



A world leading **energy and climate change consultancy**



QA/QC Data Ratification Report for the Automatic Urban and Rural Network, October-December 2010, and Annual Report, 2010

**Report produced for the Department for
Environment, Food and Rural Affairs, Scottish
Government, Welsh Assembly Government and
the DoE in Northern Ireland**

AEAT/ENV/3168 Issue 1

ED42523


Title	QA/QC Data Ratification Report for the Automatic Urban and Rural Network, October-December 2010, and Annual Report 2010
Customer	Department for Environment, Food and Rural Affairs, Scottish Government, Welsh Assembly Government and the DoE in Northern Ireland
Customer reference	RMP 4961
Confidentiality, copyright and reproduction	Unrestricted This report is the Copyright of Defra and the Devolved Administrations and has been prepared by AEA Technology plc under contract to Defra dated April 2008. The contents of this report may not be reproduced in whole or in part, nor passed to any organisation or person without the specific prior written permission of Defra and the Devolved Administrations. AEA Technology plc accepts no liability whatsoever to any third party for any loss or damage arising from any interpretation or use of the information contained in this report, or reliance on any views expressed therein.
File reference	
Reference number	AEAT/ENV/R/3168 Issue 1

AEA Group
The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR

Tel: 0870 190 6465
Fax: 0870 190 6608

AEA is a business name of AEA Technology plc

AEA is certificated to ISO9001 and ISO14001

Author	Name	Stewart Eaton
Approved by	Name	Rachel Yardley
	Signature	
	Date	June 2011

Executive summary

AEA carries out the quality assurance and control (QA/QC) activities for the Automatic Urban and Rural Monitoring Network (AURN) on behalf of the UK Department for Environment, Food and Rural Affairs (Defra), Scottish Government, Welsh Assembly Government and DoE in Northern Ireland.

Ratified hourly average data capture for the network averaged 92.1% for all pollutants (O_3 , NO_2 , SO_2 , CO , PM_{10} and $PM_{2.5}$) during the 3-month reporting period October-December 2010. Data capture for all pollutants except PM_{10} and $PM_{2.5}$ were above 90%. There were 29 sites with data capture less than 90% for the period.

The number of monitoring sites in the AURN during this quarter was 133, of which 73 are Local Authority owned sites affiliated to the national network. Some are co-located and separately named gravimetric particulate analysers at sites with automatic analysers. Many affiliated sites have additional Defra-funded analysers installed on site.

The overall data capture for the whole of 2010 is 88.5%. There were 55 sites which did not make the 90% data capture. Reasons for significant data loss are given in Section 10.

The main reasons for data loss at the sites have been provided and these were predominantly due to instrument faults, response instability or problems associated with the replacement of analysers and infrastructure. A summary of recommendations to help improve network performance is given in Appendix 1.

Table of contents

PART A Data Ratification

Introduction	1
1.1 Overview of Network Performance	1
1.2 Status of Ratified Data	2
2 Changes in the Network for Directive Compliance	2
3 Generic Data Quality Issues	2
3.1 Auto-calibration Run-on	2
4 Site Specific Issues	3
4.1 London	3
4.2 England (excluding London)	4
4.3 Scotland	8
4.4 Wales	9
4.5 Northern Ireland (including Mace Head)	10
4.6 Overall Data Capture	10
PART B Annual Review	
5 Introduction	13
6 Changes to network during 2010	14
7 Network Intercalibrations	14
8 ESU, CMCU, LSO and QA/QC Meetings	15
9 TEOM Upgrades to FDMS and Installation of new FDMS	16
10 Network Data Capture	16
11 Significant Site Issues	21
11.1 Birmingham Tyburn Roadside	21
11.2 Chesterfield and Chesterfield Roadside	22
11.3 London Marylebone Road	24
11.4 London Marylebone Road PM _{2.5} Partisol	25
11.5 Lullington Heath	25
11.6 Manchester Piccadilly	25
11.7 Newport	26
11.8 Plymouth Centre	26
11.9 Port Talbot Margam	26
11.10 Rochester Stoke	26

Appendices

- Appendix 1: Recommendations for Upgrade or Replacement of Equipment
- Appendix 2: Inventory of Defra-owned Equipment
- Appendix 3: Partisol Data Report
- Appendix 4: Information for New Sites

PART A Data Ratification October-December 2010

1 Introduction

This quarterly report covers the Quality Assurance and Control (QA/QC) activities undertaken by AEA to ratify automatic monitoring data from Defra and the Devolved Administrations' urban and rural air quality monitoring network (AURN) for the period October-December 2010. During this period there were 133 operational monitoring sites in the Network of which there are 98 urban sites, 27 rural sites and a further 8 sites in the London Air Quality Monitoring Network (LAQN) which are affiliated into the national network. There are currently 62 Defra-funded sites and 71 affiliate sites, although many affiliate sites have fully-funded PM₁₀ and/or PM_{2.5} analysers. Eleven sites have non-automatic particulate samplers (Partisols); some of these are collocated with FDMS analysers at Auchencorth Moss, Harwell, London North Kensington and Marylebone Road for both PM₁₀ and PM_{2.5}. Port Talbot Margam has a Partisol, which was converted from PM_{2.5} to PM₁₀ during February 2010.

1.1 Overview of Network Performance

Ratified hourly average data capture for the network averaged 92.1% for all pollutants (O₃, NO₂, SO₂, CO, PM₁₀ and PM_{2.5}) during the 3 month reporting period October-December 2010 (see Table 1.1). All gaseous pollutants achieved 90% or higher data capture. Data capture rates are calculated using the actual data capture as hourly averages (daily for Partisol) against the total number of hours (or days) in the relevant period; service and maintenance are counted as lost data. For sites starting or closing, the data capture is based on the actual date starting or closing.

Table 1.1: AURN Ratified Data Capture (%) by Quarter, 2010

	CO	PM ₁₀	PM _{2.5}	NO ₂	O ₃	SO ₂	Mean
Q1 2010 %	90.3	85.1	85.9	89.9	91.8	91.2	88.8
Q2 2010 %	93.6	81.0	84.0	89.8	93.4	92.1	88.4
Q3 2010 %	85.2	77.5	84.4	89.1	92.4	89.6	87.8
Q4 2010 %	97.5	80.8	87.8	93.0	95.9	94	92.1

Overall, 340 out of the 409 analysers (77%) achieved data capture levels above the required 90% target during this reporting period (See Table 1.2).

Table 1.2: Number of Analysers with Data Capture below 90%

Total Number Of Analysers		Q1 Jan-Mar 2010 (No. below 90%)	Q2 Apr-Jun 2010 (No. below 90%)	Q3 Jul-Sept 10 (No. below 90%)	Q4 Oct-Dec 10 (No. below 90%)
CO	24	5	4	5	2
NO ₂	117	22	19	25	12
O ₃	80	10	15	12	7
PM ₁₀ ¹	68	21	30	31	19
PM _{2.5} ¹	76	27	26	25	23
SO ₂	45	10	11	10	6
Total <90%	-	93	105	108	69

1. Includes TEOM, FDMS, BAM and Partisol analysers.

In total, 29 out of the 133 operational network sites in the quarter (22.2%) had an average data capture rate below the required 90% level for the October-December 2010 period. This is influenced by the fact that new analysers at existing sites have data capture figures calculated from the start date of the quarter, not from the start of the analyser itself. The main site operational and QA/QC issues giving rise to data capture below the required 90% level are summarised in Section 4.

1.2 Status of Ratified Data

During ratification of the October-December data, a number of issues were discovered which affect data already reported as ratified in previous quarters. As a result, the following data already reported as ratified have been deleted.

Birmingham Tyburn Roadside PM_{2.5}, 1 Dec 2009 - 30 Sep 2010; low volatiles compared to region
 Birmingham Tyburn Roadside PM₁₀, 1 May 2009 - 30 Sep 2010; low volatiles compared to region
 Brighton Roadside NO₂, 1 Jul - 31 Oct; no calibrations
 Cardiff Centre PM₁₀, 24 May - 30 Sep, various instrument faults
 Chesterfield Roadside PM₁₀, 1 Dec 2009 - 30 Sep 2010; low volatiles compared to region
 Derry PM₁₀, 27-30 Sep 2010; low volatiles compared to region
 London Marylebone Road PM_{2.5} (FDMS), 17 May 2010 - 30 Sep 2010; low volatiles compared to region
 Lullington Heath O₃ 25 Jan-14 Oct 2010, sampling fault
 Newport PM_{2.5}, 1 May-30 Sep 2010; high volatiles compared to region
 Plymouth Centre PM₁₀, 11 Aug-30 Sep 2010; PM₁₀ volatiles lower than PM_{2.5}
 Wigan Centre PM_{2.5}, 1 Jul-31 Aug 2010; high volatiles compared to region

In addition, the following data have been revised:

Ladybower SO₂, 1-30 June 2010; rescaled due to invalid calibration results

A full list of changes to ratified data is given at http://uk-air.defra.gov.uk/data/verification_and_ratification?action=report

2 Changes in the Network for Directive Compliance

One analyser was installed in the network during the fourth quarter

Site	Pollutant	Date Installed
Eastbourne	NO ₂	5/11/2010

However, problems with installation and calibration resulted in all data being deleted until into 2011.

A full list of new sites and analysers installed in the network during 2010 is given in Section 6.

A full description of the changes necessary for compliance with the Directive is given in Part B Section 8 of the October-December 2007 Report.

In 2011 the UK will be undertaking a full assessment of the AURN in accordance with Articles V to VII of the Air Quality Directive (2008/50/EC). It is expected that the results of this will be available by the end of the year. It will review the number and locations of sites and equipment required for monitoring.

3 Generic Data Quality Issues

3.1 Auto-calibration Run-on

The 22 sites (22 analysers) showing continuing problems with the autocalibration run-on during October-December 2010 are given in Table 3.1. Any autocalibration run-on data that look visibly significant have been deleted from these data sets during ratification.

