RECOMMENDATION

ESU to check the configuration of the zero baseline as well as the condition of any zero air scrubbers

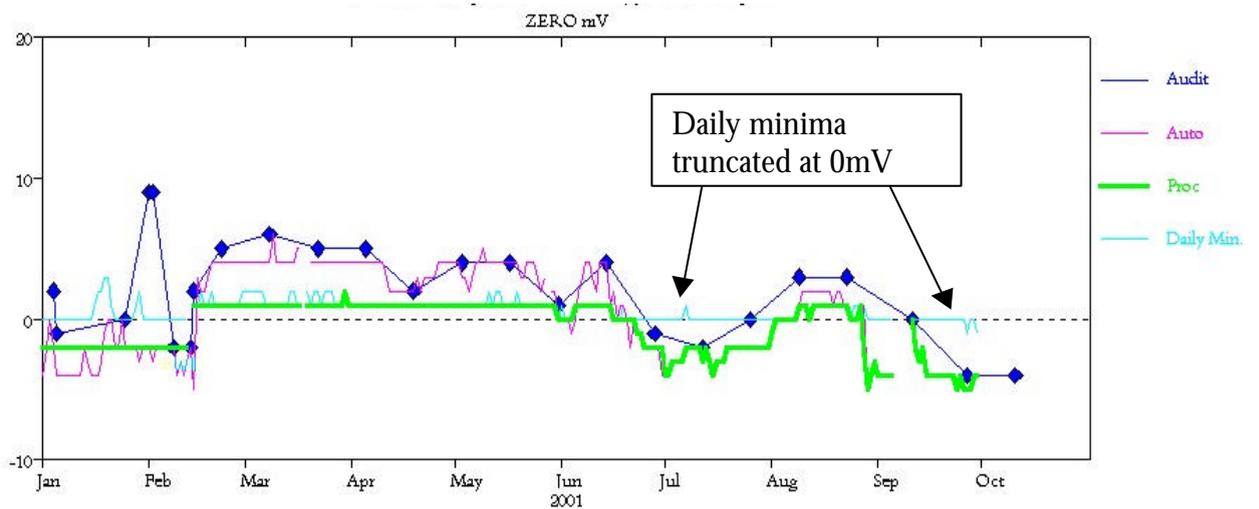


Figure 3.4 Thurrock CO zero baseline configuration

elow

problems which have
ng period January to
is also given. In some
ch case the total data loss

calculated from the
capture statistics,
to June), as shown in

	Data Loss
om 10-	18 days
	18 days

to 6 weeks
nalyser
ain until

analyser

CO = 50%	Routine monitoring suspended until 29 th January.	4 weeks
	Data loss from 2 nd May until 3 rd July due to unstable zero baseline response. Replacement analyser installed on 3 rd July.	8.5 weeks <i>(9 weeks in total)</i>
PM ₁₀ = 65%	Routine monitoring suspended until 29 th January.	4 weeks
	Response instability from 26 th February. The LSO re-seated the filter on several occasions but no improvement in stability was achieved. A replacement analyser was installed on 29 th March.	4.5 weeks

Blackpool

NO ₂ = 89%	Spuriously low ambient data rejected from 26 th May until 12 th June due to a software fault following a logger reset.	17 days
CO = 86%	Chopper motor failure 22-27 th March.	5 days
	Spuriously low ambient data rejected from 26 th May until 12 th June due to a software fault following a logger reset.	17 days

Bournemouth

General	New DD1 site started on 5 th March 2001.	
	Air conditioning unit failed resulting in high rack temperatures from 29-31 st May.	2 days
NO ₂ = 74%	Photomultiplier tube fault from 2 nd May and the analyser was removed from site for repair. The analyser was reinstated on 23 rd April but incorrect configuration resulted in further data loss until 25 th April.	3.5 weeks
SO ₂ = 86%	An analyser software fault resulted in data loss from 12-18 th April and from 27 th April to 2 nd May.	11 days

Bradford Centre

NO ₂ = 89%	Air conditioning unit fault effecting all data 13-25 th April.	12 days
	Pump fault 30 th April – 3 rd May.	3 days
CO = 89%	Air conditioning unit fault effecting all data 13-25 th April.	12 days
	Unacceptably large change in sensitivity (25%) resulting in data rejection from 26-31 st January.	6 days

