AIR QUALITY IN LONDON 2003
PRELIMINARY REPORT

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SUMMARY

During 2003, the UK experienced a series of pollution episodes that caused the Air Quality Strategy (AQS) Objectives to be exceeded throughout London and South East England.

The purpose of this preliminary report is to review air quality in London during 2003. This report is based on measurements that are subject to further ratification. As such, reported values may be subject to change.

South East England experienced a series of PM_{10} incidents during 2003. The incident based AQS Objective for PM_{10} was exceeded at kerbside and roadside sites in inner London and at several such sites in outer London. PM_{10} at background sites was largely below the Objective.

The main PM_{10} incidents were measured during February, March, April and August, with lesser incidents measured during September and November. The first 5 episodes were mainly caused by secondary PM_{10} from distant sources, with summer episodes also being linked to photochemistry. The November episode was associated with Guy Fawkes Night. Roadside sites measured additional PM_{10} from local traffic. This additional PM_{10} increased the roadside concentrations during PM_{10} incidents and caused additional incidents not measured at background sites. The incidents during 2003 reversed the established trend of improving PM_{10}, with levels returning to those experienced during 1998.

The O_3 Objective was exceeded at all sites except Marylebone Road. The O_3 season in 2003 was exceptionally long and the hot summer weather caused the highest concentrations measured in the 10 year history of the London Air Quality Network (LAQN).

All roadside and kerbside sites exceeded the NO_2 annual mean Objective. The annual mean Objective was also exceeded at background sites in inner and west London. Several roadside and kerbside sites exceeded the hourly mean Objective; some outer London sites exceeded the hourly mean Objective for the first time.

All sites met the CO and SO_2 Objectives.

During 2003, 12 new monitoring sites joined the LAQN.

INTRODUCTION

During 2003, the UK experienced a series of pollution episodes that caused the Air Quality Strategy (AQS) Objectives to be exceeded throughout London. The pollution episodes measured during 2003 present massive challenges to air quality managers as little time remains before the AQS Objectives need to be met in 2005. The purpose of this preliminary report is to review air quality in London during 2003. This report is based, primarily, on measurements that are subject to further ratification. As such, reported values may change as further information is gathered from equipment audits during 2004 and as calibration histories are established beyond the end of 2003. However, the production of a preliminary report at this stage is merited to provide a timely overview of air pollution during a very eventful year. The Annual Report for 2003 will be produced following final measurement ratification and will contain additional analysis.

Measurements have been analysed with specific reference to the AQS Objectives which are detailed in Appendix 4. Full details of the sites in the London Air Quality Network (LAQN) are presented in Appendix 1 and the detailed monitoring results are presented in Appendix 3.

The LAQN was formed in 1993 to coordinate and improve air pollution monitoring in London. Currently, 30 London boroughs are supplying data to the LAQN. Increasingly, these data are being supplemented by measurements from local authorities surrounding London, thereby providing an overall perspective of air pollution in South East England. The LAQN is operated and managed by the Environmental Research Group (ERG) at King's College London. Each borough funds air quality monitoring in its own area. The core LAQN activities are funded by the ERG itself. The Department of Environment, Food and Rural Affairs (DEFRA) funds the ERG to operate the Marylebone Road site and to maintain 14 of the LAQN sites as affiliate sites to the UK Automatic Urban and Rural Network (AURN). This DEFRA support assists the operation of the overall LAQN.

This report is funded from the ERG Research and Development fund. Production of this report is not a contractual obligation and has not been externally funded.

Analysis of LAQN measurements has been augmented by measurements from the directly funded DEFRA sites in London. These 6 sites, listed in Appendix 2, provide further information concerning pollution in central and west London. Hourly and 15 minute mean measurements from these sites have been obtained from the DEFRA National Air Quality Archive and included within the LAQN database.

In response to requests from air pollution modellers, this report also includes annual mean NO_X measurements for each NO_2 monitoring site in the LAQN. Building upon the precedent of the quarterly reports for 2001, this report also presents gas measurements expressed as mass per unit volume (μgm^{-3} and mgm^{-3}) using conversion factors at 293 K and 1.03 KPa as suggested in the Draft Guidance LAQM.TG(02) (DEFRA 2002). NO_X measurements are reported as NO_2 equivalent.

To understand air pollution in London it is necessary to understand air pollution in the surrounding area and vice-versa. The LAQN contains sites in Essex, Kent and Surrey. A more complete picture of air pollution in South East England can be obtained from the combined results of the LAQN, the Kent Air Quality Monitoring Network (KAQMN) and the Hertfordshire and Bedfordshire Air Pollution Monitoring Network (HBAPMN). Reports for these networks are available from the ERG.

Hourly updated measurements from the LAQN and neighbouring networks are published by the ERG on the Internet at:

www.erg.kcl.ac.uk

AIR QUALITY DURING 2003

Discussion of Results

Comparisons of measurements with national objectives and standards are shown in Appendix 3.

When examining data it is important to consider the location of the monitoring site; kerbside, urban background, rural, etc., and the data quality. The site type and quality assurance standard for each site is listed in Appendix 1 and 2. Sites are classified into three quality standards. Data from sites affiliated to the AURN and London Standard sites have traceabilty to National Metrological Standards, whereas for the Locality Standard sites there is insufficient information to demonstrate such traceability.

No scientific measurement is absolutely accurate or absolutely precise. The combination of accuracy and precision is termed the uncertainty. In order to place results in context, the uncertainty associated with each result has to be considered. Estimates of the uncertainty associated with air quality measurement are discussed in the 2001 LAQN Annual Report (ERG, 2003). This suggests that a working uncertainty of around 10% (2σ) should be considered when discussing high values and long-term averages of CO, NO_2 and SO_2 measured at London Standard sites. This is justified on the basis of both mathematical modelling and equipment performance tests. However, due to the statistical distribution of the data, a 10% uncertainty in measurements does not imply a 10% uncertainty in the number of exceedences of a standard. The uncertainty associated with the measurement of PM_{10} is more complex since the results obtained are highly dependent on the measurement method used.

Data are subject to two quality assurance processes. Initially, data are validated using the best calibration and instrument performance information available at the time. Data are retrospectively examined during the ratification process, using long-term instrument histories and the results of further quality checks. Data in this report is still subject to ratification. Further revisions will be made before a final data set is published in the 2003 Annual Report.

The final data sets for the AURN sites are published by the DEFRA.

The Air Quality Regulations (DETR 2000b) specify objectives in terms of mass/volume for all pollutants. However, continuous gas analysers and the calibration standards used are measured in terms of volume ratio. These are two entirely different bases of measurement with conversion between them being dependent on temperature and pressure conditions. Conversions have been made based on 293 K and 101.3 kPa, where appropriate, for comparison to the AQS Objectives, (DETR 2000c).

PM_{10}

Measuring PM_{10}

PM_{10} poses many measurement challenges. Rather than comprising a single, defined chemical compound, like CO or SO_2 for example, the composition of PM_{10} varies with location, time of year and during episodes. PM_{10} can be considered to comprise; primary particulates (mainly emitted from local sources), secondary particulates (mainly from distant sources), and coarse particulates whose origin can be local or further afield. The variation in composition affects each measurement technique differently and therefore each measurement technique produces systematically different results. The EU Daughter Directive is based on a 'gravimetric' method where PM_{10} is collected on a filter that is then weighed in a laboratory (CEN, 1998). There is ample evidence to suggest that the most common measurement methodology employed in the UK, the Tapered Element Oscillating

Microbalance (TEOM), produces a result lower than the 'gravimetric' method (APEG, 1999; Green 1999, Green *et al*., 2000). DETR (1999) suggested that a correction factor of 1.3 be applied to TEOM results for comparison to the AQS Objective.

Beta Attenuation Monitors (BAM) are also used to measure PM_{10} in the LAQN. Research at Marylebone Road (Green, 1999) sought to compare the results from TEOM, 'gravimetric' and BAM instruments. The BAM instrument tested produced higher results than the 'gravimetric' method at this location during the test period. However, no correction factor has been applied to the BAM measurements.

<u>*2003 Results*</u>

There are two AQS Objectives for PM_{10}. These are in line with the EU Daughter Directive Stage 1 Limit Value. The AQS has an incident based objective of 50 μgm^{-3}, measured as a daily mean not to be exceeded on more than 35 days per year, and an annual mean objective of 40 μgm^{-3}.

During 2003 London experienced a series of PM_{10} episodes. The temporal distribution of PM_{10} during the year is illustrated by measurements from the inner London background site Kensington & Chelsea 1 and is shown in Figure 1. Figure 1 shows 7 distinct episodes during the year when the daily mean exceeded 50 μgm^{-3} (TEOM*1.3). These episodes are labelled A to G. Figure 1 also shows the mean concentration measured at the site during the period 1998 to 2002 with episodes A to D being obvious elevations above this mean.

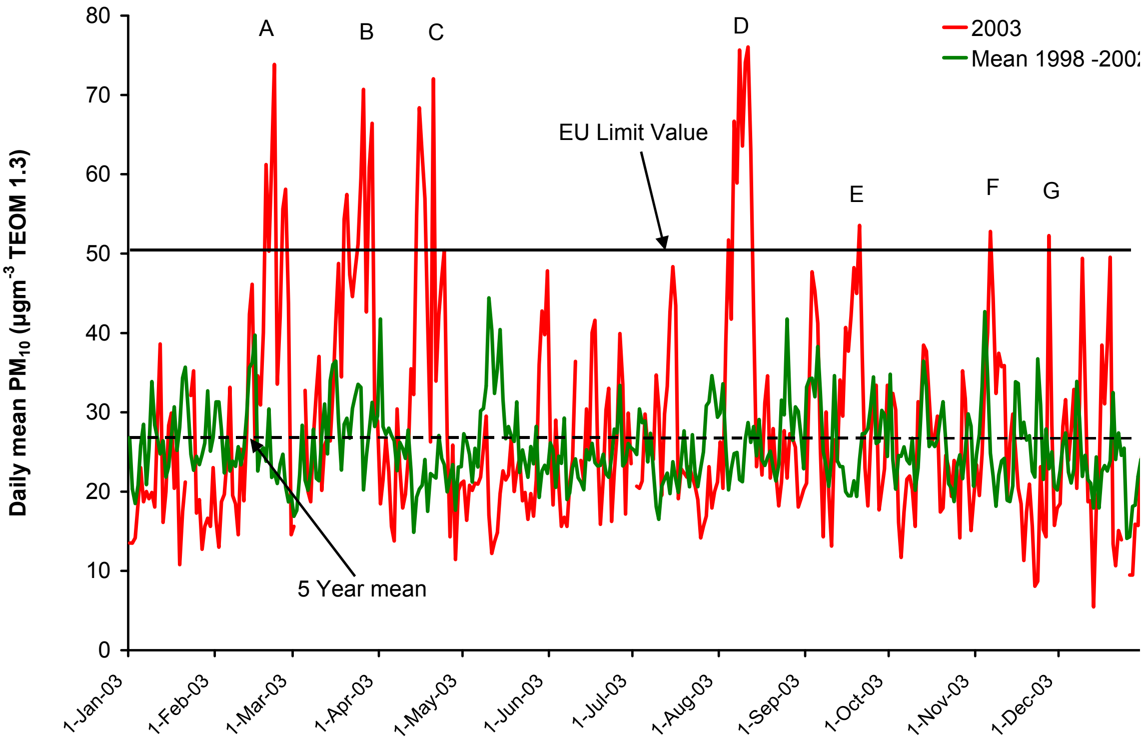

Figure 1 Daily Mean PM_{10} at Kensington and Chelsea 1

As a consequence of the episodes shown in Figure 1, the incident based PM_{10} AQS Objective was exceeded at kerbside and roadside TEOM sites in inner London and at several such sites in outer London. The highest number of daily means above 50 μgm^{-3} at TEOM sites was measured at the Marylebone Road kerbside site (161 days) and at the Bexley 4 roadside site (131 days) where the latter site was regularly affected by PM_{10} arising from vehicles accessing nearby industrial sites. All background and suburban TEOM sites met the incident based Objective except those affected by additional PM_{10} from local sources: Barking & Dagenham 2, Tower Hamlets 1 and Thurrock 1. The Objective was also exceeded at Brent 3 background site. The annual mean Objective of 40 μgm^{-3} was exceeded at the roadside TEOM sites Bexley 4 and Camden 3 and at the kerbside site Marylebone Road.

The incident based Objective was exceeded at all BAM sites irrespective of location. The greatest number of daily means above 50 μgm^{-3} was measured at the roadside sites Enfield 4 (131 days) and Enfield 2 (81 days). The annual mean Objective was also exceeded at the roadside BAM sites Enfield 2, Enfield 4 and Redbridge 4.

