The London Wide Environment Programme

Benzene Diffusion Tube Survey 2004

Ref: AGG00901

August 2005

Report

London Wide Benzene Diffusion Tube Survey Annual Report 2004

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London Borough of Bexley
London Borough of Brent
London Borough of Greenwich
London Borough of Hackney
London Borough of Hammersmith and Fulham
London Borough of Harrow
London Borough of Hillingdon
London Borough of Hounslow
Royal Borough of Kensington and Chelsea
Corporation of London
London Borough of Newham
London Borough of Richmond
London Borough of Sutton
City of Westminster

9th August 2005

Our Ref: AGG00901
Document Ref: CS/AQ/2352

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Executive Summary

This report presents the results of the 2004 London Wide Benzene Monitoring Programme. The main objective of the programme is to determine the ambient concentration of benzene to which people are exposed in urban areas, since benzene is a genotoxic carcinogen and as such is strongly linked to the formation of cancer.

During the 2004 programme participating boroughs maintained one hundred and five sites across London. These sites included urban background locations, thus allowing the levels of benzene to which the general public are exposed for significant periods of time to be quantified. Monitoring sites also included roadside and petrol station locations, as motor vehicles are the major source of atmospheric benzene, with significant evaporative emissions resulting from the handling, distribution and storage of petrol. Toluene, ethyl benzene, m, p-xylene and o-xylene were also monitored at thirty-seven sites in six boroughs across London. Such measurements can be of use in determining possible emission sources. Benzene, toluene, ethyl benzene, m, p-xylene and o-xylene levels were determined using passive diffusion tubes. These provide long term measurements, which give a good indication of personal exposure.

As would be expected, maximum benzene concentrations were recorded at petrol station locations. Annual mean benzene concentrations ranged from 0.9μg m^{-3} to 4.1μg m^{-3} at roadside locations, 1.0μg m^{-3} to 2.0μg m^{-3} at background locations and 1.7μg m^{-3} 9.5μg m^{-3} at petrol station. The annual mean benzene concentrations for the three different location types were 2.0μg m^{-3}, 1.4μg m^{-3} and 3.6μg m^{-3} at roadside, background and petrol station locations respectively.

These results are consistent with road traffic and petrol being significant sources of atmospheric benzene. This is shown in the results where a reduction in benzene has occurred with increasing distance from the road. Ambient benzene levels are influenced by several factors; for example traffic flow, meteorological conditions and height of the sampler. This partially explains why there appeared to be little influence of road traffic benzene levels in some boroughs.

During 2004, benzene levels exhibited some seasonal variation similar to that of previous years with mean concentrations at many sites showing little variation. In most boroughs, concentrations followed the pattern documented for other primary pollutants, with much greater variation in ground level concentrations occurring in winter months.

Benzene levels recorded in this study were compared against the Air Quality Objective and the Air Quality Standard *(AQS)* for benzene set by the Expert Panel on Air Quality Standards. The objective and the AQS are set at 16.25μg m^{-3}

as a running annual mean and is the level 'at which the risks are exceedingly small and unlikely to be detectable'. Although such comparisons give a good indication of likely exceedences of such criteria, direct comparisons cannot be made, due to the different averaging periods used. However, as a guide the annual mean can be converted into a running mean by using a multiplication factor of 1.1[18].

In 2004 annual mean concentrations at all sites were below the Standard and Objective of 16.25μg m^{-3} and were typically lower than previous years. This supports the assertion made by the Expert Panel on Air Quality Standards that annual average benzene concentrations rarely exceed the AQS. Current policies already in place have helped considerably to reduce benzene concentrations and keep levels below the EPAQS long-term target concentration of 5μg m^{-3}.

[18] Department of the Environment (2000),LAQM.TEG 4 (00) Pollutant Specific Guidance

1 Introduction

This report presents the results of the 2004 London Wide Benzene Monitoring Programme. The report describes results collected from January 2004 to December 2004 and covers the thirteenth year during which the programme has been in operation. The Benzene Monitoring Programme forms part of the London Wide Environmental Programme *(LWEP)*, an integrated programme dealing with environmental issues for London Boroughs.

The following London Boroughs sponsored the 2004 Benzene Monitoring Programme:

London Borough of Bexley
London Borough of Brent
London Borough of Greenwich
London Borough of Hackney
London Borough of Hammersmith and Fulham
London Borough of Harrow
London Borough of Hillingdon
London Borough of Hounslow
Royal Borough of Kensington and Chelsea
Corporation of London
London Borough of Newham
London Borough of Richmond
London Borough of Sutton
City of Westminster

The main objective of the Benzene Monitoring Programme is to determine the ambient concentrations of benzene to which people are exposed in urban areas. The programme was initiated in response to continuing concern that people living within urban areas are often exposed to elevated concentrations of benzene, which may be harmful to human health. Monitoring conducted as part of the Programme also allows compliance with relevant guidelines to be assessed.

During the 2004 programme, a total of one hundred and five sites across London were maintained by participating boroughs. Benzene levels were surveyed using the passive diffusion sampler technique incorporating procedures developed by Casella Stanger specifically for monitoring ambient levels. Diffusion samplers were despatched to participating boroughs at regular intervals, exposed by local council staff and returned to Casella Stanger following a standard exposure period.

Toluene, ethyl benzene, m, p-xylene and o-xylene were also monitored at a total of thirty-seven sites within six boroughs across London. This additional analysis was carried out on the same diffusion samplers used for benzene monitoring.

There are currently no ambient air quality guidelines or standards regarding these volatile organic compounds, however monitoring can be useful in determining possible emission sources in order to aid the understanding of the pollutant occurrence. The ratio between benzene and toluene varies depending on the emission source and so can be used to assess whether road traffic or industrial sources are the main contributors to VOC levels at certain locations. A benzene/toluene ratio of approximately 1:2-1:4 indicates that road traffic is likely to be the major source of VOC's measured at a particular location.

Towards the end of the 2004 monitoring period, it was noted that benzene/toluene ratios at some sites were no longer typical of locations influenced by road traffic. Comparison between the more accurate hydrocarbon network monitor and the diffusion tubes deployed at Marylebone Road found that although the benzene concentrations for both monitoring techniques showed good correlation, toluene levels were over estimated by the diffusion tube technique. The cause of the over estimation was investigated and a laboratory audit was carried out. Following this investigation, several measures were taken to minimise any sources of contamination and improve the sampling, storage and analysis methods. Subsequent results have shown benzene/toluene ratios returning to levels more typical of roadside locations. Benzene/toluene ratios for this study can be found in Appendix H, Table 4. Although the toluene results were over estimated by the diffusion tubes, a benzene/toluene ratio similar to that found by the Marylebone Road diffusion tubes (1:7) are thought to be indicative of a site influenced by road traffic. Given the lack of published data regarding these VOC's, this report concentrates primarily on sources and effects of benzene.

As road traffic and petrol stations are major sources of atmospheric benzene, at least one site in each borough was located near one of these emission sources. However, as the overall objective of the study was to determine long term concentrations to which the general public are exposed for significant periods of time, samplers were also located at background sites away from the direct sources, such as residential areas. Sites were located at varying distances from busy roads, which enabled the importance of road traffic as a source to be assessed.

2 Sources of Benzene

Benzene is an aromatic hydrocarbon occurring as a colourless, clear liquid. Benzene is one of a group of substances known as volatile organic compounds; this group of compounds also includes toluene, ethyl benzene and xylenes.

There are no well-defined natural sources of benzene although it is known to occur naturally as a constituent of natural gases. Other industrial processes including the pyrolysis of petrol also synthetically produce benzene. In Western Europe in the early 1980s, production of benzene was estimated to be 6.9 million tonnes, with the UK, Federal Republic of Germany and Netherlands being the major producers.

Benzene is added to petrol as an anti-knock agent. Since 1 July 1989 the content of benzene in petrol in the UK had been limited to 5% by volume in leaded or unleaded petrol by the EC Directive COM (84) 226. In practice this amount varied since refineries often used a variety of other compounds to obtain the same effect depending upon the availability and cost. Since January 2000, EU legislation implemented through the Auto-Oil Programme requires that the amount of benzene in petrol be below 1% in volume and is presently about 0.6% in volume on average for fuel sold in the UK[19]

Benzene in ambient air arises mainly from anthropogenic sources, in particular through the combustion of petrol and oil, although natural benzene emissions occur from plant and animal matter and seepage from petroleum reservoirs. Table 1 shows the benzene emission inventory for the UK, which illustrates motor vehicles being the major source of benzene emissions. On a national basis, this accounted for about 71% of the total emissions in 1999. These sources are also significant contributors to ambient concentrations of other VOC's such as toluene, ethyl benzene and xylenes.

An additional significant source of ambient benzene is petrol evaporation from vehicles and evaporative emissions from the handling, distribution and storage of petrol. A study undertaken in Leeds identified motor vehicles, as the single largest source of VOC's responsible for almost half of all releases. A high proportion of VOC emissions were also attributed to solvent use, particularly in the city centre where there was a large number of industrial point sources *(Clarke et al 1996)*.

[19] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. A consultation document on proposals for Air Quality Objectives for particles, benzene, carbon monoxide and polycyclic aromatic hydrocarbons *(September 2001)*

Table 1: UK Annual Benzene Emissions, 1990-1999 (Ktonnes)

Source	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	% in 1999
Industrial Combustion	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	3%
Industrial Processes	3.7	3.8	3.9	3.9	4	4	3.4	2.9	2	1.8	6%
Domestic	3.5	3.6	3.4	3.4	3.1	2.8	3	2.8	2.9	3	10%
Road Transport Combustion	42.4	41.5	39.8	36.8	34.1	31.3	29	26.1	23.4	21	71%
Other	4	4.1	4.2	4.2	4.3	4	3.9	3.8	3.5	3.1	10%

(From The Air Quality Strategy for England, Scotland, Wales and Northern Ireland; *A consultation document of proposals for air quality objectives for particles, benzene, carbon monoxide and polycyclic aromatic hydrocarbons: September 2001*)

While the previously mentioned sources of benzene contribute significantly to ambient benzene levels, it is important to realise that there are other benzene sources that can contribute significantly to an individual's total intake of the chemical. Cigarette smoke contains benzene, and may be the main source of exposure for a heavy smoker; passive smoking may also contribute to benzene intake. It is also present at low concentrations in food and drinking water, and diet may be the main source of benzene for non-smokers living in unpolluted rural areas.

3 Human Exposure to Benzene

Since benzene is a primary pollutant, concentrations are generally higher close to the emission source. However, the sources of personal exposure to benzene may be very different from those contributing to outside air due to time activity and behavioural patterns. Smoking, in particular, is linked to benzene exposure, as tobacco smoke contains significant benzene concentrations.

Personal exposure to benzene in the home may also result from evaporative emissions from consumer products, such as paints, adhesives and marker pens, while in homes with attached garages, evaporative emissions from petrol tanks of cars could be significant. However, the importance of these sources for personal exposure in the UK is unknown and yet to be established.

Benzene in motor vehicles is likely to be a significant source of exposure. These exposures can results from exhaust and evaporative emissions arising from the vehicle itself or from the higher concentrations of this primary pollutant in the road. The actual concentrations may be influenced by the age and model of the vehicle, by traffic and weather conditions, and by whether the vehicle is being driven with the window open or with the fans or heaters on. Again, there is very little data on the actual UK exposures in vehicles, but the data from elsewhere suggest these exposures could be 2-10 times those at urban monitoring sites. Finally, exposure while refilling vehicles with petrol may be high, although the time spent by most individuals at such locations is generally small.

These complex sources of benzene mean that the contributions from different sources to total outdoor emissions give a poor indication of the importance of different sources to personal exposure. For example, in the US it has been estimated direct outdoor exposure only contributes 15% of the total population exposure, where as 60% is due to direct and indirect exposure to tobacco smoke.

Since the health concerns of ambient benzene exposure are not respiratory effects, and the pollutant tends to accumulate in fatty tissue within the body, exposure in food and drink may be important, as well as that in air. However, most calculations suggest that the exposure through food and drink is likely to be small relative to that through the lungs, on a population basis. Deposition to local gardens and allotments could additionally contribute to the total benzene dose of some individuals in urban areas, although little is known about actual rates of benzene deposition to, and accumulation in, vegetation.

Benzene exposure is especially high in certain groups of industrial workers, in the chemical and petrochemical sectors, and among certain groups with a high exposure to adhesives. These exposures are much greater than those due to ambient benzene and it is studies of these occupational groups, which have provided the clearest evidence of adverse health effects of this pollutant.

4 Health Effects of Benzene

At extremely high concentrations, relatively short-term exposure to benzene can cause anaesthesia or fatal damage to the bone marrow. However, such concentrations can only build up as a result of accidental release into poorly ventilated indoor environments, and are several orders of magnitude higher than ambient concentration *(10 to 100mg m^{-3})*. Consequently, these toxicological effects are of little relevance when considering the health effects of ambient concentrations.

The concern relating to normal ambient exposure is linked to the fact that benzene is a proven genotoxic carcinogen and as such no absolutely safe level can be specified for ambient levels. Benzene has the effect of modifying the genetic makeup of living cells, which has been deduced from laboratory studies with animals. There is also evidence from several studies of occupational groups that long term exposure to high concentrations of benzene is associated with a small increase in the probability of developing certain types of leukaemia.

Since leukaemia is a relatively rare disease, and since lifetime exposures as a result of ambient exposure are relatively low, it is effectively impossible to carry out epidemiological studies of the association between benzene exposure and the risk of contracting leukaemia in the general population. Thus, any assessment of the health risks associated with ambient benzene exposure is usually based on extrapolation from the occupational studies.

These occupational investigations are primarily cohort studies, in which defined groups of workers are followed forward over many years, and the number of deaths due to leukaemia recorded. In most of these studies, the number of subjects was no more than 3000, and since the chances of contracting leukaemia overall are only 1 in 6000, the results are generally based on a very small number of deaths. This fact, together with the relatively crude estimates of benzene exposure, which were made in some cases, makes it very difficult to establish exposure-response relationships for benzene.

The data from these studies provide good evidence of an effect after exposure at 32,440 µg m^{-3} over 20 years, and some evidence of an effect at exposures between 3,244 µg m^{-3} and 32,440µg m^{-3}. However, any assessment of the risk of adverse health effects from long-term exposures to ambient benzene, which are likely to range from 3.24µg m^{-3} to 32.44µg m^{-3} in non-smokers, must rely on extrapolation downward over several orders of magnitude assuming a particular shape to the exposure-response relationship. Assuming a linear exposure-response relationship, it would be possible to calculate the benzene exposure corresponding to any particular level of risk, but there is no means of verifying the actual shape of the exposure-response relationship.

Some research *(Yu,*R *etal, 1996)* has suggested that the health risk from exposure to low levels of benzene, such as ambient levels, may be greater than that predicted by extrapolation of occupational research. Muconic acid, a harmful metabolite of benzene, is produced in much higher quantities at lower concentrations than high concentrations. A 2% increase in muconic acid levels was typical at high ppm exposures whereas at exposures 2 to 3 orders of magnitude 25% was produced. This is consistent with enzymes involved in the metabolic pathway processing much more efficiently at low concentrations. This effect was measured in humans exposed to tobacco smoke but is likely to be relevant to other petrochemical exposures.

Clearly, the understanding of the health effects of benzene is increasing all the time through studies of the type quoted here. However, until further evidence is gathered, it shall be assumed that there is no acceptable level of benzene that should be set against which health risks become acceptable.

5 The Air Quality Strategy

In March 1997, the Government published *The United Kingdom Air Quality Strategy)*. This fulfilled the requirement for a National Air Quality Strategy under the Environment Act 1995, by setting out policies for the management of air quality. The aim of this strategy was to map out, as far as possible, the future of ambient air quality policy in the United Kingdom for at least the next ten years. A particular purpose was to ensure that all those who contribute to air pollution, or are affected by it, or have a part to play in its abatement, can identify both what is statutorily required from them and what further contribution they could voluntarily make in as efficient manner as possible[17]

The revised *Air Quality Strategy* was published in January 2000 and addresses remaining problems on air quality issues. Standards are set in the Strategy, which are concentrations below which effects are unlikely, even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely on the effects of a particular pollutant.

The Government has established air quality objectives for pollutants, which are based on recommendations of the Expert Panel on Air Quality Standards *(EPAQS*). These set out the extent to which the standards are to be achieved for this year and future years. They take account of the costs, benefits, feasibility and practicality of achieving the standards.

The European Parliament and Council of Ministers concluded a conciliation agreement on three Auto-Oil vehicle emissions and fuel quality directives in 1998, which were introduced from January 2000.

This agreement includes stringent emission standards for new vans and cars sold from January 2001 *(Euro IV standards)*. These are complemented by tighter fuel quality specifications applying to all petrol and diesel sold from 2000 and 2005. These alone should result in a reduction in benzene emissions from road transport by 2005.

The Strategy is currently under review following the published consultation document of September 2002.

[17] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (January 2000).

6 Air Quality Standards and Objectives for Benzene

The UK expert Panel on Air Quality Standards *(EPAQS)* set an Air Quality Standard *(AQS)* for benzene in 1994. A running annual mean concentration of 5ppb was recommended which was based on a study of occupational data and the consideration of medical evidence for carcinogenic effects. In the report, the EPAQS also recommended a long-term policy target of 1ppb (3.25μg m^{-3}) as a running annual mean, to be achieved in all areas by the end of 2003.

The provisions of the Air Quality regulations 1997 in relation to England have been replaced by the Air Quality (England) Regulations 2000, which were authorised by the Secretary of State for the Environment, Transport and Regions. Such regulations incorporate an objective of 16.25μg m^{-3} for benzene. The Governments intention is that this objective will be used for the purpose of Local Air Quality Management (LAQM). Annual mean concentrations recorded at background and roadside locations were well below AQS 16.25μg m^{-3} to be achieved by the end of 2003.

6.1 Future Air Quality for Benzene

In November 2000, the second Air Quality Daughter Directive was adopted, which sets limit values for benzene and carbon monoxide *(Council Directive 2000/69/EC)*. This European Directive sets a limit value for benzene in ambient air of 5μg m^{-3} as an annual mean to be achieved by Member States by 1st January 2010[21]

Since the latest Air Quality Strategy was published in 2000, an addendum to the Air Quality Strategy was subsequently published in January 2003, which adopted new objectives for benzene. The addendum explains that the objectives are to be kept under review on a pollutant by pollutant basis to take account of scientific and technical developments and developments in European legislation. Thus, as the EU Directive's limit value for benzene (5μg m^{-3}) differs from the previously proposed long-term objective of 3.25μg m^{-3}, the UK Government decided to set an objective of 5μg m^{-3} as an annual mean to be met by the end of 2010 throughout England. This is because the measurable health benefits of achieving a target of 3.25μg m^{-3} rather than 5μg m^{-3} are likely to be extremely small.

[21] The Air Quality Strategy for England, Scotland, Wales and Norhern Ireland: Addendum (February 2003)

7 Methodology

7.1 Monitoring Sites

Descriptions of all 105 monitoring sites are given in Appendix A on an individual borough basis. As motor vehicle emissions are a major source of benzene, sites have been categorised according to distance from the nearest busy road. Over time site classifications tend to change within air quality surveys due to assessment of new data and opinion. Theoretically, this could mean the relocation of a site to meet new criteria, which could mean the loss of a valuable data source. Individual borough data thus includes sites that have been moved, ceased to exist, or new sites established.

For the purpose of this survey, sites are defined using roadside, petrol station and background locations only. The term kerbside location is no longer used but instead classified as roadside if within 20m from the kerb edge. A background site is one which is beyond 20m of any road, usually situated in a residential area. A petrol station site can be located within roadside or background locations. Monitoring was conducted at 67 roadside sites, 33 background sites and 5 petrol stations as shown in Figure A.

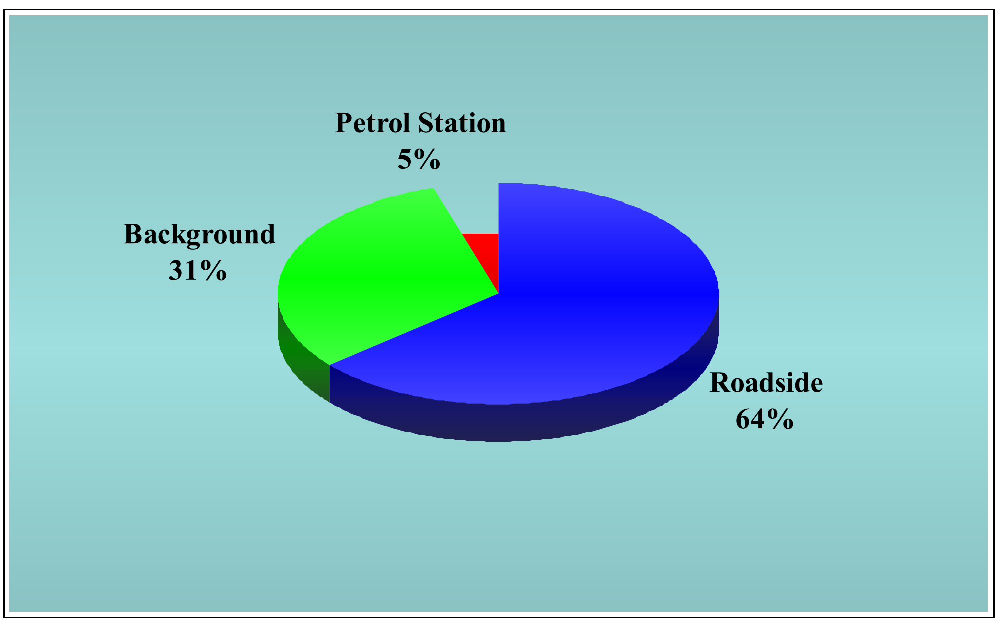


Figure A. Percentage of classified sites, which participated in the survey

7.2 Measurement Technique

Benzene, toluene, ethyl benzene, m, p and o-xylene *(BTEX)* measurements were made using Perkin-Elmer type diffusive samplers[1]. These are 9cm long stainless steel tubes packed with Chromosorb 106 polymer, an adsorbent material with an excellent affinity for benzene, and sealed at both ends with protective caps. One end is sealed with a brass fitting containing a teflon ferrule, the other end with a white teflon cap. On exposure, the white teflon cap is removed and replaced with a diffusive cap, which allows air to diffuse at a constant rate into the tube.

The samplers operate on the principle of molecular diffusion, whereby during exposure benzene in air will migrate to the adsorbent at a rate dependent on several quantifiable variables defined by Fick's Law of Diffusion:

(a) The pathlength between the top surface of the monitor and the absorbent bed.

(b) The cross sectional area of the sampler

(c) The exposure time

(d) The diffusive coefficient of benzene through air

(e) The ambient concentration of benzene

Casella Stanger prepared all tubes in accordance with in-house technical procedure note: TP44 AIR(C). The tubes were despatched by special post to each borough and exposed for periods of approximately 2-weeks, following which the diffuser head was replaced with the original protective cap. Upon receipt the tubes were stored in a refrigerator prior to analysis.

Although tubes are exposed for 2-week periods, previous work has shown that the uptake for benzene on to Chromosorb 106 differs by less than 1% for exposure periods of one, two and 4 weeks[20]. For most adsorbents their uptake rates decline rapidly over the first 16-24 hours of sampling, after which rates tend to stabilise.

[20] Health and Safety Laboratory Environment Measurement Group. Diffusive sampling of VOC's as an aid to monitoring urban air quality.

7.3 Sample Analysis

All tubes were analysed by a UKAS accredited laboratory using desorption scanning gas chromatography/mass spectrometry *(GC/MS)*. This method of analysis gives unequivocal identification of BTEX peaks.

7.3.1 QC Checks

Quantitation was performed and determined by the internal standard technique with formal native compound calibration. A QC standard solution was spiked on to a blank tube together with the internal standard. The validity of the internal calibration was then verified by the analysis of the sample. A blank tube was also spiked with internal standard and analysed. A variation of +/- 20% was considered acceptable for the analysis of samples to continue.

7.3.2 Detection Limits

These were also assessed from the low standards sample i.e. 1ng on the tube and this was determined to be better than 1ng for the benzene based on the minimum detectable peak on the mass chromatogram.

7.3.3 Cleaning of Tubes

After analysis all tubes were heated to 230°C for 60 minutes with a desorption flow of 100ml/min. 10% of tubes were then spiked with internal standard and analysed. These tubes were then re-cleaned.