Bristol Old Market

CO = 62%	Data deleted from 26 th March to 1 st June due to zero baseline drift resulting in response truncation at 0mV. The LSO has been reminded to ensure that a suitable baseline offset (30mV) is always applied.	9 weeks
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Bury Roadside

SO ₂ = 84%	UV lamp aligned incorrectly resulting in data loss from 4-29 th January.	3.5 weeks
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Coventry Memorial Park

General	Coventry Centre site was closed on 8 th January and the equipment relocated to a new site at Coventry Memorial Park. Monitoring at the new site location commenced on 26 th February 2001 including the affiliation of a PM ₁₀ analyser (DD1 requirement).	7 weeks
CO = 89%	Chopper motor failure 15-23 rd May.	8 days

Grangemouth

General	New DD1 site affiliated into the network from January 1 st 2001.	
SO ₂ = 74%	Spurious high data with frequent intermittent data gaps resulting in data deletion from 11-25 th February.	2 weeks
	Data deleted from 9 th April to 5 th May due to noisy baseline response causing periods of negative data.	26 days
	Unstable baseline response resulting in further data loss from 21-24 th May.	3 days

Hull Centre

CO = 83%	Data were rejected from 24 th January to 19 th February due to excessive baseline response drift.	27 days
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Leeds Centre

CO = 89%	Unstable rack temperature resulted in response problems throughout this period causing intermittent drops in baseline response and negative data. Data were deleted due to this fault from 22-26 th January, 28 th March – 3 rd April and 8-14 th July. The rack cooling fan was replaced on 26 th July to resolve the problem.	16 days
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London Brent

NO ₂ = 87%	Spurious low data were deleted from after the service on 29 th January until 21 st February. No routine calibrations were carried out during this period and the autocalibration response was also unstable.	23 days
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London Hillingdon

O ₃ = 62%	Spurious low data were deleted from after the service on 22 nd January until 27 th March due to contamination of the sample manifold. Normal monitoring resumed after the manifold was cleaned and the sample lines to the analysers changed.	9 weeks
	Data communications fault following a power cut resulted in data loss from 14-19 th June.	4 days
SO ₂ = 62%	As above	

Manchester Piccadilly

General	The site was relocated on April 29 th to a location across the gardens 80m from the original site.	
NO ₂ = 52%	Poor analyser performance throughout this period due to a series of analyser faults and problems with replacement analysers installed.	
	A fault with the analyser's transistor and solenoid switching valve occurred immediately after the site service giving rise to data loss from 13 th to 22 nd February.	9 days
	Data were lost from 19-23 rd March due to an electrical fault with the analyser.	5 days
	Site temporarily closed from 17-20 th April and relocated 80m from original site.	8 days
	In addition, data have been deleted following the site relocation on 20 th April until 25 th June due a range of analyser faults. These are summarised as follows: 20-25 th April electrical problem with a ribbon cable. May 6-14 th response instability due to an electrical wiring fault. Analyser was removed from site for repair but the replacement instrument was also unstable. May 24 th – June 19 th problems with the autocalibration zero and span and the permeation oven was replaced. June 9-14 th converter solenoid switching valve problems. New instrument installed on 25 th June.	2 months

Newcastle Centre

NO ₂ = 73%	Analysers fault after power cut from 15-18 th January.	3 days
	Data loss from 4 th May to 14 th June due to a faulty analogue signal converter card and instrument power supply giving rise to low response on the NO channel.	6 weeks

Norwich Centre

General	Air conditioning unit over-heating and site switched out of service for safety reasons from 12-20 th April.	8 days
SO ₂ = 60%	Site out of service from 12-20 th April due to an air conditioning fault.	8 days
	The analyser was generally noisy throughout the 6-month period. A range of faults including UV lamp voltage instability and a photomultiplier tube fault resulted in poor quality data being deleted from 26 th April until 26 th June, when a new optical bench was installed.	2 months

Norwich Roadside

NO ₂ = 82%	A low converter efficiency (85%) was identified at the summer QA/QC audit (14/8/01) and data from 1 June until the service on 31 August have been deleted.	8.5 weeks <i>(13 weeks in total)</i>
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Nottingham Centre