A full set of gravimetric PM_{10} measurements is not yet available. However, the available measurements indicated that roadside and kerbside sites have exceeded the Objective. For the year up to 29th December, the Kensington & Chelsea 6 roadside site had measured 90 daily means above 50 μgm^{-3} and 81 such daily means were measured at the Marylebone Road kerbside site during the first 10 months of 2003. These data support the conclusion from TEOM measurements; that the incident based Objective was exceeded alongside roads in central and inner London. At the inner London background Kensington & Chelsea 1, 30 daily means above 50 μgm^{-3} were measured during the first 10 months of 2003. It is possible that pollution incidents during November and December will have caused the gravimetric measurements at this background site to exceed the incident based Objective.

PM_{10} Source Apportionment

To understand the causes of the 2003 episodes it is necessary to apportion the measured PM_{10} according to source. PM_{10} modelling methodology is described in Fuller *et al,* 2002. The ERG model divides PM_{10} by source through analysis of measurements of annual mean NO_X, PM_{10} and $PM_{2.5}$ across a network of monitoring sites. PM_{10} is identified as arising from three source components; primary (associated with NO_X), secondary (mainly the $PM_{2.5}$ not associated with NO_X but also some coarse particulate) and natural (coarse component not associated with NO_X). Here coarse PM is defined as $PM_{10} - PM_{2.5}$. The daily mean secondary and natural components were found to be invariant across London. For the preliminary analysis of 2003, the model was used in a reduced form with mean secondary and natural components being derived from a single background site in Bexley. Total daily mean PM_{10} concentrations at other locations were then calculated by adding the secondary and natural PM_{10} to primary PM_{10} derived from NO_X at each location. This preliminary analysis does not contain sufficient information to apportion PM_{10} on each day of the year; specifically, apportionment is not possible for short periods during late March and early June. More detailed source apportionment will be undertaken following the availability of a ratified dataset.

Figure 2 shows the source apportionment of PM_{10} measured at Kensington & Chelsea 1; a typical inner London background site. Daily means above 50 μgm^{-3} (TEOM*1.3) were due to distinct episodes; labelled A to F. The preliminary source apportionment underestimates the PM_{10} concentration during episode G in Figure 1 and the modelled daily mean does not exceed 50 μgm^{-3} (TEOM*1.3) at this time. During episodes A to E, PM_{10} was dominated by secondary particulate brought into London from continental sources. The imported secondary PM_{10} is present in the $PM_{2.5}$ as expected and is also present in the coarse (PM_{10} - $PM_{2.5}$) fraction; this is especially the case in the first part of episode C. Episodes B to E were associated with photo-chemical activity as indicated by elevated concentrations of ground level ozone. Episode D was dominated by secondary PM_{10} and coincided with record-breaking temperatures and the highest ground-level O_3 concentrations measured since 1990. Episode F was caused by Guy Fawkes Night bonfires and fireworks. The source apportionment method is not accurate at this time due to large local sources of particulate that are not also sources of NO_X.

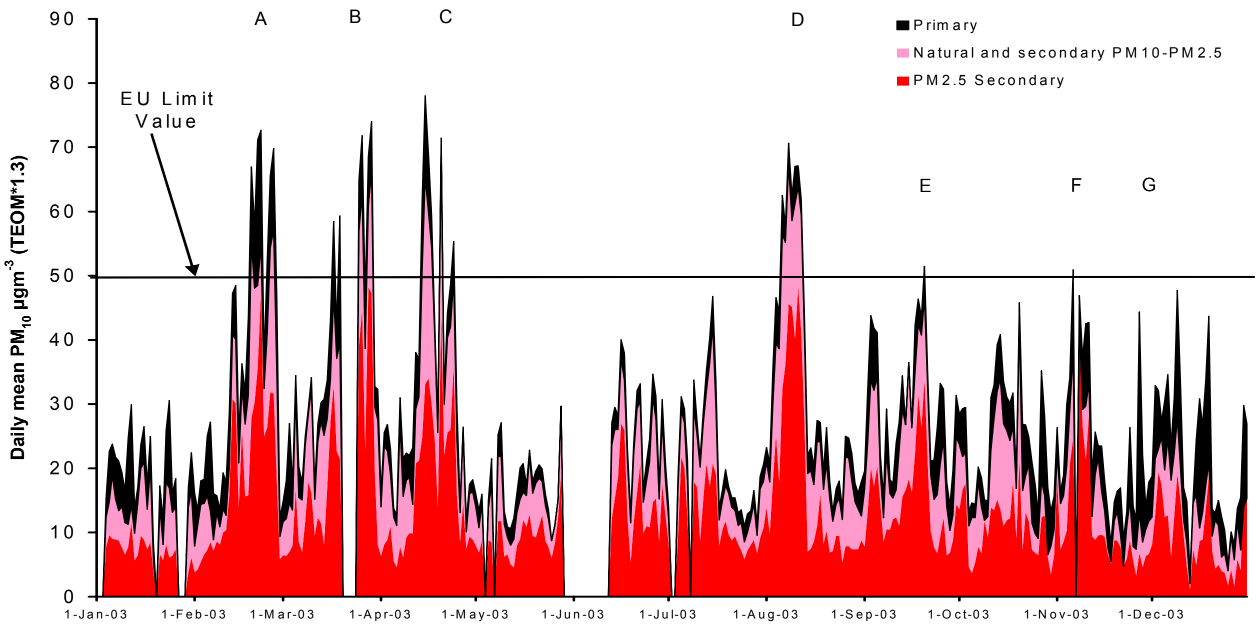

Figure 2 Source apportioned daily mean PM_{10} at the inner London background site Kensington & Chelsea 1

Figure 3 shows the source apportionment of PM_{10} measured at Kensington & Chelsea 2; a typical inner London roadside site. Due to its proximity to a major road the site experienced more primary PM_{10} particulate than the background site. This additional primary PM_{10} increased the impact of episodes A to E, with additional daily means above 50 µgm-3 (TEOM*1.3). The additional primary PM_{10} also led to 4 further episodes not measured at the background site; these are labelled 1 to 4 in Figure 3. Episodes 1 to 3 were caused by a mixture of local primary and secondary particulate.
Episode 4 was dominated by local primary sources and is a classic winter-time pollution episode occurring in poor dispersion conditions. As expected, during such winter-time episodes, elevated NO_2 and very low levels of O_3 were also measured during episode 4 as shown in Figure 5 and Figure 6.

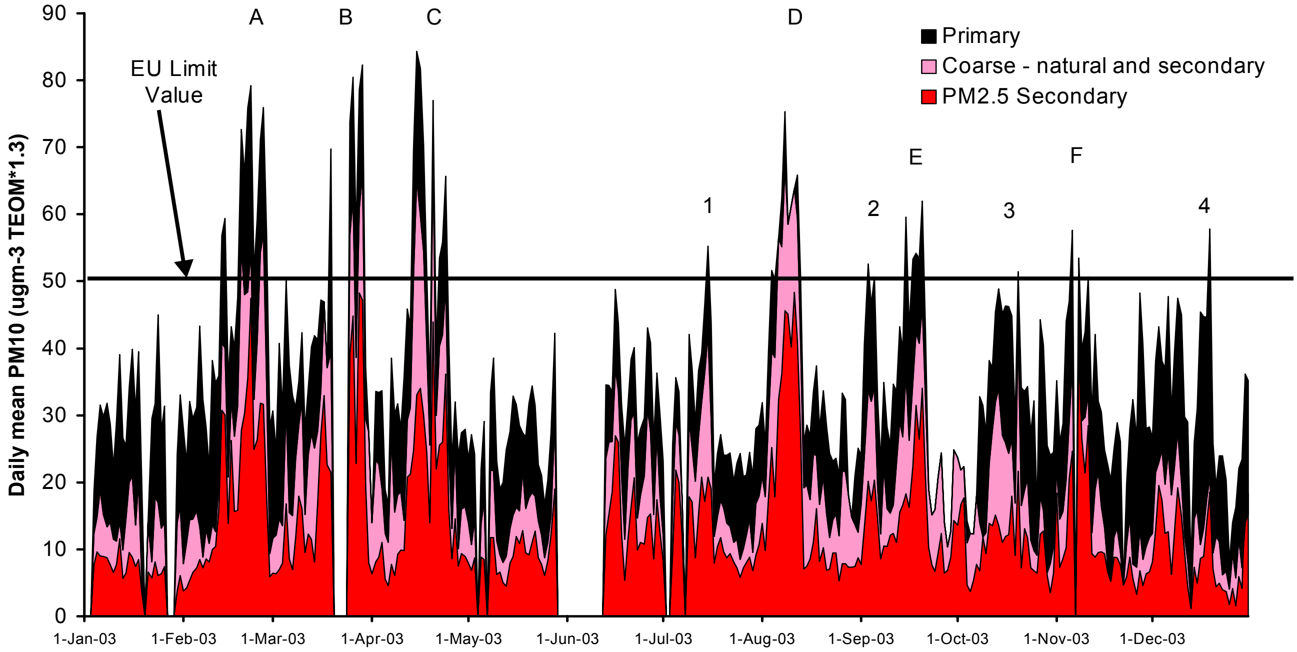

Figure 3 Source apportioned daily mean PM_{10} at the inner London roadside site Kensington & Chelsea 2

Medium Term Trends

Figure 4 shows the annual number of daily mean PM_{10} measurements above 50 µgm^{-3} (TEOM*1.3) at three different types of location. The long-term measurements at inner London background sites exhibit a downward trend from around 50 days above 50 µgm^{-3} in 1995 to around 10 days in 2002. The similar downward trend of all site types reflects a reduction in secondary and primary PM_{10} emissions, whilst the convergence in the number of daily means above 50 µgm^{-3} (TEOM*1.3) illustrates the reduction in traffic emissions of primary PM_{10}.

During 1995 typical inner London background sites exceeded the Objective, which implied a widespread breach of the Objective throughout London. The situation deteriorated in Spring 1996 due to the substantial secondary episode at this time. As a consequence, 76 daily means above 50 µgm^{-3} (TEOM*1.3) were measured in inner London during the year ending April 1996; more than double the 2005 objective of 35 days. A repetition of such an episode would clearly provide significant challenges for air quality management. The additional days above 50 µgm^{-3} caused by the Spring 1996 episode left the running count in Spring 1997. Other events affecting the number of daily means above 50 µgm^{-3} (TEOM*1.3) included the primary episode of Autumn 1997 and the unsettled weather in late 2000. Inner London background sites have consistently achieved the Objective since 1998. The number of daily means above 50 µgm^{-3} (TEOM*1.3) measured at outer London sites was only marginally below those measured in inner London. A larger difference can be seen between the background and kerb/roadside sites in inner London than between outer and inner London background sites.

The number of daily means above 50 µgm^{-3} (TEOM*1.3) at the kerb/roadside in inner London follows a similar trend to background, albeit with additional days due to local traffic emissions. Inner London roadside sites have generally achieved the Objective since 2000. Measurements at Marylebone Road are not shown in Figure 4 but have been in the range 70–160 days per year and show variations in part due to local events such as building works.

Provisional measurements shown in Figure 4 reflect the impact of the PM_{10} episodes in 2003. Compared to 2002, background sites measured around 20 additional daily means above 50 μgm^{-3} (TEOM*1.3) during 2003, with kerb/roadside sites in inner London measuring around 30 such additional days. The results presented in Figure 4 are means calculated from a sample of sites within each site type and therefore mask individual site variations. By the end of 2003, many road and kerbside TEOM sites in London had exceeded the 2005 AQS Objective. The majority of inner London background TEOM sites did not exceed the Objective; the exception being Tower Hamlets 1 where building works may have caused additional local PM_{10}. Regrettably, measurements from the TEOM at the Bloomsbury AURN site were not available due to an equipment fault. Insufficient TEOM measurements of central London background conditions were therefore available to determine if the Objective was exceeded in this area. Substituting measurements from the background site Kensington & Chelsea 1 for the missing measurements at Bloomsbury provides a conservative estimate of at least 33 daily means above 50 μgm^{-3} (TEOM*1.3) for the Bloomsbury site. There is hence a possibility that background locations in central London exceeded this Objective.

The measurements shown in Figure 4 suggest that the previously improving trend in PM_{10} concentration was reversed in 2003; with 2003 PM_{10} levels being comparable to those during 1998. A comparison between the severity of the secondary PM_{10} episodes during 2003 and those in 1996 is not straightforward and would need to account for the reduction in emissions of secondary PM_{10} precursors. However, a simple comparison of the number of daily means above 50 μgm^{-3} (TEOM*1.3), due solely to secondary and natural particulate, shows that 34 such daily means were measured during 1996 compared to around 20 during 2003.