Table 3.1: Autocalibration Run-ons: October-December 2010

Site	Pollutant	Run-On Conc	Autocal Conc	Hours lost
Billingham	NO ₂	3	200	1 hour
Cardiff Centre	NO ₂	4	350	1 hour
Glasgow Centre	NO ₂	3	250	1 hour
Hull Freetown	NO ₂	5	200	1 hour
Leeds Centre	NO ₂	5	300	1 hour
Leicester Centre	NO ₂	3	455	1 hour
Manchester Piccadilly	NO ₂	4	100	1 hour
Market Harborough	NO ₂	5.4	350	1 hour
Narberth	NO ₂	4.5	300	1 hour
Norwich Lakenfields	NO ₂	4	200	1 hour
Oxford Centre Roadside	NO ₂	4	200	1 hour
Plymouth Centre	NO ₂	3	275	1 hour
Preston	NO ₂	5	250	1 hour
Reading New Town	NO ₂	7	250	1 hour
Sheffield Centre	NO ₂	6	280	1 hour
Southampton Centre	NO ₂	3	300	1 hour
Wirral Tranmere	NO ₂	4	250	1 hour

4 Site Specific Issues

In this section, we now discuss in turn specific site issues for sites in the following geographic groupings – London, England (except London), Scotland, N. Ireland and Wales. Note that where analysts were commissioned during the period, the stated data capture for these instruments is calculated from the date of commissioning.

4.1 London

4.1.1 Data Capture

The data capture for sites in London (within the M25) for the period October-December 2010 is given in Table 4.1:

Table 4.1: Data capture for London: October-December 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
England							
Camden Kerbside	-	90.8	71.7	62.9	-	-	75.1
Haringey Roadside	-	90.8	98.1	98.3	-	-	95.7
London Bexley	98.8	-	98.8	98.9	-	95.4	98.0
London Bloomsbury	93.8	99.5	99.7	99.6	99.9	99.9	98.7
London Cromwell Road 2	99.4	-	-	99.3	-	99.3	99.3
London Eltham	-	-	68.4	96.1	99.3	-	87.9
London Haringey	-	-	-	98.4	99.6	-	99.0
London Harlington	-	99.4	99.2	98.5	96.5	-	98.4
London Harrow Stanmore	-	-	81.9	-	-	-	81.9
London Hillingdon	-	-	-	99.9	99.9	-	99.9
London Marylebone Road	99.2	94.9	86.1	96.3	95.8	98.1	95.0
London Marylebone	-	93.5	87.0	-	-	-	90.2

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Road PARTISOL							
London N. Kensington	99.4	97.2	94.3	99.3	99.0	99.5	98.1
London N. Kensington PARTISOL	-	98.9	96.7	-	-	-	97.8
London Teddington	-	-	65.4	57.1	56.4	-	59.6
London Westminster	98.6	-	98.9	97.9	98.6	97.5	98.3
Tower Hamlets Roadside	85.7	-	-	97.6	-	-	91.7
Number of sites	7	8	13	14	9	6	17
Number of sites < 90%	1	0	6	2	1	0	4
Mean (%)	96.4	95.6	88.2	92.9	93.9	98.3	92.0

Shaded boxes are for data capture < 90%

Bold data captures are for data that are provisional and subject to further quality control

4.1.2 Site Specific Issues

Camden Kerbside

The NO_x analyser developed several faults during the quarter resulting in it being removed for repair. data quality was poor following reinstallation and significant quantities of data were deleted. In addition, power cuts caused instability of both FDMS units resulting in further data loss.

London Eltham

A recurring software problem on the PM_{2.5} FDMS resulted in the loss of several periods of data.

London Marylebone Road PM_{2.5} Partisol

As reported in the October-December 2009 QA/QC report, anomalous results from the PM_{2.5} Partisol prompted a detailed investigation into the analyser performance in April 2010. A full description of the investigation is given in Section 11.

London Teddington

The NO_x and O₃ instruments were replaced at Teddington on 15/16th November. Several faults with these resulted in the loss of data.

4.2 England (excluding London)

4.2.1 Data Capture

The data capture for sites in England for the period October-December 2010 is given in Table 4.2:

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
England							
Barnsley 12	-	-	-	-	-	99.5	99.5
Barnsley Gawber	-	-	-	93.4	93.1	95.6	94.0
Bath Roadside	-	-	-	99.2	-	-	99.2
Billingham	-	-	-	95.6	-	-	95.6
Birmingham Tyburn	-	99.3	99.3	99.6	99.5	99.6	99.5
Birmingham Tyburn Roadside	-	0.0	0.0	99.7	100.0	-	49.9
Blackburn Darwen Roadside	-	-	-	99.7	-	-	99.7

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Blackpool Marton	-	-	0.0	0.0	0.0	-	0.0
Bottesford	-	-	-	-	99.5	-	99.5
Bournemouth	-	-	96.7	99.9	69.6	-	88.7
Brighton Preston Park	-	-	84.8	99.8	99.9	-	94.8
Bristol Old Market	96.4	-	-	96.0	-	-	96.2
Bristol St Paul's	99.7	98.6	99.2	99.7	99.9	99.9	99.5
Bury Roadside	99.5	99.7	98.8	99.7	-	-	99.4
Cambridge Roadside	-	-	-	98.6	-	-	98.6
Canterbury	-	-	-	99.7	-	-	99.7
Carlisle Roadside	-	92.3	92.0	95.3	-	-	93.2
Charlton Mackrell	-	-	-	99.9	99.6	-	99.8
Chatham Centre Roadside	-	99.6	92.9	99.7	-	-	97.4
Chesterfield	-	96.2	81.3	97.6	-	-	91.7
Chesterfield Roadside	-	0.0	66.2	94.3	-	-	53.5
Coventry Memorial Park	-	-	99.4	99.8	99.5	-	99.6
Eastbourne	-	40.3	76.1	0.0	-	-	38.8
Exeter Roadside	-	-	-	99.6	99.7	-	99.7
Glazebury	-	-	-	98.8	99.0	-	98.9
Great Dun Fell	-	-	-	-	97.1	-	97.1
Harwell	-	57.2	99.5	99.6	99.9	99.9	91.2
Harwell PARTISOL	-	93.5	95.7	-	-	-	94.6
High Muffles	-	-	-	99.4	99.5	-	99.5
Horley	-	-	-	96.3	-	-	96.3
Hull Freetown	99.9	99.7	95.4	95.6	98.8	99.8	98.2
Ladybower	-	-	-	96.4	90.7	82.3	89.8
Leamington Spa	-	97.7	98.2	99.3	98.8	94.4	97.7
Leeds Centre	99.8	98.7	99.5	95.6	99.6	99.7	98.8
Leeds Headingley Kerbside	-	99.6	99.5	99.6	-	-	99.6
Leicester Centre	99.8	99.1	91.7	86.6	89.0	99.9	94.3
Leominster	-	-	-	98.3	99.5	96.0	97.9
Liverpool Queen's Drive Roadside	-	-	-	99.8	-	-	99.8
Liverpool Speke	96.2	92.1	96.0	99.8	99.7	96.5	96.7
Lullington Heath	-	-	-	99.5	85.4	99.7	94.9
Manchester Piccadilly	-	-	39.9	95.5	99.2	79.8	78.6
Manchester South	-	-	-	99.9	99.9	-	99.9
Market Harborough	-	-	-	95.1	99.3	-	97.2
Middlesbrough	99.8	96.6	99.3	99.5	94.7	99.7	98.3
Newcastle Centre	99.7	99.5	93.7	99.9	99.8	99.9	98.8
Newcastle Cradlewell Roadside	-	-	-	97.3	-	-	97.3
Northampton	-	-	91.3	99.8	99.9	97.6	97.2
Norwich Lakenfields	-	31.3	99.6	95.5	99.8	92.3	83.7
Nottingham Centre	-	95.8	98.5	99.8	98.6	99.8	98.5
Oxford Centre Roadside	-	-	-	88.0	-	-	88.0
Oxford St Ebbes	-	96.8	98.4	99.8	-	-	98.3
Plymouth Centre	-	2.6	90.5	95.2	99.6	-	72.0
Portsmouth	-	0.0	99.7	99.8	99.9	-	74.9
Preston	-	-	99.3	95.5	98.5	-	97.8
Reading New Town	-	63.8	63.4	95.5	99.4	-	80.5
Rochester Stoke	-	0.0	98.8	98.7	99.2	98.7	79.1
Salford Eccles	98.1	96.8	82.1	97.6	97.9	26.0	83.1
Sandwell West Bromwich	-	-	-	99.8	99.9	99.9	99.8
Sandy Roadside	-	95.3	15.7	99.3	-	-	70.1

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Scunthorpe Town	-	99.8	-	99.2	-	65.4	88.1
Sheffield Centre	99.9	99.5	98.9	95.5	99.7	99.7	98.9
Sheffield Tinsley	-	-	-	99.8	-	-	99.8
Sibton	-	-	-	-	100.0	-	100.0
Southampton Centre	79.2	90.8	99.4	89.3	97.6	93.5	91.6
Southend-on-Sea	-	-	99.5	95.6	99.8	-	98.3
St Osyth	-	-	-	98.9	99.7	-	99.3
Stanford-le-Hope Roadside	-	95.2	95.2	99.6	-	95.5	96.4
Stockton-on-Tees Eaglescliffe	-	99.4	95.8	99.8	-	-	98.3
Stoke-on-Trent Centre	-	91.0	97.6	97.1	98.3	-	96.0
Storrington Roadside	-	99.0	95.9	99.5	-	-	98.1
Sunderland Silksworth	-	-	99.8	92.7	92.9	63.9	87.3
Thurrock	-	89.9	-	45.0	82.2	95.7	78.2
Warrington	-	99.5	97.8	98.8	-	-	98.7
Weybourne	-	-	-	-	99.8	-	99.8
Wicken Fen	-	-	-	99.1	99.1	83.9	94.0
Wigan Centre	-	-	98.6	99.8	99.8	-	99.4
Wirral Tranmere	-	-	82.3	95.7	99.3	-	92.4
Yarner Wood	-	-	-	94.8	100.0	-	97.4
York Bootham	-	86.2	93.6	-	-	-	89.9
York Fishergate	-	99.9	-	99.8	-	-	99.8
Number of sites	12	39	47	73	51	29	80
Number of sites < 90%	1	11	11	6	5	6	19
Mean (%)	97.3	79.3	86.9	94.3	95.5	91.5	91.6

Shaded boxes are for data capture < 90%

Bold data captures are for data that are provisional and subject to further quality control

4.2.2 Site Specific Issues

Birmingham Tyburn Roadside

Measured concentrations of both PM_{2.5} and PM₁₀ are significantly lower than the nearby Tyburn background site. All data for 2010 have been deleted-see section 11.

