



QA/QC Data Ratification Report for the Automatic Urban and Rural Network, April-June 2010

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Environment, Food and Rural Affairs, Scottish
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the DoE in Northern Ireland**

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

Tel: 0870 190 6574
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	October 2010

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 88.4% for all pollutants (O_3 , NO_2 , SO_2 , CO , PM_{10} and $PM_{2.5}$) during the 3-month reporting period April-June 2010. Data capture rates for CO , O_3 and SO_2 were above 90%. There were 42 sites with data capture less than 90% for the period.

The number of monitoring sites in the AURN during this quarter was 134, of which 73 are Local Authority owned sites affiliated to the national network. Some are co-located gravimetric particulate analysers at sites with automatic analysers.

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.

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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 April-June 2009. During this period there were 134 operational monitoring sites in the Network of which there are 99 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 61 Defra-funded sites and 73 affiliate sites. 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 2010.

1.1 Overview of Network Performance

Ratified hourly average data capture for the network averaged 88.4% for all pollutants (O₃, NO₂, SO₂, CO, PM₁₀ and PM_{2.5}) during the 3 month reporting period April-June 2010 (see Table 1.2). Only CO, O₃ and SO₂ 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 1.2: 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

Overall, 313 out of the 406 analysers (77%) achieved data capture levels above the required 90% target during this reporting period (See Table 1.3).

Table 1.3: Number of Analysers with Data Capture below 90%

Total Number Of Analysers		Q1 Jan-Mar 2010 (No. below 90%)	Q2 Jan-Mar 2010 (No. below 90%)
CO	24	5	4
NO ₂	113	22	19
O ₃	80	10	15
PM ₁₀ ¹	67	21	30
PM _{2.5} ¹	77	27	26
SO ₂	45	10	11
Total <90%	-	93	105

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

In total, 42 out of the 134 operational network sites in the quarter (30%) had an average data capture rate below the required 90% level for the April-June 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 April-June 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.

Charlton Mackrell: NO_x data deleted from 2-31 March 2010, poor quality data

Sunderland Silkworth: PM_{2.5} data deleted from 25-31 March 2010; damaged seals in FDMS unit.

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2 Changes in the Network for Directive Compliance

Table 2.1: Sites Added to the AURN during 2010

	Pollutants	Date started
Ballymena	SO ₂	01/01/10
Eastbourne	PM _{2.5} PM ₁₀	01/01/10
Storrington Roadside	PM _{2.5} PM ₁₀	01/01/10
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. The analysers are listed in Table 2.2:

Table 2.2: 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 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.

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

3 Generic Data Quality Issues

3.1 Auto-calibration Run-on

The 18 sites (18 analysers) showing continuing problems with the autocalibration run-on during April-June 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: April-June 2010

Site	Pollutant	Run-On Conc	Hours lost
Hull Freetown	NO ₂	5	1 hr (01:00 - 01:45)
Ladybower	NO ₂	3.3	1hr (01:00-02:00)
Leamington Spa	NO ₂	2	
Leeds Centre	NO ₂	3	1 hr (01:00 - 01:30)
Leicester Centre	NO ₂	3	1 hr (01:00 - 01:30)
Liverpool Speke	NO ₂	3	1 hr (01:00 - 01:30)
London Hillingdon	NO ₂	4	1 hr
Market Harborough	NO ₂	4.9	1 hr
Norwich Lakenfields	NO ₂	6	1 hr (01:00 - 01:45)
Oxford Centre Roadside	NO ₂	5	1 hr (01:00 - 01:30)
Plymouth Centre	NO ₂	3	1 hr (01:00 - 01:30)
Port Talbot Margam	NO ₂	3	1 hr (01:00 - 01:45)
Preston	NO ₂	4	1 hr (01:00 - 01:30)
Reading New Town	NO ₂	3	1 hr (01:00 - 01:30)
Sheffield Centre	NO ₂	5	1 hr (01:00 - 01:30)
Southampton Centre	NO ₂	3	1 hr (01:00 - 01:30)
Southend-on-Sea	NO ₂	3	1 hr (01:00 - 01:30)
St Osyth	NO ₂	3.4	1 hr

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 analysers 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 April-June 2010 is given in Table 4.1:

Table 4.1: Data capture for London: April-June 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
England							
Camden Kerbside	-	60.8	46.6	97.1	-	-	68.2
Haringey Roadside	-	57.8	98.3	99.4	-	-	85.1
London Bexley	99.8	-	97.1	99.6	-	99.6	99.0
London Bloomsbury	99.3	99.1	83.8	99.3	99.4	99.3	96.7
London Cromwell Road 2	57.4	-	-	58.6	-	58.3	58.1
London Eltham	-	-	94.8	99.5	99.5	-	98.0
London Haringey	-	-	-	98.5	52.7	-	75.6
London Harlington	-	65.1	90.9	88.6	95.4	-	85.0
London Harrow Stanmore	-	-	92.4	-	-	-	92.4
London Hillingdon	-	-	-	91.8	96.8	-	94.3
London Marylebone Road	92.4	92.9	86.7	97.5	90.8	89.7	91.7
London Marylebone Road PARTISOL	-	96.7	0.0	-	-	-	48.3
London N. Kensington	95.2	75.6	95.1	91.9	78.6	89.4	87.6
London N. Kensington PARTISOL	-	74.7	62.6	-	-	-	68.7
London Teddington	-	-	93.1	85.9	97.0	-	92.0
London Westminster	97.9	-	82.4	89.6	98.1	97.2	93.0
Tower Hamlets Roadside	99.7	-	-	84.9	-	-	92.3
Number of sites	7	8	13	14	9	6	17
Number of sites < 90%	1	5	6	5	2	3	8
Network Mean (%)	91.7	77.8	85.8	91.6	89.8	88.9	86.6

Shaded boxes are for data capture < 90%

4.1.2 Site Specific Issues

Camden Kerbside

The FDMS analyser faults continued from the previous quarter; significant quantities of data have been lost from both analysers.

Haringey Roadside

The PM₁₀ analyser performed poorly during the quarter, with problems with pump, and anomalously low volatile concentrations. Data were lost from 16 May to 21 June.

London Cromwell Road 2

Following air conditioning failure, the equipment was switched off on 24 May to avoid damage through overheating. Monitoring recommenced on 10 September.

London Harlington

Air conditioning faults caused the loss of NO_x, PM₁₀ and PM_{2.5} data during the quarter. The PM₁₀ FDMS also suffered data loss due to damaged seals.

London Haringey

Repeated problems with the ozone analyser resulted in a replacement loan analyser being installed which was not calibrated correctly. Data have been deleted from 17 May to 30 June

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. It was found that a pipe on the sample inlet was missing, and so the instrument was sampling internally, bypassing the size selective head. No clear change point can be identified when the tube was removed, and so based on the agreement with the FDMS, all 2009 and Q1 2010 data from the Partisol have been deleted.

London North Kensington

The ozone analyser was found to be sampling internally in April; 12 days data were lost. There were several analyser faults during the quarter, causing further data loss. A dryer fault on the PM₁₀ analyser caused the loss of 13 days data in June.

London North Kensington Partisol

See Appendix 4. The last 14 days data were unavailable at time of writing.

4.2 England (excluding London)

4.2.1 Data Capture

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

Table 4.2: Data capture for England (except London): April-June 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
England							
Barnsley 12	-	-	-	-	-	99.8	99.8
Barnsley Gawber	-	-	-	97.2	97.5	99.3	98.0
Bath Roadside	-	-	-	99.8	-	-	99.8
Billingham	-	-	-	95.7	-	-	95.7
Birmingham Tyburn	-	97.5	96.8	99.3	99.3	99.3	98.5
Birmingham Tyburn Roadside	-	99.9	98.2	99.6	100.0	-	99.4