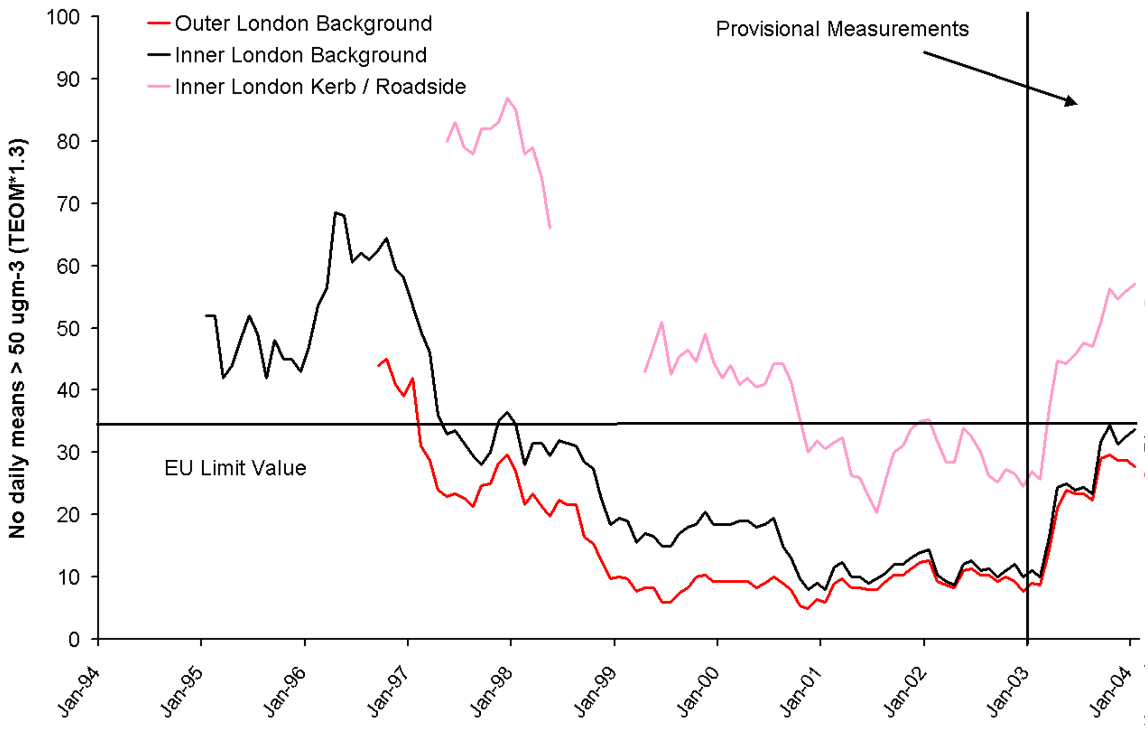

Figure 4 Annual number of days when daily mean PM_{10} exceeded 50 µgm^{-3} (TEOM*1.3)

O_3

O_3 is a seasonal pollutant with the highest concentrations being measured during the summer months. It is also a regional pollutant, with episodes extending over many hundreds of kilometres. O_3 exhibits local variation caused by the scavenging effect of NO close to NO_X emission sources, for example at the roadside. Health-based standards are rarely exceeded at roadside and kerbside sites and O_3 monitoring is not generally undertaken in these locations. However, roadside monitoring of O_3 can lead to a better understanding of the mechanisms that determine roadside NO_2 concentrations (e.g. Clapp and Jenkins, 2001 and Carslaw and Beevers, 2004) and for this reason further O_3 monitoring at roadside sites in London would be encouraged.

The AQS has an Objective of 100 µgm^{-3} (50 ppb), measured as a rolling 8 hour mean, which should not be exceeded on more than 10 days per year. The greatest concentrations of O_3 are generally measured at sites on the edge of London and in the Home Counties. During the 3 years 2000 to 2002, the majority of sites in outer London and the Home Counties exceeded the Objective and many sites in inner and west London met the Objective. During 2000 to 2002, outer London sites typically experienced around 20 to 30 days per year with peak concentrations above 100 µgm^{-3}, measured as a rolling 8 hour mean. During 2003, several sites measured over 40 days above 100 µgm^{-3}, expressed as a rolling 8 hour mean; almost double the number of days measured annually during 2000 to 2002. During 2003 the AQS Objective was exceeded at all O_3 measurement sites in London except the kerbside site Marylebone Road.

The temporal distribution of O_3 during the year is illustrated in Figure 5 which shows the mean of measurements at the suburban sites Enfield 3 and Kingston 1. The PM_{10} episodes A to F and 1 to 4 are also labelled in Figure 5. The elevated O_3 during PM_{10} episodes B to E and 1 and 2 can be clearly seen, as can the very low O_3 concentrations during the primary pollution episode 4. During 2003, London experienced the longest 'O_3 season' (defined in terms of 'moderate' O_3) and also the highest concentrations measured in the 10 year history of the LAQN. The season began on 23rd March (the earliest measured in 10 years) and finished on the relatively late date of the 21st September. On the 6th August the hourly mean O_3 reached 262 µgm^{-3} (131 ppb) at Enfield 3; this is the highest concentration measured in the 10 year history of the LAQN and the highest concentration measured in the UK since 1990. During early August 2003 many sites measured concentrations above 240 µgm^{-3}. These concentrations are, however, around half those measured during the summer of 1976. (PORG 1993).

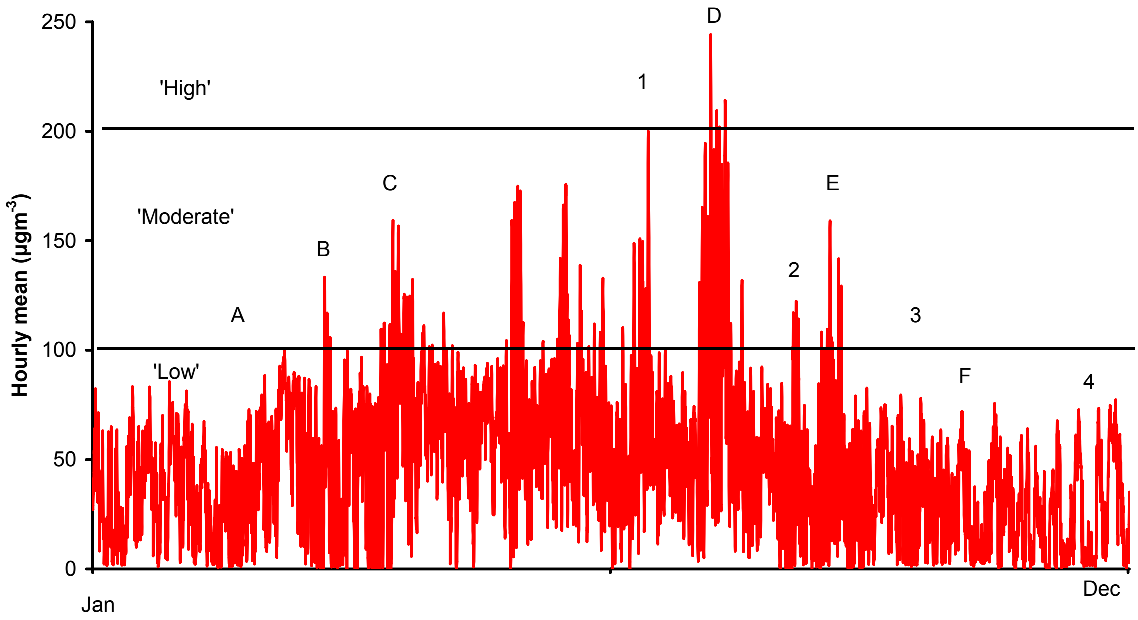

Figure 5 Hourly mean O_3; the mean of measurements at Enfield 3 and Kingston 1

NO_2

NO_2 is largely a secondary pollutant formed by the oxidation of NO. In the LAQN area, road transport is the dominant source of NO_X. This is reflected in the general distribution of NO_2, with the highest annual mean concentrations being measured near roads and in central London locations. Lower concentrations are observed in background and suburban areas.

2003 Results

The AQS stipulates two Objectives for NO_2: an annual mean of 40 µgm^{-3} (21 ppb) and an incident based Objective of 200 µgm^{-3} (105 ppb), as an hourly mean, not to be exceeded more than 18 times per year.

During 2003, the annual mean NO_2 Objective was exceeded at all kerbside and roadside monitoring sites. This Objective was also exceeded at background sites in inner London. The area exceeding the Objective extended beyond inner London to include Redbridge 1 in the north-east and Heathrow Airport, Hillingdon (AURN) and Hounslow 2 in the west.

All kerbside sites measured hourly mean concentrations above 200 µgm^{-3} (105 ppb) during the year. The incident based Objective for NO_2 was exceeded at the kerbside sites Barnet 1, Marylebone Road, Redbridge 2 and Sutton 4. The Objective was also exceeded at the roadside sites Hammersmith & Fulham 1, Hillingdon 1, Hounslow 4, Kensington & Chelsea 3 and Kensington & Chelsea 4. This is the first time that Barnet 1, Hillingdon 1 and Hounslow 4 have exceeded this Objective.

The temporal distribution of NO_2 through the year is illustrated in Figure 6, which shows measurements from the roadside site Hillingdon 1. Hourly mean NO_2 exceeded 200 μgm^{-3} (105 ppb) during both winter and summer. Wintertime incidents are caused by poor pollutant dispersion; those in November and December being typical. During these episodes elevated primary PM_{10} was also measured; the December NO_2 episode coinciding with roadside PM_{10} episode 4. During these wintertime incidents, peak NO_2 concentrations are normally measured during the morning when pollution dispersion is weakest. Summertime incidents are caused by the increased oxidising capacity of the atmosphere during O_3 episodes; the NO_2 episodes in mid April and early August illustrate this well and also coincide with PM_{10} episodes C and D. During summertime incidents, the peak NO_2 concentration normally occurs in the evening as solar radiation decreases. These summertime incidents may not be easily amenable to control by reduction of local NO_X emissions.

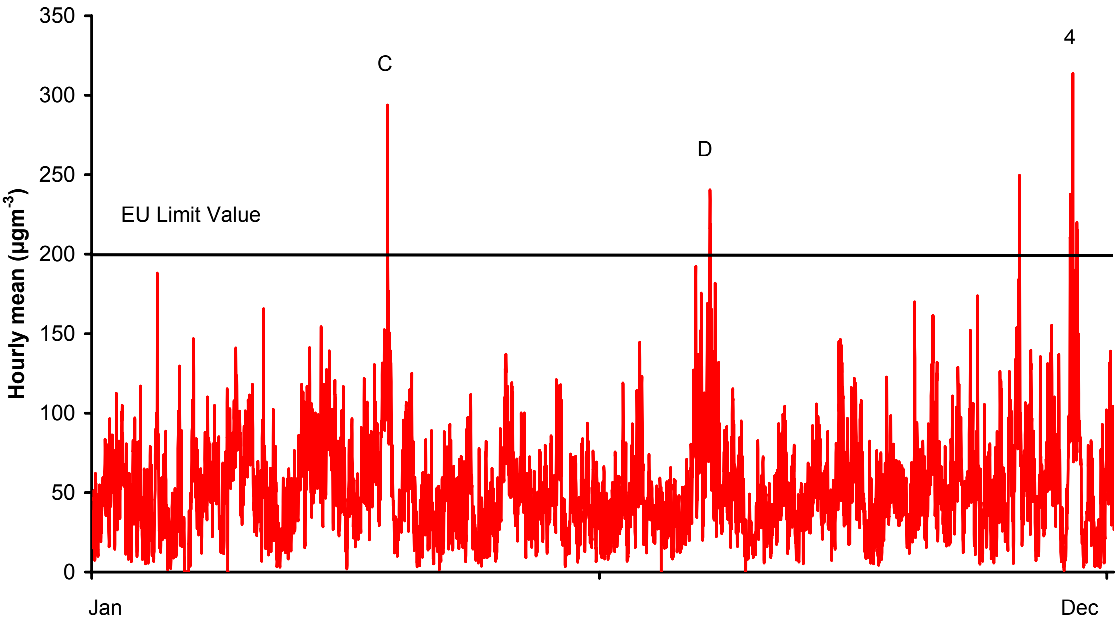

Figure 6 Hourly mean NO_2 at Hillingdon 1

Medium Term Trends

Figure 7 compares the annual mean NO_2 at 3 different types of location in London using a sample of LAQN sites for location type. All location types show an overall reduction and exhibit fluctuations due to the same factors; for example, the pollution episodes in Autumn 1997 and, to a lesser extent, the photochemical episodes during 2003. Annual mean concentrations at typical background sites in outer London have been below the AQS Objective since 1998, whereas those at typical roadside and background sites in central London have been consistently above the Objective. During 2003, annual mean NO_2 shows an increase of 13% at background sites. This initial analysis is based on a sample of 11 background sites; 5 in outer London and 6 in inner London. In Figure 7 the sample inner London roadside sites (5 sites) show no overall change during 2003 but this masks substantial individual site variations. Annual mean concentrations at the Marylebone Road kerbside site are not included in the analysis in Figure 7, but have remained in the range 80–105 μgm^{-3} since the site commenced. During 2003, NO_2 concentrations at Marylebone Road increased by over 30%, offsetting the improvements brought about by the installation of a bus lane during August 2001. The cause of this recent deterioration in NO_2 concentration at the site requires further investigation.