Blackpool Marton

The site remained closed during the quarter whilst repairs to the hut infrastructure were carried out. Monitoring restarted on 14 January 2011.

Chesterfield Roadside

PM₁₀ data from this site has been persistently lower than the Chesterfield site. All data have been deleted back to June 2009. Full details are given in section 11.

Eastbourne

The PM₁₀ dryer was found to be full of water at the audit in August. Since new dryer fitted in August the volatile fraction has remained high with the PM₁₀ concentrations lower than previously recorded at the start of this site. Further investigation was carried out in October. In addition, the NO₂ analyser was sampling internally up to the QA/QC audit on 8 February 2011.

Harwell

The PM₁₀ FDMS unit suffered various flow and valve problems resulting in loss of significant quantities of data.

Manchester Piccadilly

Air conditioning problems during the second half of 2010 resulted in temperature faults in the PM_{2.5} FDMS.

Norwich Lakenfields

An engineer attended site to replace the shuttle valve seals on 6 October. As a result of negative volatile data being recorded, an engineer attended site again on 8 December. The PM₁₀ shuttle valve seals were found to be damaged, and the seal on the chiller was of the wrong type.

Plymouth

Low PM₁₀ volatile concentrations were recorded following the service in August 2010. All PM₁₀ data have been deleted up to the engineer's visit on 29 December, when the sensor units were swapped.

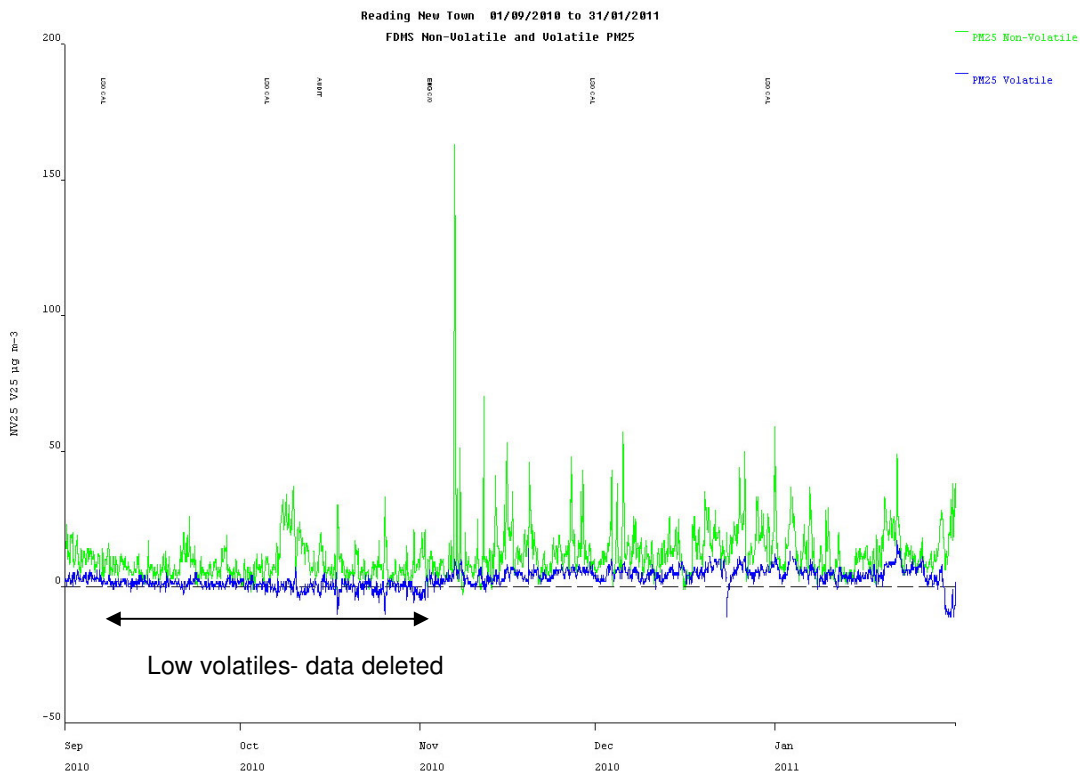
Portsmouth

A suspected FDMS dryer failure caused elevated PM₁₀ concentrations; data for the quarter have been deleted. A replacement analyser was installed in April 2011.

Reading New Town

The volatile component for both PM₁₀ and PM_{2.5} were consistently negative following an LSO visit in early October up to an engineer callout on 2 November, where both reference filter seals were replaced. Data from both instruments have been deleted from 5 October to 2 November. The negative volatile concentration is shown (for PM10) in Figure 4.1

Figure 4.1 Reading New Town PM₁₀



Rochester Stoke

The site closed in early November 2009 due to a water leak in the cabin. A replacement cabin has been purchased by the LSO, and the site restarted in early June 2010, although problems with some analysers persist. The PM₁₀ data have all been deleted up to the end of December due to persistent poor quality data.

Salford Eccles

A fault with the UV lamp and detector resulted in the deletion of SO₂ data from 25 October 2010 up to repair on 17 January 2011.

Sandy Roadside

The PM_{2.5} concentrations have been consistently higher than the PM₁₀ following LSO calibration on 5 November. PM_{2.5} data have been deleted into 2011. No information on the nature of the fault has been received, and repairs have been delayed by access problems. The fault persists into Q1 2011.

Thurrock

The NO₂ analyser suffered erratic and low response from the calibration on 11 November and was ultimately removed for repair; data have been deleted up to repair in January.

Walsall Willenhall

The Walsall Willenhall site was destroyed by fire on 3 February 2010. Work on commissioning a replacement site is under way.

4.3 Scotland

4.3.1 Data Capture

The data capture for sites in Scotland for the period October-December 2010 is given in Table 4.3.

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Scotland							
Aberdeen	-	99.3	26.0	54.6	69.2	-	62.3
Aberdeen Union Street Roadside	-	-	-	87.6	-	-	87.6
Auchencorth Moss	-	97.8	81.5	-	100.0	-	93.1
Auchencorth Moss PM ₁₀ PM ₂₅ (FDMS)	-	92.3	97.0	-	-	-	94.6
Bush Estate	-	-	-	99.9	99.9	-	99.9
Dumbarton Roadside	-	-	-	99.8	-	-	99.8
Dumfries	-	-	-	99.8	-	-	99.8
Edinburgh St Leonards	99.8	100.0	99.4	99.6	99.8	99.5	99.7
Eskdalemuir	-	-	-	99.8	99.9	-	99.8
Fort William	-	-	-	98.6	98.8	-	98.7
Glasgow Centre	99.7	99.1	98.5	95.5	99.7	99.9	98.7
Glasgow City Chambers	-	-	-	91.6	-	-	91.6
Glasgow Kerbside	-	94.2	99.1	99.5	-	-	97.6
Grangemouth	-	99.9	99.6	99.7	-	99.7	99.7
Grangemouth Moray	-	-	-	99.6	-	-	99.6
Inverness	-	87.0	83.7	99.8	-	-	90.2
Lerwick	-	-	-	-	100.0	-	100.0
Peebles	-	-	-	99.3	91.4	-	95.4
Strath Vaich	-	-	-	-	99.7	-	99.7
Number of sites	2	8	8	15	10	3	19
Number of sites < 90%	0	1	3	2	1	0	
Mean (%)	99.8	96.2	85.6	95.0	95.8	99.7	95.1

Shaded boxes are for data capture < 90%

Bold data captures are for data that are provisional and subject to further quality control

4.3.2 Site Specific Issues

Aberdeen

The NO_x analyser was damaged by water ingress on 22 September; 50 days data were lost. A damaged v-seal on the PM_{2.5} FDMS caused unstable data, resulting in considerable data loss.

Aberdeen Union Street Roadside

A NO_x converter fault resulted in the loss of 22 days data whilst the analyser was removed for repair.

4.4 Wales

4.4.1 Data Capture

The data capture for sites in Wales for the period October-December 2010 is given in Table 4.4.

Table 4.4 Data Capture for Wales, October-December 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Wales							
Aston Hill	-	-	-	99.8	99.5	-	99.7
Cardiff Centre	99.8	9.7	85.8	95.6	99.6	99.9	81.7
Chepstow A48	-	19.7	99.5	99.7	-	-	73.0
Cwmbran	-	-	-	99.8	99.9	-	99.8
Mold	-	-	-	94.7	89.6	-	92.1
Narberth	-	74.0	-	94.6	98.7	98.7	91.5
Newport	-	0.0	99.0	99.7	-	-	66.2
Port Talbot Margam	99.2	55.4	99.7	99.6	99.4	99.5	92.1
Port Talbot Margam PM ₁₀ PM _{2.5} (Partisol)	-	98.9	-	-	-	-	98.9
Swansea Roadside	-	99.5	87.8	99.9	-	-	95.7
Wrexham	-	100.0	85.9	90.0	-	99.5	93.8
Number of sites	2	8	6	10	6	4	11
Number of sites < 90%	0	5	3	1	1	0	
Network Mean (%)	99.5	57.2	92.9	97.3	97.8	99.4	89.5

Shaded boxes are for data capture < 90%

Bold data captures are for data that are provisional and subject to further quality control

4.4.2 Site Specific Issues

Cardiff Centre

Following a power cut on 24 May, the performance of both FDMS units was poor. The PM₁₀ analyser ultimately had to be removed for workshop repair; 212 days PM₁₀ were lost in total. The fault was rectified on 22 December, when the PM₁₀ and PM_{2.5} analysers were swapped.