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Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Blackburn Darwen Roadside	-	-	-	97.0	-	-	97.0
Blackpool Marton	-	-	0.0	0.0	0.0	-	0.0
Bottesford	-	-	-	-	95.9	-	95.9
Bournemouth	-	-	25.3	99.8	99.7	-	74.9
Brighton Preston Park	-	-	3.3	60.9	84.0	-	49.4
Brighton Roadside	-	-	-	0.0	-	-	0.0
Bristol Old Market	99.8	-	-	97.6	-	-	98.7
Bristol St Paul's	98.4	95.3	93.6	98.4	98.5	98.4	97.1
Bury Roadside	83.2	95.7	96.1	98.2	-	-	93.3
Cambridge Roadside	-	-	-	98.9	-	-	98.9
Canterbury	-	-	-	99.2	-	-	99.2
Carlisle Roadside	-	95.7	97.6	98.1	-	-	97.1
Charlton Mackrell	-	-	-	0.0	100.0	-	50.0
Chesterfield	-	66.8	98.7	98.4	-	-	88.0
Chesterfield Roadside	-	99.4	98.8	99.7	-	-	99.3
Coventry Memorial Park	-	-	99.8	97.0	99.8	-	98.9
Eastbourne	-	61.7	99.8	-	-	-	80.7
Exeter Roadside	-	-	-	97.8	89.5	-	93.6
Glazebury	-	-	-	99.9	100.0	-	99.9
Great Dun Fell	-	-	-	-	88.7	-	88.7
Harwell	-	90.2	98.1	99.3	100.0	99.8	97.5
Harwell PARTISOL	-	93.4	71.4	-	-	-	82.4
High Muffles	-	-	-	99.8	99.9	-	99.8
Horley	-	-	-	99.7	-	-	99.7
Hull Freetown	99.9	79.4	99.0	95.2	99.7	99.7	95.5
Ladybower	-	-	-	97.8	99.8	99.7	99.1
Leamington Spa	-	99.2	99.5	99.5	99.6	99.6	99.5
Leeds Centre	100.0	98.4	99.3	95.5	90.7	99.6	97.2
Leeds Headingley Kerbside	-	13.5	82.5	96.6	-	-	64.2
Leicester Centre	99.1	57.7	57.5	91.3	98.6	99.0	83.9
Leominster	-	-	-	76.9	77.9	66.8	73.9
Liverpool Queen's Drive Roadside	-	-	-	100.0	-	-	100.0
Liverpool Speke	99.9	99.1	98.9	95.6	99.7	99.8	98.8
Lullington Heath	-	-	-	99.8	99.9	99.6	99.8
Manchester Piccadilly	-	-	99.7	98.4	98.7	99.6	99.1
Manchester South	-	-	-	99.9	100.0	-	99.9
Market Harborough	-	-	-	94.0	99.5	-	96.7
Middlesbrough	99.8	85.3	87.5	98.3	99.9	99.6	95.1
Newcastle Centre	99.9	100.0	100.0	99.5	99.8	99.8	99.8
Newcastle Cradlewell Roadside	-	-	-	99.5	-	-	99.5
Northampton	-	-	84.6	99.7	99.9	99.7	96.0
Norwich Lakenfields	-	99.5	99.8	95.1	98.0	99.6	98.4
Nottingham Centre	-	92.1	79.9	97.3	96.8	96.9	92.6
Oxford Centre Roadside	-	-	-	95.4	-	-	95.4
Oxford St Ebbes	-	86.5	92.8	99.4	-	-	92.9
Plymouth Centre	-	99.7	98.1	96.7	68.0	-	90.6
Portsmouth	-	97.3	92.6	99.8	98.1	-	97.0

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Preston	-	-	91.8	78.1	95.9	-	88.6
Reading New Town	-	98.1	93.1	90.5	99.8	-	95.4
Rochester Stoke	-	4.1	18.5	17.9	22.9	5.6	13.8
Salford Eccles	99.6	99.7	97.3	93.2	99.6	98.8	98.0
Saltash Roadside	-	84.9	86.1	-	-	-	85.5
Sandwell West Bromwich	-	-	-	99.9	86.3	99.9	95.4
Sandy Roadside	-	97.3	95.5	97.1	-	-	96.7
Scunthorpe Town	-	89.9	-	88.0	-	88.0	88.6
Sheffield Centre	93.7	99.6	99.2	94.6	96.5	97.1	96.8
Sheffield Tinsley	-	-	-	99.7	-	-	99.7
Sibton	-	-	-	-	100.0	-	100.0
Southampton Centre	44.4	43.4	37.5	40.4	48.5	50.9	44.2
Southend-on-Sea	-	-	99.9	0.0	86.9	-	62.3
St Osyth	-	-	-	90.5	94.0	-	92.3
Stanford-le-Hope Roadside	-	69.7	0.0	99.7	-	81.1	62.6
Stockton-on-Tees Eaglescliffe	-	94.2	91.3	99.0	-	-	94.8
Stoke-on-Trent Centre	-	99.6	98.9	99.5	98.4	-	99.1
Storrington Roadside	-	97.9	95.8	-	-	-	96.9
Sunderland Silksworth	-	-	93.7	99.5	99.5	99.5	98.0
Thurrock	-	93.6	-	99.5	99.8	99.5	98.1
Walsall Willenhall	-	-	-	0.0	-	-	0.0
Warrington	-	21.3	95.0	99.8	-	-	72.0
Weybourne	-	-	-	-	100.0	-	100.0
Wicken Fen	-	-	-	99.6	99.8	99.7	99.7
Wigan Centre	-	-	99.5	99.9	99.3	-	99.5
Wirral Tranmere	-	-	98.4	98.3	99.4	-	98.7
Yarner Wood	-	-	-	99.8	100.0	-	99.9
York Bootham	-	85.6	98.2	-	-	-	91.9
York Fishergate	-	88.3	-	88.2	-	-	88.2
Number of sites	12	39	47	72	51	29	82
Number of sites < 90%	2	15	13	12	10	5	22
Network Mean (%)	93.2	83.9	83.8	87.8	92.2	92.3	87.7

Shaded boxes are for data capture < 90%

4.2.2 Site Specific Issues

Blackpool Marton

The site remained closed during the quarter whilst repairs to the hut infrastructure are carried out.

Bournemouth

The Partisol was removed twice for workshop repairs-See Appendix 4.

Brighton Preston Park

The Partisol was vandalised on 4 April-see Appendix 4.

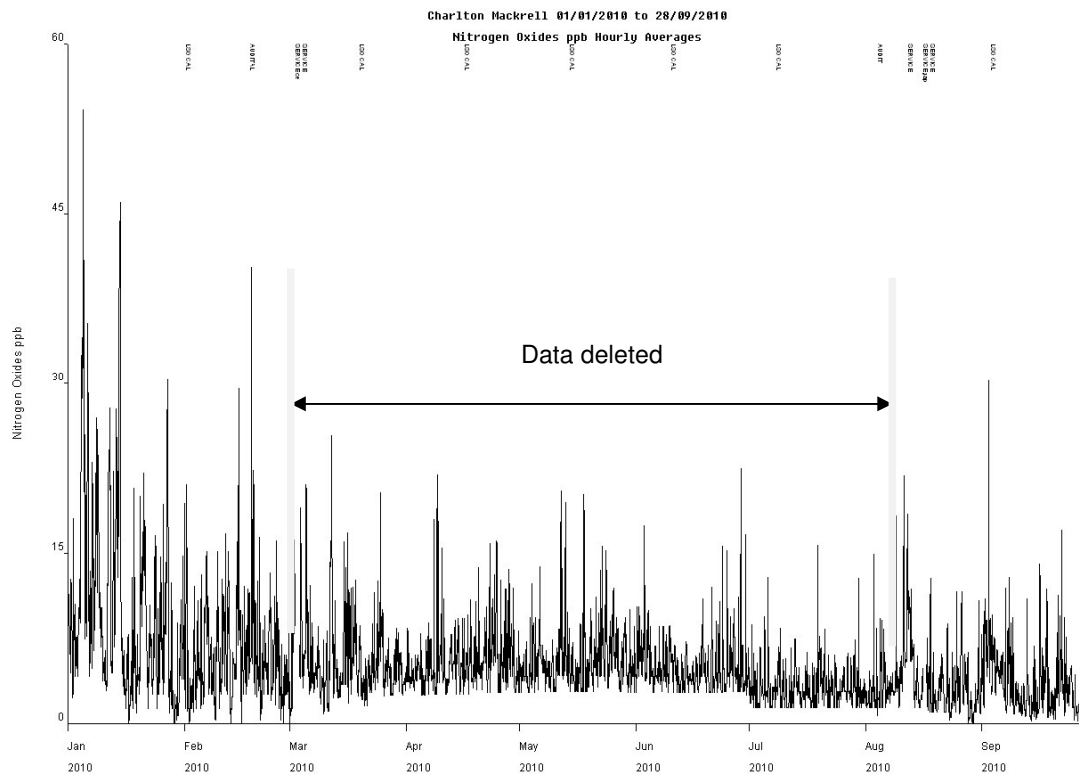
Brighton Roadside

The NO_x analyser suffered several significant changes in response during the quarter, but only one LSO calibration was carried out during the 3-month period due to access restrictions. The NO cylinder was also found to be contaminated, further reducing the confidence in the calibrations. All data for the quarter have been deleted.