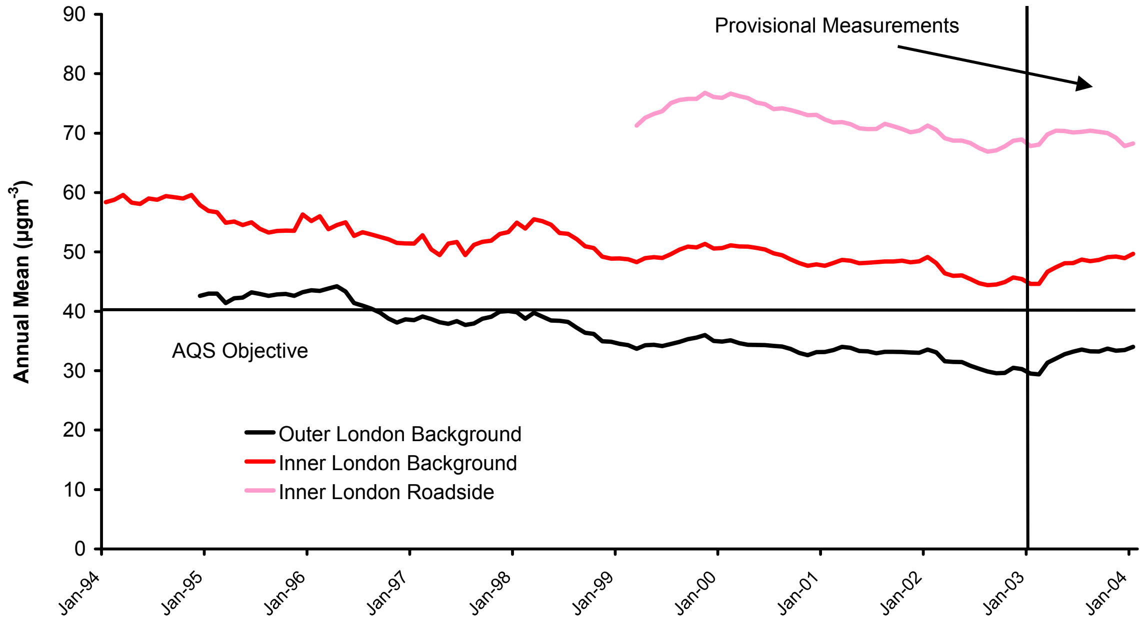

Figure 7 Annual mean NO_2

SO_2

The distribution of SO_2 concentrations is influenced by both road traffic and industrial point sources. Road traffic sources are the main factor influencing annual mean concentrations, whereas industrial point sources produce short term high values due to plume grounding. The annual mean concentrations of SO_2 do not vary to any large degree over the network.

The AQS Objective for SO_2 is based on 35 exceedences of a 15 minute mean of 266 µgm^{-3} (100 ppb). This was not approached at any site in the network, although Brent 1, Bexley 1, Croydon 4, Enfield 3, Hounslow 2, Lewisham 1, Tower Hamlets 1 and Thurrock 1 measured 15 minute means in excess of 266 µgm^{-3}. The AQS also has an hourly mean Objective of 350 µgm^{-3} (132 ppb) which should not be exceeded on more than 24 occasions per year. A single hourly mean above 350 µgm^{-3} was measured at Thurrock 1.

The temporal distribution of SO_2 during the year is illustrated by measurements from the background site Lewisham 1, shown in Figure 8. SO_2 incidents in London are mainly caused by plume grounding from large industry located in the East Thames area and are, therefore, associated with easterly winds. Pollution from continental sources is also transported into London by easterly winds and, therefore, SO_2 incidents often occur at the same time as secondary PM_{10} and O_3 incidents. This is evident in Figure 8 which shows elevated SO_2 during PM_{10} episodes A to D, and 1 and 3.

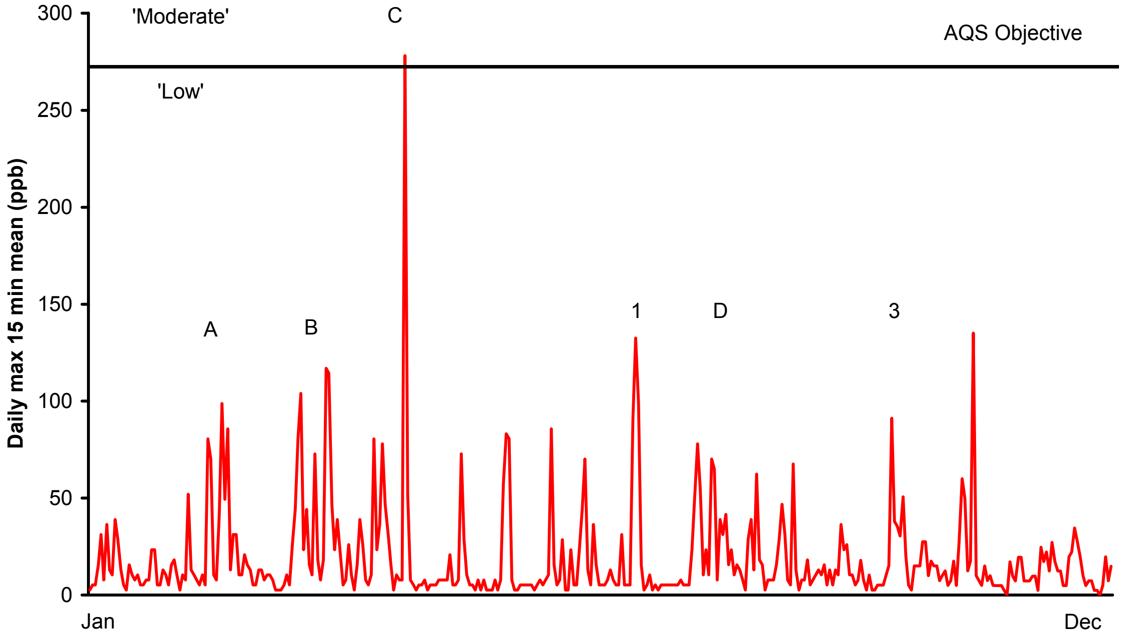

Figure 8 Daily maximum 15 minute mean SO_2 at Lewisham 1

CO

CO emissions within the LAQN area are dominated by road transport sources. All sites met the AQS Objective of 10 mgm^{-3} (8.6 ppm) as a rolling 8 hour mean. CO is a primary pollutant and its temporal distribution is easier to understand than that for NO_2, O_3 or $PM_{10.}$ CO concentrations are determined by emission rates and dispersion only, and are therefore generally highest during the winter months when atmospheric dispersion is weakest. This is evident in Figure 9 which shows the temporal distribution of CO during the year as measured at the roadside site Wandsworth 4.

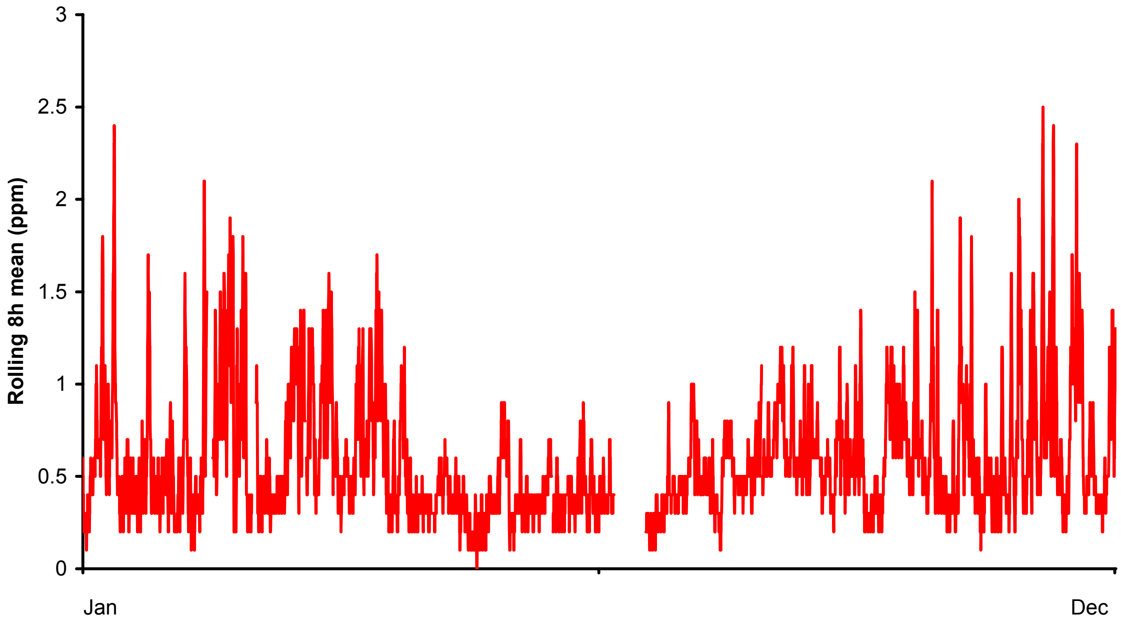

Figure 9 Rolling 8h mean CO at Wandsworth 4

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APPENDIX 1: LAQN MONITORING SITES

A 1.0 Network Changes

Twelve new monitoring sites joined the LAQN during the year. These are shown in Figure 10 to Figure 20.

Figure 10 The Brent 4 site that joined the LAQN during June as a replacement for Brent 2. The site is located on the A406 around 300 m from the location of Brent 2. The site monitors NO_X, SO_2 and PM_{10} (TEOM).

Figure 11 The Hillingdon 2 site that became fully operational during April. The site monitors NO_X and PM_{10} (TEOM) at a roadside location close to Hillingdon Hospital.

Figure 12 The Waltham Forest 3 site that joined the network during July. The site is located in a roadside location in Chingford and measures NO_X, SO_2 and PM_{10} (TEOM).

Figure 13 The Ealing 6 site that joined the LAQN during August. The site monitors NO_X and is located close to housing façades at Hanger Lane.

Figure 14 The Harrow 2 site that joined the LAQN during June. The site is located in a roadside location and monitors NO_X and PM_{10} (TEOM).

Figure 15 The Hammersmith & Fulham 2 background site that joined the LAQN during July. The site monitors NO_X and PM_{10} (TEOM).

Figure 16 The Hounslow 5 roadside site that replaced Hounslow 1 during August. The site is located beside the A4 and M4 and monitors CO, NO_X and PM_{10} (TEOM).

Figure 17 The Lambeth 4 roadside site that joined the LAQN in December. The site measures NO_X, SO_2 and PM_{10} (BAM) alongside the A23 in Brixton.

Figure 18 The Reigate and Banstead 2 NO_X site that joined the LAQN during August. The site is located in a suburban area immediately adjacent to Gatwick Airport. The site forms part of a larger monitoring programme, which also includes Reigate and Banstead 1, and aims to quantify NO_2 around the airport.

Figure 19 The Thurrock 2 roadside site that measures NO_X. The site joined the LAQN during May.

Figure 20 The Thurrock 3 roadside site joined the LAQN during August and measures NO_X, SO_2 and PM_{10} (TEOM).

Figure 21 The Redbridge 5 site also joined the LAQN during 2003. The site was installed in November as a replacement for Redbridge 2 that closed during April. The site measures CO, NOX and PM10 (BAM).

A.1.1 Details of Monitoring Sites

The following tables detail the pollution monitoring sites in the LAQN at the end of 2003 The start date of each site is shown along with the pollutants monitored and the data quality. In some cases a monitoring site was not operating during the 12 month period. The availability of data from a site is indicated in the data column in the tables below.