Chepstow A48

The PM₁₀ data from Chepstow has been unreliable and often below the PM_{2.5} concentrations. Much of the data have been deleted; the problem continues into Q1 2011.

Newport

The PM₁₀ data were noisy from 1 May to the service on 3 August, when the dryer was replaced. This improved the data only briefly, and further data from 7 August to 25 October have been deleted.

Port Talbot Margam

As reported in the April-June report, careful inspection of the Port Talbot Margam particulate data, it was noticed that the PM₁₀ appeared to have a positive offset from around 20 May. A cooler failure was diagnosed, but following repair, the data was still suspect. A possible mass transducer fault has been suggested. Data from the PM₁₀ FDMS have been deleted from 20 May to the replacement of the analyser on 22 November.

4.5 Northern Ireland (including Mace Head)

4.5.1 Data Capture

The data capture for sites in Northern Ireland (including Mace Head) for the period October-December 2010 is given in Table 4.5.

Table 4.5 Data Capture for Ireland, October-December 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
N Ireland							
Armagh Roadside	-	99.1	-	96.9	-	-	98.0
Ballymena	-	-	-	-	-	100.0	100.0
Belfast Centre	99.7	99.0	99.5	99.3	99.9	99.8	99.5
Derry	-	75.8	99.3	99.9	100.0	91.6	93.3
Lough Navar	-	40.7	-	-	99.6	-	70.1
Ireland							
Mace Head	-	-	-	-	100.0	-	100.0
Number of sites	1	4	2	3	3	3	6
Number of sites < 90%	0	2	0	0	0	0	
Network Mean (%)	99.7	78.6	99.4	98.7	99.8	97.1	93.5

Shaded boxes are for data capture < 90%

Bold data captures are for data that are provisional and subject to further quality control

4.5.2 Site Specific Issues

Lough Navar

Low volatile PM₁₀ concentrations were recorded in November into December; these have been deleted.

4.6 Overall Data Capture

Overall data capture for each pollutant across the network for the quarter is given in Table 4.6

Table 4.6: Data Capture by Pollutant, Entire Network

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Total sites
Number of sites	24	67	76	115	80	45	133
Number of sites < 90%	2	19	23	11	7	6	29
Network Mean (%)	97.5	80.6	87.8	94.6	95.9	94.0	92.1

Shaded boxes are for data capture < 90%

Note that data capture is calculated for the whole month for each pollutant (except for new sites, which are from the start date), so additional analysers installed during the period will have reduced data captures quoted.

Part B: Annual Review 2010

5 Introduction

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

Recommendations for equipment and site upgrades and replacements have also been made. A list of the reports for 2010 is given in Table 5.1.

Table 5.1 QA/QC Data Ratification and Intercalibration Reports, 2010

	Type	Report Title	Reference
1	Ratification and Intercalibration	QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network, January-March 2010	AEAT/ENV/R/3049
2	Ratification	QA/QC Data Ratification Report for the Automatic Urban and Rural Network, April-June 2010	AEAT/ENV/R/3082
3	Ratification and Intercalibration	QA/QC Data Ratification and Intercalibration Report for the Automatic Urban and Rural Network July-September 2010	AEAT/ENV/R/3123
4	Ratification and Annual Review	QA/QC Data Ratification Report for the Automatic Urban and Rural Network October-December 2010 and Annual Review for 2010	AEAT/ENV/R/3168

All reports are available on the UK Air Information Resource website (<http://uk-air.defra.gov.uk/>).

Data are routinely ratified on a 3-monthly basis. It should however be noted that there are occasionally circumstances where data which have been flagged as "Ratified" could be subject to further revision. This may be for example where:

- A QA/QC audit has detected a problem which affects data back into an earlier ratification period.
- Long-term analysis has detected an anomaly between expected and measured trends which requires further investigation and possible data correction. This was the case with 2000 –2008 gravimetric particulate monitoring data in the UK national network.
- Further research comes to light which indicates that new or tighter QA/QC criteria are required to meet the data quality objectives. This may require review and revision of historical data by applying the new criteria.

In addition, site issues found during one quarter may affect data from previous quarters, and it may be necessary on occasions to delete data which have already been reported as ratified. A list of these occurrences is given in each QA/QC report and also on the air quality archive.

6 Changes to network during 2010

Table: 6.1 Additional Analysers installed for Directive Compliance from 1 Jan 2010

Site	Pollutant	Date started
Chepstow A48	PM _{2.5}	09/02/10
Port Talbot Margam PM _{2.5} PM ₁₀	PM _{2.5}	19/02/10
Saltash Roadside	PM _{2.5}	23/02/10

The Saltash Roadside site was closed on 31 August and a new location is being sought. Brighton Roadside was closed on 31 March due to redevelopment work in the building.

The rural CO analysers at St Osyth and Market Harborough were discontinued from 31 Dec 2009. The Partisol at Port Talbot Margam was converted from PM_{2.5} to PM₁₀ on 18 February 2010. This is not strictly necessary for compliance, as the site also has an FDMS instrument for PM₁₀.

Table 6.2: Sites Added to the AURN during 2010

	Pollutants	Date started
Ballymena	SO ₂	01/01/10
Eastbourne	NO ₂ PM _{2.5} PM ₁₀	01/01/10 (NO ₂ in 2011)
Storrington Roadside	PM _{2.5} PM ₁₀	01/01/10
Chatham Centre Roadside	NO ₂ PM _{2.5} PM ₁₀	01/07/10
Dumbarton Roadside	NO ₂	01/09/10

The PM_{2.5} Partisol at Inverness has been affiliated into the network backdated to 1 June 2008. In addition, several existing sites have had additional PM_{2.5} analysers installed to ensure compliance.

7 Network Intercalibrations

Two complete network intercomparisons were carried out at 6-monthly intervals during 2010. These are an important part of the overall QA/QC programme for the AURN network. The purpose of these intercomparisons is to determine the network measurement accuracy, consistency and intercomparability across the entire network. The latest exercise covered 127 sites plus any co-located Partisols. The procedures used, and a summary of the results obtained, are provided in the January-March and July-September QA/QC reports.

A summary of the number of analysers in the network found to be providing provisional data outwith the defined accuracy limits (the "outlier" sites) is given in Figure 7.1. A full definition of what constitutes an outlier site for the different pollutants is given in the appropriate Quarterly Reports. Note also that, for the vast majority of these outlier sites, the data will have been fully corrected as part of the subsequent data ratification process.

Figure 7.1 Outliers identified during 2010 intercalibration exercises.

Analyser	Winter 2010 intercalibration			Summer 2010 intercalibration		
	Number of outliers	Number in network	% outliers in total	Number of outliers	Number in network	% outliers in total
NOx analyser	37	115	33%	25	115	22%
CO analyser	3	26	12%	2	26	8%
SO ₂ analyser	10	43	23%	7	43	16%
Ozone analyser	13	81	17%	14	81	17%
TEOM and BAM analysers	2 k ₀ , 11 flow	4 TEOM PM ₁₀ 53 FDMS PM ₁₀ 1 BAM PM ₁₀ 0 TEOM PM _{2.5} 63 FDMS PM _{2.5} 1 BAM PM _{2.5}	11%	1 k ₀ , 5 flow	4 TEOM PM ₁₀ 54 FDMS PM ₁₀ 1 BAM PM ₁₀ 0 TEOM PM _{2.5} 68 FDMS PM _{2.5} 1 BAM PM _{2.5}	3%
Gravimetric PM analysers	1	8 PM ₁₀ 9 PM _{2.5}	6%	3	8 PM ₁₀ 9 PM _{2.5}	0%
Total	77	406	19%	57	410	14%

The overall fraction of outliers has remained dropped slightly during 2010.

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

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

In addition to the network intercalibrations, the QA/QC Unit carries out pre-commissioning audits on new sites and analysers introduced to the network. Although these audits are not included in the summary above, these provide a vital role in ensuring the overall data quality; data are not disseminated from new sites or analysers until a satisfactory performance has been verified by the QA/QC Unit. The installation timetable for FDMS PM₁₀ and PM_{2.5} analysers, and new CEN-compliant gas analysers has meant the QA/QC Unit has had to make numerous replicate visits to sites to ensure data may be disseminated in time for Directive Compliance, for example.

8 ESU, CMCU, LSO and QA/QC Meetings

During 2010, the QA/QC Unit continued to liaise closely with the ESUs to ensure optimal performance of the network through service and maintenance arrangements. The QA/QC Unit have provided the ESUs with spreadsheets to calculate various analyser performance parameters (eg converter efficiency, linearity) in line with the CEN requirements; ESUs have been requested to integrate the principles into their routine site tests.

All parties were in agreement that work undertaken by the ESUs is a vitally important part of the overall data quality management process for the network, and it is planned to repeat the meetings at regular intervals. Regular meetings between Defra and the devolved administrations, CMCU and the QA/QC Unit have also been initiated.

The QA/QC Unit has attended and presented at the AURN LSO meeting, and presented network updates as appropriate. These presentations are available on the AURN Hub.

The QA/QC Unit has continued to provide ESUs with ozone photometer calibrations prior to the start of each 6-monthly service schedule. In addition, weighed TEOM filters have been supplied to ESUs as required, to enable reliable Ko measurements to be made.

9 TEOM Upgrades to FDMS and Installation of new FDMS

The initial upgrade programme for TEOMs has been completed, and there are now 126 operational FDMS analysers, of which 66 (as at April 2010) are configured for PM_{2.5}. The Armagh Roadside TEOM was upgraded to FDMS on 3 September 2010, but suffered a fault until 30 September. The York Fishergate TEOMs were upgraded in 2011.

