

**London Air Quality Network:  
Ratification Report for  
January to June 1999**

B P Sweeney and A M Woolley

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Approved on behalf of Managing Director, NPL  
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by

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## **1. INTRODUCTION**

This report has been prepared for the Department of the Environment, Transport and the Regions by NPL under contract EPG 1/3/123. It covers the ratification of data in the London Air Quality Network relating to the period January to June 1999.

The ratified data capture percentages and specific problems at sites are presented in this report.

## **2. RATIFICATION PROCEDURE**

The data received by NPL from the CMCU were processed and scaled according to calibrations carried out by the Local Site Operators every two weeks, and by NPL on a three monthly basis. The results of these NPL field calibrations are reported to the Department separately.

During an NPL intercomparison ozone analyser accuracy is quantified with a transfer standard photometer, NO<sub>x</sub>, CO and SO<sub>2</sub> analyser calibration responses are measured with gas mixtures - certified against primary standard gases at NPL. Analyser linearities are determined by multi-point dilution of a high concentration mixture with zero air. Particulate analysers are calibrated with traceable pre-weighed masses, and sample and bypass flow rates are measured.

The data ratification process takes account of all relevant data from LSO's, NPL and Equipment Service Unit calibrations. The optimum time-varying set of analyser response functions are determined and then applied to raw data to produce the ratified data set. The causes of gaps in the new data set are identified and periods for which analyser responses are seen to be unstable or changing rapidly are deleted.

### 3. DATA CAPTURE

The percentage data capture at each site for each pollutant is given in Table 1.

**Table 1: Data capture for January to June 1998**

Site Name	Percentage Data Capture by Pollutant					
	O <sub>3</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	PM <sub>10</sub>	Mean
Bromley		93		53		
Camden		95			92	
Eltham	99	95	99		99	
Hackney	94	95		89		
Haringey 1		97			99	
Haringey 2	98					
Hounslow		97		97		
Kensington and Chelsea	99	99	99	99	99	
Lewisham	99	98	92			
Marylebone Road	94	94	93	93	92	
Southwark 1	98	97	98	98		
Southwark 2		63	97	98		
Sutton 1		97	95	97	99	
Sutton 3	99	91				
Tower Hamlets		96		96		
Wandsworth 2	99	98				
<b>Mean</b>	<b>98</b>	<b>94</b>	<b>96</b>	<b>91</b>	<b>97</b>	

## **4. GENERIC REASONS FOR ABSENT RATIFIED DATA**

We distinguish three general categories for ratified data loss:

### **4.1 ABSENT UNRATIFIED DATA**

During periods of power failure, telecommunications failure, instrument calibration and repair, or other similar circumstances, clearly there is no “raw” data to ratify, and this will be reflected directly in the data capture. Such instances are described below as periods for which data was not received by the QA/QC Unit. Typically the reasons are not investigated, as this is more of a matter for the CMCU.

### **4.2 ISOLATED INSTRUMENT MALFUNCTIONS**

From time to time most instruments will produce some data that cannot be ratified with sufficient confidence due to an analyser problem, leaking pipework etc that is not readily apparent remotely. In these cases the problem is usually noticed at a visit by the LSO or QA/QC Unit, then reported and remedied. As LSO visits on the London Network are fortnightly (and QA/QC Unit visits quarterly) this can lead to periods of data lasting several weeks being deleted. The crucial elements in minimising data loss are experience in recognising the problems, clear communication of the problem to the CMCU, and prompt remedial action. To a limited extent the experience of these problems can be used to modify LSO, CMCU, ESU or QA/QC Unit procedures, or extend the training of LSOs.

### **4.3 RECURRENT INSTRUMENT MALFUNCTIONS**

In some instances, the cause of ratified data loss is an underlying problem which can be predicted to recur, and preventative action can therefore be recommended.

## 5. SPECIFIC PROBLEMS AT SITES

The sites with data capture of less than 90% for any pollutant are listed here and reasons are given for the absence of the data.

### **Bromley (CO 53 % data capture)**

#### Absent unratified data

29 January - 2 February (97 hours) caused by a power cut.

#### Instrument malfunction

2 February - 5 March (748 hours) due to analyser malfunction following power cut. This was apparent on examination of the raw data. A replacement analyser was installed on 5 March.

5 March - 14 April (1378 hours) due to an unknown analyser factor. The replacement analyser at the site was calibrated on 9 and 29 March and the two calibrations showed a 33% standard deviation. As a result no analyser factor could be determined and so data could not be scaled until the original analyser was returned and calibrated on 14 April.

### **Hackney (CO 89% data capture)**

#### Absent unratified data

12 January - 30 June (169 hours) due to excessively long auto-calibrations - one hour of data per day was therefore invalid. The ESU were made aware of the problem in March.

#### Instrument malfunction

1 - 11 January (274 hours) due to incorrect configuration of a new data logger installed by the ESU (the resolution given by the CO channel was insufficient).

**Southwark 2 (NO<sub>x</sub> 63% data capture)**Instrument malfunction

18 February - 16 March (628 hours) caused by a large change in instrument response between two LSO calibrations. The analyser response was stable both before and after the change, and there was no indication as to the reason for the shift, such as a change in the analyser span factor.

14 April - 21 April (180 hours) due to a large change in instrument zero between calibrations. There were no auto-calibration data to verify when this took place and so it was not possible to assign a zero value to the data.

8 - 11 May (71 hours) due to a large change in the zero response of the NO<sub>x</sub> analyser. There was no discernible reason for this change, which was apparent from examination of the data. The analyser was serviced on 11 May.

3 - 30 June (658 hours) caused by unknown zero and span factors on both analysers at the site. Following a power interruption on 3 June the LSO calibrations became inconsistent and could not be combined with the ambient data to produce any kind of meaningful dataset. The problem was most evident from analysis of the ambient data.

## **7. INVENTORY**

The DETR assets held by NPL for this work are shared with the Automatic Rural Network and are given in the corresponding report.