QAQC Report for the Automatic Urban and Rural Network, April-June 2017

Report for the Environment Agency, Defra and the Devolved Administrations

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Contact:

Alison Loader
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR,
United Kingdom

t: +44 (0) 1235 753632

e: alison.loader@ricardo.com

Ricardo Energy & Environment is certificated to ISO9001 and ISO14001

Author:

Stewart Eaton

Approved By:

Alison Loader

Date:

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Executive Summary

Ricardo Energy & Environment carries out the quality assurance and quality 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), the Scottish Government, Welsh Government and Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland.

A total of 158 monitoring stations (plus two co-located Partisols) in the AURN operated during the three-month period April-June 2017.

The target for annual data capture is 85%, which is based upon the 90% data capture target of the Air Quality Directive, with an allowance of 5% for planned maintenance.

Ratified hourly average data capture for the network averaged 94.32% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the three-month reporting period April-June 2017. Average data captures for all pollutants were above 85%. There were 18 monitoring stations with data capture less than 90% for the period, of which 12 had data capture below 85%.

The main reasons for data loss were sampling faults, poor analyser performance and persistent temperature problems in the cabins resulting from air conditioning systems not working adequately.

The routine QA/QC procedures have included checking of particulate analyser baselines for some time now. The CEN standard method for ambient particulate matter EN16450 states that action must be taken when baseline response is higher than 3 µg m^{-3} but does not state what the action should be. Until 2015, the only agreed action was to delete the data. However, as part of ongoing improvement activities a protocol has been agreed to enable baselines to be corrected where baseline responses exceed 3 µg m^{-3}. The April to June 2017 dataset has been assessed and a number of baseline corrections were applied at this point.

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1 Introduction

1.1 Background

The UK Automatic Urban and Rural Network (AURN) was established to provide information on air quality throughout the UK for a range of pollutants. The primary function of the AURN is to provide data in compliance with EU Directives on Air Quality. However, in addition, the data and information from the AURN are required by scientists, policy makers and planners to enable them to make informed decisions on managing and improving air quality for the benefit of health and the natural environment.

A number of organisations are involved in the day-to-day running of the network. Currently, the role of Central Management and Co-ordination Unit (CMCU) for the AURN is contracted to Bureau Veritas, whilst the Environmental Research Group (ERG) of King's College London has been appointed as Management Unit for the AURN monitoring stations that are also part of the London Air Quality Network (LAQN). Ricardo Energy & Environment undertakes the role of Quality Assurance and Quality Control Unit (QA/QC Unit) for stations within the AURN. The responsibility for operating individual monitoring stations is assigned to local organisations with relevant experience in the field under the direct management of (and under contract to) CMCU. Calibration gases for the network are supplied by Air Liquide (UK) Ltd and are provided with an ISO17025 certificate of calibration by Ricardo. The monitoring equipment is serviced and maintained by a number of Equipment Support Units, under contract to the CMCU.

Dissemination of the data from the AURN via UK-AIR (the UK online Air Information Resource, http://uk-air.defra.gov.uk/) and other media such as freephone services is undertaken by the Data Dissemination Unit (DDU). A summary report of the data is also published annually in the "Air Pollution in the UK" series of reports, available on UK-AIR.

A total of 158 monitoring stations in the AURN operated during this quarter. There are also two sites where Partisol gravimetric particulate samplers are co-located with automatic particulate analysers. For data processing purposes the gravimetric sampler is treated as a separate station; and they are shown, and counted, separately in the data capture tables in section 4.

The main reasons for data loss at the stations are discussed in section 4. These were predominantly due to instrument or air conditioning faults, response instability or problems associated with the replacement of analysers and infrastructure.

1.2 What this Report Covers

This report covers the three-month period April-June 2017, or "Quarter 2" (Q2) of the year. This report covers the main QA/QC activities – data ratification and monitoring station QAQC intercalibration audits.

1.3 Where to Find More Information

Further information on the AURN can be found in the following:

- The AURN Hub. This online resource for AURN stakeholders contains network-specific information relating to the AURN, including the LSO Manual, QA/QC audit and ESU service schedules, CMCU reports and supporting information. The Hub login page is at: https://aurnhub.defra.gov.uk/login.php .
- UK-AIR, which contains information on individual stations along with real-time hourly data, graphs and statistics.

1.4 Changes to the Network during this Quarter

Table 1.1 shows the new monitoring stations which were commissioned in April – June 2017, and those which began monitoring additional pollutants during this quarter. One monitoring station – Birmingham Tyburn – closed during this quarter due to the site becoming unavailable. (It is to be relocated.)