The mass of BTEX collected in the tube was then expressed as an average airborne concentration ($\mu g\ m^{-3}$) measured over the monitoring period. This calculation is shown in Appendix B. The diffusion coefficient for benzene has been empirically calculated at Casella Stanger as described in Section 7.4.

As identified above quality control procedures integral to the analytical procedure involve verification of the benzene peak and calibration against internal spiking solutions. All cleaned tubes were analysed prior to exposure to ensure the Chromosorb retains no benzene. Duplicate and Triplicate tubes were also exposed at a selection of boroughs each month thus allowing the coefficient of variation between tubes to be assessed.

7.4 Empirical Determination of the Benzene Diffusion Coefficient

Benzene tubes were exposed to a known benzene concentration in air generated using a permeation vial held at 50°C in a glass oven, in turn held in a thermostatic water bath. A purge flow of pure air from an Aadco Model 737 Pure Air Generator was passed through a glass ball filled heat exchanger at a rate of 1-litre/minute to flush the benzene from the oven.

The generated benzene/air mix was further diluted with pure air at a rate of 5-l/m and fed to a 30-cm diameter spherical glass reaction vessel. Diffusion tubes were mounted on a carousel turning at approximately 1.2-revs per minute.

Tubes were exposed over a period of two weeks and benzene uptake was determined by thermal desorption and detection with flame ionisation detection *(FID)* using internal standards. The diffusion coefficient was calculated according to the equation shown in Appendix B. A photovac, photo ionisation detector with gas chromatography *(PID GC)* was used to determine any losses of benzene in the diffusion coefficient test rig.

8 Results of the 2004 Benzene Monitoring Programme

Benzene, toluene, ethyl benzene, m, p and o-xylene data collected between January 2004 and December 2004 are given on an individual bases in Appendices C, D, E, F and G respectively.

Annual mean benzene concentrations have been calculated for each monitoring site in order to allow comparison with the published Air Quality Standard *(AQS)* and Objective. Making such comparisons gives a good indication of likely exceedences of such criteria. Due to the different averaging periods, direct comparisons cannot be made however, as a guide, the annual mean can be converted to a running mean by using a multiplication factor of 1.1 *(LAQM.TE4 (00)*. For the purposes of Local Air Quality Management *(LAQM)* results have been expressed in micrograms per cubic meter.

The following section provides results for individual boroughs, given in alphabetical order. In order to maintain validity of results, annual means have not been reported for site locations with data capture of less than 75% or where blocks of seasonal data are missing.

8.1 London Borough of Bexley

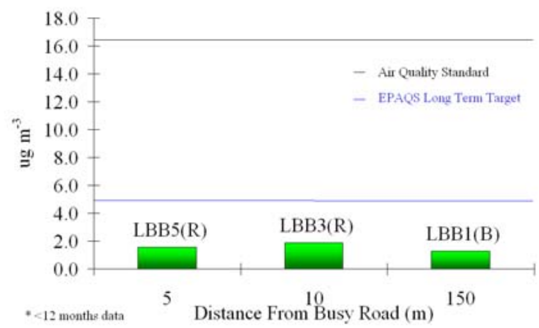


Figure 1A. Annual Mean Benzene Concentrations - 2004

Annual Mean Concentration

Annual mean concentrations ranged from 1.3µg m^{-3} at site LBB1 a background location at Whitehall Lane, Slade Green to 1.9µg m^{-3} at site LBB5, a roadside site at Walting Street, Bexleyheath. Neither the AQS nor the EPAQS long-term target was exceeded or approached at any of the three sites.

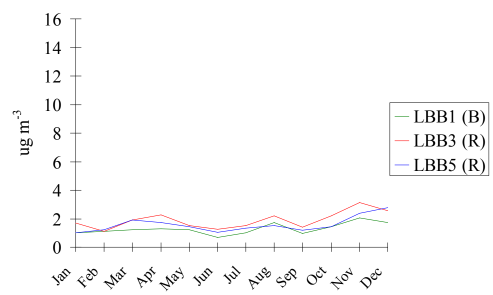


Figure 1B. Temporal Variation - 2004

Temporal Variation

Throughout the year, a similar trend was shown at all Bexley sites with only moderate seasonal variation displayed. A maximum peak level of 3.1µg m^{-3} was recorded for November at roadside site LBB3 and annual low of 0.7µg m^{-3} was recorded at site LBB1 in June.

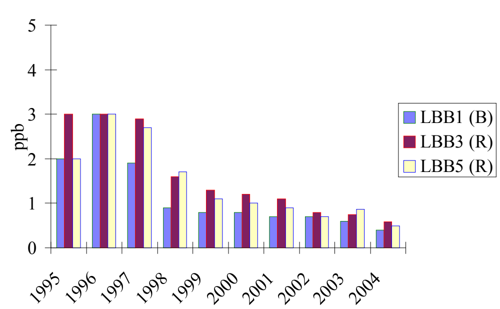


Figure 1C. Trends in Annual Average Benzene Concentrations

Annual Trends

An initial sharp decrease from 1996-1999 has been followed by a more gradual decline from 1999-2004. Annual mean benzene concentrations have remained consistently below the AQS since 1995 with levels showing a continued decrease since 1996.

8.2 London Borough of Brent

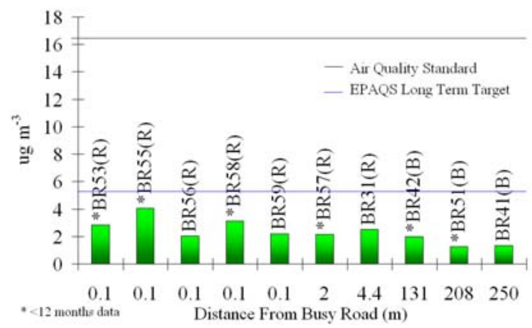


Figure 2A. Annual Mean Benzene Concentrations – 2004

Annual Mean Concentration

Annual mean benzene concentrations ranged from 1.3µg m^{-3} at background site BR51 and BR41 which are both located at schools, to 4.1µg m^{-3} recorded at roadside site BR55, 79 High Street, Harlesden. The AQS and EPAQS target were not exceeded or approached at any site.

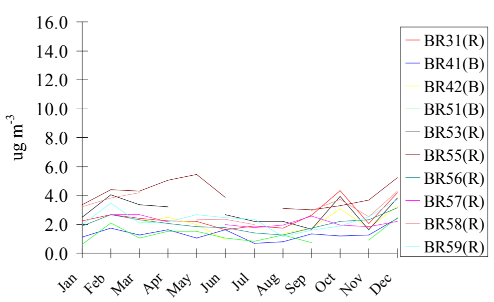


Figure 2B.Temporal Variation – 2004

Temporal Variation

Temporal trends for 2004 are illustrated in Figure 2B. Concentrations throughout the year displayed a similar trend. Seasonal variation was minimal, with only a slight rise in concentrations during winter months. A maximum concentration of 5.4µg m^{-3} was recorded during May at roadside site BR55.

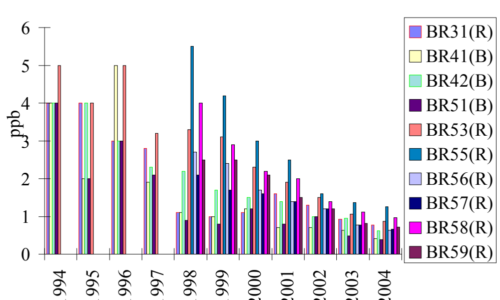


Figure 2C. Trends in Annual Average benzene Concentrations

Annual Trends

Since 1998, Concentrations have substantially dropped and have continued to show decline at all sites during 2004. As with 2003 the highest levels were recorded at site BR55.

8.3 London Borough of Greenwich

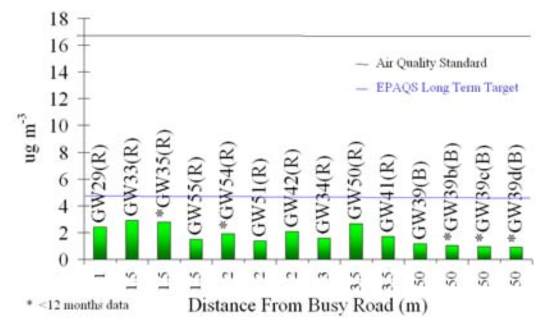


Figure 3A. Annual Mean Benzene Concentrations – 2004

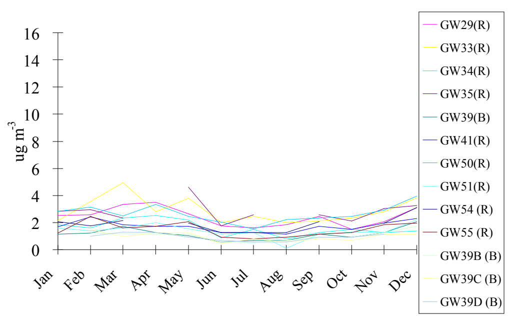


Figure 3B. Temporal Variation 2004

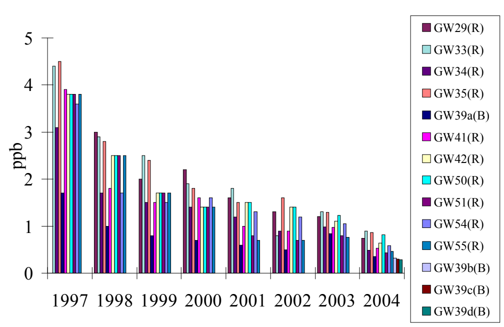


Figure 3C. Trends in Annual Average Benzene Concentrations

Annual Mean Concentration

Mean concentrations ranged from 0.9µg m^{-3} recorded at the background site GW39d, to 2.9µg m^{-3} recorded at the roadside site GW33. Although the relationship between mean concentration and distance from a busy road was not consistent, all four background sites showed lower concentrations than the roadside sites. Neither the AQS nor the EPAQS long-term target was exceeded or approached by any site.

Temporal Variation

A similar temporal trend was observed at all fourteen sites throughout the year. Very little seasonal variation was observed with only a slight increase in concentrations during winter months. A maximum peak level of 5.0µg m^{-3} was recorded at roadside site GW33 during March.

Annual Trends

Figure 3C shows that levels have consistently declined at all sites since 1997. Following a sharp decrease in levels from 1997-2000, a more gradual decrease has been observed in subsequent years.

8.4 London Borough of Hackney

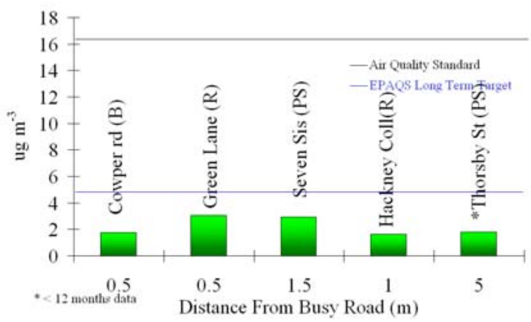


Figure 5A. Annual Mean Benzene Concentrations – 2004

Annual Mean Concentration

Annual mean concentrations ranged from 1.7$\mu g\ m^{-3}$ at petrol station site Thorsby Street to 3.1$\mu g\ m^{-3}$ at the roadside site at the Green Lane and Seven Sisters Road intersection. The low data capture prevents meaningful assessment against long-term criteria, but indications are that neither the AQS nor the EPAQS long-term target are likely to be exceeded.

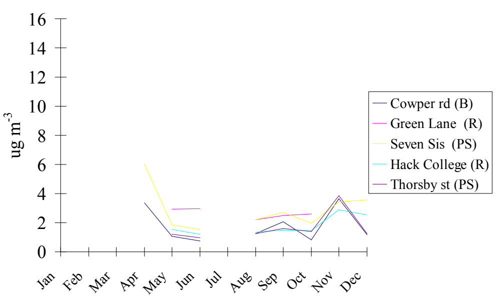


Figure 5B. Temporal Variation – 2004

Temporal Variation

Figure 5B illustrates the temporal variation, but due to insufficient data few comments can be made. However, in April a maximum concentration of 6.1$\mu g\ m^{-3}$ was observed at the petrol station location at Seven Sisters.

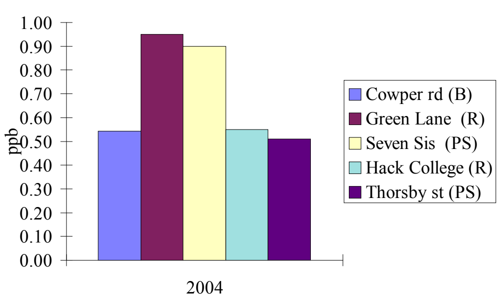


Figure 5C. Trends in Annual Average Benzene Concentrations

Annual Trends

As this is the first year Hackney has participated in the LWEP monitoring programme, no observations can be made regarding annual trends*.

* Only 7 months of data was collected for Hackney during 2004.

8.5 London Borough of Hammersmith and Fulham

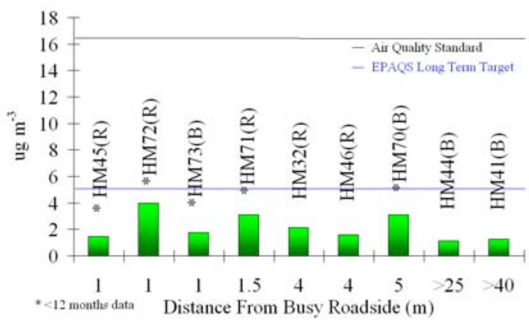


Figure 4A. Annual Mean Benzene Concentrations – 2004

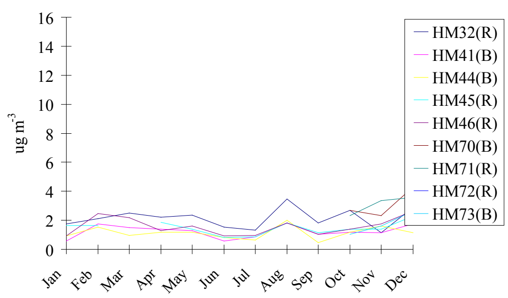


Figure 4B. Temporal Variation – 2004

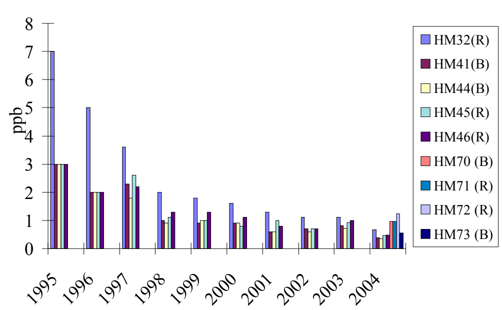


Figure 4C. Trends in Annual Average Benzene Concentrations

Annual Mean Concentration

Annual mean concentrations ranged from 1.1µg m^{-3} to 2.2µg m^{-3}. The highest annual mean concentration of 2.2µg m^{-3} was recorded at site HM32, a roadside location in the vicinity of Hammersmith Broadway. The lowest mean level of 1.1µg m^{-3} was recorded at site HM44 background location situated at Eel Brook Common. Neither the AQS nor the EPAQS long-term target was exceeded or approached at any site.

Temporal Variation

Figure 4B illustrates that temporal trends were similar at all sites. Concentrations were relatively stable throughout 2004 with only minimal seasonal variation. A small increase in levels was observed in August with a peak of 3.5µg m^{-3} measured at roadside site, HM32.

Annual Trends

Figure 4C shows a decline in levels since 1995 with concentrations stabilising over the past six years. Levels at roadside site HM32 have been consistently higher than those at all other historical sites[*].

[*] The late commencement of sites HM70-73 did not permit their inclusion in the above analysis.

8.6 London Borough of Harrow

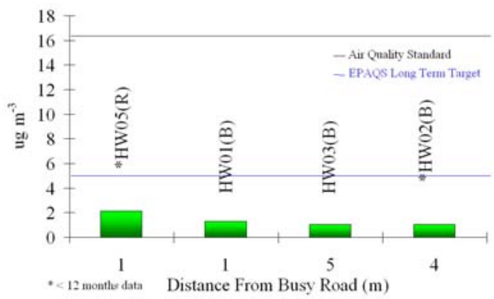


Figure 6A. Annual Mean Benzene Concentrations – 2004

Annual Mean Concentration

Annual mean concentrations varied from 2.1μg m^{-3} at site HW05 to 1.0μg m^{-3} at site HW02 and HW03. The highest concentration of 2.1μg m^{-3} was recorded at the only roadside site HW05. The lowest mean of 1.5μg m^{-3} was recorded at background locations HW02 at Grimsdyke School, Hatch End and HW03 at Aylward School, Pangbourne Drive. The AQS and EPAQS long-term target were not exceeded at any site.

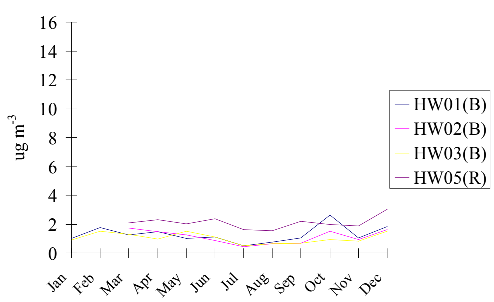


Figure 6B. Temporal Variation – 2004

Temporal Variation

Temporal trends shown in Figure 6B were similar at all sites. Concentrations were stable throughout the year with little seasonal variation. The highest concentration of 3.0μg m^{-3} was recorded at roadside site HW05 in December.

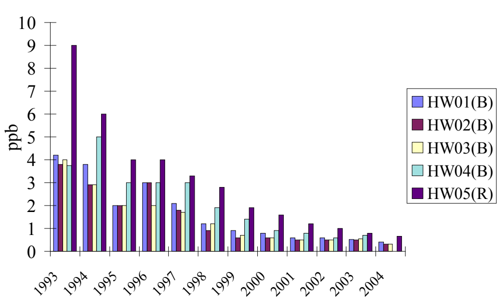


Figure 6C. Trends in Annual Average Benzene Concentrations

Annual Trends

After the substantial drop in concentrations from 1993-98, a more gradual decline in annual mean concentrations was observed at all sites*.

* Due to the closure of the petrol station site HW04, tube HW04 was relocated in October 2004. Subsequently site HW04 has not been included in the above analysis due to lack of data.

8.7 London Borough of Hillingdon

Annual Mean Concentration

Annual mean concentrations varied between 1.3µg m^{-3} at site HD31 to 1.8µg m^{-3} at site HD46. The lowest mean was recorded at a background site located at Sipson Road, West Drayton. The highest mean was recorded at a roadside site at south Ruislip monitoring station, West End Road. The AQS and the EPAQS long-term target were not exceeded or approached by any site.

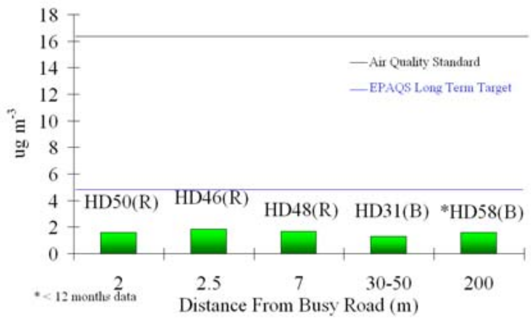


Figure 7A. Annual Mean Benzene concentrations – 2004

Temporal Variation

Figure 7B showed that the benzene levels followed a similar profile throughout the year with levels increasing slightly in December. The highest levels were recorded in December at background site HD58.

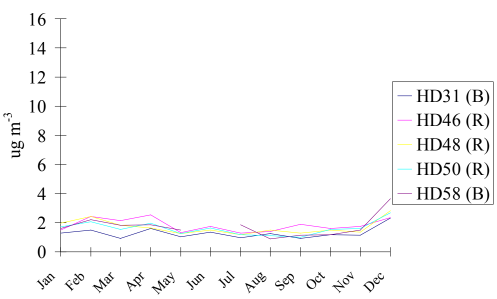


Figure 7B. Temporal Variation – 2004

Annual Trends

Since joining the benzene-monitoring programme in 2003, the annual mean concentrations at all the Hillingdon sites have decreased.

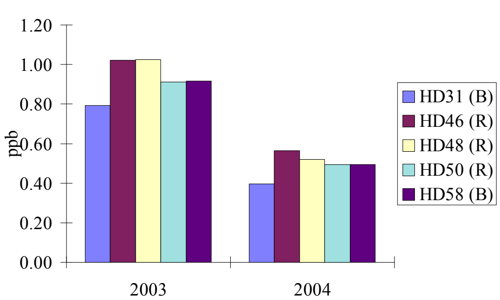


Figure 7C. Trends in Annual Average Benzene concentrations

8.8 London borough of Hounslow

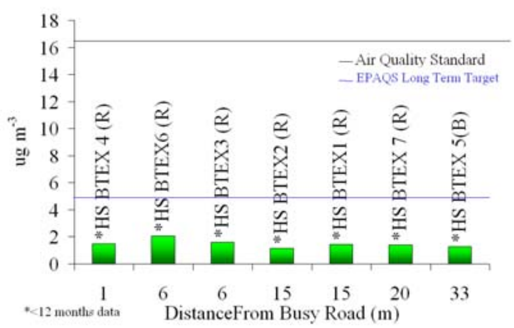


Figure 8A. Annual Mean Benzene concentration – 2004

Annual Mean Concentration

The annual mean concentrations varied between 1.1µg m^{-3} and 2.1µg m^{-3}. The highest mean value of 2.1µg m^{-3} was seen at roadside site HS BTEX6 located at 24 Adelaide Terrace, Brentford. The lowest mean value of 1.1µg m^{-3} was recorded at roadside site HS BTEX2 located at Marjory Kinnon School, Hatton Road. The AQS and EPAQS long-term target were not exceeded or approached at any time.

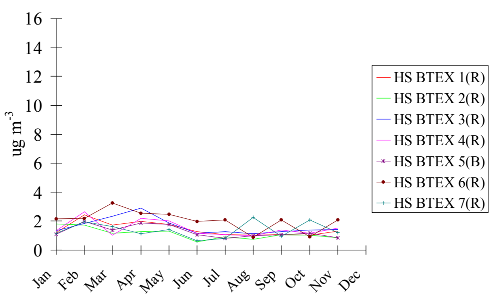


Figure 8B. Temporal Variation – 2004

Temporal Variation

Figure 8B shows temporal trends for 2004. Benzene levels followed similar trends throughout the year. During March, a maximum peak value of 3.2µg m^{-3} was recorded at roadside site HS BTEX6*.

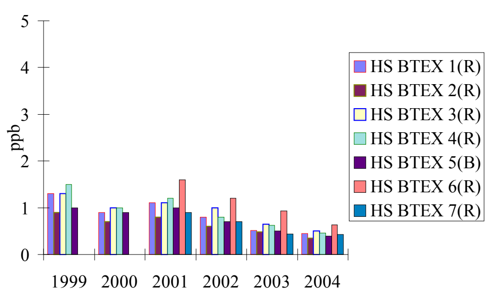


Figure 8C. Trends in Annual Average Benzene Concentrations

Annual Trends

Figure 8C shows that following a reasonably stable period from 1999-2001 a steady decline in concentrations has been observed at all sites from 2001-2004.

* Due to an error with the analytical instrument (GCMS), no results were recorded for December.

8.9 Royal Borough of Kensington and Chelsea

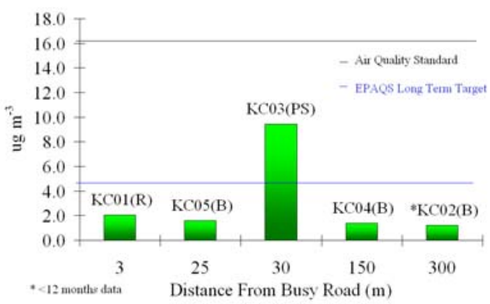


Figure 9A. Annual Mean Benzene Concentrations – 2004

Annual Mean Concentration

Annual mean concentrations varied from 1.2µg m^{-3} to 9.5µg m^{-3}. The lowest mean value was recorded for background site KC02, located at Holland Park Offices. The highest mean value was recorded for site KC03, located at Warwick Road, a petrol service station. The AQS was not exceeded or approached at any site. However, the EPAQS long-term target was exceeded at petrol station site KC03.

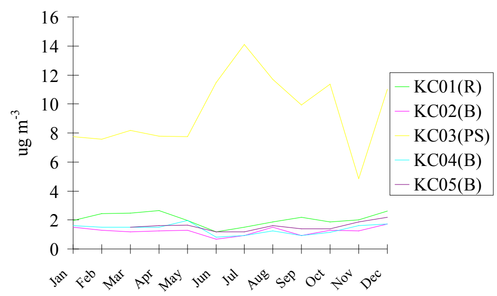


Figure 9B. Temporal Variation – 2004

Temporal Variation

Figure 9B illustrates temporal trends for 2004. As expected, benzene levels were consistently higher at petrol station location KC03 with a maximum peak level of 14.1µg m^{-3} for July. All sites except KC03 followed a similar trend throughout the year with little seasonal variation.