Sites are classified according to their location:

- Kerbside sites are those with sampling locations within 1 m of the kerbside and with a sampling height of 3 m or less.
- Roadside sites are those with sampling locations within 1-5 m of the roadside and with a sampling height of 3 m or less.
- Urban background sites are located to represent pollution conditions in the centre of an urban area. Sampling locations are away from the influence of individual pollution sources; 25 m from major roads for example.
- Suburban sites are typical of residential locations on the edge of a built up area. Sampling locations are away from the influence of individual pollution sources; 25 m from major roads for example.

A.1.1 Kerbside Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Barnet 1	**Dec 98**		●			**T**		**Yes**	∗∗
Bromley 4	**Feb 96**	**Closed Jul 98**							
Camden 1	**Apr 96**		●			**T**		**Yes**	∗∗ **A1**
Marylebone Road	**Jun 97**	●	●	●	●	**TG**	●	**Yes**	∗∗ **A1**
Redbridge 2	**Dec 99**	**Closed Apr 03**							
Redbridge 3	**Dec 99**		●			**B**		**Yes**	∗
Richmond 5	**Feb 01**	**Closed Aug 01**							
Sutton 4	**Jul 02**		●			**T**		**Yes**	∗∗

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, ∗Locality Standard, ∗∗Traceability to National Standards
A= Affiliated to UK AURN- final data set published by DEFRA

A.1.2 Roadside Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Bexley 4	May 99					T		Yes	**
Brent 2	Jun 01	Closed Sep 02							
Brent 4	Jun 03		●	●		T		Yes	**
Bromley 7	July 98	●	●			B	(B)	Yes	*/**A
Camden 3	Apr 00		●			T		Yes	**
Croydon 2	Sept 94		●					Yes	**
Croydon 4	Sept 99		●	●		T		Yes	**
Croydon 5	Oct 00		●					Yes	**
Crystal Palace	Oct 99	●	●	●		T		Yes	**
Ealing 2	Sept 96	●	●			T	T	Yes	**
Ealing 4	Dec 98	Closed Mar 99							
Ealing 5	Mar 99	Closed Jun 01							
Ealing 6	Aug 03		●					Yes	**
Enfield 2	Jan 98	●	●			B		Yes	**
Enfield 4	Mar 00		●	●		B		Yes	**
Greenwich 5	Sept 97		●			T		Yes	*
Greenwich 7	Mar 02		●			T		Yes	**
Greenwich Bexley 6	Oct 00		●			T	T	Yes	**
Hams & Fulham 1	Aug 99		●	●		T		Yes	**
Hackney 6	Nov 02		●			T		Yes	**
Haringey 1	Dec 94		●	●		T		Yes	** A
Haringey 3	Apr 99	Closed Mar 01							
Harrow 2	Jun 03		●			T		Yes	**
Havering 1	Dec 95		●					Yes	**
Havering 3	Dec 98		●	●		T		Yes	**
Hillingdon 1	Sept 99		●			T		Yes	**
Hillingdon 2	Sept 02		●			T		Yes	**
Hounslow 1	Apr 93	Closed Dec 02							

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, *Locality Standard, **Traceability to National Standards
A= Affiliated to UK AURN- final data set published by DEFRA

A.1.2 Roadside Sites (continued)

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Hounslow 3	Mar 99					T		Yes	**
Hounslow 4	Aug 99		●	●		T		Yes	**
Hounslow 5	Aug 03	●	●			T		Yes	**
Islington 2	Jul 00	●	●			T		Yes	**
Ken & Chelsea 2	May 98					T		Yes	**
Ken & Chelsea 3	Mar 00		●					Yes	**
Ken & Chelsea 4	Sep 00		●					Yes	**
Ken & Chelsea 5	May 02					G		Yes	*
Kingston 2	Apr 96		●			T		No	
Lambeth 1	Sep 00		●	●		B		Yes	*
Lambeth 2	Dec 01		●	●		B		Yes	*
Lambeth 4	Dec 03		●	●		B		Yes	*
Redbridge 4	Dec 99	●	●	●		B		Yes	*
Redbridge 5	Nov 03		●	●		B		Yes	*
Richmond 1	Jun 00		●			T		Yes	**
Southwark 2	Oct 94	●	●	●		T		Yes	*/**A
Sutton 1	May 95	Closed May 02							
Thurrock 2	May 03			●				Yes	** A
Thurrock 3	Aug 03		●	●		T		Yes	** A
Tower Hamlets 2	Mar 94	●	●					Yes	** A
Wandsworth 1	Sept 94	Closed Mar 96							
Wandsworth 4	Feb 98	●	●			T		Yes	**
Waltham Forest 3	Jul 03		●	●		T		Yes	**
Westminster 2	Jun 95	Last data 95							

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, *Locality Standard, **Traceability to National Standards
A= Affiliated to UK AURN- final data set published by DEFRA

A.1.3 Urban Background Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Barnet 2	Aug 00		●			T		Yes	**
Barnet 3	Aug 00		●			T		Yes	**
Brent 1	Aug 95	●	●	●	●	T		Yes	* A
Brent 3	Dec 01		●	●		T		Yes	**
Bromley 1	Jan 93	Closed Feb 96							
Castle Point	May 96		●	●				Yes	**
City of London 1	Oct 01		●	●	●			Yes	*
Croydon 3	May 97				●	T		Yes	**
Ealing 1	Mar 95	(●)	●	●	●			Yes	**
Enfield 3	Nov 98	●	●	●	●	B		Yes	**
Greenwich 4	Sept 93		●	●	●	T		Yes	** A
Hackney 4	Oct 93	●	●		●		T	Yes	*/**A
Hams & Fulham 2	Aug 03		●			T		Yes	**
Heathrow Airport	Mar 99	●	●			T		Yes	*
Hillingdon (O)	Oct 94	Last Data Apr 95							
Ken & Chelsea 1	Mar 95	●	●	●	●	TG	G	Yes	**A
Islington 1	Sep 94	(●)	●			T		Yes	**
Lambeth 3	Dec 01		●	●		B		Yes	*
Lewisham 1	Jan 95		●	●	●			Yes	**A
Mole Valley 3	Oct 01		●			T		Yes	**
Redbridge 1	Dec 99		●		●	B		Yes	*
Sevenoaks 2	Feb 98	●	●	●	●	T		Yes	**
Southwark 1	Mar 93	●	●	●	●	T		Yes	*/**A
Thurrock 1	Feb 95	●	●	●	●	TG		Yes	*A
Tower Hamlets 1	Jan 94		●	●	●	T		Yes	**
Tower Hamlets 3	Oct 99		●	●		T		Yes	**
Waltham Forest 1	Jul 98		●	●		T		Yes	**
Wandsworth 2	Oct 94	●	●	●	●			Yes	**A
Westminster 1	Jan 93	Last Data 96							

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, *Locality Standard, **Traceability to National Standards
A = final data set published by DEFRA

A.1.4 Suburban Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Bark & Dag 1	Sep 93		●	●				Yes	**
Bark & Dag 2	Oct 99					T		Yes	**
Bexley 1	Jan 93	●	●	●	●	T		Yes	*A
Bexley 2	Jan 98		●			T	T	Yes	**
Bexley 3	Jan 98					T	T	Yes	**
Bexley 5	Nov 99	●	●	●				Yes	**
Brentwood 1	Aug 95		●					Yes	**
Bromley 5	Mar 96				●			Yes	**
Croydon 6	Jan 01		●					Yes	**
Enfield 1	Jul 95		●					Yes	**
Haringey 2	Apr 96		●		●	B		Yes	**A
Havering 2	Apr 98	Closed Nov 00							
Harrow 1	Apr 99		●	●		T		Yes	**
Hounslow 2	Apr 99		●	●	●	T		Yes	**
Kingston 1	Mar 96				●			Yes	**
Mole Valley 2	Apr 97		●			T		Yes	**
Reigate & Bans 1	Jul 00		●			T		Yes	**
Reigate & Bans 2	Aug 03		●					Yes	**
Richmond 2	Apr 01		●		●	T		Yes	**
Sutton 2	May 95	Closed May 02							
Sutton 3	May 95	Closed May 02							
Wandsworth 3	Oct 94	Closed Nov 00							

A.1.5 Rural Sites

	Start	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$	Data	Quality
Mole Valley 1	Mar 96	Closed Mar 99							
S'oaks Scudders H	Sept 95	Closed Sept 97							

Key: T =TEOM, B=Beta Attenuation, G= Gravimetric, *Locality Standard, **Traceability to National Standards A= Affiliated to UK AURN- final data set published by DEFRA.

Deployments of the Richmond mobile site (Richmond 3+) are not individually listed.

APPENDIX 2: DEFRA DIRECTLY FUNDED SITES

A.2.0 Roadside Sites

	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$
A3	●	●			T	
Cromwell Rd	●	●	●		#	

A.2.1 Background Sites

	CO	NO_2	SO_2	O_3	PM_{10}	$PM_{2.5}$
Bloomsbury	●	●	●	●	T	T
Hillingdon	●	●	●	●	T	
Teddington		●	●	●		
Westminster	●	●	●	●	G	
West London	●	●				

 # Reported as LAQN site Kensington & Chelsea 2.
T = TEOM. G = Gravimetric.

APPENDIX 3: PRELIMINARY MONITORING RESULTS

Monitoring results have been compared to the AQS Objectives and the UK Air Quality Information System descriptors. Many AQS Objectives require data representative of the whole year. If insufficient data are available, then comparison with the objective is not possible. This, for example, may be the case for sites installed during the year or those that experienced serious and prolonged instrument failure. A data capture objective of 90 % is recommended in LAQM.TG(02) (DEFRA 2002) in line with EU Directive requirements. The UK Air Quality Information System for PM_{10} only applies to TEOM measurements; results from other methods are included in parenthesis for information only.

A.3.0 Carbon Monoxide

Carbon Monoxide	Type	Capture Rate (%)	Days Moderate and Above
A3	R	97	0
Bloomsbury	U	94	0
Brent 1	U	95	0
Bexley 1	U	95	0
Bexley 5	S	28	0
Bromley 7	R	79	0
Crystal Palace 1	R	98	0
Ealing 2	R	96	0
Enfield 2	R	86	0
Enfield 3	U	95	0
Hillingdon	S	95	0
Hackney 4	U	97	0
Hounslow 5	R	34	0
Islington 2	R	97	0
Kens and Chelsea 1	U	92	0
Kens and Chelsea 2	R	89	0
Heathrow Airport	U	82	0
Marylebone Road	K	98	0
Redbridge 2	K	31	0
Redbridge 4	R	91	0
Redbridge 5	R	4	0
Richmond 11	K	37	0

Carbon Monoxide	Type	Capture Rate (%)	Days Moderate and Above
Richmond 13	R	53	0
Sevenoaks 2	U	96	0
Southwark 1	U	98	0
Southwark 2	R	39	0
Tower Hamlets 2	R	99	0
Thurrock 1	U	96	0
Wandsworth 2	U	88	0
Wandsworth 4	R	95	0
West London	U	56	0
Westminster	U	89	0

Carbon Monoxide	Type	No occurrences of rolling 8hr mean >=10mgm^{-3} (8.6ppb)	Achieved
A3	R	0	YES
Bloomsbury	U	0	YES
Brent 1	U	0	YES
Bexley 1	U	0	YES
Bexley 5	S	0	NA
Bromley 7	R	0	NA
Crystal Palace 1	R	0	YES
Ealing 2	R	0	YES
Enfield 2	R	0	NA
Enfield 3	U	0	YES
Hillingdon	S	0	YES
Hackney 4	U	0	YES
Hounslow 5	R	0	NA
Islington 2	R	0	YES
Kens and Chelsea 1	U	0	YES
Kens and Chelsea 2	R	0	NA
Heathrow Airport	U	0	NA
Marylebone Road	K	0	YES
Redbridge 2	K	0	NA
Redbridge 4	R	0	YES
Redbridge 5	R	0	NA

Carbon Monoxide	Type	No occurrences of rolling 8hr mean >=10mgm^{-3} (8.6ppb)	Achieved
Richmond 11	K	0	NA
Richmond 13	R	0	NA
Sevenoaks 2	U	0	YES
Southwark 1	U	0	YES
Southwark 2	R	0	NA
Tower Hamlets 2	R	0	YES
Thurrock	U	0	YES
Wandsworth 2	U	0	NA
Wandsworth 4	R	0	YES
West London	U	0	NA
Westminster	U	0	NA

A.3.1 Nitrogen Oxides

Nitrogen Oxides	Type	Capture Rate (%)
A3	R	80
Barking & Dagenham 1	S	98
Bloomsbury	U	67
Barnet 1	K	85
Barnet 2	U	84
Brent 1	U	93
Brent 3	U	77
Brent 4	R	31
Brentwood 1	U	96
Bexley 1	U	91
Bexley 2	S	97
Bexley 5	S	96
Bromley 7	R	97
Camden 1	K	97
Camden 3	R	97
Castle Point 1	U	98
Croydon 2	R	96
Croydon 4	R	92