Charlton Mackrell

The NO_x analyser response changed at the service on 2 March, which prevented the correct processing top be applied without making NO₂ data negative. This continued up to the service on 16 August. The shift in baseline can be seen in Figure 4.1. No information is available on the nature of the fault.

Figure 4.1 Charlton Mackrell NO_x, Jan-Sept 2010



Chesterfield

The PM₁₀ analyser was diagnosed with a serious leak at the audit; in addition, the valve motor failed. Data have been deleted from 1 to 30 June, and subsequent data will be assessed during the ratification of the next quarter's data.

Eastbourne

The PM₁₀ analyser suffered excessively noisy volatile measurements for much of May.

Harwell Partisol

The PM_{2.5} Partisol suffered repeated flow faults-see Appendix 4.

Leeds Headingley Kerbside

The FDMS analysers repeatedly produced poor quality data due to excessively high sample dewpoints. The PM₁₀ analyser also had flow problems resulting in the loss of data from 1 April to 31 May.

Leicester Centre

Poor quality, unstable data on both FDMS units resulted in the loss of data for both PM_{2.5} and PM₁₀ from 23 May to the end of June.

Leominster

The ozone analyser suffered from repeated flow problems diagnosed in July; a total of 14 days data from 3 June have been deleted. In addition, the NO_x analyser pump failed on 12 June, with the loss of 20 days data. Further problems with the SO₂ pump resulted in the loss of data from 1 June into July.

Preston

Elevated baselines in the NO_x and NO channels gave cause for concern following an ESU visit on 16 June to remove the old analysers and equipment. Investigation by the QA/QC unit in September found that there was a gap in the roof around the sample inlet tubes. The pressurisation of the cabin by the air conditioning unit meant that cabin air was being sampled by the NO_x analyser. The NO_x data have been deleted from 16 June to September.

Rochester Stoke

The site has been closed since early November 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.

Saltash Roadside

Both FDMS units suffered frequent, short periods of unstable data due to dew points being too high. The 90% data capture target was just missed for both instruments.

Southampton Centre

The air conditioning unit failed early in April. The analysers were switched off in order to prevent damage through overheating.

Southend-on-Sea

The NO_x baseline problem reported in the October-December 2009 report was repaired on 9 April. The ESU reported the sample lines were wrongly attached, and that the calibration system required excessive gas pressure to work correctly. A total of 98.5 days data were lost.

Stanford-le-Hope Roadside

The poor FDMS performance reported in January –December 2009 continued this quarter. Tests to establish if a baseline offset was present were carried out using a zero filter. A total of 100 days PM_{2.5} data were deleted. The SO₂ analyser also suffered persistent performance issues which ultimately required removal of the instrument for repair by the ESU.

Walsall Willenhall

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

Warrington

The PM₁₀ data was found to be significantly higher than the PM_{2.5} data due to an offset. Much of the PM₁₀ data have been deleted up to replacement of the dryer on 27 September.

4.3 Scotland

4.3.1 Data Capture

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

Table 4.3 Ratified Data Capture for Scotland, April-June 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Scotland							
Aberdeen	-	69.7	99.6	99.6	98.4	-	91.8
Aberdeen Union Street Roadside	-	-	-	99.6	-	-	99.6
Auchencorth Moss	-	91.2	89.0	-	99.7	-	93.3
Auchencorth Moss PM ₁₀ PM ₂₅ (FDMS)	-	89.4	76.4	-	-	-	82.9
Bush Estate	-	-	-	99.9	99.7	-	99.8
Dumfries	-	-	-	99.7	-	-	99.7
Edinburgh St Leonards	99.8	98.8	81.4	99.8	89.1	97.5	94.4
Eskdalemuir	-	-	-	99.5	100.0	-	99.7
Fort William	-	-	-	95.2	99.7	-	97.5
Glasgow Centre	99.6	0.0	99.8	99.7	99.7	99.7	83.1
Glasgow City Chambers	-	-	-	99.8	-	-	99.8
Glasgow Kerbside	-	99.1	94.0	93.4	-	-	95.5
Grangemouth	-	89.3	88.0	74.8	-	91.2	85.8
Grangemouth Moray	-	-	-	99.5	-	-	99.5
Inverness	-	86.8	80.2	99.7	-	-	88.9
Lerwick	-	-	-	-	100.0	-	100.0
Peebles	-	-	-	99.7	99.9	-	99.8
Strath Vaich	-	-	-	-	100.0	-	100.0
Number of sites	2	8	8	14	10	3	18
Number of sites < 90%	0	5	5	1	1	0	4
Network Mean (%)	99.7	78.0	88.6	97.1	98.6	96.1	95.1

Shaded boxes are for data capture < 90%

4.3.2 Site Specific Issues

Auchencorth Moss PM₁₀ PM_{2.5}

Temperature control problems continue to affect the site, resulting in noisy and unstable PM₁₀ and PM_{2.5} data.

Glasgow Centre

The PM₁₀ volatile concentrations at Glasgow Centre were anomalously high during the period and the data have been deleted. As a result, the dryer was replaced in September.

Grangemouth

A NO_x analyser fault on 5 May lost 15 days data. A power cut on 25 May lost approximately 7 days data from all channels.

Inverness

Problems were encountered with the Partisols-see Appendix 4. The last 14 days data of the quarter were unavailable at time of writing.

4.4 Wales

4.4.1 Data Capture

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

Table 4.4 Data Capture for Wales, April-June 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Wales							
Aston Hill	-	-	-	99.9	98.9	-	99.4
Cardiff Centre	98.9	58.6	85.2	98.9	99.1	98.7	89.9
Chepstow A48	-	96.9	97.2	99.9	-	-	98.0
Cwmbran	-	-	-	99.8	100.0	-	99.9
Mold	-	-	-	0.0	100.0	-	50.0
Narberth	-	9.4	-	92.6	99.7	71.5	68.3
Newport	-	30.4	99.6	99.8	-	-	76.6
Port Talbot Margam	89.3	50.2	99.9	94.2	89.6	89.2	85.4
Port Talbot Margam PM ₁₀ PM _{2.5}	-	92.3	-	-	-	-	92.3
Swansea Roadside	-	99.8	99.6	99.8	-	-	99.7
Wrexham	-	97.8	90.1	99.8	-	99.4	96.8
Number of sites	2	8	6	10	6	4	11
Number of sites < 90%	1	4	1	1	1	2	5
Network Mean (%)	94.1	66.9	96.7	88.5	97.9	89.7	87.1

Shaded boxes are for data capture < 90%

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; 68 days PM₁₀ and 8 days' PM_{2.5} data were lost.

Mold

The QA/QC Unit noticed unusual NO₂/NO_x ratios from this site during the ratification of the January-March 2010 data. Investigations by CMCU, LSO and the ESU were initially inconclusive, as all calibration and audit data were within expected limits. It was subsequently discovered that the sample inlet system was leaking, and cabin air was being sampled by the NO_x analyser. Data have been deleted from 4 February (ESU visit) to 17 September 2010. The ozone was apparently unaffected.

Narberth

A leak in the filter holder on the SO₂ analyser was found 26 April; data have been deleted back to 18 February. A fault with the dryer on the PM₁₀ analyser required removal of the instrument for workshop repair; data between 31 March and 22 June have been lost.

Newport

The PM₁₀ data were noisy from 1 May to the service on 3 August, when the dryer was replaced. This improved the data, but 92 days data were deleted.

Port Talbot Margam

On 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. A replacement mass transducer or replacement analyser will be installed, but data loss will continue into October.

There were also communications faults with the other analysers intermittently between June and August following replacement of the analysers.

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 April-June 2010 is given in Table 4.5.

Table 4.5: Data Capture for Ireland, April-June 2010

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	Site Average
Ireland							
Armagh Roadside	-	99.8	-	96.4	-	-	98.1
Ballymena	-	-	-	-	-	88.6	88.6
Belfast Centre	99.8	99.8	99.1	94.9	99.8	99.5	98.8
Derry	-	97.8	39.4	99.6	89.0	99.7	85.1
Lough Navar	-	79.1	-	-	99.9	-	89.5
Mace Head	-	-	-	-	95.8	-	95.8
Number of sites	1	4	2	3	3	3	6
Number of sites < 90%	0	1	1	0	1	1	3
Network Mean (%)	99.8	94.1	69.2	97.0	96.2	96.0	92.0

Shaded boxes are for data capture < 90%

4.5.2 Site Specific Issues

Ballymena

A logger fault resulted in the loss of 10 days data

Derry

The ozone analyser was faulty from 21 June to 30 June when a replacement was installed. However this was not set up correctly, and data up to 11 August have been deleted. In addition, leaks persisted in both FDMS analysers, and excessively noisy PM_{2.5} data from 1 February to 18 May have been deleted.