Table 1.1 Station changes in Q2 of 2017

New stations	Pollutants	Date started
Northampton Spring Park[1]	NO_2 $PM_{2.5}$ (Smart BAM)	6 April 17 (NO_2) 8 May 17 ($PM_{2.5}$)
Coventry Binley Road	NO_2	25 April 17
Bristol Temple Way	NO_2	4 May 17
Ballymena Antrim Road	NO_2	13 April 17
Stations closed	**Pollutants**	**Date**
Birmingham Tyburn	$PM_{2.5}$ PM_{10} [2]	6 June 17

1. Replaces Northampton Kingsthorpe, closed in Q1
2. Gaseous pollutants discontinued 31 December 2016.

The Fidas analyser (both $PM_{2.5}$ and PM_{10}) at Greenock A8 Roadside has been affiliated into the AURN with effect from 1 January 2017. The data are not yet included in this report, but are available on UK-AIR.

2 Methodology

2.1 Overview of QA/QC Activities

The QA/QC activities consist of the following key parts:

- QA/QC audits of all analysers in the network every six months (three months for ozone).
- Ratification of the data on a three-monthly basis, and upload of ratified data to the Data Dissemination Unit.
- Assessment of new station locations in conjunction with the CMCU, and assessment of compliance with the siting criteria in the Directive.
- Investigation of instances of suspected poor quality data.

2.2 QA/QC Audits

2.2.1 Purpose of Intercalibration

The QA/QC intercalibration audits fulfil a number of important functions:

- A “health check” on the production of provisionally scaled data, which is rapidly disseminated to the public soon after collection.
- Identification of poorly-performing analysers and infrastructure, together with recommendations for corrective action.
- A measure of network performance, by examining for example, how different NOx analysers around the network respond to a common gas standard. This test checks how “harmonised” UK measurements are; i.e. that a 200ppb NO_2 pollution episode in (for example) Belfast would be reported in exactly the same way at every other station in the UK, regardless of the location or the analyser used to record the event.
- Assessment of the area around the monitoring station: has the environment changed in the last six months? Is the location still representative of the station classification?

2.2.2 Methodology for FDMS & BAM Baseline Checks

As part of the QA/QC remit for continuous improvement, an ad hoc study of particulate matter (PM) analyser baseline response has been undertaken for the past two years. This study has been coordinated following investigations of issues identified both by CMCU during routine operation and by QA/QC unit during the ratification process.

The study initially concentrated on FDMS analysers, examining the baseline profile of the reference channels and the relationship with other neighbouring monitoring stations. It has become clear that, on a daily mean basis, regional reference PM concentrations regularly reach a minimum value that approaches 0 µg m^{-3}. The test is equally valid for BAM instruments, and thus the tests are also carried out on these.

The routine QA/QC procedures have included checking of particulate analyser baselines for some time now. The CEN standard method for ambient particulate matter EN16450 states that action must be taken when baseline response is higher than 3 µg m^{-3} but does not state what the action should be. Until 2017 the only agreed action was to delete the data. However, as part of ongoing improvement activities a protocol has been agreed to enable baselines to be corrected where baseline responses exceed 3 µg m^{-3}.

2.3 Overview of Data Ratification

Data for each station are supplied monthly by the CMCUs. Once initial monthly data files have been received, checked and loaded into MODUS, the process of data ratification begins. This process is required to refine data scaling based on all the calibration and audit data available, and to identify, withdraw or flag anomalous data due to instrument or sampling faults or where data fall outside the Uncertainties or Limits of Detection defined by the Data Quality Objectives (DQOs) of Directive 2008/50/EC (the Air Quality Objective) and the European Union's Implementing Provisions for Reporting.

3 Intercalibration Results Summary (2017)

3.1 National Network Overview

During April 2017, Ricardo Energy & Environment undertook an intercalibration of 78 ozone monitoring stations in operation in the Defra and the Devolved Administrations Automatic Urban and Rural Monitoring Network. These calibrations constitute the ISO17025 traceable calibration required every three months by the DQO. The intercalibration exercise is a vital step in the process of data ratification. The audits are used to undertake a number of analyser and infrastructure performance checks that cannot be performed by Local Station Operators, with a view to ensuring confidence in the accuracy, consistency and traceability of air pollution measurements made at all the monitoring stations.