Nitrogen Oxides	Type	Capture Rate (%)
Croydon 5	K	98
Croydon 6	S	99
City of London 1	U	87
Crystal Palace 1	R	98
Ealing 1	U	87
Ealing 2	R	94
Ealing 6	R	5
Enfield 1	S	99
Enfield 2	R	88
Enfield 3	U	95
Enfield 4	R	99
Greenwich Bexley 6	R	93
Greenwich 4	U	97
Greenwich 5	R	99
Greenwich 7	R	90
H'smith and Fulham 1	R	48
H'smith and Fulham 2	U	16
Haringey 1	R	88
Haringey 2	S	86
Hillingdon	S	82
Hillingdon 1	R	99
Hillingdon 2	R	45
Hackney 4	U	92
Hackney 6	R	65
Harrow 1	U	91
Harrow 2	R	22
Hounslow 2	S	93
Hounslow 4	R	88
Hounslow 5	R	41
Havering 1	R	95
Havering 3	R	83
Islington 1	U	98
Islington 2	R	100

Nitrogen Oxides	Type	Capture Rate (%)
Kens and Chelsea 1	U	94
Kens and Chelsea 2	R	94
Kens and Chelsea 3	R	98
Kens and Chelsea 4	R	98
Lambeth 1	R	95
Lambeth 2	R	40
Lambeth 3	U	99
Heathrow Airport	U	80
Lewisham 1	U	99
Lewisham 2	R	100
Mole Valley 2	S	97
Mole Valley 3	U	98
Marylebone Road	K	94
Redbridge 1	U	99
Redbridge 2	K	31
Redbridge 3	K	87
Redbridge 4	R	82
Redbridge 5	R	10
Reigate and Banstead 1	S	99
Reigate and Banstead 2	S	20
Richmond 1	R	96
Richmond 2	S	99
Richmond 11	K	26
Richmond 13	R	52
Sevenoaks 2	U	96
Southwark 1	U	73
Southwark 2	R	91
Sutton 4	K	96
Teddington	U	95
Tower Hamlets 1	U	99
Tower Hamlets 2	R	97
Tower Hamlets 3	U	94
Thurrock	U	94

Nitrogen Oxides	Type	Capture Rate (%)
Thurrock 2	R	45
Thurrock 3	R	35
Wandsworth 2	U	91
Wandsworth 4	R	94
West London	U	96
Waltham Forest 1	U	68
Waltham Forest 3	R	36
Westminster	U	72

Nitrogen Oxides	Type	Annual Mean NO_X ppb	Annual Mean NO_X as NO_2 μgm^{-3}
A3	R	96	183
Barking & Dagenham 1	S	28	53
Bloomsbury	U	53	100
Barnet 1	K	107	204
Barnet 2	U	37	71
Brent 1	U	33	62
Brent 3	U	70	134
Brent 4	R	179	342
Brentwood 1	U	27	52
Bexley 1	U	35	67
Bexley 2	S	33	63
Bexley 5	S	27	51
Bromley 7	R	42	80
Camden 1	K	78	148
Camden 3	R	79	150
Castle Point 1	U	20	38
Croydon 2	R	76	145
Croydon 4	R	63	121
Croydon 5	K	122	232
Croydon 6	S	38	72
City of London 1	U	51	97
Crystal Palace 1	R	60	116
Ealing 1	U	43	82

Nitrogen Oxides	Type	Annual Mean NO_X ppb	Annual Mean NO_X as NO_2 μgm^{-3}
Ealing 2	R	88	167
Ealing 6	R	196	375
Enfield 1	S	32	60
Enfield 2	R	49	94
Enfield 3	U	31	59
Enfield 4	R	62	118
Greenwich Bexley 6	R	85	163
Greenwich 4	U	29	55
Greenwich 5	R	55	105
Greenwich 7	R	77	148
H'smith and Fulham 1	R	129	246
H'smith and Fulham 2	U	31	59
Haringey 1	R	60	115
Haringey 2	S	33	63
Hillingdon	S	67	127
Hillingdon 1	R	74	142
Hillingdon 2	R	46	87
Hackney 4	U	57	108
Hackney 6	R	87	166
Harrow 1	U	28	53
Harrow 2	R	80	152
Hounslow 2	S	48	91
Hounslow 4	R	102	195
Hounslow 5	R	92	176
Havering 1	R	42	80
Havering 3	R	59	112
Islington 1	U	42	80
Islington 2	R	101	193
Kens and Chelsea 1	U	39	74
Kens and Chelsea 2	R	101	193
Kens and Chelsea 3	R	125	239
Kens and Chelsea 4	R	137	262
Lambeth 1	R	67	128

Nitrogen Oxides	Type	Annual Mean NO_X ppb	Annual Mean NO_X as NO_2 μgm^{-3}
Lambeth 2	R	74	141
Lambeth 3	U	34	65
Heathrow Airport	U	67	128
Lewisham 1	U	61	117
Lewisham 2	R	70	134
Mole Valley 2	S	23	45
Mole Valley 3	U	27	51
Marylebone Road	K	161	307
Redbridge 1	U	37	71
Redbridge 2	K	173	331
Redbridge 3	K	78	149
Redbridge 4	R	67	127
Redbridge 5	R	91	174
Reigate and Banstead 1	S	26	50
Reigate and Banstead 2	S	45	85
Richmond 1	R	50	96
Richmond 2	S	29	55
Richmond 11	K	73	140
Richmond 13	R	64	122
Sevenoaks 2	U	22	43
Southwark 1	U	43	81
Southwark 2	R	84	159
Sutton 4	K	95	182
Teddington	U	24	45
Tower Hamlets 1	U	35	67
Tower Hamlets 2	R	93	179
Tower Hamlets 3	U	40	77
Thurrock 1	U	37	70
Thurrock 2	R	118	226
Thurrock 3	R	61	117
Wandsworth 2	U	62	119
Wandsworth 4	R	59	112
West London	U	48	91

Nitrogen Oxides	Type	Annual Mean NO_X ppb	Annual Mean NO_X as NO_2 μgm^{-3}
Waltham Forest 1	U	37	70
Waltham Forest 3	R	48	92
Westminster	U	45	86

A.3.2 Nitrogen Dioxide

Nitrogen Dioxide	Type	Capture Rate (%)	Days moderate and above
A3	R	80	1
Barking & Dagenham 1	S	98	0
Bloomsbury	U	67	0
Barnet 1	K	85	0
Barnet 2	U	84	0
Brent 1	U	93	0
Brent 3	U	77	1
Brent 4	R	31	0
Brentwood 1	U	96	0
Bexley 1	U	91	0
Bexley 2	S	97	0
Bexley 5	S	96	0
Bromley 7	R	97	0
Camden 1	K	97	2
Camden 3	R	97	0
Castle Point 1	U	98	0
Croydon 2	R	96	0
Croydon 4	R	92	0
Croydon 5	K	98	1
Croydon 6	S	99	0
City of London 1	U	87	0
Crystal Palace 1	R	98	0
Ealing 1	U	87	0
Ealing 2	R	94	0
Ealing 6	R	5	0
Enfield 1	S	99	0
Enfield 2	R	88	0
Enfield 3	U	95	0
Enfield 4	R	99	0
Greenwich Bexley 6	R	93	0
Greenwich 4	U	97	0
Greenwich 5	R	99	0

Nitrogen Dioxide	Type	Capture Rate (%)	Days moderate and above
Greenwich 7	R	90	0
H'smith and Fulham 1	R	48	0
H'smith and Fulham 2	U	16	0
Haringey 1	R	88	0
Haringey 2	S	86	0
Hillingdon	S	82	0
Hillingdon 1	R	99	2
Hillingdon 2	R	45	0
Hackney 4	U	92	0
Hackney 6	R	65	0
Harrow 1	U	91	0
Harrow 2	R	22	0
Hounslow 2	S	93	0
Hounslow 4	R	88	3
Hounslow 5	R	41	0
Havering 1	R	95	0
Havering 3	R	83	0
Islington 1	U	98	0
Islington 2	R	100	0
Kens and Chelsea 1	U	94	0
Kens and Chelsea 2	R	94	0
Kens and Chelsea 3	R	98	10
Kens and Chelsea 4	R	98	0
Lambeth 1	R	95	1
Lambeth 2	R	40	0
Lambeth 3	U	99	0
Heathrow Airport	U	80	0
Lewisham 1	U	99	0
Lewisham 2	R	100	0
Mole Valley 2	S	97	0
Mole Valley 3	U	98	0
Marylebone Road	K	94	7
Redbridge 1	U	99	0

Nitrogen Dioxide	Type	Capture Rate (%)	Days moderate and above
Redbridge 2	K	31	29
Redbridge 3	K	87	0
Redbridge 4	R	82	0
Redbridge 5	R	10	0
Reigate and Banstead 1	S	99	0
Reigate and Banstead 2	S	20	0
Richmond 1	R	96	0
Richmond 2	S	99	0
Richmond 11	K	26	0
Richmond 13	R	52	0
Sevenoaks 2	U	96	0
Southwark 1	U	73	0
Southwark 2	R	91	0
Sutton 4	K	96	0
Teddington	U	95	0
Tower Hamlets 1	U	99	0
Tower Hamlets 2	R	97	0
Tower Hamlets 3	U	94	0
Thurrock 1	U	94	0
Thurrock 2	R	45	0
Thurrock 3	R	35	0
Wandsworth 2	U	91	0
Wandsworth 4	R	94	0
West London	U	96	0
Waltham Forest 1	U	68	0
Waltham Forest 3	R	36	0
Westminster	U	72	0

Nitrogen Dioxide	Type	Annual Mean less than 21ppb	Annual Mean less than 40µgm^{-3}	Achieved
A3	R	37	70	NA
Barking & Dagenham 1	S	16	31	YES
Bloomsbury	U	30	57	NA
Barnet 1	K	44	84	NA
Barnet 2	U	20	39	NA
Brent 1	U	19	37	YES
Brent 3	U	35	67	NA
Brent 4	R	43	82	NA
Brentwood 1	U	18	35	YES
Bexley 1	U	19	36	YES
Bexley 2	S	19	36	YES
Bexley 5	S	18	35	YES
Bromley 7	R	22	42	NO
Camden 1	K	34	64	NO
Camden 3	R	35	66	NO
Castle Point 1	U	14	26	YES
Croydon 2	R	29	55	NO
Croydon 4	R	29	56	NO
Croydon 5	K	38	73	NO
Croydon 6	S	20	38	YES
City of London 1	U	30	58	NA
Crystal Palace 1	R	24	47	NA
Ealing 1	U	22	43	NA
Ealing 2	R	32	61	NO
Ealing 6	R	47	90	NA
Enfield 1	S	18	34	YES
Enfield 2	R	24	46	NA
Enfield 3	U	17	33	YES
Enfield 4	R	27	51	NO
Greenwich Bexley 6	R	28	54	NO
Greenwich 4	U	18	34	YES
Greenwich 5	R	26	49	NO
Greenwich 7	R	31	59	NO

Nitrogen Dioxide	Type	Annual Mean less than 21ppb	Annual Mean less than 40µgm^{-3}	Achieved
H'smith and Fulham 1	R	47	89	NA
H'smith and Fulham 2	U	21	40	NA
Haringey 1	R	27	52	NA
Haringey 2	S	19	36	NA
Hillingdon	S	27	52	NA
Hillingdon 1	R	27	52	NO
Hillingdon 2	R	22	42	NA
Hackney 4	U	27	52	NO
Hackney 6	R	35	67	NA
Harrow 1	U	16	31	YES
Harrow 2	R	26	49	NA
Hounslow 2	S	27	52	NO
Hounslow 4	R	43	82	NA
Hounslow 5	R	23	44	NA
Havering 1	R	21	40	NO
Havering 3	R	23	43	NA
Islington 1	U	25	48	NO
Islington 2	R	36	69	NO
Kens and Chelsea 1	U	23	44	NO
Kens and Chelsea 2	R	40	77	NO
Kens and Chelsea 3	R	48	92	NO
Kens and Chelsea 4	R	51	98	NO
Lambeth 1	R	31	58	NO
Lambeth 2	R	35	67	NA
Lambeth 3	U	21	41	NO
Heathrow Airport	U	30	57	NA
Lewisham 1	U	29	56	NO
Lewisham 2	R	31	58	NO
Mole Valley 2	S	14	27	YES
Mole Valley 3	U	16	30	YES
Marylebone Rd	K	55	105	NO
Redbridge 1	U	21	40	NO
Redbridge 2	K	71	136	NA