NO ₂ = 71%	A low converter efficiency (93%) was recorded at the QA/QC audit (21/02/01) and data were deleted from 4 th January (first evidence of a significant drop in NO ₂ response seen during calibration) until a new converter was fitted on 27 th February. The ESU re-tested the converter during the service on 16 th March and it was found to be operating satisfactorily.	7 weeks
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Preston

CO = 89%	Chopper motor fault resulted in data loss from 27 th December to 3 rd January 2001	3 days <i>(1 week total)</i>
	Following an analyser fault on 10 th April a replacement analyser was installed. This analyser showed unacceptably high noise response and data were rejected from 10-25 th April. The original site analyser was reinstated on 25 th April.	2 weeks

Redcar

NO ₂ = 67%	Poor quality data from 25 th March until 5 th April could not be scaled accurately due to a rapid drift in response stability during a period when no routine calibrations were performed and the autocalibration response was unstable.	11 days
	Data were rejected from 23 th April until 6 th June due to a photomultiplier tube fault.	6 weeks

Sandwell West Bromwich

CO= 36%	Data were deleted from 26 th January to 5 th February due to a correlation wheel fault and the analyser was replaced.	12 days
	The original site analyser was reinstalled at the service on 20 th March, however this showed unacceptably high noise and unstable baseline response resulting in data rejection from 20 th March until the end of August. (Note there may be a need for further data deletion until the repair been carried out). The ESU visited the site in October 2001). (See Section 3.2)	3.5 months (6 months in total)

Scunthorpe

PM ₁₀ = 87%	A fault due to water ingress from a leak in the site roof resulted in data loss from 16 th March until 6 th April.	3 weeks
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Thurrock

PM ₁₀ = 88%	Data were lost from 27 th March until 5 th April due to water ingress to the TEOM caused by a leak in the roof of the site.	9 days
	Further short periods of data were lost due to the following flow faults: Loose sensor connection (12-15 th March) Faulty mass flow controller (27-30 th May) Pump fault (29 th June)	1 week

Wirral Tranmere

CO = 88%	Data were deleted from after the service on 6 th March until 27 th March due to a rapid drift in response sensitivity (>11% per week). The ESU replaced the pump and flow sensor on 27 th March.	3 weeks
SO ₂ = 68%	The analyser had optical bench and circuit board problems throughout this period, giving rise to periods of noisy response, rapid zero drift and negative data. Poor quality data were rejected from 29 th April to 25 th May due to response instability.	4 weeks

5. Ratified Data Capture Statistics

Table 5.1 provides the ratified data capture figures for each site for the 6-month period January to June 2001. Data capture values below 90% are shown in the shaded boxes.

Table 5.1 AUN ratified data capture (%) for January – June 2001.

Site Name	O ₃	NO ₂	CO	SO ₂	PM ₁₀	Site Average
ENGLAND						
Barnsley 12	-	-	-	99	-	99
Barnsley Gawber	97	97	-	97	-	97
Bath Roadside	-	69	99	-	-	84
Billingham	-	99	-	-	-	99
Birmingham Centre	98	98	98	98	97	98
Birmingham East	98	98	97	98	98	98
Blackpool	97	89	86	95	97	93
Bolton	97	97	93	91	97	95
Bournemouth*	-	74	-	86	-	80
Bradford Centre	90	89	89	92	93	90
Brighton Roadside	-	98	95	-	-	97
Bristol Centre	94	96	90	96	97	95
Bristol Old Market	-	98	62	-	-	80
Bury Roadside	98	97	98	84	97	95
Cambridge Roadside	-	99	-	-	-	99
Canterbury*	-	99	-	-	96	98
Coventry Memorial Park*	94	96	89	92	99	94
Exeter Roadside	99	98	93	99	-	97
Hove Roadside	-	95	98	98	-	97
Hull Centre	98	98	83	98	98	95
Leamington Spa	94	92	99	99	99	97
Leeds Centre	98	97	89	93	92	94
Leicester Centre	98	97	91	98	97	96
Liverpool Centre	98	91	97	98	98	97
London A3 Roadside	-	97	99	-	98	98
London Bexley	98	97	98	95	96	97
London Bloomsbury	97	94	90	96	98	95
London Brent	99	87	99	99	99	96
London Cromwell Road 2	-	95	96	95	-	95
London Hillingdon	62	94	95	62	96	82
Manchester Piccadilly	96	52	95	95	96	87
Manchester South	99	98	-	99	-	98
Manchester Town Hall	-	98	99	-	-	99
Middlesbrough	98	96	98	96	98	97
Newcastle Centre	98	73	92	98	98	92
Northampton*	-	97	-	98	95	97
Norwich Centre	94	94	94	60	94	87