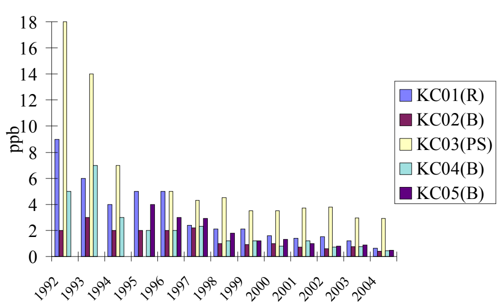


Figure 9C. Trends in Annual Average Benzene Concentrations

Annual Trends

Figure 9C shows that after a substantial drop in levels from 1992-1998, little change has been observed in subsequent years. A small decrease in levels has been observed this year compared to 2003.

8.10 Corporation of London

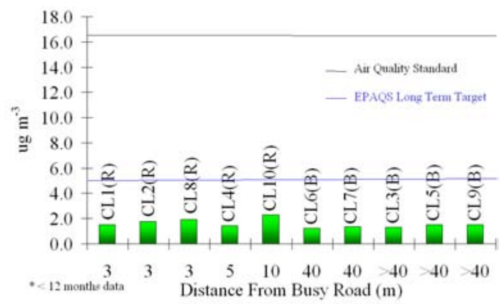


Figure 10A. Annual Mean Benzene Concentration – 2004

Annual Mean Concentration

Annual mean benzene concentrations ranged from 1.2µg m^{-3} to 2.3µg m^{-3}. The lowest mean level of 1.2µg m^{-3} was recorded at background site CL6 St Pauls Cathedral, St Pauls Church Yard. The highest mean level of 2.3µg m^{-3} was recorded at roadside site CL10 Mansion House, Mansion House Street. Mean levels have remained low with no exceedences of the AQS or of the EPAQS long-term target.

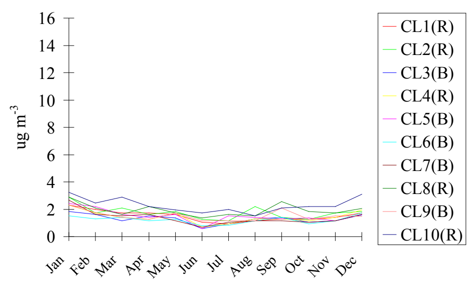


Figure 10B Temporal Variation – 2004

Temporal Variation

Figure 10B shows that all sites have followed a similar trend with minimal seasonal variation. A maximum peak concentration of 3.2µg m^{-3} was recorded for site CL10, a roadside location.

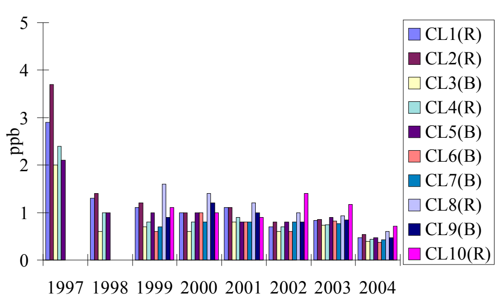


Figure 10C. Trends in Annual Average Benzene Concentrations

Annual Trends

The annual average benzene concentrations illustrated in Figure 10C show a substantial decrease in levels from 1997 to 1998 followed by a period of stability in later years. This year has shown a marked decrease in levels compared to the previous period.

8.11 London Borough of Newham

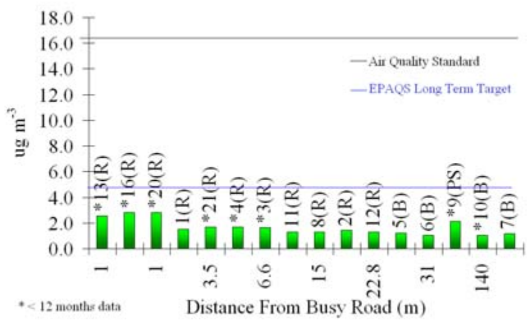


Figure 11A, Annual Mean Benzene Concentrations – 2004

Annual Mean Concentration

Mean benzene concentrations ranged from 1.0µg m^{-3} to 2.8µg m^{-3}. The maximum mean concentration of 2.8µg m^{-3} recorded at two roadside sites, site 16 located at Leytonstone Road, Stratford and site 20 located at the corner of Canning Town Roundabout, Silver Town Way. The lowest mean value of 1.0µg m^{-3} was recorded at site 10, a background site located at Mayflower Nursery School, Taut Avenue. The AQS and EPAQS long-term target were not exceeded or approached at any site.

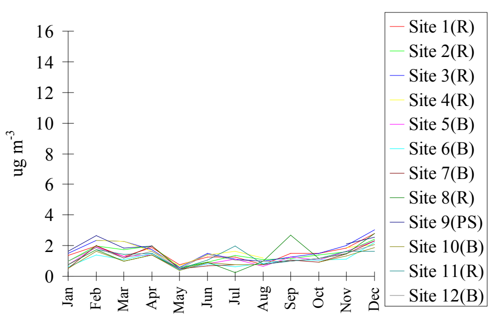


Figure 11B. Temporal Variation – 2004

Temporal Variation

Figure 11B illustrated temporal trends for 2004. Benzene levels followed a similar profile displaying some seasonal variation with lower levels observed during summer months compared to winter. A maximum peak concentration of 4.9µg m^{-3} was in April at roadside site 16.

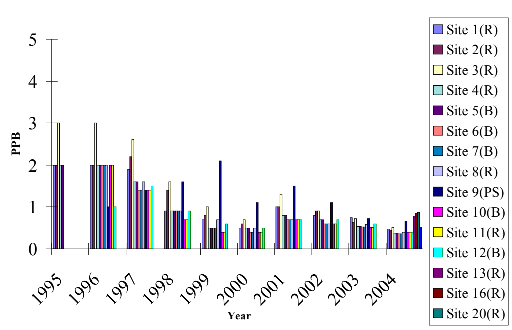


Figure 11C. Trends in Annual Average Benzene Concentrations

Annual Trends

After an initial decline in levels from 1995 to 2000, a slight increase in concentration was observed during 2001. Levels have resumed a steady decrease in subsequent years.

8.12 London Borough of Richmond

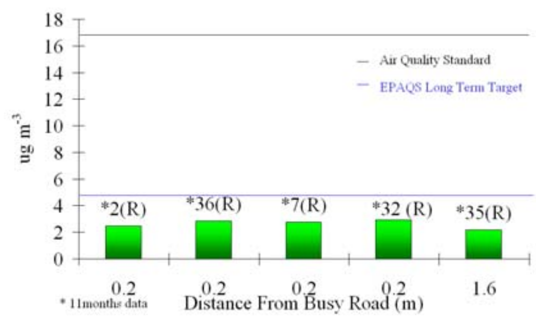


Figure 12A. Annual Mean Benzene Concentrations – 2004

Annual Mean Concentration

The lowest annual mean concentration 2.2µg m^{-3} was recorded at site 35 located at High Street, Hampton Wick. The highest mean concentration of 2.9µg m^{-3} was recorded at site 32 located at Kings Street, Twickenham and site 36 located at Upper Richmond road, East Sheen. Neither the AQS nor the EPAQS long-term target was exceeded or approached at any site.

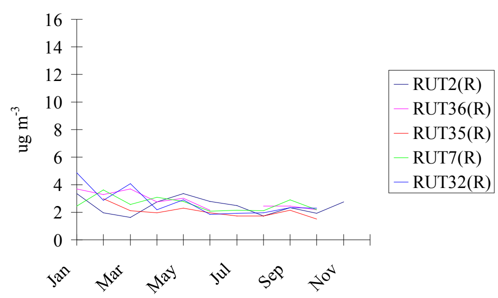


Figure 12B. Temporal Variation 2004

Temporal Variation

Figure 12B shows concentrations at all sites following similar trends. Throughout the year, some seasonal variation can be seen with an increase in concentrations during winter months. A maximum peak concentration of 2.9µg m^{-3} was recorded in January for roadside site RUT32*.

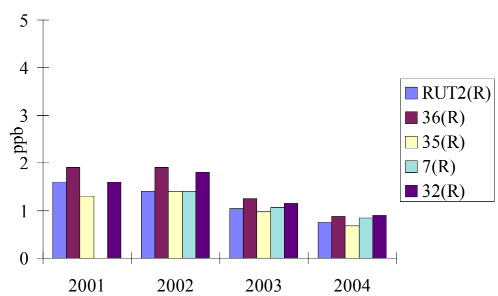


Figure 12C. Trends in Annual Average Benzene Concentrations

Annual Trends

A period of stability for annual average concentrations can be seen in Figure 12C during 2001 to 2002, this was followed by a clear decrease in concentrations from 2003 to 2004.

* Due to an error with the analytical instrument (GCMS), no results were recorded for part of November and December.

8.13 London Borough of Sutton

Annual Mean Concentration

Mean benzene concentrations ranged from 1.1µg m^{-3} to 1.7µg m^{-3}. The minimum mean value of 1.1µg m^{-3} was recorded at site 2, a background location at Devonshire School, Devonshire Avenue. The highest mean value of 1.7µg m^{-3} was recorded for site 1, a roadside location at Paynes Poppets, Croydon Road. The AQS and EPAQS long-term target were not exceeded at any site.

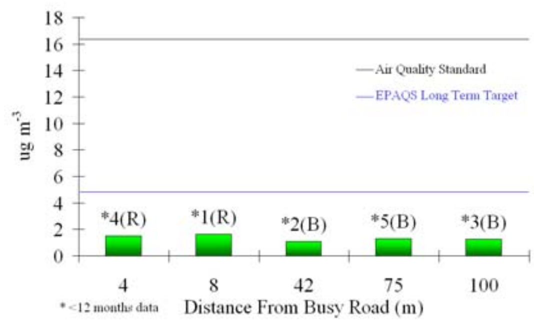


Figure 13A. Annual Mean Benzene Concentrations – 2004

Temporal Trends

Temporal trends, illustrated in Figure 13B, were similar at all five sites with peak concentrations in January and February. The highest peak value of 2.9µg m^{-3} was recorded in January for site 4, a roadside location*.

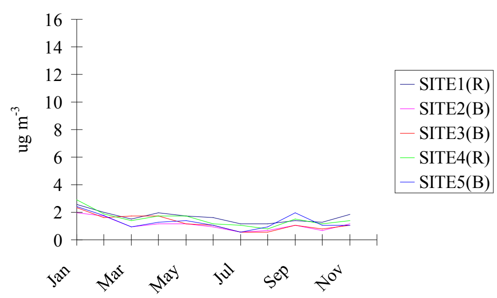


Figure 13B. Temporal Variation – 2004

Annual Trends

Annual trends are illustrated in Figure 13C. Following a decrease in levels from 1995-1998, levels were relatively stable from 1999-2003. Concentrations then decreased during 2004.

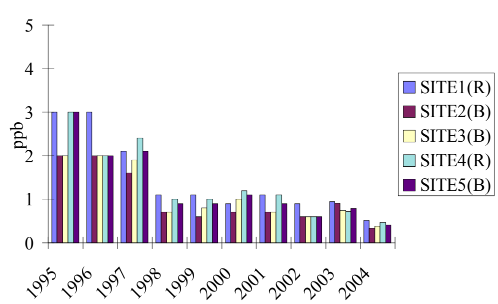


Figure 13C. Trends in Annual Average Benzene Concentrations

* Due to an error with the analytical instrument (GCMS), no results were recorded for December.

8.14 London Borough of Westminster

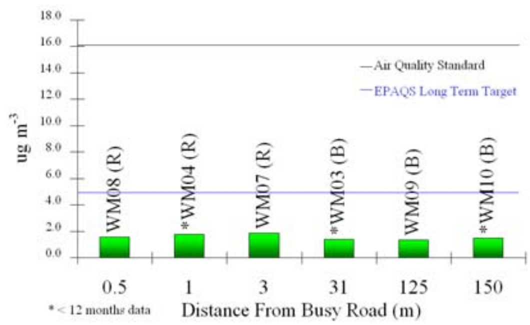


Figure 14A. Annual Mean Concentrations – 2004

Annual Mean Concentration

Mean benzene concentrations ranged from 1.4µg m^{-3} to 1.9µg m^{-3}. The lowest mean value of 1.4µg m^{-3} was recorded at sites WM03, WM04 and WM09. The highest value of 1.9µg m^{-3} was recorded at WM07, a roadside site located at Westminster Council House in Marylebone Road. The AQS and EPAQS long-term target were not exceeded at any of the sites.

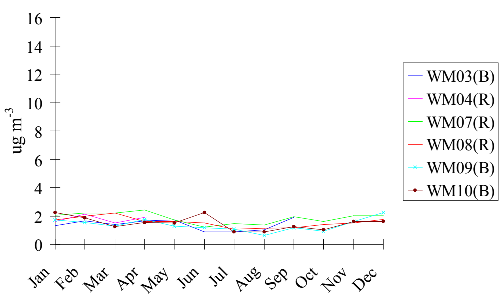


Figure 14B. Temporal Variation 2004

Temporal Variation

Figure 14B illustrated benzene levels following a similar pattern with very little seasonal variation. Peak levels were recorded at all sites during January. A maximum peak level of 2.4µg m^{-3} was recorded in April at background site WM07 located at Westminster Council House.

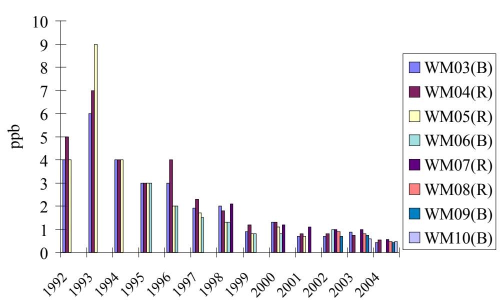


Figure 14C. Trends in Annual Average Benzene Concentrations

Annual Trends

Figure 14C shows annual mean concentrations sharply declining from 1993 to 1999. A slight increase followed in 2000. After 2000, concentrations showed little fluctuation until 2004 where concentrations decreased.

8.15 Summary of 2004 Annual Mean Benzene Concentrations

Across all boroughs, mean concentrations recorded at roadside sites ranged from 0.9µg m^{-3} recorded in Greenwich, to 4.1µg m^{-3} in Brent. At background sites, mean benzene concentrations varied from 1.0µg m^{-3} at Harrow and Sutton to 2.0µg m^{-3} at Brent. Mean concentrations recorded at petrol stations varied from 1.7µg m^{-3} at Harrow and Newham to 9.5µg m^{-3} at Kensington and Chelsea. The annual mean benzene concentrations for the three different location types are summarised in Table 2 below:

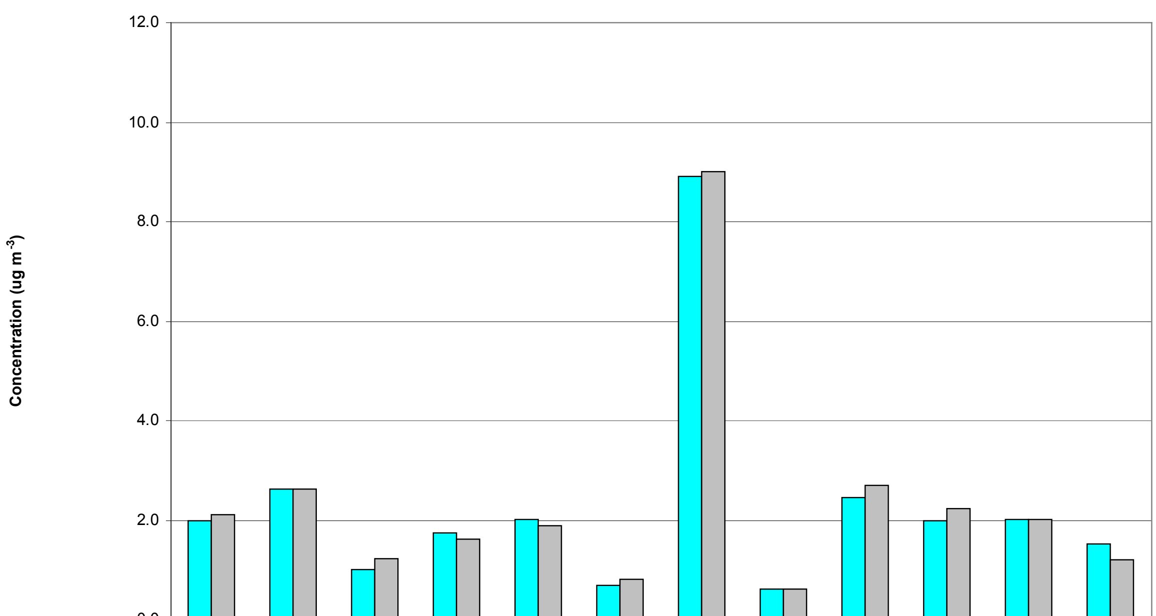
Table 2: Summary of 2004 Annual Mean Concentration (µg m^{-3})

Site Type	Minimum	Mean	Maximum
Background	1	1.4	2
Roadside	0.9	2	4.1
Petrol Station	1.7	3.6	9.5

9 Quality Assurance and Quality Control

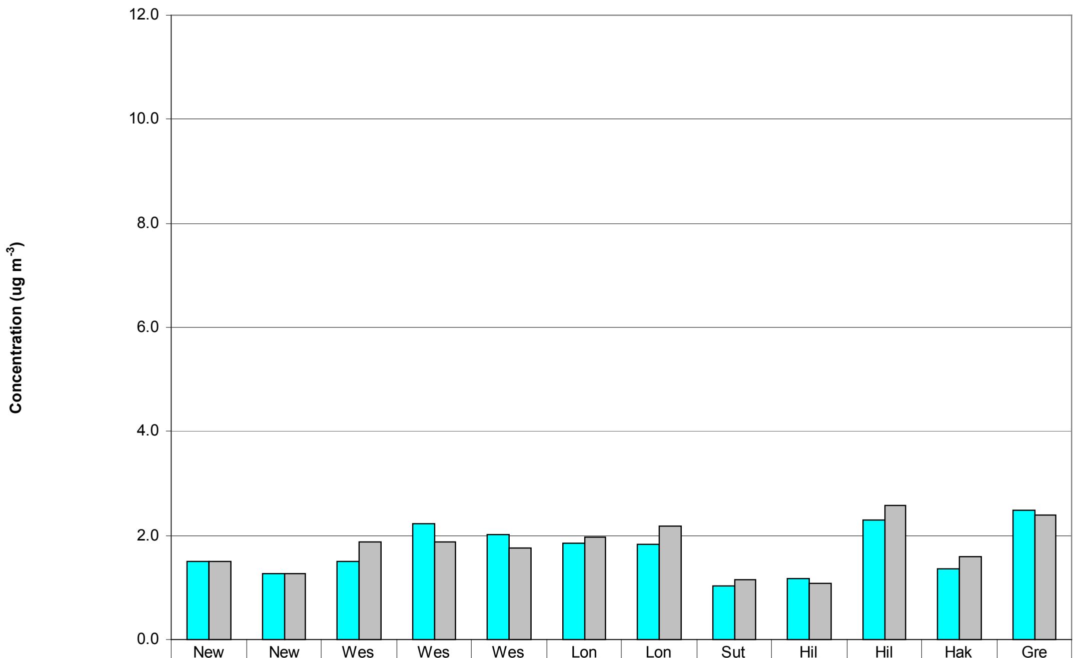
9.1 Duplicate Exposures at Monitoring Sites

As part of quality control procedures integral to the London-Wide Benzene Survey, a selection of boroughs are sent one extra diffusion tube for duplicate exposure at a monitoring site within the borough. In 2004, duplicate exposures were made on twenty two occasions and triplicate exposures on seven. The results of these tubes indicate satisfactory agreement between duplicate and triplicate tubes. The maximum difference between duplicates is $\pm$ 0.4μg m^{-3} and the maximum difference between triplicates is $\pm$ 0.7μg m^{-3}. The results of these duplicate exposures are summarised below in Figures 17a-17d.



	Bre	Bre	Bex	Bex	Har	Har	Hou	Hou	Ken	Ken	Ken	Ham
Sampler ugm-3	2.0	2.6	1.0	1.7	2.0	0.7	8.9	0.6	2.5	2.0	2.0	1.5
Duplicate ugm-3	2.1	2.6	1.2	1.6	1.9	0.8	9.0	0.6	2.7	2.2	2.0	1.2

Figure 15A. 2004 Duplicate Exposure within London Boroughs.



	New	New	Wes	Wes	Wes	Lon	Lon	Sut	Hil	Hil	Hak	Gre
Sampler ugm-3	1.5	1.3	1.5	2.2	2.0	1.8	1.8	1.0	1.2	2.3	1.4	2.5
Duplicate ugm-3	1.5	1.3	1.9	1.9	1.8	2.0	2.2	1.2	1.1	2.6	1.6	2.4

Figure 15B. 2004 Duplicate Exposures within London Boroughs.

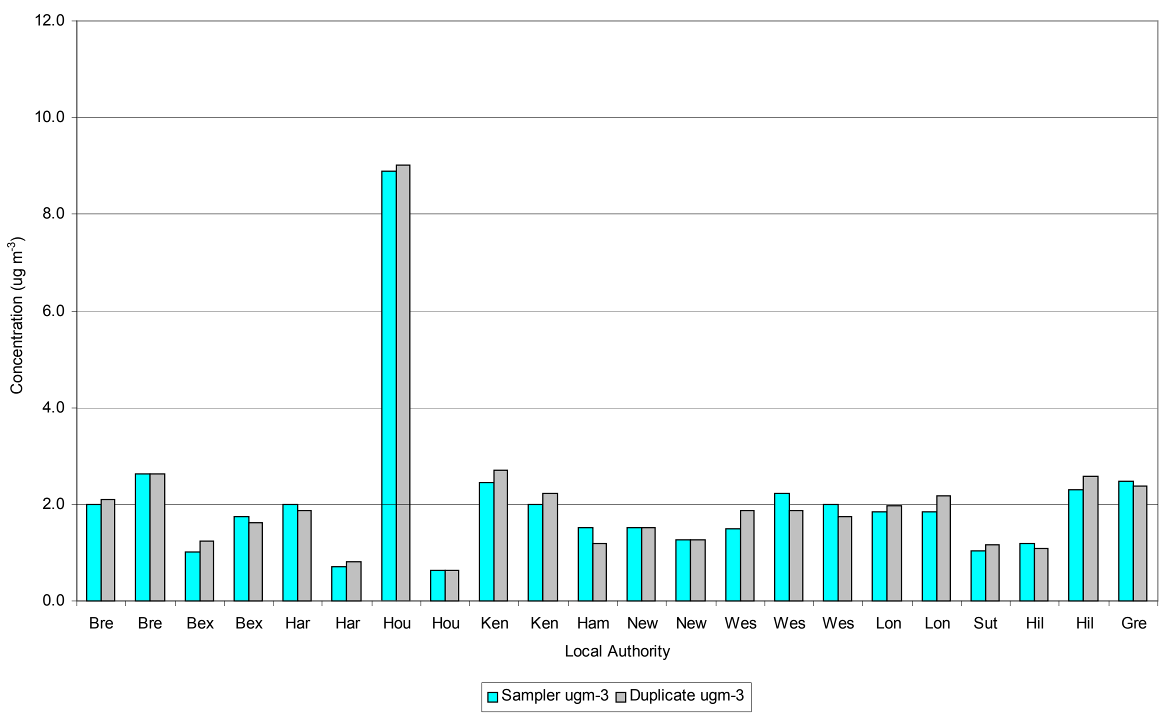


Figure 15C. Summary of 2004 Duplicate Exposures within London Boroughs showing all Twenty Two Exposures.