Nitrogen Dioxide	Type	Annual Mean less than 21ppb	Annual Mean less than 40µgm^{-3}	Achieved
Redbridge 3	K	32	62	NA
Redbridge 4	R	27	52	NA
Redbridge 5	R	27	51	NA
Reigate and Banstead 1	S	16	31	YES
Reigate and Banstead 2	S	19	36	NA
Richmond 1	R	25	47	NO
Richmond 2	S	17	32	YES
Richmond 11	K	26	50	NA
Richmond 13	R	24	45	NA
Sevenoaks 2	U	13	25	YES
Southwark 1	U	23	44	NA
Southwark 2	R	36	68	NO
Sutton 4	K	38	72	NO
Teddington	U	15	29	YES
Tower Hamlets 1	U	21	41	NO
Tower Hamlets 2	R	34	64	NO
Tower Hamlets 3	U	25	47	NO
Thurrock	U	20	39	YES
Thurrock 2	R	41	78	NA
Thurrock 3	R	23	43	NA
Wandsworth 2	U	32	61	NO
Wandsworth 4	R	27	52	NO
West London	U	29	55	NO
Waltham Forest 1	U	21	39	NA
Waltham Forest 3	R	21	40	NA
Westminster	U	26	50	NA

Nitrogen Dioxide	Type	No more than 18 occurrences of hourly mean >=200μgm^{-3} (104.6ppb)	Achieved
A3	R	11	NA
Barking & Dagenham 1	S	0	YES
Bloomsbury	U	0	NA
Barnet 1	K	94	NO
Barnet 2	U	0	NA
Brent 1	U	1	YES
Brent 3	U	17	NA
Brent 4	R	6	NA
Brentwood 1	U	0	YES
Bexley 1	U	0	YES
Bexley 2	S	0	YES
Bexley 5	S	0	YES
Bromley 7	R	0	YES
Camden 1	K	14	YES
Camden 3	R	1	YES
Castle Point 1	U	0	YES
Croydon 2	R	13	YES
Croydon 4	R	2	YES
Croydon 5	K	11	YES
Croydon 6	S	0	YES
City of London 1	U	0	NA
Crystal Palace 1	R	4	YES
Ealing 1	U	0	NA
Ealing 2	R	4	YES
Ealing 6	R	6	NA
Enfield 1	S	1	YES
Enfield 2	R	0	NA
Enfield 3	U	0	YES
Enfield 4	R	3	YES
Greenwich Bexley 6	R	4	YES
Greenwich 4	U	0	YES

Nitrogen Dioxide	Type	No more than 18 occurrences of hourly mean >=200µgm^{-3} (104.6ppb)	Achieved
Greenwich 5	R	0	YES
Greenwich 7	R	0	YES
H'smith and Fulham 1	R	46	NO
H'smith and Fulham 2	U	0	NA
Haringey 1	R	0	NA
Haringey 2	S	0	NA
Hillingdon	S	0	NA
Hillingdon 1	R	21	NO
Hillingdon 2	R	2	NA
Hackney 4	U	11	YES
Hackney 6	R	0	NA
Harrow 1	U	0	YES
Harrow 2	R	9	NA
Hounslow 2	S	0	YES
Hounslow 4	R	87	NO
Hounslow 5	R	0	NA
Havering 1	R	5	YES
Havering 3	R	0	NA
Islington 1	U	0	NO
Islington 2	R	5	YES
Kens and Chelsea 1	U	0	YES
Kens and Chelsea 2	R	6	YES
Kens and Chelsea 3	R	223	NO
Kens and Chelsea 4	R	50	NO
Lambeth 1	R	1	YES
Lambeth 2	R	0	NA
Lambeth 3	U	0	YES
Heathrow Airport	U	0	NA
Lewisham 1	U	1	YES
Lewisham 2	R	2	YES
Mole Valley 2	S	0	YES
Mole Valley 3	U	0	YES

Nitrogen Dioxide	**Type**	**No more than 18 occurrences of hourly mean >=200µgm^{-3} (104.6ppb)**	**Achieved**
Marylebone Rd	K	424	NO
Redbridge 1	U	0	YES
Redbridge 2	K	458	NO
Redbridge 3	K	11	NA
Redbridge 4	R	0	NA
Redbridge 5	R	0	NA
Reigate and Banstead 1	S	0	YES
Reigate and Banstead 2	S	0	NA
Richmond 1	R	2	YES
Richmond 2	S	0	YES
Richmond 11	K	0	NA
Richmond 13	R	0	NA
Sevenoaks 2	U	0	YES
Southwark 1	U	0	NA
Southwark 2	R	1	YES
Sutton 4	K	50	NO
Teddington	U	0	YES
Tower Hamlets 1	U	0	YES
Tower Hamlets 2	R	4	YES
Tower Hamlets 3	U	0	YES
Thurrock 1	U	1	YES
Thurrock 2	R	7	NA
Thurrock 3	R	0	NA
Wandsworth 2	U	8	YES
Wandsworth 4	R	0	YES
West London	U	0	YES
Waltham Forest 1	U	8	NA
Waltham Forest 3	R	0	NA
Westminster	U	0	NA

A.3.3 Ozone

Ozone	Type	Capture Rate (%)	Days moderate and above
Bloomsbury	U	85	25
Brent 1	U	88	54
Bexley 1	U	96	57
Bromley 5	S	90	63
Croydon 3	S	92	53
City of London 1	U	79	35
Ealing 1	U	99	57
Enfield 3	U	89	60
Greenwich 4	U	92	47
Haringey 2	S	88	47
Hillingdon	S	98	33
Hackney 4	U	97	40
Hounslow 2	S	76	70
Kens and Chelsea 1	U	98	46
Kingston 1	S	99	75
Lewisham 1	U	98	27
Marylebone Road	K	96	6
Redbridge 1	U	99	39
Richmond 2	S	99	70
Richmond 11	K	38	10
Richmond 13	R	56	30
Sevenoaks 2	U	98	79
Southwark 1	U	98	44
Teddington	U	99	72
Tower Hamlets 1	U	98	62
Thurrock	U	95	56
Wandsworth 2	U	94	27
Westminster	U	87	32

Ozone	Type	No more than 10 days where maximum rolling 8hr mean >=100µgm^{-3} (50ppb)	Achieved
Bloomsbury	U	17	NO
Brent 1	U	39	NO
Bexley 1	U	36	NO
Bromley 5	S	47	NO
Croydon 3	S	38	NO
City of London 1	U	25	NO
Ealing 1	U	33	NO
Enfield 3	U	42	NO
Greenwich 4	U	31	NO
Haringey 2	S	37	NO
Hillingdon	S	20	NO
Hackney 4	U	22	NO
Hounslow 2	S	50	NO
Kens and Chelsea 1	U	30	NO
Kingston 1	S	56	NO
Lewisham 1	U	14	NO
Marylebone Road	K	4	YES
Redbridge 1	U	29	NO
Richmond 2	S	51	NO
Richmond 11	K	1	NA
Richmond 13	R	26	NO
Sevenoaks 2	U	59	NO
Southwark 1	U	31	NO
Teddington	U	50	NO
Tower Hamlets 1	U	42	NO
Thurrock	U	40	NO
Wandsworth 2	U	12	NO
Westminster	U	19	NO

A.3.4 PM_{10}

PM_{10}	Type	Instrument	Capture Rate (%)	Days moderate and above
A3	R	T	96	30
Barking & Dagenham 2	S	T	97	28
Bloomsbury	U	T	58	8
Barnet 1	K	T	94	21
Barnet 2	U	T	98	9
Brent 1	U	T	94	12
Brent 3	U	T	78	23
Brent 4	R	T	40	25
Bexley 1	U	T	94	23
Bexley 2	S	T	96	23
Bexley 3	S	T	13	0
Bexley 4	R	T	98	136
Bromley 7	R	B	52	23
Camden 1	K	T	99	22
Camden 3	R	T	96	40
Croydon 3	S	T	94	9
Croydon 4	R	T	96	15
Crystal Palace 1	R	T	95	2
Ealing 2	R	T	99	36
Enfield 2	R	B	90	108
Enfield 3	U	B	90	57
Enfield 4	R	B	94	171
Greenwich Bexley 6	R	T	94	36
Greenwich 4	U	T	99	22
Greenwich 5	R	T	98	23
Greenwich 7	R	T	92	30
H'smith and Fulham 1	R	T	83	30
H'smith and Fulham 2	U	T	0	0
Haringey 1	R	T	97	17
Haringey 2	S	B	95	76
Hillingdon	S	T	89	18
Hillingdon 1	R	T	93	25

PM_{10}	Type	Instrument	Capture Rate (%)	Days moderate and above
Hillingdon 2	R	T	60	12
Hackney 6	R	T	77	28
Harrow 1	U	T	93	8
Harrow 2	R	T	52	10
Hounslow 2	S	T	96	8
Hounslow 4	R	T	74	26
Hounslow 5	R	T	55	15
Havering 3	R	T	85	9
Islington 1	U	T	97	10
Islington 2	R	T	85	36
Kens and Chelsea 1	U	T	98	19
Kens and Chelsea 2	R	T	88	30
Lambeth 1	R	B	94	145
Lambeth 2	R	B	44	58
Lambeth 3	U	B	97	91
Heathrow Airport	U	T	81	13
Lewisham 2	R	T	77	32
Mole Valley 2	S	T	99	8
Mole Valley 3	U	T	87	12
Marylebone Road	K	T	99	93
Redbridge 1	U	B	94	83
Redbridge 3	K	B	75	104
Redbridge 4	R	B	96	119
Redbridge 5	R	B	11	14
Reigate and Banstead 1	S	T	98	9
Richmond 1	R	T	95	14
Richmond 2	S	T	98	19
Richmond 11	K	T	35	16
Richmond 13	R	T	47	12
Sevenoaks 2	U	T	99	6
Southwark 1	U	T	99	20
Southwark 2	R	T	66	40
Sutton 4	K	T	99	24

PM_{10}	Type	Instrument	Capture Rate (%)	Days moderate and above
Tower Hamlets 1	U	T	96	29
Tower Hamlets 3	U	T	93	14
Thurrock	U	T	96	30
Thurrock 3	R	T	32	0
Wandsworth 4	R	T	95	30
Waltham Forest 1	U	T	78	4
Waltham Forest 3	R	T	43	7

Instrument type; T = TEOM, B = BAM.

PM_{10}	Type	Instrument	No more than 35 days where daily mean >=50µgm^{-3} (TEOM *1.3, BAM *1)	Achieved
A3	R	T	43	NO
Barking & Dagenham 2	S	T	44	NO
Bloomsbury	U	T	15	NA
Barnet 1	K	T	45	NO
Barnet 2	U	T	25	YES
Brent 1	U	T	25	YES
Brent 3	U	T	37	NO
Brent 4	R	T	41	NO
Bexley 1	U	T	33	YES
Bexley 2	S	T	28	YES
Bexley 3	S	T	0	NA
Bexley 4	R	T	131	NO
Bromley 7	R	B	15	NA
Camden 1	K	T	48	NO
Camden 3	R	T	69	NO
Croydon 3	S	T	15	YES
Croydon 4	R	T	32	YES
Crystal Palace 1	R	T	17	YES
Ealing 2	R	T	61	NO
Enfield 2	R	B	81	NO
Enfield 3	U	B	39	NO
Enfield 4	R	B	131	NO
Greenwich Bexley 6	R	T	47	NO

PM_{10}	Type	Instrument	No more than 35 days where daily mean >=50µgm^{-3} (TEOM *1.3, BAM *1)	Achieved
Greenwich 4	U	T	25	YES
Greenwich 5	R	T	33	YES
Greenwich 7	R	T	55	NO
H'smith and Fulham 1	R	T	54	NO
H'smith and Fulham 2	U	T	0	NA
Haringey 1	R	T	32	YES
Haringey 2	S	B	57	NO
Hillingdon	S	T	33	NA
Hillingdon 1	R	T	41	NO
Hillingdon 2	R	T	18	NA
Hackney 6	R	T	40	NO
Harrow 1	U	T	16	YES
Harrow 2	R	T	20	NA
Hounslow 2	S	T	21	YES
Hounslow 4	R	T	49	NO
Hounslow 5	R	T	28	NA
Havering 3	R	T	26	NA
Islington 1	U	T	29	YES
Islington 2	R	T	57	NO
Kens and Chelsea 1	U	T	29	YES
Kens and Chelsea 2	R	T	56	NO
Lambeth 1	R	B	111	NO
Lambeth 2	R	B	45	NO
Lambeth 3	U	B	69	NO
Heathrow Airport	U	T	30	NA
Lewisham 2	R	T	44	NO
Mole Valley 2	S	T	15	YES
Mole Valley 3	U	T	21	NA
Marylebone Road	K	T	161	NO
Redbridge 1	U	B	60	NO
Redbridge 3	K	B	72	NO
Redbridge 4	R	B	86	NO
Redbridge 5	R	B	19	NA

PM_{10}	Type	Instrument	No more than 35 days where daily mean >=50µgm^{-3} (TEOM *1.3, BAM *1)	Achieved
Reigate and Banstead 1	S	T	16	YES
Richmond 1	R	T	28	YES
Richmond 2	S	T	34	YES
Richmond 11	K	T	26	NA
Richmond 13	R	T	22	NA
Sevenoaks 2	U	T	14	YES
Southwark 1	U	T	32	YES
Southwark 2	R	T	52	N0
Sutton 4	K	T	37	NO
Tower Hamlets 1	U	T	43	NO
Tower Hamlets 3	U	T	26	YES
Thurrock 1	U	T	40	NO
Thurrock 3	R	T	7	NA
Wandsworth 4	R	T	45	NO
Waltham Forest 1	U	T	16	NA
Waltham Forest 3	R	T	10	NA

Instrument type; T = TEOM, B = BAM.