4 Data Ratification Results (2nd Quarter)

4.1 Data Capture – Network Overview

4.1.1 Overall Data Capture

Ratified hourly average (daily average for Partisols) data capture for the network averaged 94.32% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the three-month reporting period April-June 2017. Data capture statistics 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. It is permissible to discount routine service and calibration from achievable data capture targets, but this is not calculated. For stations starting or closing during the period, the data capture is based on the actual date starting or closing. All pollutants achieved 85% or higher data capture on average. The data capture target for the purposes of monitoring compliance with the EU Air Quality Directive (Directive 2008/50/EC) is 90% excluding planned servicing and maintenance. For

practical purposes in the AURN, planned maintenance is assumed to be 5% so a target of 85% data capture is used.

Data capture for the quarter is shown in Table 4.1.

Table 4.1: AURN Ratified Data Capture (%) for April-June 2017 and Previous Quarter

Quarter	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Mean
Q1	90.98	95.33	96.72	89.11	90.39	94.13	93.39
Q2	97.46	96.08	98.34	92.05	93.67	95.09	94.32

The data captures from previous quarters have been recalculated to reflect data changed in subsequent quarters.

Note that the overall data capture value is the average calculated from the data captures at individual sites, these themselves being the average of all pollutants at that site.

4.1.2 Generic Data Quality Issues

The following data quality issues have been identified in April to June 2017:

- Delays in carrying out repairs to affiliated analysers resulting in long periods of lost data (e.g. Newcastle Cradlewell Roadside)
- Poor performance or failure of air conditioning, resulting in long periods of poor quality data deleted during ratification (e.g. Barnstaple A39) or analysers switched off to avoid damage due to high enclosure temperatures (e.g. Sandy Roadside).

4.1.3 Data Precision

As part of the requirements of the INSPIRE Directive 2007/2/EC and 2011/850/EU Implementing Decision, data is required to be reported to one decimal place (two for CO). As of June 2017, only Armagh Roadside and York Bootham were still reporting gaseous data as integers.

4.2 Data Capture and Station-Specific Issues April-June 2017- England (Excluding Greater London)

Table 4.2 shows percentage data capture for stations in England during Quarter 2 of 2017. The table is followed by details of individual station-specific issues.

Table 4.2 Data Capture – England – Quarter 2 (April-June) 2017

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Quarter Average
Barnsley Gawber		99.68	99.86			99.68	99.74
Barnstaple A39				0.00	0.00		0.00
Bath Roadside		98.81					98.81
Billingham		99.86					99.86
Birkenhead Borough Road		99.36					99.36
Birmingham A4540 Roadside		99.45	99.73	99.04	94.96		98.29
Birmingham Acocks Green		88.37	99.91		74.31		87.53
Birmingham Tyburn				91.79	96.08		93.93
Blackburn Accrington Road		99.82					99.82

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Quarter Average
Blackpool Marton		95.15	98.26		100.00		97.80
Bournemouth		88.87	99.59		100.00		96.15
Bradford Mayo Avenue		99.22					99.22
Brighton Preston Park		99.68	89.79		98.90		96.12
Bristol St Paul's		99.91	100.00	99.68	98.35		99.48
Bristol Temple Way		99.82					99.82
Bury Whitefield Roadside		99.68		98.53			99.11
Cambridge Roadside		99.40					99.40
Cannock A5190 Roadside		92.99					92.99
Canterbury		99.68	99.91				99.79
Carlisle Roadside		99.77		99.68	99.54		99.66
Charlton Mackrell		92.49	100.00				96.25
Chatham Roadside		99.27		99.13	99.86		99.42
Chesterfield Loundsley Green		95.01		47.34	99.68		80.68
Chesterfield Roadside		91.16		96.75	99.95		95.96
Chilbolton Observatory		90.38	94.83	99.73	100.00	97.57	96.50
Christchurch Barrack Road		97.76					97.76
Coventry Allesley		98.44	98.95		98.35		98.58
Coventry Binley Road		99.54		99.95			99.75
Derby St Alkmund's Way		99.86					99.86
Doncaster A630 Cleveland Street		99.73					99.73
Eastbourne		99.36			99.63		99.50
Exeter Roadside		99.63	83.33				91.48
Glazebury		87.91	99.59				93.75
High Muffles		99.86	99.91				99.89
Honiton		99.08					99.08
Horley		99.63					99.63
Hull Freetown		99.31	99.86		96.70	99.40	98.82
Hull Holderness Road		99.50		54.21			76.85
Ladybower		99.77	88.14			92.54	93.48
Leamington Spa		97.80	99.59	97.16	96.47		97.76
Leamington Spa Rugby Road		99.63		99.45	99.22		99.44
Leeds Centre	97.44	98.67	99.86	99.68	99.68	98.26	98.93
Leeds Headingley Kerbside		100.00		96.98	99.82		98.93