Lough Navar

A faulty "V" seal caused anomalously low volatile PM₁₀ data during May; 19 days data 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

Network Data Capture for 01/04/2010 to 30/06/2010 from start date of any new site

Site	CO	PM ₁₀	PM ₂₅	NO ₂	O ₃	SO ₂	
Number of sites	24	67	76	113	80	45	134
Number of sites < 90%	4	30	26	19	15	11	42
Network Mean (%)	93.6	81.0	84.0	89.8	93.4	92.1	88.4

Shaded boxes are for data capture < 90%

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

A summary of the main site analyser operational problems, which have resulted in data capture below the required 90% level during the reporting period April-June 2010 is given in Appendix 2. 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. The table lists all gaps of 6 hours or more for each pollutant where overall data capture is below 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.

Appendices

Appendix 1: Recommendations for Upgrade or Replacement of
Equipment

Appendix 2: Data Gaps Listing: April-June 2010

Appendix 3: Inventory of Defra-owned Equipment

Appendix 4: Partisol Data Report

Appendix 5: Information for New Sites

Appendix 1

Recommendations for Upgrade or Replacement of Equipment

As requested by the Department, QA/QC Unit has provided a list of suggestions for equipment that may need replacing or upgrading in the network. The following provides a summary of the outstanding issues to date since 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)	High	Many sites now cured, but some need attention at next ESU visit

Appendix 2

Gaps listing April-June 2010

01/04/2010 to 30/06/2010 Gaps in 15-minute table \geq 6 hours and data capture \leq 90%

Pollutant	Data Capture (%)	Start date	End date	Reason	Comments	Number of days	Number of hours
England							
Blackpool Marton							
NO2	0.0%	01-Mar-10	31-Aug-10	Switched out-of-service for repairs		184	4416
O3	0.00%	01-Mar-10	31-Aug-10	Switched out-of-service for repairs		184	4416
Bournemouth							
PM25	0.00%	24-Feb-10	28-Apr-10	Analyser removed for repair		64	1536
		05-May-10	10-Jun-10	Analyser removed for repair		37	888
		26-Jun-10	28-Jun-10	Filter jam		3	72
Brighton Preston Park							
NO2	60.90%	26-May-10	31-Jul-10	Sampling fault	Sample line incorrectly fitted & internal sampling	66.5	1597
O3	84.00%	24-May-10	07-Jun-10	Sampling fault	Sample line modified but internal sampling	14.5	348
PM25	0.00%	04-Apr-10	30-Jun-10	Vandalism		88	2112
Brighton Roadside							
NO2	0.00%	01-Apr-10	05-Jul-10	Instrument fault	No calibrations	95.5	2292
Bury Roadside							
CO	83.20%	22-Mar-10	10-Apr-10	ESU service	service followed by autocal run on problem	18	433
		08-May-10	10-May-10	Autocal run-on	intermittent fault auto cal	1	25
		23-May-10	25-May-10	Autocal run-on	intermittent fault auto cal -	1	25
		02-Jun-10	02-Jun-10	Instrument fault	Analyser response unstable - affected by IZS	0.3	6
		25-Jun-10	26-Jun-10	Instrument fault	Analyser response unstable - affected by IZS	1	23
		26-Jun-10	27-Jun-10	Instrument fault	Analyser response unstable - affected by IZS	1	24
Camden Kerbside							
PM10	60.80%	06-Apr-10	07-Apr-10	Instrument fault	ENG C/O Leak	1.4	33
		30-Apr-10	02-Jun-10	Instrument fault	c/o noisy & erratic	33.8	811
PM25	46.60%	01-Jun-10	17-Jun-10	Instrument fault	Cooler fault	16.7	401
Charlton Mackrell							

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NO2	0.00%	02-Mar-10	17-Aug-10	Instrument fault	Poor analyser performance between Services	168	4032
Chesterfield							
PM10	66.80%	01-Jun-10	30-Jun-10	Unstable response	C/O Poor data Large leak and valve motor failed.	30	720
Eastbourne							
PM10	61.70%	02-Apr-10	03-Apr-10	FDMS volatile recovery or noisy	Poor data deleted	0.8	20
		03-Apr-10	04-Apr-10	Vandalism	Poor data deleted	0.9	21
		17-May-10	28-May-10	High noise	Poor data deleted	11.1	267
		09-Jun-10	30-Jun-10	Instrument faults	Poor data deleted	21.3	512
Exeter Roadside							
O3	89.50%	11-Apr-10	12-Apr-10	Power cut		0.7	16
		09-Jun-10	10-Jun-10	Unstable response		0.6	14
		21-Jun-10	29-Jun-10	Instrument fault	Unspecified fault	8.1	195
Great Dun Fell							
O3	88.70%	11-Jun-10	15-Jun-10	Instrument fault	Call out: No data.	3.9	94
		19-Jun-10	25-Jun-10	Instrument fault	Call out: No data.	5.8	139
Haringey Roadside							
PM10	57.80%	19-Apr-10	19-Apr-10	Unstable response	Iso - filter change and recovery	0.7	16
		16-May-10	21-Jun-10	Unstable response	various C/O to fix low volatiles replace pump + valve motor	36.5	876
Hull Freetown							
PM10	79.40%	30-Apr-10	06-May-10	Instrument fault	Valve block needs replacement	6.3	152
		20-May-10	20-May-10	Instrument fault	Unspecified fault	0.3	6
		23-May-10	23-May-10	Instrument fault	Unspecified fault	0.4	9
		05-Jun-10	06-Jun-10	Instrument fault	Unspecified fault	1.5	36
		07-Jun-10	07-Jun-10	Instrument fault	Unspecified fault	0.3	8
		09-Jun-10	09-Jun-10	Instrument fault	Unspecified fault	0.3	7
		22-Jun-10	02-Jul-10	High noise	Noisy data nulled. Call-out requested.	10.2	245
Leeds Headingley Kerbside							
PM10	13.50%	01-Apr-10	31-May-10		ENG C/O Call Out for filter loading on PM10FDMS - replaced pump	61	1464
		02-Jun-10	02-Jun-10	FDMS dew point too warm		0.5	11
		03-Jun-10	04-Jun-10	FDMS dew point too warm		0.6	14
		04-Jun-10	06-Jun-10	FDMS dew point too warm		2.3	55
		07-Jun-10	07-Jun-10	FDMS dew point too warm		0.5	11

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		11-Jun-10	11-Jun-10	FDMS dew point too warm		0.4	9
		12-Jun-10	13-Jun-10	FDMS dew point too warm		0.5	12
		15-Jun-10	15-Jun-10	FDMS dew point too warm		0.4	10
		16-Jun-10	17-Jun-10	FDMS dew point too warm		0.8	19
		17-Jun-10	18-Jun-10	FDMS dew point too warm		1	23
		18-Jun-10	18-Jun-10	FDMS dew point too warm		0.3	7
		20-Jun-10	21-Jun-10	FDMS dew point too warm		0.8	18
		21-Jun-10	01-Jul-10	FDMS dew point too warm		9.9	238
PM25	82.50%	20-May-10	20-May-10	FDMS dew point too warm		0.4	9
		21-May-10	21-May-10	FDMS dew point too warm		0.4	10
		22-May-10	23-May-10	FDMS dew point too warm		0.8	18
		23-May-10	24-May-10	FDMS dew point too warm		0.8	18
		24-May-10	24-May-10	FDMS dew point too warm		0.3	6
		02-Jun-10	02-Jun-10	FDMS dew point too warm		0.4	10
		03-Jun-10	04-Jun-10	FDMS dew point too warm		0.5	12
		04-Jun-10	05-Jun-10	FDMS dew point too warm		0.5	13
		05-Jun-10	06-Jun-10	FDMS dew point too warm		0.7	16
		12-Jun-10	12-Jun-10	FDMS dew point too warm		0.3	8
		15-Jun-10	15-Jun-10	FDMS dew point too warm		0.3	6
		16-Jun-10	17-Jun-10	FDMS dew point too warm		0.5	12
		17-Jun-10	18-Jun-10	FDMS dew point too warm		0.7	17
		20-Jun-10	21-Jun-10	FDMS dew point too warm		0.5	12
		21-Jun-10	22-Jun-10	FDMS dew point too warm		0.8	19
		22-Jun-10	23-Jun-10	FDMS dew point too warm		0.8	20
		23-Jun-10	29-Jun-10	FDMS dew point too warm		6.1	146
		30-Jun-10	30-Jun-10	FDMS dew point too warm		0.7	16
Leicester Centre							
PM10	57.70%	23-May-10	30-Jun-10	Unstable response	Poor quality data	38.4	921
PM25	57.50%	23-May-10	30-Jun-10	Unstable response	Poor data deleted	38.3	920
Leominster							
NO2	76.90%	12-Apr-10	13-Apr-10	Switched out-of-service		0.5	12
		10-Jun-10	30-Jun-10	ESU service	c/o to recondition pump +service	20.5	492
		18-Jun-10	06-Aug-10	Instrument fault	analyser fault	49.1	1179
O3	77.90%	03-Apr-10	08-Apr-10	Instrument fault	ENG C/O M400E analyser Lamp fault.	5.5	132
		11-Apr-10	19-Apr-10	Low flow rate	audit + c/o 19/04 to remove blockage in inlet pipe	8.5	203
		18-Jun-10	24-Jun-10	Power cut	power cut	6	145
SO2	66.80%	01-Jun-10	31-Jul-10	Pump fault	deleted data - failing pump	61	1464
London Bloomsbury							
PM25	83.80%	09-Apr-10	10-Apr-10	Power cut		0.5	13
		27-Apr-10	11-May-10	High noise	High noise after ESU visit	14.2	340
London Cromwell Road 2							