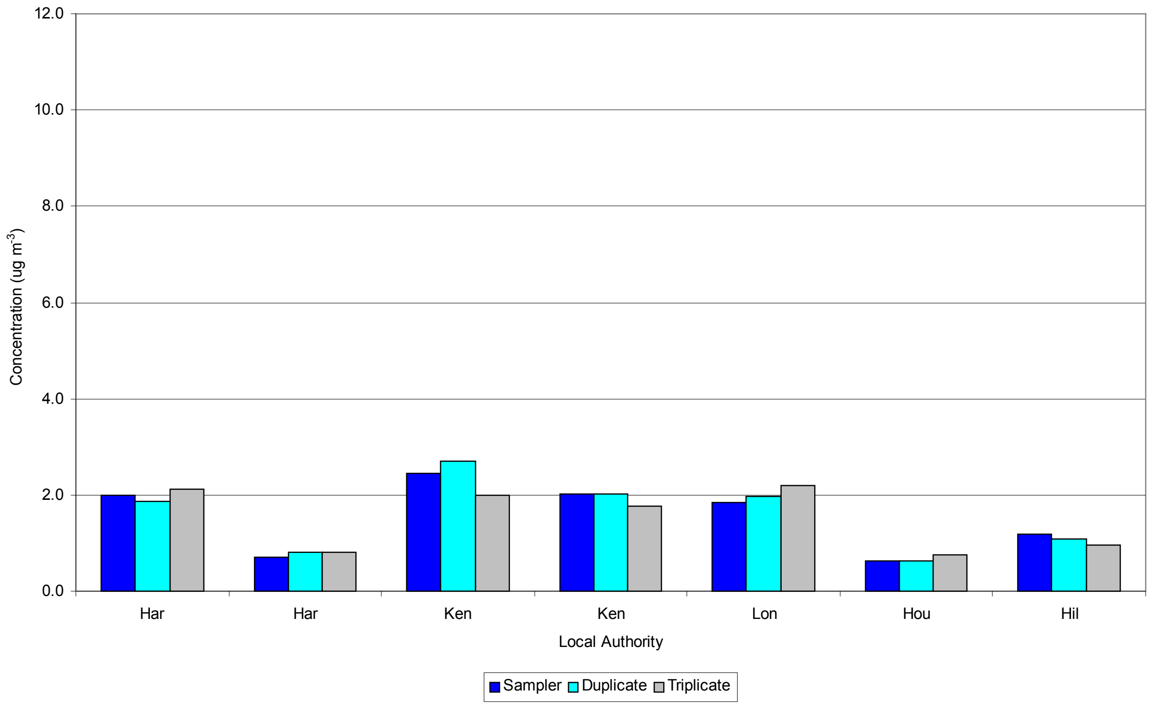


Figure 15D. Summary of 2004 triplicate Exposures within London Boroughs showing all Seven Exposures.

9.2 Duplicate Exposures at the Hydrocarbon Network

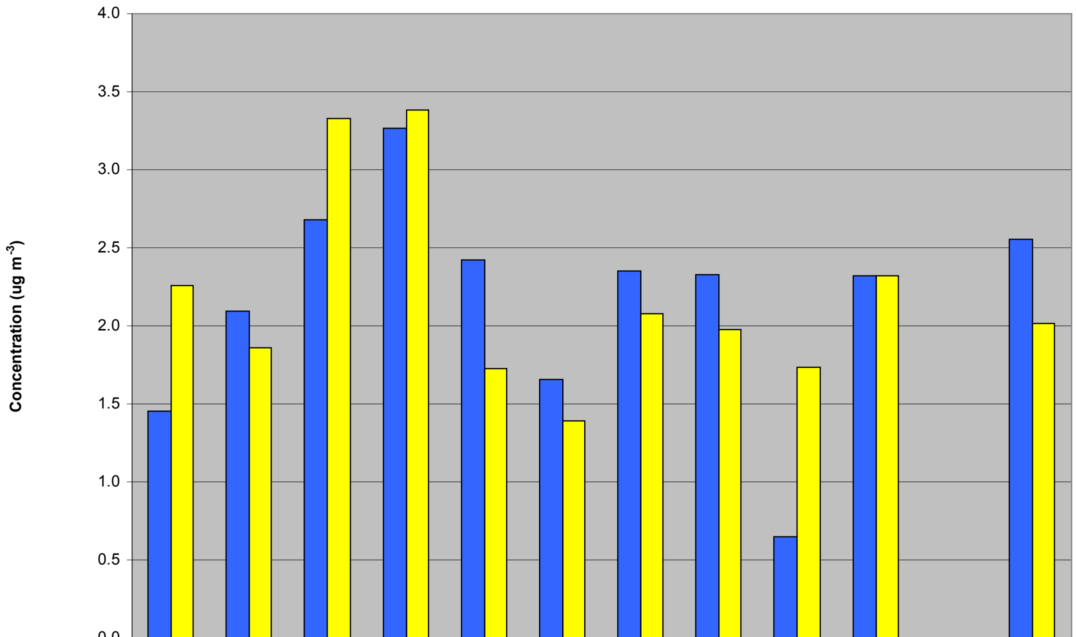
As an additional part of the quality assurance/control procedures, diffusion tubes were also exposed at the Hydrocarbon Network site on Marylebone Road *(super-site)*. Tubes exposed at this site were analysed for benzene, toluene, ethyl benzene, m, p-xylene and o-xylene *(BTEX)* and the data compared against data from the automatic Hydrocarbon Network data for comparable periods.

Excluding November, eleven-months of validated data was included in the diffusion tube results this year. Benzene levels ranged from 0.7µg m^{-3} recorded in September to 3.4µg m^{-3} recorded in April. From this data, an annual mean value of 2.2µg m^{-3} was calculated, this is comparable to the calculated annual mean value of 2.8µg m^{-3} recorded by the Hydrocarbon Network. Mean values for toluene ranged from 5.7µg m^{-3} recorded in September to 34.6µg m^{-3} recorded in July. Calculated mean values for ethyl benzene ranged between 0.7µg m^{-3} in September to 32.9µg m^{-3} in May. Results for m, p-xylene ranged from 0.0µg m^{-3} in February to 78.8µg m^{-3} in May. Mean values for o-xylene ranged between 0.4µg m^{-3} in September to 25.8µg m^{-3} in May. Figures 17a-17e illustrate the comparison between duplicate tubes for BTEX. Data is also provided in Appendix I.

Table 3 below shows a comparison between the Hydrocarbon Network and the diffusive sampling at the Marylebone Road site. Data has been calculated and compared for the same exposure periods. Results for the network are considered to show satisfactory correlation between the data sources considering the different averaging period. The Hydrocarbon Network data was based on hourly data and the diffusion sampling was based on one exposure period within a calendar month.

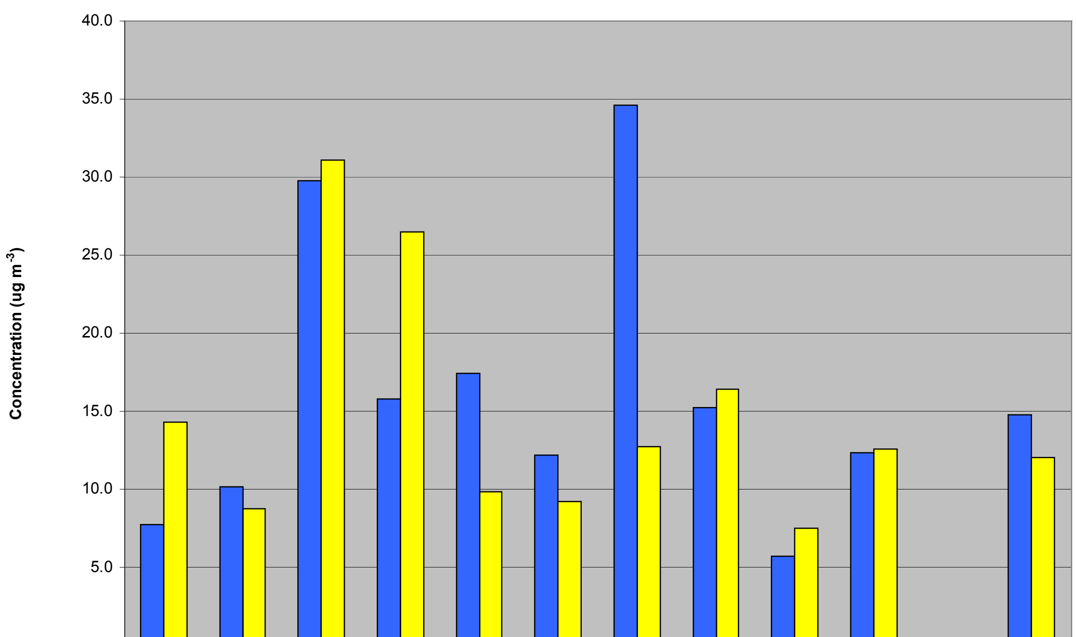
Table 3: Comparison of Annual Mean Concentrations at Marylebone Road Hydrocarbon Station.

Species (ug m-3)	Casella Stanger tubes	Network analyser
Benzene	2.2	2.8
Toluene	15.3	11
Ethyl Benzene	4.2	2.5
m, p Xylene	9.7	9.6
o Xylene	3.6	2.8



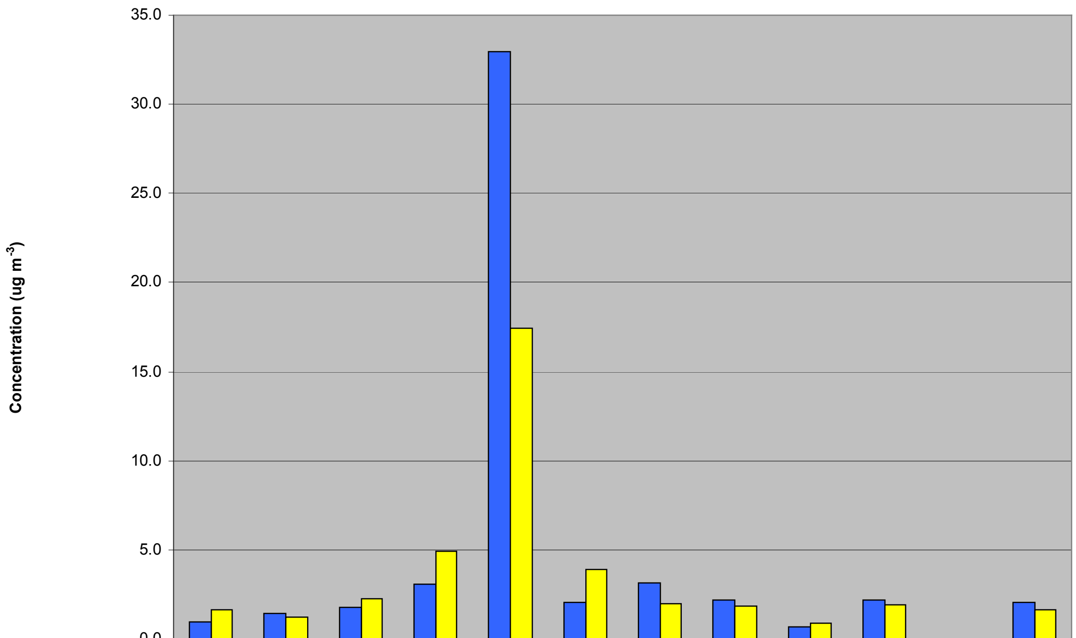
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benzene 1	1.5	2.1	2.7	3.3	2.4	1.7	2.4	2.3	0.7	2.3	0.0	2.6
Benzene 2	2.3	1.9	3.3	3.4	1.7	1.4	2.1	2.0	1.7	2.3	0.0	2.0

Figure 16A. Summary of 2004 Duplicate Benzene Exposures at London Marylebone Road



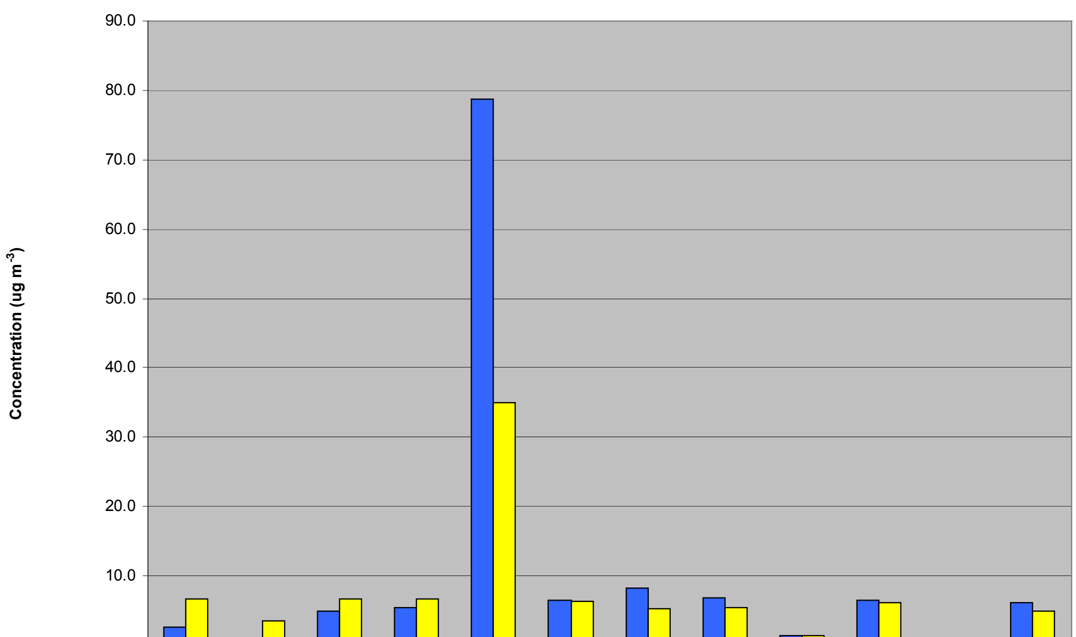
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Toluene 1	7.7	10.2	29.7	15.8	17.5	12.2	34.6	15.3	5.7	12.4	0.0	14.8
Toluene 2	14.3	8.8	31.1	26.5	9.8	9.2	12.7	16.4	7.5	12.6	0.0	12.0

Figure 16B. Summary of 2004 Duplicate Toluene Exposures at London Marylebone Road



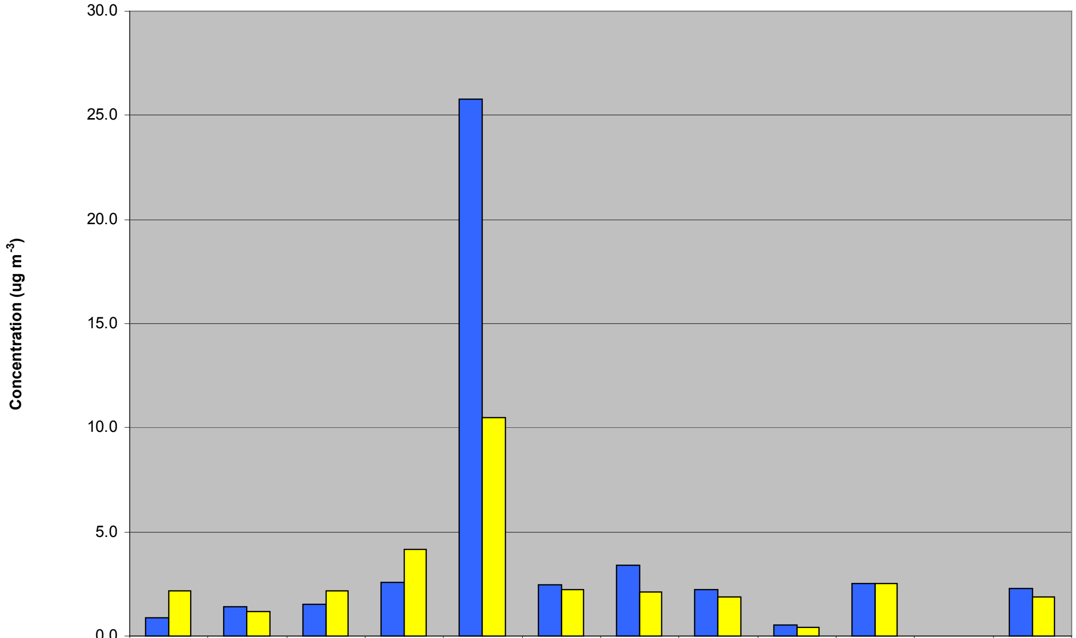
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ethyl Benzene 1	0.9	1.5	1.8	3.1	32.9	2.1	3.1	2.2	0.7	2.2	0.0	2.0
Ethyl Benzene 2	1.6	1.2	2.3	4.9	17.4	3.9	2.0	1.8	0.9	1.9	0.0	1.6

Figure 17C. Summary of 2004 Duplicate Ethyl Benzene Exposures at London Marylebone Road



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
m,p Xylene 1	2.6	0.0	4.9	5.5	78.8	6.6	8.2	6.8	1.5	6.4	0.0	6.2
m,p Xylene 2	6.6	3.5	6.6	6.7	35.0	6.4	5.2	5.5	1.4	6.1	0.0	5.0

Figure 17D. Summary of 2004 Duplicate m, p Xylene Exposures at London Marylebone Road



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
o Xylene 1	0.9	1.4	1.5	2.6	25.8	2.4	3.4	2.2	0.5	2.5	0.0	2.3
o Xylene 2	2.2	1.2	2.2	4.1	10.5	2.2	2.1	1.9	0.4	2.5	0.0	1.9

Figure 16E. Summary of 2004 Duplicate o Xylene Exposures at London Marylebone Road*

* Although the duplicate results for ethyl benzene and xylenes at Marylebone Road showed poor replication for May, good replication was found by the duplicate and triplicate samples exposed by Corporation London and Kensington and Chelsea during the same month. As such, it was thought to be unlikely that the replication problems at Marylebone road were indicative of the repeatability of all Mays results. A fault in one of the diffusion tubes was thought to be a more likely explanation for the abnormal results.

10 Discussion

10.1 Mean Benzene Concentrations

As Expected, maximum concentrations were recorded at roadside and petrol station locations, which accounted for 64% and 5% of sites respectively. These findings are consistent with motor vehicle emissions and evaporative emissions from petrol being significant sources of atmospheric benzene. Within some boroughs, there was a relationship between distance from a busy road and mean concentration, with benzene levels decreasing with increasing distance from the roadside. This emphasises the significance of traffic as a source of benzene and the strong influence of emission source on urban benzene levels.

Compared to roadside sites, background concentrations were generally lower. However, there was some concentration overlap between site classifications, for example mean levels recorded at background sites ranged from 1.0µg m^{-3} to 2.0µg m^{-3} and at roadside mean values ranged from 0.9µg m^{-3} to 4.1µg m^{-3}. Although this overlap exists, maximum mean values were consistent across the three categories. Such variability mainly reflects spatial variation in intensity of traffic flow, which in turn is attributable to heterogeneity in London's road network. Benzene concentrations are also influenced by factors such as meteorological conditions and height of sampler. Factors, which influence ambient benzene concentrations, will obviously vary from site to site and from borough to borough. This may explain why in some boroughs there was no clear relationship between distance from the roadside and benzene concentrations.

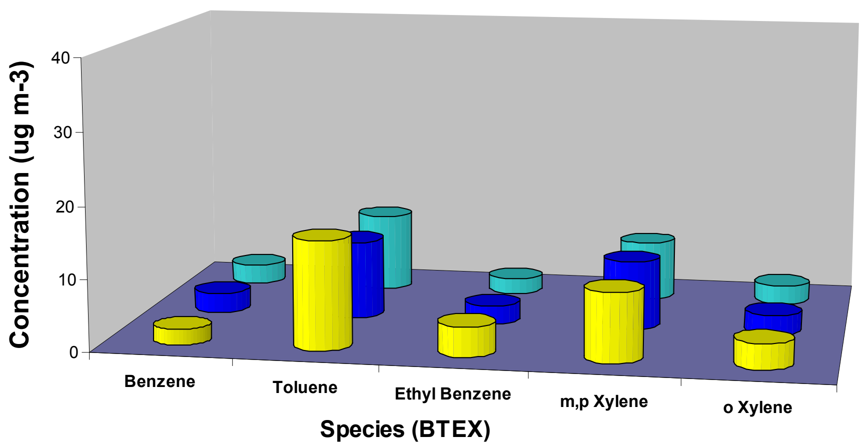
In Harrow and Newham, mean benzene levels recorded at the petrol station sites were similar to levels recorded at the busy roadside sites. This suggests that the influence of evaporative exhaust emissions on benzene levels at these sites is similar to the influence of exhaust emissions at roadside sites. However, benzene levels at the Kensington and Chelsea petrol station were consistently higher than typical roadside levels with a mean concentration of 9.5µg m^{-3}. This was also higher than petrol station levels recorded at other boroughs. Thus, at this site, it would appear that evaporative emissions of benzene from petrol have a significant effect on benzene levels. It is likely that this petrol station site is located near a relatively busy road and thus vehicle emissions would have contributed to levels recorded at this site. This may also reflect the number of transactions taking place and/or size of the station.

10.2 Comparison with other Data

Comparison of the LWEP data calculated mean data for the Automatic Hydrocarbon Monitoring Network *(AHMN)* indicates that the concentrations recorded in this survey for all BTEX species were very comparable. This may in part be attributed to the extra quality control measures introduced following the investigation into high toluene recorded during 2004*.

The calculated annual mean level for the roadside location type was 1.9μg m^{-3}, which compares with 2.2μg m^{-3} and 2.8μg m^{-3} calculated for Marylebone Road diffusion tube and Hydrocarbon Network (LWEP exposure period) data respectively. Within the survey, the highest annual mean recorded at roadside was 4.1μg m^{-3}, which was recorded for Brent. The maximum annual mean recorded at a background site was 2.0μg m^{-3}, which was also recorded at Brent.

Hydrocarbon species *(BTEX)* measured at London Marylebone Road were comparable with diffusion tube data recorded at that location. Figure 18 illustrates the comparison in mean levels between species measured.



	Benzene	Toluene	Ethyl Benzene	m,p Xylene	o Xylene
Mean data for LWEP diffusion tubes	2.2	15.3	4.2	9.7	3.6
Hydrocarbon Network mean data for LWEP exposure period	2.8	11.0	2.5	9.6	2.8
Hydrocarbon Network annual mean data.	2.8	11.0	2.2	8.3	2.6

Figure 17. Comparison of Species Measured at London Marylebone Road.

* Following unusually high toluene levels recorded during 2004, a series of additional quality control measures were introduced throughout the year to reduce possible contamination sources. These are listed in Appendix C.

10.3 Seasonal Trends

All site locations showed some degree of inter-site variation. Unlike previous years, no months stood out as having exceptionally high benzene level. However, a slight increase in benzene levels was observed at a number of sites during January and December. This lack of high peaks could have been due to favourable meteorological conditions. High peaks and pollution episodes typically occur during winter months, therefore the stability of the pollutant levels may have been attributed to a mild winter.

Measurements of benzene made by Imperial College during the London 1991 pollution episode showed a substantial episodic increase in benzene levels, with a concentration of 58.3μg m^{-3} *(2 day mean)* prior to the episode, increasing to a mean of 382.7μg m^{-3} *(4 day mean)* during the episode *(QUARG 1993)*. Therefore, it seems that benzene concentrations follow the pattern described for other primary pollutants, with high ground levels occurring in winter as a results of cold temperatures and low wind speeds trapping the pollution in a stable air mass near to the ground.

During January 2004, the majority of sites followed a similar profile, with little seasonal variation. Slight increases in benzene concentrations were observed during January and December at Corporation of London, Richmond, Sutton, Bexley, Brent, Greenwich, Harrow, Hillingdon and Newham. As shown in Figure 18, the stability in concentrations observed at the majority of London sites was also confirmed by results from the continuous hydrocarbon monitoring network at Marylebone Road.