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Quarter Average
Leicester A594 Roadside		99.91		81.27			90.59
Leicester University		99.45	99.50		99.91		99.62
Leominster		99.68	99.77				99.73
Lincoln Canwick Road		99.63					99.63
Liverpool Speke		99.82	99.73	100.00	99.91	99.95	99.88
Lullington Heath		99.86	91.35			59.25	83.49
Luton A505 Roadside		96.43					96.43
Manchester Piccadilly		95.15	84.34		99.54	99.77	94.70
Manchester Sharston		99.40	99.54				99.47
Market Harborough		95.51	99.73				97.62
Middlesbrough		99.13	99.86	97.34	97.66	95.60	97.92
Newcastle Centre		99.82	99.73	99.63	100.00		99.79
Newcastle Cradlewell Roadside		0.00					0.00
Northampton Spring Park		99.63	99.73		75.96		91.77
Norwich Lakenfields		98.95	99.82	99.77	99.68		99.55
Nottingham Centre		99.82	99.82	100.00	100.00	99.73	99.87
Nottingham Western Boulevard		99.68		99.40			99.54
Oldbury Birmingham Road		98.35					98.35
Oxford Centre Roadside		94.18					94.18
Oxford St Ebbes		99.27		99.95	99.95		99.73
Plymouth Centre		99.18	100.00	92.31	98.08		97.39
Plymouth Tavistock Road		67.22					67.22
Portsmouth		94.78	99.86	86.54	85.44		91.66
Preston		99.22	99.54		98.31		99.02
Reading London Road		94.60		94.78			94.69
Reading New Town		99.82	99.91	99.63	99.91		99.82
Rochester Stoke		93.86	93.96	91.30	90.66	93.36	92.63
Salford Eccles		95.28		98.72	99.73		97.91
Saltash Callington Road				90.38	99.50		94.94
Sandy Roadside		92.67		55.08	57.10		68.28
Scunthorpe Town		99.77		68.86		96.84	88.49
Shaw Crompton Way		98.49					98.49
Sheffield Barnsley Road		99.45					99.45

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Quarter Average
Sheffield Devonshire Green		96.98	98.49	97.30	95.05		96.96
Sheffield Tinsley		99.27					99.27
Sibton			99.82				99.82
Southampton A33		99.91		81.50			90.71
Southampton Centre		99.40	93.96	87.73	99.27	99.40	95.95
Southend-on-Sea		99.54	99.63		99.82		99.66
St Helens Linkway		96.02		94.00			95.01
St Osyth		99.59	99.54				99.57
Stanford-le-Hope Roadside		99.63		86.08	84.16		89.96
Stockton-on-Tees A1305 Roadside		99.27			99.91		99.59
Stockton-on-Tees Eaglescliffe		99.68		99.45	96.38		98.50
Stoke-on-Trent A50 Roadside		99.73		98.12			98.92
Stoke-on-Trent Centre		99.82	99.86		98.90		99.53
Storrington Roadside		99.63					99.63
Sunderland Silksworth		95.33	99.86		97.99		97.73
Sunderland Wessington Way		48.12					48.12
Thurrock		99.73	95.33	98.31		99.45	98.20
Walsall Woodlands		99.82	99.95				99.89
Warrington		94.64		92.72	92.81		93.39
Weybourne			98.76				98.76
Wicken Fen		99.73	99.59			98.44	99.25
Widnes Milton Road		70.28					70.28
Wigan Centre		99.45	99.95		97.39		98.93
Wirral Tranmere		98.63	99.91		100.00		99.51
Worthing A27 Roadside		99.22					99.22
Yarner Wood		99.54	99.77				99.66
York Bootham		99.63		91.85	96.98		96.15
York Fishergate		60.26		54.44	54.03		56.24
Number of sites	1	99	49	44	50	15	104
Number of sites < 85 %	0	5	2	8	6	1	10
Number of sites < 90%	0	8	4	11	7	1	13
Average	97.44	95.60	97.99	88.99	93.31	95.28	93.45

Barnstaple A39

During ratification, it was noticed that the sample dewpoints showed significant diurnal variation, probably due to inadequate temperature control within the enclosure. This could be seen in the mass data, and all data from both analysers have been deleted for the quarter.