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CO	57.40%	23-May-10	31-May-10	Air Conditioning or Temp fault		8.5	204
		25-May-10	31-Aug-10	Air Conditioning or Temp fault		98.3	2360
NO2	58.60%	24-May-10	31-May-10	Air Conditioning or Temp fault		7.4	178
		25-May-10	31-Aug-10	Air Conditioning or Temp fault		98.3	2360
SO2	58.30%	24-May-10	31-May-10	Air Conditioning or Temp fault		7.4	178
		25-May-10	31-Aug-10	Air Conditioning or Temp fault		98.3	2360
London Haringey							
O3	52.70%	19-May-10	05-Aug-10	Instrument fault	Spurious data deleted	78.6	1886
London Harlington							
NO2	88.60%	15-Apr-10	23-Apr-10	Air Conditioning or Temp fault		8.5	204
PM10	65.10%	28-Feb-10	16-Apr-10	High noise	ENG C/O V seals replaced then air con fault	47.5	1141
		25-Apr-10	10-May-10	Unstable response	ENG C/O data recovers.	15.3	366
		07-Jun-10	08-Jun-10	Unstable response	short period of unstable data.	0.6	15
London Marylebone Road							
PM25	86.70%	10-May-10	10-May-10	High noise	noisy data deleted	0.4	10
		17-May-10	21-May-10	Instrument removed for repair	ENG C/O Removed sensor unit - damaged taper element	4.1	98
		03-Jun-10	03-Jun-10	Service		0.3	6
		04-Jun-10	07-Jun-10	FDMS volatile recovery or noisy	negative volatile data	3	71
		16-Jun-10	16-Jun-10	FDMS volatile recovery or noisy	Volatile recovery.	0.5	11
SO2	89.70%	23-May-10	27-May-10	Air Conditioning or Temp fault	Air con failure	3	71
		04-Jun-10	07-Jun-10	Instrument fault	ENG C/O changed pump and peaked lamp.	3.3	80
		22-Jun-10	25-Jun-10	Air Conditioning or Temp fault	Air con failure	2.9	69
			25-Jun-10	Air Conditioning or Temp fault	Air con failure	2.8	66
London N. Kensington							
O3	78.60%	24-Mar-10	07-Apr-10	Sampling fault	Internal sampling	14	337
		19-May-10	23-May-10	Instrument fault	unresponsive after cal - recovered on its own	4.2	100
		29-May-10	01-Jun-10	Power cut	fuse tripped power - O3 CO NOx SO2 & PM10	2.8	66
		25-Jun-10	06-Jul-10	Instrument fault	analyser fault	11.1	267
PM10	75.60%	07-Apr-10	08-Apr-10	Unstable response	erroneous data following filter change	1	25
		30-Apr-10	05-May-10	Unstable response	erroneous data - filter re seated	6	144
		29-May-10	11-Jun-10	FDMS drier	Service to repair drier fault	13	312

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		30-Jun-10	01-Jul-10	Unstable response	unstable data following filter change	0.9	21
SO2	89.40%	24-Mar-10	07-Apr-10	Switched out-of-service	internally sampling	14	337
		29-May-10	01-Jun-10	Power cut	fuse tripped NOx SO2 CO O3 & PM10	2.8	66
London Teddington							
NO2	85.90%	10-Apr-10	20-Apr-10	Flat response	instrument fault	10.1	242
		28-Jun-10	30-Jun-10	Logger fault	Logger fault	2.3	56
London Westminster							
NO2	89.60%	06-May-10	07-May-10	Power cut		0.9	21
		24-May-10	25-May-10	Power cut		1	23
		23-Jun-10	30-Jun-10	Instrument fault	pmt faulty - replaced 30/06 + recovery	7.5	180
Middlesbrough							
PM10	85.30%	08-Jun-10	21-Jun-10	Unstable response	unstable data - filter not seated properly	13.2	316
PM25	87.50%	01-Apr-10	01-Apr-10	Unstable response	Spurious data deleted	0.8	19
		19-May-10	23-May-10	Unstable response	Spurious data deleted	4.3	103
		05-Jun-10	05-Jun-10	Unstable response	Spurious data deleted	0.3	6
		26-Jun-10	30-Jun-10	Unstable response	Spurious data deleted	4.5	108
Nottingham Centre							
PM25	79.90%	07-Apr-10	07-Apr-10	ESU service		0.3	6
		27-Apr-10	27-Apr-10	High noise	noisy data nulled during flow and dew point temp alarm	0.3	7
		28-Apr-10	29-Apr-10	ESU service		0.6	14
		29-Apr-10	29-Apr-10	High noise	noisy data nulled during flow and dew point temp alarms	0.3	6
		19-May-10	24-May-10	High noise	Noisy data with large negatives nulled following an eng callou	5.2	125
		04-Jun-10	04-Jun-10	FDMS dew point too warm		0.4	9
		05-Jun-10	06-Jun-10	FDMS dew point too warm		0.6	14
		06-Jun-10	06-Jun-10	FDMS dew point too warm		0.3	7
		08-Jun-10	09-Jun-10	FDMS dew point too warm		0.4	10
		09-Jun-10	09-Jun-10	FDMS dew point too warm		0.3	6
		21-Jun-10	22-Jun-10	FDMS dew point too warm		0.5	12
		22-Jun-10	30-Jun-10	Vandalism	Call out: PM2.5 and cyclone stolen	8.6	206
Oxford St Ebbes							
PM10	86.50%	10-Jun-10	10-Jun-10	FDMS volatile recovery or noisy	noisy	0.3	7
		14-Jun-10	25-Jun-10	FDMS volatile recovery or noisy	ENG C/O Call out Noisy FDMS Action Taken: Replaced filters.	11.1	267
Plymouth Centre							