Site Name	O ₃	NO ₂	CO	SO ₂	PM ₁₀	Site Average
Norwich Roadside	-	82	-	-	-	82
Nottingham Centre	99	71	94	99	97	92
Oxford Centre	-	99.5	99.5	99.5	-	99.5
Plymouth Centre	98	98	98	90	98	96
Portsmouth*	-	99	-	96	97	97
Preston	99	98	89	97	98	96
Reading	97	97	93	97	94	96
Redcar	98	67	95	98	98	91
Rotherham Centre	98	93	-	93	-	95
Salford Eccles	97	97	97	97	97	97
Sandwell West Bromwich	98	98	36	98	-	83
Scunthorpe	-	-	-	97	87	92
Sheffield Centre	98	98	98	98	94	97
Sheffield Tinsley	-	99	94	-	-	97
Southampton Centre	98	98	98	98	98	98
Southend-on-Sea	98	97	98	98	99	98
Stockport	-	99	99	99	99	99
Stockton-on-Tees Yarm	-	97	-	-	94	96
Stoke-on-Trent Centre	97	97	97	98	99	98
Sunderland	-	-	-	99	-	99
Thurrock	97	97	96	97	88	95
Walsall Alumwell	-	95	-	-	-	95
Walsall Willenhall	-	92	-	-	-	92
West London	-	95	99	-	-	97
Wigan Leigh	-	96	-	98	96	97
Wirral Tranmere	97	98	88	68	97	90
Wolverhampton Centre	98	98	98	98	94	97
NORTHERN IRELAND						
Belfast Centre	83	82	50	82	65	72
Belfast Clara Street [#]	-	-	-	-	88	88
Belfast East	-	-	-	92	-	92
Derry	94	97	97	97	97	96
SCOTLAND						
Aberdeen	-	93	88	88	96	91
Dumfries*	-	91	-	-	-	91
Edinburgh Centre	97	98	98	98	97	97
Glasgow Centre	98	97	95	98	99	97
Glasgow City Chambers	-	99	97	-	-	98
Glasgow Kerbside	-	99	99	-	99	99
Grangemouth	-	94	-	74	98	89
WALES						
Cardiff Centre	98	96	98	98	98	98
Port Talbot	97	93	-	96	96	95
Swansea	93	93	92	91	93	92
Network Mean (%)	96	93	93	94	96	94

[#]Provisional PM₁₀ BAM data

*data capture for new DD1 sites calculated from site start date – see below

New DD1 sites	Start date
Bournemouth	05/03/01
Canterbury	02/01/01. NO ₂ started 1/2/01
Coventry Memorial Park	26/02/01
Northampton	12/01/01. NO ₂ started 23/05/01, SO ₂ started 12/02/01.
Portsmouth	01/01/01. SO ₂ started 16/01/01.
Stockton-on-Tees Yarm	01/01/01.
Wigan Leigh	01/01/01.
Dumfries	01/03/01
Grangemouth	01/01/01
Aberdeen (<i>existing site</i>)	01/01/01 SO ₂
Hove (<i>existing site</i>)	03/01/01 SO ₂

Appendix A

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

QA/QC Unit's inventory of Department-owned equipment, October 2001

Computer software	A 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	1 intercalibration equipment set (includes mass flow controllers and read-out unit) A second intercalibration kit (commissioned January 2001) 3 UV photometers : <i>API model M401- purchased April 99</i> <i>ML model 9812 – purchased April 99</i> <i>API model 401 - purchased October 2000</i>
Zero air pumps	6 spare zero air pumps for routine maintenance/repair of zero air generators in the AUN

Appendix B

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. From October 2000, the recommendations have been prioritised as follows:

Priority	
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