Birmingham Acocks Green

Throughout this period the malfunctioning air conditioning unit was responsible for raised enclosure temperature and subsequent severe impact upon performance of the $PM_{2.5}$ system. Significant periods of data were deleted due to the instrument response instability and performance stability was restored on 28 April. A pump fault resulted in the loss of NOx data from 6-14 June.

Bournemouth

As a result of low measured NOx concentrations, an investigation by the ESU found a loose sample holder on 27 June. Following this an analyser fault was observed, requiring a new power supply on 7 July. Data for this period have been lost.

Brighton Preston Park

The ozone data from 4-12 April was lost due to a leaking main valve.

Chesterfield Loundsley Green

The PM_{10} data were deleted from 1-7 April and 20 April-22 May due to a number of faults with the cooler unit. Further data loss resulted from a suspected pump fault attended to by the ESU on 30 May.

Glazebury

As described in the Q1 report, the NOx analyser was switched off 9 March to 11 April due to air conditioning failure and consequent temperature issues.

Hull Holderness Road

The PM_{10} FDMS was replaced by a BAM in Q1. Although the audit and LSO training was completed earlier in May the analyser was plagued by recurring tape breakages and this delayed the start of the data dissemination. Following multiple ESU investigations and apparent tape stability CMCU decided to commence the data dissemination on 15 May. Unfortunately, on 17 May, recurring tape breakage prompted CMCU to request the ESU to collect the instrument and return it to the supplier for warranty repair. The BAM was in the workshop from 19 May- 14 June but the supplier failed to identify the cause of the recurring tape breakages and the instrument was reinstalled at site on 15 June. On 22 June CMCU requested further supplier investigation and on 23 June the corresponding engineer site visit reported that the analyser roller tape mechanism was not moving as freely as it should. The mechanism was lubricated, the roller movement appeared satisfactory and, to date, there have been no further tape failures.

Ladybower

A blockage in the ozone sample line caused intermittent flow faults early in April; this was cleared by the ESU on 19 April.

Leicester A594 Roadside

NOx data were lost 31 May to 1 June (moisture in cooler) and 19-26 June (cooler fault). In addition, some data around these periods were deleted during ratification due to spurious volatile concentrations.

Lullington Heath

The SO_2 data were very noisy for several periods in March and April. At the ESU callout on 4 May, the lamp intensity was found to be too low. This improved the data but some spurious peaks were still observed, possibly due to line voltage fluctuations.

Manchester Piccadilly

The ozone filter holder was found to be leaking on 18 April; data from 4-18 April have been deleted.

Newcastle Cradlewell Roadside

Following appointment of the ESU in Q1, a code activated switch was installed by the ESU on 9 May, however, data collection failure prompted a return visit and on 10 May ESU investigation diagnosed NOx analyser processor failure. This has not been resolved this quarter.

Northampton Spring Park

The $PM_{2.5}$ BAM was installed on 20 April, and this was then followed by a zero check, resulting in some data loss.

Plymouth Tavistock Road

The NOx analyser produced periods of noisy data which were deleted during ratification. Data between 23 May and 22 June were lost.

Portsmouth

Some PM_{10} and $PM_{2.5}$ data were lost from both FDMS analysers, probably due to elevated temperatures within the enclosure. Problems continue into Q3.

Sandy Roadside

The air conditioning failed during the summer, and the FDMS analysers were turned off on 26 May to prevent damage.

Scunthorpe Town

The PM_{10} FDMS analyser has continued to perform poorly during the summer. Data from 31 May to 28 June have been deleted due to being a regional outlier. Data improved following an ESU callout on 28 June.

Southampton A33

The performance of the PM_{10} FDMS was poor during the quarter, with several spurious peaks and a number of ESU callouts. Following a valve fault on 18 June, data quality was even poorer, and further investigation found the main flow changed when the valve moved. A hotspare sensor unit was fitted in early July.

Southampton Centre

The PM_{10} data appears unacceptably noisy for periods during the quarter, and some have been deleted during ratification. Data between 27 May-1 June have been deleted, poor quality data possibly caused by a leaking valve block.

Stanford-le-Hope Roadside

Both FDMS analysers suffered frequent dewpoint faults up to drier replacement on 20 April; thereafter a valve fault with the $PM_{2.5}$ analyser lost data up to 24 May. Air conditioning problems resulted in further loss of PM_{10} data.