The ESUs have been instructed to ensure that all FDMS units are fitted with B type dryers, and a programme of replacement of the less satisfactory C types has been completed. The B type dryer is currently the only dryer which has demonstrated equivalence with the reference (gravimetric) method.

There has been significant discussion and debate on problems encountered during commissioning and operation of FDMS analysers. The QA/QC Unit has gratefully received valuable input from the Management Units, ESUs, the manufacturer and from INERIS in France, amongst others.

10 Network Data Capture

The overall network data capture for 2010 was 88.5%, which is just below the 90% target level. However, not all sites achieved >90% and a table of data capture for the 55 sites with less than 90% capture is given in Table 10.1.

Table 10.1 Sites with Annual Average Data Capture Below 90% for 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
England							
Birmingham Tyburn Roadside	-	0.0	0.0	98.6	97.6	-	49.1
Blackburn Darwen Roadside	-	-	-	83.6	-	-	83.6
Blackpool Marton	-	-	16.1	16.1	16.1	-	16.1
Bournemouth	-	-	69.0	99.2	91.6	-	86.6
Brighton Preston Park	-	-	61.1	89.4	95.3	-	81.9
Bristol Old Market	97.8	-	-	77.0	-	-	87.4
Bury Roadside	60.8	97.9	93.0	99.1	-	-	87.7
Camden Kerbside	-	86.8	62.4	82.9	-	-	77.4
Charlton Mackrell	-	-	-	53.8	99.0	-	76.4
Chesterfield Roadside	-	0.0	89.0	96.1	-	-	61.7

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Eastbourne	-	49.7	93.5	0.0	-	-	47.7
Exeter Roadside	-	-	-	96.7	71.8	-	84.3
Great Dun Fell	-	-	-	-	79.9	-	79.9
Harwell PARTISOL	-	80.3	89.9	-	-	-	85.1
Leeds Headingley Kerbside	-	64.9	85.4	98.5	-	-	82.9
Leicester Centre	98.6	76.9	66.3	80.6	84.8	84.4	81.9
Leominster	-	-	-	83.1	92.0	79.8	85.0
London Cromwell Road 2	68.7	-	-	68.9	-	68.9	68.8
London Haringey	-	-	-	98.9	76.4	-	87.7
London Harlington	-	81.6	75.2	90.8	97.0	-	86.1
London Harrow Stanmore	-	-	87.7	-	-	-	87.7
London Marylebone Road	95.7	92.7	58.2	97.3	94.2	92.3	88.4
London Marylebone Road PARTISOL	-	81.6	27.9	-	-	-	54.8
London N. Kensington	97.5	65.4	92.6	90.8	87.6	93.6	87.9
London Teddington	-	-	76.7	77.8	83.1	-	79.2
Lullington Heath	-	-	-	96.5	28.0	97.2	73.9
Manchester Piccadilly	-	-	25.9	95.4	97.1	92.2	77.7
Plymouth Centre	-	60.6	94.3	94.9	90.9	-	85.2
Portsmouth	-	41.9	74.8	98.0	99.0	-	78.4
Preston	-	-	93.1	74.4	97.0	-	88.2
Reading New Town	-	74.0	81.2	72.4	99.0	-	81.6
Rochester Stoke	-	0.0	54.2	33.2	55.8	43.8	37.4
Saltash Roadside	-	92.1	85.5	-	-	-	88.8
Sandy Roadside	-	86.5	76.6	95.9	-	-	86.3
Scunthorpe Town	-	83.3	-	96.7	-	85.3	88.4

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Southampton Centre	80.1	80.8	75.3	79.0	85.2	85.1	80.9
Southend-on-Sea	-	-	98.1	49.0	85.3	-	77.5
Stanford-le-Hope Roadside	-	89.2	55.4	97.4	-	85.3	81.8
Warrington	-	55.7	96.2	99.0	-	-	83.6
Ireland							
N Ireland							
Armagh Roadside	-	91.6	-	87.4	-	-	89.5
Ballymena	-	-	-	-	-	89.9	89.9
Derry	-	72.8	59.7	99.2	85.6	94.9	82.4
Lough Navar	-	76.8	-	-	99.6	-	88.2
Scotland							
Aberdeen	-	91.5	80.0	71.6	90.3	-	83.3
Aberdeen Union Street Roadside	-	-	-	78.9	-	-	78.9
Auchencorth Moss PM ₁₀ PM ₂₅ (FDMS)	-	68.7	70.0	-	-	-	69.4
Glasgow Centre	98.6	25.9	99.0	97.7	98.7	98.8	86.5
Inverness	-	88.2	88.8	88.8	-	-	88.6
Wales							
Cardiff Centre	98.6	40.9	84.8	95.5	97.6	98.6	86.0
Chepstow A48	-	72.4	71.8	98.5	-	-	80.9
Mold	-	-	-	30.5	97.2	-	63.9
Narberth	-	49.9	-	94.6	96.6	80.6	80.4
Newport	-	17.2	79.9	95.9	-	-	64.3
Port Talbot Margam	96.0	50.5	94.9	96.2	95.9	95.8	88.2
Port Talbot Margam PM ₁₀ PM _{2.5} (PM ₁₀ Partisol)	-	95.3	71.4	-	-	-	83.3

Numbers in bold indicate some or all data remain provisional pending further investigation

A summary of data capture by pollutant for the year 2010 is given in Table 10.2

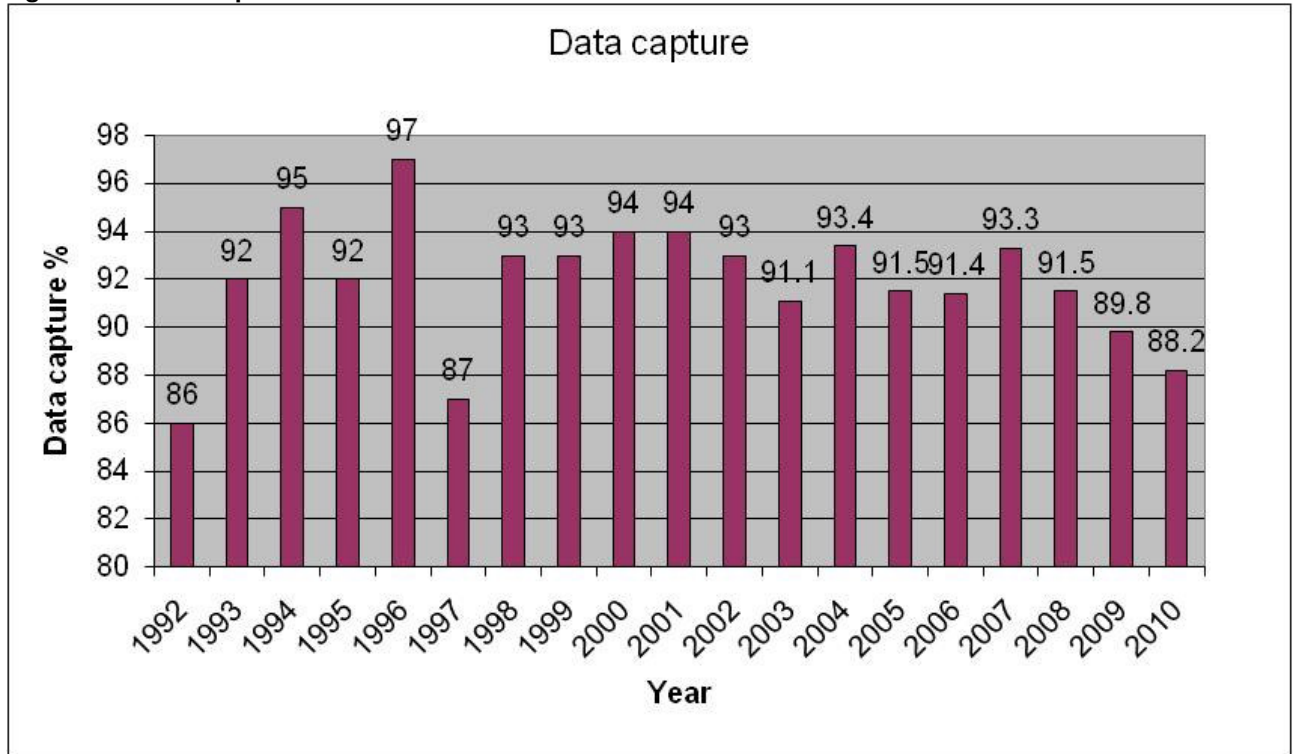
Table 10.2 Summary of data capture by pollutant, 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Total
Number of sites	24	68	78	117	80	45	136
Number of sites < 90%	5	42	40	26	15	12	55
Network Mean (%)	92.7	77.7	82.6	90.5	92.7	92.1	88.5

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

The network annual average data capture of 88.5% is lower than the previous year. The performance has been affected this year by long-term problems with analysers, mainly FDMS. Figure 10.1 shows the annual network data capture since the start of the AURN in 1992.

Figure 10.1 Data Capture 1992-2010



11 Significant Site Issues

A number of sites have been identified at which the analyser performance has been below expectation, and significant quantities have been deleted from previous quarters. These are discussed individually below. These data from previous quarters may have been reported as ratified.

11.1 Birmingham Tyburn Roadside

The sites at Birmingham Tyburn and Tyburn Roadside offer a good opportunity for comparison between roadside and background concentrations of both PM_{2.5} and PM₁₀. It can reasonably be expected that the PM₁₀ will be higher at the roadside site, but this was not the case for all of 2010 (PM₁₀) and most of 2009-10 (PM_{2.5}).