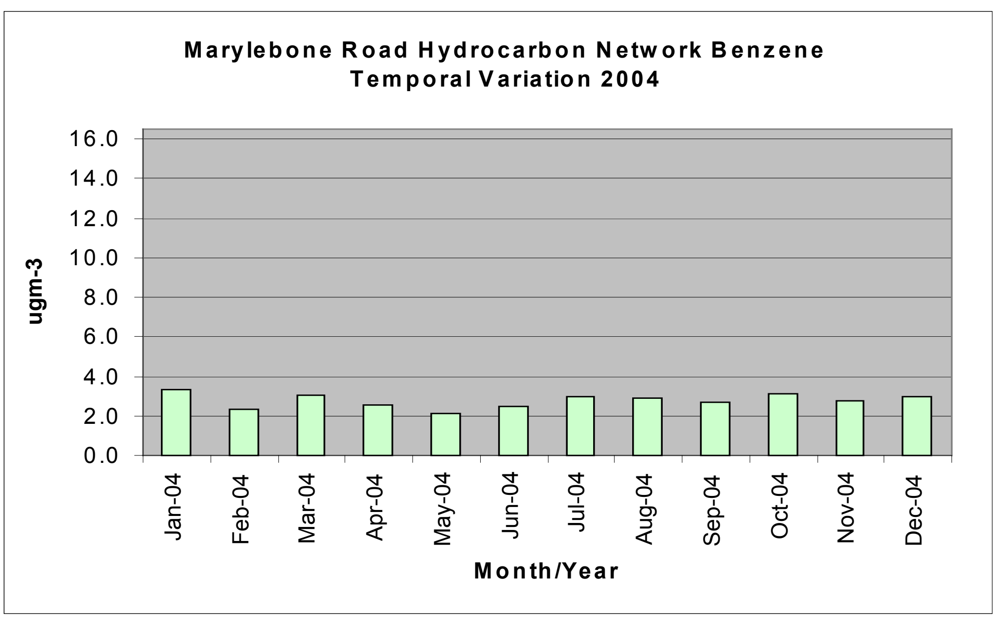


Figure 18. Marylebone Road Temporal Variation

11 Predictions for Future Urban Benzene Concentrations

Several measures have been introduced over the past few years to reduce the emissions of pollutants from the transport sector. The current trend of decreasing annual benzene emissions has primarily been caused by the introduction of catalytic converters for cars *(Directive 91/441/EEC)* and a further Directive implemented in 1996 (*94/12/EEC)*. Policy developments such as the *Auto-oil Programme (Euro Standards)* implemented in January 2000 are expected to further reduce benzene levels in future years.

As predicted the policy measures in place have helped all urban background and roadside locations achieve the objective of 16.25μg m^{-3} (2204) and the EPAQS long-term target of 5μg m^{-3} annual mean (2010). In addition, favourable meteorological conditions during 2004 helped prevent winter episodes caused by temperature inversions, although the winter was uncharacteristically mild and evidence suggests that future levels may not show the decline seen in 2004. It is therefore important to ensure through monitoring that the EPAQS long-term target 5μg m^{-3} as an annual mean is met by 2010.

12 Report Statement

Casella Stanger completed this report on the basis of a defined program of works and within the terms and conditions agreed with the client.

This report was compiled with all reasonable skill and care, bearing in mind the project objectives, the agreed scope of works, prevailing site conditions and the degree of manpower and resources allocated to the project as agreed.

Casella Stanger cannot accept responsibility to any parties whatsoever, following issue of this report, for any matters arising which may be considered outside the agreed scope of works.

This report is issued in confidence to the client and Casella Stanger cannot accept any responsibility to any third party to whom this report may be circulated, in part or in full, and any such parties rely on the contents of this report solely at their own risk.

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In addition to the above, in reports containing results for UKAS accredited procedures, all non-accredited activities, subcontracted results, recommendations and professional opinions will be disclaimed.

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(21) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum (February 2003)

Appendix A

Site Descriptions

London Borough of Bexley

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
LBB1	Whitehall Day Centre Whitehall Lane, Slade Green	150	Background	TQ551813/176394
LBB3	Crayford Library Crayford Road, Crayford	10	Roadside	TQ551660/174607
LBB5	Watling Street, Bexleyheath	5	Roadside	TQ550269/174941

London Borough of Hammersmith and Fulham

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
HM32	Queen Caroline Street	4	Roadside	TQ523303/178408
HM41	Bishops Park	>40	Background	TQ523809/176209
HM44	Eel Brook Common	>25	Background	TQ525309/176803
HM45	Byrony Road	1	Roadside	TQ522406/180604
HM46	Cobbold Road	4	Roadside	TQ521606/179609
HM70	1 Ellaline Road, W6 9NZ	5	Background	TQ523689/177595
HM71	Courner of Fulham Palace Road and Ellaline Road, W6 9NZ	1.5	Roadside	TQ523713/177609
HM72	198 Fulham Palace Road, W6 9PA	1	Road side	TQ523686/177699
HM73	9-11 Larnach Road, W6 9NX	1	Background	TQ523642/177641

London Borough of Brent

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
BR31	IKEA (car park) 2 Dury Way, London NW10	4.4	Roadside	TQ520756/185142
BR41	Alperton Community School, Stanley Avenue, Wembley HA0	250	Background	TQ518451/184111
BR42	Harlesden Polic Station, Craven Park, Harlesden, London NW10 8RJ	131	Background	TQ521152/184002
BR51	Kingsbury High School, Princes Ave, Kingsbury, London NW9	208	Background	TQ519562/189276
BR53	High Road (435-431), Wembley, Middx, HA	0.1	Roadside	TQ518303/185181
BR55	79 High Street, Harlesdon, London	0.1	Roadside	TQ521743/183361
BR56	Opposite 73 Chamberloyne Road, Willesden, London, NW10	0.1	Roadside	TQ523635/183153
BR57	1 Kilburn Bridge, High Road, Kilburn, London NW6	2	Roadside	TQ525461/183558
BR58	51 High Road, Willesden, London NW10	0.1	Roadside	TQ522031/184655
BR59	1 Cricklewood Broadway Cricklewood, London	0.1	Roadside	TQ524167/185251

Corporation of Hillingdon

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
HIL31	Aurn London Hillingdon Sipson Road / Keats Way, West Drayton, Middlesex	30-50	Suburban	TQ506926/178614
HD46	South Ruislip Monitoring Station, West End Road, South Ruislip, Middlesex	2.5	Roadside	TQ510821/184923
HD48	Citizens Advice Bureau, Eastcote Road, Ruislip, Middlesex	7	Roadside	TQ509094/187645
HD50	Hillingdon Hospital Monitoring Site, Colham Road / Pield Health Road, Hillingdon, Middlesex	2	Roadside	TQ506989/181920
HD58	Brendon Close, Harlington, Middlesex	200	Background	TQ508415/177125

London Borough of Harrow

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
HW01	Roxeth Manor School, Eastcote Lane	71	Background	TQ513131/136233
HW02	Grimsdyke School, Hatch End	497	Background	TQ512522/191623
HW03	Aylward School, Pangbourne Drive, Stanmore	377	Background	TQ518013/192250
HW04	North Harrow, Social Services, Council owned Bin Area.	<5	Background	TQ513667/188630
HW05	Psychology Service, Station Road, Harrow	>25	Roadside	TQ51375/188990

London Borough of Greenwich

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
GW29	Antigallican PH, Woolwich Road	1.0	Roadside	TQ541166/178511
GW33	9 Blackheath Hill, Blackheath SE3	1.5	Roadside	TQ537978/176770
GW34	Bannockburn School, Plumstead High Street SE18	3	Roadside	TQ545490/178543
GW35	Greenwich Mini Town Hall, SE 10	1.5	Roadside	TQ539527/178282
GW55	O/S 581/583 Westhorne Avenue, Eltham SE 9	2	Roadside	TQ541914/175038
GW39a,b, c,d	Environmental Curriculum Centre, Bexley Road, Eltham SE9	50	Background	TQ543975/174647
GW41	699 Sidcup Road, New Eltham	3.5	Roadside	TQ543390/172764
GW42	Near 10 Greenwich Church Street, SE10	2	Roadside	TQ541915/175042
GW50	O/S Rear of 26 Fearon Street, Peartree Way	3.5	Roadside	TQ540176/178394
GW51	Bugsbys Way	2	Roadside	TQ539638/179024
GW55	GRE/BEX 6 Monitoring Station, Crown Woods Way	1.5	Roadside	TQ545001.7/175098.4

London Borough of Hackney

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
Cowper Rd	Cowper Road, Stoke Newington Raod.	0.5	Background	TQ533224/185606
Green Lane	Green Lane, Seven Sisters	0.5	Roadside	TQ532051/187466
7Sister Rd	Seven Sister Road	1.5	Petrol Station	TQ531591/186898
Hackney College	Six Form College, Brooke House, Kenninghall Road, E5	5	Roadside	TQ534802/186229
Thoresby St	Thoresby Street	1	Petrol Station	TQ532262/182871

London of Hounslow

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
BTEX 1	West View, Bedfont, A30, Gt S-West Rd	15	Roadside	TQ508142/173665
BTEX 2	Marjory Kinnon School, Hatton Road	15	Roadside	TQ509127/174568
BTEX 3	Cranford Library, A4 Bath Road	6	Roadside	TQ510747/176687
BTEX 4	The Avenue, Cranford	1	Roadside	TQ510491/177160
BTEX 5	Church of the Good Shepherd, Gt South West Road	33	Background	TQ510986/176032
BTEX 6	24 Adelaide Terrace, Brentford	6	Roadside	TQ517592/178212
BTEX 7	Chiswick Community School	20	Roadside	TQ521028/077321

Royal Borough of Kensington and Chelsea

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
KC01	North Kensington Library	3	Roadside	TQ524401/181160
KC02	Holland Park Offices	300	Background	TQ524773/179641
KC03	Petrol Station Warwick Road	30	Petrol station	TQ525029/178570
KC04	Dovehouse Street	150	Background	TQ526958/178187
KC05	Notting Hill Library, Pembridge Square	25	Background	TQ525202/180664

London Borough of Sutton

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
Site 1	Paynes Poppets, Croydon Road, Croydon CRO 4QE	8	Roadside	TQ530687/164837
Site 2	Devonshire Primary School, Devonshire Avenue, Sutton SM2 5JL	42	Background	TQ526158/163221
Site 3	Sutton Cemetery, Alcorn Close, Sutton SM3 9PX	100	Background	TQ525128/165823
Site 4	Robin Hood Junior School, Thorncroft Road, Sutton SM1 1RL	4	Roadside	TQ525713/164498
Site 5	The Lodge, Honeywood Walk, Carshalton SM5 3PB	75	Background	TQ527775/164606

London Borough of Newham

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
Site 1	London International Freight Terminal, Temple Mill Lane, E15	3.3	Roadside (kerbside)	TQ538280/185359
Site 2	Fire Station, Romford Road, Stratford, E15	17.2	Roadside	TQ539572/184659
Site 3	Salisbury School, Romford Road, E12	6.5	Roadside (kerbside)	TQ541954/185430
Site 4	Town Hall Annex,, Barking Road, E15	4.5	Roadside (kerbside)	TQ542832/183617
Site 5	Courtyard, West Ham Town Hall, Romford Road, E15	26.5	Background	TQ538899/184283
Site 6	East London Cemetery, Grange Road, E13	31	Background	TQ539859/182655
Site 7	Newham General Hospital, Glen Road, E13	330	Background	TQ541492/182332
Site 8	Mortuary High Street South, E6	14.8	Roadside	TQ542688/183202
Site 9	Save Petrol Station, 99 Barking Road, E16	30.8	Petrol Station (intermediate)	TQ539585/181720
Site 10	Mayflower Nursery School, Taut Avenue, E16	140	Background	TQ539747/181477
Site 11	London City Airport, Car Park Entrance, E16	12.5	Roadside	TQ542583/180201
Site 12	Pumping Station, Gallions Roundabout, E16	22	Roadside	TQ543762/180784
Site 13	290-292 Green Street, Upton park. E7	<1	Road side	TQ541134/184098
Site 16	Leytonstone Road, Lamp Post Opposite 107, Stratford, E15	<1	Roadside	TQ541134/184098
Site 20	Corner of Canning Town Roundabout, Silvertown Way, Canning Town, E13	<1	Roadside	TQ539556/181499
Site 21	Monitoring Station Cam Road, Stratford, E15	3.5	Roadside	TQ538657/183973

London Borough of Richmond

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
RUT2	George Street, Richmond	0.2	Roadside	TQ517916/174926
RUT7	Broad Street, Teddington, Middlesex	0.2	Roadside	TQ515690/170983
RUT32	Kings Street, Twickenham, Middlesex	0.2	Roadside	TQ516246/173217
RUT35	High Street, Hampton Wick, Middlesex	1.6	Roadside	TQ517628/169795
RUT36	Upper Richmond Road West, East Sheen, SW14	0.2	Roadside	TQ520533/175399

City of Westminster

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
WM03	Harrow Road, Housing Office	31	Background	TQ525493/181763
WM04	Lancaster Gate Hotel	1	Roadside	TQ526684/182015
WM07	Westminster Council House	3	Roadside	TQ527727/181881
WM08	Oxford Street	0.5	Roadside	TQ528275/181064
WM09	Horseferry Road	125	Background	TQ529777/178960
WM10	Covent Garden London Transport Museum, The Piazza Covent Garden	150	Background	TQ30444/80903

Corporation of London

Site Code	Location	Distance from Busy Road (m)	Classification	Grid Reference
CL1	St Andrews Church Queen Victoria St	3	Roadside	TQ53189/18096
CL2	St Dustins Church Fleet Street	3	Roadside	TQ53123/18115
CL3	Pleach Walk, Barbican, Moorgate	>40	Background	TQ53249/18174
CL4	Crescent House, Goswell Road	5	Roadside	TQ53211/18205
CL5	Petticoat Square Estate, Harrow Place	>40	Background	TQ53353/18147
CL6	St Pauls Cathedral St Pauls Churchyard	>40	Background	TQ53203/18119
CL7	St Bartholomews Hospital	40	Background	TQ53191/18158
CL8	London Bridge Lower Thames Street	3	Roadside	TQ53285/18073
CL9	Finsbury Park	>40	Background	TQ53284/18159
CL10	Mansion House Mansion House Street	10	Roadside	TQ53269/18108

Benzene Calculation and Conversion

$$\text{Average Benzene Concentration (ppb)} = \frac{M\ (\text{ng}) \times 1000}{T\ (\text{mins}) \times Dc}$$

Where:

M = the amount of benzene adsorbed by each tube

T = the period during which the tube was exposed

Dc = the diffusion coefficient

Where:

$$\text{Diffusion coefficient} = \frac{D(v) \times F \times 1000}{T \times C}$$

Where:

D(v) = uptake of benzene (ng)
F = 3.244 = ppm to µg m^{-3} conversion factor at 20°C
T = Time in mins
C = Concentration (µg m^{-3})

1 ppb = 3.244 µg m^{-3}

To convert from ppb to µg m^{-3} = multiply by 3.244
To convert from µg m^{-3} to ppb = multiply by 0.31

Appendix C

Additional Quality Control Measures

Additional Quality Control Measures

Following unusually high toluene levels recorded during 2004, an investigation into the overestimation of toluene levels was carried out towards the end of 2004. This included a laboratory audit that checked analytical methods, quality control systems and storage methods. Subsequently a number of improvements were made to minimise contamination during diffusion tube storage, handling and analysis. These are listed below:

Laboratory:

1. To reduce the possibility of contamination during sample log-in, the sample log-in area has changed to a non-laboratory area.
2. To reduce the possibility of contamination during storage the diffusion tubes are now stored in a sealed box containing an activated carbon pouch and stored in a VOC free refrigerator.
3. Following an investigation into the possibility of PTFE cap leakage, all old PTFE caps are being replaced with new ones.

Casella Stanger:

1. Diffusion tubes are now stored in a sealed box containing an activated carbon pouch and continue to be stored in a VOC free fridge.
2. As an extra measure, all diffusion tubes were repacked with fresh absorbent ahead of schedule.

Local Council:

1. White PTFE caps are now stored in a sealed bag during the exposure period to minimise the possibility of build up of toluene absorbed on the caps O-rings.

Since these measures have been adopted, subsequent analytical results have shown significant improvements.

Appendix D

Benzene Concentrations (ppb & $\mu g\ m^{-3}$)

Benzene Concentrations 2004

London Borough of Bexley

Month	Site Code LBB1 ppb	ug m3	LBB3 ppb	ug m3	LBB5 ppb	ug m3
January	0.3	1.0	0.5	1.7	0.3	1.0
February	0.3	1.1	0.3	1.1	0.4	1.2
March	0.4	1.2	0.6	1.9	0.6	1.9
April	0.4	1.3	0.7	2.3	0.5	1.7
May	0.4	1.2	0.5	1.5	0.4	1.4
June	0.2	0.7	0.4	1.3	0.3	1.0
July	0.3	1.0	0.5	1.5	0.4	1.3
August	0.5	1.7	0.7	2.2	0.5	1.5
September	0.3	1.0	0.4	1.4	0.4	1.2
October	0.4	1.4	0.7	2.2	0.4	1.4
November	0.6	2.1	1.0	3.1	0.7	2.4
December	0.5	1.7	0.8	2.5	0.9	2.8
Annual Mean	0.4	1.3	0.6	1.9	0.5	1.6

London Borough of Brent

Month	Site Code BR31 ppb	ug m3	BR41 ppb	ug m3	BR42 ppb	ug m3	BR51 ppb	ug m3	BR53 ppb	ug m3
January	0.7	2.2	0.3	1.1	0.4	1.4	0.2	0.6	0.8	2.5
February	0.8	2.7	0.5	1.7	-	-	0.6	2.1	1.2	4.1
March	0.7	2.4	0.4	1.3	0.6	2.1	0.3	1.0	1.0	3.4
April	0.7	2.3	0.5	1.6	0.8	2.5	0.5	1.5	1.0	3.2
May	0.7	2.2	0.3	1.0	0.6	2.0	0.5	1.5	-	-
June	0.5	1.6	0.5	1.6	0.3	0.9	0.3	1.1	0.8	2.7
July	0.6	1.9	0.2	0.7	-	-	0.3	0.8	0.7	2.2
August	0.5	1.7	0.2	0.8	0.4	1.4	0.4	1.3	0.7	2.2
September	0.8	2.6	0.4	1.3	0.5	1.7	0.2	0.7	0.5	1.7
October	1.3	4.3	0.4	1.2	0.9	3.1	-	-	1.2	3.9
November	0.6	2.1	0.4	1.3	0.5	1.7	0.3	0.9	0.5	1.6
December	1.3	4.2	0.7	2.4	1.0	3.2	0.8	2.4	1.2	3.8
Annual Mean	0.8	2.5	0.4	1.3	0.6	2.0	0.4	1.3	0.9	2.8

Benzene Concentrations 2004

London Borough of Brent (continued)

Month	Site Code BR55 ppb	ug m3	BR56 ppb	ug m3	BR57 ppb	ug m3	BR58 ppb	ug m3	BR59 ppb	ug m3
January	1.0	3.4	0.6	1.9	-	-	1.0	3.2	0.6	2.0
February	1.4	4.4	0.8	2.7	0.8	2.7	1.2	3.8	1.1	3.5
March	1.3	4.3	0.7	2.3	0.8	2.7	1.3	4.2	0.6	2.1
April	1.6	5.0	0.6	2.0	0.7	2.1	-	-	0.7	2.1
May	1.7	5.4	0.6	1.9	-	-	0.7	2.3	0.8	2.7
June	1.2	3.9	0.5	1.8	0.6	2.0	0.7	2.3	0.8	2.5
July	-	-	0.4	1.4	0.5	1.7	0.6	2.0	0.7	2.3
August	1.0	3.1	0.4	1.3	0.6	2.0	-	-	0.4	1.2
September	0.9	3.0	0.5	1.7	0.8	2.6	0.9	2.9	0.5	1.6
October	1.0	3.3	0.7	2.2	0.6	1.9	1.1	3.7	0.6	1.9
November	1.1	3.7	0.7	2.3	0.6	1.8	0.8	2.5	0.8	2.5
December	1.6	5.2	1.0	3.1	0.7	2.2	1.3	4.3	1.1	3.7
Annual Mean	1.3	4.1	0.6	2.0	0.7	2.2	1.0	3.1	0.7	2.3

Corporation of London

Month	Site Code CL1 ppb	ug m3	CL2 ppb	ug m3	CL3 ppb	ug m3	CL4 ppb	ug m3	CL5 ppb	ug m3
January	0.7	2.3	0.9	2.9	0.6	1.8	0.7	2.3	0.7	2.4
February	0.6	2.0	0.5	1.7	0.5	1.6	0.5	1.7	0.7	2.2
March	0.5	1.7	0.6	2.1	0.4	1.2	0.4	1.4	0.5	1.6
April	0.5	1.7	0.5	1.6	0.5	1.5	0.4	1.3	0.4	1.4
May	0.5	1.6	0.6	1.8	0.4	1.4	0.5	1.7	0.5	1.6
June	0.3	1.0	0.4	1.3	0.2	0.6	0.2	0.7	0.2	0.6
July	0.3	0.9	0.4	1.2	0.3	0.9	0.3	0.9	0.5	1.5
August	0.4	1.2	0.7	2.2	0.4	1.3	0.4	1.3	0.4	1.4
September	0.4	1.3	0.4	1.4	0.4	1.4	0.4	1.3	0.4	1.3
October	0.4	1.3	0.4	1.3	0.3	1.0	0.4	1.2	0.4	1.4
November	0.4	1.4	0.5	1.7	0.4	1.2	0.4	1.4	0.4	1.2
December	0.5	1.7	0.6	1.8	0.5	1.6	0.6	1.9	0.5	1.6
Annual Mean	0.5	1.5	0.5	1.8	0.4	1.3	0.4	1.4	0.5	1.5

Benzene Concentrations 2004

Corporation of London (continued)

Month	Site Code CL6 ppb	ug m3	CL7 ppb	ug m3	CL8 ppb	ug m3	CL9 ppb	ug m3	CL10 ppb	ug m3
January	0.5	1.5	0.8	2.7	0.9	2.9	0.7	2.3	1.0	3.2
February	0.4	1.3	0.5	1.6	0.6	2.1	0.5	1.7	0.8	2.4
March	0.4	1.4	0.5	1.5	0.5	1.6	0.4	1.4	0.9	2.9
April	0.4	1.2	0.5	1.6	0.7	2.2	0.4	1.3	0.7	2.2
May	0.4	1.3	0.4	1.2	0.5	1.7	0.5	1.7	0.6	2.0
June	0.2	0.8	0.2	0.7	0.4	1.4	0.4	1.2	0.5	1.7
July	0.3	0.8	0.3	1.0	0.5	1.6	0.4	1.2	0.6	2.0
August	0.4	1.2	0.4	1.2	0.5	1.5	0.4	1.2	0.5	1.5
September	0.4	1.4	0.4	1.2	0.8	2.6	0.6	2.1	0.6	2.1
October	0.3	0.9	0.3	1.0	0.6	1.8	0.4	1.3	0.7	2.2
November	0.4	1.2	0.4	1.2	0.5	1.7	0.5	1.5	0.7	2.2
December	0.5	1.7	0.5	1.6	0.6	2.1	0.5	1.5	1.0	3.1
Annual Mean	0.4	1.2	0.4	1.4	0.6	1.9	0.5	1.5	0.7	2.3

London Borough of Greenwich

Month	Site Code GW29 ppb	ug m3	GW33 ppb	ug m3	GW34 ppb	ug m3	GW35 ppb	ug m3	GW39 ppb	ug m3
January	0.8	2.5	0.7	2.2	0.6	1.9	0.9	2.8	0.4	1.2
February	0.8	2.6	1.1	3.6	0.5	1.6	0.9	3.0	0.4	1.2
March	1.0	3.3	1.5	5.0	0.7	2.3	0.7	2.3	0.5	1.7
April	1.1	3.5	0.9	2.8	0.8	2.6	-	-	0.4	1.3
May	0.8	2.6	1.2	3.8	0.7	2.2	1.4	4.6	0.3	1.0
June	0.5	1.8	0.6	2.0	0.3	0.9	0.5	1.8	0.2	0.6
July	0.5	1.6	0.8	2.4	0.5	1.5	0.8	2.6	0.2	0.7
August	0.6	1.9	0.6	2.0	0.3	0.8	-	-	0.2	0.7
September	0.8	2.4	0.6	2.1	0.4	1.3	0.8	2.6	0.4	1.2
October	0.5	1.5	0.7	2.3	0.5	1.5	0.6	2.1	0.3	0.9
November	0.6	2.1	0.9	2.8	0.4	1.3	0.9	3.0	0.4	1.3
December	1.0	3.1	1.2	3.8	0.4	1.4	1.0	3.3	0.6	2.1
Annual Mean	0.7	2.4	0.9	2.9	0.5	1.6	0.9	2.8	0.4	1.2

Benzene Concentrations 2004

London Borough of Greenwich (continued)