PM_{10}	Type	Instrument	Annual Mean less than 40µgm^{-3} (TEOM *1.3, BAM *1)	Achieved
A3	R	T	33	YES
Barking & Dagenham 2	S	T	32	YES
Bloomsbury	U	T	30	NA
Barnet 1	K	T	33	YES
Barnet 2	U	T	26	YES
Brent 1	U	T	26	YES
Brent 3	U	T	34	NA
Brent 4	R	T	41	NA
Bexley 1	U	T	27	YES
Bexley 2	S	T	27	YES
Bexley 3	S	T	21	NA
Bexley 4	R	T	46	NO
Bromley 7	R	B	28	NA

PM_{10}	Type	Instrument	Annual Mean less than 40µgm^{-3} (TEOM *1.3, BAM *1)	Achieved
Camden 1	K	T	35	YES
Camden 3	R	T	40	NO
Croydon 3	S	T	26	YES
Croydon 4	R	T	31	YES
Crystal Palace 1	R	T	27	YES
Ealing 2	R	T	34	YES
Enfield 2	R	B	41	NO
Enfield 3	U	B	29	YES
Enfield 4	R	B	51	NO
Greenwich Bexley 6	R	T	32	YES
Greenwich 4	U	T	27	YES
Greenwich 5	R	T	29	YES
Greenwich 7	R	T	35	YES
H'smith and Fulham 1	R	T	37	NA
H'smith and Fulham 2	U	T	35	NA
Haringey 1	R	T	29	YES
Haringey 2	S	B	35	YES
Hillingdon	S	T	30	NA
Hillingdon 1	R	T	31	YES
Hillingdon 2	R	T	31	NA
Hackney 6	R	T	37	NA
Harrow 1	U	T	24	YES
Harrow 2	R	T	31	NA
Hounslow 2	S	T	26	YES
Hounslow 4	R	T	36	NA
Hounslow 5	R	T	36	NA
Havering 3	R	T	27	NA
Islington 1	U	T	28	YES
Islington 2	R	T	38	NA
Kens and Chelsea 1	U	T	28	YES
Kens and Chelsea 2	R	T	39	NA
Lambeth 1	R	B	46	NO
Lambeth 2	R	B	46	NA

PM_{10}	Type	Instrument	Annual Mean less than $40 \mu g m^{-3}$ (TEOM *1.3, BAM *1)	Achieved
Lambeth 3	U	B	37	YES
Heathrow Airport	U	T	30	NA
Lewisham 2	R	T	37	NA
Mole Valley 2	S	T	24	YES
Mole Valley 3	U	T	27	NA
Marylebone Road	K	T	48	NO
Redbridge 1	U	B	35	YES
Redbridge 3	K	B	42	NA
Redbridge 4	R	B	41	NO
Redbridge 5	R	B	52	NA
Reigate and Banstead 1	S	T	26	YES
Richmond 1	R	T	28	YES
Richmond 2	S	T	27	YES
Richmond 11	K	T	36	NA
Richmond 13	R	T	34	NA
Sevenoaks 2	U	T	23	YES
Southwark 1	U	T	30	YES
Southwark 2	R	T	39	NA
Sutton 4	K	T	34	YES
Tower Hamlets 1	U	T	31	YES
Tower Hamlets 3	U	T	27	YES
Thurrock	U	T	30	YES
Thurrock 3	R	T	28	NA
Wandsworth 4	R	T	32	YES
Waltham Forest 1	U	T	24	NA
Waltham Forest 3	R	T	27	NA

Instrument type; T = TEOM, B = BAM.

A.3.5 $PM_{2.5}$

$PM_{2.5}$	Type	Instrument	Capture Rate (%)	Annual Mean μgm^{-3}
Bexley 2	S	T	98	13
Bexley 3	S	T	99	13
Bloomsbury	U	T	72	14
Ealing 2	R	T	28	17
Greenwich Bexley 6	R	T	98	16
Hackney 4	U	T	73	18
Marylebone Road	K	T	32	20

Instrument type; T = TEOM, B = BAM.

A.3.6 Sulphur Dioxide

Sulphur Dioxide	Type		Days moderate and above
Barking & Dagenham 1	S	98	0
Bloomsbury	U	94	0
Brent 1	U	95	0
Brent 3	U	77	1
Brent 4	R	30	0
Bexley 1	U	89	1
Bexley 5	S	96	0
Castle Point 1	U	98	0
Croydon 4	R	97	1
City of London 1	U	72	0
Crystal Palace 1	R	97	0
Ealing 1	U	92	0
Enfield 3	U	94	3
Enfield 4	R	96	0
Greenwich 4	U	98	0
H'smith and Fulham 1	R	48	0
Haringey 1	R	92	0
Hillingdon	S	96	0
Harrow 1	U	91	0
Hounslow 2	S	94	1
Hounslow 4	R	88	0
Havering 3	R	79	0
Kens and Chelsea 1	U	98	0
Kens and Chelsea 2	R	88	0
Lambeth 1	R	97	0
Lambeth 2	R	40	0
Lambeth 3	U	99	0
Lewisham 1	U	99	1
Lewisham 2	R	96	0
Marylebone Road	K	96	0
Redbridge 4	R	94	0
Richmond 11	K	35	0

Sulphur Dioxide	Type	Capture Rate (%)	Days moderate and above
Richmond 13	R	51	0
Sevenoaks 2	U	98	0
Southwark 1	U	98	0
Southwark 2	R	91	0
Teddington	U	98	0
Tower Hamlets 1	U	99	1
Tower Hamlets 3	U	82	0
Thurrock	U	89	5
Thurrock 3	R	35	0
Wandsworth 2	U	95	0
Waltham Forest 1	U	67	0
Waltham Forest 3	R	29	0
Westminster	U	80	0

Sulphur Dioxide	Type	No more than 35 occurrences of 15min mean >=350µgm^{-3} (100ppb)	Achieved
Barking & Dagenham 1	S	0	YES
Bloomsbury	U	0	YES
Brent 1	U	0	YES
Brent 3	U	1	NA
Brent 4	R	0	NA
Bexley 1	U	1	NA
Bexley 5	S	0	YES
Castle Point 1	U	0	YES
Croydon 4	R	1	YES
City of London 1	U	0	NA
Crystal Palace 1	R	0	YES
Ealing 1	U	0	YES
Enfield 3	U	3	YES
Enfield 4	R	0	YES
Greenwich 4	U	0	YES
H'smith and Fulham 1	R	0	NA
Haringey 1	R	0	YES

Sulphur Dioxide	Type	No more than 35 occurrences of 15min mean >=350µgm^{-3} (100ppb)	Achieved
Hillingdon	S	0	YES
Harrow 1	U	0	YES
Hounslow 2	S	1	YES
Hounslow 4	R	0	NA
Havering 3	R	0	NA
Kens and Chelsea 1	U	0	YES
Kens and Chelsea 2	R	0	NA
Lambeth 1	R	0	YES
Lambeth 2	R	0	NA
Lambeth 3	U	0	YES
Lewisham 1	U	2	YES
Lewisham 2	R	0	YES
Marylebone Road	K	0	YES
Redbridge 4	R	0	YES
Richmond 11	K	0	NA
Richmond 13	R	0	NA
Sevenoaks 2	U	0	YES
Southwark 1	U	0	YES
Southwark 2	R	0	YES
Teddington	U	0	YES
Tower Hamlets 1	U	1	YES
Tower Hamlets 3	U	0	NA
Thurrock	U	9	NA
Thurrock 3	R	0	NA
Wandsworth 2	U	0	YES
Waltham Forest 1	U	0	NA
Waltham Forest 3	R	0	NA
Westminster	U	0	YES

APPENDIX 4: AIR QUALITY STRATEGY OBJECTIVES & UK AIR QUALITY INFORMATION SYSTEM

The following objectives are set out in the Air Quality Regulations 2000 for the purposes of Local Air Quality Management.

Pollutant	Objective		by
	Concentration	Measured as	
Benzene	5 μgm^{-3} (1 ppb)	Running Annual Mean	31 Dec 2010
1, 3 Butadiene	2.25 μgm^{-3} (1 ppb)	Running Annual Mean	31 Dec 2003
Carbon Monoxide	10 mgm^{-3} (8.6 ppb)	Running 8 hour mean	31 Dec 2003
Lead	0.5 μgm^{-3} 0.25 μgm^{-3}	Annual Mean Annual Mean	31 Dec 2003 31 Dec 2008
Nitrogen Dioxide (provisional)	200 μgm^{-3} (105 ppb) not to be exceeded more than 18 times a year 40 μgm^{-3} (21 ppb)	1 hour mean Annual Mean	31 Dec 2005 31 Dec 2005
Particles (PM_{10})	50 $\mu g/m^3$ not to be exceeded more than 35 times a year 40 μgm^{-3}	24 hour mean Annual Mean	31 Dec 2004 31 Dec 2004
Sulphur Dioxide	350 μgm^{-3} (132 ppb) not to be exceeded more than 24 times a year 125 μgm^{-3} (47 ppb) not to be exceeded more than 3 times a year 266 μgm^{-3} (100 ppb) not to be exceeded more than 35 times a year	1 hour mean 24 hour mean 15 minute mean	31 Dec 2004 31 Dec 2004 31 Dec 2005

The following objectives are not included in the Air Quality Regulations 2000 for the purposes of Local Air Quality Management.

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Objectives for the protection of human health			
Ozone (provisional)	100 μgm^{-3} (50 ppb) not to be exceeded more than 10 times per year	Daily maximum of running 8 hour mean	31 Dec 2005
Objectives for the protection of vegetation and ecosystems			
Nitrogen Oxides (assuming NO_X is taken as NO_2)	30 μgm^{-3} (16 ppb)	Annual mean	31 Dec 2000
Sulphur Dioxide	20 μgm^{-3} (8 ppb) 20 μgm^{-3} (8 ppb)	Annual Mean Winter Mean (1 Oct- 31 Mar)	31 Dec 2000 31 Dec 2000

DETR, 2000; The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – A consultation Document.

DETR, 2000; Air Quality Regulations 2000.

DEFRA, 2002; Report on the Review of the National Air Quality Strategy; Proposals to Amend the Strategy.

The ‘descriptors’ applied to air pollution concentrations are defined by the UK Air Quality Information system.

Pollutant / Band		**MODERATE**	**HIGH**	**VERY HIGH**
Sulphur Dioxide	below 100ppb, averaged over 15 minutes	100ppb, averaged over 15 minutes	200ppb, averaged over 15 minutes	400ppb, averaged over 15 minutes
Ozone	below 50ppb, as an 8 hour running average and below 50ppb averaged over one hour	50ppb, as an 8 hour running average or 50ppb averaged over one hour	90 ppb, averaged over one hour	180 ppb, averaged over one hour
Carbon Monoxide	below 10 ppm, as an 8 hour running average	10 ppm, as an 8 hour running average	15 ppm, as an 8 hour running average	20 ppm, as an 8 hour running average
Nitrogen Dioxide	below 150 ppb, averaged over one hour	150 ppb, averaged over one hour	300 ppb, averaged over one hour	400 ppb, averaged over one hour
PM_{10} Particles (by TEOM)	below 50 ug/m^3, as a 24 hour running average	50 ug/m^3, as a 24 hour running average	75 ug/m^3, as a 24 hour running average	100 ug/m^3, as a 24 hour running average