Sunderland Wessington Way

The LSO attended the site on 22 May to investigate a communications failure, and found that the air conditioning was causing the station power to trip out. Investigations revealed the air conditioning unit was beyond economic repair. Delays in obtaining a replacement unit resulted in monitoring not restarting before 20 July.

Widnes Milton Road

A fault was detected by CMCU on 18 April. The ESU attended and diagnosed an ozone generator fault, but communications with CMCU were lost. The ESU installed a hotspare on 3 May, but CMCU were unaware and once again the CMCU could not download data until 6 May. Further data collection problems were detected on 16 May; communications were re-established on 25 May, but only data from 22 May were recoverable.

York Fishergate

The poor air conditioning performance caused the loss of PM_{10} data on 9, 20-24 April and 24 May; ultimately, on 25 May the site was powered down to avoid temperature-related damage. Monitoring was finally restored on 5 July.

4.3 Data Capture and Station-Specific Issues April-June 2017- Greater London

Table 4.3 shows percentage data capture for stations in Greater London during Quarter 2 of 2017. The table is followed by details of individual station-specific issues.

Table 4.3 Data Capture – Greater London - Quarter 2 (April-June) 2017

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Quarter Average
Camden Kerbside		99.68		96.89	98.99		98.52
Ealing Horn Lane				99.63			99.63
Haringey Roadside		99.86					99.86
London Bexley		99.59			99.27		99.43
London Bloomsbury		99.77	99.91	94.28	95.74	87.68	95.48
London Eltham		95.56	99.63		99.22		98.14
London Haringey Priory Park South		99.82	99.63				99.73
London Harlington		99.50	99.22				99.36
London Harlington				99.73	99.73		99.73
London Harrow Stanmore					29.85		29.85
London Hillingdon		99.86	99.91				99.89
London Marylebone Road	97.07	98.76	99.40	99.27	99.91	99.40	98.97
London Marylebone Road (Partisol)				98.90	95.60		97.25
London N. Kensington	98.44	99.36	99.40	96.75	98.63	99.45	98.67
London Teddington Bushy Park					85.26		85.26
London Westminster		98.67					98.67
Southwark A2 Old Kent Road		99.73		88.69			94.21
Tower Hamlets Roadside		98.99					98.99
Number of Sites	2	13	7	8	10	3	18
Number of sites < 85 %	0	0	0	0	1	0	1
Number of sites < 90%	0	0	0	1	2	1	2
Average	97.76	99.17	99.59	96.77	90.22	95.51	93.98

London Bloomsbury
The SO2 analyser was removed for workshop repair from 20 to 26 June.

London Teddington Bushy Park

Several short periods of poor quality data were deleted during the quarter; also a failed valve motor resulted in the loss of data from 29 April to 5 May.

London Harrow Stanmore

The power to the site was disconnected on 28 April while the adjacent school was demolished.

Southwark A2 Old Kent Road

Some short periods of PM_{10} data were deleted on 17 May, 17-18 June and 21-26 June due to data being identified as regional outliers, possibly due to site temperature problems.

4.4 Data Capture and Station-Specific Issues April-June 2017– Wales

Table 4.4 shows percentage data capture for stations in Wales during Quarter 2 of 2017. The table is followed by details of individual station-specific issues.

Table 4.4 Data Capture - Wales - Quarter 2 (April-June) 2017

Name	CO	NO_2	O_3	PM_{10}	PM_{25}	SO_2	Average
Aston Hill		99.13	96.66				97.89
Cardiff Centre	99.31	100.00	93.04	99.27	88.32	100.00	96.66
Chepstow A48		77.11		99.95	100.00		92.35
Cwmbran		99.86	99.77				99.82
Hafod-yr-Ynys Roadside		99.50					99.50
Narberth		95.74	96.02	95.28		71.29	89.58
Newport		96.06		90.71	99.68		95.48
Port Talbot Margam				98.90			98.90
Port Talbot Margam	97.80	93.73	97.99	88.97	91.71	97.80	94.67
Swansea Roadside		99.18		97.80	98.31		98.43
Wrexham		99.73		95.60	92.31	98.58	96.55
Number of Sites	2	10	5	8	6	4	11
Number of sites < 85 %	0	1	0	0	0	1	0
Number of sites < 90%	0	1	0	1	1	1	1
Average	98.56	96.00	96.69	95.81	95.05	91.92	96.35

Cardiff Centre

As a result of poor quality $PM_{2.5}$ data, the LSO was called out on 23 June to change the filters, and the ESU on 27 June, when a leak was found in the main flow. Data from 20 to 30 June have been deleted.