Month	Site Code GW41 ppb	ug m3	GW42 ppb	ug m3	GW50 ppb	ug m3	GW51 ppb	ug m3	GW54 ppb	ug m3
January	0.5	1.7	0.5	1.6	0.9	2.9	0.5	1.6	0.6	2.1
February	0.7	2.4	0.8	2.7	1.0	3.1	0.4	1.4	0.5	1.7
March	0.6	1.8	0.7	2.2	0.8	2.5	0.5	1.6	0.7	2.2
April	0.5	1.7	1.0	3.2	1.0	3.4	0.6	2.0	-	-
May	0.5	1.7	0.8	2.5	0.8	2.5	0.5	1.5	0.6	2.0
June	0.4	1.3	0.4	1.3	0.6	2.0	0.4	1.1	0.4	1.3
July	0.4	1.3	0.4	1.4	0.5	1.5	0.4	1.3	0.4	1.3
August	0.4	1.2	0.5	1.5	0.7	2.2	0.0	0.1	0.4	1.3
September	0.5	1.7	0.6	2.0	0.7	2.3	0.4	1.2	0.6	2.1
October	0.5	1.5	0.6	1.9	0.8	2.5	0.4	1.3	-	-
November	0.6	2.0	0.7	2.2	0.9	2.9	0.4	1.3	0.6	2.0
December	0.7	2.3	0.8	2.6	1.2	4.0	0.7	2.2	1.0	3.1
Annual Mean	0.5	1.7	0.6	2.1	0.8	2.6	0.4	1.4	0.6	1.9

Month	Site Code GW55 ppb	ug m3	Site Code GW39b ppb	ug m4	Site Code GW39c ppb	ug m5	Site Code GW39d ppb	ug m6
January	0.4	1.2	-	-	-	-	-	-
February	0.8	2.5	0.4	1.2	0.5	1.5	0.3	1.0
March	0.5	1.6	0.4	1.2	0.3	1.0	0.4	1.3
April	0.5	1.7	0.4	1.2	0.4	1.3	0.4	1.3
May	0.6	2.1	0.4	1.2	0.4	1.3	0.3	0.9
June	0.3	0.9	0.2	0.6	0.1	0.5	0.2	0.7
July	0.2	0.8	0.2	0.6	0.2	0.8	0.2	0.6
August	0.3	0.9	0.2	0.7	0.2	0.6	0.2	0.6
September	0.4	1.2	0.3	0.9	0.3	0.8	0.3	0.9
October	0.4	1.3	0.3	0.9	0.2	0.7	0.3	0.9
November	0.6	1.9	0.4	1.3	0.4	1.2	0.4	1.2
December	0.6	2.0	0.5	1.7	0.4	1.2	-	-
Annual Mean	0.5	1.5	0.3	1.0	0.3	1.0	0.3	0.9

Benzene Concentrations 2004

London Borough of Hammersmith and Fulham

Month	Site Code HM32 ppb	ug m3	HM41 ppb	ug m3	HM44 ppb	ug m3	HM45 ppb	ug m3	HM46 ppb	ug m3
January	0.5	1.8	0.2	0.6	0.3	0.9	0.5	1.6	0.3	0.9
February	0.6	2.1	0.5	1.8	0.5	1.5	0.5	1.6	0.8	2.5
March	0.8	2.5	0.5	1.5	0.3	1.0	-	-	0.7	2.2
April	0.7	2.2	0.4	1.4	0.4	1.2	0.6	1.9	0.4	1.3
May	0.7	2.4	0.4	1.3	0.4	1.2	0.4	1.4	0.5	1.6
June	0.5	1.5	0.2	0.6	0.3	0.8	0.3	0.8	0.3	0.9
July	0.4	1.3	0.3	0.9	0.2	0.7	0.3	0.9	0.3	1.0
August	1.1	3.5	0.6	1.8	0.6	2.0	0.6	1.8	0.6	1.8
September	0.6	1.8	0.3	1.0	0.1	0.5	0.4	1.2	0.3	1.0
October	0.8	2.7	0.4	1.2	0.4	1.2	0.4	1.4	0.4	1.4
November	0.4	1.2	0.4	1.2	0.5	1.6	0.4	1.4	0.5	1.7
December	0.9	2.9	0.5	1.7	0.4	1.2	0.7	2.3	0.8	2.6
Annual Mean	0.7	2.2	0.4	1.2	0.4	1.1	0.5	1.5	0.5	1.6

Month	Site Code HM70 ppb	ug m3	HM71 ppb	ug m3	HM72 ppb	ug m3	HM73 ppb	ug m3
January	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-
April	-	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-	-
June	-	-	-	-	-	-	-	-
July	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-	-
October	0.8	2.7	0.7	2.3	-	-	0.3	1.1
November	0.7	2.3	1.0	3.4	1.1	3.6	0.5	1.6
December	1.3	4.3	1.1	3.6	1.4	4.4	0.8	2.7
Annual Mean	1.0	3.1	1.0	3.1	1.2	4.0	0.5	1.8

Benzene Concentrations 2004

London Borough of Harrow

Month	Site Code HW01 ppb	HW01 ug m3	HW02 ppb	HW02 ug m3	HW03 ppb	HW03 ug m3	HW04 ppb	HW04 ug m3	HW05 ppb	HW05 ug m3
January	0.3	1.0	0.1	0.3	0.3	0.9	0.2	0.6	0.7	2.4
February	0.5	1.8	-	-	0.5	1.5	0.6	1.9	-	-
March	0.4	1.3	0.5	1.7	0.4	1.3	0.7	2.2	0.6	2.1
April	0.5	1.5	0.5	1.5	0.3	1.0	0.6	1.8	0.7	2.3
May	0.3	1.0	0.4	1.3	0.5	1.5	0.4	1.4	0.6	2.0
June	0.3	1.1	0.3	0.9	0.3	1.1	0.5	1.8	0.7	2.4
July	0.2	0.5	0.1	0.4	0.2	0.5	-	-	0.5	1.6
August	0.2	0.8	0.2	0.6	0.2	0.6	-	-	0.5	1.6
September	0.3	1.0	0.2	0.7	0.2	0.7	-	-	0.7	2.2
October	0.8	2.6	0.5	1.5	0.3	0.9	0.5	1.5	0.6	2.0
November	0.3	1.0	0.3	0.9	0.3	0.8	0.5	1.6	0.6	1.9
December	0.6	1.8	0.5	1.6	0.5	1.5	0.7	2.3	0.9	3.0
Annual Mean	0.4	1.3	0.3	1.0	0.3	1.0	0.5	1.7	0.7	2.1

London Borough of Hounslow

Month	Site Code HS BTEX1 ppb	HS BTEX1 ug m3	HS BTEX2 ppb	HS BTEX2 ug m3	HS BTEX3 ppb	HS BTEX3 ug m3	HS BTEX4 ppb	HS BTEX4 ug m3
January	0.4	1.2	0.6	1.8	0.4	1.3	0.4	1.3
February	0.7	2.4	0.5	1.7	0.6	1.8	0.8	2.7
March	0.5	1.7	0.4	1.2	0.7	2.3	0.3	1.0
April	0.6	2.0	0.4	1.3	0.9	2.9	0.7	2.2
May	0.5	1.8	0.4	1.3	0.6	1.9	0.6	2.0
June	0.4	1.3	0.2	0.6	0.4	1.2	0.4	1.2
July	0.3	1.0	0.3	0.9	0.4	1.3	0.3	1.0
August	0.3	1.1	0.2	0.7	0.3	1.1	0.3	1.0
September	0.3	1.0	0.3	1.0	0.4	1.3	0.4	1.4
October	0.3	1.0	0.3	1.0	0.4	1.4	0.4	1.2
November	0.4	1.3	0.3	0.9	0.4	1.4	0.5	1.5
December	-	-	-	-	-	-	-	-
Annual Mean	0.4	1.4	0.3	1.1	0.5	1.6	0.5	1.5

Benzene Concentrations 2004

London Borough of Hounslow (continued)

Month	Site Code HS BTEX5		HS BTEX6		HS BTEX7	
	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.3	1.1	0.7	2.1	0.4	1.2
February	0.6	2.0	0.7	2.2	0.6	2.0
March	0.4	1.4	1.0	3.2	0.5	1.6
April	0.6	1.9	0.8	2.5	0.4	1.1
May	0.5	1.8	0.8	2.5	0.4	1.4
June	0.3	1.1	0.6	2.0	0.2	0.6
July	0.2	0.8	0.6	2.1	0.3	0.8
August	0.3	1.0	0.3	0.9	0.7	2.2
September	0.3	1.0	0.6	2.1	0.3	0.9
October	0.4	1.2	0.3	0.9	0.6	2.1
November	0.3	0.9	0.6	2.1	0.4	1.2
December	-	-	-	-	-	-
Annual Mean	0.4	1.3	0.6	2.1	0.4	1.4

London Borough of Newham

Month	Site Code 1		2		3		4	
	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.4	1.4	0.3	1.0	0.5	1.5	-	-
February	0.6	2.0	0.6	2.0	0.7	2.3	0.7	2.3
March	0.4	1.3	0.5	1.7	0.7	2.3	0.7	2.3
April	0.6	1.9	0.6	2.0	0.5	1.7	0.5	1.6
May	0.2	0.7	0.2	0.6	0.2	0.6	0.2	0.7
June	0.4	1.3	0.3	0.9	0.5	1.5	0.4	1.4
July	0.4	1.2	0.4	1.4	0.3	1.1	0.5	1.6
August	0.2	0.8	0.3	1.1	0.3	1.0	0.4	1.2
September	0.5	1.5	0.4	1.2	0.4	1.3	-	-
October	0.5	1.5	0.4	1.4	0.5	1.5	-	-
November	0.6	1.8	0.5	1.6	0.6	2.0	0.6	1.9
December	0.9	2.8	0.7	2.4	0.9	3.0	0.6	2.1
Annual Mean	0.5	1.5	0.4	1.4	0.5	1.6	0.5	1.7

Benzene Concentrations 2004

London Borough of Newham (continued)

Month	Site Code 5		6		7		8	
	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.2	0.7	0.2	0.6	0.2	0.5	0.2	0.7
February	0.6	1.9	0.4	1.4	0.6	2.0	0.5	1.7
March	0.4	1.3	0.3	1.1	0.4	1.2	0.3	1.0
April	0.4	1.4	0.5	1.5	0.6	2.0	0.4	1.4
May	0.1	0.4	0.1	0.4	0.1	0.5	0.1	0.5
June	0.3	0.8	0.2	0.8	0.2	0.7	0.3	0.9
July	0.3	1.1	0.2	0.6	0.2	0.7	0.1	0.2
August	0.2	0.6	0.3	0.9	0.2	0.8	0.3	1.0
September	0.4	1.3	0.3	1.0	0.3	1.0	0.8	2.7
October	0.3	1.0	0.3	1.0	0.3	0.9	0.4	1.2
November	0.5	1.6	0.3	1.1	0.5	1.5	0.5	1.5
December	0.7	2.3	0.7	2.2	0.7	2.3	0.9	2.8
Annual Mean	0.4	1.2	0.3	1.1	0.4	1.2	0.4	1.3

London Borough of Newham (continued)

Month	Site Code 9		10		11		12	
	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.5	1.6	0.2	0.5	-	-	0.3	1.0
February	0.8	2.7	0.5	1.6	0.5	1.7	0.6	1.9
March	0.6	1.8	0.3	1.0	0.4	1.4	0.4	1.2
April	0.6	2.0	0.4	1.4	0.5	1.5	0.5	1.6
May	-	-	0.1	0.4	0.1	0.5	0.1	0.5
June	-	-	0.3	0.9	0.3	1.1	0.4	1.4
July	-	-	0.2	0.7	0.6	2.0	0.3	1.0
August	-	-	0.2	0.8	0.2	0.8	0.3	1.0
September	-	-	-	-	0.3	1.0	0.3	1.0
October	-	-	0.3	0.9	0.4	1.2	0.4	1.2
November	0.6	2.1	0.4	1.3	0.5	1.6	0.5	1.5
December	0.8	2.5	0.6	1.9	0.5	1.6	0.6	2.1
Annual Mean	0.7	2.1	0.3	1.0	0.4	1.3	0.4	1.3

Benzene Concentrations 2004

London Borough of Newham (continued)

Month	Site Code 13		16		20		21	
	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
February	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
March	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
April	0.9	2.8	1.5	4.9	1.1	3.5	0.8	2.6
May	0.3	0.9	0.3	1.1	0.4	1.2	0.2	0.7
June	0.8	2.5	0.6	1.8	0.7	2.4	0.5	1.6
July	0.8	2.6	0.8	2.6	1.2	3.9	0.4	1.4
August	0.8	2.6	0.7	2.2	0.7	2.2	0.3	1.1
September	0.7	2.3	0.9	2.8	0.7	2.2	0.5	1.5
October	0.7	2.3	0.8	2.5	0.8	2.4	0.5	1.5
November	1.1	3.4	0.8	2.5	1.0	3.3	0.5	1.7
December	1.0	3.4	1.5	4.7	1.3	4.2	0.9	2.9
Annual Mean	0.8	2.5	0.9	2.8	0.9	2.8	0.5	1.7

Royal Borough of Kensington and Chelsea

Month	Site Code KC01		KC02		KC03		KC04		KC05	
	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.6	2.0	0.5	1.5	2.4	7.8	0.5	1.6	0.6	1.9
February	0.8	2.4	0.4	1.3	2.3	7.6	0.5	1.5	-	-
March	0.8	2.5	0.4	1.2	2.5	8.2	0.5	1.5	0.5	1.5
April	0.8	2.7	0.4	1.3	2.4	7.8	0.5	1.5	0.5	1.6
May	0.6	2.0	0.4	1.3	2.4	7.7	0.6	2.0	0.5	1.6
June	0.4	1.2	0.2	0.7	3.5	11.5	0.2	0.8	0.4	1.2
July	0.5	1.5	0.3	0.9	4.4	14.1	0.3	0.9	0.4	1.2
August	0.6	1.9	0.5	1.5	3.6	11.7	0.4	1.3	0.5	1.6
September	0.7	2.2	0.3	0.9	3.1	9.9	0.3	0.9	0.4	1.4
October	0.6	1.9	0.4	1.3	3.5	11.4	0.4	1.2	0.4	1.4
November	0.6	2.0	0.4	1.2	1.5	4.8	0.5	1.6	0.6	1.9
December	0.8	2.6	0.5	1.7	3.4	11.0	0.5	1.7	0.7	2.2
Annual Mean	0.6	2.1	0.4	1.2	2.9	9.5	0.4	1.4	0.5	1.6

Benzene Concentration 2004

London Borough of Richmond

Month	Site Code RUT 2 ppb	ug m3	RUT 36 ppb	ug m3	RUT 35 ppb	ug m3	RUT 7 ppb	ug m3	Rut 32 ppb	ug m3
January	1.0	3.4	1.1	3.7	-	-	0.8	2.4	1.5	4.9
February	0.6	2.0	1.0	3.3	0.9	3.0	1.1	3.6	0.9	2.9
March	0.5	1.6	1.1	3.7	0.6	2.1	0.8	2.6	1.3	4.1
April	0.9	2.8	0.9	2.8	0.6	2.0	1.0	3.1	0.7	2.2
May	1.0	3.3	0.9	3.0	0.7	2.3	0.9	2.8	0.9	2.9
June	0.9	2.8	0.7	2.2	0.6	2.0	0.6	2.1	0.6	1.8
July	0.8	2.5	-	-	0.5	1.7	0.7	2.2	0.6	1.9
August	0.5	1.7	0.8	2.4	0.5	1.7	0.6	2.1	0.6	2.0
September	0.7	2.3	0.8	2.5	0.7	2.1	0.9	2.9	0.7	2.4
October	0.6	1.9	0.7	2.2	0.5	1.5	0.7	2.2	0.7	2.3
November	0.9	2.8	-	-	-	-	-	-	-	-
December	-	-	-	-	1.1	3.4	1.3	4.4	1.5	4.7
Annual Mean	0.8	2.5	0.9	2.9	0.7	2.2	0.8	2.8	0.9	2.9

London Borough of Sutton

Month	Site Code Site 1 ppb	ug m3	Site 2 ppb	ug m3	Site 3 ppb	ug m3	Site 4 ppb	ug m3	Site 5 ppb	ug m3
January	0.8	2.6	0.6	2.0	0.7	2.3	0.9	2.9	0.7	2.4
February	0.6	2.0	0.5	1.8	0.5	1.6	0.6	1.9	0.5	1.8
March	0.5	1.5	0.3	0.9	0.5	1.7	0.4	1.4	0.3	0.9
April	0.6	2.0	0.4	1.2	0.5	1.7	0.5	1.7	0.4	1.3
May	0.5	1.7	0.4	1.2	0.4	1.2	0.5	1.7	0.4	1.4
June	0.5	1.6	0.3	0.9	0.3	1.0	0.4	1.2	0.3	1.0
July	0.4	1.2	0.2	0.6	0.2	0.6	0.3	1.0	0.2	0.6
August	0.4	1.2	0.2	0.7	0.2	0.6	0.2	0.8	0.3	0.9
September	0.4	1.4	0.3	1.0	0.3	1.0	0.5	1.5	0.6	2.0
October	0.4	1.3	0.2	0.7	0.2	0.8	0.4	1.2	0.3	1.0
November	0.6	1.9	0.4	1.2	0.3	1.0	0.4	1.4	0.3	1.0
December	-	-	-	-	-	-	-	-	-	-
Annual Mean	0.5	1.7	0.3	1.1	0.4	1.2	0.5	1.5	0.4	1.3

Benzene Concentrations 2004

City of Westminster

Month	Site Code WS03 ppb	ug m3	WS04 ppb	ug m3	WS07 ppb	ug m3	WS08 ppb	ug m3
January	0.4	1.3	0.5	1.6	0.6	2.1	0.5	1.7
February	0.5	1.6	0.7	2.1	0.7	2.2	0.6	2.0
March	0.4	1.4	0.5	1.5	0.7	2.2	0.7	2.2
April	0.5	1.6	0.6	1.9	0.7	2.4	0.5	1.6
May	0.5	1.7	-	-	0.5	1.7	0.5	1.6
June	0.3	0.9	-	-	0.4	1.2	0.5	1.5
July	0.3	0.9	-	-	0.4	1.5	0.3	1.1
August	0.3	1.0	-	-	0.4	1.4	0.3	1.1
September	0.6	1.9	-	-	0.6	2.0	0.4	1.2
October	-	-	-	-	0.5	1.6	0.4	1.4
November	-	-	-	-	0.6	2.0	0.5	1.5
December	-	-	-	-	0.6	2.0	0.5	1.8
Annual Mean	0.4	1.4	0.5	1.8	0.6	1.9	0.5	1.6

Month	Site Code WS09 ppb	ug m3	WS10 ppb	ug m3
January	0.5	1.7	0.7	2.2
February	0.5	1.5	0.6	1.9
March	0.4	1.3	0.4	1.3
April	0.5	1.7	0.5	1.5
May	0.4	1.3	0.5	1.5
June	0.4	1.2	0.7	2.2
July	0.3	1.1	0.3	0.9
August	0.2	0.6	0.3	0.9
September	0.4	1.2	0.4	1.2
October	0.3	0.9	0.3	1.0
November	0.5	1.6	0.5	1.6
December	0.7	2.2	0.5	1.6
Annual Mean	0.4	1.4	0.5	1.5

Benzene Concentrations 2004

London Borough of Hillingdon

Month	Site Code HD31 ppb	ug m3	HD46 ppb	ug m3	HD48 ppb	ug m3	HD50 ppb	ug m3	HD58 ppb	ug m3
January	0.4	1.3	0.5	1.5	0.6	2.0	0.5	1.7	0.5	1.6
February	0.5	1.5	0.7	2.4	0.7	2.4	0.6	2.1	0.7	2.2
March	0.3	0.9	0.7	2.1	0.6	1.8	0.5	1.5	0.6	1.8
April	0.5	1.6	0.8	2.5	0.5	1.6	0.6	2.0	0.6	1.9
May	0.3	1.0	0.4	1.3	0.4	1.2	0.4	1.2	0.5	1.5
June	0.4	1.4	0.5	1.8	0.5	1.5	0.5	1.6	0.0	0.0
July	0.3	1.0	0.4	1.3	0.4	1.2	0.4	1.2	0.6	1.8
August	0.4	1.3	0.4	1.4	0.5	1.5	0.3	1.1	0.3	0.9
September	0.3	0.9	0.6	1.9	0.4	1.3	0.3	1.0	0.3	1.1
October	0.4	1.2	0.5	1.6	0.5	1.5	0.5	1.5	0.4	1.2
November	0.3	1.1	0.5	1.7	0.4	1.4	0.5	1.6	0.5	1.5
December	0.7	2.3	0.7	2.4	0.9	2.8	0.8	2.7	1.1	3.6
Annual Mean	0.4	1.3	0.6	1.8	0.5	1.7	0.5	1.6	0.5	1.6

London Borough of Hackney

Month	Site Code Cowper rd ppb	ug m3	Green Lane ppb	ug m3	Seven Sis ppb	ug m3	Hack Coll ppb	ug m3	Thorsby St ppb	ug m3
January	-	-	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-
April	1.0	3.4	-	-	1.9	6.1	-	-	-	-
May	0.3	1.1	0.9	2.9	0.6	1.9	0.5	1.5	0.4	1.2
June	0.2	0.8	0.9	3.0	0.5	1.5	0.4	1.2	0.3	1.0
July	-	-	-	-	-	-	-	-	-	-
August	0.4	1.2	0.7	2.2	0.7	2.2	0.4	1.4	0.4	1.2
September	0.6	2.1	0.8	2.5	0.8	2.7	0.5	1.5	0.5	1.6
October	0.3	0.8	0.8	2.6	0.6	2.0	0.5	1.5	0.4	1.4
November	1.1	3.6	-	-	1.1	3.4	0.9	2.9	1.2	3.9
December	0.4	1.2	1.6	5.3	1.1	3.6	0.8	2.5	0.4	1.3
Annual Mean	0.5	1.8	1.0	3.1	0.9	2.9	0.6	1.8	0.5	1.7

Appendix E

Toluene Concentrations (ppb & $\mu g\ m^{-3}$)

Toluene Concentrations (2004)

Royal Borough of Kensington and Chelsea

Month	Site Code KC01 ppb	ug m3	KC02 ppb	ug m3	KC03 ppb	ug m3	KC04 ppb	ug m3	KC05 ppb	ug m3
January	3.3	12.6	2.2	8.5	6.4	24.4	2.3	8.7	1.6	6.3
February	3.1	11.8	1.9	7.3	11.9	45.5	2.2	8.3	-	-
March	4.5	17.2	2.3	8.6	12.5	47.7	2.2	8.5	1.7	6.5
April	6.1	23.3	3.3	12.7	13.2	50.7	4.4	16.9	6.3	24.0
May	3.0	11.6	2.0	7.5	12.1	46.2	13.9	53.3	3.1	11.9
June	4.3	16.3	3.4	13.2	22.8	87.3	4.5	17.3	5.6	21.6
July	3.2	12.4	2.2	8.5	26.7	102.2	2.6	10.1	2.8	10.7
August	3.6	13.6	3.0	11.4	26.9	102.9	2.8	10.7	3.4	13.1
September	3.5	13.5	1.5	5.6	17.7	67.7	1.5	5.7	1.9	7.3
October	3.1	11.8	1.7	6.3	20.6	78.8	1.8	6.8	2.2	8.6
November	3.3	12.6	3.2	12.4	8.4	32.3	2.7	10.5	2.9	11.0
December	3.0	11.5	2.8	10.6	17.2	65.9	2.5	9.7	2.5	9.8
Annual Mean	3.7	14.0	2.4	9.4	16.4	62.6	3.6	13.9	3.1	11.9

Corporation of London

Month	Site Code CL1 ppb	ug m3	CL2 ppb	ug m3	CL3 ppb	ug m3	CL4 ppb	ug m3	CL5 ppb	ug m3
January	1.3	5.1	1.8	6.8	2.3	8.6	1.7	6.4	3.0	11.6
February	2.8	10.6	2.6	10.1	2.2	8.4	2.2	8.4	11.7	45.0
March	2.7	10.3	11.0	42.1	1.6	6.1	2.0	7.8	3.9	14.8
April	1.6	6.2	1.9	7.2	3.2	12.3	3.2	12.3	2.0	7.7
May	3.4	13.1	3.8	14.7	2.0	7.6	7.6	29.1	3.9	14.7
June	4.2	16.2	6.3	24.0	2.6	10.1	3.9	15.1	3.5	13.4
July	3.0	11.4	3.3	12.8	3.5	13.4	2.1	8.2	3.1	12.0
August	2.8	10.6	3.1	12.1	3.1	11.9	1.4	5.5	2.5	9.7
September	2.4	9.3	2.2	8.4	4.0	15.2	2.0	7.6	2.4	9.3
October	2.0	7.6	2.4	9.1	1.9	7.2	2.2	8.3	1.5	5.6
November	2.4	9.0	3.3	12.6	2.2	8.3	2.7	10.4	6.1	23.5
December	3.4	12.9	3.4	12.9	3.1	12.0	3.1	12.0	2.9	11.2
Annual Mean	2.7	10.2	3.8	14.4	2.6	10.1	2.9	10.9	3.9	14.9