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O3	68.00%	04-May-10	02-Jun-10	Low flow rate	ENG C/O found separator paper within filter housing.	28.9	694
Preston							
NO2	78.10%	14-Jun-10	31-Aug-10	Sampling fault	Excessively high NO2 concs after sample inlet changed	78.5	1885
Rochester Stoke							
NO2	17.90%	03-Nov-09	09-Jun-10	Switched out-of-service	Site offline	218	5243
		22-Jun-10	22-Jun-10			0.3	8
		26-Jun-10	26-Jun-10			0.5	11
O3	22.90%	03-Nov-09	09-Jun-10	Switched out-of-service	LSO turned off site due to water leak	218	5243
PM10	4.10%	01-May-10	24-Jun-10	Sampling fault	Removed as discussed at QC	55	1319
		25-Jun-10	25-Jun-10	FDMS dew point too warm		0.4	10
		26-Jun-10	26-Jun-10	FDMS dew point too warm		0.4	9
		27-Jun-10	27-Jun-10	FDMS dew point too warm		0.4	10
		29-Jun-10	30-Jun-10	FDMS dew point too warm		0.9	22
PM25	18.50%	01-Jun-10	11-Jun-10	Sampling fault	Data deleted	10.3	246
		21-Jun-10	24-Jun-10	Sampling fault	ENG C/O Call out for PM10 FDMS	2.9	69
SO2	5.60%	03-Nov-09	10-Jun-10	Switched out-of-service		219	5253
		15-Jun-10	22-Jul-10			37.1	890
Saltash Roadside							
PM10	84.90%	21-May-10	25-May-10	FDMS dew point too warm		4.6	110
		02-Jun-10	02-Jun-10	FDMS dew point too warm		0.3	7
		03-Jun-10	03-Jun-10	FDMS dew point too warm		0.5	13
		04-Jun-10	04-Jun-10	FDMS dew point too warm		0.5	12
		05-Jun-10	05-Jun-10	FDMS dew point too warm		0.4	10
		11-Jun-10	11-Jun-10	FDMS dew point too warm		0.4	9
		12-Jun-10	12-Jun-10	FDMS dew point too warm		0.3	7
		16-Jun-10	16-Jun-10	FDMS dew point too warm		0.4	10
		17-Jun-10	17-Jun-10	FDMS dew point too warm		0.5	13
		18-Jun-10	18-Jun-10	FDMS dew point too warm		0.4	9
		20-Jun-10	20-Jun-10	FDMS dew point too warm		0.4	10
		21-Jun-10	21-Jun-10	FDMS dew point too warm		0.5	12
		22-Jun-10	22-Jun-10	FDMS dew point too warm		0.5	11
		23-Jun-10	23-Jun-10	FDMS dew point too warm		0.3	7
		25-Jun-10	26-Jun-10	FDMS dew point too warm		0.6	14
		26-Jun-10	27-Jun-10	FDMS dew point too warm		0.6	15
		27-Jun-10	27-Jun-10	FDMS dew point too warm		0.6	14
		28-Jun-10	28-Jun-10	FDMS dew point too warm		0.4	10
		29-Jun-10	29-Jun-10	FDMS dew point too warm		0.3	6
		30-Jun-10	30-Jun-10	FDMS dew point too warm		0.3	7
PM25	86.10%	21-May-10	25-May-10	FDMS dew point too warm		4.5	108
		02-Jun-10	02-Jun-10	Unstable response		0.3	7
		03-Jun-10	03-Jun-10	Unstable response		0.6	14

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		04-Jun-10	04-Jun-10	Unstable response		0.5	13
		05-Jun-10	05-Jun-10	Unstable response		0.4	10
		12-Jun-10	12-Jun-10	Unstable response		0.3	7
		16-Jun-10	16-Jun-10	Unstable response		0.4	9
		17-Jun-10	18-Jun-10	Unstable response		0.6	15
		18-Jun-10	18-Jun-10	Unstable response		0.4	9
		20-Jun-10	20-Jun-10	Unstable response		0.3	7
		21-Jun-10	21-Jun-10	Unstable response		0.5	13
		22-Jun-10	22-Jun-10	Unstable response		0.4	10
		25-Jun-10	25-Jun-10	Unstable response		0.6	15
		26-Jun-10	27-Jun-10	Unstable response		0.7	17
		27-Jun-10	27-Jun-10	Unstable response		0.6	15
		28-Jun-10	28-Jun-10	Unstable response		0.5	11
Sandwell West Bromwich							
O3	86.30%	17-Feb-10	13-Apr-10	ESU service	Low response. Internal sampling	55	1321
Scunthorpe Town							
NO2	88.00%	27-May-10	01-Jun-10	Instrument fault	Cal System Faults System Upgrades Unstable MV'S	5.1	122
		25-Jun-10	30-Jun-10	Instrument fault	Cal System Faults System Upgrades Unstable MV'S	5	120
PM10	89.90%	19-May-10	20-May-10	Instrument fault	Analyser Fault - Temps out of Spec	0.7	16
		20-May-10	20-May-10	Instrument fault	Analyser Fault - Temps out of Spec	0.6	15
		21-May-10	21-May-10	Instrument fault	Analyser Fault - Temps out of Spec	0.5	11
		22-May-10	24-May-10	Instrument fault	Analyser Fault - Temps out of Spec	2.4	57
		28-May-10	28-May-10	Instrument fault	Analyser Fault - Temps out of Spec	0.3	6
		02-Jun-10	03-Jun-10	Instrument fault	Analyser Fault - Temps out of Spec	0.6	15
		14-Jun-10	17-Jun-10	Instrument fault	Analyser Fault - Temps out of Spec	2.8	67
		29-Jun-10	29-Jun-10	Instrument fault	Analyser Fault - Temps out of Spec	0.3	8
SO2	88.00%	19-May-10	24-May-10	Instrument fault	Poor Analyser Performance	4.7	112
		01-Jun-10	03-Jun-10		ENG C/O	2.3	55
		14-Jun-10	17-Jun-10		Software upgrade	2.9	70
Southampton Centre							
CO	44.40%	08-Apr-10	29-May-10	Air Conditioning or Temp fault	all analysers were switched off due to a A/C fault	50.5	1211
NO2	40.40%	06-Apr-10	29-May-10	Sampling fault	Sampling fault & a/con fault	52.6	1262
O3	48.50%	01-May-10	29-May-10	Air Conditioning or Temp fault	all analysers were switched off due to a A/C fault	28	673
		26-Jun-10	28-Jun-10	No mv data collected	No mv data collected possible logger fault or power cut	2	49
PM10	43.40%	04-Apr-10	04-Apr-10	High noise	noisy data nulled	0.4	9

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		06-Apr-10	07-Apr-10	High noise	noisy data nulled	0.5	12
		08-Apr-10	29-May-10	High noise	noisy data nulled	50.5	1212
PM25	37.50%	06-Apr-10	30-Apr-10	High noise	noisy data nulled	24.7	592
		14-Apr-10	01-Jun-10	Air Conditioning or Temp fault	all analysers were switched off due to a A/C fault	48.5	1163
SO2	50.90%	01-May-10	29-May-10	Air Conditioning or Temp fault	all analysers were switched off due to a A/C fault	28	673
Southend-on-Sea							
NO2	0.00%	01-Apr-10	30-Jun-10	Sampling fault	Data deleted	91	2184
O3	86.90%	01-Mar-10	07-Apr-10	Sampling fault	possible internal sampling	37.6	903
		16-Apr-10	19-Apr-10	Instrument fault	analyser locked up	2.9	69
		02-Jun-10	04-Jun-10	Sampling fault	LSO reported sample lines slipped. Met LSO on s	2.1	50
Stanford-le-Hope Roadside							
PM10	69.70%	30-Mar-10	01-Apr-10	High noise	switched heads 2.5 under investigation	2	49
		14-Apr-10	16-Apr-10	Instrument fault	ENG C/O Replaced polished valve shuttle	2.3	56
		24-Apr-10	04-May-10	Instrument fault	C/O Failed leak test - replaced v seals	10.5	252
		16-May-10	28-May-10	Instrument fault	Call out replaced different V seals	12.3	295
		15-Jun-10	16-Jun-10	Unstable response	ENG C/O Pre service leak check PUMP OFF main / aux = 0.19 / 0.18	1.5	36
PM25	0.00%	18-Feb-10	17-May-10	ESU service	SERVICE + leak	88.1	2114
		01-Jun-10	15-Jul-10	Unstable response	ENG C/O Pre service - Leak check -Base	45	1080
SO2	81.10%	04-Mar-10	17-Apr-10	Instrument fault	PMT repair at esu workshop	44.5	1069
Tower Hamlets Roadside							
NO2	84.90%	05-May-10	06-May-10	Sampling fault	sample pressure fault	1.5	36
		10-May-10	13-May-10	Sampling fault	sample pressure fault	2.5	60
		18-May-10	20-May-10	Sampling fault	sample pressure fault	1.5	36
		27-May-10	27-May-10	Sampling fault	sample pressure fault	0.5	13
		11-Jun-10	12-Jun-10	Sampling fault	sample pressure fault	1	25
		15-Jun-10	15-Jun-10	Sampling fault	sample pressure fault	0.4	10
		16-Jun-10	21-Jun-10	Sampling fault	ENG C/O Reported flatline - OK on arrival. Replaced modem splitte	5.1	122
Walsall Willenhall							
NO2	0.00%	03-Feb-10	31-Aug-10	Monitoring suspended	LSO reports site burnt down.	209	5017
Warrington							
PM10	21.30%	09-Apr-10	09-Apr-10	FDMS volatile recovery or	Unstable/noisy volatiles	0.5	11