Chepstow A48

CMCU noted problems collecting the NOx data on 28 March. Correct operation of the analyser was restored on 5 April by the LSO, but the data from this period were lost. Several further instances of the analyser locking up occurred, until the instrument was removed for workshop repair on 21 April.

Narberth

The ESU were called out on 26 June to investigate low SO_2 data. The sample inlet filter glass was found to be damaged and leaking. Low data continued to be observed up to a further visit on 3 July, where a blocked IZS valve was found. Data from 10 to 30 June have been deleted, and more will be lost from Q3.

Port Talbot Margam

Two periods of poor quality PM_{10} data on 22 to 25 May and 14 to 19 June were deleted during ratification.

4.5 Data Capture and Station-Specific Issues April-June 2017– Scotland

Table 4.5 shows percentage data capture for stations in Scotland during Quarter 2 of 2017. The table is followed by details of individual station-specific issues.

Table 4.5 Data Capture Scotland - Quarter 2 (April-June) 2017

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Quarter Average
Aberdeen		97.02	97.25	97.07	97.02		97.09
Aberdeen Union Street Roadside		99.91					99.91
Aberdeen Wellington Road		96.98					96.98
Auchencorth Moss			99.86	99.54	99.68		99.69
Bush Estate		99.86	99.95				99.91
Dumbarton Roadside		94.23					94.23
Dumfries		96.89					96.89
Edinburgh St Leonards	98.53	99.73	99.68	90.84	99.91	99.63	98.05
Eskdalemuir		99.86	99.95				99.91
Fort William		85.58	99.86				92.72
Glasgow Great Western Road		99.86					99.86

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Quarter Average
Glasgow High Street		95.74		100.00	99.73		98.49
Glasgow Kerbside		99.68					99.68
Glasgow Townhead		99.63	99.91	99.82	100.00		99.84
Grangemouth		96.66		96.11	96.47	89.70	94.73
Grangemouth Moray		77.15					77.15
Greenock A8 Roadside		99.77					99.77
Inverness		98.76		96.70	96.70		97.39
Lerwick			98.86				98.86
Peebles		99.59	98.58				99.08
Strathvaich			99.95				99.95
Number of Sites	1	18	10	7	7	2	21
Number of sites < 85 %	0	1	0	0	0	0	1
Number of sites < 90%	0	2	0	0	0	1	1
Average	98.53	96.49	99.39	97.15	98.50	94.67	97.15

Fort William

The NOx analyser suffered a failure of the detector on 3 April; a hotspare was installed on 13 April. The site analyser was reinstalled on 2 May, but further problems meant the analyser was again removed from 30 May to 2 June.

Grangemouth

The SO_2 data from 25 April to 4 May were lost due to an unspecified fault following a baseline shift.

Grangemouth Moray

NOx data from 26-30 May and 1-12 June have been lost due to the failure of the air conditioning unit.

4.6 Data Capture and Station-Specific Issues April-June 2017- Northern Ireland

Table 4.6 shows percentage data capture for stations in Northern Ireland (also the Mace Head station in the Republic of Ireland) during Quarter 2 of 2017. The table is followed by details of individual station-specific issues.

Table 4.6 Data Capture Northern Ireland - Quarter 2 (April-June) 2017

Name	CO	NO_2	O_3	PM_{10}	$PM_{2.5}$	SO_2	Average
Mace Head			100.00				100.00
Armagh Roadside		95.60		99.82			97.71
Ballymena Antrim Road		85.94					85.94
Ballymena Ballykeel		98.99				95.74	97.37
Belfast Centre	93.64	99.22	99.82	96.11	99.68	99.68	98.02
Belfast Stockman's Lane		97.57		97.57			97.57
Derry Rosemount		99.82	99.86	98.86	97.71	99.18	99.08
Lough Navar			99.59	98.72			99.15
Number of Sites	1	6	4	5	2	3	8
Number of sites < 85 %	0	0	0	0	0	0	0
Number of sites < 90%	0	1	0	0	0	0	1
Average	93.64	96.19	99.82	98.21	98.70	98.20	96.86

Ballymena Antrim Road

This site was scheduled to start on 1 April; however data supplied commences on 13 April.