Toluene Concentrations (2004)

Corporation of London (continued)

Month	Site Code CL6 ppb	ug m3	CL7 ppb	ug m3	CL8 ppb	ug m3	CL9 ppb	ug m3	CL10 ppb	ug m3
January	1.3	4.8	2.4	9.4	2.6	10.1	1.6	6.2	3.5	13.6
February	2.2	8.4	2.9	11.3	3.0	11.4	2.7	10.4	4.6	17.6
March	6.5	25.1	6.8	25.9	3.1	12.0	8.8	33.5	9.0	34.3
April	4.9	18.6	2.8	10.7	2.6	10.1	1.2	4.6	3.0	11.5
May	2.9	10.9	2.4	9.2	4.1	15.6	4.8	18.6	3.7	14.0
June	4.4	17.0	4.5	17.1	5.4	20.8	6.8	25.9	4.5	17.2
July	2.3	8.9	2.2	8.3	4.3	16.6	4.4	17.0	3.8	14.7
August	2.1	8.2	1.6	6.2	4.0	15.2	3.7	14.3	3.4	12.9
September	2.1	8.0	2.1	8.0	4.5	17.2	2.8	10.6	2.9	11.2
October	1.7	6.4	1.8	6.9	3.8	14.7	3.8	14.6	3.6	13.9
November	2.3	8.8	2.4	9.1	9.0	34.6	8.1	31.1	7.8	30.0
December	3.1	11.8	3.3	12.6	4.0	15.5	5.6	21.4	7.3	28.0
Annual Mean	3.0	11.4	2.9	11.2	4.2	16.1	4.5	17.3	4.8	18.2

London Borough of Hounslow

Month	Site Code HS BTEX1 ppb	ug m3	HS BTEX2 ppb	ug m3	HS BTEX3 ppb	ug m3	HS BTEX4 ppb	ug m3
January	1.5	5.9	2.0	7.8	5.0	19.3	1.6	6.0
February	3.2	12.3	2.2	8.6	2.2	8.5	3.1	11.9
March	3.8	14.4	9.3	35.6	9.9	38.0	4.3	16.4
April	5.1	19.7	2.2	8.4	6.1	23.5	2.8	10.6
May	3.2	12.2	2.1	8.1	2.9	11.2	3.0	11.5
June	4.6	17.7	2.9	11.3	4.3	16.6	5.8	22.2
July	4.0	15.2	5.9	22.7	3.3	12.5	4.3	16.3
August	3.2	12.3	2.2	8.6	2.4	9.0	3.6	13.7
September	1.6	5.9	1.2	4.7	1.7	6.4	1.9	7.2
October	1.4	5.5	1.7	6.7	2.3	8.8	1.9	7.3
November	10.5	40.3	7.8	29.8	6.1	23.2	8.4	32.3
December	-	-	-	-	-	-	-	-
Annual Mean	3.8	14.7	3.6	13.8	4.2	16.1	3.7	14.1

Toluene Concentrations (2004)

London Borough of Hounslow (continued)

Month	Site Code HS BTEX5 ppb	ug m3	HS BTEX6 ppb	ug m3	HS BTEX7 ppb	ug m3
January	1.8	6.9	2.1	8.1	1.5	5.9
February	2.4	9.4	4.2	16.3	11.6	44.3
March	2.6	10.0	4.5	17.4	3.2	12.3
April	6.9	26.3	8.5	32.5	4.8	18.3
May	3.7	14.1	4.1	15.8	3.1	11.9
June	5.9	22.5	7.0	26.9	6.0	23.2
July	4.2	16.2	4.7	18.2	3.2	12.3
August	3.0	11.5	6.9	26.4	10.1	38.9
September	1.2	4.7	2.7	10.3	1.5	5.6
October	1.7	6.5	1.3	5.1	3.0	11.5
November	6.2	23.6	9.2	35.2	11.7	44.9
December	-	-	-	-	-	-
Annual Mean	3.6	13.8	5.0	19.3	5.4	20.8

London Borough of Richmond

Month	Site Code RUT 2 ppb	ug m3	RUT 36 ppb	ug m3	RUT 35 ppb	ug m3	RUT 7 ppb	ug m3	Rut 32 ppb	ug m3
January	4.8	18.2	4.2	15.9	-	-	3.2	12.1	3.8	14.6
February	3.5	13.3	5.6	21.4	4.5	17.3	8.9	34.2	3.6	13.8
March	2.2	8.5	5.5	20.9	8.9	34.1	6.2	23.7	4.9	18.7
April	3.1	11.8	12.3	47.1	6.8	26.2	5.3	20.3	4.1	15.7
May	5.2	19.8	6.0	23.2	3.0	11.6	9.7	37.3	4.1	15.8
June	5.1	19.5	5.1	19.4	2.9	11.1	14.4	55.1	2.8	10.7
July	7.2	27.6	-	-	4.6	17.6	15.4	59.1	1.3	4.8
August	3.7	14.2	4.8	18.4	3.9	14.9	10.9	41.7	3.9	15.0
September	3.9	15.1	5.0	19.0	4.7	17.9	10.1	38.8	2.6	10.1
October	3.0	11.3	3.8	14.4	2.7	10.3	6.5	24.9	3.1	11.9
November	6.5	24.8	-	-	-	-	-	-	-	-
December	-	-	-	-	5.9	22.8	7.0	26.8	8.2	31.6
Annual Mean	4.4	16.7	5.8	22.2	4.8	18.4	8.9	34.0	3.9	14.8

Toluene Concentrations (2004)

London Borough of Sutton

Month	Site Code Site 1 ppb	ug m3	Site 2 ppb	ug m3	Site 3 ppb	ug m3	Site 4 ppb	ug m3	Site 5 ppb	ug m3
January	2.3	8.7	1.7	6.4	2.3	8.8	2.7	10.2	2.4	9.2
February	3.2	12.1	2.3	8.9	3.0	11.6	-	-	2.5	9.6
March	2.4	9.0	1.3	4.9	2.3	9.0	1.9	7.1	2.1	7.9
April	4.9	18.8	5.6	21.6	1.8	6.9	2.1	7.9	2.2	8.3
May	2.6	9.9	1.7	6.5	2.5	9.5	2.8	10.6	3.3	12.5
June	2.9	11.0	2.5	9.5	1.6	6.3	1.7	6.5	2.2	8.3
July	5.9	22.7	4.2	15.9	3.4	12.8	3.5	13.6	3.4	13.0
August	3.4	12.9	2.3	8.9	1.9	7.1	2.2	8.2	1.6	5.9
September	2.0	7.7	1.7	6.4	1.6	6.3	2.4	9.4	2.1	8.0
October	1.6	6.0	2.7	10.2	1.4	5.3	1.3	5.1	1.3	4.9
November	12.2	46.9	10.3	39.4	5.4	20.5	5.0	19.1	7.2	27.4
December	-	-	-	-	-	-	-	-	-	-
Annual Mear	3.9	15.1	3.3	12.6	2.5	9.5	2.6	9.8	2.7	10.5

London Borough of Hackney

Month	Site Code Cowper rd ppb	ug m3	Green Lane ppb	ug m3	Seven Sis ppb	ug m3	Hack Coll ppb	ug m3	Thorsby St ppb	ug m3
January	-	-	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-
April	8.2	31.5	-	-	11.2	42.9	-	-	-	-
May	3.0	11.5	5.2	19.8	3.5	13.4	5.3	20.3	3.0	11.6
June	-	-	6.0	22.9	-	-	5.1	19.7	3.3	12.5
July	-	-	-	-	-	-	-	-	-	-
August	4.5	17.4	6.4	24.4	15.6	59.9	5.1	19.7	4.3	16.5
September	3.9	14.8	5.6	21.4	4.3	16.3	5.0	19.2	4.7	18.0
October	4.3	16.5	4.8	18.3	4.7	18.0	4.2	16.1	3.7	14.0
November	40.5	155.0	-	-	35.3	135.3	21.6	82.9	39.7	152.1
December	2.6	10.1	7.5	28.6	6.1	23.3	5.1	19.6	3.5	13.3
Annual Mean	9.6	36.7	5.9	22.6	11.5	44.2	7.4	28.2	8.9	34.0

Appendix F

Ethyl Benzene Concentrations (ppb & $\mu g\ m^{-3}$)

Ethyl Benzene Concentrations (2004)

Royal Borough of Kensington and Chelsea

Month	Site Code KC01 ppb	ug m3	KC02 ppb	ug m3	KC03 ppb	ug m3	KC04 ppb	ug m3	KC05 ppb	ug m3
January	0.5	2.3	0.4	1.8	1.2	5.1	0.4	1.9	0.4	1.8
February	0.4	1.6	0.2	1.0	1.3	5.6	0.2	1.1	-	-
March	0.4	1.8	0.2	0.7	1.5	6.5	0.2	0.9	0.2	0.7
April	0.5	2.3	0.3	1.2	1.4	6.1	0.3	1.2	0.5	2.2
May	0.4	1.7	0.3	1.1	1.3	5.9	0.7	3.2	0.4	1.6
June	0.3	1.3	0.2	1.0	2.5	11.0	0.3	1.3	0.4	1.7
July	0.3	1.3	0.2	0.7	3.1	13.7	0.3	1.1	0.3	1.1
August	0.4	1.6	0.2	1.1	3.3	14.4	0.2	1.0	0.3	1.5
September	0.5	2.2	0.2	0.9	2.0	8.6	0.2	0.8	0.2	1.1
October	0.4	1.8	0.3	1.2	2.5	11.0	0.2	1.1	0.3	1.3
November	0.4	1.6	0.3	1.3	0.8	3.5	0.4	1.6	0.4	1.6
December	0.4	1.8	0.3	1.3	2.0	8.8	0.3	1.3	0.3	1.4
Annual Mean	0.4	1.8	0.3	1.1	1.9	8.4	0.3	1.4	0.3	1.5

Corporation of London

Month	Site Code CL1 ppb	ug m3	CL2 ppb	ug m3	CL3 ppb	ug m3	CL4 ppb	ug m3	CL5 ppb	ug m3
January	0.4	1.7	0.4	1.9	0.4	1.8	0.4	1.8	0.5	2.2
February	0.3	1.3	0.3	1.2	0.2	1.0	0.2	1.1	0.5	2.1
March	0.3	1.2	0.4	1.6	0.1	0.6	0.2	0.9	0.3	1.2
April	0.3	1.2	0.3	1.2	0.3	1.3	0.2	1.1	0.2	1.0
May	0.5	2.2	0.5	2.4	0.3	1.3	0.5	2.2	0.4	1.9
June	0.3	1.3	0.4	1.9	0.2	0.7	0.2	1.1	2.1	9.5
July	0.3	1.2	0.3	1.2	0.2	1.1	0.2	0.9	1.8	7.9
August	0.2	0.9	0.2	0.7	0.2	0.9	0.1	0.6	1.5	6.7
September	0.3	1.3	0.3	1.2	1.0	4.3	0.2	1.1	0.2	1.1
October	0.3	1.3	0.3	1.3	0.3	1.3	0.3	1.2	0.2	1.1
November	0.3	1.2	0.4	1.6	0.2	1.0	0.3	1.3	0.3	1.5
December	0.4	1.6	0.4	1.6	0.3	1.4	0.4	1.6	0.3	1.3
Annual Mean	0.3	1.4	0.3	1.5	0.3	1.4	0.3	1.2	0.7	3.1

Ethyl Benzene Concentrations 2004

Corporation of London (continued)

Month	Site Code CL6 ppb	ug m3	CL7 ppb	ug m3	CL8 ppb	ug m3	CL9 ppb	ug m3	CL10 ppb	ug m3
January	0.4	1.6	0.4	1.9	0.5	2.2	0.4	1.8	0.6	2.8
February	0.2	1.0	0.3	1.2	0.3	1.5	0.3	1.3	0.4	1.8
March	0.2	0.9	0.2	1.1	0.2	1.1	0.2	1.0	0.6	2.4
April	0.3	1.3	0.3	1.2	0.3	1.5	0.2	0.9	0.6	2.4
May	0.5	2.2	0.3	1.5	0.4	1.9	0.6	2.8	0.5	2.2
June	0.2	1.1	0.3	1.2	0.4	1.7	0.4	1.8	1.5	6.7
July	0.2	0.7	0.2	1.0	0.4	1.7	0.3	1.2	0.5	2.1
August	0.1	0.5	0.2	0.7	0.3	1.3	0.2	0.7	0.4	1.8
September	0.3	1.3	0.3	1.2	0.4	1.6	0.4	1.7	0.4	1.8
October	0.2	1.0	0.2	1.1	0.5	2.3	0.4	1.7	0.5	2.3
November	0.2	1.0	0.3	1.2	0.5	2.3	0.5	2.1	0.6	2.4
December	0.3	1.4	0.4	1.6	0.4	1.8	0.4	1.8	0.8	3.6
Annual Mean	0.3	1.2	0.3	1.2	0.4	1.7	0.4	1.6	0.6	2.7

London Borough of Hounslow

Month	Site Code HS BTEX1 ppb	ug m3	HS BTEX2 ppb	ug m3	HS BTEX3 ppb	ug m3	HS BTEX4 ppb	ug m3
January	0.2	1.1	0.2	1.1	0.2	1.1	0.3	1.2
February	0.4	1.6	0.2	1.1	0.3	1.2	0.4	1.7
March	0.2	1.1	0.1	0.6	0.4	1.6	0.1	0.5
April	0.3	1.5	0.2	0.7	0.6	2.6	0.3	1.2
May	0.5	2.1	0.4	1.6	0.5	2.2	0.5	2.1
June	0.4	1.6	0.2	0.9	0.3	1.5	0.4	1.7
July	0.3	1.2	0.4	1.6	0.3	1.2	0.3	1.3
August	0.2	1.0	0.1	0.7	0.2	0.8	0.2	1.0
September	0.2	0.9	0.2	0.9	0.2	1.0	0.2	1.1
October	0.2	0.7	0.2	0.7	0.2	1.1	0.2	0.9
November	0.5	2.2	0.4	1.6	0.4	1.6	0.4	1.9
December	-	-	-	-	-	-	-	-
Annual Mean	0.3	1.4	0.2	1.0	0.3	1.4	0.3	1.3

Ethyl Benzene Concentrations 2004

London Borough of Hounslow (continued)

Month	Site Code HS BTEX5		HS BTEX6		HS BTEX7	
	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.2	1.0	0.4	1.9	0.2	1.0
February	0.3	1.2	0.4	1.7	0.4	1.7
March	0.1	0.6	0.5	2.1	0.2	0.7
April	0.4	1.8	0.6	2.5	0.2	1.1
May	0.8	3.6	0.8	3.7	0.7	3.1
June	0.4	1.6	0.6	2.6	0.3	1.3
July	0.3	1.2	0.5	2.3	0.3	1.2
August	0.2	0.9	0.2	0.9	0.4	2.0
September	0.2	0.7	0.4	1.7	0.2	0.9
October	0.2	0.8	0.1	0.6	0.4	1.6
November	0.3	1.2	0.6	2.5	0.5	2.3
December	-	-	-	-	-	-
Annual Mean	0.3	1.3	0.5	2.0	0.3	1.5

London Borough of Richmond

Month	Site Code RUT 2		RUT 36		RUT 35		RUT 7		Rut 32	
	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.6	2.7	0.8	3.4	-	-	0.5	2.1	0.7	3.0
February	0.3	1.4	0.5	2.2	0.5	2.1	0.6	2.5	0.4	2.0
March	0.2	0.8	0.6	2.6	0.3	1.5	0.4	1.8	0.6	2.8
April	0.4	1.9	0.5	2.4	0.3	1.4	0.5	2.2	0.4	1.7
May	0.8	3.6	0.8	3.6	0.5	2.3	0.6	2.7	0.7	3.0
June	0.7	3.3	0.6	2.5	0.4	1.8	0.5	2.2	0.4	1.9
July	0.7	3.0	-	-	0.4	1.9	0.5	2.4	0.1	0.2
August	0.4	1.7	0.5	2.2	0.4	1.8	0.4	2.0	0.4	1.8
September	0.5	2.2	0.5	2.0	0.5	2.0	0.6	2.5	0.3	1.3
October	0.4	1.7	0.4	1.8	0.3	1.4	0.4	1.9	0.4	1.9
November	0.4	1.9	-	-	-	-	-	-	-	-
December	-	-	-	-	0.6	2.5	0.7	2.9	0.7	3.3
Annual Mean	0.5	2.2	0.6	2.5	0.4	1.9	0.5	2.3	0.5	2.1

Ethyl Benzene Concentrations 2004

London Borough of Sutton

Month	Site Code Site 1 ppb	ug m3	Site 2 ppb	ug m3	Site 3 ppb	ug m3	Site 4 ppb	ug m3	Site 5 ppb	ug m3
January	0.5	2.2	0.4	1.6	0.4	1.8	0.5	2.1	0.4	1.9
February	0.3	1.4	0.2	1.1	0.3	1.2	0.4	1.7	0.3	1.2
March	0.2	0.7	0.1	0.4	0.2	1.0	0.1	0.6	0.1	0.5
April	0.4	1.8	0.3	1.5	0.2	1.1	0.4	1.6	0.2	0.9
May	0.4	1.8	0.3	1.2	0.3	1.3	0.5	2.1	0.4	1.8
June	3.2	14.2	2.2	9.7	-	-	0.3	1.3	0.3	1.2
July	0.3	1.3	0.2	0.9	0.2	1.1	0.2	1.1	0.2	1.1
August	0.2	1.1	0.2	0.7	0.1	0.6	0.2	0.7	0.1	0.6
September	0.2	1.1	0.2	0.8	0.2	1.0	0.2	1.0	0.3	1.2
October	0.2	0.9	0.2	0.9	0.1	0.6	0.2	0.9	0.2	0.7
November	0.6	2.8	0.5	2.1	0.3	1.3	0.4	1.9	0.3	1.5
December	-	-	-	-	-	-	-	-	-	-
Annual Mear	0.6	2.7	0.4	1.9	0.2	1.1	0.3	1.4	0.3	1.1

London Borough of Hackney

Month	Site Code Cowper rd ppb	ug m3	Green Lane ppb	ug m3	Seven Sis ppb	ug m3	Hack Coll ppb	ug m3	Thorsby St ppb	ug m3
January	-	-	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-
April	0.9	3.9	-	-	1.6	6.8	-	-	-	-
May	0.3	1.1	0.7	2.9	0.4	1.6	0.9	4.2	0.3	1.4
June	1.2	5.1	0.7	3.1	2.3	10.3	0.3	1.5	0.3	1.4
July	-	-	-	-	-	-	-	-	-	-
August	0.5	2.1	0.6	2.9	0.7	3.2	0.5	2.1	0.4	1.7
September	0.3	1.5	0.5	2.4	0.4	1.7	0.4	1.6	0.4	1.8
October	0.1	0.6	0.4	1.8	0.4	1.6	0.3	1.3	0.3	1.1
November	0.7	3.2	-	-	1.0	4.5	0.6	2.6	1.0	4.3
December	0.2	1.1	0.9	3.9	0.7	2.9	0.5	2.3	0.3	1.2
Annual Mean	0.5	2.3	0.6	2.8	0.9	4.1	0.5	2.2	0.4	1.8

Appendix G

m, p-Xylene Concentrations (ppb & $\mu g\ m^{-3}$)

m, p-Xylene Concentrations 2004

Royal Borough of Kensington and Chelsea

Month	Site Code KC01 ppb	ug m3	KC02 ppb	ug m3	KC03 ppb	ug m3	KC04 ppb	ug m3	KC05 ppb	ug m3
January	1.3	5.6	1.0	4.2	2.7	12.0	1.0	4.5	1.0	4.3
February	1.0	4.2	0.5	2.2	4.0	17.7	0.6	2.6	-	-
March	1.2	5.3	0.3	1.5	4.6	20.3	0.4	1.8	0.4	1.7
April	1.2	5.1	0.4	1.6	4.1	17.9	0.4	1.8	0.7	2.9
May	0.9	3.9	0.4	1.9	3.7	16.4	1.3	5.6	0.7	3.2
June	0.7	3.1	0.3	1.4	8.2	36.0	0.6	2.5	0.8	3.7
July	0.8	3.6	0.3	1.1	10.6	46.8	0.6	2.5	0.5	2.4
August	1.1	4.7	0.6	2.7	11.0	48.4	0.5	2.4	0.8	3.6
September	1.4	6.1	0.3	1.5	6.4	28.4	0.3	1.5	0.6	2.7
October	1.1	4.8	0.4	1.9	8.0	35.4	0.5	2.4	0.8	3.3
November	1.0	4.3	0.7	2.9	2.6	11.3	0.8	3.7	0.8	3.6
December	1.1	5.0	0.7	3.1	6.6	29.0	0.8	3.6	0.9	4.1
Annual Mean	1.1	4.6	0.5	2.2	6.0	26.6	0.7	2.9	0.7	3.2

Corporation London

Month	Site Code CL1 ppb	ug m3	CL2 ppb	ug m3	CL3 ppb	ug m3	CL4 ppb	ug m3	CL5 ppb	ug m3
January	1.0	4.2	1.1	4.6	0.9	4.1	0.9	4.1	1.1	4.9
February	0.7	3.3	0.7	3.1	0.5	2.2	0.5	2.4	1.2	5.4
March	0.8	3.4	1.0	4.5	0.3	1.5	0.4	1.8	0.2	1.0
April	0.5	2.2	0.6	2.5	0.5	2.2	0.5	2.0	0.5	2.0
May	0.8	3.7	0.9	3.8	0.5	2.4	0.8	3.5	0.9	4.2
June	0.6	2.8	0.9	4.2	0.3	1.2	0.4	1.8	1.7	7.5
July	0.6	2.5	0.6	2.8	0.5	2.3	0.3	1.5	0.5	2.2
August	0.5	2.1	0.5	2.3	0.7	3.1	0.4	1.6	0.5	2.1
September	0.8	3.3	0.7	3.1	1.4	6.0	0.6	2.5	0.6	2.7
October	0.6	2.7	0.6	2.8	0.6	2.5	0.6	2.7	0.4	1.8
November	0.6	2.8	0.9	4.0	0.5	2.4	0.7	3.2	1.2	5.1
December	1.0	4.5	1.0	4.6	0.8	3.7	0.9	4.0	0.8	3.6
Annual Mean	0.7	3.1	0.8	3.5	0.6	2.8	0.6	2.6	0.8	3.5

m, p-Xylene Concentrations 2004

Corporation of London (continued)

Month	Site Code CL6 ppb	ug m3	CL7 ppb	ug m3	CL8 ppb	ug m3	CL9 ppb	ug m3	CL10 ppb	ug m3
January	0.8	3.7	1.0	4.3	1.2	5.3	1.0	4.4	1.6	6.9
February	0.5	2.3	0.6	2.9	0.9	3.8	0.7	3.1	1.1	4.8
March	0.4	1.9	0.6	2.8	0.7	3.0	0.5	4.0	1.5	6.8
April	0.3	1.5	0.5	2.4	0.6	2.7	0.3	1.2	1.1	4.6
May	0.8	3.6	0.5	2.4	0.9	4.1	1.1	5.0	1.1	5.0
June	0.4	1.7	0.5	2.0	0.9	3.8	0.9	4.2	2.0	8.8
July	0.4	1.6	0.4	1.8	1.1	4.7	0.7	3.1	1.3	5.9
August	0.4	1.9	0.3	1.5	0.9	4.0	0.8	3.4	1.2	5.1
September	0.6	2.9	0.6	2.7	0.8	3.5	0.8	3.7	1.1	5.0
October	0.4	1.9	0.5	2.1	1.1	4.8	1.0	4.3	1.4	6.0
November	0.5	2.3	0.6	2.8	1.9	8.3	1.7	7.4	2.0	8.7
December	1.0	4.3	1.0	4.3	1.2	5.4	1.2	5.3	2.5	11.2
Annual Mean	0.6	2.5	0.6	2.7	1.0	4.4	0.9	4.1	1.5	6.6