Figure 11.1 Birmingham Tyburn PM₁₀ 2010

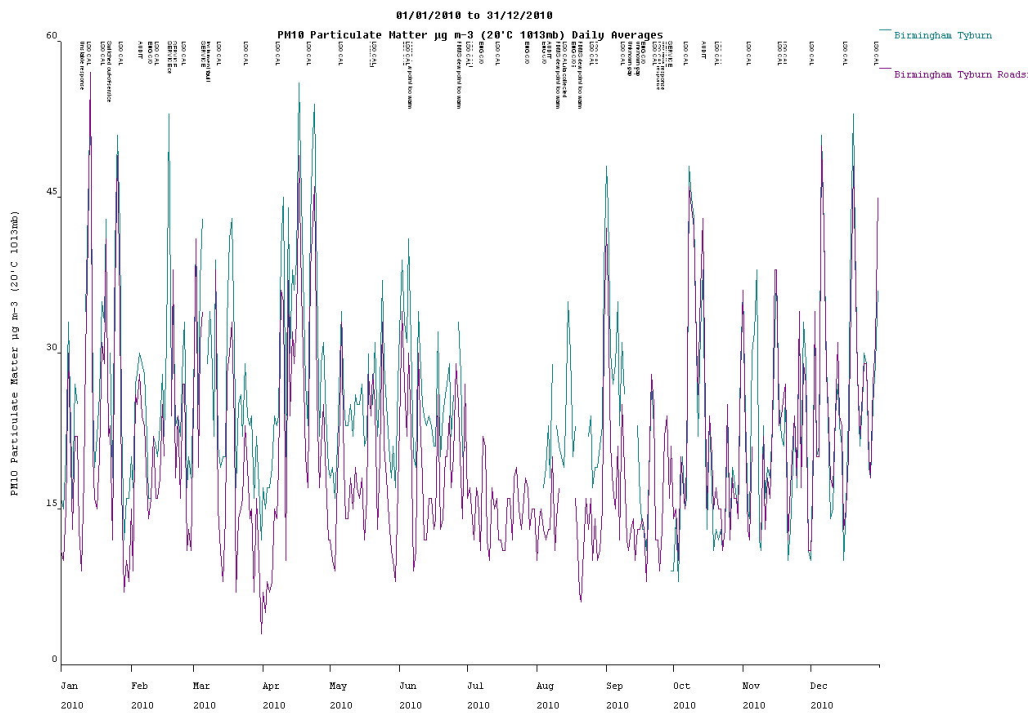
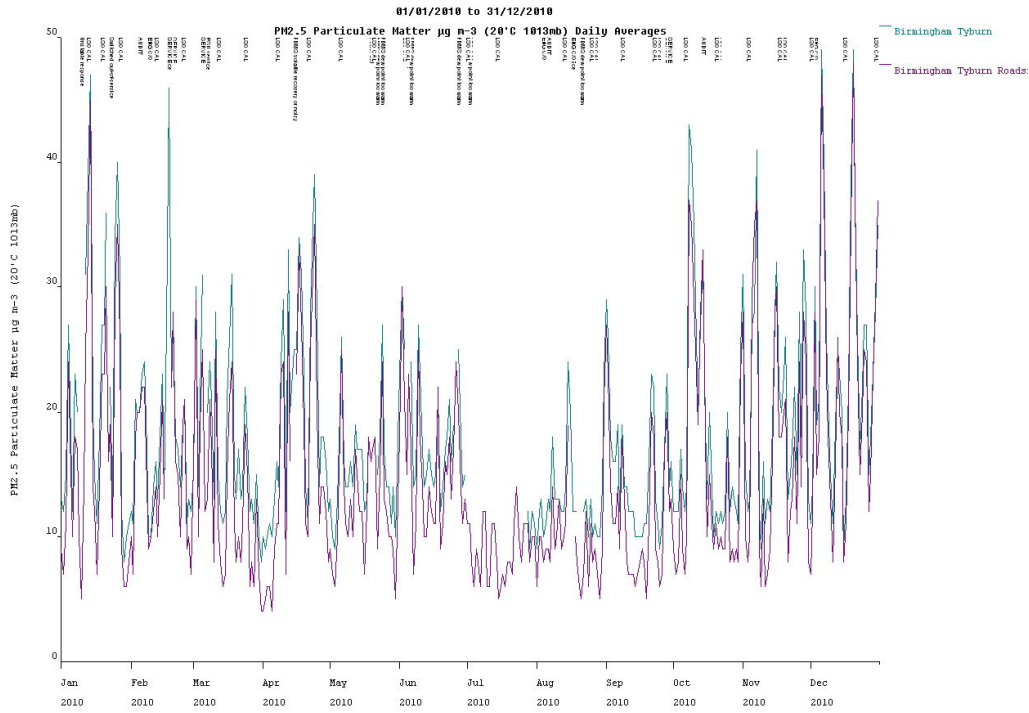


Figure 11.2 Birmingham Tyburn PM_{2.5} 2010



11.2 Chesterfield and Chesterfield Roadside

Again, analysis of the long term trends from these two closely located sites show that the PM₁₀ concentrations are anomalously low at the roadside site. The ESU had been called out several times during 2010 to investigate, but the problem persisted up to the end of 2010. The PM₁₀ data from Chesterfield Roadside have been deleted from June 2009 to December 2010.

Figure 11.3 Chesterfield volatile concentrations

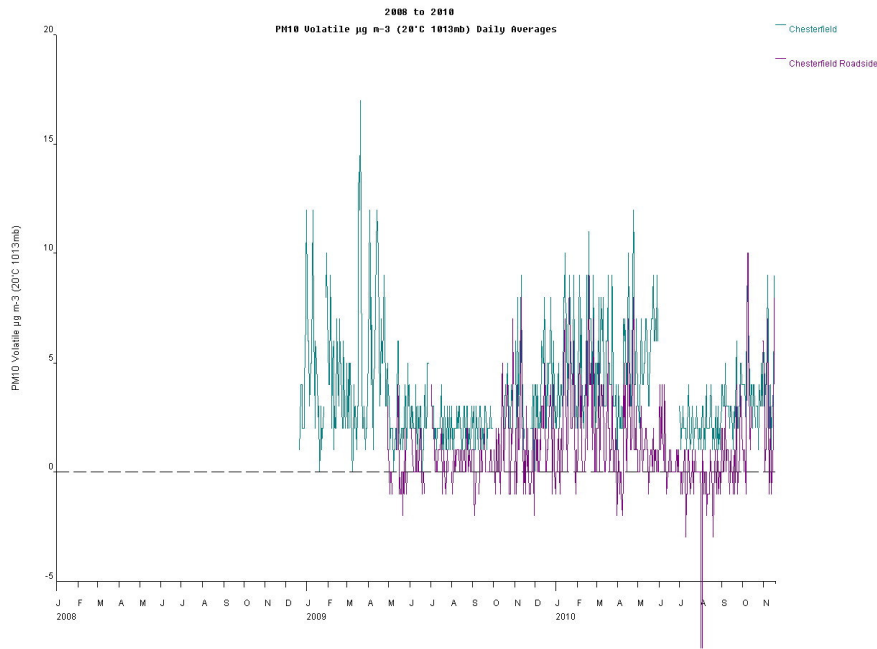
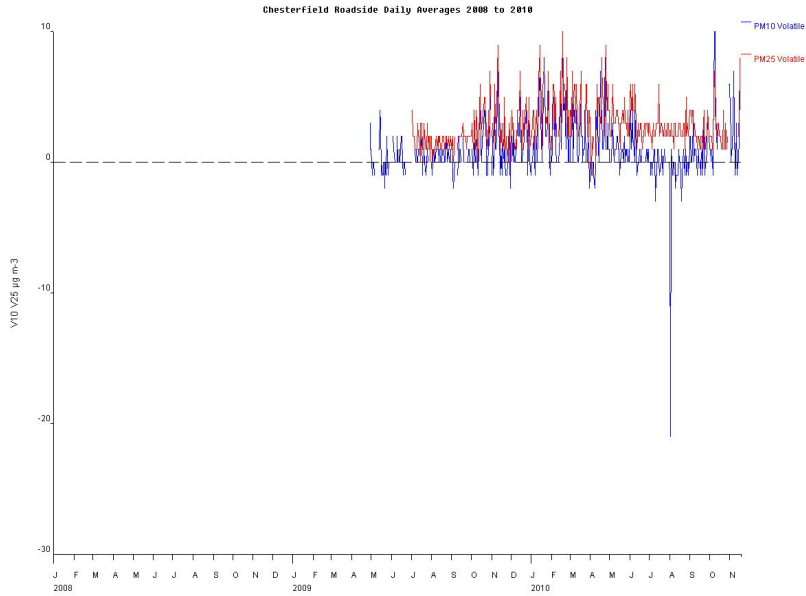


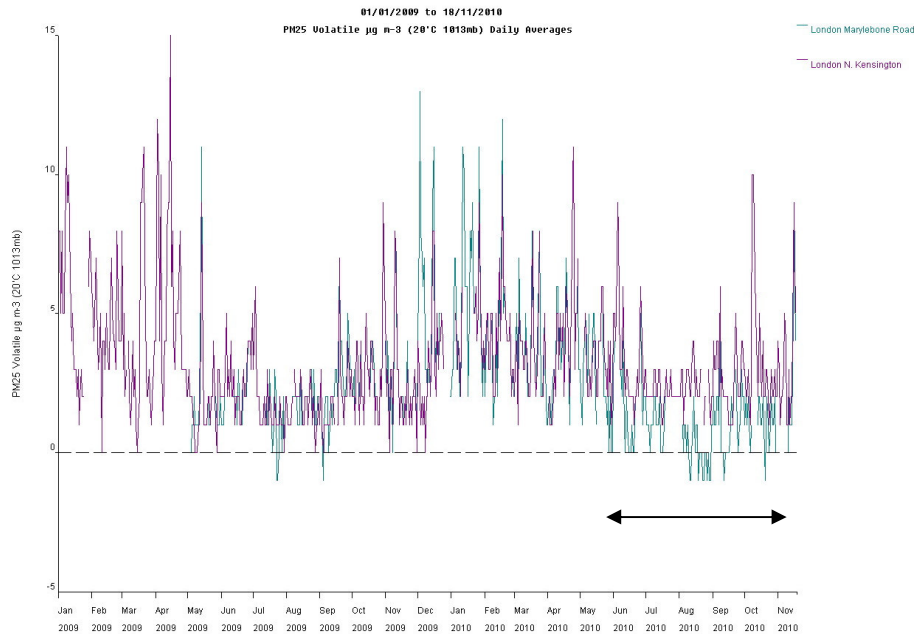
Figure 11.4 Chesterfield Roadside PM₁₀ and PM_{2.5} volatiles



11.3 London Marylebone Road

A comparison of the reference PM_{2.5} concentrations at Marylebone Road shows these to be noticeably lower than other local sites; data have been deleted from May up to a filter change in November.