4.7 Changes to Previously Ratified Data

The following data from previous quarters have been changed as a result of the ratification process for this quarter (all 2017 unless otherwise stated):

Table 4.7 Changes Affecting Ratified Data in Previous Quarters

Monitoring Station	Pollutant(s)	Dates	Nature of Change
Glasgow Townhead	NOx	All of Q1	Reprocess sensitivity.
Glazebury	NOx	All of Q1	Reprocess zero baseline.
Liverpool Speke	PM_{10}	22 Feb – 1 Aug	Zero baseline adjustment, from gap on 22 Feb, to 1 Aug.
London Bloomsbury	PM_{10} & $PM_{2.5}$	1 Jan – end of Q2 (and beyond)	PM_{10}: Zero baseline adjustment, from 2.4 µg m^{-3} on 6 Feb (winter 2017 zero test), to 3.6 µg m^{-3} on 7 Aug (summer 2017 zero test), extrapolated back to 1 Jan. $PM_{2.5}$: zero baseline adjustment, ramp from winter zero result 2.6 µg m^{-3} on 6 Feb, to summer zero result 3.2 µg m^{-3} on 7 Aug, ongoing into Q3.

Monitoring Station	Pollutant(s)	Dates	Nature of Change
London Westminster	NOx	All of Q1	Reprocess, also deleted between audit on 2 Feb and service 14 – 15 Feb.
Newcastle Centre	$PM_{2.5}$	2 Feb – 10 Aug and beyond.	Zero baseline adjustment: ramped from 0 µg m^{-3} on 2 Feb to 4.7 µg m^{-3} on 10 Aug, then 4.7 µg m^{-3} onwards.
Norwich Lakenfields	PM_{10}	30 Jan – 10 Aug	Zero baseline adjustment: ramped from 0 µg m^{-3} on 30 Jan to 4.1 µg m^{-3} on 10 Aug.
Peebles	O_3	All Q1	Blockage in valve found to affected flowrate; data rescaled
Rochester Stoke	All (NOx, O_3, SO_2)	28 – 30 Mar	Missing data received, uploaded and processed.

A list of changes to ratified data is given at http://uk-air.defra.gov.uk/data/changes-to-ratified-data .

4.8 Zero Baseline Correction

Until 2015, the only agreed action that could be taken in the event of a zero baseline response outside the range ±3 µg m^{-3} was to reject data. However, as of 2017, as part of ongoing improvement activities a protocol has been agreed to enable PM baselines to be corrected where baseline responses exceed 3 µg m^{-3}. Baseline correction has been incorporated into the data ratification protocols as of 2017, and the 2015 dataset has also been retrospectively reviewed, and baseline corrections applied where appropriate. Rescales involving data prior to Q2 are listed in Table 4.7 above.

The following particulate data were rescaled between April-June 2017:

Table 4.8 Particulate Baseline Rescales, Q2 2017

Station	Pollutant	Dates	Details
Belfast Centre	PM_{10}	1 Apr-4 May	Zero baseline correction of 4.0µgm^{-3} continued from previous quarter up to 4 May
Carlisle Roadside	$PM_{2.5}$	15 May-17 Jul	Zero baseline correction of 3.2 µgm^{-3} from 1 May to 17 Jul (drier change).
Chesterfield Roadside	$PM_{2.5}$	5 Jun-24 Aug	Zero baseline correction of 3.5µgm^{-3} up to 24 Aug
Sunderland Silksworth	$PM_{2.5}$	1 Apr-22 Aug	Ramped correction applied to zero baseline, from 0 µgm^{-3} from 1 April to 3.6 µgm^{-3} on 22 Aug.

5 Health and Safety Report April-June 2017

This section lists instances when the risk status of any AURN monitoring stations was raised to “High” on the Health & Safety Database during April to June 2017. This list includes all Defra monitoring networks, not just the AURN, as the QAQC contractor acts as health and safety co-ordinator for all monitoring networks. (Issues which were erroneously raised as “High” are excluded).

In Quarter 2 of 2017, there were no instances of any monitoring stations going to “High” risk

6 Equipment Upgrade Requirements

6.1 Equipment

At the request of the CMCU, suggestions of analysers requiring replacement has been supplied and are being evaluated.

7 Conclusions

7.1 Data Capture April-June 2017

During Quarter 2 of 2017 there were a total of 158 AURN monitoring stations in operation, plus two co-located Partisol sites.

Data ratification for this quarter was completed by the deadline of 30 September 2017.

Ratified hourly average data capture for the network averaged 94.32% for all pollutants (O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) during the three-month reporting period April-June 2017. Average data captures for all pollutants were above 85%. There were 18 monitoring stations with data capture (across all pollutants) less than 90% for the period, of which 12 had data capture below 85%

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The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com