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				noisy			
		16-Apr-10	26-Apr-10	Instrument fault	control lost its memory taken to workshop repair	10	241
		01-May-10	30-Jun-10	FDMS volatile recovery or noisy	PM10>PM2.5. Dryer fault	61	1464
York Bootham							
PM10	85.60%	09-May-10	18-May-10	Unstable response	ENG C/O Valve (shuttle) was not switching. Removed from site	9.2	220
		20-May-10	20-May-10	Unstable response	Unstable data deleted	0.3	8
		21-May-10	21-May-10	Unstable response	Unstable data deleted	0.4	10
		22-May-10	22-May-10	Unstable response	Unstable data deleted	0.5	13
		23-May-10	23-May-10	Unstable response	Unstable data deleted	0.6	14
		04-Jun-10	04-Jun-10	Unstable response	Unstable data deleted	0.3	7
		05-Jun-10	05-Jun-10	Unstable response	Unstable data deleted	0.4	10
		08-Jun-10	09-Jun-10	Unstable response	Unstable data deleted	0.7	16
York Fishergate							
NO2	88.20%	19-May-10	29-May-10	Unstable response		10.5	253
PM10	88.30%	21-May-10	31-May-10	Unstable response		10.6	254
N Ireland							
Ballymena							
SO2	88.60%	07-May-10	17-May-10	Logger fault		10	240
		25-May-10	25-May-10	Logger fault		0.3	6
Derry							
O3	89.00%	21-Jun-10	11-Aug-10	Instrument fault	Large period of noisy data nulled	51.3	1232
PM25	39.40%	01-Feb-10	18-May-10	Instrument fault	Data nulled deemed unacceptable at QC	107	2559
		03-Jun-10	10-Jun-10	High noise	Data nulled noisy data with large hourly negatives	7.5	181
Lough Navar							
PM10	79.10%	01-May-10	19-May-10	Instrument fault	ENG C/O High volatiles / Repair Vac 20.5 perished 'O' ring on by	18.5	444
Scotland							
Aberdeen							
PM10	69.70%	11-May-10	31-May-10	Instrument fault	Call out: Sample dew point DATA FLAT	20.1	483
Auchencorth Moss PM10 PM25							
PM10	89.40%	03-Apr-10	03-Apr-10	High noise	Data deleted	0.3	8
		09-Apr-10	12-Apr-10	High noise	Data deleted	3.5	83

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		17-May-10	20-May-10	No data collected	analyser was turned off	3	71
		05-Jun-10	07-Jun-10	No data collected		1.6	38
PM25	76.40%	05-Jun-10	07-Jun-10	No data collected		1.6	38
		07-Jun-10	09-Jun-10	No data collected		2	48
		13-Jun-10	30-Jun-10	No data collected		17	409
Edinburgh St Leonards							
O3	89.10%	25-Apr-10	26-Apr-10	Instrument fault	ENG C/O Flow fault. Fitted external pump	0.8	18
		09-Jun-10	18-Jun-10	Instrument fault	Leak found at sample filter.	9	215
PM25	81.40%	01-Jun-10	16-Jun-10	Instrument fault	Noisy data; engineer call-out	15.9	381
Glasgow Centre							
PM10	0.00%	01-Jan-10	31-Aug-10	FDMS volatile recovery or noisy	High Volatiles	243	5832
Grangemouth							
NO2	74.80%	04-May-10	19-May-10	Instrument fault	ozone generator failed	14.9	358
		25-May-10	01-Jun-10	Power cut		7.1	170
PM10	89.30%	25-May-10	01-Jun-10	Power cut		7.5	179
		10-Jun-10	11-Jun-10	Switched out-of-service	possible software update	1.1	27
		23-Jun-10	23-Jun-10	ESU service	possible software update	0.4	10
		24-Jun-10	24-Jun-10	ESU service		0.3	7
PM25	88.00%	25-May-10	02-Jun-10	Instrument fault	Power cut	7.8	186
		10-Jun-10	11-Jun-10	Switched out-of-service	possible software update	1	25
		23-Jun-10	23-Jun-10	ESU service	possible software update	0.5	11
		24-Jun-10	24-Jun-10	ESU service		0.3	7
Wales							
Cardiff Centre							
PM10	58.60%	24-May-10	31-Jul-10	Instrument fault	Instrument fault - removed from site on 1 Jun	68.5	1643
PM25	85.20%	07-Apr-10	07-Apr-10	Switched out-of-service	calibration + recovery	0.3	6
		14-May-10	15-May-10	Unstable response	Poor data deleted	0.5	11
		24-May-10	01-Jun-10	Power cut	power cut - then data was unstable	8	192
		26-Jun-10	30-Jun-10	Unstable response	Poor data deleted	4.3	104
Mold							
NO2	0.00%	04-Feb-10	21-Aug-10	Sampling fault	Analyser sampling internal air	199	4764
Narberth							

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PM10	9.40%	31-Mar-10	22-Jun-10	FDMS drier	Dryer fault	82.8	1987
SO2	71.50%	18-Feb-10	26-Apr-10	Sampling fault	filter holder was not fully tightened.	67.3	1616
Newport							
PM10	30.40%	21-Apr-10	22-Apr-10	FDMS delta dew point < 4C	dew point temp too low	1.7	41
		23-Apr-10	23-Apr-10	FDMS delta dew point < 4C	dew point temp too low	0.4	10
		01-May-10	31-Jul-10	FDMS volatile noisy	Noisy volatiles	92	2208

Appendix 3

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, June 2010

Computer software	The HIS (Heuristic Information System) software suite used for all data management. A few specific capabilities of HIS were developed in order to meet specific Department deliverables or requirements (examples include software for annual report analysis/compilation, for formatting/transmitting network data to archive or DDU and for reporting Directive compliance data to the EC).
Field support equipment	Field support equipment: 1 intercalibration equipment set (includes mass flow controllers and read-out unit) A second intercalibration (commissioned January 2001) UV photometers: API model M401 s/n 123- purchased April 1999 API model 401 s/n 151 - purchased October 2000 API model 401 s/n 176 – purchased December 2002 API model 401 s/n 290 – purchased May 2004 API model 401 s/n 291 – purchased May 2004 API model 401 s/n 292 purchased May 2004 API model 401 s/n 293 purchased May 2004 API Model 703 s/n 254 purchased Jan 2010 API Model 703 s/n 255 purchased Jan 2010 Mass flow controllers - purchased April 2002 (incorporated into existing audit dilution apparatus) 3 Drycal flow meters - purchased September 2002 1 Mass flow controller read-out unit to be incorporated in the audit dilution apparatus – purchased September 2002. A third intercalibration kit (commissioned May 2004) Drycal flow meter – purchased March 2004 Sabio 2010 dilution calibrator – purchased February 2005 Sabio 2020 zero air generator – purchased February 2005 Sabio 2030 ozone photometer – purchased February 2005 Sabio 2010 dilution calibrator – purchased June 2006 Sabio 2020 zero air generator – purchased June 2006 Sabio 2030 ozone photometer – purchased June 2006 Sabio 2020 zero air generator – purchased March 2008 Sabio 2030 ozone photometer – purchased March 2008 Sabio 2010 dilution calibrator – purchased March 2008
Zero air pumps	6 spare zero air pumps for routine maintenance/repair of zero air generators in the AURN.
Analysers	AC31 dual chamber NO _x analyser TEI 43C SO ₂ analyser TEI 48C CO analyser M265 chemiluminescent ozone analyser (All of the above purchased on behalf of Defra by Casella Stanger in March 2003 and transferred to QA/QC Unit) Thermo 49i ozone analysers (2 off)

Appendix 4

Partisol Data: April-June 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 Apr	30 th Jun	91.2
Auchencorth Moss PM _{2.5}	1 st Apr	30 th Jun	89.0
Bournemouth PM _{2.5}	1 st Apr	30 th Jun	25.3
Brighton Preston Park PM _{2.5}	1 st Apr	30 th Jun	3
Harwell PM ₁₀	1 st Apr	30 th Jun	93.4
Harwell PM _{2.5}	1 st Apr	30 th Jun	71.4
Inverness PM ₁₀	1 st Apr	30 th Jun	86.8
Inverness PM _{2.5}	1 st Apr	30 th Jun	80.2 (incomplete dataset)
L. Marylebone Road PM ₁₀	1 st Apr	30 th Jun	96.7
L. Marylebone Road PM _{2.5}	1 st Apr	30 th Jun	0% (data rejected)
London N Kens PM ₁₀	1 st Apr	30 th Jun	74.7 (incomplete dataset)
London N Kens PM _{2.5}	1 st Apr	30 th Jun	62.6% (incomplete dataset)
London Westminster PM _{2.5}	1 st Apr	30 th Jun	82.4
Northampton PM _{2.5}	1 st Apr	30 th Jun	92.3
Port Talbot Margam PM ₁₀	1 st Apr	30 th Jun	92.3
Wrexham PM ₁₀	1 st Apr	30 th Jun	97.8
Wrexham PM _{2.5}	1 st Apr	30 th Jun	90.1

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.
- Carrying out a more detailed quarterly comparison of Partisol data with co-located or nearby FDMS-TEOM data.