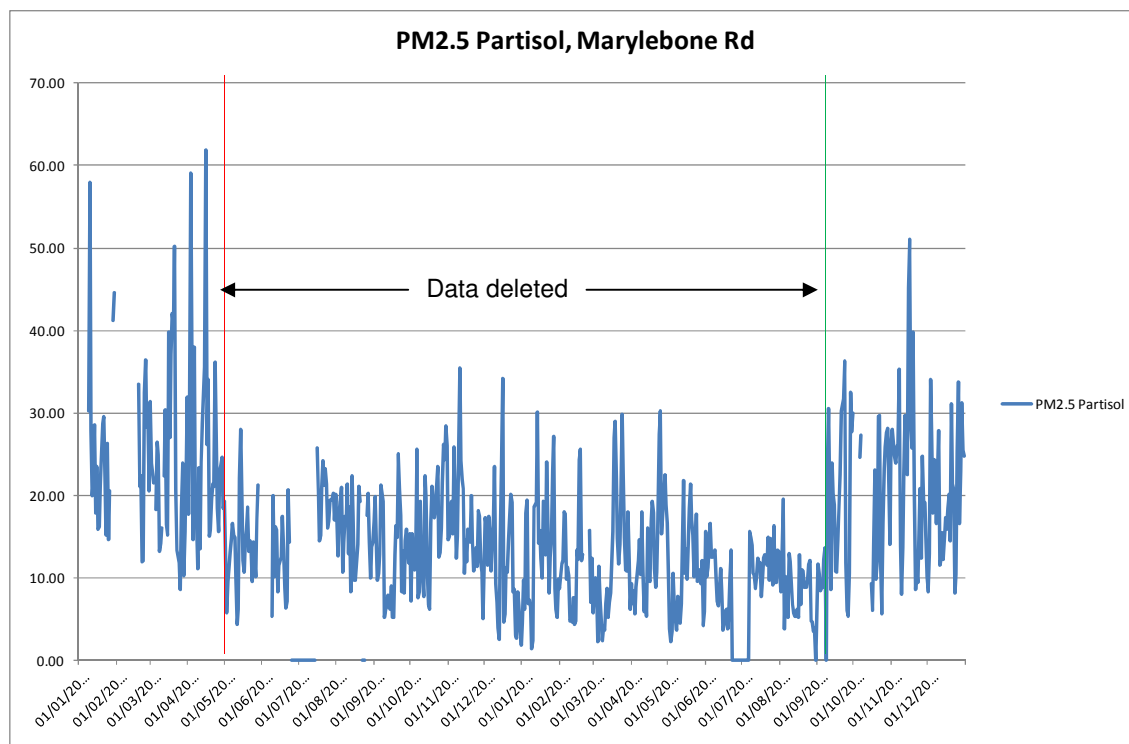
Figure 11.5 Marylebone Road PM_{2.5} volatile



11.4 London Marylebone Road PM_{2.5} Partisol

As previously reported, a tube between the sampling head and the filter on the PM_{2.5} Partisol was found to be missing at the QA/QC audit. As a result, the instrument was sampling internally with no size fractionation for this period. There is no clear record of when this may have been removed, but a comparison of data with the FDMS and TEOM data from the site suggest that it was in May 2009. As a result, all Partisol data from 2nd May 2009 to 8th Sep 2010 have been deleted. This can be seen in Figure 11.6.

Figure 11.6 Marylebone Road PM_{2.5} Partisol



11.5 Lullington Heath

The sample inlet was modified at the service in January 2010 to provide individual sample lines. It was later found that the ozone inlet was sampling air from inside the cabin; therefore all ozone data have been deleted from the service up to the winter audit in October.

11.6 Manchester Piccadilly

Although there is only a PM_{2.5} FDMS unit at Manchester Piccadilly, a comparison of measured concentrations at other local sites shows that the concentrations are too low. Data from the service in March to the end of December 2010 have been deleted.

11.7 Newport

The PM_{2.5} volatile concentrations are consistently higher than other sites in South Wales during the period July-October, and the PM_{2.5} data have been deleted.

11.8 Plymouth Centre

A step change in the volatile PM₁₀ fraction at Plymouth Centre was observed following the service in August up to an ESU callout at the end of December; the PM₁₀ data have been deleted for this period.

11.9 Port Talbot Margam

As reported in previous reports, the FDMS PM₁₀ data at Port Talbot has been regarded as of suspect quality up to replacement of the analyser in November; all data from mid May to November 2010 have been deleted.

11.10 Rochester Stoke

Following the replacement of the cabin in spring 2010, the PM₁₀ FDMS analyser has proved unreliable, and all PM₁₀ data for 2010 have been deleted. The instrument has been removed for remedial work by the ESU.

Appendices

Appendix 1: Recommendations for Upgrade or Replacement of Equipment

Appendix 2: Inventory of Defra-owned Equipment

Appendix 3: Partisol Data Report

Appendix 4: Information for New Sites

Appendix 1

Recommendations for Upgrade or Replacement of Equipment

As requested by Defra, QA/QC Unit has provided a list of suggestions for equipment that may need replacing or upgrading in the network. The following provides a summary of the outstanding issues to date since July 2005. Recommendations have been prioritised 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 January 2010	Priority	Action
30	All permanently pressurised cylinder calibration systems to be fitted with passivated stainless steel tubing	High	ESU
	Recommendations August 2008	Priority	Action
27	Many sites require modifications to permit safe roof access for measuring PM analyser flows	High	CMCU
	Recommendations January 2008	Priority	Action
25	It is recommended that LSOs continue to pay particular attention to the NO ₂ calibration results, to see whether the NO response is significantly higher (>10ppb) than that obtained for the zero calibration. These observations should be reported to CMCU as soon as possible	High	LSO
24	It is strongly recommended that ESUs clean all NOx analyser switching valves during servicing, and ensure the valve is leak checked afterwards.	High	ESU
	Recommendations January 2007		
22	ESUs to ensure all NOx converter software settings to be 100%.	High	ESUs to check at service
	Recommendations July 2005		
13	Continuing problems with some autocal run-ons causing loss of up to 2 hours per day-see Section 3.2 CMCU to ensure ESUs are asked to attend to offending sites (Action May 2008)	Medium	Many sites now cured, but some need attention at next ESU visit

Appendix 2

Inventory of Defra owned Equipment

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

QA/QC Unit's inventory of Department-owned equipment, December 2010

Relevant Contract	Asset Description	Serial no	Purchase date
AURN QA/QC	API model M401	123	01/04/1999
AURN QA/QC	API model M401	151	01/10/2000
AURN QA/QC	API model M401	176	01/12/2002
AURN QA/QC	API model M401	290	01/05/2004
AURN QA/QC	API model M401	245	unknown
AURN QA/QC	API model M401	291	01/05/2004
AURN QA/QC	API model M401	292	01/05/2004
AURN QA/QC	API model M401	293	01/05/2004
AURN QA/QC	API model M703	254	01/01/2010
AURN QA/QC	API model M703	255	01/01/2010
AURN QA/QC	Sabio 2010 dilution calibrator	374040708	01/02/2005
AURN QA/QC	Sabio 2010 dilution calibrator	02940306A	unknown
AURN QA/QC	Sabio 2020 zero air generator	02720306B	01/02/2005
AURN QA/QC	Sabio 2030 ozone photometer	15591	01/02/2005
AURN QA/QC	Sabio 2010 dilution calibrator	away for repair	01/06/2006
AURN QA/QC	Sabio 2020 zero air generator	away for repair	01/06/2006
AURN QA/QC	Sabio 2030 ozone photometer	17743	01/06/2006
AURN QA/QC	Sabio 2020 zero air generator	away for repair	01/03/2008
AURN QA/QC	Sabio 2030 ozone photometer	7820708	01/03/2008
AURN QA/QC	Sabio 2010 dilution calibrator	away for repair	01/03/2008
AURN QA/QC	Drycal flow meter	110085	unknown
AURN QA/QC	Drycal flow meter	107881	unknown
AURN QA/QC	Drycal low flow meter	6699	unknown
AURN QA/QC	Sabio 2020 zero air source	36207088	unknown
AURN QA/QC	Sabio 2020 zero air source	03711208c	unknown
AURN QA/QC	Sabio 2020 zero air source	03701208c	unknown
AURN QA/QC	AC31 dual chamber NOx analyser	1672	01/03/2003
AURN QA/QC	TEI 43C SO ₂ analyser	386	01/03/2003
AURN QA/QC	TEI 48C CO analyser	16067	01/03/2003
AURN QA/QC	M265 chemiluminescent ozone analyser	16373	01/03/2003
AURN QA/QC	Thermo 03 Analyser Model 49i	713021784	unknown
AURN QA/QC	API fluorescent SO ₂ Analyser Model 100A	1572	unknown
AURN QA/QC	Thermo NO-NO ₂ -NO _x Analyser Model 42c	42c-56236-307	unknown
AURN QA/QC	API model M703	19417	30/06/2010
AURN QA/QC	API model M703	19418	30/06/2010
AURN QA/QC	Ozone analyser Thermo 49i	713021785	unknown
AURN QA/QC	Ozone analyser Thermo 42i	713021784	unknown
AURN QA/QC	API model M703	18941	06/01/2010
AURN QA/QC	API model M703	18942	06/01/2010

Appendix 3

Partisol Data: October-December 2010

Partisol data were ratified for the following sites and measurement periods.