London Borough of Hounslow

Month	Site Code HS BTEX1 ppb	ug m3	HS BTEX2 ppb	ug m3	HS BTEX3 ppb	ug m3	HS BTEX4 ppb	ug m3
January	0.7	2.9	0.6	2.8	0.7	3.0	0.7	3.2
February	0.9	4.0	0.6	2.7	0.6	2.8	0.9	4.1
March	0.7	3.1	0.2	1.0	1.0	4.4	0.3	1.2
April	0.7	3.3	0.2	1.0	1.4	6.1	0.6	2.6
May	0.9	3.9	0.6	2.7	0.8	3.6	0.9	4.1
June	0.6	2.7	0.3	1.1	0.5	2.4	0.6	2.8
July	0.5	2.4	0.5	2.0	0.5	2.4	0.5	2.3
August	0.6	2.4	0.2	1.1	0.4	1.8	0.5	2.3
September	0.4	1.9	0.3	1.4	0.4	1.9	0.5	2.2
October	0.4	1.6	0.4	1.7	0.7	2.9	0.5	2.2
November	1.6	7.1	1.3	5.7	1.2	5.3	1.6	7.0
December	-	-	-	-	-	-	-	-
Annual Mean	0.7	3.2	0.5	2.1	0.8	3.3	0.7	3.1

m, p-Xylene Concentrations 2004

London Borough of Hounslow (continued)

Month	Site Code HS BTEX5 ppb	ug m3	HS BTEX6 ppb	ug m3	HS BTEX7 ppb	ug m3
January	0.6	2.7	1.2	5.4	0.6	2.7
February	0.7	2.9	1.0	4.4	0.9	4.1
March	0.3	1.2	1.5	6.5	0.4	1.9
April	0.7	3.2	1.2	5.2	0.3	1.1
May	0.9	3.9	1.4	6.0	0.7	3.2
June	0.6	2.7	1.2	5.5	0.5	2.1
July	0.4	1.9	1.4	6.2	0.4	1.7
August	0.4	1.7	0.4	1.9	1.2	5.4
September	0.3	1.3	1.0	4.2	0.4	1.9
October	0.5	2.0	0.3	1.5	1.1	4.9
November	1.0	4.5	2.0	8.8	2.0	8.9
December	-	-	-	-	-	-
Annual Mean	0.6	2.6	1.1	5.1	0.8	3.4

London Borough of Richmond

Month	Site Code RUT 2 ppb	ug m3	RUT 36 ppb	ug m3	RUT 35 ppb	ug m3	RUT 7 ppb	ug m3	Rut 32 ppb	ug m3
January	1.6	6.9	1.8	8.1	-	-	1.1	5.0	1.7	7.4
February	0.8	3.6	1.4	6.2	1.2	5.5	1.5	6.6	1.1	4.9
March	0.5	2.3	1.8	7.8	0.9	4.1	1.2	5.5	2.0	8.8
April	0.9	4.2	1.3	5.5	0.8	3.6	1.1	4.9	0.8	3.7
May	1.8	8.1	1.8	7.8	1.1	4.9	1.5	6.5	1.6	6.9
June	1.7	7.4	1.4	6.0	1.0	4.5	1.2	5.1	1.0	4.5
July	1.6	7.3	-	-	1.1	4.7	0.5	2.2	0.1	0.5
August	1.1	4.8	1.5	6.6	1.2	5.4	1.3	5.7	1.2	5.5
September	1.3	5.9	1.4	6.3	1.3	5.8	1.5	6.4	0.7	3.0
October	1.0	4.5	1.1	4.7	0.7	3.3	1.2	5.2	1.1	5.0
November	1.4	6.2	-	-	-	-	-	-	-	-
December	-	-	-	-	1.7	7.7	2.0	8.8	2.4	10.5
Annual Mean	1.3	5.6	1.5	6.6	1.1	4.9	1.3	5.6	1.2	5.5

m, p-Xylene Concentrations 2004

London Borough of Sutton

Month	Site Code Site 1 ppb	 ug m3	 Site 2 ppb	 ug m3	 Site 3 ppb	 ug m3	 Site 4 ppb	 ug m3	 Site 5 ppb	 ug m3
January	1.1	5.0	0.8	3.6	1.0	4.2	1.1	4.8	1.0	4.4
February	0.7	3.3	0.5	2.3	0.6	2.7	0.8	3.7	0.6	2.7
March	0.4	1.8	0.1	0.6	0.6	2.7	0.3	1.5	0.2	0.9
April	0.8	3.5	0.4	1.6	0.3	1.5	0.6	2.8	0.3	1.3
May	0.7	3.3	0.4	1.9	0.5	2.3	0.9	3.8	0.6	2.8
June	2.9	12.7	1.6	6.9	-	-	0.6	2.6	0.5	2.0
July	0.6	2.5	0.2	0.9	0.3	1.5	0.4	1.8	0.3	1.5
August	0.7	3.0	0.3	1.5	0.2	1.0	0.3	1.2	0.2	0.9
September	0.6	2.5	0.3	1.5	0.4	1.7	0.5	2.1	0.4	1.7
October	0.5	2.2	0.5	2.2	0.3	1.4	0.3	1.5	0.3	1.1
November	2.4	10.8	1.9	8.2	0.9	4.0	1.5	6.8	1.2	5.1
December	-	-	-	-	-	-	-	-	-	-
Annual Mear	1.0	4.6	0.6	2.8	0.5	2.3	0.7	3.0	0.5	2.2

London Borough of Hackney

Month	Site Code Cowper rd ppb	 ug m3	 Green Lane ppb	 ug m3	 Seven Sis ppb	 ug m3	 Hack Coll ppb	 ug m3	 Thorsby St ppb	 ug m3
January	-	-	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-
April	1.9	8.5	-	-	3.7	16.3	-	-	-	-
May	0.6	2.8	1.7	7.5	1.0	4.2	1.2	5.4	0.8	3.3
June	1.8	7.9	2.2	9.8	2.8	12.2	0.8	3.6	0.7	3.0
July	-	-	-	-	-	-	-	-	-	-
August	1.3	5.8	2.0	8.8	2.2	9.8	1.4	6.2	1.2	5.1
September	0.7	3.0	1.4	6.3	1.0	4.2	1.0	4.3	1.1	4.7
October	0.4	1.6	1.3	5.6	1.1	4.7	0.9	3.8	0.7	3.3
November	2.2	9.7	-	-	3.5	15.2	1.7	7.7	3.4	15.0
December	0.8	3.4	2.6	11.6	2.0	8.6	1.5	6.6	0.9	3.8
Annual Mean	1.2	5.3	1.9	8.3	2.1	9.4	1.2	5.4	1.2	5.4

Appendix H

o-Xylene Concentrations (ppb & $\mu g\ m^{-3}$)

o-Xylene Concentrations 2004

Royal Borough of Kensington and Chelsea

Month	Site Code KC01 ppb	ug m3	KC02 ppb	ug m3	KC03 ppb	ug m3	KC04 ppb	ug m3	KC05 ppb	ug m3
January	0.5	2.1	0.4	1.6	1.2	5.1	0.4	1.8	0.4	1.8
February	0.3	1.5	0.2	0.8	1.4	6.3	0.2	0.9	-	-
March	0.4	1.6	0.1	0.2	1.6	7.1	0.1	0.3	0.1	0.4
April	0.4	1.8	0.1	0.4	1.4	6.3	0.1	0.6	0.2	1.0
May	0.3	1.2	0.1	0.3	1.5	6.5	0.5	2.2	0.2	0.9
June	0.3	1.1	0.1	0.4	2.8	12.6	0.2	1.0	0.3	1.5
July	0.3	1.3	0.1	0.6	3.7	16.4	0.3	1.1	0.2	1.0
August	0.4	1.6	0.2	0.9	3.8	17.0	0.2	0.8	0.3	1.2
September	0.5	2.1	0.1	0.4	2.3	10.0	0.1	0.6	0.2	0.9
October	0.4	1.8	0.2	0.9	2.9	12.7	0.2	1.0	0.3	1.2
November	0.4	1.6	0.2	1.1	0.9	3.8	0.3	1.3	0.3	1.4
December	0.4	1.8	0.2	1.1	2.3	10.1	0.3	1.2	0.3	1.4
Annual Mean	0.4	1.6	0.2	0.7	2.2	9.5	0.2	1.1	0.3	1.2

Corporation of London

Month	Site Code CL1 ppb	ug m3	CL2 ppb	ug m3	CL3 ppb	ug m3	CL4 ppb	ug m3	CL5 ppb	ug m3
January	0.4	1.7	0.4	1.8	0.4	1.6	0.4	1.7	0.4	1.9
February	0.3	1.1	0.2	1.0	0.2	0.8	0.2	0.8	0.4	1.7
March	0.2	1.0	0.3	1.2	0.1	0.2	0.1	0.4	0.7	3.1
April	0.2	0.8	0.2	0.9	0.2	0.7	0.1	0.6	0.1	0.6
May	0.3	1.1	0.3	1.2	0.1	0.6	0.2	1.0	0.3	1.1
June	0.3	1.1	0.4	1.8	0.1	0.4	0.2	0.8	0.5	2.3
July	0.3	1.1	0.3	1.2	0.3	1.1	0.2	0.7	0.3	1.1
August	0.1	0.6	0.2	0.7	0.2	0.8	0.2	0.9	0.2	0.7
September	0.2	1.0	0.2	1.0	0.5	2.2	0.2	0.8	0.2	0.8
October	0.3	1.1	-	-	0.2	1.0	0.3	1.1	0.2	0.8
November	0.2	1.0	0.3	1.4	0.2	0.9	0.3	1.1	0.4	1.6
December	0.3	1.5	0.3	1.5	0.3	1.2	0.3	1.3	0.3	1.2
Annual Mean	0.2	1.1	0.3	1.3	0.2	1.0	0.2	0.9	0.3	1.4

o-Xylene Concentrations 2004

Corporation of London (continued)

Month	Site Code CL6 ppb	ug m3	CL7 ppb	ug m3	CL8 ppb	ug m3	CL9 ppb	ug m3	CL10 ppb	ug m3
January	0.3	1.4	0.4	1.7	0.5	2.1	0.4	1.7	0.6	2.7
February	0.2	0.8	0.2	1.0	0.3	1.3	0.2	1.0	0.4	1.6
March	0.1	0.3	0.2	0.7	0.2	0.7	0.1	0.4	0.5	2.1
April	0.1	0.4	0.2	1.0	0.3	1.2	0.1	0.4	0.4	1.9
May	0.2	0.8	0.1	0.6	0.3	1.3	0.3	1.4	0.4	1.7
June	0.2	0.8	0.2	0.8	0.4	1.6	0.3	1.4	0.7	3.0
July	0.1	0.6	0.2	0.7	0.4	1.9	0.3	1.2	0.5	2.2
August	0.2	0.7	0.2	0.9	0.3	1.3	0.4	1.7	0.2	0.9
September	0.2	0.9	0.2	0.8	0.3	1.2	0.3	1.1	0.4	1.7
October	0.2	0.8	0.2	0.9	0.5	2.2	0.3	1.4	0.5	2.2
November	0.2	0.8	0.2	1.0	0.6	2.6	0.5	2.3	0.6	2.8
December	0.3	1.4	0.3	1.4	0.4	1.9	0.4	1.8	0.9	4.0
Annual Mean	0.2	0.8	0.2	0.9	0.4	1.6	0.3	1.3	0.5	2.2

London Borough of Hounslow

Month	Site Code HS BTEX1 ppb	ug m3	HS BTEX2 ppb	ug m3	HS BTEX3 ppb	ug m3	HS BTEX4 ppb	ug m3
January	0.3	1.1	0.3	1.1	0.3	1.1	0.3	1.2
February	0.3	1.4	0.2	1.0	0.2	1.0	0.3	1.4
March	0.2	0.9	0.0	0.1	0.3	1.3	0.1	0.2
April	0.3	1.3	0.1	0.4	0.5	2.1	0.2	0.9
May	0.3	1.2	0.1	0.6	0.2	1.0	0.3	1.2
June	0.3	1.2	0.1	0.6	0.2	1.0	0.3	1.3
July	0.3	1.3	0.3	1.2	0.2	1.0	0.2	1.0
August	0.2	0.8	0.1	0.4	0.1	0.6	0.2	0.8
September	0.1	0.6	0.1	0.4	0.2	0.7	0.2	0.8
October	0.1	0.4	0.1	0.6	0.2	0.9	0.2	0.7
November	0.5	2.2	0.4	1.7	0.4	1.7	0.5	2.2
December	-	-	-	-	-	-	-	-
Annual Mean	0.3	1.1	0.2	0.7	0.3	1.1	0.2	1.1

o-Xylene Concentrations 2004

London Borough of Hounslow (continued)

Month	Site Code HS BTEX5		HS BTEX6		HS BTEX7	
	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.2	1.1	0.4	1.9	0.2	1.1
February	0.3	1.1	0.4	1.6	0.3	1.5
March	0.1	0.2	0.5	2.1	0.1	0.6
April	0.3	1.1	0.4	1.9	0.1	0.3
May	0.3	1.2	0.5	2.0	0.2	0.9
June	0.3	1.3	0.5	2.2	0.2	1.1
July	0.2	0.8	0.5	2.3	0.2	0.9
August	0.1	0.6	0.2	0.7	0.4	1.9
September	0.1	0.4	0.3	1.5	0.1	0.6
October	0.1	0.6	0.1	0.4	0.4	1.7
November	0.3	1.3	0.6	2.8	0.6	2.7
December	-	-	-	-	-	-
Annual Mean	0.2	0.9	0.4	1.8	0.3	1.2

London Borough of Richmond

Month	Site Code RUT 2		RUT 36		RUT 35		RUT 7		Rut 32	
	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3	ppb	ug m3
January	0.6	2.7	0.7	3.1	-	-	0.5	2.0	0.7	2.9
February	0.3	1.3	0.5	2.0	0.4	1.9	0.5	2.3	0.4	1.8
March	0.2	0.7	0.6	2.6	0.3	1.2	0.4	1.7	0.7	3.0
April	0.3	1.5	0.4	1.9	0.2	1.1	0.4	2.0	0.3	1.3
May	0.7	3.1	0.7	2.9	0.4	1.6	0.5	2.3	0.6	2.4
June	0.6	2.8	0.5	2.3	0.3	1.5	0.4	1.8	0.3	1.5
July	0.8	3.4	-	-	0.4	1.9	1.2	5.3	0.1	0.3
August	0.4	1.7	0.5	2.3	0.4	1.9	0.5	2.0	0.5	2.0
September	0.5	2.1	0.5	2.3	0.6	2.5	0.5	2.4	0.2	1.0
October	0.4	1.8	0.4	1.8	0.3	1.2	0.4	1.9	0.4	1.9
November	0.5	2.2	-	-	-	-	-	-	-	-
December	-	-	-	-	0.6	2.8	0.7	3.2	0.8	3.7
Annual Mean	0.5	2.1	0.5	2.3	0.4	1.7	0.6	2.4	0.5	2.0

o-Xylene Concentrations 2004

London Borough of Sutton

Month	Site Code Site 1 ppb	ug m3	Site 2 ppb	ug m3	Site 3 ppb	ug m3	Site 4 ppb	ug m3	Site 5 ppb	ug m3
January	0.4	1.9	0.3	1.5	0.4	1.7	0.4	1.9	0.4	1.7
February	0.3	1.2	0.2	0.8	0.2	1.0	0.3	1.3	0.2	1.0
March	0.1	0.3	0.0	0.1	0.2	0.9	0.1	0.3	0.0	0.0
April	0.3	1.2	0.1	0.6	0.2	0.7	0.3	1.2	0.1	0.3
May	0.2	0.9	0.1	0.3	0.1	0.6	0.3	1.1	0.2	0.8
June	1.0	4.2	0.4	1.9	0.1	0.4	0.2	0.7	0.1	0.6
July	0.3	1.1	0.1	0.4	0.2	0.7	0.2	0.9	0.2	0.7
August	0.3	1.1	0.1	0.6	0.1	0.3	0.1	0.4	0.1	0.3
September	0.2	0.8	0.1	0.6	0.1	0.6	0.2	0.8	0.1	0.6
October	0.2	0.9	0.2	0.9	0.1	0.6	0.2	0.7	0.1	0.6
November	0.8	3.3	0.6	2.4	0.3	1.3	0.5	2.1	0.3	1.4
December	-	-	-	-	-	-	-	-	-	-
Annual Mear	0.4	1.5	0.2	0.9	0.2	0.8	0.2	1.0	0.2	0.7

London Borough of Hackney

Month	Site Code Cowper rd ppb	ug m3	Green Lane ppb	ug m3	Seven Sis ppb	ug m3	Hack Coll ppb	ug m3	Thorsby St ppb	ug m3
January	-	-	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-
April	0.7	3.0	-	-	1.4	6.4	-	-	-	-
May	0.2	0.7	0.6	2.8	0.3	1.4	0.3	1.2	0.2	1.0
June	0.6	2.8	0.8	3.4	1.0	4.6	0.2	1.0	0.2	0.9
July	-	-	-	-	-	-	-	-	-	-
August	0.8	3.6	0.9	4.2	1.1	4.7	0.8	3.4	0.6	2.7
September	0.2	1.0	0.6	2.5	0.4	1.6	0.4	1.5	0.4	1.7
October	0.1	0.5	0.4	2.0	0.4	1.7	0.3	1.3	0.3	1.1
November	0.7	3.3	-	-	1.1	4.6	0.6	2.6	1.1	4.9
December	0.3	1.2	1.0	4.2	0.7	3.0	0.5	2.2	0.3	1.3
Annual Mean	0.5	2.0	0.7	3.2	0.8	3.5	0.4	1.9	0.4	1.9

Appendix I

Benzene/Toluene Ratios

Borough	Site Code	Site Classification	Annual Benzene Concentration (ppb)	Annual Toluene Concentration (ppb)	Benzene: Toluene
Richmond	RUT 2	Roadside	0.8	4.4	1: 6
	RUT36	Roadside	0.9	5.8	1: 7
	RUT35	Roadside	0.7	4.8	1: 7
	RUT7	Roadside	0.8	8.9	1: 10
	RUT32	Roadside	0.9	3.9	1: 4
Kensington	KC01	Roadside	0.6	3.7	1: 6
	KC02	Background	0.4	2.4	1: 6
	KC03	Roadside/PS	2.9	16.4	1: 6
	KC04	Background	0.4	3.6	1: 9
	KC05	Roadside	0.5	3.1	1: 6
Sutton	1	Roadside	0.5	3.9	1: 8
	2	Background	0.3	3.3	1: 10
	3	Background	0.4	2.5	1: 6
	4	Roadside	0.5	2.6	1: 5
	5	Background	0.4	2.7	1: 7
Hounslow	BTEX 1	Roadside	0.4	3.8	1: 9
	BTEX 2	Roadside	0.3	3.6	1: 10
	BTEX 3	Roadside	0.5	4.2	1: 8
	BTEX 4	Roadside	0.5	3.7	1: 8
	BTEX 5	Background	0.4	3.6	1: 9
	BTEX 6	Roadside	0.6	5.0	1: 8
	BTEX 7	Roadside	0.4	5.4	1: 13
Corporation of	CL1	Roadside	0.5	2.7	1: 6
London	CL2	Roadside	0.5	3.8	1: 7
	CL3	Background	0.4	2.6	1: 7
	CL4	Roadside	0.4	2.9	1: 6
	CL5	Background	0.5	3.9	1: 8
	CL6	Background	0.4	3.0	1: 8
	CL7	Background	0.4	2.9	1: 7
	CL8	Roadside	0.6	4.2	1: 7
	CL9	Background	0.5	4.5	1: 10
	CL10	Roadside	0.7	4.8	1: 7
Hackney	Cowper rd	Background	0.5	9.6	1: 18
	Green Lane	Roadside	1.0	5.9	1: 6
	Seven Sis	Petrol Station	0.9	11.5	1: 13
	Hack College	Roadside	0.6	7.4	1: 13
	Thorsby st	Petrol Station	0.5	8.9	1: 17
Marylebone Road					
	Duplicate 1	Roadside	2.2	16.0	1: 7
	Duplicate 2	Roadside	2.2	15.0	1: 7

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* **Note:** Above ratios are approximated values, calculated using available data which may not be representative of a full year.

Appendix J

Marylebone Road Duplicate BTEX Data

Hydrocarbon Network Comparison, Marylebone Road Duplicate Exposure

Benzene Diffusion Tube Results

Site Code	Date On	Time On	Date Off	Time Off	Conc Tube (ng)	Benzene	Benzene		Toluene	Toluene		Ethyl-benzene	Ethyl-benzene		M+p-Xylene	M+p-Xylene		o-Xylene	o-Xylene
						ppb	ug/m3		ppb	ug/m3		ppb	ug/m3		ppb	ug/m3		ppb	ug/m3
Jan-04	23/12/2003	14:00	30/01/2004	13:35	34	0.4	1.5	170	2.0	7.7	21	0.2	0.9	62	0.6	2.6	22	0.2	0.9
	23/12/2003	14:00	30/01/2004	13:35	53	0.7	2.3	315	3.7	14.3	36	0.4	1.6	115	1.1	4.8	42	0.4	1.7
Feb-04	30/01/2004	13:35	20/02/2004	11:30	27	0.6	2.1	123	2.7	10.2	18	0.3	1.5	0	0.0	0.0	19	0.3	1.4
	30/01/2004	13:35	20/02/2004	11:30	24	0.6	1.9	106	2.3	8.8	15	0.3	1.2	46	0.8	3.5	16	0.3	1.2
Mar-04	04/03/2004	12:20	19/03/2004	14:50	25	0.8	2.7	260	7.8	29.7	16	0.4	1.8	47	1.1	4.9	15	0.4	1.5
	04/03/2004	12:20	19/03/2004	14:50	31	1.0	3.3	272	8.1	31.1	20	0.5	2.3	63	1.5	6.6	21	0.5	2.2
Apr-04	02/04/2004	17:00	16/04/2004	14:25	28	1.0	3.3	127	4.1	15.8	25	0.7	3.1	48	1.2	5.5	23	0.6	2.6
	02/04/2004	17:00	16/04/2004	14:25	29	1.0	3.4	213	6.9	26.5	40	1.1	4.9	59	1.5	6.7	37	0.9	4.1
May-04	07/05/2004	13:45	21/05/2004	15:00	21	0.7	2.4	142	4.6	17.5	272	7.5	32.9	698	17.9	78.8	233	5.8	25.8
	07/05/2004	13:45	21/05/2004	15:00	15	0.5	1.7	80	2.6	9.8	144	4.0	17.4	310	7.9	35.0	95	2.4	10.5
Jun-04	16/06/2004	12:09	28/07/2004	13:23	43	0.5	1.7	296	3.2	12.2	51	0.5	2.1	174	1.5	6.6	66	0.6	2.4
	16/06/2004	12:09	28/07/2004	13:23	36	0.4	1.4	225	2.4	9.2	96	0.9	3.9	169	1.4	6.4	60	0.5	2.2
Jul-04	06/08/2004	15:30	24/08/2004	13:45	26	0.7	2.4	359	9.0	34.6	33	0.7	3.1	93	1.9	8.2	39	0.8	3.4
	06/08/2004	15:30	24/08/2004	13:45	23	0.6	2.1	132	3.3	12.7	21	0.5	2.0	59	1.2	5.2	24	0.5	2.1
Aug-04	06/08/2004	15:30	20/08/2004	13:47	20	0.7	2.3	123	4.0	15.3	18	0.5	2.2	60	1.5	6.8	20	0.5	2.2
	06/08/2004	15:30	20/08/2004	13:47	17	0.6	2.0	132	4.3	16.4	15	0.4	1.8	48	1.2	5.5	17	0.4	1.9
Sep-04	17/09/2004	15:25	02/10/2004	13:30	6	0.2	0.7	49	1.5	5.7	6	0.2	0.7	14	0.3	1.5	5	0.1	0.5
	17/09/2004	15:25	02/10/2004	13:30	16	0.5	1.7	65	2.0	7.5	8	0.2	0.9	13	0.3	1.4	4	0.1	0.4
Oct-04	01/10/2004	14:25	22/10/2004	13:30	30	0.7	2.3	150	3.2	12.4	27	0.5	2.2	85	1.5	6.4	34	0.6	2.5
	01/10/2004	14:25	22/10/2004	13:30	30	0.7	2.3	153	3.3	12.6	24	0.4	1.9	81	1.4	6.1	34	0.6	2.5
Nov-04	05/11/2004	14:10	26/11/2004	15:42	Instrument	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0
	05/11/2004	14:10	26/11/2004	15:42	Failed	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0
Dec-04	26/11/2004	15:40	17/12/2004	14:15	33	0.8	2.6	179	3.9	14.8	25	0.5	2.0	82	1.4	6.2	31	0.5	2.3
	26/11/2004	15:40	17/12/2004	14:15	26	0.6	2.0	146	3.1	12.0	20	0.4	1.6	66	1.1	5.0	25	0.4	1.9