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 – Winter 2009-10 and summer 2010 periods.

Site	Audit date	Flowrate m ³ /h	% out from 16.7 m ³ /h
Auchencorth Moss PM ₁₀ (serial no. 21550)	3 Feb 2010	16.7	0
	23 Jun 2010	17.41	4.43
Auchencorth Moss PM _{2.5} (serial no. 21548)	3 Feb 2010	16.7	0
	23 Jun 2010	17.09	2.51
Bournemouth PM _{2.5} (serial no. 21863)	8 Feb 2010	17.48	4.70
	12 Aug 2010	16.38	-1.76
Brighton Preston Park PM _{2.5} (212200001)	22 Feb 2010	No access	No access
	09 Aug 2010	17.46	4.71
Harwell PM ₁₀	28 Jan 2010	16.7	0
	20 Aug 2010	16.90	1.4
Harwell PM _{2.5}	28 Jan 2010	16.7	0
	20 Aug 2010	17.07	2.40
Inverness PM ₁₀ (serial no. 21255)	20 Jan 2010	16.7	0
	23 Jul 2010	17.24	3.44
Inverness PM _{2.5} (serial no. 21861)	20 Jan 2010	16.7	0
	23 Jul 2010	16.54	-0.75
London Marylebone Road PM ₁₀ (serial no. 21306)	11 Feb 2010	16.79	0.68
	09 Aug 2010	0.02	-99.87
London Marylebone Road PM _{2.5} (serial no. 21493)	11 Feb 2010	Partisol not operating.	Partisol not operating.
	09 Aug 2010	0	-100%
London N Kens PM ₁₀ (serial no. 21722) – assumed to be “2 nd set”.	12 Jan 2010	16.53	1.0
	23 Aug 2010	16.02	-3.9
London N Kens PM _{2.5} – assumed to be “2 nd set”.	12 Jan 2010	16.31	2.3
	23 Aug 2010	16.16	-3.06
London Westminster PM _{2.5}	8 Feb 2010	16.0	-4.14
	26 Aug 2010	16.44	-1.4
Northampton PM _{2.5}	10 Feb 2010	Not tested, no safe ladder access.	-
	24 Aug 2010	16.93	1.54
Port Talbot Margam PM ₁₀ (formerly 2.5) (serial number 22588)	02 Jan 2010	16.7	0
	14 Jul 2010	16.81	0.8
Wrexham PM ₁₀ (serial no. 21224)	23 Feb 2010	16.7	0
	17 Aug 2010	15.87	-4.77
Wrexham PM _{2.5} (serial no. 21011)	23 Feb 2010	16.7	0
	17 Aug 2010	15.73	-5.77

Flowrate test results in all cases where it was possible to carry out a flowrate test on the Partisol were normal (i.e. within 10%).

Auchencorth Moss

PM₁₀: data capture 91.2%.. Data losses –

- 12th Apr: problem with clock corrected.
- 15th – 19th Apr: filter exchange failures – LSO attended.
- 13th – 14th May: upgrade to site power supply.

PM_{2.5}: data capture was 89.0%. Data losses as follows:

- 1st Apr: power failure continued from previous day
- 12th Apr: problem with clock corrected.
- 20th Apr: flow halted, resulting in < 18h sampling.
- 12th May: double filter.
- 13th – 14th May: upgrade to site power supply.
- 28th May: error in filter weighing.
- 6th – 7th Jun: filters inverted
- 23rd Jun: filter not re-weighed.

There appear to be a lot of filter-related problems with the PM_{2.5} at this site this quarter, though not the PM₁₀.

Bournemouth

PM_{2.5} only: Data capture in Q2 was only 25.3%. Following a filter exchange failure on 24th Feb in Q1, the Partisol was taken to the ESU's workshop for repair, where it remained until 27th Apr. It operated for less than two weeks before an element burnt out, and it was once again removed to the ESU's workshop for repair where it remained until 10th Jun. Further data loss occurred due to a filter exchange failure at the end of June. Data losses were as follows:

- 24th Feb – 28th Apr: off-site repair.
- 5th -6th May: ran out of filters
- 7th May – 9th Jun: off-site repair after element burnt out.
- 26th – 28th Jun: filter exchange failure.

Brighton Preston Park

PM_{2.5} only: Data capture was 3% for this quarter. The unit was vandalised in early April, and repair is awaiting funding from Defra. Data losses:

- 4th Apr onwards: vandalised, awaiting repair.

Harwell

PM₁₀: 93.4% data capture. Data losses:

- 11th Jun: very low value (1 ug/m3) rejected by BV.
- 21st – 22nd and 28th – 30th Jun: filter exchange failures.

PM_{2.5}: 71.4% data capture. Data losses as follows:

- 11th – 14th May: flow problems.
- 5th – 30th Jun (except 18th, 24th, 26th and 27th) flow problems requiring repeated visits by ESU.

Inverness

PM₁₀: data capture 86.8%. Data losses as follows:

- 5th – 17th May (except 14th): series of filter exchange failures requiring visits from ESU.

PM_{2.5}: data capture 80.2%, but we have only received data up to 14th Jun from BV.

Data losses:

- 28th Apr: negative filter weight. Re-weighed in triplicate before rejection.
- 3rd Jun: < 18h sampling.
- 15th – 30th Jun: filters to be re-weighed by BV: still awaiting data.

London Marylebone Road

PM₁₀: data capture 96.7%. This Partisol shows good agreement with the co-located FDMS.

Data losses:

- 25th -26th May: damaged filters.
- 15th Jun: < 18h sampling – reason not clear but there was no audit on that day.

PM_{2.5}: ***The PM_{2.5} Partisol has consistently under-read relative to the co-located FDMS. An investigative visit on 28th April discovered that a connector inside the sampler was completely missing, so the Partisol had been sampling from inside the housing. It is not clear when this connector was removed, but all data from that time will be invalid and must be deleted. It is suspected that this could be well back into 2009. The Partisol was repaired in August.***

Data capture is therefore 0%.

London North Kensington

PM₁₀: data capture 74.7%, but still awaiting some data.

Data losses:

- 5th Apr: suspiciously high filter weighing. Re-weighed in triplicate before rejection.
- 21st Apr: error in initial weighing.
- 30th Apr, 3rd-4th May: site power failures
- 2nd Apr – contaminated field blank.
- 19th May: filter exchange failure (FEF).
- 30th May: < 18h sampling.
- 6th, 14th June: errors in initial weighing.
- 18th – 30th Jun: filters to be re-weighed by BV: still awaiting data.

PM_{2.5}: data capture 62.6%, but still awaiting data.

Data losses:

- 14th – 20th Apr: filter exchange failure
- 30th Apr – 4th May: power failure.
- 7th May: filter not returned/re-weighed.
- 9th & 10th May: rejected as PM_{2.5} > PM₁₀.
- 26th May: filter exchange failure
- 28th May: reason not specified.
- 30th May – 1st Jun: power failure.
- 16th – 30th Jun: filters to be re-weighed by BV: still awaiting data.

London Westminster

PM_{2.5} only.. Data losses –

- 5th Mar – 12th Apr: low flows led to ESU callout: pump and water trap removed for repairs. Partisol remained out of action.

- 6th – 7th May – power failure
- 24th – 25th May – power failure.

Northampton

PM_{2.5} only: Data capture was 92.3%. Data losses:

- 1st – 7th Apr – filter exchange failure (FEF).
- 4th – 6th May: filter exchange failure (FEF).
- 8th – 10th Jun: filter exchange failure (FEF).

Port Talbot Margam

PM₁₀ only: Partisol was converted to PM₁₀ as of 18th Feb. Data capture 92.3%.. Data losses:

- 3rd – 7th Jun: filter exchange failure requiring ESU attention
- 9th Jun: filter damaged.
- 23rd Jun: quartz filter used (presumably an error).

Wrexham

PM₁₀: Data capture was 97.8%. Data losses:

- 11th May: very low value (1 ug/m3) rejected by BV.
- 27th May: filter not re-weighed.

PM_{2.5}: Data capture 90.1%. Data losses:

- 7th – 9th May: sampling but no record
- 9th Jun: double filter
- 25th – 29th Jun: sampling but no records. Memory wiped 29th Jun. (Note: this is a recurrence of a problem that occurred in March).

Appendix 5

Site Details for New Sites

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

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