Site	Start date	End date	Ratified Data Capture, %
Auchencorth Moss PM ₁₀	1 st Oct	31 st Dec	98.9
Auchencorth Moss PM _{2.5}	1 st Oct	31 st Dec	81.5
Bournemouth PM _{2.5}	1 st Oct	31 st Dec	96.7
Brighton Preston Park PM _{2.5}	1 st Oct	31 st Dec	85.0
Harwell PM ₁₀	1 st Oct	31 st Dec	93.5
Harwell PM _{2.5}	1 st Oct	31 st Dec	95.7
Inverness PM ₁₀	1 st Oct	31 st Dec	87.0
Inverness PM _{2.5}	1 st Oct	31 st Dec	81.5
L. Marylebone Road PM ₁₀	1 st Oct	31 st Dec	93.4
L. Marylebone Road PM _{2.5}	1 st Oct	31 st Dec	87.0
London N Kens PM ₁₀	1 st Oct	31 st Dec	98.9
London N Kens PM _{2.5}	1 st Oct	31 st Dec	96.7
London Westminster PM _{2.5}	1 st Oct	31 st Dec	98.9
Northampton PM _{2.5}	1 st Oct	31 st Dec	91.3
Port Talbot Margam PM ₁₀	1 st Oct	31 st Dec	98.9
Wrexham PM ₁₀	1 st Oct	31 st Dec	100
Wrexham PM _{2.5}	1 st Oct	31 st Dec	85.9

Bureau Veritas carry out the following:

- filter conditioning and weighing.
- Calculation of ambient particulate concentrations using the Partisol download data and the filter weighings.
- Providing a field blank correction based on filters supplied with each batch, which travel to the Partisol site in the canister with the other filters, but are not actually exposed.
- Checking that the correct filter ID is matched with the correct day's sampling data.
- Checking that the PM₁₀ and PM_{2.5} datasets "track" each other.
- Do a rough comparison of ambient concentrations with those from co-located or nearby FDMS-TEOM sites.

The raw data and calculated concentrations are supplied to AEA in a spreadsheet, which is uploaded to AEA's Partisol processing system.

AEA complete the ratification process by

- Independently checking BV's calculation of the ambient PM₁₀ concentration.
- Ensuring that data with a Partisol fault code or filter fault are rejected.
- Checking site audit data where available.

Data Rejection

Data codes are recorded during ambient measurement, and filter faults are recorded during filter weighings. Some codes indicate a fatal fault and are used to automatically reject data during ratification.

Site Audits

Site audit results for the AURN Partisols are shown in the table below. Audits take place every 6 months, so there may not necessarily have been an audit during the “quarter” currently being ratified. The table below therefore shows the two most recent audits.

The flowrate must be within +/-10% of the nominal value (16.7 m³/h).

Site Audits – Summer 2010 and Winter 2010-11 periods.

Site	Audit date	Flowrate m ³ /h	% out from 16.7 m ³ /h
Auchencorth Moss PM ₁₀ (serial no. 21550)	23 Jun 2010	17.41	4.43
	12 Jan 2011	16.92	1.3
Auchencorth Moss PM _{2.5} (serial no. 21548)	23 Jun 2010	17.09	2.51
	12 Jan 2011	16.5	-1.19
Bournemouth PM _{2.5} (serial no. 21863)	12 Aug 2010	16.38	-1.76
	11 Jan 2011	16.67	-0.1
Brighton Preston Park PM _{2.5} (21865)	09 Aug 2010	17.46	4.71
	08 Feb 2011	20.19	20.8
Harwell PM ₁₀ (201439802)	20 Aug 2010	16.90	1.4
	25 Feb 2011	15.21	-8.9
Harwell PM _{2.5} (210209902)	20 Aug 2010	17.07	2.40
	25 Feb 2011	17.83	7.3
Inverness PM ₁₀ (serial no. 21255)	23 Jul 2010	17.24	3.44
	03 Feb 2011	17.21	3.05
Inverness PM _{2.5} (serial no. 21861)	23 Jul 2010	16.54	-0.75
	03 Feb 2011	16.67	-0.1
London Marylebone Road PM ₁₀ (serial no. 21306)	09 Aug 2010	0.02	-99.87
	24 Jan 2011	Reported “not working”	-
London Marylebone Road PM _{2.5} (serial no. 21493)	09 Aug 2010	0	-100%
	24 Jan 2011	16.6	0.5
London N Kens PM ₁₀ (serial no. 22650)	23 Aug 2010	16.02	-3.9
	25 Jan 2011	16.7	0
London N Kens PM _{2.5} – (serial no. 21015)	23 Aug 2010	16.16	-3.06
	25 Jan 2011	16.7	0
London Westminster PM _{2.5}	26 Aug 2010	16.44	-1.4
	20 Jan 2011	0	-100%
Northampton PM _{2.5} (serial no. 21013)	24 Aug 2010	16.93	1.54
	26 Jan 2011	17.5	4.7
Port Talbot Margam PM ₁₀ (formerly 2.5) (serial number 22588)	14 Jul 2010	16.81	0.8
	03 Feb 2011	16.4	-1.8
Wrexham PM ₁₀ (serial no. 21224)	17 Aug 2010	15.87	-4.77
	24 Feb 2011	16.7	0
Wrexham PM _{2.5} (serial no. 21011)	17 Aug 2010	15.73	-5.77
	24 Feb 2011	16.7	0

Flowrate test results were normal (i.e. within 10%) at all Partisols except Brighton Preston Park.

Auchencorth Moss

PM₁₀: data capture 98.9%. Data losses –

- 16th Dec: power failure.

PM_{2.5}: data capture was 81.5%. Data losses as follows:

- 17th – 18th Nov: flow halted. Codes cleared by CMCU.
- 26th Nov: < 18h sampling.
- 28th Nov – 1st Dec: flow failure. ESU replaced pump.
- 9th – 10th Dec: filters appeared unexposed.
- 16th – 22nd Dec: Filter exchange failure (FEF), followed by pump diaphragm failure, replaced again by ESU.

Bournemouth

PM_{2.5} only: Data capture was 96.7% for this quarter. Data losses:

- 4th -6th Dec: FEF

Brighton Preston Park

PM_{2.5} only: data capture was 85%. Data losses:

- 13th -15th Oct: power failure.
- 12th – 17th Nov: LSO unable to change filters due to lack of access to site.
- 4th – 8th Dec: power failure.

However, please note that flow was 20% high: data remain provisional

Harwell

PM₁₀: 93.5% data capture:

- 16th – 19th & 28th Oct: FEF

Under-reading w.r.t. the FDMS by ~ 5 µg m⁻³. Also, note that the Partisol flow was 8% low.

PM_{2.5}: 95.7% data capture.

- 6th Oct: PM_{2.5} > PM₁₀.
- 4th -5th Nov: filters appeared unexposed.
- 17th Nov: FEF.

Inverness

PM₁₀: data capture 87%. Data losses as follows:

- 24th – 25th Oct – Filter Exchange Failure (FEF)
- 9th – 15th Nov: FEF
- 22nd Nov: FEF
- 30th Nov: ran out of filters.

Lots of FEFs at this site, as was the case last quarter.

PM_{2.5}: data capture 81.5%. Data losses:

- 2nd Oct: PM_{2.5} > PM₁₀
- 30th Oct: error in initial weighing.
- 10th Dec: PM_{2.5} > PM₁₀
- 15th – 28th Dec, whole 2-week batch with PM_{2.5} > PM₁₀. PM_{2.5} values uncharacteristically high, so these have been rejected.

London Marylebone Road

PM₁₀: data capture 93.4%. This Partisol shows good agreement with the co-located FDMS.

Data losses:

- 8th – 12th Oct: power failure and subsequent problems caused by it.
- 19th Oct: clock changes, < 18h sampling.

PM_{2.5}: data capture 87.0%. Data losses:

- 1st- 5th Oct, 8th – 14th Oct: temperature control issues were causing unit to fail.

Partisol and FDMS data appear to match each other closely since repair in September.

London North Kensington

PM₁₀: data capture 98.9%. Data losses:

- 15th Dec: filter not returned.

PM_{2.5}: data capture 96.7%. Data losses:

- 18th – 19th Nov: delayed filter change.
- 27th Dec: damaged filter.

London Westminster

PM_{2.5} only. Data capture = 98.9%. Data losses –

- 13th Oct: installation of aircon unit, < 18h sampling.

Northampton

PM_{2.5} only: Data capture was 91.3%. Data losses:

- 2nd – 6th Oct: FEF
- 20th Oct: FEF
- 21st Nov: damaged filter.
- 17th Dec: FEF.

Port Talbot Margam

PM₁₀ only: data capture 98.9%. Data losses:

- 10th Nov: damaged filter.

Wrexham

PM₁₀: Data capture was 100%.

PM_{2.5}: Data capture 85.9%. Data losses:

- 2nd – 6th Oct: filter memory lost. Not possible to confirm that 24 m³ of air had been sampled on each day. (Note: this is a recurrence of a problem that occurred in Mar, Jun and Aug 2010).
- 5th – 8th Nov: Jul: FEF.
- 27th – 29th Nov: FEF.

Appendix 4

Site Details for New Sites

Site Name	Pollutants	Region Name	Grid	Easting	Northing	Altitude m	Type
Chatham C Roadside	NO ₂ PM ₁₀ PM ₂₅	SE England	TQ 77487 66947				Traffic Urban
Eastbourne	NO ₂ PM ₁₀ PM ₂₅	SE England	TQ 60085 02118	560085	102118	-	Background Urban
Storrington Roadside	PM ₁₀ PM ₂₅	SE England	TQ 08991 14249	508991	114249	-	Traffic Urban
Dumbarton Roadside	NO ₂	Scotland	NS 49724 72042	249724	672042	49	Traffic Urban
Ballymena	SO ₂	N Ireland	D 11990 02630	311900	402600	-	Background Urban

AEA group
The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
Tel: 0870 190 6465
Fax: 0870 190 6608

